



RIP-WATCH

ANALYSIS OF THE REGIONAL DIMENSIONS OF INVESTMENT IN RESEARCH

CASE STUDY REGIONAL REPORT: CARINTHIA (AUSTRIA)

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Date: December 2006

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

OBJECTIVE

The main objective of this regional case study report is to provide a better understanding of the structural 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.

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1 Introduction

Carinthia (Kärnten; Koroka) is the most southerly of the nine Austrian provinces. It lies south of the main crest of the Alps and its immediate neighbours are Italy and Slovenia. Carinthia comprises an area of 9 536 km² and has a population of 559 404 (2001). It is bounded by the Tauern Alps in the north and by the Carnic Alps and the Karawanken Alps in the south (border to Italy and Slovenia). Difficult access, location on the periphery of Austrian and European centres, and lack of its own large city were important factors influencing the development of the region over the years.

Graph 1: Carinthia's location within Austria



Compared with the 113% for Austria as a whole, Carinthia had a GDP per capita of 95% of the EU-15 average in 2003. In 2003, the gross regional product (GRP) was €13.2 billion, about 6% of Austrian GDP. With a GRP per capita of €23 600, Carinthia is ahead of Burgenland and Lower Austria. Nevertheless the level is €4 400 or 16% below the Austrian average. This is due in part to the lack of growth in the last few years and to high seasonal unemployment in the region. Unemployment is about 5.6%.

The regional economy is mainly based on small and medium-sized enterprises (SMEs). Almost all regional enterprises have less than 249 employees and are therefore classified as SMEs. As in the Austrian economy in general, manufacturing is highly important to the regional economy. Furthermore, Carinthia is a region with a tradition of tourism, particularly in summer and increasingly in winter as well. The service sector thus accounts for the lion's share of GDP (66%), followed by manufacturing (32%) and agriculture and forestry (2%). A detailed table on the regional economic structure of the region, which compares regional with national structure, is to be found in the annex to the report.

Carinthia's regional gross expenditure on R&D (GERD) was €229m in 2002, or 4.9% of the Austrian total. The business enterprise sector accounts for more than 85% of total RTD (research & technological development) expenditure in Carinthia. The semiconductor/electronics sector is especially important, not only in terms of employment (5 400) but also because it is by far the biggest sector in terms of RTD expenditure. The sector is dominated by Austria's second largest RTD company, Infineon Technologies (www.infineon.com).

The next most important sector where RTD is concerned is the software sector, employing about 1000 persons, with many companies focusing on business applications such as CRM

and workflow systems. Carinthia's mechanical engineering sector comes in third place, employing about 4 600 persons.

2 Regional knowledge base

This chapter provides a description and analytical discussion of regional knowledge creation, absorption and transmission mechanisms in terms of quantitative and qualitative indicators for infrastructure, human resources, efforts and outcomes in the field of RTDI (research and technological development and innovation).

Furthermore a description is provided of regional (and, where relevant, national) RTDI policy frameworks, including governance structures with regard to RTDI, objectives, instruments and main actors.

2.1 Description of the regional knowledge base

2.1.1 Knowledge creation capacity

According to Eurostat data for 2006, 1606 persons were employed in RTD-related activities in 2002. Compared to Austria in general, 4.13% of employees in RTD were working in Carinthia. Of these, almost 85% were employed in the business enterprise sector, as can be seen in Table 1 in the annex to the report. Carinthia hosts 1184 researchers, of which 85% work in the business sector.

Regional GERD increased from EUR 121.2 million in 1998 (3.9% of the Austrian total) to EUR 229.5 million in 2002 (4.9% of the Austrian total). Carinthia thus experienced faster growth than Austria as a whole. As with RTD personnel, RTD expenditure is also dominated by the business enterprise sector. It accounted for 85% of total RTD performance in 2002, and the increase in total regional GERD was largely due to this sector as well: it more than doubled RTD expenditure from EUR 97.3 million in 1998 to EUR 196.7 million in 2002.

The strength of the business enterprise sector is the result of the strong position of the **semiconductor/electronics** sector. Infineon Technologies, Austria's second largest RTD company, is located in Carinthia. The Villach plant is the corporation's headquarters for automotive and industrial components, in which more than 500 researchers and developers work on power semiconductors and chips for communication equipment. In total, more than 5 300 persons were employed in the semiconductor industry in 2003.

In terms of RTD funding, Carinthia (like Austria in general) is characterised by a high share of funding from abroad (30%). The business enterprise sector accounts for 51% of total RTD funding. The data thus indicate a strong internationalisation of the Austrian private enterprise sector, as the funding from abroad goes mainly into the business enterprise sector. The data also show that the role of EU funding for the region is limited, accounting for a mere 0.8% of total RTD funding in Carinthia in 2002.

As regards research output, only patent data (no publication data) are available for Carinthia. In 2002 Carinthia had 91 patent applications, 6% of the Austrian total. This was the highest absolute number and share since 1978, but is nevertheless the third lowest share of all 9 Austrian provinces. The strong position of Carinthia in the electronics industry is also visible in the patent statistics: 25% of all patents in Carinthia are in electronics (Section H), while for Austria as a whole the share of patents in Section H is 15%. Section B (performing operations, transport) accounts for 29% (Austria: 23%). Looked at in more detail, the strongest patent classes are basic electric elements (11%; Austria: 4.53%), vehicles in general (10.5%; 4.1%), electric communication technologies (7.35%; 6.73%), furniture (7.2%, 3.57%), and basic electronic circuitry (6.92%, 1.55%).

The higher education sector

RTD in the Carinthian higher education sector is limited. Carinthia has one university and one university of applied sciences (higher vocational school). There is a lack of higher education in science and engineering, although the creation of the University of Applied Sciences in 1995 has somewhat made up for this weakness. In 2004 7 755 students were enrolled at Carinthian higher education institutions (Eurostat 2006). This is a mere 3.25% of the total number of students enrolled in Austria. In 2003/2004 about 600 students were enrolled in science or engineering courses at Carinthia's University of Applied Sciences (FH Technikum Kärnten), about 8% of all students enrolled in Carinthia. According to data from the University of Klagenfurt, 499 students graduated from the latter in 2004 (with the equivalent of a master's degree) and 86 doctorates were awarded. However, the data on doctorates conflict with the data in the University Report 2005 published by BMBWK, which mentioned 33 awarded doctorates, 2% of the total doctorates awarded in Austria.

The public **Klagenfurt University** (<http://www.uni-klu.ac.at>) was founded as a college for educational sciences in 1970. Today, the university is organised in **three faculties** that are the home of around 30 institutes and research groups:

- The **Faculty of Cultural Sciences** has about 4.700 students and engages in research projects within the humanities with a strong intercultural and multi-perspective approach.
- The **Faculty of Economics and Computer Sciences**, with approx. 3 000 students, focuses on the development and management of organisations and how they are supported by technology through software and application systems. The E-Business Industrial Foundation Institute (biztec) analyses business processes and technologies for the network economy. In cooperation with the emerging Lakeside Software & Technology Park at the southern end of the campus, the faculty's technical departments are currently being enlarged in the area of information and communication technologies.
- The **Faculty for Interdisciplinary Research and Continuing Education** (IFF) tackles issues and problems of social-science technology research, socio-ecological research and intervention research in the context of public goods: health, environment, education, science, technology and culture.

The **Carinthian Tech Institute** (<http://www.fh-kaernten.ac.at>) was founded in 1995 as the body responsible for the degree programmes of the University of Applied Sciences in Carinthia. It has the legal form of an association with its headquarters in Spittal/Drau. The Institute hosts study programmes in civil engineering & architecture, health, economics & social work, and IT and electronics. In total, about 900 students are enrolled at the Institute, of which about 600 study science and engineering. The main fields of research are: civil engineering; electronics; geoinformatics; healthcare management; medical information technology; public management; social work; telematics / network engineering.

Table 2 in the annex to the report provides information on universities and higher vocational schools with details of the number of students, the proportion of science & engineering students, doctorates, academic staff, and income from RTD/contractual work in 2004.

Public & private non-profit research sector

The RTD capacity of the public and private non-profit research sector is limited. RTD personnel in public research establishments totalled 240.6 FTEs in 2002. The private non-profit sector is marginal, with only 42.8 FTE researchers.

No data on RTD expenditure are available for the private non-profit sector. Government RTD expenditure was EUR 7.9 million in 1998 (3.7% of the Austrian total) and EUR 7.2 million in

2002 (2.7% of the Austrian total). Public RTD expenditure thus shrank in both absolute and relative terms.

Apart from the RTD institutions in the private sector and the higher education sector, there are two renowned semi-public research institutes with both public and private shareholders:

1. **Carinthian Tech Research** (CTR — originally a Kplus Centre) focuses on smart sensors and actuators, particularly in the areas of automation, simulation, spectral imaging, microsystems engineering and sensor development.
2. **The Carinthian Wood Competence Centre** (W3C) is part of the WOOD Kplus centre funded by the federal government. Research covers the wood business and wood technology, enzymatics, biotechnology, physics, process engineering, etc.

Furthermore, the Institute for Advanced Studies (IHS), a private non-profit organisation, also has an affiliate organisation in Carinthia. In Klagenfurt, around 10 researchers work on applied solutions to economic and political questions in the fields of: energy economics, capital market research, banking and regional/structural benchmarking.

Overall, approximately 70 researchers are employed at these research facilities. Key figures are presented in Table 3 on public and private research institutes in the annex to the report.

2.1.2 Knowledge diffusion capacity

Apart from a regional case study on the innovation system and policy framework of Carinthia (KWF and Joanneum Research 2006), no detailed statistics, indicators or coherent information as requested in the data questionnaire exist. The qualitative data presented here on knowledge diffusion capacity are thus primarily based on the KWF-Joanneum Research report.

Carinthia hosts one university technology transfer office/start-up centre. The “build! Gründerzentrum Kärnten GmbH”, the Graduate Centre for Entrepreneurship in Carinthia, was set up at the University of Klagenfurt and the University of Applied Sciences in July 2002. So far, the Centre has realised 13 start-ups and plans a further 30 in the next five years. It is an ‘AplusB Centre’, of which there are a total of 6 in Austria (see section 2.2.2 for the programme description), and a member of the Gate2Growth Incubator Forum. The Gate2Growth Initiative is supported by the European Commission (DG Enterprise’s Innovation/SME programme).

The public actors involved in RTD knowledge diffusion are presented in section 2.2.1 on the policy framework and actors. *Technology parks* and *cluster initiatives* are the main mechanisms for inter- and intra- industry knowledge diffusion in Carinthia, which has six technology parks and four clusters/networks. There has been substantial public investment in the infrastructure for technology parks in order to facilitate the diffusion of knowledge between RTD facilities and private companies. The specific aims are to support and develop new technology-oriented companies and to foster inter-industry linkages. Technology parks are seen as an appropriate way to promote science/industry linkages (especially the Lakeside Technology Park <http://www.lakeside-software.com/>) and also as a means to attract new companies and inward investment. Table 4 in the annex provides an overview of the locations, tenants and subjects of the technology parks. As can be seen from the table, the technology parks focus mainly on software technologies, micro-electronics, wood technologies and the environment.

The share of RTD-intensive and knowledge-intensive start-ups among all start-ups in manufacturing/business services (in %) is given in Table 7 in the annex (taken from a study on start-ups in Austria — Egelin et al. 2006). In Carinthia, the shares fluctuated in the period under review. It can be seen that there were more start-ups in the business services sector than in manufacturing industry. In 1999/2000 the percentages reached their peak in both sectors. After this climax, a slight decline in RTD-intensive and knowledge-intensive start-ups can be observed, reaching a low in 2003/04. Compared to the other nine Austrian provinces, Carinthia

comes in the bottom third. Possible explanations for this pattern in business services might be the overall crisis in the software and electronics industry, which plays a particular role in Carinthia.

2.1.3 Knowledge absorption capacity

The educational level of the labour force indicates the ability of the labour force to absorb new knowledge. In 2004, for the age group between 25 and 64 years, 68.8% of the economically active population in Carinthia had an upper secondary and post-secondary non-tertiary education (ISCED levels 3-4). This is about the same level as in Austria as a whole (67.8%). In 2004, 20.3% had a tertiary education in Carinthia (ISCED 5-6) compared with a total of 21.2% for Austria.

In Carinthia, the willingness of the labour force to absorb new knowledge through participation in lifelong learning was 10.1% in 2004. This was slightly below the Austrian level (11.6%), but above the EU-15 level (9.3%). It is worth mentioning that this figure compares well with the very low levels at the end of the nineties (2.3%).

However, human resources in science and technology (S&T) as a percentage of the economically active population is somewhat below the overall Austrian level. In 2004 (Eurostat, 2006), this share was 42.35% in Carinthia compared with 44.36% in Austria as a whole. The core population was 11.97% in Carinthia and 13.07% in Austria.

2.2 Policy context

2.2.1 Policy framework and actors

In Austria, the national federal government is responsible for implementing RTD policy. Each ministry is responsible for research in its own area of competence, e.g. the Ministry of Agricultural and Environment is responsible for environmental research. There are thus three main ministries in charge of RTD activities:

The **Federal Ministry for Education, Science and Culture (BMBWK)** is responsible for research and teaching at universities, and for non-university research institutions in the areas of basic research and general scientific research.

The **Federal Ministry of Transport, Innovation and Technology (BMVIT)** is responsible for programmes and matters concerning industry-related research, technology development and innovation funding, as well as the priority areas of research in national research programmes established by the Council for Research and Technology Development.

The **Federal Ministry for Economic Affairs and Labour (BWA)** funds research cooperation between science and industry as well as innovation projects in enterprises under various programmes.

The Austrian Science Council and the Council for Research and Technology Development act as independent strategic advisory bodies at policy level. At agency level, three main actors can be identified:

1. The **Austrian Research Promotion Agency (FFG)** is responsible for research and technology promotion for industry, thematic-oriented RTD promotion (for example nanotechnology, IT etc.), science-industry cooperation, the European programmes and the national space programme.
2. The **Austrian Science Fund (FWF)** is Austria's central body for the promotion of basic research. About 70% of its funds are devoted to competitive investigator-driven research projects in the higher education sector. Its RTD promotion is almost exclusively geared towards higher education institutions.

3. The **Austrian Wirtschaft Service** (AWS) describes itself as the 'special bank for company support' in Austria. AWS plays a major role in funding company start-ups, providing both business and innovation support. AWS plays an especially important role in the area of innovation with its services to entrepreneurs ahead of start-up, its high-tech start-up programme and seed capital provision. It also has a programme to help universities and researchers obtain patent protection for their inventions.

2.2.1.1 *The regional policy framework*

Under the Austrian constitution, the provinces have considerable powers in the field of innovation policy, although their scope for establishing or influencing tax regimes etc. is strictly limited. Economic policy measures are often innovation-oriented, and in recent years a regionalisation of innovation policy can be observed in Austria. This is reflected in several regional strategies and additional regional funding for implementing these strategies. Because of the diversity of approaches among the regions, the coordination mechanisms between the federal and regional levels are facing challenges. No clear model of policy interaction has yet evolved: some regions follow a strategy of additionality while others favour supplementary funding, although the latter is regarded as highly problematic.

Coordination between federal and state level is primarily on concrete programmes, with federal government evidently taking a leading role both in terms of financing and in setting the agenda. Regional policy can be said to build upon federal guidelines (Jörg, 2004). The local community councils, which have some legal powers, are of only minor importance for setting strategic policy in the regions. They cooperate mostly with the provincial executives in indicating the directions of innovation policy.

Where Carinthia is concerned, the regional policy framework has been thoroughly discussed in the Corinna project (www.corinna-net.info). Since 1999, technology policy has been the responsibility of the governor of Carinthia (no specific department). At the beginning of 2005, the governor also took over the government offices for economy and finance.

The governor is advised by the Carinthian Economic Council, a panel of industrialists, politicians and scientists. As the province's only subsidising authority for RTD, the Carinthian Economic Promotion Fund (KWF) (www.kwf.at) implements the government's technology policy strategies by devising funding guidelines.

Other institutions that shape regional RTD policy are the Carinthian Development Agency (EAK) (Entwicklungsagentur Kärnten, <http://www.entwicklungsagentur.at/eak/>), the regional industry association (IV Kärnten, www.industrie-kaernten.at) and the regional chamber of commerce (WK Kärnten, www.wkk.or.at).

EAK manages the regional technology parks and offers networking and consulting services. IV Kärnten is a lobbying organisation that makes itself heard if political projects with implications for RTD do not accord with the expectations of its members. WK Kärnten primarily targets small firms in traditional sectors. It hosts the regional consultancy for participation in the EU RTD Framework Programmes and contact point for the Innovation Relay Centres (IRC).

Planning for more systematic coordination between the above institutions is currently under way. The research organisations (University, University of Applied Sciences, CTR) already cooperate on common curricula, joint research etc. The core responsibilities for promoting international RTD cooperation lie with the regional chamber of commerce. It is the IRC contact point and promotes participation in the EU Framework Programmes. Applications on behalf of some of Austria's biggest players in the field are prepared by the private firm Technikon in Villach.

Like other Austrian provinces, Carinthia takes part in the planning of national programmes to promote industrial research such as Kplus, NANO etc., where KWF represents the regional government.

2.2.2 Policy objectives and instruments

2.2.2.1 Policy objectives

The **national objectives** and priorities for RTD policy are currently being investigated by Joanneum Research and partners in a “RTD policy mix” research project for DG Research. The results of the ongoing project indicate that national policy objectives can be seen as the result of a strategy process formulated in two documents of the Council for Research and Technology Development: the National Research Innovation Plan (2002) and the strategy paper “Strategy 2010”. While RTD policy priorities in general represent a mixture of functional and thematic priorities in Austria, the objectives and priorities have not changed very much over the last five years following the two documents mentioned above. There has been only some fine-tuning of the proposed principles between 2002 and 2005.

However, there has been a slight shift in the focus of discussion on the main topic of the 3% RTD quota target: Nowadays, many in the RTD policy-making arena emphasise that the creation of a high-quality innovation system is more important than just meeting a given RTD intensity target. The ERAWATCH Base Load Inventory report (2006) identifies the following general trends:

1. Reorganisation of the funding landscape — where since 2000 a concentration of intermediary RTD-promoting organisations has taken place. Several old (and new) agencies responsible for programme management under a wide range of instruments were merged into three main funding agencies.
2. Since the mid-nineties, research programmes have grown significantly in importance as compared to direct institutional funding and bottom-up, non-specific project funding.
3. In recent years, some provinces have formulated their own strategies for RTD, and set up intermediary agencies and research organisations to support the implementation of these strategies. These activities were partly driven by the introduction of federal co-financing schemes, in particular the competence centres, and by EU policies.
4. The move to combine the Austrian government’s thematic and functional priorities, strongly encouraged by the Austrian Council for Research and Technology Development, has tried to target a number of functional (e.g. promotion of scientific excellence, etc.) and thematic (i.e. both scientific-technological and problem-oriented) priorities for research funding. To this end, dedicated programmes have been designed and implemented.
5. With funding heading towards the 3% goal, Austria is one of the few European countries that is well on track to achieving the Barcelona targets, both in terms of the 3% target and in terms of the 2/3 share of private-sector RTD funding. In 2005, 2.38% of GDP is estimated to have been spent on RTD in Austria.

The initiatives and programmes that have been set up thus need looking at in terms of the efficiency of the RTD policy mix rather than as regards the overall volume of public RTD support. In this respect, Joanneum Research’s experts in this area stress that two guidelines have to be emphasised. One calls for the reorganisation of the research promotion portfolio by intervening in the institutional structure to overcome deficiencies in effectively and efficiently supporting RTD and innovation. The other seeks to establish rules for better resource allocation under RTD policy and innovation policy.

The **regional RTD promotion objectives** in Carinthia and the regional strategy concepts are developed by the above-mentioned government agencies in collaboration with international

experts as well as outside research institutes. Priority setting is done with the aid of experts as well as research on local innovation demand, often carried out by outside institutes.

The main areas targeted by Carinthia's RTD policy are electronics, software and wood-processing, along with "high value-adding, export-oriented" industries, i.e. traditional firms with a track record of successful RTD and business acumen. The small size of most Carinthian firms — also of those doing RTD — limits their capacity for strategic innovation projects and systematic innovation. The development of such capabilities is another challenge facing Carinthian RTD policy.

2.2.2.2 Policy instruments

One important aspect of policy instruments affecting the region is the interaction between national and regional levels. For example, the competence centre programme K-Plus was launched by BMVIT but public funding is provided jointly by the federal and provincial governments. The programme, its aims, and the rules for its implementation are set out in federal innovation policy (European Trend Chart on Innovation, 2005: 4). Co-funding has raised the commitment to the programme and the centres so far established.

The programmes AplusB and Regplus are federal programmes with a regional impact. Aplus B supports the establishment of incubator facilities at universities or other public research institutions. REGplus addresses technology centres and supports competence building and networking activities in the regions (European Trend Chart on Innovation, 2005. 5).

In the following, the main policy instruments at EU, national and regional level with an impact on the regional RTD landscape are analysed. The instruments are grouped according to the policy areas described in the annex to this report.

A) Improving innovation and RTD governance

At national level, the Austrian Council for Research and Technology Development is the main vehicle for improving R&D governance and innovation in Austria. It advises the federal government and the provinces on all matters relating to research, technology and innovation, and it also defines the long-term national RTD strategy and monitors its implementation.

At regional level, the above-mentioned *Carinthian Economic Council* and the province's only subsidising authority for RTD, the *Carinthian Economic Promotion Fund* (KWF), are the main bodies in charge of improving RTD innovation and governance. KWF is responsible for improving the innovation capability of SMEs, company and inter-company business development, and the promotion of high-tech projects and clusters.

B) Creation of an innovation- and entrepreneur-friendly environment

The creation of an innovation- and entrepreneur-friendly environment is a core element of RTD policies at European, national and regional level. Most of the instruments in place are geared to this end, though some of the programmes in the region have multiple aims. At European level, the *European Framework Programmes* 5 (FP5) (1998-2002) and 6 (FP6) (2002-2006) are the most important EU initiatives in the area of RTD. Table 8 and Table 9 in the annex provide detailed information on Carinthian participation in FP5. In Carinthia, total FP5 funding was EUR 5.4 million, a mere 1.9% of the total for Austria as a whole. In the same period, the total funding for Styria was EUR 73.5 million (26% of the Austrian total). This poor result for Carinthia is largely due to the lack of a strong higher education sector. Table 9 in the annex shows the breakdown by projects. Of the 33 Carinthian projects in FP5, 23 (70%) were conducted by industry, whereas only 6 projects (18.2%) were conducted by the higher education sector. In Austria as a whole, 36.2% of projects were conducted by industry, 33.0% by the higher education sector and 16.8% by research institutes. In FP5, Carinthia has a strong focus on the information society, however: of the EUR 5.4 million spent, about 50% went on information

society projects. The strong information society participation shows that the framework programmes accurately capture the region's strengths in RTD.

The *EU Structural Funds* constitute another important regional measure with an impact on RTD and innovation (e.g. the Objective 2 programme and the Innovative Strategies for Regional Competitiveness programme). For Carinthia, the Objective 2 programme¹ provides a total of EUR 122.3 million, of which EUR 89 million are set aside for trade, industry and productive services, EUR 23.7 million for tourism and regional development, EUR 6.7 million for training and the economy, and EUR 2.8 million for technical assistance. The programme's focus on regional economies is based on knowledge and technological innovation, the information society, regional identity and sustainable development. The objective for Carinthia is to support its "new economy" and prevent a further widening of regional differences within Carinthia, thereby increasing Carinthia's overall competitiveness.

The main **national** programmes affecting the region are the *FFG General Programmes* (FFG-BP). FFG-BP provides bottom-up support for RTD projects carried out by industry. Total funding in 2005 was EUR 265 million. In 2004, FFG-BP spent a total of EUR 248 million, of which 10.5% (EUR 26 million) went to Carinthia. Furthermore, the *FFG Thematic Programmes* promote selected national thematic priorities to foster RTD projects between Austrian companies and research organisations. Total funding in 2005 was EUR 41 million, but Carinthia's share is not known.

In addition, FFG has two structural programmes with an impact on Carinthia. *FFG-RegPlus* subsidises the infrastructure for regional *Impulse Centres* to promote their innovative "content". Finally, *AplusB (Academia plus Business)* funds innovative, technology-oriented university spin-offs. AplusB provides professional support for scientists in turning a good idea into a viable business. The duration of public funding is ten years. In Austria, nine AplusB-Centres have been or are being established, one in Carinthia (see above — Build! Business Incubator Centre)

At **regional level**, all instruments for the creation of an innovation- and entrepreneur-friendly environment are in the hands of KWF. The Carinthian technology fund operated by KWF was launched in 1999, and offers incentives for restructuring the economy and investing in companies in growth-oriented sectors. The fund focuses on technological topics (software research, operations innovations, energy and environmental technology, electronics) to promote technological and innovative development for industrial and production-related products. *KWF- Research and Development Projects* seek to strengthen competitiveness through the promotion of RTD, new technologies, products and services. *Start-up Loan Financing for Technology-Oriented Enterprises* provides up to EUR 400 000 at zero to low interest rates, and aims to promote the growth of competitive, technology-oriented and/or innovative small enterprises. Also addressing SMEs in particular is *KWF-Innovation Assistant "De minimis"*, which helps with the implementation of innovation projects. For SMEs a non-repayable cash grant is provided for salary costs of up to 50% of gross salary costs or a maximum of EUR 31 000.

C) Development of human capital

The development of human capital for science and technology in the region is only touched upon by some minor programmes at European, national and regional level. At EU level, the

¹http://ec.europa.eu/regional_policy/country/prordn/index_en.cfm?gv_pay=AT&gv_reg=AT21&gv_obj=2&gv_the=ALL.

FP5 scheme *Improving human research potential and the socio-economic knowledge base* has offered EUR 380 000 to participants from Carinthia.

At national level, the *Austrian Science Fund (FWF)* is Austria's central body for the promotion of basic research. Total funding in 2005 was EUR 112 million, hence quite significant for Austria as a whole. For Carinthia, however, FWF funds play only a minor role due to the lack of a strong higher education sector. Whereas, for example, Styria received EUR 17.7 million (almost 16% of total funding), only EUR 0.48 million (0.4%) went to the University of Klagenfurt.

At regional level, the most important policy measure was the creation of the University of Applied Sciences, which enables the region to provide its own newly qualified human capital. Apart from the creation of the University of Applied Sciences, measures addressing e.g. qualification and training are limited. KWF offers a scheme called *Information, Consulting and Qualification*, under which it provides funding for information events, consulting and qualification measures, particularly for activities spread among different companies and sectors, up to a maximum of EUR 100 000.

D) Networking, co-location and clustering measures

Networking, co-location and clustering measures are at the core of national and regional funding policies for the regions. *At national level*, FFG has structural programmes to strengthen the infrastructure for research and innovation in Austria. Particular objectives are to improve the cooperation between science and industry and increase the innovative potential of the regions. The most prominent of the structural programmes are the competence centre programmes K-plus and K-ind. *K-plus* aims to build long-term cooperative research initiatives between public institutions and private companies. It was developed, launched and financed by BMVIT and the regions. About 25% of the industrial partners are SMEs. In contrast, the *K-ind/K-net programme* is industry-driven. Its purpose is to advance, develop and transfer application-oriented technological knowledge. It was launched and financed by the Ministry of Economics and Labour. Carinthia hosts one K-plus centre (Austria: 18), but no K-ind/K-net centre (Austria 14/8).

FFG Thematic Programmes (Nano): An important programme within the *FFG Thematic Programmes* (see above) is the Austrian NANO Initiative, which is a multi-annual public funding programme for nanoscale sciences and nanotechnology. Total funding for all five Nano clusters was EUR 6.8 million in 2005. The province of Carinthia is a funding partner in the Austrian NANO Initiative.

Significant regional funds are also devoted to networking and co-location measures. Here, *technology parks* and *cluster initiatives* are the main mechanisms. For its part, Carinthia has six technology parks and four clusters/networks. The Carinthian clusters and networks have a clear focus on intra-industry relationships rather than on science-industry relationships.

E) Knowledge and technology transfer to enterprises

Knowledge and technology transfer is addressed by some minor specific national and regional programmes. At national level, the programme *protec-NETplus* promotes technology transfer under RTD cooperation between at least three companies (and if possible involving research institutes). In 2005, the total funding of the programme in Austria was EUR 2.5 million. Furthermore, the programme *FHplus* aims at creating and enhancing RTD capacity and competence at *Fachhochschulen* (universities of applied sciences). Its objectives are to increase the number of applied science universities with suitable structures and a capacity for long-term, application-oriented RTD, and to increase and intensify RTD cooperation between these universities and industry. Total funding in 2005 was EUR 5.3 million.

At regional level, KWF targets technology transfer schemes with two "de minimis" programmes. The technology transfer scheme aims at strengthening RTD capacity and promoting the take-

up and exploitation of outside research results, technology know-how and new technologies by SMEs, especially in the fields of energy and environmental technology, IT, and electronics. The scheme *Cooperation Business and Industry "De minimis"* seeks to foster intra-industry cooperation and knowledge transfer.

Besides these instruments specifically for knowledge transfer, the networking, co-location and clustering measures are also important means of knowledge transfer, as the underlying rationale for the creation of technology parks is closely related to knowledge transfer considerations.

F) Cooperation of public research organisations with the private sector

Technology parks and *cluster initiatives* are the most important mechanisms in place for research cooperation between science and industry. The clustering measures and competence centre programmes mentioned above constitute the main programmes in Austria for cooperation between public research organisations and the private sector. For both federal government and the provinces, research cooperation is a major issue in science policy, and for the FFG Thematic Programmes (e.g. the Nano-Technology Initiative) research cooperation between the public and private sectors is a requirement for obtaining funding.

G) Support for public research

Support for public research in Carinthia is limited due to the dearth of public RTD institutions. However, the CTR, W3C and the University of Applied Sciences receive national and regional funding.

H) Financial RTD measures for the private sector

Most of the instruments described above are direct financial RTD promotion instruments. In addition to these measures, the Austrian Ministry of Finance offers some tax incentives for private firms to perform RTD. Firms can make use of the "*Forschungsfreibetrag*" (RTD tax allowance), which can be set off against profit and consequently reduces the tax base. Firms can claim 25% (in exceptional cases up to 35%) of their RTD expenditure up to a total of EUR 100 000 per year. Alternatively, firms can utilise the "*Forschungsprämie*" (RTD bonus), whereby the Ministry of Finance credits a bonus of 8% of the firm's RTD expenditure to its tax account. These measures are also available for contract research if carried out by universities or public research organisations and provided there is no double funding (e.g. receipt of a similar bonus) (ZIT, 2006).

At regional level, support from the technology fund is monetary in nature. The Austrian provinces do not have the ability to introduce regimes affecting company taxes on their own. Exhibit 1 summarises the policy mix for the region.

Exhibit 1: RTD 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
Improving innovation and RTD governance		The Council for Science and Technology has developed the core strategies to improve RTDI governance.	KWF, at operational level, for RTDI funding and the Carinthian Development Agency for the creation of networks are the core bodies.
Creation of an innovation- and entrepreneur-friendly environment	Participation in European Framework programmes is clearly dominated by industry in Carinthia.	Bottom-up funding for RTD in BES is mainly provided by FFG-BP	KWF has core responsibility for this policy area. Funding in this area is provided for both RTD and non-RTD projects. The Carinthian Technology Fund provides approx. €15m annually for RTD-related projects. Some promotion schemes may duplicate national programmes.
Development of human capital	The FP5 mobility scheme has little influence due to lack of higher education sector.	Human capital development focuses strongly on the HE sector and has little impact on regions with a weak HE sector.	KWF – Information, Consulting and Qualification – is responsible for the business sector. About 15% of funds are reserved for this purpose.
Networking, co-location and clustering measures	As the FPs include networking aspects, there might be an impact, but no data/estimates exist.	FFG Structural Programmes and Thematic Programmes are important measures. Participation in Carinthia is relatively low, but has an impact.	Technology Parks and Cluster Initiatives by EAK are the main measures of the provincial government. The measures are not geared exclusively to RTDI but form part of economic policy strategy.
Knowledge and technology transfer to enterprises		Some specific programmes, e.g. ProTec-NETplus, FH-plus, exist in this field. But the FFG Thematic Programmes also address the issue.	KWF – Technology Transfer Scheme – and KWF – Cooperation Business and Industry – specifically address this aspect. The Cluster Initiatives are also geared to this end.
Research collaboration of public research organisations with private sector		The FFG Structural Programmes affect Carinthia only to some extent.	Technology Parks and Cluster Initiatives foster this aspect in part.
Support of public research	The FPs play a	Basic funding for	There are also some

	minor role due to the lack of a strong public research sector.	universities is the main contribution. The FFG Structural Programmes affect Carinthia only to some extent.	efforts to strengthen public-sector RTD in the course of creating technology parks and cluster Initiatives. But the scope is limited
Financial RTD measures for the private sector	All FP measures are direct financial measures	Except for the direct RTD measures above, the RTD tax allowance and/or the RTD bonus are the main instruments targeting private-sector RTD	All of the programmes mentioned above are primarily direct financial RTD measures. The provinces have no power to offer tax incentives to support RTD

Compilation from typologies described in the bibliography such as Boekholt, P. et al (2001), *An international review of methods to measure the relative effectiveness of technology policy instruments*, Technopolis B.V., Amsterdam;

Soete, L. et al (2002), *Benchmarking National Research Policies: The impact of RTD on Competitiveness and Employment (IRCE)*, A STRATA-ETAN Expert Group Report, DG Research, European Commission, Brussels;

Guy, K. and Nauwelaers, C (2003), "Benchmarking STI Policies in Europe: In Search of Good Practice", *The IPTS Report*, Vol. 71, February, IPTS, Seville;

European Commission (2003), *Raising EU RTD Intensity: Improving the Effectiveness of the Mix of Public Support Mechanisms for Private Sector Research and Development*, Report to the European Commission by an independent expert group, Brussels.

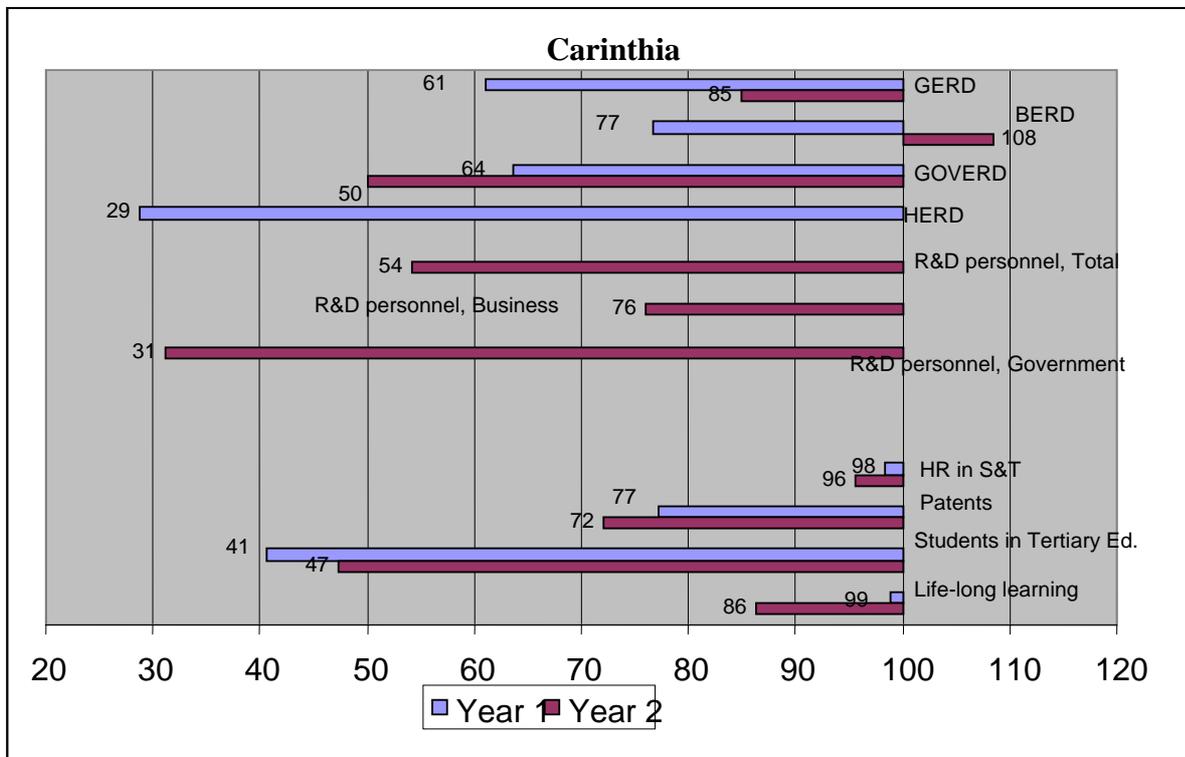
TrendChart has also developed its own policy mix taxonomy.

2.3 Conclusions

The data and characteristics presented in the sections above and in the summary graph permit us to describe the regional knowledge base as follows. Carinthia has a small public RTD infrastructure, but is host to Austria's second largest company in terms of RTD expenditure. The private sector is fairly active in RTD, with above-average RTD expenditure for Austria. It is heavily specialised in microelectronics and information technology. Public RTD institutions and RTD efforts are mostly marginal and far below the Austrian average (see graph below). The public RTD facilities are particularly lacking in basic research capacity.

In addition, there is a scarcity of nationally financed higher education institutions in Carinthia. The university in Carinthia offers studies only in informatics, with no concrete focus on science and engineering. This restricts the availability of human resources for science and technology and limits the potential for the development of high-tech start-ups. On the other hand, the foundation of the University of Applied Sciences with its focus on science studies has enabled the region to partly overcome these constraints, and serves locally as a provider of highly qualified human resources.

Graph 2: Key indicators on Carinthia's knowledge base development in comparison with Austria



Source: Eurostat

Note: See Annex 2 for an explanation of the indicators

Apart from the public RTD knowledge base (higher education facilities and public research institutes), there is a clear public focus on the creation of well-equipped infrastructure in the form of technology parks. There is a strong emphasis on software technologies, micro-electronics, wood technologies and environment. While the targeted areas of micro-electronics and software electronics clearly point to the desire to strengthen relatively strong economic sectors with a strong RTD focus (strengthening regional strengths), the choice of wood technologies and the environment aims to address areas of economic/social importance against a background of under-investment in R&D and innovation-related activities (catching-up strategies).

Exhibit 1, displaying the most important RTD policy instruments for the region, shows that there is a wealth of measures provided by federal government and the region. Due mainly to the lack of a strong higher education sector and strong public research centres, however, Carinthia has problems attracting academic, basic research oriented RTD support from federal government.

Participation in the European Framework Programmes is also largely limited to the private sector. Hence, of the two major funding agencies in Austria, FFG and FWF, only FFG plays an important role in Carinthia. Carinthia has a good participation in the bottom-up funding scheme FFG-BP, mainly due to strong skills in electronics/microelectronics. On the other hand, Carinthia has a relatively low participation in the FFG Structural Programmes, as measured by its participation in the Competence Centre Programmes (K-plus, K-ind/K-net), the RegPlus programme, and the AplusB programme.

At regional level, the data show that the Carinthian Economic Promotion Fund (KWF) is the main regional provider of support to the business sector, as a one-stop-shop coordinating the

federal and regional promotion instruments and the EU support mechanisms. The KWF's promotion measures comprise both RTD-related measures and non-RTD-related measures (see section 3.2). The breakdown of KWF funding shows (see Table 13) that Carinthia had a strong emphasis on infrastructure measures and regional development in 2005 (46%, EUR 19.3 million). Measures under the KWF Technology Fund accounted for EUR 15.5 million in 2005, clearly below the average level for the years 2001-2004.

The technology fund has 4 strategic action areas — measures for single companies (65% of funds in 2001-2005), measures bridging branches and themes (3%), qualification and education measures (20%) and infrastructure measures (12%). The Carinthian network initiatives developed by the regional authorities also have a strong emphasis on the private sector, whereas funding for public sector RTD is limited. The public RTD institutions in turn have a clear focus on supporting private-sector RTD in the fields of microelectronics and wood technologies.

As regards the interplay between national and regional policy instruments, some degree of overlap exists. Whereas the technology park efforts are clearly stand-alone efforts on the part of the regional government, initiatives specifically for technology transfer, start-up loans, and measures for single-company RTD projects exist at both national and regional level. Here, there is a risk of windfall gains through double funding.

3 Regional economic structure

3.1 Description of the economic structure

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

Carinthia's economy is lagging behind Austria as a whole. Compared with Austria's 113%, Carinthia had a GDP per capita of 95% of the EU-15 average in 2003. In 2003, the gross regional product (GRP) was €13.2 billion, about 6% of Austrian GDP. With a GRP per capita of €23 600, Carinthia is still ahead of Burgenland and Lower Austria, but the level is €4 400 or 16% below the Austrian average.

In terms of **value added** in 2003, the primary sector in Carinthia accounted for 2.6% (Austria: 1.9%), the secondary sector for 33% (30.1%) and the services sector for 64.4% (68.0%). Consequently, just as in all other European regions the service sector is dominant in Carinthia. Carinthia's economy resembles to a large extent the Austrian structure as a whole, but is slightly more oriented towards industry.

In 2005 190 625 persons were employed in Carinthia (6.1% of total employment in Austria). The economic structure of Carinthia broken down by **employment** shows that the service sector (70.2%) is the most important job provider. Manufacturing accounts for 28.8% of employment; which is 1.5 percentage points above the Austrian average. Compared with Austria, other major differences exist, particularly in the electronics industry (NACE 30-33), which accounts for 17.1% of employment in manufacturing (+6.4% above the Austrian average). Leather manufacturing, mining, energy and water also have employment shares above the Austrian average. A detailed picture is to be found in Table 11 in Annex 3 to this report.

Carinthia had 19 547 companies in 2005, of which 16 780 (85.8%) had between 0 and 9 employees, and 2 228 (11.4%) had 10-49 employees. There are only 428 (2.3%) companies with 50-256 employees and 83 (0.4%) with more than 250 employees. A detailed picture of the number and size of companies is provided in Table 12 in Annex 3 to this report.

In total, 17.9% of all employees in manufacturing were working in high-technology and 20.1% in medium- to high-technology sectors in 2005 (*Hauptverband der Österreichischen Sozialversicherungsträger*). These figures are based on the OECD classification². In manufacturing, therefore, Carinthia has a higher technology orientation than Austria as a whole.

As highlighted by Joanneum Research and KWF (2006), by far the biggest sector of the economy in Carinthia **in terms of RTD** is the semiconductors/electronics sector, employing about 5 800 persons in 2005. It is dominated by Austria's second largest RTD company, Infineon Technologies, the company's Villach plant being the corporation's headquarters for automotive and industrial components (www.infineon.com/at). More than 500 researchers and developers in Villach work on all kinds of power semiconductors and on chips for wireless communication equipment. The next important sector of the region in terms of RTD is the software sector, employing about 1 000 persons, with many companies focusing on business applications such as CRM and workflow systems. Carinthia's mechanical engineering sector comes in third place in terms of company RTD, employing about 4 600 persons. The firms in the sector manufacture a wide range of products. Other sectors of high economic importance for the region are wood processing, chemistry & plastics and energy & environment.

² High-technology NACE sectors: 24.4, 30, 32, 33, 35.3; Medium-high technology: 24-24.4, 29, 31, 34, 35.2, 35.4, 35.5.

Within the service sector, tourism and health play a major role in Carinthia. Carinthia's health sector with approx. 7500 employees is larger than all the others. It is also important because of the research it carries out, but is mentioned last here because it is mostly publicly owned.

In tourism, Carinthia has experienced a considerable drop in overnight stays in the last two decades. In 1979/1980 Carinthia had more than 18 million overnight stays, but after a continuous decline in the mid-eighties recorded only 12 million overnight stays in 1999/2000. Whereas Carinthia accounted for 16% of Austrian tourism (in terms of overnight stays) in the eighties, its market share was reduced to 11% by 2005. Furthermore, tourists in Carinthia spend less per day than the Austrian average. This holds true for board and accommodation as well as for entertainment and transport. Summer tourism is heavily concentrated in July and August — almost 20% of all summer tourists are camping tourists.

In recent times, winter tourism has contributed significantly towards halting the downswing, while an increase in the number of domestic tourists in summer has also improved the situation. Overall, a clear trend towards stronger demand for high-quality tourism can be observed. Here, the regional government and the national authorities have measures in place to improve quality and infrastructure for tourism (see section 3.2 Policy Context).

3.1.2 Systemic characteristics

It is evident from national and regional policies and programmes (see section 2.2) that policy-making in Austria and its regions has a systemic view of the existing economic structure and the routes for change. Clusters and networks in Carinthia and in Austria as a whole are thus seen as both self-emerging economic characteristics (patterns of specialisation) and active policy tools. Carinthia's cluster initiatives are presented in Table 5 in Annex 3. The clusters are in the following sectors:

1. Microelectronics: Cluster me2c (www.me2c.org)
2. Wood: Network Wood (www.entwicklungsagentur.at/holz),
3. Plastics: (www.entwicklungsagentur.at/kunststoff)
4. Environment and energy: (www.entwicklungsagentur.at/umwelt)

Carinthia's biggest cluster is the [micro]electronic cluster based in Villach. Among its 100 or so members are many of Austria's leading electronics companies, as the cluster also draws members from Styria, Burgenland and even Tyrol. Around its big core companies — Infineon, SEZ, AT&S (www.ats.net), austriamicrosystems (www.austriamicrosystems.com/), BECOM (www.becom.at), Datacon (www.datacon.at) — and a number of smaller electronics companies, the cluster also includes a range of suppliers to the electronics industry from factory software developers and facility management companies to research institutes and consultants.

The me2c cluster was initially industry-driven, whereas the networks for wood, environment and plastics were founded by the Carinthian Development Agency (Entwicklungsagentur Kärnten GmbH, EAK). Consequently, me2c has its own management and staff. It has EAK as a member and is partly funded by the Carinthian Economic Promotion Fund, KWF. The cluster supports company strategy development with a current project for informing members about technology trends. It has been active in setting up a facility management network for cluster firms to provide an integrated offer to customers.

The wood network (Netzwerk Holz Kärnten) comprises approx. 60 firms, the largest being Mondi Packaging Frantschach (www.mondipackaging.com), FUNDERMAX (www.fundermax.com), Johann Offner Holzindustrie (www.offner.at), Griffnerhaus (www.griffnerhaus.com) and Hasslacher Drauland (www.hasslacher.at).

The plastics network (Netzwerk Kunststoff Kärnten) has approx. 40 members, the leading firms being Expan (www.expan.at), Chemson (www.chemson.com), Hobas (www.hobas.com/at/), ITW Austria (www.itw-austria.at/), and Kruschitz (www.kruschitz-plastic.com).

The environment and energy network ("Netzwerk Energie und Umwelt Kärnten") currently comprises approx. 60 companies in the fields of environmental technology, energy technology and mechanical engineering. Leading firms are Lindner Recyclingtech (www.lindner-recyclingtech.com), KELAG (www.kelag.at), GREENoneTEC (www.greenonetec.com), Kostwein (www.kostwein.at) and Schwing (www.schwing.de).

The clusters were set up in line with the specific strengths of the regional innovation systems. The main focus of each cluster was subject to a thorough scientific analysis in advance. All existing Austrian clusters have been developed following regional or local policy initiatives and clear political decisions on investment. Alongside cluster policy, regional educational strategies have also been developed, including the foundation of universities of applied sciences to bolster the specific knowledge base of the regions.

As outlined earlier, the economic structure and RTD capacities in Carinthia are largely influenced by the microelectronic sector. Interestingly, the microelectronic cluster me2c is the only cluster set up in Carinthia via a bottom-up, industry-led initiative. While the networks on wood, environment and plastics play an important role in economic terms, policy-makers have felt the need to actively stimulate networking.

In conclusion, therefore, both the regional economy and the policy approach can be said to display a systemic character.

The regional economy in the international context: foreign direct investment and the export orientation of local firms

Carinthia is not a major destination for inward investment in Austria. According to the Central Bank of Austria (OENB), the cumulative amount of foreign direct investment in Carinthia was EUR 1.32 billion at the end of 2003, which is only 2.9% of the total and the third lowest value of the 9 provinces (Vienna alone has about 55%). In 2003, Carinthia hosted 92 foreign firms (3.4% of the Austrian total), employing 9 500 persons (approx. 5% of all employees employed in Carinthia) (ÖNB, 2005: 57; WIBIS, 2006). No information on the sectoral distribution has been published.

According to OENB FDI, export-oriented investment in Carinthia was EUR 1 676 million in 2003. This is about 3.4% of the Austrian total and the fourth lowest value (ahead of Burgenland, Tyrol, and Vorarlberg). 61.5% of all export-oriented investment was in the Vienna region. Unlike with Styria, no recent data on exported manufactured goods could be obtained for Carinthia. The latest publicly available information refers only to the year 2000 (Pohn-Weidinger and Zumbusch, 2003). The export data show that the share of Carinthian exports in the Austrian total (4.6%) is slightly below Carinthia's share of Austrian GNP (5.8%), which shows there is potential for increasing the internationalisation of the region.

According to Pohn-Weidinger and Zumbusch, the share of exports in the Carinthian manufacturing sector is similar to the overall Austrian share, although there are differences among industries. Mechanical engineering (NACE 29) and electronics (NACE 30-33) account for more than half of all exports in the manufacturing sector, while at national level these industries are responsible for only one third. The export data thus further underline the strong relevance of these sectors for the Carinthian economy.

3.1.3 Capacities and instruments of the financial market

Besides the private capital market, public institutions also provide funding for RTD and business activities. *AWS – Austria Wirtschaftsservice* – is the central promotional bank in Austria and acts as the central agency for business development. Its instruments include grants, loans, liability arrangements and consulting for private companies.

In 2004 AWS supported 29 projects in Carinthia (12% of the total) with loans and guarantees. These projects mobilised investments of EUR 99 390 thousand (12% of the total). Furthermore, AWS supported 330 projects with grants (9%), which in turn mobilised investments of EUR 128 597 thousand (7%). (Source AWS – Annual Report 2005, see Table in Annex 3.)

In addition, AWS offers funding at national level for the following activities: pre-seed funding for the pre-start-up phase of high-technology firms (in IT, physical and life sciences: 2-3 years, max. EUR 100 000) as well as start-up funding for high-technology firms, either in the form of credits (seed financing up to EUR 726 000) or credit guarantees (high-tech double equity funds; max. EUR 2 million). Moreover, it offers financial support for growth phases, including the implementation of new processes, through various programmes (<http://www.awsg.at/portal/index.php?x=54&n=52>). AWS also operates the only Austrian 'business angel' database, which tries to match entrepreneurs with potential backers (<http://www.awsg.at/portal/index.php?x=227&n=286>).

3.2 Policy context

3.2.1 Governance structure and actors

The governance structure for economic policy at national level in relation to the regions and at regional level in Carinthia does not differ from the governance structure analysed in section 2.2. At national and regional levels, the main economic and technology policy actors are the same.

Apart from KWF, the *Entwicklungsagentur Kärnten GmbH* (Carinthian Development Agency – EAK) plays a prominent role in economic promotion at agency level. EAK is the partner for entrepreneurs, companies, regions and public institutions. It is a private company established by the province of Carinthia to support and monitor innovatory and cooperative projects initiated by companies in Carinthia with the aim of fostering lasting economic growth in the province (www.entwicklungsagentur.at). The EAK support measures are described in 3.2.3.

3.2.2 Policy objectives

Where policy objectives are concerned, some specific framework conditions at European and national level affect regional policy. At European level, Aumayer et al. (2006) emphasise the relevance of the growth and employment efforts and the Lisbon strategy: the European coordination mechanisms in place influence national policy objectives, as can be seen in the national Economy and Employment Law 2005.

Policy objectives and instruments are defined after discussions between government, social partners, national experts and enterprises. The following areas may be singled out

- infrastructure (investment in roads and railways),
- research (extension of fiscal and financial measures as described in 2.2),
- official procedures (accelerating official procedures for private investment),
- broadband (extension of broadband connections in rural areas),
- flexibilisation of working time,

- qualification and education, and
- internationalisation (export promotion measures).

At regional level, the policy objectives have a strong technological orientation (see section 2.2). The promotion of clusters and high-tech projects are core priorities in economic and technology policy. Apart from the technology-oriented objectives, tourism capacity and quality, new entrepreneurs, location promotion and SME support also constitute important objectives in Carinthia.

3.2.3 Policy instruments

At **national level**, apart from the FFG's RTD promotion measures, economic promotion measures are provided directly by the AWS in particular through the AWS-managed European Recovery Programme fund (ERP) (Aumayer et al. 2006).

In the financial domain, the AWS offers a portfolio of financial measures such as allowances, ERP credits and special liability arrangements for SMEs in the form of micro-credits and double equity for financing set-up and growth (see Hofer 2006). AWS also offers guarantees for SMEs, restructuring activities and internationalisation efforts. At the macroeconomic policy level, special attention is given to promoting business start-ups (e.g. the law for supporting the founding of new enterprises) (see Hofer 2006). Aumayer et al. (2006) report for Carinthia that the ERP fund supported 18 projects with loans worth EUR 32.6 million in 2005 (7% of the Austrian total). The loans in turn spurred investments of EUR 61.1 million. Two of the eighteen projects came under the ERP technology programme (18% of the Austrian total). Under the European regional development fund (ERDF), EUR 7.3 million were provided in 2004, or 31% of the Austrian total. The ERDF funding was accompanied by investments of EUR 50 million in Carinthia. Tables showing the distribution of funds by AWS and ERP are to be found in the annex to the report.

In the human capital domain, Hofer (2006) points to the introduction of tuition fees for students with the new law governing the organisation of universities. Previously, participation was free. On the other hand, a major part of promoting employment in Austria is to improve the qualifications of unemployed persons. Several measures therefore focus on the reintegration and qualification of women and on helping young people get a professional education. They mainly consist of professional courses and coaching. The effect is to improve the match between demand and supply and enhance qualifications. For Carinthia, human capital measures are especially important as it has a low participation of women and elderly people in the economy (see IHS 2005).

At national level, bonuses and grants have been allocated for 183 tourism-related projects in Carinthia. The value of subsidies is EUR 3.5 million, the volume of loans EUR 18.6 million. This has given rise to an investment volume of more than EUR 80 million in Carinthia (Aumayer et al. 2006). 177 environmental projects have been subsidised to a value of EUR 9.7 million EUR, for a total investment of EUR 56.3 million.

Furthermore, special investment incentive programmes for tourism, trade and industry have been established in a **joint initiative** by the federal government and the province of Carinthia. In total, EUR 50 million will be provided through special funds, with additional loans of EUR 110 million to be provided by AWS and ERP. The programme, which only started in late 2005, provides support for measures to create new employment and conserve existing employment.

At **regional level**, the non-RTD-related instruments operated by KWF and EAK are also important.

Aside from the "Technology Fund" (see section 2.2) the **KWF** promotion schemes comprise "Trade and Industry", "Tourism", "Capital Mobilisation", and "Young Entrepreneurs".

In the area of trade and industry, KWF provides support for new investments, young entrepreneurs, company take-overs, and cooperation with economic partners in new markets (networking).

In the area of tourism policy, measures aim to support structural change in the sector. The focus is on fostering cooperation, enhancing infrastructure and improving the quality of tourist services. Regional initiatives seek to extend the availability of low-cost carrier connections to the region and to support the establishment of event tourism and investment in spas (see IHS 2005).

KWF measures for young entrepreneurs include legal/management advice, coaching activities and qualification courses. In addition, there are promotion measures for technology transfer projects and new start-ups.

Total KWF funding was EUR 52.1 million in 2004 and EUR 46.6 million in 2005. In terms of sectors, 35.3% went to tourism, 16.3% to industry, 2.6% to commerce (Handel), 14.0% to trade (Gewerbe) and 31.8% to others in 2005. As regards the size of funded companies, a clear focus on SMEs is evident: 73.5% of all funding was devoted to SMEs (< 250 employees) (see Table 14 in Annex 3 on KWF promotion by company size).

EAK, the agency responsible for business and network development support, has the following schemes: "Founding", "Settling/Business Locations", "Cooperating/Networking", "Expanding", and "Exporting".

The EAK *Founder Monitoring Service* provides advisory services, training courses and individual coaching right up to the creation of the business plan. It provides information on funding and financing possibilities, support in researching patents and market studies, and networking with other new founders. In addition, it offers a mentoring service where experienced executives or entrepreneurs place their experience and their contacts at the disposal of new founders.

EAK promotes 6 *Carinthian business locations/technology parks* and provides companies settling there with support for the successful realisation of business ideas. The technology parks have a strong technological orientation (see table 4).

The 4 *networks* of the region managed by EAK (see Table 3 on the thematic orientation of networks) are seen as hubs of communication and information, linking network partners and offering a platform for, and access to, new customer markets for network members, more and better access to partners along the supply chain, cost benefits through joint marketing activities, and joint research and development activities.

For *expanding companies*, EAK provides a "Staff Coordination" service to help them recruit staff. In addition, advice can be requested on funding personnel education and qualification.

EAK also has *Export Offices* within the Alpine-Adriatic Region (Slovenia-Ljubljana, Croatia-Zagreb, Italy-Verona and Germany-Düsseldorf). Here, export managers act as direct contacts for Carinthian companies who want to export, help companies in establishing networks for market development, and also respond to individual queries.

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

Policy areas	Relevant policies complementary to RTDI instruments*	Effects on the region's R&D and innovation capacity
Creation of an innovation- and entrepreneur-friendly environment	<p>At national level, AWS, ERP, and EFRE support new investment in promising business endeavours.</p> <p>At regional level, there are special support programmes for tourism, trade and industry. Both advice and investment funding are provided.</p> <p>For tourism, the regional government is increasing its efforts to promote cultural and sport events.</p>	<p>Innovative actions bear certain risks. By providing loans and subsidies, the public sector is taking on risks that the private sector capital market would not consider. This thus raises the potential for successful innovation.</p> <p>Publicly promoted and sponsored cultural events provide incentives for service providers to increase innovation (positive external effects, spillovers).</p>
Development of human capital	<p>Several measures to improve the qualification of young unemployed people and re-integrate women with children into the labour force. Coaching and specific courses are provided.</p> <p>Also at regional level, KWF measures include coaching and promotion of qualification.</p>	<p>Increase in qualification and better match between labour supply and demand.</p>
Networking, co-location and clustering measures	<p>The EAK's various networking, co-location and clustering measures in the region are geared to spurring innovation in the broad sense.</p>	<p>The networking measures increase the region's knowledge absorption capacity. Through partnerships, risk sharing and more RTDI projects could result.</p>
Financial measures for the private sector	<p>The AWS offers a portfolio of financial measures such as allowances, ERP credits and special liability arrangements for SMEs in the form of micro-credits and double equity for financing set-up and growth.</p> <p>Capital mobilisation is also sponsored by KWF via start-up loans and capital guarantees.</p> <p>Innovative SMEs are sponsored.</p>	<p>By providing loans and subsidies, the public sector is taking on risks that the private-sector capital market would not consider. This thus raises the potential for successful innovation.</p>

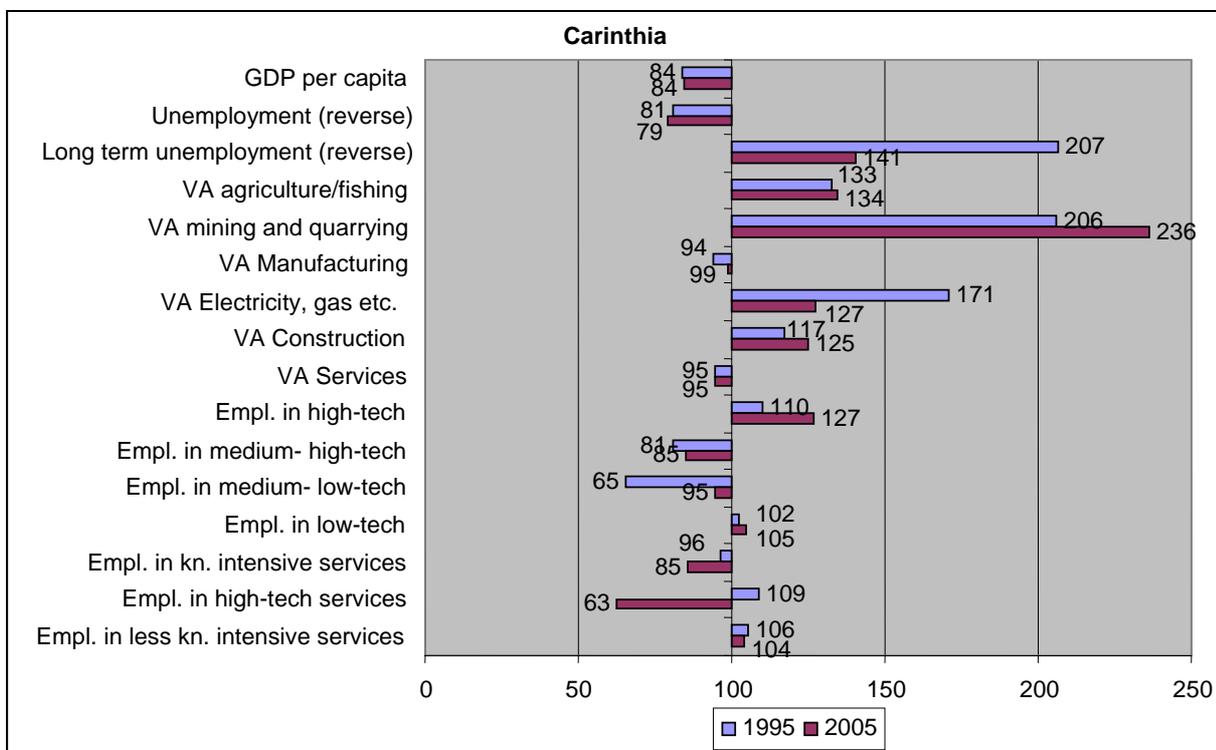
*[*Examples are fiscal, industrial, regional, educational, labour, trade and competition policy.]*

3.3 Conclusions

The regional economic data in Graph 2 confirm that Carinthia is still undergoing a process of structural change. Carinthia shows some distinct economic strengths compared with Austria in general, but the transition process in Carinthia is far from complete. This is despite the very strong RTD-intensive production sector, the most prominent part being electronics, which is responsible for the positive trend in employment in high-tech manufacturing.

GDP per capita and long-term unemployment (inverse rate) are still below the Austrian average. In the main tourism sectors, the transition to high-quality tourism throughout the year has not yet been accomplished, and in particular employment in high-tech services is below the Austrian average.

Graph 3: Key indicators on Carinthia's economic structure and development — with Austria



Source: EUROSTAT

Note: See Annex 2 for an explanation of the indicators

4 Conclusions

4.1 Assessment of the regional innovation system

The following picture emerges in the endeavour to assess the efficiency and coherence of the regional innovation system with regard to the needs and capacities of the regional economy based upon the data and discussion in the previous sections:

Systemic characteristics of the development of innovation in the region

The data and discussion in sections 2 and 3 show that regional economic structure and RTD and innovation capacity is largely influenced by the microelectronic sector. The economic report on Carinthia and the Carinthian Economic Information System data (WIBIS) show that the technology-oriented sectors have been continuously gaining in importance. While manufacturing has been generally characterised by falling employment, employment in the technology sectors has increased.

The systemic orientation of regional policy is evident in the measures to promote clustering initiatives and new infrastructure through technology parks. To a large extent, the initiatives focus on the promotion of regional strengths and structural change in the private sector.

Public-sector RTD infrastructure investment is relatively small compared with the size of RTD-intensive companies in the region. The local university, in line with national policy, has a strong focus on social sciences. The regional government has only recently increased efforts to strengthen the field of IT and software technologies at Klagenfurt University through the establishment of regional KWF-sponsored professorships (see Aumayer et al. 2006). The University of Applied Sciences and Carinthian Tech Research were created in the mid-nineties, and were further steps towards gearing public RTD provision and the creation of new human resources to regional industry needs.

With the EAK initiatives, regional policy-makers are seeking to promote the learning and innovation capacities of Carinthian companies both in general but specifically in those sectors with a relatively strong economic importance but so far limited innovation capacities. Examples are the establishment of the wood, environment, and plastics networks for companies. The history of EAK shows that policy-makers were not too certain about the orientation of the EAK initiatives. As stated in the 2004 economic report (IHS 2005), the shareholders, name and strategic orientation of EAK changed several times from 1999 onwards. The trend in strategic orientation has been from technology park management to location management and cluster development, with a stronger service orientation for companies in general.

In Exhibit 3, we seek to describe the match between knowledge creation and economic specialisation in the region.

Exhibit 3: Matching knowledge and economic specialisation

Knowledge production in the region	Related economic sectors	Specialisation of the region's economy	Conclusions
Public – CTR: electronics, microelectronics	Electronics, microelectronics	Electronics, microelectronics	Limited public knowledge creation, but very strong and RTD-intensive in the private sector. Public RTD efforts seek to adapt to private sector.
Public: economics and computer sciences	Electronics, IT services	Electronics, microelectronics All productive sectors	Attempts to strengthen public knowledge creation and provision of human capital in the field of IT in order to serve market demand. New management capacity for all regional companies.
Public: material technologies (wood)	Wood	Wood	Economic specialisation but limited RTD capacity.
Public: cultural sciences, humanities, interdisciplinary research	Public education	-	Provision of human resources for public education facilities etc.

The discussion in section 2 has shown that the only outstanding sector in Carinthia is the (micro)electronics sector. Private-sector RTD is thus heavily specialised. The public RTD institutions and RTD efforts are mostly marginal in nature and lack capacity in basic research. Overall, the strong focus on only a few economic sectors carries a high risk of vulnerability to specific sector crises, such as that already experienced in 2001-2002 in the microelectronics field.

An overview of the **strengths and weaknesses** of the regional innovation system in Carinthia is presented in Exhibit 4.

Exhibit 4: Strengths and weaknesses of the regional innovation system

	Strengths	Weaknesses
Knowledge creation capacity	<ul style="list-style-type: none"> • Strong private sector research activities in some specific sectors 	<ul style="list-style-type: none"> • Poor public RTD creation capacity. Except for BERD, all knowledge creation indicators in Graph 2 are below the Austrian or European average.
Knowledge diffusion capacity	<ul style="list-style-type: none"> • Public R&D clustering measures and network initiatives provide stimuli for inter-business knowledge transfer 	<ul style="list-style-type: none"> • R&D and technology transfer collaboration between the local public research sector and local industry is still at a low level and the diffusion of knowledge is limited. • Poor match between public RTD knowledge creation (social sciences and humanities) and private knowledge creation (microelectronics) at universities • Fall in knowledge-intensive start-ups (new company creation) in the IT sector due to the crisis in the software sector after the year 2000
Knowledge absorption capacity	<ul style="list-style-type: none"> • Strong increase in lifelong learning, which is now at about the Austrian level 	<ul style="list-style-type: none"> • Company structure is dominated by small and medium-sized enterprises with limited learning capacities
RTDI governance capacity	<ul style="list-style-type: none"> • Nowadays, well-established RTDI governance structure at national and regional level. • Focus on potential sectors for growth and regional economic relevance such as electronics, software and wood processing, and on “high value-adding, export-oriented” industries 	<ul style="list-style-type: none"> • Duplication of measures of the regional and the local authorities • Long-lasting re-structuring processes • Criticism of the excessive influence of lobbying organisations in priority setting processes.
Economic structure	<ul style="list-style-type: none"> • Strong employment in high-tech manufacturing • Above-average employment in construction 	<ul style="list-style-type: none"> • Below-average employment in knowledge-intensive services • Below-average employment in high-tech services

4.2 Assessment of policies

The analysis of RTDI-related policy measures has shown that there is a wealth of both national and regional instruments for the region. The weak higher education sector limits participation in public RTD programmes geared to basic research. Participation in the EFP is also limited. On the other hand, participation in bottom-up funding schemes run by the federal government is above the Austrian average. This is due to the strong business-sector RTD in the regional economy.

As regards the interplay between national and regional policy instruments, Exhibit 1 shows that some degree of overlap exists. Whereas the technology park efforts are clearly stand-alone efforts on the part of the regional government, initiatives specifically concerning technology transfer, start-up loans, and measures for single-company RTD projects exist at both national and regional level. Here, there could be a risk of windfall gains from double funding. However, the Carinthian Economic Promotion Fund (KWF) is increasing the funds devoted to qualification measures in addition to RTD project funding.

As regards the priorities of RTDI policies vis-à-vis other socio-economic challenges, the analyses show that socio-economic promotion measures and RTDI measures are not mutually exclusive. Indeed, there is evidently a strong coherence between these measures.

In terms of governance capacities, the region is characterised by a process of learning and transformation. Whereas there was initially a strong focus on specific technologically oriented measures, the concept of innovation promotion has now become broader. Policy measures show a balanced system of technologically oriented promotion measures and actions focused on upgrading skills and promoting investment and restructuring.

The Corinna report on the regional innovation system and policy framework (KWF, Joanneum Research 2006) showed that policy setting in Carinthia is basically top-down, but is adjusted following inputs from lobbying organisations, key industrialists and local politicians: recognised experts are usually involved in providing the initial inputs, whereas the subsequent decision processes involve whoever is strong enough to make themselves heard. While the top-down process allows for visionary concepts, their implementation is dependent on securing a minimum degree of support from strong stakeholders, so a fair amount of horse-trading is involved. The Corinna report recognises the openness to new ways — driven by inputs from external experts or small organisations — as a strength of Carinthian R&D policy setting. Yet as policy implementation must ultimately respect local special interests, compromises have to be reached on the original concepts.

4.3 Challenges and trends of the knowledge economy

Following Pohn-Weidinger and Zumbusch (2003), we may conclude that the region of Carinthia has begun to successfully manage structural change. The technology and human-capital intensive sectors, such as (micro-)electronics or mechanical engineering, have gained momentum and the regional efforts to strengthen research and development activities have helped to spur structural change and increase the potential of both the regional economy in general and the knowledge-intensive sectors in particular. The economic report by Carinthia IHS (2005) stresses that structural change in Carinthia has continued, but also identifies three main challenges for Carinthia's knowledge economy:

- To expand the supply of well-qualified human resources in general, and to strengthen education in science and engineering in particular, by expanding courses at the University of Applied Sciences and the University of Klagenfurt;
- To broaden the base of innovative companies and in particular to tackle the innovation deficit among SMEs — the positive RTDI measures introduced in recent years need to continue;
- To continuously invest in the restructuring and improvement of the tourism sector in the region.

Other, less prominent challenges are:

- To foster inter-regional cooperation with the neighbouring regions in Slovenia and Italy;
- To improve the provision of childcare facilities in order to increase the participation of women in the labour market;
- To further invest in qualification measures for older employees in order to ensure high productivity of employees at all stages of working life.

Exhibit 5: Identification of policy challenges

Policy challenge	Corroborating indicator	Inducement mechanisms	Effective approaches
To improve the provision of qualified human resources	Lack of S&E courses at universities, hence also low numbers of graduates in the region	Creation of S&E courses at University of Applied Sciences and Klagenfurt University	[only measures that appear to contribute significantly to meeting the challenge are presented] Pool resources of university and applied university because critical mass is missing. Joint initiatives by region and private companies. Joint efforts with neighbouring regions.
To improve public RTD creation	Low public RTD expenditure. Limited capacity of regional universities	Support and creation of public RTD infrastructure	Creation of universities of applied sciences and participation in competence centre programmes geared towards needs of the regional economy
To improve economic activity in high-tech services and knowledge-intensive services	Proportion of knowledge-intensive services and high-tech services has decreased in last decade	Mechanisms of EAK, KWF and AWS related to technology transfer	Improve and strengthen services and initiatives at technology parks. Increase resource endowment.
To restructure and improve the tourism sector in the region.	Overnight stays have decreased constantly over the last twenty years in summer tourism	Increase of public spending on infrastructure and cultural events. Qualification measures for improved services. Loans and guarantees for new investment in hotels etc. Investing in particular in winter tourism	Increase quality of services offered and hotels. Joint actions by Austrian regions and federal government. Reduction of duplicated efforts in the marketing of tourist services
To foster inter-regional cooperation with the neighbouring regions in Slovenia and Italy	-	Joint participation in EU inter-regional programmes	Joint participation in EU inter-regional programmes

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Annexes

Annex 1: Definition of policy mix typology

- **Improving innovation and R&D governance capacity.** Technical assistance-type funding used by public authorities, regional agencies and public-private partnerships in developing and improving policies and strategies in support of R&D investments and innovation. This could include changes in the organisation of decision making, national and regional forecasting, measures for improving evaluation, etc.
- **Creating an innovation- and entrepreneur-friendly environment.** This category covers a wide range of actions which seek to improve the overall environment in which enterprises, universities and research organisations innovate. This includes the following measures:
 - Promoting an entrepreneurial and innovation culture in the private sector by undertaking awareness initiatives and changing regulations and disincentives that discourage entrepreneurship;
 - Regulations and initiatives addressing intellectual property rights either by improving legislation dealing with cases where the results of public or collaborative research are commercialised 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.
- **Developing human capital.** This category includes measures aimed at upgrading human resources in R&D and innovation-related activities, such as helping science and technology graduates to follow research and innovation-oriented careers; training researchers in enterprises or research centres; intra- and inter-national mobility of scientists; curriculum development in higher education aimed at developing science and technology; orientated under- and post-graduate courses, etc.
- **Networking, co-location and clustering measures.** Policies under this category focus on remedying deficiencies in innovation systems by promoting cooperation, networking and interaction. Measures promoting co-location of industrial and scientific organisations (e.g. innovation poles), 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 organisations and commercialisation of public research results. Direct support includes aid schemes for utilising technology-related services or for implementing projects transferring technology from the public or private sector to the private sector. Indirect policies include developing infrastructures facilitating technology transfer such as technology parks, innovation centres, university liaison and transfer offices.

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

Annex 2: Description of key indicators used in the graphs

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

Index: Country=100

Source: Eurostat, 2006

Graph 1: Key indicators on the region's knowledge base development in comparison to the country

1. Total 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. Lifelong Learning: Participation of adults aged 25-64 in education and training as a percentage of population

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

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

Annex 3: Tables and Figures

Table 1: RTD personnel and expenditure by sectors & funding sources

Sector	2002	1998	2002	1998	2002
	<i>RTD personnel (FTE)</i>		<i>RTD expenditure in € '000</i>		
<i>Total</i>	1606.7	955.8	229532	122279	
Business enterprise sector	1358.5	750	196689	98020	
Government sector	42.8	56.3	7271	7531	
Higher education sector	nA	144.4	25344	16562	
Private non-profit sector	nA	5.1	228	165	

Funding Source	Percentage
BES	50.78%
ABR	29.87%
PUB	18.45%
PNP	0.10%
EU	0.79%

Source: Eurostat 2006, ST.AT F&E Erhebung 2002

Table 2: EPO Patents per IPC patent class, 2002

IPC Section	Carinthia	Austria	% of national total	Carinthia	Austria	% of national average	Carinthia	Austria	% of national average
	No of patents			Patents per million active population			Patents per million population		
A-Human Necessities	13.1	231.4	6%	50.8	60.0	85%	23.4	28.7	81%
Performing operations -transporting	26.2	341.3	8%	101.7	88.5	115%	46.8	42.3	111%
Chemistry, metallurgy	3.9	157.7	2%	15.1	40.9	37%	7.0	19.5	36%
Textiles, Paper	0.1	63.3	0%	0.4	16.4	3%	0.2	7.8	3%
Fixed constructions	8.6	136.8	6%	33.2	35.5	94%	15.3	17.0	90%
Mechanical engineering; lighting, weapons	5.5	141.2	4%	21.3	36.6	58%	9.8	17.5	56%
Physics	10.2	191.7	5%	39.4	49.7	79%	18.1	23.8	76%
Electricity	23.0	218.6	11%	89.0	56.7	157%	41.0	27.1	151%

Table 3: Universities and higher vocational schools in Carinthia

Name	Students (04/05)	in S&E Fields	Doctorates (Degrees 03/04)	Academic staff 2005 (FTE)	of which professors (FTE)f	Income from RTD/contractual work in 2004
Alpen-Adria Universität Klagenfurt	9 444	709 ~ Informatics 230 ~ Tech.Math. 202 ~ Geography	86 Source Univ. Klagenfurt 33 Source: BMBWK Universitätsbericht 2005	327.95	62.5 Full Prof. 68.5 Assoc. Prof.	€8.86m Contractual Acquisitions €43.6m Global Budget
FH Technikum Kärnten -Carinthian Tech Institute	884 (03/04)	598	-	~83 headcount	~ 24 FH-Prof. headcount	not available

Source: publicly available information: <http://www.uni-klu.ac.at/main/inhalt/1538.htm> (as at 17 August 2006), BMBWK – Universitätsbericht 2005, Statistik Austria – Statistisches Jahrbuch 2006, <http://www.fh-kaernten.at>

Table 4: Public and Private Research Institutes in Carinthia

Name	Location	Type of Organisation	Scientific Fields	Staff in Carinthia
Carinthian Tech Research (CTR) http://www.ctr.at	Villach	Semi-Public	Optical Sensors & Imaging, Smart Automation & Simulation and Microsystem Technology	~47
Wood Carinthian Competence Centre (W3C) http://www.wood-kplus.at	St. Veit	Semi-Public	Knowledge Based Process Optimisation Spectroscopic Applications From 2006 onwards: Surfaces and Logistics	~10 ~15 additional in 2006
Institut für Höhere Studien Kärnten (IHS Kärnten) - Institute for Advanced Studies Carinthia http://www.carinthia.ihs.ac.at	Klagenfurt	Private Non-Profit	Applied solutions for economic and political questions: energy economics, capital market research, banking and regional/structural benchmarking.	~10 researchers

Source: publicly available information extracted from: KWF-Kärntner Wirtschaftsförderungs Fonds: CORINNA – Cooperation of Regions for Innovation: Regional Case Study – Innovation System and Policy Framework: Carinthia

Table 5: Technology parks in Carinthia

Name	Location	Tenants, topic	Link
Lakeside Science & Technology Park	Klagenfurt, next to Klagenfurt University campus	Institutes of Klagenfurt University; software companies (Infineon Technologies IT Services, Uniquare, etc.)	www.lakeside-software.com
Technology Park Klagenfurt	Klagenfurt, next to Carinthian Tech Institute	Telematics, informatics and new media companies (S&T Austria, Business Software GmbH, etc.)	www.entwicklungsagentur.at
Technology Park Villach	Villach	Departments of Carinthian Tech Institute; microelectronics & ICT companies (CTR, Micronas, CenterPoint, etc.)	www.technologiepark-villach.com
Stimulus Centre Völkermarkt	Völkermarkt:	Mechanical engineering, automation, packaging technologies (Dana Austria, ITW Austria, etc.)	www.entwicklungsagentur.at
Stimulus Centre Arnoldstein	Arnoldstein	Mechanical engineering (IOS, Lasercon Messtechnik, etc.)	www.entwicklungsagentur.at
Stimulus Centre St. Veit an der Glan:	St. Veit an der Glan	Renewable energy (GreenOneTec, Sonnenkraft, etc.)	www.entwicklungsagentur.at

Source: KWF, JR-InTeReg

Table 6: Overview of Clusters in Carinthia

Title	SMEs	Large companies	Support Institutions/ Regional Stakeholders	No of employees	Top-down (T)/bottom-up (B)	Common infrastructure/instituti onalised management	Strategy Programmes
me2c	78	30*	5/33**	18 500	B	C	Y
Network Wood	120	13*	2/5***	n.a.	T	C	Y
Network Environment	68	10*	1 / 4***	n.a.	T	C	Y
Network Plastics	44	10*	3 / 7***	n.a.	T	C	Y
Network Lifeland	Is being relaunched	0	0	0	T	C	Y

*incl. public organisations and subsidiaries of large companies; **public/total incl. e.g. consultants, banks; ***incl. managing organisation Carinthian Development Agency EAK

Source: KWF, JR-InTeReg

Table 7: RTD-intensive and knowledge-intensive start-ups as percentage of all start-ups in manufacturing and business services

	1993/94	1995/96	1997/98	1999/00	2001/02	2003/04*
RTD-/knowledge-intensive start-ups in manufacturing						
Burgenland	7.20	10.16	16.36	14.53	14.07	18.58
Carinthia	13.64	14.89	12.85	18.28	14.78	9.84
Lower Austria	15.27	10.31	17.46	14.95	13.44	15.60
Upper Austria	15.69	16.73	16.93	18.57	20.68	17.90
Salzburg	17.23	11.78	22.86	22.54	24.23	12.75
Styria	20.98	19.65	16.73	16.55	19.08	10.47
Tyrol	14.43	13.59	16.29	12.50	12.81	16.87
Vorarlberg	20.98	13.03	15.91	12.70	18.32	25.56
Vienna	17.37	20.93	20.98	24.03	23.14	7.33
<i>Austria</i>	<i>16.56</i>	<i>15.72</i>	<i>17.76</i>	<i>18.16</i>	<i>18.77</i>	<i>13.76</i>
RTD-/knowledge-intensive start-ups in services						
Burgenland	39.33	51.69	52.05	59.89	47.59	65.85
Carinthia	43.89	43.23	36.67	51.19	38.40	38.76
Lower Austria	51.92	51.51	50.06	51.06	53.79	55.89
Upper Austria	46.70	52.90	50.35	51.06	42.41	37.96
Salzburg	35.19	43.02	42.05	41.01	33.52	42.51
Styria	52.28	51.60	60.00	53.25	53.77	49.23
Tyrol	51.94	43.15	44.28	48.07	41.73	43.43
Vorarlberg	41.91	48.46	49.02	46.50	43.43	62.76
Vienna	42.39	44.90	44.50	48.69	45.41	43.36
<i>Austria</i>	<i>45.42</i>	<i>47.43</i>	<i>47.43</i>	<i>49.57</i>	<i>45.69</i>	<i>45.27</i>

* preliminary

Source: Egelin et al. (2006: 30)

Table 8: Participation in FP5 1999-2002, in EUR thousand

	Austria	Carinthia
Life Sciences	43 669	78
Information Society	79 409	2 644
Economic Growth & Sustainable Development	70 357	1 076
Environment	24 414	0
Energy	41 024	1 180
Cooperation with Third Countries (INCO)	4 801	0
Innovation and SMEs	1 387	0
Education and Mobility	20 086	380
Total	285 147	5 359

Source: BIT-WIBIS – Kärnten

Table 9: Participation in FP5 by type of organisation

	Austria		Carinthia	
	No. projects	%	No. projects	%
Industry	721	36.2%	23	69.7%
Universities	657	33.0%	6	18.2%
RTD institutes	335	16.8%	1	3.0%
Others	249	12.5%	3	9.1%
not applicable	29	1.5%	0	0.0%
Total	1 991	100.0%	33	100.0%

Source: BIT-WIBIS Kärnten

Table 10: AWS Grants in 2004 & 2005*Loans and Guarantees in EUR thousand*

	supported projects		mobilised investments		public support	
	2005	2004	2005	2004	2005	2004
Burgenland	18	15	55 161	45 925	24 908	21 480
Carinthia	19	29	85 192	99 390	33 100	46 370
Lower Austria	47	37	175 629	109 404	79 762	47 908
Upper Austria	60	61	272 534	204 718	121 375	111 268
Salzburg	17	15	85 123	33 111	36 027	16 605
Styria	61	37	295 346	144 766	103 539	66 720
Tyrol	17	26	71 131	67 947	36 148	39 481
Vorarlberg	12	12	55 079	46 123	28 602	19 684
Vienna	16	15	154 437	70 230	53 068	39 580
Total	267	247	1 249 632	821 614	516 529	409 096

Grants in EUR thousand

	supported projects		mobilised investments		public support	
	2005	2004	2005	2004	2005	2004
Burgenland	175	192	97 200	117 068	7 414	13 064
Carinthia	290	330	125 586	128 597	12 926	11 652
Lower Austria	443	441	261 731	203 592	18 653	15 155
Upper Austria	881	994	590 998	674 104	28 722	32 054
Salzburg	190	212	87 840	51 204	5 735	3 834
Styria	587	653	434 501	314 525	28 109	18 118
Tyrol	214	223	68 776	71 342	5 298	4 608
Vorarlberg	222	212	62 905	76 570	3 079	3 822
Vienna	315	354	35 932	49 801	6 218	9 269
Abroad	18	1	10 917	383	10 617	383
Total	3 335	3 612	1 776 386	1 687 186	126 771	111 959

Source: AWS – Annual Report 2005

Table 11: Economic Structure in Carinthia (in % of total employment)

<i>Economic Structure 2004 (in % of total employment)</i>	Carinthia	Difference:	Austria
Employment Total	100% = 188 657		100% = 3 078 547
Agriculture and Forestry	1.0	0.1	0.9
Production Sector in total - of which...	29.7	1.7	28.0
Mining, Energy, Water	8.5	3.8	4.7
Manufacturing 15-37	62.4	-5.6	68.0
<i>NACE Technology Areas NACE 23/24, 29-35</i>	<i>41.5</i>	<i>6.5</i>	<i>35.1</i>
NACE 15/16 Food, Beverages & Tobacco	12.7	0.0	12.7
NACE 17/18 Textiles, Wearing Apparel	1.2	-3.1	4.3
NACE 19 Leather Manufacturing	4.1	3.2	1.0
NACE 20 Wood	7.1	1.2	5.8
NACE 21 Printing, Paper, Publishing	2.4	-0.6	3.0
NACE 22 Wood, Paper, Printing	4.0	-0.4	4.4
NACE 23/24 Chemicals incl. Pharmaceuticals	5.1	-0.6	5.7
NACE 25 Plastics	2.6	-1.7	4.3
NACE 26 Non-Metal Minerals	6.5	1.7	4.8
NACE 27/28 Basic Metals/Fabricated Metals	10.4	-7.7	18.1
NACE 29 Machinery	13.1	1.8	11.3
NACE 30-33 Electrical Equipment, Elect. Machinery, Instruments	16.4	5.9	10.5
NACE 34/35 Motor Vehicles and Other Transport Equipment	6.9	-0.6	7.6
NACE 36/37 Furniture, Recycling	7.5	0.9	6.6
Construction	29.1	1.8	27.4
Services sector in total - of which	69.3	-1.8	71.2
Trade & Storage	23.4	0.6	22.8
Hotels	9.1	1.9	7.3
Transport & Information	8.6	-1.2	9.8
Insurance Sector	5.2	0.2	5.0
<i>Knowledge Intensive Service Sectors (Ö-NACE-No. 72, 73, 74.1-74.4)</i>	<i>42.4</i>	<i>-5.3</i>	<i>47.7</i>
NACE 70/71	14.7	-0.5	15.2
NACE 72	7.2	-2.6	9.8
NACE 73/74	78.1	3.1	75.0
Public Services, Other Services	44.7	2.9	41.7

Source: Joanneum Research -InTeReg & Synthesis (raw data: HVSV)

Table 12: Size of companies in Carinthia, NACE 2-digit level

NACE 2-digit level	Size of companies (in terms of employees)								
	Total		0 - 9		10 - 49		50 - 249		>250
	19,356	in %	16,694	in %	2,147	in %	428	in %	87
Total	of tot.		of group		of group				
Production Sector in total, of which...	2 052	10.6%	1,550	75.54%	368	17.93%	118	5.75%	16
<i>NACE Technology Areas NACE 23/24, 29-35</i>	462	2.4%	325	70.35%	93	20.13%	44	2.14%	0
NACE 15/16 Food, Beverages & Tobacco	324	1.7%	240	74.07%	64	19.75%	19	0.93%	G
NACE 17 Textiles	31	0.2%	24	77.42%	7	22.58%	0	0.00%	0
NACE 18 Wearing Apparel	45	0.2%	41	91.11%	4	8.89%	0	0.00%	0
NACE 19 Leather	26	0.1%	18	69.23%	3	11.54%	3	0.15%	G
NACE 20 Wood	138	0.7%	93	67.39%	33	23.91%	11	0.54%	G
NACE 21 Printing, Paper, Publishing	14	0.1%	7	50.00%	3	21.43%	3	0.15%	G
NACE 22 Wood, Paper, Printing	115	0.6%	86	74.78%	21	18.26%	8	0.39%	0
NACE 23/24 Chemicals incl. Pharmaceuticals	82	0.4%	65	79.27%	9	10.98%	7	0.34%	G
NACE 25 Plastics	47	0.2%	30	63.83%	12	25.53%	5	0.24%	0
NACE 26 Non-Metal Minerals	106	0.5%	79	74.53%	16	15.09%	9	0.44%	G
NACE 27 Basic Metals	4	0.0%	4	100.00%	0	0.00%	0	0.00%	0
NACE 28 Fabricated Metals	314	1.6%	242	77.07%	59	18.79%	12	0.58%	G
NACE 29 Machinery nec	164	0.8%	99	60.37%	43	26.22%	19	0.93%	G
NACE 30-33 Electrical Equipment, Elect. Machinery, Instruments	182	0.9%	140	76.92%	28	15.38%	11	0.54%	G
NACE 34/35 Motor Vehicles and Other Transport Equipment	42	0.2%	21	50.00%	13	30.95%	7	0.34%	G
NACE 36/37 Furniture, Recycling	418	2.2%	361	86.36%	53	12.68%	4	0.19%	0
Business Services Total	2 403	12.4%	2,206	91.80%	165	6.87%	28	1.36%	4
NACE 70	541	2.8%	518	95.75%	20	3.70%	3	0.15%	0
NACE 71	53	0.3%	50	94.34%	2	3.77%	0	0.00%	G
NACE 72	198	1.0%	182	91.92%	14	7.07%	2	0.10%	0
NACE 73 RTD	17	0.1%	14	82.35%	3	17.65%	0	0.00%	0
NACE 74 Other Business Activities	1 594	8.2%	1,442	90.46%	126	7.90%	23	1.12%	G
... 741	641	3.3%	598	93.29%	43	6.71%	0	0.00%	0
... 742	375	1.9%	347	92.53%	28	7.47%	0	0.00%	0
... 743	82	0.4%	78	95.12%	4	4.88%	0	0.00%	0
... 744	101	0.5%	99	98.02%	2	1.98%	0	0.00%	0
... 745	76	0.4%	38	50.00%	24	31.58%	13	0.63%	G
... 746	26	0.1%	21	80.77%	1	3.85%	4	0.19%	0
... 747	112	0.6%	92	82.14%	12	10.71%	6	0.29%	G
... 748	181	0.9%	169	93.37%	12	6.63%	0	0.00%	0

Source: Joanneum Research -InTeReg & Synthesis (raw data: HVSV)

Table 13: KWF – Promotion by business area, in EUR

Business Area	No. Projects	Present Value	Per Project	Employment	New*	Present Value per Employee
Advice and Basic Promotion	427	5 758 283	13 485	2 900	374	1 986
Start-Ups	130	987 830	7 599	191	352	5 172
Infrastructure and Regional Development	74	19 259 481	260 263	2 039	342	9 446
Technology Fund	94	15 259 303	162 333	9 976	435	1 530
Restructuring	8	879 822	109 978	292	27	3 013
Total	733	42 144 719	57 496	15 398	1 530	2 737

Source: KWF - March 2006