Austrian Research and Technology Report 2008

Report under Section 8 (1) of the Research Organisation Act, on federally subsidised research, technology and innovation in Austria

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Preface

Experience shows that prosperity and progress in our society are nourished by the fruits of science, research and innovation. What begins as pure scientific inquiry often yields a completely new type of product in the end. The Austrian federal government has committed itself to a platform of securing lasting economic growth with an increase in both the quantity and quality of jobs. Modern frontier research is one of the key engines for driving progress on all fronts and making such progress accessible to businesses through application-oriented research. Numerous government projects such as the Excellence Initiative for Science, the COMET Programme for Competence Centres, the Innovation Voucher and efforts to promote research at institutions of higher education (universities and universities of applied sciences) share the goal of broadening the base for research and development in Austria to bolster the objectives of Lisbon and Barcelona.

To prepare for the period after 2010, the government launched its Research Dialogue and System Evaluation in Alpbach in 2007. The results of these initiatives will be integrated into the national RTI strategy to support and expand the long-term role of Austria as a destination for science and research. The aim of our joint efforts is to improve the climate for research and innovation and their significance for the future of our society.

It is our sincere hope that the Research and Technology Report 2008 will contribute to this effort as a barometer of Austria's RTI environment!

Dr. Johannes Hahn
Federal Minister for Science and Research

Werner Faymann
Federal Minister for Transport, Innovation and Technology

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Executive Summary

The Austrian Research and Technology Report is an annual compilation of current statistics, findings and assessments on research, technology and innovation policy in Austria, providing an overview of Austria's position in this policy field. This year's report was commissioned by the Federal Ministry of Science and Research (BMWF), the Federal Ministry for Transport, Innovation and Technology (BMVIT) and the Federal Ministry of Economics and Labour (BMWA) with the cooperation of STATISTIK AUSTRIA and tip[1].

Current Developments in the Austrian Innovation System

The year 2008 will continue the very positive trend in research and development spending in Austria. STATISTIK AUSTRIA expects an **R&D share (relative to GDP) of 2.63%**, up from 2.55% (2007). This puts Austria's R&D rate ahead of both the EU member states' average and the comparable value among OECD member states.

In recent years, this trend was especially dynamic in the share of the business sector, which finances the lion's share of Austria's R&D expenditures. The public sector's share of funding also saw substantial growth.

The most recent issue of the **European Innovation Scoreboard** also gives high marks to Austria for innovation. Austria scored eighth in the overall ranking, placing it securely in the middle of the field alongside Luxembourg, Ireland, France, Belgium and the Netherlands. Since 2003, Austria has also shown the most dynamic performance among the EU-15 countries, with an upward tendency. As in past years, the group of "innovation leaders" includes countries such as Sweden, Finland, Denmark and Germany.

In 2007, Austrian research and technology policies made significant strides in the development of this policy field by introducing an Innovation Voucher, establishing a Climate and Energy Fund and launching the Austrian Research Dialogue. Only in the coming years will we be able to fully assess the impact and results of these activities.

Innovation in the Business Sector

Austrian businesses have greatly intensified their research efforts in the past ten years. Austria joins Germany, Denmark and Finland among the EU countries with the sharpest rise in R&D expenditure in the business sector relative to GDP. This quantitative growth

1 Tip (www.tip.ac.at) is a consulting programme for research, technology and innovation policy and a joint project of the Austrian Institute of Economic Research (WIFO), Joanneum Research (JR) and the Austrian Research Centers (ARC). This report was written by Bernhard Dachs (coordination, ARC), Claudia Steindl (coordination, ARC), Martin Berger (JR), Helmut Gassler (JR), Werner Hölzl (WIFO), Daniela Kletzan (WIFO), Angela Köppl (WIFO), Karl-Heinz Leitner (ARC), Brigitte Nones (JR), Michael Peneder (WIFO), Andreas Reinstaller (WIFO), Doris Schartinger (ARC), Ingrid Schacherl (JR), Andreas Schibany (JR), Helene Schiffbänker (JR), Nicole Schaffer (JR), Gerhard Streicher (JR), Fabian Unterlass (WIFO) and Georg Zahradnik (ARC).

in innovation activities is accompanied by a qualitative change in Austria's business sector.

One sign of this qualitative change can be seen by analysing the **Austrian patent portfolio**. Austria has held onto its traditional strengths in material sciences, machine tools and construction, while weaknesses in information technology, medical technology and semiconductors have been lessened or turned into strengths. The finding that Austria is specialised primarily in low- and medium-level technologies is only partly true.

This same qualitative and quantitative change in the Austrian business sector is also evident from an industry-level perspective: Nearly all industries increased their **R&D intensity**. At the same time, a gradual **structural change** toward more R&D-intensive industries can also be seen. Despite clear signs of change, however, the analysis is still based on the assessment that the "Austrian structural paradox" persists. Austrian businesses are strongly specialised in traditional industries, where they are also highly competitive.

Founding a company requires capital – capital that small, young and innovative companies in particular are often unable to raise through traditional sources of funding. This leads to a key role for **private equity and venture capital** in funding innovation and growth. A reduction of welfare losses due to market failures, a positive contribution to the overall economic structural change and additional growth incentives: three good reasons why policymakers should pay close attention to private equity and venture capital. The primary focus here, besides the necessity of public funding, is on creating optimal conditions.

One of the major long-term challenges to policymakers is **coping with climate change**. Technological innovations are among the key solutions here as well, because a change toward sustainable and climate-friendly economic structures requires the development of radically new technological solutions over the long term. Targeted technology funding programmes can accelerate this change, generating effects that are good for both the ecology and the economy. In addition to delivering greater independence from energy imports and reduced emissions, investing in the development of energy- and emission-efficient technologies can also create export opportunities for the producers of environmental technologies. The Austrian environmental technology industry has already proven in the past that innovations – pushed by regulations – contribute to dynamic economic development.

Universities in Transition

Universities are the most important source of new scientific insights within the innovation system. Universities are also needed to train highly qualified human resources. Participation in the Bologna process and the enactment of the Universities Act 2002 have done much to help universities succeed in this dual role and will continue to influence development in the coming years.

One example of this is the trend in third-party funding of Austrian universities. The share of non-earmarked public funding that universities receive is falling. At the same time, the proportion of funds from proposal-oriented research is rising, with much of this money coming from the Science Fund. The share of university funding coming from businesses and foreign organisations is also growing.

The Universities Act 2002 mandates that Austrian universities publish intellectual capital reports. An intellectual capital report is a presentation and evaluation of a university's intellectual capital, providing information on strategic focal points, personnel development, research outputs, third-party funding and commercialisation of research results. The intellectual capital report, along with the agreement on productivity and evaluation, is an important management tool for universities and also provides valuable information for science and education policy.

The Bologna process and the growing demand for scientific personnel have also changed how **doctoral studies** are commonly structured. Various universities have instituted doctoral programmes in which students work in a group with close coordination of the subject of study, and funding is linked to a specific doctoral dissertation whose primary purpose is to prepare the doctoral candidate for a career in science. Here we also see structural changes whose purpose is to more precisely and thus more effectively meet the requirements for a career in science.

Internationalisation of the Austrian Innovation System

As a small, open economy, Austria is highly dependent on strong international integration and networking. The Austrian innovation system today is much more internationalised than it was in the early 1990s. This internationalisation is driven both by foreign multinationals that invest in Austria and by Austria's participation in the European Framework Programme for Research and Technological Development.

Austria is not just a destination for R&D investments, however, but also a source: Austrian businesses are stepping up their **research and development activities abroad**. In 2003, for example, 30% of Austrian patent applications to the European Patent Office cited the collaboration of at least one foreign inventor. The primary reasons Austrian companies decide to pursue innovation abroad are expansion and market considerations (on-site support of foreign production, worldwide supply of services, etc.). These foreign activities are thus often merely complementary to, and not a replacement for, the firm's domestic R&D work.

The most significant host country for Austrian R&D activities abroad is Germany, followed by several other EU states and the US. As a rule, **China** is not currently a common host country for the **R&D activities of Austrian companies**. The lack of experience and expertise coupled with uncertainties about the protection of intellectual property remain (for now) major hurdles to China's involvement. Nevertheless, a gradual expansion of R&D activities in China is expected. A stronger (international) delegation of corporate R&D is anticipated, with the focus of R&D activities in China still on the development end over the medium term.

The key incentive toward the internationalisation of R&D to come from policymakers is the creation of a joint **European Research Area (ERA)** transcending national borders. The most important tool facilitating the creation of the ERA is the **EU Framework Programme (FP)** for Research and Technological Development with the support of a series of additional tools. Austrian organisations played an active role in FP6 (which ran from 2002 to 2006). Austria contributed 2.6% of all successful participants. Compared to the earlier EU Framework Programmes, this represents an increase of 0.2% (FP5) and 0.3% (FP4). The Austrian contribution is especially high among the "new instruments," which encourage collaboration among diverse partner organisations and a bundling of critical masses.

Women in Research and Innovation

The situation of women in research and development has attracted increased attention in recent years. This interest stems from the fact that relatively few women are active in R&D in Austria compared to other countries.

The Research and Technology Report draws on various data to show that the **gender gap in science, research and development is slowly shrinking**. A growing number of women are active in R&D, for example, while more and more research proposals are submitted by women and the number of female graduates is on the rise in most scientific disciplines.

The greatest challenges still lie in increasing the number of female students and graduates in the engineering fields that are crucial for R&D and recruiting female researchers in the business sector, where they remain strongly underrepresented. Special attention here must be given to filling higher positions. There have been only minor changes to the situation of women in R&D when it comes to income, the assumption of leadership roles and other objective career benchmarks. A continued increase in the representation of women is needed here, as Austria remains near the bottom in this category among its European peers.

Tomorrow's challenges also include establishing sustainable structural changes: Corporate work structures and culture, the availability of child care facilities, and career and role models all need to change if women are to have the same opportunities in R&D as men based on their subjective life experiences.

1 Current Developments in the Austrian Innovation System

1.1 Trends in R&D spending in Austria

Today there is wide-spread consensus about the positive relationship between innovation, research and development activities on the one hand and general economic growth, along with high per-capita income on the other (OECD 2004). Although other important factors (such as the quality of human capital, the spread of new technologies, the dynamics of company start-ups, the institutional structure such as intellectual property laws, …) significantly influence growth and per-capita income, R&D spending has established itself in the research and development policy discussion as being the most important indicator. The increase in R&D spending is therefore one of the most significant goals of every country's research and development policies.

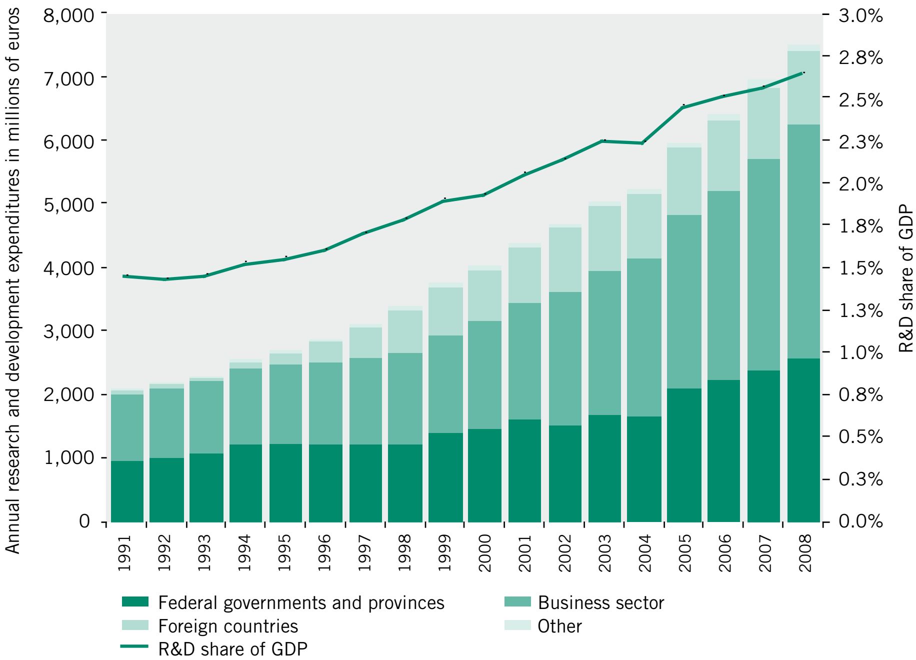
Austria has pursued this goal very successfully during the last few years. Total expenditures for research and experimental development performed in Austria will be more than € 7.512 billion in 2008, according to global estimates by STATISTIK AUSTRIA. This increases Austrian R&D spending by 8.1%, compared to the prior year. Based on current forecasts for the gross domestic product, this results in an expected R&D share of GDP of 2.63% for 2008, compared to 2.55% in 2007.

As in most OECD countries, the business sector finances the largest portion of R&D spending (€ 3.65 billion) in Austria. This capital is for the most part also used within the business sector. Only a small portion is passed on to universities in the form of research contracts (see also chapter 2.1).

The second most important financier is the public sector. The federal and state governments are expected to spend € 2.59 billion on R&D financing in 2008. This amount also includes the funds of the National Foundation for Research, Technology and Development and the funds of the research premium; it does not, however, include loss of corporate income tax due to the research tax allowance.

The third most important financing sector for R&D in Austria is the foreign sector. Capital procured from foreign countries is expected to reach € 1.16 billion in 2008. This capital comes mainly from the parent companies of multinational corporations and is used to finance R&D activities at these corporation's Austrian subsidiaries. In addition, capital from foreign countries also includes subsidies as part of the European Union's and other international organisations' framework programmes.

Figure 1: Development of research and development expenditures, and the R&D share of GDP in Austria, 1991 – 2008

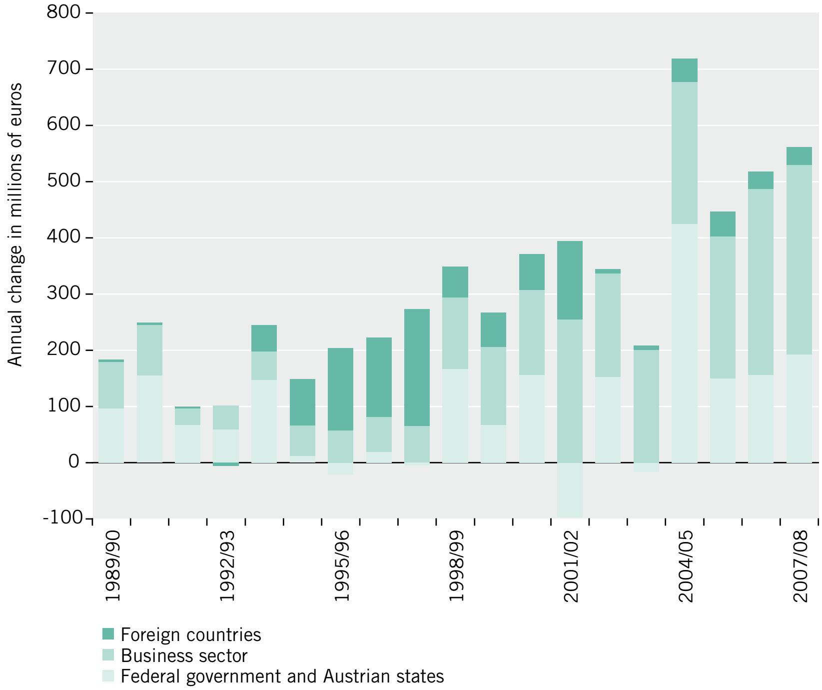


Source: STATISTIK AUSTRIA, tip presentation

Three clear trends in the development of financing for research and development have been visible in Austria over time. To illustrate these trends, the annual change in R&D financing in Austria by the most important financing sectors is shown in Figure 2 in absolute numbers.

On the one hand, the increase in the business sector – despite a significant rise recently in public funds – remains the driving force behind the growth of Austrian R&D spending. Since 1999, R&D financing by the business sector has increased by more than 8% every year. Even during the cyclical downturns in 2001 and 2002, the corporations did not reduce their financing, rather, they significantly increased it. Austrian companies evidently see research and development as long-term investments and plan their R&D spending independently of the country's cyclical economic situation. It can therefore be expected that the business sector's R&D financing will continue to increase even during the cyclical downturns forecasted for the next few years.

Figure 2: Annual change in R&D financing in Austria, by sector, in € millions



Source: STATISTIK AUSTRIA, tip calculations

Secondly, the financing portions of the federal and state governments have been stably increasing again annually by approximately € 150 million, after some fluctuations at the beginning of the decade. The portion of total R&D financing provided by the Austrian states and the central government reached its lowest point in 2004 at 31.8% and has been slightly increasing since. It is expected to reach 34.5% in 2008. This is a little more than the average EU financing portion, and lies significantly above the figures for Denmark, Finland and Sweden. At the same time, the figure also underscores the importance of steadying public subsidies, so as to avoid too large a fluctuation.

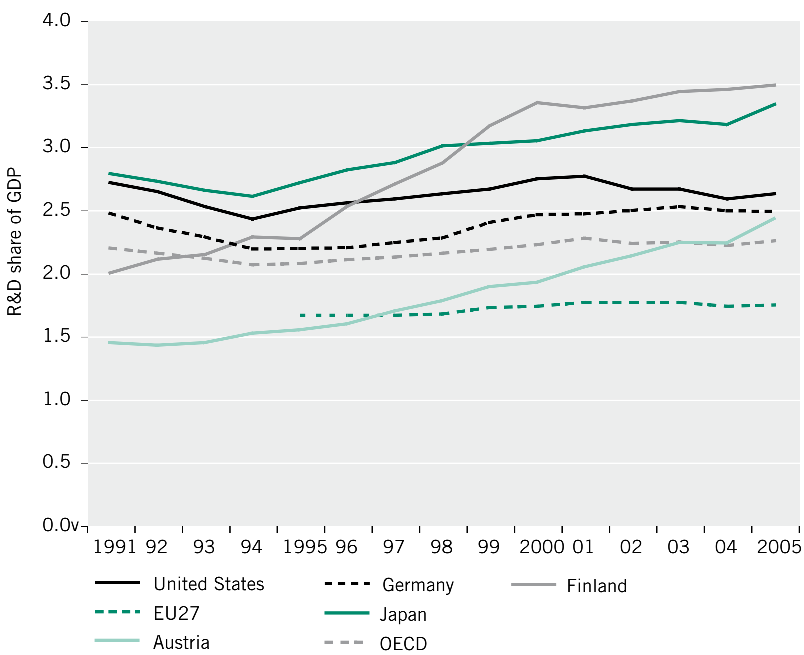
The third important trend, the numbers on R&D financing, show that the portion of foreign sources has remained solidly at a high level since 2002. Since 2002, approximately € one billion of R&D financing has flown annually to Austria from foreign countries. Since public and corporate spending has significantly increased during the last few years, the foreign portion of total R&D financing has decreased from 21% (2002) to 15% (2008).

An interpretation of this development is difficult without additional analysis. It could be that foreign companies in Austria did not receive new R&D assignments and responsibilities from their parent corporations. Another explanation could be that, as part of increased independence, foreign companies in Austria financed R&D activities more from their own internal capital and less from their parent companies' capital, so that capital in-flows from foreign countries were replaced by financing from the business sector. We also must remember that the speed with which R&D spending is increasing in Austria is an international exception and the lower rates of increase in foreign financing might simply reflect the slower increase in spending in the multinational corporations' countries of origin. In any case, the numbers on R&D financing certainly do not point to a large drain or shift of foreign-financed R&D activities away from Austria.

Since 1997 the Austrian R&D share of GDP has exceeded the average of the EU member states, since 2004 it has exceeded the average of the OECD countries and since 2006 it has been above the figure for Germany. This increase is also noteworthy when compared globally since these increases are an exception: the R&D rates have stagnated in the large economic areas during the last few years (Figure 3):

In the EU, R&D rates increased only at less than 0.1 percentage points during the period 1995-2005. This is mainly due to the stagnation of spending in the large EU countries. During this decade the R&D rates decreased in France (from 2.29% to 2.13%) and in the United Kingdom (from 1.95% to 1.78%), while Germany (2.19% to 2.48%) and Italy (0.97% to 1.10%) showed only moderate increases.

Figure 3: Development of R&D rates in selected countries, the EU and the OECD, 1991 – 2005



Source: OECD (2007b), tip presentation

The R&D share of GDP in the US increased somewhat faster than in the EU. However, even in the US, the increase during the last 10 years hovered in the range of a little over 0.1 percentage points. As a result of the stagnation in both of the OECD's large economic areas, the OECD countries' average also increased only very slowly during the period 1995-2005. The largest dynamism among the large national economies was in China, where the R&D rates increased from 0.57% to 1.33% during the comparable period. In absolute numbers, China meanwhile uses about half the capital of the EU for research and development; however, output indicators such as patent applications or citations of scientific articles point to the fact that the distance to the EU currently remains significantly larger (OECD 2007c).

Within the EU, significant increases in R&D shares of GDP can only be found in a group of a few small countries, which also includes Austria. The dynamic development in Finland during the 90s is known; a similar dynamic development can also be seen in Denmark, Ireland, Greece and Portugal, although the latter started their catch-up processes from a significantly lower level.

The Central and Eastern European countries showed an uneven development between 1995 and 2005. While the Czech Republic and Hungary achieved an increase in their R&D rates, Poland showed a stagnation and in the Slovak Republic and Slovenia there was even a decrease in the R&D shares of GDP during this period.

1.2 Austria's position on the European Innovation Scoreboard 2007

1.2.1 Introductory comment

In its conclusions at Lisbon (2000), the Council of Europe urged the European Commission "to create by 2001 European 'Innovation Index" containing an appropriate base of indicators for assessing development in research and innovation. This would be a substantial step on the European path to becoming "the most competitive and most dynamic knowledge-based economic community in the world." This "Lisbon goal" should be reached by 2010.

A preliminary innovation index was published in September 2000 (European Commission 2000). In October 2001 the European Commission published the first complete European Innovation Scoreboard (EIS), for which data on 17 indicators in four areas were collected and processed.

The EIS aims to be comprehensive, isolating results, trends, strengths and weaknesses of the innovation accomplishments of the member countries, and has researched European coherence in the area of innovation. At the same time the comparative evaluation has culminated in a summary innovation index (Summary Innovation Index – SII), which summarises in numbers both the trends and the current status of the countries.

Since the 1990s we have seen a series of scoreboards and competitive rankings created, all of which try to fulfil the understandable need of comparison with other countries – how else can a country find its own strengths and weaknesses, which by definition are always relative to other countries? Despite this desire for comparable rankings, we must be careful not to use the indicators in a purely mechanistic way, disregarding economic and institutional conditions. This can lead to a warped perception and to false policy conclusions.

In the following evaluation, Austria's position will be analysed on the basis of the recently published EIS 2007. We will highlight the scope of possible political actions that would improve the country's overall ranking.

1.2.2 EIS 2007 Indicators

During the year the list of indicators was expanded and somewhat revised. The current EIS 2007 (Pro Inno Europe 2008) includes 25 individual indicators, categorised into five groups.

Innovation Input

- The innovation drivers are indicators that portray the structural conditions for the potential for innovation.
- The knowledge creation group includes indicators that describe both investments in human capital, and research and development activities.
- The innovation & entrepreneurship group attempts to record expenditures for innovations on the micro-level (companies).

Innovation Output

- The applications group measures the results of the innovative efforts using data on employment and real net output, with a focus on high tech orientation.
- The group of intellectual property rights records the directly measurable results of innovative efforts, such as patents or other forms of intellectual property protection (industrial designs, trademarks).

Table 1: Indicators of the European Innovation Scoreboard 2007

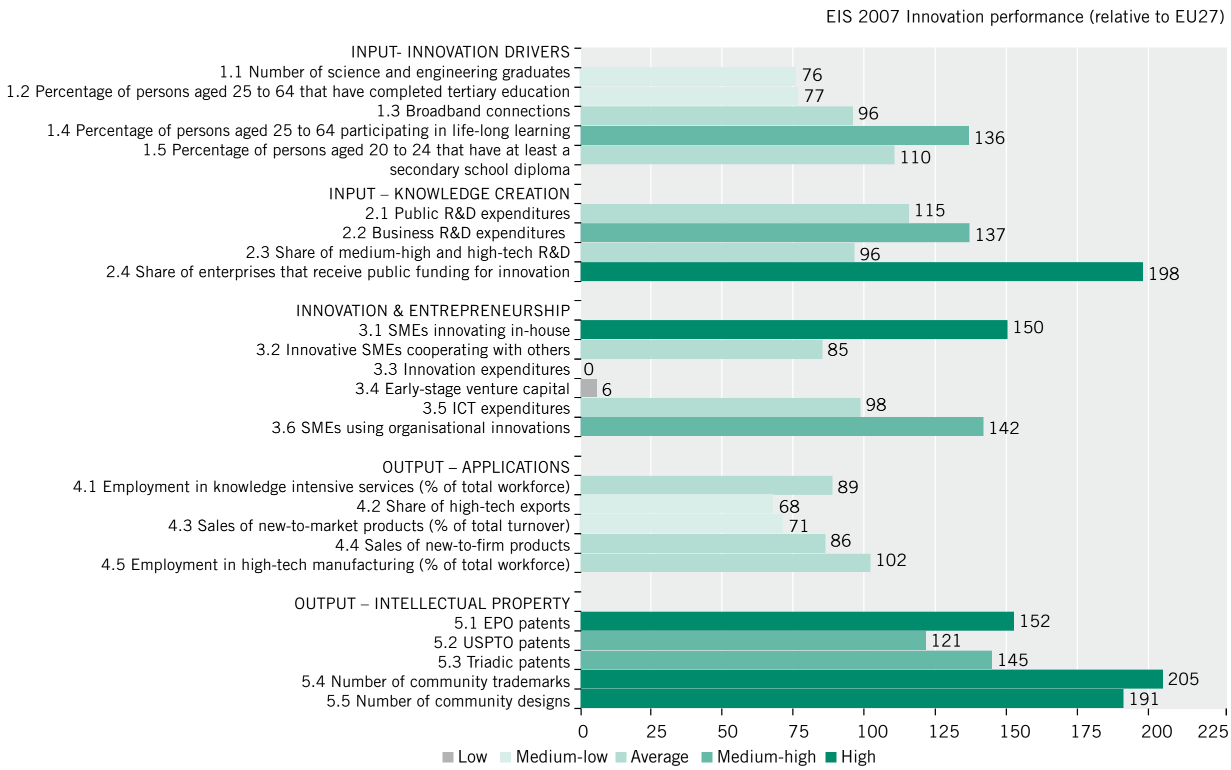
	Input – Source of innovation drivers	
1.1	Number of graduates in natural sciences and engineering per 1000 population aged 20 – 29	EUROSTAT
1.2	Share with tertiary education per 100 population aged 25 – 64	EUROSTAT, OECD
1.3	Broadband connections per 100 population	EUROSTAT, OECD
1.4	Percentage of 25 – 64 year aged participating in life-long learning	EUROSTAT
1.5	Percentage of 20 to 24 year aged that have at least secondary school diplomas	EUROSTAT
	Input – Knowledge creation	
2.1	Public R&D expenditures (% of GDP)	EUROSTAT, OECD
2.2	Business R&D expenditures (% of GDP)	EUROSTAT, OECD
2.3	Share of medium-high and high-tech R&D (% of total manufacturing R&D expenditures)	EUROSTAT, OECD
2.4	Share of enterprises that receive public funding	EUROSTAT (CIS4)
	Innovation and entrepreneurship	
3.1	Small and medium-sized enterprises innovating in-house (% of all SMEs)	EUROSTAT (CIS4)
3.2	Innovative SMEs cooperating with others (% of all SMEs)	EUROSTAT (CIS4)
3.3	Innovation expenditures (% of turnover)	EUROSTAT (CIS4)
3.4	Early stage venture capital (% of GDP)	EUROSTAT
3.5	ICT expenditures (% of GDP)	EUROSTAT, World Bank
3.6	SMEs using organisational innovations (% of all SMEs)	EUROSTAT (CIS4)
	Output – Applications	
4.1	Share of workforce employed in knowledge intensive services	EUROSTAT
4.2	Share of total export income that comes from high-tech products	EUROSTAT
4.3	Sales of new-to-market (% of total innovation turnover)	EUROSTAT (CIS4)
4.4	Sales of new-to-firm products (% of total innovation turnover)	EUROSTAT (CIS4)
4.5	Employment in medium-high/high-tech manufacturing (% of total workforce)	EUROSTAT, OECD
	Output – Intellectual property	
5.1	EPO patents per million population	EUROSTAT, OECD
5.2	USPTO patents per million population	EUROSTAT, OECD
5.3	Triadic patents per million population	EUROSTAT, OECD
5.4	Number of registered trademarks per million population	OIHM
5.5	Number of registered designs per million population	IHM

Note: OIHM – Office for Harmonization in the Internal Market (Trade and Designs): http://oami.eu.int/
Source: EIS 2007

1.2.3 Austria's relative position

Figure 4 shows Austria's (relative) position with respect to the individual indicators for the EU-27 (=100).

Figure 4. Austria's relative position with respect to the 25 individual indicators



Source: EIS 2007

Austria is exceptionally well positioned (50% and more above the EU-average) with regard to the following individual indicators:

The numbers for the indicators 5.4 *Number of community trademarks* and 5.5 *Number of community designs* are roughly double those of the EU average. Apparently, Austrian companies frequently seek to safeguard their innovations (internationally) by registering trademarks and designs. The barriers to entry (costs, expense/duration of the process) for this approach are significantly lower[2] than seeking EPO or USPTO patents, which may also be beneficial to the numerous innovations made by small and medium-sized enterprises (SMEs) in Austria. The brisk activity in this area is an indication that Austrian businesses are highly innovative, although these

2 Nonetheless, Austria is significantly above the EU average even for these indicators (see paragraphs below).

innovations do not necessarily demonstrate a high degree of technical novelty.

This is corroborated by Austria's similarly exceptional above-average position in relation to *3.1. Innovative SMEs*. These innovative activities often concern incremental innovations that nonetheless may be of great significance for the competitiveness of the businesses in question (for the purposes of a continuous improvement of their position in niche markets, etc.). This is very consistent with Austria's pre-eminent position with regard to the protection of intellectual property through trademarks and utility models.

Austria's position with regard to the percentage of public subsidies for business innovations, measured in *2.4 Companies receiving public funding*, is also clearly above average, although the question of international comparability arises with regard to this indicator. At the same time, the implications of this indicator are theoretically not clear. A large percentage of subsidised companies could also suggest innovative weakness (e.g. businesses only innovate when they receive public subsidies, possibly because they cannot obtain the funding necessary for this on the capital market).

Furthermore, Austria is still significantly (20% to 50%) above the EU average in the following indicators:

In all three indicators concerning *patent applications* (*5.1 EPO patents, 5.2. USPTO patents* and *5.3 Triadic patents*), Austria is 20 to 50% above the EU average. Austria thus has an entirely pre-eminent position within the EU with regard to the protection of intellectual property.

In each of the individual indicators for lifelong learning (*1.4. Percentage of 25-64-year-aged participating in life-long learning*, 2.2 *Business R&D expenditures* and *3.6 SMEs using organisational innovations*, Austria surpasses the EU average by more than one third. The good position of the indicator of business R&D spending is particularly worthy of note. This is not only a "hard" indicator determined in an internationally standardised manner (according to the OECD Frascati Manual) it is actually one of the central innovation indicators, showing the significant monetary expenditures businesses make for innovation processes.

On the other hand, Austria shows clearly below-average values for the following indicators:

Weaknesses are found in the area of tertiary education. Both with regard to *1.1 Number of graduates in natural sciences and engineering* (referring to the 20 to 29-year-aged) and *1.2 Percentage of persons with tertiary education* (percentage of the population between 25 and 64 years of age), Austria is clearly below the EU average. This deficit in the field of higher education is not new and has basically been known for a long time. Even if this is partially attributable to organisational differences between the educational systems of the various countries, the field of higher education continues to be a problem area for Austria.

3.4. *Early-stage venture capital*. The weakness of the Austrian venture capital market has been a topic of discussion for a long time due to the fact that Austria's financial system (like the one in Germany and a number of other continental European countries) is structurally characterised by the role of banks as providers of capital via credits and loans and the absence of suitable fund structures (cf. chapter 2.2).

1.2.4 The Summary Innovation Index

The comparative evaluation based on individual indicators is recorded in a *Summary Innovation Index* (SII). A country's degree of innovation is thus summarised in an overall index combined from 25 individual indicators. To that end, the individual indicators are first applied to the EU average and transformed into the value range 0-100 (the country that has the highest value for a specific individual indicator is given the value 100). After that, a (non-weighted) mean value of these relative values is formed for the five indicator groups; the mean values of the groups (also non-weighted) are combined into an overall mean value[3], the SII.

From a methodological-theoretical perspective, this approach can be subject to some reservations, the most significant ones being:

- the question of the weighting and
- the specific selection of the indicators

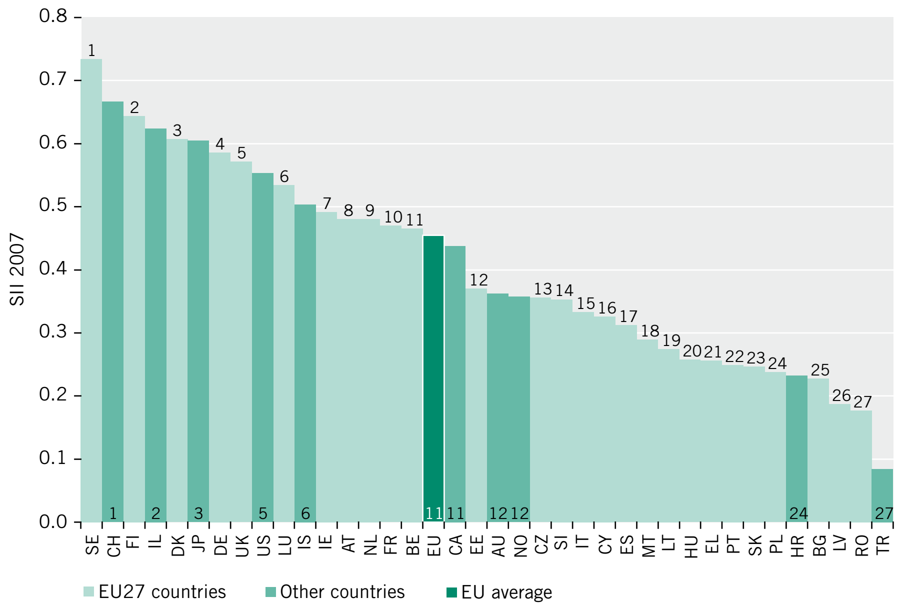
The second point represents a special problem, in particular the fact that some of the indicators are highly correlated and may possibly measure the same underlying "innovation variable" as is the case with the three patent indicators EPO, USPTO and triadic patents. However, if these three individual indicators in fact measure the same "latent" variable (such as "intellectual property warranting protection"), the equal weighting of all individual indicators in the SII means that this latent variable is significantly overrepresented in the overall index (because the three indicators refer to it). For details regarding these methodological reservations, see, for example Grupp and Mogee (2004), Schubert (2006) and Schibany et al. (2007b). However, these objections do not invalidate the SII per se; rather, they point out the limitations and traps that must be taken into account in interpreting the EIS.

The overall SII index shows an interesting, partially linear curve: The countries in the first seven places show a quite linear downward trend from Sweden at 0.73 to Luxembourg at 0.53 (these countries hold places one to six in the EU). The next countries (at a somewhat lower level) are clustered very closely together in EU rankings seven to 11: Ireland, Austria, Netherlands, France and Belgium (in that order) lie in a narrow range from 0.49 to 0.47, practically indistinguishable considering the uncertainties of the individual indicators as well as the reservations relating to the aggregation weightings[4]. The SII values of the following EU countries – after a definite jump in the direction of the previous group which essentially separates the EU15 from the EU27 (although Greece, Portugal and Spain are in this group) – exhibit a slightly positive trend, which ranges from the Czech Republic with an SII of 0.36 to Romania at 0.18.

3 Since each of the five indicator groups includes four to six individual indicators, this approach implies an equal weighting of all individual indicators.

4 The Summary Index (SII) is determined as a practically non-weighted mean value of the 25 individual indicators, an approach that is indeed entirely understandable (it is probably nearly impossible to derive a "meaningful" and "undisputed" weighting) but which can nonetheless cause some reservations (see, for example Grupp and Mogee 2004; Schubert 2006; Schibany et al. 2007)

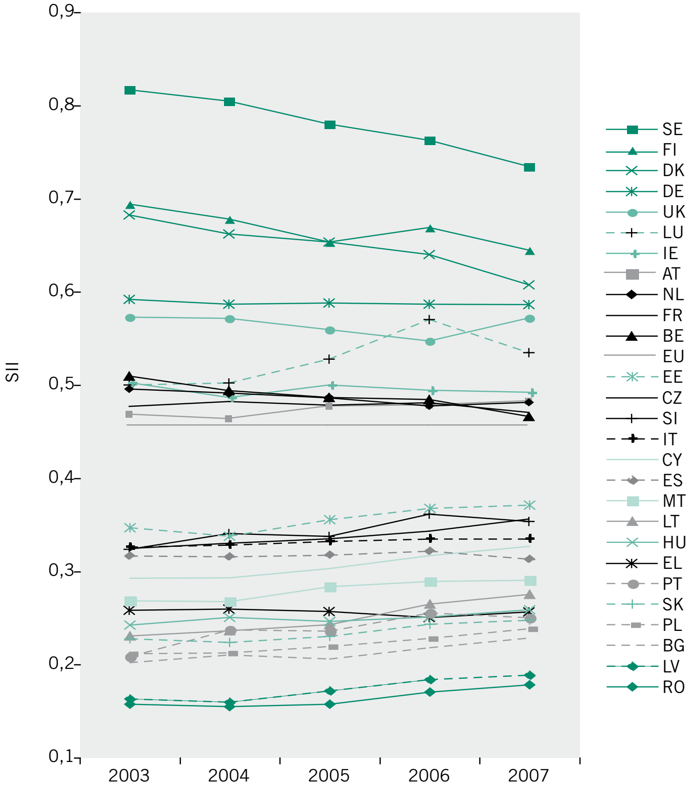
Figure 5: SII 2007, country values and rankings



Source: EIS 2007

Figure 6 below shows that the relative country positions in the SII remain quite stable over time. Changes of positions take place almost exclusively within the three groups referred to above (upper echelon with places one to six or seven, the following group at positions seven or eight to 11, and the two final groups primarily comprising the "new" member states). Especially within the group of innovation followers, which includes Austria, the numerical values of the SII are clustered very closely together. However, Austria's development over the last few years stands out: In the period 2003 – 2007, except for Luxembourg, Austria has exhibited the greatest improvement of the SII indicator within the EU15.

Figure 6: SII and ranking over time



Ranking over time	2003	2004	2005	2006	2007	DRang
SE	1	1	1	1	1	0
FI	2	2	2	2	2	0
DK	3	3	3	3	3	0
DE	4	4	4	4	4	0
UK	5	5	5	6	5	1
LU	8	6	6	5	6	3
IE	7	9	7	7	7	2
AT	11	11	11	11	8	3
NL	9	8	9	10	9	2
FR	10	10	10	9	10	1
BE	6	7	8	8	11	5
EE	12	13	12	12	12	1
CZ	14	14	14	14	13	1
SI	15	12	13	13	14	3
IT	13	15	15	15	15	2
CY	17	17	17	17	16	1
ES	16	16	16	16	17	1
MT	18	18	18	18	18	0
LT	21	22	21	19	19	3
HU	20	20	20	21	20	1
EL	19	19	19	22	21	3
PT	24	21	22	20	22	4
SK	22	23	23	23	23	1
PL	23	24	24	24	24	1
BG	25	25	25	25	25	0
LV	26	26	26	26	26	0
RO	27	27	27	27	27	0

Source: EIS 2007

Calculation of the rankings

As the table below shows, there are two ways to calculate the rankings, which occasionally lead to different results. Table 2 below shows a time series that sums up these different results:

Table 2: Austria's position in the SII, 2003 – 2007

	2003	2004	2005	2006	2007
"Official ranking" at the time of publication	10	10	5	9	8
Ranking based on EIS2007	11	11	11	11	8

The reason for this (apparent) discrepancy lies in the calculation of the two time series: The "ranking based on EIS 2007" is based on the currently available (2008) list of indicators, weighting method and database, whereas the "official ranking" is based on the indicator lists, weighting methods and available data in the respective years of publication. It is thus possible that the values of these two time series be different for a specific year when

1 the indicator list changes (as occurred between 2002 and 2003 and between 2004 and 2005),
2 the weighting method changes (the weight of each individual indicator changes with the number of indicators and the main groups; such changes were also effective between the years 2002 and 2003 as well as 2004 and 2005), or
3 the data availability changes.

The last point was the reason that other, older data was used for the official EIS2006 than was used for the value T-1 of EIS2007 (T-1 itself of course also corresponding to the year 2006).[5]

This last point also explains the apparent discrepancy between the fifth place in EIS 2005 and the 11th place results for the year T-2 in EIS2007. While neither the indicator list (with the exception of one indicator) nor the weighting method changed between 2005 and 2006, the data availability did. The seven CIS-based indicators, in particular, show significant differences. EIS2005 was thus determined on the basis of CISlight (2002); however, it was already possible to fall back on the CIS4 data (2004) for T-1 of EIS 2006 for the same year. A comparison of the CISlight values with the CIS4 numbers shows that the (more current) CIS4 values are (in part significantly) below those of CISlight in all indicators. This is the case for indicator 3.2, which declined from 13.2 (CISlight) to 7.7 (CIS4) and for indicator 4.4 (from 10.6 in CISlight to 5.4 in CIS4). This is implausible on this scale and implies a comparability problem which is intensified by the fact that CISlight presumably delivers very (too?) high indicator values for different reasons (cf. the more detailed comments in Schibany et al. (2007b)).

This means that the fifth place ranking for Austria in EIS2005 is probably an overstatement; the current eighth place in EIS2007 more likely reflects the actual situation. Compared to the 11th place of the previous year which results from the calculation of the SII value for T-1, even this shows an improvement. For the sake of completeness, however, it should be noted that this improvement must also be qualified. As Figure 6 shows, the innovation followers (i.e. the group following the upper echelon and which, in addition to Austria, also contains the Netherlands, France, Belgium and Ireland from the EU15 group) are clustered so tightly together that the fuzziness of the individual indicators and certain reservations in the weighting method make it impossible to derive an unambiguous ranking of these five countries. In other words, in the current EIS 2007, Austria lies in the range between places seven and 11 among the EU27 states. This group around Austria follows the upper echelon containing Sweden, Finland, Denmark and Germany in places one to four; countries such as Italy, Spain, Portugal and Greece (together in a group with the 12 "new" EU27 states) are significantly behind this second group.

5 It must be noted here that, to a considerable degree, these comments reflect an interpretation by the authors of the study (Schibany et al. 2007). In the official documents relating to the EIS, there was no clear description of the approach used to calculate the values at point of time T-i.

1.2.5 Summary

Most of the indicators in the EIS reflect structural circumstances that are subject to slow and gradual change including both the indicators relevant to education and to economic structure. These indicators can hardly be improved substantially in the short term. Only two of the total 25 indicators can be influenced directly (and relatively rapidly) by policy: *2.1 Public R&D expenditures* and *2.4 Proportion of companies receiving public funding.* In the last two years, Austria has experienced strong growth in both these indicators and in the meantime has clearly exceeded the EU average. For the most part, the other indicators are the result of long-term development structures that can indeed be influenced by incentive systems but are not subject to direct intervention.

Based on the Summary Innovation Index (SII), the countries show a rather flat curve with a trend to the mean: Countries with above-average SII values tend to exhibit a slight downwards inclination while countries with low SII values show a slight rising trend. For the ranking, this means that there are only moderate changes in the placements. They appear almost exclusively within country groups with very similar SII values.

Taking the methodical reservations into account, we can draw the following conclusions for Austria:

- In the SII ranking, Austria is in 8th place EU-wide and has thus improved compared to the previous year by one place. Together with Luxembourg, Ireland, France, Belgium and the Netherlands, it is in the group of innovation followers. The group of innovation leaders contains Denmark, Finland, Germany, Sweden and the UK.
- In the group of the EU15 countries, Austria (except for Luxembourg) has shown the greatest momentum with a clear upward trend since 2003.
- Irrespective of its current placement, the Austrian position can be seen as stable with an upward trend. Due to the hardly distinguishable differences between the countries within the group, the ultimate positioning involves a certain degree of statistical uncertainty.

1.3 New Instruments in Austrian Research and Technology Policy

1.3.1 Innovation Voucher

The Innovation Voucher is a voucher for small- and medium-sized enterprises (SMEs) that can be redeemed for consulting services at research institutions. The prerequisite is that there cannot have been any research cooperation between the partners in recent years. The fundamental idea of the Innovation Voucher is that, in order to facilitate the entrance of SMEs in continuous research and innovation activities, anxieties concerning market entry must be relieved and cooperative ability and readiness between SMEs and scientific research institutions must be increased, thereby increasing the number of SMEs conducting research in the intermediate term.

The development of the programme was entrusted to the FFG by the Federal Ministry for Transport, Innovation and Technology (BMVIT) and the Federal Ministry for Economics and Labour (BMWA). Application for and clearance of the Innovation Voucher should proceed quickly and without any bureaucratic red tape. The Innovation Voucher is especially attractive for smaller companies, thanks to its more limited scope of services when compared with other programmes. In the first year, a grant in the amount of € 5 million was provided to be distributed in 1,000 cheques. Because of the great interest in the Innovation Vouchers, both the BMVIT and the BMWA have allocated an additional € 3 million to the programme.

Along with Ireland, Austria is one of the first countries in Europe to introduce a model based on Holland's "innovation vouchers" to promote cooperation between SMEs and research institutions. The Dutch model was tried out in two pilot programmes before 2006, and both programmes received extremely positive reviews. The evaluations showed that the innovation vouchers established additional research cooperation between SMEs and scientific research institutions (Cornet et al. 2006). The Austrian model is very similar to the Dutch model.

1.3.2 Climate and Energy Funds

In July 2007, the Austrian federal government created a climate-specific research programme called the Climate and Energy Fund. The foundation for this was laid by Climate and Energy Funds Act (KLI.EN Fund Act, Federal Law Gazette I no. 40/2007).

The goals of this fund are to establish a sustainable energy supply, reduce greenhouse gas emissions and promote research within this area. The funds are meant to promote research projects on sustainable energy technologies and climate research, projects for public local and regional transportation, environmentally friendly transportation of goods, mobility management, and to provide financial support during the market launch and penetration of climate-related sustainable energy technologies.

A subsidy volume of € 45 million was disbursed through the Climate and Energy Fund in 2007. Of that amount, € 15.4 million flowed into research and development in the area of sustainable energy technologies and climate research. In the first call 2007, a total of 69 R&D projects were financed. € 155 million are available for 2008. For the period of time from 2007 to 2010, the funds have been endowed with € 500 million.

1.3.3 Austrian Research Dialogue

Austria has a high-performance scientific research system that has undergone dynamic changes in recent years. Reforms in the tertiary education sector and in the area of research grant programmes have created dynamism and flexibility from an institutional perspective. Thanks to heavy investment in recent years, Austria's research rate has secured the country a ranking among the top of the European centre field. In order to reach the upper echelon of Europe's knowledge societies by 2020, the scientific research system's potential must be further exploited. Strategic considerations must be evaluated and brought into dialogue with fresh ideas. During the Alpbacher technology talks in August 2007, Austria's future in the context of European research and in global competition formed the point of departure for Federal Minister Hahn's invitation to a year of intensive discourse about the future strategic themes for Austrian knowledge policy until 2020. Students and researchers at universities, research institutes and universities of applied sciences, businesses and individuals interested in research, are all invited to collect and discuss ideas for Alpbach 2008, thereby participating in the Austrian Research Dialogue and helping to determine the course of strategic research policy into the next decade.

The Austrian Research Dialogue is highly respected as an example of good governance. Supported by the entire federal government under the leadership of the Federal Ministry of Science and Research (BMWF), a broad coalition of institutions and groups is being brought together, from university conferences, councils and agencies to interest groups and Parliament. In order to promote the idea collection process throughout all of Austria, the Austrian Research Dialogue is taking place in forums and informal meetings in every province. To ensure that everyone can participate, there are Joint Venture events with interested institutions and an online forum at www.forschungsdialog.at. The thematic fields covered under this programme are quite varied, from Austria's attractiveness as a location for research and cooperation between businesses and researchers, to the future of universities, including searches for qualified women and men in science, research and technology. Specific considerations discussed at Austrian Research Dialogue events in spring 2008 have addressed the central role of frontier research for the future of the innovation system, universities as competitive locations for research and knowledge centres, and mobility and career paths for men and women in research.

2 Innovation in the Business Sector

2.1 Austria's technological specialisation

A country's technological specialisation is a significant goal of political and technological action. In many countries political and technological measures aim to increase the share of intensive high-technology research sectors in the economy, in the hopes that these sectors will bring especially positive impulses for the development of productivity and growth (Falk und Unterlass 2006). Companies and countries which are very successful in individual technologies can also become the victim of their own success when an old technology is supplanted by a new one. If the specialisation is high in the old technology, it is often difficult to adapt to technological change. That means that a high degree of specialisation is partly bought with loss of the capability to absorb new technological developments (Weber et al. 2004).

Patent statistics are used to measure the technological specialisation of companies, regions and states. They offer various advantages (Griliches 1990): Firstly patents directly register technologies. Patent documents use a uniform, very detailed classification pattern and cover a variety of technologies. There are several years of patent statistics, enabling us to make time comparisons. This allows us, for example, to estimate speed of technological change in the individual technology fields.

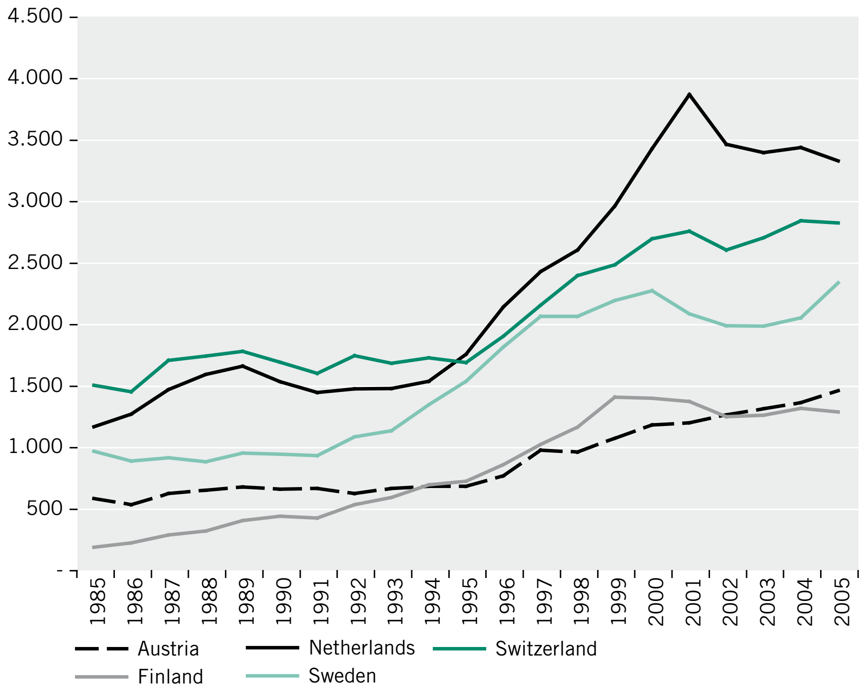
However, there are some limitations to the use of patent statistics. For example, patenting tendency varies from sector to sector or technology field, meaning not all (basically patentable) inventions are registered for patent. Furthermore, patents are often used to keep a certain technology away from the competition, to protect the original technological development (Cohen et al. 2000). Studies have also shown that the economic benefit of patents is subject to extreme fluctuation due to the insecurities which are connected with technological development and that a large number of patents are regarded by those registering them as more or less valueless (Scherer und Harhoff 2000).

For the following analysis, this report uses data from the European Patent Office. Patents have been allotted here to the inventor's country and not to the owner's. This means that, for example, inventions of foreign companies in Austria are regarded as domestic inventions. Domestic and foreign companies can be found in the data amongst those registering patents as well as persons, foundations and universities. The latter form only a very small part of the patent registrations, however.

2.1.1 Austria's patent specialisation over time

The development of patent activities in Austria (see Figure 7) shows a great increase in the number of patent inventions from the middle of the 1990s. *While during the period from 1988 to 1995 the number of patent inventions per year stagnated at about 700, in the next ten years there followed a relatively even increase to probably just under*[6] *1500 patent inventions in 2005.*

Figure 7: Number of patented inventions of various small European countries, 1985 – 2005 EPO



Source: European Patent Office, prepared by the OECD, tip calculations

An increasing number of patent inventions can also be observed in other small European states (Finland, the Netherlands, Sweden and Switzerland). In contrast to these states however, Austria was able to escape from the drop in invention activities around the year 2000. This allowed Austria to make up for its comparatively low growth rate during the nineties and puts it just in front of Finland for annual patent inventions in 2005.

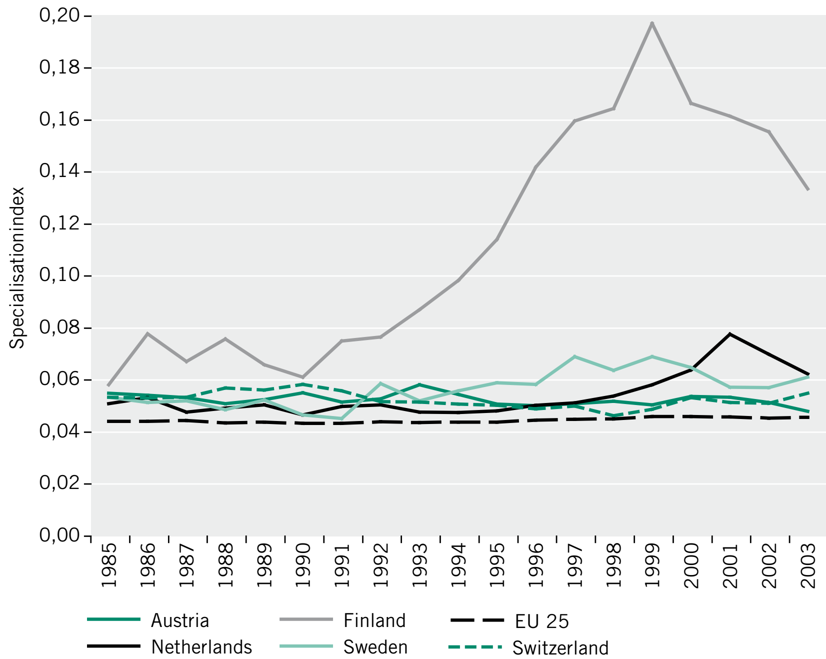
The reason that Austria showed a different development pattern here is because it was less specialised in the information and communication technologies area (ICT), which protected it from the "new economy" crisis. In Austria in 2000 patent inventions in this area constituted just 18.37% of the total patent activity; in comparison, the share of ICT in the whole European Union (EU) amounted to 29.51%. In the four countries mentioned above, the share of ICT in the total patents is partially noticeably higher, in particular in Finland (56.91%) and in the Netherlands (46.83%). This distinctive specialisation of the Finnish and Dutch economies was responsible both for the strong increase in patent inventions annually in the second half of the nineties and for the strongest decline in the two countries shortly after the turn of the millennium. In contrast to this, Austria was able to increase its total number of patent inventions in each individual year. Earlier editions of the Research and Technology Report critically discussed Austria's low level of specialisation in international comparison. New figures show that little has changed in this situation in spite of increasing specialisation in the important area of ICT[7]. Austria is, on the whole, less specialised than countries of a comparable size. Figure 8 shows the degree of specialisation[8] for various small European countries for the years 1985 – 2003. A value of one indicates that all patent inventions are attributable to one single technology field. The lower the index, the lower the level of specialisation.

6 The issuance of a patent involves many examinations and objection periods making a waiting period of three to five years between submission and issuance is not unusual. For this reason, the OECD regularly estimates the number of patents expected to be issued in one year based on how many patent applications were submitted.

7 However, the ICT sector is one of those areas in which protective mechanisms other than patents are often applied, to avoid the long classification times.

8 The indicator is based on the shares of the individual technology fields in the total number or patents. A concentration (the Herfindahl-Hirschman index) was used to determine it, whereby the index value corresponds to the total of the quadrates of the shares of the individual technology fields in all patent inventions. In accordance with this, a value of one would mean that all patent inventions are for only one single technology while the smallest possible value of 0.0333 would mean that in all 30 technologies there are exactly the same number of patent inventions.

Figure 8: Degree of specialisation of various small European countries, 1985 – 2003, EPO



Source: European Patent Office, prepared by the OECD, tip calculations

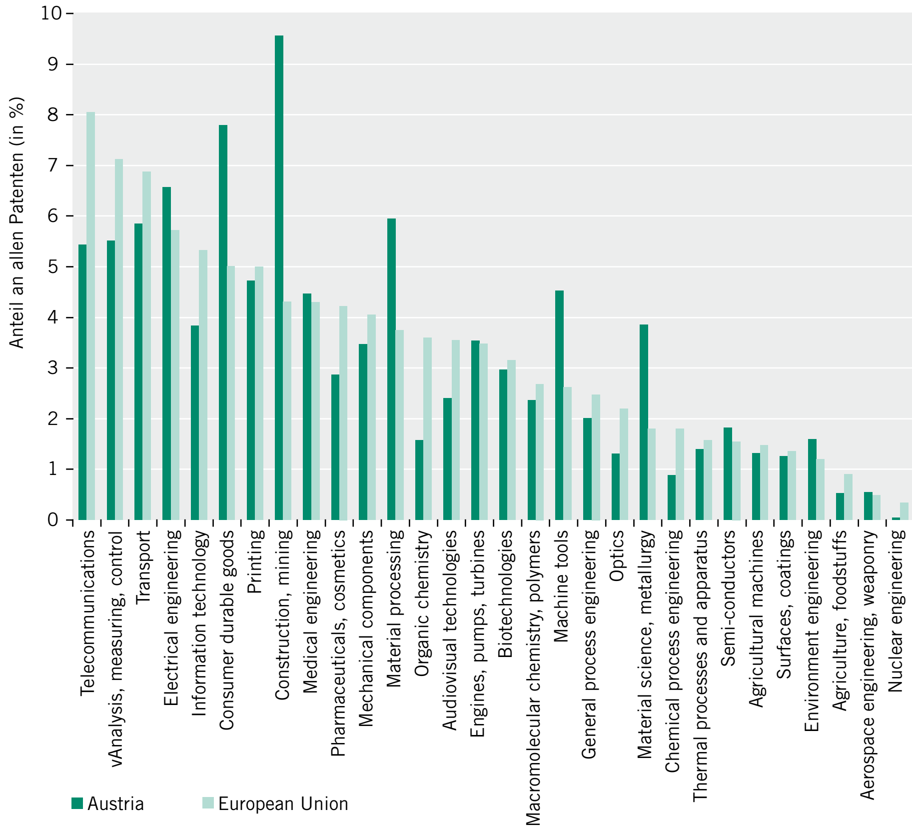
Austria, similar to Switzerland, shows a constant and low degree of specialisation over the complete period. In contrast to this, the Netherlands, Sweden and, in particular, Finland are clearly more strongly specialised in individual technologies. As mentioned in the introduction, this could result in Austria losing growth advantages. As the example of development in the ICT area since 2000 shows, the country is, however, also less exposed to external shocks.

2.1.2 Austria's position in individual technology fields

In spite of the generally lower degree of specialisation, there are some technology fields in the Austrian economy in which the country is specialised to a higher degree than the overall EU figure. In such cases we speak of Austria's "strengths". Figure 9 provides an overview of these strengths. The figure compares the share of thirty technology fields in total patent inventions in Austria and in the EU.

The technology field with the greatest proportionate significance in Austria is "construction, mining" to which just under 10% of all Austria's patents can be apportioned. In second place is the technology field "consumer durable goods" (with a portion of just under 8%) followed by "electrical engineering" (6% portion).

Figure 9: Austria's technology profile compared with the EU (shares of the technology fields, average for the years 2001 – 2003)



Source: European Patent Office, prepared by the OECD, tip calculations

This ranking differs greatly from that of the European Union where the technology fields "telecommunications", "analysis, measuring, control" and "transport" top the list. In addition, there are some technology fields such as "material processing", "machine tools" and "material sciences, metallurgy", that are significant for Austria but which play a far smaller role in the international technology profile. Figure 9 mainly confirms the known findings that some traditional technologies have a high share in the total Austrian patent output.

Austria's technological specialisation is a function of the specific industrial alignment of Austrian companies which in turn is based on quite specific development paths (Schibany et al. 2007a). Of particular interest in this regard is the temporal stability of this specialisation and to what extent we must establish either a structural shift towards new patterns of specialisation or an adherence to the development paths that are already being followed. Figure 8 showed that nothing has changed in the low degree of Austria's specialisation on a *general* level. The question is, have there been changes on the level of *individual* technology fields?

The so-called RCA indices are customarily calculated to answer this question. The RCA index ("revealed comparative advantage") measures the relative specialisation of a country against a group of comparative countries (in our case, the EU) in a certain field of technology. The patent registrations at the European Patent Office (EPO) are taken as the empirical basis for the calculation. Formally, the RCA index is defined as follows:

$$RCA_i = \frac{\frac{P_{ij}}{\sum_j P_{ij}}}{\frac{\sum_i Pij}{\sum_i \sum_j P_{ij}}}$$

whereby:

P = the number of patents issued at the EPO
i = the country
j = the technology field

An RCA value > 1 means that a country is over-proportionally specialised in the technology field concerned. We then speak of a strength in Austria. If the RCA value < 1, there is a weakness.

In Figure 10, Austria's RCA values for the periods 1991 – 1993 and 2001 – 2003 are compared to one another graphically (in each case the averages for the years concerned) whereby the individual sizes of the circles characterise the absolute significance (number of Austrian patent inventions) of the R&D fields in the period 2001 – 2003. If the RCA values of the period 2001 – 2003 corresponded exactly to those of the period 1991 – 1993, all circles would lie on the 45 degree line. This would mean that Austria would have had no structural change relative (!) to any other country[9]. In actual fact, the circles are dispersed around the 45 degree line whereby the correlation co-efficient is, at 0.79, high. Nevertheless the dispersal around the 45 degree line indicates a technological structure change in Austria (relative to all the other countries) of various strengths – depending on the technology field – and in various directions.

The following classification is helpful for interpreting Figure 10:

- An RCA value of more than one in an R&D field states that the technological field has above-average representation in Austria, on the other hand, an RCA value of less than one a below-average representation.
- The situation of the R&D fields above or below the 45 degree line states whether Austria's specialisation has become stronger or weaker relative to all other countries in the period of observation.

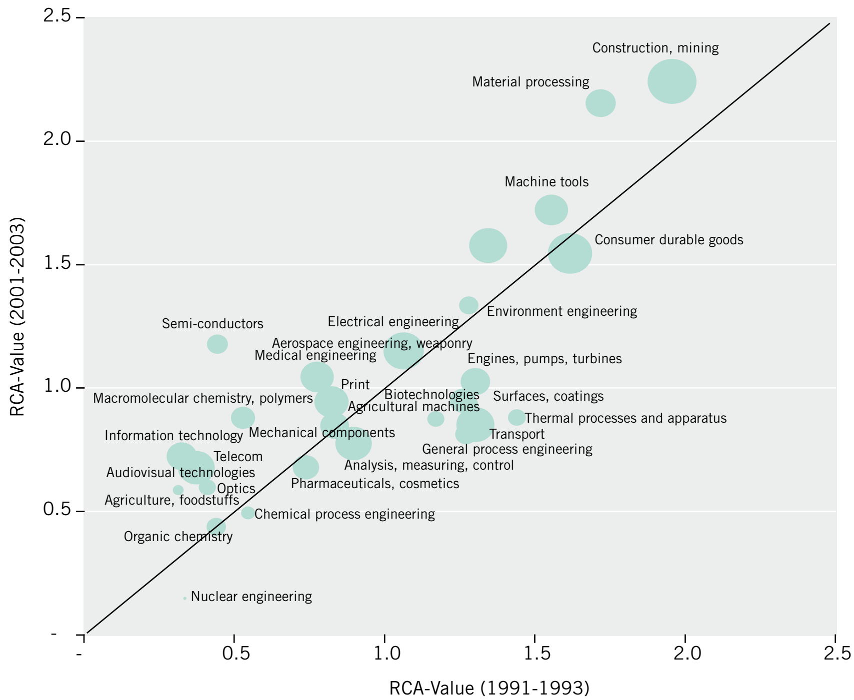
For example, the position of the technology field "construction, mining" means that, on the annual average 1991 – 1993, Austria showed a share of patents in this technology field which was almost double as high as the comparable value on the level of the European Union (RCA value close to 2). On the annual average from 2001 – 2003, an RCA value of 2.34 can now be observed for this technology field, an indication that Austria has further expanded the above-average specialisation which already existed in this technological field at the beginning of the nineties.

The technology fields can be classified in five groups in accordance with their development:

9 By calculating the RCA value in this way the structural change of all countries is basically used as a benchmark. The movement in Austria's specialisation model is thus compared with that of all countries taken together.

- Technology fields in which Austria was able to *expand its strengths*: In three technology fields, "construction, mining", "material sciences, metallurgy" and "machine tools", Austria shows even stronger specialisation than in the comparative period at the end of the eighties.
- Technology fields which show *weaknesses in both periods*: In four technology fields ("information technology", "telecommunications", "audiovisual technologies" and "optics") Austria was able to gain ground over the EU while it continued to lose ground only in one field, that of "nuclear technology". In three further technology fields ("pharmaceuticals, cosmetics", "chemical process technology" and "organic chemistry"), there was little change.
- Technology fields in which Austria significantly *reduced its strengths*: These include "consumer durable goods", "environmental technology" and "space technology, arms" where the decline was very clear.
- Technology fields in which Austria *significantly reduced its weaknesses*: The two most marked improvements can be observed on the one hand in "material processing" (a slight weakness became a clear strength) and "semi-conductors" (the technology field with the lowest RCA value became a slight strength). There were also smaller increases in "electrical engineering" and "printing".
- Technology fields in which Austria's *strengths changed into weaknesses*: In two cases, "engines, pumps, turbines" and "surfaces, coatings", this applies to technologies in which Austria was still clearly specialised in the eighties and that show an RCA value of around one for the 2001 to 2003 period. The clearest decline of specialisation can be observed in "agriculture, foodstuffs".
- In six technology fields ("analysis, measuring, controls", "medical engineering", "macromolecular chemistry, polymers", "biotechnologies", "mechanical components", "transport"), Austria shows RCA values of around one both in 2001-2003 and already from 1986-1988 , which means it has *neither a particular specialisation nor a distinctive weakness in these fields*.

Figure 10: Austria's degree of specialisation: Austria's RCA indexes in time comparison (annual average values of the period 1991 – 1993 compared with 2001 – 20039



Source: European Patent Office, prepared by the OECD, tip calculations

Figure 10 shows improvements in the RCA values in a few technology fields that can be classified as "high technology". This is an indication of a structural shift towards these technologies. This development can be particularly clearly observed in the technology field "semi-conductors". On the whole, Austria's technological specialisation model can be characterised as quite stable for the period 1990/93 to 2000/03 as the high correlation coefficient of 0.79 between the two specialisation profiles shows. Austria's relative specialisation model is constant compared with the rest of the EU throughout the period. This is not necessarily a sign of a lack of desire to change; specialisation always has to be seen relative to the comparative group. The result also means that the structural change is taking place at the same speed in Austria and in the EU.

The Austrian position is notable however, because of the large number of technologies in Austria that have RCA values close to one. That means that Austria is specialised in most technologies similarly to the EU25 and shows neither strengths nor weaknesses.

2.1.3 Summary

The analysis confirms a known finding: Compared with other European countries, Austria is significantly less specialised in individual technology fields than other smaller economies. It cannot be said ad hoc whether this is an advantage or disadvantage; countries which are strongly specialised in certain technologies pay for growth advantages resulting from this with a loss of flexibility and breadth of technological competence.

Austria's technological profile has been remarkably stable over the last 20 years. In view of the long time span, most changes in specialisation are rather minimal. Strengths exist in the fields "construction, mining", "material sciences, metallurgy" and "machine tools", while "telecommunications", "analysis, measuring, control" and "organic chemistry" represent weaknesses. Austria shows the clearest improvements in the areas of "semiconductors" and "material processing".

2.2 The effect of private equity and venture capital on companies' innovation and growth

2.2.1 Introduction

The founding, expansion or restructuring of a company requires capital, which especially the smaller, younger and innovative companies are often unable to cover with traditional financing sources. When projects with a good profit outlook can't be realised due to a lack of financing, the entire economy looses out because of the "market failure".
Institutional risk capital helps to reduce these "financing gaps". Information problems can be reduced by means of a careful inspection (due diligence) and selection of the projects as well as the ongoing monitoring and support of the companies by the specialised management at the investment companies, . This makes it possible to use private funds to profitably finance some of the business sectors that are affected by the traditional "market failure".

In this way, well-developed markets for risk capital have become an integral part of modern and highly efficient innovation systems.

To distinguish them from the public trading at stock exchanges, equity or equity-like financing by companies that are not listed are referred to as *private equity* (Jud 2003; EVCA 2007). Here the term *venture capital* is restricted to over-the-counter equity capital that is used during the early founding and growth stages of a company and usually refers to a minority holding (Grabherr 2003). But at the same time, private equity is also used for restructurings and changes of ownership in more mature companies.

Private equity and venture capital (PE/VC) are distinguished from other forms of equity by two characteristics in particular (Peneder and Wieser 2002). Firstly, these holdings have a limited duration. Secondly, there are typically no payouts expected during the period of the participation. Because the yield for the investor depends on the value increase realised during the sale, the money earned is usually immediately reinvested in the company.

The aggregate economic significance of the PE/VC investment markets is based on three typical functions (Peneder 2006):

1. The special *financing function* is based on the development of new businesses in the PE/VC markets, which generally do not have (sufficient) alternative financing available from traditional capital sources. These financing gaps are usually a result of the unequal distribution of information between investors and capital-seeking companies concerning, for example, the quality of the project or the (risk) behaviour of the company owners. PE/VC investment companies can reduce such information

asymmetries through their specialisation and active involvement in the company.
2. The *selection function* refers to the assignment of financing to projects with the best profitability outlook. This function applies to all capital markets but in the PE/VC markets it involves increased uncertainty about the profit potential and project risk.
3. Additionally, PE/VC companies offer an *value added function* when they bring not only capital but also, for example, management experience, important contacts or a professional business model to the company in their role as active investors.

The additional cost for the evaluation of the projects during the *selection* as well as the monitoring and support of the companies in the course of the value added function increases the financing costs for the company seeking capital. Therefore PE/VC is usually only requested by companies that do not have enough other sources of capital at their disposal in the sense of the first financing function mentioned above.

Considering these factors, we can see that venture capital simply must have a place on every international scoreboard and in every benchmarking or economic policy-oriented strategy document about innovation and the ability to compete. But because of the complex functionality of the risk capital markets, there is also the danger of *creating a myth*, in which exaggerated expectations and the resulting contradictions and disappointments in the implementation of economic policy measures confront each other. Therefore Peneder and Schwarz (2007) conducted an investigation commissioned by the Federal Ministry for Economics and Labour (BMWA) and the Austrian Federal Economic Chamber (WKÖ) to determine which functions of PE/VC financing can be empirically substantiated based on their concrete effects on the development of the companies in question.

2.2.2 Data and methods

The methodological requirement for measuring the effect of PE/VC on the companies in question is the formation of a control group for comparable observations that should ideally only differ from the test group in the investment status of its PE/VC financing. With the aid of statistical matching procedures (propensity, score models), Peneder and Schwarz (2007) selected companies for the control group that are as similar as possible to the test group in terms of legal structure, applicable industry, regional assignment, size, age, credit rating and (if available) the selected key financial indicators.

The test group of companies with PE/VC investments was selected in cooperation with Austrian Private Equity and Venture Capital Organisation (AVCO). The control group of "twin companies" without PE/VC investments that were as similar as possible was determined with the support of the credit rating agency 1870. In the company survey conducted afterwards by the Austrian Institute of Economic Research (WIFO) in 2006, a total of 829 companies were contacted. With an overall response rate of 29%, the authors received 84 answers from companies with PE/VC financing and 154 answers from companies without PE/VC. Thanks to the support by AVCO, a very high response rate of 51% was achieved for the test group (compared with 23% in the control group).

In the sampling, the "median" company

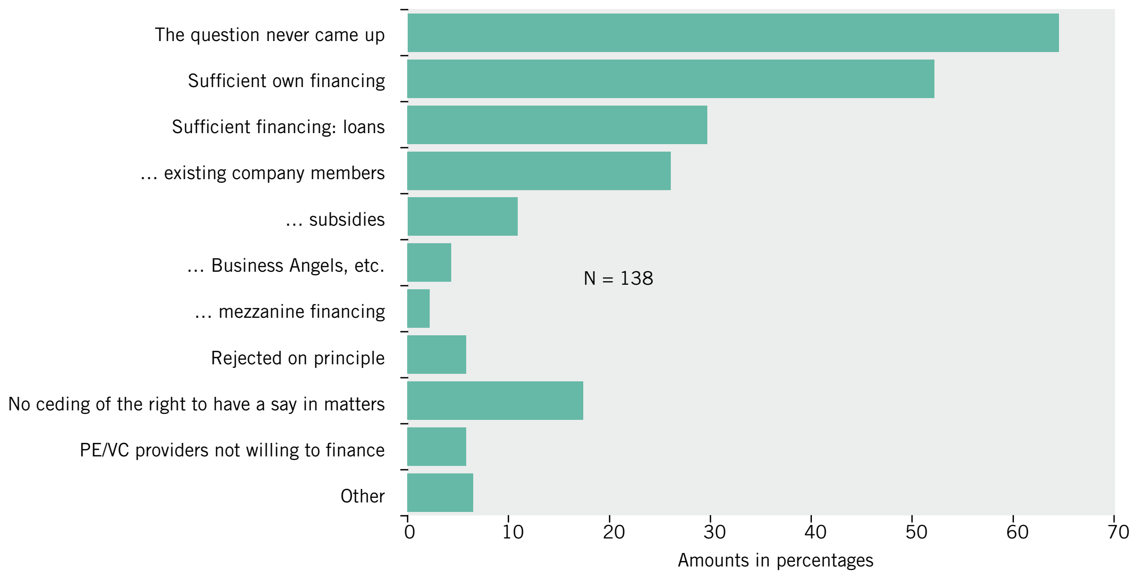
with a PE/VC investment is six years old and has 20 employees. With 49% of all responses, the industry distribution of the PE/VC financing is primarily concentrated on company-oriented, knowledge-intensive services. Within the manufacturing sector, mechanical engineering constitutes the largest group with a 10% share. The rest is distributed among different industries of material goods production, trade and other services.

2.2.3 Empirical results

The goal of the survey was to empirically verify the impacts of the PE/VC investment on company development. The significance of the particular *financing function* is confirmed by the subjective assessment of the companies in the context of three qualitative questions:

In response to the question why the companies in the control group did not utilise PE/VC financing, more than 52% refer to sufficient own financing, 27% to enough credit and 26% to adequate financing by the existing company members (Figure 11). Only 17% state that their motivation lies in not wanting to grant a right of co-determination. Less than six per cent say they reject PE/VC on principle.

Figure 11: Why didn't your company take advantage of PE/VC?



NB: This question was only directed at companies that do not have any PE/VC investors.
Source: Peneder and Schwarz (2007).

64% of the companies with PE/VC investments state that their motivation is that the financing by other sources was either not possible, not sufficient or not attractive enough. Of those, for example, credit financing was not a possible alternative for almost 50% of the companies and for another 40% it was not sufficient (Table 3).

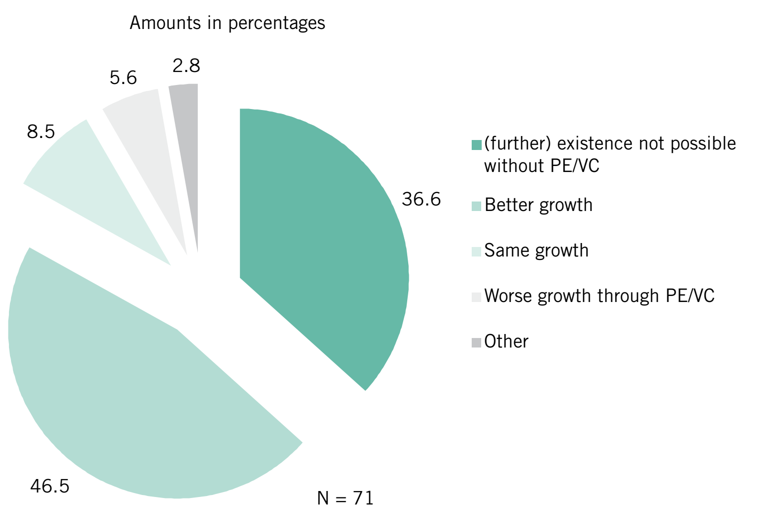
Table 3: Reasons to choose PE/VC over other forms of financing

	not...			Number
	possible	sufficient	attractive	
	Share in %			
IPO	92.3	2.6	5.1	39
Bond issue	86.5	2.7	10.8	37
Profit securities	70.6	11.8	17.6	34
Loan	46.7	40.0	13.3	45
Strategic providers of capital	35.3	17.6	47.1	34
providers of capital	27.0	64.9	8.1	37
Mezzanine financing	25.8	45.2	29.0	31
Business Angels etc.	25.0	34.4	40.6	32
Subsidies	16.2	83.8	-	37

NB: This question was only directed at companies that have PE/VC investors.
Source: Peneder and Schwarz (2007).

37% of the companies with PE/VC investments even state that the (continued) existence of the company would not have been possible without this financing. Another 47% refer to a "better development of the company through PE/VC". These values mostly coincide with the results of other European studies with the same questions (Figure 12).

Figure 12: What is the effect of the PE/VC financing on the growth of your company (in %)?

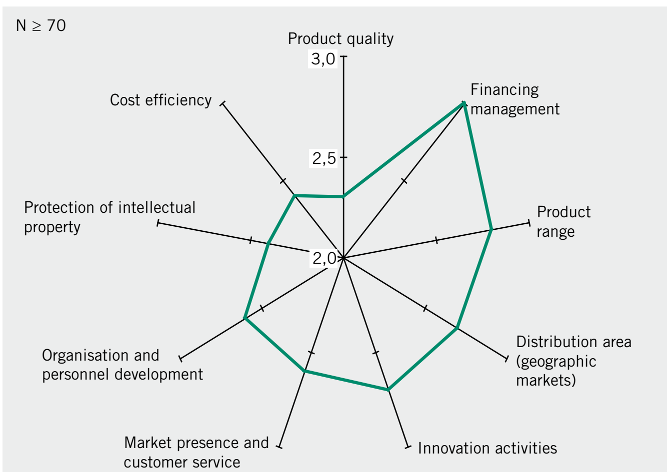


NB: This question was only directed at companies that have PE/VC investors.
Source: Peneder and Schwarz (2007).

The subjective assessment provided in answer to these qualitative questions also provides concrete references to the value added function of PE/VC investment. In addition to improving financing management, the value added is reflected above all in a professional and very growth-oriented business model:

- 61% of the answers refer to the "PE/VC providers as competent partners for the continued development of the company" as a motive for taking up PE/VC.
- In response to the question of what has changed in the company as a result of the PE/VC financing, financing management is listed in first place, followed by two traditional growth strategies: the expansion of the product range and expansion of the geographical distribution area (Figure 13).
- In addition, PE/VC-financed companies also consider "actively managed cooperation with customers, suppliers, research facilities, etc." and investments in marketing and advertising to be more important than the control group does.

Figure 13: What changed in your company as a result of the PE/VC financing?



NB: This question was only directed at companies that have PE/VC investors.
0.. the situation got much worse 1.. the situation got worse 2.. the situation stayed the same
3.. the situation got better 4.. the situation got much better

Source: Peneder and Schwarz (2007).

Following the subjective evaluations in the qualitative response categories, a *quantitative impact analysis* of key company indicators is done. This part tries to answer following questions:

1 Do companies with PE/VC investments show better performance in terms of innovation, exports or growth than companies without PE/VC?
2 If so, is this the case because PE/VC providers invest in particularly innovative, export-oriented and growth-capable companies (= selection function) or because the PE/VC investment itself makes the companies more productive (= value added function)?

In response to the first question, the results in all three dimensions confirm clear differences between the test group and the control group. Companies with PE/VC investments not only grow more quickly but increasingly name the EU or economic regions outside of the EU as their primary distribution markets. In addition, they carry out more product and process innovations (Figure 14) and register more industrial property rights for them (Figure 15). They also more frequently report that they introduced new management technologies, organisational structures or marketing strategies.

The second question goes beyond the observation of significant differences between the two groups of companies and, in a second step of the statistical matching procedure, tests which of these are based on general selection effects and which on the causal value added effect of the PE/VC financing. The second matching step was used because the survey showed that both groups of companies differed not only in the dependent result variables but also in a series of explanatory structural variables. Possible causes of the general selection effects are, in particular, when a company introduces its own product innovations on the market and its geographic determination of the main distribution markets. The authors control these additional factors when they select the companies in order to determine the causal value added of the PE/VC financing more narrowly and precisely.

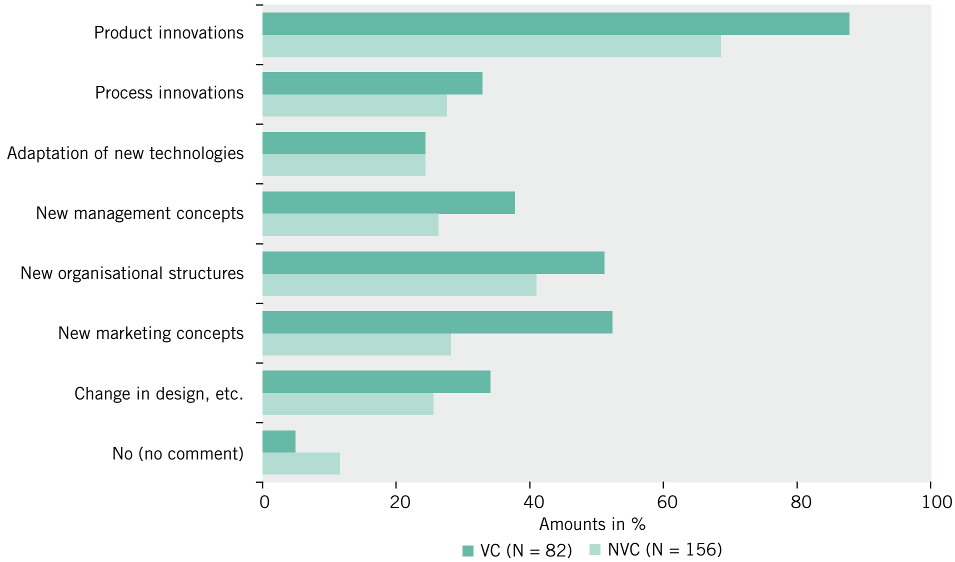
Here the two-level matching procedure leads to two remarkable results.

For one, it identifies the originally observed differences in the share of product innovations in the sales revenues or the average export growth as being general selection effects and not a causal value added of the PE/VC financing. On the other hand, however, the same method shows a lastingly positive growth advantage of the companies with PE/VC financing in terms of turnover and employment. Peneder and Schwarz (2007) draw the following two pivotal conclusions from this:

- PE/VC investments do not generally make the companies more innovative or export-oriented but are provided primarily to companies that are already highly innovative and export-oriented. In terms of innovation and export performance, the positive selection function of PE/VC financing therefore clearly dominates.

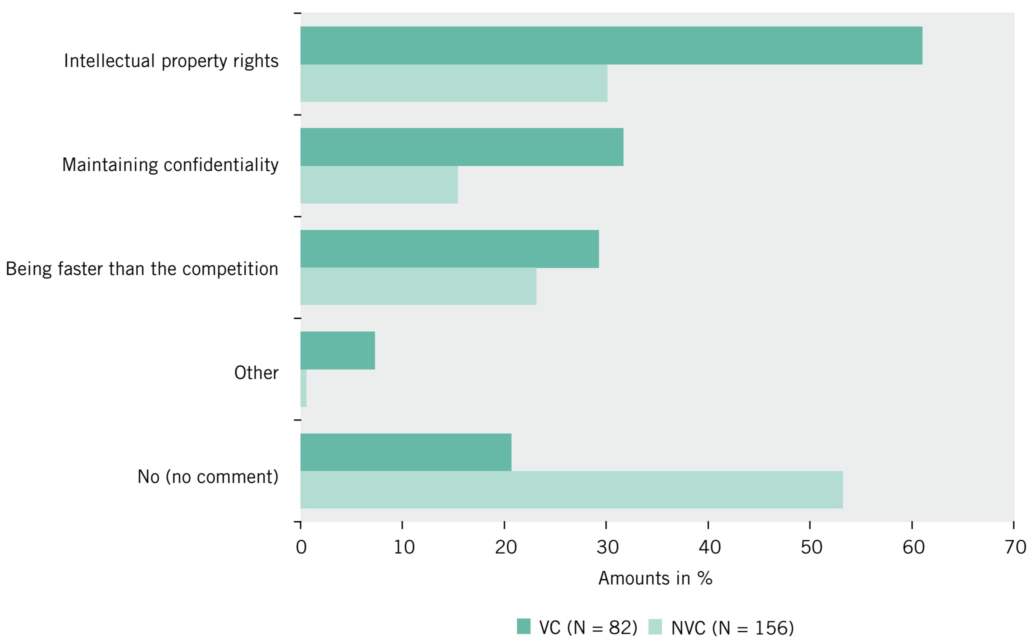
  But PE/VC investments do provide additional impulses for increasing sales and employment levels at the companies. The highly above-average growth of the PE/VC-financed companies is therefore the sum of direct causal effects in the sense of the value added function of actively managed investments as well as specific selection effects that are a result of the careful inspection and selection of the projects.

Figure 14: Has your company implemented any of the following innovations since 2002?



Source: Peneder and Schwarz (2007) VC = companies with PE/VC investors, NVC = without PE/VC investors.

Figure 15: During the past few years, has your company used any of the following methods to protect innovations or inventions?



Source: Peneder and Schwarz (2007) VC = companies with PE/VC investors, NVC = without PE/VC investors.

Furthermore, when we take a look at the range of all the impact factors on the growth of sales and employment for different specifications of the model, they lie between 0.5 and 3.4; i.e. the presence of PE/VC financing increases the average company growth by 50% to more than 300%. Because of the great variation and the fact that impacts of the past can not be automatically transferred to other arbitrary companies in the future, the concrete values must be interpreted with a certain amount of reservation. Therefore Peneder and Schwarz (2007) have selected the lower limit of the observed impact factors as their conservative rule of thumb. In summary, this means we can expect at least 70% more sales growth in companies with PE/VC investments, along with a 50% higher growth in employment, than in the control groups containing largely comparable companies[10].

2.2.4 Summary and economic policy-oriented evaluation

The empirical results confirm the significance of all three general economical functions of the PE/VC markets. The special *financing function* reduces the market failure of traditional capital markets that is caused by the combination of uncertainty and asymmetrical information. A first and very significant effect is that the majority of the companies with PE/VC investments would not be capable of achieving their desired growth objectives or couldn't exist at all without those investments. This impact would still be relevant if, for example, PE/VC-financed companies did not differ themselves from others in their key performance indicators.

Additionally, the *selection function* has the effect that PE/VC companies usually invest in highly innovative and export-oriented companies. Even though this does not yet allow us to see a direct causal effect on any individual company, the PE/VC markets do support the modernisation and structural change of a national economy as a whole (if sufficient alternative financing sources are missing).

In the end the results confirm that PE/VC providers achieve a *causal value added* by providing additional growth impulses in the companies in question. For example, they have a strong effect on the marketing of new products and speed up the commercialisation of innovations that have already been achieved. This makes it possible for innovative companies to grow more quickly.

Reducing the loss to welfare caused by market failures, making a positive contribution to the overall economical structural change and providing growth impulses in the affected companies are therefore three good reasons why modern company and location policies should pay special attention to the creation of functioning and productive PE/VC investment markets.

This is also the position taken by the Austrian Council for Research and Technology Development in a current recommendation (RFTE 2008). At the same time the primary focus should not be on public subsidies but on creating ideal framework conditions. In Austria there is currently a strong need for action in the legal organisation of new fund structures. Although the traditional instrument of Mittelstandsfinanzierungs GmbH was generously formed from a subsidy perspective, it

10 The results for revenue growth are very robust and significant in each of the applied model specifications. In contrast to this, the impact factors for employment growth are all positive but not always significant.

is an "insular solution" in Austria that does not correspond to the international standard. Therefore the PE/VC industry is demanding that modern European fund structures based on international standards be made available soon. The concrete goal is for Austria to have its own PE law that takes the requirements of both investors and investment companies into account and is therefore not subject to restrictions in terms of geography, investment technology or anything else. The providers of risk capital should ideally consolidate in the form of a limited partnership (KG) and decide for themselves which industries, company sizes and phases they want to invest in.

The complex manner in which the PE/VC markets function tends to speak against the use of direct subsidy instruments and simple intervention channels, e.g. in the form of publicly endowed PE/VC companies. The only exception are funds that consistently finance companies at the earliest stage of the company development. Due to the especially high uncertainty in these cases, the risk of crowding out private investors is relatively low. However, closing the "financing gaps" requires not only that capital be made available but above all that the fundamental information problems be solved. If one thing happens without the other, this leads to considerable losses at the expense of the general population. An internationally proven approach to a solution is for the public sector to invest in individual funds that are specialised in early-phase financing instead of making direct investments in companies. The key points of such a "fund of funds" initiative would be the fact that private investors hold a majority share in the fund, the regular market conditions and an open bidding process. As a result, this approach funnels additional capital into the early development phase, which is very critical for innovative companies, while at the same time the surmounting of information problems that the business model is based on remains the responsibility of the private investment management specialised in this.

In addition, the strict separation of investors and the operational investment management excludes the possibility of a political influence on the concrete composition of the portfolio and therefore the selection of individual companies.

Another way to raise the overall low level of PE/VC investments in Austria would be to utilise public guarantee instruments. Of course these have to include premium benefits and own risks corresponding to the uncertainty to avoid incentive problems. In a relatively small market, such instruments can create trust and above all be an entry-level aid for new investors who don't have much experience with this instrument yet.

2.3 Development and structural composition of R&D intensities in the Austrian business sector in 2004 in comparison with other OECD countries

2.3.1 Introduction

Expenditures for research and development, along with the formation of human capital and innovation, are important determinants for long-run economic growth (Aiginger and Falk 2005).[11] R&D expenditures in the business sector are linked as closely as possible

11 The terms "R&D intensity" and "R&D share of GDP" will be used synonymously at the industry and country levels. R&D intensity as well as R&D share of GDP is defined as the share of gross value added that is spent on R&D. This definition differs from the more common usage of the term intensity as an indication of the relationship between R&D expenditures and revenue.

with the creation of new production technologies and products (Falk 2007; Leo et al. 2007).

Businesses carry out R&D with the goal of developing new products or lowering the production costs of existing products. But R&D activities don't only increase a company's innovation and its productivity, they are often also the prerequisite for absorbing scientific discoveries and more complex technological developments, resulting in a higher chance that these developments will be used as viable economic opportunities.

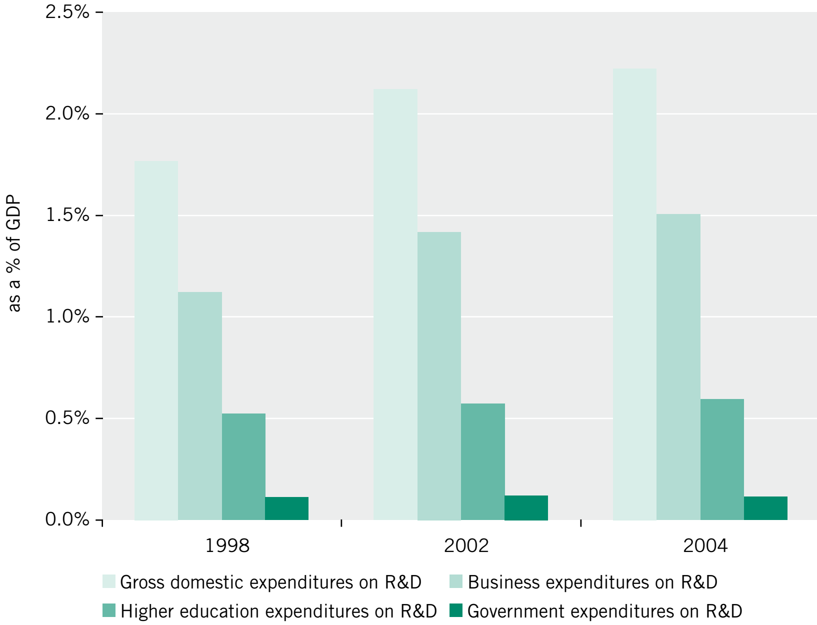
In most of the EU countries, business expenditures on R&D represent the bulk of overall R&D expenditures. In Austria, about two-thirds of R&D expenditures were made by the business sector (2004: 67.7%), which was above the average of the EU 27 and the same as the OECD average (OECD2007b).[12] R&D expenditures in the Austrian business sector have undergone dynamic growth in the last fifteen years. In 1993, R&D expenditures accounted for 0.8% of GDP. Five years later, expenditures had already risen to 1.123%, reaching 1.5% in 2004 (OECD 2007b).

As Figure 16 shows, between 1998 and 2004, business expenditures on R&D have increased significantly more than other expenditure categories, such as spending in the higher education or the government sector expressed in terms of GDP, which has essentially remained unchanged. The figure suggests that the increase in overall R&D expenditures was due primarily to the dynamism of R&D expenditures in the business sector. Together with Germany, Denmark and Finland, Austria ranks among the EU countries with the fastest growth of business expenditures on R&D relative to GDP (European Commission 2007a, p. 65). Given the importance of business sector R&D for the long-term growth of a national economy, this development should be viewed positively.

For a clearer assessment of developments in Austria, it is necessary to compare with the development of other European and OECD countries. We must keep in mind that national development trends can be attributed both to differences in the structure of the business sector and the fact that, in some industries, research and development expenditures are below the average of the countries under comparison. For this reason, when comparing R&D intensities for the business sector, it must be clarified to what degree the change in R&D expenditures was caused by an increase in R&D intensity in individual industries and how much by a structural shift toward sectors with a higher R&D intensity. Differences in industry structure have a considerable influence on the country results.

12 R&D expenditures in the business sector were financed not only by the business sector itself, but also with public support. While two-thirds of all R&D expenditures were invested in the business sector, only 45.8% of R&D expenditures were financed by private companies. The EU 27 average is 54.5% (European Commission 2007a, p. 61).

Figure 16: The development of various R&D expenditure rates in Austria.



Source: STATISTIK AUSTRIA R&D survey, tip calculations

2.3.2 Difficulties encountered when making an international comparison of R&D expenditures in the business sector

The comparison of R&D intensities in the business sector is often used to evaluate national technology and innovation policy measures (as in OECD 2006, p. 3031). There is often an implicit assumption that a higher R&D intensity is better in principle than a lower one, and that countries with a low R&D intensity need to take political action. However, these sorts of conclusions, formed on the basis of simple direct comparison, are problematic. Different R&D intensities in the business sector are not just a consequence of different national policies. They can also be caused by different industry structures and the resulting specialisation of the national economies under review.

National specialisation patterns are the result of the different historical development of each national innovation system. If the R&D intensities in the business sectors of two countries are directly compared, one country may have sectors with on average high R&D intensities that also have a higher weight in the country's total value added. The result of these structural differences would be that the two countries have different R&D intensities in the business sector, even if the political framework conditions before and at the time of data collection were the same in both countries. This could mean that R&D expenditures no longer increase, since rational entrepreneurs do not deviate from their spending plans or, alternatively, it could lead to overinvestment causing the productivity of R&D expenditures to fall, wasting scarce R&D resources.

Because of these problems, Sandven and Smith (1998) have developed a simple method of structural analysis that will be used in this chapter. The difference between measured and expected R&D intensity will be divided into a structural component and a country effect. This country-specific effect shows to what extent R&D expenditures in the business sector differ independently of industry structure. It also provides a measure of how much the national innovation system influences corporate innovation behaviour. This approach is especially well-suited for producing comparisons between different countries at a specific point in time. It forms the basis for the following discussion of the results.

2.3.3 Data

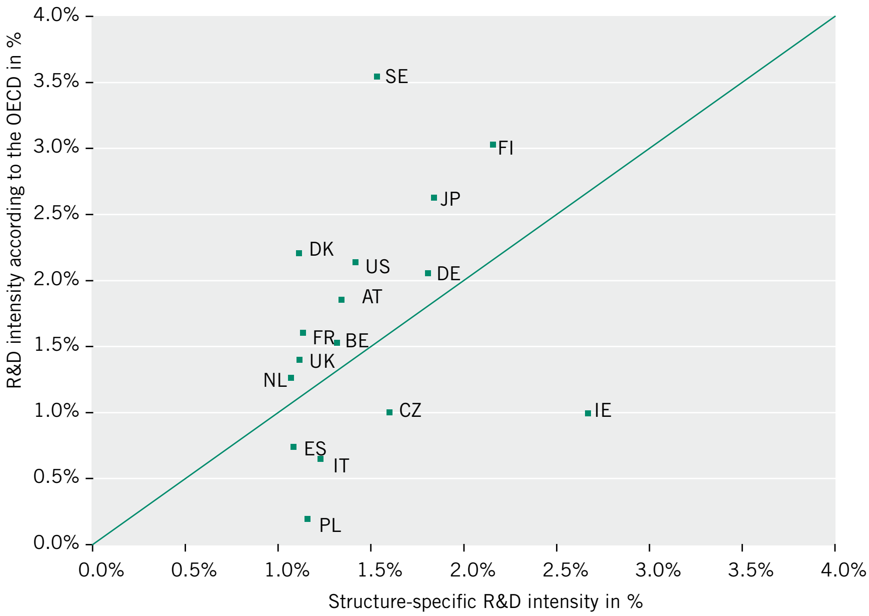
The data for business expenditures on research and development (BERD) includes all expenditures for research and experimental development conducted in the business sector, without regard to the financing source. For the calculations in this chapter, we used the R&D spending data for the business sector in the OECD ANBERD database, as well as the R&D survey of STATISTIK AUSTRIA for the years 1998 and 2004. Value added data for industries was drawn from the OECD STAN database. Possible problems due to data distortion are discussed in detail by Reinstaller and Unterlass (2008).

2.3.4 International comparison of R&D expenditures in the business sector

In this section, the R&D intensities in the Austrian business sector will be compared with a series of data from other countries. The list of countries is provided in the first column of Table 4. Sandven and Smith's (1998) procedure of structural adjustment analyses divides the aggregated R&D intensity of the business sector into a "structure-specific component" of R&D intensity and a "deviation" from this that represents the country-specific effect. These two components can also be visually represented by plotting the expected R&D intensity for a country against the R&D intensity derived from the official data. Figure 17 shows this for 2004. The structure-specific component is calculated from the weighted sum of each industry's shares in the value added of the business sector in a country and the average R&D intensity of this industry in the OECD. This illustrates the structure of the country's business sector and the R&D intensity that is expected to go with it. On the other hand, the "deviation" provides the country-specific share of R&D intensity. This shows whether the country's business sector in a given industry structure is investing less or more than average in R&D. This country-specific effect is, in a way, the structurally adjusted R&D intensity for the business sector.

The chart is to be read as follows: If the measured and expected rates are exactly the same then the observation point is on the 45° line. If the observation point is above the 45° line, then more is being spent on R&D than would be expected given the specific industry structure. If the observation point is below the 45° line, the business sector in that country is spending less on R&D than expected. Thus the vertical distance from the 45° line represents the deviation of the R&D intensity in the business sector from its expected, structure-specific amount.

Figure 17: R&D intensities in the business sector, a comparison between OECD countries



Source: tip calculations

A country's industry specialisation can also be read from the chart. If an observation point is located far to the right in the coordinate system, this indicates that the country is specialised in industries with a high average amount of R&D intensity (see also Table 4). If, however, the point is to the left, near the vertical axis, then industries with a low R&D intensity constitute a larger percentage of total value added in the business sector.

A detailed segmentation of the R&D intensity for the entire business sector for 1998 and 2004 is also summarised in Table 4. This table shows the segmentation of the entire business sector. The columns in the table are to be interpreted as follows:

- The column labelled "according to official statistics" shows the R&D intensities of the business sector that were calculated from the OECD and STATISTIK AUSTRIA data.
- The column labelled "structure-specific component" shows the expected value based on the structure, i.e. which would correspond to the industry profile for that country. It is calculated from the weighted sum of the percentages of each industry in a country in the value added of the business sector times the average R&D intensity of an industry in the OECD.
- The next column represents the "structure-independent industry contribution". This value shows whether, independently from the specialisation profile, the R&D intensity in the industries is higher than the country median. The structure-dependent industry contribution is a positive (negative) number whenever the majority of

industries invest more (less) in R&D than in the industry average for the compared OECD countries.

- The last column represents a "specialisation effect." This shows whether those industries that receive an above-average amount of R&D investment in a country are also the industries that contribute an above-average value added to the country in an OECD comparison. The value of the specialisation effect is positive (negative) whenever the industries in which a national economy specialises invest more (less) in R&D than the industry average in comparable countries. The "structure-independent industry contribution" and the "specialisation effect" result in the country-specific percentage of R&D intensity for the business sector, which corresponds to the vertical deviation from the 45° line in Figure 17.

Table 4: Segmentation of R&D intensity in the business sector of various OECD countries

	1998				2004			
	According to official statistics	Structure-specific component[1])	Country-specific component[2])		According to official statistics	Structure-specific component[1])	Country-specific component[2])	
			Structure-independent industry contribution	Specialisation effect[3])			Structure-independent industry contribution	Specialisation effect[3])
	in % of value added							
Austria	1,4057	1,1611	0,1901	0,0546	1,852	1,3425	0,399	0,1105
Belgium	1,563	1,3201	0,2182	0,0247	1,5255	1,3174	0,2013	0,0068
Germany	1,8288	1,4895	0,2518	0,0876	2,0556	1,8081	0,0692	0,1783
Great Britain	1,4282	1,2916	0,1702	– 0,0335	1,4013	1,1164	0,3145	– 0,0295
France	1,5968	1,1068	0,5543	– 0,0643	1,6036	1,1356	0,5396	– 0,0716
Denmark	1,7103	0,9862	0,6386	0,0855	2,2032	1,1143	0,9159	0,173
Finland	2,4297	1,8688	0,2872	0,2737	3,0269	2,1584	0,3796	0,489
Ireland	1,1069	2,8418	– 0,295	– 1,4398	0,9939	2,6693	– 0,3286	– 1,3468
Netherlands	1,209	1,0408	0,1293	0,0389	1,2601	1,0696	0,1598	0,0307
Sweden	3,179	1,5817	1,1029	0,4944	3,5444	1,5334	2,0454	– 0,0344
Italy	0,62	1,1225	– 0,47	– 0,0326	0,6489	1,228	– 0,513	– 0,0662
Spain	0,5567	1,1125	– 0,5419	– 0,0139	0,7367	1,083	– 0,4149	0,0686
Poland	0,3498	1,0369	– 0,757	0,0699	0,1933	1,1588	– 1,0364	0,0709
Czech Republic	0,9354	1,3797	– 0,308	– 0,1362	1,0026	1,6009	– 0,3138	– 0,2845
Japan	2,3203	1,6283	0,6297	0,0623	2,6239	1,8408	0,6652	0,1179
USA	2,2266	1,427	0,6813	0,1183	2,138	1,4174	0,6562	0,0644

Source: OECD ANBERD, STATISTIK AUSTRIA, tip calculations. Business sector without the primary sector. 1) R&D intensity expected for the given industry structure. 2) Industry structure independent portion of R&D intensity; positive when the intensity (according to OECD statistics) is above the structure-specific share. 3) Positive when the more research intense industries contribute disproportionately more to the total value added.

It is clear from Figure 17 that the countries under comparison can differ very strongly, both in terms of their "structure-specific component" as well as their "structure-independent industry contributions" for R&D intensity in the business sector. We can see a group of countries in which the business sector specialises in industries with lower R&D intensity, meaning that R&D investment is less than average. Spain (ES), Italy (IT), the Czech Republic (CZ) and Poland (PL) belong to this group. In the Netherlands (NL), the United Kingdom (UK), France (FR) and Belgium (BE), the business sector also has a similar specialisation profile, although these countries invest more in R&D. Denmark (DK) has a specialisation model similar to the Netherlands or France, but Denmark's research intensity is much higher than in these countries. As Table 4 shows (difference between the values of the sixth and seventh columns), Denmark's R&D intensity is more than one percentage point over the expected value.

Sweden, Finland, Japan and Ireland are countries with very R&D-intensive industry structures. In these countries (except Ireland), R&D intensity is also especially high within the industries. This is particularly the case in Sweden's value, which is around two percentage points over the expected value. Table 4 also shows that in the USA – contrary to widespread opinion – the business sector is not specialised in R&D-intensive industries. Because the United States has a large, relatively closed national economy, a very wide spectrum of sectors with low R&D intensity makes an important contribution to value added. Therefore, the development of individual rapidly growing industries in the high technology sector with high R&D intensity is reflected only slowly in the statistics and in the specialisation model.

Reinstaller and Unterlass (2008) show, however, that R&D expenditures in the US service sectors are much higher than in most other countries (excluding Denmark).

The Austrian business sector (AT) holds a middle position based on its specialisation profile. It is roughly parallel to Belgium's specialisation profile. Unlike Belgium, however, R&D investment in most industries is higher than the average of the observed countries, even in industries with lower R&D intensity. The industries with above-average R&D intensity also have an above-average effect on value added (Table 4). Between 1998 and 2004, a shift toward a more R&D intensive industry structure and an overall intensification of R&D expenditures were recorded in the industries. The positive country-specific effect indicates that technological policy is having a positive influence on R&D expenditures in the business sector.

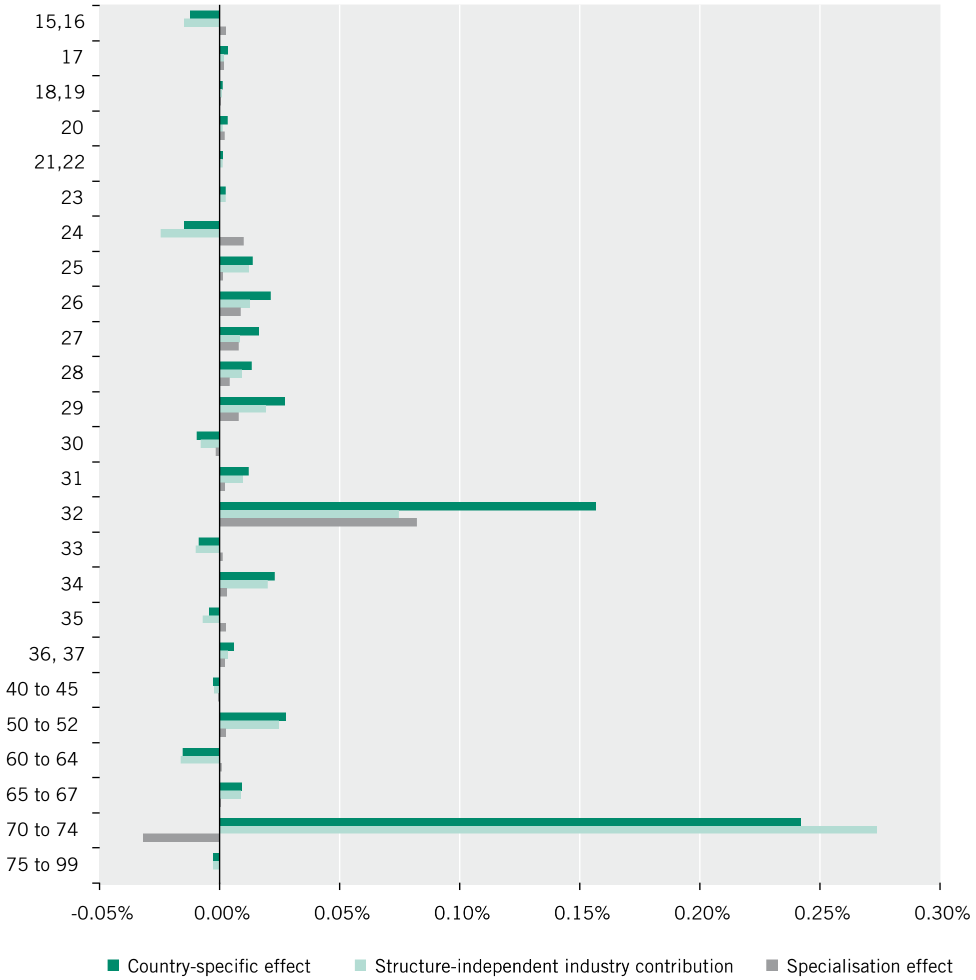
2.3.5 Industry-specific breakdown of R&D intensities in the Austrian business sector

Figure 18 shows the industry contributions to the country-specific effect for the Austrian business sector as well as the breakdown into structure-independent industry contribution and the specialisation effect modelled on the country results as presented in Table 4. A large portion of overall deviation from the expected R&D intensity is concentrated in two industries or industry aggregates. On the one hand, these are five service industries (ÖNACE 70-74), among them the data processing, database and software companies (ÖNACE 72), business services (ÖNACE 74), as well as research and development (ÖNACE

73) and the production of radio, television and communications equipment (ÖNACE 32). In third place was another aggregate of three service industries (ÖNACE 50-52), including trade. This industry not only invests more in R&D than comparable branches of the economy in other countries, it also has an especially high share of value added.

The high dependency of R&D activities in the business sector suggests too narrow a specialisation profile and too little diversification of the research portfolio in the business sector. However, it should be noted that allocation problems due to the Frascati method (OECD 2002) result in the overestimation of the importance of these industries and the underestimation of the importance of others.

Figure 18: Industry contributions to the country-specific effect in the R&D intensity for the business sector in 2004.



Source: STATISTIK AUSTRIA, 2006, tip calculations

It should be noted that the result for both groups of service industries (70-74, 50-52) developed from statistical allocation problems. Industry group 7074 also includes the research and development sector (ÖNACE 73) as well as the provisioning of business services (ÖNACE 74). In Austria, a range of large public research and grant programmes were assigned to both of these industries because they are legally organised as limited liability companies (such as the Austrian Research Centers GmbH, or the K*plus* competence centres of the BMVIT; see Schiefer 2006). In other countries, such as Germany, comparable institutions like the Fraunhofer Gesellschaft were ranked as public sector entities. This creates distortions that make it difficult to conduct an international comparison of expenditures in the service sector.

The problem with industry group 50-52 is somewhat different. Trade falls into this group, as well as the maintenance and repair of motor vehicles and consumer durable goods. It seems surprising at first glance that R&D is being conducted in these industries. The problem, however, is caused by the methodology outlined in the Frascati manual, and it affects all OECD countries. With this method, the R&D expenditures for a company that is active in several industries are assigned to its primary business field. In Austria, this primarily affects international pharmaceutical companies, but it also affects a few auto manufacturers that operate one or two production facilities with an R&D department in the domestic market and receive the bulk of their revenues through an extensive net of retail branches and workshops. The R&D expenditures of these businesses were therefore assigned to industry group 50-52. This resulted in the overestimation of R&D expenditures for trade and underestimation of R&D expenditures for other industries. Since trade, with its high share of value added and its very high revenues, goes into the aggregated R&D intensity for the business sector, the resulting distortions can be significant.

If we ignore the allocation problems in the service sectors, the industries that make a significant contribution to the business sector's R&D intensity, in addition to radio, television and communications equipment (ÖNACE 32), are the machines and equipment segment (ÖNACE 29) and the motor vehicle industry (ÖNACE 34). On the other side of the spectrum, the R&D investment in some sectors are so low that their contribution to the aggregated country effect is negative. As Figure 18 shows, this group includes the chemical industry (ÖNACE 24), medical, precision and optical instruments (ÖNACE 33), and food products, beverages and tobacco (ÖNACE 15-16) in the goods production sector. These industries contribute a relatively high amount to the creation of value in the business sector. In the services sector, the R&D expenditures in the transportation and communication sector (ÖNACE 60-64) are very low.

The results for the radio, television and communication equipment industry (32) met expectations. This includes the R&D activities of a few international corporations that make an extraordinarily high contribution to R&D expenditures in the Austrian business sector. It is striking how powerfully this one industry rises above all of the others.

2.3.6 Summary

The analysis above has shown that the industry structure and its development over time decisively influence the level and trend of overall R&D expenditures in the business sector. This paints the following picture of the Austrian business sector: Between 1998 and 2004, R&D activities increased and there was a gradual structural transformation towards more R&D-intensive industries. The segmentation of business sector R&D intensity into a structural component and a country component suggests that framework conditions (e.g. technology policy) create incentives for businesses to invest in R&D above the typical levels for their industry.

A closer examination of development in R&D expenditures at the industry level reveals, however, that the R&D portfolio of Austria's business sector is not very differentiated. R&D expenditures that exceed levels typical for their industries are highly concentrated in the manufacturing sector. In the services sector, on the other hand, development is difficult to assess as the survey of R&D expenditures for this sector is very different internationally and only allows a limited comparison of the results. It is quite possible that service sector contributions to R&D intensity in the business sector are overestimated.

2.4 Innovation and climate protection

2.4.1 Introduction

Climate protection is the global challenge for the environmental policy of the 21st century. The fact and causes of global climate change have been clearly established. Anthropogenic emissions are primarily responsible for the continuous increase in the concentration of greenhouse gases in the atmosphere and therefore for global warming. Their impact will change many natural, physical and biological systems in the future, which will result in increasing temperatures, changing precipitation patterns, and the changing frequencies and intensities of extreme weather events (Stern et al. 2006; IPCC 2007). On the one hand, the changes in natural conditions require adaptation measures to reduce the risks due to vulnerability. On the other hand, it is necessary to avoid an uncontrollable climate change by implementing measures for the reduction and avoidance of greenhouse gas emissions.

In order to establish measures to reduce the anthropogenic greenhouse gas emissions and limit the ecological and economical problems associated with climate change, agreements have been made on an international level. The climate framework convention (United Nations Framework Convention on Climate Change, UNFCCC) of 1992 has the goal of stabilising greenhouse gas concentrations in the atmosphere at a level that will prevent dangerous anthropogenic damage to the climate system (UNFCCC 1992)[13]. The Kyoto Protocol specified quantitative goals for emissions reductions for the industrial and transition countries in 1997 that are binding under international law. The first five-year commitment period of the Kyoto Protocol began on 1 January 2008. Austria's target for the period from 2008 to 2012 is the reduction of greenhouse gas emissions by 13% compared to 1990, i.e. achieving an emissions level of 68.7 million CO_2 equivalent in this period.

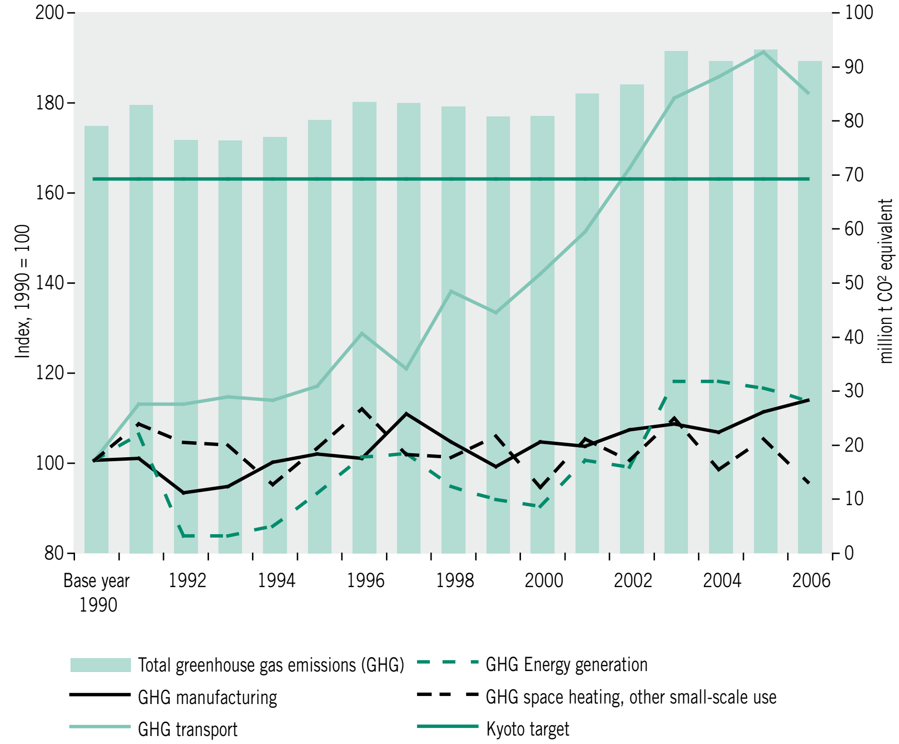
But since 1990 the emissions in Austria have in fact increased from 79 million t to 91

13 The goal of the UN climate framework convention is "...to stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system." In general the target value is assumed to be a concentration of 500 ± 50 ppm, meaning a value below the double of the pre-industrial concentration (280 ppm).

million t (2006) (see Figure 19), and the emissions caused by transport have seen a particularly massive increase (+ 82%).

The emissions from industry also show a slight growth while those from energy generation and space heating are mostly stable and show annual, weather-dependent fluctuations. In 2006 a reduction of greenhouse gas emissions by 2% could be noted compared to 2005.

Figure 19: Development of greenhouse gas emissions in Austria, 1990 – 2006



Source: Umweltbundesamt (Federal EnvironmentAgency), tip calculations

Therefore about 25% of the emissions would currently have to be reduced to meet the goal. This ambitious target can only be achieved by utilising all of the potentials[14] for emission reductions available in the country (WIFO et al, 2007) and by purchasing emissions certificates from foreign countries.

To this end the Austrian JI/CDM programme[15] was started in 2003, which has been anchored in the Austrian Environmental Support Act. This programme is intended to enable the publicly funded purchase of a total of 45 million emissions reduction units from projects of the flexible mechanisms "Joint

14 This primarily includes measures in the sectors of energy generation, industry, traffic and space heating (households and trade), which about 86% of the greenhouse gas emissions are attributed to.

15 Cf: http://www.klimaschutzprojekte.at/de/portal/.

implementation"[16] and "Clean development mechanism"[17] as well as from investments in funds and facilities.

As of October 2007, about 36 million t CO_2 equivalent were purchased; emission reduction purchase agreements were completed for about 9 million t from 14 JI projects and 21 million t from 32 CDM projects, while an additional 6 million t were provided by funds and facilities.

However, here it must be noted that climate policy and the resulting measures must not primarily be seen as a cost factor but as an instrument of economic innovation in the sense of the European Union's Lisbon Strategy. There are strategies available that can contribute to the strengthening of the Austrian economic structure by means of increasing energy efficiency and innovation activities, with the side effect of also making a strong contribution to the reduction of greenhouse gas emissions. Other additional effects that are associated with climate-relevant measures are, for example, helping to ensure energy security, reducing the economic burden caused by increasing oil prices and decreasing negative health effects due to other emissions associated with the combustion of fossil fuels (e.g. fine particulate matter).

A number of such measures in the areas of mobility, buildings, industry and energy were analysed in the context of the project "Innovation & climate" (WIFO et al. 2007).

At the same time measures were identified that satisfy the criteria of a high innovation potential, strong signal effect and political consensus.

Technological developments continue to be seen as a central aspect to achieve the goal of stabilising the concentration of greenhouse gases in the atmosphere (cf. for ex. Grubb 2004; Pacala and Sokolow 2004; Murphy et al. 2005; Fischer and Newell 2007; Fischer 2008). However, this will require an extensive restructuring of the current system of energy generation and consumption. Although currently available technologies can already contribute to the clear reduction of emissions in the short term, an expansion of the technology portfolio and therefore an early investment in research, development and innovation is required for the long term.

Pacala and Sokolow (2004) show that a stabilisation of greenhouse gas emissions[18] using existing technologies (grouped into seven "technology wedges") is possible in the next 50 years and that the broad diffusion of innovative technologies is required after that to reach the concentration goals. Each of the technology categories that are available in the short term – even if some are not yet broadly diffused and cost intensive[19] – can make a significant contribution to the mitigation of emissions. Here a broad spectrum of measures is considered that comprises energy efficiency improvements in buildings, traffic and energy generation, a reduction of the emission intensity of energy generation

16 Joint Implementation (JI) according to Art. 6 of the Kyoto Protocol refers to the joint execution of emissions-reducing projects by two Annex I countries (Annex I of the UN climate framework convention; industry and transformation countries).

17 Clean Development Mechanism (CDM) according to Art. 12 of the Kyoto Protocol refers to the execution of emissions-reducing projects in developing countries, where the investment is carried out by countries with a quantitative reduction obligation (Annex 1 countries).

18 This corresponds to the current global emissions of about seven billion t CO equivalent. Due to the growth in population and economic activity (especially in emerging countries) business as usual forecasts assume a doubling of this value until the middle of the 21st century (Nakicenovic 2005).

19 Cf. Grubb 2004 about the cost digression as a result of learning effects for environmental technologies.

(natural gas instead of coal, renewable energies, nuclear energy), carbon capture and storage as well as reforestation measures.

According to Pacala and Sokolow (2004), the challenge consists in the broad application of the available technologies for one, and for another in the initiation of a large-scale, climate-relevant research and development (R&D).

In addition to the time that is required to develop new technologies, the overcoming of barriers also plays a role for the broad application in this context. On the one hand, this refers to societal preferences for certain technologies and lifestyles on a household level. On the other hand, setting insufficient incentives at the political level can reduce or delay the implementation in the business sector, which is intensified by the long investment cycles of, for example, power plants and production facilities. On top of this, new technologies (e.g. electricity generation based on renewable energy sources) are often not competitive due to the higher costs during their market launch. For that reason political interventions must set price signals on the one hand (by means of taxes, subsidies, regulations), which comprehensively reflect[20] the social costs of different technology options and create incentives for innovations ("market pull" approach). On the other hand, technology-specific public research subsidy programmes can contribute to generating energy and emissions-efficient R&D to the required extent ("technology push" approach).

Therefore a comprehensive set of instruments and measures should be utilised to force technological innovations in the direction of climate protection. They should include economic instruments as well as standards, publicly financed R&D and infrastructural measures (e.g. IPCC 2001).

Stable, predictable framework conditions (e.g. feed-in tariffs for clean power that are guaranteed for the long-term, pre-announced increases in energy taxes, etc.) are also central in this context in order to guarantee the planning safety of the companies and minimise the economic risks of innovation activities.

2.4.2 Guidelines and strategies for energy efficiency, climate protection and environmental technologies

On a political level, setting such goals has become noticeably more frequent in the past few years. The strategic goals determined in Lisbon in March 2000 are intended to make Europe into the most competitive economic area in the medium term, whereby technological innovations are seen as a key factor. As a supplement to the Lisbon Strategy, the European Council agreed on an EU strategy for sustainable development in the following year in Göteborg (European Commission 2001), which expands the Lisbon strategy and its stronger concentration on economic aspects by adding ecological perspectives. The European Spring Council solidified the aim of sustainable development as a comprehensive goal in March 2005.

Different EU regulations are aimed at increasing energy efficiency in different areas as well as pushing renewable energies. This includes items such as the directive on the promotion of electricity produced from re-

20 In respect to technologies based on fossil energies, the negative externalities in the form of (greenhouse gas) emissions would therefore have to be considered.

newable energy sources in the internal electricity market[21], (Directive 2001/77/EC) the directive on the promotion of cogeneration based on a useful heat demand in the internal energy market (Directive 2004/8/EC) and the directive on the energy performance of buildings (Directive 2002/91/EC)[22]. For a more detailed description of the legal regulations, see Köppl et al. (2006) and WIFO et al. 2007.

The directive establishing a scheme for greenhouse gas emission allowance trading within the Community (2003/87/EC) is specifically targeted towards climate policy and represents the foundation for emissions trading by companies in industry and energy generation in Europe, which was introduced in 2005. In Austria, this directive was transposed into a federal law with the emissions certificate law (Federal Law Gazette. I no. 46/2004). It was also discussed in the EU what approach should be taken for the post-Kyoto phase until 2020 (see for example "Limiting Global Climate Change to 2 Degrees Celsius", European Commission 2007b; European Environment Agency 2007). The discussion led to ambitious target proposals for emissions reductions in the EU in the amount of at least 20% by 2020 (30% if other significant emitters, such as the U.S., are trying to meet similar targets).

In addition, the goal is to raise the share of renewable energy to 20% of total energy consumption by the year 2020. These ambitions were formulated (European Commission 2008a; 2008b; 2008c) at the beginning of 2008 in the proposal for a directive to promote the use of energy from renewable sources (COM(2008) 19 final), the proposal about the efforts by the member states to reduce their greenhouse gas emissions with a view to satisfy the obligations of the community to reduce the greenhouse gas emissions by 2020 (COM(2008) 17 final) and the suggestion for a directive to change the emissions trade directive for the purpose of improving and expanding the EU system for the trade with greenhouse gas emissions certificates (COM(2008) 16 final).

The potential positive effects of increasing resource efficiency as well as of environmental innovations for growth and employment are also emphasised in other areas on a European level. What should be mentioned here are focal points in European technology policy-oriented and research support programmes (e.g. 7th Framework Programme, research programmes by DG TREN such as Intelligent Energy – Europe) or the Environmental Technologies Action Plan (ETAP). Here it is emphasised that environmental policies help strengthen competition and can boost the innovative power of the European economy. For example, commissioner Dimas pointed out: *"Growth that ignores environmental considerations will clearly not be sustainable. I also strongly believe that strong environmental policies are contributing to the EU's ability to compete." (Dimas 2005).*

In the beginning of 2004, the Environmen-

21 This directive includes indicative goals for an increase in power generation based on renewable energy sources. For Austria, an increase of the percentage from 70% (1997) to 78.1% (including large hydro generation) of the gross national power consumption is planned for 2010. This was accompanied by the statement "… that based on the assumption that the gross national power consumption will be 56.1 TWh in 2010, 78.1% is a realistic number." In contrast, the WIFO energy scenarios (Kratena and Wüger 2005) estimated a gross national power consumption of about 76 TWh for 2010.

22 The Energy Pass Act was approved in Parliament in 2006 to enforce the directive. Starting on 1 January 2008, the state construction laws have to be adapted to require that an energy pass be presented when new buildings are sold or rented. It was not possible to harmonise the respective construction-related regulations for all the Austrian provinces by means of an agreement according to Art. 15a.

tal Technologies Action Plan was presented at the European Union. The goal of the ETAP (European Commission 2004a) is to mobilise and utilise the potential of the environmental technologies in the European Union in order to increase the resource efficiency, improve quality of life and generate a positive growth impulse. The ETAP is a kind of connecting link between the EU strategy for sustainable development and the Lisbon Strategy. The ETAP is meant to help stimulate innovative power and technological change so that the EU can occupy a leading role in the development and distribution of environmental technologies. This is meant to improve the ecological efficiency of the economic structures as well as Europe's competitiveness. To achieve this goal, obstacles to developing the potential of environmental technologies should be removed and a broad support should be mobilised. The measures suggested in the action plan are divided into three groups: from research to marketing (e.g. creating technology platforms, coordinating programmes), improvement of the market conditions (e.g. mobilising financing instruments, agreeing on performance goals for products, etc.) and global activity (e.g. supporting responsible investments in environmental technology in developing and emerging countries). A first report by the EU Commission about the implementation of the ETAP was published in 2005 (European Commission 2005).

At the end of 2005, the member states submitted national "ETAP road maps" to the EU Commission, in which the countries' strategies for the support of environmental technologies are represented. In the Austrian road map (BMLFUW 2005), 18 measures are described and the focus is laid on the section containing measures for improving the market conditions. A second report regarding the implementation and evaluation of the national road maps including the description of best practice examples was published by the Commission in 2007 (European Commission 2007c, COM(2007)162 final).

2.4.3 The Austrian environmental technology industry

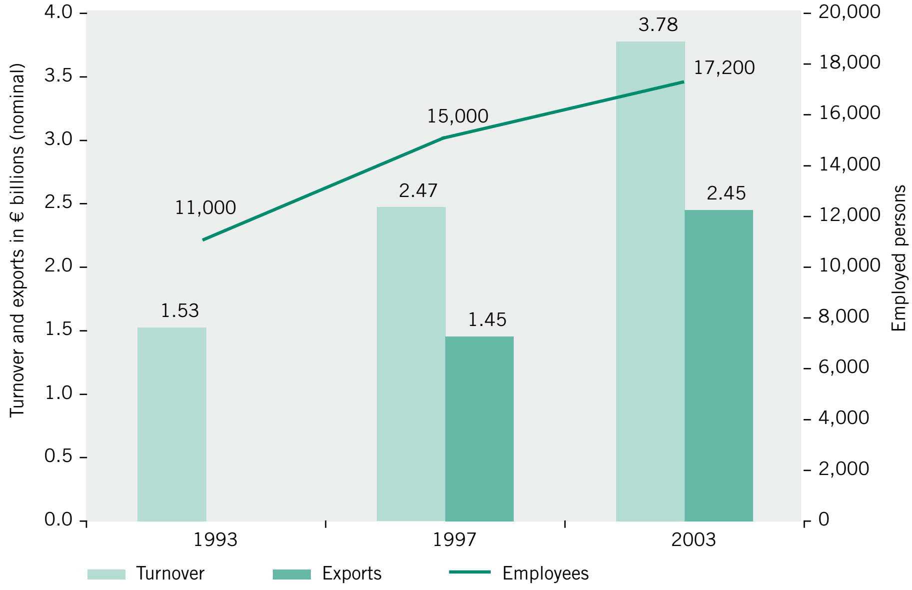
The supply of environmental technologies[23] and the economic performance of the environmental technology producers in Austria have already been analysed three times by WIFO (Köppl and Pichl 1995; Köppl 2000; 2005). Since the environmental technology industry is an industry that includes companies from various sectors and with various technological competences, it is not identifiable in conventional economic statistics and must be measured by means of a survey.

Using the data from the present three analyses of the Austrian environmental technology industry, we can demonstrate the significance of this economic area in the ten year period from 1993 to 2003 (Figure 20)[24]. The figure shows the clearly positive development of the environmental technology industry in Austria. Not only the turnover and export volume grew during this period but also the number of employees shows a clearly positive trend.

23 In the analyses done by the Austrian Institute of Economic Research (WIFO) the environmental technology industry was considered to be the core area of the environmental technology range. This includes the producers of clean and end-of-pipe technologies while environmental services are not included in the analyses.

24 Because of data restrictions, there is no valuation for the exports for 1993.

Figure 20: Development of the Austrian environmental technology industry



Source: Köppl (2005), tip calculations.

The relative importance and dynamics of the environmental technology industry over time is reflected in its growing contribution to the GDP or the share in total turnover and employment of manufacturing. The GDP contribution was at 1% in 1993, increased to 1.4% in 1997 and reached 1.7% in 2003. When measured by the turnover in manufacturing, the share of the environmental technology industry increased from 2.1% in 1993 to 3.7% in 2003. The share of employment in manufacturing also grew dynamically and reached a share of 3.3% in 2003. Overall, the Austrian environmental technology industry achieved a turnover of EUR 3.78 billion and employed 17,200 people in 2003.

The positive employment trend gives rise to the question of what the determining factors are. Econometric estimates (Köppl et al. 2006) of relevant determinants of labour demand (e.g. domestic turnover, foreign turnover, research rate) show that a 1% increase in turnover results in an increase of employment by 0.4% (domestic turnover) or 0.5% (foreign turnover). The research rate has a significantly smaller effect. However, the delays in the effects between the R&D expenses and employment trends might play a role here.

According to these estimates, a company's in-house innovation activities are among the factors that have an important influence on the employment expectations of the environmental technology producers. The probability that an environmental technology producer has positive employment expectations goes up by 15 percentage points if in-house company innovations were introduced on the market during the previous three years. The hypothesis that the general legal framework has a positive influence is addressed in the literature and is captured by assessing the importance of the EU legislation. Empirical results show that companies that consider the legislation to be an important factor in determining demand estimate future employment levels to be 17% higher. This result supports the hypothesis that there is a correlation between environmental legislation and the favourable development of the environmental technology industry.

Within the environmental technology industry there have been structural shifts in the period between 1993 and 2003. Over time, integrated technologies gained in significance at the expense of end-of-pipe environmental technologies. In particular, clean energy technologies now play a greater role in the range of Austrian environmental technologies. The structural shift towards integrated technologies and clean energy technologies indicates that Austrian producers of environmental technologies have picked up on important policy issues of recent years, such as climate change and the increased use of renewable energies. Austrian providers of environmental technologies are basing a good part of their product range on offering technologies that make production processes more resource and energy efficient.

Companies in the area of environmental technologies are highly innovative compared to companies in manufacturing. An analysis of the R&D expenses in the business sector for the year 2002 (Messmann and Schiefer 2005) shows an average R&D ratio of 2.0% for the companies in manufacturing. Compared with this, the companies of the business samples in Köppl (2005) show an R&D ratio of 3.5%. Overall 83% of the environmental technology producers reported that they had introduced innovations in their product area in the years from 2000 to 2003. Producers of environmental technologies see innovations above all as important prerequisites for entering new markets and ensuring their competitiveness. The increasing share of industry-wide innovations suggests that the Austrian producers of environmental technologies are increasing their international innovation power (three quarters of the innovations in 2003 compared to 60% in 1997).

46% of the innovating companies obtained financial support from public funds. In the waste technologies segment, 59% of the innovating companies received subsidies. Innovations in the area of energy technologies also profited more than the average (47%) from public subsidies. Compared to environmental technologies, the share of all innovating companies that received subsidies for their innovations in the period from 1998 to 2000 was 38% (Falk and Leo 2004). Providers of environmental technologies therefore profited slightly more from public innovation subsidies.

In the end, research and development as well as innovations have the goal of holding or improving a company's position in international competition. In the corporate survey there were concrete questions about the effects of the innovations on the companies' competitiveness. More than a third of the innovating companies said their competitiveness clearly improved as a result of the innovation. Half of the companies said the innovation improved their competitiveness and only 10% answered that no change resulted from their innovation activities.

The impetus for innovation activities in a company has to be seen in connection with the environment that it operates in. Accordingly, different innovation impulses play a role. In general we can distinguish between internal and external innovation impulses, meaning an impetus that comes from the company itself or ideas that come from the outside or general conditions that might be determined by legislators. The most important impulse for innovation (first place) comes from the customers. That means that the close cooperation between customers and suppliers has a positive spillover effect on the innovation activity of companies. Company-in-house research and development follows in second place as an impulse for product innovations. The company management is in third place. The legislation in the EU and in Austria is also attributed an important role as an engine for innovation. This probably has two reasons: For one, the general conditions for the national legislation are to a large extent determined by the EU, and secondly the EU market plays a dominating role as a sales market for Austrian environmental technologies. Public subsidies are not decisive as an innovation impulse, even if a series of companies in the company survey take advantage of public funds for their innovation activities. Technical literature, the science sector and patents play a subordinate role as impulses for an innovation decision.

Another characteristic of the Austrian environmental technology industry is its growing outward orientation. This is reflected over time by the fact that export profits are making up an ever larger portion of turnover. In the mid-1990s, about 50% of the sales of environmental technologies was generated on the Austrian market while 50% was exported. In 2003 the share of the exports was at around 65%. The Austrian environmental technology industry is well positioned in an international comparison. As a small, open economy, Austria holds about the same share of global trade as Denmark and Sweden. Austria's share of global trade in environmental technologies is slightly above Austria's share of global trade for the export of all goods.

The Austrian environmental technology industry has achieved a good competitive position. We must assume that in the coming years new markets will grow and, at the same time, new rivals will lead to increased competition. The favourable starting position of the Austrian environmental technology providers supports the expectation that the structural changes will be mastered successfully. Policy plays a significant role in this context by designing the general conditions and by increasing the attention paid to environmental technologies in research agendas.

2.4.4 Climate-relevant aid programmes in Austria

The central role of research and development or technological innovation in the structural shift towards sustainable economic structures was already discussed in the introduction. Research should focus on technologies that are able to generate the service productivity – i.e. the provision of the desired services – through an optimal combination of capital stocks and flows in a way that is as efficient as possible (e.g. technologies that save on carbon or energy). This means that an improvement of the implemented technologies (capital stocks such as buildings with passive house standard, zero emission vehicles) can result in the desired energy services (e.g. room heating, mobility) using a noticeably smaller amount of energy flows (see Kletzan et al. 2006).

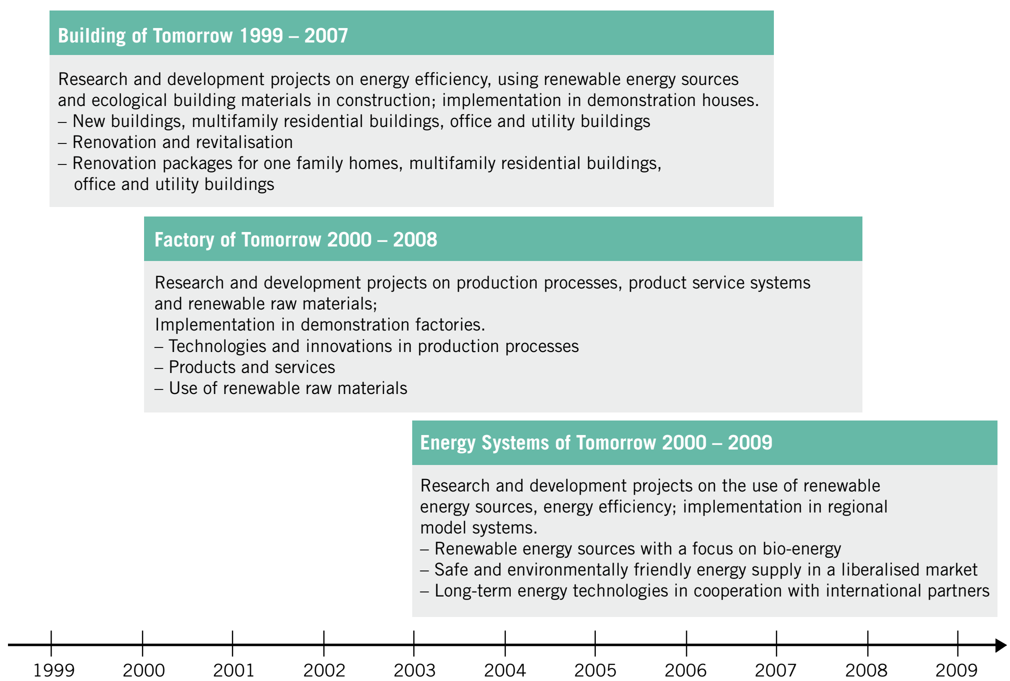
Developments of this kind can increase the economy's international competitiveness and, at the same time, offer opportunities for foreign trade by utilising potential "first mover advantages". A fundamental prerequisite for such technologies to be developed and applied is appropriate technology policy. The orientation of the content of R&D has to be seen as a political task and be accompanied by an incentive for sustainable technologies. However, not only R&D activities may be promoted all the way to demonstration facilities. What is also important is the public support during the diffusion of climate-relevant innovations.

Austrian Program on Technologies for Sustainable Development

In Austria, the Program on Technologies for Sustainable Development (BMVIT 2007b) was started by the Federal Ministry for Transport, Innovation and Technology in 1999 with three programme lines: "Building of Tomorrow", "Factory of Tomorrow" and "Energy Systems of Tomorrow". The intention is to set innovative impulses for the Austrian economy to support a structural shift towards eco-efficient practices through research, development and diffusion measures. An overview of the programme lines and the schedule is shown in Figure 21.

The Program on Technologies for Sustainable Development promotes innovations and contributes to an increase in the competitiveness and environmental compatibility of the economy by researching and developing eco-efficient technologies. Clear goals and a multi-year strategy were established for every programme line. The pilot and demonstration facilities will be implemented based on basic studies, concepts as well as technology

Figure 21: The programme lines of the Program on Technologies for Sustainable Development



Source: Federal Ministry for Transport, Innovation and Technology: Sustainable Economic Management impulse programme, http://www.nachhaltigwirtschaften. at/nw_pdf/041012_nw_zwischenbilanz.pdf.

and component development. The projects have been promoted by calls for submissions on the topics and a selection by an international jury.

Overall, the goal of the Program on Technologies for Sustainable Development is to bring about visible innovative steps (jumps in technology), which will be achieved by establishing clear goals and multi-year strategies in the individual areas. The types of projects include basic studies, concepts, economy-related basic research, technology and component development as well as demonstration activities as the desired end product. The subsidy therefore applies primarily to basic research and ends before the results of the research are implemented or diffused. To generate more extensive effects in respect to the market introduction, implementation and the (international) transfer of the developed technologies and approaches, thereby influencing both growth and employment, it seems necessary to install initiatives that complement the Program on Technologies for Sustainable Development. After subsidising the basic research, support must be offered to help the developed innovations reach market maturity and promote their application and diffusion. In addition to making information offers available (through relevant distribution markets, cooperation partners, support possibilities and the like) they can also be supported by public procurement. An application of the technologies on investments made by the public sector sets a good example and provides an incentive for the continued distribution.

Energy of the future

Based on the results of the Program on Technologies for Sustainable Development and the strategy process ENERGY 2050, the research and technology programme ENERGY OF THE FUTURE[25] was launched in 2007 by the Federal Ministry for Transport, Innovation and Technology and the Federal Ministry for Economics and Labour.

The first invitation for submissions resulted in around 100 projects being selected for subsidies from the Climate and Energy Fund after an international assessment and confirmation.

The programme is oriented in three fundamental directions – energy efficiency, renewable energy sources and intelligent energy systems. Under the terms of the strategy process, the supported projects are expected to make contributions in the following technological subject areas: energy systems and networks, advanced biogenic fuel production (bio-refinery), energy in industry and trade, energy in buildings, energy and end consumers, advanced incineration and transfer technologies along with cross-over issues that support foresight and strategy.

What is relevant in the selection of projects or research and development work is the presence of ambitious concepts with a long-term perspective that should be directed towards marketability. In addition to the technology-specific subjects, the programme also has the goal of considering social issues and foundations for long-term planning processes (e.g. climate strategies, social processes of change, public investment decisions, etc.).

25 Cf: http://www.e2050.at, http://www.energiederzukunft.at.

In the future, the programme is intended to be developed continuously by means of regular, increasingly focused invitations for submissions and key projects that pursue lines of development (from the technology concept to pilot facilities).

Environmental support schemes in Austria

One support instrument that targets the implementation and application of climate and energy-relevant technologies is the environmental support scheme of the Federal Ministry for Agriculture and Forestry, Environment and Water Management (based on the Environmental Support Act (UFG) of 16 March 1993 (Federal Law Gazette 185/1993, last modified by Federal Law Gazette I no. 112/2005)). This includes the measures in the areas of remediation of contaminated sites, residential water supply and sewage disposal, domestic and foreign environmental subsidies for plant-related measures and, since 2003, the Austrian JI/CDM Programme. The focus in the context of environmental subsidies for business operations in Austria is on the avoidance or reduction of air pollution, climate-relevant emissions, noise and waste. With the increasing significance of climate policy, this pillar of environmental subsidies has been increasingly directed to climate-relevant measures since the end of the 1990s, i.e. the number of projects that lead to emissions reductions has continuously increased[26] (from 65% in 1998 to 99% in 2006). By now, the domestic environmental support is directed almost exclusively to the subsidising the application of climate-relevant technologies. In 2006 an investment volume of € 424 million was generated with subsidies amounting to almost € 73 million. This corresponds to a share of approx. 28% in the total funds of the environmental support in Austria.

Corresponding to the subsidy guidelines, subsidies are primarily provided for measures for the use of renewable energies and for improving energy efficiency. The majority of the projects goes to the areas of biomass heating systems and biomass cogeneration, solar energy, operational energy efficiency and the thermal renovation of buildings.

Strategy programme IV2Splus – intelligent traffic systems and services plus

Mobility and traffic technologies are central areas of pro-active research and technology policies, because a prerequisite for an attractive economic location is that traffic systems be designed in a productive and efficient as well as environmentally compatible and functional manner.

The Federal Ministry for Transport, Innovation and Technology uses the opportunities of a shared responsibility for traffic and technology and has placed core development points on environmentally compatible and safe mobility for years. This is solidified for example in the new strategy programme called IV2Splus – INTELLIGENT TRAFFIC SYSTEMS AND SERVICES plus (2007 – 2012).

The strategic direction of the programme is

26 The subsidy cash value of the climate-relevant measures came to about 96% of the total subsidy volume in 2006.

mission-oriented, i.e. central social challenges in the transport sector are being addressed. That way a sustainable structural shift in the area of mobility and transport will be supported while at the same time strengthening the ability of Austrian companies to innovate and compete. The placement of thematic impulses addresses existing strengths and market potentials for one, and for another developments for the medium to long-term, which have not actually entered the market or only incompletely due to market or system failures.

The strategy programme IV2Splus comprises four thematic programme lines:

- The *programme line A3 plus* wants to make future transport more energy efficient and environmentally friendly through innovative propulsion technologies and alternative fuels. Key innovations are meant to initiate technological advances that enable completely new propulsion concepts for surface transport with best-ever consumption and emission levels.
- The *programme line I2V* supports cooperative research and development projects in the area of the intermodality and interoperability of transport systems.

The goal is an increase in efficiency by improving the interaction of different transport carriers, the increased integration of environmentally compatible modes of transport and the better usage of the existing infrastructure. Solutions for freight and passenger services are being developed and tested.

- The *programme line ways2go* supports the development of sustainable mobility solutions in the context of future social challenges (e.g. demographic shifts). A long-term research approach is being pursued that will develop socially and ecologically sustainable, barrier-free solutions while at the same time integrating measures that heighten awareness.
- The *action line IMPULS* supports interdisciplinary research on innovations in transport. Here research results from different disciplines will be made accessible to the transport sector.

Research programme 'proVISION: for nature and society'

proVISION is the programme by the Federal Ministry of Science and Research (BMWF), which funds research for sustainable development. It was launched in 2004 and will run until 2012. It will provide the scientific foundation for the national sustainability strategy in association with the complementary research initiatives. While partner programmes (e.g. Austrian Program on Technologies for Sustainable Development) support technological development, proVISION focuses on social, economical and ecological aspects. Together with interested and affected parties from science, administration and politics social innovation is assessed, e.g. new decision processes that support or actually enable the implementation of technological innovations.

proVISION examines the effects of climate change on ecosystems, spatial development and the quality of life and is dedicated above all to the regional dimensions of climate change, such as the question of how climate change affects the ski tourism, fauna and flora, space and land use and natural hazards. In the second call for submissions, projects are supported that pursue the question of how climate change and spatial development are interconnected with health issues and the quality of life, along with projects that examine the demographic trends and their meaning for managing the effects of climate change. The projects are action-oriented, combine science with education and cooperate on an international level. They develop visions for adapting to climate change and generally for the responsible handling of basic living conditions. Transdisciplinarity is the guiding research principle.

StartClim research programme

StartClim is an initiative by the AustroClim research platform (founded in 2002), which assembles numerous institutions in Austria that deal with research about climate change and its effects. It sees itself as a research programme that supports pilot projects about current issues relating to climate change. The projects address new questions and identify in which areas further research will be needed. StartClim was focused on the subject 'climate change and health' from 2003 to 2005. The StartClim projects are financed by the Federal Ministry of Science and Research, the Federal Ministry of Agriculture, Forestry, Environment and Water Management, the Federal Ministry for Health and Women, the Federal Ministry of Economics and Labour, the Austrian National Bank, Austrian Hail Insurance, the Federal Environmental Protection and Control Agency and AHP Association.

2.4.5 Summary

As the fourth assessment report by the IPCC (IPCC 2007) made clear, climate change and its largely anthropogenic origins are indisputable. The effects of the increasing concentration of greenhouse gases in the atmosphere result in rising average air and ocean temperatures, the melting of glaciers and polar caps, changes in precipitation and wind patterns, a rising ocean level and an increase in extreme weather events.

The necessity of confining climate change has led to political agreements about the limitation or reduction of greenhouse gas emissions. However, the goals defined in the Kyoto Protocol (a reduction of the emissions in the industrial countries by about 5% in the period from 2008 – 2012 compared to 1990) are only a first step. In the long term (by the end of the century), emissions have to be reduced drastically, i.e. at a scope of up to 80% in order to achieve a stabilisation of the atmospheric concentration.

Technological developments and innovations are considered to be one of the central approaches to a solution. While the continued development, broad application and therefore cost reduction of available technologies are required for a restructuring in the direction of sustainable and climate-protecting economical structures, groundbreaking technological solutions must be developed for the long term. To achieve this, early investments in large-scale and goal-oriented R&D are a must. The government plays an important role in defining these goals as well as in providing the funds and in creating the general conditions for the research.

Target-oriented support programmes such as the Austrian Program on Technologies for Sustainable Development are proving successful in developing innovative solutions and technologies that can generate positive ecological and economical effects. In addition to the greater independence from energy imports and the avoidance of emissions, investing in the development of energy- and emission-efficient technologies can also create export opportunities for the producers of environmental technologies. The Austrian environmental technology industry has already proven in the past that innovations –pushed by regulations – contribute to the dynamic economic development.

But what is important for both the suppliers of technologies and the demand side are stable general political conditions that guarantee planning safety and reduce the risk of investing in innovation and new technologies. This also includes the continuity of political targets along with the instruments and incentive systems that are used to meet them. Sufficiently stringent regulations are seen as necessary to set incentives for a sufficient level of research activities. This includes, for example, guaranteed feed-in tariffs for electricity from renewables, foreseeable developments of technical standards, energy or emissions taxes and a more durable and sufficient provision of support programmes. In the end this also requires the different political departments and funding institutions to coordinate and agree on the themes.

3 Universities in Transition

3.1 The development of third-party funding at Austrian universities

The relationship between university and corporate research has been examined in detail during the last twenty-five years (Schartinger et al. 2002; Tether 2002; Caloghi-rou et al. 2003; Abramovsky et al. 2005). After the concept of innovation systems was developed, a number of studies were conducted beginning in the late 1990s which attempted to measure the extent of collaborations between universities and companies. There were also some benchmarking studies done on an international level, for example by the OECD and the EU.

The pursuit of these research topics was accompanied by warnings that more cooperation between universities and the business world would not necessarily be an improvement because it could have negative long-term effects on the quality of the research conducted at universities (Cohen et al. 1998). Therefore, some of the more recent studies focus explicitly on the correlation between the quality of research and proximity to industry, as well as the commercialisation of research (Schartinger and Rammer 2002; Breschi et al. 2006; Zucker and Darby 2007). The contradictory result of these studies is that the research plans of universities and companies are too disparate in many sectors to be able to effectively enrich each other. However, wherever the relevance of university research to companies is readily apparent, such as in biotechnology, universities seem so closely aligned with industry that the standards for sharing research in the form of publications and lectures, which is inherent to the scientific system, may be restricted.

The currently predominant view is that universities may quickly become more efficient and make a greater contribution to the economy's ability to compete if they have appropriate incentive structures. This is also reflected politically in the form of different programmes that support collaboration between both sectors and university reforms.

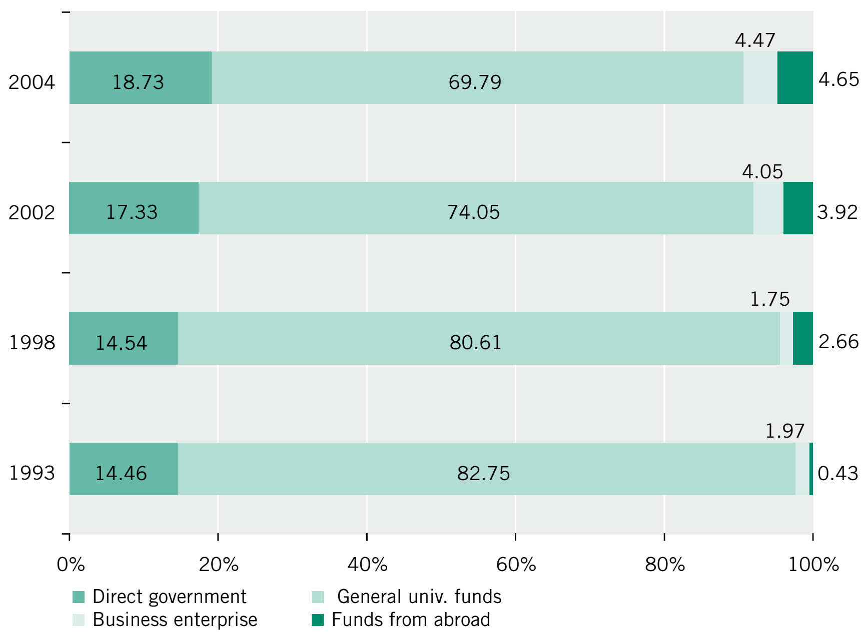
3.1.1 The development of the structure of university financing

The changed perception of the role of universities as being service providers that must increasingly shape their research to match the requirements of the "users" in business and society goes hand in hand with a changed financing structure at universities. Figure 22 shows the respective trends for Austria.

The relative share of contributions that is received by the universities from the Ministry for Science and Research for higher education spending on research and development (HERD) with no appropriations for their research and teaching costs has been *dropping* (General University Funds – GUF) from 82.75% in 1993 to 80.61% in 1998, 74.05% in 2002 and 69.79% in 2004.

In contrast, the share of application-oriented research has *grown* from 14.46% in 1993 to 17.33% in 2002 and 18.73% in 2004. A significant part of these third-party funds are from the Science Fund (FWF). The third-party funding for universities from the FWF amounts to € 53 million for 1998, € 86 million for 2002 and € 90 million for 2004.[27]

Figure 22: HERD according to source of financing



Source: STATISTIK AUSTRIA, tip calculations.
In this chart the categories private non-profit and higher education have been ignored. When they are included, the total adds up to 100%.

The share of the HERD that is financed by the business sector has also risen, from 1.97% in 1993 to 4.47% in 2004. With a total of € 1.402 billion in university expenses for research and development in 2004 and € 1.266 billion in university expenses for research and development in 2002, this amounts to € 63 million and € 51 million for 2004 and 2002.

What has also increased is the share financed by foreign countries, e.g. by supporting programmes of the EU (from 0.39% in 1993 to 4.65% in 2004). The financing sources of the local universities are becoming more diverse on one hand, while on the other, the funds are appropriated to a higher extent than in the 1990s. The trend towards a larger share of competitive funds for financing of universities will only increase when the Universities Act of 2002 comes into force in 2004, according to which the income from research and development (R&D) assignments are used for calculating formula-based budget allocations.

27 These numbers are provided by Statistik Austria. The figures may be different from those provided by FWF since they refer to the support that has been paid rather than the authorised funds in the respective years.

3.1.2 Amount of third-party funding by companies at the industry level

The figure above makes it clear that companies play an increasingly important role in financing universities. Therefore, third-party funding of Austrian universities will be explained in more detail below, based on the R&D survey results from 1998 to 2004 (Bauer et al. 2001; Messmann and Schiefer 2005; Schiefer 2006).[28] This question focuses on the source of third-party funding at the industry level and the dynamics of the development.

Table 5: R&D expenditures by companies: Intramural and extramural

	1998	2002	2004
Intramural R&D expenditures	2,160,673	3,130,884	3,556,479
Extramural R&D expenditures	291,536	483,525	508,898
Of which R&D expenditures for universities	21,415	24,819	28,563
Universities as a % of all R&D expenditures	0.87	0.69	0.70

Source: STATISTIK AUSTRIA, R&D surveys 1998, 2002 and 2004, tip calculations. Numbers in € thousands.

Table 5 places the extramural R&D expenditures of companies for domestic universities in the context of other expenditures. Overall, the extramural R&D expenditures of companies for universities have steadily grown, from € 21,415 million in 1998 to € 24,819 million in 2002 and € 28,563 million in 2004.[29] However, they only account for less than one percent of all R&D expenditures by companies. This is in harsh contrast to the increasing role that company orders play for universities (see Figure 22) and demonstrates that it is not customary for companies to continuously give away larger amounts of their research budgets to universities.

The data lead instead to the assumption that universities are only consulted selectively and for very specific problems in the research process.

Table 6 shows the extramural R&D expenditures by companies for services from domestic universities at the industry level for 1998, 2002 and 2004.

The data are arranged in a descending order according to extramural R&D expenditures at universities in 2004 and show the absolute numbers in thousands of euros. In absolute numbers, trade is in the top position for 2004. Because of the size of the industry (according to the gross added value, trade is in second place among the industries with almost double the gross added value of the industries ranked third and fourth), the overall research intensity of trade is still low (see Figure 23).

28 The results of the R&D survey for 2006 were not available at the time this report was created.

29 Information about how much money is passed from the business sector to the university sector in the form of research assignments varies widely depending on whether universities or companies are questioned. The difference is especially striking in 2004, since the amount is € 63 million according to the universities but € 28.6 million according to companies. According to Statistik Austria, the reasons for this are diverse: They can be traced to i) a diverse culture and diverse degree of detail in accounting; ii) the fact that funds from the national bank (in the range of about € 8-10 million) for the universities are attributed to the business sector, but the national bank is not included in the R&D assessment; and iii) the cooperative area (especially the competency centres and CD laboratories) is underestimated by the companies in the R&D assessment.

Table 6: Extramural R&D expenditures of companies for universities 1998 – 2004

NACE	Industries	Extramural expenditures for R&D at universities, 1998	Ranking 1998	Extramural expenditures for R&D at universities, 2002	Ranking 2002	Extramural expenditures for R&D at universities, 2004	Gross added value 2004	Ranking GAV 2004
							in million €	
50-52	Trade; motor vehicles services and consumer durable goods	1,206	8	581	13	4,608	27,630	2
73	Research and development	486	15	3,404	2	3,761	540	29
31	Electricity generation and distribution equipment	1,252	7	1,358	6	2,916	1,764	21
29	Machinery and equipment	1,825	3	2,085	4	2,191	5,344	6
70+71+74	Real estate, renting of movables and business services	1,655	4	2,678	3	2,062	32,665	1
27	Metal production	643	12	1,142	7	1,346	3,167	11
28	Metal products	444	16	819	10	1,283	4,596	8
33	Medical, precision and optical instruments	841	10	518	14	1,058	949	24
40+41	Electricity, gas and water supply	2,424	1	680	11	979	5,179	7
60-64	Transport and communication	1,381	6	1,618	5	932	15,356	4
24 without 24.4	Chemicals, chemical products (without pharmaceuticals)	486	14	650	12	829	1,363	22
72	Data processing and databases (incl. software companies)	401	18	947	9	785	2.968	12
24.4	Pharmaceutical products	1,110	9	4.212	1	771	813	27
32.1	Electronic components	319	19	956	8	735	822	26
25	Rubber and plastic products	418	17	323	17	565	1.787	20
34	Motor vehicles and motor vehicle parts	80	23	96	27	526	2.804	13
45	Construction	4	26	100	26	429	15.996	3
32 without 32.1	Telecommunications (without electronic components)	225	20	156	24	330	2.117	16
20	Wood (without furniture production)	679	11	180	22	275	2.258	15
36	Jewellery, musical instruments, sporting goods, toys, furniture, etc.	198	21	239	18	216	2.101	17
26	Non-metallic mineral products	1,421	5	405	15	209	2.512	14
21	Paper and pulp	116	22	379	16	190	1.801	19
65-67	Financial intermediation	2,265	2	52	29	189	11.687	5
01+02+05	Agriculture and forestry, fisheries	1)	N/A	228	19	164	4.000	9
15	Food products, beverages and tobacco	594	13	186	21	136	3.695	10
17	Textiles and textile goods (without apparel)	64	25	20	30	36	1.022	23
10-14	Mining and excavation of rocks and soils	G	N/A	101	25	27	883	25
22	Publishing and printing	65	24		N/A	21	2.046	18
18+19	Apparel, leather goods, shoes	1)	N/A	187	20	20	666	28
30	Office machines, computing devices and installations	1)	N/A	60	28	19	208	31
35	Other vehicle construction	1)	N/A	177	23	6	537	30

Source: R&D surveys 1998, 2002, 2004 and EUKLEMS. Numbers in thousands of euros. 1) For confidentiality reasons, the data cannot be listed separately. The following industries are missing entirely since no numbers were reported during the survey periods: Coke and refined petroleum products (23), tobacco processing (16), recycling (37), restaurants and hotels (55).

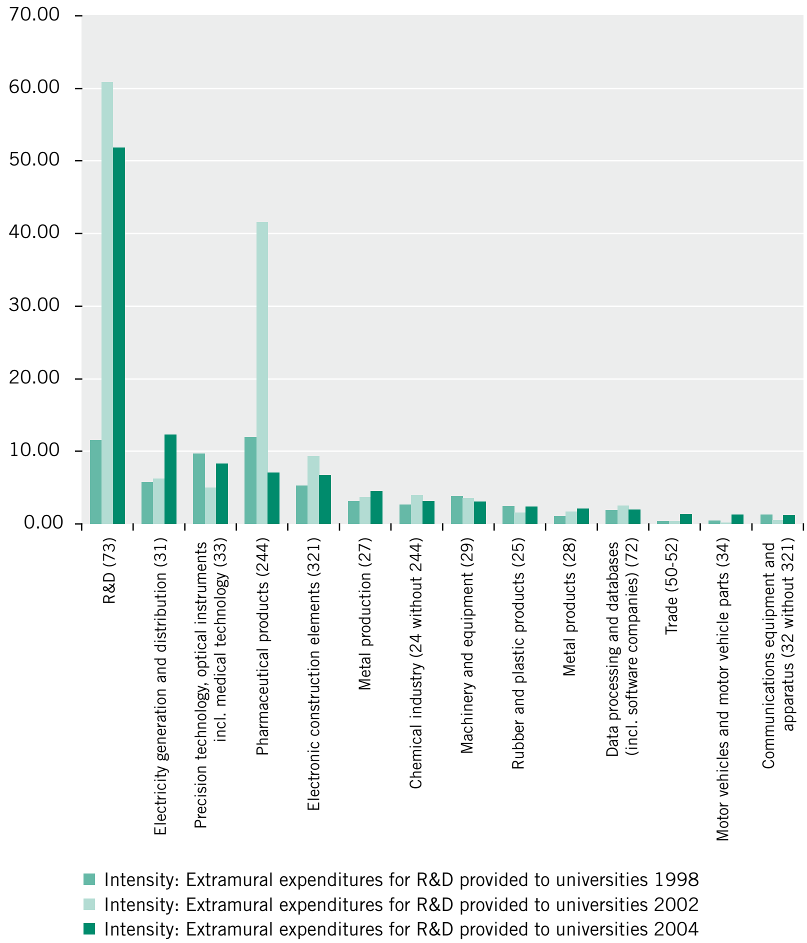
The obvious jumps in the numbers in individual industries are a striking feature of this trend: The extramural R&D expenditures by trade to universities grew to eight times their original amount from 2002 to 2004. During this period, the R&D expenditures of the electronics industry (NACE 31) doubled at universities, but those by the pharmaceuticals industry shrank to about one-sixth in the same time period.[30] Other industries also show enormous fluctuations in the comparable time period, for example metal products (NACE 28) or the producers of precision technologies (NACE 33). The reason for this can be found in the stochastic nature of contract allocation by companies to universities: A few larger projects can completely change the industry pattern from one survey period to the next.

Only in 2004 are the expenditures of € 12,979,000 in the service area at about the same amount as in the production sector with € 13,985,000. In previous years, the production of durable goods and associated extramural R&D expenses at universities were clearly ahead of the service sector.

However, the high absolute expenses of trade and other industries become relative when they are placed in the context of the size of the respective industries. Figure 23 shows the extramural R&D expenditures for universities, adjusted by the size of the industry as measured by its gross added value. The share of extramural R&D expenditures that are awarded by an industry to universities in one year in the entire sum of extramural R&D expenditures for universities in this year divided by the share of an industry in the entire gross added value results in the intensity of the extramural R&D expenditures for the universities of one industry. Industries with a value greater than one disburse above-average amounts of research funds to universities, i.e. higher expenditures than would be expected from the size of the industry in the form of the gross added value. This indicator includes those industries at the top that are naturally research-intensive, such as commercial R&D service providers (NACE 73), electricity generation, measurement and medical technology, and the pharmaceutical industry.

30 Some pharmaceutical companies have completely outsourced their research activity to independent organisations; those are now part of the research and development industry (NACE 73).

Figure 23: The intensity of extramural R&D spending in the business area



Source: R&D surveys 1998, 2002, 2004, EUKLEMS database (Timmer, O'Mahony et al. 2007), tip calculations

3.1.3 Summary

By applying appropriate incentive structures, universities can quickly be made more efficient and make a greater contribution to the economy's competitiveness. This view has been reflected in politics in the form of different programmes that support cooperation between science, the economy and the university reform.

Third-party funding of universities is considered to be a significant indicator for the transparency of research results between universities and the economy. Overall, the extramural R&D expenditures of companies for universities have grown consistently and were at € 28,563 million in 2004, where the research-intensive industries also show the highest intensity of extramural expenditures for R&D at universities.

The changed perception of the role of universities as service providers that also have to shape their research to the requirements of the "users" in economy and society goes hand in hand with a changed financing structure at universities. The share that universities receive from the state continued to decline overall, from 97.21% in 1993 to 88.52% in 2004. However, the share of the business area in HERD, as well as the share that is financed by foreign countries, such as through EU support programmes, has been growing. Even with this changed financing structure, the share of HERD in the gross national product remains at a high level internationally.

3.2. University development: Positioning on the basis of key figures from intellectual capital reports

3.2.1 Intellectual capital reports under the Universities Act of 2002

Since the passage of the 2002 Universities Act (UG 2002), Austrian universities have been required to publish intellectual capital reports.[31] In the spring of 2006, a Regulation and an auxiliary document were published that describe the construction and structure of the intellectual capital report and define the figures that the universities are to survey.[32]

With the intellectual capital report, indices that are important for managing universities are to be defined on the basis of a uniform classification, which is to be compiled and published annually as an independent report. This is followed by the presentation, evaluation and communication of intellectual capital, production processes, outputs and effects, based on based on comprehensive and self-defined goals.

This allows the processing of quantitative data, which provides information on strategic prioritisation, personnel development, research outputs, third-party financing and commercialisation of research.

The intellectual capital report, along with the agreement on productivity and evaluation, is an important management tool for universities and also provides valuable information for science and education policy. The publication of comparable indices also increases transparency within the university system and enables reporting on the performance of public investments – a development that is being discussed internationally under the slogan of "accountability".

The intellectual capital report is clearly structured and includes the following information:

- Human resources: Information on scientific and general university personnel, including resignations and appointments,
- Structural resources: Data on usable space, information on measures for the promotion of women, data on research data banks and scientific journals,
- Relationship resources: Information on contractually fixed cooperative agreements, participation and activities in committees and scientific journals,
- Core process teaching and continuing education: Data on organised studies, the number of students and mobility programmes,
- Core process research and development: Categorisation of scientific personnel in R&D, persons according to application group, number of scientists financed by

31 See the Federal Act on the Organisation of Universities and Their Curricula (Universiteis Act of 2002), searchable under http://www.bmwf.gv.at/fileadmin/user_upload/wissenschaft/recht/englisch/E_UG.pdf
32 Cf. Decree on Intellectual capital reports (Intellectual capital reports Decree – WBV), Federal Law Gazette II no. 63/2006.

third parties, number of R&D projects financed by third parties, and the number of doctoral students,
- Output teaching and continuing education. Data on the number of graduates,
- Output research and development: Number of scientific publications (original contributions, monographs, research reports, etc.), number of doctorates completed, data on income from R&D projects.

According to the intellectual capital report regulation, 53 indices are to be collected in these categories, which follow a specific logical procedure, and are to be reported electronically to the Federal Ministry of Science and Research (BMWF). Certain additional specific indices are to be collected from the medical universities and the arts universities. In addition to the data in these categories, a narrative report on goal-setting and strategies, as well as a summary and an outlook, are to be included in the intellectual capital report. An interpretation of the indices must also be provided. The intellectual capital reports of all 21 public universities and the Krems University for Continuing Education for the past calendar year are to be turned in to the Federal Ministry of Science and Research by April 30, and, after a data clearing process, are to be published in the information publication of the university.

The first intellectual capital reports for 2005 were published the spring of 2006 with a sharply reduced set of indices. All 21 universities and the Krems University for Continuing Education published the first complete intellectual capital report in the spring of 2007. At the same time, the BMWF has constructed a data base that makes a large portion of the indices publicly available.[33] Despite the greatest possible precision in the definition of the indices, the universities still need further clarification on several indices, and for this reason all of the indices are not yet ready for use. Because of changing definitions, reclassifications and new observational periods, the indices are not always comparable with earlier data, such as those collected by the previous Federal Ministry for Education, Science and Culture (BMBWK) or STATISTIK AUSTRIA.

In the following indices that provide information about the development of research and development at universities will be introduced and described. This report will not go further into the accomplishments of universities in connection with teaching and continuing education. Detailed information on this topic is to be found in the university report of the Austrian federal government.

3.2.2 The intellectual assets of the university: Human, structural and relationship capital

The intellectual capital report differentiates between intellectual assets that are human, structural or relationship capital. These three forms comprise the basic resources of the university, and the development of all three resources determines the future potential of a university. The legislature has decided to adopt a classification that has been suggested by a European research group for assessing intangible assets and intellectual capital (Leitner 2004).

The human resources of a university include all scientific and non-scientific workers. The intellectual capital report includes a series of indices on personnel. These results

33 See data warehouse for universities: http://www.bmwf. gv.at/unidata

cannot be compared directly with earlier values because new classifications and application categories have been established. By recording these data every year according to various group characteristics the trends can be monitored continually. Table B (see Annex) shows the growth of full-time personnel levels at Austrian universities between 2005 and 2006. According to the intellectual capital report indices, 22,820 persons (full-time equivalents – FTE) were employed at 22 Austrian public universities in 2006, 2% more than in 2005. While the employment of professors dropped slightly in comparison to 2005, the proportion of academic assistants and other scientific personnel and the proportion of general personnel rose slightly between 2005 and 2006.

At the same time, many universities created a large number of new professorships. These appointments were made within the framework of strategic planning, and one may expect future increases in this area. Women made up 37% of the scientific and artistic personnel (number of persons) in 2005; in 2006, 38%. In the professorial ranks, women accounted for 15% of professors in 2006, the same as in the previous year. The arts universities have a large proportion of women professors, but the proportion is lower at the technical universities.

An analysis of the number of persons in R&D projects sponsored by third parties (not shown here) also shows that in comparison to other categories this group has grown considerably at all universities, on average by around 20%. This increase is also a sign of the successful receipt of third party funds by the universities; based on the university data provided in the intellectual capital report, this is an important strategy for research activities.

Looking at the overall growth of personnel, it appears that the greatest growth has taken place at the Krems University for Continuing Education, the Medical University of Graz, and Academy of Fine Arts Vienna, the University of Innsbruck and the University of Graz.

Table 7: Number of university teaching authorisations awarded in 2006

University	Women	Men	Total
University of Art and Industrial Design Linz	0	0	0
Academy of Fine Arts Vienna	0	0	0
Graz University of Technology	2	3	5
University of Mining Leoben	0	1	1
University of Klagenfurt	2	4	6
University of Natural Resources and Applied Life Sciences, Vienna	2	3	5
Vienna University of Technology	1	15	16
University of Vienna	19	30	49
Medical University of Vienna	21	54	75
Medical University of Innsbruck	9	28	37
Medical University of Graz	5	17	22
University of Veterinary Medicine Vienna	4	2	6
University of Salzburg	1	8	9
University of Graz	7	13	20
University of Innsbruck	11	11	22
Vienna University of Economics and Business Administration	2	16	18
University of Linz	0	5	5
University pf Applied Arts Vienna	1	0	1
University of Music and Dramatic Arts Mozarteum Salzburg	4	2	6
University of Music and Performing Arts Vienna	1	1	2
University of Music and Performing Arts Graz	0	2	2
Total:	92	215	307

Source: Federal Ministry of Science and Research (BMWF)
Note: This index is missing for the Krems University for Continuing Education due to special circumstances.

The number of habilitations is an important indicator of the development of scientific personnel and the scientific output of the universities; it is also shown in the intellectual capital report. Table 7 shows an overview of the successfully completed habilitations in 2006.

In total, 307 teaching authorisations were granted, almost one third of them to women. If one considers the number of teaching authorisations according to academic branch, it appears that more than one third occurred in human medicine (not illustrated). In both the natural sciences and the social sciences 54 habilitations were awarded. As expected, the number of teaching authorisations granted indicated gender differences within the disciplines; the social sciences and the humanities had a relatively high proportion.

The **structural capital** of the universities includes the infrastructure, processes and organisational solutions. Indices of spending on research data bases and laboratory equipment were collected for the intellectual capital report that is discussed here. Austrian universities spend € 3.2 million annually for research data bases to allow electronic access to scientific journals. While expenditures at the smaller universities and the arts universities were relatively low, between € 564 and € 70,000, at the larger universities they amounted to between € 250,000 and € 450,000. These costs were due primarily to licenses for access to reference, full-text, and information data bases, and thus form an important part of the research infrastructure of a university.

The universities with natural science and technical faculties reported the highest amounts of expenditures for large R&D equipment.[34] Thus the Graz and Vienna Universities of Technology,, the University of Innsbruck, the University of Natural Resources and Applied Life Sciences Vienna, the University of Salzburg, the University of Graz and the University of Vienna each had annual expenses of more than € 1 million. At the very top of the list was the largest university, the University of Vienna, with about € 4 million. In sum, the 22 universities spent more than € 16 million in 2006 on large R&D equipment. Just as the index for research data bases varies, so too does the amount spent in total, thus reflecting the fact that the necessity for material investment depends heavily on the particular scientific discipline.

The **relationship capital** of a university includes personal and institutional relationships and cooperation agreements. It also constitutes an important resource of a university, one that provides information about future capabilities. Acting on the editorial boards of scientific journals and participating on scientific committees or other boards promotes the transfer of knowledge within the scientific community and provides a basis for continued cooperation. The number of persons employed in external professorial and habilitation committees shows that in 2006, scholars participated in such functions 386 times. First place was taken by the Medical University of Innsbruck with 101 persons active in these areas. An assessment by individual disciplines over all universities reveals the same trend. In human medicine, such external functions were undertaken especially frequently (140 persons), followed by the natural sciences (68 persons) and the social sciences (59 persons).

Table 8 gives an overview of the activity of scientific personnel at Austrian universities in scientific or artistic journals. It is clear from this that employees of medical universities are especially frequently active in scientific journals, either as referees or editors. If this indicator is examined according to sci-

34 This is equipment with an acquisition price of over € 70,000. It only includes equipment that was also financed out of the gloabl budget of the universities.

entific specialty, here too the great relevance of such activities in human medicine is clear, followed by the natural sciences. Both are disciplines in which publication is done primarily in international journals. These types of activity often allow one to obtain information very early on about new scientific developments, something that is becoming more and more important in global competition. Furthermore, employees of Austrian universities fulfil 3,147 functions in scientific or artistic committees, and are entrusted with coordinating activities. These make corresponding demands on time resources, but they should be perceived as investments that simultaneously strengthen relationship resources.

Table 8: Persons with functions on scientific and artistic journals

University	Women	Men	Total
University of Graz	-	-	-
Vienna University of Economics and Business Administration	23	60	83
University of Klagenfurt	7	37	44
Medical University of Vienna	119	308	427
Academy of Fine Arts Vienna	7	9	16
Medical University of Graz	38	185	223
University of Linz	14	101	115
University of Natural Resources and Applied Life Sciences, Vienna	41	145	186
University of Mining Leoben	4	39	43
Graz University of Technology	0	39	39
Vienna University of Technology	5	88	93
University of Salzburg	35	146	181
University of Innsbruck	45	181	226
University of Vienna	111	305	416
Krems University for Continuing Education	9	15	24
Medical University of Innsbruck	87	431	518
University of Art and Industrial Design Linz	0	5	5
University of Veterinary Medicine Vienna	27	42	69
University of Music and Performing Arts Vienna	5	11	16
University of Music and Dramatic Arts Mozarteum Salzburg	0	2	2
University of Music and Performing Arts Graz	2	4	6
University of Applied ArtsVienna	6	6	12
Total:	585	2,159	2,744

Source: Federal Ministry of Science and Research

In addition to the relationships among university employees, the intellectual capital report also examines institutionally-anchored cooperation agreements, such as cooperating contracts or participations in other entities. The University of Natural Resources and Applied Life Sciences Vienna has some 270 cooperating contracts with partner institutions and universities; two thirds of these are with foreign partners. Other Austrian universities hold a similarly large number of cooperating agreements, which may be augmented and expanded.

3.2.3 Research and development as a core process of the universities

Teaching and continuing education as well as research and development are the two core processes of the university for which indices are available. The number of doctoral students in the area of research and development is presented below. These figures supply specific information about the next generation of potential scientists. The intellectual capital report for Austrian universities shows the number of doctoral students. Most universities experienced an increase in the number of students writing dissertations between 2005 and 2006 (see Table 9). Of the total 18,660 doctoral students, about 3,979 came from abroad; the proportion of international students writing dissertations in 2006, about 21% of the whole, was the same as in 2005. In 2006, 550 doctoral students had completed a specialised degree (not illustrated).

Table 9: Number of doctoral students at the universities

University	Winter semester 2006 (as at 12.02.07)	Winter semester 2005 (as at 28.02.06)
University of Linz	813	753
Vienna University of Economics and Business Administration	958	947
Graz University of Technology	959	853
Vienna University of Technology	1,618	1,459
University of Graz	1,841	1,830
Academy of Fine Arts Vienna	48	42
University of Art and Industrial Design Linz	38	24
University of Music and Performing Arts Graz	91	75
University of Music and Dramatic Arts Mozarteum Salzburg	79	70
University of Music and		
Performing Arts Vienna	147	114
University of Applied Arts Vienna	115	104
University of Klagenfurt	612	583
University of Salzburg	1,100	969
University of Innsbruck	1,990	1,929
University of Vienna	6,425	5,955
University of Minig Leoben	255	207
University of Natural Resources and Applied Life Sciences, Vienna	645	551
University of Veterinary Medicine Vienna	339	284
Medical University of Vienna	351	299
Medical University of Graz	62	78
Medical University of Innsbruck	183	134
Total	18,669	17,260

Source: Federal Ministry of Science and Research (BMWF)
Note: This indicator is missing for the Krems University of Continuing Education due to special circumstances.

An analysis of the number of doctoral students by ISCED fields (see Table 10) shows that the number of doctoral students in natural sciences and engineering rose by 14% from 2005 to 2006. The proportion of women remained about the same (not shown).

Table 10: Number of doctoral studies according to ISCED

ISCED 1-Steller	Winter semester 2006 (as at 12.02.07)	Winter semester 2005 (as at 28.02.06)
Humanities and Arts	3,383	3,413
Social sciences, Business and Law	3,865	3,824
Education	792	798
Natural sciences	3,205	2,824
Engineering, Manufacturing and Construction	2,605	2,290
Agriculture	593	574
Health and Social work	705	662
Services	151	151
Unknown/no details given	468	2

Source: Federal Ministry of Science and Research (BMWF)

3.2.4 Outputs in research and development

The category of "core processes" in the intellectual capital report supplies information on the scope and orientation of achievements. Research results are recorded and assessed in the category "output and effects." Information in the area of output and effects includes information on publications, patents, completed dissertations and income from third parties. Even though here too the legislature has defined a standard set of indices, the universities have the option of showing and assessing developments and results by using additional optional indices. So far, they have hardly taken advantage of this option.

Reference is made to section 2.1 of this report on the development of third-party funds. Completed doctoral studies and patents will be discussed here in more detail. According to the intellectual capital report, most Austrian universities regard themselves as research universities with teaching guided by research. The growth in the number of doctoral students thus translates into an increase in younger scientists, and is therefore of great significance and a central factor for success in the interface between research and teaching. Table C in the Annex shows this development of completed doctorates in 2005 and 2006 at Austrian universities, differentiated by educational fields. While the index of doctoral studies in the core process provides information on ongoing dissertations, the completed doctorates are the measure of actual output. During the academic year 2005-2006, a total of 2,137 students successfully completed their doctorate studies at Austrian universities. This was somewhat less than in the academic year 2004-2005 (2,237 graduates). The University of Vienna is by far the largest research-based educational institution for doctoral students, with a total of 699 completions in 2005-2006. Of the 2,137 graduates all over Austria, 884 were women (41%), a slight decline from 2004-2005 (44%, not illustrated).

Classification of completed doctorates by student origin also shows that in 2005-2006, some 22% were of international origin, a number slightly higher than in the previous academic year (20%). This is also assign of the internationalisation and attractiveness of Austrian universities.

An analysis of completed doctorates by educational field on the second ISCED level also shows that in most fields one can detect a decline in completed doctorates (not illustrated). Increased numbers are shown for mathematics and statistics, engineering, technical specialities and services. 28 completed doctorates in 2005-2006 could not clearly be placed into one of the ISCED fields, so this field grew in comparison to last year. There was a relatively strong general decline in education, the humanities, journalism, agriculture and veterinary medicine. One must however be careful when interpreting these numbers, since the numbers are subject to certain variations.

A total of 21 patents were awarded in 2006: Five of these were at the University of Veterinary Medicine Vienna, four each at the Vienna University of Technology and the University of Linz, three at the Krems University for Continuing Education and two at the Vienna University of Technology. The University of Mining Leoben, the University of Innsbruck, and the Medical University of Vienna received one patent each in the name of the university.

When we consider the number of patents issued by scientific field we see that the emphasis, as expected, lay in the area of natural sciences (4 patents) and technical sciences (8 patents, including 5 in electronic technology or electronics). Moreover, four patents were issued in human medicine and four in veterinary medicine. The number of patent filings in 2006 as reflected in the intellectual capital report was appreciably higher than the number of patents actually issued. We can count on higher numbers in the future due to the time delays between patent filing and issuance.

The Vienna University of Technology filed 36 patents in 2006; the Graz University of Technology, 37. The intellectual capital reports currently provide no information on the actual utilisation of these patents. The patent process forms the basis for commercialising university inventions. According to the data in the intellectual capital reports, several universities plan to make use of these inventions, probably through licensing arrangements.

Because the method of classifying publications has not yet been agreed upon (for example, we do not yet have a complete classification of publications according to various categories and disciplines), this important form of output of university research and development cannot be fully presented at this time.

The details provided here for the University of Innsbruck and the University of Natural Resources and Applied Life Sciences Vienna are meant to serve as an example. Scientists at the University of Natural Resources and Applied Life Sciences Vienna produced 1,944 publications in 2006. Of these, 353 were original publications in professional journals listed in the Science Citation Index (SCI), the Social Science Citation Index (SSCI) or the Arts and Humanities Citation Index (A/HCI). In addition, 952 lectures were given at scientific conferences.

Researchers at the University of Innsbruck completed 3,586 publications, of which 597 were SSCI, SCI or A/HCI publications. 231 textbooks were published for the first time. Information from a large number of the intellectual capital reports reveals a rising number of contributions in SSCI, SCI or A/HCI listed professional journals, which highlights the increasing trend toward publication in international journals. In addition, an analysis of the publications shows that the number and type of publications depends on the discipline, and a direct comparison between different branches of study is not possible. In the future, it is here that information on the accomplishments of individual universities will show development over time.

3.2.5 Summary

The indices of the intellectual capital reports for all Austrian public universities have been analysed for the first time in the course of the Research and Technology Report. These indices provide information on the actual resources, processes and outputs of the universities. According to the data in the university intellectual capital reports, the various indices help the universities see if they are attaining their stated goals and strategies. Some new indices have been made available for science and education policy and for other interest groups, such as students and companies. These indices will enable broader analyses in the future that can consider developments over time against the background of university goals and strategies, or between disciplines and universities. One possible area of application is efficiency analyses, as done on the basis of data from the working reports of the heads of the institutes (early reporting before introduction of UG 2002) by Leitner et al. (2007) in the natural science and technical areas.

3.3 Doctoral study in Austria: International comparison and empirical survey of doctoral candidates

3.3.1 The European doctorate

Since the follow-up conferences in Berlin (2003), Bergen (2005) and London (2007), increased attention is being paid to doctoral education in the Bologna process. In 1987, there was an OECD study on "Post-graduate Education in the 1980s," which focused on long periods of study and the high dropout rate (OECD 1987). In the early 1990s, a reform commission staffed by the science ministers of Belgium, Germany, France and the Netherlands recommended that graduate schools be organised according to the United States model. If we examine the studies and discussions that have taken place to date in Europe, they all suggest an increasing dissatisfaction with "traditional European doctoral study." The core elements of the European doctoral programme, as well as the criticisms levied against it, are most evident in contrast to the North American PhD programme, which has long served as a role model for planning reforms. Traditionally, the European doctorate is described as an "apprenticeship model" and is differentiated from the doctoral education models that are structured along the lines of North American "doctoral programmes." The essential difference between the two models is that the traditional European form of organisation is only formalised to a very limited degree with respect to choice, advising and quality assurance, while the North American system is rigorously formalised and standardised. As Europe expands its university system, the North American model has exercised an increasing influence in Europe, shaping the approach and orientation of numerous political and academic actors, because the hierarchy provided by the U.S. system, including such features as graduate study, post-docs and guest professorships, is very appealing.

Therefore, the standard European forms of doctoral education are under pressure for several reasons:

- Traditional European doctoral studies assume that at the end of their basic studies all graduates will possess a sufficient foundation in scientific work for their disciplines. This system considers neither a transparent form of doctoral study admissions nor a more systematic education system for doctoral studies to be necessary. It does not take account of the fact that student abilities and interests have become increasingly broader while specialisation in research has become more pronounced.
- The expansion of higher education has led to growing anonymity among students, which pushes the boundaries of individualised forms of admissions and advising in doctoral study. In the natural sciences, a research process based on the division of labour has long led doctoral candidates to be integrated into research teams. There is a different state of affairs in the humanities and social sciences, where the majority of students produce their dissertations in isolation after an informal discussion with their supervisor, hoping that the dissertation will be accepted at the end of the process. Given the current informal character of such programmes, the standardisation of doctoral study would prove to be superior in the humanities and social sciences. Increasing specialisation in research, as well as the accompanying division of labour, requires the ability to work cooperatively in a team, which no longer justifies individual supervision and isolated work.
- Considering the progressive internationalisation of education and research, national traditions have faded into the background. We need to hold our ground in the competition for the brightest minds.
- And finally, in the competition among the academic disciplines, the natural sciences are becoming increasingly important. This isn't necessarily clear from students' choice

35 The following chapter on doctoral study in Austria is based on the study by Pechar et al. (2008).

of study (as this is primarily or exclusively affected by interests and aptitudes), but is determined rather by the set of priorities established by political and economic decision-makers. The latter are especially important for the allocation of financial resources.

Developments in doctoral programmes over the last two decades have been a reaction to these challenges. Even though these organisational units only existed in Anglo-Saxon countries until recently, they have now spread throughout Europe, motivated by the Bologna process and other initiatives.

3.3.2 New forms of doctoral study in Europe

Germany, Sweden and the Netherlands have assumed a pioneering role in the creation of new forms for doctoral programmes in Europe. All three countries have demonstrated a trend toward stronger structuring of doctoral study and are highly advanced in the European context. Their primary motive is to reduce the duration of doctoral studies, which is considered unacceptably long. The structuring of these studies – which implies the creation of new organisational units, clear rules for the course of study and for the relationship between supervisor and candidate, regular monitoring of progress, greater emphasis on mandatory and custom-designed courses for candidates, as well as financial security for doctoral candidates – should contribute to lowering study times and the dropout rate. Furthermore, an increase in the quality of research training is the goal.

Reforms in Germany

Traditionally, German doctoral study was the prototype of the "apprenticeship model," a model that is no longer as dominant as it once was. Doctoral study in Germany is in upheaval, a transformation initiated primarily by the introduction of the Deutsche Forschungsgemeinschaft (DFG; German Research Foundation) doctoral school in the 1990s. The German Rectors' Conference (HRK) and the German Council of Science and Humanities (WR) have been involved in the reform of doctoral education in several ways. The experiences with the DFG doctoral school have been overwhelmingly positive, and the Science and Humanities Council is arguing for the establishment of graduate level research schools. The graduate schools will be defined as "an institution created by a consortium of professors for the purpose of educating and supervising doctoral students." Their objective is that the school will "accept graduates who wish to pursue their doctorate in a transparent, competitive process with high academic standards, that the participants offer a meaningful programme of study and that the participating professors bear collective responsibility for the supervision of doctoral candidates as well as providing good working conditions" (German Council of Science and Humanities 2002, p. 51). Furthermore, the German Council of Science and Humanities has produced a "two-tier concept" in which several graduate schools are pooled into "Centres for Graduate Studies." These centres would take over the task of "creating a space for cooperation, exchange and collaborative activities for various graduate schools, thereby organising educational and advanced training offerings of interest across the board" (German Council of Science and Humanities 2002, p. 56). As a result of these initiatives, there has been a noticeable change in Germany's culture of doctoral education, where two different paradigms of education are to be found today, both to the benefit of the next generation of researchers: The traditional German doctorate and an educational programme structured on the North American PhD model, which is increasingly growing in significance.

Reforms in Sweden

At 2.2%, Sweden has one of the highest rates of doctoral education within the OECD. Originally, the Swedish education system was strongly oriented toward the German model. After the Second World War, however, the American system exerted a strong influence at every level of Sweden's system and was adapted to Sweden's requirements. Far-reaching reforms in doctoral admissions were undertaken in 1998 (Mähler 2004, p. 203). Their objective was to increase and ensure the transparency of admission proceedings, so that students would only be admitted when there were enough supervisors to supervise them. As part of the process, agreements had to be made between supervisors and doctoral candidates in which the obligations of both parties, including advising intensity, scheduling, required infrastructure, participation in conferences and the like, were enumerated. There is a new law that states that doctoral graduates must be hired. Since the 1980s, this has also created several new facilities for graduate schools. In 2001, the government founded 16 graduate schools, so-called "inter-institutional graduate schools," across the country. These are meant to complement the existing system and increase the efficiency of doctoral education (Bartelse et al. 1999).

Reforms in the Netherlands

In reaction to the expansion of higher education after the 1960s, doctoral study has become a subject of higher education policy in the Netherlands. The primary discussion topics focused on the duration of doctoral study and the desired quantitative relationship between university graduates and doctoral students. This discussion led in several stages to a rejection of the traditional master-student model, which influenced two important steps in the reform of doctoral education: (1) the creation of positions for doctoral candidates (assistant *in opleiding*) in 1986 and (2) the introduction of doctoral universities (*Onderzoekscholen*) in 1991. The latter was meant to promote the education of a critical mass of doctoral candidates to promote excellence in research. This objective is to be achieved mainly through cooperation between various universities, putting the Dutch doctoral schools – as the Swedish – in the category of "inter-institutional graduate schools." In 2004, 107 doctoral schools were finally accredited for concentrating on resources that create an excellent environment for research training.

The core elements of these institutions are

36 According to Mähler (2004, p. 205), the "inter-institutional graduate schools" are to be characterised as follows: "Each National Graduate School has a host institution and several partner institutions. The host institution bears the main responsibility for the programmes, the coordination, and the mission statement of the school. One of the aims of this form of organization is for the National Graduate Schools to promote co-operation among different higher education institutions and different research environments, especially among higher education institutions not having the right to award postgraduate degrees and institutions having this right".

the development of a curriculum with mandatory course elements, transparent admissions for doctoral candidates and professional administration.

3.3.3 Distinctive features and initiatives in Austria

A number of radical reforms were recently carried out in Austrian higher education policy. Among them is the Universities Act of 2002, which instituted a reorganisation of all higher education. The goal of the new Universities Act was to remove the universities from state administrative control and establish them as independent corporate entities constituted under public law, fully endowed with rights and obligations. The state administration will no longer directly manage the universities and will now be restricted to overall regulation and control of the system. The purpose of the reforms was to augment the effectiveness and efficiency of education and research conducted at Austrian universities by encouraging a focus on performance and competition.

In comparison to other OECD countries, the graduates of Austria's institutions of higher education are distinguished by two characteristics (OECD 2007a, p. 67):

- On the one hand the graduation rate of 20% is extremely low; in comparison the OECD average is 36%. It is remarkable that in the last few years the difference with respect to countries whose higher education systems have grown fastest has actually increased.
- Secondly, the proportion of people with doctorates is very high in Austria. At 2%, it is much greater than the OECD average of 1.3%.

In Austria, discussions of higher education policy are characterised by the following contradictions: On the one hand, a great deal of emphasis is placed upon the importance of research as an integral component of university training, even more so than in the university cultures of other countries; nonetheless, decision makers are perfectly aware that this ambition cannot be entirely fulfilled under the conditions prevailing at mass universities. On the other hand, this real restriction in no way hinders the continued validity of the governing principle that ordains the unity of research and teaching. Against this background, it is doubly remarkable that doctoral programmes still do not include an explicit preparation for a career in research. The principle of unity between research and teaching does not hold up to the realities of today's highly specialised research operations.

One way to face this challenge is to promote the introduction of structured doctoral programmes, as has been done elsewhere. In addition to the Science Fund (FWF), the "Doktoratskollegs-Plus" doctoral programme supports research groups in all academic disciplines at Austrian universities and at nonprofit research institutions devoted to academic research, with the goal of creating educational centres for highly qualified young scholars. Furthermore, the universities have also shown initiatives to establish their own PhD programmes. For example, at the Medical University of Graz, a PhD programme in molecular medicine was created in 2007 in which the best-qualified applicants are awarded paid dissertation research positions that last three years. Funding is provided primarily through comprehensive budgets, and a small portion is covered by funds from third-party sources. The University of Vienna, for its part, actually provides for the establishment of initiative schools in its development plan. These schools are distinctive in several ways: individual counselling of dissertation candidates is replaced by group counselling; counsellors receive appointments at the university; dissertations are integrated into international research programmes currently conducted by the counselling team; and the results of candidates' research are made known to the international scientific community. In all, five initiative schools started up during the 2006-2007 winter semester, and seven more began operations during the 2007-2008 winter semester. In addition, there are initiatives for structured doctoral programmes that do not include employment contracts. For example, at the Vienna University of Economics and Business Administration, the traditional doctorate in social and economic sciences, covering an extremely broad range of subject matters, is currently being replaced by a cluster of specialised research-oriented PhD programmes.

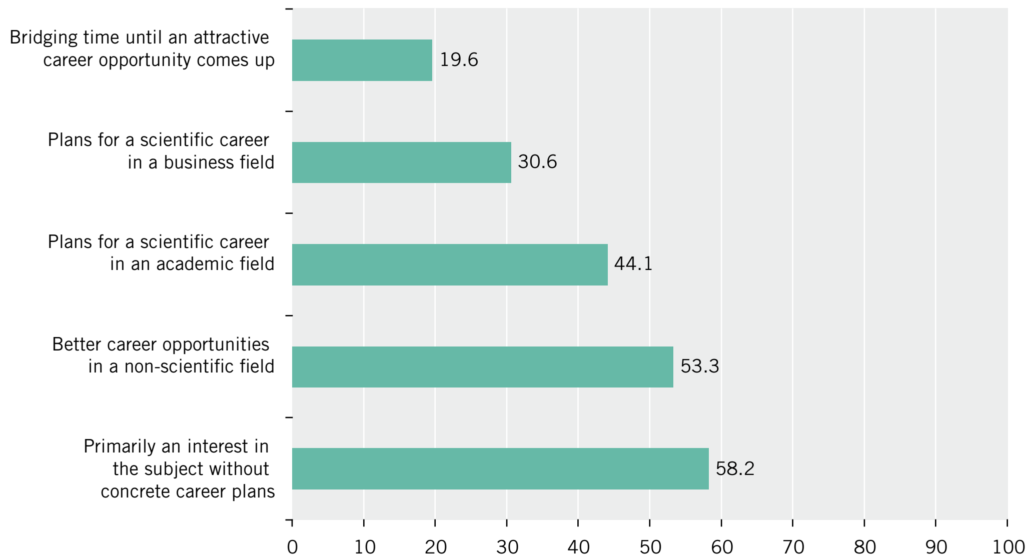
Until now, PhD programmes have been created in management and finance. They will concentrate on training young scholars to a high degree of proficiency. These innovations coincide with a paradigm shift in doctoral study driven by an institutional research orientation and the prominence of faculty members within their respective fields.

3.3.4 Doctoral studies in Austria from the students' perspective

The Institute for Scientific Communication and Higher Education Research (WIHO) at the University of Klagenfurt's Faculty of Interdisciplinary Education and Research (IFF) was asked in 2007 to conduct an empirical study with the aim of ascertaining and analysing the perspective of doctoral candidates on doctoral studies in Austria. Austrian universities contacted a total of 16,020 doctoral candidates in Austria to solicit their participation through an online questionnaire. The responses of 2,535 students were validated and analysed. Based on the 19,260 students who completed their doctoral studies in the 2007 summer semester, this represents a calculated response rate of 13.2%.

From the students' perspective, the completion of a doctorate does not necessarily entail plans to pursue a scientific career. The primary motivation for starting such a course of studies was for over 58% of the respondents an interest in the subject without concrete career plans and for 53% the prospect of better career opportunities in a non-scientific field. But one third of those surveyed were motivated by plans for a scientific career in the private sector. On the other hand, few respondents overall said they were motivated to complete their doctorate as a means of bridging the time until attractive career opportunities opened up (see Figure 24).

Figure 24: What are the motivations for doctoral studies?



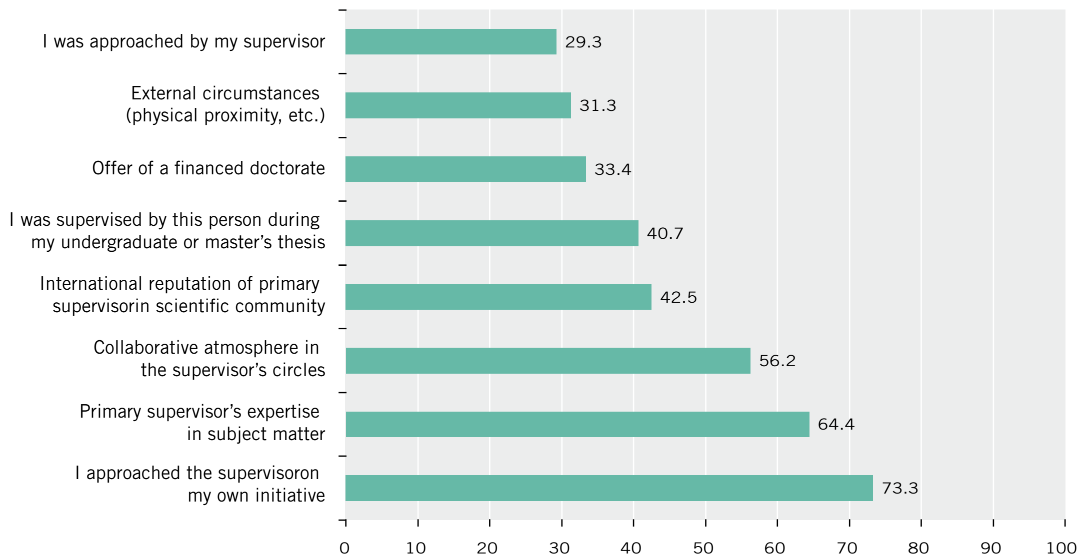
Source: Pechar et al. 2008.

The motivation varied according to discipline. Whereas those pursuing doctorates in law and economics were motivated in greater numbers by improved career opportunities in a non-scientific field, plans for a career in science played a much greater role among students of the natural sciences, humanities and, to a lesser extent, social sciences. Only slight differences emerge when these results are broken down by gender: For example, men in the humanities are more likely than women to be motivated by plans for a scientific career in academics. On the other hand, women pursuing their doctorate in the technical sciences cite this same motivation more often than the men in their discipline.

Figure 25 shows that most students choose the primary supervisor for their dissertation themselves. Some three quarters state that they approached the supervisor on their own initiative. The criteria deemed most important in selecting a primary supervisor are expertise in the subject matter and a collaborative atmosphere in the supervisor's circles. This is followed by the international reputation of the primary supervisor and positive personal experience with the supervisor during an undergraduate or master's thesis. Broken down by scientific disciplines, the study shows that the offer of financing for doctoral studies plays a key role in the selection of an supervisor for about half the candidates in the natural and technical sciences. This is true as well in agriculture and forestry, veterinary medicine and to a somewhat lesser degree in human medicine. Students of the natural sciences, human medicine and technical sciences attached the greatest importance to the international reputation of the doctoral supervisor in the scientific community. When we examine why supervisors take on an supervisory function for a doctorate in the first place, several critical reasons emerge: Doctoral students are essential for the supervisors' own research, supervisors share their own scientific knowledge to establish and strengthen the next generation of scientists, and the exchange between supervisors and doctoral candidates provides opportunities for mutual learning.

Accordingly, the subject of the dissertation is often within the sphere of the supervisor's research interests as well. The closer a dissertation subject is to the specific research field of the supervisor (especially when the dissertation is financed), the more intense the support.

Figure 25: Criteria for selecting the primary advisor



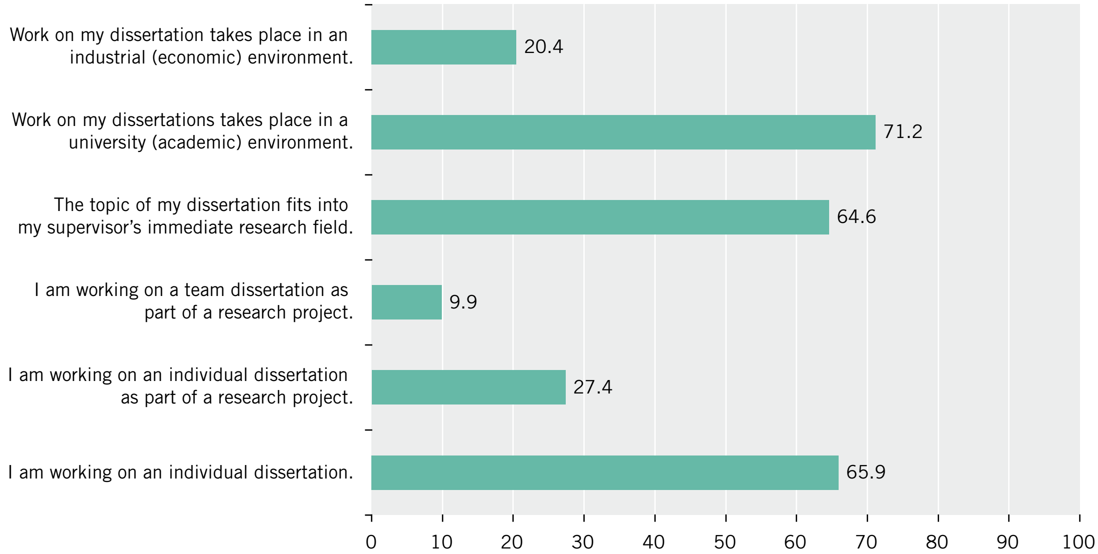
Source: Pechar et al. 2008.

Doctoral dissertations are usually supervised by one or two supervisors. Supervisory teams of three or more headed by a primary supervisor tend to be the exception in all disciplines. The situation differs for doctoral candidates in human medicine, where a third of all cases have more than two supervisors. Here, the average length of doctoral studies is some three years. It is not uncommon in the course of the supervisory relationship to establish binding agreements on individual elements of the studies, including the content of the dissertation, the scope and duration of the work and the frequency of contact with the supervisor. There is also great importance attached to progress checks – through interim reports, seminar presentations and the like – especially in the humanities and natural sciences. It is interesting to note that, by contrast, integration into university operations through teaching and the like does not play a major role in the majority of disciplines. One exception is the technical sciences, where more than one third of doctoral candidates state that they have made commitments for integration into university operations.

Most doctoral candidates (over 70%) write their dissertation in the university environment. The proportion of dissertations developed in the commercial sector is very low across all disciplines. One exception is in economics, where the proportion of students writing their dissertation in a business environment is 50%. The technical sciences also have a disproportionately high rate of dissertations composed in an industry research field. Figure 26 shows that doctoral candidates typically (66%) write individual dissertations. The next most common form of developing a dissertation is as part of a research project. The latter case is especially common among the natural and technical sciences, where students are usually integrated more closely into projects and project teams due simply to the high costs of research.

Just under 10% of doctoral candidates in Austria work on a team dissertation as part of a research project. Again, this type of dissertation is not uncommon in the natural, technical and medical sciences, agriculture and forestry, but overall, team dissertations are only of very slight significance.

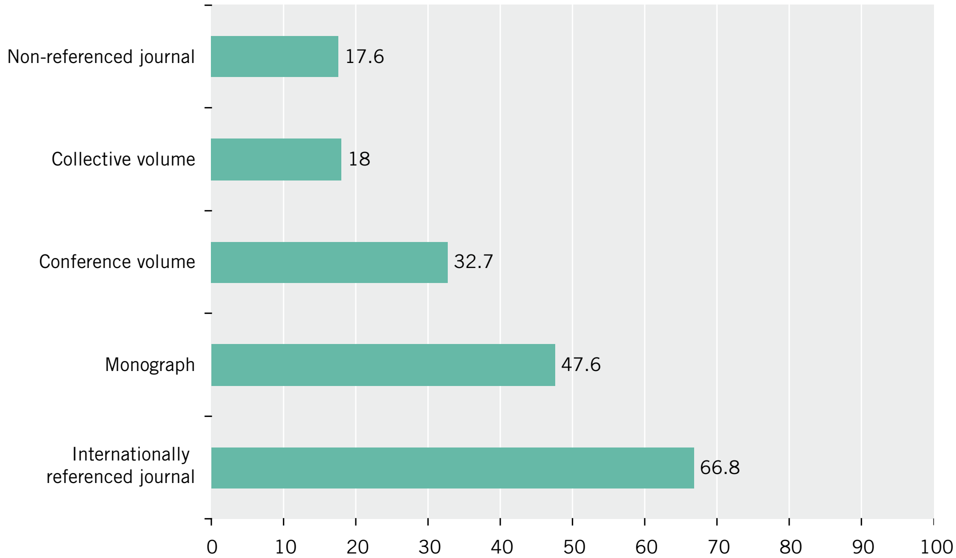
Figure 26: Integration of the dissertation into surrounding research fields



Source: Pechar et al. 2008.

Today's dissertation is still submitted as a book manuscript, the traditional monograph. This is especially true in the social and technical sciences. The accumulated collective dissertation is also common in the natural sciences and human medicine. German and English play nearly equal roles as the dissertation language. The language in which the dissertation is written generally corresponds to the form of publication typical for the respective discipline. In other words, if the preferred form of publication is an article in an internationally referenced trade journal, the dissertation is generally written in English. For this reason, the proportion of dissertations in English is especially high in the natural sciences, technical sciences and human medicine. Dissertations are written primarily in German, on the other hand, when the regional element takes on an important role – in the social sciences, for example, where the social surroundings, regional environment or national law are part of the research subject, or in the philological subjects, where language and linguistic expression are at the core of the research. Naturally, there is a certain general expectation that a dissertation will be published. Doctoral candidates in the natural and technical sciences, human medicine, agriculture, forestry and veterinary medicine tend to publish excerpts or split up the dissertation into individual publications in keeping with the nature of the publication media typical in those disciplines. In general, internationally referenced trade journals are seen as the most common and important form of publication for this objective. Figure 27 shows that 67% of doctoral candidates set out to have the results of their dissertation published in internationally referenced journals, while nearly half seek publication in the form of a monograph. It should be noted here that publication in an internationally referenced journal and publication in the form of a monograph are valued nearly equally in the social sciences and economics, whereas the monograph is the most highly regarded format in the humanities and law. Publication in a volume of conference proceedings is also deemed important in the technical sciences, where it was cited as an objective by a full one third of doctoral candidates in Austria.

Figure 27: Planned forms of publication of the dissertation

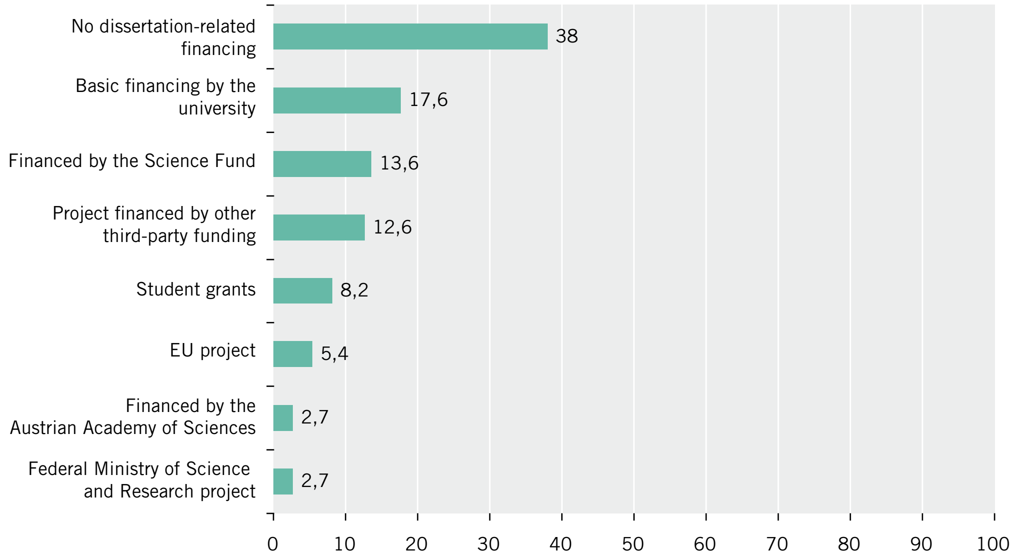


Source: Pechar et al. 2008.

In addition, about one third of doctoral candidates feel that their studies make them part of an international network. This impression is disproportionately high among those in the natural sciences and technical disciplines. More than half the students in the humanities also cite occasional and in some cases regular contact with international scientists. One factor rated as particularly important by all doctoral candidates is the participation in scientific events abroad.

The level of employment is high among both male and female candidates, with three quarters indicating that they are working while pursuing their doctorates. One third of the candidates works full time, including more men than women. Meanwhile, the proportion of women is higher than that of men in all forms of part-time employment. One reason for this may be that 20% of doctoral candidates must provide for family members, children or other relatives and thus have financial obligations in addition to their studies.

Figure 28: Various tracks of dissertation-related financing



Source: Pechar et al. 2008.

Figure 28 shows that 38% of students do not receive any dissertation-related funding to finance their doctoral studies. The most common sources cited by those receiving guaranteed, dissertation-related funding for the duration of their studies are basic university funding (nearly 18%) and grants from the Science Fund (FWF, just under 14%). Broken down by discipline, the following picture emerges: Basic funding by the university is cited by a quarter of students in the technical sciences, followed by those in the natural sciences and human medicine. Grants from the Austrian Science Fund are also dominant in these disciplines, especially in the natural sciences. Austrian Academy of Sciences grants are cited as funding sources for only very few dissertations. The same is true of third-party funding from EU projects and research grants from the Federal Ministry of Science and Research.

The majority of doctoral students feel that in the future, there should be a significant increase in fully funded doctoral candidate positions assigned to applicants based on their qualifications in a transparent, competitive process. This should be accompanied by an expansion of funding tools based on the graduate school model. Postgraduate education should be better embedded in a systematic training and research programme. A parallel programme of scientific and career-oriented doctoral studies and the teaching of generic skills as a fixed component of the doctoral degree are also seen as positive. The students tend to reject extending the length of study or more strict separation of the supervisory and evaluation roles.

3.3.5 "Careers of Doctorate Holders" survey in Austria, 2007

The "Careers of Doctorate Holders (CDH statistics)"[37] survey is an international comparative study on the career paths of doctoral graduates. The CDH survey was launched in 2004 by the Institute for Statistics of UNESCO, OECD and EUROSTAT with the aim of collecting internationally comparative educational policy data on the career paths of those holding doctorates. Data was first collected in 2005 with seven countries participating. In January 2007, the Federal Ministry for Education, Science and Culture hired STATISTIK AUSTRIA to conduct the survey in Austria. Austria first participated in the study's second round in 2007 (STATISTIK AUSTRIA 2007). The number of participating countries has since grown to over 20.

The second international survey collected data from the year 2006. The base population for the "Careers of Doctorate Holders" survey is all persons in Austria under 70 years old who reported an ISCED level-six doctorate as of December 1, 2006. These doctorates were earned as secondary degrees in Austria or abroad between October 1990 and September 2006 following an initial degree[38]. This population comprises some 25,800 persons according to the estimate model created for this purpose. More than half of this number (14,533 graduates) were 35 to 44 years of age on the cut-off date (December 1, 2006). About one third of all the doctoral graduates are women (8,835).

National origin and scientific branch of doctoral graduates

About 10% of the graduates living in Austria are not Austrian citizens. Some two thirds of the foreigners, or 1,725 doctorate holders, are German. Most of the foreign graduates (2,407 of 2,544) were also born abroad. Overall, every seventh graduate was born outside of Austria. Of these, nearly two fifths were born in Germany. The proportion of foreign-born graduates increases with age: 13.7% of those under 35, 15.2% of the 35–44-year-aged and 23.9% of those 45 to 54 years of age.

More than one third (36.5%) of the doctorate holders living in Austria earned their doctorate in one of the social sciences (see Table 11). This includes 3,484 law graduates and 2,969 economics graduates. The second most important discipline among graduates is the natural sciences, with 7,929 persons (30.7%) earning their doctorate in this field. The remaining third comprises 3,684 graduates (14.3%) in the technical sciences, 3,155 (12.2%) in the humanities and 1,180 (4.6%) in agriculture and forestry; 442 doctorates were earned in medicine and health sciences. The latter category is relatively underrepresented in Austria, since it has only been possible

37 This chapter was written by Markus Schwabe, STATISTIK AUSTRIA.

38 The 1997 amendment of the University Studies Act as part of the Bologna Process led to a replacement in 1999 of the two-part division of university studies by a three-part division consisting of a bachelor's programme (six to eight semesters), master's programme (two to four semesters) and doctoral programme (two to six semesters). Strictly speaking, a doctorate is a third degree under this structure. The bachelor phase offers a clearly structured programme of study in which certain forms of academic freedom and the expectation of involvement in research are reduced. The master's programme, by contrast, offers more in-depth studies and specialisation. A master's degree and in some cases the subsequent PhD is for some careers not merely an initial benefit but an essential requirement.

to earn a scientific doctorate in medicine at ISCED level six for a few years now.

Table 11: Doctoral graduates in the years 1990 to 2006 by branch of science

Graduates' branch of science	Overall	Men	Women
Total	25,801	16,966	8,835
Natural sciences	7,929	5,527	2,402
Technical sciences	3,684	3,222	462
Human medicine	442	207	235
Agriculture and forestry, veterinary medicine	1,180	718	462
Social sciences	9,411	5,749	3,662
Humanities	3,155	1,543	1,612

Source: STATISTIK AUSTRIA, CDH survey 2007 (data from 2006)

A comparison of the field of study with the nationality of the graduates shows that among non-Austrians, the share of those with a doctorate in the natural sciences is especially high at 14.1%. The same tendency emerges when linking the national origin to the branch of science of the doctorates: the share of foreigners among doctorate holders in the natural sciences is especially high at 17.7%.

Age at time of graduation, length of studies, financing of doctorate

Some 8% of graduates earned their doctorate abroad, mostly (two thirds) in Germany. It is very likely that the overwhelming majority of this group also received the prior academic degree in Germany.

What is known, at least, is that 61% of those who earned doctorates at a foreign university earned the previous degree in the same country.

The average age of those receiving a doctorate is 33.1 years (arithmetic mean) among graduates in the years 2002 to 2006 (see Table 12). Half of those were under 31.1 years of age when receiving their doctorates, however. Women complete their doctorates at an average age of 30.3, over one year earlier than men (median age of 31.4). The average age at the time of graduation is highest in the humanities among both women (36.7) and men (39.6) and lowest for men in the social sciences (32.6). The lowest average of female graduates is found in the natural sciences (30.7).

A good third of graduates finance their doctoral studies through a research position, while another third relies on (outside) employment. The share of students financing their doctoral studies through a research position is especially pronounced (about 60%) in the technical sciences. Every seventh doctorate overall is financed through the student's own savings, a loan or support from the family.

Table 12: Doctoral graduates by age, 2002 to 2006

Graduates' branch of science	Age (in years) at time doctorate is earned					
	Overall		Men		Women	
	Average	Median	Average	Median	Average	Median
Total	33.1	31.1	33.6	31.4	32.3	30.3
Natural sciences	32.3	30.6	33.1	33.1	30.7	30.7
Technical sciences	33.3	31.8	33.4	33.4	32.8	32.8
Human medicine	30.9	29.7	(31.4)	(31.4)	(30.6)	(30.6)
Agriculture and forestry, veterinary medicine	32.2	30.8	33.0	33.0	31.4	31.4
Social sciences	32.1	30.3	32.6	32.6	31.6	31.6
Humanities	38.1	34.2	39.6	39.6	36.7	36.7

Source: STATISTIK AUSTRIA, CDH survey 2007 (data from 2006); values in parentheses ( ) can not be statistically interpreted.

Professional situation of doctoral graduates

In December 2006, 93% of doctoral graduates were employed (24,002 people). The overall share of self-employed increases with age: While only 6.7% of those under 35 are self-employed, the rate rises to 13.7% among 35- to 44-year-aged and 15.7% among 45- to 54-year-aged. The employment status also varies according to the subject of study: 20% of graduates with doctorates in the social sciences are self-employed, while the figure is less than 10% for the natural sciences.

Some 7% of graduates are not employed, including over 2% who are seeking employment. An analysis of employment status by gender shows that the share of doctorate holders not working and not seeking work is especially high among women (10.4%).

The graduates who are employed work in a wide array of career fields in keeping with their subject of study. Graduates with doctorates in the social sciences represent the largest group (8,815 people or 36.7%) among those employed. One quarter of this group works as lawyers, one of every seven works in a career in the social sciences and 1,173 graduates (13.3% of those with doctorates in the social sciences) are instructors at universities or colleges. The second most numerous group among the employed doctorate holders are those with a degree in the natural sciences (7,386 people or 30.8%). About one quarter of these work as physicists and chemists.

More than one half of doctorate holders have had the same employer or have been self-employed in the same profession for five or more years.

Mobility of doctoral graduates

Some 70% of the 25,801 doctorate holders have lived in Austria for ten or more years without interruption. The others spent part of the past ten years abroad or immigrated to Austria from abroad.

The most important country of origin by far is Germany. One quarter of the 7,387 persons who emigrated or returned to Austria in the last ten years came from Germany. The main reasons for returning or immigrating to Austria are personal, economic and political factors. These motives were cited as the most important reasons for coming to Austria by half of the 2,131 respondents who moved to Austria in the last five years (2002 to 2006).

Scientific productivity of doctorate holders

Among all employed doctorate holders, 57% stated that they are working in research; 72.2% of this group are men, 27.8% women. Doctorate holders working in research published on average 4.7 articles and 1.1 books in the last three years (2004 to 2006). The survey showed that men published more articles on average than women (4.7 vs. 4.1). The other categories – patent applications, conversion of patents into commercial products or processes, founding of companies – are not very significant. An average of less than one patent application (0.28) was registered under the name of a doctorate holder, for example.

4 The internationalisation of the Austrian innovation system

4.1 R&D activities of Austrian firms abroad

Technological change and the increasing globalisation of society and the economy are closely related to each other in several different ways. On one hand, modern technologies, especially transportation, information and communications technologies, enable an intensification of connections between different countries, companies and people, and are consequently a major engine of globalisation. On the other hand, the development and dissemination of new technologies through the research, development and innovation work performed by corporations, universities and government institutions is becoming increasingly organised on an international basis.

From the standpoint of science and technology, Austria is one of the winners in the globalisation process. Austria's role as a host country for foreign investments has already been explained in detail in previous research and technology reports. According to figures from Statistik Austria, already more than 15% of Austrian expenditures on R&D – amounting to more than one billion euros – are funded by foreign sources (see Chapter 1 of this report). These investments primarily benefit corporations. Austrian universities receive significantly less funds from abroad.

Statistik Austria estimates that 45% of R&D expenditures by Austrian corporations in 2004, or a total of € 1.6 billion, were made by corporations belonging to foreign owners. Many of these foreign companies are firmly rooted in the Austrian system of innovation by virtue of their contacts and cooperation with Austrian universities and with other businesses. Furthermore these foreign companies have considerable freedom of action. Both of these factors – being well integrated and at the same time relatively unconstrained – are crucial prerequisites for any lasting involvement in Austria (see Research and Technology Report 2005, p 63). The extent of foreign-controlled R&D in Austria is less critical than the high concentration of foreign-owned R&D in a very few industries. The bulk of this R&D is accounted for by a few large companies, primarily in the electrical engineering and pharmaceuticals industries. As a result of this fact, a single decision by just one corporation is capable of greatly affecting the development of overall R&D expenditures in the country.

However, with respect to globalisation, Austria is not only on the receiving end. In the last few years, Austrian companies have substantially expanded their foreign business in the form of growing exports and direct investments. In the course of this expansion, research, development and innovation functions are increasingly being conducted abroad. This chapter offers a survey of the current status and trends of these activities, and the following chapter is devoted to China's role as a host country for R&D work for Austrian corporations.

4.1.1 Measuring the R&D conducted by Austrian corporations abroad

The extent to which Austrian corporations conduct R&D abroad can be measured either in terms of the inputs into the innovation process or its outputs. The crucial inputs are expenditures on research staff, equipment and funds for outsourced research projects. In the following pages, we will analyse outsourced research projects reported in Statistik Austria's R&D surveys (Bauer et al. 2001; Messmann and Schiefer 2005; Schiefer 2006) as input values.

As an indicator for outputs, we will use international patent filings (Guellec and van Pottelsberghe de la Potterie 2004). A patent is an ownership right that protects both the patent filer (usually a company) and the originator of an invention, namely the inventor. In patent law, the inventor must always be a natural person. The patent application contains the names and addresses of both filer and inventor.

Thus, patents can be used as an indicator for the internationalisation of R&D: The number of patents based on inventions made in Austria, but filed by foreign corporations and organisations, can be determined by comparing the address of the filer with that of the inventor. If for example a patent is filed by a company whose head office is located in Vienna, Austria, and it names as inventor a person residing in Hamburg, we may safely assume that the patent in question is the result of R&D activity conducted by the German subsidiary of an Austrian company. As a rule, multinational corporations report the company's registered headquarters when filing a patent.[39] we describe this as a foreign patent invention belonging to an Austrian entity when at least one of the filing parties is listed in the patent application with an Austrian address. Table 13 shows the quantitative development of this type of R&D project.

4.1.2 Development of R&D activities abroad by Austrian corporations

Both the figures for outsourced research projects and for international patent filings show that Austrian R&D work abroad has bloomed in the last 10 to 20 years. Table 13 illustrates this trend for the years 1998, 2002 and 2004.

The share of all international patents belonging to Austrians filed at the European Patent Office (EPO) amounted to only 14.3% in 1984; by 2003, 30% of patents belonging to Austrians listed at least one foreign inventor. Another indicator, that does not merely count whole patents but takes into account the respective shares of Austrian and foreign inventors in each patent, quotes 18% as the share pertaining to foreign inventions in total Austrian patent filings.

The most remarkable aspect of foreign R&D conducted by Austrian corporations is its rapid growth, depicted in Figure 29. According to this graph, the number of foreign inventions belonging to Austrians increased fourfold between 1985 and 2003 and doubled from 1998 to 2003, whereas the total number of Austrian patent inventions and filings increased by only two and a half-fold between 1985 and 2003.

39 The country where a patent is filed need not be the same country where the invention enjoys the resulting patent protection.

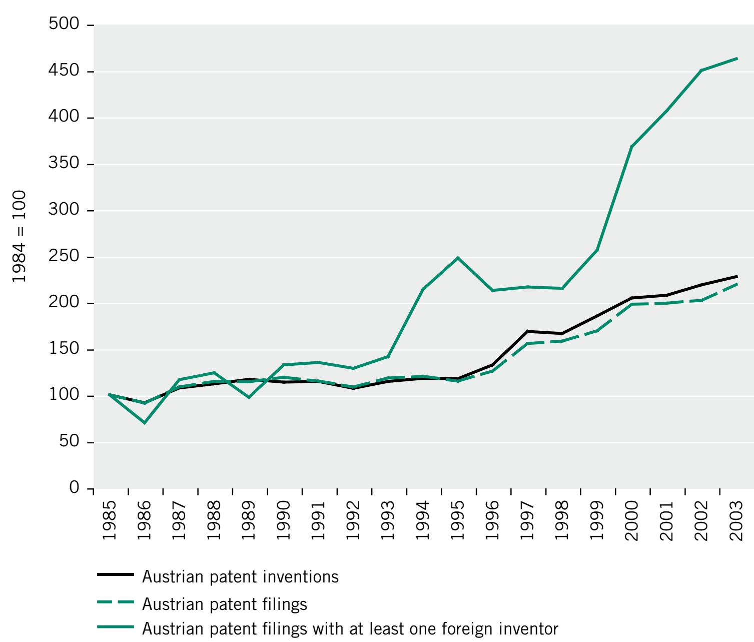
Table 13: Input and output indicators of active internationalisation in Austrian business research, 1998, 2002 and 2004

	1998	2002	2004
Internal R&D expenditures (€ million)	2,161	3,131	3,556
External R&D expenditures (€ million)	292	484	509
R&D expenditures abroad (€ million)	175	277	248
Foreign projects as a % of internal R&D expenditures	8.1%	8.8%	7.0%
Austrian patent filings	884	1,171	
Austrian patent filings with participation of foreign inventor(s)	172	360	
Percentage of patents with foreign participation	19.5%	30.7%	

Source: STATISTIK AUSTRIA, European Patent Office, tip calculations

In 2004, Austrian firms funded research projects abroad in the amount of € 248 million (Schiefer 2006). R&D projects commissioned abroad also increased significantly, growing by 41% between 1998 and 2004. This rate of growth, however, is lower than that of patents filed across national boundaries. 2004 actually registered a decrease in outsourced research projects compared to 2002 (Bauer et al. 2001; Messmann and Schiefer 2005; Schiefer 2006).

Figure 29: Austrian patent filings and patent inventions as well as patent filings with at least one foreign inventor at the European Patent Office 1998-2003.

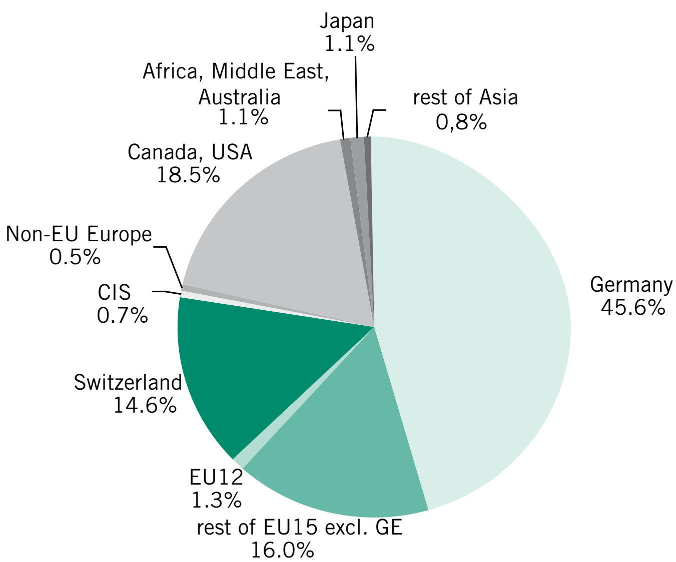


Source: European Patent Office (prepared by the OECD), tip calculations

Compared to other countries, Austria is considerably more active than the European Union average in filing foreign patents. In Austria, patents filed across national boundaries make up roughly the same share of total patents as they do in other small and medium-sized countries like Sweden, Belgium, Finland or the Netherlands (OECD 2007d, p. 165).

The most prominent target country for R&D projects of Austrian corporations abroad – as a share of patents filed across national boundaries – is Germany, where 40% of all filings took place between 2000 and 2005. The European Union makes up 63% of the total; most of this share is distributed among the EU15 states and few filings come from the new member states (EU12). Countries outside Europe make up a 21% share, the bulk of which goes to the USA. Contrary to many people's expectations, the share going to Asian states – including China and India – is remarkably low, amounting to less than one percent. The reasons for this meagre result will be explained in the following chapter.

Figure 30: Source countries of Austrian patents filed across national borders 2000-2005, Patents filed with the EPO



Source: European Patent Office, tip calculations

The distribution among host countries rules out any suspicion that there may be Austrian firms outsourcing a major portion of their R&D to low-wage countries. Instead, we see a heavy concentration in countries with costs similar to or even higher than Austria's. The reasons for this lie in the motives that drive foreign outsourcing of R&D.

4.1.3 Actors and strategies

What are the reasons for this extraordinary growth in recent years and the concentration of foreign R&D in EU states and the US? On the one hand, R&D and other innovative work by Austrian firms is increasingly conducted abroad as a direct result of the growing internationalisation of production. Examples from patent records are the Austrian companies Andritz, Plasser & Theurer, AVL or Voest Alpine Anlagen. These corporations are increasingly resorting to an international network of R&D locations in order to conduct development close to their respective customers or to take advantage of their foreign contacts' expertise.

One advantage of conducting technical development work in major foreign markets is the opportunity it affords to adapt products to local regulations and environment standards or to their customers' requirements. The specialised literature calls this phenomenon "home-base exploiting" (Kuemmerle 1999) or "asset exploiting" (Dunning and Narula 1995). For example, the Austrian equipment engineering company Andritz operates design studios in Finland because some of its major clients are in the Scandinavian paper and cellulose industry.

The desire to be near their clients will doubtless lead corporations to establish R&D facilities in India and China as well, and these countries will eventually become major R&D locations. Currently however, Austrian firms are still able to cater to these markets from their home base, as can be seen in Figure 30.

There is a second factor that increasingly drives corporations to open up their innovation procedures, supplement their own expertise with outside sources, and seek whatever information they may need for their innovative processes in foreign countries. The terms used to describe these phenomena are "asset augmenting" or "home-base augmenting" strategies (Dunning and Narula 1995; Kuemmerle 1999), or also "open innovation" (Chesbrough 2003; Laursen and Salter 2006). Foreign subsidiaries of a firm progressively acquire new expertise in order to augment their profile within the parent firm. Location advantages, such as proximity to universities, major customers and competitors, can enable and foster the development of their expertise. Decentralisation is promoted by the parent corporation's willingness to delegate responsibilities to its subsidiaries (Birkinshaw and Hood 1998; Birkinshaw et al. 1998). An additional factor promoting R&D internationalisation is mergers. Two examples from Austria are Kapsch Traffic Com and AT&S, both of which acquired innovation capacities in foreign locations by taking over foreign firms that they then integrated into their respective organisations (Dachs et al. 2005).

Aside from companies whose headquarters are located in Austria, several Austrian subsidiaries of multinational groups are filing for patents for inventions that were made outside of Austria. Since these corporations have their head offices in Austria, their filings are counted as Austrian patent filings. This phenomenon is most likely one of the reasons why patents filed across national boundaries increased at a faster rate than did R&D projects outsourced from Austria. Little is

40 The share in a patent that pertains to a given country is calculated by dividing the number of inventors from that country by the total number of inventors of the patent. If, for example, the patent document lists one Austrian and one German inventor, half of the patent is allocated to Austria and half to Germany. In contrast, OECD statistics count only one inventor from each country.

known for certain about the reasons for this process; on the one hand, these patents are presumably developed in cooperation with other subsidiaries. On the other hand, the phenomenon betrays the parent corporation's intention of delegating R&D coordination in certain areas to a single local company.

The most striking example of this strategy is Novartis Austria GmbH, which since 2001 has filed the most Austrian patents at the European Patent Office. The Austrian subsidiary is largely responsible, together with its Swiss parent company, for the quickening of the pace that has occurred since 2000, as shown in Figure 29, and also for Switzerland's importance as a source country of patents filed across national borders. Novartis announced in December 2007 that it intends to reduce the share of R&D that it conducts in Vienna, Austria (cf. *Der Standard,* 19 Dec. 2007) and it remains to be seen how this will affect the trend described above over the next few years.

Finally, there are a number of individuals who file patents stemming from inventions they made in cooperation with foreign partners. These individuals seldom file more than one or two patents per year. We are unable to determine from the available data whether these people are independent inventors, or employees of universities and corporations who prefer to own the patent themselves.

Most of the R&D projects outsourced abroad are commissioned by manufacturers of radio, TV and communications technology (including electronic components), manufacturers of motor vehicles and of parts for motor vehicles, and the pharmaceutical industry.

These industries fund approximately one third of all R&D projects commissioned to foreign entities. Most of these funds flow abroad either within a single corporation or to unrelated firms. The share of government institutions (including universities) in this funding was less than 5% in 2004.

4.1.4 Does outsourced R&D replace or complement domestic R&D?

The international expansion of European firms often provokes fears that production expansion abroad may lead to cutbacks at home and that various lines of business may be outsourced to low-wage countries (see for example

B. Rose and Treier 2005). Most empirical studies dealing with this issue have concluded that such fears have not come true. R&D is less prone to outsourcing than other types of commercial activity (see Narula and Zanfei 2005). Foreign activities are generally considered a supplement to R&D carried out by a corporation at its home base.

The data presented here indicate that R&D conducted abroad by Austrian firms support this kind of supplementary function. First, as shown in Figure 29, domestic patent inventions have increased in parallel over the last few years with foreign activities. Consequently, if a shift has taken place from Austria to foreign countries, it has only affected increases and did not bring about an absolute reduction in domestic inventions.

Second, R&D projects assigned abroad between 1998 and 2004 actually grew more slowly than did internal R&D expenditures.

Despite the growth in foreign activity, the Austrian-based research staff located in the industries that have become most internationalised has also grown.

Third, the figures indicate that foreign activity increased not in industries with shrinking domestic R&D expenditures, but rather that industries with growing domestic R&D budgets commission the bulk of Austrian R&D outsourced to foreign countries.

Fourth, the distribution of countries where R&D is conducted did not suggest that these decisions are motivated by cost savings; on the contrary, the countries most frequently targeted are those with similar or even higher wage levels, and not low-wage countries located in Central and Eastern Europe or Asia.

As a result – at least in the short term – there is no detectable trend toward a mass exodus or replacement of domestic R&D by foreign R&D, nor any replacement of domestic research, development and innovation activity through foreign commitments on the part of Austrian companies.

4.1.5 Summary

During the last few years, Austrian corporations have increasingly been conducting innovative work abroad. An indicator that provides a measure of this development is the number of patents filed across national boundaries. Thirty percent of patents belonging to Austrian entities in 2003 listed at least one foreigner as an inventor (1984: 14.3%). The most significant host country for Austrian innovation functions abroad is Germany, followed by several other EU states and the USA. Decisions by Austrian firms to conduct innovative activities abroad are primarily motivated by motives related to expansion and markets (for example, by supporting foreign on-site production and world-wide provisioning of services). Therefore, these foreign activities are often complementary to, and not a replacement for, the corporation's domestic R&D work.

4.2 China as a location for Austrian corporate R&D

China plays a special role in the internationalisation of R&D. The following section therefore focuses briefly on the significance and attractiveness of China as an R&D location for internationally active companies and presents the summary results of qualitative interviews with Austrian companies. This section examines the motives and obstacles, the current state of and future plans for innovation activities in China and the expected effects on Austria's position.

4.2.1 The attractiveness of the Chinese (research) market

China's economy has grown very quickly in the last quarter century. From 1980 to 2006, the average annual growth rate of the gross domestic product (GDP) was 9.8%[41] (IMF 2007). There is some uncertainty about the absolute size of GDP, especially in internationally comparable units. First, at the end of 2005, the Chinese statistical office had to correct the previous year's GDP by 17%, since the services sector had been underestimated. Second, GDP was reduced by 40% at the end of 2007 following a re-evaluation of the purchasing power parities (PPP) by the World Bank. Depending on calculations, the People's Republic reached a GDP of $2.2 billion (market exchange rate) in 2005, of $5.3 billion (new PPP estimate), or even of $8.9 billion (old PPP estimate). Therefore, China, valued at market exchange rates, is the fourth largest national economy in the world, or, measured by purchasing power parity, the second largest after the USA (The Economist 2006; 2007).

41 Measured in constant prices of the particular national currency.

In contrast to the absolute values, the relative values are much less impressive. With a gross national income (GNI) per capita of about $2,000, China ranks with countries like Albania and Thailand among the "lower middle income" states (World Bank definition). In comparison, Austria achieved a GNI per capita of almost $39,600 (World Bank 2007).

The indicators for research and development show similar dynamic and high absolute values. In 2006, China invested $144 billion (PPP) in R&D. Only the USA, with $344 billion (PPP), spent more, while the EU 15 invested $221 billion. This high value is the result of a very rapid catching-up process. Since 1991, R&D expenditures have risen by an average of 15% per year, compared with 3% in the USA and 2% in the EU 15.[42] The R&D share, however, was quite a bit under that of the USA (2.6%) and the EU 15 (1.9%). In particular, the share of expenditures for basic research was quite modest at 5% (NBS 2007).

In addition, China has a large pool of highly qualified human resources. Around 1.2 million researchers (full-time equivalents, 2006) work in China, around the same number as in the USA (2005: 1.4 million) and in the EU 15 countries (2005: 1.1 million). At just about 7%, the average annual growth rate since 1991 has been about twice as high as in the USA and the EU 15 (each at 3%) (OECD 2007b). Currently, the annual "replenishment" of college graduates numbers about 3.1 million (2005; NBS 2007), compared to 2.2 million in the USA and 2.9 million in the EU 25 (Eurostat 2007). In 2004, 34% of graduates studied engineering and 9% studied natural science (NBS 2005); comparable numbers were 12% and 11% in the EU 25 and 6% and 8% in the USA.

The growth rates of academic training are breathtaking – in a mere 15 years the number of graduates rose five-fold – but the numbers also make it clear that this enormous growth could not have taken place without qualitative losses. While the number of students rose from 2.1 million to 15.6 million in the period 1990 to 2005, the number of teachers only increased by a factor of 2.5 to 960,000 (NBS 2007).

The output of the Chinese innovation system has also risen significantly in recent years. For example, the number of scientific articles[43] tripled between 2000 and 2005. In the meantime, China's "world market share" of scientific publications is about 7%. Only the USA, Japan, and Great Britain produce more articles (MOST 2007). The number of triad patent families[44], patent filings in European[45] and grants of patents at US Patent Offices[46] rose by 20-30% a year. Nonetheless, the absolute number of patents is relatively low, amounting to only 3-4% of those in the USA or the EU 15 (OECD 2007b).

42 Measured in $ for PPP and constant prices 2000.
43 Articles are recorded in the Science Citation Index (SCI), Engineering Index (EI) and the Index to Scientific & Technical Proceedings (ISTP).
44 Patents that were filed with the European, US, and Japanese Patent Offices. See Dernis and Khan (2004) for a definition.
45 1990 – 2005
46 1990 – 2003

Table 14: Indicators in the Chinese innovation system in international comparison (2006)

	China	EU-15	EU-25	USA	Japan	Austria
GERD (billons, applicable PPP $)	144.0	221.22 [1]	230.9 [1]	343.8	130.8 [1]	7.4
Growth rate per annum in % (since 1991)	17.7	4.4	...	5.2	4.2	8.2
GERD per capita (applicable PPP $)	110	570 [1]	499 [1]	1,147	1,023 [1]	890
R&D share	1.4	1.9 [1]	1.8 [1]	2.6	3.3 [1]	2.5
Share (%) of GERD financed by:						
Industry	69	55 [1]	54 [1]	65	76 [1]	46
State	25	34 [1]	35 [1]	29	17 [1]	46
Foreign	2	9 [1]	9 [1]	...	0 [1]	17
Share (%) of GERD in the business sector	71	63 [1]	63 [1]	70	76 [1]	68
Researchers (FTE, in thousands)	1,224	1,134 [1]	1,268 [1]	1,395 [1]	705 [1]	31
Growth per annum in % (since 1991)	6.6	3.0	...	2.5	1.2	6.9 [3]
Researchers per thousand employed	1.6	6.4 [1]	6.2 [1]	9.7 [1]	11.0 [1]	7.2
Graduates of tertiary education (ISCED 5 and 6 in thousands)[#]	5,623	2,842 [4]	3,608 [4]	2,558 [1]	1,059 [1]	33 [1]
University graduates (IUSCED 5A and 6 in thousands) [$]	3,068 [1]	2,170 [5]	2,886 [5]	2,154 [1]	652 [1]	28 [1]
Patent families in triad countries (priority year)	433 [1]	14,292 [1]	14,988 [1]	16,368 [1]	15,239 [1]	301 [1]
Growth rate per annum in % (since 1991)	27.3	2.5	2.7	2.7	2.9	3.8
Patent filings with EPO (priority year)	1,403 [1]	51,736 [1]	52,255 [1]	32,064 [1]	22,123 [1]	1,451 [1]
Patent grants by USPTO (priority year)	838 [2]	33,667 [2]	33,821 [2]	128,299 [2]	43,307 [2]	635 [2]
Share (%) of articles worldwide in SCI/SSCI[§]	4.2 [2]	31.5 [2]	...	30.3 [2]	8.6 [2]	0.7 [2]
Growth rate per annum in % (since 1991)	1.8	3.1	...	0.7	3.5	4.9
Growth of domestic product (billions applicable PPP $)	10,044	12,493	13,773	13,133	4,078	301
Growth rate per annum in % (since 1991)	12.5	4.3	...	5.4	3.3	4.5
Population (million)	1,314	389 [1]	463 [1]	300	128 [1]	8
Growth rate per annum in % (since 1991)	0.9	0.4	...	1.1	0.2	0.4

Abbreviations: GERD: Gross Domestic Expenditure on R&D, PPP: purchasing power parities, FTE: Full-time equivalent, ISCED: International Standard Classification of Education, EPO: European Patent Office, USPTO, United States Patent and Trademark Office, SCI/SSCI, Science Citation Index and Social Sciences Citation Index. [1] = 2005, [2] = 2003, [3] = since 1993, [4] = sum of national data, last available applicable year, usually 2004 or 2005, [5] = sum of national data, last available applicable year, usually 2005.
Source: OECD, 2007a, except [§] NSB, 2006, [#] UNESCO, 2007, and [$] Eurostat, 2007 and NBS, 2007; tip calculations.

In view of the resources used, the output is still quite small; nonetheless, this brief overview (see also Table 14) clearly indicates China's attractiveness. The country offers a large (potential) market, a large number of academically trained workers, especially in the engineering sciences, and the political will to invest further in science and technology, to acquire foreign R&D units, and to promote the expansion of research services. At the same time, the costs for infrastructure and personnel are still well under the level of the Western industrial states (von Zedtwitz 2004; Schwaag Serger 2006; OECD 2007c).

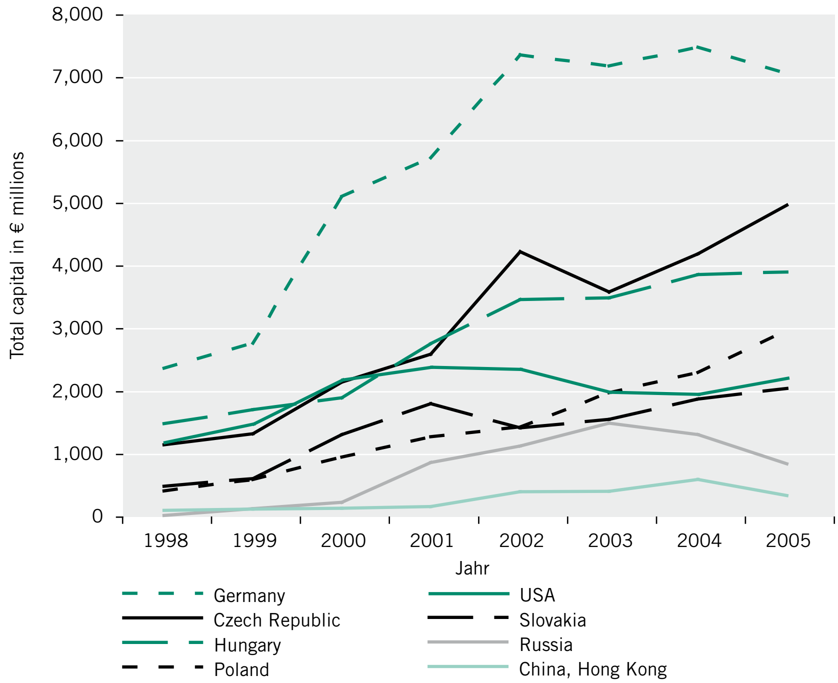
Thus it is less surprising that companies view China as one of the "hot spots" for future R&D-driven foreign direct investments (FDI) (EIU 2004; UNCTAD 2005; INSEAD and Booz Allen Hamilton 2006; Thursby and Thursby 2006).

4.2.2 Austrian company activities in China

At the moment, China is not a preferred area of investment for Austrian companies. China and Hong Kong's share in direct foreign investment in 2005 was 0.5%; in 2006, 2% of all foreign investment went to the Middle Kingdom (Dell'mour 2007; see also the following illustration). According to the data of the Austrian Chamber of Commerce (2005), around 240 Austrian companies with about

3,800 employees are concealed in these numbers (Dell'mour 2007). Of these, some 60 companies run production facilities in China. No secondary statistical data exist at this time for the number of companies with R&D activities

Figure 31: Amount of active direct investment at year's end according to the headquarters of the foreign subsidiaries (selected countries), 1998 – 2005, in € million



Source: OeNB (Dell'mour 2007), tip presentation

A 2007 survey of 32 companies in Austria conducted by the Roland Berger consulting firm provides empirical evidence on the scope of their R&D activities (Petry et al. 2007). This survey concluded that 5% of all R&D locations of the companies surveyed are in China, but no information was available on the size and assignments of these R&D units.

In addition, supplementary data on cross-border patent filings (see also 4.1.1) can be included. Among the patents awarded by the US Patent Office (2001-2003) and the patent filings at the European Patent Office (2002-2004), only six Austrian cross-border patents or patent filings with Chinese participation appear. There are thus no indicators that Austrian companies at this time are carrying out significant R&D activities in China. It must be considered, however, that the state of the data is unsatisfactory, since patent data on R&D activities can really only be understood after some time has elapsed.

Therefore, the following discussion will refer to the unrepresentative, qualitative results of interviews with Austrian subsidiaries in China and companies with main headquarters in Austria between summer 2005 and spring 2006 (Berger et al. 2007).

Innovation and R&D activities in China

Austrian companies have only in the very recent past begun to construct production sites in China. As Figure 31 makes clear, aside from a few "pioneer companies," the majority of Austrian investment was first made after China's admission to the World Trade Organisation in 2001. Since R&D usually follows production abroad after a period of time, and since the build-up of R&D capacity is a long-term process, many companies perform no R&D in the early phases of their foreign engagement or only gradually build up such activities. Among the currently running activities, one should include incremental product and process improvements and the localisation of products, meaning the adaptation of products to local market needs. Some companies have construction divisions on site. Companies conduct product and process development (or further development), although almost exclusively for the local market, and often in technologically less ambitious areas. Developments for the international market are still the absolute exception, as are research cooperating agreements with local universities (Berger et al. 2007).

With regard to future activities, respondents indicated that they would pursue gradual growth in technological activities. These include in particular the making or further development of test series and product tests, as well as the creation of construction, engineering and development activities. The focus is on activities for the local market and on less knowledge-intensive, more labour-intensive subsectors. Some companies mentioned concrete plans for research cooperation with suppliers (such as in the area of materials and component research) or with local universities.

Additionally, it is well known that individual Austrian companies have in the meantime built up R&D locations in China, such as Infineon Technologies Austria (since 2003 in X'ian), AT&S (since 2006 in Shanghai) and AVL List (since 2003 Technical Centre Shanghai) (Panzitt 2006; Fugger 2007; Vorarber 2007).

Motives for R&D activities in China

For all of the surveyed companies, the major reason for building up production sites in China was the spread of business activities to the Chinese market, which is considered to be dynamic and promising. In order to be successful in this market, companies believe it is necessary to be represented there with production facilities. The basic reasons given are the costs ("If you want to sell at Chinese prices, you have to produce at Chinese costs") and the bridging of cultural and linguistic barriers (requests for proposals and specifications are often formulated only in Chinese). A few companies have come to China at the express wish of important European or American customers, who have built up production facilities there and would like to integrate their Austrian suppliers into the local production network. Companies also want to take advantage of strengthened Chinese suppliers and seek to be near them in order to guarantee reliable "supply chain management."

There are several reasons for the expansion of innovation and R&D capacity in China. Companies often search for a location close to the production site so that R&D teams can be quickly drawn into production support and problem solving, allowing the production process to provide important information for the further development of products and processes. Furthermore, specific customer requirements and structural conditions necessitate the development and adjustment of products ("localisation"), which are performed by development teams on site. Proximity to customers is an advantage, since this allows a more intensive cooperation in product development.

Since China has become a very important market for some products (such as mobile telephones) for which standards and (technological) trends have been established, companies with R&D capacity have to be represented in order to be able to participate early on in the latest developments.

More and more frequently, the availability of human resources in the large number of college graduates in the natural and engineering sciences is cited as a reason to locate facilities in China. This talent pool is attractive not only for one's personnel policy, but it also raises expectations of future scientific accomplishments by local research institutions. Obviously, the comparatively low wage costs and expenses for construction, operations and maintenance of infrastructure are significant. In the economic metropolitan centres of Beijing and Shanghai, there are reports of significant increases in salaries in the area of relatively scarce highly qualified, experienced, English-speaking employees.

China's attractiveness for R&D is also due to the existence of several very productive and well equipped universities, which are interested in being cooperating partners for research projects, and the availability of a strongly growing knowledge base, which is available only in Chinese (scientific articles and patents).

Finally, the technology policy of the Chinese government and the incentives for the establishment of R&D centres by multinational corporations were mentioned positively, even if the surveyed managers did not consider these reasons to be crucial.

Limitations on R&D activities in China

Respondents reported both external and internal company reasons that argue against the build-up of R&D capacity.

Since many companies have only been producing in China for a short time and therefore are still in their initial orientation and building phase, it is simply too early to begin R&D activities. The necessary skills and experience are (still) absent on site. The build-up of appropriate skills is a long-term learning process. Other internal limitations that were mentioned were investments associated with establishing an R&D department and (expected) objections from the management board or from middle management. In part, the management board at company headquarters would speak out against forming or developing R&D on grounds of political sensitivity. There are cases where the management strategy would only be supported "half-heartedly" by middle management at company headquarters because of a concern for keeping their jobs.

External limitations, on the other hand, would relate in particular to finding and keeping experienced and qualified personnel for building up R&D institutions in China. Based on the short period of time since the transformation, the appropriate technical and organisational skills are still lacking. For that reason, there is high demand for qualified employees, and equally high turnover. Also, university education is in part inadequate, a result of the rapid expansion of the college system and the lack of modernisation in the educational system. Foreign language skills (especially speaking skill) and management knowledge are particularly lacking, as are creative and critical thinking. To be sure, not all managers voice these criticisms; several respondents were very satisfied with their employees' skills.

The assessment of the significance of intellectual property rights (IPRs) is also mixed. On one hand, there are firms that regard the unsatisfactory protection of IPRs and the insufficient enforcement of appropriate laws as a basic hindrance to R&D, and therefore do not perform R&D. On the other hand, a number of interviewees note that the IPR situation is quite difficult, but that it does not create an insurmountable obstacle for innovation and R&D activities. Satisfactory measures can be taken to protect against IPR violations. Respondents believe that the situation will improve significantly in the medium term, since more and more Chinese companies are taking responsibility for IPR violations and are pushing the state authorities to more strictly enforce existing laws.

The Innovation Protection Programme (IPP) of the "*Austria Wirtschaftsservice*" (AWS) and the Foreign Trade Organisation of the Austrian Federal Economic Chamber are addressing the need for protection of intellectual property abroad. The funding programme initiated by this group in September 2006 supports Austrian companies in filing and completing technological property rights in China and other emerging countries.

A properly conducted patent litigation process before Chinese courts can offer effective protection and is available to foreign companies as well. The prerequisites exist for a solid legal basis of formal protected rights, including sufficient and reliable evidence and case coordination in Chinese. For these reasons, the AWS has set up its own office in China. Small- and medium-size Austrian businesses receive, in addition to operational support, 50% of the costs for filing and enforcement of technological property rights. Since Austria has filed relatively few patents in China and other emerging economy countries, the Innovation Protection Programme promotes applying for such rights. With the Innovation Protection Program, domestic companies can also receive special conditions from Chinese patent attorneys.

Expected effects in Austria as a location

Those interviewed emphasize that the build-up of production capacity in China means an extension of business activity in a growth market, the dynamism of which outpaces the saturated European and North American markets.

This is more a matter of expansion, not of outsourcing. Some companies also report that previous internationalisation measures (such as in Eastern Europe) have had a positive effect on the Austrian job market as well. New sites are often referred to central headquarters for assistance during the start-up phase, which in turn would lead to additional work there. Moreover, the market expansion to China and the possibility of creating more cost-effective workflows there would strengthen the company's competitiveness, thereby helping Austrian locations and safeguarding jobs there. There is still the question of what would happen in economic downturns, when companies would have to decide where to cut staff and where to achieve cost savings.

With regard to innovation and R&D activities, the respondents refer to the fact that development capacities must first be built up for the Chinese market. If R&D tasks are outsourced, these would be labour-intensive and knowledge-extensive development activities in marginal areas with higher demand in China. Some managers made it clear that after working out the basic design of new products or processes, the actual "knowledge work" would be complete, and further development work would be rather routine work. This could very well be done in China. The surveyed companies that are building up or want to build up R&D skills in China emphasised that work duplication should be avoided and that a clear division of labour is necessary.

Most respondents do not anticipate outsourcing of basic research or R&D in the area of core competences in the foreseeable future, since these operations are too sensitive to be conducted in the relatively precarious Chinese environment. A few of the respondents, however, made it clear that they see no exclusively location-related advantages for Austria that would exclude the middle or long-term outsourcing of basic R&D activities to China. In cases where innovation activities are based on intensive cooperating agreements with the manufacturers of custom process technologies, they make reference to the fact that decades of business relationships and experience with cooperative agreement in Europe have a very high value, which make outsourcing of R&D very unlikely.

The developments outlined here might lead to a structural change in Austrian R&D departments, which might concentrate more strongly in the future on knowledge-intensive tasks like design and basic research, while the later stages of development activities and labour-intensive processes, such as testing and drawings, might be outsourced. In general, a stronger division of labour is likely in company-sponsored R&D, with individual tasks assigned to the location best suited for each task.

In addition, companies in Austria profit from international knowledge flows. Although internal company knowledge currently flows primarily from Austria to China, companies are also reporting a significant transfer of knowledge from Chinese subsidiaries. Thus information on new technologies and strategies would be conveyed by customers, suppliers and competitors, since many of these companies are now represented in China. The omnipresent Guanxi (friendship) networks and the open commerce of many Chinese suppliers in confidential market information create a lively circulation of knowledge. Companies also report that technologically "simpler" and cheaper production processes developed in China can be transferred through headquarters in Austria to other foreign locations, where they can be profitably implemented. In the future, the evaluation of Chinese professional articles and patents are expected to create other knowledge flows.

4.2.3 Summary

The interviews reveal that there are only a few exceptional cases of Austrian companies conducting their R&D in China. Nonetheless, a gradual build-up of technological activities is to be expected. Currently, the lack of experience and skills, coupled with uncertainties about intellectual property protection, continue to represent major hurdles to China's involvement. To be sure, these problems will gradually become less significant. It can be assumed that in the future companies will conduct a great deal of testing to see if China is a suitable place for their R&D. In this case, it can be assumed that a stronger (international) division of labour in corporate research and development will occur, and that in the medium term the emphasis in China will continue to be on development.

4.3 Austria in the European Research Area

4.3.1 The concept of the European Research Area (ERA)

While section 4.1 treated the topic "Internationalisation of R&D activities" from the point of view of Austrian or Austria-based companies, the "European Research Area" places two completely different sets of questions in the foreground, questions that are no less relevant:

- How can the overall European system be designed so that the "disadvantages of European division" (in many nation-states of different sizes) are transformed into the "advantages of synergy"?
- How does an individual country – in this case, Austria – find its role from this angle, both in terms of domestic interests and for the benefit of the overall system?

And all of this is to be developed with regard for the "Lisbon/Barcelona goals,"[47] by which means the European Union formulated the desire to develop into a globally competitive economy, and in which RTI activities are viewed as a central key to increasing competitiveness.[48]

The concept of the European research area is now being implemented to place RTI policies, systems and instruments in contact with each other at the community, national and even regional level. Every element can be considered as part of the system, embedded in the overall European perspective.

In principle, the ERA does not oppose national interests in building up strength, but instead posits the principle of "seamless" European cooperation precisely where national abilities need to be supplemented in order to contribute to a greater whole. Only when the existing possible combinations are fully realised will a maximum contribution to the increase of overall European competitiveness be achieved. This approach includes measures that are intentionally not set up on an interregional or transnational level in order to retain national and regional flexibility.

47 Formulated and decided in line with the European Councils of Lisbon and Barcelona in 2000 and 2002; Lisbon: Europe is to become a globally competitive region with regard to knowledge (in which RTI is to be regarded as a central element in reaching this goal); Barcelona: The total expenses for R&D in the EU by 2010 are to be 3% of GDP; the share of the private sector in these new investments is to be increased to two thirds.

48 By continuing on the growth path that it has been following for some years, by 2010, Austria can be one of the few countries to actually achieve the 3% goal (the Austrian government has also set this as a goal).

The **ERA concept** is based essentially on the interplay of the following three interrelated elements (Commission of the European Community 2000):

1 An effective Europe-wide coordination of individual state and regional research activities, programmes and strategies.
2 Complementary initiatives that will ideally be implemented and financed at the pan-European level, and
3 A "European domestic market" for science, in which researchers, technology and knowledge can effortlessly cross borders.

4.3.2 Implementation of the European Research Area

From the community point of view, the EU Framework Programme for research and technological development is the central instrument for implementing the European Research Area. In comparison to the previous 6th EU Framework Programme, the average amount of funds for RTI available annually has been significantly increased under the current 7th EU Framework Programme. The budget (excluding EURATOM) of around € 50.5 billion represents about a 60% increase per year.[49] At the same time, the duration of the programme was increased from four to seven years, which takes account of both planning security and strategic development components.

The 7th EU Framework Programme consists of the **partial programmes *"Cooperation," "Ideas," "People,"* and *"Skills."*** The **"Cooperation" programme** forms the "traditional heart" of the framework programme. It is divided into ten thematic priorities, providing a framework in which transnational consortium projects can be advertised in various thematic areas.

The "**Ideas**" **programme** is completely new. It involves a programme completely open to all themes for innovative basic research ("pioneering research"), whereby "scientific excellence" is the only selection criterion. For the first time, a portion of the Framework Programme diverges from the principle of trans-national consortium formation; in principle, such a research project can only be awarded in one country to a single location. In the context of the European Research Area, this can contribute to the formation of pioneering European research, which promotes pan-European excellence over national excellence. The intention is to play down the duplication of national centres of excellence and encourage the creation of synergistic elements of excellence instead.

To implement the ideas programme and to foster the selective promotion of pioneering research, the European Commission has suggested the creation of a **European Research Council** (ERC). Promoting research through the ERC follows the "bottom up" principle, that is, project applications may be submitted from all research areas for all research topics. Those projects that follow the "science-driven" principle of excellence will be sponsored. The ERC officially began its work on 1 January 2007 (European Research Council 2007).

The **"People" programme** is an essential instrument in the implementation of mobility for researchers; it contributes to the formation of a Europe without limits and without borders (both from the view of the individual researcher and from the point of view of a

49 Cf.: PROVISO (February 2007).

research institute with the need for specialists).

Finally, the **"Skills" programme** concentrates on overlapping topics like "research for the good of small and medium-sized enterprises," "international cooperation" and "science and society."

The **"research infrastructures" sub programme** (part of the "Skills" programme) makes an essential contribution to the research area of thought, which in comparison to the prior Framework Programme has been significantly built up, and contributes to the formation of centres of excellence on a pan-European level (specialisation instead of duplication).

In the first year of the 7th EU Framework Programme, some 23,000 project proposals were evaluated. 2,918 project proposals, with 19,988 project participants, were judged as worthy of funding. Austrian partner organisations were represented on 369 successful projects with 513 participants. Therefore, 2.6% of all participations approved thus far for the 7th EU Framework Programme come from Austria (Ehardt-Schmiederer et al. 2008).

A closer content relationship exists between the EU Framework Programme and the new **"European Institute of Technology" (EIT)** (European Commission 2006a), which will constitute a major component for the creation and visualisation of "excellence on a world level."[50] The chief task of the institute (modelled on MIT, the Massachusetts Institute of Technology) is to connect the three sides of the knowledge triangle – training, research and innovation – with each other. Currently, Austria is competing as a site for the administration of the EIT. The research is to be organised in geographically dispersed "Knowledge and Innovations Communities" (KICs) along broadly defined thematic lines.

The transnational coordination of research activities and programmes – with the ***ERA-Net***, ***ERA-Net Plus***, and ***coordination under Article 169 of the EC treaty*** – is firmly anchored directly in the EU Framework Programme, but is funded primarily by national funds, not by the Framework Programme. Mechanisms for connecting national sets of instruments based at the community level have been created that are firmly rooted in the framework programme. Thus, the aforementioned coordinating instruments form the heart of the research area for thought.

The instruments listed above are implemented on the research *programme* level. In the ***ERA-Nets***, related national (and if available, regional) programmes come together in networks, which prepare and implement common coordinated requests for proposals. The ERA-Nets take 100% of their funding from the additional coordination costs of the Framework Programme, while the actual project assignment costs are financed solely at the national level and are funded by the participating national programmes.

As the data from PROVISO show, Austria participates in a total of 44 (out of 97) ERA-Net projects (Bruecker 2007), and thus has extensive ties with the ERA-Net system.

With a high degree of coordination and with a substantial number of tenders, collective tenders can have a significant pan-European effect. In such cases, the ***ERA-Net-Plus*** system can ensure that the Commission finances a part (15-30%) of the actual tender funds. These funds come from the corresponding

50 Financing within or outside the Framework Programme has not yet definitively been decided at this time.

programmes or the corresponding thematic priority in the EU Framework Programme.

Finally, the most intensive stage of coordination is represented by ***coordination under Article 169 of the EC treaty***. Activities under this agreement are permanently established as combinations of national (or, if necessary, regional) programmes with a very high degree of commonality (common advertising criteria, common project selection, common structural flow, etc.). The national funds committed by participating states over multiple years are increased by commission funds (again stemming from the corresponding programme or the corresponding thematic priority in the structural programme). A proper co-decision process is required for the establishment of this highest stage of coordination.

The only use of Article 169 of the EC treaty in the 6th Framework Programme was launched in 2004, serving the purpose of bundling resources from the EU research budget and from national research programmes for clinical tests in the areas of HIV/AIDS, malaria and tuberculosis (EDCTP research programme – European and Developing Countries Clinical Trials Partnership).

The first two cases of coordination under Article 169 of the EC treaty in the 7th Framework Programme affect the areas of Ambient Assisted Living (AAL) (Research goal: making life for the elderly easier to promote longer independent living) and research-intensive small and medium-sized enterprises. For the latter, the Article 169 approach of "Eurostars" was created based on the European EUREKA technology initiative, by means of which transnational research projects are promoted under the overall control of "research intensive small and medium enterprises." Austria is tied into all three Article 169 initiatives.

In connection with "policy coordination," one should also mention the ***open method of coordination (OMC)***, which, in contrast to the other typical methods, is implemented not on the programme level, but only on the policy level and worked out under common voluntary guidelines and recommendations.

EUREKA – Status report

The European technology initiative EUREKA represents a precursor to the national coordination of research initiatives. For more than 20 years, EUREKA has been promoting industrial, market-oriented and cooperative research in the form of transnational projects. The coordination was (and is) "more loosely" formed than under the ERA-Nets. One should emphasise the long-term and comprehensive experiences with this initiative, and the fact that no fewer than 37 countries participate in it. Another essential characteristic of a EUREKA project is its "bottom up" character, meaning that project participants may at any time submit and decide themselves on project content, scope and duration. Acknowledgment of EUREKA status for an R&D project occurs on the basis of recommendations from national project coordinators in the EUREKA conferences, which are held four times a year. Promotion occurs nationally; in Austria, this usually happens through the FFG "basic programme" (FFG 2008). In 2007, 27 successful EUREKA projects received FFG basic programme funds with grants totalling € 4.1 million.

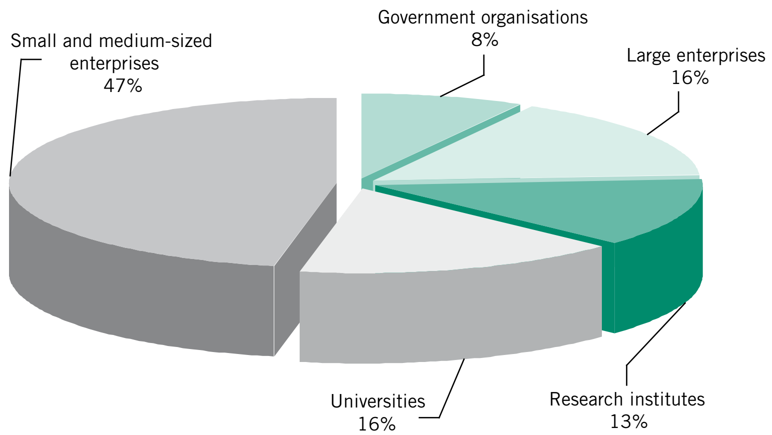
Currently (as of February 2008), 91 ongoing EUREKA projects are being conducted in Austria. 68 of these are individual projects and umbrella projects[51] with a volume of € 39 million.

17 of these projects are coordinated by Austrian partner organisations. Austria participates as an associate in 15 projects. All 37 EUREKA member countries are participating in 720 individual and umbrella projects. 12.64% of these projects take place with Austrian participation.

There are another 23 ongoing EUREKA cluster projects (as of January 2008) with Austrian project partners and an investment volume of € 60 million.

About half of all EUREKA project participants are small and medium-sized enterprises (47%), as seen in Figure 32. Participation by universities and large enterprises is about equal, each with 16%, while research institutes and government organisations participate in 13% and 8% of EUREKA projects, respectively.

Figure 32: Austrian participation in EUREKA projects by organisational type and individual and umbrella projects.



Source: EUREKA, dated February 2008

51 These are projects with a coordinated subsidy focus.

In addition, the **European Technology Platforms (ETPs)** form another important instrument in the European research area. The goal of these platforms is to create pan-European stakeholder networks under the overall control of European industry and based on specific technological topics. The "Strategic Research Agendas," which are necessary in the medium term and are crafted for the development path of European research, are to be implemented according to the availability of instruments at the community (EU Framework Programme), national and nationally coordinated levels. The formulation of ETPs influences the long-term goals and strategic research plans of various interest groups, and they have an effect on the real thematic orientation of requests for proposals in the EU Framework Programme. Again, the principle of pan-European excellence and the utilisation of synergy (with simultaneous elimination of duplication) are emphasised. Austria is satisfactorily tied into the ETP system.

For those technology topics which seem to require a large general strategic European effort in a global context, and where the desired position of Europe is to be achieved only through a massive "bundling of strengths," the instrument of the ***"Joint Technology Initiatives"*** **(JTIs)** is available. While the ETPs exert a (more or less significant) influence on the form of proposal contents in the Framework Programme, in the JTIs, the detailed topic is derived completely from the Framework Programme, and, through the founding of a "Joint European Company," is administered independently in a strategic fashion (drawing on the business sector). In some JTIs (Embedded systems/ ARTEMIS and nanoelectronics/ ENIAC), both national funds and funds from the Framework Programme flow into the JTIs. In other JTIs (Innovative Medicines/IMI, Air Travel/Clean Sky, and Hydrogen/fuel cells HFP), the public funds come exclusively from the community budget through the Framework Programme.

Against the background of the Lisbon-Barcelona process, one should list the interfaces between the actual instruments of the European research area and the other policy areas whose potential contribution to these goals can be made useful:

Under a broadly arranged innovation strategy in the area of competition policy, improved framework conditions were created through a new RTI-friendly community framework for state aid. In addition, with the ***Competitiveness and Innovation Framework Programme (CIP)***, an instrument was developed that rebundles the activities in the implementation phase of research results and thus increases and makes more visible the significance of this postponed phase.

An important element of the CIP is the Europe-wide selection and strengthening of cluster activities in which the boundary-breaking complementary potential of clusters can be better realised – an idea that clearly resonates with the goals of the European research area. In this context, the adoption of the "European Cluster Memorandum" in January 2008 represents the strategic direction for a pan-European cluster strategy. Compared internationally, the cluster theme in Austria is being – and has been for a number of years – pursued very successfully at the regional level.

R&D activities under the structure fund are becoming increasingly important. In this regard, the topic of "research infrastructures" is especially noteworthy. Here, special infrastructure promotions in the Framework Programme that are based on the excellence principle fit together optimally at the structure fund level with the promotions based on regional development.

Finally, the area of "opening European research to the world" represents an additional challenge, both at the community and national levels. At the level of policy coordination, "internationally oriented ERA-Nets" have been formed in this context that have a specific cooperation area as their focus (e.g., Southeastern Europe). At the same time, there is the parallel instrument of the so-called "INCO-Nets"

(e.g., Southeast Asia, Latin America, and Southeastern Europe), within which political preparation of common themes takes place (between the countries of the European Union and the countries of a particular region).

Since the beginning of the 7th EU Framework Programme, project partners from third countries can generally participate in all projects of the Framework Programme and also receive development funds. As a result, the theme of "opening to the world" has become a basic element of European community research.

4.4 Austria in the 6th EU Framework Programme[52]

The 6th EU Framework Programme for Research and Technological Development (FP6) reached the end of its effective five-year term at the end of 2006. The overall budget for the years 2002 to 2006 was €17,883 million plus €1,352 million for EURATOM, a programme for research and training in the field of nuclear energy.

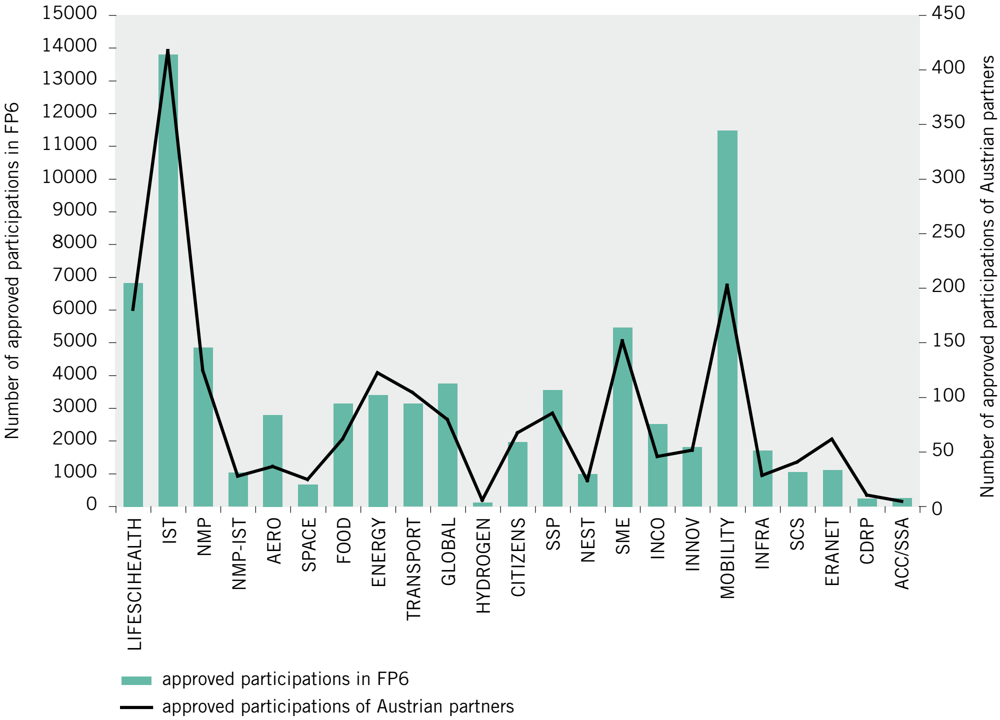
4.4.1 *Austria's participation in the 6th EU Framework Programme – results at a glance*[53]

FP6 funded 9,832 project proposals from among the 51,649 that were properly submitted and evaluated as of October 2007. This represents an average approval rate of 19%.

Austrian partner organisations successfully participated in 1,314 project proposals with 1,946 participants. This means that 2.6% of all successful participations came from Austria, an increase of 0.2% (FP5) and 0.3% (FP4) over earlier programmes. The proportion of successful participations in which Austrian partners were responsible for coordination actually grew by 0.5% over FP5 and 1.6% over FP4 to its current level of 3.3%.
Figure 33 below shows Austrian participation broken down by programme:

52 The data cited in this chapter comes from PROVISO (Ehardt-Schmiederer et al. 2007).
53 According to the data as at October 2007, contracts have been signed for 85% of the approved projects, with the results of the negotiations announced to PROVISO by the European Commission (EC). The EC has not yet announced the results of the negotiations of the remaining 15%; the data for these projects is based on projections.

Figure 33: Total number of approved participations in FP6 and number of approved Austrian participations with a breakdown by programme; data as at 10/2007



Source: PROVISO (data); tip (interpretation)

The ERANET[54] initiative has the highest Austrian share of approved participations at 5.5%. The programmes CDRD, SCS and Energy follow with shares of 4.2%, 3.8% and 3.6%, respectively.

The traditional STREP[55] instrument, with 410 approved projects, remains the most commonly selected project type in Austria. Comparing the approved Austrian projects, broken down by preferred project type, with the full spectrum of approved projects shows that Austrian researchers are closely involved in "new instruments" such as networks of excellence (NoE) and integrated projects (IP). This new type of collaboration involving numerous partner organisations is designed to encourage the accumulation of a critical mass of resources and expertise, thereby making an important contribution to strengthening Europe's competitiveness. In concrete terms, Austria is involved in nearly half (44.6%) of NoE and more than one third (35.6%) of IPs.

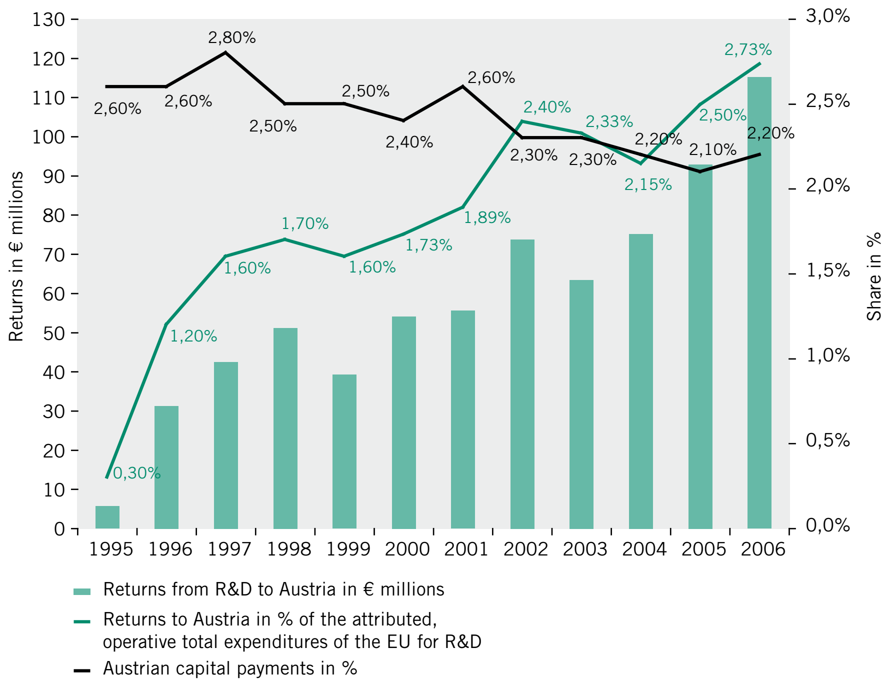
4.4.2 Funds and Returns

To date, Austrian participants in FP6 have received funding commitments of €425 million, or 2.57% of the total funds pledged.

54 The aim of this initiative is the coordination and cooperation of research and technology activities (through a network of research activities and reciprocal sharing among contributors in the participating countries).
55 STREP = Specific Targeted Research Project

Returns to Austria for R&D paid out in 2006 – including those funds from FP5 – totalled €115.2 million. This represents 2.73% of the total operational expenses allocated by the EU for R&D. Figure 34 below shows that these returns of proportional domestic capital payments increased by €22.3 million or 0.23% over the previous year, thereby continuing the positive trend from 2005 into 2006.

Figure 34: Annual R&D returns to Austria compared to the Austrian share of capital payments



Source: Data: European Commission; prepared by PROVISO, a project of the Federal Ministry of Science and Research (BMWF), the Federal Ministry for Agriculture, Forestry, Environment and Water Management (BMLFUW), the Federal Ministry for Transport, Innovation and Technology (BMVIT), the Federal Ministry for Economics and Labour (BMWA)

When we compare the returns to Austria categorised by organisation type with the analogous, successful participations of all programmes (cf Table 15) we see that the former are higher in particular in non-university research institutions (+ 4 percentage points), universities and colleges (+3.5 percentage points). On the other hand, small and medium-sized enterprises and the public sector partake to a larger extent (+3.5 and +1.8 percentage points) in successful Austrian participations than their proportion of returns to Austria for R&D make up.

Table 15: Distribution by organisational category (in %): Returns to Austria for R&D and successful Austrian participations, as at 10/2007[56]

Organisational category	Returns to Austria[57]	successful participations
Large companies (from 250 employees)	9%	8%
SMEs (up to 249 employees)	13%	16.5%
Universities and Colleges	41%	37.5%
Non-university research institutes	25%	21%
Public sector	2.2%	4%
Other	9.8%	13%
Total	100%	100%

Source: Data: European Commission; Preparation: PROVISO, a project of the Federal Ministry of Science and Research (BMWF), the Federal Ministry for Agriculture, Forestry, Environment and Water Management (BMLFUW), the Federal Ministry for Transport, Innovation and Technology (BMVIT), and the Federal Ministry for Economics and Labour (BMWA)

4.4.3 Summary

The European Research Area (ERA) established a first-of-its-kind joint research area extending beyond national borders. Among the most important tools of the ERA was without question the EU Framework Programme (FP) for Research. The FP was in turn extended and expanded through a series of additional and collaborative instruments.

Austrian researchers participated very actively in the 6th Framework Programme (FP6), which ran from 2002 to 2006. Austria contributed 2.6% of all successful participants. Compared to the earlier EU Framework Programmes, this represents an increase of 0.2% (FP5) and 0.3% (FP4). The proportion of Austrian partner organisations is especially high among the "new instruments," which encourage collaboration among diverse partner organisations and a bundling of critical masses. The positive trend of annual R&D returns to Austria continued in 2006.

56 According to the data as at October 2007, contracts have been signed for 85% of the approved projects, with the results of the negotiations announced to PROVISO by the European Commission (EC). The EC has not yet announced the results of the negotiations of the remaining 15%; the data for these projects is based on projections.

57 Expressed as a percentage of the total operational expenses allocated by the EU for R&D.

5 Women in Research, Development and Innovation

5.1 Introduction

The situation of women in research and development (R&D) has received growing attention in recent years: This is the result of political activities on a European and subsequently national level. In the inter-ministry initiative fFORTE Women in Research and Technology, these activities were bundled, following a recommendation by the Council for Research and Technology Development, and financed by the special proactive funds I and II from 2002 to 2007. The fact that the share of women in R&D in Austria is below average in international comparison played a decisive role in this process (European Commission 2004c; 2006b). Four ministries are now involved in different programmes to implement fFORTE:

- fFORTE academic (Federal Ministry of Science and Research)
- wfFORTE (Federal Ministry of Economics and Labour)
- FEMtechfFORTE (Federal Ministry for Transport, Innovation and Technology)
- fFORTE School (Federal Ministry for Education, Art and Culture)

In addition to other measures and programmes, the distribution and increasing systematisation of gender-differentiated data in R&D constitute one of the focal points of work in recent years. In order to focus the support measures more on the requirements of the target groups in the future, it was and is necessary to know more about women (and men) in this innovative employment field, not only in terms of representation (according to implementation sectors, science disciplines, hierarchy levels, etc.) but also to better assess the qualitative situation: In what way does the reality of women's work and life differentiate itself from that of men in respect to income, work hours and career motivation? Corresponding surveys and studies[58] in the context of fFORTE and beyond provide valuable information on this subject; the central parameters of the occupational field as well as a few important content-related dimensions are described below. This includes the subject level – in terms of the development and types of careers – as well as structural and institutional aspects, such as work culture and evaluation procedures.

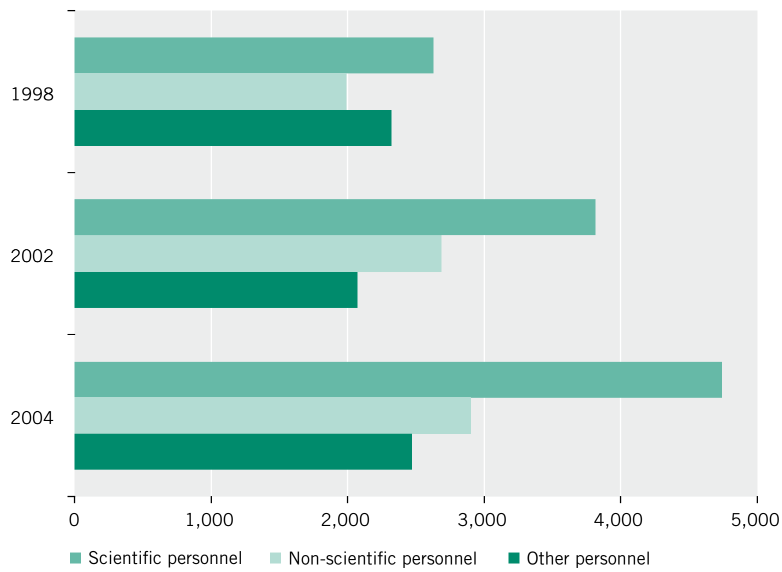
The goal of this work is therefore to uncover the basic knowledge that has been available so far, which can be used for the development of future policies as well as to reveal existing "blind spots" that need to be worked on in the coming years. Based on the described activities, question about future political (and support-oriented) challenges are to be raised.

58 See Gordon (2007), Knoll et al. (2007), Riesenfelder et al. (2006), Schiffbänker et al. (2007)

5.2 Women in research and development – Employment trends

With the transition to a two-year survey pattern, it is possible to provide an overview of the development of the share of women in Austria's research landscape for the years from 1998 to 2004 with the publication of the R&D survey results for 2004. The results of the R&D survey show that employment in the R&D area has significant dynamics. Overall R&D employment in Austria grew by 10.3% to a total of 42,891.3 people (full-time equivalent – FTE) in 2004 compared to the last survey in 2002. The share of women in overall employment grew only slightly from 22.2% in 1998 to 23.6% (FTE) in 2004. But if one differentiates according to the employment categories, it is clear that there has been a strong structural shift in the employment of women in research and technology in recent years. Although research-supporting functions are still primarily staffed by women (50.7% of the non-scientific assistant personnel in 2004), significant growth rates resulted in a clear increase of the female employment share in the core category of the R&D personnel – the scientific research staff – which is at 18.3% (FTE) in this category in 2004 (Statistik Austria 2008).

Figure 35: Development of female employees (FTE) in R&D according to employment categories 1998 – 2004 in all sectors



Source: Statistik Austria, tip calculations

Compared to the 1998 survey, the overall number of female researchers grew from 2,626.6 to 4,739.9 employees (FTE) in the year 2004 and the number of male researchers from 16,088.2 to 21,215.3 (FTE). The growth rate for the female researchers is therefore clearly higher at 80.5% than for male researchers at 31.9%; the share of women in research personnel therefore grew from 14% to 18.3% in the research period from 1998 to 2004.

Based on the head count, which reflects the employment situation more accurately due to high part-time quotas among female employees in R&D, the quota of female researchers was at about 24% in 2004 (see Table 16).

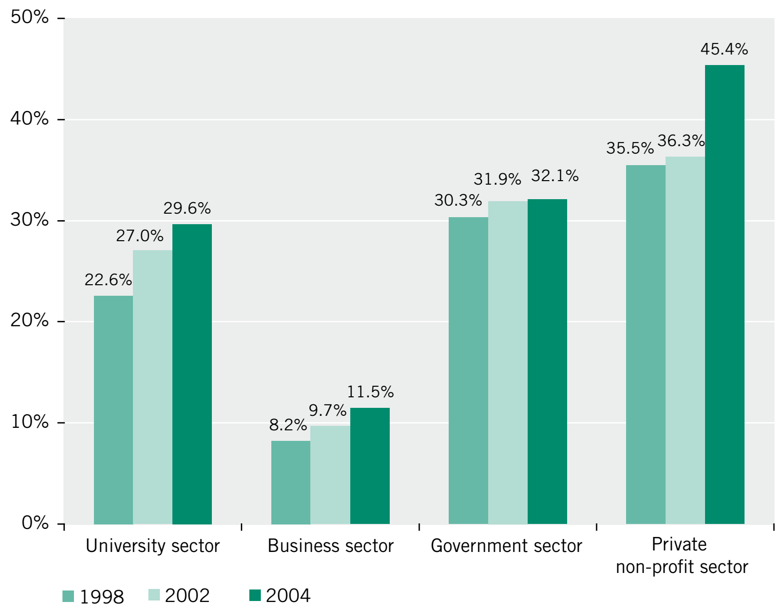
Table 16: Increase in the percentage of women in the category of scientific personnel (FTE and headcounts) in R&D 1998 – 2004 in all sectors

	FTE	Percentage of women (FTE)	Headcounts	Percentage of women (headcounts)
1998	2,626.6	14.0	5,901	18.8
2002	3,810.7	15.8	8,192	20.7
2004	4,739.9	18.3	10,427	23.6

Source: Statistik Austria, tip calculations

Clear changes can be seen at the sector level as well. In addition to the extremely different share of women in the category of "scientific research personnel," Figure 36 also shows the growth of the share of women in the different sectors in the period from 1998 to 2004. Significant increases of the share of women can be seen especially in the university sector and the private non-profit sector (PNP). The state sector, however, shows only minor growth rates for the share of women among the R&D employees. The share of women among the R&D employees in the business sector developed at a much lower level, although still with slight growth rates.

Figure 36: Share of women in the category of scientific research personnel according to sectors (in FTE), 1998 – 2004



Source: STATISTIK AUSTRIA, tip calculations

As the following Table 17 shows, the business sector does play an essential role in employment development in R&D, since it represents the area with the most employees (16,508 FTE) and indicates development potential as far as the share of women (11.5%) is concerned. However, the private non-profit sector, with a total of 136.6 employees (FTE), and the state sector, with a total of 1,029.8 employees (FTE), occupy a far lower position in R&D.

Table 17: Scientific research personnel in 2004, by sector and gender (FTE)

	Total	Women	Men	Share of women in %
University sector	8,280.8	2,454.0	5,826.8	29.6
Government sector	1,029.8	330.5	699.3	32.1
Private non-profit sector	136.6	62.0	74.6	45.4
Business sector	16,508.0	1,893.4	14,614.6	11.5
Total	25,955.2	4,739.9	21,215.3	18.3

Source: Statistik Austria, tip calculations

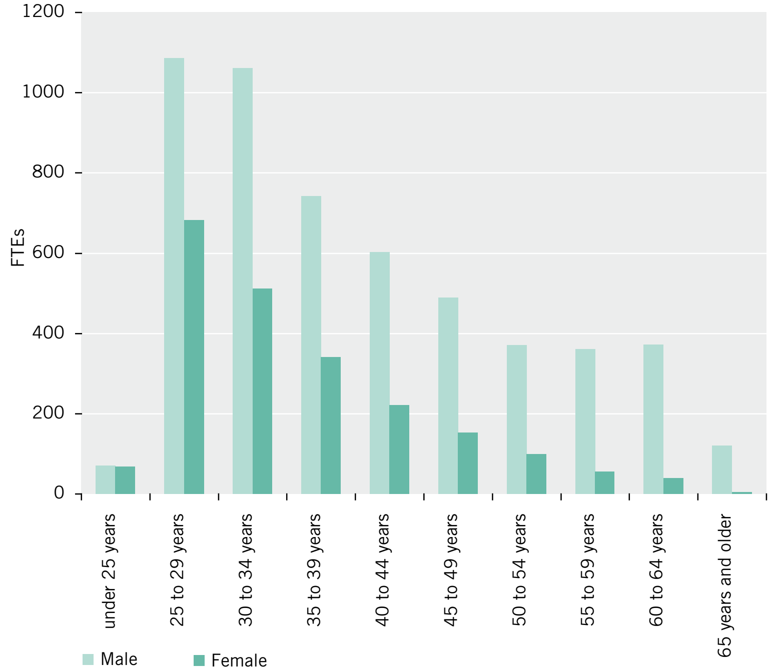
5.2.1 Employment conditions in the academic sector

In 2004, 11,501.5 people (FTE) were employed at Austrian universities (29,358 people), of which 8,280.8 (FTE) were academics or equivalent employees (20,888 people). As shown in Figure 36, the percentage of women as scientific research personnel grew from 22.6% in 1998 to 29.6% in 2004. A total of 18,909 scientists (7,450.8 FTE) were employed at the research universities relevant for R&D in 2004; here too, the share of women grew from 22.3% in 1998 to 29.2% in 2004.

Figure 37 represents the employment situation in R&D 2004 at the research universities. What can be seen on the one hand is a generational effect that affects the size of the gap at the current time. This gap is reflected in the employment categories of professors and assistants.[59]

59 A comparison with the results of the F&E survey is only conditionally possible.

Figure 37: Research universities overall: Scientific research personnel[60] FTEs by age groups and gender 2004



Source: STATISTIK AUSTRIA, Statistical Yearbook 2007

Table 18: Professors and academic assistants FTE on research universities 2001 – 2005

	2001		2003		2005	
	Total	Percentage women	Total	Percentage women	Total	Percentage women
Professors	1,610.5	6.8	1,594.2	9	1,546.9	10.8
Academic assistants	7,215.8	25.9	7,503.9	27.2	8,419.9	30.3

Source: bm:bwk, Statistische Taschenbücher 2002, 2004, 2006

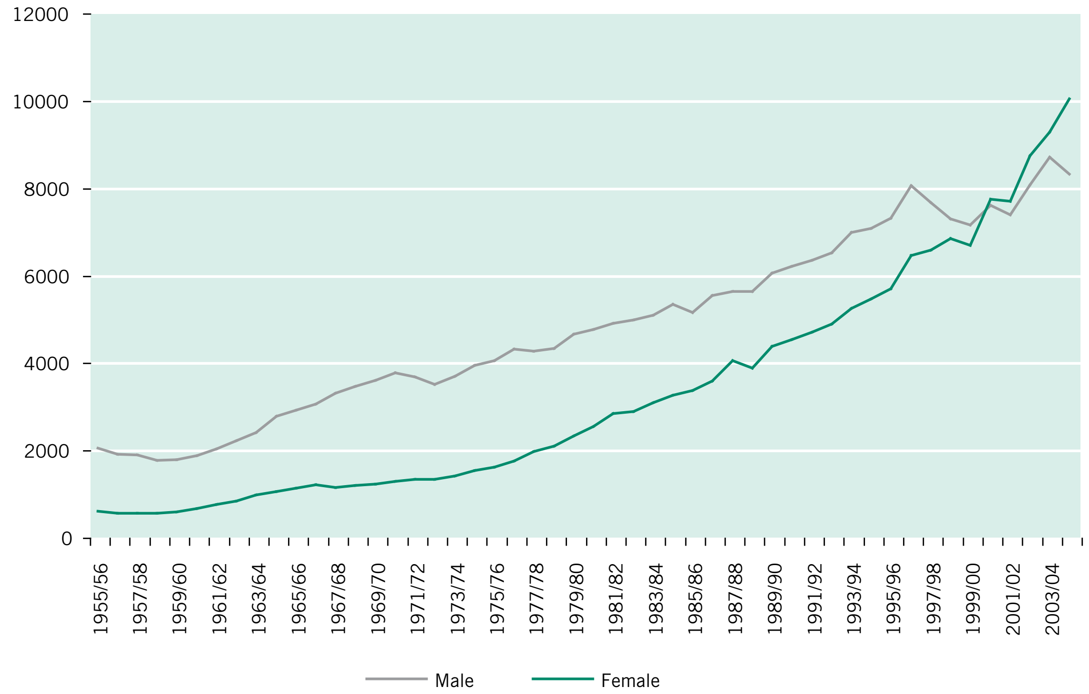
In 2006, the share of female professors at all universities was **14.7%**. At the universities concentrated solely on scientific research, the share of female professors was **11.3%** in 2006 (see uni:data warehouse with end date of 31 December 2006).

Since the total amount of graduations by women and men and the relative share of female graduates has also consistently increased since the 1950s (see Figure 38), we can assume that the next decades will also continue to see a change in employment structures in favour of women.

The share of women among undergraduates was 56.4% in the academic year 2004/05 and 43.7% among the graduates (BMBWK 2006).

60 Scientific personnel at universities includes professors, assistants and lecturers. Professors emeritus and visiting professors with an R&D share are included; people on leaves of absence are not considered.

Figure 38: Graduations at all Austrian universities according to gender, 1955 – 2004



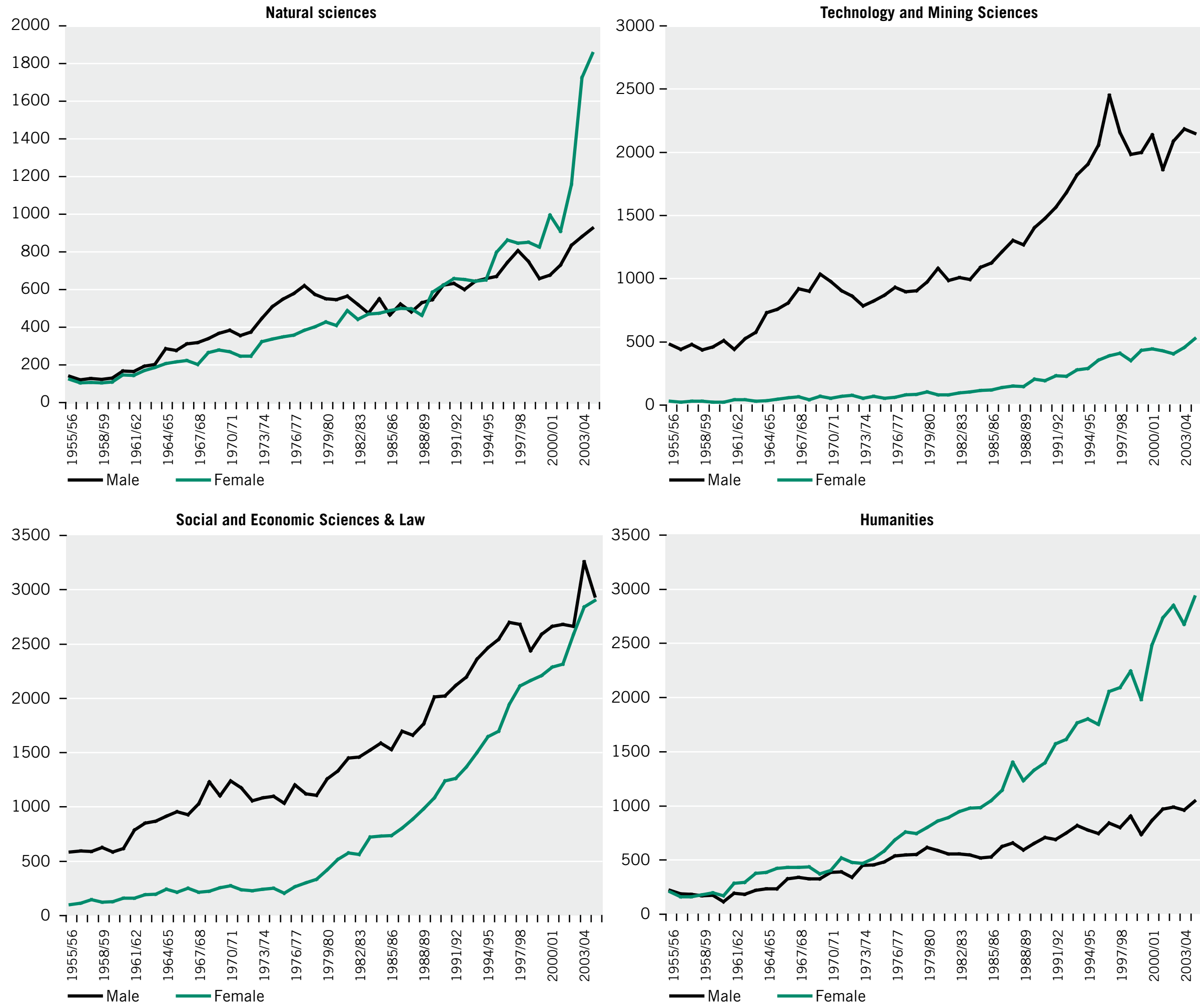
Source: STATISTIK AUSTRIA, Statistical Yearbook 2007

If the graduations are differentiated according to the individual disciplines, conspicuous differences become apparent in the change of the proportions of male and female graduates (see Figure 39):

While the shares of women and men in the social and economic sciences have evened out in recent years, the share of women in the natural sciences has virtually exploded since 2000. The rise in graduations for women in the natural sciences can presumably be traced sack to the introduction of the bachelor's degree programmes.

However, the gap between the percentages of women and men in technology and mining sciences has increased to the disadvantage of women. That means that the technical disciplines are faced with the existing challenge of increasing the pool of future recruitments and motivating young women to enter these specialised fields. This is the precise goal of the initiative "FIT Women in Technology" in the context of fFORTE. But, even in those areas where an equalisation of the rate of female graduates has already been observed, such as in the social and economic sciences, measures have to be implemented so that this is also reflected at the professorial level. "Excellentia," the financial incentive system of fFORTE to double the quota of female professors, deserves mention here as a current state programme.

Figure 39: Graduations according to gender, 1955 – 2004



The most significant rate of increase in female graduations can be seen in the humanities. Here it becomes especially clear that the increase in graduation rates that began back in the 1970s is not automatically reflected by employment data in the respective scientific disciplines. In 2002, the share of women among humanities professors throughout Austria was 14% and 37% for the assistants.[61] An uneven gender distribution in university employment situations does not automatically resolve itself with the generational shift. That makes it all the more important to implement appropriate measures in the proper key areas.

61 Comparable surveys with more recent dates are not possible due to the restructuring of the faculties.

5.2.2 Research funding and the employment situation

The employment situation at the universities is reflected in research grants. The Austrian Science Fund's (FWF) support of individual projects provides a support tool that can be used to improve the situation of women in science with a priority on merit grants. In this respect, the Science Fund can look back on a fairly positive development: Table 19 shows that applications by women for individual Science Fund projects doubled by 2005; the share of women in all applications amounted to 20.3% for this year. In 2006, the share dropped back to 17%. Women were successful in 19% of the authorised projects in 2006.

Table 19: Share of women in applications and approvals of Austrian Science Fund "Individual Projects" 1998 – 2006

	Science Fund total		Women			
	Applied	approved	Applied women	Percentage women of all applications	Approved women	Percentage of all applications
1998	676	339	87	12.9%	42	12.4%
1999	703	334	93	13.2%	53	15.9%
2000	636	344	70	11.0%	49	14.2%
2001	701	343	96	13.7%	44	12.8%
2002	791	373	138	17.4%	53	14.2%
2003	944	353	155	16.4%	51	14.4%
2004	780	324	115	14.7%	52	16.0%
2005	919	312	187	20.3%	50	16.0%
2006	952	374	163	17.1%	71	19.0%

Source: Austrian Science Fund

As far as employment conditions for the new generation of scientists in Science Fund projects are concerned, the positive trend of recent years has continued: According to the Science Fund, the number of women has come very close to that of the men. There was an increased employment of women in all three categories: degree candidates, PhD and post doctoral scholars. In the period from 1998 – 2006, the share of women employed in Science Fund projects grew from 30.4% to 40.3% (see Table 20).

Table 20: Full-time equivalent jobs in Science Fund projects 1998 and 2006 by gender

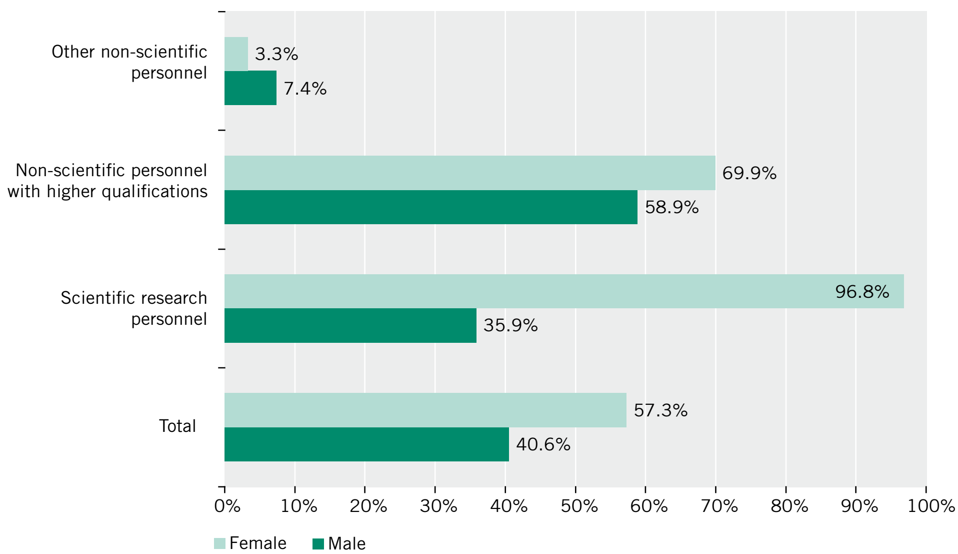
	1998			2006		
	Women	Men	Men	Women	Men	Men
Post doc	145.2	337.9	30.1%	212.9	334.9	38.9%
PhD	165.1	390.1	29.7%	452.5	688.0	39.7%
Degree candidates	49.2	94.6	34.2%	92.7	99.5	48.2%
Total	359.5	822.6	30.4%	758.1	1122.4	40.3%

Source: Austrian Science Fund

5.2.3 Employment conditions in the business sector

In the business sector – which constitutes the majority of R&D personnel with 29,142.7 employees FTE, but which has always shown the lowest share of women in R&D – a sustainable structural shift can be seen. Figure 40 shows that between 1998 and 2004 a significant catching-up process was started, supported by scientific research personnel and more highly qualified non-scientific research personnel.

Figure 40: Increase in the percentage of women and men in the business sector, 1998 – 2004



Source: Statistik Austria, tip calculations

In 2004, a peak level was reached with an 11.5% share of women in research personnel; the number of female researches has nearly doubled from 961.9 FTE in 1998 to 1,893.4 FTE in 2004 (see Table 21). The number of female, more highly qualified non-scientific employees grew from 1,009.5 people (FTE) in 1998 to 1,715.5 people (FTE) in 2004, where the percentage of women has been consistent at 16.9%.

Table 21: Percentage of women in the business sector by employment category (FTE), 1998 – 2004

	1998			2002			2004		
	Personnel	Women	in %	Personnel	Women	in %	Personnel	Women	in %
Scientific research personnel	11,716.1	961.9	8.2	16,001.2	1,551.5	9.7	16,508.0	1,893.4	11.5
Non-scientific personnel with higher qualifications	6,318.6	1,009.5	16.0	8,326.4	1,524.6	18.3	10,149.8	1,715.5	16.9
Other support staff	2,349.9	941.3	40.1	2,399.9	760.8	31.7	2,484.9	972.6	39.1

Source: Statistik Austria, tip calculations

5.2.4 Research personnel in natural science and technical research facilities outside the university

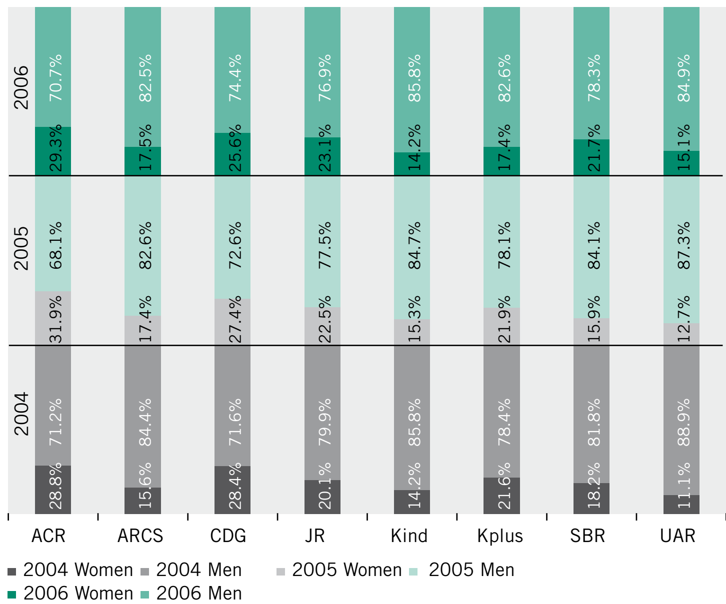
Every year, the gender booklet provides current data about the situation of women and men in research outside the university with an orientation towards natural science and technology based on head counts. The survey has been carried out for four years within the scope of FEMtechfFORTE. The 85 examined programmes can be attributed to the cooperative area in the business sector: They include the programmes by Austrian Cooperative Research (ACR), the Austrian Research Centres (ARC), Joanneum Research (JR), Salzburg Research, Upper Austrian Research and the Kplus and K_ind/K_net competency centres. In addition, 27 laboratories from the Christian Doppler Gesellschaft participated in the survey. The research personnel in the examined programmes comprised 2,905 people for the survey year 2006. There was an increase among female researchers (+3%) as well as male researchers (+5%). The share of women in the scientific personnel stayed relatively the same at around 20%, after a brief increase to 21.4% in 2005 (BMVIT 2007a).

The annual comparison in the last three years shows different developments according to the structure of the research programmes. Accordingly, a slight and continuous increase can be observed in the group of female researchers at the two large Austrian research programmes in the business sector (cooperative area), the Austrian Research Centre (ARC) and Joanneum Research (JR). The scientific personnel also grew slightly in the two small research programmes of Salzburg Research and Upper Austrian Research.

All other groups that were examined were composed of several research organisations. Austrian Cooperative Research (ACR) is an association of existing research programmes in which there has been an overall increase of the scientific personnel within the last three years. Between 2004 and 2005, the gain was to the women's advantage, while the men profited more between 2004 and 2005, which resulted in another decrease in the share of women. Personnel fluctuations in the competency centres as well as the Christian Doppler laboratories can be traced back to basic structural conditions. Here it is a matter of research programmes based on public support that is conditional for a fixed time period. At the K-plus centres, this led to an overall staff decrease in the last three years. The women were more strongly affected by this than the men, which led to a decline in the share of women at the K-plus competency centres from 22% to 17%. The differentiated analysis showed that the participation of women depends on the content orientation of the research centres.

The more the research fields are directed towards engineering sciences, the more the men dominate the research personnel. If the content is oriented more towards natural science research, the share of women in the research personnel increases.

Figure 41: Research groups outside the university: Gender relations among science employees, 2004 – 2006



Source: Gender Booklet 2004, 2005, 2006

5.2.5 About the situation of female scientists in technically oriented research outside the university: Trends of the last three years

In a three year comparison, employment conditions show a slight trend towards a decline in full-time employees accompanied by an increase in part-time employees to the extent of between 50% to 90%. This is true for male as well as female researchers, although full-time employment still dominates in the professional field. Full-time employment accounts for 78% of employees when distributed across the entire research personnel. The share of the female researchers in this employment group is 16%.

As far as the share of female scientists in managing positions is concerned, there is a conspicuous lack of women in leading positions at research institutes. The higher the function, the lower the participation of female scientists. If all management levels are considered together, the share of women at the managing level has slightly declined in the last three years. Only three women can be found at the highest level in an executive management function in 2006, compared to 68 male chief executives.

Table 22: Non-university research institutions: Scientific research employees in managerial positions, on committees or holding board positions, by gender

	2004		2005		2006	
	Women %	Men %	Women %	Men %	Women %	Men %
Managerial level*	7.9%	92.1%	8.0%	92.0%	7.1%	92.9%
Supervisory Board, Management Board	3.7%	96.3%	4.2%	92.6%	5.7%	94.3%
Scientific Advisory Board, Boards	8.25%	91.8%	7.4	92.6%	9.8%	90.2%
Employee Representative	9.9%	90.1%	27.3%	72.7%	26.5%	73.5%

Source: Gender booklet 2004, 2005, 2006 * including company management

In 2006, women in decision-making committees, such as boards of directors and management boards, were represented to an equally marginal degree (5.7%). The share of women in scientific advisory councils is a little higher at 9.8% and is highest in the corporate advisory councils at 26.5%. The increase in the amount of women from 17% to 27% in the last three years is a result of a 36% decline in male advisory counsellors. The number of female corporate counsellors has stayed the same.

These numbers indicate how slowly changes are progressing. In the future, it will continue to be a challenge to develop research policies that encourage gender equality by means of activity support and initiatives in order to realise the potential of all female and male researchers.

5.3 Gender and excellence: Using strategies for excellence against the gender bias

Here begins the discussion about gender and excellence, which is marked by two trends: One of the goals is to utilise available human resources in research and development to strengthen research output and competitive ability. Here the group of female researchers, which has been underrepresented so far, plays a special role. But at the same time, empirical studies about shortcomings in performance evaluation in the science and research grant system show that science itself – production conditions, evaluation criteria and selection procedures – contributes to unequal gender distribution. Therefore, priorities will be placed upon the support of scientific output and scientific quality in the future, while simultaneously minimising structural impediments.

The optimisation of scientific excellence has to be understood as one of several measures that are coordinated with each other. In order to counteract a bias in the evaluation of research performance or its quality, there is a higher demand for increased transparency in the procedures for submission invitations and appraisals, more accountability for the appraisers, a growth in the share of women in commissions dominated by men, as well as a critical review of the current parameters for scientific excellence, which may turn out to be structure-preserving and risk averse (European Commission 2004b; Schacherl et al. 2007). In its strategy for 2010 (RFTE 2005) as well as its Strategy for Excellence (RFTE 2007), the Council for Research and Technological Development also emphasises the necessity of opening up appropriate career opportunities for women in R&D by keeping the design of measures and selection processes and criteria as gender-neutral as possible.

The new **Laura Bassi Centres of Expertise** (LBCentres) can be seen as a direct response to these requirements. The LBCentres, having publicised a request for submissions in a unique campaign within the scope of wf-FORTE (BMWA), are located at the intersection of science and the economy with the goal of paying appropriate attention to excellent research accomplishments by female scientists. In this way, women are specifically encouraged to apply for positions in scientific management. In its conception, the programme attempts to counteract the previously identified disadvantages of female researchers in R&D and adjust the selection criteria to the actual requirements of future research and management performance. In addition to scientific references by female applicants, which are evaluated according to the internationally recognised bibliometric standards, factors such as a modern conception of science and a team and management orientation are also considered in the evaluation. The federal government is providing funds for a maximum of six LBCentres with a duration of seven years (€ 320,000 per year and research centre, 60% of the total amount), where 35% of the sum has to be contributed by economic partners and 5% by the research partners.

A successful support instrument to ensure quality in the personnel development of universities was created in the form of fFORTE **excellentia**. Each university receives the amount of € 33,880 for every professorship that is awarded to a woman, thereby increasing the existing number of female professors as well as the share of women among professors compared to the previous year. The financial reward system has supported the employment of 62 female professors since the programme's inception in 2005. One million € are available annually for the aid programme. The programme will be expanded to mid-level university positions in 2008.

The area of human resource development including gender measures also plays a central role in the "Strategy for Excellence in Science" by the Science Fund (FWF): A department for gender issues was established in 2004 to address these topics. The national funding agency gives the excellence criterion the highest priority in its aid decisions. However, there has also been a developing awareness that funding design and decisions can serve to bring about structural changes in equalising different conditions for women and men, thereby anchoring female scientists and their potential in Austria. In addition to concrete grant programmes for women (post doc programme Herta Firnberg and senior post doc programme Elise Richter to attain a professorship), measures have also been introduced to make the application process more flexible. In 2007, 27 positions were authorised in the career development program for women, which has an available annual budget of about five million euros (including 14 Herta Firnberg positions and 13 Elise Richter positions with a total budget of € 4,861,769). In 2006, there were a total of 31 positions (including 15 Herta Firnberg positions and 16 Elise Richter positions with a total budget of € 5,037,619). Examples to make the application process more flexible include the consideration of the academic age limit instead of the biological one, or the complete removal of the age limit in the Elise Richter programme, or the inclusion of child education periods that accommodate the requirements of female scientists, since they often have different career paths and "later" careers than their male colleagues.

5.4 Women's careers in research and technology

Accordingly, special attention is paid to the individual career paths of women and men and the factors that influence their development. The research projects financed through fFORTE provided detailed insights, which in turn represent an important foundation for additional planning steps (Riesenfelder et al. 2006; Gordon 2007; Knoll and Szalei 2007; Schiffbänker et al. 2007).

At the moment, the careers of women in R&D are described with the metaphor of the "leaky pipeline," which expresses the continuously shrinking share of women on each level of the career ladder. In contrast to this hierarchical career perception, however, "career" is used in the following section in a broader sense, as a succession of job positions and therefore synonymous with "professional path." This is based on the assumption that each career has a double face: The objective career describes changes observed from the outside, such as changes in the workplace or position, salary raises, interruptions, etc. This is countered by the subjective career, in which all individuals define the meaning of the career themselves. Here, personal value perceptions, attitudes and experiences are relevant, such as the priorities of the profession and personal life.

5.4.1 Gender-specific careers

A study authorised by wfFORTE about the career paths of women and men demonstrates gender-specific (dis-) continuities (Reisenfelder et al. 2006). Based on a cross-section analysis[62] that appraises 3,600 women with an academic degree in the natural sciences or technology and an equally large male comparison group, the study shows that the differences in the linearity of the acquisition processes cannot be explained alone by leaves of absence. In comparison to men, women also have lower employment continuity if leave-oriented interruptions are disregarded: 54% of all men, but only 42.4% of all women, were "mostly employed" without leaves of absence during the observation period. [63]If people with interruptions caused by leaves of absence are included, the share of women drops to 29.5% while it remains nearly the same for men at 53.5%. Interruptions[64] caused by leaves remain a "female phenomenon": Compared to 3% of men, 33% of the women have such career interruptions, which last twice as long on average for the women as for the men and are also less likely to generate additional income as shown by the objective career paths.

This result relativises the frequently heard argument that child-specific interruptions explain the "leaky pipeline," and it raises the question about additional explanatory factors. These are shown in the form of a shorter average employment duration of women com-

62 For sample forms and further content, see: Riesenfelder et al.
63 = 91-100% of the observation period with employment in various forms
64 This includes parental leave, educational leave and support leave

pared to men (people without leaves in each case), even when male and female natural scientists or technicians become independent. The use of networks – another factor relevant to careers – is determined by limited time resources (conditional on support).

Furthermore, the study results do not show a gender-specific usage of these social resources, which instead is more dependent on individual career orientations (Riesenfelder et al. 2006, ch. 11). (Dimas 2006).

In the R&D field, part-time employment is also a customary form of employment that is compatible with the responsibility for providing childcare: Out of all the surveyed scientists with children under 15 years old, 83% of the mothers but only 12% of the fathers work less than 35 hours a week (BMVIT 2007a). But part-time employment generally restricts access to management functions and thus amounts to a rejection of the classical hierarchical career. The number of women in management functions, especially in upper management, therefore tends to remain low; female role models are absent along with the visibility and development capacities of women.

In addition to this highly limited vertical mobility, part-time employees also find limited horizontal mobility; there are only few possibilities of changing to other companies ("glass wall").

The compatibility of private responsibilities – in addition to children, the care for sick and older people also has to be considered, along with desires for advanced education and other private interests – with the professional ethos of the scientist, which is perceived as a calling (sic!), seems to be scarcely possible, a phenomenon that has also been described as the "myth of the incompatibility of science" (Nowotny 1986). However, a corresponding change in the work culture and a concept of the work/life balance that goes beyond the question of compatibility does seem increasingly important in order to increase the attractiveness of the research and technology employment field for women (and increasingly more men): A cookbook (Gordon 2007) clearly demonstrates that professional success and a satisfactory private life are not mutually exclusive, even for men.

Existing role models are being softened and top scientific achievements and a quality of life are being presented as complementary and compatible. Heterogenous career paths are multiplying and occupational progress is increasingly experienced in phases with different prioritisations ("phasing"). People on leave describe this period of their employment interruption as an opportunity for advanced professional qualifications or a shift in their profession, and therefore they certainly view it as career continuity in the sense of a subjective career understanding (see above).

5.4.2 The career form of self-employment

Self-employment is considered a male form of employment in which the share of women is generally 30 – 35%; this number decreases to an estimated 15% in the R&D field, although exact data about this have previously been unavailable for Austria. The professional and private lives of self-employed female engineers have been analysed as an example (see Knoll and Szalei 2007). The primary motivation for this type of employment rests in the responsibility for working on demanding projects with flexible design parameters, but there is little satisfaction in terms of freedom and income. Self-employment certainly assumes ("woman-") specific forms: The majority of self-employed women have one or more children (54%), report having regular weekly work hours, and 30% hold another job in addition to their self-employment.

Self-employed female engineers, however, represent a very small group (architectural offices: 11%, engineer consultants, technical offices (civil engineers), builders: less than 3%). An international policy analysis was conducted to discover support possibilities for start-ups by women in the R&D field in general (see Schiffbänker et al. 2007). The transferability of innovative promotion programmes in the Austrian context is stimulated on two levels: On the one hand, industry-specific pilot programmes with a very target-group-oriented approach are required; on the other hand, strategies have to be formulated and bundled measures have to be implemented that start on different levels and are coordinated in terms of their period of effectiveness (start-up incentives in general and while studying, awareness measures for female start-ups / role models, concrete offers to potential female entrepreneurs).

5.5 Conclusions

The data in the first section of the chapter clearly demonstrate that the gap between the shares of women and men in science, research and development is slowly shrinking. In Austria there are also more women employed and involved in research applications and authorisations, accompanied by a growing number of graduates in most areas.

The greatest challenges continue to be the increase of student and graduate numbers in the technical and engineering field, which is so crucial to R&D, and in the vitalisation of the still strongly underrepresented female researchers in the business sector. Here special attention has to be paid to filling higher positions, because the women's status in R&D in terms of income, takeover of management functions and other objective career properties has only changed insignificantly. There needs to be an additional increase in the share of women in this field, which continues to be ranked low in a European comparison.

Much has been achieved thus far with regard to "empowerment" of individuals (in most cases women). Now the future challenges are in the sustainable establishment of changed structures: Work organisation and work culture in companies, care systems, career and role models etc. have to be changed if women want to find the same opportunities in the professional R&D field as men in their subjective living environment. Corresponding measures have to be implemented in the respective sectors, disciplines and specialised cultures, adapted to the requirements of the target groups.

In this regard, many studies have already been initiated that determine the causes of previously lower career opportunities of women in R&D, although the focus has been on individual career dispositions (career path, motivation, individual compatibility patterns). These insights can be the foundations for future support programmes that can supplement existing measures.

On an institutional level, there is also evidence that there is a growing awareness of the different conditions for women and men in research institutions and funding agencies. A continuing challenge for the future will be to develop concrete measures in this field and promote their distribution and implementation. In addition, the maintenance, improvement and evaluation of existing measures has to ensure continuity by making orientation and planning opportunities available that can only produce medium- or long-term impacts. There must be patience, especially when measuring the possible success of existing measures, because so much is in transition and change is coming slowly.

Annex

Table A: Classification of industries in the business sector without the primary sector. According to ISIC Rev. 3 NACE 1.1, ÖNACE

15, 16	Food products, beverages and tobacco
17	Textiles
18, 19	Apparel, leather production and processing
20	Treatment and processing of wood
21, 22	Production and processing of paper and pulp; publishing, printing and reproduction of recorded media
23	Coke, refined petroleum products, fissible and fertile material
24	Chemicals and chemical products
25	Rubber and plastic products
26	Glass, products of stone and earth/ Other non-metallic mineral products
27	Metal production and processing
28	Manufacture of metal products
29	Machinery and equipment
30	Office machinery and computers
31	Devices for the generation & distribution of electricity and the like
32	Radio, television and communication equipment and apparatus
33	Medical, precision and optical instruments
34	Motor vehicles and motor vehicle parts
35	Other transport equipment
36, 37	Furniture, jewellery, musical instruments, sports equipment, toys and other products; recycling
40 to 45	Electricity, gas and water supply; construction
50 to 52	Sale, maintenance and repair of motor vehicles and utility goods
55	Hotels and restaurants
60 to 64	Transport and communication
65 to 67	Financial and insurance activities
70 to 74	Real estate activities, renting of machinery, other business activities
75 to 99	Public administration, national defence, national insurance; education; other social and personal service activities; private households; extraterritorial organisations and bodies

Table B: Personnel at universities by category (FTE), 2005 and 2006

	2006 (as at 31.12.06)				2005 (as at 31.12.05)			
	Professors	Academic assistants and other scientific personnel	General personnel	Total	Professors	Academic assistants and other scientific personnel	General personnel	Total
Medical University of Graz	70,7	467,9	573,7	1.112,3	65,0	471,4	509,4	1.045,9
Medical University of Vienna	119,5	1.314,9	1.915,3	3.349,7	121,1	1.338,6	1.965,6	3.425,3
Linz University of Art and Industrial Design	19,6	45,0	73,1	137,7	18,6	48,0	74,0	140,6
Graz University of Music and Performing Arts	103,6	130,6	124,5	358,7	93,3	139,6	121,6	354,4
Mozarteum University of Salzburg	97,5	123,5	117,3	338,3	94,0	126,4	113,4	333,8
Vienna University of Music and Performing Arts	167,5	263,0	275,8	706,2	186,5	258,8	258,4	703,7
Vienna University for Applied Arts	32,5	126,3	112,8	271,7	33,5	123,3	112,4	269,2
University of Klagenfurt	58,2	217,7	272,1	548,0	54,9	213,5	276,9	545,3
University of Linz	107,0	684,5	513,1	1.304,6	103,0	699,6	513,2	1.315,7
Vienna University of Economics and Business Administration	70,0	398,2	398,3	866,5	67,2	367,2	408,1	842,5
University of Veterinary Medicine Vienna	26,0	216,6	396,3	638,9	28,1	207,4	428,0	663,4
University of Natural Resources and Applied Life Sciences, Vienna	55,8	283,6	431,1	770,5	60,8	285,5	423,5	769,8
Montanuniversität Leoben	33,9	144,1	211,4	389,4	32,8	132,8	213,2	378,8
Graz University of Technology	77,1	530,7	608,6	1.216,4	82,2	530,6	587,4	1.200,1
Vienna University of Technology	139,6	721,1	819,5	1.680,2	147,8	731,3	812,7	1.691,8
Krems University for Continuing Education	6,7	81,7	158,3	246,6	1,4	53,3	139,7	194,5
Academy of Fine Arts Vienna	21,2	85,3	118,4	224,9	24,7	62,6	123,0	210,3
Medical University of Innsbruck	61,2	477,5	511,2	1.049,9	59,7	532,0	451,9	1.043,6
University of Salzburg	121,8	411,4	543,4	1.076,6	128,0	410,6	484,8	1.023,4
University of Innsbruck	136,6	633,2	851,5	1.621,2	141,5	634,4	797,9	1.573,8
University of Graz	140,8	500,1	825,7	1.466,5	148,3	491,3	731,5	1.371,2
University of Vienna	300,9	1.519,3	1.625,3	3.445,5	306,9	1.426,7	1.532,6	3.266,2
Total	1.967,2	9.376,2	11.476,7	22.820,2	1.999,1	9.285,0	11.079,1	22.363,3

Source: Federal Ministry of Science and Research

Table C: Number of doctoral graduates at the universities by educational fields (ISCED) in the 2005/2006 and 2004/2005 academic years

University	ISCED 1-digit level	2005/06 academic year	2004/05 academic year
Academy of Fine Arts Vienna		3	4
	Education	1	1
	Humanities and arts	-	3
	Engineering, manufacturing and construction	1	-
	Unknown/no details given	1	-
Mozarteum University of Salzburg		3	6
	Education	1	-
	Humanities and arts	-	5
	Unknown/no details given	2	1
Vienna University of Technology		243	242
	Education	-	4
	Natural sciences	70	82
	Engineering, manufacturing and construction	173	156
Vienna University of Music and Performing Arts		10	4
	Humanities and arts	-	4
	Unknown/no details given	10	-
Linz University of Art and Industrial Design		1	-
	Humanities and arts	1	-
Vienna University for Applied Arts		7	1
	Humanities and arts	2	1
	Unknown/no details given	5	-
Graz University of Music and Performing Arts		10	8
	Humanities and arts	10	7
	Unknown/no details given	-	1
University of Linz		128	168
	Education	5	4
	Social sciences, economics and law	64	98
	Natural sciences	29	43
	Engineering, manufacturing and construction	27	23
	Unknown/no details given	3	-
University of Klagenfurt		82	84
	Education	14	17
	Humanities and arts	23	18
	Social sciences, economics and law	38	40
	Natural sciences	7	9
University of Salzburg		123	118
	Education	11	8
	Humanities and arts	18	16
	Social sciences, economics and law	67	48
	Natural sciences	24	45
	Engineering, manufacturing and construction	-	1
	Services	2	-
	Unknown/no details given	1	-

continued

Source: Federal Ministry of Science and Research

Table C (continued): Number of doctoral graduates at the universities by educational fields (ISCED) in the 2005/2006 and 2004/2005 academic years

University	ISCED 1-digit level	2005/06 academic year	2004/05 academic year
University of Innsbruck		246	255
	Education	18	26
	Humanities and arts	34	41
	Social sciences, economics and law	106	98
	Natural sciences	59	65
	Engineering, processing and construction	15	13
	Health and social work	10	11
	Services	4	1
University of Graz		165	202
	Education	8	22
	Humanities and arts	41	48
	Social sciences, economics and law	60	67
	Natural sciences	40	46
	Health and social work	14	15
	Services	2	4
University of Vienna		699	719
	Education	24	19
	Humanities and arts	158	205
	Social sciences, economics and law	285	292
	Natural sciences	214	180
	Engineering, manufacturing and construction	2	-
	Health and social work	12	20
	Services	4	3
Vienna University of Economics and Business Administration		72	62
	Education	4	5
	Social sciences, economics and law	62	57
	Unknown/no details given	6	-
Graz University of Technology		148	143
	Natural sciences	24	22
	Engineering, manufacturing and construction	124	121
Montanuniversität Leoben		45	40
	Engineering, manufacturing and construction	45	37
	Services	-	3
University of Natural Resources and Applied Life Sciences, Vienna		77	100
	Engineering, manufacturing and construction	46	58
	Agriculture	31	42
University of Veterinary Medicine Vienna		49	61
	Agriculture	49	61
Medical University of Vienna		14	5
	Health and social work	14	5
Medical University of Graz		6	10
	Health and social work	6	10
Medical University of Innsbruck		6	5
	Health and social work	6	5

Source: Federal Ministry of Science and Research

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Statistical Annex

1 Financing of gross domestic expenditure on R&D and research rate (Tables 1 and 1a) 1

Austrian gross domestic expenditure on research and experimental development (R&D) – i.e. the total sum of spending on R&D carried out in Austria – will rise to 2.63% of the gross domestic product in 2008, an increase of 8.1% over 2007. Thus in the current year, according to the latest estimate made by STATISTIK AUSTRIA, a total € 7.512 billion will be spent on R&D. Of this amount 35.5% will be financed from public funds (federal and state governments, other public institutions), 48.6% of the funds for R&D will come from the business sector, 15.5% from abroad, and 0.4% will be contributed by the private non-profit sector.

This means that of the gross domestic expenditure for R&D in 2008, about € 2.22 billion come from the federal government, € 371.7 million from the states, and around € 75.4 million from other public financing sources (local governments, chambers, social insurance carriers). Thus in total the public sector spends around € 2.7 billion. About € 3.65 billion are spent by Austrian businesses on R&D; € 1.16 billion come from abroad, and around € 31 million from the private non-profit sector. Financing from abroad primarily comes from European companies connected to domestic firms that have chosen Austria as a research site, though this also includes returns from the EU Framework Programmes for research, technological development, and demonstration.

The current global estimate, which includes the first partial results from the projection of Austria's gross domestic expenditure on R&D from the survey of research and experimental development made by Statistik Austria for 2006, paints a picture of both a further increase in R&D spending by the federal government and an increase in R&D activities by the private sector. In comparison to the previous year, financing by the federal government will rise by 8.9% in 2008, and R&D financing by the private sector will be about 10.2% over the level of the previous year.

1 On the basis of the results of the R&D statistical surveys and other currently available documents and information, in particular the R&D related estimates and year-end data of the federal government and the states, Statistik Austria annually creates a "Global estimate of the Austrian Gross Domestic Expenditure on R&D." This annual creation of the global estimate is based on the latest data including any retroactive revisions or updates. The financing of the expenditure on research and experimental development carried out in Austria is shown in accordance with the globally valid definitions (OECD, EU) ensuring international comparability as laid out in the Frascati manual. According to these definitions and guidelines, foreign financing of R&D done in Austria is included, although Austrian payments for R&D performed abroad are excluded (domestic concept).

2. Federal R&D spending in 2008

2.1. In 2008, federal expenditure on R&D carried out in Austria will thus be some € 2.22 billion or around 8.9% over the level of the previous year (*Table 1).* The federal expenditure shown in *Table 1* for R&D carried out in Austria is composed as described below. According to the methodology used for the R&D global estimate, the core of the total amount is Schedule T of the Auxiliary Document for the Federal Finances Act 2008. This contains the budgeted amounts. The estimate also includes the funds from the National Foundation for Research, Technology, and Development available for 2008 as well as the estimates of the 2008 payout for research premiums which are based on the currently available information.

2.2. In addition to the above expenditure, in 2008 the federal government will pay contributions to international organisations aimed at research and the promotion of research amounting to € 63.8 million. They are shown in Schedule T/Part a of the Auxiliary Document for the Federal Finances Act of 2008, but according to the domestic concept these are not included in the gross domestic expenditure on R&D.

2.3. The federal government expenditure impacting research, as presented in Schedule T of the Auxiliary Document for the Federal Finances Act/Parts a and b (see Table 3), which includes its research-effective share in contributions to international organisations, (see 2.2 above), is traditionally summarised as "federal expenditure on research and research promotion" and corresponds to the so-called "GBAORD" concept,[2] applied by the OECD and the EU on the basis of the Frascati manual, relating, as it does, primarily to the budget of the central or federal state. It includes (in contrast to the domestic concept) research-related contributions to international organisations and provides the basis for classification of R&D budget data by socio-economic objectives as required for reporting to the EU and OECD.

2.3.2. For the 2008 budget, a functional breakdown, by socio-economic objectives, of federal expenditure on research and research promotion (including the research-oriented share of contributions to international organisations) is available (*Table 7*).

In 2008, the largest shares of federal spending on research and research promotion are allocated to the following socio-economic objectives:

- General knowledge advancement: 32.1%
- Promotion of trade, commerce, and industry: 23.7%
- Promotion of health care: 22.4%
- Promotion of research on the earth, oceans, atmosphere and space: 4.9%
- Promotion of social and socio-economic development: 4.7%
- Promotion of agriculture and forestry: 3.2%
- Promotion of environmental protection: 2.9%

2 GBAORD: Government Budget Appropriations or Outlays for R&D (official EU translation)

3. R&D expenditures by the Austrian states

The research financing by the Austrian government as collated in *Table 1* is listed from the state budget-based estimates reported by the offices of the state governments. Spending on R&D by the provincial hospitals is estimated by Statistik Austria in line with a methodology agreed with the state governments.

4. Analysis of the facts documentation of 2006 (Tables 8 – 13)

STATISTIK AUSTRIA evaluated the data on research promotion and research contracts awarded by the federal government in 2006 (status as of August 2007) and combined in the 2006 facts documentation by the federal offices, broken down by recipients, socio-economic objectives and scientific sectors.
As in past years, results tables were prepared for 2006, after reconciliation with the year-end closing of the federal government in 2006, comprising, on the one hand, tables that include "major" promotion schemes (such as the global financing of the Fonds zur Förderung der wissenschaftlichen Forschung, Österreichische Forschungsförderungsgesellschaft mbH, Ludwig Boltzmann-Gesellschaft, Austrian Academy of Sciences and ARC Seibersdorf research GmbH) and, on the other hand, tables that do not include such "major" schemes.

5. An international comparison of 2005 R&D expenditure (Table 14)

The overview table shows Austria's position compared to the other Member States of the European Union and the OECD in terms of the most important R&D related indices. (Source: OECD, MSTI 2007-2).

6. Preliminary results of the 2006 R&D survey in the company owned business sector

The R&D survey in the company owned business sector for the reporting year 2006 was done by STATISTIK AUSTRIA as a complete survey of around 5,000 companies that do R&D. The company owned sector is the most important sub-area of the business sector, and includes companies producing for the market. The second sub-area of the business sector, the cooperative area, has not yet been included in these provisional results.

"Expenditure on R&D" ("R&D Expenditure") in this presentation means spending on internal or intramural R&D, that is, those expenditures that were made for R&D performed in the firm. This presentation thus does not contain spending on external or extramural R&D, that is, expenditures commissioned or purchased by the companies.

For the first time, domestic companies spent a total of € 4.0 billion on research and experimental development (R&D) in 2006. This is 25% more than in 2004 (€ 3.21 billion). Of all the R&D expenditures, 79% (€ 3.2 billion) occurred in manufacturing companies, while 20% (€ 820 million) were made in the services sector. Compared to 2004, this distribution remained about the same.

A little more than half (51%) of the total spending on R&D, € 2.1 billion, was for personnel expenses. This corresponds to an increase of 19% over 2004. Investment expenditure for R&D rose well out of proportion by 43%. Investments in buildings and property for R&D in the two-year period rose more than double, though it must be mentioned that this type of R&D expenditure, with less than 2% of the total, amounts to a very small part.

In 2006 R&D was conducted in 2,356 Austrian companies. That is an increase of 14% compared to 2004, when 2,071 companies reported R&D activities.

In 2006 around € 850 million of R&D expenditures were financed from abroad, amounting to 21.2% of the total R&D expenditure. Following a decline of foreign funds in the period 2002-2004, an increase came in 2004-2006, although the share of these funds in total business R&D expenditure declined (and still amounted to 24.4% in 2004). The most significant amount came from foreign firms that belong to the same company group as the researching domestic company. These financed the R&D activities of domestic companies in 2006 with € 688 million. The domestic business sector itself is responsible for the lion's share of R&D financing: € 2.9 billion were supplied by the companies themselves. The public sector financed 7.4% of the R&D expenditure of Austrian companies with € 297 million. For the first time, public financing by means of the research premium was also surveyed. Based on the survey, Austrian businesses used some € 153 million from the research premiums to finance R&D in 2006. € 91 million were contributed by the Austrian Society for the Promotion of Research (FFG) (2004: € 77 million).

The preliminary results for 2006 show a personnel count of 30,783.5 full-time headcounts in R&D. this is 17% more than in the comparable year 2004. From 2002 to 2004 another rise from 13.6% to 15% could be observed.

R&D expenditure in 2004 and 2006 in company owned businesses

	Business sectors based on OeNACE 2003	2004	2006[1)]
		in EUR '000	in EUR '000
01+02+05	Agriculture and forestry, fisheries	2,981	3,012
10-14	Mining and excavation of rocks and soils	3,203	7,146
15-37	manufacturing	2,549,878	3,156,657
40+41	Electricity, gas and water supply	7,562	9,360
45	Construction	17,452	24,929
50-93	Services	627,700	819,080
01-93	TOTAL	3,208,776	4,020,184

Source: Statistik Austria, Surveys of Research and Experimental Development 2004 and 2006. 1. Provisional results

R&D expenditure in 2004 and 2006 in company owned businesses

Financing sectors		R&D expenditure 2004		R&D expenditures 2006[1)]	
		in 1,000 €	in %	in 1,000 €	in %
Business sector		2,301,103	71.7	2,868,463	71.4
Public sector		123,155	3.8	296,979	7.4
of which	FFG (only subsidies)	77,208	2.4	91,401	2.3
	Fed.Gov.	15,984	0.5	22,140	0.6
	Fed. states	21,975	0.7	16,798	0.4
	Research premium[2)]	-	-	153,145	3.8
	Other public financing	7,988	0.2	13,495	0.3
Private non-profit sector		950	0.0	1,129	0.0
Abroad		783,568	24.4	853,613	21.2
of which	Foreign affiliated companies	613,162	19.1	687,759	17.1
	Other foreign companies	140,656	4.4	132,706	3.3
	Other	29,750	0.9	33,148	0.8
TOTAL		3,208,776	100.0	4,020,184	100.0

Source: Statistik Austria, Surveys of Research and Experimental Development 2004 and 2006. 1. Provisional results – 2) R&D financing with the research premiums was not recorded separately for 2004 but rather included under own financing in the "business sector". The research premium can be applied for under the tax provisions for R&D, and is credited to the company's fees account.

List of Tables

Table 1: Global estimate 2008: gross domestic expenditure on R&D Financing of research and experimental development carried out in Austria in 1989 – 2008

Financing sectors	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
1. Gross domestic expenditure on R&D (in € million)	**1,669.07**	**1,857.58**	**2,104.78**	**2,203.55**	**2,303.31**	**2,550.73**	**2,701.68**	**2,885.55**	**3,123.21**	**3,399.83**	**3,761.80**	**4,028.67**	**4,393.09**	**4,684.31**	**5,041.98**	**5,249.55**	**5,972.11**	**6,423.21**	**6,946.19**	**7,512.21**
of which financed by:																				
Federal government [1])	617.84	695.33	836.04	893.50	957.12	1,075.14	1,092.28	1,066.46	1,077.59	1,097.51	1,200.82	1,225.42	1,350.70	1,362.37	1,394.86	1,462.02	1,764.86	1,881.95	2,039.22	2,221.70
State governments [2])	89.38	108.66	123.68	133.57	129.67	158.69	153.89	159.06	167.35	142.41	206.23	248.50	280.14	171.26	291.62	207.88	330.17	362.38	361.70	371.73
Corporate sector [3])	885.35	967.79	1,057.61	1,086.69	1,128.40	1,179.42	1,233.50	1,290.76	1,352.59	1,418.43	1,545.25	1,684.42	1,834.87	2,090.62	2,274.95	2,475.55	2,727.83	2,981.52	3,312.15	3,649.69
Abroad [4])	53.87	58.02	62.14	65.94	59.69	106.52	190.10	337.00	478.21	684.63	738.91	800.10	863.30	1,001.97	1,009.26	1,016.61	1,058.36	1,101.82	1,132.07	1,163.20
Others [5])	22.63	27.79	25.31	23.85	28.42	30.96	31.91	32.27	47.47	56.86	70.59	70.23	64.08	58.09	71.29	87.49	90.89	95.54	101.05	105.89
2. Nominal GDP [6]) (in € billion)	**126.48**	**136.33**	**146.59**	**155.47**	**160.27**	**168.94**	**175.53**	**181.87**	**185.14**	**192.38**	**200.03**	**210.39**	**215.88**	**220.84**	**226.18**	**236.15**	**245.33**	**257.90**	**272.77**	**285.84**
3. gross domestic expenditure on R&D in % of GDP	***1.32***	***1.36***	***1.44***	***1.42***	***1.44***	***1.51***	***1.54***	***1.59***	***1.69***	***1.77***	***1.88***	***1.91***	***2.03***	***2.12***	***2.23***	***2.22***	***2.43***	***2.49***	***2.55***	***2.63***

Status: 21. April 2008

Source: STATISTIK AUSTRIA (Bundesanstalt Statistik Österreich)

1 1989, 1993, 1998, 2002 and 2004: survey results. 1990-1992, 1994-1997, 1999-2001, 2003, 2005 and 2006: Each from Schedule T/Part b of the Auxiliary Document for the Federal Finances Act (actual spending). 2005: Additionally (not included in Schedule T): € 84.4 million for the National Foundation for Research, Technology and Development and € 121.3 million in research premiums paid our under Federal Law Gazette II No. 506/2002. Additionally (not included in Schedule T): € 93.4 million National Foundation for Research, Technology and Development and € 157.9 million research premiums paid out. 2007: Preliminary draft of Schedule T/Part b based on preliminary result 2007 (BMF, as per April 2008). Additionally (not included in Schedule T): € 85.5 million National Foundation for Research, Technology and Development, € 242.3 million research premiums paid out. 2008: Schedule T/Part b of the Auxiliary Document for the Federal Finances Act 2008(budget). Additionally (not included in Schedule T): € 85.5 million National Foundation for Research, Technology and Development, € 270.0 million for research premiums expected to be paid out based on information currently available (source: BMF).

2 1989, 1993, 1998, 2002 and 2004: survey results. 1990-1992, 1994-1997, 1999-2001, 2003, 2005 and -2008: based on the estimates of R&D expenditure reported by the state government offices.

3 Financing by business. 2 1989, 1993, 1998, 2002 and 2004: survey results. 1990-1992, 1994-1997, 1999-2001, 2003, 2005 and -2008: Estimate based on the results of R&D surveys made by Statistik Austria in all economic sectors and the R&D survey carried out by the Austrian Economic Chamber in the industrial sector up to 1993, taking into consideration the preliminary partial results of the 2006 R&D survey in the business sector.

4 1989, 1993, 1998, 2002 and 2004: survey results. 1990-1992, 1994-1997, 1999-2001, 2003, 2005 and -2008: estimates made by Statistik Austria. From 1995 including returns from the EU Framework Programmes for Research, Technological Development and Demonstration.

5 Financing by local governments (excluding Vienna), chambers, social insurance institutions and other public financing and from the private non-profit sector. 2 1989, 1993, 1998, 2002 and 2004: survey results. 1990-1992, 1994-1997, 1999-2001, 2003, 2005 and -2008: estimates made by Statistik Austria.

6 1989 – 2007: Statistik Austria. 2008: Austrian Institute of Economic Research (WIFO), economic forecast March 2008.

Table 1a: Global estimate 2008: gross domestic expenditure on R&D Financing of research and experimental development carried out in Austria in 1989-2008 (in percent of GDP)

Financing sectors	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
1. gross domestic expenditure on R&D (in % of GDP)	**1.32**	**1.36**	**1.44**	**1.42**	**1.44**	**1.51**	**1.54**	**1.59**	**1.69**	**1.77**	**1.88**	**1.91**	**2.03**	**2.12**	**2.23**	**2.22**	**2.43**	**2.49**	**2.55**	**2.63**
of which financed by:																				
Federal government [1])	0.49	0.51	0.57	0.57	0.60	0.64	0.62	0.59	0.58	0.57	0.60	0.58	0.63	0.62	0.62	0.62	0.72	0.73	0.75	0.78
State governments [2])	0.07	0.08	0.08	0.09	0.08	0.09	0.09	0.09	0.09	0.07	0.10	0.12	0.13	0.08	0.13	0.09	0.13	0.14	0.13	0.13
Corporate sector [3])	0.70	0.71	0.72	0.70	0.70	0.70	0.70	0.71	0.73	0.74	0.77	0.80	0.85	0.95	1.01	1.05	1.11	1.16	1.21	1.28
Abroad [4])	0.04	0.04	0.04	0.04	0.04	0.06	0.11	0.19	0.26	0.36	0.37	0.38	0.40	0.45	0.45	0.43	0.43	0.43	0.42	0.41
Others [5])	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.04	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.04
2. Nominal GDP [6]) (in € billion)	**126.48**	**136.33**	**146.59**	**155.47**	**160.27**	**168.94**	**175.53**	**181.87**	**185.14**	**192.38**	**200.03**	**210.39**	**215.88**	**220.84**	**226.18**	**236.15**	**245.33**	**257.90**	**272.77**	**285.84**

Status: 21. April 2008

Source: STATISTIK AUSTRIA (Bundesanstalt Statistik Österreich)

Footnotes cf. Table 1.

Table 2: Federal expenditure on research and research promotion, 2005-2008
Breakdown of Schedule T of the Auxiliary Document for the Federal Finances Act 2007 and 2008 (Part a and Part b)

Ministries [1]	Actual figures				Budget			
	2005 [2]		2006 [3]		2007 [3]		2008 [3]	
	€ million	%	€ million	%	€ million	%	€ million	%
Federal Chancellery	1.553	*0.1*	1.575	*0.1*	1.647	*0.1*	1.665	*0.1*
Federal Ministry of the Interior BMI	0.146	*0.0*	0.543	*0.0*	0.576	*0.0*	0.573	*0.0*
Federal Ministry for Education, Science and Culture BMBWK	1 174.310	*72.6*	1 216.290	*71.8*	.		.	
Federal Ministry for Education, Arts and Culture BMUKK	.		.		46.167	*2.5*	47.535	*2.5*
Federal Ministry of Science and Research	.		.		1 253.116	*67.0*	1 272.741	*65.9*
Federal Ministry for Social Security, Generations and Consumer Protection BMSGK	1.912	*0.1*	1.697	*0.1*	.		.	
Federal Ministry of Social Affairs and Consumer Protection	.		.		1.616	*0.1*	1.816	*0.1*
Federal Ministry for Health and Women BMGF	6.104	*0.4*	6.214	*0.4*	.		.	
Federal Ministry for Health, Family and Youth	.		.		5.409	*0.3*	5.583	*0.3*
Federal Ministry for Foreign Affairs BMAA	1.702	*0.1*	1.850	*0.1*	.		.	
Federal Ministry for European and International Affairs	.		.		1.789	*0.1*	1.789	*0.1*
Federal Ministry of Justice BMJ	0.090	*0.0*	0.117	*0.0*	0.085	*0.0*	0.111	*0.0*
Federal Ministry for Defence BML	1.654	*0.1*	1.602	*0.1*	2.039	*0.1*	2.082	*0.1*
Federal Ministry of Finance BMF [4]	31.473	*1.9*	33.607	*2.0*	93.908	*5.0*	132.931	*6.9*
Federal Ministry for Agriculture, Forestry, Environment and Water Management BMLFUW	42.679	*2.6*	44.985	*2.7*	46.596	*2.5*	46.229	*2.4*
Federal Ministry of Economics and Labour	43.299	*2.7*	51.835	*3.1*	64.612	*3.5*	64.047	*3.3*
Federal Ministry for Transport, Innovation and Technology BMVIT	314.818	*19.4*	331.713	*19.6*	352.253	*18.8*	352.862	*18.3*
Total	1 619.740	*100.0*	1 692.028	*100.0*	1 869.813	*100.0*	1 929.964	*100.0*

Status: April 2008

Source: Statistik Austria (Bundesanstalt Statistik Österreich)

1 In accordance with the applicable version of the Act Governing Federal Ministries of 1986 (2005, 2006: Federal Law Gazette I No. 17/2003; 2007, 2008: Federal Law Gazette I No. 6/2007).
2 Auxiliary Document for the Federal Finances Act of 2007.
3 Auxiliary Document for the Federal Finances Act of 2008.
4 Including the funds provided for in Budget Chapter 51 for the "Proactive Research Programme" (2007: € 60 million 2008: € 100 million).

Table 3

Schedule T

of the Auxiliary Document for the Federal Finances Act of 2008

Federal expenditure on research from 2006 to 2008

The following overviews for 2006-2008 are divided into two sections:

1. Contributions from federal funds paid to international organisations which (i.a.) aim at research and research promotion **(Part a)**
2. Other federal expenditure on research and research promotion **(Part b, federal research budget)**

This list is made out primarily with a view to the research impact, which in its concept goes beyond Item 12 "research and science" and which is based on the research concept as used by the OECD's Frascati manual and applied by STATISTIK AUSTRIA in its research statistical surveys.

Research-effective shares of federal expenditure are thus to be found not only in the expenditure on Item 12 "research and science", but also in other items (e.g. 11/education; 13/art; 34/agriculture and forestry, 36/industry and commerce; 43/other territorial administration) where the emphasis is on the objectives of the respective field.

Please note:
The notes on the following overviews can be found in the annex to Schedule T.

Statistik Austria (Bundesanstalt Statistik Österreich)

Beilage T

B U N D E S V O R A N S C H L A G 2 0 0 8
Forschungswirksame Ausgaben des Bundes (*)
(Beträge in Millionen Euro)

a) Beitragszahlungen aus Bundesmitteln an internationale Organisationen, die Forschung und Forschungsförderung (mit) als Ziel haben

VA-Ansatz	AB	VA-Post Nr.	Ugl	Bereich-Ausgaben Bezeichnung	Anm.	Bundesvoranschlag 2008 Insgesamt	hievon %	hievon Forschung	Bundesvoranschlag 2007 Insgesamt	hievon %	hievon Forschung	Erfolg 2006 Insgesamt	hievon %	hievon Forschung
				Bundeskanzleramt:										
1/10007	43	7800	001	Mitgliedsbeitrag für OECD		3,200	20	0,640	3,120	20	0,624	3,170	20	0,634
		7800	003	OECD-Energieagentur (Mitgliedsbeitrag)		0,220	20	0,044	0,220	20	0,044	....	...	....
1/10008	43	7800	009	OECD-Beiträge zu Sonderprojekten		0,020	20	0,004	0,010	20	0,002	....	...	....
				Summe Bereich 10...		3,440		0,688	3,350		0,670	3,170		0,634
				BM für Bildung Kunst und Kultur:										
1/12008	11	7800	001	OECD-Schulbauprogramm		0,026	100	0,026	0,026	100	0,026	0,026	100	0,026
				BM für Wissenschaft und Forschung:										
1/14117	12	7271		Verpflichtungen aus internationalen Abkommen		0,030	50	0,015	0,030	50	0,015	0,038	50	0,019
	43	7801		Beiträge für internationale Organisationen		0,650	50	0,325	0,650	50	0,325	0,565	50	0,283
1/14118	12	7271		Verpflichtungen aus internationalen Abkommen		0,597	50	0,299	0,597	50	0,299	0,776	50	0,388
		7800		OECD-CERI-Mitgliedsbeitrag		0,001	100	0,001	0,001	100	0,001	....	...	....
1/14178	43	7263		Mitgliedsbeiträge		0,600	100	0,600	0,600	100	0,600	0,600	100	0,600
		7262		*Österreichischer Beitrag zur Internat. Universität*		....	...	....	....	...	....	0,105	50	0,053
		7264		*Beitrag für die IFAC*		....	...	....	....	...	....	0,046	100	0,046
		7803		*Internationales Zentrum für mechanische Wissenschaft*		....	...	....	....	...	....	0,015	50	0,008
1/14187	43	7801		Beitrag für die CERN		14,500	100	14,500	14,500	100	14,500	13,930	100	13,930
		7802		Molekularbiologie - Europäische Zusammenarbeit		1,900	100	1,900	1,900	100	1,900	1,729	100	1,729
		7803		World Meteorological Organisation		0,400	50	0,200	0,400	50	0,200	0,343	50	0,172
		7804		Europäisches Zentrum für mittelfristige Wettervorhersage		1,000	100	1,000	1,000	100	1,000	0,891	100	0,891
1/14188	12	7803		Beiträge für interationale Organisationen		0,715	50	0,358	0,715	50	0,358	0,919	50	0,460
	43	7281		Internationale Forschungskooperation		0,200	100	0,200	0,200	100	0,200	0,186	100	0,186
				Summe Bereich 14...		20,593		19,398	20,593		19,398	20,143		18,765
				BM für soziale Sicherheit,Generationen und Konsumentenschutz:										
1/15008	43	7802		Europarat - Teilabkommen		0,011	20	0,002	0,011	20	0,002	0,010	20	0,002
				BM für Gesundheit, Familie und Jugend:										
1/17007	43	7802		Weltgesundheitsorganisation		3,436	30	1,031	3,436	30	1,031	3,039	30	0,912
		7807		Europ. Maul- u. Klauenseuchenkommission		0,010	50	0,005	0,010	50	0,005	0,010	50	0,005
		7808		Internat.Tierseuchenamt		0,108	50	0,054	0,108	50	0,054	0,090	50	0,045
1/17008	43	7802		Europarat Teilabkommen		0,165	20	0,033	0,165	20	0,033	0,148	20	0,030
				Summe Bereich 17...		3,719		1,123	3,719		1,123	3,287		0,992
				BM für europäische und internationale Angelegenheiten:										
1/20036	43	7801		Institut der VN für Ausbildung und Forschung (UNITAR)		0,050	40	0,020	0,050	40	0,020	0,050	50	0,025
		7831		Beitrag zum Budget des EUREKA-Sekretariates		0,001	52	0,001	0,001	52	0,001	....	...	....
		7841		Drogenkontrollprogramm der VN (UNDCP)		0,550	20	0,110	0,550	20	0,110	0,502	35	0,176
1/20037	43	7260		Internationale Atomenergie-Organisation (IAEO)		2,800	35	0,980	2,800	35	0,980	2,780	35	0,973
		7802		Organisation d.VN f.Erziehung,Wissenschaft u.Kultur (UNESCO)		2,260	30	0,678	2,260	30	0,678	2,252	30	0,676
				Summe Bereich 20...		5,661		1,789	5,661		1,789	5,584		1,850

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B U N D E S V O R A N S C H L A G 2 0 0 8
Forschungswirksame Ausgaben des Bundes (*)
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a) Beitragszahlungen aus Bundesmitteln an internationale Organisationen, die Forschung und Forschungsförderung (mit) als Ziel haben

VA-Ansatz	AB	VA-Post Nr.	Ugl	Bereich-Ausgaben Bezeichnung	Anm.	Bundesvoranschlag 2008 Insgesamt	hievon %	hievon Forschung	Bundesvoranschlag 2007 Insgesamt	hievon %	hievon Forschung	Erfolg 2006 Insgesamt	hievon %	hievon Forschung
				BM für Land- u.Forstwirtschaft,Umwelt u.Wasserwirtschaft:										
1/60007	43	7801		FAO-Beiträge		2,760	50	1,380	2,735	50	1,368	2,849	50	1,425
1/60008	43	7800		Internationales Weinamt	*	0,049	50	0,025	0,049	50	0,025	0,049	50	0,025
				Europäische Vereinigung für Tierproduktion	*	0,011	50	0,006	0,011	50	0,006	0,011	50	0,006
				Europäische Pflanzenschutzorganisation	*	0,017	50	0,009	0,017	50	0,009	0,017	50	0,009
				Internationale Kommission für Be- und Entwässerungen	*	0,002	50	0,001	0,002	50	0,001	0,002	50	0,001
				Internationale Bodenkundliche Gesellschaft	*	....	...	....	....	...	....	0,018	50	0,009
				Summe Kapitel 60...		2,839		1,421	2,814		1,409	2,946		1,475
1/61007	43	7817		ECE-EMEP-Konvention/Grenzüberschreitende Luftverunreinigung		0,051	100	0,051	0,051	100	0,051	0,035	100	0,035
1/61206	21	7810		Umweltfonds der Vereinten Nationen		0,523	30	0,157	0,523	30	0,157	0,479	30	0,144
1/61208	21	7800		RAMSAR - Abkommen	*	0,021	50	0,011	0,021	50	0,011	0,021	50	0,011
				Summe Kapitel 61...		0,595		0,219	0,595		0,219	0,535		0,190
				Summe Bereich 60...		3,434		1,640	3,409		1,628	3,481		1,665
				BM für Wirtschaft und Arbeit:										
1/63007	43	7801		Beitrag zur internationalen Arbeitsorganisation .		2,200	8	0,176	2,200	8	0,176	2,062	8	0,165
		7810		Internationales Büro für Maße und Gewichte (BIPM)	*	0,123	80	0,098	0,123	80	0,098	0,123	80	0,098
				Internationale Organisation f.d. gesetzliche Meßwesen (OIML)	*	0,013	80	0,010	0,013	80	0,010	0,013	80	0,010
				Internationales Institut für Kältetechnik (IIF) .	*	0,008	80	0,006	0,008	80	0,006	0,008	80	0,006
				Internationale Union für Geodäsie und Geophysik (UGGI)	*	0,004	80	0,003	0,004	80	0,003	0,004	80	0,003
				Summe Bereich 63...		2,348		0,293	2,348		0,293	2,210		0,282
				BM für Verkehr, Innovation und Technologie:										
1/65007	43	7800		Europäische Konferenz der Verkehrsminister (CEMT)	*	0,084	6	0,005	0,084	6	0,005	0,082	6	0,005
				Internationale Zivilluftfahrtorganisation (ICAO)	*	0,426	20	0,085	0,426	20	0,085	0,382	20	0,076
				Europäische Zivilluftfahrtskonferenz (ECAC)	*	0,035	10	0,004	0,035	10	0,004	0,040	10	0,004
1/65008	43	7800		Institution für den Lufttransport (ITA)	*	0,001	40	0,000	0,001	40	0,000	0,003	40	0,001
				Ständige Internat. Vereinigung f.Schiffahrtskongresse(AIPCN)	*	0,002	50	0,001	0,002	50	0,001	0,001	50	0,001
1/65027	43	7800		Beiträge an internationale Organisationen (UIT) .	*	0,220	20	0,044	0,220	20	0,044	0,357	20	0,071
1/65248	33	7800		Beiträge an internationale Organisationen		0,025	100	0,025	0,025	100	0,025	....	...	....
1/65337	12	7800		ESA - Beitrag		14,445	100	14,445	14,533	100	14,533	14,435	100	14,435
	43	7801		EUMETSAT		3,625	100	3,625	3,625	100	3,625	2,648	100	2,648
		7802		OECD-Energieagentur		0,060	100	0,060	0,060	100	0,060	0,068	100	0,068
1/65338	12	7801		Beiträge für internat. Organisationen		0,060	100	0,060	0,060	100	0,060	0,059	50	0,030
	43	7800		OECD-Energieagentur (Beitrag zu den Projektkosten)		0,050	100	0,050	0,050	100	0,050	0,005	100	0,005
1/65378	12	7800		ESA-ERS 1		0,071	100	0,071	0,071	100	0,071	....	...	....
		7801		ESA-PSDE		0,448	100	0,448	0,448	100	0,448	....	...	....
		7802		ESA-ARIANE V		0,571	100	0,571	0,571	100	0,571	0,992	100	0,992
		7803		ESA-DRTMArtemis		0,076	100	0,076	0,076	100	0,076	0,029	100	0,029
		7804		ESA-ERS 2		0,001	100	0,001	0,001	100	0,001	....	...	....
		7805		ESA-ASTP 4		0,001	100	0,001	0,001	100	0,001	....	...	....
		7806		ESA-EOPP		0,165	100	0,165	0,165	100	0,165	....	...	....
		7807		ESA-ENVISAT		0,750	100	0,750	0,750	100	0,750	0,311	100	0,311
		7808		ESA-METOP		0,001	100	0,001	0,001	100	0,001	0,145	100	0,145
		7809		ESA-GSTP		0,001	100	0,001	0,001	100	0,001	1,095	100	1,095
		7810		ESA-FESTIP		0,001	100	0,001	0,001	100	0,001	....	...	....
		7811		ESA-MSG		0,075	100	0,075	0,075	100	0,075	0,060	100	0,060
		7812		ESA-ARTES		5,201	100	5,201	5,201	100	5,201	4,814	100	4,814
		7813		ESA-EOEP		3,582	100	3,582	3,582	100	3,582	4,825	100	4,825
		7814		ESA-CRV		0,645	100	0,645	0,645	100	0,645	....	...	....
		7815		Neue ESA-Programme		8,807	100	8,807	8,719	100	8,719	1,171	100	1,171
		7816		ESA - AURORA		0,001	100	0,001	0,001	100	0,001	1,541	100	1,541
		7817		ESA - ELIPS		0,001	100	0,001	0,001	100	0,001	1,755	100	1,755

Beilage T

B U N D E S V O R A N S C H L A G 2 0 0 8
Forschungswirksame Ausgaben des Bundes (*)
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a) Beitragszahlungen aus Bundesmitteln an internationale Organisationen, die Forschung und Forschungsförderung (mit) als Ziel haben

VA-Ansatz	AB	VA-Post Nr.	VA-Post Ugl	Bereich-Ausgaben Bezeichnung	Anm.	Bundesvoranschlag 2008 Insgesamt	hievon %	hievon Forschung	Bundesvoranschlag 2007 Insgesamt	hievon %	hievon Forschung	Erfolg 2006 Insgesamt	hievon %	hievon Forschung
				(Fortsetzung)										
1/65378	12	7818		ESA - Earth Watch GMES		0,001	100	0,001	0,001	100	0,001	1,725	100	1,725
		7819		ESA - GalileoSat		0,001	100	0,001	0,001	100	0,001	1,310	100	1,310
				Summe Bereich 65...		39,433		38,804	39,433		38,804	37,853		37,117
				Summe Abschnitt a)...		**78,665**		**63,763**	**78,550**		**63,733**	**75,764**		**61,333**

Beilage T

B U N D E S V O R A N S C H L A G 2 0 0 8
Forschungswirksame Ausgaben des Bundes (*)
(Beträge in Millionen Euro)

b) Ausgaben des Bundes **(ausgen. die bereits im Abschnitt a) ausgewiesen sind)** für Forschung und Forschungsförderung (Bundesbudget-Forschung)

VA-Ansatz	AB	VA-Post Nr.	Ugl	Bereich-Ausgaben Bezeichnung	Anm.	Bundesvoranschlag 2008 Insgesamt	hievon %	hievon Forschung	Bundesvoranschlag 2007 Insgesamt	hievon %	hievon Forschung	Erfolg 2006 Insgesamt	hievon %	hievon Forschung
				Bundeskanzleramt:										
1/10008	43	7280	300	Werkverträge, Veranstaltungen, Veröffentl. - Raumplanung		0,683	15	0,102	0,683	15	0,102	0,442	15	0,066
		7285		Raumordnungskonferenz		0,450	50	0,225	0,450	50	0,225	0,445	50	0,223
1/101				Dienststellen		7,607	1	0,076	7,601	1	0,076	7,772	1	0,078
1/102				Bundesstatistik		57,422	1	0,574	57,372	1	0,574	57,362	1	0,574
				Summe Bereich 10...		66,162		0,977	66,106		0,977	66,021		0,941
				BM für Inneres:										
1/1172	42			Bundeskriminalamt		7,157	8	0,573	7,200	8	0,576	6,782	8	0,543
				BM für Bildung Kunst und Kultur:										
1/1200	43			Zentralleitung (Verwaltungsbereich Bildung)	*	4,285	100	4,285	4,285	100	4,285	4,285	100	4,285
1/12006	43	7669	400	Bildm.d.EU (ESF-3 nat.A) (F&E-Offensivprogramm) .		0,001	100	0,001	0,001	100	0,001	0,133	100	0,133
1/1205	13			Anstalten öffentlichen Rechts		96,511	28	27,023	90,511	28	25,343	90,511	28	25,343
1/12208	11			Allgemein-pädagogische Erfordernisse		37,524	3	1,079	31,521	3	1,079	25,589	4	1,079
1/1244	13			Museen		36,545	20	7,309	38,145	20	7,629	35,462	20	7,092
1/1245	13			Museen (zweckgebundene Gebarung)		0,636	20	0,127	0,636	20	0,127	0,648	20	0,130
1/1247				Bundesdenkmalamt		27,213	20	5,443	27,304	20	5,461	24,553	20	4,911
1/1248	13			Bundesdenkmalamt (zweckgebundene Gebarung)		3,481	20	0,696	3,481	20	0,696	6,297	20	1,259
1/1250	11			BI f. Bildungsforsch., Innovation u. Entw. d. Bildungswesens	*	1,564	50	0,782	1,511	50	0,756	....	...	....
1/1280				Technische und gewerbliche Lehranstalten	*	491,746	0	0,073	489,780	0	0,073	475,068	0	0,073
1/1283	11			Technische und gewerbl. Lehranstalten (zweckgeb. Gebarung)	*	5,398	5	0,254	5,398	5	0,254	6,522	4	0,254
1/12908	11			Pädagogische Forschung		11,518	1	0,069	6,118	0	0,015	6,376	0	0,015
1/12928	*11*			*Berufspädogische Forschung*		....	...	....	0,837	1	0,008	0,843	1	0,008
1/12948	*11*			*Pädagogische Forschung*		....	...	....	4,600	1	0,046	4,542	1	0,045
				Summe Bereich 12...		716,422		47,141	704,128		45,773	680,829		44,627
1/63233	13	0635	457	Wien 1,Burgring 5, Kunsthist.Museum,Gen.San.(BT)		0,100	23	0,023	0,100	23	0,023	0,000	23	0,000
		0635	458	Wien 1, Burgring 7, Naturhist.Museum, Gen.San. (BT)		1,500	23	0,345	1,500	23	0,345	0,000	23	0,000
		0635	464	Wien 14,Mariahilferstr.212,Techn.Mus., Gen.San.u.Erweiterung		0,001	23	0,000	0,001	23	0,000	....	...	....
				Summe Bereich 12 einschl. Bauausgaben ...		718,023		47,509	705,729		46,141	680,829		44,627
				BM für Wissenschaft und Forschung:										
1/14008	43			Zentralleitung		8,953	30	2,686	7,319	30	2,196	0,796	30	0,239
1/14018	12	7024	110	Normmieten		4,041	44	1,778	4,041	44	1,778	4,122	44	1,814
		7024	111	Zuschlagsmieten		0,001	44	0,000	0,001	44	0,000	....	...	....
		7024	112	Mieterinvestitionen		0,001	44	0,000	0,001	44	0,000	....	...	....
		7024	113	Betriebskosten		0,250	44	0,110	0,250	44	0,110	0,277	44	0,122
1/1403				Universitäten; Träger öffentlichen Rechts		2.218,488	46	1.020,504	2.193,048	46	1.008,802	2.016,849	46	927,751
1/14038	12	7342	900	Vorziehprofessuren (F&E Offensive)		4,000	100	4,000	4,000	100	4,000	5,322	100	5,322
		7347	900	Universitäts - Infrastruktur (F&E Offensive)		22,000	100	22,000	22,000	100	22,000	25,000	100	25,000
1/14048	12	7280	000	Externe Gutachten und Projekte		0,300	46	0,138	0,300	46	0,138	0,296	46	0,136
		7353	400	Klinischer Mehraufwand (Klinikbauten)		33,946	50	16,973	32,940	50	16,470	57,264	50	28,632
		7480	423	VOEST-Alpine Medizintechnik Ges.m.b.H. (VAMED) ..		32,500	50	16,250	19,000	50	9,500	13,787	50	6,894
1/14108	12	7020	001	Institut für angewandte Systemanalyse		0,720	100	0,720	0,720	100	0,720	0,575	100	0,575
		7271	001	Fulbright-Kommission		0,255	60	0,153	0,255	60	0,153	0,254	60	0,152
		7279	013	fForte Universitäten (F&E)		0,045	100	0,045	0,045	100	0,045	0,002	100	0,002
		7280	013	fForte Universitäten (F&E)		2,500	100	2,500	2,500	100	2,500	0,940	100	0,940
		7330	052	Hertha Firnberg Programm		1,500	100	1,500	2,000	100	2,000	....	...	....
		7340	090	Universitätszentrum für Weiterbildung (Krems) ...		6,841	15	1,026	5,921	15	0,888	4,201	15	0,630
		7684		Studientätigkeit im Ausland		1,300	60	0,780	1,300	60	0,780	1,506	60	0,904
		7686		Vortragstätigkeit im Ausland		2,000	60	1,200	2,000	60	1,200	2,047	60	1,228
		7688		ERASMUS (F&E Offensive)		0,002	100	0,002	0,002	100	0,002	0,000	100	0,000
		7689		EU-Bildungsprogramme		2,000	60	1,200	2,000	60	1,200	2,000	60	1,200
1/1411				Wissenschaftliche Einrichtungen		4,317	30	1,295	4,319	30	1,296	3,574	30	1,072

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B U N D E S V O R A N S C H L A G 2 0 0 8
Forschungswirksame Ausgaben des Bundes (*)
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VA-Ansatz	AB	VA-Post Nr.	Ugl	Bereich-Ausgaben Bezeichnung	Anm.	Bundesvoranschlag 2008 Insgesamt	hievon %	hievon Forschung	Bundesvoranschlag 2007 Insgesamt	hievon %	hievon Forschung	Erfolg 2006 Insgesamt	hievon %	hievon Forschung
				(Fortsetzung)										
1/14126	12			Bibliothekarische Einrichtungen		0,172	30	0,052	0,172	30	0,052	0,186	30	0,056
1/1413				Forschungsvorhaben		4,245	100	4,245	4,245	100	4,245	2,519	100	2,519
1/14146	12	7332	052	Schrödinger-,Meitner- u. Habilitationsstipendien		4,478	100	4,478	4,478	100	4,478	4,992	100	4,992
		7332	152	Schrödinger-,Meitner-u. Habilitationsstip. (F&E-Offensive)		0,001	100	0,001	0,001	100	0,001	....	...	....
		7340	900	Transferzahlungen Träger öffentl.Rechts (F&E-Offensive)		0,001	100	0,001	0,001	100	0,001	....	...	....
1/14148	12	7332	252	Excellenz Wissenschaft (F&E Offensive)		0,001	100	0,001	0,001	100	0,001	....	...	....
1/1416	12			Forschungseinrichtungen		33,038	100	33,038	33,038	100	33,038	29,967	100	29,967
1/1417	12			Österr. Akademie der Wissenschaften und Forschungsinstitute		47,726	100	47,726	47,726	100	47,726	58,455	100	58,455
1/14186	12			Forschungsvorhaben in internationaler Kooperation		3,200	100	3,200	3,200	100	3,200	4,930	100	4,930
1/14188	12	7271		IIASA-Stipendien		0,001	100	0,001	0,001	100	0,001	0,003	100	0,003
		7274		Verpflichtungen aus WTZA		0,700	100	0,700	0,700	100	0,700	0,313	100	0,313
		7275		Stimulierung bilat. Wiss.beziehungen (EP)		0,001	100	0,001	0,001	100	0,001	....	...	....
		7279	900	Leistungen von Einzelpersonen (F&E-Offensive) ...		0,001	100	0,001	0,001	100	0,001	0,077	100	0,077
		7280	900	Leist.v.Gewerbetr.,Firmen u. jur.Pers. (F&E-Offensive)		25,625	100	25,625	25,625	100	25,625	10,412	100	10,412
		7282		Vorträge, Seminare, Tagungen (Unt.)		0,300	100	0,300	0,300	100	0,300	0,202	100	0,202
		7285		Stimulierung bilat. Wiss.beziehungen (Unt.)		0,200	100	0,200	0,200	100	0,200	0,122	100	0,122
		7665		Stiftung Dokumentationsarchiv		0,167	100	0,167	0,167	100	0,167	0,167	100	0,167
		7681		START-Wittgenstein-Programme		4,000	100	4,000	4,000	100	4,000	4,072	100	4,072
	43	7260		Mitgliedsbeiträge an Institutionen im Inland		0,001	100	0,001	0,001	100	0,001	0,002	100	0,002
		7279		Entgelte für sonstige Leistungen von Einzelpersonen		0,200	100	0,200	0,200	100	0,200	0,189	100	0,189
		7280	001	Leistungen v. Gewerbetreibenden, Firmen und jur. Personen		3,000	100	3,000	3,000	100	3,000	2,760	100	2,760
		7280	002	Entgelte an universitäre Einrichtungen		0,500	100	0,500	0,500	100	0,500	0,438	100	0,438
		7284		Internationales Forschungszentrum		0,001	100	0,001	0,001	100	0,001	....	...	....
1/1422				Bibliotheken (zweckgebundene Gebarung)		0,027	44	0,012	0,027	44	0,012	0,000	44	0,000
1/1423				Bibliotheken		2,585	44	1,137	2,285	44	1,005	2,089	44	0,919
1/1424				Wissenschaftliche Anstalten		29,424	44	12,947	29,934	44	13,171	30,686	44	13,502
1/1425				Wissenschaftliche Anstalten (zweckgebundene Gebarung)		0,028	44	0,012	0,028	44	0,012	0,005	44	0,002
1/14606	12			Fachhochschulen, Förderungen		169,362	10	16,936	163,008	10	16,301	161,598	10	16,160
				Summe Bereich 14...		2.674,945		1.253,343	2.626,803		1.233,718	2.452,996		1.152,872
				BM für soziale Sicherheit,Generationen und Konsumentenschutz:										
1/15006	12	7669	900	Subventionen an private Institutionen/Forschung .		0,001	100	0,001	0,001	100	0,001	0,008	100	0,008
1/15008	12	4035	900	Handelswaren zur unentgeltlichen Abgabe/F		0,001	100	0,001	0,001	100	0,001	....	...	....
		7271	900	Entgelte f. sonst. Leistungen an Einzelpers./F ..		0,001	100	0,001	0,001	100	0,001	....	...	....
		7281	900	Sonstige Leistungen von Gew.Firm. u. jur.Pers./F		0,038	100	0,038	0,038	100	0,038	....	...	....
		7286		S. Leist. v. Gew., Firm. u. jur. Pers./Grundsatzforschung		1,005	100	1,005	0,574	100	0,574	0,569	100	0,569
	43	7261		Mitgliedsbeitr. an d.Forschungsinst. f. Orthopädie-Technik		0,181	100	0,181	0,176	100	0,176	0,171	100	0,171
		7262		Beitrag a.d. Europ. Zentrum f. Wohlfahrtspol. u. Sozialfor.		0,687	50	0,344	0,687	50	0,344	0,687	50	0,344
		7280		Sonstige Leistungen v. Gewerbetreib., Firmen u. jur. Pers.		2,970	4	0,119	3,793	6	0,228	2,836	1	0,028
1/15818		7280		Sonstige Leistungen v. Gewerbetreib., Firmen u. jur. Pers.		0,988	4	0,040	0,988	15	0,148	....	...	....
1/15828		7280		Sonstige Leistungen v. Gewerbetreib., Firmen u. jur. Pers.		0,937	9	0,084	0,937	11	0,103	....	...	....
				Summe Bereich 15...		6,809		1,814	7,196		1,614	4,271		1,120
				BM für Gesundheit, Familie und Jugend:										
1/17000				Zentralleitung		0,605	100	0,605	0,531	100	0,531	0,605	100	0,605
1/17006	*21*	*7330*	*047*	*Österr. Bundesinstitut für Gesundheitswesen .....*		....	...	....	....	...	....	3,170	49	1,553
1/17107	21	7420		Laufende Transferzahlungen, Ernährungsagentur (Ges.m.b.H)		35,104	4	1,404	32,704	4	1,308	28,616	4	1,145

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				(Fortsetzung)										
1/17206	21	7660	900	Subventionen an sonstige private Institutionen ..		5,176	6	0,311	5,176	6	0,311	4,528	6	0,272
		7663	900	Ludwig Boltzmann-Gesellschaft		0,157	100	0,157	0,157	100	0,157	0,247	100	0,247
		7700	8..	Ludwig Boltzmann-Gesellschaft		0,001	100	0,001	0,001	100	0,001	0,001	100	0,001
1/17208	21	7270		) (		0,105	6	0,006	0,104	6	0,006	0,087	6	0,005
		7280		)Vorsorgemedizin; Grundlagenermittlung ....(		2,320	6	0,139	2,456	6	0,147	5,107	6	0,306
		7290	014	) (		0,001	6	0,000	0,001	6	0,000	....	...	....
1/17226	21	7660	900	Subventionen an sonstige private Institutionen ..		2,033	10	0,203	2,033	10	0,203	1,873	10	0,187
1/17228	21	7270		)Suchtgiftmißbrauch; Grundlagenermittlung ......(		0,013	10	0,001	0,013	10	0,001	0,008	10	0,001
		7280		) (		0,192	10	0,019	0,192	10	0,019	0,295	10	0,030
1/17316				Veterinärwesen		0,524	1	0,005	0,524	1	0,005	0,468	1	0,005
1/17318				Veterinärwesen		6,931	5	0,347	8,728	4	0,349	5,888	4	0,236
1/17328				Lebensmittel- und Chemiekalienkontrolle		0,481	51	0,245	0,481	51	0,245	0,272	76	0,207
1/17336				Gentechnologie		0,005	19	0,001	0,005	19	0,001	....	...	....
1/17338				Gentechnologie		0,377	70	0,264	0,381	70	0,267	0,322	94	0,303
1/17348				Strahlenschutz		0,417	64	0,267	0,417	64	0,267	0,321	37	0,119
				Summe Kapitel 17...		54,442		3,975	53,904		3,818	51,808		5,222
1/19118	22	7270	002	Entgelte für Leistungen von Einzelpersonen		0,074	20	0,015	0,074	20	0,015	0,119	20	0,024
		7280	002	Entgelte an Unternehmungen und jur. Personen		1,383	10	0,138	1,209	10	0,121	2,192	10	0,219
1/19386	22	7664		Forschungsförderung gem. § 39i FLAG 1967		0,250	100	0,250	0,250	100	0,250	0,259	100	0,259
1/19418	11	7270		Entgelte für sonstige Werkleistungen von Einzelpersonen		0,313	10	0,031	0,313	10	0,031	0,074	10	0,007
		7280		Sonstige Leistungen v. Gewerbetreib., Firmen u. jur. Pers.		1,017	5	0,051	1,017	5	0,051	1,327	5	0,066
				Summe Kapitel 19...		3,037		0,485	2,863		0,468	3,971		0,575
				Summe Bereich 17...		57,479		4,460	56,767		4,286	55,779		5,797
				BM für Justiz:										
1/30006	12	7667		Institut für Rechts- und Kriminalsoziologie		0,111	100	0,111	0,085	100	0,085	0,117	100	0,117
				BM für Landesverteidigung:										
1/40108	41	4691		Versuche und Erprobungen auf kriegstechnischem Gebiet		0,595	10	0,060	0,580	10	0,058	0,419	10	0,042
1/404	12			Heeresgeschichtl. Museum, Militärhistorisches Institut		4,931	41	2,022	4,832	41	1,981	3,805	41	1,560
				Summe Bereich 40...		5,526		2,082	5,412		2,039	4,224		1,602
				BM für Finanzen:										
1/50008	43	6441		Arbeiten des Wifo		3,341	50	1,671	3,277	50	1,639	2,997	50	1,499
		6443		Arbeiten des WIIW		0,857	50	0,429	0,841	50	0,421	0,769	50	0,385
		6444		Arbeiten des WSR		1,102	50	0,551	1,103	50	0,552	1,009	50	0,505
1/50296	43	7661		Institut für Finanzwissenschaft und Steuerrecht .		0,010	50	0,005	0,010	50	0,005	0,010	50	0,005
		7662		Institut für höhere Studien und wiss. Forschung .		1,110	50	0,555	1,077	50	0,539	1,015	50	0,508
		7663		Forum Alpbach		0,045	50	0,023	0,043	50	0,022	0,041	50	0,021
				Summe Kapitel 50...		6,465		3,234	6,351		3,178	5,841		2,923
1/5185				Forschungsoffensive		100,000	100	100,000	60,000	100	60,000	....	...	....
1/.....				Forschungswirksamer Lohnnebenkostenanteil	*	29,697	100	29,697	30,730	100	30,730	30,684	100	30,684
				Summe Bereich 50...		136,162		132,931	97,081		93,908	36,525		33,607
				BM für Land- u.Forstwirtschaft,Umwelt u.Wasserwirtschaft:										
1/60000	43			Zentralleitung		0,599	100	0,599	0,599	100	0,599	0,605	100	0,605

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				(Fortsetzung)										
1/60027		7421		Transfer an die Ernährungsagentur GmbH		23,400	4	0,936	21,802	4	0,872	27,616	4	1,105
		7422		Transfer a.d.Bundesforsch.u.Ausbildungsz. für Wald		15,500	62	9,610	15,500	62	9,610	15,500	62	9,610
1/60028		7420		Laufende Transferz.a.d. österr. Ernährungsagentur GmbH		0,380	4	0,015	0,380	4	0,015	0,357	4	0,014
1/60038	34	7280	035	Wasserw.Planungen u.Untersuchungen, Entg.an Unternehm.		0,644	30	0,193	0,644	30	0,193	0,818	30	0,245
		7280	039	Wasserw.Grundsatzkonzepte, Entg. an Unternehmungen		0,020	30	0,006	0,020	30	0,006	....	...	....
		7280	040	Wasserw. Unterlagen; Entgelte an Unternehmungen .		0,100	30	0,030	0,100	30	0,030	0,077	30	0,023
		7280	900	Agrarische Maßnahmen		6,057	19	1,147	6,057	19	1,147	6,057	9	0,561
1/60086	34	7660	009	Sonstige Ausgaben, Institut.		0,150	50	0,075	0,150	50	0,075	0,071	50	0,036
1/60126	34	7700	001	Erhebungen,Projekt.u.Betreuung in Wäldern m.Schutzw.,Invest.		0,010	10	0,001	0,010	10	0,001	0,008	10	0,001
1/60196	12			Förderung von Forschungs- und Versuchsvorhaben ..		0,205	100	0,205	0,205	100	0,205	....	...	....
1/60198	12			Forschungs- und Versuchswesen		3,896	100	3,896	3,896	100	3,896	4,291	100	4,291
1/6050	11			HBLA und Bundesamt für Wein- und Obstbau	*	5,098	46	2,345	5,098	46	2,345	5,046	46	2,321
				HBLA für Gartenbau	*	3,504	15	0,526	3,504	15	0,526	3,588	15	0,538
				Agrapädagogoische Akademie		1,668	3	0,050	1,668	3	0,050	1,531	3	0,046
	12			Höhere Bundeslehr- u. Forschungsanstalt für Landwirtschaft		10,470	42	4,397	10,470	42	4,397	10,203	42	4,285
				Höh.Bundeslehr-u. Forschungsanst.f. Landw., Landt.u.Lebensm.		8,187	12	0,982	8,187	12	0,982	8,275	12	0,993
1/6054	12			Bundesanstalt für Agrarwirtschaft		1,744	52	0,907	1,693	52	0,880	1,612	52	0,838
1/6055				Bundesanstalt für alpenländische Milchwirtschaft		3,008	38	1,143	3,040	38	1,155	3,030	38	1,151
1/6056	12			Bundesanstalt für Bergbauernfragen		1,008	67	0,675	0,962	67	0,645	0,890	67	0,596
1/6057				Bundesamt für Weinbau		3,710	20	0,742	3,716	20	0,743	4,144	20	0,829
1/6058	12			Bundesamt für Wasserwirtschaft		5,178	15	0,777	5,078	15	0,762	6,141	15	0,921
1/60836	34	7700	004	Erheb.u.Projektierungen in Wäldern mit Schutzwirkg., Invest.		0,001	10	0,000	0,001	10	0,000	....	...	....
1/60838	34	7270		Entgelte für sonstige Leistungen von Einzelpersonen		0,081	30	0,024	0,081	30	0,024	0,072	30	0,022
		7280		Entgelte für sonstige Leistungen von Unternehmungen		3,401	30	1,020	3,401	30	1,020	5,805	30	1,742
1/6093	37			Bundesgärten		12,788	1	0,128	12,973	1	0,130	12,298	1	0,123
				Summe Kapitel 60...		110,807		30,429	109,235		30,308	118,035		30,896
1/6110	21			Umweltbundesamt Gesellschaft m.b.H. (UBA-GmbH) ..		15,357	5	0,768	15,357	5	0,768	15,356	5	0,768
1/6120	21			Umweltpolitische Maßnahmen		42,300	25	10,575	44,300	25	11,075	35,015	25	8,754
1/61226	21	7700	500	Investitionszuschüsse		40,668	1	0,228	40,668	1	0,228	38,296	1	0,523
1/61236	37	7700	201	Investitionsförderungen		319,944	0	1,236	309,066	0	1,236	286,884	1	1,467
1/61238	37	7280	000	Entgelte an Unternehmungen (Maßnahmen gem. UFG) .		0,230	100	0,230	0,230	100	0,230	0,226	100	0,226
1/61246	37	7700	500	Investitionszuschüsse		72,381	1	0,438	66,092	1	0,438	45,009	0	0,157
1/61258	21			Strahlenschutz		8,553	8	0,684	8,553	8	0,684	6,617	8	0,529
1/6128				Klima- und Energiefonds		0,002	33	0,001	0,002	33	0,001	....	...	....
				Summe Kapitel 61...		499,435		14,160	484,268		14,660	427,403		12,424
				Summe Bereich 60...		610,242		44,589	593,503		44,968	545,438		43,320
				BM für Wirtschaft und Arbeit:										
1/6309				Bundesamt für Eich- und Vermessungswesen	*	77,270	0	0,200	77,173	0	0,200	71,503	0	0,200
1/63156	36	7660	900	Zuschüsse an Institutionen nicht Invest.		1,861	10	0,186	7,510	10	0,751	5,441	10	0,544
		7330	*053*	*Forschungsförderungsfonds (F&E Offensive), TF* ...		....	...	....	....	...	....	18,957	100	18,957
		7331	*061*	*ERP-Fonds F&E Offensive) TF*		....	...	....	....	...	....	2,233	100	2,233
		7664	*900*	*Zuschüsse an Institutionen (F&E Offensive) TF* ...		....	...	....	....	...	....	7,597	100	7,597
		7665	*900*	*Förderungsbeitrag - Nicht Invest. (InstitutionenITV)*		....	...	....	....	...	....	1,515	100	1,515
		7666	*900*	*Förderung Institutionen (F&E Offensive) TF*		....	...	....	....	...	....	6,525	100	6,525
1/63158	36	7270		Entgelte für sonstige Werkleistungen von Einzelpersonen		0,250	50	0,125	0,250	50	0,125	0,273	50	0,137
		7280	100	Werkleistungen von gewerbl. Betrieben, Firmen u. jur. Pers.		7,842	50	3,921	7,842	50	3,921	2,784	50	1,392
		7282		Werkleistungen von Betrieben, Firmen u. jur. Pers. (TV)		0,050	100	0,050	0,050	100	0,050	0,143	100	0,143

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BUNDESVORANSCHLAG 2008
Forschungswirksame Ausgaben des Bundes (*)
(Beträge in Millionen Euro)

b) Ausgaben des Bundes **(ausgen. die bereits im Abschnitt a) ausgewiesen sind)** für Forschung und Forschungsförderung (Bundesbudget-Forschung)

VA-Ansatz	AB	VA-Post Nr.	Ugl	Bereich-Ausgaben Bezeichnung	Anm.	Bundesvoranschlag 2008 Insgesamt	hievon %	hievon Forschung	Bundesvoranschlag 2007 Insgesamt	hievon %	hievon Forschung	Erfolg 2006 Insgesamt	hievon %	hievon Forschung
				(Fortsetzung)										
1/63158	*36*	*7271*		*Entgelte für Werkleistungen von Einzelpersonen (TF)*		....	...	....	....	...	....	0,117	100	0,117
		7280	*204*	*Zahlungen an die Innovationsagentur (F&E Offensive) TF*		....	...	....	....	...	....	4,370	100	4,370
		7280	*205*	*Gutachten Kompetenzzentren (F&E Offensive) TF*		....	...	....	....	...	....	0,044	100	0,044
		7280	*900*	*Sonstige Werkleistungen (F&E Offensive) TF*		....	...	....	....	...	....	2,869	100	2,869
		7281	*102*	*Forschungs, Technologie- u. Bildungskooperation*		....	...	....	....	...	....	0,635	100	0,635
		7281	*900*	*Werkleistungen von Betrieben, Firmen u. jur. Pers. (TF)*		....	...	....	....	...	....	2,333	100	2,333
		7282	*104*	*Christian Doppler Gesellschaft (F&E Offensive) TF*		....	...	....	....	...	....	0,024	100	0,024
		7282	*105*	*Biotech-Initiative (F&E Offensive) TF*		....	...	....	....	...	....	0,967	100	0,967
		7330	*053*	*Förderungsabwicklung FFF, TF*		....	...	....	....	...	....	0,106	100	0,106
		7330	*153*	*Förderungsabwicklung FFF (F&E Offensive) TF*		....	...	....	....	...	....	0,811	100	0,811
1/6316				Klima- und Energiefonds		0,002	33	0,001	0,002	33	0,001	....	...	....
1/6317				Technologie- und Forschungsförderung		59,200	100	59,200	59,200	100	59,200	....	...	....
1/63518	12			Arbeitsmarktpolitische Maßnahmen gemäß AMFG und AMSG		0,070	100	0,070	0,070	100	0,070	0,034	100	0,034
1/63926	21			Arbeitsinspektion		0,001	100	0,001	0,001	100	0,001	....	...	....
				Summe Bereich 63...		146,546		63,754	152,098		64,319	129,281		51,553
				BM für Verkehr, Innovation und Technologie:										
1/65118	12	7280	600	Unfallforschung		0,001	100	0,001	0,001	100	0,001	0,000	100	0,000
	33	7280	300	Sonstige Verkehrsprojekte		1,100	100	1,100	1,100	100	1,100	2,063	100	2,063
		7280	301	Generalverkehrsplan		0,010	20	0,002	0,010	20	0,002	....	...	....
		7280	500	Grundlagenuntersuchungen - Schiene		0,020	100	0,020	0,020	100	0,020	....	...	....
		7280	502	Sonstige Leistungen am Eisenbahnsektor		1,000	35	0,350	1,000	35	0,350	0,629	35	0,220
1/65133	12	0806	122	Forschungsförderungs GmbH		0,001	100	0,001	0,001	100	0,001	....	...	....
1/65246	12	7660		Sonstige Subventionen		0,300	95	0,285	0,300	95	0,285	....	...	....
	33	*7660*		*Sonstige Subventionen*		....	...	....	....	...	....	0,193	80	0,154
1/65248	33	7279		Entgelte für sonstige Leistungen von Einzelpersonen		0,092	80	0,074	0,092	80	0,074	....	...	....
		7280		Sonstige Leistungen v. Gewerbetreib., Firmen u. jur. Pers.		0,080	80	0,064	0,080	80	0,064	0,095	80	0,076
1/65256	12	7660		Sonstige Förderungen		0,153	95	0,145	0,153	95	0,145	....	...	....
	36	7660		Sonstige Förderungen		0,000	80	0,000	0,000	80	0,000	0,557	80	0,446
1/65258	36	7279		Werkverträge, Studien, Untersuchungen (Einzelpersonen)		0,001	80	0,001	0,001	80	0,001	....	...	....
		7280		Werkverträge, Studien, Untersuchungen (jur. Personen)		0,292	80	0,234	0,292	80	0,234	0,233	80	0,186
		7420		Lfd. Transferz. an Unternehmungen mit Bundesbeteiligung		0,064	80	0,051	0,064	80	0,051	....	...	....
1/6527				Klima- und Energiefonds		0,002	33	0,001	0,002	33	0,001	....	...	....
1/6532	12			Technologie- u. Forschungsförderung (wissenschaftl.)/FWF		77,218	100	77,218	60,943	100	60,943	70,900	100	70,900
1/6533				Forschungs- und Technologietransfer		13,105	100	13,105	12,654	100	12,654	12,844	100	12,844
1/65346	12	7330	661	ERP-Fonds (F&E-Offensive)		0,554	100	0,554	1,254	100	1,254	1,382	100	1,382
		7420		Laufende Transferz.an Untern.m.Bundesbet. (Technologiemill.)		0,001	100	0,001	0,001	100	0,001	....	...	....
		7420	900	Zahlungen an Untern. m. Bundesbet. (F&E-Offensive)		0,150	100	0,150	0,250	100	0,250	0,136	100	0,136
		7430		Lauf. Transferz.a.d.übrigen Sektoren d.Wirtsch.(Tech.mill.)		0,001	100	0,001	0,001	100	0,001	....	...	....
		7430	900	Forschung und Entwicklung (F&E-Offensive)		0,001	100	0,001	0,001	100	0,001	....	...	....
		7431		Fachhochschulen-Kooperationen (Technologiemilliarde)		0,001	100	0,001	0,001	100	0,001	0,071	100	0,071
		7432	900	Lauf.Transfz. a.d.übr.Sektoren d. Wirtsch. (F&E Offensive)		0,150	100	0,150	0,250	100	0,250	0,072	100	0,072
		7670		Verein zur Förderung der wiss. Forschung (Technologiemill.)		0,001	100	0,001	0,001	100	0,001	0,000	100	0,000
		7680	900	Phys.Pers.-Förd.beitr. (nicht Invest.) (F&E-Offensive)		0,150	100	0,150	0,250	100	0,250	0,185	100	0,185
1/65348	12	7279	900	Einzelpers. - Entgelte f. sonst. Leistungen (F&E-Offensive)		0,100	100	0,100	0,100	100	0,100	0,040	100	0,040
		7280	001	Sonst. Leist. v. Gewerbetreib.u.jur.Pers. (Technologiemill.)		0,001	100	0,001	0,001	100	0,001	0,012	100	0,012

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B U N D E S V O R A N S C H L A G 2 0 0 8
Forschungswirksame Ausgaben des Bundes (*)
(Beträge in Millionen Euro)

b) Ausgaben des Bundes **(ausgen. die bereits im Abschnitt a) ausgewiesen sind)** für Forschung und Forschungsförderung (Bundesbudget-Forschung)

VA-Ansatz	AB	VA-Post Nr.	Ugl	Bereich-Ausgaben Bezeichnung Anm.	Bundesvoranschlag 2008 Insgesamt	hievon %	hievon Forschung	Bundesvoranschlag 2007 Insgesamt	hievon %	hievon Forschung	Erfolg 2006 Insgesamt	hievon %	hievon Forschung
				(Fortsetzung)									
1/65348	12	7280	900	Leist.v. Gewerbetr., Firm.u. jur. Pers. (F&E-Offensive)	2,500	100	2,500	4,000	100	4,000	2,853	100	2,853
		7283	900	Rat f. Forschung u. Technologieentw. (F&E-Offensive)	0,001	100	0,001	0,001	100	0,001	0,505	100	0,505
		7330	661	ERP-Fonds (F&E-Offensive)	0,001	100	0,001	0,001	100	0,001	....	...	....
		7420	900	Zahlungen an Untern.m.Bundesbet. (F&E-Offensive)	5,903	100	5,903	6,403	100	6,403	....	...	....
		7430	900	Forschung und Entwicklung (F&E-Offensive)	0,001	100	0,001	0,001	100	0,001	....	...	....
		7480		Impulsprogramme (Technologiemilliarde)	0,001	100	0,001	0,001	100	0,001	0,001	100	0,001
1/65356	12	7426		ARC-Zuschüsse für nicht investitionsfördernde Maßnahmen	41,852	90	37,667	41,852	90	37,667	22,597	85	19,207
		7426	001	ARC - Forschungsprogramme	0,001	100	0,001	0,001	100	0,001	11,205	100	11,205
		7426	002	ARC - Technologietransfer	0,001	100	0,001	0,001	100	0,001	3,540	100	3,540
		7476		ARC - Investitionskostenzuschuss	3,225	85	2,741	3,225	85	2,741	3,225	85	2,741
		7686		ARC - Humanressourcen-Programm	0,001	100	0,001	0,001	100	0,001	1,513	100	1,513
1/65358	12	7420		Lauf. Transferzahl. an Unternehmungen mit Bundesbeteiligung	0,736	95	0,699	0,736	95	0,699	1,944	95	1,847
		7421		ARC-Nukleare Dienste (NES)	7,730	79	6,107	7,470	79	5,901	7,003	79	5,532
1/6536				Bundesamt FPZ Arsenal	2,562	68	1,742	2,633	68	1,790	2,563	68	1,743
1/65376	12	7480		Technologieschwerpunkte (Unternehmungen)	6,239	100	6,239	6,239	100	6,239	3,859	100	3,859
		7480	001	Forschungsschwerpunkte (Unternehmungen)	4,081	100	4,081	4,081	100	4,081	0,204	100	0,204
1/65378	12	7279		Technologieschwerpunkte (Einzelpersonen)	0,001	100	0,001	0,001	100	0,001	....	...	....
		7279	001	Forschungsschwerpunkte (Einzelpersonen)	0,001	100	0,001	0,001	100	0,001	....	...	....
		7280		Technologieschwerpunkte (Unternehmungen)	0,594	100	0,594	0,594	100	0,594	0,369	100	0,369
		7280	001	Forschungsschwerpunkte (Unternehmungen)	0,086	100	0,086	0,086	100	0,086	....	...	....
1/6538				Forschungsförderungs GmbH (FFG)	150,915	100	150,915	164,190	100	164,190	149,583	100	149,583
1/6567	12			Straßenforschung	0,971	100	0,971	0,971	100	0,971	1,048	100	1,048
1/65708	32	7280		Sonstige Leistungen v. Gewerbetreib., Firmen u. jur. Pers.	0,831	5	0,042	0,831	5	0,042	1,170	5	0,059
				Summe Bereich 65...	322,783		314,058	322,143		313,449	302,594		294,596
				Summe Abschnitt b)...	**4.751,945**		**1.866,201**	**4.640,123**		**1.806,080**	**4.284,857**		**1.630,695**
				Gesamtsumme...	**4.830,610**		**1.929,964**	**4.718,673**		**1.869,813**	**4.360,621**		**1.692,028**

Beilage T/Anhang

B U N D E S V O R A N S C H L A G   2 0 0 8
Forschungswirksame Ausgaben des Bundes (*)

Anmerkungen zur Beilage T

(*) F & E Koeffizienten geschätzt

Die Beilage T ist aufgegliedert nach:
a) Beitragszahlungen aus Bundesmitteln an internationale Organisationen, die Forschung und Forschungsförderung (mit) als Ziel haben,
b) sonstigen Ausgaben des Bundes für Forschung und Forschungsförderung (Bundesbudget-Forschung)
Für die Aufstellung dieser Ausgaben ist in erster Linie der Gesichtspunkt der Forschungswirksamkeit maßgebend, der inhaltlich über den Aufgabenbereich 12 'Forschung und Wissenschaft' hinausgeht und auf dem Forschungsbegriff des Frascati-Handbuches der OECD beruht, wie er im Rahmen der forschungsstatistischen Erhebungen der STATISTIK AUSTRIA zur Anwendung gelangt

Forschungswirksame Anteile bei den Bundesausgaben finden sich daher nicht nur bei den Ausgaben des Aufgabenbereiches 12 'Forschung und Wissenschaft', sondern auch in zahlreichen anderen Aufgabenbereichen (z. B. 11/Erziehung und Unterricht, 13/Kunst, 34/Land und Forstwirtschaft, 36/Industrie und Gewerbe, 43/Übrige Hoheitsverwaltung), bei denen die Zielsetzungen des betreffenden Aufgabenbereiches im Vordergrund stehen.

VA-Ansatz	AB	VA-Post Nr.	Ugl	A n m e r k u n g
1/1200	43			Forschungsanteil: Pauschalbetrag
1/1250	11			Forschungsanteil: Pauschalbetrag
1/1280				Forschungsanteil: Pauschalbetrag.
1/1283	11			Forschungsanteil: Pauschalbetrag
1/60008	43	7800		Teilbetrag der VA-Post.
1/6050	11			Von den übrigen landwirtschaftlichen Bundeslehranstalten werden Forschungs- und Versuchsaufgaben derzeit nicht durchgeführt.
1/61208	21	7800		Teilbetrag der VA-Post.
1/6309				Forschungsanteil: Pauschalbetrag.
1/65007	43	7800		Teilbetrag der VA-Post.
1/65008	43	7800		Teilbetrag der VA-Post.
1/65027	43	7800		Teilbetrag der VA-Post.
1/.....				F&E-Anteil an den Lohnnebenkosten der in Forschungseinrichtungen tätigen Bundesbeamten. Imputation nach OECD-Richtlinien.

Table 4: Federal expenditure in 1993-2008 for research and research promotion by socioeconomic objectives
Breakdown of Schedule T of the Auxiliary Document for the Federal Finances Act 1995 – 2008 (Part a and Part b)

Reporting years		Total federal expenditure for R&D	of which												
			Promotion of research on the earth, the seas, the atmosphere, and space	Promotion of agriculture and forestry	Promotion of trade, commerce, and industry	Promotion of energy production, storage and distribution	Promotion of transport, traffic and communications	Promotion of education	Promotion of health care	Promotion of social and socio-economic development	Promotion of environmental protection	Promotion of urban and physical planning	Promotion of national defence	Promotion of other objectives	Promotion of the general knowledge advancement
1993 1)	in 1000 €	1 063 049	48 743	48 585	153 961	18 381	27 194	14 308	262 368	69 792	51 015	6 080	20	9 353	353 250
	in %	*100.0*	*4.6*	*4.6*	*14.5*	*1.7*	*2.6*	*1.3*	*24.7*	*6.6*	*4.8*	*0.6*	*0.0*	*0.9*	*33.1*
1994 2)	in 1000 €	1 151 932	50 916	49 590	177 759	21 797	36 287	14 997	273 868	78 242	52 342	5 747	137	10 767	379 484
	in %	*100.0*	*4.4*	*4.3*	*15.4*	*1.9*	*3.2*	*1.3*	*23.8*	*6.8*	*4.5*	*0.5*	*0.0*	*0.9*	*33.0*
1995 3)	in 1000 €	1 150 418	55 288	49 073	169 867	16 869	32 760	15 350	270 121	75 571	47 665	6 531	82	11 037	400 206
	in %	*100.0*	*4.8*	*4.3*	*14.8*	*1.5*	*2.8*	*1.3*	*23.5*	*6.6*	*4.1*	*0.6*	*0.0*	*1.0*	*34.7*
1996 4)	in 1000 €	1 123 669	54 154	47 560	163 642	17 052	28 159	15 488	248 314	79 359	44 173	6 188	73	10 856	408 653
	in %	*100.0*	*4.8*	*4.2*	*14.6*	*1.5*	*2.5*	*1.4*	*22.1*	*7.1*	*3.9*	*0.6*	*0.0*	*1.0*	*36.3*
1997 5)	in 1000 €	1 132 901	54 939	49 177	155 087	21 884	30 385	15 713	265 641	79 076	43 121	6 433	31	11 178	400 236
	in %	*100.0*	*4.8*	*4.3*	*13.7*	*1.9*	*2.7*	*1.4*	*23.4*	*7.0*	*3.8*	*0.6*	*0.0*	*1.0*	*35.4*
1998 6)	in 1000 €	1 207 908	85 538	69 262	173 102	22 694	34 064	14 514	270 452	86 414	41 747	10 090	57	11 549	388 424
	in %	*100.0*	*7.1*	*5.7*	*14.3*	*1.9*	*2.8*	*1.2*	*22.4*	*7.2*	*3.5*	*0.8*	*0.0*	*1.0*	*32.1*
1999 7)	in 1000 €	1 281 498	91 387	75 421	188 151	25 314	32 337	15 552	280 577	91 162	42 771	10 136	12	11 348	417 329
	in %	*100.0*	*7.1*	*5.9*	*14.7*	*2.0*	*2.5*	*1.2*	*21.9*	*7.1*	*3.3*	*0.8*	*0.0*	*0.9*	*32.6*
2000 8)	in 1000 €	1 287 326	86 343	79 177	194 247	21 365	29 644	14 299	291 038	89 881	43 301	10 006	336	11 502	416 187
	in %	*100.0*	*6.7*	*6.2*	*15.1*	*1.7*	*2.3*	*1.1*	*22.6*	*7.0*	*3.4*	*0.8*	*0.0*	*0.9*	*32.2*
2001 9)	in 1000 €	1 408 773	92 134	78 480	251 049	25 093	36 435	15 342	306 074	94 474	43 909	10 739	174	11 939	442 931
	in %	*100.0*	*6.5*	*5.6*	*17.8*	*1.8*	*2.6*	*1.1*	*21.7*	*6.7*	*3.1*	*0.8*	*0.0*	*0.8*	*31.5*
2002 10)	in 1000 €	1 466 695	94 112	85 313	243 301	26 243	42 459	16 604	315 345	97 860	45 204	11 153	21	12 579	476 501
	in %	*100.0*	*6.4*	*5.8*	*16.6*	*1.8*	*2.9*	*1.1*	*21.5*	*6.7*	*3.1*	*0.8*	*0.0*	*0.9*	*32.4*
2003 11)	in 1000 €	1 452 124	96 812	86 018	241 728	25 960	39 550	15 787	316 273	92 762	49 487	10 665	4	12 966	464 112
	in %	*100.0*	*6.7*	*5.9*	*16.6*	*1.8*	*2.7*	*1.1*	*21.8*	*6.4*	*3.4*	*0.7*	*0.0*	*0.9*	*32.0*
2004 12)	in 1000 €	1 537 890	84 670	61 182	308 316	25 716	41 489	10 846	362 961	73 670	41 336	13 260	163	15 724	498 557
	in %	*100.0*	*5.5*	*4.0*	*20.0*	*1.7*	*2.7*	*0.7*	*23.6*	*4.8*	*2.7*	*0.9*	*0.0*	*1.0*	*32.4*
2005 13)	in 1000 €	1 619 740	85 101	57 618	347 841	28 320	35 275	9 557	362 000	73 978	46 384	13 349	243	16 165	543 909
	in %	100.0	5.3	3.6	21.5	1.7	2.2	0.6	22.3	4.6	2.9	0.8	0.0	1.0	33.5
2006 14)	in 1000 €	1 692 028	84 320	59 276	373 666	26 930	37 745	10 179	393 346	81 099	48 460	14 739	220	15 168	546 880
	in %	*100.0*	*5.0*	*3.5*	*22.1*	*1.6*	*2.2*	*0.6*	*23.2*	*4.8*	*2.9*	*0.9*	*0.0*	*0.9*	*32.3*
2007 15)	in 1000 €	1 869 813	85 927	60 961	465 933	47 681	43 452	11 370	401 149	86 687	52 924	15 580	237	16 269	581 643
	in %	*100.0*	*4.6*	*3.3*	*24.9*	*2.6*	*2.3*	*0.6*	*21.5*	*4.6*	*2.8*	*0.8*	*0.0*	*0.9*	*31.1*
2008 15)	in 1000 €	1 929 964	93 932	62 505	458 328	29 084	45 312	11 981	432 057	90 904	55 229	16 376	246	16 952	617 058
	in %	*100.0*	*4.9*	*3.2*	*23.7*	*1.5*	*2.3*	*0.6*	*22.4*	*4.7*	*2.9*	*0.8*	*0.0*	*0.9*	*32.1*

Status: April 2008

Source: Statistik Austria (Bundesanstalt Statistik Österreich)

1) Schedule T of the Auxiliary Document for the Federal Finances Act 1995, actual figures. Revised data. 2) Schedule T of the Auxiliary Document for the Federal Finances Act 1996, actual figures. 3) Schedule T of the Auxiliary Document for the Federal Finances Act 1997, actual figures. 4) Schedule T of the Auxiliary Document for the Federal Finances Act 1998, actual figures. 5) Schedule T of the Auxiliary Document for the Federal Finances Act 1999, actual figures. 6) Schedule T of the Auxiliary Document for the Federal Finances Act 2000, actual figures. Revised data. 7) Schedule T of the Auxiliary Document for the Federal Finances Act 2001, actual figures. Revised data. 8) Schedule T of the Auxiliary Document for the Federal Finances Act 2002, actual figures. 9) Schedule T of the Auxiliary Document for the Federal Finances Act 2003, actual figures. 10) Schedule T of the Auxiliary Document for the Federal Finances Act 2004, actual figures. 11) Schedule T of the Auxiliary Document for the Federal Finances Act 2005, actual figures. 12) Schedule T of the Auxiliary Document for the Federal Finances Act 2006, actual figures. Revised data. 13) Schedule T of the Auxiliary Document for the Federal Finances Act 2007, actual figures. 14) Schedule T of the Auxiliary Document for the Federal Finances Act 2008, actual figures. 15) Schedule T of the Auxiliary Document for the Federal Finances Act 2008, budget.
Rounding-offidifferences.

Table 5: Federal expenditure in 2006 for research and research promotion by socioeconomic objectives and ministries Breakdown of annual values for 2006 1) from Schedule T of the Auxiliary Document for the Federal Finances Act 2008 (Part a and Part b)

Ministries		Total federal expenditure for R&D	of which												
			Promotion of research on the earth, the seas, the atmosphere, and space	Promotion of agriculture and forestry	Promotion of trade, commerce, and industry	Promotion of energy production, storage and distribution	Promotion of transport, traffic and communications	Promotion of education	Promotion of health care	Promotion of social and socio-economic development	Promotion of environmental protection	Promotion of urban and physical planning	Promotion of national defence	Promotion of other objectives	Promotion of the general knowledge advancement
BKA	in 1000 €	1 575	-	-	-	-	-	-	-	1 208	-	289	-	-	78
	in %	*100.0*	-	-	-	-	-	-	-	*76.7*	-	*18.3*	-	-	*5.0*
BMI	in 1000 €	543	-	-	-	-	-	-	-	543	-	-	-	-	-
	in %	*100.0*	-	-	-	-	-	-	-	*100.0*	-	-	-	-	-
BMBWK	in 1000 €	1 216 290	65 168	26 846	167 619	14 793	14 514	9 139	325 439	66 755	20 367	13 264	178	14 652	477 556
	in %	*100.0*	*5.4*	*2.2*	*13.8*	*1.2*	*1.2*	*0.8*	*26.7*	*5.5*	*1.7*	*1.1*	*0.0*	*1.2*	*39.2*
BMSGK	in 1000 €	1 697	-	-	-	-	-	-	171	1 526	-	-	-	-	-
	in %	*100.0*	-	-	-	-	-	-	*10.1*	*89.9*	-	-	-	-	-
BMGF	in 1000 €	6 214	-	50	-	-	-	-	5 893	30	-	-	-	-	241
	in %	*100.0*	-	*0.8*	-	-	-	-	*94.8*	*0.5*	-	-	-	-	*3.9*
BMAA	in 1000 €	1 850	-	-	-	973	-	-	-	852	-	-	-	-	25
	in %	*100.0*	-	-	-	*52.5*	-	-	-	*46.1*	-	-	-	-	*1.4*
BMJ	in 1000 €	117	-	-	-	-	-	-	-	117	-	-	-	-	-
	in %	*100.0*	-	-	-	-	-	-	-	*100.0*	-	-	-	-	-
BML	in 1000 €	1 602	-	-	-	-	-	-	-	-	-	-	42	-	1 560
	in %	*100.0*	-	-	-	-	-	-	-	-	-	-	*2.6*	-	*97.4*
BMF	in 1000 €	33 607	1721	996	4734	513	473	234	8343	4325	638	380	-	439	10811
	in %	*100.0*	*5.1*	*3.0*	*14.1*	*1.5*	*1.4*	*0.7*	*24.8*	*12.9*	*1.9*	*1.1*	-	*1.3*	*32.2*
BMLFUW	in 1000 €	44 985	1 007	29 805	-	-	-	-	-	1 425	12 748	-	-	-	-
	in %	*100.0*	*2.2*	*66.3*	-	-	-	-	-	*3.2*	*28.3*	-	-	-	-
BMWA	in 1000 €	51 835	16	95	46 740	815	663	-	2 957	275	265	-	-	-	9
	in %	*100.0*	*0.0*	*0.2*	*90.2*	*1.6*	*1.3*	-	*5.7*	*0.5*	*0.5*	-	-	-	*0.0*
BMVIT	in 1000 €	331 713	16 408	1 484	154 573	9 836	22 095	806	50 543	4 043	14 442	806	-	77	56 600
	in %	*100.0*	*4.9*	*0.4*	*46.7*	*3.0*	*6.7*	*0.2*	*15.2*	*1.2*	*4.4*	*0.2*	-	*0.0*	*17.1*
Total	**in 1000 €**	**1 692 028**	**84 320**	**59 276**	**373 666**	**26 930**	**37 745**	**10 179**	**393 346**	**81 099**	**48 460**	**14 739**	**220**	**15 168**	**546 880**
	in %	***100.0***	***5.0***	***3.5***	***22.1***	***1.6***	***2.2***	***0.6***	***23.2***	***4.8***	***2.9***	***0.9***	***0.0***	***0.9***	***32.3***

Status: April 2008

Source: Statistik Austria (Bundesanstalt Statistik Österreich)

1 Actual figures.

Table 6: Federal expenditure in 2007 for research and research promotion by socioeconomic objectives and ministries
Breakdown of annual values for 2007 [1] from Schedule T of the Auxiliary Document for the Federal Finances Act 2008 (Part a and Part b)

Ministries		Total federal expenditure for R&D	of which												
			Promotion of research on the earth, the seas, the atmosphere, and space	Promotion of agriculture and forestry	Promotion of trade, commerce, and industry	Promotion of energy production, storage and distribution	Promotion of transport, traffic and communication	Promotion of education	Promotion of health care	Promotion of social and socio-economic development	Promotion of environmental protection	Promotion of urban and physical planning	Promotion of national defence	Promotion of other objectives	Promotion of the general knowledge advancement
BKA	in 1000 €	1 647	-	-	-	44	-	-	-	1 198	-	327	-	-	78
	in %	*100.0*	-	-	-	*2.7*	-	-	-	*72.7*	-	*19.9*	-	-	*4.7*
BMI	in 1000 €	576	-	-	-	-	-	-	-	576	-	-	-	-	-
	in %	*100.0*	-	-	-	-	-	-	-	*100.0*	-	-	-	-	-
BMUKK	in 1000 €	46 167	4 628	-	327	-	-	1 931	-	6 157	-	-	-	-	33 124
	in %	*100.0*	*10.0*	-	*0.7*	-	-	*4.2*	-	*13.3*	-	-	-	-	*71.8*
BMWF	in 1000 €	1 253 116	62 294	29 008	179 566	15 560	15 615	8 435	338 134	64 917	21 898	14 103	179	15 755	487 652
	in %	*100.0*	*5.0*	*2.3*	*14.3*	*1.2*	*1.2*	*0.7*	*27.0*	*5.2*	*1.7*	*1.1*	*0.0*	*1.3*	*39.0*
BMSK	in 1000 €	1 616	-	-	-	-	-	-	-	1 616	-	-	-	-	-
	in %	*100.0*	-	-	-	-	-	-	-	*100.0*	-	-	-	-	-
BMGFJ	in 1000 €	5 409	-	59	-	-	-	-	4 495	501	-	-	-	-	354
	in %	*100.0*	-	*1.1*	-	-	-	-	*83.1*	*9.3*	-	-	-	-	*6.5*
BMEIA	in 1000 €	1 789	-	-	-	980	-	-	-	788	-	-	-	-	21
	in %	*100.0*	-	-	-	*54.8*	-	-	-	*44.0*	-	-	-	-	*1.2*
BMJ	in 1000 €	85	-	-	-	-	-	-	-	85	-	-	-	-	-
	in %	*100.0*	-	-	-	-	-	-	-	*100.0*	-	-	-	-	-
BML	in 1000 €	2 039	-	-	-	-	-	-	-	-	-	-	58	-	1 981
	in %	*100.0*	-	-	-	-	-	-	-	-	-	-	*2.8*	-	*97.2*
BMF [2]	in 1000 €	93 908	1 742	991	44 727	20 510	471	234	8 330	4 577	637	380	-	438	10 871
	in %	*100.0*	*1.9*	*1.1*	*47.5*	*21.8*	*0.5*	*0.2*	*8.9*	*4.9*	*0.7*	*0.4*	-	*0.5*	*11.6*
BMLFUW	in 1000 €	46 596	862	29 373	-	-	-	-	-	1 368	14 993	-	-	-	-
	in %	*100.0*	*1.8*	*63.1*	-	-	-	-	-	*2.9*	*32.2*	-	-	-	-
BMWA	in 1000 €	64 612	16	-	64 340	-	-	-	-	247	-	-	-	-	9
	in %	*100.0*	*0.0*	-	*99.6*	-	-	-	-	*0.4*	-	-	-	-	*0.0*
BMVIT	in 1000 €	352 253	16 385	1 530	176 973	10 587	27 366	770	50 190	4 657	15 396	770	-	76	47 553
	in %	*100.0*	*4.7*	*0.4*	*50.3*	*3.0*	*7.8*	*0.2*	*14.2*	*1.3*	*4.4*	*0.2*	-	*0.0*	*13.5*
Total	**in 1000 €**	**1 869 813**	**85 927**	**60 961**	**465 933**	**47 681**	**43 452**	**11 370**	**401 149**	**86 687**	**52 924**	**15 580**	**237**	**16 269**	**581 643**
	in %	***100.0***	***4.6***	***3.3***	***24.9***	***2.6***	***2.3***	***0.6***	***21.5***	***4.6***	***2.8***	***0.8***	***0.0***	***0.9***	***31.1***

Status: April 2008
Source: Statistik Austria (Bundesanstalt Statistik Österreich)

[1] Budget.
[2] Including the funds provided for in Budget Chapter 51 for the 2007 "Proactive Research Programme" (€ 60 million).

Table 7: Federal expenditure in 2008 for research and research promotion by socioeconomic objectives and ministries
Breakdown of annual values for 2008 1) from Schedule T of the Auxiliary Document for the Federal Finances Act 2008 (Part a and Part b)

Ministries		Total federal expenditure for R&D	of which												
			Promotion of research on the earth, the seas, the atmosphere, and space	Promotion of agriculture and forestry	Promotion of trade, commerce, and industry	Promotion of energy production, storage and distribution	Promotion of transport, traffic and communication	Promotion of education	Promotion of health care	Promotion of social and socio-economic development	Promotion of environmental protection	Promotion of urban and physical planning	Promotion of national defence	Promotion of other objectives	Promotion of the general knowledge advancement
BKA	in 1000 €	1 665	-	-	-	44	-	-	-	1 214	-	327	-	-	80
	in %	*100.0*	-	-	-	*2.6*	-	-	-	*73.0*	-	*19.6*	-	-	*4.8*
BMI	in 1000 €	573	-	-	-	-	-	-	-	573	-	-	-	-	-
	in %	*100.0*	-	-	-	-	-	-	-	*100.0*	-	-	-	-	-
BMUKK	in 1000 €	47 535	4 912	-	327	-	-	1 957	-	6 139	-	-	-	-	34 200
	in %	*100.0*	*10.3*	-	*0.7*	-	-	*4.1*	-	*12.9*	-	-	-	-	*72.0*
BMWF	in 1000 €	1 272 741	62 611	29 336	181 898	15 736	15 791	8 532	348 698	65 610	22 144	14 256	186	15 931	492 012
	in %	*100.0*	*4.9*	*2.3*	*14.3*	*1.2*	*1.2*	*0.7*	*27.4*	*5.2*	*1.7*	*1.1*	*0.0*	*1.3*	*38.7*
BMSK	in 1000 €	1 816	-	-	-	-	-	-	-	1 816	-	-	-	-	-
	in %	*100.0*	-	-	-	-	-	-	-	*100.0*	-	-	-	-	-
BMGFJ	in 1000 €	5 583	-	59	-	-	-	-	4 654	518	-	-	-	-	352
	in %	*100.0*	-	*1.1*	-	-	-	-	*83.3*	*9.3*	-	-	-	-	*6.3*
BMEIA	in 1000 €	1 789	-	-	-	980	-	-	-	788	-	-	-	-	21
	in %	*100.0*	-	-	-	*54.8*	-	-	-	*44.0*	-	-	-	-	*1.2*
BMJ	in 1000 €	111	-	-	-	-	-	-	-	111	-	-	-	-	-
	in %	*100.0*	-	-	-	-	-	-	-	*100.0*	-	-	-	-	-
BML	in 1000 €	2 082	-	-	-	-	-	-	-	-	-	-	60	-	2 022
	in %	*100.0*	-	-	-	-	-	-	-	-	-	-	*2.9*	-	*97.1*
BMF [2])	in 1000 €	132 931	4 626	2 083	50 061	2 292	2 974	625	25 877	7 362	3 296	926	-	942	31 867
	in %	*100.0*	*3.5*	*1.6*	*37.6*	*1.7*	*2.2*	*0.5*	*19.5*	*5.5*	*2.5*	*0.7*	-	*0.7*	*24.0*
BMLFUW	in 1000 €	46 229	874	29 482	-	-	-	-	-	1 380	14 493	-	-	-	-
	in %	*100.0*	*1.9*	*63.7*	-	-	-	-	-	*3.0*	*31.4*	-	-	-	-
BMWA	in 1000 €	64 047	16	-	63 775	-	-	-	-	247	-	-	-	-	9
	in %	*100.0*	*0.0*	-	*99.6*	-	-	-	-	*0.4*	-	-	-	-	*0.0*
BMVIT	in 1000 €	352 862	20 893	1 545	162 267	10 032	26 547	867	52 828	5 146	15 296	867	-	79	56 495
	in %	*100.0*	*5.9*	*0.4*	*46.1*	*2.8*	*7.5*	*0.2*	*15.0*	*1.5*	*4.3*	*0.2*	-	*0.0*	*16.1*
Total	**in 1000 €**	**1 929 964**	**93 932**	**62 505**	**458 328**	**29 084**	**45 312**	**11 981**	**432 057**	**90 904**	**55 229**	**16 376**	**246**	**16 952**	**617 058**
	in %	***100.0***	***4.9***	***3.2***	***23.7***	***1.5***	***2.3***	***0.6***	***22.4***	***4.7***	***2.9***	***0.8***	***0.0***	***0.9***	***32.1***

Status: April 2008

Source: Statistik Austria (Bundesanstalt Statistik Österreich)

[1] Budget.
[2] Including the funds provided for in Budget Chapter 51 for the 2008 "Proactive Research Programme" (€ 100 million).

Table 8: Research promotion schemes and contracts awarded by the federal government in 2006, broken down by recipients (by economic sectors/areas) and awarding ministries, analysis of the facts documentation by federal offices for 2006 (as of August 2007) including "major" global promotion schemes[1)]

Ministries	Partial amounts in 2006	of which awarded to: University sector						State sector								Private non-profit sector			Business sector						
		Universities (including teaching hospitals)	Art colleges	Austrian Academy of Sciences	Universities of Applied Science	Testing institutes of technical colleges	Total	Federal institutions (excluding university sector)	State institutions	Municipalities	Chambers	Social insurance institutions	Private non-profit facilities mostly run on public financing	Ludwig Boltzmann Gesellschaft	Total	Private non-profit sector	Individual researchers	Total	Cooperative sector including competence centres (excluding ARCs)	Austrian Research Centers GmbH – ARC	Enterprises	Total	Fund for the Promotion of Scientific Research	Österreichische Forschungsförderungsgesellschaft mbH	Abroad
	in €	in %																							
BKA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BMI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BMBWK	138 759 165	10.5	0.1	48.0	0.0	0.1	58.7	0.4	-	-	-	-	8.9	2.9	12.2	4.9	0.1	5.0	1.2	0.0	2.9	4.1	6.5	-	13.5
BMSGK	1 199 139	2.3	-	4.2	-	-	6.5	28.3	1.4	-	-	-	16.4	-	46.1	17.1	1.4	18.5	-	-	28.9	28.9	-	-	-
BMGF	314 856	78.8	-	-	-	-	78.8	-	-	-	-	-	12.7	-	12.7	-	8.5	8.5	-	-	-	-	-	-	-
BMAA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BMJ	116 040	12.9	-	-	-	-	12.9	-	-	-	-	-	69.0	-	69.0	18.1	-	18.1	-	-	-	-	-	-	-
BML	108 712	9.1	-	-	-	-	9.1	-	-	-	-	-	-	-	-	-	40.3	40.3	-	-	-	-	-	-	50.6
BMF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BMLFUW	4 044 997	53.0	-	-	-	-	53.0	17.7	0.5	-	-	-	3.0	2.9	24.1	2.3	-	2.3	1.1	8.7	10.7	20.5	-	-	0.1
BMWA	20 213 997	0.0	-	-	-	-	0.0	0.0	-	-	-	-	-	-	0.0	-	-	-	0.5	0.2	0.8	1.5	-	98.4	0.1
BMVIT	265 690 198	0.0	-	-	-	-	0.0	0.0	-	-	-	-	1.0	-	1.0	0.0	-	0.0	0.0	15.8	0.1	15.9	26.7	56.4	-
Total	**430 447 104**	**4.0**	**0.0**	**15.5**	**0.0**	**0.0**	**19.5**	**0.4**	**0.0**	**-**	**-**	**-**	**3.5**	**1.0**	**4.9**	**1.7**	**0.0**	**1.7**	**0.4**	**9.9**	**1.2**	**11.5**	**18.6**	**39.4**	**4.4**

Status: April 2008

Source: Statistik Austria (Bundesanstalt Statistik Österreich)

[1] i.e. including global subsidies for: Fonds zur Förderung der wissenschaftlichen Forschung, Österreichische Forschungsförderungsgesellschaft mbH, Ludwig Boltzmann Gesellschaft, Österreichische Akademie der Wissenschaften, Austrian Research Centers GmbH – ARC (total: € 342 398 639); agreed with the year-end closing of the federal government in 2006.

Table 9: Research promotion schemes and contracts awarded by the federal government in 2006, broken down by recipients (by economic sectors/areas) and awarding ministries, analysis of the facts documentation by federal offices for 2006 (status: August 2007) excluding "major" global promotion schemes[1)]

Ministries	Partial amounts in 2006	of which awarded to																							
		University sector						State sector								Private non-profit sector			Business sector						
		Universities (including teaching hospitals)	Art colleges	Austrian Academy of Sciences	Universities of Applied Science	Testing institutes of technical colleges	Total	Federal institutions (excluding university sector)	State institutions	Municipalities	Chambers	Social insurance institutions	Private non-profit facilities mostly run on public financing	Ludwig Boltzmann Gesellschaft	Total	Private non-profit sector	Individual researchers	Total	Cooperative sector including competence centres (excluding ARCs)	Austrian Research Centers GmbH – ARC	Enterprises	Total	Fund for the Promotion of Scientific Research	Österreichische Forschungsförderungsgesellschaft mbH	Abroad
	in €	in %																							
BKA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BMI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BMBWK	81 360 327	*18.0*	*0.2*	*26.9*	*0.0*	*0.1*	*45.2*	*0.7*	-	-	-	-	*15.1*	*0.6*	*16.4*	*8.4*	*0.2*	*8.6*	*2.1*	*0.1*	*4.7*	*6.9*	-	-	*22.9*
BMSGK	1 199 139	*2.3*	-	*4.2*	-	-	*6.5*	*28.3*	*1.4*	-	-	-	*16.4*	-	*46.1*	*17.1*	*1.4*	*18.5*	-	-	*28.9*	*28.9*	-	-	-
BMGF	314 856	*78.8*	-	-	-	-	*78.8*	-	-	-	-	-	*12.7*	-	*12.7*	-	*8.5*	*8.5*	-	-	-	-	-	-	-
BMAA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BMJ	116 040	*12.9*	-	-	-	-	*12.9*	-	-	-	-	-	*69.0*	-	*69.0*	*18.1*	-	*18.1*	-	-	-	-	-	-	-
BML	108 712	*9.1*	-	-	-	-	*9.1*	-	-	-	-	-	-	-	-	-	*40.3*	*40.3*	-	-	-	-	-	-	*50.6*
BMF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BMLFUW	4 044 997	*53.0*	-	-	-	-	*53.0*	*17.7*	*0.5*	-	-	-	*3.0*	*2.9*	*24.1*	*2.3*	-	*2.3*	*1.1*	*8.7*	*10.7*	*20.5*	-	-	*0.1*
BMWA	341 007	*1.5*	-	-	-	-	*1.5*	*1.5*	-	-	-	-	-	-	*1.5*	-	-	-	*28.7*	*10.4*	*50.6*	*89.7*	-	-	*7.3*
BMVIT	563 387	*23.2*	-	-	-	-	*23.2*	*6.0*	-	-	-	-	*7.1*	-	*13.1*	*13.4*	-	*13.4*	*7.9*	-	*42.4*	*50.3*	-	-	-
Total	**88 048 465**	***19.5***	***0.2***	***24.9***	***0.0***	***0.1***	***44.7***	***1.9***	***0.0***	**-**	**-**	**-**	***14.5***	***0.7***	***17.1***	***8.3***	***0.2***	***8.5***	***2.1***	***0.5***	***5.8***	***8.4***	**-**	**-**	***21.3***

Status: April 2008

Source: Statistik Austria (Bundesanstalt Statistik Österreich)

[1] i.e. excluding global subsidies for: Fonds zur Förderung der wissenschaftlichen Forschung, Österreichische Forschungsförderungsgesellschaft mbH, Ludwig Boltzmann Gesellschaft, Österreichische Akademie der Wissenschaften, Austrian Research Centers GmbH – ARC (total: € 342 398 639).

Table 10: Research promotion schemes and contracts awarded by the federal government in 2006, broken down by recipients, socio-economic objectives and awarding ministries, analysis of the facts documentation by federal offices for 2006 (as of August 2007) including "major" global promotion schemes[1)]

Ministries		Partial amounts in 2006	of which												
			Promotion of research on the earth, the seas, the atmosphere, and space	Promotion of agriculture and forestry	Promotion of trade, commerce, and industry	Promotion of energy production, storage and distribution	Promotion of transport, traffic and communication	Promotion of education	Promotion of healthcare	Promotion of social and socio-economic development	Promotion of environmental protection	Promotion of urban and physical planning	Promotion of national defence	Promotion of other objectives	Promotion of the general knowledge advancement
BKA	in €	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	in %	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BMI	in €	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	in %	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BMBWK	in €	138 759 165	7 620 681	1 565 843	2 007 658	112 495	216 956	1 859 201	38 417 656	18 038 112	4 846 884	982 254	-	451 697	62 639 728
	in %	*100.0*	*5.5*	*1.1*	*1.4*	*0.1*	*0.2*	*1.3*	*27.8*	*13.0*	*3.5*	*0.7*	-	*0.3*	*45.1*
BMSGK	in €	1 199 139	-	-	-	-	-	25 000	-	1 174 139	-	-	-	-	-
	in %	*100.0*	-	-	-	-	-	*2.1*	-	*97.9*	-	-	-	-	-
BMGF	in €	314 856	-	205 330	14 313	-	-	-	40 429	14 784	-	-	-	-	40 000
	in %	*100.0*	-	*65.3*	*4.5*	-	-	-	*12.8*	*4.7*	-	-	-	-	*12.7*
BMAA	in €	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	in %	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BMJ	in €	116 040	-	-	-	-	-	-	-	116 040	-	-	-	-	-
	in %	*100.0*	-	-	-	-	-	-	-	*100.0*	-	-	-	-	-
BML	in €	108 712	-	-	-	-	25 000	-	-	83 712	-	-	-	-	-
	in %	*100.0*	-	-	-	-	*23.0*	-	-	*77.0*	-	-	-	-	-
BMF	in €	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	in %	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BMLFUW	in €	4 044 997	413 193	2 543 874	90 734	40 500	-	14 877	107 160	444 974	134 973	19 057	-	82 084	153 571
	in %	*100.0*	*10.2*	*63.0*	*2.2*	*1.0*	-	*0.4*	*2.6*	*11.0*	*3.3*	*0.5*	-	*2.0*	*3.8*
BMWA	in €	20 213 997	96 000	99 365	14 833 131	854 539	697 555	-	3 100 186	177 292	313 809	-	-	-	42 120
	in %	*100.0*	*0.5*	*0.5*	*73.3*	*4.2*	*3.5*	-	*15.3*	*0.9*	*1.6*	-	-	-	*0.2*
BMVIT	in €	265 690 198	5 892 219	2 090 419	135 797 718	10 867 654	10 622 937	420 800	49 002 737	4 123 287	8 062 799	420 800	-	943 505	37 445 323
	in %	*100.0*	*2.2*	*0.8*	*51.0*	*4.1*	*4.0*	*0.2*	*18.4*	*1.6*	*3.0*	*0.2*	-	*0.4*	*14.1*
Total	**in €**	**430 447 104**	**14 022 093**	**6 504 831**	**152 743 554**	**11 875 188**	**11 562 448**	**2 319 878**	**90 668 168**	**24 172 340**	**13 358 465**	**1 422 111**	**-**	**1 477 286**	**100 320 742**
	in %	***100.0***	***3.3***	***1.5***	***35.5***	***2.8***	***2.7***	***0.5***	***21.1***	***5.6***	***3.1***	***0.3***	**-**	***0.3***	***23.3***

Status: April 2008

Source: Statistik Austria (Bundesanstalt Statistik Österreich)

1 i.e. including global subsidies for: Fonds zur Förderung der wissenschaftlichen Forschung, Österreichische Forschungsförderungsgesellschaft mbH, Ludwig Boltzmann Gesellschaft, Österreichische Akademie der Wissenschaften, Austrian Research Centers GmbH – ARC (total: € 342 398 639); agreed with the year-end closing of the federal government in 2006.

Table 11: Research promotion schemes and contracts awarded by the federal government in 2006, broken down by socioeconomic objectives and awarding ministries, analysis of the facts documentation by federal offices for 2006 (status: August 2007) excluding "major" global promotion schemes[1]

Ministries		Partial amounts in 2006	of which: Promotion of research on the earth, the seas, the atmosphere, and space	Promotion of agriculture and forestry	Promotion of trade, commerce, and industry	Promotion of energy production, storage and distribution	Promotion of transport, traffic and communication	Promotion of education	Promotion of health care	Promotion of social and socio-economic development	Promotion of environmental protection	Promotion of urban and physical planning	Promotion of national defence	Promotion of other objectives	Promotion of the general knowledge advancement
BKA	in €	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	in %	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BMI	in €	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	in %	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BMBWK	in €	81 360 327	1 636 734	1 520 523	584 622	94 367	144 444	1 804 817	18 912 210	13 718 748	4 784 021	167 378	-	138 553	37 853 910
	in %	*100.0*	*2.0*	*1.9*	*0.7*	*0.1*	*0.2*	*2.2*	*23.2*	*16.9*	*5.9*	*0.2*	-	*0.2*	*46.5*
BMSGK	in €	1 199 139	-	-	-	-	-	25 000	-	1 174 139	-	-	-	-	-
	in %	*100.0*	-	-	-	-	-	*2.1*	-	*97.9*	-	-	-	-	-
BMGF	in €	314 856	-	205 330	14 313	-	-	-	40 429	14 784	-	-	-	-	40 000
	in %	*100.0*	-	*65.3*	*4.5*	-	-	-	*12.8*	*4.7*	-	-	-	-	*12.7*
BMAA	in €	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	in %	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BMJ	in €	116 040	-	-	-	-	-	-	-	116 040	-	-	-	-	-
	in %	*100.0*	-	-	-	-	-	-	-	*100.0*	-	-	-	-	-
BML	in €	108 712	-	-	-	-	25 000	-	-	83 712	-	-	-	-	-
	in %	*100.0*	-	-	-	-	*23.0*	-	-	*77.0*	-	-	-	-	-
BMF	in €	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	in %	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BMLFUW	in €	4 044 997	413 193	2 543 874	90 734	40 500	-	14 877	107 160	444 974	134 973	19 057	-	82 084	153 571
	in %	*100.0*	*10.2*	*63.0*	*2.2*	*1.0*	-	*0.4*	*2.6*	*11.0*	*3.3*	*0.5*	-	*2.0*	*3.8*
BMWA	in €	341 007	96 000	-	67 500	-	2 000	-	-	97 800	35 587	-	-	-	42 120
	in %	*100.0*	*28.2*	-	*19.8*	-	*0.6*	-	-	*28.6*	*10.4*	-	-	-	*12.4*
BMVIT	in €	563 387	12 101	-	211 636	-	174 969	-	-	55 444	77 435	-	-	21 802	10 000
	in %	*100.0*	*2.1*	-	*37.6*	-	*31.1*	-	-	*9.8*	*13.7*	-	-	*3.9*	*1.8*
Total	**in €**	**88 048 465**	**2 158 028**	**4 269 727**	**968 805**	**134 867**	**346 413**	**1 844 694**	**19 059 799**	**15 705 641**	**5 032 016**	**186 435**	**-**	**242 439**	**38 099 601**
	in %	***100.0***	***2.5***	***4.8***	***1.1***	***0.2***	***0.4***	***2.1***	***21.6***	***17.8***	***5.7***	***0.2***	**-**	***0.3***	***43.3***

Status: April 2008

Source: Statistik Austria (Bundesanstalt Statistik Österreich)

[1] i.e. excluding global subsidies for: Fonds zur Förderung der wissenschaftlichen Forschung, Österreichische Forschungsförderungsgesellschaft mbH, Ludwig Boltzmann Gesellschaft, Österreichische Akademie der Wissenschaften, Austrian Research Centers GmbH – ARC (total: € 342 398 639).

Table 12: Research promotion schemes and contracts awarded by the federal government in 2006, broken down by science and awarding ministries, analysis of the facts documentation by federal offices for 2006 (status: August 2007) including "major" global promotion schemes[1)]

Ministries		Partial amounts in 2006	of which					
			1.0 Sciities	2.0 Technical sciences	3.0 Human medicine	4.0 Agriculture and forestry, veterinary medicine	5.0 Socialities	6.0 Humanities
BKA	in €	-	-	-	-	-	-	-
	in %	-	-	-	-	-	-	-
BMI	in €	-	-	-	-	-	-	-
	in %	-	-	-	-	-	-	-
BMBWK	in €	138 759 165	73 416 941	2 181 948	21 614 218	1 929 589	21 317 168	18 299 301
	in %	*100.0*	*52.8*	*1.6*	*15.6*	*1.4*	*15.4*	*13.2*
BMSGK	in €	1 199 139	-	-	-	-	1 199 139	-
	in %	*100.0*	-	-	-	-	*100.0*	-
BMGF	in €	314 856	42 663	11 650	15 000	230 759	14 784	-
	in %	*100.0*	*13.6*	*3.7*	*4.8*	*73.2*	*4.7*	-
BMAA	in €	-	-	-	-	-	-	-
	in %	-	-	-	-	-	-	-
BMJ	in €	116 040	-	-	-	-	116 040	-
	in %	*100.0*	-	-	-	-	*100.0*	-
BML	in €	108 712	-	25 000	-	-	83 712	-
	in %	*100.0*	-	*23.0*	-	-	*77.0*	-
BMF	in €	-	-	-	-	-	-	-
	in %	-	-	-	-	-	-	-
BMLFUW	in €	4 044 997	879 374	372 247	54 234	2 549 145	189 997	-
	in %	*100.0*	*21.7*	*9.2*	*1.3*	*63.1*	*4.7*	-
BMWA	in €	20 213 997	2 312 029	16 077 971	1 251 998	462 079	109 920	-
	in %	*100.0*	*11.4*	*79.6*	*6.2*	*2.3*	*0.5*	-
BMVIT	in €	265 690 198	70 935 580	145 966 827	29 783 189	5 421 018	4 579 255	9 004 329
	in %	*100.0*	*26.7*	*55.0*	*11.2*	*2.0*	*1.7*	*3.4*
Total	**in €**	**430 447 104**	**147 586 587**	**164 635 643**	**52 718 639**	**10 592 590**	**27 610 015**	**27 303 630**
	in %	***100.0***	***34.3***	***38.3***	***12.2***	***2.5***	***6.4***	***6.3***

Status: April 2008

Source: Statistik Austria (Bundesanstalt Statistik Österreich)

1 i.e. including global subsidies for: Fonds zur Förderung der wissenschaftlichen Forschung, Österreichische Forschungsförderungsgesellschaft mbH, Ludwig Boltzmann Gesellschaft, Österreichische Akademie der Wissenschaften, Austrian Research Centers GmbH – ARC (total: € 342 398 639); agreed with the year-end closing of the federal government in 2006.

Table 13: Research promotion schemes and contracts awarded by the federal government in 2006, broken down by science and awarding ministries, analysis of the facts documentation by federal offices for 2006 (status: August 2007) excluding "major" global promotion schemes[1)]

Ministries		Partial amounts in 2006	of which					
			1.0 Sciities	2.0 Technical sciences	3.0 Human medicine	4.0 Agriculture and forestry, veterinary medicine	5.0 Socialities	6.0 Humanities
BKA	in €	-	-	-	-	-	-	-
	in %	-	-	-	-	-	-	-
BMI	in €	-	-	-	-	-	-	-
	in %	-	-	-	-	-	-	-
BMBWK	in €	81 360 327	38 541 602	1 749 217	14 423 977	1 757 373	17 269 992	7 618 166
	in %	*100.0*	*47.4*	*2.1*	*17.7*	*2.2*	*21.2*	*9.4*
BMSGK	in €	1 199 139	-	-	-	-	1 199 139	-
	in %	*100.0*	-	-	-	-	*100.0*	-
BMGF	in €	314 856	42 663	11 650	15 000	230 759	14 784	-
	in %	*100.0*	*13.6*	*3.7*	*4.8*	*73.2*	*4.7*	-
BMAA	in €	-	-	-	-	-	-	-
	in %	-	-	-	-	-	-	-
BMJ	in €	116 040	-	-	-	-	116 040	-
	in %	*100.0*	-	-	-	-	*100.0*	-
BML	in €	108 712	-	25 000	-	-	83 712	-
	in %	*100.0*	-	*23.0*	-	-	*77.0*	-
BMF	in €	-	-	-	-	-	-	-
	in %	-	-	-	-	-	-	-
BMLFUW	in €	4 044 997	879 374	372 247	54 234	2 549 145	189 997	-
	in %	*100.0*	*21.7*	*9.2*	*1.3*	*63.1*	*4.7*	-
BMWA	in €	341 007	126 000	100 087	-	5 000	109 920	-
	in %	*100.0*	*36.9*	*29.4*	-	*1.5*	*32.2*	-
BMVIT	in €	563 387	53 903	454 040	-	-	55 444	-
	in %	*100.0*	*9.6*	*80.6*	-	-	*9.8*	-
Total	**in €**	**88 048 465**	**39 643 542**	**2 712 241**	**14 493 211**	**4 542 277**	**19 039 028**	**7 618 166**
	in %	***100.0***	***44.9***	***3.1***	***16.5***	***5.2***	***21.6***	***8.7***

Status: April 2008

[1] i.e. excluding global subsidies for: Fonds zur Förderung der wissenschaftlichen Forschung, Österreichische Forschungsförderungsgesellschaft mbH, Ludwig Boltzmann Gesellschaft, Österreichische Akademie der Wissenschaften, Austrian Research Centers GmbH – ARC (total: € 342 398 639).

Table 14: Research and experimental development (R&D) in 2005: an international comparison

Country	gross domestic expenditure on R&D in % of GDP	Financing of gross domestic expenditure of R&D by		Employees in R&D as full-time equivalents	Gross expenditure on R&D by			
		state	business		business sector	University sector	State sector	Private non-profit sector
		%			in % of gross domestic expenditure on R&D			
Belgium	1.86	24.7	59.7	53,517	68.0	22.3	8.4	1.3
Denmark	2.45	27.6	59.5	43,499	68.3	24.6	6.5	0.7
Germany	2.48	28.4	67.6	480,758	69.3	16.5	14.1 o)	. n)
Finland	3.48	25.7	66.9	57,471	70.8	19.0	9.6	0.6
France	2.13	38.2	52.5	357,327	62.6	18.6	17.6	1.3
Greece	0.51	47.0	31.0	33,958	31.0 p)	47.5	20.3	1.3
Ireland	1.26	32.0	57.5	16,690	65.5	27.1	7.4	0.7 c)1)
Italy	1.10	50.7	39.7	175,248	50.4	30.2 a)	17.3	2.1
Luxembourg	1.61	16.6	79.7	4,392	86.4	1.5	12.1	.
Netherlands	1.73 c)p)	36.2 2)	51.1 2)	89,535 c)p)	58.3 c)p)	28.1 2)	13.8 c)o)p)	. n)
Austria	2.43 5)	36.2 5)	45.7 5)	42,891 4)	67.8 4)	26.7 4)	5.1 4)	0.4 4)
Portugal	0.81	55.2	36.3	25,728	38.5	35.4	14.6	11.5
Sweden a)	3.89	23.5	65.7	77,704	74.1	20.9	4.7	0.3
Spain	1.12	43.0	46.3	174,773	53.8	29.0	17.0	0.1
United Kingdom	1.78	32.8	42.1	323,358 b)	61.6	25.6	10.6	2.2
EU 15 b)	**1.87**	**34.0**	**54.7**	**1,961,541**	**63.4**	**22.4**	**13.1**	**1.1**
Poland	0.57	57.7	33.4	76,761	31.8	31.6	36.4	0.3
Slovak Republic	0.51	57.0	36.6	14,404	49.9	20.4	29.7 d)	0.1
Slovenia	1.49	37.2	54.8	8,994	58.8	16.8	24.2	0.2
Slovenia	1.41	40.9	54.1	43,370 a)	64.5	16.4	18.7	0.5
Hungary	0.94	49.4 v)	39.5 v)	23,239	43.2 v)	25.2 v)	28.0 v)	.
EU 25 b)	**1.77**	**34.6**	**54.2**	**2,150,933**	**62.7**	**22.6**	**13.7**	**1.1**
Australia 3)	1.78	39.4 v)	53.0 v)	118,145	54.1	26.8	16.0	3.1
Iceland	2.78	40.5	48.0	3,226	51.5	22.0	23.5	3.0
Japan	3.33	16.8 e)	76.1	921,173	76.5	13.4	8.3	1.9
Canada p)	1.98	32.9 c)	47.9	199,060 c)3)	53.9	36.4	9.2	0.5
Korea g)	2.98	23.0	75.0	215,345	76.9	9.9	11.9	1.4
Mexico	0.50	45.3	46.5	89,398	49.5	27.4	22.1	1.0
New Zealand	1.17	43.0	41.3	23,178	41.8	32.5	25.7	.
Norway	1.52	44.0	46.4	30,492	53.7	30.7	15.6	.
Switzerland3)	2.90	22.7	69.7	52,250	73.7	22.9	1.1 h)	2.3
Turkey	0.79	50.1	43.3	49,251	33.8	54.6	11.6	.
United States j)p)	2.62	30.4	64.0 o)	,	69.7	14.1	12.0 h)	4.3
OECD total b)p)	**2.25**	**29.5**	**62.7**	**.**	**68.0**	**17.7**	**11.8**	**2.6**

Source: OECD (MSTI 2007-2), Statistik Austria (Bundesanstalt Statistik Österreich)

a) Break in the time series – b) Estimate by the OECD Secretariat (based on national sources). – c) National estimate, where necessary the OECD Secretariat has adjusted them to meet the OECD standards. – d) R&D expenditure on national defence not included. – e) Results of national surveys. Figures have been adjusted by the OECD Secretariat to fit the OECD standards. – g) Only science/engineering research. – h) Only federal or central government funds. – j) Excluding investment expenditure. – n) Included elsewhere. – o) Includes other categories as well. – p) Preliminary values. – v) Sum of components does not equal total.
1) 1997. – 2) 2003. – 3) 2004. – 4) Statistik Austria, Results of the survey on research and experimental development 2004. – 5) Statistik Austria, in accordance with global R&D estimate for 2008.
Full time equivalent – person year.

Table 15: FWF Science Fund: Approvals by research locations: New approvals in 2007[1)]

Research locations	Research projects	SFB project parts	FSP project parts	WK	International	Translation-al research	Richter pro-gramme	Mobility programme	Contribution to printing costs	Procure-ments	Total	%	START	Wittgen-stein	Firnberg	Impuls	Total	%
a) University research locations:																		
University of Vienna	91.9	7.0	6.0		4.0	2.1	7.0	16.0	8.0	5.0	147.0	21.65	3.0	1.0	4.0		8.00	25.81
University of Graz	26.8		3.0			1.2		6.0	5.0	2.0	43.9	6.46		1.0	1.0		2.00	6.45
University of Innsbruck	32.9		5.3		4.0	1.5	2.0	6.0	5.0		56.7	8.34	2.0		3.0		5.00	16.13
Medical University of Vienna	31.4	8.9	1.0		2.0	1.1	1.0	10.0			55.4	8.16			1.0		1.00	3.23
Medical University of Graz	6.8					0.7		3.0		1.0	11.4	1.68					0.00	0.00
Medical University of Innsbruck	18.0		1.0			2.9	1.0	2.0			24.9	3.67			1.0	2.0	3.00	9.68
University of Salzburg	21.1			0.9	1.0			3.0	2.0	1.0	29.0	4.27					0.00	0.00
Vienna University of Technol-ogy	33.3		4.0		1.0	5.2		12.0	1.0	1.0	57.4	8.46				2.0	2.00	6.45
Graz University of Technology	19.8		2.0			1.3		9.0			32.1	4.72			1.0		1.00	3.23
Montanuniversität Leoben	1.0							1.0			2.0	0.30	1.0				1.00	3.23
University of Natural Resources and Applied Life Sciences, Vienna	21.4				1.0	6.4		7.0		1.0	36.8	5.42					0.00	0.00
University of Veterinary Medi-cine Vienna	7.4		1.0			1.0		2.0			11.4	1.67			1.0		1.00	3.23
Vienna University of Econom-ics and Business Adminis-tration	2.0					1.0		4.0	1.0		8.0	1.18			1.0		1.00	3.23
University of Linz	15.5	1.0	5.4	0.8	1.0	3.6	2.0	1.0		2.0	32.3	4.76				1.0	1.00	3.23
University of Klagenfurt	1.7					1.0					2.7	0.40					0.00	0.00
Academy of Fine Arts											0.0				1.0		1.00	
Vienna University for Applied Arts						0.4					0.4	0.06					0.00	0.00
Graz University of Music and Performing Arts						1.0					1.0	0.15					0.00	
Vienna University of Music and Performing Arts	1.0										1.0	0.15					0.00	0.00
b) Extra-university research locations:																	0.00	
Austrian Academy of Sciences	30.2		1.3	0.2	1.0	1.5		3.0	13.0		50.2	7.39	1.0				1.00	3.23
Other research locations	35.9	2.2	5.0	0.1	2.0	7.3		10.0	12.0	1.0	75.5	11.11	1.0			2.0	3.00	9.68
Total	**398.0**	**19.0**	**35.0**	**2.0**	**17.0**	**39.0**	**13.0**	**95.0**	**47.0**	**14.0**	**679.1**	**100.00**	**8.0**	**2.0**	**14.0**	**7.0**	**31.00**	**100.00**

[1] Research projects performed jointly at several research locations have been valued pro rata. Schördinger grants are considered at the beneficiary's original research location.
[2] Schrödinger, Meitner, Richter Programme

Table 16: FWF Science Fund: Approvals by research locations (€ million) 2007 [1)]

Research locations	Research projects	SFB project parts	FSP project parts	WK	Interna-tional	Trans-lational research	Richter pro-gramme	Mobil-ity pro-gramme	Contribu-tion to printing costs	Pro-curement	Total	%	START	Wittgen-stein	NANO	Firn-berg	Im-puls	Total	%
a) University research locations:																			
University of Vienna	22.33	3.96	1.51	0.09	1.06	0.72	1.17	1.41	0.05	0.12	32.42	21.55	2.03	1.50		0.78	0.21	4.52	35.12
University of Graz	5.55	0.42	1.47	0.03	0.14	0.21		0.41	0.03		8.26	5.49		1.50		0.19		1.69	13.13
University of Innsbruck	7.61	0.50	1.02	0.00	0.62	0.37	0.41	0.70	0.05		11.28	7.50	1.28		0.01	0.56		1.85	14.37
Medical University of Vienna	7.78	6.35	0.32	0.05	0.54	0.14	0.22	0.66			16.06	6.2				0.19		0.19	3.0
Medical University of Graz	1.76	0.04	0.00		0.00	0.14	0.01	0.12		0.03	2.10	1.40			0.05			0.05	0.39
Medical University of Innsbruck	5.31	3.00	0.17	0.04		0.57	0.09	0.09			9.27	6.16				0.19	0.20	0.39	3.03
University of Salzburg	4.62	0.01	0.25	1.34	0.03	0.02	0.01	0.19	0.02	0.04	6.53	4.34				0.01		0.01	0.08
Vienna University of Technology	7.99	0.07	1.15	0.03	0.22	0.85		0.77	0.02		11.10	7.38	0.60		0.01	0.01		0.62	4.82
Graz University of Technology	4.21	0.03	0.57	0.04	0.01	0.22		0.45			5.53	3.68			0.01	0.18		0.19	1.48
Montanuniversität Leoben	0.20		0.02					0.06			0.28	0.19	0.60		0.01			0.61	4.74
University of Natural Resources and Applied Life Sciences, Vienna	5.41		0.29		0.17	1.67		0.40		0.03	7.97	5.30	0.15			0.01		0.16	1.24
University of Veterinary Medicine Vienna	2.16	0.01	0.11			0.24		0.18			2.70	1.79				0.18		0.18	1.40
Vienna University of Economics and Business Administration	0.33	1.70		0.01		0.26		0.15	0.01		2.46	1.63				0.18		0.18	1.40
University of Linz	3.86	1.00	1.44	1.29	0.25	0.77	0.30	0.10		0.03	9.04	6.01	0.60		0.02		0.11	0.73	5.67
University of Klagenfurt	0.52					0.20		0.06			0.78	0.52						0.00	0.00
Academy of Fine Arts											0.00					0.18		0.18	
Vienna University for Applied Arts	0.01					0.10					0.11	0.07						0.00	0.00
Graz University of Music and Performing Arts						0.23					0.23							0.00	
Vienna University of Music and Performing Arts	0.26										0.26	0.17						0.00	0.00
b) Extra-university research locations:																		0.00	
Austrian Academy of Sciences	7.12	0.04	1.85	0.01	0.38	0.38		0.32	0.11		10.21	6.79	0.48		0.01			0.49	3.81
Other research locations	7.02	2.46	1.44	0.15	0.48	1.61		0.62	0.09		13.87	9.22	0.62		0.01		0.20	0.83	6.45
Total	**94.05**	**19.59**	**11.61**	**3.08**	**3.90**	**8.70**	**2.21**	**6.69**	**0.38**	**0.25**	**150.46**	**100.00**	**6.36**	**3.00**	**0.13**	**2.66**	**0.72**	**12.87**	**100.00**

[1] Research projects performed jointly at several research locations have been valued pro rata. Schördinger grants are considered at the beneficiary's original research location.
[2] Schrödinger, Meitner, Bühler/Richter Programme and Schrödinger Return Programme

Table 17: FWF Science Fund: New and additional approvals for all grant categories in € million, 2005 – 2007 – autonomous sector

Grant category	2005				2006				2007			
	New approvals [1]	Additional approvals	Total	%	New approvals [1]	Additional approvals	Total	%	New approvals [1]	Additional approvals	Total	%
Research projects	59.00	3.57	62.57	58.00	77.20	2.97	80.17	58.72	90.97	3.08	94.05	62.51
Special research areas (SFBs)	17.14	0.84	17.98	16.67	17.95	0.63	18.58	13.61	18.90	0.69	19.59	13.02
National Research Networks (NFNs)	4.32	0.44	4.76	4.41	8.87	0.24	9.11	6.67	11.31	0.30	11.61	7.72
Post-graduate programmes (DKs)	5.41	0.14	5.55	5.15	11.42	0.18	11.60	8.50	2.76	0.32	3.08	2.05
Translational research	8.19	0.11	8.30	7.69	4.90	0.25	5.15	3.77	8.44	0.26	8.70	5.78
EURYI	0.62	0.02	0.64	0.59	0.83	0.00	0.83	0.61	0.00	0.00	0.00	0.00
Erwin Schrödinger Grants	2.04	0.30	2.34	2.17	2.85	0.15	3.00	2.20	3.34	0.26	3.60	2.39
International	2.01	0.05	2.06	1.91	2.60	0.06	2.66	1.95	3.67	0.23	3.90	2.59
Erwin Schrödinger Return Programme	0.32	0.04	0.36	0.33	0.00	0.02	0.02	0.01	0.00	0.01	0.01	0.01
Elise Richter Programme	0.00	0.00	0.00	0.00	2.27	0.00	2.27	1.66	2.15	0.06	2.21	1.47
Lise Meitner Programme	1.13	0.81	1.94	1.80	1.46	0.68	2.14	1.57	1.97	1.09	3.06	2.03
Charlotte Bühler Programme	0.53	0.06	0.59	0.55	0.09	0.01	0.10	0.07	0.00	0.02	0.02	0.01
Contribution to print costs	0.50	0.00	0.50	0.46	0.35	0.00	0.35	0.26	0.38		0.38	0.25
Procurement of international cooperation	0.28	0.01	0.29	0.27	0.55	0.01	0.56	0.41	0.24	0.01	0.25	0.17
Total:	**101.49**	**6.39**	**107.88**	**100**	**131.34**	**5.20**	**136.54**	**100**	**144.13**	**6.33**	**150.46**	**100**
	94.07%	**5.93%**	**100.00%**		**96.19%**	**3.81%**	**100.00%**		**95.79%**	**4.21%**	**100.00%**	

[1] including continuation of SFBs, NFNs and DKs.

Table 18: FWF Science Fund: New and additional approvals for all grant categories in € million, 2005 – 2007 – commissioned sector

Grant category	2005				2006				2007			
	New approvals	Additional approvals	Total	%	New approvals	Additional approvals	Total	%	New approvals	Additional approvals	Total	%
START	6.45	0.00	6.45	45.26	4.80	0.00	4.80	33.29	6.36	0.00	6.36	49.42
Wittgenstein	2.60	0.00	2.60	18.25	1.50	0.00	1.50	10.40	3.00	0.00	3.00	23.31
NANO Iniiative	2.90	0.00	2.90	20.35	0.88	3.83	4.71	32.66	0.00	0.13	0.13	1.01
Firnberg Programme	1.92	0.11	2.03	14.25	2.68	0.08	2.76	19.14	2.55	0.11	2.66	20.67
Impuls	0.27	0.00	0.27	1.89	0.65	0.00	0.65	4.51	0.72	0.00	0.72	5.59
Total:	**14.14**	**0.11**	**14.25**	**100**	**10.51**	**3.91**	**14.42**	**100**	**12.63**	**0.24**	**12.87**	**100**
	99.23%	***0.77%***	***100.00%***		***72.88%***	***27.12%***	***100.00%***		***98.14%***	***1.86%***	***100.00%***	

Table 19: FWF Science Fund: Approvals by scientific disciplines (€ million) 2005 – 2007 (autonomous sector)

Scientific discipline	2005		2006		2007	
Natural sciences	62.32	57.77%	78.91	57.79%	80.86	53.74%
Technical sciences	4.03	3.74%	5.71	4.18%	6.01	3.99%
Human medicine	19.64	18.20%	24.24	17.75%	30.40	20.21%
Agriculture and forestry, veterinary medicine	1.05	0.97%	1.57	1.15%	1.87	1.24%
Social sciences	4.92	4.56%	7.06	5.17%	12.92	8.59%
Humanities	15.92	14.76%	19.05	13.95%	18.40	12.23%
Total	**107.88**	**100.00%**	**136.54**	**100.00%**	**150.46**	**100.00%**

Table 20: FWF Science Fund: Approvals by scientific disciplines (€ million) 2005 – 2007 (commissioned sector)

Scientific discipline	2005		2006		2007	
Natural sciences	10.26	72.00%	13.10	90.85%	8.90	69.15%
Technical sciences	0.17	1.19%	0.20	1.39%	0.92	7.15%
Human medicine	1.64	11.51%	0.64	4.44%	0.85	6.60%
Agriculture and forestry, veterinary medicine	0.00	0.00%	0.05	0.35%	0.05	0.39%
Social sciences	0.34	2.39%	0.08	0.55%	0.59	4.58%
Humanities	1.84	12.91%	0.35	2.43%	1.56	12.12%
Total	**14.25**	**100.00%**	**14.42**	**100.00%**	**12.87**	**100.00%**

Table 21: FFG SURVES OF SCHEMES 2007, BROKEN DOWN BY ECONOMIC ACTIVITIES (NACE)
Allocation for the budget year = year the subsidy is decided and not when the contract is set up

Sector	NACE	No. of projects		Grants awarded in EUR 1,000	Percentage of subsidies		Cash value 2007 in EUR 1,000	Average cash value per project
		2007	2006		2007	2006		
Agriculture, hunting	1	8	9	993	0.3%	0.5%	720	90
Forestry	2	1	0	280	0.1%	0.0%	280	280
Fishing, operation of fish hatcheries and fish farms	5	1	0	6	0.0%	0.0%	6	6
Mining and quarrying	14	1	0	6	0.0%	0.0%	6	6
Manufacture of food products and beverages	15	18	25	2,698	0.9%	1.2%	1,269	70
Manufacture of textiles (without apparel)	17	7	3	1,610	0.5%	0.1%	790	112
Manufacture of wearing apparel	18	4	4	1,488	0.5%	0.7%	639	159
Tanning and leather processing	19	1	2	78	0.0%	0.0%	40	40
Manufacture of wood and of products of wood, except furniture	20	23	15	3,114	1.0%	0.9%	1,796	78
Manufacture of paper and paper products	21	9	11	1,253	0.4%	0.7%	761	84
Publishing, printing and reproduction of recorded media	22	0	1	0	0.0%	0.1%	0	0
Manufacture of coke, refined petroleum products and nuclear fuel	23	2	1	602	0.2%	0.1%	350	175
Manufacture of chemicals and chemical products	24	90	87	39,987	12.6%	15.8%	21,075	234
Manufacture of rubber and plastic products	25	47	27	9,072	2.9%	1.6%	4,585	97
Manufacture of glass and other non-metallic mineral products	26	24	25	6,544	2.1%	2.9%	3,765	156
Manufacture of basic metals	27	29	23	8,650	2.7%	2.1%	4,022	138
Manufacture of metal products	28	29	21	7,906	2.5%	1.3%	4,610	158
Manufacture of machinery and equipment	29	114	128	41,967	13.3%	12.9%	19,553	171
Manufacture of office, accounting and computing machinery	30	3	4	2,047	0.6%	1.0%	703	234
Manufacture of electrical machinery and apparatus	31	26	26	14,692	4.6%	2.5%	6,142	236
Radio, television and communication equipment and apparatus	32	65	72	50,040	15.8%	14.9%	24,472	376
Medical, precision and optical instruments, watches and clocks	33	116	110	42,712	13.5%	14.6%	21,339	183
Manufacture of motor vehicles, trailers and semi-trailers	34	39	36	21,436	6.8%	5.9%	11,064	283
Other transport equipment	35	18	15	8,135	2.6%	4.1%	4,646	258
Manufacture of furniture; jewellery, musical instruments, athletic equipment, toys etc.	36	10	12	1,778	0.6%	0.5%	1,048	104
Recycling	37	0	2	0	0.0%	0.1%	0	0
Electricity, gas, team and hot water supply	40	5	1	41	0.0%	0.0%	41	8
Collection, purification and distribution of water	41	0	1	0	0.0%	0.0%	0	0
Construction	45	48	42	5,034	1.6%	1.8%	3,261	67
Sale, maintenance & repair of motor vehicles & motorcycles; retail sale of autom. fuel	50	0	1	0	0.0%	0.0%	0	0
Retail sales, except sales of motor vehicles and petrol stations, repair	52	0	1	0	0.0%	0.1%	0	0
Land transport; transport via pipelines	60	3	7	9	0.0%	0.2%	9	3
Aeronautics	62	3	0	15	0.0%	0.0%	15	5
Real estate activities	70	0	1	0	0.0%	0.0%	0	0
Software	72	161	161	36,605	11.6%	10.6%	22,270	138
Research and development	73	52	10	1,984	0.6%	0.5%	1,568	30
Other business activities	74	12	12	1,373	0.4%	0.4%	1,373	114
Health and social work	85	2	1	129	0.0%	0.1%	129	64
Sewage and refuse disposal, sanitation and similar activities	90	25	26	4,047	1.3%	1.6%	2,316	92
Activities of membership organisations	91	0	1	0	0.0%	0.0%	0	0
TOTAL		**996**	**924**	**316,344**	**100.0%**	**100.0%**	**164,679**	**165**

* incl. guarantees, bonus payments, EU and state; including core programmes (e.g. OeNB, NATS, Brücke, Headquarter)

Table 22: FFG SURVES OF SCHEMES 2007, BROKEN DOWN BY ECONOMIC ACTIVITIES (NACE) BROKEN DOWN BY SPECIAL RESEARCH AREASnach zwei verschiedenen Systemen? (Wirtschaftstätigkeit oder Sonderbereiche)? Allocation for the budget year = year the subsidy is decided and not when the contract is set up (multiples allowed)

Special area	No. of projects		Grants awarded in EUR 1,000	Percentage of subsidies		Cash value	
	2007	2006		2007	2006	in EUR '000	in %
Biomedical technology	21	19	9,475	2.4%	2.1%	5,344	2.4%
Life sciences	62	57	29,374	7.6%	9.4%	16,339	7.4%
BRAIN construction industry	122	81	19,269	5.0%	3.2%	10,844	4.9%
BRAIN plastic industry	115	81	27,465	7.1%	6.8%	13,566	6.2%
EIP large joint project (formerly IP)	15	0	140	0.0%	0.0%	140	0.1%
EIP small joint project (formerly STREP)	55	0	315	0.1%	0.0%	315	0.1%
EIP Network of Excellence (NoE)	1	0	7	0.0%	0.0%	7	0.0%
EIP Research for SME Associations (Collective Research)	2	0	17	0.0%	0.0%	17	0.0%
EIP Research for SMEs (formerly CRAFT)	5	0	42	0.0%	0.0%	42	0.0%
Energy technology	31	35	7,784	2.0%	1.9%	4,434	2.0%
EU procurement costs, traditional	0	3	0	0.0%	0.0%	0	0.0%
EU procurement costs, new tools	0	3	0	0.0%	0.0%	0	0.0%
EU BMVIT clients	0	3	0	0.0%	0.0%	0	0.0%
EU cofinancing	3	1	211	0.1%	0.0%	211	0.1%
Feasibility	43	38	409	0.1%	0.1%	409	0.2%
Headquarters Strategy	32	21	21,980	5.7%	4.8%	21,980	10.0%
High Tech Start-up	11	0	4,835	1.3%	0.0%	2,578	1.2%
Timber research	30	32	6,244	1.6%	2.0%	3,645	1.7%
Food initiative	26	33	3,572	0.9%	1.3%	2,181	1.0%
Aeronautics	3	3	1,338	0.3%	1.3%	999	0.5%
Material sciences	136	131	46,114	11.9%	10.2%	22,861	10.4%
Microtechnology incl. nanotechnology	65	78	55,764	14.4%	15.3%	25,562	11.6%
Sustainable economy (BP)	15	29	2,612	0.7%	1.0%	1,642	0.7%
Aid for young talents	30	37	8,431	2.2%	1.3%	5,107	2.3%
NANO (core programmes excluding microtechnology)	18	23	6,070	1.6%	2.5%	2,671	1.2%
Start-up aid	96	79	26,474	6.8%	3.6%	14,426	6.6%
Technologies for the information society	0	1	0	0.0%	0.0%	0	0.0%
Technology transfer	1	0	285	0.1%	0.0%	285	0.1%
Environmental technology	20	39	3,787	1.0%	2.1%	2,012	0.9%
Transport/logistics	4	14	2,494	0.6%	1.0%	1,141	0.5%
Science – business	273	303	81,336	21.0%	23.0%	50,617	23.0%
Automotive suppliers	37	51	20,988	5.4%	6.9%	10,249	4.7%

* incl. guarantees, bonus payments, EU and state; including core programmes (e.g. OeNB, NATS, Brücke, Headquarter)

Table 23: FFG SURVES OF SCHEMES 2007, BROKEN DOWN BY ECONOMIC ACTIVITIES (NACE) BY AUSTRIAN STATE (PROJECT LOCATION)

Allocation for the budget year = year the subsidy is decided and not when the contract is set up

State	No. of projects**	No. of operations**	Total subsidies in EUR '000	Percentage of subsidies		Cash value	
				2007	2006	in EUR '000	in %
Abroad	7	7	305	0.1%	0.1%	217	0.10%
Burgenland	15	16	3,871	1.2%	0.7%	2,518	1.50%
Carinthia	71	46	31,645	10.0%	11.8%	14,908	9.10%
Lower Austria	115	107	21,706	6.9%	7.1%	13,187	8.00%
Upper Austria	226	171	81,144	25.7%	25.8%	38,674	23.50%
Salzburg	68	50	13,018	4.1%	5.6%	7,582	4.60%
Styria	192	159	74,555	23.6%	22.0%	36,824	22.40%
Tirol	67	60	16,579	5.2%	6.0%	9,605	5.80%
Vorarlberg	49	44	12,916	4.1%	3.2%	6,459	3.90%
Vienna	252	213	60,602	19.2%	17.6%	34,701	21.10%
TOTAL			**316,344**	**100.00%**	**100.00%**	**164,679**	**100.00%**

* incl. guarantees, bonus payments, EU and state; including core programmes (e.g. OeNB, NATS, Brücke, Headquarter)
** multiples allowed

Table 24: FFG SURVES OF SCHEMES 2007, BROKEN DOWN BY ECONOMIC ACTIVITIES (NACE)
FFG: Contracts signed in 2007 and payments on current projects

Area	Programme		2006	Contracts signed 2007			Payments 2007	
			Projects	Projects	Subsidies (incl. guarantees) [in € '000]	Cash value of the subsidies [in € '000]	Projects*	Funds paid out (subsidies and loans) [in € '000]
Aeronautics and Space Agency (ALR)	Austrian Space Applications Programme – ASAP		11	51	11,034	11,034	84	8,452
			11	**51**	**11,034**	**11,034**	**84**	**8,452**
Core programmes	Bottom up subsidies	core programme	841	891	280,347	128,599	1,727	187,799
		Programme line HEADQUARTER	21	35	22,900	22,900	49	16,923
	Bottom-up cooperation science – business – BRIDGE		84	69	13,199	13,199	134	8,521
	Focus SME innovation voucher			375	1,875	1,875	0	0
			946	**1,370**	**318,320**	**166,572**	**1,910**	**213,243**
European and international programmes	Procurement financing for science			192	891	891	125	354
				192	891	891	125	354
Structure programmes	Competence & excellence	K-ind/K-net industrial competence centres	13	11	10,876	10,876	36	23,638
		Kplus Competence centre programme	11	7	3,482	3,482	25	18,180
		COMET – Competence Centers for Excellent Technologies			First contracts signed 2008			0
	Cooperation & innovation	SELP – Subsidies for excellent leading projects		1	5,000	5,000	2	563
		Protect-net – technology transfer in business cooperations	12	1	143	143	27	1,176
		FHplus – Subsidies for R&D at universities of applied science	7		No call for submissions 2007		27	1,973
		Prokis – Support of coop. research institutions for SME services	4	11	9,266	9,266	28	3,678
		AplusB – companies formed from the academic area		5	10,385	10,385	15	3,844
		CIR-CE cooperations with Central and Eastern Europe	12	6	1,173	1,173	19	1,063
		EraSME – SME-related transnational cooperation		2	445	445	2	223
		REGplus – strengthening technology centres			No call for submissions 2007, discontinued		16	666
	Human potential	Brainpower –services for men and women in research			302	302		243
		wfFORTE – support for highly qualified women			365	365		251
		PUST – creating public awareness of research ("Long night of research", "Research creates jobs")	2		1,179	1,179	15	792
		FEMtech – support for women in research and technlology	8	10	437	437	24	414
			69	**54**	**43,053**	**43,053**	**236**	**56,702**
Thematic programmes	FIT-IT – information technology		39	25	8,811	8,811	79	8,000
	**GENAU		21		2,655	2,655	Payments by the Federal Ministry for Science and Research (BMWF)	
	Intelligent traffic systems and services (IV2S and follow-up programme IV2Splus		67	14	3,652	3,652	91	7,831
	KRAS – Austrian safety research programme		0	30	6,778	6,778	12	624
	Austrian NANO initiatives		17	35	5,384	5,384	57	4,348
	Sustainable Economic Management		48	29	3,312	3,312	123	5,588
	Energy of the future			Programme has begun, first contracts to be signed 2008				0
	TAKE-OFF – Austrian aeronautics programme		3	5	2,487	2,487	11	1,145
			195	**138**	**33,080**	**33,080**	**373**	**27,537**
FFG TOTAL			**1,221**	**1,805**	**406,378**	**254,630**	**2,728**	**306,289**

* 56% of projects that have received payments were approved before 2007
** Managed by the FFG but not formally transferred to the FFG