



RIP-WATCH

ANALYSIS OF THE REGIONAL DIMENSIONS OF INVESTMENT IN RESEARCH

CASE STUDY REGIONAL REPORT: NORTH (PORTUGAL)

**Authors: Domingos Santos and Magda Porta,
Instituto de Estudos Sociais e Economicos**

Date: December 2006

ERAWATCH Network asbl: Project management: Logotech S.A., Project team: Instituto de Estudos Sociais e Economicos

Disclaimer: The views expressed are purely those of the authors and may not in any circumstances be regarded as stating an official position of the European Commission.

ERAWATCH® is a registered Trade Mark.

Reproduction of content is authorised provided the source is acknowledged.

© European Communities, 2007.

Website: <http://cordis.europa.eu/erawatch/>

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

OBJECTIVE

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

BACKGROUND

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

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

COVERED REGIONS

Phase 1		Phase 2	
1. Andalusia (ES)	2. Catalonia (ES)	11. Bavaria (DE)	12. Corsica (FR)
3. Carinthia (AT)	4. Crete (EL)	13. Emilia-Romagna (IT)	14. Etelä-Suomi (FI)
5. Dél-Dunántúl (HU)	6. Jihozápad (CZ)	15. Balearic Islands (ES)	16. Lorraine (FR)
7. Norte (PT)	8. Sicily (IT)	17. Midi-Pyrénées (FR)	18. Saxony (DE)
9. Styria (AT)	10. Wielkopolskie (PL)	19. Scotland (UK)	20. Västsverige (SE)

THE REPORTS

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

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

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

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

JRC-IPTS launched the first phase of the activity in June 2006 with the contribution of the ERAWATCH Network. The work has been undertaken between June and December 2006 by a project team led by LOGOTECH S.A. (EL) with the participation of iDeTra (ES), IKU Innovation Research Centre (HU), Institute of Fundamental Technological Sciences of the Polish Academy of Sciences (PL); Instituto de Estudos Sociais e Economicos (PT), Joanneum Research InTeReg (AT), Nomisma (IT), Poznan University of Economics (PL), Technology Centre of the Czech Academy of Sciences (CZ), The Bigger Splash (ES) and Transdanubian Institute of Centre of Regional Studies of Hungarian Academy of Sciences (HU).

A first set of ten regional case study reports is now available on the ERAWATCH web-site at <http://cordis.europa.eu/erawatch/index.cfm?fuseaction=intService.home>

The second phase of the activity was launched in December 2006. A second set of ten regional case study reports and a synthesis report are expected to be available on the ERAWATCH web-site by October 2007.

Table of Contents

1	INTRODUCTION	1
2	REGIONAL KNOWLEDGE BASE	2
2.1	Description of the regional knowledge base	2
2.1.1	Knowledge creation capacity	2
2.1.2	Knowledge dissemination capacity	5
2.1.3	Knowledge absorption capacity	6
2.2	Policy context	6
2.2.1	Policy framework and actors	6
2.2.2	Policy objectives and instruments	7
3.	THE ECONOMIC STRUCTURE OF THE NORTH REGION	15
3.1	Description of the economic structure	15
3.1.1	Characteristics of the economy	15
3.1.2	Systemic characteristics of the region	16
3.1.3	The regional economy in the international context	18
3.2	Policy context	19
3.2.1	Governance structure and actors	19
3.2.2	Policy Objectives and instruments	19
4.	CONCLUSIONS	25
4.1	Assessment of the RIS	25
4.2	Assessment of policies	28
4.3	Challenges and trends in the knowledge economy	30
	BIBLIOGRAPHY	35
	ANNEXES	36
	ANNEX 1: DEFINITION OF POLICY MIX TYPOLOGY	36
	ANNEX 2: DESCRIPTION OF KEY INDICATORS USED IN THE SUMMARY GRAPHS	38
	ANNEX 3: TABLES AND FIGURES	40
	ANNEX 4: DESCRIPTION OF THE STRUCTURE OF PROGRAMMES FINANCIALLY SUPPORTED BY THE EUROPEAN UNION, IMPLEMENTED IN PORTUGAL AND IN THE NORTH REGION	81

EXHIBITS

Exhibit 1: RTDI policy mix affecting the region	10
Exhibit 2: Effects of policies complementary to RTDI instruments on R&D and innovation capacity of the region	21
Exhibit 3: Strengths and weaknesses of the regional economy	24
Exhibit 4: Strengths and weaknesses of the regional innovation system	27
Exhibit 5: Matching of knowledge and economic specialisation	30
Exhibit 6: Identification of policy challenges	33
Summary Graph 1: Key indicators on North Region's knowledge base development in comparison with Portugal	13
Summary Graph 2: Key indicators on the North Region's economic structure and development – in comparison with Portugal	23

ANNEXES TO THE CASE STUDY REPORT

Annex 1	Definition of policy mix typology
Annex 2	Description of key indicators used in the summary graphs
Annex 3	Tables and Figures
Annex 4	Description of the structure of programmes financially supported by the European Union, implemented in Portugal and in the North Region

Abbreviations

MC	Management Committee
PM	Project Management
TOR	Terms of Reference
ANBERD	Analytical Business Enterprise Research and Development Database
BERD	Expenditure on R&D in the business enterprise sector
EPO	European Patent Office
GBAORD	Government budget appropriations or outlays for R&D
GDP	Gross domestic product (cp – current prices)
GERD	Gross Domestic Expenditure on R&D
GUF	General university funds
HERD	Expenditure on R&D in the higher education sector
ISIC	International standard industrial classification
IPTS	Institute of prospective Studies, Seville, Spain
NACE	Nomenclature Générale des Activités Economiques dans les Communautés Européenes
N.E.C	Not elsewhere classified
PPP	Purchasing Power Parity

1 Introduction

This Case Study is intended to contribute to policy learning through better understanding of successes and failures in regional RTDI policies in the North Region's innovation system and economic contexts. For this purpose it focuses on an analysis of statistical and documentary information, responding to the objectives set out in the Technical Specifications, namely to:

- identify trends with regard to R&D and innovation in the North Region;
- identify key research and innovation policy issues which are relevant for improving the technological performance and the knowledge creation and absorption capacities of the economy of the North Region; and
- focus on R&D and innovation policy challenges, successes and failures, conflicts and synergies, between different policies at the overall policy level.

In sum, it seeks to show what the North Region research policy is, and what instruments are available to improve the performance of the regional economy and its innovation system.

The North Region is positioned in an area frequently designated as the Atlantic Arch. It is a region with clear contrasts between the high/medium level of development in the urban centres on the coast and the medium/low level of development in the rural interior.

The region covers an area of 21,289 sq. km, almost 23% of Portugal's total area. It accounts for 36% of the resident population (2001 data), about 28% of gross domestic product (GDP) and almost 37% of employment (2004 data). The region's economy is based on traditional industries (textiles, shoes, timber and cork) and made up mostly of small and medium-sized businesses. Annex 1 shows some of the more significant social and economic indicators.

In social and economic terms, the most negative indicators are GDP and the unemployment rate:

- ↳ In current price terms, and compared to the Portuguese average, GDP declined slightly between 1995 (85%) and 2003 (79%). Performance is similar when weighed against the European average (EU 25), having declined from 63.8% in 1995 to 57.4% in 2004.
- ↳ The unemployment rate has been increasing: at the end of 2001 it was 3.6%. This rose to 9% at the end of 2005, a negative performance which closely matches unemployment rates for Portugal as a whole.

On the other hand, other regional indicators have performed much better, particularly the following:

- ↳ The number of students enrolled in Higher Education has increased in the past few years: from 97,000 in 1995/1996 to 117,000 in 2004/2005.
- ↳ Per capita GDP has increased slightly: from 9.1 (EUR '000) in 2000 to 9.9 in 2003.
- ↳ There have been significant increases in research and development (R&D) expenditure: in 2003 R&D expenditure in the North Region represented 0.64% of GDP. This is still considerably lower than the European average (1.90%).

2 Regional knowledge base

This chapter provides a description and an analytical discussion of the main characteristics of the North Region's knowledge base, focusing mainly on aspects related to regional knowledge creation and its absorption and transmission mechanisms. Quantitative and qualitative indicators are used to support this analysis.

2.1 Description of the regional knowledge base

2.1.1 Knowledge creation capacity¹

The main R&D activities in the NR are concentrated in the Porto metropolitan area – Porto University being the largest higher education establishment in Portugal, with approximately 40,000 students. It is also the largest centre for Science and Technology (S&T) in the country. This is mainly due to strong investment in R&D infrastructure, which has emphasized that district's central role.

There are two main R&D fields in the Porto area, based on the human and financial resources involved: *Health Sciences* and *Technology and Engineering Sciences*. The main organizations in these areas are the following:

- IBMC – Institute for Molecular and Cellular Biology;
- IPATIMUP – Institute for Pathology and Molecular Immunology of Porto University;
- INESC – Porto Branch of the Institute for Systems and Computer Engineering; and
- INEGI – Institute for Mechanical and Industrial Engineering.

More recently, some new scientific and technological centres have emerged, particularly in the Braga-Guimarães area. The Minho University, which has campuses in both cities, played a decisive and dynamic role in developing new knowledge and innovation centres.

These two centres already contain a significant number of institutes dedicated to R&D:

- *University of the Minho* (Braga): IBQF – Institute for Biotechnology and Pure Chemistry; and IMAT – Institute for Materials;
- *Trás-os-Montes and Alto Douro University* (Vila Real): ICETA – Institute for Science and Agrarian Technology and Agri-food.

The development of advanced scientific research skills has been based on public funding, mainly taken up by the Porto and Minho universities. This sector suffers from known weaknesses in the Portuguese national research system, namely: a very broadly-defined spectrum of activities; poor demarcation of state and business roles; inability to co-operate effectively; etc. Despite these drawbacks, some research centres in the universities, which are internationally recognized, have used these resources to positive advantage.

Despite the development of advanced skills in scientific research and increases in R&D expenditure, R&D accounted for no more than 0.64% of GDP in 2003 - a lower percentage than the national values (0.74%) and far lower than the European average (1.9%).

Analysing R&D expenditure in the NR over the years, sector by sector, it is noticeable that the largest sector in 1995 was Higher Education, with 49.6% of total R&D expenditure. Much lower down we find the business sector, with little research undertaken. As can be seen in the table below, this situation has changed over the years. Business has now caught up: in 2003, it accounted for 41.2% of R&D expenditure, and the Higher Education sector 38.5%.

¹ Cf. More detailed statistical information in Annex 3: Tables and Figures (Tables 6 to 32)

Table 1: R&D expenditure by type of organisation

(EUR '000)

Execution Sectors	R&D expenditure			
	1995	1999	2001	2003
Businesses	22,409.1	50,070.0	58,196.8	112,821.8
Public Research Centres	8,922.5	12,221.4	11,098.9	11,214.7
Higher Education	46,869.2	81,039.4	105,144.3	105,464.2
Non profit Private Institutions	16,344.2	26,194.1	38,180.4	44,112.6
Total Region	94,545.1	169,524.8	212,620.4	273,613.2

Sources: R&D Survey, Observatory of Science and Higher Education (Ministry of Science, Technology and Higher Education); OCDE, Principaux Indicateurs de la Science et de la Technologie, 2002(2) - Base de données

In terms of R&D expenditure by type of research, over the last eight years the business sector has become increasingly significant:

- 1995: the majority of funds were concentrated in Applied Research (44.4%). Expenditure on Experimental Development accounted for 28.7% of the total amount involved in R&D;
- 2003: Experimental Development activities accounted for 40.7% of total R&D expenditure, while Applied Research accounted for 35.4%.

This group of organisations comprises a large number of R&D institutions (some with an excellent scientific reputation). In 2003, the North Region had the highest proportion of R&D personnel in the country - about one-fifth of all personnel involved in R&D activities.

Most researchers work in higher education (51.0%) and the business sector (25.1%), and come from an academic background. Compared to the national average, the region has a higher proportion of R&D personnel working in the business sector. This is a positive factor in any comparison with other Portuguese administrative regions.

Table 2: Total personnel in R&D activities by sector

Sectors	Total Personnel			
	1995	1999	2001	2003
Businesses ^{a)}	1,242	2,020	1,985	2,846
Public Research Centres	553	1,151	1,090	855
Higher Education	3,265	4,319	4,517	5,771
Non profit Private Institutions	831	1,398	1,508	1,851
Total	5,891	8,888	9,100	11,323

Source: Observatory of Science and Higher Education (Ministry of Science, Technology and Higher Education)

NOTE: a) the number of people in the corporate sector is estimated on the basis of the percentage distribution of total corporate R&D expenditure by different locations in the region.

Nevertheless, overall numbers in R&D are very low – only about 0.17% of the resident population and 0.33% of the working population, although the core scientific entities have been trying to recruit more researchers in all sectors.

On a full-time equivalent basis, most researchers work in the public sector (in 2003, universities and public research centres jointly accounted for 53.5% of all R&D personnel). Higher Education had the highest numbers (65%) which, combined with the number of doctorates, demonstrates how well-qualified they are. In the private sector, most researchers work part-time.

Table 3: R&D personnel (Full-Time Equivalent), 2003

Year	R&D units	Total	Sector of performance			
			Business enterprises	Public Research Centres	Higher education	Non-profit private institutions
2001	NA	4,961	1,078	438	2,433	1,012
2003	637	6,315	1,684	398	2,978	1,255

Source: R&D Survey, Observatory of Science and Higher Education (Ministry of Science, Technology and Higher Education), in INE, *Anuário Estatístico da Região North*, 2004

In the scientific field, most researchers are to be found in the Human and Social Sciences (30.3% in 2003). In the eight-year period from 1995 to 2003, Human and Social Sciences was the fastest-growing field, with numbers almost tripling – from 934 in 1995 to 2.566 in 2003. In second and third place in 2003 were the Engineering and Technological Sciences, with 23.8%, and the Natural Sciences, with 20.3%.

In the same period (1995-2003), funding for R&D activities mainly came directly from the central government (53.4%) indicating that, in spite of the increasing role of private funding, R&D activities remain essentially a publicly funded activity.

An overview of innovative activities can be created based on patent applications. The table below shows how patent applications followed the national pattern but that, when compared to EU statistics, levels of invention (and consequently innovation), they were very low.

This situation is, in part, due to the low levels of employment in knowledge intensive services and medium/high technology compared to the European average. In this respect, the relative position of the NR is also low as far as technological capital and innovation are concerned.

Table 4: Patent applications per million Euro of Regional GDP

Years	Patent applications (Regional level)			Patent applications (National level)		
	GDP*	North Region	by million euros	GDP*	Total National	by million euros
1995	24,289	17	0.0007	80,827	81	0.0010
1996	25,910	13	0.0005	86,230	83	0.0010
1997	27,449	20	0.0007	93,014	71	0.0008
1998	29,484	22	0.0007	100,962	93	0.0009
1999	31,448	22	0.0007	108,030	81	0.0007
2000	33,178	23	0.0007	115,548	82	0.0007
2001	34,802	26	0.0007	122,550	107	0.0009
2002	36,445	28	0.0008	128,458	130	0.0010
2003	36,557	37	0.0010	130,511	126	0.0010

Source: INPI – National Institute of Industrial Property.

*millions of euros

In terms of the number of publications by scientific field, in 2003, over half came from two main fields – Life Sciences (33.3%) and Physical, Chemical and Earth Sciences (21.4%).

2.1.2 Knowledge dissemination capacity

The NR has six universities, three of them (Porto, Minho and Trás-os-Montes and Alto Douro) being the most important ones in the public sector; four regionally well-established Polytechnic Institutes; six Technology Centres² (including main and satellite units), which are part of the national technology system (Textile and Clothing; Shoes; Cork; Metallurgy; Moulds, Specialized Tools and Plastics; Ornamental and Industrial Gemstones); five Technology Transfer Centres³ (IDITE, AESBUC, ISQ, PIEP); and four New Technology Institutes⁴ (IDIT, ICTPOL, INEGI, INESC Porto). In addition, the NR contains a large number of Research Centres (mostly in the universities) and Laboratories. It also has vocational training centres linked to sectors with strong roots in the region (timber and furniture, footwear,...).

In the regional network Technology Centres play a key role, as they have well-established relationships with the productive economy. In many cases they provide the best access to R&D opportunities for small and medium-sized businesses.

In addition to these organisations, all three public universities have offices dedicated to promoting industrial property. Recently (in 2006) the Innovation Agency approved the implementation of Knowledge and Technology Transfer Offices, with support from the POC_C Program. The idea behind these organisations is to professionalise them, providing the universities with new opportunities for developing innovation.

The NR also has two Science and Technology Parks:

- Tecmaia – situated in the town of Maia, in the Porto metropolitan area. This S&T infrastructure opened in 1999 and involves many local, regional and national actors. The majority share of the starting capital was provided by the local authority (51%), the remainder deriving from various institutions, such as Apiparques (the operational arm of the Portuguese Investment Agency for managing business parks – 17%), IAPMEI (the national body which coordinates support for SMEs – 8.8%), and other minority partners such as ANJE (National Young Businessmen's Association – 0.1%).

Tecmaia has had a big impact on regional economic and social performance. Its 10,000 sq. metres are home to 34 businesses active in new technology and production (24% of the firms belong to the Information and Technology Sector; 23% to the Electronics and Communication Sector; and 13% are related to public or cooperative R&D organisations).

- Avepark, situated near Guimarães, will open in March 2007. This infrastructure is the result of a partnership between the local authority and the Minho University, involving an investment of 9 million Euros, of which 4 million Euros were co-financed by the Operational Programme for the Economy.

² **Technology Centres:** those best suited to providing technical and quality support to companies in each sector.

³ **Centres for Technology Transfer:** are multi-sectoral, disseminating new technologies to businesses, mainly in strategic innovation areas.

IDITE – Minho Institute for Development and Technological Innovation;
AESBUC – Association for the Higher College of Botechnology of the Catholic University;
ISQ – Institute for Quality Inspection and Testing; CVR – Centre for Waste Management; and
PIEP – Innovation for Polymer Engineering.

⁴ **Institute for New Technologies:** promotes effective links between research and production.

IDIT – Institute for Development and Technological Innovation;
ICTPOL – Institute of Science and Technology of Polymer;
INEGI – Institute of Mechanical Engineering and Industrial Management;
INESC – Institute of Systems and Computer Engineering.

It is worth mentioning that, due to the importance and pioneering characteristics of Avepark, in February 2006 the European Union - through its Community Support Programme for Scientific and Technological Research, - decided to make the Minho University the headquarters for the European Institute of Excellence in Fabric Engineering and Regenerative Medicine. The Institute will be built at Avepark, at an initial cost of five million Euros, to be funded by the EU during the first ten years, plus an annual budget of five million Euros. In terms of employment, this project is expected to provide work for about 400 people (including 150 researchers). The Avepark will also include a technological incubator as one of its strategic infrastructures.

2.1.3 Knowledge absorption capacity⁵

In the sphere of education, the North Region's performance is one of the worst in the EU25, since about half of the population between the ages of 25 and 64 have no more than the first level of basic schooling (4 years). However, although there is still a high rate of illiteracy, and many leave school early, considerable progress has been made in improving the resident population's skills and qualifications over the past few years. This educational attainment profile suggests there are some problems with knowledge absorption capacity and the potential for adapting to technological change. This is a constant challenge for modern economies.

From 1998 to 2004, the number of higher education degrees awarded rose substantially, by 56%, from 14,466 in 1998 to 22,508 in 2004. The national increase for the same period was 48%. Social Sciences, Commerce and Law (25.2%), as well as Education (20.1%), account for the bulk of these increases, while Engineering accounts for 14.2% and Sciences, Mathematics and Computing for only 6.3%. Another relevant factor is the trend observed in these two particular S&T areas. There was a slight drop in their relative importance over the period: Sciences, Mathematics and Informatics went down from 6.8% to 6.3% and Engineering from 14.6% to 14.2%.

Over the same period (1998 to 2004), the number of PhDs went up from 114 to 275, generally in line with the corresponding national growth rate.

This brief description of human resources, bearing in mind the region's productive specialisation, illustrates the types of knowledge absorption capacity problems the region faces in the field of Research, Development and Innovation.

2.2 Policy context

2.2.1 Policy framework and actors

There is no consolidated national RDI policy with a regional base, nor is there a regional policy focused specifically on what is needed to promote research and innovation. The policy measures undertaken in these areas almost always come from central government – RTDI governance in Portugal is centrally run. There is little coordination between the various stakeholders. Funding for R&D comes mainly from the Structural Funds and the central government Investment Plan.

The state body responsible for supporting and funding the scientific community is the Science and Technology Foundation (FCT), located in Lisbon. Its overall budget for 1995 was 281 million Euros.

⁵ Cf. More detailed statistical information in Annex 3: Tables and Figures (Tables 39 to 43)

The Innovation Agency (AdI) is also a key player, functioning as a one-stop shop for R&D programmes. Its main objective is to promote innovation and technological development and thereby strengthen relationships between the research world and Portuguese businesses.

In this context several national initiatives were launched to improve R&D levels in the corporate sector. These are yet to be fully assessed:

- IDEIA Programme – supports R&D in state-corporate joint ventures;
- NEST – supports the formation of new technology-based companies;
- DEMTEC – supports pilot innovative technology projects in companies;
- SIME Innovation – encourages innovation strategies;
- Doctorate Grants for companies – promotes R&D in key business areas;
- SIFIDE – provides fiscal incentives to business;
- NITEC – supports the setting up of in-house R&D teams.

There is one exception to the rule on national/regional policies. The North Region has its own Programme for Innovative Actions, known as NORTINOV. This Programme was approved (by Decision C(2001) 4350 of 27 December 2001) and co-financed by the European Commission under the ERDF (European Regional Development Fund). The decision-making process is in the hands of the North Region Coordination and Development Commission (CCDRN), which is the programme's management and payment authority.

The Commission is a department of the Ministry of Planning, Equipment and Territorial Administration and has been playing an increasingly important role in the management of ERDF funding programmes. It is responsible for co-ordination between regional development funding projects and government departments. The CCDRN promotes and co-ordinates several technical, financial and administrative support programmes at the regional level. The major objective of the CCRN is to establish a close dialogue between government, local bodies and the private sector.

We should also mention COTEC, an association of businesses (now with over 100 members), established in 2003 under Portuguese chairmanship. COTEC is a significant actor because (i) it operates in the Research & Technological Development & Innovation (RTDI) environment by implementing a culture of innovation and disseminating knowledge generated by the national scientific and technological systems; and (ii) it contributes to the formulation of RTDI policy, which, together with the public sector, helps to increase business competitiveness.

This innovation agency is based near Porto (Feira), the capital of the North Region. It is hoped that its role as an interface between institutions generating knowledge and companies with the capacity to absorb that knowledge will favourably impact the innovation system in the region and in the country as a whole.

2.2.2 Policy objectives and instruments

In Portugal all policies which promote R&D and innovation are covered by a large "umbrella" programme, the so-called **Technological Plan**. This is basically a political instrument designed to integrate and cross-reference innovation policies in all of Portugal's regions. Its four main objectives are:

- to transform Portugal into an information society;
- to provide a new impetus to innovation;
- to overcome backwardness in S&T; and
- to improve employees' skills and qualifications.

The political setting and the policy mix for innovation is thus basically defined by measures which are national in scope. Portugal is not formally divided into regions. Measures of a specifically regional nature, for example the allocation of funds, are generally marginal in relation to national measures.

Measures implemented through the Operational Programme for the Economy (OPE) for 2000-2006 have helped to strengthen supply factors (modernisation of plant and equipment, consolidation of production facilities), rather than to improve business organization in terms of innovation and R&D.

It should be emphasised that the OPE is specifically designed to raise productivity levels (11 of its 12 measures are clearly intended to achieve this objective). Promoting innovation based on R&D is therefore only a secondary aim of this programme.

Because this programme was the most important structural policy instrument for aid to manufacturing (it accounted for 24% of the total amount of the Third Portuguese CSF) and since almost half of its funding was allocated to the NR, there is a feeling that an opportunity to promote R&D and innovation was lost here. In fact, its clear orientation towards higher productivity meant that business strategy initiatives remained at their earlier low levels. This suggests that there is a clear need to re-assess prevailing ideas on the formulation of industrial policy.

On the other hand, one of the priority areas in the Science, Technology and Innovation Operational Programme for the period 2000-06 was the development of RDTI. It comprised three measures:

1. Developing a modern network of R&D institutions (ERDF).
2. Establishing a coherent matrix of scientific facilities (ERDF).
3. Promoting scientific production, technological development and innovation (ERDF).

The Programme distributed 39.6% of its total allocation of 931,000,000 Euros to the NR. Its most visible achievement in the region was the creation of a National Institute for Biomedical Innovation, in Porto, the functions of which are to fund, assess and encourage R&D activities in this specific area.

NORTINOV is the exception in that it covers only the North region. This programme focuses basically on promoting technology-based entrepreneurship by developing interaction between technology supply and demand and launching *spin-offs* in conjunction with companies, universities, R&D centres, technology infrastructures and financial entities. It has two main objectives:

- ↳ to draw up a regional innovation strategy for the automotive, information, communication and electronic technology sectors, and to encourage *spin-offs*;
- ↳ to put into practice a network which induces drag effects in the overall entrepreneurial structure and which is self-sustaining over time, along with the emergence of innovative and dynamic entrepreneurial initiatives in sectoral and regional clusters.

Because of its limited financial resources (its overall budget comes to 2,526,491 Euros) the underlying idea of NORTINOV is to develop an exploratory/pilot programme aimed at establishing the embryo phase of the regional innovation system. NORTINOV focuses on starting, encouraging and developing value chains and cluster strategies in science and technology-intensive sectors. However, initiatives in the North Region have tended to be diverted to specific aspects and sectors considered relevant to the region and to cases where it is assumed that there is a gap not covered by central government measures.

In this context, NORTINOV, together with the Innovation Agency, supports an exhibition for Venture Capital Ideas, to which 157 projects were submitted. Of those, 30 were chosen as being innovative. The chosen projects were afterwards channelled to and supported within the NEST initiative (new technology-based companies). We should also mention projects such as the *Network for the Automotive and Information and Communication Technology (ICT) Industries*, which were exploratory in nature but clearly constituted an attempt to encourage networking and clustering in emerging productive sectors.

Grants for R&D projects implemented in universities and other public research organisations are allocated by the Science and Technology Foundation (FCT) at the national level.

Innovation policy in Portugal has different priorities from those in other Member States. Initiatives linked to fostering a culture of innovation are favoured over those which encourage links between research and innovation. This suggests there is a need to redefine the priorities of national innovation policy (which is reflected in the NEST and IDEA programmes).

Policy measures have generally been formulated in the light of the underlying aim of increasing technology transfers. This is reflected in the transition from OPIS (Operational Programme for the Information Society) to POS_C (Operational Programme for the Knowledge Society) and, in particular, from OPSTI (Operational Programme for Science, Technology and Innovation) to POSI 2010 (Operational Programme for Science and Innovation 2010).

An interesting policy measure within the Technological Plan is the placement of young graduates (INOV_JOVEM) in small and medium-sized businesses. The objective is to increase the levels of Technology and Knowledge absorption in S&T, economics and management. The Technological Plan also includes measures aimed at:

- ↳ improving coordination between entities which are part of the innovation system;
- ↳ creating fiscal incentives for R&D activities;
- ↳ setting up venture capital funds;
- ↳ setting up a specific fund for S&T development.

Two bodies have been set up in the intellectual property field: the ISUIP – Incentive System for the Use of Industrial Property - and the GAPI – Office for Support and Promotion of Industrial Property. Their purpose was to provide information and support on industrial property through liaison offices located in universities, R&D centres, business associations, etc., and to develop the ability to respond to the challenges of *intellectual capitalism*⁶, based on R&D protection through patents.

⁶ The most important challenge is to develop the necessary organisational platform for social capital, on which intellectual capital can grow. Business leaders wanting to capitalise on their organisation's intellectual assets must develop the culture of their organisation.

Exhibit 1: RTDI policy mix affecting the region

Policy Areas	Policy objectives and instruments at EU level affecting the region	Policy objectives and instruments at National* level affecting the region	Policy objectives and instruments at Regional* level
Improve innovation and R&D governance	NORTINOV – Innovating Actions for the North Region	Innovation Agency: one-stop shop for R&D programmes. Introduction of mechanisms at universities and laboratories that reward the results of researchers' participation and improve their mobility.	Implementation of NORTINOV
Creation of an innovation and business-friendly environment	Support the creation of new technological companies	NEST Programme: aims to create new technology-based companies. DEMTEC: aims to carry out technologically innovative pilot projects. SIUPI – Incentive System for the Use of Industrial Property and GAPI Offices.	Networking projects for the Automotive and ICT industry Organisation of the Exhibit for Venture Capital Ideas
Development of human capital	Support Measures for the mobility of researchers	Grants for the training of master's degree and doctoral candidates. Support for international mobility.	Subsidy for infrastructure for training organisations
Networking, co-location and clustering measures	Integration in virtual centres of excellence	Support for the creation of science parks and incubation centres.	Implementation of an inter-regional cooperation strategy through benchmarking exercises. Promotion of spin-offs and new technology-based firms.
Knowledge and technology transfer to businesses	Reinforcement of the technological capabilities of SMEs, facilitating internationalisation	INOV_JOVEM: support the integration of masters and doctorates in companies, namely with specialisations in management and Innovation. OTIC Initiative: Technology Transfer and Knowledge Workshops. NITEC: support for the creation of R&D teams in companies. NEOTEC – promotes the transfer of knowledge from institutions of the National Scientific System to the market, transforming potential ideas into Innovation. Other: doctorate grants in companies; support to the implementation of science and technology parks.	Identification of critical technologies in the economy and of opportunities for businesses to take advantage of academic R&D.
Research collaboration of public research organisations with private sector	Implementation of research projects through joint ventures, in health, pharmaceutical, biotechnology and ICT sectors.	IDEIA Programme: promotes R&D in partnership with R&D companies and institutions.	
Support for public research	Support the creation of centres of excellence in R&D matters (for instance, the European Institute of Excellence). Support for research teams in universities and research centres.	Support for universities, research centres and state laboratories.	
Financial R&D measures for the private sector	Incentives to R&D to allow some companies to involve themselves in R&D projects at a European	SIME Programme: supports investment projects for carrying out R&D.	Implementation of a regional risk capital network.

Policy Areas	Policy objectives and instruments at EU level affecting the region	Policy objectives and instruments at National* level affecting the region	Policy objectives and instruments at Regional* level
	level, namely in the health and biotechnology areas	<p>SIFIDE: fiscal incentives for carrying out R&D;</p> <p>Others: supply of seed capital to promote and reinforce venture capital mechanisms; redirection of financial incentives to companies, focusing on the support for innovation.</p>	

The measures undertaken in these areas are mostly complementary and derive largely from the policies formulated by central government. One of the most critical aspects is the lack of linkages in territorial policies; the absence of a regional research policy seems to be the main reason why it has been impossible to define a regional RDTI strategy to bring the different players together in the innovation system around consensual objectives. The embryonic NR RDTI policy has basically contributed to infrastructure development aspects rather than to helping organizations and empowering the territory. The hardware elements of NR innovation dynamics have been emphasized at the expense of the software elements.

The policy measures which have been implemented lack continuity and, in addition, are adversely affected by the cyclical fluctuations of electoral politics. This is destabilising, and generates additional uncertainty for businessmen and institutional decision-makers, preventing them from taking strategic decisions for the medium to long term. Therefore, it is essential that those responsible for formulating and implementing RDI policy measures ensure a stable framework which allows the implementation of systemic actions, duly adapted to the regional characteristics of the innovation system.

In general, the measures undertaken have favoured supply-side mechanisms, the dissemination of information and knowledge, and the public sector.

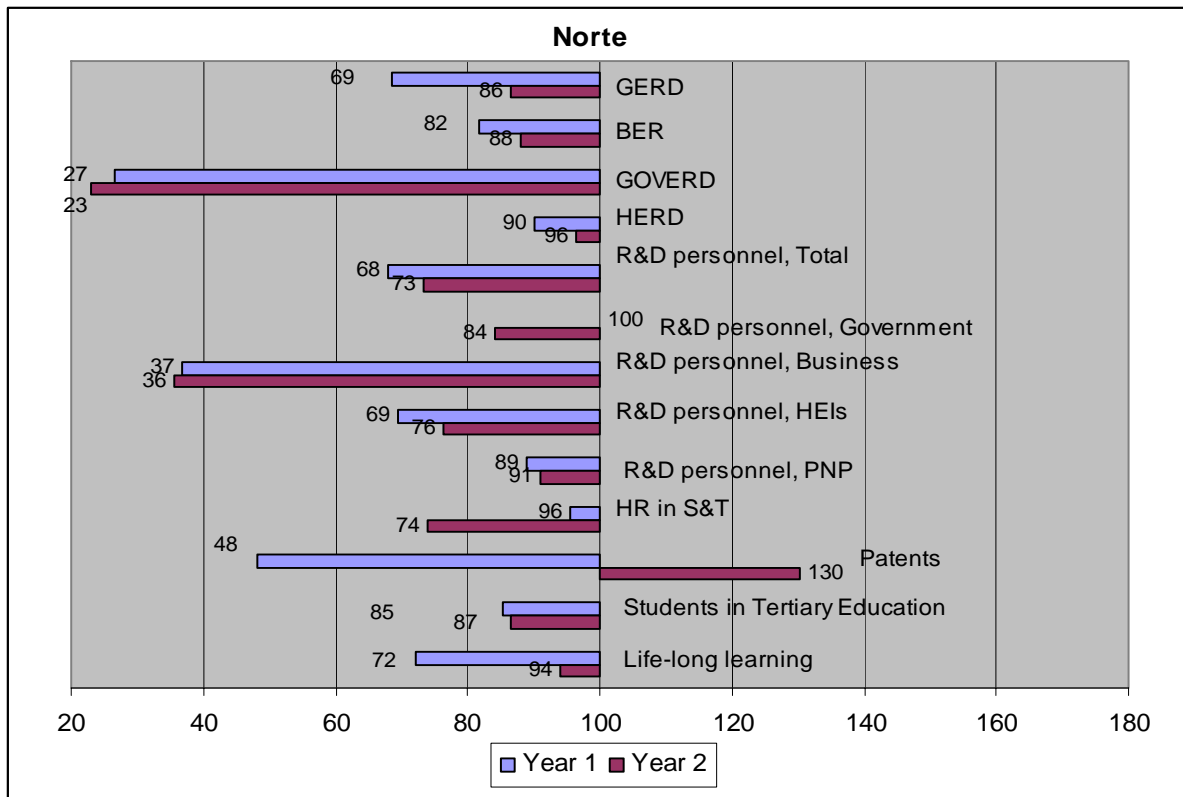
2.3. Conclusions

In spite of the sustained growth of public expenditure in the System for Science and Technology, research and development activities in the region remain centred in universities and in R&D, and not oriented towards commercial ends. This is partly because there is much fragmentation of the work of the public or quasi-public institutions (universities, polytechnics, autonomous research institutions and advanced training and technology centres), and is also the result of poor linkage between R&D activities and the market; this leads to situations of insufficiency, namely a lack of scale and duplication of efforts. In summary, the NR is some way from being able to put together a regional innovation system.

Although there has been a slow increase in R&D expenditure in the regional knowledge base, it remains far below the European average, with R&D activities being mainly funded and implemented with public money. The significance of the business sector is nonetheless growing: in terms of total regional expenditure, firms already account for 41.2%. The growing investment in infrastructure and human resources allocated to R&D activities is only residually transformed into industrial property. Most human resources in R&D are found in universities. One of the main NR structural handicaps is found in the qualification levels of the labour force, both academically and professionally. Although progress has been made in the numbers of students enrolled in tertiary education, and especially in the area of life-long learning, these remain critical areas that need special attention, as the overall low educational profile suggests there are some fairly serious problems with knowledge absorption capacity.

The summary table and graph below clearly demonstrate one of the main problems of the Portuguese innovation system, namely its highly centralised and polarised structure, dominated by the Lisbon metropolitan region. This feature is, in fact, a substantial part of the explanation of the NR's results in the overall national context. The dynamics of the NR, despite all the major structural RDTI handicaps we have pointed out, have been relatively positive over the period reviewed. However, due to this *Lisbon Effect*, it is still underperforming at a national level, except in the area of patent registrations. This is possibly due to the fact that the business sector has significantly enlarged its role in the NR RDI system of late.

Summary Graph 1: Key indicators on North Region's knowledge base development in comparison with Portugal



Source: Eurostat

Note: See Annex 2 for the explanations of the indicators

Nonetheless, in general terms, a situation still prevails in which R&D activities are not commercially exploited. This gap arises essentially from the combination of two factors: corporate technological and economic strategy is still rudimentary, and this is reflected in weak demand for RDI services; and, secondly, institutions in the S&T system distance themselves from the necessary marketing strategies in order to keep their activities “whole”, i.e. as an integrated system.

As a result, there is installed capacity in terms of RDI supply which is not adapted to market needs, and is not reasonably exploited by businesses which, because of their short-range planning and weak technological capabilities, are a long way from being able to meet the main challenges of competitive renewal based on innovation factors. In addition, the types of graduates emerging from the universities do not match up with the needs of the regional economy, and there is an imbalance in the numbers of researchers active in the various different scientific fields and their outputs.

In particular since 1986 (the year Portugal became a full member of the European Community), the North Region - through a series of public investments - has developed a much stronger R&D infrastructure; new players have appeared. Some have become stronger, and some private firms already play an important role in R&D. Nevertheless, because of inefficiencies in the regional innovation system, research outputs and their impact on the regional economy are still far from adequate when compared to the performances of other regional economies.

It is widely felt that, despite the increasing numbers of regional R&D players and the growing levels of investment in R&D, the regional innovation system is under-

performing, and that one of the key causes of this is the lack of linkages between its component parts. In particular, there is a strong need for bridging initiatives in order to overcome the gap between the supply-side S&T institutions and the demands of the manufacturing sector, mainly made up of low-tech SMEs.

The recent emergence of different R&D actors, such as the AdI (The Innovation Agency) and the COTEC, seems to be positive as far as regards the challenges of governance and the need to formulate and implement measures with some degree of strategic coherence based on economic facts. The work of NORTINOV follows the same lines. Despite its modest financial resources, it has introduced some critical variables that were almost completely absent from R&D policy at the regional level, such as diagnostic studies and forecasting exercises.

Political measures have generally been formulated with the aim of strengthening technology transfer aspects. This adjustment corresponded, basically, to a growing tendency to reinforce supply-side mechanisms, which did not always produce effective results. Part of the explanation lies in the excessive emphasis placed on political instruments which aim to promote technology transfer from the universities and research centres to companies - assuming *ab initio* that the technology will fulfil the needs of the company and that they can easily absorb it. For example, the three policy measures launched under the POS_C (the Centre of Excellence, the Technology and Knowledge Transfer Workshops – OTIC – and the NEOTEC initiative) suffer from this drift in various ways. An “old” linear model of innovation has prevailed, leading to excessive optimism when it comes to the prospects for closing the technological gap by carrying through a “Technology Push”.

3. The economic structure of the North Region

3.1 Description of the economic structure

3.1.1 Characteristics of the economy⁷

Of all the Portuguese regions, the North Region is the one whose economy is most open to the foreign market, being strongly oriented towards exports. The productive profile is characterised by a high spatial concentration of factories, with some negative aspects: low productivity and a strong concentration of several labour-intensive, low-technology sectors seriously threatened by unemployment.

The region has a greater comparative advantage in low-technology activities, in that it has specialised in traditional sectors which are very dependent on poorly qualified labour and the exploitation of natural resources, although there has also been an increase in R&D. Confirming this finding is the contribution of medium/high technology sectors to industrial EVA, which is one of the lowest on the Portuguese mainland.

The North Region's structure is characterised by industrial clusters in traditional sectors, where access to technology in general is relatively easy and, to that extent, global markets are strong competitors - competitiveness being greatly influenced by salary costs. Typical examples of these clusters in the region (by NUTS III – Nomenclatures of Territorial Units for statistical purposes) are:

- textiles and clothing in Ave and Cávado;
- shoes in Entre-Douro-e-Vouga;
- timber and furniture in Tâmega; and,
- cork in Entre-Douro-e-Vouga.

Although these clusters have different dynamics, they can all be said to be made up of mainly micro and small companies (see table in Annex 3), with no capacity for operating in global markets. These clusters are also dependent on international subcontracting and external decisions about relocation. There has been a clearly inadequate response to the drastic changes that have taken place in market conditions, given that distribution functions, international logistics and marketing have been growing in importance both in the value chain and also as determinants of businesses' relative power in the market.

At the national level these sectors account for between 70% and 90%, based on the number of companies, employees or Economic Value Added (EVA). On the other hand, the total number of companies in these sectors accounts for almost 60% of manpower working in the manufacturing industry in the North region, but not more than 46% of regional added value (in 2001 value added was invariably below the national average for the manufacturing industry, especially in textiles, clothing, timber and cork).

The low productivity of some traditional sectors (textiles, shoes and clothing) is the result of an unsustainable entrepreneurial model that is based, quite often, on low wages and on productivity mechanisms which rely on intensive labour. This means that the North Region, besides being tenth in Europe in terms of the level of regional employment in industry, also has the lowest productivity of the EU-25's most industrialised regions (62% of average European productivity, while those 25 regions achieve 108% of that same average productivity).

Most businesses in the NR are SMEs (in 2002, 81.9% of firms had fewer than 10 employees); they are frequently family-run (there are practically no middle managers, and businessmen do not have the necessary training to manage a company within the

⁷Cf. More detailed statistical information in Annex 3: Tables and Figures (Tables 48 to 60)

context of a globalised economy) and employees' educational attainment levels are low. Their small size means they are unable to generate the critical mass required to absorb innovation and achieve competitiveness.

In this kind of structure, the main channels for spreading innovation are still contacts with equipment suppliers and clients (design, quality control, etc.). In addition, businesses continue to adopt a company strategy based on physical capital investment, which is not followed by improvements in the qualifications of their employees.

Under these circumstances, it is not surprising that the NR is seeing its competitiveness eroded, since it is so dependent on manpower and natural resources factors which do not give it comparative advantage in international markets.

The process of adaptation of the industrial/entrepreneurial structure to changes in markets has been lagging behind in the value chain, with the result that manufacturing processes have become more fragmented, and less demanding from an innovation point of view.

The main agents for innovation in companies are usually equipment suppliers, normally foreign companies, and the clients themselves, also foreigners, who supply the technical specifications of the products they order.

There are significant territorial asymmetries in the region. Almost half the regional EVA is concentrated in the Porto urban area. If we add this area to those NUTS III areas which have single industries (the four sectors mentioned – Ave, Cávado, Tâmega and Entre-Douro-e-Vouga), their total added value comes to 86% in the North Region, with the remaining 14% being spread throughout NUTS III areas in the region's hinterland: Minho-Lima, Douro and Alto Trás-os-Montes.

In overall terms, new business formation in the NR has remained at levels similar to national ones. In 2000/01, 17 companies were set up in the region for every 1,000 residents of working age, showing that there are significant levels of entrepreneurship and autonomy in the creation of jobs. However, these high levels of business formation do not translate into adequate thresholds of business survival. This produces a context of turbulence and excessive rotation, which hinders the creation of a solid, mature entrepreneurial structure that can help redefine the region in terms of greater productive specialisation. There are definite problems in converting the increase in company formation into sustainable businesses.

3.1.2 Systemic characteristics of the region

Broadly, the entrepreneurial structure, especially in manufacturing, is characterised by the predominance of traditional sectors in an advanced stage of (re)adjustment, urgently needing technological intensification and development of the value chain. The low level of labour productivity is a major financial problem, given the difficulty the region has in rising further in the hierarchy of international specialisation and the consequences of this in the lack of regional economic competitiveness. In this context, the risk of deindustrialisation is a real threat, because the situation is socially unsustainable given the importance of industry in the region's social and economic life.

Firms with no R&D activity make up the vast majority of businesses in the NR, many of which are SMEs active in the more traditional, low-tech sectors. The innovation-related deficits for these firms include non-existent or comparatively undeveloped in-house R&D skills, low levels of R&D and innovation expenditure as a percentage of turnover, very limited cooperation with public research institutions and/or other companies, and a negligible share of world markets for high-tech products. The motivation to perform R&D is often absent, because of the lack of a perceived need.

Nonetheless, the NR has significant business potential, mainly in ICT and Electronics and also in Biotechnology/Biochemistry and the Agri-food industry, given the fact that the region has significant production, scientific and technological skills and is thus able to create a strategic line of competitive renovation. The table below shows trends in the allocation of human resources to those areas.

Table 5: Total Personnel in R&D activities, by scientific and technological areas

Scientific and Technological areas	Total Personnel a)			
	1995	1999	2001	2003
Exact and natural Sciences	965	1,341	1,345	1,720
Engineering and Technological Sciences	1,466	1,618	1,704	2,016
Agrarian and Veterinarian Sciences	692	1,335	1,549	1,410
Health Sciences	591	700	640	765
Human and Social Sciences	934	1,865	1877	2,566
Not specified	-	9	-	-
Total	4,649	6,868	7,115	8,477

Source: R&D Survey, Observatory of Science and Higher Education (Ministry of Science, Technology and Higher Education), in INE, *Anuário Estatístico da Região North*, 2004

a) the data by disciplinary area, for technical and other personnel, are estimated on the basis of the percentage of distribution of total R&D expenditure as declared by R&D units

The fact that the NR is low down on the scale for medium/high technology sectors in the region's employment structure explains the low contribution of these sectors to the region's industrial Economic Value Added. In intra-regional terms, there is a strong disparity at the heart of the region, since only in the NUTS III area of Greater Porto is the contribution of the medium/high technology sectors above the national average.

In the tertiary sector, apart from the process of concentration and vertical and horizontal integration which has been taking place over the last decade, the retail trade and restaurants continue to be significant in the regional economy, especially in terms of creating jobs. As for the service sector (production support, financial intermediaries, land transport, wholesale trade in consumer and intermediate goods), it absorbs most of the human resources in the tertiary sector.

It is important to stress that the characteristics of the region's economy (with a significant proportion of SMEs), and its types of specialisation, are not very favourable for developing demand for services to match the local supply of services, particularly as far as more specialised services and generators of higher added value are concerned. In fact, small businesses often find it difficult to assess which services will improve their competitive position in the medium and long term.

There are still serious gaps in collective learning and entrepreneurial networking, as well as between companies and official institutions. The prevailing relational framework is characterised by traditional paradigms of competition. It is rare to find examples of partnerships in value added projects, which as a rule are limited to a few companies with highly qualified personnel in emerging sectors. However, at this level, the more limiting factor is not the size of the business but the inability to overcome isolation, which is currently becoming more marked but is not recognized – producing the so-called “not small but lonely” syndrome!

The increase in unemployment is a direct consequence of the absence of change in regional specialisation, which means that the region continues to be specialised in

traditional sectors which are work-intensive, characterised by low levels of productivity and very susceptible to the open market scenario and growing competition at an international level.

Unemployment is clearly one of the region's worst problems, increasingly affecting women, young people and more skilled individuals. Alongside unemployment, the region faces situations of poverty, as measured by household income surveys. The increase in the rate of unemployment is a direct result of the absence of change in regional specialisation, which has now become a structural limitation.

In sum, the economic path pursued is clearly characterised by structural difficulty in making the "leap" needed in terms of competitiveness, shifting from more traditional to the more high-technology sectors.

3.1.3 The regional economy in the international context⁸

The North Region (NR) is thus an economy in decline. It produces goods in traditional areas of specialisation in segments and sectors which are vulnerable to international competition and very much affected by the countries newly emerging in the global market. At the same time, and despite some successful investments, the region's economy has not been able to build clusters of more innovative knowledge-based businesses. The NR has acquired greater visibility because, in national terms over the last decade, it has gone from having one of the lowest rates of unemployment to having one of the highest.

For many years the NR economy was able to sustain a business model based on low wages. It is now unable to meet the challenges it faces in the global and knowledge economy.

The model endured until the mid-90s, after Portugal's accession to the European Union, because of certain advantages deriving from its membership, namely the common customs tariff, trade protection for some products (e.g. textiles), the margin for exchange rate liberalisation (which made the escudo – the former national currency – devaluation-competitive under the "crawling peg"), and the early community support programmes funded by the Structural and Cohesion Funds, which helped that business model to survive and even expand.

That cycle is now definitely at an end: the Union's external policy has been progressively liberalised, enlargement to the East has stiffened intra-community competition in the region's main exporting sectors, regional industry already operates in a single currency context, with all that this entails, and lastly, Community support has become increasingly selective.

In truth, in the present context of globalisation, the NR faces strong competition from similarly specialised emerging markets with better quality-cost ratios for their product portfolio. In this connection there has been irreversible slippage in the traditional export base (textiles/clothing and shoes), while some products which exploit regional comparative advantage are still competitively positioned in international markets, usually by virtue of niche strategies (e.g. cork and wine). On the other hand, especially over the last three years, some foreign direct investment has been withdrawn, mostly in the footwear and textile industries, and even in the car industry, with factories closing down.

In any event, from 2000 to 2005 there were 61 foreign direct investment projects in the NR, involving 152 million Euros (representing 28.2% of total FDI projects in Portugal). The NR has the institutional and entrepreneurial capacity to emerge in new dynamic

⁸ Cf. More detailed statistical information in Annex 3: Tables and Figures (Tables 80 to 86)

sectors of the world economy, and there are already a few good examples of this, demonstrating the possibilities and potential of this path; these are in the fields of biotechnology and pharmaceuticals, new materials, and new information and communication technologies.

3.1.4 The local financial market

The North Region financial market reflects the main features of the Portuguese financial and banking system, which has been modernising and expanding rapidly. The financial system is still quite conservative in supporting projects with higher commercial risks by virtue of their innovative nature.

The main player in the risk capital field is PME Capital, a public-private partnership whose main partners are IAPMEI (the public body which provides support to SMEs) and several private Portuguese banks. It dates back to 1989 (having started out under the name Norpedip) and, since then, has provided funding to more than a hundred projects. Today it has a stake in 49 firms, with a total investment of 36.4 million Euros. Nearly 60% of the projects are concentrated in the NR and cover mainly start-ups and business internationalisation plans. It is the most important financial support instrument in the NEST Programme run by the Portuguese Innovation Agency – whose aim is precisely to promote new technology-based firms.

There are some other recent initiatives involving seed capital funds, usually associated with entrepreneurship promotion projects and incubation centres involving banks, universities and business associations, but as yet no analytically useful data are available on these.

3.2 Policy context

3.2.1 Governance structure and actors

The governance structure for economic policy is the same as that outlined in section 2.2. At the national and regional levels the principal economic, science and technology actors are practically the same.

Policy in Portugal is centralised. Decisions and planning take place mainly at the central government level. The Regional Coordination and Development Commissions, such as the CCDRN for the NR, are politically dependent on the government. The financial resources for the various policies they run via the Operational Programmes are co-funded by the government and the structural funds. These regionalised administrative organisations are able to draft regional policies in line with regional objectives but, as has already been pointed out, for RTDI policy these are mainly conducted and planned at national level by different ministries.

There are some very important regionalised national bodies which play an important role in the economic field, such as IAPMEI (Institute for Support to Small and Medium-sized Businesses) – the body which co-ordinates state aid to SMEs, accompanying them throughout their life cycles.

3.2.2 Policy Objectives and instruments

At the regional level, the North Region Operational Programme is the main instrument of regional policy for this territory, comprising three main strategic objectives for the period 2000-2006:

- ⌘ better qualifications for employees, increasing their employability and strengthening social cohesion;

- ↳ promoting regional competitiveness factors and improving territorial productive systems;
- ↳ promoting sustainable regional development.

The objectives within these various policy measures are essentially to reinforce the region's competitiveness and enhance the local economy, as well as to create the conditions for pursuing more sustainable development. These main development strategies have an effect on both the present areas of industrial specialisation and the promotion of new activities, in particular those with greater added value, and are aimed at strengthening initiative and entrepreneurship.

The instruments used are, above all, based on improving qualifications, within the overall aim of increasing internal company skills and making people more employable. Other instruments seek to ensure the creation of solid jobs in companies that are competitive and sustainable in the medium to long term by, for instance, upgrading those aspects which help companies to be more competitive and more international (industrial planning, training, science and technology, strategic management, etc.).

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

Policy Areas	Policies complementary to RTDI instruments affecting policy area*	Effects on R&D and innovation capacity of the region
Improve innovation and R&D governance	Industrial; land management; creation of COTEC	Increase level of attractiveness of the Region with regard to IDE of a technological base; creation of technological centres with affinities with tradition and regional accumulated know-how; development of the analytical studies and forecasts. Changing the region's future.
Creation of an innovation and entrepreneurial friendly environment	Educating and informative; higher Education; industrial.	Increase training for entrepreneurship; added training in <i>soft skills</i> for (young) management;
Development of human capital	Educating and informative	Better qualifications for employees; improved knowledge absorption by companies; better matching of supply and demand
Networking, co-location and clustering measures	Industrial; Land management	Studies on implementation of technology centres; reinforcing competitiveness of medium-sized cities; territorial infrastructures with broadband; Implementation of liaison offices in HEI.
Knowledge and technology transfer to enterprises	Higher education, R&D	Professionalization of interfaces of an academic nature which impact favourably on links with business; increase in number of projects, increase in regional potential for innovation.
Research collaboration of public research organisations with private sector	Fiscal; Employment	Adopting a policy of fiscal incentives for R&D; creation of scientific work in public institutions and companies; greater mobility for teaching staff and researchers.
Support for public research	Higher Education	Career terms for university staff Encouraging greater academic and professional value of applied research for companies and institutions
Financial R&D measures for the private sector	Industrial; fiscal	Reinforce financial fiscal incentives (venture capital, seed capital) aimed at promoting innovation in a corporate environment.

In general, the policies indicated are supplementary and, within this framework, seek to converge, so as to obtain results in promoting competitiveness based on RDI factors. It should also be mentioned that direct investment in low to medium-technology sectors of production is being sucked away from the region to other locations, due to more advantageous quality-cost ratios in other countries and regions, particularly Eastern Europe. In the current social and economic climate in Portugal, it is very difficult to define policy instruments of a fiscal, vocational training or other nature to deal with this problem.

Shortcomings in the region's educational, vocational and occupational profiles are a critical variable in determining how effective the policy measures will be. This base-line clearly needs to be worked on as a priority, otherwise all organisational efforts to reinforce competitiveness will be in vain. It should also be noted that demographic factors make it more difficult to achieve the required numbers of scientists and engineers: the NR workforce is ageing, and there are too few new science and

engineering graduates in the pipeline, as the share of enrolments in science and engineering is in decline (as indicated in chapter 2.1.3).

In terms of educational policy and higher education, established career terms for teachers are still a major obstacle, in that they discourage academics from moving to business. The lack of encouragement for such moves prevents applied research work from being used to solve problems in the region's businesses and institutions. There are clear motivational obstacles to closer contact between the academy and business, and to applying know-how to the real needs of the regional economy.

The fact that a substantial proportion of these weaknesses may be attributed to the industrial profile of the regional economy suggests that policy responses to this gap go beyond the sphere of R&D or innovation policy and into the realm of macroeconomic and industrial policy.

3.3. Conclusions

Industrial sectors which rely heavily on less sophisticated competitive factors dominate the North Region. Qualification and salary levels in these sectors are lower, and so the workforce is less productive. To a great extent the region's comparative advantage still rests on lower unit labour costs and on sectors which are unable to compete in external markets. It will have to seek competitive advantage in new factors, such as product differentiation and R&D, and commit not only to adding value in the more traditional export-oriented sectors like clothing, timber, furniture and cork, but also to developing emerging sectors which are technologically more sophisticated (information and communication technologies for education, biotechnology, the agri-food business).

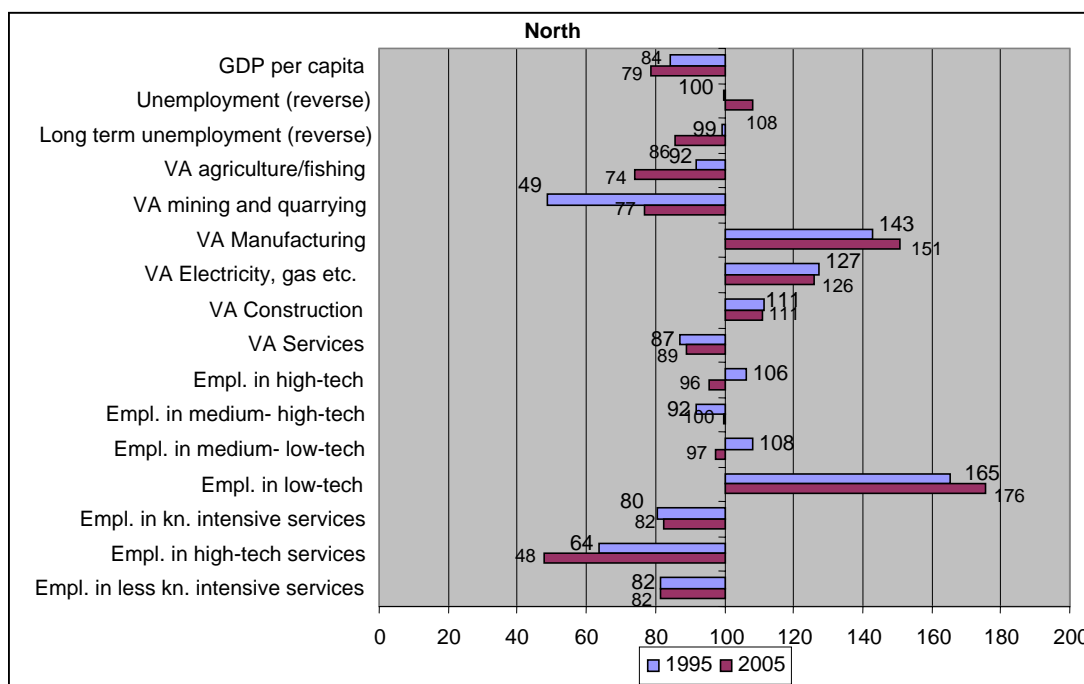
As the region's economy grew, it failed to make fundamental changes to its pattern of economic specialisation. The more important sectors of the regional economy continue to be tied to the more traditional industries. Particularly negative was the fact that increases in industrial investment led to business modernisation strategies based on new equipment, to the detriment of business strategies based on R&D factors and innovation.

The region's economy is largely made up of small to medium-sized firms, and so lacks economies of scale. It has neither the financial means nor the human resources needed for strategic participation in innovation networks. There is an absorption gap, which is one of its severest challenges.

With this economic profile, unless current economic bottlenecks are dealt with, it is doubtful whether the NR can achieve the growth and employment rates that are needed in the era of the knowledge economy in the long term. There is an urgent need to upgrade this economic trajectory by actively restructuring the economy towards higher value-added segments of existing sectors, or by entering new ones.

Nevertheless, with the emergence of new and important business and R&D players in new fields (pharmaceuticals, health, biotechnology, new materials, ...) regional economic innovation dynamics seem to point to the conclusion that the shifting of industrial activity into higher technology sectors would certainly provide an opportunity to take regional R&D intensities to higher levels.

Summary Graph 2: Key indicators on the North Region's economic structure and development – in comparison with Portugal



Source: Eurostat

Note: GDP data 1995-2003; Unemployment data 1998-2001; VA data 1995-2003; Employment in high-tech 2002-2005

Note: See Annex 2 for the explanations of the indicators

The above graph is a good illustration of the North Region's economic profile. It clearly shows that the strong industrial base is the key economic feature of the regional economy, directly linked to the absolute and relative importance of employment in low-tech industries (such as textiles, shoes, wood and cork).

It also demonstrates one of the main bottlenecks of the NR, namely the lack of medium and high-tech sectors, and particularly employment in high-tech services.

Due to this lack of regional economic specialisation, it is no surprise that per capita GDP has performed badly and that unemployment rates remain high, even after taking into account that fact that Portugal's performance has been worse than the European average over this period.

Exhibit 3: Strengths and weaknesses of the regional economy

Strengths	Weaknesses
<ul style="list-style-type: none"> • Secular industrial know-how in different sectors (textile, shoes, timber, cork); • Emergence of new regionally-based clusters (automotive, ICT, health); • Active cluster organization (specially by some enterprise associations, as in the footwear industry – APICCAPS); • Existence of some innovative regionally – based enterprises in several sectors (either on traditional sectors or in emerging sectors); • High potential for exploiting renewable energy sources, namely wind and biomass; • Greater internationalisation of the regional economy • New and improved foreign direct investment associated with multinational R&D activity centres; • Cultural and historic heritage as a basis for new types of tourism; • Investment in infrastructure, improving accessibility at regional, national and international level. 	<ul style="list-style-type: none"> • Productive specialisation based on low-intensity industries; • Quantitative, organizational and skills deficits in most firms; • Very low academic profile of most businessmen; • Lack of perception in the private sector of the need to carry out S&T activities, particularly R&D; • Increases in industrial investment produced business modernization strategies based on new equipment, to the detriment of business strategies based on R&D factors and innovation; • Low standards in business services; • Cheap labour still the basis of adjustment to the dynamics of international markets; • Foreign direct investors tending to divest and move away; • Low increases in productivity • Divergent economic trajectory in relation to Portugal and the EU25; • Higher unemployment rate than the Portuguese average; • Insufficient intra- and inter- industrial linkages; • Downward trend in competitiveness.

4. Conclusions

4.1 Assessment of the RIS

The NR has been making a reasonably positive effort to increase its investment in RDI; nevertheless, growth of RDI output is below expectations, and lower than the Community average. The regional innovation system seems to focus on knowledge generation, putting aspects relating to dissemination, and above all assimilation, in a subordinate position, bearing in mind that the key players in the innovation system are businesses.

Some typical features of the scientific and technological system of the North Region in Portugal are presented below:

- slow increase in R&D expenditure, which is still far below average European levels;
- R&D is mainly publicly funded and administered, although the business sector is increasingly significant here – in terms of total regional expenditure, businesses already account for 41.2% of the total;
- over the last eight years, the increasing weight of the business sector has produced a pattern of R&D production much more in line with market needs;
- R&D is very fragmented (with many dispersed R&D units), which limits the potential impact of this investment in the economy; there is no concentration of funding in a limited and strategic number of areas which enhance competitiveness;
- mismatches in the allocation of R&D personnel in terms of scientific fields, NR R&D output performance and even in the region's economic and productive profile;
- investment in R&D is only residually transformed into industrial property;
- investment in R&D does not generate technology-based businesses with significant added value;
- most researchers are found in universities and have no motivation to transfer the knowledge they generate to the productive sector;
- the number of graduates and post-graduates in the labour market is low; moreover, generally low educational attainment levels suggest that there are some fairly serious problems with knowledge absorption capacity;
- clear mismatch between the supply of academic graduates and demand in the regional economy;
- a growing deficit of graduates in the fields of Science, Mathematics, Informatics and Engineering;
- increasing limitations in researchers' mobility both between education/research institutions and between the latter and business;
- excessive use of researchers/professors for administrative tasks;
- investment in venture capital is low and there is a lack of specialized entities for funding R&D-based business projects .

It would seem there is already a large enough number of institutions in the North Region to form a regional innovation system, but in our view there is no concerted strategy. This makes it difficult to develop a network in which everyone knows their role, avoiding overlapping functions and treading on each others' toes. There seems to be a clear need to reinforce interfacing strategies, giving them an outward direction,

managing complementarities and creating synergies among the diverse institutional and entrepreneurial players in the embryonic regional RTDI system.

Many of the elements of the structural and conventional notion of a regional innovation system are already in place. However, given the clear absence of a contact culture and weak networks, the different players act on the basis of their specific and sectoral requirements, rarely building bridges with each other – the partnerships or networks which provide clear added value to the concept of a regional system of innovation. In our opinion, the regional innovation system is at a pre-systematic stage. In other words, the forms for increasing relational capital and creating collective learning mechanisms which will lead to innovation are still embryonic.

Several measures have been implemented in projects that are advantageous from an economic and regional competitiveness point of view, but the resources allocated for this purpose are still insufficient. Production based on RTDI factors is increasing, but in overall terms is still only residual.

Exhibit 4: Strengths and weaknesses of the regional innovation system

	Strengths	Weaknesses
Knowledge Creation Capacity	<ul style="list-style-type: none"> • Significant RTD infrastructure investment; • Increasing levels of private R&D expenditure; • Emergence of new R&D actors (public and private) who participate fully in international research networks; • Quality and prestige of some of the R&D institutions. 	<ul style="list-style-type: none"> • Extremely low innovation rates; • Weak commercial orientation of the research function; • Emphasis placed on support for types of R&D too far removed from the market needs; • Prevalence of linear production mechanisms of innovation, still mainly based on the functionalist technology-push model; • Smaller number and unit size of R&D centres and technology-intensive companies by comparison to developed regions.
Knowledge Dissemination Capacity	<ul style="list-style-type: none"> • Pioneering and successful joint university-business collaboration projects with strong media impact.; • Pro-active behaviour of some institutional players (AdI) in the dissemination of strategic information for RDI project applications. 	<ul style="list-style-type: none"> • Shortage of interface organisms and of brokerage instruments; • Lack of critical mass of scientific, human and institutional resources necessary to participate effectively in advanced international research; • RDI programmes usually tend to favour the larger companies.
Knowledge Absorption Capacity	<ul style="list-style-type: none"> • Existence of some companies, in both traditional businesses and emerging areas (TICE, biotechnology, pharmaceutical, ...) that already pursue an aggressive innovation policy, and can therefore serve as an example to others; • Success of programmes designed to reinforce the companies' capabilities in management, technological and research activities, by placing young graduates and researchers; • Significant increase in number of students enrolled in Higher Education. 	<ul style="list-style-type: none"> • Deficits in "advanced" human capital; • Very low academic profile among the large majority of entrepreneurs; • Lack of perception in the private sector of the need perform S&T activities, particularly R&D; • Difficulties in transforming R&D investment into innovation values for markets; • Not enough students enrolled in S&T areas; • Inefficient financial mechanisms for support to innovation activities, especially seed capital.
Interactions of Main Actors	<ul style="list-style-type: none"> • Strong institutional density in the S&T area, involving <i>players</i> with different vocations and complementarities; • Existence of a regional network of technological centres that have a good working relationship with many SMEs and can help to promote RDI-based strategies. 	<ul style="list-style-type: none"> • Low levels of cooperation and internal investment by SMEs; • Insufficient intra and inter-industrial linkages; • RTD and dissemination activities remain predominantly a public affair, failing to involve private operators.
RTDI Governance Capacity	<ul style="list-style-type: none"> • Active role played by the CCDRN in building an overall climate of trust and understanding among all RDI main actors (enterprises, research centres and universities); • Launching of pilot programmes, such as NORTINOV; • Appearance of new important institutional players, such as COTEC. 	<ul style="list-style-type: none"> • Political system excessively centralised; • Absence of a well-defined strategy for reconciling interests and activities of institutions and business in the innovation regional system; • Academic (university) over-emphasis on the elaboration and implementation of S&T policy measures; • Excessive dependency on the S&T system of national and Community funding; • Failing to take advantage of national and Community RDI programmes as a source of extra-regional funding.

Good practices

- ✓ pro-active behaviour of the Innovation Agency (AdI), especially in establishing dialogue with SMEs;
- ✓ programmes to strengthen management, technological and research capabilities of businesses by placing young graduates and researchers;
- ✓ active role of the CCDRN (through, for instance, the NORTINOV Program) in building an overall climate of trust and understanding among all the main RDI actors, such as businesses, research centres and universities.

Bad practices

- ✓ bureaucratic procedures for fiscal and financial incentives for RDI, regarded as both cumbersome and costly, and urgently needing simplification, especially for smaller projects;
- ✓ inability to formulate targeted policy measures aimed at stimulating greater SME participation in FPs;
- ✓ overly academic emphasis in drawing up and implementing S&T policy measures;
- ✓ inability to fully optimize and utilize the R&D infra-structure due to low levels of business activity;
- ✓ the region's RDI policy is often more concerned with high technology and technology transfer than with low-profile techniques that are relevant and adaptable to traditional low-tech sectors.

There is still much to be done to reinforce the fundamental and irreplaceable role of businesses. Effective, systematic and lasting solutions are needed in order to bring businesses and institutions together in supporting innovation (higher education institutions, research centres, technology centres, training centres, etc.).

It is not necessary to start from scratch, but rather to take advantage of the knowledge the region already has, the institutions which already exist and previous experience with innovation - much of it successful.

In particular, measures to foster institutional and entrepreneurial networking are essential to overcome the *lonely syndrome* which typifies players' behaviour. It is important to intervene at this level, creating a new culture in which new initiatives can work effectively.

4.2 Assessment of policies

There seems to be a very acceptable increase in the number of institutional players in the RDI sector and also a wide range of available policies to achieve these objectives, namely within the national operational programmes for economy, science, technology and knowledge society, as well as actions implemented by non-governmental associations (COTEC), and others such as the Co-ordination and Development Commission 's NORTINOV Programme.

The study of RTDI-related policy measures has shown that there is a certain imbalance in national and regional instruments affecting this territory. The allocation of resources to RDI is quantitatively and qualitatively still very far from what is desired, when compared to the best international examples and, above all, in relation to the

development challenges facing the North Region. In fact, although the regional innovation system is at the embryo stage, it is very much focused on supply mechanisms and enhancement of infrastructural actions.

There is much to be gained from encouraging networking between institutional and entrepreneurial players and collective learning mechanisms for the market, with a view to exploiting and enhancing the commercial value of research work.

Multiple instruments seem to have contributed more to stimulating the individual efficiency of firms rather than to stimulating forms of collective efficiency and entrepreneurial cooperation. This has had a negative impact on innovation based on R&D factors.

Governments have been erratic in implementing fiscal incentives. This prevents businesses from budgeting correctly for future tax benefits when making R&D investment decisions.

Exhibit 5: Matching of knowledge and economic specialisation

Knowledge production in the region	Related economic sectors	Specialisation of the region's economy	Conclusions
Engineering (textiles, mechanics, ...) Design (textiles, industrial, ...) Economic management Marketing	Clothing, textiles shoes, timber, furniture and cork	Clothing, textiles shoes, timber, furniture and cork	Qualified technicians specialized in these sectors can undergo fundamental retraining when a business is closed down, downsized or relocated; many businesses still employ poorly qualified labour; intermediate-level technicians benefit from specific training available in the region
Biotechnology	Agri- food Pharmaceutical Health Technology	Agri-food	An interesting infrastructure, of recognized quality and having great potential for development of specialised sectors associated with the agri-food industry (wine is the most characteristic product)
Pharmacy Paramedical Medicine Life Sciences	Pharmaceuticals Health care Health Technologies	Existence of an interesting set of young companies in the pharmaceutical and health areas	High-quality training on offer has been vital in helping the new technological base to emerge and in upgrading competitiveness
TIC	Horizontal Services	Services	More training opportunities and greater ability to meet demand for skilled workers
Social Sciences Humanities Education	Horizontal Services	Services	There seems to be overproduction in these areas, with increasing numbers of skilled workers being unemployed, especially in teaching

4.3 Challenges and trends in the knowledge economy

The North Region's transition to a knowledge-based economy requires measures to reinforce and displace the existing institutional fabric, the dissemination of specialised skills, and the embedding of innovation potential in regional businesses – which brings us back to the absolute need to define strategies which bring SMEs closer to RDI-based thinking. It is important for policies to acquire an increasingly territorial dimension, so that they are better adjusted to territorial specificities and so that measures may be continuous and not subject to arbitrary changes following elections. Otherwise, there is an increasing risk that agents outside the region may fill this gap by responding to the real S&T needs of businesses.

The North Region does not have a world-class centre of academic excellence to act as the focus for regional growth. There are relatively few firms engaged in industrial R&D. Efforts might therefore usefully converge on policy combinations which combine multiple financial and fiscal R&D support measures in a few carefully selected industrial

sectors with a strong emphasis on policies which will stimulate demand and foster absorptive capacity in the economy in general.

In order to be effective, direct measures encouraging firms to become involved in R&D and to collaborate with research organisations need to be complemented by actions designed to make firms aware of opportunities and threats, and of the need to innovate. If the aim is - as it should be - to broaden the research community by attracting low-intensity R&D firms and stretching their R&D horizons, it surely needs to include advisory and support services, as well as the straight provision of finance.

The promotion of collaborative R&D programmes would be very helpful in the sense that they could locate firms within a broader knowledge infrastructure and help overcome the barriers arising from restricted knowledge flows.

There is an absolute need to find a strategy for sustainable development in value chains which enables that sustainability to be achieved in the following ways (or a combination of them):

- promoting the modernisation of the so-called "traditional" sectors;
- promoting strategies to foster technology-based local/regional entrepreneurship; and
- seeking to attract to the region other, more capital- and technology-intensive sectors, capable of raising the competitiveness of the "traditional" sectors by means of upstream and downstream relationships.

Efforts to support R&D in SMEs should thus aim not only to provide direct financial support, but also to create effective introductions and links to networks anchored by larger firms. Forming regional and/or sectoral *clusters* may be a way of achieving this objective.

It is fundamentally necessary to envisage a strategic intervention framework based on these two strands:

- ↳ Upgrading traditionally specialised clusters, improving their innovative capacity and re-targeting resources to those segments, either upstream or downstream in the value chain, which will help them to upgrade (upstream: product technology; downstream: distribution networks and international marketing); in these sectors the main challenge is to extend the value chain, shifting these traditional and mature industries to the initial phases of new product life-cycles, and at the same time building linkages to activities with greater technological input. This is a stage on the road to acquiring greater scientific and technological knowledge;
- ↳ Creating and consolidating new clusters based on enhancing knowledge which combines various types of business initiative (replication of successful examples, attracting FDI, technological start-ups).

For pathways involving the initiation of R&D activities in firms not currently engaged in R&D, and the creation of new R&D-intensive SMEs, a key element of the task is to create incentives for catalytic risk capital, so as to provide guarantees in support of information exchange and networking.

Successful renewal of the competitiveness of the regional economy can only be achieved if there is at the same time a continuous improvement in qualifications and skills. This is clearly one of the difficulties of competitive development and has to be taken on board. To upgrade the region's competitive potential in this area, it is imperative to develop educational policies which will encourage people to stay on longer at school and reach higher levels of educational attainment.

Technological start-ups - both local and regional - need to be promoted more aggressively than in the past, with universities and other S&T sectors being more actively involved. Recent initiatives within NORTINOV and COTEC have shown the way. In particular, more suitable financial instruments need to be developed to fund these innovative and technological start-ups, either by providing more seed capital or by making specialised services available to assist management. This could have a direct impact on R&D levels by producing new regional R&D actors, even though the impact of such measures is small in the short term.

It is also very important to improve mainstream policies, in particular the Operational Programme for the Economy, owing to the large amounts of money involved, the many SMEs covered, and the programme's potential for upgrading business strategies based on R&D.

One of the means by which is possible to develop the North Region's innovation system is for different R&D players to obtain new extra-regional funding. In order to attain this goal it is fundamental that research groups, and above all businesses, take on a bigger role at the national and European level (FP7, other programmes such as Eureka, Eureka-Asia, Iberoeka, ...).

More investment in R&D - although still low in comparison to EU levels - has produced a relatively diverse number of R&D organizations, mainly at the academic level. It would seem to be a good strategic option now to consolidate these NR research organisations into what could be the nucleus of a regional innovation network, adopting a philosophy of complementarity and cooperation. This mass effect could lead to the attraction or installation of high added-value technological infrastructures related to emerging sectors in the NR.

Finally, a key element in achieving these outcomes is an endogenous dynamic for the strategic co-ordination of regional RDI, enhancing the mechanisms of governance and creating a more efficient institutional framework. The NR can only gain by reshaping its institutional architecture and framework of governance, so as to tailor it to the current and future needs of business, and provide a safety network at the same time. This type of strategic focus within the territory will facilitate a sustained increase in its competitiveness.

Exhibit 6: Identification of policy challenges

Policy challenge	Corroborating indicator	Inducement mechanisms <i>[all measures taken at the regional or national level to meet the challenge are described]</i>	Effective approaches <i>[only measures which appear to have a significant contribution to facing the challenge are presented]</i>
<p>Better co-ordination and function levels for the regional innovation system</p>	<ul style="list-style-type: none"> Absence of a regional innovation agency 	<ul style="list-style-type: none"> Reinforce existing CCDRN mechanisms for co-ordination and promotion of RDI Creation of effective mechanisms to link the CCDRN and the Innovation Agency Full advantage of COTEC potential and operations Concentration of resources in areas where there is good capacity and strong economic actors, for the demonstration effect it may have, and by virtue of its greater impact on regional economy Develop a territorial curriculum with forecasting functions Establish contracts-programmes with C&R institutions with clear objectives and mechanisms for assessing results, tying funding, indexing finance to performance Implementation of comprehensive forecasting exercises 	<p>Creation of a regional agency for innovation, and regionalization of the Innovation Agency</p> <p>Definition of a regionally-based research and innovation policy to promote clusters based on new forms of competitive advantage</p> <p>Assessment of what is needed to change the regional innovation system, involving the strategic redefinition of actors' roles, feasibility of setting up new skills centres, encouraging synergies and complementarities</p> <p>Dissemination of good practices in organization and management</p>
<p>Greater commercial use of R&D and economic enhancement</p>	<ul style="list-style-type: none"> R&D too far from the market Reduces entrepreneurial involvement (financing and execution) in R&D activities Poor patent registration performance 	<ul style="list-style-type: none"> Concentrate on companies' RDI policies Reinforce tax and financial incentives to promote entrepreneurial involvement in R&D R&D promotion in joint ventures, encouraging public-private partnerships Incentives to demand for INI through regional institutions and businesses Support for the involvement of businesses and institutions in the 7th Community Support Programme Increasing investment in the professionalisation of academics Implementation of a funding model for the scientific and technological system and innovation, including an increase in factors which encourage the transfer of knowledge to economic actors Reinforce tax mechanisms and intellectual property rights 	<p>Define strategic areas and take on the challenge of enhancing existing resources (entrepreneurial, natural, institutional), to improve and enhance regional clusters (present and future)</p> <p>Active public procurement in strategic regional socio-economic areas (forest, sea, renewable energy, ...)</p> <p>Involvement of business associations in the definition of RDI support policies</p> <p>Greater segmentation in support schemes for basic and applied R&D, seeking progressively to implement mechanisms which bring research more into the market</p> <p>Promotion of joint ventures for the development of projects to enhance the commercial foundation of Science and Technology</p>

(cont.)

Policy challenge	Corroborating indicator	Inducement mechanisms <i>[all measures taken at the regional or national level to meet the challenge are described]</i>	Effective approaches <i>[only measures which appear to have a significant contribution to facing the challenge are presented]</i>
Increase technological qualifications of companies' employees	<ul style="list-style-type: none"> • Low levels of academic qualifications in companies • Very small number of internal R&D units • Rudimentary innovation production 	<ul style="list-style-type: none"> • Continuation of initiatives aimed at placing young graduates, and holders of master's and doctoral degrees in companies • Adjust the supply of education and training to actual company needs • Reinforce support mechanisms for the creation of R&D centres within companies • Measures to provide support for foreign researchers of recognized merit • Establish effective dialogue between the academic world and R&D and the business sphere 	<p>Reinforce tax incentives for RDI</p> <p>Identify sectoral problems/ requirements/challenges, making it possible to define and implement projects with a significant impact and achieving the required critical mass (in contrast to projects directed only at single businesses)</p>
Promotion of endogenous technology-based entrepreneurship	<ul style="list-style-type: none"> • Small number of technology-based companies formed • Insufficient allocation of venture and seed capital • Shortage of incubation centres 	<ul style="list-style-type: none"> • Improve mobility between the academic world and the business world • Temporary secondments for professors and researchers • Strengthen financial resources and access to venture and seed capital • Increase in the logistical mechanisms for incubator support • Creation of a regional network of business ambassadors • Enhancing the higher education curriculum with training in entrepreneurship 	<p>Reinforce logistical, training, and financial mechanisms to support technological entrepreneurship</p>

BIBLIOGRAPHY

Innovation Agency (2006), *Technological Infrastructure of the National Innovation System – Trends 1996-2005*, Santa Maria da Feira: AdI

CCDRN (2002), *NORTINOV – Programme for Innovative Actions in the North Region of Portugal*, Porto: CCDRN

CCDRN (2002), *ON – Operation North – North Region Operational Programme 2000-2006*, Porto: CCDRN

CCDRN (2006), *NORTH 2015: Competitiveness and Development – a Vision for the Future*, Porto: CCDRN

QSF Observatory (2005), *Territorial Competitiveness and Economic and Social Cohesion – North Region*, Lisbon: QSFO

Science and Higher Education Observatory / Ministry of Science, Technology and Higher Education [SHEO/MSTHE] (2004), *Survey and Characterisation of the Relations between Businesses and R&D Institutions of the Portuguese Scientific and Technologic System*, Lisbon: SHEO/MSTHE

SHEO/MSTHE (2005), *Relationship between Universities and Business*, Lisbon: SHEO/MSTHE

SHEO (2005), *Trends in Higher Education Degree Awards, by District and by NUTS II – 1998-2004*, Lisbon: SHEO

Annexes

Annex 1: Definition of policy mix typology

- **Improve innovation and R&D governance capabilities:** Technical assistance-type funding used by public authorities, regional agencies and public-private partnerships in developing and improving policies and strategies in support of R&D investment and innovation. This could include changes in the organization of decision making, national and regional forecasting, measures for improving methods of evaluation etc.
- **Creation of an innovation and business-friendly environment:** This category covers a wide range of actions which seek to improve the overall environment in which businesses, universities and research organizations innovate. This category includes the following measures:
 - Promotion of an entrepreneurial and innovation culture in the private sector by undertaking awareness initiatives and by changing regulations and disincentives which discourage entrepreneurship;
 - Regulation and initiatives addressing intellectual property rights either by improving legislation in cases of marketing of public or collaborative research or by covering protection costs.
 - Direct or indirect support for spin-offs and new technology-based firms (NTBFs). Direct support includes public financial schemes such as pre-seed and first-stage capital, while indirect measures include funding of incubators, training related to entrepreneurship, etc.
- **Development of human capital:** This category includes measures to upgrade human resources in R&D and innovation-related activities, such as assisting science and technology graduates to follow research and innovation-oriented careers; training of researchers in businesses or research centres; intra- and international mobility of scientists; curriculum development in higher education aimed at developing science and technology; supervised undergraduate and post-graduate courses, etc.
- **Networking, co-location and clustering measures:** Policies in this category focus on remedying deficiencies in innovation systems by promoting cooperation, networking and interaction. Measures promoting co-location of industrial and scientific organisations (e.g. innovation centres), funding for cluster infrastructure and technology and innovation-oriented activities and support for innovation networking (e.g. information exchange clubs) are some of the possible measures in this category.
- **Knowledge and technology transfer to industry:** This category includes policies directly or indirectly supporting knowledge and technology transfer from universities and public research organizations and marketing of public research results. Direct support includes aid schemes for utilizing technology-related services or for implementing technology transfer projects from the public or private sector to the private sector. Indirect policies include development of infrastructures facilitating technology transfer, such as technology parks, innovation centres, university liaison and transfer offices, etc.
- **Research collaboration of public research organizations with private sector:** Measures supporting collaborative research projects and development of common (for use by private and public sector) research infrastructures are included.

- **Support for public research:** Measures in this category include:
 - public investments in research infrastructure and direct funding of public R&D, e.g. setting up new infrastructures, or supporting centres of excellence.
 - grants for R&D projects implemented in universities and other public research organisations.
 - regulatory changes and incentives for universities and other public research organisations which encourage the marketing of research results and collaboration with industry.
- **Financial R&D measures for the private sector:** Two main categories of measures are included:
 - **Direct and indirect financial R&D measures for the private sector:** Direct measures include direct public funding of R&D in the private sector, e.g. grants, conditional loans, etc. Indirect measures include tax incentives for firms to undertake R&D activities.
 - **Catalytic financial R&D Measures for the private sector:** Includes instruments facilitating access of firms undertaking R&D to external private sector sources of finance. Typical measures of this type are measures encouraging the use of *risk capital* (e.g. venture capital funds) for both R&D and innovation-related activities, and *loan and equity guarantee measures*.

Annex 2: Description of key indicators used in the summary graphs

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

Index: Country=100

Source: Eurostat, 2006

Summary Graph 1: Key indicators on knowledge base development in Regions in comparison to Country

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

Summary Graph 2: Key indicators on economic structure and development of the Regions

1. GDP per capita at current market prices.
2. Long-term unemployment rate (based on total unemployment).
3. Unemployment rate (%).
4. Value-added at basic prices (EUR million): Share (%) of sectors to total.
 - Agriculture/ fishing
 - Mining and quarrying
 - Manufacturing
 - Electricity, gas and water supply
 - Construction
 - Services (excl. extra-territorial organizations and bodies)
5. Annual data on employment in technology- and knowledge-intensive sectors at the regional level : Percentage of total employment
 - High technology manufacturing: NACE Rev. 1.1 codes 30, 32 and 33
 - Medium-high technology manufacturing: NACE Rev. 1.1 codes 24, 29, 31, 34 and 35
 - Medium-low technology: NACE Rev. 1.1 codes 23 and 25 to 28
 - Low technology: NACE Rev. 1.1 codes 15 to 22 and 36 to 37

- Total knowledge-intensive services: NACE Rev. 1.1 codes 61, 62, 64 to 67, 70 to 74, 80, 85 and 92
- Knowledge-intensive high-technology services: NACE Rev. 1.1 codes 64, 72, 73
- Total less knowledge-intensive services: NACE Rev. 1.1 codes 50, 51, 52, 55, 60, 63, 75, 90, 91, 93, 95 and 99

GDP pc North – (PT=100)

- 85% (1995) – 81% (2000) – 79% (2003)

GDP pc North – (EU 25=100, in pps)

- 63.8% (1995) – 64.6% (2000) – 57.4% (2004)

Unemployment rate in the North

- 3.6% (4th quarter 01) – 9% (4th quarter 05)

R&D Expenditure 2003

- North – 0.64%; Portugal – 0.74%; EU 25 – 1.90%

Productivity (PT=100)

- 86% (1995) – 83% (2000) – 83% (2003)

Utilization rate of exports/imports (2003)

- North – 1.13; Portugal – 0.64

North Exports

- 45.1% (1996) – 43.1. (2000) – 42.8% (2004)

Ageing Indicator 2004

- North– 88.6%; Portugal – 108.7%

Students enrolled in Higher Education

- 97.000 (1995/1996) – 117.000 (2004/2005)

Child Mortality Rate – Permilage

- 8.1 (1993/1997) – 5.6 (1996/2003)

Annex 3: Tables and Figures

Table 6: Number of Public Research Services Establishments (Public research institutes)

NOTE: Number of R&D Units which declared they had R&D activities

	Institutions a)			
	1995	1999	2001	2003
Total National	216	785	1 025	1 766

Source: R&D Survey, Observatory of Science and Higher Education (Ministry of Science, Technology and Higher Education).

NOTE: Refers to the units/sectors that were included in the Survey: Public; High Education Establishments, Non-profit Private Institutions. Companies are not included.

Table 7: Number of laboratories

NOTE: Number of R&D units belonging to Government Laboratories which declared they had R&D activities

	Institutions			
	1995	1999	2001	2003
Government Laboratories	3	4	4	4

Source: R&D Survey, Observatory of Science and Higher Education (Ministry of Science, Technology and Higher Education)

Table 8: Number of R&D personnel in Public Research Services Establishments

NOTE: Total number of personnel in R&D activities; the number of human resources in the company sector is estimated based on the percentage distribution of the total R&D expenditure by the different places (in the region) where the company carries out activities of this kind.

	Total personnel			
	1995	1999	2001	2003
Total National	5 891	8 888	9 100	11 323

Source: R&D Survey, Observatory of Science and Higher Education (Ministry of Science, Technology and Higher Education)

Table 9: Number of personnel in research institutes

Note: Total personnel in R&D activities in the investigation units belonging to public laboratories

	Total personnel			
	1995	1999	2001	2003
Total	118	127	146	95

Source: R&D Survey, Observatory of Science and Higher Education (Ministry of Science, Technology and Higher Education)

Table 10: Number of higher education institutes (HEIs)

	High Education Establishments	Organic Unity
2001	54	96
2003	55	101
2005	55	102

Source: Observatory of Science and Higher Education (Ministry of Science, Technology and Higher Education)

Table 11: Number of academic staff in HEIs / Number of doctorates awarded in the region

High Education Establishments	Organic Unity	2001		2003	
		Nr. of Doctorates	Nr. of academic staff	Nr. of Doctorates	Nr. of academic staff
University of Minho	Universidade do Minho	495	1231	587	1258
University of Porto	Faculdade de Ciências da Nutrição e Alimentação	8	24	8	20
	Faculdade de Arquitectura	21	79	23	80
	Faculdade de Ciências	167	288	239	283
	Faculdade de Economia	63	178	79	170
	Faculdade de Engenharia	317	469	345	480
	Faculdade de Farmácia	49	62	57	72
	Faculdade de Letras	123	310	126	297
	Faculdade de Medicina	152	256	148	282
	Faculdade de Psicologia e de Ciências da Educação	43	85	51	90
	Instituto de Ciências Biomédicas de Abel Salazar	120	298	119	274
	Faculdade de Ciências do Desporto e de Educação Física	38	74	41	75
	Escola de Gestão do Porto	25	34	25	34
	Faculdade de Medicina Dentária	25	60	32	58
	Faculdade de Direito	13	37	16	38
Faculdade de Belas-Artes	19	74	20	69	
University of Trás-os-Montes and Alto Douro	Universidade de Trás-os-Montes e Alto Douro	174	516	213	518
	Universidade de Trás-os-Montes e Alto Douro (Miranda do Douro)	2	10	3	16
	Universidade de Trás-os-Montes e Alto Douro (Chaves)	3	13	4	13
Portuguese Catholic University	Escola Superior de Biotecnologia	26	79	25	66
	Faculdade de Ciências Sociais	9	23	22	48
	Faculdade de Filosofia	21	61	27	72
	Faculdade de Teologia (Braga)	11	20	11	21
	Faculdade de Teologia (Porto)	17	38	17	41
	Escola das Artes	6	67	10	72
	Faculdade de Economia e Gestão	21	87	32	95
	Faculdade de Direito (Porto)	17	68	17	52
University Lusíada (Porto)	Universidade Lusíada (Porto)	58	270	69	283
	Universidade Lusíada (Vila Nova de Famalicão)	29	94	28	94
University Portucalense Infante D. Henrique	Universidade Portucalense Infante D. Henrique	46	210	49	173
University Fernando Pessoa	Universidade Fernando Pessoa	72	241	98	261
	Universidade Fernando Pessoa (unidade de Ponte de Lima)	14	57	16	58
	Universidade Fernando Pessoa (unidade de Ponte de Lima)			53	126

	Escola Superior de Saúde			9	49
Polytechnic Institute of Cávado and Ave	Escola Superior de Gestão de Barcelos		67	2	85
Polytechnic Institute of Bragança	Escola Superior Agrária de Bragança	14	112	25	115
	Escola Superior de Educação de Bragança	10	115	13	114
	Escola Superior de Tecnologia e de Gestão de Bragança	31	193	35	209
	Escola Superior de Tecnologia e Gestão de Mirandela	10	44	13	54
	Escola Superior de Enfermagem de Bragança	1	35	2	36

(cont.)

Table 12: Number of academic staff in HEIs / Number of doctorates awarded in the region (cont.)

High Education Establishments	Organic Unity	2001		2003	
		Nr. of Doctorates	Nr. of academic staff	Nr. of Doctorates	Nr. of academic staff
Polytechnic Institute of Porto	Instituto Politécnico do Porto	1	9	2	12
	Escola Superior de Educação do Porto	9	109	17	116
	Escola Superior de Música e das Artes do Espectáculo do Porto	2	73	1	74
	Escola Superior de Estudos Industriais e de Gestão	4	77	7	86
	Instituto Superior de Contabilidade e Administração do Porto	10	222	15	227
	Instituto Superior de Engenharia do Porto	56	544	70	529
	Escola Superior de Tecnologia e Gestão de Felgueiras		21	7	33
Polytechnic Institute of Viana do Castelo	Escola Superior Agrária de Ponte de Lima	2	38	4	41
	Escola Superior de Educação de Viana do Castelo	9	73	10	69
	Escola Superior de Tecnologia e Gestão de Viana do Castelo	21	161	17	151
	Escola Superior de Ciências Empresariais de Valença	1	7		11
	Escola Superior de Enfermagem de Viana do Castelo		40	1	47
Polytechnic Institute of Viseu	Escola Superior de Educação de Viseu (Lamego)	2	33	2	38
	Escola Superior de Tecnologia e Gestão de Lamego		10	2	28
Nursing Superior School Cidade do Porto	Escola Superior de Enfermagem Cidade do Porto	5	47		
Nursing Superior School São João	Escola Superior de Enfermagem de São João	2	74		
Nursing Superior School D. Ana Guedes	Escola Superior de Enfermagem de D. Ana Guedes	4	58		
Superior School of Health Technology Saúde of Porto	Escola Superior de Tecnologia da Saúde do Porto	12	204		
Superior School of Music of Gaia	Conservatório Superior de Música de Gaia	3	17	1	14
Artistic Superior School of Porto	Escola Superior Artística do Porto	6	161	7	156
	Escola Superior Artística do Porto (Guimarães)		22		17
Superior School Gallaecia	Escola Superior Gallaecia	7	28	5	32
University Moderna	Universidade Moderna (Porto)	29	143	26	126
Art and Design Superior School	Escola Superior de Artes e Design		71	1	68
Education Superior School of Fafe	Escola Superior de Educação de Fafe	4	90	4	89
Education Superior School Jean Piaget	Escola Superior de Educação Jean Piaget de Arcozelo	13	240	10	189
	Escola Superior de Educação Jean Piaget - Nordeste	2	106	5	100
Education Superior School Paula Frassinetti	Escola Superior de Educação de Paula Frassinetti	9	78	10	81

Nursing High School of the Portuguese Red Cross	Escola Superior de Enfermagem da Cruz Vermelha Portuguesa de Oliveira de Azeméis				17
Education High School of Santa Maria	Escola Superior de Educação de Santa Maria	2	28	1	22
Nursing High School Imaculada Conceição	Escola Superior de Enfermagem da Imaculada Conceição	2	33	4	44
Nursing High School Dr. José Timóteo Montalvão Machado	Escola Superior de Enfermagem Dr. José Timóteo Montalvão Machado	3	35	4	48
Nursing High School Santa Maria	Escola Superior de Enfermagem de Santa Maria	8	36	8	45
Nursing High School Jean Piaget	Escola Superior de Enfermagem Jean Piaget - Nordeste	1	64	5	87
Journalism High School	Escola Superior de Jornalismo	5	23	4	5

(cont.)

Table 13: Number of academic staff in HEIs / Number of doctorates awarded in the region (cont.)

High Education Establishments	Organic Unity	2001		2003	
		Nr. of Doctorates	Nr. of academic staff	Nr. of Doctorates	Nr. of academic staff
Health High School Jean Piaget of Vila Nova de Gaia	Escola Superior de Saúde Jean Piaget de Vila Nova de Gaia			11	46
Health Polytechnic Institute of North	Escola Superior de Saúde do Vale do Ave	5	75	9	104
	Escola Superior de Saúde do Vale do Sousa	12	110	14	146
Technological Superior School of Fafe	Escola Superior de Tecnologias de Fafe	1	22	1	21
Higher Institute for Finance	Instituto de Estudos Superiores Financeiros e Fiscais (Porto)	5	30	4	24
Portuguese Institute of Administration and Marketing, Matosinhos	Instituto Português de Administração de Marketing de Matosinhos	7	40	3	43
Superior Institute of Administration and Management	Instituto Superior de Administração e Gestão	3	52	3	51
Superior Institute of Assistants and Interpreters	Instituto Superior de Assistentes e Intérpretes	2	51	3	48
Superior Institute of Health Sciences	Instituto Superior de Ciências da Saúde - North	30	192	37	163
Superior Institute of Educational Sciences	Instituto Superior de Ciências Educativas de Felgueiras	7	87	5	81
Superior Institute of Tourism and Management Sciences	Instituto Superior de Ciências Empresariais e do Turismo	3	48	4	51
Superior Institute of Entre Douro and Vouga	Instituto Superior de Entre Douro e Vouga			3	47
Superior Institute of Education and Work	Instituto Superior de Educação e Trabalho	8	34	9	25
Superior Institute of Espinho	Instituto Superior de Espinho				14
Superior Institute of Intercultural Studies	Instituto Superior de Estudos Interculturais e Transdisciplinares - Mirandela	7	45	9	41
Superior Institute of Languages and Administration of Bragança	Instituto Superior de Línguas e Administração de Bragança	2	34	4	34
Superior Institute of Languages and Administration of Vila Nova de Gaia	Instituto Superior de Línguas e Administração de Vila Nova de Gaia	8	63	8	69
Superior Institute of Maia	Instituto Superior da Maia	38	258	45	248
Superior Institute of Paços de Brandão	Instituto Superior de Paços de Brandão	4	41	4	37
Polytechnic Superior Institute Portucalense of Penafiel	Instituto Superior Politécnico Portucalense de Penafiel	1	12		
Polytechnic Superior Institute of Gaya	Escola Superior de Desenvolvimento Social e Comunitário	4	42	5	40
	Escola Superior de Ciência e Tecnologia	3	54	3	53
Health Superior Institute of Alto Ave	Instituto Superior de Saúde do Alto Ave			8	88
Social Service Superior Institute of Porto	Instituto Superior de Serviço Social do Porto	5	42	6	44
Superior Institute of Advanced Technologies of Lisboa (Porto)	Instituto Superior de Tecnologias Avançadas de Lisboa (Porto)		17		15
Superior Institute of Enterprise Technology	Instituto Superior de Tecnologia Empresarial	4	23		
Nursing Superior School Calouste Gulbenkian	Escola Superior de Enfermagem de Calouste Gulbenkian	2	52	2	74

Nursing Superior School Cidade do Porto	Escola Superior de Enfermagem Cidade do Porto			5	42
Nursing Superior School São João	Escola Superior de Enfermagem de São João			2	77
Nursing Superior School D. Ana Guedes	Escola Superior de Enfermagem de D. Ana Guedes			6	82
Nursing Superior School of Vila Real	Escola Superior de Enfermagem de Vila Real	1	41	1	46
Health Technology Superior School of Porto	Escola Superior de Tecnologia da Saúde do Porto			13	258
Total General		2666	10419	3186	10965

Source: Observatory of Science and Higher Education (Ministry of Science, Technology and Higher Education)

Note: It is possible that these data may include some double counting, in cases where the staff in two or more high education establishments are added together.

Table 14: Number of higher education institutes awarding science and engineering degrees

Number awarding science and engineering degrees	% of total
36	33,64

Table 15: Number of enrolled students

Establishment	Number of enrolled students at 31st December of													
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Public High Education Establishments	35398	40087	43738	46870	50516	53560	58848	62273	65400	69585	73358	75279	76646	75549
Private High Education Establishments	11155	19771	24716	33261	36997	41799	49415	49461	40689	42457	41265	41065	41528	40678
Portuguese Catholic University (Private)	1516	1770	1879	1780	1919	1728	1975	1981	2032	1932	1864	1707	1605	1834

Table 16: Total number of students enrolled in the Public Higher Education establishments

NOTE: number of enrolled students in programmes of 5 (graduated, academic degree) and 3 years (bachelor's degree)

Establishment	Number of enrolled students at 31st December of													
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
University of Minho	6297	7922	9066	10246	11320	12163	13418	14336	14910	15634	15932	16100	16506	15610
University of Oporto	17740	18714	19263	20099	21179	21474	22550	23106	23314	23864	24538	24718	25140	25338
University of Trás-os-Montes and Alto Douro	3502	3824	4506	5008	5173	5621	6444	6587	7233	7616	7712	7720	7143	6706
Polytechnic Institute of Cávado and Ave							74	196	382	648	856	1097	1277	1399
Polytechnic Institute of Bragança	1146	1450	1699	1824	2020	2351	2880	3403	4070	4486	5273	5588	5731	5494
Polytechnic Institute of Porto	5526	6556	7220	7517	8176	8771	10121	11166	11954	12962	13478	14310	14799	14762
Polytechnic Institute of Viana do Castelo	779	981	1262	1404	1674	1920	2209	2390	2547	2960	3470	3416	3588	3517
Nursing Superior School São João	193	303	338	344	378	360	403	349	328	350	806	652	610	706
Nursing Superior School of D. Ana Guedes	120	187	199	242	212	211	180	210	151	223	273	279	324	309
Nursing Superior School of Vila Real	95	150	185	186	218	217	180	151	146	153	236	346	330	375
Health Technology Superior School of Porto					166	472	389	379	365	689	784	1053	1198	1333
TOTAL	35398	40087	43738	46870	50516	53560	58848	62273	65400	69585	73358	75279	76646	75549

Table 17: Total number of students enrolled in science and engineering programmes

NOTE: number of enrolled students in programmes of 5 (graduated, academic degree) and 3 years (bachelor's degree)

Establishment	Number of students enrolled in science and engineering programmes (in each final year)													
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Public High Education Establishments	15649	17284	18176	19342	21044	23040	24750	26338	28089	28913	29572	30106	30484	30478
Private High Education Establishments	0	424	556	623	672	968	1326	1328	1306	1233	1300	1291	1233	1194
Portuguese Catholic University (Private)	320	357	405	453	533	561	609	632	698	788	875	898	911	895

Table 18: Size of research budget of universities and research institutes

R&D expenditure, 2001 (thousand euros)					
Year	Business enterprises	Government	Higher education	Private non-profit institutions	Total
2001	58,2				171644,9
2003	85,6	11215,0	105464,0	44113,0	246403,0

Source: R&D Survey, Observatory of Science and Higher Education (Ministry of Science, Technology and Higher Education), in INE, Anuário Estatístico da Região North, 2004

Table 19: R&D personnel by type of organisation

Note: Total personnel in R&D activities by sector of implementation

Execution Sectors	1995	1999	2001	2003
Companies a)	1242	2020	1985	2846
Public	553	1151	1 090	855
High Education	3 265	4319	4 517	5 771
Non profit Private Institutions	831	1398	1 508	1 851
Total	5 891	8 888	9 100	11 323

Source: Observatory of Science and Higher Education (Ministry of Science, Technology and Higher Education)

NOTES: a) the number of human resources in the company sector is estimated based on the percentage distribution of the total R&D expenditure by the different places (in the region) where the company carries out these kinds of activities.

Table 20: R&D personnel by scientific field (according to the OECD classification, i.e. natural science, social sciences, humanities)

Total Personnel in R&D activities, by scientific and technological areas

Scientific and Technological areas	1995	1999	2001	2003
Exact and natural Sciences	965	1341	1345	1720
Engineering and Technological Sciences	1466	1618	1704	2016
Agrarian and Veterinarian Sciences	692	1335	1549	1410
Health Sciences	591	700	640	765
Human and Social Sciences	934	1865	1877	2566
Non specified	-	9	-	-
Total	4649	6868	7115	8477

Source: R&D Survey, Observatory of Science and Higher Education (Ministry of Science, Technology and Higher Education), in INE, Anuário Estatístico da Região North, 2004

NOTES: a) the data by disciplinary area, for the technical and other personnel, are estimated on the basis of the percentage of the distribution of total R&D expenditure declared by the R&D units.

Table 21: Trend in total R&D expenditure

(thousand euros)

Years	Portugal	North	North (%)
1988	272 684,4	45 317,6	16,6
1990	379 362,0	70 357,3	18,5
1992	477 780,5	104 444,2	21,9
1995	460 037,3	94 545,1	20,6
1997	539 626,2	107 454,4	19,9
1999	711 590,2	147 195,0	20,7
2001	838 163,1	171 644,9	20,5

Source: R&D Survey, Observatory of Science and Higher Education (Ministry of Science, Technology and Higher Education); OCDE, Principaux Indicateurs de la Science et de la Technologie, 2002(2) - Base de données.

Figure 1: R&D expenses as a % of GDP

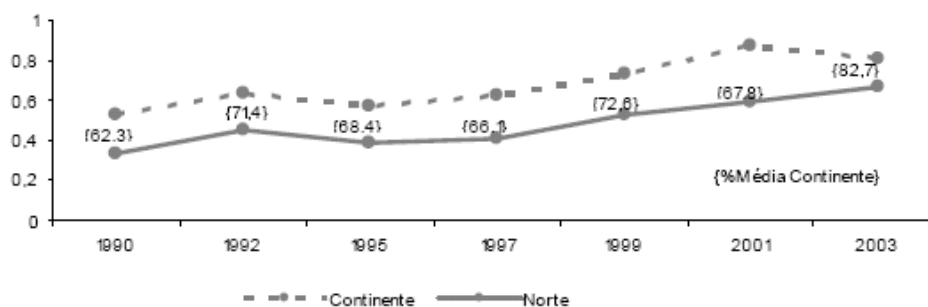


Table 22: R&D expenditure by type of organisation (i.e. R&D institutes/higher education/firms)

(thousand euros)

Execution Sectors	R&D expenditure			
	1995	1999	2001	2003
Companies	22409,1	50070,0	58 196,8	112821,8
Public	8 922,5	12221,4	11 098,9	11214,7
Higher Education	46 869,2	81039,4	105 144,3	105464,2
Non profit Private Institutions	16 344,2	26194,1	38 180,4	44112,6
Total Region	94545,1	169524,8	212620,4	273613,2

Source: R&D Survey, Observatory of Science and Higher Education (Ministry of Science, Technology and Higher Education); OCDE, Principaux Indicateurs de la Science et de la Technologie, 2002(2) - Base de données.

Table 23: R&D expenditure by type of activity (i.e. basic/ applied research, experimental development)

(thousand euros)

Type of activity	R&D Expenditure			
	1995	1999	2001	2003
Basic research	25 477,9	46 989,7	60 581,2	65 442,7
Applied research	41 943,2	75 126,7	91 880,1	96 899,1
Experimental Development	27 124,0	56 661,9	74 361,2	111 271,5
Total region	94 545,1	178 778,2	226 822,5	273 613,2

Source: R&D Survey, Observatory of Science and Higher Education (Ministry of Science, Technology and Higher Education); OCDE, Principaux Indicateurs de la Science et de la Technologie, 2002(2) - Base de données.

Table 24: R&D expenditure by scientific field (according to the OECD classification, i.e. natural science, social sciences, humanities)

(thousand euros)

Scientific and Technological areas	R&D Expenditure a)			
	1995	1999	2001	2003
Exact and natural Sciences	14 881,8	22 538,3	31 296,1	37 379,0
Engineering and Technological Sciences	27 540,8	34 975,1	44 503,4	46 131,0
Agrarian and Veterinary Sciences	8 697,4	15 659,1	19 987,7	21 960,1
Health Sciences	8 947,6	10 329,0	18 135,1	14 218,0
Human and Social Sciences	12 068,3	35 953,3	40 501,2	41 103,3
Total region	72 136,0	119 454,9	154 423,6	160 791,5

Source: R&D Survey, Observatory of Science and Higher Education (Ministry of Science, Technology and Higher Education); OCDE, Principaux Indicateurs de la Science et de la Technologie, 2002(2) - Base de données.

NOTE: a) The R&D expenditure data, by disciplinary area, do not include companies because there are no data available in this implementation sector.

Table 25: R&D expenditure by source of funding (domestic companies, foreign companies, national or regional government)

(thousand euros)

Source of founding	R&D Expenditure			
	1995	1999	2001	2003
Companies	21 956,4	43 553,9	57 980,6	106 097,5
Public	56 047,6	102 246,2	128 661,1	146 142,4
High Education	1 925,7	6 168,4	4 826,5	3 939,3
Non profit Private Institutions	4 351,6	10 119,7	5 585,0	7 214,5
Foreign	10 263,8	6 445,5	15 567,2	10 219,5
Total region	94 545,1	168 533,6	212 620,4	273 613,2

Source: R&D Survey, Observatory of Science and Higher Education (Ministry of Science, Technology and Higher Education); OCDE, Principaux Indicateurs de la Science et de la Technologie, 2002(2) - Base de données.

Table 26: Number of Publications in North Region

	2001	2003	2004	2005*
Number of publications	1 198	1 514	1 890	1 775

Source: Observatory of Science and Higher Education (Ministry of Science, Technology and Higher Education); determined from Institute for Scientific Information, National Citation Report for Portugal 1981/2005

* Provisional data

Table 27: Percentage of publications by scientific field

	2001	%	2003	%	2004	%	2005*	%
[1] Publications in classified magazines	1 460	100	1 761	100	2 140	100	2 080	100
Physical, Chemical & Earth Sciences	351	24,0	377	21,4	448	20,9	464	22,3
Life Sciences	459	31,4	586	33,3	679	31,7	617	29,7
Clinical Medicine	205	14,0	277	15,7	349	16,3	348	16,7
Agriculture, Biology & Environmental Sciences	209	14,3	257	14,6	260	12,1	268	12,9
Engineering, Computing & Technology	205	14,0	219	12,4	325	15,2	311	15,0
Social and Behavioural Sciences	30	2,1	41	2,3	72	3,4	70	3,4
Arts & Humanities	1	0,1	4	0,2	7	0,3	2	0,1
[2] Publications in non-classified magazines	62		148		205		133	
Total of Publications [1] + [2]	1 522		1 909		2 345		2 213	

Source: Observatory of Science and Higher Education (Ministry of Science, Technology and Higher Education); determined by the Institute for Scientific Information, National Citation Report for Portugal 1981/2005

* Provisional data; % of total publications in classified magazines

Table 28: Percentage of citations by scientific field

	2001	%	2003	%	2004	%	2005*	%
[1] Publications in classified magazines	3 484	100	5 122	100	5 910	100	7 334	100
Physical, Chemical & Earth Sciences	747	21,4	1 092	21,3	1 325	22,4	1 652	22,5
Life Sciences	1 336	38,3	1 893	37,0	2 101	35,5	2 550	34,8
Clinical Medicine	459	13,2	688	13,4	745	12,6	933	12,7
Agriculture, Biology & Environmental Sciences	464	13,3	760	14,8	886	15,0	1 140	15,5
Engineering, Computing & Technology	409	11,7	612	11,9	733	12,4	920	12,5
Social and Behavioural Sciences	69	2,0	77	1,5	119	2,0	139	1,9
Arts & Humanities		0,0		0,0	1	0,0		0,0
[2] Publications in non-classified magazines	122		146		178		235	
Total de Publicações [1] + [2]	3606		5268		6088		7569	

Source: Observatory of Science and Higher Education (Ministry of Science, Technology and Higher Education); determined from Institute for Scientific Information, National Citation Report for Portugal 1981/2005

* Provisional data; % of total publications in classified magazines

Table 29: Number of patent applications (by industrial field and technology intensity i.e. IPC)

Section	International Patent Classification	Patent requests																					
		1995		1996		1997		1998		1999		2000		2001		2002		2003		2004		2005	
		Nort Region	Total Resid.	Nort Region	Total Resid.	Nort Region	Total Resid.	Nort Region	Total Resid.	Nort Region	Total Resid.	Nort Region	Total Resid.	Nort Region	Total Resid.	Nort Region	Total Resid.	Nort Region	Total Resid.	Nort Region	Total Resid.	Nort Region	Total Resid.
A	Human Necessities	5	8	4	17	3	12	6	15	5	18	6	21	1	11	5	15	11	31	10	26	16	43
B	Performing Operations, Transporting	7	17	2	17	3	21	7	20	6	20	7	15	2	13	8	22	9	26	8	25	9	31
C	Chemistry, Metallurgy	1	11	3	17	5	14	1	14	2	16	1	13	4	27	2	22	3	17	3	14	6	32
D	Textiles, Paper	0	3	0	3	1	3	2	3	0	1	2	2	7	8	3	3	3	4	0	2	2	2
E	Fixed Constructions	1	12	1	15	2	5	2	9	3	9	1	3	1	5	0	13	4	9	2	19	1	14
F	Mechanical Engineering, Lighting, Heating, Weapons	1	12	2	5	1	7	2	13	1	5	2	10	1	13	2	19	0	17	1	9	2	18
G	Physics	1	14	1	6	5	9	1	14	2	4	3	9	7	16	7	28	3	11	9	19	3	9
H	Electricity	1	4	0	3	0	0	1	5	3	8	1	9	3	14	1	8	4	11	1	7	2	9
	Total	17	81	13	83	20	71	22	93	22	81	23	82	26	107	28	130	37	126	34	121	41	158

Source: INPI – National Institute of Industrial Property

Table 30: Patent applications per million Euro of Regional GDP

Years	*millions of euros GDP*	Patent requests	
		Nort Region	by million euros
1995	24.289	17	0,0007
1996	25.910	13	0,0005
1997	27.449	20	0,0007
1998	29.484	22	0,0007
1999	31.448	22	0,0007
2000	33.178	23	0,0007
2001	34.802	26	0,0007
2002	36.445	28	0,0008
2003	36.557	37	0,0010

Source: INPI – National Institute of Industrial Property

Table 31: Patent applications per million Euro of Regional GDP

Years	*millions of euros GDP*	Patent requests	
		Total National	by million euros
1995	80.827	81	0,0010
1996	86.230	83	0,0010
1997	93.014	71	0,0008
1998	100.962	93	0,0009
1999	108.030	81	0,0007
2000	115.548	82	0,0007
2001	122.550	107	0,0009
2002	128.458	130	0,0010
2003	130.511	126	0,0010

Source: INPI – National Institute of Industrial Property

Figure 2: Patent requests in the EPO, by million inhabitants

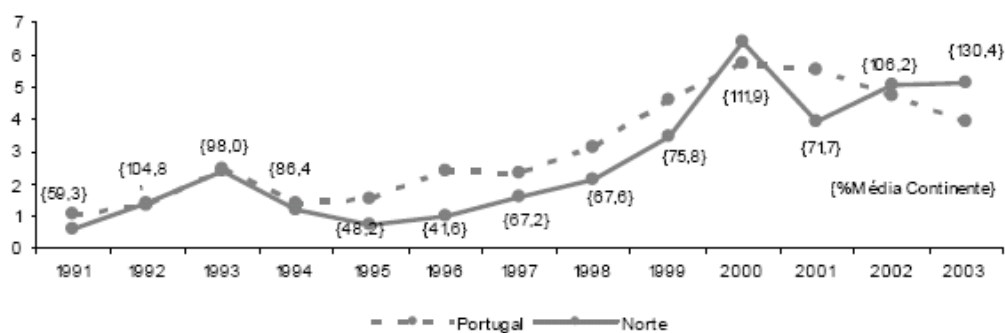


Table 32: Percentage of economically active population by completed level of education in the region

	1991	2001
High school education	20,8	18,7
Higher education	5,6	12,7

Source: Population General Census, INE

Table 33: R&D personnel per sector of performance

	R&D units	Sector of performance				
		Total	Business enterprises	Government	Higher education	Private non-profit institutions
2001	-	4961	1078	438	2433	1012
2003	637	6315	1684	398	2978	1255

Source: R&D Survey, Observatory of Science and Higher Education (Ministry of Science, Technology and Higher Education), in INE, Anuário Estatístico da Região North, 2004

Table 34: Human resources in S&T as percentage of economically active population

	2001	2003
Resident population	3687293	3711797
Active population	1775015	1942700

Source: INE, Population and Habitation General Census, 2001; INE, Labour Force Survey, 2001, 2002 and 2003.

	2001	2003
Human resources in S&T as percentage of total population in the Region	0,13	0,17
Human resources in S&T as percentage of economically active population	0,28	0,33

Source: R&D Survey, Observatory of Science and Higher Education (Ministry of Science, Technology and Higher Education) OCDE, Principaux Indicateurs de la Science et de la Technologie, 2002(2) - Base de données.

Table 35: Gross regional product by type of activity (NACE first digit level A-P)

Years	GDP per capita (thousand euros)
1996	7,3
2000	9,1
2003	9,9

Source: INE, Regional accounts in INE, in Anuário estatístico da Região North 2002, 2003 e 2004

Table 36: Value added by type of activity (NACE)**Gross Value Added at Basic Prices**

(Thousand euros)

Type of Activities	1996	2000	2003
A - Agriculture, hunting and forestry	986	779	825
B - Fishing	56	48	61
C - Mining and quarrying	57	80	78
D - Manufacturing	6618	7678	7975
E - Electricity , gas and water supply	926	1037	1138
F - Construction	1765	2662	2429
G - Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	3498	4236	4691
H - Hotels and restaurants	334	467	555
I - Transport, storage and communication	1115	1416	1519
J - Financial intermediation	1065	1223	1272
K - Real estate, renting and business activities	2297	3196	3 595
L - Public administration and defence; compulsory social security	1446	2163	2 475
M - Education	1623	2355	2919
N - Health and social work	1168	1750	2 325
O - Other community, social and personal service activities	474	760	825
P - Private households with employed persons	156	209	272
FISIM	-1109	-1454	-1437
Total	22471	28606	31518

Source: INE, Regional accounts in INE, in Anuário estatístico da Região North 2002, 2003 e 2004

Table 37: Gross fixed capital formation by type of activity (NACE)

(Thousand euros)

Type of Activities	1996	1999	2002
A - Agriculture, hunting and forestry	171	237	185
B - Fishing	5	3	6
C - Mining and quarrying	25	38	31
D - Manufacturing	1078	1714	1559
E - Electricity , gas and water supply	90	298	370
F - Construction	163	272	59
G - Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	286	405	412
H - Hotels and restaurants	68	83	78
I - Transport, storage and communication	124	402	772
J - Financial intermediation	134	158	285
K - Real estate, renting and business activities	1601	2222	2240
L - Public administration and defence; compulsory social security	899	1091	1184
M - Education	167	294	290
N - Health and social work	114	234	265
O - Other community, social and personal service activities	116	275	308
P - Private households with employed persons	-	-	n.a.
FISIM	-	-	n.a.
Total	5042	7725	8 042

Source: INE, Regional accounts in INE, in Anuário estatístico da Região North 2002, 2003 e 2004

Table 38: Total employment in region as % of total employment in country

Year	%
1997	36,71
2000	36,07
2004	36,58

Source: INE, Labour Force Survey., in Anuários Estatísticos, 1997, 2000 e 2004

Table 39: Employment in region by type of activity (NACE) (%)

	1997	2000	2004
Total	1590,4	1770,5	1697,4
Agriculture, forestry and fishing	196	219,7	224
Industry, Construction, Energy and Water	636	809,4	736,8
Mining and quarrying	5,9	14,7	16,4
Electricity, gas, steam and hot water supply	15,4	-	-
Manufacture of food products and beverages	29	34,1	33,7
Manufacture of textiles	230,1	278,6	256,9
Wood and paper industry, of publishing and printing	46,7	55,7	53,4
Manufacture refined petroleum products, of chemical, of rubber and plastic products and of other non-metallic mineral products	32,4	37,2	37,2
Manufacture of basic metals and metal products	47,9	48,2	46,8
Manufacture of electrical and electronic machinery	30,9	42,3	41,1
Manufacture of motor vehicles and other transport equipment	18,1	11,9	14,7
Manufacture of furniture and recycling	38,2	50,7	44,9
Construction	141,3	236,1	191,5
Services	758,4	741,5	833,2
Sale, maintenance and repair of motor vehicles and sale of automotive fuel	45,2	45,8	50,1
Wholesale trade and commission trade	35,2	43,5	57,9
Retail trade; repair of personal and household goods	133,5	157	162,6
Hotels and restaurants	63,8	64,7	69,4
Transports and auxiliary transport activities	43,1	47,3	51,1
Post and telecommunications	10,4	-	-
Financial intermediation and insurance	41,8	27,1	24,7
Computer and related activities; Research and development	53,4	43,9	70,2
Public administration and defence; compulsory social security	48,6	59,8	67,9
Education	102,6	88,7	98,1
Health and social work	67,6	70,6	93
Other service activities	113,2	93,1	88,2

Source: Regional Annual of North Region – 1997,2000; INE, Labour Force Survey; in Annual Statistics, 2004

Reference: INE, Employment Enquiry, 1997, 2000; published information

Table 40: Total factor productivity in region by type of activity (NACE)

	thousand euros		
	1996	2000	2003
Productivity	14,2	16,9	18,7

(GVA/Employment)

Source: INE, Annual of Regional accounts in INE, Region North 2002, 2003 e 2004

Table 41: Knowledge-intensity of production in region by type of activity (NACE)

thousand euros

NACE	DESCRIPTION	R&D Expenditure			
		1995	1999	2001	2003
1	Agriculture, hunting and related service activities	-	118,6	74,2	71,7
5	Fishing, fish farming and related service activities	-	-	44,9	-
11	Extraction of crude petroleum and natural gas; service activities incidental to oil and gas extraction, excluding surveying	-	17,8	-	-
14	Other mining and quarrying	-	9,3	32,3	27,2
15	Manufacture of food products and beverages	1 341,4	586,1	1 258,3	1 591,0
17	Manufacture of textiles	2 002,9	3 921,1	4 341,9	7 080,9
18	Manufacture of wearing apparel; dressing and dyeing of fur	-	109,0	201,3	2 009,2
19	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	613,0	687,7	760,9	340,7
20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	-	6 071,8	1 937,5	3 129,7
21	Manufacture of pulp, paper and paper products	471,2	141,9	788,3	1 085,7
22	Publishing, printing and reproduction of recorded media	-	31,0	162,1	48,5
23 and 24 a)	Manufacture of coke, refined petroleum products and nuclear fuel; and Manufacture of chemicals and chemical products	2 366,3	3 785,7	8 215,1	8 344,8
25	Manufacture of rubber and plastic products	202,1	1 969,4	3 281,6	9 341,1
26	Manufacture of other non-metallic mineral products	56,1	78,9	129,0	1 157,1
27	Manufacture of basic metals	-	465,9	188,0	703,8
28	Manufacture of fabricated metal products, except machinery and equipment	50,1	2 440,6	1 692,7	615,8
29	Manufacture of machinery and equipment n.e.c.	1 701,4	5 352,2	5 699,6	8 958,0
30	Manufacture of office machinery and computers	78,2	46,4	-	429,3
31	Manufacture of electrical machinery and apparatus n.e.c.	2 935,6	2 739,9	2 444,5	1 973,6
32	Manufacture of radio, television and communication equipment and apparatus	3 890,8	3 978,6	3 264,3	9 044,1
33	Manufacture of medical, precision and optical instruments, watches and clocks	679,9	2 601,0	2 778,5	2 651,5
34	Manufacture of motor vehicles, trailers and semi-trailers	3 273,9	1 542,6	1 882,8	2 307,6
35	Manufacture of other transport equipment	356,4	184,6	21,9	109,4
36	Manufacture of furniture; manufacturing n.e.c.	257,8	559,1	434,2	611,8
40	Electricity, gas, steam and hot water supply	-	338,5	264,7	-
41	Collection, purification and distribution of water	-	212,0	66,2	224,6
45	Construction	23,9	626,9	156,4	609,9
51	Wholesale trade and commission trade, except of motor vehicles and motorcycles	-	198,5	633,4	511,8
52	Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods	-	593,0	480,2	591,1
60	Land transport; transport via pipelines	401,5	32,8	43,9	92,1
63	Supporting and auxiliary transport activities; activities of travel agencies	-	56,4	53,3	337,7
64	Post and telecommunications	-	-	-	63,5
65	Financial intermediation, except insurance and pension funding	-	631,7	10,0	31 096,6
66	Insurance and pension funding, except compulsory social security	-	72,4	-	171,8

72	Computer and related activities	252,2	5 498,2	7 192,0	6 212,0
73	Research and development	145,2	66,8	45,7	859,3
74	Other business activities	1 067,3	3 468,5	8 961,5	8 350,1
80	Education	-	-	298,0	327,9
85	Health and social work	56,4	236,9	17,5	97,1
90	Sewage and refuse disposal, sanitation and similar activities	-	-	-	42,9
91	Activities of membership organizations n.e.c.	185,4	577,8	318,0	1 397,1
92	Recreational, cultural and sporting activities	-	20,5	22,0	203,9
Total da região		22 409,1	50 070,0	58 196,8	112 821,8

Source: Observatory of Science and Higher Education (Ministry of Science, Technology and Higher Education)

NOTE: a) For reasons of statistical secrecy, the results for NACE 23 and 24 are presented together

Table 42: Number of companies in region by type of activity (NACE) and Size distribution of companies in region by type of activity (NACE)

NACE	DESCRIPTION	Year 1998						Year 2000						Year 2002					
		1 to 9	10 to 19	20 to 99	100 to 199	More than 200	Total	1 to 9	10 to 19	20 to 99	100 a 199	More than 200	Total	1 to 9	10 a 19	20 to 99	100 a 199	More than 200	Total
A	Agriculture, hunting and forestry																		
1	Agriculture, hunting and related service activities	871	74	55	4	1	1005	1154	81	51	2	1	1289	1469	97	45	1	0	1612
2	Forestry, logging and related service activities	193	11	2	1	0	207	232	9	3	0	0	244	248	14	2	0	0	264
B	Fishing																		
5	Fishing, fish farming and related service activities	22	17	8	2	0	49	32	23	6	1	0	62	34	20	6	0	0	60
C	Mining and quarrying																		
10	Mining of coal and lignite; extraction of peat	2	0	0	0	0	2	2	0	0	0	0	2						
12	Mining of uranium and thorium ores	1	0	0	0	0	1												
13	Mining of metal ores	4	1	0	0	0	5	2	0	0	0	0	2	1	0	0	0	0	1
14	Other mining and quarrying	238	66	72	5	0	381	248	69	72	3	0	392	237	76	71	4	0	388
D	Manufacturing																		
15	Manufacture of food products and beverages	1157	357	275	30	7	1826	1274	379	267	26	9	1955	1430	390	256	20	14	2110
16	Manufacture of tobacco products	0	0	1	0	0	1	1	0	1	0	0	2	0	0	1	0	0	1
17	Manufacture of textiles	1137	395	562	109	79	2282	1292	454	548	107	64	2465	1254	457	544	84	50	2389
18	Manufacture of wearing apparel; dressing and dyeing of fur	3010	909	1138	101	48	5206	3501	970	1190	81	46	5788	3159	1056	1084	71	41	5411
19	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	860	420	562	61	34	1937	906	402	552	60	24	1944	869	405	515	57	16	1862

NACE	DESCRIPTION	Year 1998						Year 2000						Year 2002					
		1 to 9	10 to 19	20 to 99	100 to 199	More than 200	Total	1 to 9	10 to 19	20 to 99	100 a 199	More than 200	Total	1 to 9	10 a 19	20 to 99	100 a 199	More than 200	Total
20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	1782	276	188	18	7	2271	1919	270	189	20	7	2405	2067	284	175	13	8	2547
21	Manufacture of pulp, paper and paper products	110	60	48	6	1	225	112	58	42	8	1	221	112	53	45	5	2	217
22	Publishing, printing and reproduction of recorded media	508	138	95	5	3	749	556	152	97	6	2	813	596	140	82	8	1	827
23	Manufacture of coke, refined petroleum products and nuclear fuel	0	0	1	0	1	2												
24	Manufacture of chemicals and chemical products	132	69	56	8	2	267	144	66	65	7	3	285	178	57	66	4	3	308
25	Manufacture of rubber and plastic products	144	61	102	8	7	322	160	74	94	13	7	348	166	76	90	10	6	348
26	Manufacture of other non-metallic mineral products	632	173	146	4	3	958	733	195	154	4	3	1089	729	198	131	6	3	1067
27	Manufacture of basic metals	73	20	53	8	5	159	72	21	44	10	4	151	67	28	43	6	7	151
28	Manufacture of fabricated metal products, except machinery and equipment	1897	335	275	19	12	2538	2133	373	302	22	10	2840	2262	391	295	25	10	2983
29	Manufacture of machinery and equipment n.e.c.	380	122	176	21	10	709	396	128	182	20	9	735	450	154	166	16	8	794
30	Manufacture of office machinery and comp.													1	0	0	0	0	1
31	Manufacture of electrical machinery and apparatus n.e.c.	136	37	27	8	11	219	134	35	28	9	11	217	147	35	32	8	14	236

NACE	DESCRIPTION	Year 1998						Year 2000						Year 2002					
		1 to 9	10 to 19	20 to 99	100 to 199	More than 200	Total	1 to 9	10 to 19	20 to 99	100 a 199	More than 200	Total	1 to 9	10 a 19	20 to 99	100 a 199	More than 200	Total
32	Manufacture of radio, television and communication equipment and apparatus	22	6	8	3	6	45	24	8	7	2	5	46	20	6	17	2	5	50
33	Manufacture of medical, precision and optical instruments, watches and clocks	83	10	8	2	3	106	100	11	10	3	4	128	129	7	8	4	3	151
34	Manufacture of motor vehicles, trailers and semi-trailers	39	20	32	10	5	106	40	21	36	10	9	116	44	18	38	9	7	116
35	Manufacture of other transport equipment	16	5	9	1	2	33	15	4	8	1	2	30	17	4	9	2	2	34
36	Manufacture of furniture; manufacturing n.e.c.	2589	504	318	16	7	3434	2736	515	360	11	7	3629	2560	444	316	12	3	3335
37	Recycling	15	4	3	0	0	22	27	7	5	0	0	39	40	8	5	0	0	53
E	Electricity, gas and water supply																		
40	Electricity, gas, steam and hot water supply	92	33	64	6	2	197	94	25	60	5	2	186	99	34	46	5	1	185
41	Collection, purification and distribution of water	3	3	2	0	0	8	7	4	5	0	0	16	7	6	7	1	0	21
F	Construction																		
45	Construction	8999	1389	849	66	25	11328	12341	1808	962	56	27	15194	13488	2121	1090	72	29	16800
G	Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods																		
50	Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel	4332	480	249	7	2	5070	4943	504	268	10	1	5726	5247	555	253	11	2	6068
51	Wholesale trade and commission trade, except of motor vehicles and motorcycles	6292	991	468	13	9	7773	7360	1148	512	16	8	9044	8398	1128	536	20	5	10087

(Cont.)

NACE	DESCRIPTION	Year 1998						Year 2000						Year 2002					
		1 to 9	10 to 19	20 to 99	100 to 199	More than 200	Total	1 to 9	10 to 19	20 to 99	100 a 199	More than 200	Total	1 to 9	10 a 19	20 to 99	100 a 199	More than 200	Total
52	Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods	14814	648	238	16	9	15725	16834	737	300	19	13	17903	17747	756	324	19	13	18859
H	Hotels and restaurants																		
55	Hotels and restaurants	6782	501	174	6	1	7464	7845	557	232	9	1	8644	8673	606	264	8	2	9553
I	Transport, storage and communication																		
60	Land transport; transport via pipelines	1166	144	138	18	8	1474	1606	182	152	16	9	1965	2384	185	152	12	10	2743
61	Water transport	4	0	3	0	0	7	7	1	2	0	0	10	2	1	1	0	0	4
62	Air transport	3	3	1	1	1	9	6	3	1	1	1	12	7	2	0	1	1	11
63	Supporting and auxiliary transport activities; activities of travel agencies	516	89	47	4	2	658	578	114	59	7	3	761	643	112	62	3	3	823
64	Post and telecommunications	116	60	61	16	9	262	133	54	62	24	5	278	149	49	68	22	6	294
J	Financial intermediation																		
65	Financial intermediation, except insurance and pension funding	1039	308	106	14	5	1472	1327	284	88	16	3	1718	1307	286	81	13	4	1691
66	Insurance and pension funding, except compulsory social security	215	30	16	1	3	265	213	28	15	1	3	260	217	28	14	3	2	264
67	Activities auxiliary to financial intermediation	303	16	9	0	0	328	386	20	9	0	0	415	464	17	6	0	0	487
K	Real estate, renting and business activities																		
70	Real estate activities	900	33	7	1	0	941	1486	38	11	1	0	1536	1770	50	12	0	0	1832
71	Renting of machinery and equipment without operator and of personal and household goods	176	20	4	0	0	200	223	22	7	0	0	252	259	18	14	0	0	291

(Cont.)

NACE	DESCRIPTION	Year 1998						Year 2000						Year 2002					
		1 to 9	10 to 19	20 to 99	100 to 199	More than 200	Total	1 to 9	10 to 19	20 to 99	100 a 199	More than 200	Total	1 to 9	10 a 19	20 to 99	100 a 199	More than 200	Total
72	Computer and related activities	186	19	13	0	1	219	269	30	18	2	1	320	366	36	27	4	0	433
73	Research and development	8	4	2	0	0	14	8	3	3	0	0	14	12	3	5	0	0	20
74	Other business activities	3629	243	138	32	27	4069	4821	329	204	35	35	5424	5623	371	225	39	41	6299
L	Public administration and defence; compulsory social security																		
75	Public administration and defence; compulsory social security	43	17	5	0	0	65	36	18	8	0	0	62	88	50	36	2	1	177
M	Education																		
80	Education	466	187	141	11	5	810	660	167	163	16	4	1010	803	181	151	11	4	1150
N	Health and social work																		
85	Health and social work	1917	249	254	13	8	2441	2431	307	346	18	9	3111	2875	335	384	23	9	3626
O	Other community, social and personal service activities																		
90	Sewage and refuse disposal, sanitation and similar activities	14	6	2	0	0	22	28	8	14	0	0	50	33	12	18	1	2	66
91	Activities of membership organizations n.e.c.	329	46	26	0	0	401	439	59	36	0	1	535	534	77	50	3	2	666
92	Recreational, cultural and sporting activities	420	35	49	5	3	512	519	58	52	2	3	634	587	66	56	3	3	715
93	Other service activities	1917	49	15	0	0	1981	2314	53	19	0	0	2386	2687	50	18	0	0	2755
	TOTAL	70734	9693	7301	680	374	88782	84859	10886	7921	680	357	104703	92755	11553	7942	643	343	113236

Source: General Directorate of Studies, Statistics and Planning

Table 43: Percentage of innovative companies in the North Region

Companies with innovation activities in the North Region, for the period 1998-2000

Percentage of companies with innovation activities	43,5%
--	-------

Source: Observatory of Science and Higher Education (Ministry of Science, Technology and Higher Education); 3rd Community Innovation Survey (CIS 3)

Concepts (by the 2nd Edition of Oslo Manual, 1997):

Innovation: defined as being the introduction of a product in the market (good or service), new or significantly improved, or the introduction of a new production process or significantly improved, including methods of product distribution

Companies with innovation activities: companies that introduced innovations in the products or in the processes and also the companies which had incomplete or abandoned projects of innovation development.

Table 44: Number of foreign-owned companies in the region (e.g. multinational corporations)

NACE		DESCRIPTION		% of Foreign Capital			Nr. Companies with < 50% of Foreign Capital			Nr. Personnel in companies with < 50% Foreign Capital			Nr. Companies with > 50% Foreign Capital			Nr. Personnel in companies with > 50% Foreign Capital		
				1998	2000	2002	1998	2000	2002	1998	2000	2002	1998	2000	2002	1998	2000	2002
1	Agriculture, hunting and related service activities	2,96	5,70	0,29	1	3	0	6	17	0	5	5	3	102	87	26		
2	Forestry, logging and related service activities	0,00	1,50	0,00	0	0	0	0	0	0	0	1	0	0	17	0		
5	Fishing, fish farming and related service activities	0,00	0,00	0,00	0	0	0	0	0	0	0	0	0	0	0	0		
13	Mining of metal ores	0,27	21,05	100,00	0	0	0	0	0	0	1	1	1	5	6	3		
14	Other mining and quarrying	3,90	38,75	0,49	2	2	2	198	217	187	4	5	5	243	203	67		
15	Manufacture of food products and beverages	3,73	1,34	64,39	2	3	1	1.309	1312	459	9	11	10	559	894	1.045		
17	Manufacture of textiles	9,98	10,92	6,62	8	10	5	1.217	1200	603	24	25	25	3.562	4398	3.428		
18	Manufacture of wearing apparel; dressing and dyeing of fur	3,88	5,07	14,60	6	5	9	575	339	763	43	46	41	5.419	5485	5.121		
19	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	9,72	11,45	8,62	3	1	2	331	11	110	25	23	21	9.770	8194	7.277		
20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	1,33	2,75	2,27	1	1	2	14	8	26	16	14	9	935	755	485		
21	Manufacture of pulp, paper and paper products	1,18	1,20	0,05	1	1	0	123	134	0	2	2	1	116	156	5		
22	Publishing, printing and reproduction of recorded media	1,16	0,00	8,24	0	0	1	0	0	59	1	0	3	81	0	467		
24	Manufacture of chemicals and chemical products	15,19	23,87	24,68	2	2	2	37	49	28	11	15	10	731	791	603		
25	Manufacture of rubber and plastic products	24,32	27,45	4,42	3	4	3	289	412	326	5	6	8	1.037	1649	388		
26	Manufacture of other non-metallic mineral products	16,06	0,78	15,28	3	2	0	107	84	0	5	5	6	897	213	832		
27	Manufacture of basic metals	8,08	3,42	9,66	2	1	0	290	198	0	5	3	5	356	381	766		
28	Manufacture of fabricated metal products, except machinery and equipment	3,15	5,23	7,82	4	4	2	283	76	2	12	18	13	552	1554	2.380		
29	Manufacture of machinery and equipment n.e.c.	17,74	18,23	2,55	5	7	3	315	557	335	11	9	9	1.682	1428	783		
31	Manufacture of electrical machinery and apparatus n.e.c.	19,02	40,32	33,90	2	1	2	182	147	141	14	15	14	7.224	9401	3.255		
32	Manufacture of radio, television and communication equipment and apparatus	98,36	87,92	43,82	0	0	1	0	0	91	8	5	4	4.468	4307	2.958		
33	Manufacture of medical, precision and optical instruments, watches and clocks	62,94	32,48	50,46	0	0	0	0	0	0	7	7	8	1.384	1296	1.347		
34	Manufacture of motor vehicles, trailers and semi-trailers	36,77	36,29	32,84	1	1	4	2.131	2150	2.058	5	8	9	1.437	2606	3.194		
35	Manufacture of other transport equipment	0,00	0,00	0,00	0	0	0	0	0	0	0	0	0	0	0	0		

36	Manufacture of furniture; manufacturing n.e.c.	7,38	1,00	1,88	0	0	1	0	0	37	8	6	6	947	1270	723
37	Recycling	5,80	8,47	0,00	1	1	0	16	2	0	0	0	0	0	0	0

(Cont.)

NACE	DESCRIPTION	% of Foreign Capital			Nr. Companies with < 50% of Foreign Capital			Nr. Personnel in companies with < 50% Foreign Capital			Nr. Companies with > 50% Foreign Capital			Nr. Personnel in companies with > 50% Foreign Capital		
		1998	2000	2002	1998	2000	2002	1998	2000	2002	1998	2000	2002	1998	2000	2002
40	Electricity, gas, steam and hot water supply	20,84	25,27	15,87	5	4	2	4.204	207	121	1	1	3	46	48	59
41	Collection, purification and distribution of water	0,00	0,00	0,00	0	0	0	0	0	0	0	0	0	0	0	0
45	Construction	0,45	0,25	0,25	1	3	2	9	61	18	13	19	15	125	210	261
50	Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel	1,19	0,85	2,22	3	3	3	303	426	525	9	8	8	235	191	329
51	Wholesale trade and commission trade, except of motor vehicles and motorcycles	3,94	3,16	10,62	11	18	17	113	506	919	120	124	136	2.568	2.068	2.574
52	Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods	0,45	2,52	1,09	5	6	8	48	212	118	16	32	40	553	617	1.146
55	Hotels and restaurants	1,09	0,04	0,19	2	3	2	295	301	344	4	3	6	60	50	391
60	Land transport; transport via pipelines	0,80	0,85	0,38	0	0	1	0	0	7	4	6	9	286	527	586
61	Water transport	52,94	30,86	0,88	0	0	1	0	0	59	1	1	0	46	67	0
62	Air transport	0,00	0,00	0,00	0	0	0	0	0	0	0	0	0	0	0	0
63	Supporting and auxiliary transport activities; activities of travel agencies	1,16	1,08	4,12	2	1	1	13	23	5	10	12	20	180	306	787
64	Post and telecommunications	0,03	0,00	23,69	1	0	2	534	0	1.525	0	0	0	0	0	0
65	Financial intermediation, except insurance and pension funding	31,49	43,10	26,67	1	3	2	30	728	8.967	5	4	0	4.152	8911	0
66	Insurance and pension funding, except compulsory social security	13,06	18,58	28,86	1	1	1	1.130	1.012	1.159	0	0	0	0	0	0
67	Activities auxiliary to financial intermediation	0,46	0,04	0,08	0	0	0	0	0	0	2	1	1	11	14	3
70	Real estate activities	1,35	1,17	0,91	1	3	3	9	23	54	4	4	9	10	15	47
71	Renting of machinery and equipment without operator and of personal and household goods	0,00	0,12	0,24	0	0	0	0	0	0	0	1	1	0	4	23
72	Computer and related activities	5,53	6,14	13,64	0	0	3	0	0	173	1	2	4	4	71	157
73	Research and development	0,47	0,44	0,80	1	1	1	18	19	19	0	0	0	0	0	0
74	Other business activities	9,66	0,98	9,29	8	11	15	358	1.006	2.568	23	28	38	1.949	722	1.679
75	Public administration and defence; compulsory social security	0,00	0,00	0,00	0	0	0	0	0	0	0	0	0	0	0	0
80	Education	0,00	0,00	0,04	0	0	1	0	0	2	0	0	1	0	0	1
85	Health and social work	0,02	0,00	0,03	0	0	1	0	0	11	1	0	1	3	0	9

90	Sewage and refuse disposal, sanitation and similar activities	0,00	0,00	12,49	0	0	1	0	0	5	0	0	1	0	0	691
91	Activities of membership organizations n.e.c.	0,00	0,00	0,00	0	0	0	0	0	0	0	0	0	0	0	0
92	Recreational, cultural and sporting activities	0,00	0,35	10,02	0	0	0	0	0	0	2	4	5	158	159	129
93	Other service activities	0,04	0,07	0,25	1	0	0	6	0	0	3	8	9	37	76	134

Source: General Directorate of Studies, Statistics and Planning

Table 45: Percentage of foreign capital, by company size

	% of Foreign Capital		
	1998	2000	2002
1 to 4 employees	0,86	5,79	1,98
5 to 9 employees	8,47	1,44	9,28
10 to 19 employees	2,44	0,41	8,47
20 to 49 employees	2,55	3,52	7,38
50 to 99 employees	3,26	3,77	1,54
100 to 149 employees	51,01	12,75	3,40
150 to 199 employees	16,02	12,93	18,40
200 to 249 employees	9,14	18,49	4,79
250 to 499 employees	8,54	11,15	57,42
500 to 999 employees	15,43	24,81	16,59
1000 and more employees	25,56	39,24	29,46

Source: General Directorate of Studies, Statistics and Planning

Table 46: Number of companies with foreign capital, by company size

	Nr. of companies with < 50% foreign Capital			Nr. of companies with > 50% foreign Capital		
	1998	2000	2002	1998	2000	2002
1 to 4 employees	11	23	14	84	92	114
5 to 9 employees	15	10	20	72	93	84
10 to 19 employees	14	14	13	66	84	80
20 to 49 employees	14	20	18	67	69	77
50 to 99 employees	12	13	14	39	40	54
100 to 149 employees	8	10	8	35	36	33
150 to 199 employees	2	5	4	22	15	18
200 to 249 employees	4	2	3	14	12	16
250 to 499 employees	5	4	7	19	24	24
500 to 999 employees	1	2	1	12	14	14
1000 and more employees	4	3	5	10	9	4

Source: General Directorate of Studies, Statistics and Planning

**Table 47: Number of employees with foreign capital,
by company size**

	Nr. of employees with < 50% foreign Capital			Nr. of employees with > 50% foreign Capital		
	1998	2000	2002	1998	2000	2002
1 to 4 employees	29	62	30	219	238	288
5 to 9 employees	94	68	128	469	630	600
10 to 19 employees	206	205	186	890	1.123	1.087
20 to 49 employees	504	714	621	2.241	2.238	2.493
50 to 99 employees	815	965	1.037	2.782	2.921	3.998
100 to 149 employees	1.022	1.220	961	4.382	4.531	4.018
150 to 199 employees	348	905	687	3.679	2.648	3.052
200 to 249 employees	910	422	688	3.080	2.622	3.572
250 to 499 employees	1.515	1.195	2.707	6.562	8.481	7.972
500 to 999 employees	534	1.330	615	8.111	8.726	9.531
1000 and more employees	8.516	4.351	14.164	19.515	24.989	7.548

Source: General Directorate of Studies, Statistics and Planning

Table 48: Revenue of foreign-owned companies in the region

NACE	DESCRIPTION	Sales (Millions Euros)		
		1998	2000	2002
1	Agriculture, hunting and related service activities	6055	6423	506
2	Forestry, logging and related service activities	0	503	0
13	Mining of metal ores	0	59	0
14	Other mining and quarrying	27409	27310	17669
15	Manufacture of food products and beverages	316823	369293	129627
17	Manufacture of textiles	305779	338019	293269
18	Manufacture of wearing apparel; dressing and dyeing of fur	130838	155353	143425
19	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	306074	291217	353732
20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	64397	75260	61632
21	Manufacture of pulp, paper and paper products	16757	23168	5296
22	Publishing, printing and reproduction of recorded media	1836		42991
24	Manufacture of chemicals and chemical products	109242	132129	146942
25	Manufacture of rubber and plastic products	149792	225802	66802
26	Manufacture of other non-metallic mineral products	60866	14766	58474
27	Manufacture of basic metals	31083	33063	57693
28	Manufacture of fabricated metal products, except machinery and equipment	62908	109365	159411
29	Manufacture of machinery and equipment n.e.c.	139988	171564	110369
31	Manufacture of electrical machinery and apparatus n.e.c.	349026	462627	673694
32	Manufacture of radio, television and communication equipment and apparatus	494882	2091083	448487
33	Manufacture of medical, precision and optical instruments, watches and clocks	47013	62019	98098
34	Manufacture of motor vehicles, trailers and semi-trailers	481400	628377	650997
36	Manufacture of furniture; manufacturing n.e.c.	52748	49386	43741
40	Electricity, gas, steam and hot water supply	1131088	33203	6926
45	Construction	17049	30693	43854
50	Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel	79043	139993	208510
51	Wholesale trade and commission trade, except of motor vehicles and motorcycles	504784	734628	968800
52	Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods	62953	96823	145859
55	Hotels and restaurants	14855	10732	34646
60	Land transport; transport via pipelines	8384	22495	31712
61	Water transport	2174	4107	4603
63	Supporting and auxiliary transport activities; activities of travel agencies	30480	56407	221814
64	Post and telecommunications	0		721231
65	Financial intermediation, except insurance and pension funding	1448436	1436433	4403860
66	Insurance and pension funding, except compulsory social security	212	226701	281026
67	Activities auxiliary to financial intermediation	677	1192	0
70	Real estate activities	4131	5370	29045
71	Renting of machinery and equipment without operator and of personal and household goods		0	497
72	Computer and related activities	753	189	34779
73	Research and development	285	476	343
74	Other business activities	56667	62513	420741

85	Health and social work	89		482
90	Sewage and refuse disposal, sanitation and similar activities			15628
92	Recreational, cultural and sporting activities	6460	6986	11758
93	Other service activities	342	1195	2239

Table 49: Ratio (regions' exports) /(Regional GDP)

	1996	2000	2003
Exports	8538,59	9319,15	13067,00
GDP	25987,00	33178,00	36557,00
Ratio (regions exports) /(Regional GDP)	0,33	0,28	0,36

Source: INE, International Trade Statistics.

Source: INE, Regional accounts in INE, in Anuário estatístico da Região North

Table 50: Degree of export orientation in the various sectors, 2004

	Total	Intra-community Trading	Extra-community Trading
	Departures	Dispatches	Exports
TOTAL North	13329676	10786577	2543099
Food and Beverages	792997	622971	170026
Industrial goods not specified elsewhere	3589156	2867495	721661
Fuels and oils	177784	119282	58502
Machines, other capital goods (except transport material) and accessories	2010463	1136848	873616
Transport material and accessories	1769982	1671990	97992
Consumer goods not specified elsewhere	4986646	4367878	618768
Goods not specified elsewhere	2647	113	2534

Source: INE, International Trade Statistics.

INDICATORS SUMMARY

New Code	Old Code	Category	Sub-category	Indicators	Definition	Quantitative (Qn) / Qualitative data (QI)	National Source
1	1	Knowledge creation capacity	Knowledge Infrastructure	Number of Public Research Services Establishments (Public research institutes)	Represent the Government sector R&D performers defined by Frascati: All departments, offices and other bodies which furnish but normally do not sell to the community those common services, other than higher education, which cannot otherwise be conveniently and economically provided and administer the state and the economic and social policy of the community. (Public enterprises are included in the business enterprise sector); Non-profit institutes (NPIs) controlled and mainly financed by government.	Qn	OCES – Science and Higher Education Observatory
2	2	Knowledge creation capacity	Knowledge Infrastructure	Number of Private Non-Profit (PNP) research organisations	As a sector of R&D performance, PNP includes non-market units controlled and mainly financed by NPIs serving households, notably professional and learned societies and charities, other than those providing higher education services or administered by higher education institutions. However, R&D foundations managed by NPSH but having more than 50% of their running costs covered by a block grant from government should be included in the government sector.	Qn	OCES – Science and Higher Education Observatory
3	3	Knowledge creation capacity	Knowledge Infrastructure	Number of R&D personnel in Public Research Services Establishments	All persons employed directly on R&D should be counted, as well as those providing direct services, such as R&D managers, administrators, and clerical staff. In Head Count	Qn	OCES – Science and Higher Education Observatory
4	4	Knowledge creation capacity	Knowledge Infrastructure	Number of R&D personnel Private Non-Profit (PNP) research organisations	All persons employed directly on R&D should be counted, as well as those providing direct services such as R&D managers, administrators, and clerical staff. In Head Count	Qn	OCES – Science and Higher Education Observatory
5	5	Knowledge creation capacity	Knowledge Infrastructure	Number of higher education institutes (HEIs)	All universities, colleges of technology and other institutes of post-secondary education, whatever their source of finance or legal status (private or public, profit or non-profit). It also includes all research institutes, experimental stations and clinics operating under the direct control of or administered by or associated with higher education establishments.	Qn	OCES – Science and Higher Education Observatory
6	6	Knowledge creation capacity	Knowledge Infrastructure	Number of academic staff in HEIs	Academic staff in HEIs: includes teaching staff (corresponds to ISCED97 5-6) and Researchers (e.g. Research Fellows). Technicians and other supporting staff are not included	Qn	OCES – Science and Higher Education Observatory

New Code	Old Code	Category	Sub-category	Indicators	Definition	Quantitative (Qn) / Qualitative data (Ql)	National Source
7	7	Knowledge creation capacity	Knowledge Infrastructure	Number of doctorates awarded in the region	Doctorates: Persons under category ISCED 97 level 6 classification	Qn	OCES – Science and Higher Education Observatory
8	8	Knowledge creation capacity	Knowledge Infrastructure	Number of higher education institutes awarding science and engineering degrees	Institutes according to definition in 5 awarding Science degrees : Life science (ISC 42), Physical sciences (ISC 44), Mathematics and statistics (ISC 46), Computing (ISC 48) and Engineering degrees : Engineering and engineering trades (ISC 52), Manufacturing and processing (ISC 54), Architecture and building (ISC 58).	Qn	OCES – Science and Higher Education Observatory
9	10	Knowledge creation capacity	Knowledge Infrastructure	Number of enrolled students	Students enrolled in tertiary education including postgraduate students. ISCED 5, and 6 educational programme classification. Indicator in (a) numbers and (b) Students (ISCED 5-6) at regional level – as % of total country level students (ISCED 5-6)	Qn	OCES – Science and Higher Education Observatory
10		Knowledge creation capacity	Knowledge Infrastructure	Total number of students enrolled in science and engineering programmes	See 8 for Science and Engineering Programmes-degrees	Qn	
14	14	Knowledge creation capacity	Knowledge Infrastructure	Size of research budget of universities	For Universities see definition in 5	Qn	OCES – Science and Higher Education Observatory
15	15	Knowledge creation capacity	Knowledge Infrastructure	Size of research budget of research institutes	For research institutes see definition in 1	Qn	OCES – Science and Higher Education Observatory
16	16	Knowledge creation capacity	R&D personnel	Percentage of R&D personnel (Head count) by type of organisation or sector of performance (i.e. research institutes/ higher education/firms)	R&D personnel: All persons employed directly on R&D in a region should be counted, as well as those providing direct services, such as R&D managers, administrators and clerical staff. Those providing an indirect service, such as canteen and security staff, should be excluded, even though their wages and salaries are included as an overhead cost in the measurement of R&D expenditure. Types of organisations or sectors of performance: Government sector: legal entity, institutions, departments, public bodies etc, Higher Education sector: legal entity, universities, Higher Education establishments, etc, Private Non-Profit sector: institutes, Business Enterprise sector: the enterprise	Qn	OCES – Science and Higher Education Observatory

New Code	Old Code	Category	Sub-category	Indicators	Definition	Quantitative (Qn) / Qualitative data (QI)	National Source
17	18	Knowledge creation capacity	R&D personnel	R&D personnel by scientific field (according to the OECD classification i.e. natural science, social sciences, humanities)	R&D Personnel: see 16, OECD Classification: Earth; Infrastructure and general planning of land-use, control and care of the environment; Protection and improvement of human health; Production, distribution and rational utilisation of energy; Agricultural production and technology; Industrial production and technology; Social structures and relationships; Exploration and exploitation of space; Research financed from General University Funds (GUF); Non-oriented research; Other civil research; Defence.	Qn	OCES – Science and Higher Education Observatory
19	20	Knowledge creation capacity	R&D expenditure	R&D expenditure by type of organisation (i.e. R&D institutes/ higher education/firms)	Total R&D expenditure is: Gross domestic expenditure on R&D (GERD) R&D by type of activity: Business enterprise expenditure in R&D (BERD), Higher Education expenditure in R&D (HERD), Government expenditure in R&D (GOVERD) and Private Non-profit expenditure in R&D (PNPRD). Indicators estimated as % of GRP	Qn	OCES – Science and Higher Education Observatory
20	21	Knowledge creation capacity	R&D expenditure	R&D expenditure by type of activity (i.e. basic/ applied research, experimental development)		Qn	OCES – Science and Higher Education Observatory
21	22	Knowledge creation capacity	R&D expenditure	R&D expenditure by scientific field (according to the OECD classification i.e. natural science, social sciences, humanities)	See 17 for classification of scientific fields. In % by scientific field	Qn	OCES – Science and Higher Education Observatory
22	23	Knowledge creation capacity	R&D expenditure	R&D expenditure by source of funding (domestic companies, foreign companies, national or regional government)	In % by scientific field	Qn	OCES – Science and Higher Education Observatory
23	24	Knowledge creation capacity	Knowledge output	Percentage of publications by scientific field		Qn	OCES – Science and Higher Education Observatory
24	25	Knowledge creation capacity	Knowledge output	Percentage of citations by scientific field		Qn	OCES – Science and Higher Education Observatory
25	26	Knowledge creation capacity	Knowledge output	Number of patent applications (by industrial field and technology intensity i.e. IPC)	Use patents in EPO. In percentages by IPC	Qn	INPI – National Institute of Industrial Property
26		Knowledge creation capacity	Knowledge output	Patent applications per million Euro of Regional GDP		Qn	

New Code	Old Code	Category	Sub-category	Indicators	Definition	Quantitative (Qn) / Qualitative data (QI)	National Source
34	34	Knowledge absorption capacity	<i>Education and human resources</i>	Percentage of economically active population with higher education	Percentage of economically active population with tertiary education levels 5-6 (ISCED 1997)	Qn	National Statistical Institute, General Population and Habitation census
35	35	Knowledge absorption capacity	<i>Education and human resources</i>	Percentage of economically active population with high-school education	Percentage of economically active population with upper secondary and post-secondary education levels 3-4 (ISCED 1997)	Qn	National Statistical Institute, General Population and Habitation census
37	37	Knowledge absorption capacity	<i>Education and human resources</i>	Human resources in S&T as percentage of total population in the Region	<p>HRST is defined according to the Canberra Manual as a person fulfilling at least one of the following conditions:</p> <ul style="list-style-type: none"> ▪ Successfully completed education at the third level in a S&T field of study (HRSTE) or ▪ Not formally qualified as above, but employed in a S&T occupation where the above qualifications are normally required (HRSTO). <p>Even though the official definition of HRST as shown in the Canberra Manual contains the terms "S&T", these terms do not restrict the definition: HRSTE covers all fields of study, i.e. anyone who has successfully completed tertiary level education; HRSTO refers to two specific major ISCO classes that are broader than what one might expect from scientific and technological activities in a stricter sense.</p>	Qn	
38	38	Knowledge absorption capacity	<i>Education and human resources</i>	Human resources in S&T as percentage of Economically active population		Qn	
43	42	Productive structure of regional economy	<i>Regional product</i>	Gross regional product by type of activity (NACE first digit level A-P)		Qn	National Statistical Institute, Regional accounts
44	43	Productive structure of regional economy	<i>Regional product</i>	Value added by type of activity (NACE)	Distribution of Gross value added by NACE at 1 -digit level A to P. If possible, present higher disaggregation at 2-digit level using national or regional data	Qn	National Statistical Institute, Regional accounts

New Code	Old Code	Category	Sub-category	Indicators	Definition	Quantitative (Qn) / Qualitative data (Ql)	National Source
46	45	Productive structure of regional economy	Regional product	Gross Fixed Capital formation by type of activity (NACE)	Regional gross fixed capital formation - GFCF (ESA 1995, 3.102) consists of residents' product acquisitions, less disposals, of fixed assets during a given period, plus certain additions to the value of non-produced assets realised by the productive activity of producer or institutional units in a region. Fixed assets are tangible or intangible assets produced as outputs from processes of production that are themselves used repeatedly, or continuously, in processes of production for more than one year. Disposals of fixed assets are treated as negative acquisitions. NACE: Eurostat provides data for 1 digit from A to P. If national or regional statistic provide more disaggregated data (e.g. 2 digit level) then use them additional to those of Eurostat. Indicator: % of NACEs in Regions GFCF.	Qn	National Statistical Institute
47	46	Productive structure of regional economy	Employment, productivity and factor intensity	Total employment in region as % of total employment in country		Qn	National Statistical Institute, employment Statistics. And General Directorate of Studies, Statistics and Planning
48	47	Productive structure of regional economy	Employment, productivity and factor intensity	Employment in region by type of activity (NACE) (%)	Eurostat provides the following disaggregation: a-b, c-d-e, f, g-h-l, l-q. If possible, provide higher disaggregation	Qn	National Statistical Institute, employment Statistics. And General Directorate of Studies, Statistics and Planning
49	48	Productive structure of regional economy	Employment, productivity and factor intensity	Total factor productivity in region by type of activity (NACE)		Qn	National Statistical Institute
51	50	Productive structure of regional economy	Employment, productivity and factor intensity	Knowledge- intensity of production in region by type of activity (NACE)	BERD/Gross Value added by NACE (1 or 2 digit)	Qn	Science and Higher Education Observatory
52	51	Productive structure of regional economy	Industrial structure	Number of companies in region by type of activity (NACE)	Number of local units	Qn	National Statistical Institute, employment Statistics. And General Directorate of Studies, Statistics and Planning
53	52	Productive structure of regional economy	Industrial structure	Size distribution of companies in region by type of activity (NACE)	Classification of size 0-9; 10-19, 20-99, 100-250, more than 250 employees, and 20 and more employees	Qn	National Statistical Institute, employment Statistics. And General Directorate of Studies, Statistics and Planning

(cont.)

New Code	Old Code	Category	Sub-category	Indicators	Definition	Quantitative (Qn) / Qualitative data (Ql)	National Source
55	54	Productive structure of regional economy	<i>Industrial structure</i>	Number or percentage of innovative companies in region	Data from Community Innovation Survey according CIS definitions	Qn	OCES – Science and Higher Education Observatory
75	75	International position of the regional economy	<i>Role of FDI</i>	Number of foreign-owned companies in the region (e.g. multinational corporations)		Qn	General Directorate of Studies, Statistics and Planning
76	76	International position of the regional economy	<i>Role of FDI</i>	Size of foreign-owned companies in the region		Qn	General Directorate of Studies, Statistics and Planning
77	77	International position of the regional economy	<i>Role of FDI</i>	Revenue of foreign-owned companies in the region		Qn	General Directorate of Studies, Statistics and Planning
80	80	International position of the regional economy	<i>Global integration of local companies</i>	Ratio (regions exports) /(Regional GDP)		Qn	National Statistical Institute, International Trade Statistics.
81	81	International position of the regional economy	<i>Global integration of local companies</i>	Degree of export orientation of deferent sectors	Regional exports by NACE (%) (1 or 2 digit) or other grouping available e.g. high-tech, medium-high tech, low-tech (OECD classification)	Qn	National Statistical Institute, International Trade Statistics.

Annex 4: Description of the structure of programmes financially supported by the European Union, implemented in Portugal and in the North Region

North Operation– Operational Programme for North Region 2000-2006

Measures	Actions	Objectives	Budget	Implementation (2005)
Measure 3.5 – Science, Technology and Innovation		Support projects of scientific dissemination and the creation of a network of requalification centres	Total cost: 7.151.705€ Public expense: 6.391.713€ Private expense: 759.942 €	<i>3 projects approved, corresponding to 56,5% of the total budget</i>
Medida 3.6 - Sociedade do Conhecimento	<ul style="list-style-type: none"> ▪ Digital Portugal ▪ Open State ▪ Broaden the Knowledge Society in the territory ▪ Creation of a Digital network for the companies 	Support information and communication technologies with the aim of ensuring better social, economical and cultural conditions for citizens and companies	Total cost: 36.395.331€ Public expense: 35.645.33€ Private expense: 750.000€	<p>Open State <i>7 projects approved, corresponding to 49,1% of the total budget</i></p> <p>Digital Portugal <i>12 projects approved, corresponding to 48,2% of the total budget</i></p> <p>Broaden the knowledge Society in the territory <i>4 internet spaces approved, corresponding to 2,7% of the total budget</i></p> <p>Creation of a Digital network for the companies <i>No projects approved</i></p>

Operational Programme Science and Innovation 2010

	Nr. of supported projects in North Region	% of the total number of projects
Priority Axis I – Training and qualification		
Measure 1.1. – Advanced Training	1.030	12,2
Measure 1.2. – Support for the integration of doctors and masters in companies and R&D institutions	58	33,5
Priority Axis II – Develop the Scientific, technologic and Innovation System		
Measure 2.1. – Develop a modern net of R&D institutions	160	27,9
Measure 2.2. – Organize a coherent matrix of scientific equipment matrix	22	61,1
Measure 2.3. – Promote the scientific production, the technological development and the innovation	-	-
Priority Axis III – Promote the scientific and technological Culture		
Measure 3.1. – Promote the scientific and technological Culture	690	25,7
Priority Axis IV – Science and Higher Education		
Measure IV.1. Qualification in Higher Education	-	-
Action IV.1.1. Advanced training in Higher Education	5	26,3
Action IV.1.2. Innovative Projects in Higher Education	-	-
Measure IV.2. Expansion of the Higher Education Offer	-	-
Action IV.2.1. Technological Specialization Courses	10	50,0
Measure IV.3. Advanced Training for Science	-	-
Action IV.3.1. Master, Doctorate and Pos-doctorate in Science Scholarships	585	14,5
Measure IV.4. Higher Education Infrastructures	-	-
Action IV.4.1. Higher Education Infrastructures	11	27,3
Measure IV.5. Scientific equipments	-	-
Action IV.5.1. Scientific equipments	39	56,5

(cont.)

Operational Programme Science and Innovation 2010 (cont.)

	Nr. of supported projects in North Region	% of the total number of projects
Measure IV.6. Expansion of the Cantinas and Dorms Net	-	-
Action IV.6.1. Expansion of the Cantinas and Dorms Net	-	-
Measure IV.7. Mobility in Higher Education	-	-
Action IV.7.1. Support for Human resources mobility between the Higher Education, Scientific, Technological Development, Innovation and Entrepreneur Systems	1.314	60,4
Priority Axis V – Science and Innovation for the Technological Development		
Measure V.1. Training and Qualification for Technological Development and Innovation	-	-
Action V.1.1. Research Scholarships for Technological Development and Innovation in Companies	-	-
Action V.1.2. Support for the Integration of Doctorates in the Companies and Institutions	9	60,0
Action V.1.3. Support for Nucleus of Scientific, Technological and Innovation Development	6	66,7
Measure V.2. incentive for Transfer of Technology and Innovation	-	-
Action V.2.1. Technologic and Innovation Extension Net	-	-
Action V.2.2. Support for the Scientific, Technologic and Innovation Systems	-	-
Measure V.3. Science and Technology for the Innovation	-	-
Action V.3.1. Projects for Scientific and Technological Development	16	13,8
Measure V.4. Scientific and Technological Research and Development	-	-
Action V.4.1. Projects of Research, Development and Innovation (R&DI)	288	26,9
Measure V.5. Research, Technological Development and Innovation, in European and International Co-operation	-	-
Action V.5.1. Projects of Research, Technological Development and Innovation, in European and International Co-operation	5	22,7
Action V.5.2. Support for the National Participation in Nets and European and International Projects	-	-
Measure V.6. Scientific and Technological Promotion and Dissemination	-	-
Action V.6.1. Dissemination of Innovation and of Scientific and Technological Knowledge	1	12,5
Action V.6.2. Promotion of Scientific and Technological Culture	-	-
Priority Axis VI – Science and Innovation for the Public Policies		
Measure VI.1. – Science, Technological and Innovation Development for the Public Policies	-	-
Action VI.1.1. Projects for Science, Technological and Innovation Development within the Public Policies	-	-
Measure VI.2. – Regional Projects for Science, Technological and Innovation Development	-	-
Action VI.2.1. Regional Projects for Science, Technological and Innovation Development	-	-

Operational Programme Knowledge Society 2000-2006

Priority Axis 1 – Develop Competencies

Measure 1.1 – Basic Competencies

Measure 1.2 – Advanced Training

Measure 1.3 – Research and Development

Priority Axis 2 – Digital Portugal

Measure 2.1 – Accessibilities

Measure 2.2 – Content

Measure 2.3 – Integrated Projects: from Digital Cities to Digital Portugal

Measure 2.4 – integrated Actions on Training

Priority Axis 3 – Open State – Modernize the Public Administration

Measure 3.1 – Open State – Modernize the Public Administration

Priority Axis 4 – Broaden Access to the Knowledge Society

Measure 4.1 – Strengthen the Asymmetric Digital Subscriber Line (ADSL) Infrastructures

Measure 4.2 – Incentive for Content Production and ADSL Application

Measure 4.3 – Promote the ADSL Internet Use

Priority Axis 5 – Electronic Government – Better Service to the Citizens and to Enterprises

Measure 5.1 – Quality and Efficiency in the Public Services

Priority Axis 6 – Develop Competencies and Digital Culture

Measure 6.1 – Support the Development of Technological and Innovation Competencies in ICT

Measure 6.2 – Training Integrated Actions for ICT

Priority Axis 7 – Integrated Innovation in Information and Communication Technologies (ICT)

Measure 7.1 – Development of ICT Competencies Centres

Measure 7.2 – R&D and Entrepreneurial Initiatives in ICT

Priority Axis 8 – The Knowledge Society as a Support Instrument for the Territory Decentralization

Measure 8.1 – Digital Cities and Regions – The Knowledge Society at the Service of the Territory

Measure 8.2 – Decentralization National Network

PRIME – Programme of Incentives for Modernization of the Economy

(Description of the types of Entrepreneurial Innovation Support)

Measure 2 – Support for Companies' Investment

Action 2.4 – New Technological Support Companies

Action 2.5 System of Incentives for the Digital Economy

Measure 3 – Improve Entrepreneurial Strategies

Action 3.1. – Research Programme of Entrepreneurial Research and Development

Projects for Technological Development

IDEIA - Support to Business Applied Research and Development

Action 3.2 – Incentive Scheme for the Use of Industrial Propriety

SIME R&TD - Incentive Scheme for Business Modernisation - Research and Technological Development

NITEC - Incentive Scheme for the Establishment of Research and Technological Development Clusters Within the Business Sector

INOV-JOVEM - Young Executives for Innovation in SMEs

DEMTEC - Incentive Scheme for the Implementation of Pilot Projects Related to Technologically Innovative Products, Processes and Systems

NEST - New Enterprises Based on Technological Support

Supporting Technological Training

Fostering Investments in Human Resources

Support Measure to the Setting-up of New Technological Infrastructures and to the Existing Technological, Training and Quality Infrastructures

Measure 7 –Financial Innovation Mechanisms

Direct Support (in incentive systems) for the RDI, by Portuguese Regions, 2000-2005

Thousand Euros

Regions	Nr. of Projects	Total Cost	Incentive
North	228	77.101	35.345
Centro	113	27.593	12.919
Lisbon and Tejo Vale	54	33.096	13.723
Alentejo	11	2.491	1.350
Algarve	6	533	240
Açores	1	715	538
Madeira	2	324	148
Multi-regions	15	23.911	12.724
Total in RDI	430	165.762	76.988

Source: SIME R&TD.

FDIP⁽¹⁾ type-approvals, by Portuguese Regions, 2000-2005

Thousand Euros

Regions	Nr. of Projects	Total Cost	Incentive
North	145	1.005.910	327.402
Centro	125	451.597	112.810
Lisbon and Tejo Vale	66	295.640	64.375
Alentejo	42	352.960	64.375
Algarve	14	66.573	18.312
Açores	2	11.083	5.002
Madeira	2	11.824	3.820
Multi-regions	12	66.038	17.518
Total in RDI	408	2.261.626	650.605

Source: SIME R&TD.

⁽¹⁾FDIP – Foreign Direct Investment in Portugal

PNACE – National Programme of Action for Growth and Employment 2005-2008

- ↳ **Priority Axis I. Accelerate Scientific and Technological Development**
- ↳ **Priority Axis II. A new impulse for Innovation**
- ↳ **Priority Axis III. Promotion of the effective use of ICT and of an inclusive information knowledge society**

NORTINOV – “Regional Programme of Innovative Actions of the North of Portugal”

Action 1 – Creation of a Knowledge Base about the Regional Innovation System and support for the establishment of a Technological Strategy in the following sectors: automobile, information and communication technologies and electronics

Action 2 –Identification of Opportunities for Technological Exploitation within the enterprises of the following sectors: automobile, information and communication technologies and electronics

Action 3 – Launching of *Spin-Offs* and Creation of Technological Basis Enterprises

Action 4 – Encouragement of a Regional Capital Network

Action 5 – Encouragement of the Inter-Regions Co-operation, through Benchmarking.

Institutions	Theme	Investment
Candidature 2 1. INTELI 2. INESC Porto 3. INEGI 4. TECMINHO 5. EGP 6. Deloite & Touche 7. COTEC Portugal	Action 1	646.597,56€
Candidature 3 – 1. PME 2. INTELI 3. INESC Porto 4. EGP 5. TECMAIA 6. NET 7. CAP GEMINI ERNST & YOUNG PORTUGAL 8. COTEC Portugal	Action 4	479.180,12€

Financial Compromises in November 2004

	Cand. 1 Adl	Cand. 2 INTELI	Cand. 3 PME Cap.	Cand. 4 VCBT	Cand. 5 Study	Total Budget	Saldo
Action 1		469.361				450.218	-19.143
Action 2	167.751	136.241		250.000	71.400	626.977	0
Action 3	435.266			211.480		752.468	0
Action 4			460.189	56.942		517.131	0
Action 1 to 4	603.017	605.602	460.198	517.422	71.400	2.346.795	-19.143
Action 5		40.994	18.991			59.985	0
Action 6						119.711	44.149
Total	603.017	346.596	479.180	518.422	71.400	2.526.491	25.005

Technological Plan

Axis 1 – Knowledge

STRATEGIC OBJECTIVE
1.1. Raise average level of education
1.2. Promote Life-Long Learning
1.3. Mobilize Portuguese citizens to the Information and Knowledge Society

Axis 2 – Technology

STRATEGIC OBJECTIVE
2.1. Reinforce Scientific and Technological Competencies
2.2. Mobilize Enterprises for Research and Development

Axis 3 – Innovation

STRATEGIC OBJECTIVE
3.1. Promote Skilled Employment
3.2. Promote change in the industry and services profile