RIP-WATCH

ANALYSIS OF THE REGIONAL DIMENSIONS OF INVESTMENT IN RESEARCH

CASE STUDY REGIONAL REPORT: STYRIA (AUSTRIA)

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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 Estudios 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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Annex 3 to the Case Study Report

Abbreviations

MC	Management Committee
PM	Project Management
ToR	Terms of Reference
ANBERD	Analytical Business Enterprise Research and Development Database
BERD	Expenditure on R&D in the business enterprise sector
EPO	European Patent Office
GBAORD	Government budget appropriations or outlays for R&D
GDP	Gross domestic product
GERD	Gross Domestic Expenditure on R&D
GUF	General university funds
HERD	Expenditure on R&D in the higher education sector
ISIC	International standard industrial classification
IPTS	Institute of prospective Studies, Seville, Spain
NACE	General Industrial Classification of Economic Activities within the European Communities
N.E.C	Not elsewhere classified
PPP	Purchasing Power Parity

1 Introduction

Styria (Steiermark), in the south-east of Austria (see Figure 1), is one of nine federal provinces. With about 1.18 million inhabitants (1.1.2005), it is the fourth most populated state in the country. Some 30% of its citizens live in the capital Graz. In the 1980s and early 1990s Styria faced severe economic problems due to the crisis in the traditional steel industry in Upper Styria and its generally unfavourable geographical location on the periphery of Western Europe at the border of the Iron Curtain (Hartmann, 2003). However, since then Styria has 'moved' more into the centre of the enlarged EU, established links with its South-Eastern neighbours and managed quite successfully the transition from an old industrial to a modern regional economy, with a strong focus on manufacturing, especially in the automotive industry. Important large regional firms are Magna Steyr Fahrzeugtechnik (automotive), AV-List (engineering), AT&S (printed circuit boards) and Austria Microsystems (analog integrated circuits).

In 2002, regional GDP was EUR 27.6 billion which accounts for about 13% of Austrian GDP. Regional GDP per capita reached EUR 23 300, which is only 85% of the Austrian value. Styria's average annual growth rate between 1998 and 2002 amounted to 2.8% p.a., which is in line with GDP growth in Austria. However, growth rates in Styria were more volatile: while the state reached above average growth rate in 1999 (5.0%) and 2001 (3.6%), growth slumped to a mere 0.6% in 2002 (Statistik Austria, 2006). From a European perspective, Styria's regional GDP per capita is above the EU-25 average (index: 109 in 2003) but below the EU-15 value (88 in 2001, latest available year) (Eurostat, 2006). Unemployment in Austria is relatively low by European standards: the unemployment rate of 4.9% in 2004 was well below both the EU-25 (9.2%) and the EU-15 (8.2%) rate. Styria is doing even better in this respect with a rate of only 3.7% (Eurostat, 2006). Most employees (62.8%) work in the services sector, particularly in trade and business services even though this sector is less prominent in Styria than in Austria as such (67.3%). On the other hand, industry (22.0%) and agriculture (6.1%) play a more important role than in the national economy (19.5% and 5.0% respectively). High expenditure for R&D as a percentage of GDP (GERD) is a distinctive feature of Styria. With a GERD of 3.3% of GDP (2002), investment in R&D is clearly above the national (2.1%), the EU-25 (1.9%) and the EU-15 (2.0%) level. In absolute terms the state achieved a GERD of EUR 907 million (2002), which accounts for 19% of Austrian GERD (Eurostat, 2006).

Figure 1: Styria's location within Austria

2 Regional Knowledge Base

2.1 Description of the regional knowledge base

2.1.1 Knowledge creation capacity

Styria hosts five universities and two universities of applied sciences/polytechnics (Fachhochschulen) (see Table 1 – all the tables are in the annexes), in which 41 065 ISCED 5 and 6 students were enrolled in 2004 – about 17% of all students in Austria (Eurostat, 2006). University sources recorded about 43 000 students in the academic year 2005/ 2006, of whom about 38% were studying science or engineering-related subjects (Table 1). About 6.7% of all students are doctorate students (ISCED 6; 2004: 2 746) (Eurostat, 2006). The number of students graduating from these universities with a doctorate (PhD) degree amounted to about 380 in the 2004/2005 academic year (301 in 03/04; Table 1). Altogether, these universities employ academic staff of around 3 400, more than 500 of them professors. The approximate income from R&D and contract work came to more than EUR 50 million in 2005 (Table 1).

In addition, Styria is home to a large range of public and private research institutes (Table 2). The largest organisation is Joanneum Research Forschungsgesellschaft mbH, which operates 14 institutes and employs a workforce of 375 persons in Styria. There are also one research institute of ARC Seibersdorf research GmbH, the Austrian Foundry Institute, the Graz Centre for Electron Microscopy, two institutes of the Austrian Academy of Sciences, one institute of the Austrian Agency for Health and Food Safety GmbH (AGES), the Bundesanstalt für Alpenländische Landwirtschaft (federal agency for alpine agriculture) and the AEE - Institute for Sustainable Technologies. Furthermore, several temporarily funded research laboratories are currently located in the state: 14 Christian Doppler Laboratories,[1] four institutes of the Ludwig Boltzmann Gesellschaft,[2] six K-plus, four K-ind and one K-net competence centres[3] (Table 3).

[1] **Christian Doppler Laboratories** are established either in universities or non-university research institutions for a maximum of seven years. The labs are headed by a scientist, whose team works in application-orientated fundamental research aimed at identifying solutions for industrial problems. Therefore, cooperation with a company that has a concrete demand for new findings and know-how is mandatory.

[2] The **Ludwig Boltzmann Gesellschaft** funds research institutes for basic and applied research in the fields of humanities, cultural studies, social sciences and human medicine for up to seven years.

[3] Austria has two major competence centre programmes. Both have been operational since 1999. The K-plus programme is science-driven, while the K-ind/net programme is innovation-driven.

The **K plus** programme aims to build long-term cooperative research initiatives between public institutions and private companies. It was developed, started and financed by the Ministry of Transport, Innovation and Technology. Its emphasis is on strategic cooperative R&D at high, internationally competitive level (science-driven). The centres are selected by competitive process according to specific quality criteria. They are funded for a specified time-span (4+3 years). The rate of public funding is up to 35% of all costs. About 25% of industrial partners are SMEs.

In contrast, the **K-ind/K-net** programme is industry-driven. Its purpose is to advance, develop and transfer application-orientated technological knowledge. It was started and financed by the Ministry of Economics and Labour. The programmes address: a) pre-competitive research, b) applied industrial research, c) commercialisation of innovation (including IPR); d) diffusion of technologies in enterprises.

These centres can be set up by networking: a thematic focus and intensification of research and development cooperation between industry and science increases existing industrial and scientific competence and enhances its practical value to the industry. The individual themes should be demand-orientated and take into account specifically local approaches. In order to qualify for fixed-term grants, projects must demonstrate the broad and long-term participation of both enterprise and scientists or participating research institutes. The rate of public funding per centre can be up to 40% of all costs (depending on the proximity of the market). Public funding for both programmes is limited to four years.

For the enterprise sector, the latest R&D Survey 2002 by Statistik Austria noted 306 R&D units based in Styria. This does not take account of R&D units in firms which have their headquarters in other locations, e.g. Vienna. Nevertheless, the relatively high number of local units (for comparison: 370 in Vienna, 446 in Upper Austria, 114 in Salzburg, 137 in Tyrol) is evidence of the high R&D activity in Styria (Statistik Austria, 2002).

In total, Styria spent 3.67% of GDP on R&D in 2002 (WIBIS, 2006). This **GERD puts** Styria in the top 20 EU regions and means that it has already achieved the Lisbon target of 3%. From 1998 to 2002, intramural R&D expenditure in Styria (measured at current prices) showed an annual growth rate of 11.1% (own calculations based on Eurostat data).

The resources devoted to R&D (2002) included 12 061 (headcount)/7 215 (full-time equivalent) **R&D personnel,** of whom 52%/68% work in business enterprises, 44%/30% in higher education, 4%/3% in the government sector and less than 1% in private, non-profit-making organisations. In comparison to the national level, R&D personnel in Styria is more concentrated in higher education (+5.6% headcount) and less in the government sector (-5.4%). From an EU-25 perspective, the business sector in Styria employs far more R&D staff (+ 8.7%) while there are fewer people in the government sector (-8.9%) (Eurostat, 2006). Overall, the number of R&D personnel (FTE) in Styria grew by 5.4% per year from 1998 to 2002, which is a slightly lower increase than in Austria as a whole (5.9% p.a.). In particular, growth rates in the business sector (7.0% p.a. in Styria vs. 8.6% p.a. in Austria) and in higher education (2.3% p.a. vs. 3.9% p.a.) were below the Austrian standard (own calculations based on Eurostat data).

In terms of **R&D expenditure by sector of activity**, of the total amount of EUR 907 million (2002) 66% is spent by businesses, 30% by higher education institutes, 4% by the government sector and less than 0.1% by private, non-profit-making organisations (Eurostat, 2006). Similar to the pattern of R&D personnel, Styria also shows higher R&D expenditure in higher education. This is also true in comparison to the EU-25 (Eurostat, 2006). Annual growth rates (1998-2002) were highest in BERD (13.5% p.a.), followed by GOVERD (11.9% p.a.) and HERD (6.3% p.a.). Thus, the growth rate in Styria (total 11.1% p.a.) exceeded Austria's growth rate (8.5% p.a.)

By **type of R&D activity**, Statistik Austria established that Styria spends 20% of total funds on basic research, 35% on applied research and 45% on experimental development. Compared with the national average, these figures display a stronger focus on basic research (Austria 17.8%) and less on applied research (37.6), while experimental development is about the same (44.6%) (Austrian Research and Technology Report, 2005).

As far as the **source of funding** is concerned**,** 32% of all funds comes from businesses, 35% from the public sector (of which 74% from the federal government and 13% from the provincial government), 31% from abroad, almost 2% from the EU and less than 0.5% from private, non-profit-making organisations (Statistik Austria, R&D Survey 2002; Austrian Research and Technology Report 2005). Therefore, Styria's share of foreign funding is exceptional – even taking into account Austria's generally high share of about 21%, whereas funding from companies is below the national average of 45% (Eurostat, 2006). The large share of foreign funds is evidence of the fact that Styria is currently exporting research services.

Table 4 provides an overview of the regional R&D indicators in 1998 and 2002.

Public funding

The centres are led by industrial enterprises or consortia, which ensures fast economic implementation of positive results from the research programmes in the form of new products and services.

In total, the **state of Styria** spent almost EUR 54.5 million on R&D in 2004 (Land Steiermark, 2005a). Via its *Steirische Wirtschaftsförderungsgesellschaft* (Business Promotion Agency - SFG) it subsidised R&D activities to the tune of around EUR 16.4m in 2005 (Aumayr et al., 2006: 45).

National funds came primarily from the national *Forschungsförderungsfonds für die gewerbliche Wirtschaft (FFF; Austrian Research Promotion Fund for Industry*),[4] which targets industrial R&D, and the *Fonds zur Förderung der wissenschaftlichen Forschung (FWF;* Austrian Science Fund), which focuses on academic research. While the *FFF* gave companies EUR 46.1m (19.3% of the total) in 2004, the *FWF* devoted EUR 15m (14% of total) to research institutes in Styria. Most of the latter funds went to the University of Graz (7.1m) and the Graz University of Technology (4.6m) (Land Steiermark, 2005a). According to the *Technology and Research Report for 2005*, the successor of the FFF, the FFG (which includes several formerly independent funding agencies), spent EUR 53 million (21% of the total) in Styria in 2004.

Under the 6th Framework Programme (2003-2006) the **EU** allocated EUR 73.3m to organisations based in Styria (26% of total funds to Austria). Of this, about 45% went to businesses (Land Steiermark, 2005). As a result, Styria successfully participated in some 280 FP6 projects with a thematic focus on (ranked in descending order) information society technologies; energy systems; sustainable surface transport; nanotechnologies and nano-sciences; knowledge-based multifunctional materials and new production processes and devices; and specific research activities for SMEs (Dinhobl, 2006: 56).

Output

While Austria as a whole posted 183.8 *European Patent Office (EPO*) patent applications per million inhabitants in 2002, Styria achieved 205.2. The main field of patent application was *performing operations; transporting* (International Patent Classification section B), which accounts for 25% of all applications, followed by *physics* (G; 17%), *electricity* (H; 15%), *mechanical engineering* (F; 12%) and *chemistry/metallurgy* (C; 10%). *Human necessities* (A), *textiles/paper* (D) and *fixed construction* (E) account for roughly 7% each. In terms of specialisation in relation to Austria, Styria shows an above average share in *mechanical engineering*, *physics* and *textiles/paper*. The single most important categories are *basic electrical elements* and *measuring/testing* (about 8% each) (Eurostat, 2006).

2.1.2 Knowledge dissemination capacity

In total, there are six technology transfer centres, located in or around the three major universities offering S&E courses. These offices typically have several objectives, ranging from research promotion to training and technology transfer. In addition, an online platform offers information and access to potential technology and knowledge sources for interested parties (Table 5). Moreover, Styria hosts two out of nine *AplusB (Academia-Business*) centres whose mission it is to foster academic start-ups. Basically, the programme aims to raise the awareness of potential founders as well as advising, training and supporting young entrepreneurs with an academic background (see http://www.ffg.at/index.php?cid=96). The two centres in Styria are the *Science Park Graz (SPG*) and the *Zentrum für angewandte Technologie (ZAT*) in Leoben (see Table 6). In total, both centres have a budget of about EUR 10m. The number of start-ups envisaged is 58, of which 33 have been effected.

[4] on 1.9.2004 the FFF was merged with other funding agencies to the new Forschungsförderungsgesellschaft (FFG), which is now the main funding agency for industry-oriented R&D programmes.

In terms of university-industry links (UIL), the information on *K-plus*, *K-ind* and *K-net* competence centres (Table 3) already shows Styria's fairly high involvement in UIL. Styrian firms and universities are also involved in four other centres located in other states (K-plus for Virtual Reality and Visualisation; K-nets for Wood, Aviation Technology and Metallurgical and Environmental Technology Process Development). Hence, Styria participates in seven out of 18 K-plus, four out of 14 K-ind and four out of ten K-net centres. Moreover, in Nanonet Styria, a network has been established that currently encompasses 27 partners from universities, research organisations, competence centres, private companies, and administrative bodies. The network is part of the FFG Thematic Programme Nano (see 2.2.2). Styria has also created *Nubior Net Styria*, a network of 11 universities, research organisations and private companies, which work together in R&D on the use of biogenic resources (www.**nubior**-styria.at/).

Based on the Community Innovation Survey III, Adametz and Ploder (2003: 30) found that 23.2% of all innovating firms[5] in Styria cooperate with external partners, slightly more than in Austria as a whole (21.1%). Manufacturing companies in particular in Styria were more open to innovation cooperation (25.5%) than in the national sample (18.5%). In general, the most important partners for innovation cooperation for Austrian firms[6] were *suppliers* (55% of all cooperating firms had links with suppliers), *competitors and other firms in the same industry* (49%) and *universities and research institutes* (45%).

Since there are no statistics on spin-offs, the share of R&D- and knowledge-intensive[7] (RDKI) start-ups in Austria are used as a proxy (Table 7; Egeln et al., 2006). The figures show that in manufacturing about every fifth to every sixth start-up is an RDKI (with slight variations and an unexpected drop in 2003/04, which might be due to preliminary data). Thus, the figures for Styria are more or less in line with the figures for Austria. On the other hand, between 50-53% of service start-ups are RDKI, which is slightly but consistently above the Austrian average (~45-50%). These figures signal a fairly high share of R&D-/knowledge-intensive start-ups, although this is fairly indicative of developments in Austria as a whole.

2.1.3 Knowledge absorption capacity

The ability of the labour force to absorb new knowledge can be considered to be good, since 85% of the 15 and older age group and even 87% of the 25-64 age bracket have upper secondary, post-secondary or tertiary (ISCED 3-6) education (2004). However, the proportion of members of the labour force in Styria with a tertiary education (19% of the 25-64 years old) (ISCED 5-6) is slightly lower than in Austria (21%).

The willingness and capability to absorb new knowledge is also underlined by the above EU-average participation rate of adults (aged 25-64) in education and training (lifelong learning): with figures of 11.6% in Styria and 11.5% in Austria, participation in further education is higher than in the EU-15 (9.3%) and EU-25 (8.7%).

However, the share of human resources in science and technology[8] as a proportion of the labour force in Styria (39.6% in 2005) is slightly below the respective share in Austria (42.5%), the EU-15 (43.6%) and EU-25 (42.2%) (Eurostat, 2006).

[5] These are firms that either introduced new processes or products between 1998-2000.
[6] No information on the regional sample is available (Adametz and Ploder, 2003).
[7] For definitions of the respective sectors, see Gehrke et al. (1997), Grupp and Legler (2000), Nerlinger (1998), Engel and Steil (1999).
[8] HRST are people who fulfil one or other of the following conditions: a) successfully completed education at the third level in an S&T field of study; b) not formally qualified as above, but employed in an S&T occupation where the above qualifications are normally required (OECD, 1995: 16).

2.2 Policy context

2.2.1 Policy framework and stakeholders

2.2.1.1 National level

In Austria, the national federal government, as the executing authority, is responsible for RTD policy implementation. 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. Three main ministries can be identified as being responsible for RTD activities:

The Federal Ministry for Education, Science and Culture (**BMBWK**) is responsible for issues concerning research and teaching in universities, and for non-university research institutions in the area 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, along with issues relating to the creation of priority areas of research in national research programmes by the Council for Research and Technology Development.

The Federal Ministry for Economic Affairs and Labour (**BMWA**) 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 stakeholders can be identified:

1. The **Austrian Research Promotion Agency** (FFG) is responsible for Research and Technology Promotion for Industry, thematic RTD promotion (e.g. nanotechnology, IT, etc.), science-industry cooperation, 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 the funds of the FWF are reserved for competitive investigator-driven research projects in the higher education sector. All FWF RTD promotion is almost exclusively geared to higher education institutions.

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

2.2.1.2 Regional level

Under the Austrian constitution the federal provinces have considerable powers in the field of innovation policy, whereas their scope for providing/influencing tax regimes is strictly limited. Often, economic policy measures are innovation-orientated and in recent years regionalisation of innovation policy can be observed in Austria. This is reflected by several regional strategies and additional regional funding for strategy implementation. Because of diversity between the regions, coordination mechanisms between the federal and the regional level are challenged. No clear model of policy interaction has yet evolved: some regions follow a strategy of additionality; others favour supplementary funding.

Coordination between federal and state level occurs primarily on the basis of specific programmes whereby the federal policy seems to have taken a leading role both in financial

capability and in setting the agenda. It could be said that regional policy builds upon federal guidelines (Jörg, 2004). For example, the competence centre programme *K-Plus* was launched by BMVIT but public funding is provided jointly by the federal state and the regional government. The aims of the programme and the rules for implementation are set and defined by federal innovation policy (European Trend Chart on Innovation, 2005: 4).
The local community councils, further federal entities with certain legal powers, are of only minor importance for strategic policy-setting in the region. They cooperate mostly with the federal state executives in setting the direction of innovation policy.

Responsibility for regional technological policy in Styria lies with the provincial government and is currently distributed between three agencies: the department for *Science & Research, Transport and Technology* is responsible for all fields of R&D policy in addition to the competence centres (in the department for *Economy, Innovation and Finances*) and the Universities of Applied Sciences (department for *Youth, Women, Families and Education*) (Land Steiermark, 2006a). Recently, a *Kerngruppe* (Core Group) has been established, which consists of members from both political and administrative institutions in science, research, economy and education. Its objective is to develop the strategies and contents of the regional research policy and promotion. In order to enhance regional communication and coordination between the parties responsible for R&D, and to utilise scientific knowledge for the policy process, the *Forum Forschung Steiermark* (Forum Research Styria) has been initiated. This forum consists of members of regional research organisations and the political and administrative system, and meets three to four times per year (Land Steiermark, 2004). In addition, the current regional government has agreed on the establishment of a *regional Rat für Forschung und Technologie* (Council for Research and Technology), which will advise the regional government on the respective issues (http://www.landeshauptmann.steiermark.at/cms/beitrag/10189336/5486193/).
Another relevant, privately organised network that shapes Styrian R&D policy is *Innoregio Styria*, which has been established by the Styrian industry and which tries to bring together the relevant stakeholders from research organisation, policy and administration (http://www.innoregio-styria.at/). As in other European and Austrian regions, there has been a tendency in Styria to transfer regional research and economic policy tasks to intermediary institutions. At the beginning of the 1990s the *Steirische Wirtschaftsförderungsgesellschaft* (Styrian Business Promotion Agency - SFG) was set up by the public authorities to serve as an intermediary policy institution. One of its objectives is to implement policy strategies. The SFG therefore covers the design and management of programmes. Currently, the SFG is responsible – among other things – for the promotion of technology and innovation, cooperation between science and industry, and the improvement of infrastructure (see 2.2.2 for details).

2.2.2 Policy objectives and instruments

2.2.2.1 Policy Objectives

The **national objectives** and priorities in RTD policy are currently being investigated by Joanneum Research and partners as part of an “RTD policy mix” research project for DG Research. The results from the ongoing project confirm that national policy objectives can be seen as the result of a strategy process, being 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 in Austria generally presents a mixture of functional/systemic and thematic priorities, the objectives and priorities have not changed very much in the last five years, considering the two documents mentioned above. There has been only fine-tuning in 2005 of the indicative principles from 2002.

There has, however, been a slight shift in the focus of discussions surrounding the main topic of the 3% RTD quota target. Nowadays, many representatives in the RTD policy-making arena emphasise that creating a high quality innovation system is more important than just meeting a certain RTD intensity target. The ERAWATCH – Base load Inventory report (2006) identifies the following general trends:

1. Reorganisation of the funding landscape – a concentration of intermediary and RTD promoting organisations since 2000. Several old (and some new) agencies responsible for programme management of a wide range of instruments have been merged into three main funding agencies.

2. Since the mid-1990s, 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 their strategies. These activities have been partly driven by the introduction of federal co-financing schemes, in particular the competence centres, and by EU policies.

4. Combination of thematic and functional priorities. The Austrian government, 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-orientated) priorities for research funding. For this purpose, dedicated programmes have been designed and implemented.

5. With funding trends edging towards 3%, Austria is one of the few European countries that is well on track towards 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 which have been set up are beginning to raise concerns as to the efficiency of the RTD policy mix rather than the overall volume of public RTD support. In this respect, the Joanneum Research experts on the RTD policy mix project highlight two specific guidelines. One targets the reorganisation of the research promotion portfolio through intervention in the institutional structure to overcome deficiencies in support for RTD and innovation. The other aims to achieve better resource allocation in RTD and innovation policy.

The main documents for **regional RTDI policy in Styria** are a) the *Forschungsstrategie 2005 plus* (Research Strategy 2005 plus), b) the newly developed *Technologiepolitisches Konzept Steiermark* (Technology Policy Concept) from 2005, which is based on the *Technologiepolitischen Leitlinien* from 1995, and c) *Regionale Wettbewerbsfähigkeit für die EU-Strukturfonds-Periode 2007-2013* (Regional Competitiveness for the EU Structural Fonds period 2007 – 2013).

The overall objective of the *Forschungsstrategie 2005 plus* (Land Steiermark, 2004) is to support a "knowledge-based growth path", in order to safeguard and foster growth and competitiveness. The strategy therefore means maintaining a lead over Austria in terms of R&D expenditure. In the context of the Barcelona target, this would mean a GERD of 3.5% of GDP by 2010. Moreover, Styria wants to establish itself as "the research location within the *EU*

Future region"[9] with close ties to neighbouring regions and their institutions. Its profile should be centred on Styria's engineering core competencies. A number of strong points have therefore been identified for support (materials research; automotive and machinery; human technology; ICT, media & electronics; energy technology; environment technologies; building services engineering & construction materials; nanotechnology; chemical and process engineering; computer simulation and mathematical modelling). In addition, measures to increase internationalisation, improve human capital and broaden the regional business research base are envisaged. Four fields of action have emerged from these objectives:

- Strategic focus: Setting a strategic focus on scientific fields of strength in order to achieve a critical mass and international visibility.
- Governance: Strengthening coordination and self-regulation of the regional research system.
- Horizontal measures: Fostering the regional research base through a) internationalisation, b) support for the human capital base, c) assistance to regional firms in order to strengthen their positions as demanding customers, d) promotion of interface management between regional institutions.
- Accompanying measures: Improving the framework conditions for research and supporting a 'research-friendly' attitude in other policies.

Similar objectives are stated in the *Technologiepolitisches Konzept* (Land Steiermark, 2005b). It recommends the transition of Styria from a technology receiver to a technology provider. Therefore, it aims to position Styria (especially Upper Styria/Graz) as an innovation centre and to strengthen its leading position as a research location. In addition to the *Forschungsstrategie*, it also includes strengthening Styria's position as a production location, especially in niche markets with low-volume, flexible and demand-orientated products and system integration. The main measures are: supporting and broadening the innovation elite; fostering sectoral specialisation in fields of strength (including cluster policies); entering new technology fields; supporting internationalisation and inter-regionalisation; assisting technology-orientated, knowledge-intensive start-ups; increasing qualification and further training of human resources; improving the regional knowledge infrastructure; and enhancing comprehensive policy design and implementation.

The *Regionale Wettbewerbsfähigkeit* (Land Steiermark, 2006b) concept is based on the *Forschungsstrategie 2005 plus* and the *Technologiepolitisches Konzept.* It forms the basis for programme funding by the European Regional Development Fund (ERDF) for the period 2007 – 2013. The explicit objective of the concept is to strengthen competitiveness and thereby safeguard long-term growth and employment while taking account of the principles of sustainable development (Land Steiermark, 2006b: 34). This includes the development of Styria as an internationally acknowledged location for research and innovation; the creation of new products, processes and services in regional firms; and balanced regional development through concentration on regional strengths. The main strategies are: improving the general innovation climate, broadening the innovation basis, focusing on regional strengths, developing new fields of growth, and strengthening the regions' innovation capabilities.

[9] Beginning in 2002, the *EU Future region* initiative started to create transregional cooperation, including Styria, Burgenland and Carinthia (Austria), Slovenia, Croatia, Veneto and Friuli-Venezia-Giulia (Italy), Györ-Moson-Sopron, Vas, Zala, Somogy, Tolna and Baranya (Hungary).

2.2.2.2 Policy instruments

The most important policy instruments at EU, national and regional level influencing the regional RTD landscape are analysed below. The policy instruments are grouped according to the different policy areas described in the Annex of this report. Exhibit 1 summarises instruments by administrative level (regional vs. national) and policy area.

A) Improving innovation and RTD governance

At national level, the Austrian Council for Research and Technology Development is the main channel through which to improve R&D governance and innovation in Austria. It advises the federal government and the federal states (including Styria) in all matters relating to research, technology and innovation; it also defines the long-term national RTD strategy and monitors its implementation.

At regional level, the *Kerngruppe, Forum Forschung Steiermark* and greater coordination with the federal and other provincial governments have been established on the back of recommendations by the *Forschungsstrategie 2005 plus* (Land Steiermark, 2004). Moreover, the newly elected provincial government (autumn 2005) is about to initiate a regional Council for Research and Technology Development (Rat für Forschung und Technologie) (for all these see above). All these regional initiatives try to enhance the governance and the coordination of the regional innovation system by including the relevant stakeholders and utilising local expertise.

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

The creation of an innovation- and entrepreneur-friendly environment is a core component of RTD policy at European, national and regional level. Most of the instruments in place are geared in this direction, although some of the programmes affecting the region have multiple aims. At **European level**, *European Framework Programmes* 5 (FP5) (1998-2002) and 6 (FP6) (2002-2006) are the most important EU initiatives in the area of RTD. Tables 8 and 9 in the Annex provide detailed information about Styria's participation in FP5. Total funding in Styria was EUR 73.5 million (26% of the Austrian total). Styria holds a high share of Austria's projects in the fields of energy and competitiveness and sustainable development. In general, industry and research organisations participated more often and universities less often than the Austrian average. Up to spring 2005, Styrian partners had participated in 153 FP6 projects (15%) and coordinated 14 (14%) (WIBIS-Steiermark, 2006). Total funding allocated to Styrian partners within FP6 projects amounts to EUR 73.4 million (Land Steiermark, 2005a). The EU Structural Funds for the period 2000 – 2006 include two that are related to R&D. These are the Objective 2 Programme and the Innovative Strategies for Regional Competitiveness Programme. For Styria, priority 2 (information society) of Objective 2 Programme promotes R&D and innovation cooperation by contributing to the *Impulszentren* (technology and business parks). In total, Styria received EUR 89m in this priority (EC, 2006) Within the Innovation Action, Styria acquired a further EUR 2.9m in 2002-2003 for modules on idea creation, development and an e-marketplace for SMEs (EC, 2002).

The most important **national** programmes affecting the region are the *General Programmes of FFG* (FFG-BP). FFG-BP offers bottom-up promotion for RTD projects carried out by industry. Total funding in 2005 was EUR 265 million. In 2004, the FFG-BP spent a total of EUR 248 million, of which 21.4% (EUR 53 million) went to Styria. Furthermore, the *FFG-Thematic Programmes* support the build-up of selected national thematic priorities to foster RTD projects between Austrian companies and research organisations. Total funding in 2005 was EUR 41 million, but no regional distribution has been published.

In addition, FFG offers two structural programmes affecting Styria. *FFG-RegPlus* subsidises material infrastructure for regional Impulse Centres to promote their innovative "content". *AplusB (Academia plus Business)* funds innovative, technology-orientated university spin-offs. It provides professional support for scientists in the process of turning a good idea into a viable

business. The duration of public funding is ten years. In Austria nine AplusB-Centres have been/are being established, of which two are located in Styria.
At **regional level**, the federal province of Styria promotes innovation and entrepreneurship mainly through its *Steirische Wirtschaftsförderungsgesellschaft* (Business Promotion Agency - SFG). The SFG subsidised *R&D activities* to the tune of around EUR 16.4m and *Entrepreneurs* with EUR 1.5m (of which *Innovative Entrepreneurs* received 0.9m) in 2005 (Aumayr et al. 2006: 42). Moreover, the SFG improves the environment for innovation and entrepreneurship by offering financial support to Styrian firms mainly through its subsidiary *Steirische BeteiligungsfinanzierungsgmbH* (StBFG). Thus, several instruments target explicitly R&D and innovation projects (see F).

C) Development of human capital
The development of human capital for science and technology in the region is only affected by certain minor programmes of European, national and regional origin. At **EU level**, participants from Styria received EUR 564 000 under the FP5 scheme *Improving human research potential and the socio-economic knowledge base*.
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 and hence quite relevant. Styria benefited significantly from these funds, receiving EUR 17.7 million (almost 16% of total funding). These funds contribute at least in part to human capital development, because the respective research projects usually include PhD students. Moreover, the *Scientists for the economy programme* of the BMVIT gives post-doctorate students of any discipline the opportunity to apply to cooperate with an enterprise by proposing a research project. This should lead to a significant increase of R&D activities in companies, knowledge transfer between universities and industry and the promotion of young scientists. Maximum funding for each scientist is EUR 50 000 p.a. Data on programme participation in Styria is not available.
At **regional level**, the *Steiermärkischer Wissenschafts- und Forschungslandesfonds* (Styrian Science and Research Fund), which was initiated in 1969, has a number of instruments with which to foster human capital development. With an annual budget of about EUR 1.45 million (2004), the fund sponsors scientific conferences, summer schools, research stays abroad, publications and research projects. It also awards research grants. In addition, Styria provides scholarships for (talented) students worth EUR 50 000 in total (2004) (Land Steiermark, 2005a).

D) Networking, co-location and clustering measures
Networking, co-location and clustering measures are the core of national and regional funding policies affecting the region. At **national level**, *FFG* launches structural programmes to strengthen the infrastructure for research and innovation in Austria. The particular objectives are improving cooperation between science and industry and increasing the innovative potential of the regions. The most prominent of the structural programmes are the competence centre programmes Kplus and KInd. *K-plus* aims to build long-term cooperative research initiatives between public institutions and private companies. It was developed, started 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-orientated technological knowledge. It was started and financed by the Ministry of Economics and Labour. Styria hosts six of Austria’s 18 K-plus centres, four of 14 K-ind and one of eight K-net centres. Hence, these programmes have a very high impact on Styria’s R&D base. Similarly, the *Austrian NANO Initiative (*one of the *FFG-Thematic Programmes*), a multi-annual public funding programme for nanoscale sciences and nanotechnology, is very relevant for Styrian partners. The initiative aims to foster joint RTD projects, networking and education. In 2004, five clusters were selected of which one is based in Styria (Nanonet Styria). It currently

consists of 27 partners (universities, research organisations, competence centres, private companies, and administrative bodies). Total funding for all five nano-clusters was EUR 6.8 million in 2005; no details on Styria's share are published.

At **regional level**, Styria formulated a *cluster policy* in its 1995 technology policy concept. This became the starting point for the broad implementation of the regional cluster policy in Styria and Austria. The pilot project of the automotives cluster Styria (ACstyria) developed into an internationally renowned and highly successful cluster. Due to its success further clusters and networks were established (see above). The philosophy behind the promotion policy is to finance the starting period (over three years) and to transfer clusters and networks - if sufficient potential is identified - into own organisations with the participation of the state of Styria (Joanneum Research, 2006). The *SFG* subsidised *Networks and Clusters* to the tune of EUR 3.8m in 2005 (Aumayr et al. 2006: 45).

E) Knowledge and technology transfer to enterprises

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

At **regional level**, several measures, already mentioned, also target technology transfer, such as the *Impulse* and *Competence Centres* (SFG funding in 2005: EUR 2.1m; Aumayr et al., 2006), and network and cluster activities (see D). The *Action Programme for Research and Development* by the *SFG* (http://www.sfg.at/cms/83/) also subsidises activities that entail knowledge/technology transfer components such as *product search* (max. EUR 45 000 per project), *master or PhD theses in companies* (max. EUR 10 000), and *R&D projects in cooperation with external scientific consultants* (max. EUR 100 000). In addition, several universities set up technology transfer offices in order to foster these knowledge flows.

F) Research collaboration of public research organisations with the private sector

Still in the area of research collaboration between science and industry, t*echnology parks* and *cluster initiatives* are the most important mechanisms in place. The above mentioned clustering measures and competence centre programmes constitute the core of Austrian research programmes targeting research collaboration between public research organisations and the private sector. For both the federal state and the regions, research collaboration is a major issue in science policy, and for many of the above-mentioned measures of the thematic programmes by FFG (e.g. the Nano-Technology Initiative) research collaboration between the public and the private sector is a requirement for a successful funding application.

G) Support for public research

As mentioned above, Styria has been quite successful in acquiring research funds from EU or national sources.

At **EU level**, the Framework Programmes are the most important funding instruments for R&D in public research organisations. Styrian universities and RTD institutes participated in 49% of all FP5 projects. Within FP6, Styrian universities and RTOs were allocated EUR 33m (45% of all funds in Styria; Land Steiermark, 2005).

At **national level**, the *Austrian Science Fund (FWF)* is Austria's central body for the promotion of basic research. In 2005, it gave EUR 15m (14% of total) to research institutes in Styria. Most of these funds went to the University of Graz (7.1m) and the Graz University of Technology (4.6m) (Land Steiermark, 2005a; see above). Some public research organisations also participate in *FFG* programmes for applied research (see above).
At **regional level**, the following institutions partly fund public research: the *Zukunftsfonds Steiermark* (Future Fund Styria) was established in 2001. It finances projects in the fields of education, science, research, technology, qualification, arts, culture and youth. Academic and non-academic research institutes as well as private companies are eligible. The Zukunftsfonds organises open calls and has an annual budget of between EUR 3.6m - 7.3m (2001-04) (Zukunftsfonds Steiermark, 2005; Land Steiermark, 2005a). The *Steiermärkischer Wissenschafts- und Forschungslandesfonds* (Styrian Science and Research Fund), established in 1969, sponsors publications, scientific conferences, summer schools, research projects and research stays abroad with an annual budget of EUR 1.45m (2004) (Land Steiermark, 2005a).

H) Financial RTD measures for the private sector

In addition to the above-mentioned direct financial RTD promotion instruments, at **national level** the Austrian Ministry of Finance offers tax incentives for private firms to perform RTD. Firms can make use of the "*Forschungsfreibetrag"* (RTD tax allowance), which is a virtual operating expenditure that reduces the profit and consequently the tax base, whereby firms can reduce their tax base by 25% (or in exceptional cases by up to 35%) of their RTD expenditure up to a total of EUR 100 000 p.a. Alternatively, firms 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 it is carried out by universities or public research organisations and if no double funding occurs (e.g. the organisation receives a similar bonus) (ZIT, 2006). At **regional level,** support from the technology fund is monetary support. The Austrian regions do not have the independent ability to introduce tax regimes in the sphere of company taxes. However, the SFG offers several financing instruments to Styrian firms – mainly through its subsidiary *Steirische BeteiligungsfinanzierungsgmbH* (StBFG). It offers a) *silent partnerships*, e.g. for R&D projects for a maximum of 30-50% of the project costs, whereby the interest ranges from EUR 100 000 to 1.5 million; b) *Venture Capital* of up to EUR 1.25 million (max. 50% of total funding) for innovative, young (<5 years), small enterprises (<50 employees; < EUR 10m annual turnover); c) *microfinancing* for small enterprises; and d) a*ssumption of liability* in order to facilitate the access of small enterprises to loans and credits on the financial markets. In addition, the *Steirischer Technologie- und Wachstumsfonds* (Styrian Technology and Growth Fund) was established because the Venture Capital instruments are only available for small enterprises. With an eye to expansion and R&D projects in medium-sized firms, the current provincial government initiated this fund, which will be endowed with an initial EUR 13.5m (http://sfg06.sfg.at/cms/9/). The *Zukunftsfonds Steiermark* (see G) is also active in this domain.

Exhibit 1: RTDI policy mix affecting the region

Policy Areas[10]	Policy objectives and instruments at National* level affecting the region	Policy objectives and instruments at Regional* level
Improve innovation and R&D governance	Council for Science and Technology has developed the core strategies to improve RTDI governance.	Several organisations try to improve regional collaboration and policy advice on RTDI governance: namely *Kerngruppe*, *Forum Forschung Steiermark*, Regional Council for Research and Technology Development
Creation of an innovation and entrepreneur-friendly environ-ment	High spending by FFG - General and structural programmes (e.g. fostering university spin-off (AplusB) or business parks/incubators (Regplus; Impulse Centres)) in Styria have improved the regional conditions for innovation and entrepreneurship	SFG sponsors R&D activities and (innovative) entrepreneurs, as well as providing funds (see financial measures) which improve the environment for innovation and start-ups.
Development of human capital	High spending of FWF for basic research in Styria fosters human capital formation implicitly by financing PhDs. BMVIT programme (Scientists for the economy Programme) increases career prospects of academics in the industry.	Certain minor programmes finance scientist's mobility, further training (conferences, etc.) and higher education (scholarships).
Networking, co-location and clustering measures	Styria benefits strongly from FFG programmes aimed at competence centres (K-plus, K-ind, K-net). Moreover, it receives funding from the FFG for its Nano-Net, which has triggered similar initiatives at the federal level.	The regional Cluster Policy has paved the way for a successful regional cluster development in some fields. SFG offers significant funds for networks and clusters.
Knowledge and technology transfer to enterprises	Certain smaller programmes address this issue directly. However, larger structural programmes such as competence centres, AplusB and thematic networks implicitly entail	Only partly tackled by minor SFG programmes that foster collaboration.

[10] 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 Polices: 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 R&D 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.

	technology transfer between partners.	
Research collaboration of public research organisations with private sector	Styria benefits strongly from FFG programmes aimed at competence centres (K-plus, K-ind, K-net) and networks (Nano-Net) which bring together science and industry partners.	Regional cluster and network policies promote university-industry linkages.
Support of public research	Due to its strong research base, Styria receives a high share of FWF basic research funds.	*Styrian Science and Research Fund* and *Future fund Styria* offer limited funding for a broad range of activities, among which research projects in public research organisations/universities.
Financial R&D measures for the private sector	In addition to the high direct project funding by FFG targeting Styrian firms and sponsorship of competence centres, etc., the tax incentives (RTD tax allowance and bonus) positively affect regional firms.	SFG offers silent partnerships and venture capital for – among other things – R&D projects. *Future fund Styria* sponsor research projects in private firms; *Styrian Technology and Growth Fund* offers funds for RTDI activities in medium-sized firms.

[Policies at national level are formulated and implemented nationally even if they have a regional dimension, while policies at the regional level are under the complete and exclusive control of the regional authorities. Shared policies planned and/or implemented jointly by national and regional authorities, e.g. co-funding, are regarded as regional.]*

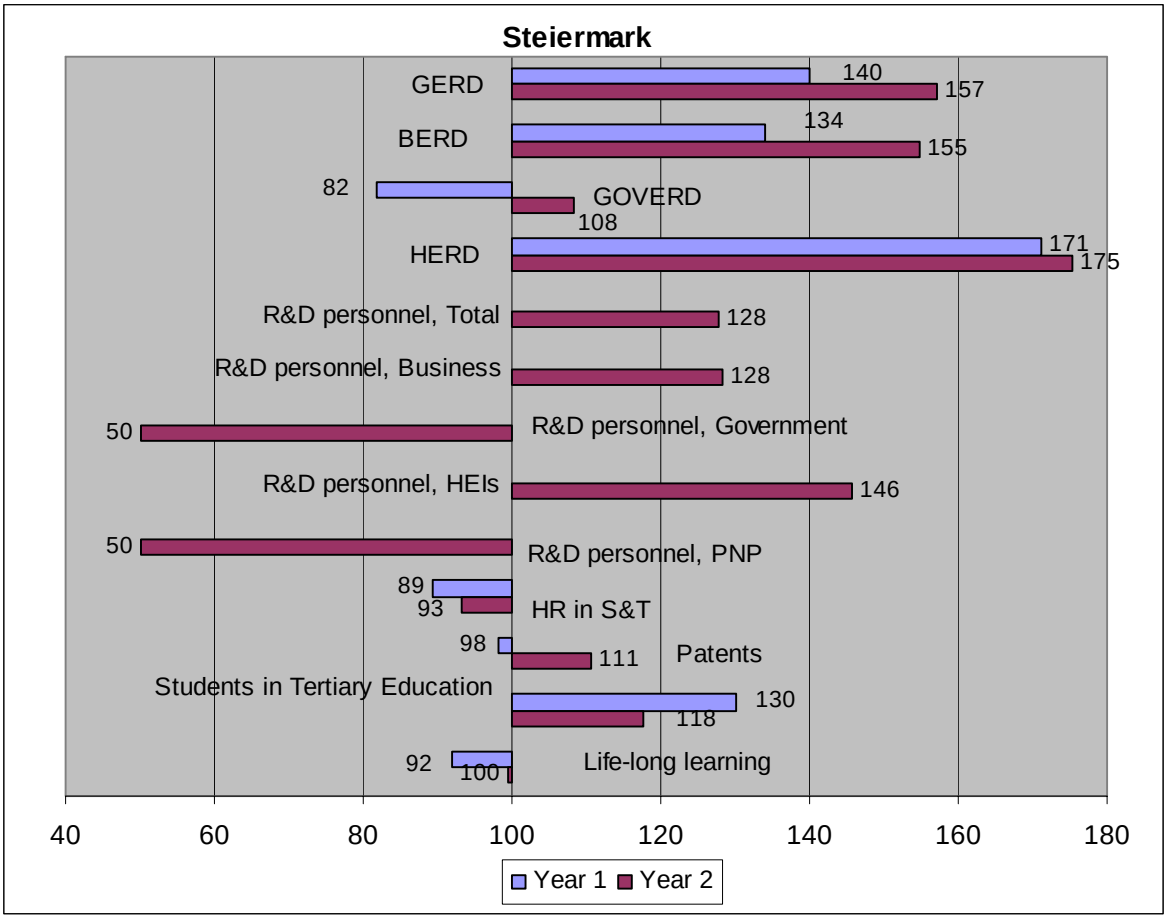
2.3 Conclusions

The data presented in 2.1 underlines the strength of the regional knowledge base in Styria. Investment in R&D – especially in the higher education and business sector – is exceptionally high. It hosts a large number of public R&D institutes, universities and competence centres and has a strong innovation elite, all of which is reflected by the high index of R&D personnel in the higher education and business sector. These organisations produce an above average number of patents, educate a significant share of Austrian's students (especially in certain traditionally strong S&E fields), and attract a significant share of external (national, EU and other foreign) R&D funding. These strengths are visible in the main indicators presented in summary graph 1, which displays the index figures for Styria in relation to Austria (Index=100) for Year 1 (1995 or nearest year) and Year 2 (2004 or nearest year). However, graph 1 also hints at certain weaknesses. For example, the share of persons engaged in science and technology is below the Austrian, EU-15 and EU-25 average, and the share of the labour force with tertiary education is also below the Austrian average. Having said that, lifelong learning, which used to be well below the EU-25 average, has dramatically risen, to above the EU-25 level in 2004, but is still slightly below the Austrian average.

In terms of policy objectives and instruments, Exhibit 1 in 2.2.2.2 shows that there are a multitude of measures available which are provided by the federal state and the provincial government. Thus, the federal province of Styria utilises the most important national and EU funding instruments very successfully. It receives almost 26% of all Austrian FP6 funds, 14.7%

of total FWF funds (2004) and 21.4% of all FFG promotion (2004). Styria had the highest per capita funding ratio for FWF and the second highest ratio for FFG funds of all Austrian provinces in 2004.
Also, Styria scored well on large structural programmes funded by the FFG. It concentrated within its boundaries 33% of all *K-plus centres*, 29% of all *K-ind* and 13% of all *K-net centres* and contributed to some of the centres in other provinces. Moreover, 22% of all *AplusB centres* are located in Styria. Consequently, these national measures are highly effective in Styria.
In addition, the regional government has established a variety of programmes to complement national policies. Most of the programmes seem to focus on specific players (e.g. SMEs) and specific objectives (e.g. funding master's students doing their theses in firms, funding external technology consultancy, etc.). This gives the impression of a fairly well coordinated toolbox of instruments.

Summary Graph 1: Key indicators on Styria's knowledge base development in comparison to Austria



Source: Eurostat 2006
Note: See Annex 2 for an explanation of indicators

3 Regional economic structure

3.1 Description of economic structure

3.1.1 Productive structure

In 2003, regional GDP in Styria was EUR 28.3 billion, which accounted for 12.5% of Austrian GDP. At the same time GDP per inhabitant amounted to EUR 23 779, which was consequently lower than in Austria (27 959), but higher than in the EU-25 (21 740). That said, Styria's average annual growth rate for GDP per capita from 1995 to 2003 (2.9%) exceeded that of Austria (2.4%) – displaying its 'catching-up process' (own calculations based on Eurostat data).

In terms of **value added** in 2003, the primary sector in Styria (Austria) accounted for 2.9% (1.9%), the secondary sector for 36.1% (30.1%) and the tertiary sector for 60.9% (68.0%). Consequently, as in all other European regions, the service sector is dominant in Styria, but compared to the national economy Styria is much more orientated towards industry. The main differences are in manufacturing (+6.4% in Styria), wholesale and retail trade (-1.5%), transport, storage and communication (-2.1%), financial intermediation (-1.6%) and real estate, renting and business activities (-2.0%) (see Table 10). Similarly, the pattern of gross fixed capital investment in Styria is more focused on industry (20.5% versus 17.6% in Austria) and less on services (74.2% vs. 79.0%) (Eurostat, 2006; all figures for 2003). In terms of average annual growth rates between 1995 and 2003 (based on value added at current prices), the primary sector (NACE A+B) displayed negative growth (-1.3%), whereas construction (F +3.2%), wholesale and retail trade (G +3.6%), manufacturing (D 3.9%), financial intermediation, real estate, renting and business activities (J-K +4.2%), activities of households (P 4.6%), real estate, renting and business activities (K +5.3%), and hotels and restaurants (H 6.9%) were the most dynamic sectors (own calculations based on Eurostat data).

In terms of **productivity**, measured in value added/employment, Styria's position is well below the Austrian average, only achieving 85% of the total. However, Styria is catching up– albeit slowly –, increasing its productivity from 83.9% of Austria's average in 1995 to 85.2% in 2003 (own calculations based on Eurostat data). The only sectors with slightly higher average productivity are manufacturing (index 101) and education (103) (Eurostat, 2006). Presumably, this may be partly due to more **labour** and less **capital-intensive production** in the Styrian industry (approximated by gross fixed capital/compensation of employees, Table 11). However, this is also true of the 'high productivity sector' of manufacturing. Thus, manufacturing (+7.7%) and hotels and restaurants (6.1%) showed the highest average annual growth rates (own calculations based on Eurostat data).

The total **number of local units** according to Eurostat (2006) was 43 874 in 2004. Compared to Austria, Styria shows a certain 'specialisation' in mining, manufacture of food/beverages, wood/wood products, non-metallic mineral products, basic metals/fabricated metals, transport equipment, manufacturing n.e.c., electricity, gas and water supply, construction, hotel and restaurant, transport, storage and transportation services (Table 12). However, the number of units is not in itself a very telling indicator. Hence, detailed **employment** figures for the manufacturing sectors are also given. The most important sectors in this respect are basic metals/fabricated metal products, transport equipment, electrical and optical equipment, and machinery and equipment. In the first two sectors Styria also shows strong specialisation compared to the national employment pattern (Table 12).

In total, 7% of all **employees** in manufacturing were working in **high-technology** and 30% in **medium to high technology** sectors in 2005 (Hauptverband der Österreichischen Sozialversicherungsträger). These figures are based on the OECD classification.[11]

According to the slightly different Eurostat classification,[12] 8.4% of all employees in manufacturing in 2005 were engaged in high technology manufacturing industries (7.5% in Austria) and 32.0% in medium to high technology (27.2%). Hence, in manufacturing, Styria has a higher technology focus than Austria. However, the share of knowledge-intensive employment in services[13] (Styria: 44.7%; Austria: 45.7%) and in knowledge-intensive high-technology services[14] (3.0% vs. 4.0%) is lower (Eurostat, 2006). Consequently, Styria displays a strong high and medium to high technology focus in manufacturing, but is relatively short of the respective knowledge-intensive services.

However, technology intensity does not directly relate to innovativeness. Based on the regional CIS III data, Adametz and Ploder (2003) found that the **share of innovating firms** in Styria (48.9%) was just as high as in Austria (48.8%) between 1998 and 2000. While the share of innovating service firms was markedly higher (56.1%) than in Austria (44.9%), fewer manufacturing firms (44.9%) introduced new products or processes than the Austrian average (53.3%). However, Adametz and Ploder (2003: p. 16) caution against a misleading interpretation of the results, because the figures have been weighted on a non-response analysis in order to be valid for the population. In the technology sector in particular, weighted and unweighted data for Styria display essential differences. According to the unweighted data, the share of innovating manufacturing firms is 59.4%, slightly higher than in Austria. In terms of size, the weighted data show a strong deficit in small firms (42% carried out innovations), while medium (66%) and especially large firms (84%) tend to have a higher innovation propensity. This pattern is in line with the general picture for Austria (ibid.: 18).

3.1.2 Systemic characteristics of regional clusters and networks, links and interactions

Styria formulated a cluster policy in its technology policy concept as early as 1995. This became the starting point for the broad implementation of regional cluster policies in Austria. The automotives cluster Styria (ACstyria) developed into a successful pilot project, which resulted in the establishment of further clusters and networks. The philosophy of the promotion policy is to finance the starting period (over three years) and to transfer cluster and networks - if sufficient potential is identified - into own organisations with the participation of the state of Styria. So far, only two (ACstyria and the wood cluster) out of six clusters have been transferred into own organisations (the others are materials, human technology, Eco&Co, Nubior and NanoNet; see Table 13). All clusters were initiated following a top-down approach and use common infrastructures (Joanneum Research, 2006).

Other networks which have originated in Styria and which try to bring together the relevant stakeholders are the *Designerstiftung Österreich* (designer foundation Austria) and the *Cleaner Production Centre Austria* (Joanneum Research, 2006). In addition, Hartmann (2003: p. 253) reports on three distinguished R&D networks operating in Styria: First, *Vereinigung der Technologiezentren Österreichs* (Association of Austrian Technology Centres), which consists - nationwide – of over 30 technology-transfer centres. It mainly focuses on knowledge exchange

[11] 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
[12] High-technology NACE (Rev. 1.1) sectors: 30, 32, 33; medium-high technology: 24, 29, 31, 34, 35
[13] Total knowledge-intensive services: NACE Rev. 1.1 codes 61, 62, 64 to 67, 70 to 74, 80, 85 and 92
[14] Knowledge-intensive high-technology services: NACE Rev. 1.1 codes 64, 72, 73

among centre managers, employees and technology-orientated enterprises. Second, the *Steirische Impulszentren* (Styrian Impulse Centres), a network with the SFG as its base that provides training for enterprises, demonstration and application of innovative technology and innovation support programmes. The main objective of these business and technology parks is to attract firms, foster start-ups and create inter-firm networks. Today they host some 300 firms. Third, the *Technologiepartner Steiermark* (technology partner Styria) a network of Styrian technology-transfer centres which acts as a gateway to the centres for specific enquiries from firms.

3.1.3 International context: FDI and exports

Styria is not a major destination for inward investment in Austria. According to figures from the Central Bank of Austria (OENB), the stock of foreign direct investment in Styria was EUR 2.3 billion at the end of 2003, which is only 5.4% of the total (Vienna alone has a concentration of about 55%). In total, the state hosted 135 foreign firms (10.5% of the Austrian total), which employed 17 200 persons (approx. 4% of all employees) in 2003 (ÖNB, 2005: 57; WIBIS, 2006). No information on the sectoral distribution of these investments has been published.

Contrary to FDI, Styria's international orientation in respect of exports is quite significant. In 2004, the provincial state exported manufactured goods worth EUR 15.4 billion, which is about 18% of the Austrian total. Only the state of Upper Austria exported more (23%). A markedly high share of products was in technology goods[15] (66% compared with 59% for Austria). Moreover, Styria has posted a dynamic increase in the share of technology exports – while the index in 2000 was 89, it had risen to 111 by 2004 (Austria = 100). In 2004, 61% of technology exports were from the *manufacture of transport equipment*, 20% from *electrical and optical equipment*, and a further 15% from *machinery and equipment* (based on unpublished data by Statistik Austria; JR InTeReg). The main destinations of Styrian exports in 2004 were Germany (about 30%), USA (10%) and Italy (9%) (Aumayr et al., 2006).

3.1.4 Capacities and instruments of the financial market

In addition to the private capital market, the following public institutions offer funding of R&D/innovation and start-ups.

At **national level**, *AWS – Austria Wirtschaftsservice (AWS)* is the central promotional bank and acts as the central agency for business development. Its instruments encompass grants, loans, liabilities and consultancy for private companies. It also offers funding 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) and start-up funding for high-technology firms, either in the form of loans (seed financing; up to EUR 726 000) or credit guarantees (high-tech double equity funds; max. EUR 2 million). Moreover, it provides financial support for growth phases, which can also include the implementation of new processes through various programmes (http://www.awsg.at/portal/index.php?x=54&n=52). AWS also operates *i2*, the only Austrian business angel database, which tries to match entrepreneurs with potential business angels (http://www.awsg.at/portal/index.php?x=227&n=286). In 2005, AWS funded 752 projects in Styria with a total budget of EUR 179.8 million (17% of the total). Of this, EUR 48 million was in liabilities, EUR 103 million in credits and loans, and another EUR 28 million in grants (Aumayr, et al., 2006).

[15] NACE categories 23, 24, 29-35.

At **regional level**, the SFG offers several financing instruments – mainly provided by SFG's subsidiary *Steirische Beteiligungsfinanzierungsgmbh* (StBFG):

- *Silent Partnership*: Regardless of size, the SFG offers silent partnerships to Styrian technology-orientated manufacturing companies and business services for production expansion, R&D projects, internationalisation, etc. The partnerships finance a maximum of 30-50% of the project costs, whereby the interest ranges from EUR 100 000 to 1.5 million. The duration of the partnership is typically seven years. The envisaged rate of return is 8-12%.
- *Venture Capital*: For innovative, young (under 5 years old), small enterprises (maximum of 50 employees and annual turnover of EUR 10 million) in manufacturing or business services, the StBFG offers consultancy and venture capital of up to EUR 1.25 million (max. 50% of total funding). The pre-condition for this instrument is that the SME has already found a venture capital firm as a lead investor, which is willing to invest at least as much as StBFG in the start-up. In return for its investment, the StBFG holds a share of the company. The usual time frame for the investment is five to seven years.
- *Micro-financing***:** For micro and small enterprises (fewer than 50 employees), which either cater for the regional market (*Nahversorgung*) or are 'first time employers', the SFG provides coaching and micro-financing up to a maximum of EUR 25 000 for a maximum duration of four years.
- *Assumption of liability***:** To facilitate the access of small enterprises (fewer than 20 employees) to loans and credits on the financial markets, the SFG provides assumption of liabilities. This liability can be used for loans of between EUR 10 000 and 60 000 that run for up to seven years and cover two thirds of the amount (http://sfg06.sfg.at/cms/9/).

Because the SFG Venture Capital instrument is only available for small enterprises and consequently not suitable for expansion projects of medium-sized firms, the current provincial government initiated the *Steirischer Technologie- und Wachstumsfonds* (Styrian Technology and Growth Fund). The fund will be endowed initially with EUR 13.5 million, contributed by the state of Styria, regional banks, insurance companies, etc. The fund will hold a minimum minority share of EUR 0.5 million and a maximum of 20% of the total volume. The duration of the fund is 10 to 12 years.

3.2 Policy context

3.2.1 Governance structure and stakeholders

Even though Austria is a federal state, the powers of the provincial governments are fairly limited, especially in economic and fiscal policy, where the main powers lie with the federal government. The main ministries in this context are the *Ministry of Economy and Labour (BMWA)* and the *Ministry of Transport, Innovation and Technology (BMVIT)* (see 2.2.1.1).
Provincial governments focus on business location policies (e.g. infrastructure). In the current Styrian provincial government, the main departments responsible for economic affairs are the *Department for Economics, Innovation and Finance*; the *Department for Social Affairs, Labour and Culture*; the *Department for Science & Research, Transport and Technology*; and the *Department for Tourism, Local Culture and Municipalities*.
At the beginning of the 1990s, the *Steirische Wirtschaftsförderungsgesellschaft* (Styrian Business Promotion Agency - SFG) was set up by the public authorities to act as an intermediary policy institution. The SFG is the main organisation for the design and management of business promotion programmes. In 2005, its total funding activity amounted to EUR 89.4m, including co-financing of European Regional Development Fund projects. Other

major funding agents within the administration of the federal state are *Department 14 - Economy and Innovation*, which managed several programmes in 2005 to the tune of EUR 3.3m, and *Department 11A – Social Law and Social Security Law*, which is responsible for implementing the *Qualifikations- und Beschäftigungsprogramme* (Qualification and Employment Programmes), which in turn had a budget of EUR 10.8m in 2005 (Aumayr et al. 2006).
The main business promotion agency at national level is the *AWS* (see 2.2.1.1 and 3.1.4), which allocated EUR 179.8m (2005) to companies in Styria (ibid.).

3.2.2 Policy objectives

A number of specific framework conditions at European and national level affect regional policy objectives. Of course, major European efforts regarding growth, employment and competitiveness (e.g. Lisbon/Barcelona processes) have had an impact on national and regional policies and political thinking. Major national policy objectives are reflected by recent initiatives and reforms, such as the tax reform (e.g. reduction of corporate income tax to 25%), infrastructure investments (streets and railroads), changes in research policy (extension of fiscal and financial measures as described in 2.2), broadband extension to rural areas, promotion of regenerative energy, streamlining of the approval process for investments, transition to more flexible working hours, qualification measures for human resource development, and promotional measures to foster exports from and the internationalisation of Austrian firms (Aumayr et al. 2006, Ploder et al., 2005).

Ever since Styria (as the first federal province in Austria to do so) developed its own RTDI policy in the mid-1990s, this topic has ranked high on its political agenda. Therefore, the policy objective of R&D and innovation promotion goes hand in hand with other key objectives: namely, to promote structural change and the modernisation of the regional economy, which includes fostering regional SMEs in their innovation and internationalisation activities, promoting entrepreneurship and qualification measures for human resources and providing funds for the regional tourism sector. Thus, in recent years the regional government has tended to supplement direct monetary business development with ‘soft’ measures and to consolidate institutional framework conditions.

3.2.3 Policy instruments

As mentioned above, at the **national level**, economic measures are promoted directly by *AWS* by means of the *European Recovery Programme Fund* (ERP) managed by AWS. In the financial domain AWS offers a portfolio of financial measures, such as allowances, ERP loans and liabilities specially arranged for SMEs as micro-finance and double equity to help finance the set-up and growth of enterprises. AWS also helps SMEs by way of guarantees, restructuring activities and internationalisation efforts (see Hofer 2006; see 3.1.4).
In terms of macroeconomic policy special attention is given to setting up new enterprises (e.g. *Law on support for founding new enterprises*). In the human capital domain, the impact is being felt of the newly introduced tuition fees for students under the new *organisation law for universities* (previously participation was free) (see Hofer 2006). Furthermore, employment policy in Austria is strongly geared to new qualifications for unemployed persons. Accordingly, several measures deal with reintegration and qualifications of women and professional education for young persons. The main instruments are professional courses and coaching designed to increase qualifications and supply to match the demand from industry.
The federal government has also tried to increase the awareness of and openness towards innovation and R&D by establishing *Innovation Awards* (*Staatspreis Innovation*, *Staatspreis*

Multimedia und e-business and *Jugend Innovativ*) and by running an *awareness campaign* entitled *Innovatives Österreich* (Innovative Austria), which is seen as a platform for exchange of information.

The main **regional policy instruments** that have an impact on RTDI are effective in the following domains:

- **Regional Structural Change**: One of the most important instruments for the promotion of structural change (and entrepreneurship) is the establishment of 28 *Impulszentren* (technology parks, incubators, innovation centres). These centres provide office space, advice and training, and agglomeration advantages through co-location with firms from the same industry, etc.

  In 2004, the *Steirische Umstrukturierungsgesellschaft* (Styrian Restructuring Company) was set up with the objective of facilitating restructuring in regional firms by providing shareholding (up to EUR 5m) and liabilities (up to EUR 10m). Moreover, the *Border region promotion package* (EUR 4m) aims to foster structural change in firms close to the border with Slovenia in an effort to avoid a possible competitiveness gap due to promotion of the new EU objective 1 in Slovenia. A 'soft' measure is the *Reassessment of Styrian Business Locations*, a re-evaluation and promotion exercise of important business location in Styria designed to attract new firms.

- **Internationalisation** of regional firms: An *Internationalisation Centre Styria* has been established to foster the internationalisation of regional SMEs. The focus is on neighbouring South-East European regions and on global markets. Complementary measures include information, training and guarantees for market extensions from the StBfG.

- **Entrepreneurship**: The SFG started a *qualification programme for entrepreneurs* in 2003. In 2004, the provincial government initiated "*gruenderland.st"* (entrepreneurial province Styria), a programme that provides advice and training for potential entrepreneurs and promotes an entrepreneurial attitude in schools and universities. In addition, the SFG offers its Action Programme for entrepreneurship and take-overs, and partial funding of costs related to (innovative) start-ups/take-overs, such as business plans, innovation concepts, equipment, etc. (see 2.2.2.2. B).

- **SMEs***:* To maximise the growth potential of regional SMEs by improving access to the capital market, the provincial government - via the SFG - offered assumptions of liability (max. EUR 60 000) and created the *Steirische Technologie- und Wachstumsfonds* (see 2.2.2.2 H). Other aspects of the *SME Initiative* are entrepreneurship programmes (see above), an *SME placement foundation* for the training of unemployed people to meet the demands of SMEs, and financial support for professional training.

- **Qualification of human resources**: In addition to the above-mentioned qualification programmes, there are several other programmes such as *Qualification in Networks* (specific training courses initiated by a network of firms - 2005: EUR 0.3m), *Qualification of skilled personnel* (funding of external training - 2005: EUR 3.1m) and *Triality 2006* (targets dual vocational training and offers additional inter-firm training - EUR 2.4m) (SFG, 2006)

- **Technology and innovation**: In addition to the commissioning and implementation of the main strategic documents (*Forschungsstrategie 2005 plus, Technologiepolitisches Konzept Steiermark, Regionale Wettbewerbsfähigkeit für die EU-Strukturfonds-Periode 2007-2013* (see 2.2.2.1), the provincial government has agreed on the *Steirische Beschäftigungs- und Wachstumspaket 2005*, a financial package worth EUR 55m which aims to attract firms, promote the extension of regional firms (especially in the R&D domain) and encourage

cluster and network initiatives. It has also started a *Broadband Initiative*, with support of EUR 7m to help improve broadband infrastructure. Furthermore, the *TeleReg* programme promotes ICT in Styrian companies. One of the objectives is to initiate clusters and networks using ICT by providing maximum funding for consultancy of 50% (with a cap of EUR 100 000) and 25% of the project costs. Another measure has been participation in the *FFG NANO Initiative* (see 2.2.2.2 D).

- **Tourism:** SMEs in the tourism sector have access to the *Tourismusförderungsfonds* (Tourism Promotion Fund), which allocates EUR 3.5m (2005) to quality improvements, infrastructure, and energy saving measures, etc. (Aumayr et al., 2006, Ploder et al., 2005, 2004).

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

Policy Areas	Policies complementary to RTDI instruments affecting policy area*	Effects on R&D and innovation capacity of the region
Improve innovation and R&D governance	*None*	*None*
Creation of an innovation- and entrepreneur-friendly environment	**National**: AWS innovation and start-up funding	Reducing entry barriers/risks of these projects and hence increasing the likelihood of these endeavours (including RTDI) in Styria.
	Awareness campaign/Innovation Awards	Improve attitude, openness and interest towards RTDI.
	Regional: Impulszentren (business/technology parks, incubators)	Incubators also for R&D-based start-ups; improved framework conditions might trigger R&D activities; knowledge spillovers due to agglomeration
	Entrepreneurship promotion measures	Reducing risk/entry barriers, enhancing awareness for (including R&D-based) start-ups
Development of human capital	**National:** New University Law	Tuition fees might improve higher education (stronger shift towards industry needs); higher autonomy of universities might cause shift towards regional firms with R&D activities
	Qualification measures for HRD	Better skills improve regional RTDI capacity
	Regional: Qualification and Employment Programmes (e.g. *Qualification in Networks, Qualification of skilled employees, Triality 2006*)	Better skills improve regional RTDI capacity
Networking, co-location and clustering measures	**Regional:** Impulszentren	Agglomeration and co-location might induce R&D/innovation networks and cooperation
	TeleReg	

Knowledge and technology transfer to enterprises	*None*	*None*
Research collaboration of public research organisations with private sector	*None*	*None*
Support for public research	*None*	*None*
Financial R&D measures for the private sector	**National**: AWS allowances, ERP loans and liabilities, etc. Tax reform (reduction of corporate income tax to 25%) **Regional**: Financial measures for expansion projects of SMEs *(e.g. Steirische Technologie- und Wachstumsfonds)*	With the provision of loans and subsidies the public sector is taking on risks that the private sector capital market would not. This increases the potential for successful innovation. Might allow more capital to be spent on RTDI Strengthening capital endowment in SMEs to perform extension projects such as RTDI

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

3.3 Conclusions

After struggling with structural change, Styria's production system now has a strong focus on modernised, medium-tech manufacturing industries, of which the most prominent is the automotive industry. Employment in the high-technology sector has also risen, from below the national average in 1995 to above the national average in 2005. Styria also 'specialises' to a certain extent in agriculture and mining.

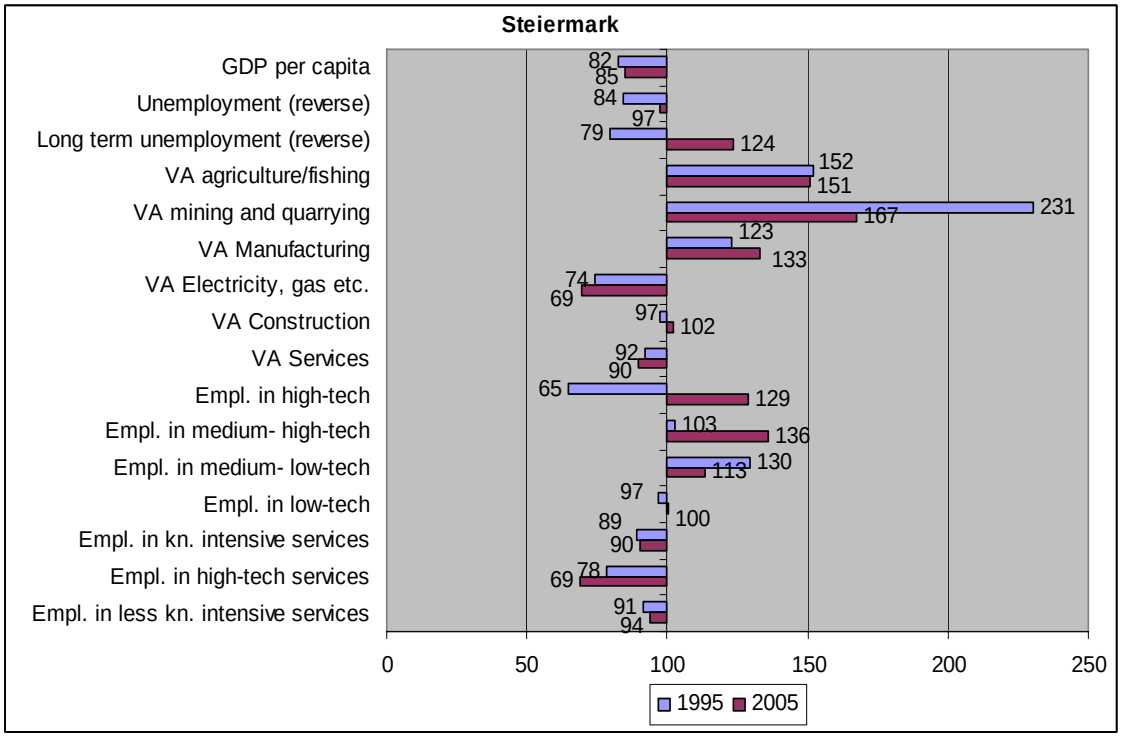
Despite recent economic growth, regional GDP per capita and productivity is still well below the Austrian average. Moreover, the system lacks business services, especially high-tech services (see Summary graph 2). While, in terms of innovativeness, some medium and large regional enterprises are doing very well, most SMEs show deficits. However, participation of the industry in recent cluster and network activities is good and industry is highly export-orientated. In addition to the private capital market, several financial instruments are provided to regional firms by regional and national agencies. Styria has also developed 24 impulse centres (25% of all Austrian centres) and hence a province-wide infrastructure to foster start-ups and technology-orientated firms.

The influence of provincial governments on the regional economy is limited, because the main responsibilities for fiscal and macroeconomic policies are with the federal government. The Styrian government's strong focus on RTDI is also reflected by the general economic objectives and instruments. The main concern relates to structural change via entrepreneurship,

modernisation (through technology and innovation) and qualification (human resources). Several instruments exist at both national and regional level to help foster R&D and innovation in regional firms, even though they do not specifically target such issues.

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

Source: Eurostat
Note: GDP data 1995 2003; Unemployment data 1995-2001; Value added (VA) data 1995-2003
Note: See Annex 2 for explanation of indicators



4 Conclusions

4.1 Assessment of the RIS

In conclusion, Styria's RIS possesses a strong knowledge base. It hosts several (traditional) universities and RTOs and an active innovation elite in the industry. In terms of R&D expenditure, Styria ranks among the top 15 European regions and achieves an above (Austrian) average number of patents. Due to its engineering tradition, scientific fields such as materials technology, mechanical and automotive engineering, and energy research are strong. In addition, a number of modern fields such as environmental research & technology, nanotechnology, IT, life sciences and mathematical modelling have become recent strengths (see Exhibit 3). Styria was the first provincial government in Austria to initiate a provincial technology policy, in the mid-1990s. Ever since, RTDI has been high on the political agenda and several instruments (e.g. cluster policies) were implemented fairly early and successfully. The constant focus on RTDI has produced several coordinating organisations, which try to enhance the governance of the regional RTDI system. That said, the influence of the provincial government on RTDI policies is fairly limited, and consequently the most important measures

are implemented by the federal government (sometimes in consultation with the provincial governments). Nevertheless, Styria has been quite successful in utilising these national programmes.

The RIS also displays a number of weaknesses. After severe problems with an ageing industrial structure up to the early 1990s, the industrial base in Styria was modernised in the following 15 to 20 years. Nonetheless, the innovative elite is still small and the majority of SMEs lack RTDI activities and capabilities. Moreover, the share of business services in the region is low, which creates problems in overcoming innovation deficits in SMEs. In addition, the strength of Styrian firms lies in traditional medium-tech sectors, which are neither typical growth sectors nor subject to increased international price competition. Consequently, Styrian companies face the challenge of increasing the knowledge content of their products and production processes in order to withstand competition or re-location to 'low-cost' regions. Creating stronger transnational cooperation with South-East European regions might be the way forward in this area. Finally, Styria is still a backward region in Austria in terms of productivity and GDP per capita. Both indicators are still well below the Austrian average, only reaching 85% of the national value (for an overview of strengths and weaknesses see Exhibit 4).

It can be argued that the quality of the knowledge base and early initiatives to strengthen science-industry links (such as clusters, competence centres and networks) have contributed to a successful structural change in at least two sectors. First, scientific advances in metal engineering (including laser technology) have helped the respective industry to adapt to new market needs in terms of product differentiation and hence spurred modernisation. Second, the high density of competency in machinery (especially combustion engine and four-wheel drive) has made for rapid growth in the automotive cluster by providing skilled engineers and advanced research.

Despite its success, structural change is still ongoing and has not yet led to a province-wide, high performing economy (as shown by low productivity and GDP/capita). Economic growth so far has focused on 'catching up'. In order to sustain future growth, however, Styria needs to develop new technology and growth fields. In this area, the strong regional knowledge base might prove to be a valuable asset.

Frequently, regions suffer from a mismatch between their knowledge and economic profile, which hinders spillovers and exploitation of research results. This, however, seems to be less of a problem in Styria, since strengths in the knowledge base are fairly well matched by strengths in the regional economy (see Exhibit 3). Having said that, it must be borne in mind that matching knowledge and economic specialisation (Exhibit 3) suffers from at least two problems. First, some fields of knowledge production cannot be directly related to one or two economic sectors, because they are generic technologies (e.g. nanotechnology) that can be applied in several sectors. Second, regional data on economic specialisation in terms of value added and capital formation are limited to one-digit NACE classifications. Only employment data in manufacturing are available for the still raw two-digit NACE classifications. Hence, misleading causal links are likely at this level of aggregation, e.g. region A displays knowledge specialisation in 'train brakes', which relates to 'transport equipment' (DM), in which A also shows economic specialisation – albeit in motor vehicles. As a consequence, exhibit 3 is based on an assessment by local experts from the Graz (Styria) office of the Institute of Technology and Regional Policy, Joanneum Research, which was drawn up for the *Technology Policy Concept Styria* (Land Steiermark: 2005b). It provides a more detailed, although sometimes non-NACE-compliant picture of the economic specialisation in Styria. In conclusion, most of Styria's strengths in knowledge production are reflected in economic specialisation, even though some matching strengths might have a slightly different focus. Only the scientific strengths of

chemical and process engineering and *computer simulation and mathematical modelling* lack a counterpart in regional economic specialisation. Hence, Styria's RIS shows a fairly well matched structure.

Exhibit 3: Matching knowledge and economic specialisation

Knowledge production in the Region	Related economic sectors	Specialisation of the Region's economy	Conclusions
Automotive engineering	Transport equipment (DM)	Automotive industry/ Transport technology	Good fit
Mechanical engineering	Machinery and equipment (DK)	Machinery and plant construction; flexible automation	Good fit
Materials research and technology (incl. metal)	Basic metals and fabricated metal products (DJ)	Metal/Materials	Good fit
Environmental research & technology	*Cross-sector technology*	Environmental Technology	Fairly good fit
Energy research	Machinery and equipment (DK); Electricity gas and water supply (E)	Environmental Technology	Fairly good fit
Nanotechnology	*Cross-sector technology*	Nanotechnology	Good fit
Information technology, electronics	*Cross-sector technology*	Information technology, elec-tronics	Good fit
Human technology, life sciences, medical technology	*Cross-sector technology*	Human Technology	Fairly good fit
Building service engineering (incl. timber structure)	Wood and wood products (DD); Construction (F)	Wood technology, Paper	Fairly good fit
Chemical and process engineering	*Cross-sector technology*		Lacks respective economic specialisation
Computer simulation and mathematical modelling	*Cross-sector technology*		Lacks respective economic specialisation

Based on Land Steiermark (2005b), Technologiepolitisches Konzept Steiermark – Langfassung. Report by Joanneum Research: 47; own compilation

Exhibit 4: Strengths and weaknesses of the regional innovation system

	Strengths	Weaknesses
Knowledge creation capacity	• A strong university and RTO base, based on engineering traditions with a strong participation in national and international research projects • A strong innovation elite of medium-sized enterprises	• Most SMEs lack RTDI capabilities
Knowledge dissemination capacity	• Styria hosts several business/technology parks and incubators; and an over-proportional share of Austria's competence centres	• Technology transfer offices seem to lack the resources needed to cater for the majority of non-R&D SMEs
Knowledge absorption capacity	• Participation rate in lifelong learning is above the EU-15/-25 average	• Share of human resources in S&T is below the EU-15/-25 and Austrian average
Interaction of main stakeholders	• Strong commitment of regional stakeholders to participate in regional 'steering groups' for RTDI • Above (national) average cooperation rate of innovating firms	• Innovation/RTDI elite very active, but lack of involvement by non-innovative firms
RTDI governance capacity	• The new *Forschungsstrategie* has developed a clear structure and responsibilities for regional RTDI governance	• For many years too many different organisations had been established in the province whose objectives for regional RTDI (cooperation) management seem to overlap

4.2 Assessment of policies

Styria realised as early as 1993 the importance of RTDI policy at regional level and, in 1995, became the first Austrian province to develop a regional technology concept (*Technologiepolitisches Konzept Steiermark*). This concept triggered several initiatives and pioneer programmes, some of which had a strong influence on the national RTDI policy debate (e.g. in terms of networks and cluster policies). Since then Styria has pursued a continuous RTDI policy, which has been successful in attracting national R&D funds and hence facilitating the high level of R&D spending in the province. Consequently, awareness of the need for RTDI policies is very good. Innovation and R&D policies have a very prominent position and very high priority in Styria compared to other socio-economic objectives.

The variety of policies implemented, however, has led to measures being fragmented and not always coherent, and thus, to date, Styria does not have an integrated technology policy.

Nevertheless, several initiatives in the fields of entrepreneurship, firm growth, etc., have added to existing RTDI instruments. There is no obvious conflict between these instruments. Even though the objectives of some instruments overlap, most target different segments of the RTDI systems/knowledge economy. Hence, they can be seen as being complementary. That said, different instruments naturally compete for scarce resources and political attention, and thus the question of the most efficient and effective policy portfolio remains unresolved.

In terms of RTDI governance institutions, Styria has established a variety of public and private governance institutions. However, these have lacked coordination and integration. This has given the impression of Styria being almost 'over-regulated' in respect of RTDI. The current *Forschungsstrategie 2005 plus* provides a clearer structure of the institutional landscape. Nevertheless, a number of recent developments, such as the foundation of the regional *Rat für Forschung und Technologie*, have contrasted with this clear-cut structure and introduced new institutions.

Taking regional RTDI policy in terms of policy learning, the strong focus on cluster and network development can be seen as 'good practice', even though implementation of the clusters has not been equally successful. For example, the cluster in the automotive industry has been highly successful and internationally appreciated, but the wood cluster less so, partly because the value chain approach that was pursued was less appropriate for wood (as a material) than for automotives (as a product). The promotion of research networks (e.g. Nanonet, K-ind/K-net) proved to be very beneficial, because it brought together a critical mass of experts in science and industry. This made it possible to acquire R&D funding from national and EU sources. In contrast, policies to promote (innovative) business services have been less successful. Strategies such as the *Technologiepolitisches Konzept Steiermark* and the *Forschungsstrategie 2005 plus* can also be considered to be good practice, because they make for policy learning by reflecting on previous strategies, providing additional information for the policy-making process, formulating (potential) future strategies and steering the respective policies.

For national policies, Austria had developed a fairly comprehensive set of measures to foster R&D in previous years. Even though most of them did not have an explicit regional dimension, Styria managed very successfully to utilise these instruments to leverage R&D activities in the province.

4.3 Challenges and trends of the knowledge economy

As regards the objectives of the Lisbon Strategy, Styria had already achieved some of the major targets set for 2010 by 2002. For example, GERD was as high as 3.67% in 2002 and BERD accounted for two thirds of GERD. On the other hand, domestic business enterprises financed only 32% of all R&D expenditure. More business enterprise spending, however, is included in the 31% funding from foreign sources (excl. EU), but available statistics only provide aggregate figures for international organisations and businesses.

It has been shown that these achievements have only partly resulted in favourable economic activities (e.g. GDP per capita and productivity are still below the Austrian average). Hence, several challenges still need to be met to develop a sustainable regional knowledge economy.

The three most important challenges for Styria's knowledge economy are to:

- broaden the basis of innovative companies and tackle the innovation deficit among SMEs in particular;

- increase the low number of business services (especially knowledge-intensive business services, whose absence might contribute to low innovativeness among SMEs);
- overcome reliance on traditional sectors of medium technology, because this makes the regional economy vulnerable in terms or price competition.

Further, but less prominent, challenges are to:

- increase the number of science and engineering graduates and thus prevent any shortage of skilled labour in these fields;
- promote economic sectors which utilise strengths in knowledge production in chemical and process engineering and computer simulation and mathematical modelling;
- increase the proportion of the labour force with tertiary education and in science and technology;
- facilitate the transformation of high R&D spending and high patent rates into value-adding activities and higher productivity.

Exhibit 5 displays the main challenges and the indicators which highlight those challenges. It includes a brief summary of instruments that try to tackle the respective challenges. Several instruments tackle most of the identified challenges. Policy-makers seem to be aware of the challenges and have designed (more or less) well targeted instruments. Assessment of the effectiveness of these measures is limited to a number of general remarks, because a detailed programme-outcome evaluation is beyond the scope of this project. Nor is it not clear how effective some of these measures are, since they will only reveal their impact in the medium to long term.

As regards the way forward to achieving the objectives of the Lisbon Strategy, Styria would seem to be well positioned. Not only has it already achieved some of the objectives, the main policy documents at regional level, namely the *Forschungsstrategie 2005 plus*, the *Technologiepolitisches Konzept Steiermark 2005* and the *Regionale Wettbewerbsfähigkeit für die EU-Strukturfonds-Periode 2007-2013*, explicitly address most of the relevant issues.

Exhibit 5: Identification of policy challenges

Policy challenge	**Corroborating indicator**	**Inducement mechanisms** *[all measures taken at regional or national level to meet the challenge are described]*	**Effective approaches** *[only measures which appear to make a significant contribution to meeting the challenge are presented]*
Low number of innovative SMEs	*Few SMEs with innovation/ R&D activities (CIS)*	• *Incentives for University-Industry Linkages (funding of master's thesis in firms, scientists for the economy, etc.)* • *Cluster/networks ; competence centres* • *Tax incentives for R&D* • *Financial support for innovation/ R&D* • *Awareness programmes* • *Qualification of human resources*	*All measures seem to have some impact, but many of the high-level programmes (clusters, networks) seem already to target innovative SMEs; no evaluation of effectiveness of small scale programmes (HR mobility between university and industry; awareness pro-grammes) and tax incentives, but effectiveness quite likely*
Lack of business ser-vices	*Low number/ employment share of/ value added by business related services (NACE J + K)*	• *Entrepreneurship programmes (funding, training, awareness)* • *Attraction of external firms (e.g. promotion of business location in Styria)*	*Entrepreneurship measures quite effective, since share of R&D/knowledge-intensive start-ups in services is quite high (Table 7); but development still too slow*
Structural change towards knowledge-intensive medium-tech or high-tech manufacturing	*High employment share of medium-tech industries*	• *Impulse Centres (incubators, technology parks)* • *Entrepreneurship programmes (funding, training, awareness)* • *R&D, innovation funding* • *R&D collaboration promotion (clusters, networks, joint R&D)* • *Attraction of external firms*	*All of the endogenous measures clearly foster structural change towards a more knowledge-intensive structure; however, the effect will emerge only in the long run*
Increase the number of S&E	*Share of students enrolled in S&E courses*	• *Promotion of S&E studies* • *Awareness*	*Very limited*

graduates		*programmes*	
Promote firms that utilise knowledge base in chemical and process engineering and computer simulation and mathematical modelling	*Lack of matching sector for these fields in knowledge production (see exhibit 3)*	*No specific programmes; in general:* • *Entrepreneurship programmes (funding, training, awareness)* • *Attraction of external firms (e.g. promotion of business location in Styria)*	*No information, but probably too unspecific.*
Increase the share of the labour force with tertiary education and in science and technology	*Share of labour force with tertiary education; human resources in science and technology*	• *Promotion of S&E studies* • *Promotion of tertiary education* • *Life-long learning/qualification programmes* • *Programmes to foster mobility between university and industry*	*Life-long learning statistics quite good, hence qualification programmes obviously quite effective. Mobility programmes could be effective, less likely for promotion of S&E studies and tertiary education.*
Facilitate the commercialisation of high R&D spending and high patent rates	*High GERD; above average EPO patent rate, but below average GDP/capita and productivity*	• *Promotion of entrepreneurial thinking of scientists and support for university spin-offs (e.g. AplusB)* • *New University Law (higher autonomy; need for external income)* • *Innovation funding (e.g. AWS, SFG) for implementation of new processes/products*	*Entrepreneurial programmes are effective but of limited scope (e.g. two AplusB centres in Styria). Available innovation funding and promotion of entrepreneurial attitude might be effective in the medium term; less clear for impact of university law.*

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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 summary graphs

Period of coverage: Two periods are used, i.e. 1995 and 2004 or the closest possible years
Index: Country=100
Source: Eurostat, 2006

Summary Graph 1: Key indicators on Styria knowledge base development in comparison to Austria

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

Summary Graph 2: Key indicators on Styria'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/fisheries
   - 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: Universities in Styria

Name	Students (05/06)	Students in S&E Fields	Doctorates (Degrees 04/05)	Academic staff 2005 (FTE)	Number of Professors (FTE)f	Income from R&D/ Contract work in 2005
Karl Franzens Universität Graz	21 715	24% (Natural Sciences)	198	900	153	€11.0m
Graz University of Technology	8 780	~ 83%	143	906	100	€28.5m
Montan University of Leoben	2 089	~ 100%	41 (05)	232	38	€9.3
FH Joanneum - University of Applied Sciences	2 448 (04/05)	~ 60%	-	164 (04/05)	115	€2.9m (04/05)
FH- Campus02 (Business University of Aplied Sci-Med)	722 (04/05)	~ 17%	-	NA (~300 lecturers)		NA
Medical University Graz	5,373 (02)	-	5 (03/04)	653 (02)	NA	€13.7m (02)
University of Music and Dramatic Arts Graz	1,824 (04/05)	-	NA	416	107	NA

Source: publicly available information (Land Steiermark, 2005a, BMBWK, Universitätsbericht, 2005; http://www.uni-graz.at/ains2www_2006_facts_figures-engl_web.pdf; http://www.campus02.at/; http://www.unileoben.ac.at/~twinkler/downloads/Jahresbericht2005_Homepage.pdf; http://www.fh-joanneum.at/global/show_document.asp?id=aaaaaaaaaaycti&download=1; http://portal.tugraz.at/pls/portal/docs/page/Files/BDR/SB/Factbook%202005%20en.pdf)

Table 2: Public and Private Research Institutes in Styria

Name	Locations in Styria	Scientific Fields/Institutes	Staff (in Styria)
Joanneum Research	13 units in Graz, Leoben, Niklasdorf, Frohnleiten, Weiz, Hart-berg.	Sustainability/Environment; IT; Electronics/Sensor Technology; Materials/Processing; Economy/Technology; Medical Technology	375
Ludwig Boltzmann Gesellschaft	Org. of 54 Institutes in Graz, Styria	1) Education and Science Law; 2) Society and Cultural History, 3) War Consequences, 4) Science Research	~ 20
Christian Doppler Research Association	14 of 36 CDG laboratories are located in Leoben and Graz	1) Metallurgical Fundamentals of Continuous Casting Processes; 2) Multi-Phase Modelling of Metallurgical Processes; 3) Materials Modelling and Simulation; 4) Advanced Hard Coatings; 5) Advanced Functional Materials; 6) Fatigue Analysis; 7) Secondary metallurgy of non-ferrous metals; 8) Fuel cell systems with liquid electrolytes; 9) Genomics and bioinformatics; 10) Non-linear signal processing; 11) Automotive measurement research 12) Thermodynamics of Reciprocating Engines; 13) Microwave Chemistry; 14) Local Analysis of deformation and Fracture	115+
ARC Seibersdorf research GmbH	2 of the 17 subsidiaries and regional offices are located in Styria (Graz, Leoben)	Medical Technology – Biosignal Processing and Telemedicine, Graz; Technology Transfer Centre, Leoben	15
Austrian Foundry Institute (ÖGI)	Leoben	Casting, materials technology	44
Austrian Academy of Sciences	Graz	Institute for Space Exploration and Institute for biophysics and X-ray structure research	93
Graz Centre for Electron Microscopy	Graz	Electron and ion beam micro- and nanocharacterisation of all kinds of advanced materials	NA
AEE - Institute for Sustainable Technologies	Gleisdorf	1) Solar components and systems; 2) sustainable buildings; 3) sustainable water management	27
Austrian Agency for Health and Food Safety GmbH	Graz	Institute for medical microbiology and hygiene; Institute for food research; Institute for veterinary medicine research	5+

(AGES)			
Bundesanstalt für Alpenländische Landwirtschaft Gumpenstein	Irdning	Livestock husbandry; plant cultivation; organic farming	120

Source: publicly available information (http://katalog.forschung.steiermark.at; http://www.arcs.ac.at/; www.telbiomed.at; http://www.ogi.at/; http://www.cdg.ac.at/cdg/cdgext/index.phtml; http://www.felmi-zfe.tugraz.at/; http://www.joanneum.at/de/index.php; http://www.aee-intec.at; http://www.ludwigboltzmann.at/gesellschaft/institute_index.php)

Table 3: Competence Centres in Styria

Name	Field	Staff	Partner
K-plus Centre			
AB - Competence Centre of applied Biocatalysis	1) Biocatalytic synthesis; 2) Enzyme development and analytics; 3) Enzymatic conversion of carbohydrates	58	TU Graz, UNI Graz, UNI Linz, BOKU Wien, Joanneum Research, Degussa, DSM, Alicona Imaging, Hämosan, JSW Research, VTU Engineering, etc.
Austrian Bioenergy Centre	Solid biomass	63	TU Graz, TU Wien, Joanneum Research, Hartl, KWB, BIOS Bioenergiesysteme, Austrian Thermal Power, etc.
Knowledge Management Centre	Development of comprehensive aspects of know-how management	Ca. 30	TU Graz, UNI Graz, Joanneum Research, MAGNA STEYR Fahrzeugtechnik, Infonova, Leykam, Hyperwave, Gosch, Concept, etc.
Materials Centre Leoben	R&D of new materials and implementation of work processes, focus on surface finishing and product development	NA	Böhler, VOEST ALPINE, Rübig, MIBA, Siemens SGP, EPCOS, Paar, TU Graz, MU Leoben, TU Wien, etc.
Polymer Competence Centre Leoben GmbH	Plastics engineering and polymer science.	77	MU Leoben, TU Graz, UNI Linz, Joanneum Research, AT&S, Balzers, Böhler Edelstahl, IB Steiner, MAGNA AUTECA, Economos, etc.
VIF - Das virtuelle Fahrzeug (virtual integrated vehicle)	Mechanics, Thermo-/Fluid Dynamics; Virtual Engineering; Virtual Manufacturing, Rail Systems;	80	AVL List, OMV, Magna Steyr Fahrzeugtechnik, MU Leoben, TU Graz, Siemens SGP, Siemens Restraint Systems, Concept Technologie, VOEST Alpine Eisenbahntechnik, etc.
K-ind Centre	Electric/Electronics		
Acoustic Competence Centre, ACC,	Noise, vibration & harshness and sound quality in the automotive sector	NA	TU Graz, AVL List, MAGNA STEYR Fahrzeugtechnik
Evolaris – interactive eBusiness Competence Centre	Web-based and mobile applications	NA	UNU and TU Graz, Joanneum Research, FH Joanneum, AVL, Gebrüder Weiss, inet logistics, Styria Medien AG, ESTAG, Raiffeisenlandesbank Steiermark
holz.bau forschungs gmbH (innovative wood structures)	Hardwoods, shell structures, etc.	11	TU Graz, Haas Fertigbau GmbH&Co KG, Holzindustrie Preding GmbH, Kaufmann Holz AG
Large Engines Competence Centre	Development of future-orientated	24	TU Graz, AVL List, Jenbacher AG

(LEC)	combustion processes in large engines		
K-net Centres			
Waterpool, Competence Network Water Resources GmbH	Water resources	7	20 research partners and over 40 business partners, international involvement (partners from Croatia, Slovenia, Italy)

Source: Joanneum Research, 2006; http://www.ffg.at/index.php?cid=95; homepages of respective centres.

Table 4: Key regional R&D indicators Styria

	1998	2002
Total intramural R&D expenditure by sector of performance (million EUR)		
GERD	595.95	906.92
BERD	360.55	599.29
GOVERD	21.85	34.31
HERD	213.55	272.63
PNPERD	..	0.0
		Source: Eurostat, 2006
Total intramural R&D expenditure per capita by sector of performance (Index: EU-25 = 100)		
GERD	156	186
BERD	149	191
GOVERD	38	54
HERD	269	258
PNPERD	..	14
		Source: Eurostat, 2006, calculation JR
R&D expenditure by source of funding (million EUR)		
Total	599.63	906.92
Business Enterprise Sector	181.73	289.55
Public	251.29	317.00
Private non-profit	1.93	1.38
From abroad	154.52	283.73
European Union	10.15	15.26
		Source: Statistik Austria
R&D personnel (FTE)		
Total	5 851.5	7 215.2
Business	3 733.0	4 889.0
Government	170.3	180.9
Higher education	1 945.7	2 132.6
Private non-profit	2.5	12.7
		Source: Eurostat, 2006
R&D personnel as a percentage of total employment (Index: EU-25 = 100)		
Total		151

Business		182
Government		42
Higher education		155
Private non-profit		50
		Source: Eurostat, 2006, calculation JR
Patent application at the EPO per million inhabitants		
Styria	116.75	205.24
Austria	133.81	183.45
		Source: Eurostat, 2006, calculation JR

Table 5: Technology Transfer Offices in Styria

Transfer Institutions	Target group	Objective	No of staff
FTI (TU) - Research and Technology Information Centre of Graz Technical University - Forschungs- und Technologiehaus	Industrial enterprises	Technology transfer/ - utilisation and research management	14
Forschungsservice, (Research service) Karl-Franzens University Graz	Companies	Research support and PR, Technology and Know—How transfer, Research Evaluation/QM; Consultancy on spin-offs; technology utilisa-tion (patents); EU project advice, event management, etc.	13
"Außeninstitut" (External Institute), Montan University Leoben	Companies	Technology transfer, further training, spin-offs, regional development and consultancy concerning research	10
Zentrum für angewandte Technologie GmbH (ZAT)	High-Tech Companies and Start-ups	Product development service for/ with firms; business incubator for start-ups offering infrastructure, consultancy and financing	3
APS Graz (at the TU Graz)	Universities, Research Organisations, Companies	- Research promotion: Advice on participation in EU FP - Technology Transfer (Innovation Relay) - Further Training/Researcher Mobility	6

Technology Transfer Centre Leoben (ARC Seibersdorf Research and Montan University of Leoben)	Small to medium-sized enterprises	- Technology Transfer - Consultancy (patents, innovation management, QM, technology marketing)	7
Technology Partner Styria	Small to medium-sized enterprises	Online management of know-how and technology transfer, help in finding a partner, know-how agency**;** access to its 32 partner organisations	NA

Sources: http://www.arctechtransfer.at/, http://www.aps.tugraz.at/, http://www.zat.co.at/, http://www.uni-graz.at/forschung; http://technologiepartner.at/; http://portal.tugraz.at/portal/page?_pageid=413,1&_dad=portal&_schema=PORTAL; http://napps.unileoben.ac.at/napps/public/mbl.nsf/531315b993d6e854c1256e230029b8bc/8a38ba5a3e818284c125719d002e1c9e/$FILE/Wissensbilanz_2005_Montanuniversit%C3%A4t.pdf#search=%22AI-TTZ%20%22; Joanneum Research, 2006

Table 6: AplusB Centre in Styria

	SPG (Science Park Graz)	**ZAT (Zentrum für angewandte Technologie)**
	Broad spectrum of natural sciences, engineering, IT, medicine	
Start	1.7. 2002	1.1. 2004
Planned start-ups (within 5 years)	37	21
Realised	22	11
Budget:	€5 107 937	€4 344 087
Funding by central government	€2 074 713	€1 623 036
Shareholder	• TU Graz • University of Graz • Medical University of Graz • Innofinanz GmbH	• Montan University Leoben • City of Leoben

Source: http://www.ffg.at/index.php?cid=140

Table 7: Share of R&D-intensive and knowledge-intensive start-ups in all start-ups in manufacturing/business services (in %)

	1993/94	**1995/96**	**1997/98**	**1999/00**	**2001/02**	**2003/04***
R&D-/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
Austria	*16.56*	*15.72*	*17.76*	*18.16*	*18.77*	*13.76*
R&D-/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
Austria	*45.42*	*47.43*	*47.43*	*49.57*	*45.69*	*45.27*

* preliminary

Source: Egeln et al. (2006: 30)

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

	Austria		Styria		Styria's share of Austria
	absolute	%	absolute	%	
Life Sciences	43 669	15.3	4 903	6.7	11.2
Information Society	79 409	27.8	19 357	26.3	24.4
Economic Growth & Sustainable Development	70 357	24.7	26 245	35.7	37.3
Environment	24 414	8.6	3 099	4.2	12.7
Energy	41 024	14.4	18 947	25.8	46.2
Cooperation with third countries (INCO)	4 801	1.7	384	0.5	8.0
Innovation and SMEs	1 387	0.5	43	0.1	3.1
Education and Mobility	20 086	7.0	564	0.8	2.8
Total	285 147	100.0	**73 541**	100.0	25.8

Source: WIBIS – Styria

Table 9: Participation in FP5 by type of organisation

	Austria		Styria		Styria's share within Austria
	No projects	*%*	*No projects*	*%*	
Industry	721	36.2	159	43.4	22.1
Universities	657	33.0	110	30.1	16.7
RTD institutes	335	16.8	68	18.6	20.3
Others	249	12.5	29	7.9	11.6
Not applicable	29	1.5	0	0.0	0.0
Total	**1,991**	100.0	**366**	100.0	**100.0**

Source: **WIBIS – Styria**

Table 10: Sectoral profile of Styria (AT22) in comparison with Austria (AT) (2003)

		Value Added/ employment (EUR)		Employment in %		Gross value added at basic prices %	
		Austria	Styria	AT	Styria	AT	Styria
	All NACE branches - Total	**49 279**	**41 988**	**100.0**	**100.0**	**100.0**	**100.0**
A/B	*Agriculture, hunting, forestry and fisheries*	*7 349*	*6 118*	*13.0*	*20.0*	*1.9*	*2.9*
C-F	*Industry*	*65 407*	*62 612*	*22.7*	*24.2*	*30.1*	*36.1*
C	Mining and quarrying	115 944	95 444	0.2	0.3	0.4	0.7
D	Manufacturing	62 369	62 852	15.3	17.2	19.4	25.8
E	Electricity, gas and water supply	173 396	104 886	0.7	0.7	2.6	1.8
F	Construction	58 815	55 163	6.4	6.0	7.7	7.8
G-P	*Services (excluding extra-territorial)*	*52 057*	*45 918*	*64.4*	*55.7*	*68.0*	*60.9*
G	Wholesale and retail trade; repair of motor vehicles, motorcycles; and personal and household goods	43 149	36 693	14.7	13.0	12.8	11.3
H	Hotels and restaurants	40 095	34 431	5.6	4.9	4.5	4.0
I	Transport, storage and communication	59 444	44 873	6.1	4.9	7.4	5.3
J	Financial intermediation	93 490	73 896	2.8	2.1	5.3	3.6
K	Real estate, renting and business activities	79 508	74 888	10.7	8.6	17.3	15.3
L	Public administration and defence; compulsory social security	49 110	48 906	6.0	5.1	6.0	5.9
M	Education	50 728	52 107	5.2	5.3	5.4	6.5
N	Health and social work	30 359	28 248	8.6	8.2	5.3	5.5
O	Other community, social, personal service activities	41 915	37 574	4.4	3.6	3.7	3.2
P	Activities of households	48 728	48 250	0.2	0.3	0.2	0.3

Source: Eurostat, 2006; calculation JR-InTeReg

Table 11: Gross fixed capital formation (million EUR)/Compensation of employees (million EUR)

	2003		
	Austria	**Styria**	**Difference**
Total	**0.427**	**0.407**	**0.020**
Agriculture, hunting, forestry and fisheries	*3.154*	*4.263*	*-1.109*
Industry	*0.257*	*0.239*	*0.018*
Mining and quarrying	0.438	0.260	0.178
Manufacturing	0.272	0.258	0.014
Electricity, gas and water supply	0.590	0.410	0.180
Construction	0.127	0.125	0.002
Services (excluding extra-territorial organisations and bodies)	*0.480*	*0.468*	*0.012*
Wholesale and retail trade; repair of motor vehicles, etc.	0.174	0.169	0.004
Hotels and restaurants	0.242	0.216	0.026
Transport, storage and communication	0.744	0.675	0.069
Financial intermediation	0.264	0.230	0.034
Real estate, renting and business activities	2.065	2.212	-0.147
Public administration and defence; compulsory social security	0.171	0.175	-0.004
Education	0.054	0.036	0.018
Health and social work	0.134	0.219	-0.085
Other community, social, personal service activities	0.425	0.496	-0.071
Activities of households	0.000	0.000	0.000

Source: Eurostat, 2006

Table 12: Number of local units and distribution of employment in manufacturing 2004

		Share (%) of total number of local units		Employment (% of manufacturing)	
NACE		Austria	Styria	Austria	Styria
c	Mining and quarrying	0.2	0.3		
d	Manufacturing	10.6	10.8	100.0	100.0
da	food products; beverages; tobacco	1.9	2.1	12.4	:c
db	textiles and textile products	0.7	0.5	4.1	2.5
dc	leather and leather products	0.1	0.1	0.9	:c
dd	wood and wood products	1.2	1.4	6.1	6.7
de	pulp, paper and paper products; publishing; printing	0.8	0.6	7.1	7.0
df	coke, refined petroleum products and nuclear fuel	0.0	0.0	0.3	:c
dg	chemicals, chemical products and man-made fibres	0.2	0.2	4.2	1.5
dh	rubber and plastic products	0.2	0.2	4.4	2.0
di	other non-metallic mineral products	0.6	0.8	5.7	5.5
dj	basic metals and fabricated metal products	1.4	1.6	16.3	20.5
dk	machinery and equipment n.e.c.	0.8	0.8	13.0	11.7
dl	electrical and optical equipment	0.8	0.8	11.4	12.3
dl30	office machinery and computers	0.0	0.0	0.2	0.1
dl31	electrical machinery and apparatus n.e.c.	0.2	0.2	4.4	4.2
dl32	radio, television; communication equip. and app.	0.1	0.1	4.0	5.2
dl33	medical, precision/optical instruments, watches	0.5	0.5	2.7	2.8
dm	transport equipment	0.1	0.2	6.5	12.8
dn	Manufacturing n.e.c.	1.7	1.8	7.6	6.4
e	Electricity, gas and water supply	0.6	0.9		
f	Construction 8.3	8.8	3,841		
g	Wholesale and retail trade; repair of motor vehicles, and personal and household goods	32.6	32.6		
h	Hotels and restaurants	16.0	16.7		
i	Transport, storage and communication	6.8	7.1		
j	Financial intermediation	:	:		
k	Real estate, renting and business activities	25.0	22.9		
	TOTAL	328,837	43,874		

Source: Eurostat, 2006; c = confidential.

Table 13: Overview of Clusters within Styria

Title	Focus	No of partners	Link
Automobile Cluster Styria	Automotive industry and suppliers	170	http://www.acstyria.com
Wood Cluster Styria	Innovative wooden construction	Ca. 134	http://holzcluster-steiermark.at/
Materials Cluster	Materials such as ceramics, metal, plastics	10	http://materialcluster.at
human.technologie.styria	Medical technologies	23	http://www.human.technologie.at
Eco & Co	Eco-/Sustainable technologies	Ca. 504	http://www.eco.at
Nubior Net Styria	Technologies for the use of biogenic resources	11	http://www.nubior-styria.at/index.htm
NanoNet Styria	Nanotechnologies	Ca. 12	http://www.nanonet.at

Source http://www.technologiepark.at/; http://www.nubior-styria.at