Austrian Research and Technology Report 2012

Report of the Federal Government to the Parliament (National Council) under Section 8 (2) of the Research Organisation Act, on federally subsidised research, technology and innovation in Austria

This 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 Economy, Family, and Youth (BMWFJ). It was written by Joanneum Research (JR), the Austrian Institute of Technology (AIT), the Centre for European Economic Research (ZEW) and with the participation of Statistics Austria.
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Imprint

Owners, Authors and Publishers:
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Federal Ministry for Transport, Innovation and Technology
Federal Ministry of Economy, Family and Youth
1010 Vienna

Designed and produced by
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Cover photos: © Svetoslav Sokolov – Fotolia.com

Printed by:
Gugler GmbH, 3390 Melk/Donau

Vienna, 2012

Preface

The Austrian Research and Technology Report 2012, as a government report pursuant to section 8 (2) of the Research Organisation Act (FOG), is devoted primarily to assessing the current challenges for national and international research and technology policy by analysing current developments and trends and presenting extensive data on research and development and other specific areas of focus.

In March 2011, the federal government adopted a research, technology, and innovation strategy entitled "Becoming an innovation leader: tapping potentials, increasing dynamism, creating the future" with the aim of making Austria an EU innovation leader by 2020. The recent anniversary of this decision is reason enough take a closer look at the initial results and Austria's progress, both at home and abroad. For this, we turn to analyses of Austria's position in current innovation rankings and their assessment, we compare the results to the areas of focus outlined in the RTI strategy, and we look at the measures already taken by the government ministries.

The growth trend of R&D in Austria continues. The positive trend of R&D expenditures is documented by the latest global estimate from Statistics Austria: Austria will spend €8.61 billion on research and development in 2012, an increase of 4.2% over the previous year. The federal government, which has been instrumental in increasing R&D expenditure in recent years, will provide a major share of some €2.87 billion or 33.3% in 2012 (up 8.5% from 2011). The business enterprise sector will contribute €3.84 billion or 44.6% of total R&D expenditure, up 2.2% year on year and thus more or less even with GDP growth. Compared to other countries, Austria's R&D intensity of 2.80% of GDP is just below Germany's (2.82%) and that of Finland, Sweden, and Denmark (at 3% each), placing it fifth in the EU-27.

This 2012 report focuses on innovations in the business enterprise sector, knowledge and technology transfer between the academic communities and industry, and the tertiary education system. It also examines the subject of innovation as the basis for improved performance and competitiveness through a broader understanding that goes beyond R&D expenditure. Austrian economic policies acknowledge the importance of entrepreneurial innovations through targeted funding. The percentage of firms that benefit from innovation-specific subsidies is higher in Austria than in any other EU country. The increasingly important and varied collaboration among the academic, research, and business communities and the implementation of the fruits of research by the business community has greatly intensified in Austria in the past decade – in part through diverse support programmes from the federal government.

Tertiary education as the foundation of a knowledge-based economy is another emphasis of the Austrian Research and Technology Report. Highly trained scientists and excellent infrastructures are key factors in the competitiveness and innovative capacity of a country. The past decade has seen improvement on this front, but this remains a challenge going forward.

The snapshot of current trends in research, technology, and innovation in Austria concludes with the latest evaluations and a comprehensive appendix listing the results of the last R&D survey in 2009.

Dr. Karlheinz Töchterle
Federal Minister of Science
and Research

Doris Bures
Federal Minister for Transport,
Innovation and Technology

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Executive Summary

The Research and Technology Report 2012 is a report by the Austrian federal government to parliament on the state and needs of research, technology, and innovation in Austria. Current data, findings, and assessments are used to identify key trends in the Austrian system of innovation and draw international comparisons in selected areas. This 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 Economy, Family, and Youth (BMWFJ). All input was discussed and agreed upon in inter-ministerial workgroups in which all offices were involved.

Global estimate of R&D expenditure in 2012

The latest global estimate from Statistics Austria (April 2012) projects total expenditures on research and development (R&D) in Austria of €8.61 billion in 2012. This represents an increase of €347 million or 4.2% (nominally) over the previous year and brings this year's R&D intensity to 2.80% of GDP. Taking into account the revised figures for the preceding years, we see a continued flattening of the growth curve in R&D intensity since the economic and financial crisis, which followed the strong, sustained upward trend in the years prior to the crisis.

The strongest growth rate – up 8.47% over the previous year – is seen in funding from the federal government, which will account for €2.87 billion in 2012. This means that the federal government is fuelling one-third of all spending on R&D in Austria.

The most important source of funds is the Austrian business enterprise sector itself, which provided €3.84 billion, or nearly 45% of all R&D expenditures. After a strong uptick of 5.28% in 2011, funding from the business enterprise sector will likely grow 2.18% in 2012 compared to the previous year. Although growth rates are now lower than in the very dynamic years before the crisis, it is now possible to see an end to the (relative) stagnation of the crisis years of 2008–2010 (during which R&D expenditure in the business enterprise sector grew by an average of only 0.61% per year).

Funds of €1.34 billion from abroad (primarily from foreign firms that contribute to the R&D spending of their Austrian subsidiaries) account for nearly 16% of research and development spending in Austria. Funding from this source is expected to rise 2.15% in 2012. The other sources ("federal states" and "other," which includes local governments, professional associations, social security institutions, etc.) play only a minor role in funding R&D in Austria.

On the international stage, Austria remains well above the R&D intensity of the EU-27 and exceeded the EU average of 2.00% in 2010 (the last year for which figures are available for international comparison). Finland, Sweden, and Denmark each have an R&D intensity of over 3%. Germany is at 2.82%, just above Austria, which has the fifth-highest R&D intensity in the EU-27.

R&D expenditure in Austria 2002–2009

The last global R&D survey conducted by Statistics Austria in 2009 makes it possible to identify certain R&D trends over the past decade. Overall, these trends paint a very positive and dynamic picture. Total R&D expenditure rose from € 4.68 billion (2002) to € 7.48 billion (2009), an increase of +60%. The higher education sector increased spending by +54% to € 1.95 billion (2009), the business enterprise sector by +63% to € 5.09 billion (2009). One factor in this growth in the business enterprise sector was a sharp expansion in the number of firms active in research, which rose +52% from 1,942 (2002) to 2.946 (2009).

Accompanying this expansion was an intensification of R&D efforts among firms active in research in Austria. In 2002, researching firms spent 1.6% of their total gross value added on R&D. By 2009, this figure had risen to 2.1%. This means that in Austria both the number of firms involved in research and the intensity with which they conducted that research increased sharply. Despite this considerable broadening of the research base in the business enterprise sector, R&D expenditure remains highly concentrated. The 3 firms with the highest R&D expenditures account for 17% of total R&D spending in the business enterprise sector, and a mere 38 firms account for a full 50% of spending. This high concentration of R&D expenditure is also found in other countries and is not unique to Austria. But it shows the enormous influence that a few "big players" exert on R&D in the business enterprise sector.

The business enterprise sector paid for two-thirds of its R&D activities with its own funds in 2009, while 22% came from abroad. The public sector funds 11% of R&D in the business enterprise sector, primarily by expanding the indirect (tax) subsidies for research. This makes Austria the European leader when it comes to funding for R&D in the business enterprise sector. By comparison, public-sector funding in the EU's most innovative economies ("*Innovation Leaders*") has fallen below 4% on average.

This trend can also be observed in a dramatic shift in how public subsidies are applied. The business enterprise sector garnered only 11% of overall public-sector R&D subsidies in 2002 but a full 21% in 2009. The percentage disbursed to the higher education sector fell accordingly from 74% in 2002 to 66% in 2009.

The number of people working in R&D grew +45% overall between 2002 and 2009 to 56,438 (FTE). By 2009, the overall number of people working in R&D had risen to 15,059 in the higher education sector (+52% from 2002) and 38,303 in the business enterprise sector (+43%).

Implementation of RTI strategy

The Austrian federal government adopted a long-term framework for its research, technology and innovation strategy on 8 March 2011. Its objective was and still is to make Austria one of the most innovative countries in the EU by 2020. One expression of this objective is to raise the R&D intensity to 3.76% of GDP by 2020. The Austrian federal government remains committed to this objective and strives to continue the nation's positive trend of recent years and create the best possible conditions for the entire research and innovation system.

Austria in the Innovation Union Scoreboard (IUS)

Sweden, Denmark, Germany, and Finland are the group of "*Innovation Leaders*" in the current Innovation Union Scoreboard (IUS 2011). Austria is in 8th place (down from 7th in the IUS 2010), where it remains firmly in the top half of the group of "*Innovation Followers*" (along with Belgium, the UK, the Netherlands, Luxembourg, Ireland, and France) that rank 5th to 11th. This grouping has been quite stable for several years. Movements within this subgroup are not uncommon given the small differences separating the countries. A comparison of individual indicators confirms Austria's pattern of strengths and weaknesses already familiar from earlier scoreboards. The main weaknesses still lie in tertiary education and the availability of venture capital, while the strengths can be found in scientific output and R&D expenditure in the business enterprise sector. Austria is down in the indicators derived from the Community Innovation Survey (CIS), but this is attributable primarily to changes in the underlying conditions under which the survey was designed and conducted.

When it comes to using an indicator-based scoreboard, it is important to keep in mind that the IUS is designed and implemented with a focus on structural aspects. For this reason, many of the indicators measure a long-term perspective, so we should not necessarily expect policy measures to produce substantial, short-term improvements in the overall ranking. The IUS (like similar benchmark studies), on the other hand, seeks to highlight structural strengths and weaknesses for the purpose of gaining long-term perspectives.

To gauge Austria's position relative to the *Innovation Leaders*, the areas emphasised in the current RTI strategy have been matched to the corresponding IUS indicators. In general, one sees that Austria ranks among the elite when it comes to its R&D system. The composite index of "innovation and corporate research" shows Austria in proximity to the *Innovation Leaders*. This comparison also confirms Austria's need for improvement in the area of tertiary education.

European comparison of innovation in the business enterprise sector

An analysis of the Community Innovation Survey (CIS) shows that Austria is in a good (to very good) position compared to the other countries in Europe. The percentage of innovating firms in Austria is well above the EU-27 average, and the innovator ratio is consistently high throughout all sectors. Meanwhile, the structure of innovation spending with its strong emphasis on R&D points toward a "mature," modern innovation system with firms that are continually generating new ideas and bringing them to market in the form of new products and services. Austrian firms also have well-established innovation networks not only with their suppliers and customers but also with research organisations and academic institutions. Austrian economic policies have long acknowledged the important role of corporate innovations and used appropriate tools to encourage businesses to innovate. This is especially evident in the extraordinary reach of Austrian subsidies: innovation is encouraged "across the board." The percentage of firms that benefit from innovation-specific subsidies is higher in Austria than in any other EU country.

International comparison of patents as indicators of technological achievement

The dynamic development of the Austrian system of innovation in recent years is also reflected in patent statistics. Among European Patent Organisation member states, Austria ranks eighth in the volume of patents, with some 1,500 patent applications on average per year. Austria accounts for 2.8% of overall EU-27 patents within the European Patent Organisation. Austria's patent activity has shown a positive trend, with a continuous rise in the number of patent applications per million people since the mid-1990s. This growth has narrowed the gap to Germany and Sweden, two countries with a traditionally high level of patent activity.

Knowledge and technology transfer between academic and business communities

Smooth interaction between the academic and business communities is a key ingredient for a successful system of innovation. First of all, universities and government research institutions provide the scientific and technical foundation of innovations that firms then develop (or adapt) and introduce in response to market conditions. In addition, academic institutions often collaborate directly with firms on innovation projects, whether it's part of a joint research project or as a provider of specialised scientific and technical services. But above all, the academic community produces graduates that provide the business community with highly qualified personnel.

The partnership between Austria's academic and business communities has greatly intensified in the past decade. The R&D income that universities generate through commissions and joint ventures with the business community is up sharply and now accounts for over 5% of overall R&D spending by universities.

The number of spin-off companies founded by scientists has increased, as is the licensing income from patents held by universities. The share of firms that rely on the results of academic research for their innovation activities or that cooperate with universities is high compared to other countries. Overall, the transfer of knowledge and technology in Austria has reached a level similar to that found in the other technologically sophisticated industrialised nations. On the academic end, the greatest amount of knowledge and technology transfer is occurring at the medical and technical universities (including University of Leoben). On the business end, one sees academic expertise applied in all sectors, though the greatest integration of scientific knowledge into innovation activities can be found in industrial sectors with high R&D intensity.

The relationship between the academic and business community has intensified as a result of several developments. First, the expansion of R&D activities in the business enterprise sector has greatly increased the demand for partnerships with academic institutions. The increased number of firms conducting R&D is of particular relevance here. The conditions for collaboration in the academic sector have continuously improved as knowledge and technology transfer agencies have been established, IP management has been professionalised, and support centres for start-ups have been established. In addition, the subsidies offered by the federal government provide various types of support for partnerships between businesses and academic institutions.

Tertiary education system in Austria

A trend toward the intensification of knowledge in nearly all value-adding activities can be observed in every advanced economy. This leads to a growing demand for highly qualified specialists. The pool of well-trained experts is a key factor impacting competitiveness and innovative capacity – both at a company level and in the economy as a whole. This trend presents enormous challenges for the entire education system, which must generate human capital and relevant specialised competences. These challenges range from early funding to advanced academic or scientific qualifications.

There has been tremendous growth in the number of people working in R&D at universities. Worthy of special note is the 71% increase in assistants (including other scientific personnel) between 2002 and 2009 (from 4,551 to 7,620 in absolute numbers). The result has been a higher concentration of young people in the age structure, which is especially pronounced in the natural sciences and engineering studies. This growth in scientific human resources at the universities has been made possible primarily by an expanded number of employees paid for through third-party funding (i.e., R&D personnel not funded through the global budget). The percentage of such personnel had already exceeded 42% by 2009 and included both publicly funded third-party funding (through the Austrian Science Fund, for example) and those funded through the private sector.

1 Current trends

1.1 Trends in R&D expenditure in Austria – Results of the global estimate for 2012

According to Statistics Austria's current global estimate of April 2012, the expenditures for research and development carried out in Austria in 2012 will amount to € 8.61 billion. This is an increase of € 347 million or 4.2% over 2011. It corresponds to an R&D intensity (gross domestic expenditures for research and development in relation to gross domestic product) of 2.80%.

According to the current estimates for recent years, the R&D intensity for 2011 was estimated at 2.74%[1]; in 2010, the rate was 2.79%. Figure 1 shows the development of the R&D intensity as well as the absolute contributions from individual sources of funds. The rapid rise in Austria's R&D intensity flattened clearly after 2008/2009 due to the financial and economic crisis. Due to slower growth in R&D expenditures, the influence of the business cycle is now more noticeable. This particularly applies to 2011, a year in which GDP growth was significantly higher than originally anticipated and therefore slightly reduced Austria's R&D ratio, despite the continuously increasing R&D expenditure.

If we take a look at the individual sources of funding, we see the following situation, based on existing data and estimates (see Table 1):
Of the entire forecasted R&D expenditure for 2012, Austrian firms will bear the largest share of funding at nearly 45% (approximately € 3.84 billion). Funding from the domestic business enterprise sector is expected to increase by 2.18% after a very slight rise during the crisis years (0.61% annually between 2008 and 2010) and a strong increase in 2011 (5.28%).

R&D funding from the public sector reached its highest level ever in 2012 at € 3.38 billion and a 39.3% share of overall R&D funding. The federal government will contribute about € 2.87 billion (+8.47% over 2011), with the regional governments contributing about € 411 million (+1.82% over 2011). Other sources of funding (such as municipalities, chambers and social insurance institutions) play a minor role in Austrian R&D funding.

Table 1: Growth rates in R&D expenditure in Austria by funding source

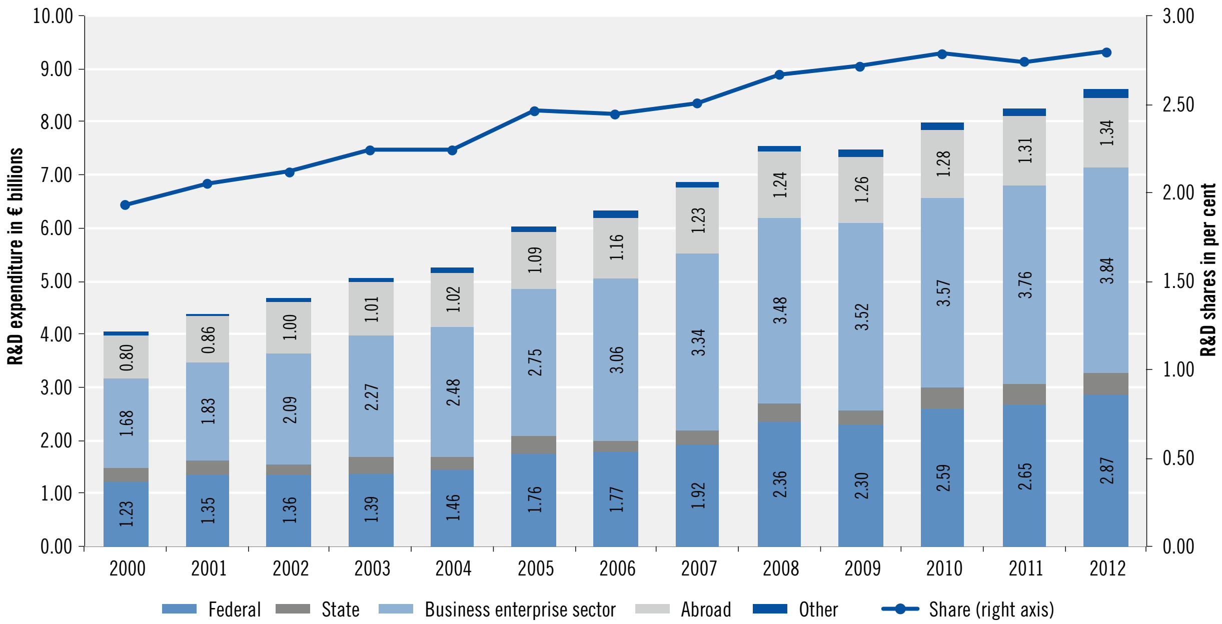
	Average annual rates of growth			
	2000–2008	2008–2010	2010–2011	2011–2012
Federal	8.52	4.76	2.30	8.47
States	4.54	6.93	-0.39	1.82
Business enterprise sector	9.50	1.30	5.28	2.18
Abroad	5.64	1.69	2.15	2.15
Other	6.45	9.19	3.86	3.86
R&D expenditure	8.16	2.85	3.50	4.20
GDP	3.88	0.61	5.28	2.18

Source: Statistics Austria, Global Estimate 25 April 2012

Austria received a total of € 1.34 billion in R&D funding from abroad in 2012. The majority of funding from abroad came from foreign firms, with a solid portion from multinational corporations that have subsidiaries conducting R&D in Austria. Foreign funding also includes returns

1 The Global Estimate for 2011 still assumed an R&D intensity of 2.79% for 2011. The deviation from the available data is a result of high GDP growth in 2011, which was much stronger than originally assumed.

Fig. 1: Research and development in Austria by funding source



Source: Statistics Austria, Global Estimate of 25 April 2012

from the EU Framework Programmes for Research, Technological Development and Demonstration.

The financial and economic crisis caused a shift in R&D funding structures toward the public sector (especially as regards federal government financing). This becomes particularly clear if we examine the widening gap in growth rates among the individual sources of funding (see Fig. 2, which combines public funding from federal, state and other governmental sources into one source of funds). Since the beginning of the economic crisis, public financing of R&D expenditures has grown much more rapidly than other sources of funding.

The funding structure for research and development in Austria is nevertheless close to the general target for research and technology policy in the European Union, namely a rough distribution of one-third public, two-thirds private funding. About 60% of Austrian research and development is funded by the industry sector (business enterprise sector plus foreign funding) (see Fig. 3).

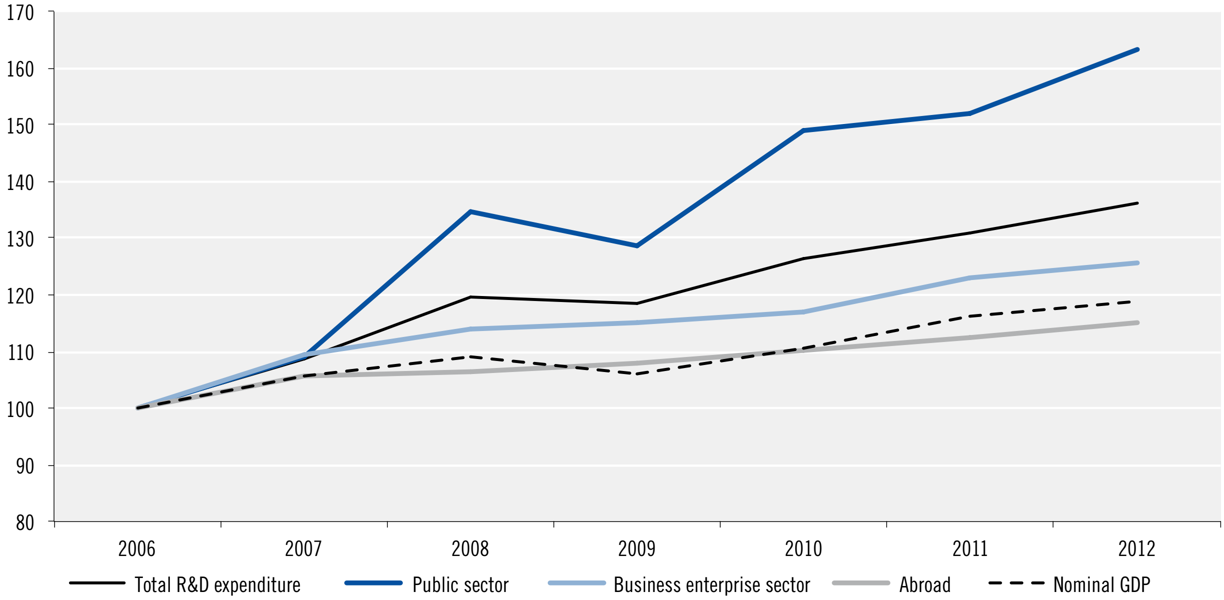
International comparison of R&D intensity

Starting from a clearly below-average R&D intensity in the 1980s (1.1% of GDP in 1981, compared to an EU 15 average of 1.64%), Austria has continuously increased the rate, doing so at an especially rapid rate since 1995; Austria exceeded the EU 15 average in 1998 (1.83% at that time). Austria has also been above the average of the OECD states since 2004.

Austria had one of the highest growth rates between 2000 and 2010 at +0.82 percentage points (from 1.92 to 2.76 %[2]). Only Denmark (+0.88 percentage points) and Portugal (+0.86 percentage points) reported higher (absolute) growth in research intensity. The group of European coun-

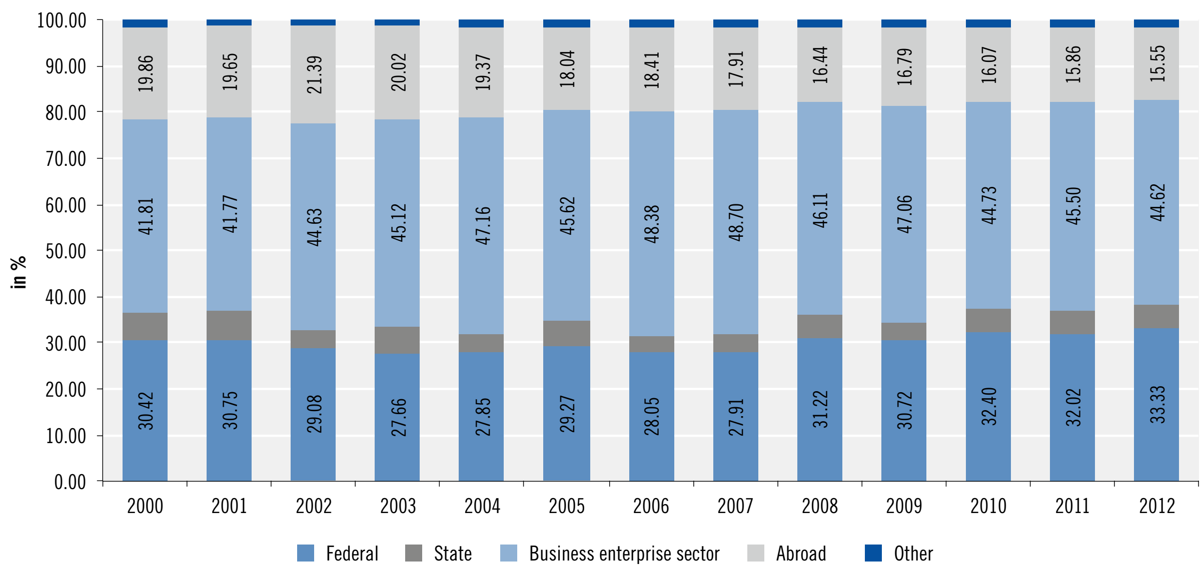
2 The OECD used 2.76% for 2010, which was slightly different than Statistics Austria's 2.79%; the differences are very minimal and are due to revisions in the data.

Fig. 2: Development of R&D in Austria by funding source (Index, 2006=100)



Source: Statistics Austria, Global Estimate 25 April 2012

Fig. 3: R&D funding share in Austria by funding source (in %)



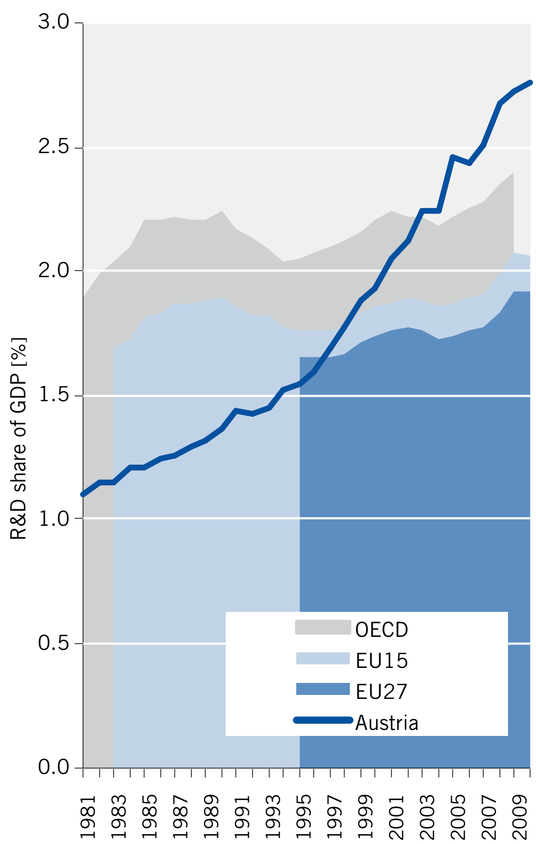
Source: Statistics Austria, Global Estimate 25 April 2012 tries with the highest R&D intensities includes Finland (3.87%), Sweden (3.43%), Denmark (3.06%), Germany (2.82%) and Austria (2.76%).

1.2 Trends in RTI policy

1.2.1 Trends at the national level

The Austrian federal government adopted a long-term framework for its research, technology and innovation strategy on 8 March 2011.[3] Its objective was and still is to make Austria one of the most innovative countries in the EU by 2020. One of the markers of this objective is to increase the R&D intensity to 3.76% of GDP in 2020. The Austrian federal government is still committed to this target, yet emphasises that the government's scope of action must be viewed against the backdrop of the international financial and economic crisis. The required budget consolidation measures will not facilitate in the medium term the kind of dynamism that the public sector has enjoyed in the very successful developments of recent years.

Fig. 4: Development of R&D expenditures as a percentage of gross domestic product by country



	2000	2010	Δ(2010-2000)
Belgium	1.97	1.99	+ 0.02
Denmark	2.18 (1999)	3.06	+ 0.88
Germany	2.47	2.82	+ 0.35
Finland	3.35	3.87	+ 0.52
France	2.15	2.26	+ 0.11
Greece	0.61 (1999)	0.60 (2007)	- 0.01
United Kingdom	1.81	1.77	- 0.04
Ireland	1.11	1.79	+ 0.68
Italy	1.04	1.26	+ 0.22
Netherlands	1.94	1.83	- 0.11
Norway	1.64 (1999)	1.69	+ 0.06
Austria	**1.93**	**2.76**	**+ 0.82**
Poland	0.64	0.74	+ 0.09
Portugal	0.73	1.59	+ 0.86
Sweden	3.58 (1999)	3.43	- 0.16
Slovak Republic	0.65	0.63	- 0.02
Spain	0.91	1.37	+ 0.47
Czech Republic	1.17	1.56	+ 0.40
Hungary	0.81	1.16	+ 0.35
EU27	1.74	1.91	+ 0.17
EU15	1.85	2.06	+ 0.21
Canada	1.91	1.80	- 0.11
Japan	3.04	3.36 (2009)	+ 0.32
Switzerland	2.53	2.99 (2008)	+ 0.46
USA	2.71	2.90 (2009)	+ 0.19
OECD	2.20	2.40 (2009)	+ 0.20
China	0.90	1.70 (2009)	+ 0.80

Source: OECD (MSTI), calculations by Joanneum Research

3 RTI Strategy (2011)

Nevertheless, for a highly developed national economy such as Austria's, and against the background of increasing international competitive pressure and major socioeconomic and environmental challenges, there is no alternative to the further strengthening of research, development and innovation. Improving competitiveness and securing prosperity will require – as the group of Innovation Leaders demonstrates – a powerful basis in research and adequate structures that guarantee an effective and coordinated deployment of public monies, as well as increased commitment from the private sector.

For this reason, the RTI strategy is being implemented at multiple levels and pursues a comprehensive approach that does not only target funding for science and technology. The RTI strategy's broad perspective systematically covers all relevant policy fields and creates a coherent set of conditions that enable the best possible utilisation of potential. It is becoming particularly clear that a coordinated policy approach is needed at the European level, where new supranational control mechanisms call for new concepts and approaches at the national level.

To facilitate the systematic implementation of the RTI strategy, in 2011 the **RTI Task Force** was established at a high administrative level under the oversight of the Federal Chancellery together with the Federal Ministry of Finance, the Federal Ministry for Transport, Innovation and Technology, the Federal Ministry of Science and Research, the Federal Ministry of Economy, Family and Youth, and the Federal Ministry for Education, Arts and Culture. The Task Force was deployed as a coordinating instrument that enables strategic, system-oriented coordination between the ministries. It meets four to five times a year and has already proven its worth in its first year as an effective coordination instrument.

Its first step was to assess all of the measures in the RTI strategy and their actual implementation status.

Because several measures include activities from various ministries, these activities were bundled into inter-ministerial working groups. The second step was to set up nine working groups in specific, important areas at the end of 2011. These working groups evaluate existing measures, develop new instruments on an as-needed basis, and work together on blocks of activities that require coordination. The inclusion of external stakeholders and experts can support these processes as needed. All of the working groups report the results of their deliberations to the Task Force. One new feature is cooperation on priority topics established by the federal government in the RTI strategy: "climate change and scarce resources" and "quality of life and demographic change". These two working groups focus especially on bundling specific research-related activities in all ministries to create a stronger focus. The other seven working groups handle measures in the areas of: human potential, research infrastructures, knowledge transfer and start-ups, business enterprise research, the international and European dimensions of research agendas, and international rankings.

The Austrian Council for Research and Technology Development (RFTE) also has an additional function in the implementation of the RTI strategy. As a consulting body for the federal government, it delivers an assessment of whether the measures taken are appropriate for reaching the RTI strategy targets. This assessment is submitted to the Parliament (National Council) as an appendix to the Austrian Research and Technology Report.

It is obvious that the implementation of an RTI strategy focuses, in addition to monetary actions, primarily upon measures that will effect structural changes that often have longer-term periods of efficacy and the effects of which are difficult to analyse in the short term. Competitive intensity, for example, has major importance for the innovative potential of a national economy. In January 2012, the Federal Ministry of Economy, Family and Youth (BMWFJ) and Federal Ministry of Justice (BMJ) introduced a reform of laws governing competition and cartels that strengthens the role of government agencies and increases transparency. These measures will have positive effects on competition in Austria and thereby also serve as a stimulus for more innovation. The effects resulting from these measures are of a long-term nature.

The Austrian federal government views the priority of research and development in the context of two necessary actions:

1 The continuation of those measures and funding schemes that were implemented in the past and that have proven to be successful and effective. These measures have become an integral component of the Austrian innovation system and represent important stages in the attainment of the RTI strategy's targets. The following chapters of the Austrian Research and Technology Report 2012 provide an overview of a few of these measures and programmes.
2 The Austrian federal government, however, has also initiated new measures that are briefly discussed in the following sections of the report.

The Austrian federal government has decided to continue all proactive measures in the R&D sector for the entire duration of the funding framework. These include:

- € 80 million each year for the higher education sector;
- Increase the total amount for universities by an additional € 750 million for the performance agreement period 2013–2015;
- Raise the research premium from 8 to 10%;
- Increase the ceiling of the research premium for the acquisition of R&D from € 100,000 to 1 million.

Human potential

Well-trained people constitute the basis for every innovation system and are a prerequisite for the development of new knowledge as well as the ability to adequately utilise, adapt and apply new knowledge. This area is therefore an essential core element of RTI strategy, particularly as a comparison with other countries shows that Austria must catch up in this area. The Austrian innovation system faces two challenges here:

1 The number of university graduates in the subjects of mathematics, information technology, natural sciences and technology (MINT) must be increased to counteract the shortage of trained staff in these disciplines. The Federal Ministry of Science and Research (BMWF) is investing additional funds in 2011/2012 to strengthen the MINT subjects within a pro-active funding programme for MINT and well-attended subjects in the amount of € 40 million.
2 It is very important to increase permeability in both secondary levels I and II, as well as in the tertiary education area. The quality of school education is an essential prerequisite for offering pupils better opportunities to develop their individual strengths.

The Austrian federal government has already set important priorities and decided upon successful measures in the past. Chapter 5.2 provides an overview of funding programmes that already exist for the area of human potential. Some of the new measures that have been developed quite recently for this area include:

- Young Science

The advisory service agency Young Science (www.youngscience.at) combines information with contacts to all of the programmes that the Federal Ministry of Science and Research (BMWF) offers as pre-university aid for young talents. The objective of the initiative is to significantly intensify cooperation between the secondary and tertiary education systems and to promote direct contacts between pupils and universities, universities of applied sciences and research institutions. The long-term goal of this innovation platform is to build a Young Science network that facilitates regular exchange among institutions of higher education and interested teachers. Young Science is supervised by the Austrian Academic Exchange Service (OeAD).

- FEMtech internships

The Federal Ministry for Transport, Innovation and Technology (BMVIT) announced its first ever FEMtech internships for female students in 2011 (www.ffg.at/femtech-praktika). FEMtech internships offer prestigious internship placements for female students at firms and non-university research institutions in the natural sciences and engineering. Students have the opportunity to become familiar with professional career paths, and they receive a profound insight into applied research and development. An internships lasts between one and six months, and funding amounts to € 2,100 per internship.

- Research expertise for industry

The Federal Ministry of Economy, Family and Youth (BMWFJ) started the "Research expertise for industry" initiative (www.ffg.at/Forschungskompetenzen) in 2011, establishing a measure against staff shortages in the R&D sector. The programme uses structural funding measures to support business enterprises in the systematic establishment and further education of existing research and innovation staff. There is a focus here on small and medium-sized firms (SMEs). Furthermore, the programme is meant to support cooperation between firms and tertiary research institutions and to lead to stronger anchoring of research priorities that are relevant to businesses. A total of € 10 million (2011/2012) was assigned to three programme lines: training seminars, training networks and educational events with a tertiary character.

Research and technology

- IST Austria

The opening of the campus of the Institute of Science and Technology Austria (IST Austria – www.ist.ac.at) in June 2009 established a top research institute in Austria that works at the intersection of computer science, evolutionary biology, cellular biology and biophysics. A total of 20 research groups were active at the beginning of 2012, and 200 employees work at IST Austria. An agreement between the federal government and the state of Lower Austria under Article 15a of the Austrian constitution to extend the funding beyond 2016 was announced in February 2012. The agreement's objective is to fully expand IST Austria to 90-100 research groups and around 1,000 scientific employees in the world's top echelon of basic-oriented research by 2026. The federal government will fulfil its obligations by providing from 2017 to 2026 a total amount of € 988 million for expenses arising from the fulfilment of tasks associated with IST Austria. Of this total amount, two-thirds should be viewed as a global amount, with one-sixth dependent on the attainment of research-related quality criteria and one-sixth on the acquisition of third-party funding. This should enable the full expansion of IST Austria. Lower Austria has budgeted for funds in the total amount of € 368 million between 2012 and 2026 for infrastructure, buildings and operations on campus. This will facilitate the attainment of the necessary conditions for the successful and long-lasting further development of IST Austria, the implementation of which is linked with regular evaluations.

- Austrian Institute of Technology (AIT)

In 2008 and 2009, AIT (Austrian Institute of Technology – www.ait.ac.at) was reorganised and strategically repositioned to further develop AIT into a leading high-tech research centre with European dimensions for Austria. This was accompanied by a simplification of ownership structure, which is currently comprised of industry and the Federal Ministry for Transport, Innovation and Technology (BMVIT) as the federal representative, as well as the conclusion of a new ownership contract that defines the roles and objectives of the business enterprise. The strategic future partnership between industry and the BMVIT was reaffirmed in November 2011 and extended to 2017. A central measure for fulfilling these requirements was the reorganisation of AIT into five departments. The career model newly introduced in 2011 can lead to careers in industry or at universities. Additional steps in the direction of international profile include the establishment of an international scientific board supporting the Supervisory Board, and international peer review evaluations for the AIT's five departments, which took place for the first time in 2012. These peer evaluations will take place every three years in future. AIT was able in recent years to become active in the European and – to an increasing extent – international market for research and science. The growing presence in the Asian market also testifies to this development.

- Austrian Cooperative Research (ACR)

A general "ACR+" strategy was developed for the research institutions brought together for cooperative purposes into the ACR association (Austrian Cooperative Research – www.acr.at). This strategy is driving forward networking and cooperation among research institutes. Important results include general accounting guidelines and the establishment of cooperation fields for specific topics. The ACR+ process should continue until the end of 2015.

- Austrian Academy of Sciences (ÖAW)

The structural reform of the ÖAW (www.oeaw.ac.at) continued in 2011 with collective efforts toward the objective of strengthening research institutions so that their position as the largest non-university institution for excellent basic research can be further expanded at an internationally competitive level. The ÖAW prepared a development plan for this purpose and concluded a performance agreement with the Federal Ministry of Science and Research (BMWF).

Innovation

- Innovation-friendly public procurement

Promoting innovation and efficiently deploying public funds – this is the goal of the strategic concept which the council of ministers decided in 2011 to prepare on the subject of public procurement that supports innovation. The public authorities, acting on the initiative of the Federal Ministry of Economy, Family and Youth (BMWFJ) and the Federal Ministry for Transport, Innovation and Technology (BMVIT), will in future increasingly demand in their role as customer innovative products. This is meant to support the development of such products and to improve infrastructures in Austria while also saving costs related to energy, materials and administration. A pilot programme was announced in October 2011 in Austria for research on transportation infrastructure, using the "pre-commercial procurement" instrument for the first time. The BMVIT together with procurement institutions provided € 2 million for this new instrument.

- Enterprise formation and venture capital

All international comparisons as well as the Innovation Union Scoreboard have identified a problem in the Austrian innovation system: the scarcity of venture capital, especially for enterprises in their early stages. This led the public authorities to initiate several venture capital initiatives in 2011 that offer a stronger incentive for private investors with a fund-of-funds model. Public funds of more than € 20 million and additional capital of at least the same amount are being invested in young, innovative enterprises in the next two to three years.

- Knowledge transfer: national contact point for intellectual property rights

The collective aim of the Federal Ministry of Science and Research (BMWF), the Federal Ministry of Economy, Family and Youth (BMWFJ) and the Federal Ministry for Transport, Innovation and Technology (BMVIT) is to promote and further expand publicly funded research in the business world. A national contact point (www.ncp-ip.at) was established for this purpose within the Federal Ministry of Science and Research (BMWF) to function as a hub of knowledge transfer, using targeted measures to strengthen cooperation between science and business, to support universities in the professional handling of intellectual property rights, and to represent Austria in European committees. The contact point also offers support for Austrian universities (IPAG – Intellectual Property Agreement Guide) as well as workshops and training for IP managers.

Governance and information

- Setting priorities

HORIZON 2020 links Austrian RTI policy tightly to objectives at the European level, thereby positioning Austria as an active partner in European innovation and research. In order to strengthen compatibility with solutions to global societal challenges (*Grand Challenges*), the Austrian federal government has defined climate change, resource scarcity, quality of life and demographic change as priorities in its RTI policy. Initiatives in the field of these priority topics are coordinated intensively and collectively encouraged. In the field of climate change, for example, since 2011 there have been collective efforts made by three federal ministries (the Federal Ministry for Transport, Innovation and Technology (BMVIT), the Federal Ministry of Economy, Family and Youth (BMWFJ) and the Federal Ministry of Agriculture, Forestry, Environment and Water Management (BMLFUW)) to promote "electromobility in and from Austria". Measures include research on new mobility systems and renewable energy sources and extend to targeted education, infrastructure, location and industry policy. Austria's Joint Programming Initiative (JPI) is also a programme noteworthy for its support of international research cooperation within Europe (see also the remarks in Chapter 1.2.2 of this report).

- Managing priorities

The question of how efficiently, transparently and effectively public funds are awarded is also central to the implementation of the RTI strategy. This is why the Federal Ministry for Transport, Innovation and Technology (BMVIT) and the Federal Ministry of Economy, Family and Youth (BMWFJ), as the owner and representative of the Austrian Research Promotion Agency (FFG), worked in such a focused manner on the simplification and standardisation of direct research funding (see also the remarks in Chapter 1.6.1 of this report).

- Catalogue of R&D performing units

The "Catalogue of R&D performing units", which will be published on the Statistics Austria website by mid-2012 at the latest, represents a contribution to improving access to information about institutions performing R&D and to facilitating access to stakeholders in science and research. "Catalogue of R&D performing units" is a web version of the list of research locations which was last published in paper form in 1994 and lists all institutions that are engaged in R&D and that have agreed to participate in an R&D statistics survey every two years. The current data relies on the R&D survey 2009 and includes about 3000 entries. The next update is planned for 2013 on the basis of the 2011 R&D survey data.

- Research infrastructure

Strengthening the international competitiveness of Austria's higher education sector will require even more cooperation among the universities, with coordinated prioritisation and targeted image management, as well as better utilisation of resources. The research infrastructure projects financed by the public authorities since 2001 successfully strengthened joint research priorities between universities and within universities. The Federal Ministry of Science and Research (BMWF) has had a database since 2011 that tracks the current portfolio of research infrastructure at universities (over € 100,000 in procurement costs). This database provides the foundation for upcoming performance agreement negotiations that will support the implementation of the Austrian University Plan. The research infrastructure of the Academy of Sciences and of the universities of applied sciences shall also be surveyed with an eye towards the integration of other non-university research institutions or firms. In order to provide active support in future for specific inter-university cooperation projects, there is now an opportunity as of 2012 to exchange infrastructure data with other universities on an interactive platform, thereby expanding on efficient joint infrastructures (see also the remarks in Chapter 5.3 of this report).

- Major research infrastructure

At the international level, the ESFRI Roadmap, which is a list of (major) research infrastructures with European significance and funding, provides a certain guideline for future developments. Austria is currently involved in seven of these projects and aims to begin operations with an eighth project, the BBMRI biomedical database, a Europe-wide centre in Graz, by the end of 2012. Additional projects are currently being evaluated and may materialise, given prioritisation and funding from cooperation partners (see also Table 68 in the tables appendix, with its listing of Austrian participation in the ESFRI Roadmap 2012).

- Office of Science and Technology (OST), Peking

The Office of Science and Technology was established at the Austrian embassy in Peking (OST Peking) on 1 January 2012. OST Peking is a joint initiative of the Foreign Ministry (BMeiA), the Federal Ministry of Science and Research (BMWF), the Federal Ministry of Economy, Family and Youth (BMWFJ) and the Austrian Economic Chambers (WKO). Much like the previously established OST at the Austrian embassy in Washington, this institute supports research and technology cooperation and offers advice on questions related to research and technology policy. Furthermore, the OST will be tasked with stimulating technology transfer, assisting with access to technological and research institutions, and providing on-site assistance to Austrian researchers.

Outlook

Even if increases in public R&D expenditures are not as dynamic as they were in previous years, both new and existing measures are nevertheless securing a level of funding that stands out in international comparison. The Austrian federal government is striving to perpetuate Austria's excellent development in recent years and to create the best possible conditions for the entire research and innovation system.

1.2.2 Trends at the European level

Motivations for reorienting the Framework Programme

The European Commission introduced its proposal for *HORIZON 2020*[4], a new Framework Programme for Research and Innovation, on 30 November 2011. This new programme will form the central basis for European research and innovation policy for the period from 2014 to 2020. The proposal's development proceeded from a comprehensive consultation process based on the initial findings of the *Common Strategic Framework*[5], which incorporated the positions of Member States[6] and contributions from various stakeholders.[7] An impact assessment was conducted in the summer of 2011, providing the basis for the definition of target indicators and evaluations processes for *HORIZON 2020*.[8] This was the basis for the preparation of the first draft of the Framework Programme by various Directorates General involved in research and innovation agendas, and the results will be coordinated with other agencies in the course of an internal commission consultation process.

4 European Commission (2011a)
5 European Commission (2011b)
6 Compare for example the Austrian position paper: BMWF (2010)
7 The documents on the results of the stakeholder consultation are available on the Horizon 2020 website at http://ec.europa.eu/research/horizon2020/index_en.cfm?pg=public-consultation
8 European Commission (2011c)

HORIZON 2020 therefore stands in the tradition of the previous seven Framework Programmes for Research and Technology Development, yet also includes essential parts of the previous *Competitiveness and Innovation Framework Programme (CIP)* and funding for the *European Institute for Innovation and Technology (EIT)*. Furthermore, a series of important modifications to the Framework Programme are being proposed that must be viewed in association with the organisational and programmatic reorientation of European research and innovation policy in the last three years.

The inauguration of the current Commission initiated not just a new perspective on Europe's future role and policy (see also the *Europe 2020* strategy[9]), but also a content-based reorientation of research and innovation policy based on the *Innovation Union* flagship initiative.[10] *Innovation Union* is one of seven flagship initiatives that the new EU Commission's *Europe 2020* strategy is driving forward. Its general thrust is also mirrored in the *HORIZON 2020* proposal.

The new content-based elements of European innovation and research policy include, along with an orientation towards a broadly conceived concept of innovation, an emphasis on societal challenges as an orientation aid for defining future priorities in research and innovation policy on one hand, and the intensification of multilateral cooperation between Member States for creating a European Research Area on the other.

The establishment of *European Innovation Partnerships*[11] in areas of central societal challenges takes into account the ambitious expectations of future research and innovation policy. Although the *European innovation partnerships* are still being tried out at present as a governance model for European policy coordination – the first pilot initiative on *Active and Healthy Ageing* is currently in an early implementation phase –, three further partnerships have been initiated in *Water-Efficient Europe, Sustainable Supply of Non-Energy Raw Materials for a Modern Society* and *Agricultural Productivity and Sustainability*.[12]

The appointment of the new Commissioner Máire Geoghegan-Quinn had already brought together responsibilities for research and innovation. This also resulted in, among other things, a shift of competencies from the Directorate General Enterprise and Industry to the General Directorate Research.

These developments comprise the context in which the new *HORIZON 2020* programme must be understood; they are outlined in the following.

The architecture of HORIZON 2020

In structural terms, the Commission's proposal for *HORIZON 2020* builds on three major pillars (see also Fig. 5):
Pillar 1: Excellent science,
Pillar 2: Industrial leadership,
Pillar 3: Societal challenges.

The first pillar, *excellent science*, bundles those activities that aim to develop scientific excellence in Europe. Significant funding in the form of grants for individuals should be provisioned for this purpose. The further expansion of the *European Research Council (ERC)*, along with the

9 European Commission (2011d)
10 European Commission (2010)
11 Compare the statements in the "Innovation Union" flagship initiative, which announced the innovation partnerships instrument.
12 Current considerations on three additional innovation partnerships, along with the "Active and Healthy Ageing" pilot partnership, were introduced by the "Lead Market Initiative Evaluation and European Innovation Partnerships" policy seminar held by the Polish president's office (Warsaw, 26-27 October 2011). Cf. http://www.lmiwarsaw.pl/download/agenda_LMIWarsaw.pdf

continuation of the Marie Curie grants, is of central importance. The programme was established to fund collaborative projects on *Future and Emerging Technologies – FET)* and was previously oriented towards the field of information and communication technology. In future, however, there should be an expansion of topics, opening the programme up for other fields of research and technology. The further expansion of European research infrastructures also serves to improve the conditions for scientific activity in Europe, thereby increasing its attractiveness as a research location.

The second pillar, *industrial leadership*, should promote research projects on generic technologies. These technologies include information and communication technologies, nanotechnologies, advanced materials, biotechnology, space, and advanced manufacturing and processing. Two special instruments are envisioned to improve conditions for access to venture capital at the European level. In addition, support for SMEs, especially in the second and third pillars, are meant to facilitate harmonisation in funding requirements. The focus here is particularly on research-intensive SMEs.

The third pillar, *societal challenges*, includes a series of known topics that shall be addressed in future with new, multidisciplinary research approaches with a renewed focus on overcoming societal challenges: health, demographic change and wellbeing; food security, sustainable agriculture, marine and maritime research, and the bioeconomy; secure, clean and efficient energy; smart, green and integrated transport; climate change, resource efficiency and raw materials; inclusive, innovative and secure societies.

Research and innovation projects that focus on overcoming societal challenges are meant to apply the findings from the two other pillars. It is particularly important for the third pillar to connect the development of solution-based approaches for societal challenges with the creation of new entrepreneurial opportunities, which is why the implementation of research results, in the form of pilot and demonstration projects for example, is being assigned greater weight than was previously the case.

In addition to the three pillars, *HORIZON 2020* includes funding for the European Institute for Innovation and Technology (EIT) and direct actions by the EU's Joint Research Centre (JRC).

Proposed budget 2014–2020

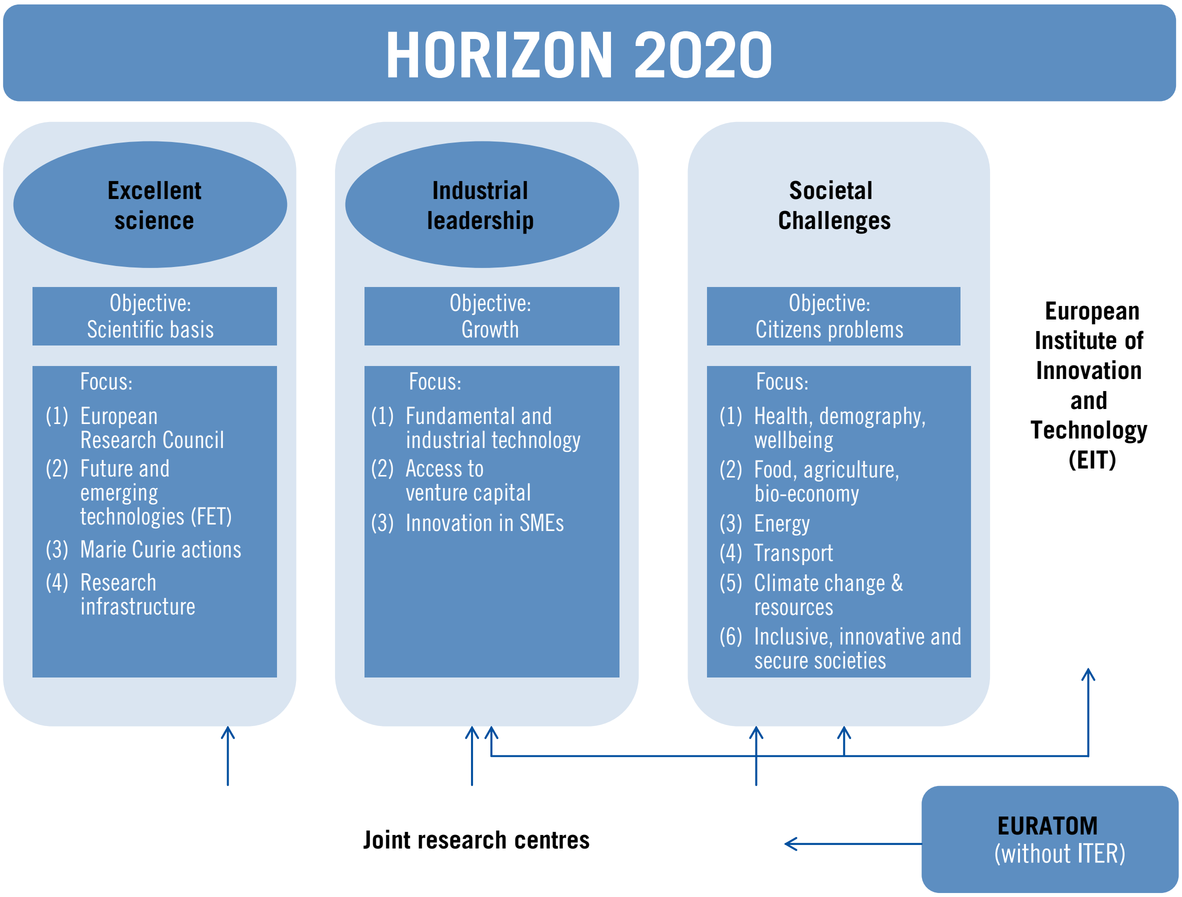
The total budget in the *HORIZON 2020* proposal amounts to € 80 billion (or 87 billion taking into account price developments). Table 2 provides an overview of the budgets proposed for the individual pillars and programme lines from 2014 to 2020. Even after taking price levels into account and incorporating EIT and CIP, this represents a serious increase in funding in comparison to the Seventh Framework Programme for Research and Technology Development, which was funded with € 50 billion over a seven-year period.

The submitted budget proposal is distinguished by its clear reinforcement of research oriented towards excellence. Both the ERC and FET programmes will receive substantial funding increases. Funds for technology-oriented programmes in the second pillar (e.g., ICT and biotechnology) should remain at the levels of the Seventh Framework Programme; however, there are numerous new possibilities for applying generic technologies in fields in which research shall be driven by the major societal challenges. This is difficult to compare with previous programmes because it applies an integrative approach that mobilises national and industrial research funds (see below). A major increase is planned for the budget of the newly established European Institute for Innovation and Technology (EIT) , which in addition to explicitly allocated funds of € 1.4 billion should profit from almost another € 1.5 billion from the second and third pillars.

The instruments of HORIZON 2020

The central mantra of *HORIZON 2020* is its emphasis on a comprehensive understanding of innovation. Seamless, coherent support from the

Fig. 5: Structure of the Commission's proposal for HORIZON 2020



Source: Adapted from the Federal Ministry of Science and Research (BMWF)

idea stage to market maturity should ensure stronger integration of research and innovation. This is also reflected in the new portfolio of instruments that the Commission has proposed for *HORIZON 2020*.

Emphasis on closer-to-market instruments

In order to be able to induce direct economic stimulus and socially relevant solutions, closer-to-market activities in the innovation cycle receive greater emphasis in *HORIZON 2020* than was the case in the Seventh Framework Programme. This objective is reflected specifically in a few new, or newly weighted, instruments. Pilot and demonstration projects are already part of the established set of Framework Programme instruments, yet they should be used with greater frequency in future. New venture capital funding instruments will close an important gap in European funding. Options for pre-commercial procurement should be strengthened in the field of research. These new instruments, however, require further specification before a conclusive evaluation can be performed. The familiar funding instruments for research activities (i.e., above all collaborative projects) should only change gradually, thereby remaining a central component of the Framework Programme.[13]

Table 2: HORIZON 2020 budget proposal

Pillars	Action items	Budget proposal [€ million, constant prices]
Excellent science	European Research Council	13,268
	Future and emerging technologies (FET)	3,100
	Marie Curie Programme	5,752
	European research infrastructures	2,478
Industrial leadership	Leading role in basic and industrial technology	13,781
	Access to venture capital	3,538
	Innovation in SMEs	619
Societal challenges	Health, demographic change and wellbeing	8,029
	Food security, sustainable agriculture, marine and maritime research, and the bio-economy	4,152
	Secure, clean and efficient energy*	5,782
	Smart, green and integrated transport	6,802
	Climate change, resource efficiency and raw materials	3,160
	Inclusive, innovative and secure societies	3,819
Horizontal acti-vities	European Institute for Innovation and Technology	1,364 + 1,461**
	Joint research position	1,961***

* Without the nuclear activities of the Euratom Agreement and ITE
** Partial contributions from the Industrial Leadership and Societal Challenges pillars
*** An additional € 724 million will flow from the Euratom treaties to the Joint Research Centre from 2014 to 2018.

Source: European Commission (2011a)

Multilateral cooperation for societal challenges

HORIZON 2020 must be viewed as an important instrument for creating a European Research Area. As a result, coordination between national funding instruments, as well as between national and European instruments, plays an important role.

The ERA Nets, which for a few years have been proven instruments for implementing national funding programmes, should also be continued in *HORIZON 2020* and, in the case of selected ERA Net+, reinforced by appropriate co-financing from the European Commission. Similarly to the ERA Nets, the comparatively new instrument of *Joint Programming* is oriented towards a coordinated approach among Member States that can be supported if needed by the European Commission. The *Joint Programming Initiatives* (JPIs), however, go one step further: the ERA Nets provide not only better coordination of existing national programmes, they also aim to develop a new European research policy agenda that will be developed by interested Member States on a voluntary basis and then implemented with new, national funding programmes that will be coordinated from the start. JPIs require the approval of the Council and should be oriented towards those societal challenges that are of major importance to the nation at hand.

13 Compare Horvath's assessment (2011), which views funding of excellent collaborative research as the central characteristic of the Framework Programme. Funds from the cohesion and structural funds are also in place to support the construction and expansion of regional capacities in research and innovation in order to create a European Research Area.

Austria has participated actively at an above-average level in the ERA Nets in past years and is also strongly represented in the JPIs initiated thus far (Table 3).

Simplifications in implementation

HORIZON 2020 promises major simplifications with a simpler programme structure, standard rules, less formalities in the preparation of proposals, a simpler cost reimbursement model, and less monitoring and accounting reviews. There will only be one standard rate of refund for all organisations participating in a project that can reach up to 100% of refundable direct costs for research projects. The guiding idea behind these simplifications is that new organisations must be won over to participate in *HORIZON 2020* and that researchers must be trusted to properly implement projects.

The process ahead

The decision process ahead for *HORIZON 2020* follows the established rules of the game for European institutions. The submission of the Commission's proposal initiates negotiations with the European Parliament and Council regarding the Framework Programme's contents and budget, although the budget discussion will coincide with talks about the general EU budget for 2014-2020. The decision-making process is expected to last well into 2013. *HORIZON 2020* would then be able to start punctually at the beginning of 2014. One last major call for proposals for the Seventh Framework Programme will be held in the middle of 2012 to serve as a bridge and transition to the start of *HORIZON 2020.* The implementation of *HORIZON 2020* promises greater flexibility in the definition of annual work programmes, which may be accompanied by the establishment of appropriate consultation processes.

Table 3: Austrian participation in Joint Programming Initiatives and their status

Name	Status	Austrian participation
Urban Europe	Pilot call for proposals planned for Spring 2012	Coordination
CLIMATE – Connecting Climate Knowledge for Europe	No call for proposals planned yet	Co-coordination
FACCE – Agriculture, Food Security and Climate Change	Call for proposals mid-2011	Participation
A Healthy Diet for a Healthy Life	Call for proposals end of 2011	Participation
More Years, Better Lives	No call for proposals planned yet	Participation
Pilot Initiative Neurodegenerative Disease Research	Pilot call for proposals in Spring 2011	Participation
Cultural Heritage and Global Change: A New Challenge for Europe	Pilot call for proposals planned for Autumn 2012	Observer
Water Challenges	Pilot call for proposals planned for 2013	Observer
Antimicrobial Resistance	No call for proposals planned yet	No participation
Healthy & Productive Seas and Oceans	No call for proposals planned yet	No participation

Source: BMWF, FFG (2011)

Austria's negotiating position

The Austrian federal government responded to the Commission's proposal with 78 issues that provide the foundation for further negotiations on *HORIZON 2020*.[14] The following discussion highlights some of the important points in Austria's position, yet is not meant to be exhaustive.

The European Commission's proposal has been welcomed in general, because its architecture and contents make it clear that some of the major suggestions in the Austrian Reflection Paper of December 2010 were integrated. This pertains especially to the three pillars, which cover the spectrum from basic research to market introduction. However, it is emphasised that such an architecture requires further deliberations with regard to permeability and synergy effects between the pillars. In addition, there are points in the education, innovation and cohesion policies that require clarification regarding the design of interfaces and coordination mechanisms that will guarantee coherent interaction among these policy fields.

In terms of the individual pillars, the strengthening of excellent science (pillar one) is being supported. Adaptations and explanations were only requested for the mobility programmes and the "Future and Emerging Technologies (FET)" funding scheme; for the latter programme, work remains to be done in terms of specifying and limiting the role and orientation of the FET flagships, which are very large in terms of budget and strongly oriented towards implementation. The second pillar is also viewed positively, especially in the context of the requirement of increasing business enterprise participation and making it easier for SMEs to enter the new Framework Programme. The new venture capital instruments, however, remain vague and will require further clarification in the course of the negotiation process. The interdisciplinary approach on which the third pillar of societal challenges is based is seen as a positive step, yet Austria's position is that the coherency and definition of the six topics must be evaluated. The areas of safety research and the social sciences and humanities seem particularly difficult to integrate under the moniker of a joint challenge.

The European Institute for Innovation and Technology (EIT) has great potential for established new knowledge-based economic sectors in Europe. In future, however, there must be a significant improvement in the implementation and the overall performance of the EIT.

The new orientation of recent years in European nuclear research is seen as a step in the right direction and should continue. This position is based not least on the high ethical standards that Austria also applies in other areas of European research agendas.

The European Commission's budgetary proposal is fundamentally welcomed. The Austrian Reflection Paper of December 2010 proposes that funds be shifted from pillar three ("societal challenges") to pillar two ("market leadership"). The dedication of budget resources in pillars two and three for the EIT is also questionable in light of the criticisms of the EIT.

HORIZON 2020 has set its sights on essential simplifications in the rules for participation. Austria supports this while emphasizing that these laudable intentions must be followed by implementation in the form of an EU Financial Regulation.

In terms of the governance of *HORIZON 2020*, the Member States in the programme committees need a stronger voice; this seems sensi-

14 See BMWF (2012)

ble and necessary given the growing importance of multilateral cooperation mechanisms in research funding (e.g. JPIs, ERA Nets, etc.). The consultative function of the Member States should also be strengthened in the strategic orientation of the ERC.

1.3 Financing and implementation of R&D in Austria

Statistics Austria conducted its biennial complete survey of the institutions that perform R&D in all sectors of the economy for 2009. The 2008 amendment of the R&D Statistics Regulation[15] shifted the timing of the surveys, which require disclosure in all economic sectors and have been conducted at two-year intervals since 2002, from even years to odd years, starting with 2007. This synchronised the reporting cycle to that of the corresponding EU Regulation.[16] The content of the Austrian R&D statistics regulation is therefore in full compliance with the corresponding obligatory EU legal basis.[17] This also explains the short time between the two R&D surveys for 2006 and 2007.

As was the case in previous R&D surveys, the 2009 R&D survey was based upon the guidelines, definitions, and standards of the Frascati Manual, which is universally valid (OECD, EU) and thus guarantees international comparability.[18] The Frascati Manual defines research and experimental development (R&D) as: " *… creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications.*"

Novelty and originality (new findings, new knowledge, new knowledge systems, new applications) are therefore the most important criteria for distinguishing R&D from other scientific and technological activities. R&D in the sense of these statistics therefore includes both the technical and natural sciences as well as the social sciences and the humanities.

Differentiation by sector

International convention differentiates between four sectors of performance (higher education sector, government sector, private non-profit sector, and business enterprise sector) and four sources of funding (public sector, business enterprise sector, private non-profit sector, and abroad).

According to the Austrian statistical survey methodology for R&D, the business enterprise sector is comprised of two sub-sectors:

- the "company R&D sub-sector" and
- the "institutes' sub-sector".

The "company R&D sub-sector" is by far the most important sub-sector of the business enterprise sector defined in the Frascati Manual. This sub-sector essentially consists of manufacturing firms and service companies who produce goods and services for the market with the goal of earning profit or other economic benefits. This definition includes both private and public firms.

Institutions included in the "cooperative segment" of the business enterprise sector are service institutions that perform research and experimental development for firms. The majority of these institutions do not have the goal of earning profit or other economic benefits. This segment consists of institutions, most of them organised under the laws on associations, which are members of the Association of Austrian Co-

15 Federal Law Gazette II no. 150/2008. of 8 May 2008

16 Decision No 1608/2003/EC of the European Parliament and the Council of 22 July 2003 concerning the production and development of Community statistics on science and technology; Commission regulation (EC) No 753/2004 of 22 April 2004 implementing Decision No 1608/2003/EC of the European Parliament and of the Council as regards statistics on science and technology.

17 See also Schiefer (2011)

18 "The Measurement of Scientific and Technological Activities. Proposed Standard Practice for Surveys on Research and Experimental Development". Frascati Manual 2002, OECD, Paris 2002.

operative Research Institutions (ACR – Austrian Cooperative Research).[19] The following research organisations are categorised under the "institutes' sub-sector":

- AIT – Austrian Institute of Technology,
- Joanneum Research Forschungsgesellschaft mbH,
- and the competence centres initiated by the COMET programme (Competence Centres for Excellent Technologies).

The survey units of the "institutes' sub-sector" are assigned exclusively to the ÖNACE categories 71 ("Architecture and engineering activities; technical testing and analysis") and 72 ("Research and Development").[20]

Table 4 outlines the breakdown of all R&D expenditures for 2009 by sectors of performance and sources of funds. It shows that just over 68% of all R&D expenditures fall to the business enterprise sector. The highest share within the business enterprise sector is of course the company R&D sub-sector with 61.1%. The higher education sector accounts for 26.1% of total R&D expenditures.

The business enterprise sector provides funding for 47.1% of R&D expenditures. If however we view the business enterprise sector in institutional and international terms – meaning the inclusion of foreign firms – then the funding share increases to 62.4% (47.1 + 15.3).

The public sector funds 35.6% of total R&D expenditures. The European Union provided € 111 million, which was 1.5% of total funding volume.

In this context, the target sectors for the financing flows are also of interest. For a presentation of the interdependencies in the financing flows („what is financed by whom"), Figure 6 shows an appropriate matrix with the following information for 2009:

- R&D expenditures by sectors of performance are shown in the boxes.
- The figures next to the arrows show the financing flows.

The business enterprise sector invested just over € 5 billion in R&D in 2009. R&D expenditures in the business enterprise sector climbed from € 4.85 billion in 2007 to € 5.09 billion in 2009 (+5%).

There were three major financing flows for the business enterprise sector with respect to R&D funding:

- The first of these flows includes in particular the own funds of firms that conduct R&D. The business enterprise sector funded € 3,391 million of € 5,093 million in R&D expenditures, or 67%, with its own funds. Own funding in business enterprise R&D climbed by 5.5% over 2007. The business enterprise sector also contributed € 101 million in R&D funding to the higher education sector, as well as € 24 million in R&D in the government sector and € 3.5 million in R&D in the private non-profit sector. Overall funding volume stood at € 3,520 million (see Table 4).
- The public sector also contributed a significant share of business-related research funding. In any case, the public sector funded a total of € 560 million (419+141) or 11% of business enterprise R&D. This was a 12.2% increase in government-financed corporate R&D over 2007. Austria has one of the highest funding rates in international comparison.
- A total of € 1,138 million (239 + 899) in funding came from abroad, which is a share of 22.3%. This financing flow climbed by just 0.6% over 2007.

19 Because of its extraordinary membership in Austrian Cooperative Research (ACR), AVL-List GmbH is also assigned to the "institutes' sub-sector". AVL-List GmbH ultimately invested approx. 12.5% of its revenues in R&D, or about € 81 million (self-financed).

20 The presentation of results from the 2009 R&D survey in the business enterprise sector was done in coordination with the applicable European requirements, applying ÖNACE 2008 for the first time.

Table 4: R&D expenditures broken down by sector of performance and source of funding (2009)

Sectors of performance	in € million	Share in %
Business enterprise sector:	5,093	68.1
Institutes' sub-sector	483	6.5
Company R&D sub-sector	4,610	61.6
Higher education sector	1,952	26.1
Government sector[1]	399	5.3
Private non-profit sector[2]	36	0.5
Total	**7,480**	**100**

Sources of funds	in € million	Share in %
Business enterprise sector	3,520	47.1
Public sector	2,662	35.6
Private non-profit sector	42	0.6
Abroad:	1,256	16.8
Foreign firms[3]	1,144	15.3
EU funds	111	1.5
Total	**7,480**	**100**

1 Federal institutions (not including those combined in the higher education sector), state, local government, and chambers of commerce, R&D institutions of the social insurance carriers, public sector-financed and/or controlled private non-profit institutions as well as R&D institutions of the Ludwig Boltzmann-Gesellschaft; including regional hospitals. The regional hospitals were not surveyed by questionnaire, but instead Statistics Austria prepared an estimate of the R&D expenditures based on the reports of the offices of the provincial governments.
2 Private non-profit institutions whose status is predominantly private or under civil law, sectarian, or other non-public.
3 Foreign firms, including international organisations (without EU)

Source: Statistics Austria (R&D survey 2009); calculated by Joanneum Research

R&D expenditures in the higher education sector rose overall from € 1,637 million (2007) to € 1,952 million (2009), reflecting a +19% increase. Financing flows in the university sector since 2007 are as follows:

- Business enterprise financing of higher education R&D (contracted research) rose from € 94 million (2007) to € 101 million (2009), which represents a 7% increase.
- The public sector financed R&D in the university sector with € 1,446 million in 2007 and € 1,746 million in 2009. This represents an increase of 20%.
- Financing volume from abroad climbed from € 80 million (2007) to € 86 million. This was an increase of 7.5%.

Table 5 provides a detailed graph of funding of R&D at business enterprises.

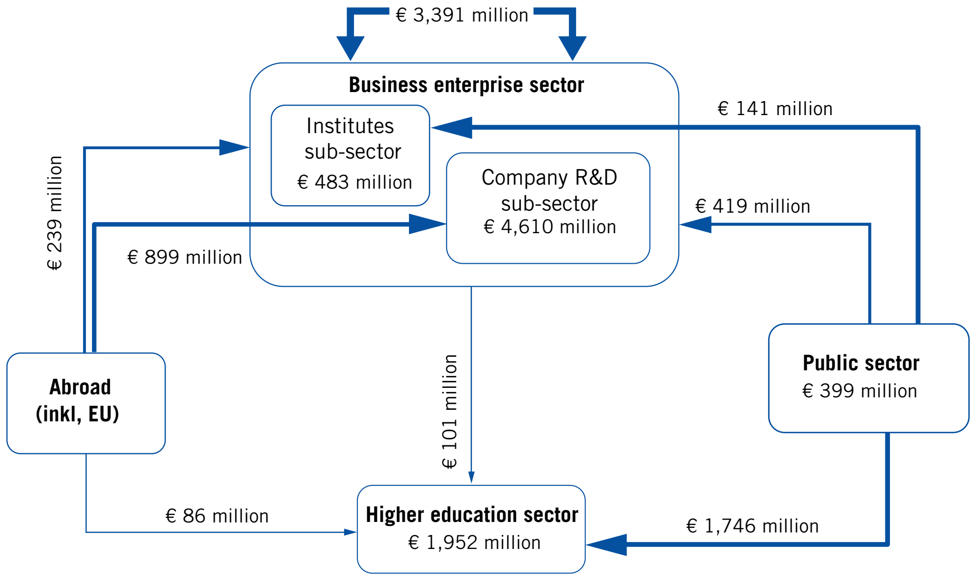
The most important single source of funds from the public sector was the research premium at € 255 million, which still accounted for 8% of public funding in the 2009 survey period.[21] The Public Finance Act includes an increase in funding: the research premium was raised from 8% to 10% effective 1 January 2011. At the same time, all forms of tax allowances were abolished. The RTI Task Force also discussed an evaluation of indirect research funding.

The strong expansion in company-related research funding (due in particular to the increases in the research premium) has caused a clear shift in the use of public research funds in recent years. In 2002, 11% of all public funding went to the business enterprise sector; in 2009, this figure stood at 21%. The higher education sector's share of financing for R&D spending fell from 74% in 2002 to 66% in 2009 (Fig. 7).

In addition to changes in the distribution of overall public funding volumes, the absolute volume of funds also increased between 2002 and 2009, from € 1,568 million in 2002 to € 2,658 million in 2009. In 2002, 11% of public funding of business enterprise R&D was still € 175 million; by 2009, 21% was already € 560 million.

21 The research premium is an instrument of indirect research funding that could be applied for until the end of 2010 in the amount of 8% of R&D expenditure (since 1 January 2011, 10%). Because the research premium – in contrast to the research tax allowance permitted up to the end of 2010 – represents a direct transfer to a firm's tax account, the Frascati Manual requires this type of financing to be subsumed under the "public sector" source of funding.

Fig. 6: Performance and funding of R&D in Austria (2009)



Note: The private non-profit sector was not shown in the interest of clarity.

Source: Statistics Austria; calculations by Joanneum Research

Funding of R&D in the higher education sector increased from € 1,157 million (2002) to € 1,746 million (2009), which is 66% of total public funding volumes. In absolute numbers, this means that funding for higher education R&D increased by € 589 million between 2002 and 2009, and that the funding volumes of business enterprise R&D increased by € 385 million.

1.4 R&D expenditures in Austria from 2002 to 2009

The following chapter presents some results of the R&D surveys conducted by Statistics Austria in 2002, 2006 and 2009. This inter-temporal comparison was supplemented by international cross-sectional comparisons based on the OECD's *Main Science and Technology Indicators (MSTI)*.

A comparison of the survey years 2002, 2006 and 2009 shows a continuous and clear increase in both the units doing research as well as R&D expenditure:

The number of units doing research rose +37% between 2002 and 2009 (from 3,290 to 4,513 units); total R&D expenditure rose by +60% (from € 4.68 billion to € 7.48 billion). The business enterprise sector in particular increased its spending by +63% (from € 3.1 billion to € 5.1 billion) very significantly; the private non-profit sector recorded a strong expansion (after a decline in 2006), yet was not of much consequence in terms of magnitude.

Funding structure

Figure 8 provides a summary representation of R&D financing structure between 2002 and 2009. This reveals a few (slight) shifts in financing structure:

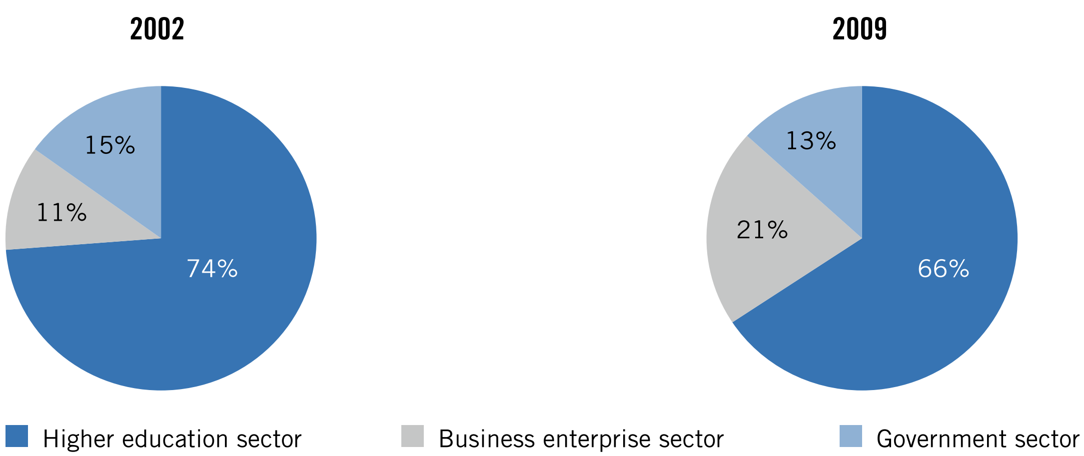
Table 5: Financing of R&D expenditures in the business enterprise sector, 2009 (in € million)

			Institutes' sub-sector	Company R&D sub-sector	Total
Funding source/segments	Business enterprise sector[1]		102	3,289	3,391
	Public sector	Federal government[2]	69	19	88
		Research premium	8	247	255
		Regional government	22	18	40
		FFG[3]	32	128	160
		Other public funding[4]	10	8	18
	Abroad	EU	10	23	33
		International organisations	1	6	7
		Foreign affiliated firms	107	488	595
		Other foreign firms	121	378	499
		Other	0	4	4
	Private non-profit sector		1	2	3
	Total		483	4,610	5,093

1 Includes firms' own capital, funds raised in the capital market, and reduced-interest loans from public sector funds. Funds from R&D contracts from other domestic firms are also subsumed within this sub-category.
2 Includes funds financed directly by the federal government (the federal offices), i.e. development funds (grants, subsidies, financial assistance) as well as payments for research projects commissioned by the federal government.
3 Contains only grants (also including loan cost subsidies) awarded by the Austrian Research Promotion Agency (FFG) to research projects of firms. These are primarily funds from the „general funding" or from the "general programmes" of the Austrian Research Promotion Agency (FFG) or grants for cooperation projects under the EUREKA programme. The amounts actually paid are shown and not the „cash values". So-called „second-stage subsidies" to FFG-supported R&D projects from development funds of the provinces or their outsourced funds are subsumed under "regional governments" or „Miscellaneous". In regional development areas there is the further option to co-financing supported R&D projects from funds of the „European Fund for Regional Development" (EFRE). These funds are included in „EU". Supported loans of the Austrian Research Promotion Agency are contained in the „business enterprise sector".
4 Includes funds from local governments, chambers, social insurance carriers, and other public financing

Source: Statistics Austria, Schiefer (2011)

Fig. 7: Distribution of public R&D funds by sector



Note: The private non-profit sector was not included due to its minor share.

Source: Statistics Austria; calculations by Joanneum Research

- The public sector's percentage of funding in research expenditures in the business enterprise sector climbed from 6% to 11%.
- The share of financing from abroad in terms of overall funding dropped from 21% to 17% (however, in absolute numbers this does not signify a decline: foreign financing rose from € 1,002 million to € 1,256 million; this growth of +26% is however significantly less than the total growth of +60%).
- The higher education sector and the government sector are funded overwhelmingly with public funds; the business enterprise share, however, climbed somewhat, even if this share remained rather low at 4-6%. The private nonprofit sector was the only one to experience significant shifts in its financing structure in the direction of reducing government financing and increasing business enterprise and foreign financing; however, at less than € 40 million, the expenditures in this category account for less than 0.5% of total research expenditures.
- The self-financing share of the business enterprise sector remained within the range of 64-67%.

Table 6: Units performing research and R&D expenditure in Austria, 2002–2006–2009

Sector of performance	Units performing R&D				Expenditures for R&D [€ millions]			
	2002	2006	2009	(Change 2002–2009)	2002	2006	2009	(Change 2002–2009)
Higher education sector	969	1,162	1,259	+30%	1,266	1,523	1,952	+54%
Government sector	308	254	272	-12%	266	330	399	+50%
Private non-profit sector	71	40	36	-49%	21	17	36	+72%
Business enterprise sector	1,942	2,407	2,946	+52%	3,131	4,449	5,093	+63%
Total	3,290	3,863	4,513	+37%	4,684	6,319	7,480	+60%

Source: Statistics Austria (R&D Survey), calculations by Joanneum Research

A major objective of both European RTI policy (Barcelona targets) and the national strategy is to increase funding of the business enterprise sector to 66% by 2020 and "… – *in accordance with the international model, to increase this to 70% wherever possible*".[22]

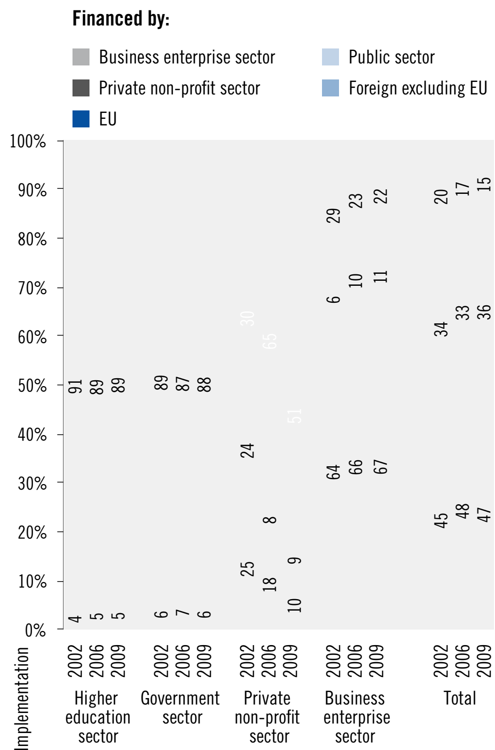
If the statistic is taken literally, Austria missed this target by a wide margin; however if we focus on the content of the objective, it has already been (almost) met for some time.

According to an R&D survey, the nominal business enterprise share in the financing of total research expenditures came to 47% in 2009 and was thus somewhat higher than in 2002 (45%) yet lower than in 2006 (48%; in 2007, this figure was even 49% – this decrease seems to be a consequence of the financial crisis). The 2/3 target for the business enterprise share was far from achieved. Nonetheless, at 15%, Austria has a very high foreign component in an international comparison; however, businesses (although foreign) are almost exclusively the sole providers (research funding by the EU comes to 1-2% and is reported separately). Taken together, domestic and foreign firms currently finance approximately 62%[23] of the total research expenditures in

22 RTI Strategy (2011), pg.
23 In 2007 this combined share was 65%, representing a near-fulfilment of the 2/3 target; the decline was a result of the financial crisis.

Fig. 8: R&D expenditures in € millions: 2002/06/09 by sources of funding

Sector of performance		Sources of funds: Business enterprise sector	Public sector	Private non-profit sector	Foreign excluding EU	EU	Total [€ millions]
Higher education sector	2002	51.3	1156.9	8.2	11.8	37.8	1266.1
	2006	76.8	1354.7	13.1	26.8	51.9	1523.2
	2009	101.5	1746.2	17.7	30.4	56.0	1951.8
Government sector	2002	16.0	236.8	2.0	3.9	7.8	266.4
	2006	22.5	287.3	1.8	1.9	16.8	330.2
	2009	23.8	352.0	3.0	3.8	16.5	399.1
Private non-profit sector	2002	5.2	5.0	6.3	1.9	2.6	20.9
	2006	3.0	1.3	10.8	0.1	1.3	16.5
	2009	3.5	3.1	18.2	5.4	5.7	35.9
Business enterprise sector	2002	2018.1	175.5	1.0	906.2	30.1	3130.9
	2006	2954.7	428.1	1.3	1030.7	33.9	4448.7
	2009	3391.2	560.3	3.2	1104.8	33.3	5092.9
Total	2002	2090.6	1574.2	17.5	923.7	78.3	4684.3
	2006	3057.0	2071.3	26.9	1059.5	103.9	6318.6
	2009	3520.0	2661.6	42.2	1144.5	111.5	7479.7



Source: Statistics Austria (R&D Survey), calculations by Joanneum Research

Austria, which is not too far away from the two-thirds goal.

Applying this type of calculation, the goal has already been (almost) met on the EU 15 and EU 27 level (see Fig. 9).

Japan and Switzerland have the highest business shares (or combined business and foreign shares) at over 75% each. Austria is at the average of the EU 27 (although with a significantly higher share from abroad). The ranking of the countries also shows that the research intensity is strongly a function of the business enterprise sector; countries with a high business share tend to have high R&D ratios.

In consideration of pure business share, Austria – given its R&D intensity – falls significantly short of the trend of the other countries (China is the positive exception). If foreign funding is included, Austria is significantly closer to the trend lines (see Fig. 9).

Types of research

Expenditures for basic research climbed at an above-average rate between 2002 and 2009 (by +71% from € 819 million to € 1,397 million), as did expenditures for experimental development (+65% from € 2,051 to € 3,382 million); applied research (+48% from € 1,727 million to € 2,552 million) remained somewhat below the overall average (+59% from € 4,598 million to € 7,331 million).

Structures by type of research are quite stable, aside from private non-profit sector (which is almost negligible in size). Overall, the percentage of experimental development in research expenditures is at 46% and increased somewhat since 2002 (from 45%), primarily at the expense of applied research (from 38% to 35%). Basic research remained almost constant at 17-19%. Not surprisingly, the primary funder of basic research is the higher education sector. Among business enterprises, experimental developments (more than 60%) and applied research (roughly one third) dominate, with basic research at 4-6% playing only a subordinate role.

Types of expenditure

The following trends emerged in R&D by expenditure type between 2002 and 2009:

Personnel and material expenses account for the greatest share of research expenditures. Interestingly, the share of personnel expenses in the higher education sector is noticeably lower (and the share of equipment investments is higher) than in the business enterprise sector (and thus probably reflects the higher share of – equipment-intensive – basic research and the salary level in the higher education sector). Construction and equipment investments together are responsible for less than 10% of the expenditures.

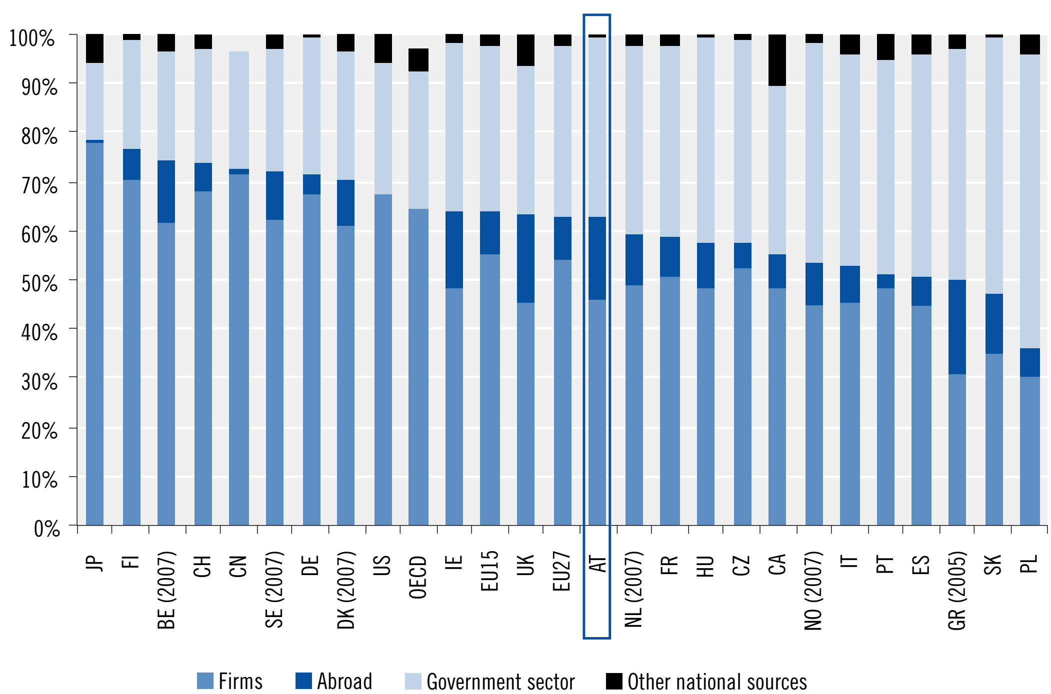
1.4.1 Business enterprise sector

The two most important funders of research and development, the business enterprise and the higher education sectors, will be discussed in somewhat greater detail below. The business enterprise sector will be broken down into economic sectors and technology content, the higher education sector into fields of science.

As a share of gross value added (GVA), R&D expenditures were increased from 1.6% to 2.1% between 2002 and 2009 (the corresponding shares of gross domestic product amount to 1.4% and 1.9%).

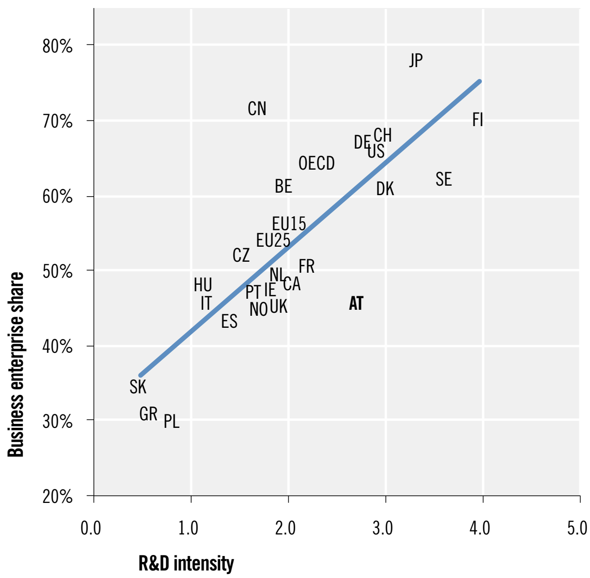
An increase of the R&D component can be ob-

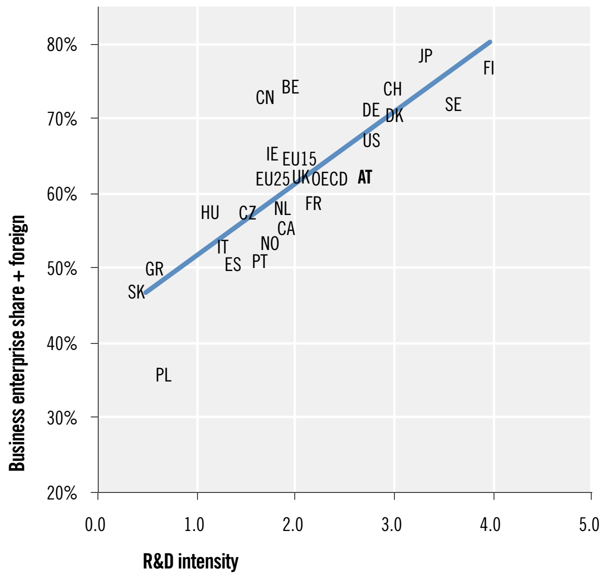
Fig. 9: Funding structure of R&D expenditures in country comparison (2008)



Source: OECD (MSTI 2011-1). Calculated by Joanneum Research

Fig. 10: Business share of the R&D intensity for 2008 by country

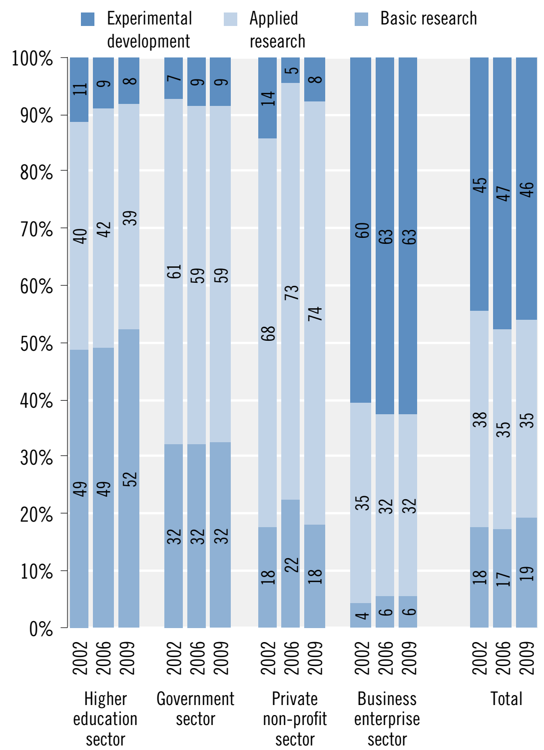




Source: OECD (MSTI 2011-1). Calculated by Joanneum Research

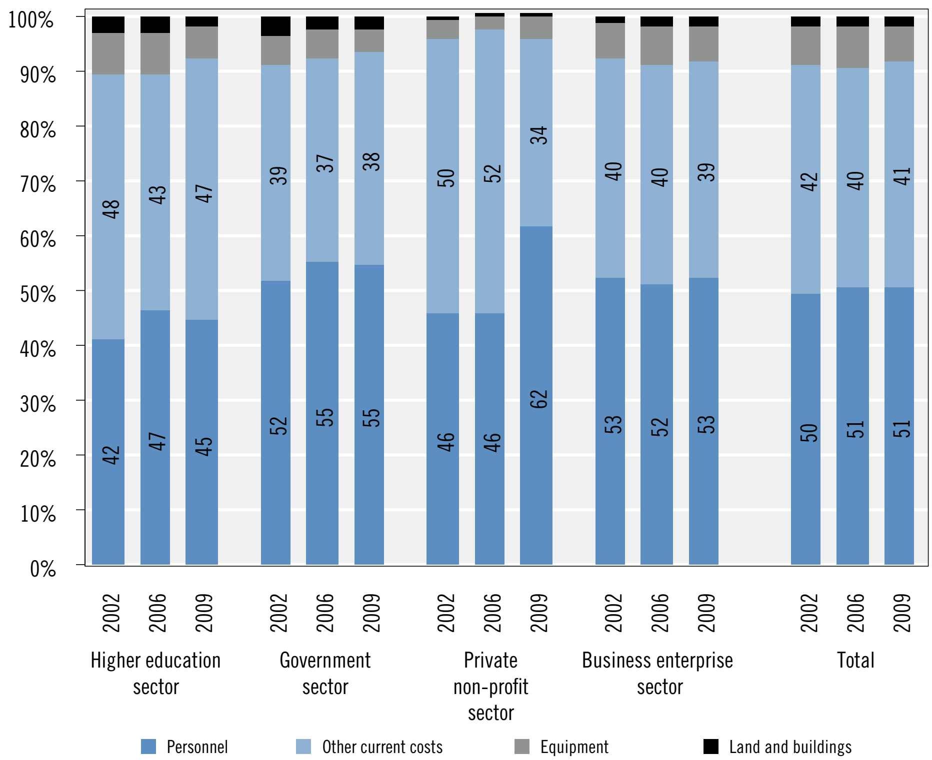
Table 7: R&D expenditures 2002/06/09 by research type, € millions

Sector of performance		Total	Basic research	Applied research	Experimental development
Higher education sector	2002	1266.1	618.9	503.5	143.7
	2006	1523.2	746.1	638.6	138.4
	2009	1951.8	1019.8	769.1	162.9
Government sector	2002	179.9	58.0	109.0	13.0
	2006	215.8	69.5	127.7	18.6
	2009	250.0	80.9	147.3	21.8
Private non-profit sector	2002	20.9	3.7	14.2	3.0
	2006	16.5	3.7	12.1	0.8
	2009	35.9	6.5	26.6	2.8
Business enterprise sector	2002	3130.9	138.4	1100.8	1891.7
	2006	4448.7	245.2	1415.1	2788.4
	2009	5092.9	289.9	1608.9	3194.2
Total	2002	4597.8	818.9	1727.4	2051.4
	2006	6204.2	1064.5	2193.6	2946.1
	2009	7330.6	1397.0	2551.9	3381.7



Source: Statistics Austria (R&D Survey), calculations by Joanneum Research

Fig. 11: R&D expenditures in 2002/06/09 by type of expenditure



Source: Statistics Austria (R&D Survey), calculations by Joanneum Research

served in (almost) all sectors; the manufacturing industry increased its share of R&D in terms of GVA from 5.9% to 8%, and the services sector posted an increase from 0.6% to 0.9%.

Subgroups classified at the level of technology content should be interpreted with caution: reclassifications of individual firms (due for example to change of activity within a large company) can significantly change the aggregates, which can lead to a decline in research intensity in the high-tech sector and a simultaneous increase in the medium-tech sector of the manufacturing industry.[24] One statement that still applies however is that the number of research survey units clearly increased: +23% among manufacturers and +100% among service providers (from 690 to 1,381). Overall, this number climbed by +52% from 1,942 to 2,946 units.

Furthermore, there is still a clearly positive connection between technology content and R&D intensity (research intensity among technology- and knowledge-intensive services was 10%, while other services only stood at 0.4%; figures were similar for manufacturers, with research intensity ranging from 2% to 19% depending on technology content).

A total of precisely two-thirds of the R&D expenditures of the companies in the business enterprise sector were self-financed, followed by the foreign sector (with a solid fifth) and the public sector with 11%. The EU plays only a marginal role in the financing of business enterprise

24 This illustrates not least the problem of classification systems that attempt to categorise economic sectors by their technology content – an absence of selectivity must be taken into account. This does not represent an insurmountable problem; however, conclusions based on such classifications should always be taken with a certain degree of caution.

R&D, and the private non-profit sector plays practically no role at all. Aside from the quantitatively insignificant mining sector, medium- and high-tech manufacturing exhibits an above-average foreign share at 19% and 30%, as do services at 25%. The services sector also receives a relatively high share of public funds (16.5%) and EU funds (1.5%), compensated for by a relatively below-average share of financing by the business enterprise sector (56.7%).

The concentration of R&D expenditures in the business enterprise sector

A total of 2,946 units that perform R&D have been identified in the business enterprise sector, and their R&D expenditures total € 5.09 billion. However, the average of €1.7 million R&D expenditures derived from this amount masks an enormous degree of scatter in R&D expenditures.

Figure 12 shows that only 43 of 2,946 business enterprises (1.5%) reported R&D expenditures above this average. The median of the R&D expenditures (i.e. the value exceeded by 50% of the firms) is € 215 thousand. The three most important firms provide 17% and 38 firms provide 50% of the entire R&D expenditures in the business enterprise sector.

Nonetheless, 934 firms record R&D expenditures of less than € 100 thousand. Just 0.7% of all R&D expenditure in the business enterprise sec-

Table 8: R&D expenditures and creation of value in the business enterprise sector, 2002 and 2009

Sector	2009						2002					
	Number of survey units performing R&D	R&D expenditure	Gross value added GVA	R&D as component of gross added value	Share in R&D expenditures	Share in gross value added	Number of survey units performing R&D	R&D expenditure	Gross value added GVA	R&D as component of gross added value	Share in R&D expenditures	Share in gross value added
		[€ million]	[€ billion]	%	%	%		[€ million]	[€ billion]	%	%	%
Agriculture and forestry, fisheries	5	1	3	0.0%	0%	1%	4	2	4	0.1%	0%	2%
Mining	10	4	1	0.4%	0%	0%	9	3	1	0.3%	0%	0%
Manufacturing	1443	3435	43	8.0%	67%	17%	1169	2273	39	5.9%	73%	19%
High tech	*197*	720	4	18.6%	14%	2%	*229*	867	4	23.4%	28%	2%
Medium tech	*945*	2484	27	9.2%	49%	11%	*672*	1265	22	5.7%	40%	11%
Other manufacturing	*301*	232	12	1.9%	5%	5%	*268*	139	13	1.1%	4%	6%
Electricity, gas and water supply	37	13	8	0.2%	0%	3%	17	14	7	0.2%	1%	3%
Construction	70	29	18	0.2%	1%	7%	53	12	14	0.1%	0%	7%
Services	1381	1610	174	0.9%	32%	70%	690	828	135	0.6%	26%	68%
High-tech knowledge intensive	*687*	864	9	10.0%	17%	3%	*299*	415	8	5.2%	13%	4%
Other services	*694*	746	166	0.4%	15%	67%	*391*	412	127	0.3%	13%	64%
Total	**2946**	**5093**	**248**	**2.1%**	**100%**	**100%**	**1942**	**3131**	**199**	**1.6%**	**100%**	**100%**

Source: Statistics Austria (R&D survey, National Account), calculations by Joanneum Research tor goes to 32% of firms conducting R&D. This phenomenon is not specific to Austria but it shows the enormity of the influence of big players in research expenditures and all indicators derived from it.

Table 10 also underscores the significance of large business enterprises in Austria.

Large enterprises with more than 250 employees account for only 14% of companies performing research; however they do account for 71% of total R&D expenditures in the business enterprise sector. Conversely, small businesses (with fewer than 50 employees) account for 59% of companies performing research, yet only 11% of R&D expenditures. On the other hand, the share of public R&D funding for small businesses at almost 15% of their research expenditures is significantly higher than for medium-sized and large enterprises (7% and 6%).

Expenditures related to number of employees must be used with caution as this is not always exactly known or determinable, especially for the smallest enterprises. However, the patterns are also clear in this area: smaller businesses have a higher percentage of R&D employees but lower R&D expenditures per R&D employee (FTEs); with regard to all employees (headcount), the R&D expenditures of small businesses are higher.

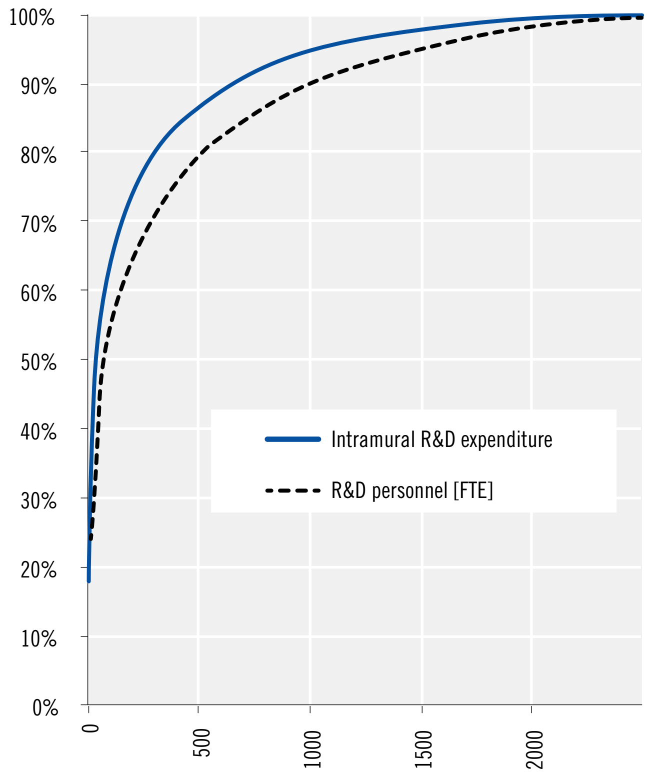
The high degree of concentration of R&D expenditures in (relatively) few firms is not a phenomenon unique to Austria, though. Germany,

Table 9: Financing of R&D expenditures in the business enterprise sector, 2009

Sector	2009												
	Number of survey units performing R&D Survey units	R&D expenditure	Business enterprise sector	Public sector						Private non-profit Sector	Abroad (excluding EU)	EU
				Federal gov.	Research premium	Regional gov.	FFG	Other public Financing	Total			
		[€ million]	%	%	%	%	%	%	%	%	%	%
Agriculture and forestry, fisheries	5	1	87.3	-	3.1	5.4	4.2	-	12.7	-	-	-
Mining	10	4	45.5	-	0.0	-	0.3	-	0.4	-	54.1	-
Manufacturing	1443	3435	71.0	0.2	5.5	0.3	2.4	0.1	8.5	0.0	20.3	0.3
High tech	*197*	720	57.8	0.8	6.5	0.5	3.1	0.0	10.9	0.0	30.6	0.6
Medium tech	*945*	2484	73.1	0.1	5.4	0.2	2.3	0.1	8.1	0.0	18.7	0.2
Other manufacturing	*301*	232	89.2	0.1	2.9	0.2	2.0	0.1	5.2	0.0	5.4	0.1
Electricity, gas and water supply	37	13	91.4	0.9	3.9	0.0	2.8	-	7.6	-	0.0	1.0
Construction	70	29	89.1	0.2	5.5	0.5	3.7	0.6	10.4	-	0.4	0.1
Services	1381	1610	56.7	5.0	4.0	1.9	4.7	0.9	16.5	0.2	25.2	1.5
High-tech knowledge intensive	*687*	864	67.2	7.5	5.5	3.1	6.0	1.5	23.6	0.2	6.8	2.1
Other services	*694*	746	44.4	2.0	2.3	0.5	3.1	0.3	8.2	0.1	46.5	0.7
Total	**2946**	**5093**	**66.6**	**1.7**	**5.0**	**0.8**	**3.1**	**0.4**	**11.0**	**0.1**	**21.7**	**0.7**

Source: Statistics Austria (R&D Survey), calculations by Joanneum Research

Fig. 12: Concentration of internal R&D expenditures in 2009 in the business enterprise sector



Share of intramural R&D expenditure [%]	Number of firms	Share in firms
17%	3	0.1%
35%	11	0.4%
40%	19	0.6%
45%	28	1.0%
50%	38	1.3%
60%	75	2.5%
70%	148	5.0%
80%	298	10.1%
90%	648	22.0%
95%	1046	35.5%
99%	1888	64.1%
100%	2946	100.0%

Source: Statistics Austria (R&D Survey), calculations by Joanneum Research

for example, has a significantly higher degree of concentration; 90% of internal R&D expenditures go to 10% of firms performing research. The German Stifterverband, which is responsible for R&D surveys there, assumes that there are about 10,000 firms conducting R&D activities.[25]

1.4.2 Higher education sector

The financing of R&D expenditures in the higher education sector is of course dominated by the public sector (Table 11).

At 98%, the public-sector share is the highest in the humanities; it is the lowest in engineering at 79%. The average is 89%. The case is exactly the opposite for the business enterprise sector: at an average of 5%, its share lies between 0% (humanities) and 15% (engineering); a similar ranking is seen for EU funding and the foreign sector (average of 3% and 2%, respectively). "Other public funds", which includes research promotion funds, accounts for 11% of research expenditures at institutions of higher education; these funds contribute the smallest amount to the social sciences (5%) while their highest contribution is to the natural sciences, human medicine and engineering (14% and 13%). EU development funds finance on average 3% of university research, again with a strongly disparate distribution: almost 4% in the natural and engineering sciences, less than 1% in the humanities.

25 Stifterverband für die Deutsche Wissenschaft (2010), pg. 37

Table 10: Intramural R&D expenditure in the Austrian business enterprise sector by size categories, 2009

Size category	Companies performing research	R&D expenditure per emp [employee]	R&D expenditure per R&D emp [FTE]	Share of R&D emp [in employees]	Share of R&D expenditure	Share of basis Research premiums	Share of public R&D funding (difference between R&D expenditures and basis research premium)
S (<50 emp)	1739	25.1	95.4	48%	11%	10%	14.7%
M (50-250 emp)	786	10.1	109.8	14%	18%	18%	7.4%
L (>250 emp)	421	8.1	135.8	8%	71%	72%	5.5%
Total	2946	12.8	113.4	20%	100%	100%	8.5%

Source: Statistics Austria (R&D Survey), Austrian Federal Economic Chambers, calculations by Joanneum Research

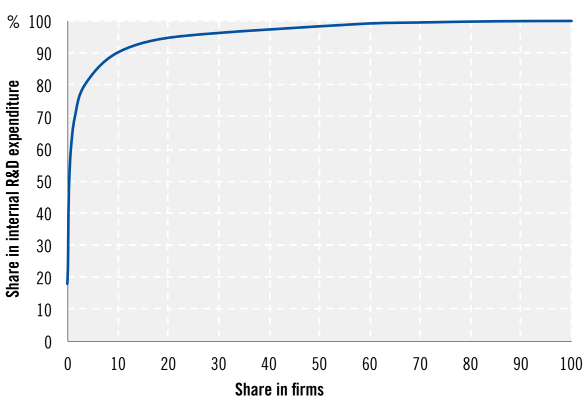
1.5 Employees in R&D

Employment (as headcount) in the R&D segment increased +47% to almost 96,502 between 2002 and 2009; this expansion was supported by the business enterprise sector at +49% and the higher education sector at +56%. The government sector has grown somewhat again since 2006 and reported the same number of employees as in 2002; the private non-profit sector was not quantitatively significant.

Expressed as full-time equivalents (FTE), the increase was slightly lower at +45% (to 56,438). The „degree of utilisation“ (the ratio of full-time equivalent to headcount) of a typical R&D employee remained practically constant and was on average slightly less than 60%; this figure is highest in the business enterprise sector (76%). The non-profit sector and the government sector expanded the "degree of utilization". Research intensity is constant, and the lowest of all sectors, in the higher education sector (where time for research competes with teaching and administrative duties).

A comparison of R&D staff by occupation and sectors of performance (see Fig. 14) shows that the business enterprise sector experienced a slight decline in the share of scientific staff (in FTEs) from 60% to 56%, with an increase in favour of more highly qualified, non-scientific personnel (from 31% to 37%). There are countertrends in the higher education sector and in the government sector, which both significantly expanded their share of scientific staff (primarily at the expense of auxiliary personnel). The higher education sector had the highest percentage of scientific staff at 75%; the government sector was able to attain the percentage of scientific staff found in the business enterprise sector.

Fig. 13: Concentration of internal R&D expenditures in Germany [business enterprise sector, 2009]



Source and calculations: SV Wissenschaftsstatistik

Percentage of women

The percentage of female R&D employees did increase slightly between 2002 and 2009, but it is still very low at 31% (and only 25% for full-time equivalents) (see Table 13).

The overall low percentage of women is primarily attributable to the business enterprise sector where only 18% of employees are women (or 17% of full-time equivalents). One explanatory factor is certainly the technological orientation of R&D in the business enterprise sector. These units are first and foremost research and development projects in the field of technical re-

Table 11: Financing of R&D expenditures in the higher education sector, 2009

Scientific discipline	Number of survey units performing R&D Survey units	R&D expenditure	Business enterprise sector	Public sector: Combined	Public sector: Federal	Public sector: Regional governments	Public sector: Municipalities	Public sector: Other public Financing	Private non-profit Sector	Abroad excluding EU	EU
		[€ million]				%					
1.0 to 4.0 Subtotal	720	**1,480**	6%	88%	73%	2%	0%	13%	1%	2%	3%
1.0 Natural sciences	282	**632**	3%	90%	75%	2%	0%	14%	0%	2%	4%
2.0 Engineering	199	**297**	15%	79%	61%	4%	0%	13%	1%	2%	4%
3.0 Human medicine	179	**472**	6%	89%	75%	1%	0%	13%	1%	2%	2%
4.0 Agriculture and forestry, veterinary medicine	60	**78**	1%	94%	85%	0%	0%	8%	1%	1%	2%
5.0 and 6.0 Subtotal	539	**472**	2%	95%	86%	2%	0%	7%	1%	1%	1%
5.0 Social sciences	308	**283**	3%	93%	85%	2%	0%	5%	2%	1%	2%
6.0 Humanities	231	**189**	0%	98%	87%	2%	0%	9%	1%	0%	1%
1.0 to 6.0 Total	**1,259**	**1,952**	**5%**	**89%**	**76%**	**2%**	**0%**	**11%**	**1%**	**2%**	**3%**

Source: Statistics Austria (R&D Survey), calculations by Joanneum Research

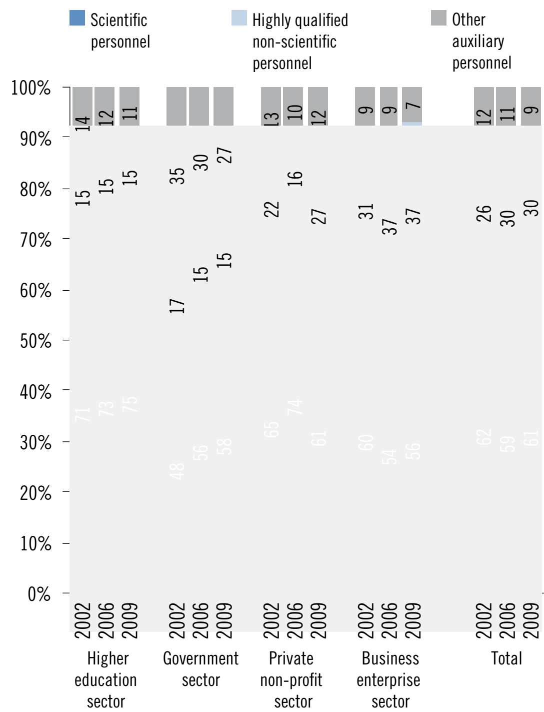
Table 12: Employees in R&D, 2002/06/09

Sector of performance	Employees - headcounts 2002	2006	2009	*(Change 2002–2009)*	Employees - full-time equivalents 2002	2006	2009	*(Change 2002–2009)*	Ratio FTE/headcount 2002	2006	2009
Higher education sector	25,072	32,715	39,084	*+56%*	9,879	12,668	15,059	*+52%*	39%	39%	39%
Government sector	6,010	5,511	6,008	*-0%*	2,060	2,423	2,679	*+30%*	34%	44%	45%
Private non-profit sector	623	404	742	*+19%*	227	161	397	*+75%*	36%	40%	54%
Business enterprise sector	34,020	45,336	50,668	*+49%*	26,728	34,126	38,303	*+43%*	79%	75%	76%
Total	65,725	83,966	96,502	*+47%*	38,893	49,377	56,438	*+45%*	59%	59%	58%

Source: Statistics Austria (R&D Survey), calculations by Joanneum Research

Fig. 14: R&D employment structure in FTEs in Austria for 2002/06/09

Sector of performance	Year	Scientific personnel	Highly qualified non-scientific personnel	Other auxiliary personnel	Total [FTE]
Higher education sector	2002	6 977	1 475	1 427	9 879
	2006	9 261	1 856	1 551	12 668
	2009	11 262	2 204	1 592	15 059
Government sector	2002	999	342	719	2 060
	2006	1 349	357	718	2 423
	2009	1 559	406	714	2 679
Private non-profit sector	2002	148	50	30	227
	2006	118	26	16	161
	2009	243	105	48	397
Business enterprise sector	2002	16 001	8 326	2 400	26 728
	2006	18 471	12 583	3 072	34 126
	2009	21 599	13 993	2 711	38 303
Total	2002	24 124	10 194	4 575	38 893
	2006	29 199	14 822	5 357	49 377
	2009	34 664	16 709	5 065	56 438



Source: Statistics Austria (R&D Survey), calculations by Joanneum Research

search and the engineering sciences. However, the percentage of women in engineering is also quite low in the university segment (16% of scientific staff [see Fig. 16] compared to 18% in the business enterprise sector).

Table 13 also presents two additional aspects:

- The percentage of women rises as the qualification level decreases. In 2009, women occupied 22% of scientific staff posts and 47% of other auxiliary staff posts. The gap, however, has become much smaller in comparison to 2002. The proportion of women among scientific staff has grown much faster than in both of the other occupational categories. This pattern is clear in all sectors of performance.
- Another aspect is the lower „degree of utilisation" of female employees, defined as the ratio of full-time equivalents to headcounts. This is reflected in Table 13 by a higher percentage of women in the headcounts than in the full-time equivalents. However, Table 14 presents this even more clearly.

On average, the degree of utilisation of a male employee is 64% while that of a female employee is only 47% (both practically unchanged compared to 2002). This can be explained by two effects, although it is not possible to determine their relative weight based on the present data: (i) a higher share of part-time employment and (ii) a higher proportion of non-research activities among female employees. The pattern of lower utilisation of female employees is evident in all sectors and occupations. The business enterprise sector has by far the highest "degree of utilization", even if we must keep in mind that the percentage of women in the business enterprise sector is also the lowest (see also Table 13).

Compared to other countries, Austria has a very low percentage of women in research and

Table 13: Percentage of women broken down by sectors of performance and occupation, 2002 and 2009

Sector of performance	Year	Total		of which					
				Scientific staff		Highly qualified non-scientific Human resources		Other auxiliary staff	
		Headcount	FTE	Headcount	FTE	Headcount	FTE	Headcount	FTE
Total	**2002**	28%	22%	21%	16%	32%	26%	53%	45%
	2009	31%	25%	28%	22%	28%	23%	53%	47%
1. Higher education sector	**2002**	41%	38%	30%	27%	65%	65%	70%	66%
	2009	45%	42%	38%	34%	66%	67%	70%	67%
2. Government sector	**2002**	46%	41%	35%	32%	50%	50%	55%	48%
	2009	47%	43%	43%	39%	48%	48%	53%	49%
3. Private non-profit sector	**2002**	50%	48%	38%	36%	63%	66%	80%	74%
	2009	51%	49%	41%	37%	69%	71%	73%	61%
4. Business enterprise sector	**2002**	15%	14%	10%	10%	18%	18%	32%	32%
	2009	18%	17%	16%	15%	16%	15%	36%	35%

Source: Statistics Austria (R&D Survey), calculations by Joanneum Research

development. Figure 15 shows the percentage of women among scientific staff in all sectors of performance.

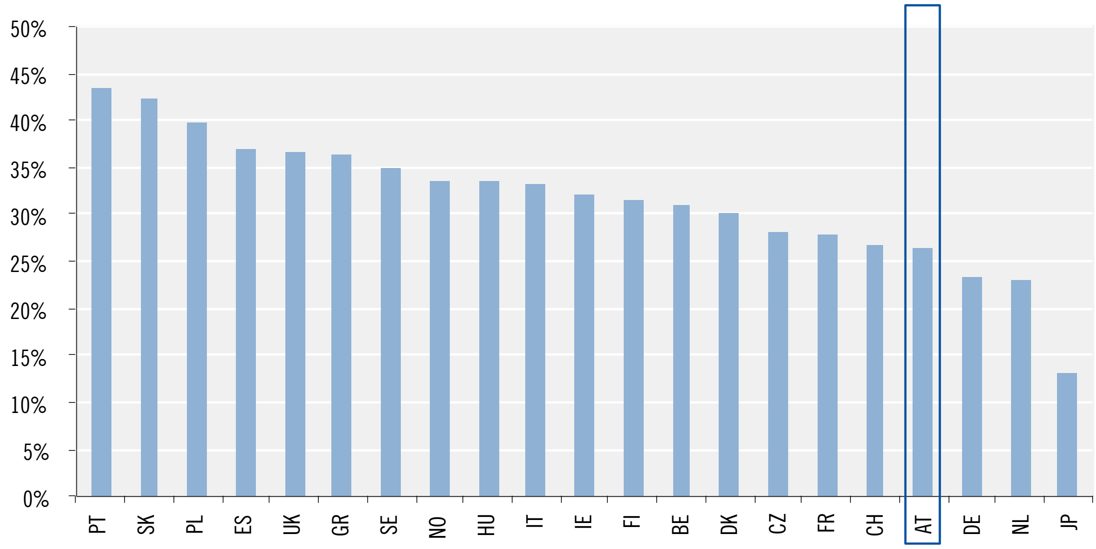
Among the 21 countries for which comparative data was available, Austria has the fourth lowest percentage of women, surpassing only Germany, the Netherlands and Japan. In the business enterprise segment, the percentage of women is lower in all countries than in the government and higher education sectors (here also this is a consequence of the technical orientation of business R&D), yet Austria exhibits a very low number in this area as well – again the fourth worst ahead of Germany, the Netherlands and Japan. In the government

Table 14: Degree of utilisation broken down by research sectors and gender, 2002 and 2009

Sector of performance	Year	Total		of which					
				Scientific staff		Highly qualified non-scientific Human resources		Other auxiliary staff	
		male	female	male	female	male	female	male	female
Total	**2002**	64%	46%	65%	47%	66%	50%	56%	41%
	2009	64%	47%	63%	46%	66%	51%	56%	44%
1. Higher education sector	**2002**	42%	36%	42%	36%	38%	37%	44%	36%
	2009	41%	36%	41%	35%	36%	39%	40%	36%
2. Government sector	**2002**	38%	30%	44%	39%	26%	26%	35%	27%
	2009	48%	41%	54%	44%	34%	34%	46%	40%
3. Private non-profit sector	**2002**	38%	35%	40%	37%	31%	35%	40%	29%
	2009	56%	51%	55%	46%	56%	62%	75%	45%
4. Business enterprise sector	**2002**	79%	75%	83%	77%	73%	75%	73%	72%
	2009	77%	70%	82%	74%	71%	68%	67%	62%

Source: Statistics Austria (R&D Survey), calculations by Joanneum Research

Fig. 15: Percentage of women in the scientific workforce (academics and equivalent employees; headcounts) in an international comparison, 2007



Source: OECD (MSTI), calculations by Joanneum Research

sector, Austria's percentage of women is at the average of the 20 countries and somewhat below that in the higher education sector.

Viewed over time, however, the trend continues toward a higher percentage of women among overall R&D employees, even if these seems relatively sluggish. However, to a certain degree this must be put in perspective. Because research careers last several decades, any „structural change" in this area must necessarily be associated with substantial inertia, which of course does not allow for any abrupt changes in a seven-year comparison (the R&D surveys of 2002 and 2009). The underrepresentation of women at higher levels of scientific institutions is obvious, yet is also a problem resulting from a *time lag*. The percentage of women among university students was just 25% in the 1970s, but today it is almost 55%. The percentage of women in scientific staff has actually increased significantly, as Figure 16 shows.[26]

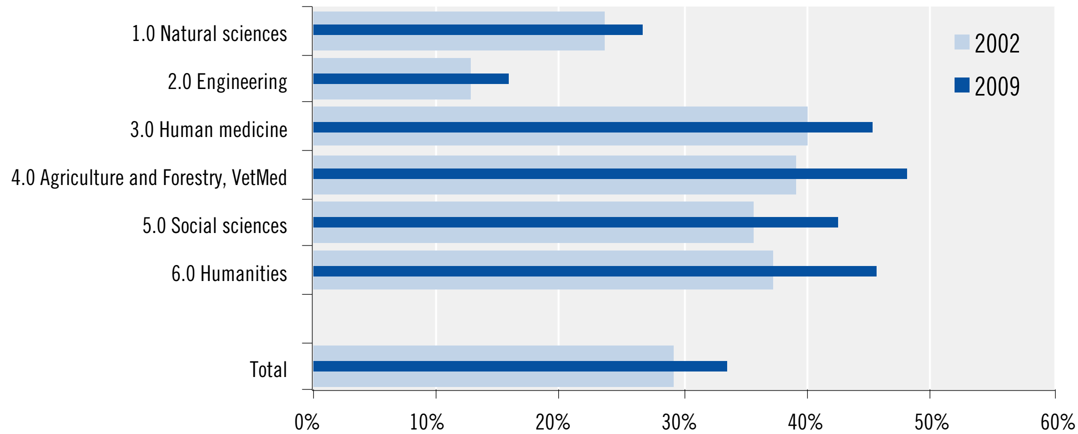
There was a clear increase between 2002 and 2009 in the percentage of women in all scientific disciplines; this was most clearly expressed in a higher percentage of women among junior researchers (see Fig. 17).

Table 15 shows the gender structure of the scientific staff in the business segment.

The scientific personnel in the knowledge-intensive services sector exhibit the highest formal qualification structure (aside from agricultural and forestry, which are statistically insignificant): more than 75% have completed a doctorate (24%) or a degree programme (52%); the percentage of persons with a non-university education is relatively low at 24% (master craftsman examination, school leaving examination, completion of vocational training, other education). At 47%, their percentage is relatively high in the manufacturing sector (for workshops and laboratory work). A certain correlation appears to exist between technology level and qualification level.

26 The university segment is a sub-segment of the higher education sector; no comparative analyses can be derived from the published data of the R&D surveys for the other sectors.

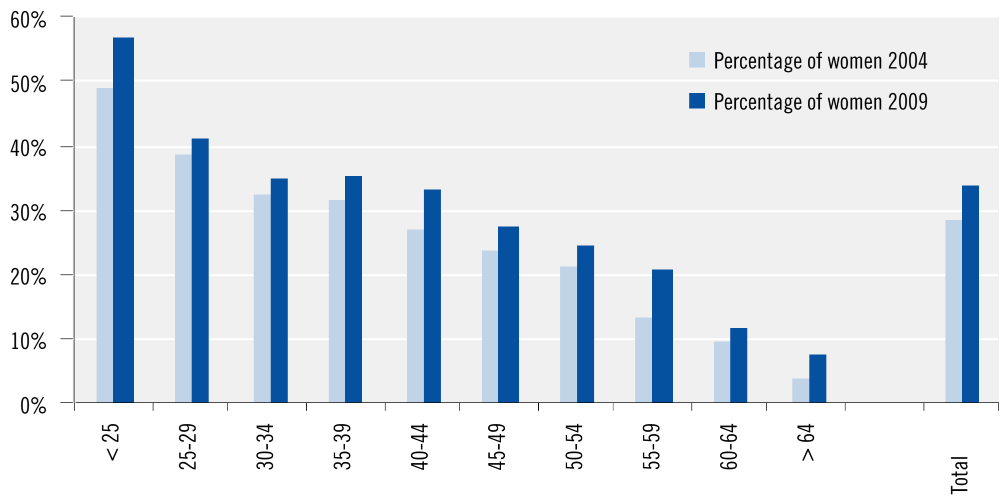
Fig. 16: Percentage of women in the scientific workforce of universities (FTE) broken down by academic disciplines, 2002 and 2009



Source: Statistics Austria (R&D Survey), calculations by Joanneum Research

The percentage of women is quite low overall at 15%. At 19%, the percentage of women is slightly above average among those with doctorates and clearly above average among staff with "non-university post-secondary education" (24%) and with „other education" (28%). The percentage of women is very low in the skilled crafts (5% of those who have completed the examination for the master's certificate).

Fig. 17: Percentage of women in the scientific workforce of universities (FTE) broken down by age group, 2004 and 2009



Source: Statistics Austria (R&D Survey), calculations by Joanneum Research

Table 15: Qualification and gender structure of scientific personnel in the business enterprise sector, full-time equivalents, 2009

sector	Number of survey units performing R&D Survey units	Scientists and engineers [FTE]	Shares: Level of university education completed: Doctorate – Share in FTE	thereof % women	Completed university or university of applied sciences education: degree programme – Share in FTE	thereof % women	Non-university post-secondary education or university education not completed – Share in FTE	thereof % women	Master craftsman examination or foreman courses – Share in FTE	thereof % women	School leaving examination, medium-level technical school, vocational training completed – Share in FTE	thereof % women	other education – Share in FTE	thereof % women	Total – **Share in FTE**	**thereof % women**
Agriculture and forestry, fisheries	5	4	72%	58%	-	-	-	-	-	-	28%	-	-	-	**100%**	**42%**
Mining	10	5	19%	10%	74%	-	-	-	-	-	8%	75%	-	-	**100%**	**8%**
Manufacturing	1443	13,678	12%	14%	41%	11%	3%	12%	3%	4%	35%	7%	6%	20%	**100%**	**10%**
High tech	*197*	3283	18%	20%	48%	12%	2%	25%	1%	28%	30%	10%	1%	24%	**100%**	**14%**
Medium tech	*945*	9500	10%	10%	39%	9%	2%	7%	4%	1%	38%	6%	7%	20%	**100%**	**8%**
Low tech	*301*	895	11%	17%	39%	23%	8%	13%	8%	7%	25%	14%	9%	22%	**100%**	**18%**
Electricity, gas and water supply	37	33	21%	15%	46%	5%	0%	-	3%	-	14%	23%	15%	20%	**100%**	**11%**
Construction	70	93	9%	12%	38%	10%	7%	-	4%	-	40%	7%	1%	-	**100%**	**7%**
Services	1381	7787	24%	22%	52%	23%	4%	38%	1%	9%	16%	19%	4%	49%	**100%**	**24%**
High-tech knowledge intensive	*687*	5056	26%	24%	50%	26%	5%	45%	0%	42%	14%	23%	5%	52%	**100%**	**27%**
Other	*694*	2731	19%	18%	55%	18%	4%	21%	1%	-	20%	15%	1%	13%	**100%**	**17%**
Total	**2946**	**21,599**	**16%**	**19%**	**45%**	**16%**	**3%**	**24%**	**2%**	**5%**	**28%**	**9%**	**5%**	**28%**	**100%**	**15%**

Source: Statistics Austria (R&D Survey), calculations by Joanneum Research

Concluding remarks

In a broad benchmarking study, the European Commission (2008) compared equal opportunity measures implemented in science and research within the European Union. The results showed that there are several relevant explanatory factors and that, in countries with highly-developed innovation systems and equal opportunity policies, there is a relatively low percentage of women, particularly in leadership positions. The major reasons for this are on the demand side of the equation, meaning the employers. And this is where cultural and organisational reasons play a role: "*Therefore, in many cases the solution may depend more upon changing the culture and organization of the science sector overall rather than on further policy development; this applies most particularly in industrial research and in the business enterprise sector.*"[27]

Like nearly all segments of society, science and research has experienced a shift in societal values as the interplay between individual research accomplishments and scientific careers has changed, along with general circumstances (see also Haller 2012). Every talented individual[28] requires a proper framework of organisation,

27 European Commission (2008), pg. 9.

28 "First-class research requires first-class talents. Most basic scientific discoveries are due to talented individuals, not large groups and institutions. These talents are most productive whenever they follow their research instincts and can define their research on their own" (FWF 2008, pg. 18).

technology and personnel as a basic prerequisite for scientific and research activity. These elements do not play off against each other, especially against the backdrop of the fact that research activity and organisation have changed. Scientists today often no longer find a clearly defined field of research; instead, they have to work creatively with the uncertainties and changes in fields of science and research (Haller 2012).

Along with these shifts in the research environment, there have also been transformations in the wider context of the lives of scientists. The shift in social values in recent years has caused leisure time and private life to gain importance vis-a-vis work and career, which can lead to problematic tensions for a scientist's career. This shift in values affects women in particular, but it also presents problems for men who want to take their familial and paternal role seriously.

However, there are positive trends as well. Helga Nowotny has written in this context about a "myth of incompatibility": the biographies and professional careers of many scientists indicate that family and children are very compatible with outstanding scientific achievements. Even *dual career couples*, in which both partners pursue successful careers, are no longer rare, yet this constellation is only possible with a redistribution of their professional and familial roles. Along with specific funding programmes, essential prerequisites for this include in particular the creation of suitable framework conditions (such as appropriate contract structures), sufficient infrastructure for research institutions, and a performance-related incentive system.

Nevertheless, social conditions also facilitate the emergence of different value orientations and shifts in life perspectives throughout a professional career. This can also lead to a voluntary and conscious decision to pursue other life goals and end a scientific career (see also Pinker 2008).

More young and talented junior scientists must be won over to the scientific professions, and this is a basic prerequisite in research policy. At the same time, the structural prerequisites and framework conditions for this must be created so that women who have already begun a scientific career and want to continue can be retained in the R&D sector. This can be done with demand-side policy approaches. This means that, even if the structural barriers for women in research and development can be dismantled, the percentage of women can only be increased by changing the work and organisation culture in scientific pursuits – and both genders would profit from this.

1.6 Funding R&D – the Austrian Research Promotion Agency (FFG) and the Austrian Science Fund (FWF)

1.6.1 The Austrian Research Promotion Agency (FFG)

The Austrian Research Promotion Agency (FFG) offers a broad array of suitable instruments for funding research projects at business enterprises and research institutions. The portfolio extends from low-threshold programmes that ease entry into sustained research and innovation activities to top-flight research and centres of excellence.

Table 16 provides an overview of the number of projects, participations and stakeholders, as well as contractually secured funds in 2011.

Total contractually secured funding volume (including liabilities) in 2011 was € 473.4 million, which corresponds to a cash value of € 349 million. Total funding was therefore significantly below that of the prior year (2010: € 431 million cash value), yet this was due to the type of survey. The tables are based on contractually secured funds and not on funds that were actually paid out. Because many of the contracts in the COMET programme, for example, were concluded last year, there was a much lower share of contractual approvals for these funding vehicles; this also applies to a few programmes in TP (technology programmes).

A funding volume of € 473 million was able to fund € 903 million in research projects. A total of

Table 16: Austrian Research Promotion Agency (FFG) – Funding statistics 2011 [amounts in € thousands]

Area	Programme	Projects	Participation	Stakeholders	Total costs	Funding including liabilities	Cash value
ALR	ASAP	20	45	35	5,646	4,071	4,071
		20	**45**	**35**	**5,646**	**4,071**	**4,071**
BP	core programme	607	643	513	409,708	233,022	112,102
	Service innovations	30	34	34	11,041	5,658	4,956
	Headquarters	25	27	23	85,566	24,915	24,915
	High-tech start-up	19	19	19	12,699	8,884	6,024
	Project start	101	101	99	606	303	303
		782	*824*	*649*	*519,620*	*272,782*	*148,299*
	BRIDGE	57	157	142	20,239	13,094	13,094
	EUROSTARS	12	16	16	7,832	3,972	3,972
	Innovation-Voucher	624	1,248	927	3,128	3,125	3,125
		1,475	**2,245**	**1,615**	**550,818**	**292,973**	**168,490**
EIP	AF-Wiss	109	109	72	900	673	673
	TOP.EU	13	13	7	648	486	486
		122	**122**	**76**	**1,548**	**1,159**	**1,159**
SP	COIN	34	193	173	23,688	13,408	13,408
	COMET	7	228	213	93,816	27,749	27,749
	FEMtech	16	28	27	2,646	1,612	1,612
	Research Studios Austria	20	30	27	18,773	12,879	12,879
	talents	658	658	412	2,945	1,747	1,747
		735	**1,137**	**765**	**141,869**	**57,395**	**57,395**
TP	Alpine Schutzhütten	2	2	2	120	53	53
	AT:net	19	20	20	7,379	2,576	2,576
	benefit	35	66	51	9,209	5,982	5,982
	ENERGIE DER ZUKUNFT	52	217	152	11,127	5,934	5,934
	ERA-NET ROAD	15	67	44	4,774	4,774	4,774
	FIT-IT	67	114	90	38,687	18,099	18,099
	GEN-AU	6	6	4	96	96	96
	IEA	6	9	8	646	441	441
	IV2Splus	41	155	117	18,495	12,090	12,090
	KIRAS	17	84	61	8,124	5,293	5,293
	Beacons for eMobility	4	48	46	22,951	10,831	10,831
	NANO	12	33	22	5,645	4,388	4,388
	Neue Energien 2020	81	310	218	61,983	36,453	36,453
	TAKE OFF	15	64	53	14,359	9,149	9,149
		372	**1,195**	**758**	**203,596**	**116,161**	**116,161**
Austrian Research Promotion Agency (FFG) (funding and expenses)		2,724	4,744	2,758	903,476	471,758	347,275
FFG authorisations						1,726	1,726
FFG total: contracts signed						**473,484**	**349,001**

ALR Aeronautics and Space Agency; BP: General Programmes; EIP: European and International Programme; SP: Structural Programme; TP: Technology Programme
Source: FFG

2,724 funded projects included 4,744 participations and 2,758 stakeholders.

An analysis at the level of organisation types also mirrors the broad funding portfolio of the Austrian Research Promotion Agency (FFG). The funding share for firms has increased to almost 64% on the basis of contractually secured funds (2010: 55%). Research institutions on the other hand saw their share drop from 27% to 21%, and institutions of higher education remained at about the same level. In a multi-year comparison, the funding share of research institutions went down for the first time. As previously mentioned, this effect was caused primarily by the COMET programme for competence centres, which since 2008 has facilitated an increase in funding shares of research institutions at the expense of the business enterprise share. Fewer approvals were issued in 2011 due to the programme's tendering schedule.

The allocation of project funding for general programmes (BP), based on the economic sub-sector system (NACE 2008)[29], shows that the highest share (almost 25%) of funds (by cash value) flowed into the electrical and electronics industry (including optics and information processing). Data processing services came in at second place with a funding share (cash value) of about 15%, followed by the pharmaceutical industry, which received almost 13% of total funds. If we examine the five industries with the highest percentages of total cash funding (with mechanical engineering in fourth place and the automobile industry in fifth), then we get a share of just under 69%.

In contrast, their share of projects stands at "just" 39%. This results in the finding that project size (and amount of funding) in these industries (which are generally quite technology- and research-intensive) are above the average.[30]. This effect is particularly pronounced in the pharmaceutical industry, where a 3% percentage of projects received nearly 13% of total cash-value research funding. This industry has the highest average project size at € 1.6 million (funding totals are also the highest, with average funding of € 531,000 cash value per supported project).

Overall, this shows that the Austrian Research Promotion Agency's general programmes are working, both in terms of the structural breadth of the Austrian economy (which is reflected in the equal distribution of project shares across industries) and the focus on the high-tech industries (focus of funds on the aforementioned five industries).

At the funding programme level in 2011, available programmes for SMEs were expanded to include an additional vehicle for supporting project preparation (project start) and the Innovation-Voucher Plus for over € 10,000. The major new initiatives in the top research area were the implementation of the new "Smart Production" priority as well as the thoroughly adapted "Competence Headquarters" programme. Finally, offerings in the area of human resources were restructured and expanded. The "Talents" programme, started in 2011, combines several precursor programmes for the mobilisation and education of young researchers. A new qualification programme, "research expertise for industry", was established to help SMEs to build up innovation competence in a sustainable way via targeted qualification measures.

Major steps were taken last year in the implementation of priority and portfolio management: calls for proposals in the individual programmes were successively integrated into the new schedule for announcements. This envisions two windows in spring and autumn for announcing competitive calls for proposals, along with the current application procedure. Furthermore, 2011 saw the successful introduction of the first package of

29 In the interest of clarity, an additional aggregation was performed on the basis of NACE 2008 in which NACE classes were combined.
30 The exception in this list of five industries is data processing services, which had a somewhat higher share of projects than its cash value.

Table 17: Austrian Research Promotion Agency (FFG) funding by organisation type 2011 [in € thousands]

Organisation type	Participations	Total funding	Cash value	Cash value share
Firms	2688	345,147	220,816	*63.6%*
Research institutions	768	73,935	73,784	*21.2%*
Universities	1048	46,228	46,228	*13.3%*
Intermediaries	42	2,862	2,862	*0.8%*
Other	198	3,586	3,586	*1.0%*
Total result	4744	471,758	347,275	*100.0%*

Source: FFG

new instrument guidelines. These are meant to ensure that, regardless of programme and topic, similarly structured projects will meet with identical conditions and frameworks everywhere. A decisive step has been taken by the Federal Ministry for Transport, Innovation and Technology (BMVIT) and the Federal Ministry of Economy, Family and Youth (BMWFJ) as the owner and representative, along with the Austrian Research Promotion Agency (FFG), towards the objective of treating similar projects in the same way.

1.6.2 The Austrian Science Fund (FWF)

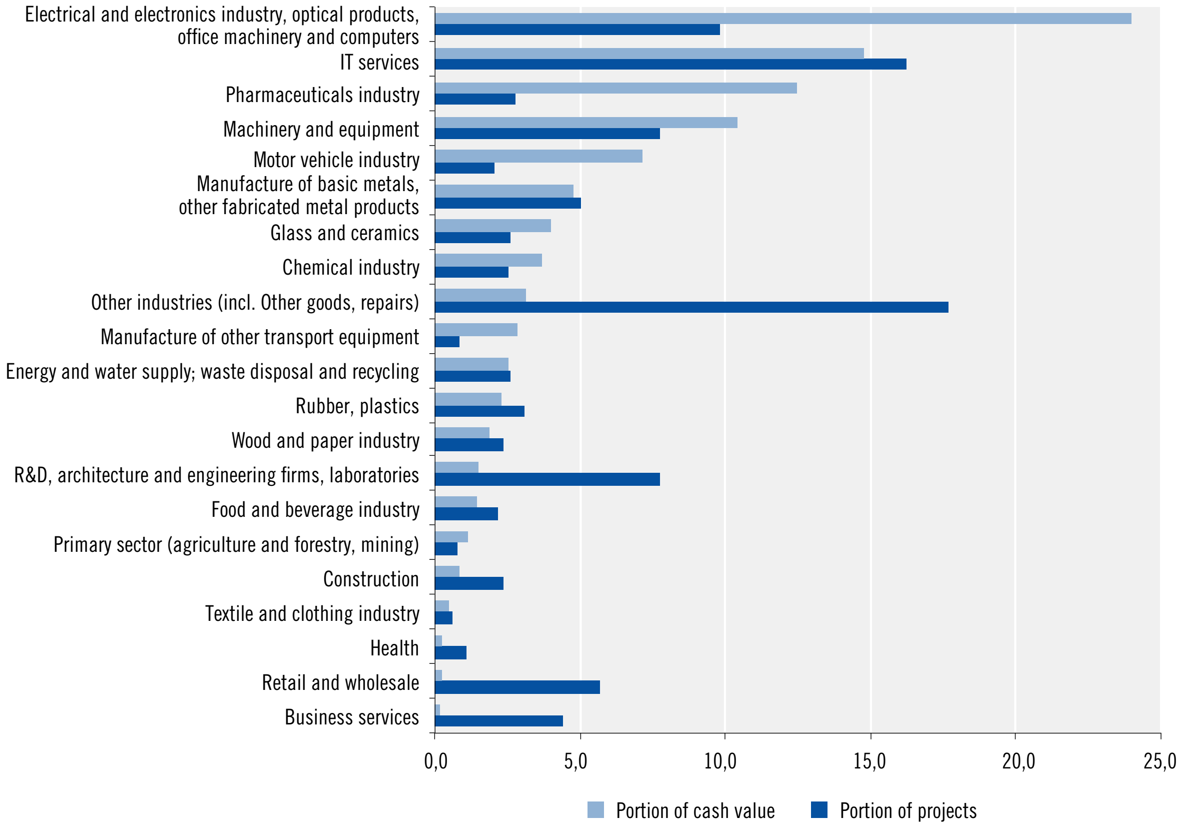
The Austrian Science Fund (FWF) focuses on funding basic research in Austria and is obligated equally to all scientific disciplines. The only yardstick for basic orientation is the international scientific community, which is expressed in the thorough application of the *peer review* principle in the process of selecting research projects that deserve funding. With its orientation towards basic research, the Austrian Science Fund (FWF) enables the academic sector in Austria to take on its role as a "knowledge producer" within the Austrian innovation system. In accordance with its mission, the Austrian Science Fund (FWF) contributes to cultural development, to building a knowledge-based society, and to increasing Austria's value and prosperity. The strategic priorities of the Austrian Science Fund (FWF) are defined as follows:[31]

- Strengthen Austria's scientific performance in international comparison and its attractiveness as a place to do research, above all by funding top research by individuals and teams, as well as contributing to the improvement of competitiveness of research institutions and Austria's science system.
- Qualitative and quantitative expansion of research potential according to the principle of "education through research".
- Strengthened communication and enhancement of the mutual effects between science and all other areas of cultural, economic and social life; systematic publicity work should consolidate acceptance of science.

The total extent of Austrian Science Fund (FWF) grants in 2011 stood at € 195.2 million, which was a nominal increase of almost 14% over 2010 (grant volume of € 171.8 million). The portfolio of funding programmes is very diverse, although grants for stand-alone projects were clearly the quantitative focus, both in terms of number and grant volumes (see Table 18). Single project funding amounted to € 87.9 million, or about 45% of overall grants. During the period under observation, there were 1086 stand-alone project applications, of which 341 were ap-

31 A full definition of the Austrian Science Fund's vision, mission and strategic priorities is available at http://www.fwf.ac.at

Fig. 18: Project funding in the general programmes sector by industry [based on NACE 2008]: Shares of projects and funding cash value of total amount



Source: FFG, calculations by Joanneum Research

proved, which is an acceptance rate of 31%. These stand-alone projects are initiated by the application (bottom-up) and provide scientists with maximum flexibility in the definition and design of their research projects, because there are neither formal limits on project size nor for the number of concurrently operated research projects. Furthermore, national and international cooperative ventures can also be supported in the context of stand-alone projects.

Throughout the course of 2011, special research areas (SRAs) and national research networks (NRNs) were combined to create a new Special Research Area programme that meets researchers' changing requirements. The objectives of this programme, which is oriented towards the long term (eight years, with an intermediate evaluation at four years) and is rather large (an approximate value of € 1 million per project), are the following:

- To create research networks of international dimensions through autonomous at one university or, under certain conditions, at several university locations;
- To build up extraordinarily high-performance, closely networked research units for addressing inter- or multi-disciplinary, long-term, complex research topics.

The figures in Table 18 however still refer to the old guidelines because the submission deadline under the new guidelines was only September 2011, and decisions about these new applications will only be made in 2012. A total of about € 32

Table 18: Austrian Science Fund (FWF) funding at a glance [2011]

	Applications (number)	New approvals (number)	Requested funding volume (€ million)	Approved funding volumes***
Stand-alone projects	1086	341	299.6	88.7
International programmes	286	79	62.8	15.1
SRAs (special research areas)*	27	23	9.6	8.3
SRA extensions	34	30	10.7	9.3
NRNs (national research networks)*	36	22	11.8	7.3
NRN extensions	36	26	10.4	7.3
START	57	8	60.8	4.8
START extensions	7	7	3.8	3.8
Wittgenstein	18	2	27.3	3
DKs*	7	4	17.5	9.4
DK extensions	5	5	12.7	10.5
Schrödinger	144	69	14	7.1
Meitner	104	38	12.4	5.1
Firnberg	49	16	10.1	3.4
Richter	45	11	12.2	3.5
Translational Research**	52	15	17.2	4.2
KLIF	183	15	38.6	3
PEEK	49	6	14.6	1.6
Total	2225	717	646.1	195.2

* Two-stage process; the figures shown here correspond to sub-projects of complete applications (2nd stage);
** Translational Research Programme 2011 incl. Brain power
*** including supplemental grants

Source: FWF

million was approved in 2011 for these two programmes (SRAs (special research areas) and NRNs (national research networks), including extensions), which is about 17% of total Austrian Science Fund (FWF) grant volume.

The FWF's various programme vehicles are enormously important for the education and further academic development of the next generation of Austrian scientists. It should be noted that, in addition to programmes explicitly oriented towards human capital (e.g., the grant programmes such as the Schrödinger Programme, the Meitner Programme, the Firnberg Programme or the Richter Programme), all of the Austrian Science Fund's programmes have in principle a direct effect on research staff because these staffers are financed with FWF funds. Overall, more than 3,500 positions were funded by the Austrian Science Fund (FWF) in 2011, of which 1,200 were post-docs and 1,800 were doctoral students. There was an increase over time of 4% against 2010 (see Table 19).

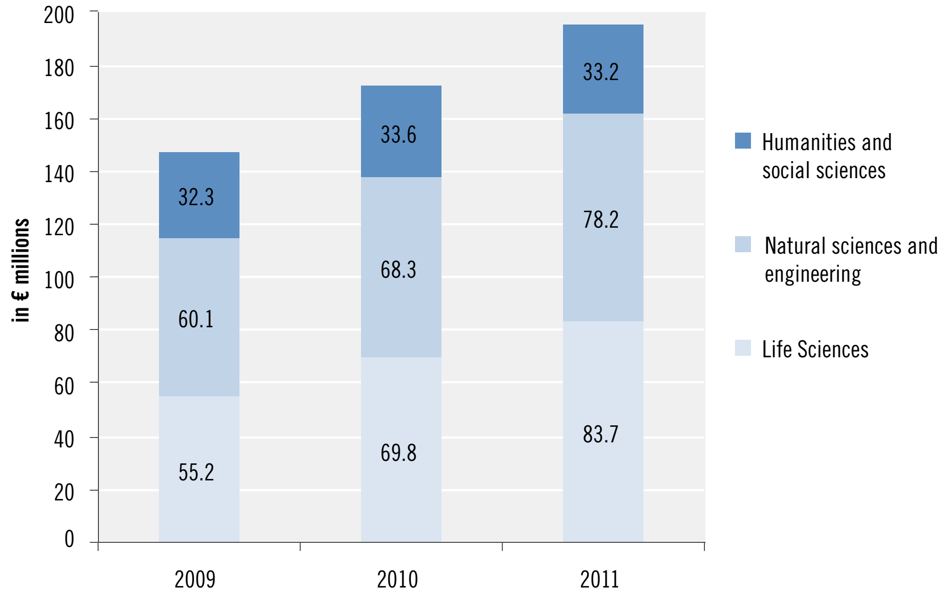
Table 19: Research personnel funded by the Austrian Science Fund (FWF)

	2009	2010	2011
Post-docs	1,156	1,197	1,229
Doctoral candidates	1,619	1,683	1,771
Technical staff	134	122	137
Other staff	405	403	405
Total	3,314	3,405	3,542

Source: FWF

Finally, we should note that the Austrian Science Fund (FWF) offers a "level playing field" for all scientists, regardless of disciplinary background, meaning that the only funding criterion is scientific quality, which is reviewed by an international *peer review* process. The distribution of total grants (see Fig. 19) is therefore the result of the specialisation of Austria's academic sector, not an expression of any preferences at the Austrian Science Fund (FWF). The largest share fell to the life sciences with 43% or € 84 million, followed by the natural sciences and engineering (40%, or just under € 80 million). The humanities and social sciences received € 33 million in 2011, which is a share of 17%. What is remarkable is that the structure shifted somewhat towards the life sciences during the period under observation.

Fig. 19: Austrian Science Fund (FWF) grants by disciplinary group (in € million)



Source: FWF

2 Structures and trends in international comparison

2.1 Research and development

The OECD's MSTI (*Main Science and Technology Indicators*) database offers a data basis comprised of R&D and technology-relevant indicators for 41 states. This publication appears twice a year and contains data on the scientific and technological performance of OECD states and selected non-member states. This data includes preliminary or final figures and government estimates for areas such as expenditures for research and development (R&D) or funding sources.

Unlike the Innovation Union Scoreboard (IUS), the MSTI does not contain any results from innovation surveys. The data are therefore "harder" yet do not cover any organisational information; they primarily represent inputs (R&D expenditures and funding, personnel) and outputs (exports of technological goods and technological trade and balance of payments, patents).

This basis is used in the following discussion for the purposes of a comparative analysis. Austria is compared with four groups of states – e.g., the groups defined in the IUS 2011 as

- Innovation Leaders:

Denmark, Finland, Germany, Sweden;

- Innovation Followers:

Austria, Belgium, Cyprus, Estonia, France, Ireland, Luxembourg, Netherlands, Slovenia und United Kingdom;

- Moderate Innovators:

Czech Republic, Greece, Hungary, Italy, Malta, Poland, Portugal, Slovak Republic und Spain; and the USA.

The last IUS group, the *Modest Innovators*, is not included due to a lack of data (of the four states classified in this group, only Romania is represented in the MSTI). The results for the groups represent unweighted mean values.

Funding and implementation

Total expenditures for research and development, or *Gross Domestic Expenditures on R&D* (GERD), consist of the following sub-groups:

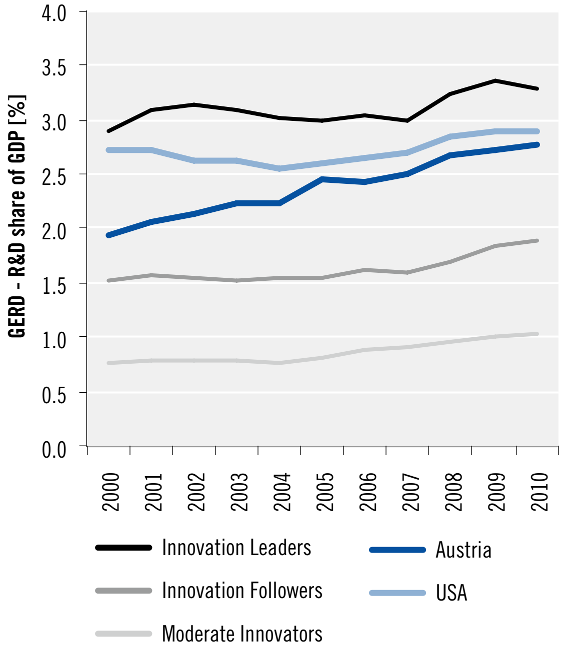
- BERD (Business Expenditures on R&D),
- HERD (Higher-Education Expenditures on R&D) and
- GOVERD (Government Expenditures on R&D).

Gross expenditures for R&D (GERD) as a share of GDP show an uninterrupted rise in Austria, leading from under 2% in 2000 to about 2.8% in 2010:
even if the distance to the group of *Innovation Leaders* continues to be significant, it has been reduced noticeably since 2000; the distance to the *Innovation Followers* (the group to which Austria belongs) was also expanded. Both statements apply in particular for the first half of the 2000s; since 2006, the three groups have developed almost in parallel.

The catching-up process toward the *Innovation Leaders* (as well as the increasing distance from the *Innovation Followers*) can be traced back primarily to the business sector (see Fig. 21).

While higher-education expenditures on R&D (HERD) displayed roughly the same trends in all three groups, Austria showed much more dy-

Fig. 20: GERD over time, 2000 to 2010



Source: OECD MSTI, calculated by Joanneum Research

namic development in business expenditures on R&D (BERD) – the distance to the Innovation Leaders was reduced from about 1 to 0.4 percentage points (with a simultaneous increase in distance to the Followers from 0.1 to 0.7 percentage points). The three groups have also shown similar trends here since 2006, meaning that the catching-up process was primarily a phenomenon of the first half of the decade.

Government expenditure on R&D (GOVERD) has shown a slightly different development: there were parallel developments in the *Innovation Followers* and *Moderate Innovators*, with a decline in the group of *Innovation Leaders*.

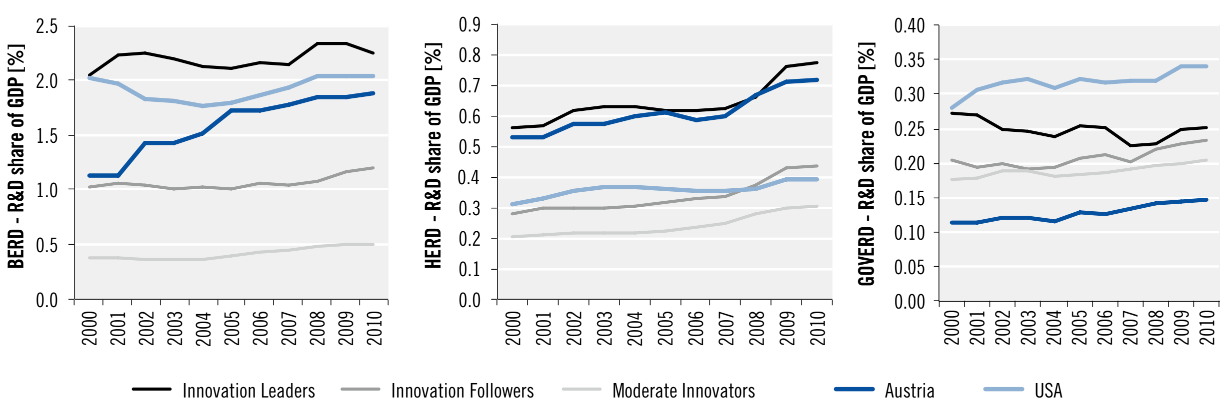
There were very striking differences between the three innovation groups in R&D expenditure by funding source and sectors of performance (see Fig. 22).

The higher the research intensity of a national economy, the higher the business share of both R&D funding and implementation (with a countertrend in public sector funding and in implementation by the public sector and higher education sector).

Austria exhibited a particularity in funding: although internationally financed R&D has declined, it still provides a very high share of R&D. This represents primarily funding from business (even if from abroad); the total funding share from abroad and from firms in Austria is very similar to the other *Innovation Followers*.

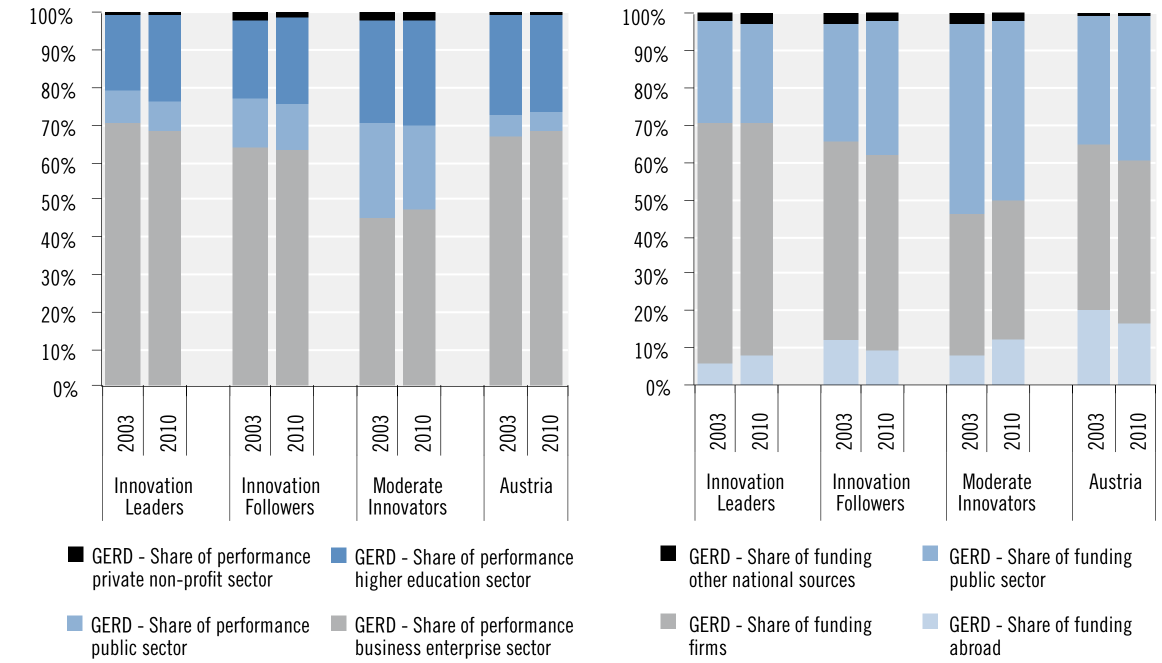
Austria's uniqueness in R&D implementation is the very low share of public sector participation; the business sector, however, is somewhat higher than among the other *Innovation Followers*, almost at the level of the *Innovation Leaders*.

Fig. 21: BERD, HERD and GERD over time, 2000 to 2010



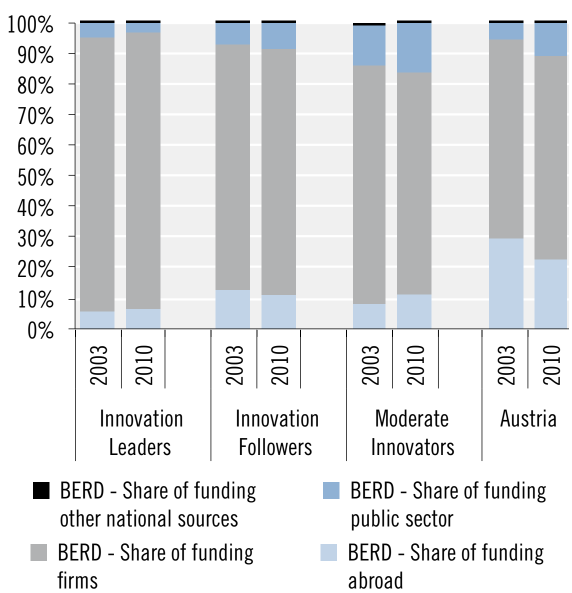
Source: OECD MSTI, calculated by Joanneum Research

Fig. 22: GERD by funding sources and sectors of performance, 2003 and 2010



Source: OECD MSTI, calculated by Joanneum Research

Fig. 23: BERD by funding sources, 2003 and 2010



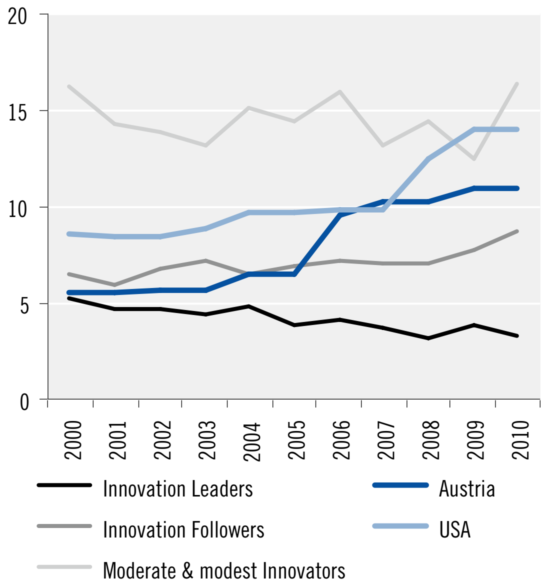
Source: OECD MSTI, calculated by Joanneum Research

The share of funding from abroad is of particular importance in the funding of corporate business research (BERD):

a good part of the decline in the share of funding from abroad was compensated by the public sector in Austria. Austria has exhibited constant growth in public sector funding of business R&D since 2005. There has been a striking gap opening up between the development of the group of *Innovation Leaders* (public funding sank below 4%) and Austria (where public sector financing rose to 11%). One major reason for this gap is the massive expansion of indirect research funding (research premiums) in Austria.

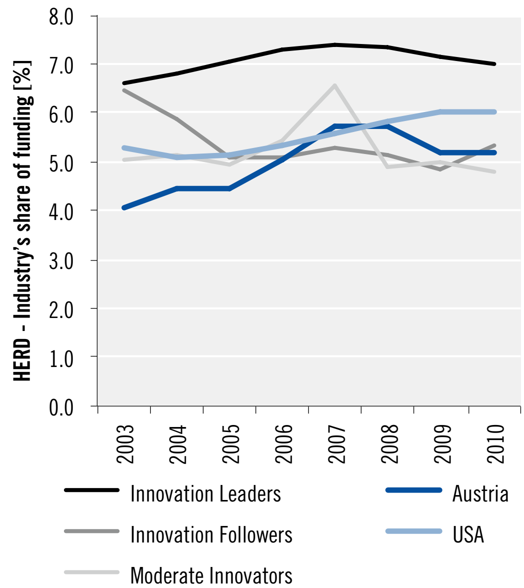
What is interesting in this context is that the USA also had a strong increase in public funding; yet this only began in 2008 and is a consequence of the financial crisis, which led to a significant expansion in government expenditures, not least for research. A slight rise that may have been

Fig. 24: BERD – Public sector funding share, 2000–2010



Source: OECD MSTI, calculated by Joanneum Research

Fig. 25: Share of industry funding of HERD, 2003–2010



Source: OECD MSTI, calculated by Joanneum Research

caused by the financial crisis also appeared among the *Innovation Followers*, while the *Innovation Leaders* had an unbroken downward trend (starting from a similar base level, the public proportion among the *Innovation Leaders* is now only half as much as the *Innovation Followers* and a solid third of the Austrian share).

Manufacturing's share of funding in higher education research shows a slight upward trend in Austria and is currently at the level of the *Innovation Followers*, yet still significantly below the average values of the *Innovation Leaders*.

Research and personnel

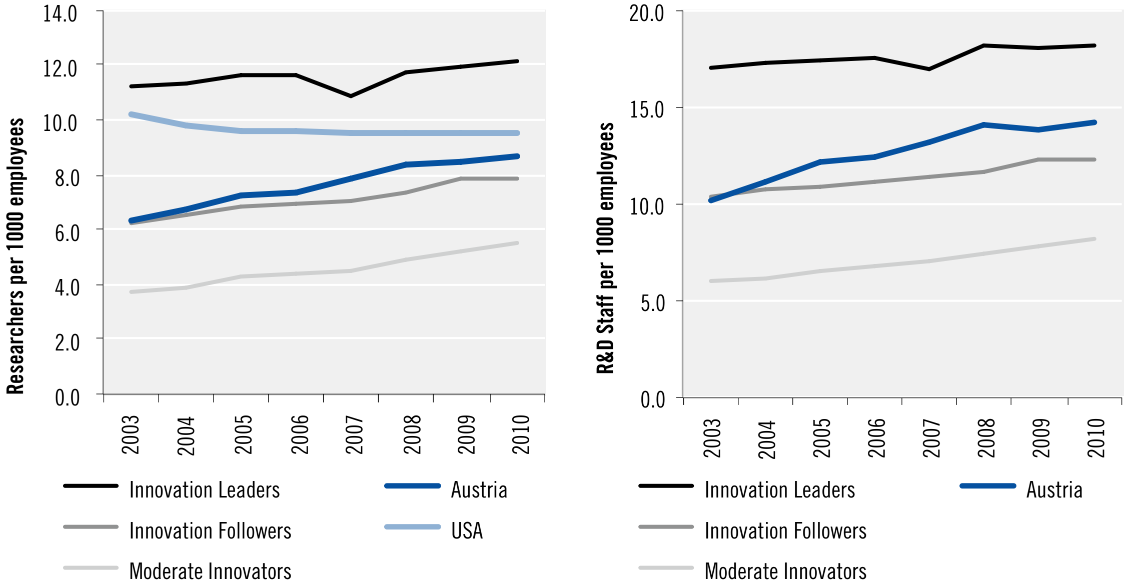
The proportion of researchers (individuals) among employed persons in Austria is relatively low when compared with the R&D expenditure as share of GDP:

While the GERD in relation to GDP in Austria is between the *Innovation Leaders* and *Innovation Followers*, the proportion of researchers among employed persons tends towards the level of the *Innovation Followers*, even if the share of R&D personnel is distinctly higher. In both essential sectors – in the higher education sector and the business enterprise sector – the proportions of research personnel are significantly below those of the reference countries.

The proportion of women is also low: in Austria, despite an upward trend, this figure remains significantly below comparable figures for the other country groups (although it must be noted that the proportion of women is negatively correlated with the R&D level – the *Moderate Innovators* posted the highest proportion of women, a consequence of historically balanced gender roles in the often post-communist countries found in the *Moderate Innovators* group). In addition to a generally high proportion of women in the higher education sector, the differences between the countries are also less pronounced (although Austria is also distinctly below the other country groups here).

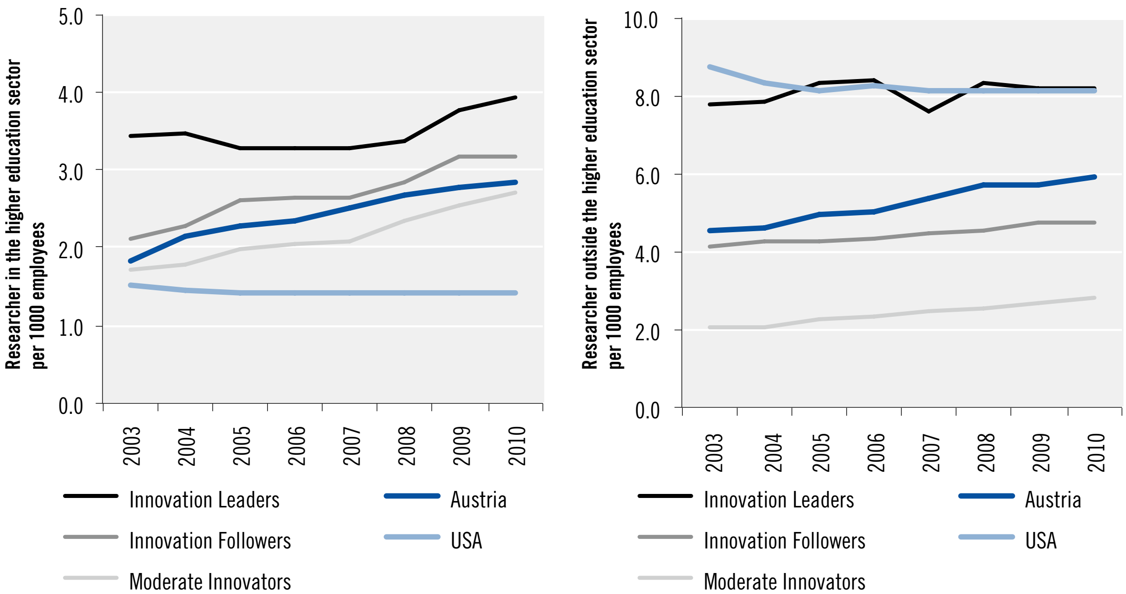
Comparative analyses yield a striking incongruence between Austria and the comparison groups: Austria has shown a remarkably high funding allocation over the past few years, which

Fig. 26: Share of researchers among the gainfully employed, 2003–2010



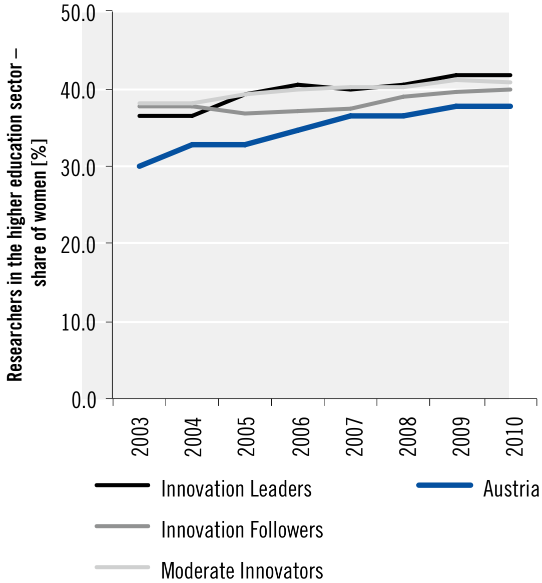
Source: OECD MSTI, calculated by Joanneum Research

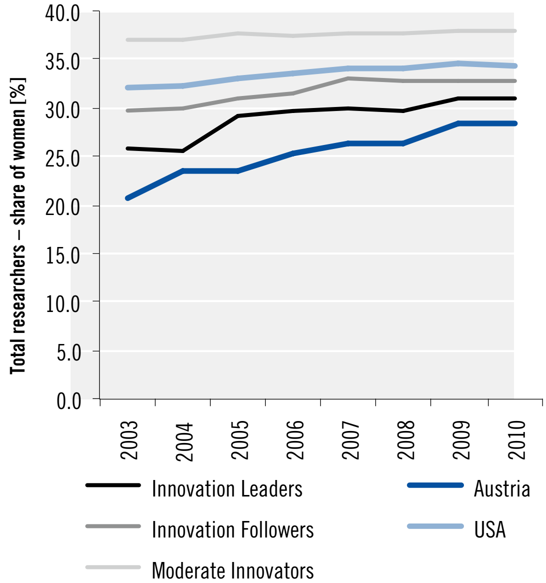
Fig. 27: Researchers by sectors, 2003–2010



Source: OECD MSTI, calculated by Joanneum Research

Fig. 28: Share of women among research personnel, 2003–2010





Source: OECD MSTI, calculated by Joanneum Research

has significantly reduced its distance to the *Innovation Leaders*. This development was driven primarily by the business enterprise sector as well as the expansion of government funding in business R&D. However, this funding allocation was not reflected accordingly in the number of employees in research and development. In both the higher education sector and the business enterprise sector, the respective shares of research personnel among employed persons remains significantly below similar figures for the the *Innovation Leaders*.

2.2 Austria's position in the IUS in 2011

The following two chapters are based on the European Commission's Innovation Union Scoreboard (IUS) and position Austria within the European context. While this section draws on the results of the recently published IUS 2011 and presents a critical analytical perspective on Austria's position, Chapter 2.3 connects the IUS 2011 results with the RTI strategy of the Austrian Federal Government and articulates Austria's position in specific fields of policy vis-à-vis the *Innovation Leaders*.

The IUS is the further development of the European Innovation Scoreboard, or EIS, and was first conducted in 2010 for the purposes of comparing European innovation. The IUS is implemented on the basis of the European Commission communication on the "*Europe 2020 Flagship Initiative Innovation Union*" to enable the assessment and comparison of innovation development within the EU 27 and the EU vis-à-vis other national economies (including the USA and Japan) (European Commission 2010).

The IUS provides a (quantifiable) representation of performance based on specific indicators that have been further developed over the years for the purpose of creating a realistic and comparable assessment of innovation development.[32]

32 The Austrian Research and Technology Report 2008 provides an extensive discussion of the EIS (p. 17ff.)

Improvements in the data basis and constant development of analytical methods (not least the increasing length of the observation period) are facilitating improvements over time in the comparability of the countries and the significance of the IUS/EIS.

Despite these improvements, however, we must keep the limitations of an indicator-based comparisons of innovation systems in mind, especially when the individual indicators used in the IUS are combined into a Summary Innovation Index (SII), resulting in the need for a highly cautious interpretation of this number. It is obvious that not all determinants and determining factors can be acquired using quantifiable indicators. However, considering these limits, the IUS has proved to be a suitable instrument for tracing developments and providing a basis for comparisons in the areas of R&D and innovation.[33]

The European scoreboard (EIS and IUS) went through changes and improvements over time; the list of indicators, for example, was reduced to 25. These indicators cover the relevant areas of research and innovation.[34] They are broken down into three types of indicators (enablers, firm activities and outputs) and eight dimensions. A description of the indicators as well as the methods used can be found in Hollanders and Tarantola (2011).

Table 20 provides an overview of the underlying indicators and sources upon which the IUS 2011 is based (European Commission 2012).

Austria in the IUS 2011

Innovation development in each country is summarised on the basis of underlying indicators into a *composite indicator* (Summary Innovation Index – SII). There are quite a few reasons why rankings shift.

The results from recent years have shown that the basic order of EU Member States in the EIS has largely stayed unchanged since the benchmark was introduced: the group comprising the *Innovation Leaders* includes four to five countries (Sweden, Denmark, Germany and Finland). There are ten countries in the *Innovation Followers* (Belgium, United Kingdom, Netherlands, Austria, Luxembourg, Ireland, France, Slovenia, Cyprus and Estonia) group that still exceeded (or were just under) the average of the 27 EU member states.

The group of *Moderate Innovators* consists of Italy, Portugal, Czech Republic, Spain, Hungary, Greece, Malta, the Slovak Republic and Poland (positions 15–23); and finally, the group of *Modest Innovators* contains Romania, Lithuania, Bulgaria and Latvia.

These groups are quite stable over time; changes in the relative positioning primarily take place within these groups.

Austria occupied 7th place in the 2010 rankings of the Summary Innovation Index (SII). Austria's current position in 8th place is "technically" a decline, yet a closer look shows that, as we have repeatedly emphasised, great caution must be exercised when interpreting the rankings (as well as all possible position changes): in terms of the IUS value, there is less difference between positions 5 and 11 than there is between positions 4 and 5 (the transition between the *Innovation Leaders* and *Innovation Followers*).

The differences within this group are quite minimal; the IUS values for positions 7, 8 and 9 (Netherlands, Austria and Luxembourg) only diverge at the thousandths level. As the Austrian Research and Technology Reports have shown in recent years, Austria continues – as in practically every year since 2005 – to remain firmly anchored in the group of *Innovation Followers*.[35]

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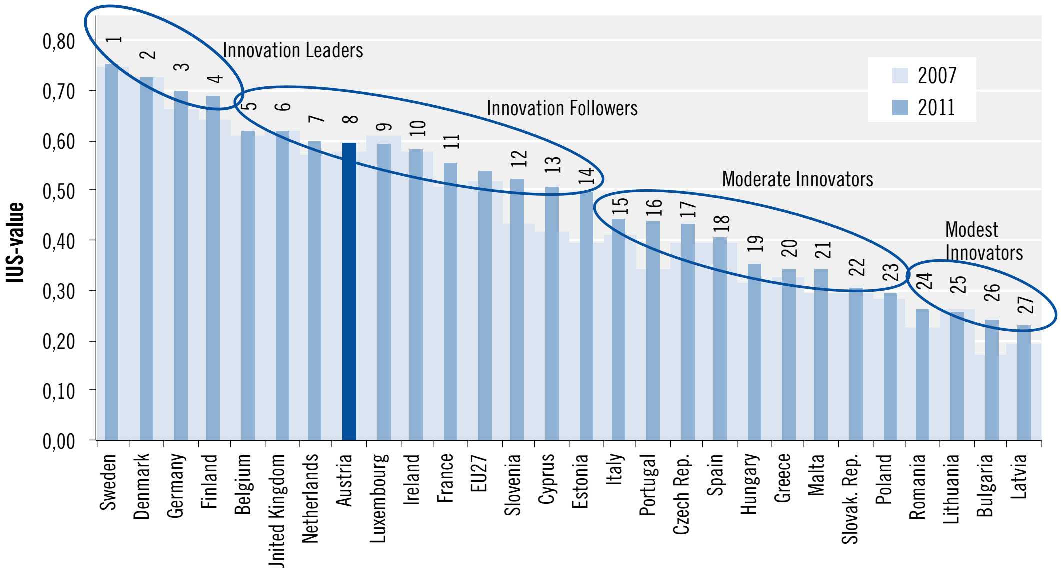
33 See Schibany and Streicher for a comprehensive discussion of these aspects (2008).
34 For more details, see the documentation at http://www.proinno-europe.eu/metrics.
35 A "real development" can be observed until about 2005, a period in which Austria's ranking climbed from the third quartile of the EU 25 to a solid position somewhere between position 5 and 10 within the EU 27.

Table 20: IUS 2011 Indicators

Indicator	Data source	Reference year(s)
ENABLERS		
Human resources		
1.1.1 New doctorate graduates (ISCED 6) per 1000 population aged 25-34	Eurostat	2005 – 2009
1.1.2 Percentage population aged 30-34 having completed tertiary education	Eurostat	2006 – 2010
1.1.3 Percentage youth aged 20–24 having attained at least upper secondary level education	Eurostat	2006 – 2010
Open, excellent and attractive research systems		
1.2.1 international scientific co-publications per million population	Science Metrix / Scopus	2006 – 2010
1.2.2 Scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country	Science Metrix / Scopus	2003 – 2007
1.2.3 Non-EU doctorate students as a % of all doctorate students	Eurostat	2005 – 2009
Finance and support		
1.3.1 R&D expenditure in the public sector as % of GDP	Eurostat	2006 – 2010
1.3.2 Venture capital (early stage, expansion and replacement) as % of GDP	Eurostat	2006 – 2010
FIRM ACTIVITIES		
Firm investments		
2.1.1 R&D expenditure in the business sector as % of GDP	Eurostat	2006–2010
2.1.2 Non-R&D innovation expenditures as % of turnover	Eurostat	2004, 2006, 2008
Linkages & entrepreneurship		
2.2.1 SMEs innovating in-house as % of SMEs	Eurostat	2004, 2006, 2008
2.2.2 Innovative SMEs collaborating with others as % of SMEs	Eurostat	2004, 2006, 2008
2.2.3 Public-private co-publications per million population	CWTS / Thomson Reuters	2004, 2008
Intellectual assets		
2.3.1 PCT patents applications per billion GDP (in PPS €)	Eurostat	2004, 2008
2.3.2 PCT patent applications in societal challenges per billion GDP (in PPS €) (climate change mitigation; health)	OECD / Eurostat	2004, 2008
2.3.3 Community trademarks per billion GDP (in PPS €)	OHIM / Eurostat	2006, 2010
2.3.4 Community designs per billion GDP (in PPS €)	OHIM / Eurostat	2006, 2010
OUTPUTS		
Innovators		
3.1.1 SMEs introducing product or process innovations as % of SMEs	Eurostat	2004, 2006, 2008
3.1.2 SMEs introducing marketing or organisational innovations as % of SMEs	Eurostat	2004, 2006, 2008
3.1.3 High-growth innovative firms	N/A	N/A
Economic effects		
3.2.1 Employment in knowledge-intensive activities (manufacturing and services) as % of total employment	Eurostat	2008, 2010
3.2.2 Medium and high-tech product exports as % total product exports	UN / Eurostat	2006, 2010
3.2.3 Knowledge-intensive services exports as % total service exports	UN / Eurostat	2005, 2009
3.2.4 Sales of new to market and new to firm innovations as % of turnover	Eurostat	2004, 2006, 2008
3.2.5 License and patent revenues from abroad as % of GDP	Eurostat	2006, 2010

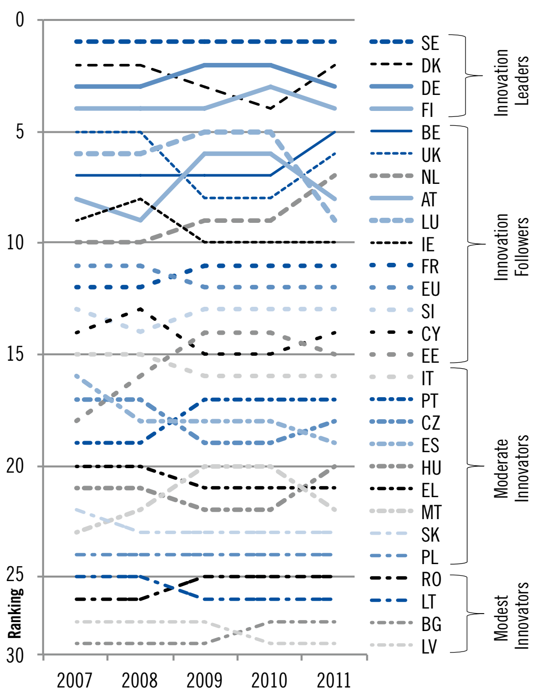
Source: European Commission, http://ec.europa.eu/enterprise/policies/innovation/files/ius-2011_en.pdf

Fig. 29: Comparison between countries based on IUS 2011 (2011 vs. 2007)



Source: InnoMetrics; calculations by Joanneum Research

Fig. 30: Rankings of 27 EU states over time (2007–2011)



Source: InnoMetrics; calculations by Joanneum Research

A look at the individual indicators[36] shows that Austria is only below the EU 27 average by a more or less significant margin (i.e., more than 10%) in just seven individual indicators (in another five indicators, Austria is within +/- 10% of the average); Austria has figures that are significantly above the average in 12 indicators. The strengths and weaknesses are quite well-known: in tertiary degrees, Austria remains far below the EU average (-30%), while Austria's position in doctoral degrees and the share of the population with at least a Level II secondary school certificate is above average.

The quality of scientific publications is above average: this margin was slight in "most-cited publications" (+ 6%), yet international co-publications stood at more than triple the EU 27 average. Austria was below the average for doctoral students from non-EU countries (this conceals, however, a high proportion of students from the EU, especially Germany). This indicator however is very unequally distributed and is dominated

36 In the figure below, the figures for Austria are shown together with the minimums and maximums of the EU 27, each based on the average for the available EU 27.

by a very few countries, with Sweden as the only country that does not have a colonial history (only the United Kingdom, France, Belgium and Spain have proportions that are higher than those in Austria).

In the group of nine corporate-related indicators, Austria is only below the average in one single figure (yet significantly below the average), namely for expenditure on non-R&D-related innovations.

Austria's position, however, is weaker when it comes to exports in high-tech services[37], turnover from innovative products, and license revenues from abroad (this represents a certain contradiction to solid positioning in patents, trademarks and SME innovators).

Individual indicators over time

The following section compares the chronological development of Austria's individual indicators with those of the *Innovation Leaders* and *Innovation Followers* (unweighted mean values). The comparison is done on the basis of the normalised indicators, which were set at 0 for the minimum value and 1 for the maximum value of the 27 EU states[38].

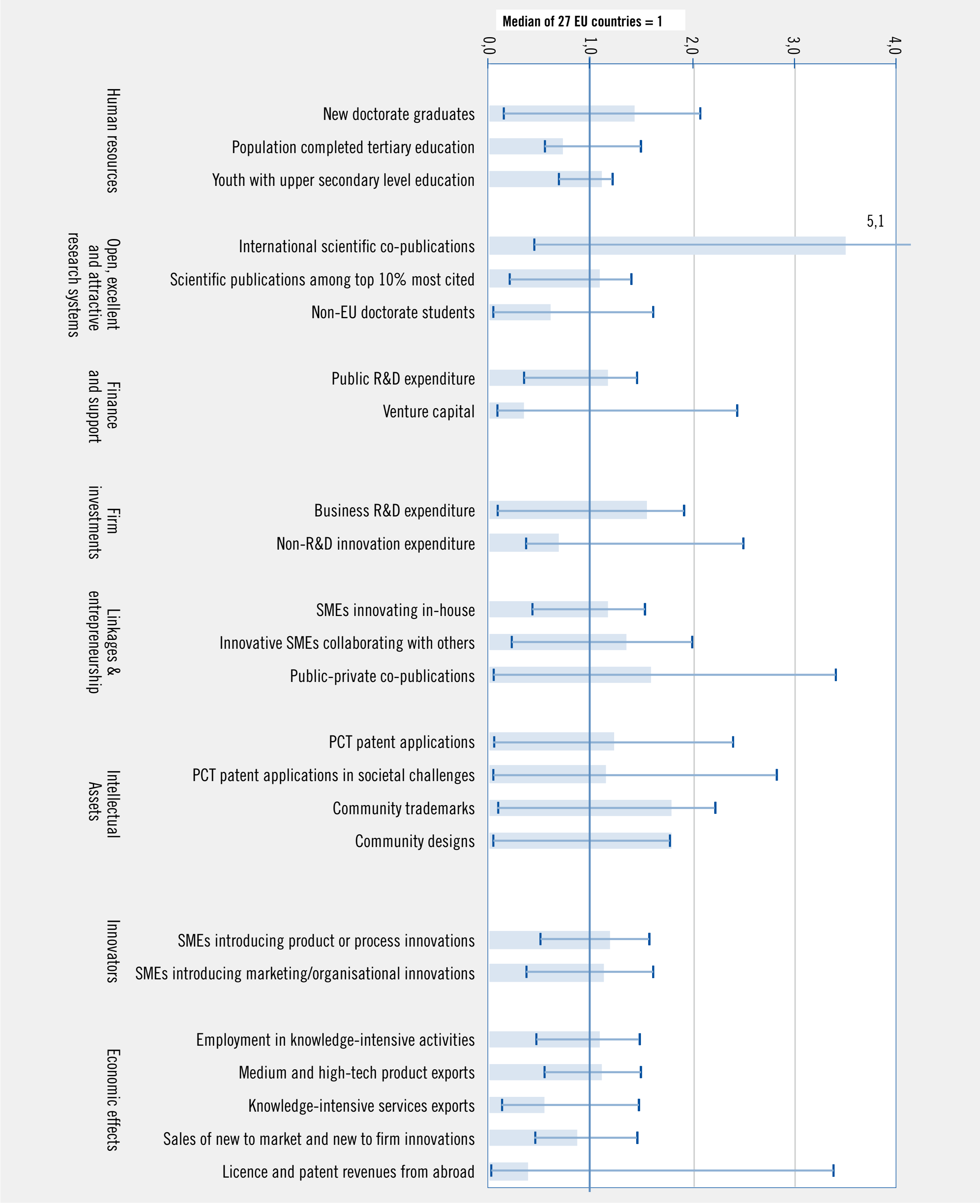
For most indicators, the *Innovation Leaders* and *Innovation Followers* and Austria displayed similar trends – this means that Austria's aforementioned relative strength-weakness constellations was very stable in the five years under observation. Austria's position deteriorated slightly for the "international license and patent revenue" indicator. This indicator, however, is viewed with extreme scepticism in empirical research on technology. Its validity is compromised, for example, by the fact that international patent and license revenues are often exchanged within companies, and that a few large companies dominate this field. This also becomes clear when we observe the specific proportional values (in contrast to the normalised values, as shown in Figure 30). The values for Austria actually swing so much between the individual years that Austria's share of international patent and license revenue in terms of GDP was 0.14% in 2005, climbed to 0.26% in 2008 and fell again to 0.18% in 2010. These swings lead – along with corresponding jumps in other states – to relative position changes with regard to this indicator. The same also applies to the "share of knowledge-intensive service exports in total service exports" indicator. The values for this indicator have been revised, sometimes heavily, between the individual reporting periods of the IUS. The 2011 report published different figures for the same period than were reported in the 2010 reporting year. These revisions affected all of the countries, even if to a different extent. A comparison of the current values of time series for this indicator shows that Austria has a stable position.

The greatest changes are found in the group of indicators taken from the Community Innovation Survey (CIS) (these are indicators 2.1.2, 2.2.1, 2.2.2, 3.1.1, 3.1.2 and 3.2.4 – those indicators that have "innovation" in their titles). With the exception of indicator 2.1.2, these indicators show that Austria experienced a significant decline from 2009 to 2010 (although this decline began from a very high level in 2009; the values for 2010 correspond to the average values for the *Innovation Followers*). The reason for this lies in the survey methodology: the values for 2010 come from the CIS 2008; the values for 2009 and

37 The IUS does not show Austria's oft-stated weakness in pure high-tech exports because medium- to high-tech exports were included here, thereby incorporating Austria's relative strengths in the medium-tech industries of mechanical engineering, mechanical equipment and vehicle technology.

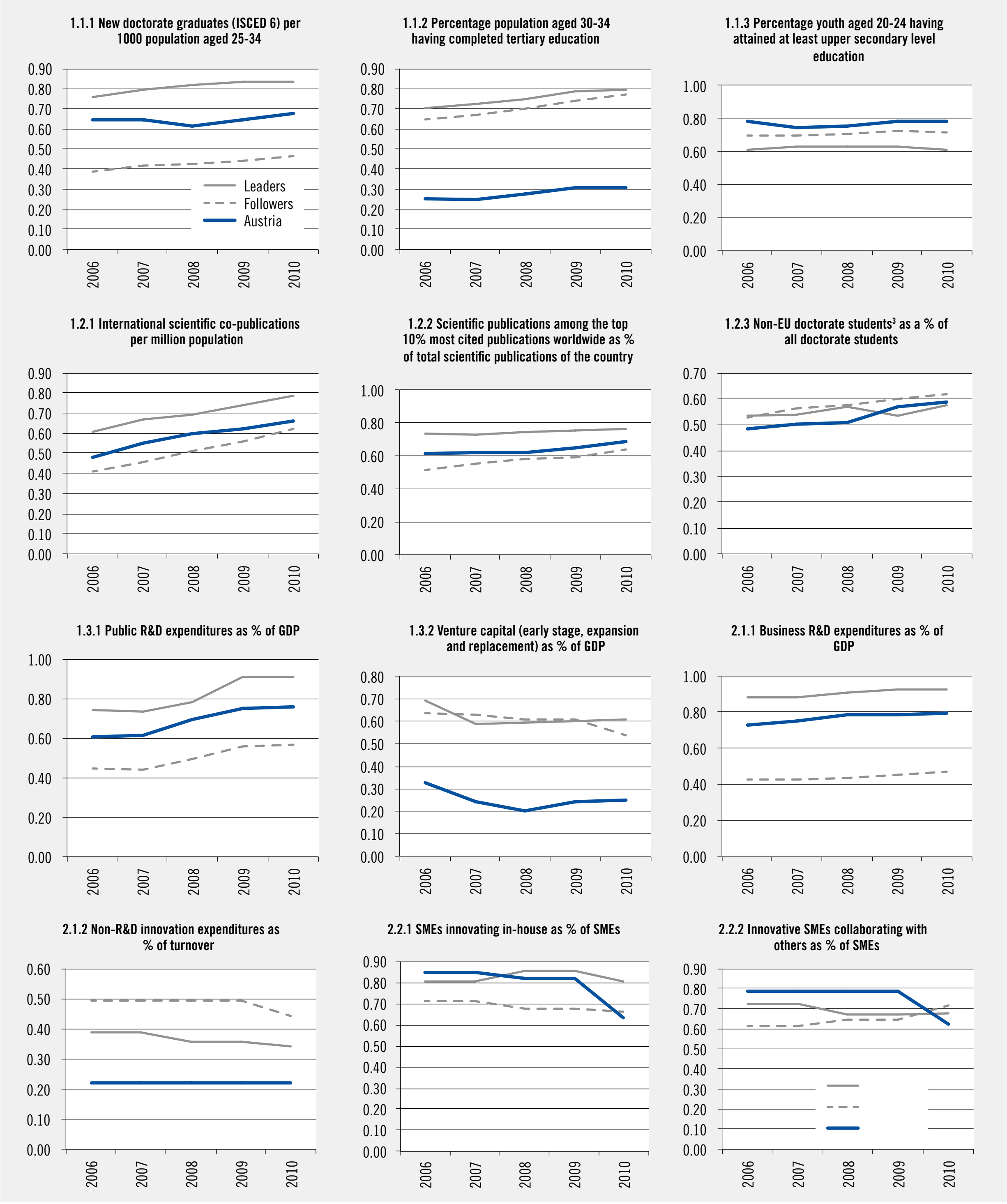
38 The advantage here is that InnoMetrics – the organisation that produces the IUS – interpolates missing values for normalised indicators; these are therefore available – in contrast to the raw data – in complete time series. See http://ec.europa.eu/enterprise/policies/innovation/files/ius-2011_en.pdf

Fig. 31: Austria vs. minimum/maximum of the EU 27 [Index EU 27=1]



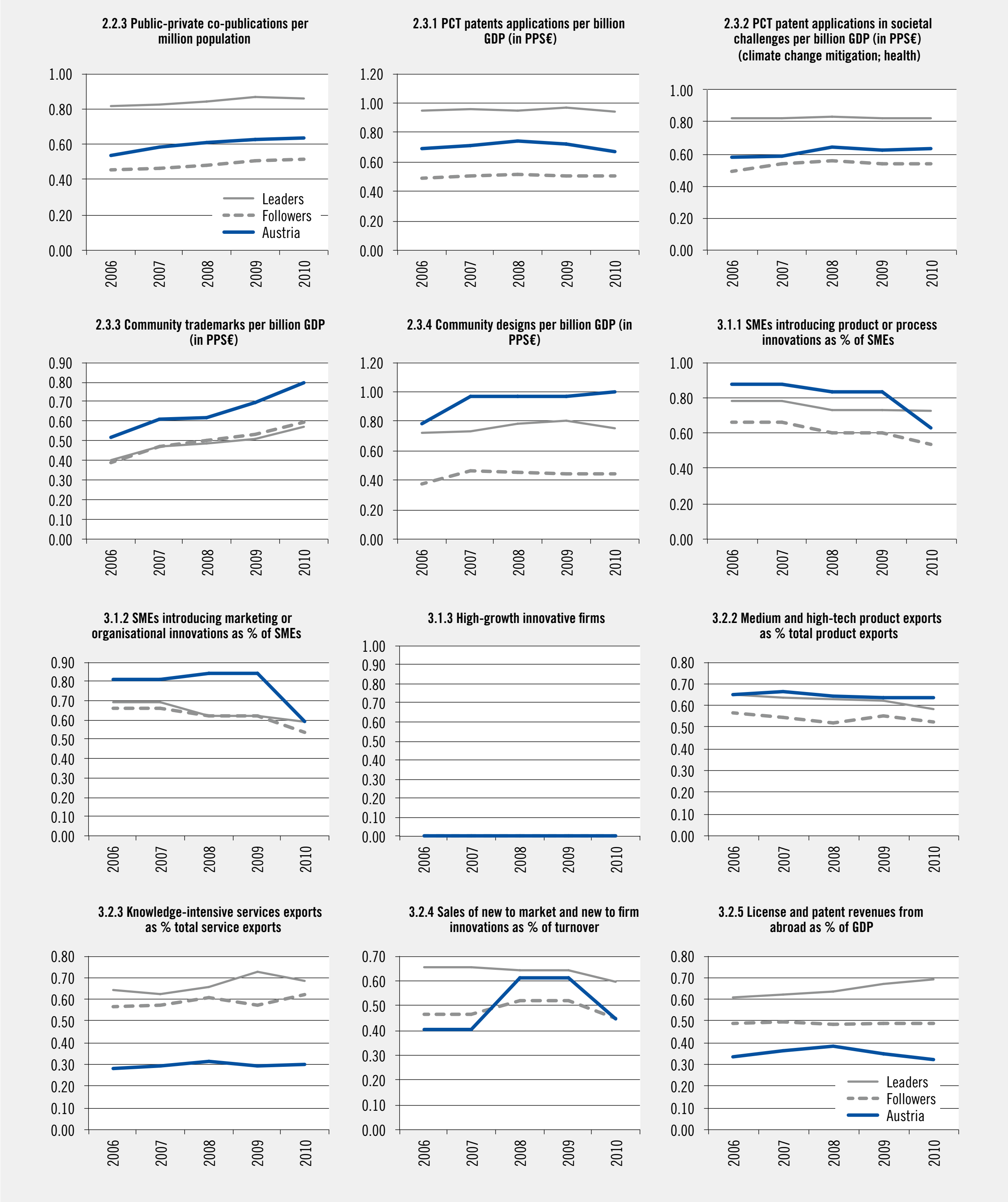
Source: InnoMetrics, calculations by Joanneum Research

Fig. 32: Historical development of individual indicators, part 1: Austria vs. Innovation Leaders and Innovation Followers (normalised values)



Source: InnoMetrics, calculations by Joanneum Research

Fig. 33: Historical development of individual indicators, part 2: Austria vs. Innovation Leaders and Innovation Followers (normalised values)



Source: InnoMetrics, calculations by Joanneum Research

2008 were taken from the CIS 2006. Due to different circumstances, however, the CIS 2006 and CIS 2008 are only comparable in a very limited manner. Statistics Austria addressed this topic as follows in "*Innovation 2006–2008 – Results of the Sixth European Innovation Survey (CIS 2008)*":

"… the comparative possibilities have become very limited over the years for various reasons (radically changed questionnaires, a modified random sampling methodology and improved handling of non-response analysis […], a new industry classification system and not least a major expansion of the term 'innovation'). The latter two reasons in particular affect the comparability between these results and those of the CIS 2006." (Statistics Austria 2010, p. 23)

Summary

In the latest Innovation Union Scoreboard (IUS 2011), Austria is in 8th place (7th place in last year's IUS 2010), thereby firmly positioned in the (upper half of) the group of *Innovation Followers*. These groupings have been very stable for years, and movements within these (partial) groups, which happen with every annual comparison, should not be considered all too important in light of the above considerations (this of course does not apply only to "deteriorations", but also to improvements in the rankings).

Austria occupies a solid position within the group of *Innovation Followers* (in the upper half of this group, together with the United Kingdom, Belgium, the Netherlands, Ireland, Luxembourg and France, in places 5 to 11), which however as a group lags significantly behind the *Innovation Leaders* (Sweden, Denmark, Finland, Germany). It must be emphasised that the difference between SII values between positions 5 and 11 are less than those between positions 4 and 5, which is the threshold between the *Innovation Leaders* and the *Innovation Followers*. Positions 7-9 (Netherlands, Austria and Luxembourg) have practically identical SII scores.

A comparison of the individual indicators confirms Austria's strength-weakness pattern from earlier scoreboards:

There continue to be weaknesses in tertiary education, venture capital availability, license and patent revenues, and knowledge-intensive service exports (the IUS does not show the oft-stated "weakness" in pure high-tech exports because medium- to high-tech exports were included here, thereby incorporating Austria's relative strengths in the "medium-tech" industries of mechanical engineering, mechanical equipment and vehicle technology).

Strengths include scientific publications, R&D spending by firms, innovative SMEs, and intellectual property (this is a contradiction to innovation-related non-R&D expenditures, an indicator for which Austria has very low figures) as well as intellectual property.

Austria posted losses for the indicators derived from the Community Innovation Survey (CIS) (of the six CIS-derived indicators, four affect the innovation behaviour of SMEs), yet these declines are attributable to changed circumstances in the survey's design and execution.

Furthermore, the IUS intends to capture structural aspects; accordingly, several indicators are oriented towards a long-term perspective. Immediate reactions to changed policy, in the form of short-term substantial improvements in the IUS, are therefore not to be expected; the IUS (as well as other similar benchmark studies) should instead illuminate structural strengths and weaknesses from which to derive long-term opportunities for the future.

2.3 The Innovation Leader benchmark

In light of the highly successful development of the Austrian research and technology system in recent decades, RTI policy faces the challenge of long-term strategic goal-setting. The Austrian federal government's strategic plan for research, technology and innovation addresses these challenges by formulating two prioritised objectives:

- The potential of science, research, technology and innovation in Austria should be devel-

oped further, thereby making Austria one of the most innovative countries in the EU by 2020, strengthening the competitiveness of its economy and increasing the prosperity of its society.
- Austria should continue expanding and leveraging the potential of science, research, technology and innovation, to tackle the great societal and economic challenges of the future.

The goals established by the RTI strategy are measured against the *Innovation Leaders*: Austria should belong by 2020 to the group of countries that perform research at the frontiers of knowledge and at the cutting edge of technology.

The RTI strategy uses the *Summary Innovation Index* (SII) of the *Innovation Union Scoreboard* (IUS) of the European Commission (European Commission 2011) as the benchmark for a country's innovation performance.[39]

The federal government's RTI strategy in this context pursues a broad policy approach in that, in addition to research and development (R&D), it considers the significance of institutional frameworks and resources, as well as the importance of an educated and skilled population for national innovation performance. This requires an assessment of the partial indicators included in the IUS that illustrate selected specific policy fields of action, thereby providing a measurable and empirically robust foundation for the objectives articulated in Austria's RTI strategy.

The following section explores the question of which areas have similarities or differences to the group of *Innovation Leaders*. The selected indicator sets of the IUS can provide information about which specific fields of Austria's RTI policy action are already in close proximity to the *Innovation Leaders* and in which areas Austria still has a pronounced deficit. This section identifies Austria's relative strengths and weaknesses in this regard in a Europe-wide comparison for four of the five fields of action in the RTI strategy.

Five fields of action for Austria's RTI strategy 2011

The previous fields of Austrian technology policy – primarily the increase of R&D expenditures and an acceleration of structural change towards R&D-intensive production (see Aichholzer et al. 1994; Mayer 2003; Berger 2010) – are expanded in the federal RTI strategy to include education policy goals, among others.

The first field of action in the RTI strategy therefore targets sustainable reform of the education system. The strengthening of the *education system* indirectly influences competences within business enterprises (Malerba 1992; Smith 2000; Chaminade and Edquist 2010). The emphasis on education policy objectives also mirrors deficits in the Austrian innovation system that tend to lie more in the tertiary education system than in the RTI area (see Aiginger et al. 2006, 2009).

The second field of action addresses the *science system* and its role in strengthening knowledge-based society. On one hand, universities and non-university research institutions are being strengthened to provide a foundation for basic research. This is meant to attain a critical mass in selected research areas by increasing cooperation between non-university research institutions and universities. The objective here is to buttress Austria's attractiveness as a research location in the competition for top researchers. On the other hand, a coordinated expansion through networking of research infrastructures[40] is also being pursued at universities and non-university research institutions. This should increase the availability of and access to national and international research infrastructures that, in addition

39 The SII can accept values in the interval between 0 (minimum value) and 1 (maximum value).
40 This also means infrastructure, research institutions and access to international infrastructures.

to human capital, are a prerequisite for Austria's development as a place to do research.

In addition, the RTI strategy should expand the innovation and research foundation for firms, promote research and innovation activities by means of strengthening cooperation between industry and science, and boost the foundation of companies. This third field of action, *Innovation and Business Research*, also pursues the goal of increasing the intensity of competition in the service sector.

Along with its focus on the education and science systems, as well as on corporate innovation and R&D activities, the RTI strategy aims to create a fourth field of action, effective *Governance of the Research and Innovation System*. This field of action will not identify any quantitative targets, which is why it will not be discussed further in this analytical context.

The fifth and last field of action aims to strengthen Austria's *R&D system*. Specifically, this means that the R&D intensity should be increased by 2020 to 3.76% of GDP, whereby 2/3 of investment in R&D should come from the business enterprise sector. This will require (i) above all a significant increase in private R&D investments that shall be attained by expanding the basis of firms that perform R&D, and (ii) the use of public funds to maximise leverage effects and impact.

Conceptual framework for combining four selected fields of RTI policy action with the IUS indicators

The federal government's RTI strategy focuses on European benchmarks as comparative reference points for specific fields of policy action. Unlike the IUS, which uses a single aggregated overall index to represent national innovation performance (SII value), this study employs individual indicators from the IUS 2011. These indicators are used to evaluate Austria's relative strengths and weaknesses in four of the five fields of action in the RTI strategy. A field of action (Governance of the research and innovation system) shall not be addressed in this analytical context due to the lack of quantitative targets. The individual indicators for a field of action are summarised into an index (see for example Grupp and Schubert 2010) to characterise relative strengths and weaknesses in individual fields of action and compare them within Europe.

A disaggregated view means that the first step is to connect IUS indicators for one field of action with individual selected fields of RTI policy action. There are indicators to which the RTI strategy refers explicitly. On the other hand, indicators that have a thematic connection to a specific problem set are also used. In a subsequent step, individual indicators that were connected to a specific field of action are weighted, transformed, standardised[41] and summarised by means of linear-additive combination into an index. The classification of individual indicators is shown in Table 21. In the third step, the index values calculated for a field of action are assessed in European comparison, thereby identifying Austria's relative strengths and weaknesses in these fields of action.

Empirical analysis of strengths and weaknesses in the four fields of action under analysis

Before the results in the individual fields of action are discussed in detail, it may be noted that three of the four evaluated fields of RTI policy

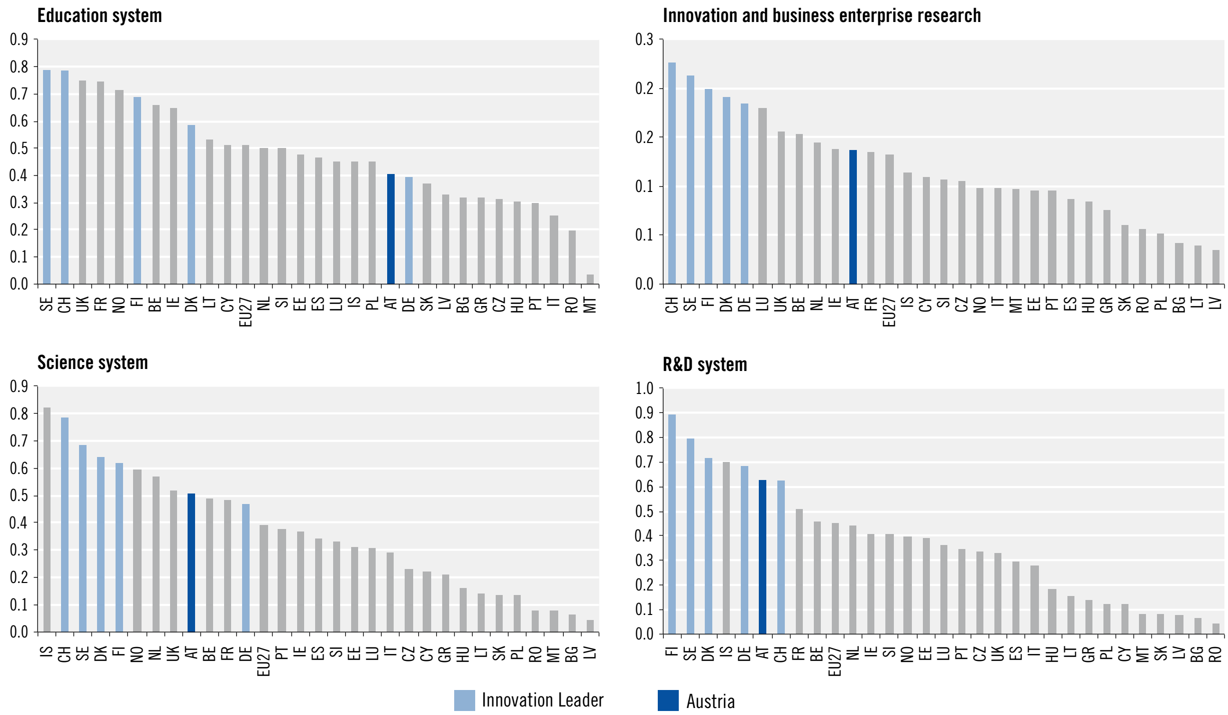
41 The indicators were remodelled with a Box-Cox transformation due to various distribution assumptions (see Hollanders and Tarantola 2011). Because the individual indicators are provided in different units, the data are transformed by means of 're-scaling' or the min-max approach (see European Commission 2005, 2011: Grupp and Hohmeyer 1986) into a uniform interval, which facilitates comparison. Weighting is done according to the specific goals of the RTI strategy, whereby explicitly identified objectives are weighted higher. A sensitivity analysis indicates robust weights in all four indexes for the fields of action. The robustness of these results is also reinforced by a comparison between the weighting manually applied in this section and the balancing of all indicators per index (Spearman's rank correlation coefficients in all cases over 0.9).

Table 21: Classification of IUS indicators to the fields of action in the RTI strategy

Field of action*	IUS indicator
1. Education system	Proportion of new doctoral degrees in the 25-34-year-old peer group (per 1000 residents), Proportion of resident population of the 30-34-year-old peer group with completed tertiary education (ISCED 5 and 6), Non-EU doctoral students as a proportion of all doctoral students in a country, Proportion of resident population of the 20-24-year-old peer group with at least a secondary school II leaving certificate (ISCED 3)
2. Science system	Proportion of new doctoral degrees in the 25-34-year-old peer group (per 1000 residents), International scientific co-publications (per million residents) Share of scientific publications among the 10% most-cited publications worldwide of a country's total scientific publications, Non-EU doctoral students as a proportion of all doctoral students in a country, R&D expenditure of the government sector and higher education sector as % of GDP (in national currency at market prices), Public-private co-publications (per million inhabitants),
3. Innovation and business research	
Innovation inputs	Venture capital as % of GDP (in national currency at market prices), R&D expenditures in the business enterprise sector as % of GDP (in national currency at market prices), Employees in medium- and high-tech sectors of manufacturing and knowledge-intensive service industries as a proportion of total employment,
Innovation throughputs	Small and medium-sized enterprises innovating in-house (% of all SMEs), Share of innovating SMEs with cooperation activities among all SMEs, Public-private co-publications (per million inhabitants), International patent applications under the Patent Cooperation Treaty (PCT) per billion GDP (in national currency at market prices), Community trademarks per billion GDP (in national currency at market prices),
Innovation outputs	Small and medium-sized enterprises introducing product or process innovations (% of all SMEs), Small and medium-sized enterprises introducing marketing or organisation innovations (% of all SMEs), Exports of medium- and high-tech products (% of all product exports), Exports of knowledge-intensive services (% of all service exports), Share of turnover from innovation (new for market or firm) of total turnover, Share of profits with patent and licenses from abroad of GDP (in US $ at market prices)
5. R&D system	R&D expenditure of the government sector and higher education sector as % of GDP (in national currency at market prices), R&D expenditures in the business enterprise sector as % of GDP (in national currency at market prices), Small and medium-sized enterprises innovating in-house (% of all SMEs)

Note: * The fourth field of action, Governance of research and innovation systems, does not set any quantitative goals, which is why there is no indicator-based country comparison.
Source: AIT graphic

Fig. 34: State rankings based on indices of fields of action (IUS 2011)



Source: IUS 2011, calculations by AIT

action are relatively strong fields for Austria in comparison with the EU 27. Austria is even among the top group in one field of action:

- Austria has taken ninth place in an EU 27 comparison – measured by the composite index – for the *science system* field of action. This positions Austria quite near the leaders in the *science system* field of action, behind the *Innovation Leaders* of Sweden, Denmark and Finland, yet in front of Germany.
- In addition, the comparison with the group of *Innovation Leaders* illustrates that Austria's position in the *R&D system* is a relative strength. Austria is among the leaders at sixth place, ahead of Switzerland.
- In the field of action for innovation and business research, Austria is at eleventh place in Europe and just above the EU 27 average, yet not in the range of the *Innovation Leaders*.
- Austria's education system is a weakness. The RTI strategy recognises Austria's relative weakness in this field of action in international comparison (see Fig. 34).

After the composite indexes for the four fields of RTI strategy action are assembled from individual partial indicators, an evaluation of the individual indicator values can provide information about the reasons for a relative strength or weakness in a field of action relative to the average of the *Innovation Leaders*. The individual fields of action will therefore be analysed in depth in the following section.

The education system field of action

A detailed evaluation of the *education system* field of action shows that Austria has a weakness here in European comparison: a below-average s*hare of persons with tertiary education*[42] among the resident population aged 30 to 34. This corresponds to the *completion rate in tertiary education (*expanded academic ratio*)* under the ISCED classification. The structural particularities of an education system exercise a major influence on positioning within the country rankings, as is demonstrated by Germany's relatively poor positioning for this indicator, despite its classification as an Innovation Leader.

Austria's weakness in this area can be attributed above all to its relatively poor performance in the s*hare of 30-34-year-old residents with completed tertiary education* indicator. In comparison with the group of *Innovation Leaders* (with a mean value of 43%[43]), Austria's shortfall, with a value of just 24%, is particularly problematic. This indicator, however, does not include significant professional qualifications in Austria for professions for which candidates are qualified upon completion of the upper secondary level leading to post-secondary professional training[44] (Federal Ministry of Science and Research 2007). The inclusion of these qualifications in the completion rate for tertiary education places Austria significantly closer to the *Innovation Leaders*.

If these highly relevant Austrian qualifications are incorporated for the "expanded academic quota" at ISCED level 4 (as "equivalent degrees"), this accounts for the fact that individual courses of education are situated at various educational levels in the reference countries. Measured in the age group of 30- to 34-year-olds, in 2010 Austria stood at 37% (ISCED 4, 5 and 6) for this expanded indicator and wants to increase this percentage to 38% by 2020.[45]

The Austrian federal government has set a clear objective regarding access to tertiary education. The portion of pupils graduating with a school-leaving certificate for an age group should be raised to 55% by 2020. The IUS does not have an indicator that separately measures the number of graduates. The comparison of the indicator published by the OECD, *share of students of the same age group with access to tertiary education within the resident population age group*, can however only approximate the number of potential students in international comparison. It shows that the matriculation rate for the 19-21 peer group in Austria stood at 59% in 2008, which was already closer to the average value for the *Innovation Leaders* at 67%. This puts Austria ahead of Germany (50%) and Switzerland (57%) (OECD 2010a).

The *share of persons with completed upper-secondary certificates among the 20-24-year-old resident population* in Austria stands at 86%, compared with the average of 79% among the *Innovation Leaders*. This ratio includes both graduates from higher general-education schools, mid-level vocational schools and apprentice education and comprises the upper-secondary level, which precedes post-secondary and tertiary education and is therefore the reservoir of potential students.

Austria had a relative deficit in comparison to the *Innovation Leaders* for the indicators *new*

42 The definition of a tertiary education certificate follows the UNESCO ISCED 1997 (International Standard Classification of Education) and includes degrees under ISCED 5 and 6. The application of ISCED by education levels in Austria makes a distinction between the highest attained and completed educational level at universities, universities of applied sciences and University Colleges of Teacher Education (ISCED 5A) and vocational and teacher-training academies, higher vocational schools and master schools (5B). Doctorates correspond to ISCED 6.

43 The values for the proportion of 30- to 34-year-olds who have completed a course of university study came from the labour survey of the European Union (AKE), which is a random sample survey; see Eurostat (2010a), available at http://epp.eurostat.ec.europa.eu/portal/page/portal/microdata/lfs, Accessed on 11 Nov 2011. The absolute numbers for Austria were calculated by applying the indicator value to the annual average population in 2010 by age, see Statistics Austria (2011).

44 All higher professional education schools (BHS) (main courses, advanced training course, college, school for professionals) as well as medium-level technical schools for the medical profession (ISCED 4A and 4B).

45 See the Federal Ministry of Science and Research, University Report 2011, p. 255

doctoral degrees and *share of non-EU doctoral students in a country*. If the mean value of the *Innovation Leaders* is taken as a benchmark for Austrian performance, then there would have to be 2.8 doctoral degrees per 1000 residents instead of 2.1 (assuming for simplicity's sake a constant trend in population growth). The share of non-EU doctoral students as an indicator for the openness of the tertiary education system would also have to climb from 11% to 13%. Austria's "deficit" based on the IUS is very relative though, as Austria is ranked eighth out of all OECD countries (OECD 2011) in this indicator and has assumed an above-average position among the EU 27 (see Fig. 31).

The science system field of action

For the *science system* field of action, Austria has a slight deficit to the *Innovation Leaders*, although it is still ahead of Germany in the rankings. Austria lags behind the top group particularly in *international scientific co-publications* as well as *co-publications between public and private institutions*, although these areas are relative strengths in comparison to the EU 27. With 1050 international scientific co-publications per million residents, meaning scientific publications with at least one co-author outside the country, Austria is behind the *Innovation Leaders*, which have an average of 1449 co-publications. Co-publications between public and private institutions within a country are also significant, as Austria's score (56 co-publications) is about half as high as the *Innovation Leaders* average (119 co-publications). This is due in particular to the fact that the non-university research sector in Austria is relatively small and the number of such institutions is low.

Iceland leads the country ranking in this field of action, which can be attributed to an above-average performance for the indicators *international scientific co-publications* as well as *co-publications between public and private institutions.* Together with the value for Switzerland, Iceland's score represents a positive exception for these scientometric indicators, and with the exception of the indicators *share of scientific publications among the 10% most-cited publications worldwide* as well as *new doctoral degrees*, Iceland is also above the EU 27 average on the rest of the indicators. The last version of the IUS (2010) did not have a value for Iceland for *international scientific co-publications*, which is why the country previously had a poorer position.

Another central point in this context are the *summarised R&D expenditures of the government sector and the higher education sector as a per cent of GDP*, which is captured in the IUS and approximates public research expenditures; in Austria, this figure is only slightly lower at 0.9% of GDP than the mean of the *Innovation Leaders* (1% of GDP). The indicator value for *public financing of R&D activities* plays a major role due to its 30% weighting. Austria was able in recent years to catch up in this area, both in comparison to the EU 27 average and in comparison to the *Innovation Leaders*. The impact of scientific results in Austria is similar to the impact among the *Innovation Leaders*: Austria's 12% score for *share of scientific publications among the 10% most-cited publications worldwide of a country's total scientific publications* corresponds approximately to the mean of the *Innovation Leaders*, which is 13%.

The innovation and business research field of action

The *Innovation and business research* field of action provides a less homogenous picture. *Innovation inputs*, which are measured by indicators including *R&D expenditure in the business enterprise sector* and *share of employees in medium- and high-tech sector of manufacturing and services segments of total employment*, represent a relative strength for Austria in European comparison. Austria's employment proportion of 14% is close to the *Innovation Leaders* and their average proportion of 17%. *Innovation through-*

puts[46] also represent a relative strength in comparison with the EU 27 average: in *share of SME with in-house innovation activities as a percentage of all SMEs*, Austria with 34% has only a slight deficit to the Innovation Leaders (38%). On the other hand, Austria displays a relative strength in *filed community trademarks* of 9.9 per billion GDP, both in comparison to the EU 27 average (5.6 per billion GDP) and to the top group (8 per billion GDP). In *filed international patents under the Patent Coordination Treaty (PCT)*, Austria has a score of 4.5 per billion GDP, which lags behind the average for the Innovation Leaders (8.6 per billion GDP). While innovation inputs and throughputs represent one of Austria's relative strengths in comparison to the EU 27 average, although Austria has a slight deficit in both areas compared to the top group, the area of *innovation outputs* remains one of Austria's relative weaknesses – both in comparison to the top group and in the EU comparison. Austria's low score for the *share of exports of knowledge-intensive services in all service exports* is striking (25% compared with 46% for the *Innovation Leaders*). Austria's 52% score in the *share of exports of medium- and high-tech products in all product exports* corresponds to the average of the top group, which is also 52%. There were however relative weaknesses in the *share of turnover from innovations of all SME turnover*(11% for Austria versus 16% for the Innovation Leaders) as well as in *revenues with patents and licenses from abroad as a percentage of GDP* (0.2% of GDP for Austria versus 1.4% of GDP for the Innovation Leaders).

The R&D system field of action

Austria's R&D system as a whole is a relative strength and is situated in the range of the top group. The objective of the RTI strategy is to increase *R&D expenditures in the business enterprise sector*, which in Austria stands at 1.9% of GDP and averages 2.2% of GDP among the *Innovation Leaders*. In addition, the share of business funding in total R&D expenditure in Austria should climb to 67% by 2020. The private share of funding in 2009 was about 45%, compared with a value of 64% for the *Innovation Leaders*. If however the share of funding from abroad is included, another picture emerges: with about 62% private funding, Austria comes closer to the *Innovation Leaders* with their average share of 71%; Switzerland is the top country at 74% (Eurostat 2010; Statistics Austria 2011).

Summary

A quantitative depiction of the fields of action in the RTI strategy by means of the Innovation Union Scoreboard (IUS), a set of indicators used in European context, therefore enables a representation of Austria's strengths and weaknesses profile in the area of selected aspects of national innovation performance that are relevant to RTI policy. The splitting of the IUS's Summary Innovation Index (SII) into individual indicators was a useful asset for comparisons with the Innovation Leaders. The intention of the previous section was to use partial indicators from the IUS to provide a measurable and empirically robust foundation for the objectives set by the RTI strategy. However, it must be emphasised – as in the concluding comments for the previous section – that national innovation systems differ in historical and structural terms, which makes comparison on the basis of a set of indicators only partially feasible. Specific indicators cover the characteristics of one innovation system better than those of another. Furthermore, indicators of a structural nature can only be influenced over the long term by direct policy measures. The use of RTI-relevant scoreboards should therefore be an ori-

46 Innovation throughputs primarily include patents and community trademarks, meaning results of creative activity that were translated into commercial value.

entation especially for the long-term implementation of RTI strategy.

In summary, Austria is positioned among the leaders in the *R&D system*. Austria's composite index in the *innovation and business research* field of action puts it close to the *Innovation Leaders*, and Austria is well-positioned in terms of innovation inputs and throughputs. Comparison with the *Innovation Leaders* also confirms Austria's deficit in the *education system* field of action. For the science system, Austria has a slight deficit to the *Innovation Leaders*, although it is still ahead of Germany in the rankings.

3 Innovation in the business enterprise sector

3.1 Innovation systems outside of R&D

The latest OECD analyses[47] and data from the recently published OECD STI Scoreboard 2011[48] show that R&D expenditures (in the narrow sense of the Frascati Manual) are not the only thing that drive the innovation process forward and define an innovation system's performance. This requires a broad understanding of innovation inputs. Recent analyses also show that in some countries the competitiveness of firms is not necessarily tied to an increase in R&D expenditures. Competitiveness depends on several factors aside from R&D. This is why we must break away from the narrow focus on R&D (and the R&D intensity) in the current debates and enable a broad understanding of innovation (on the basis of recently published indicators and analyses from the OECD).

The effort to find new sources of economic growth is a necessary and urgent process. Traditional sources of economic growth, such as capital accumulation via physical capital investments, are losing their significance in highly developed national economies. In contrast, investments in intangible assets are becoming increasingly important, both in terms of their share of total investment as well as their relevance for economic development processes. This development includes, along with research and development (in the relatively narrow definition from the Frascati Manual), investments in software, qualification, establishment of (international) brand names, license purchasing, etc.

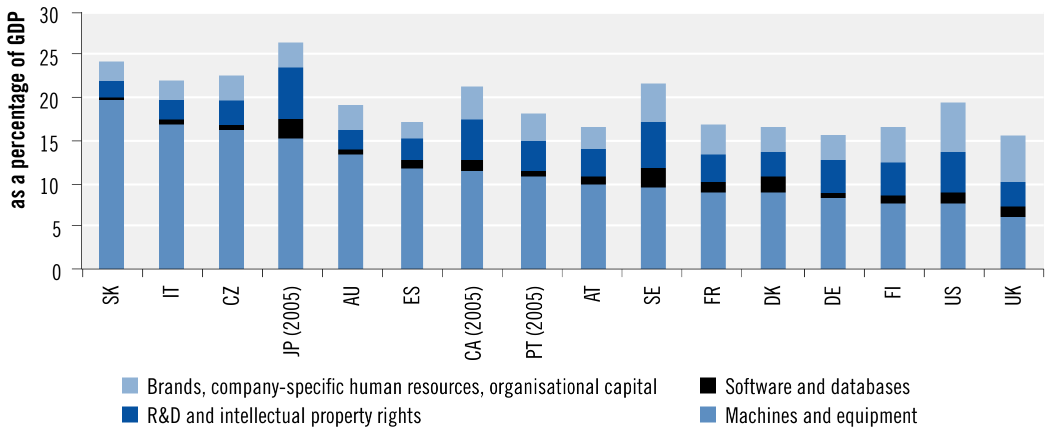
In fact, these intangible investments already have a higher share of GDP than do physical capital investments in several wealthy, highly developed countries (such as Sweden, Finland, the USA and the United Kingdom) (Fig. 35). Other distinctions are made for different types of investments in intangible assets, namely in R&D (including the purchase of external knowledge by means of licenses), software and databases, as well as investments in brand development, company-specific human capital, etc.

In Austria, the share of investments in intangible assets is significant at 6.5% of GDP, yet remains below the level of physical capital investments (which take up a share of about 10%). Along with actual R&D expenditures, investments in intangible assets in Austria is made up primarily of brand development, which has a share that is nearly as great as actual R&D (including purchase of intellectual property rights).

In contrast, investments in the catching-up countries of Eastern Europe (as well as the Southern European states) are still clearly defined by physical capital investments (machinery and equipment, buildings, etc.). This suggests that their innovation systems are still shaped primarily by "embodied technological change". These countries acquire new technological knowledge in a passive way by purchasing more modern and more efficient machinery and equipment (in which R&D efforts are "embodied"). The pattern of investment in these countries is obviously still shaped by a comprehensive need for modernisation in their capital stocks, which is ex-

47 OECD (2010)
48 OECD (2011)

Fig. 35: Investments in physical capital and intangible assets as a % of GDP (2006)



Source: OECD (2010)

pressed in the high proportions of physical capital investments (as part of overall investments as well as GDP).

It must be noted here that an "embodied technological change" pattern also applied for Austria until well into the 1980s (and early 1990s). The drastic increase in Austrian firms' own R&D efforts and their other investments in intangible assets have enabled them to leave this pattern behind. This finding also shows once again that Austria has become a "mature", modern innovation system.

There are wide variations in individual countries as to the significance of these investments in intangible assets and their contribution to economic growth. "Growth accounting" attempts to measure empirically the contribution of different input sizes (in the sense of a production function that establishes connections between inputs such as work, capital and technological progress with output).

Physical capital accumulation means the growth contribution due to investments in additional machines, and human capital refers to the growth contribution due to a better educated workforce. Multi-factor productivity (MFP) is the measure for the contribution made by technological change (in the sense of a residual quantity, meaning growth that is not generated by additional inputs and that is attributed to a general increase in efficiency, such as through technological change). Figure 36 shows the result of OECD calculations for selected countries in the period from 1995 to 2006 which differentiate between material physical capital investments and intangible investments. Growth in labour productivity functions as an output quantity (GDP/employee)[49]. These calculations confirm and emphasise once again that MFP is very important as an engine of growth. Investments in intangible assets are significant growth drivers as well.

This demonstrates that, in highly developed national economies such as Austria, Finland, Sweden, the USA and the United Kingdom, between two-thirds and three-quarters of labour productivity increases were accounted for by the

49 A country's GDP can increase solely due to population growth. At the same time, GDP per capita can increase if, for example, the employment rate (e.g. the percentage of the gainfully employed in the whole population) increases. The latter has occurred in recent decades, driven primarily by increasing participation by women in the (official) labour market. To control these effects, GDP per employee is used as a target variable.

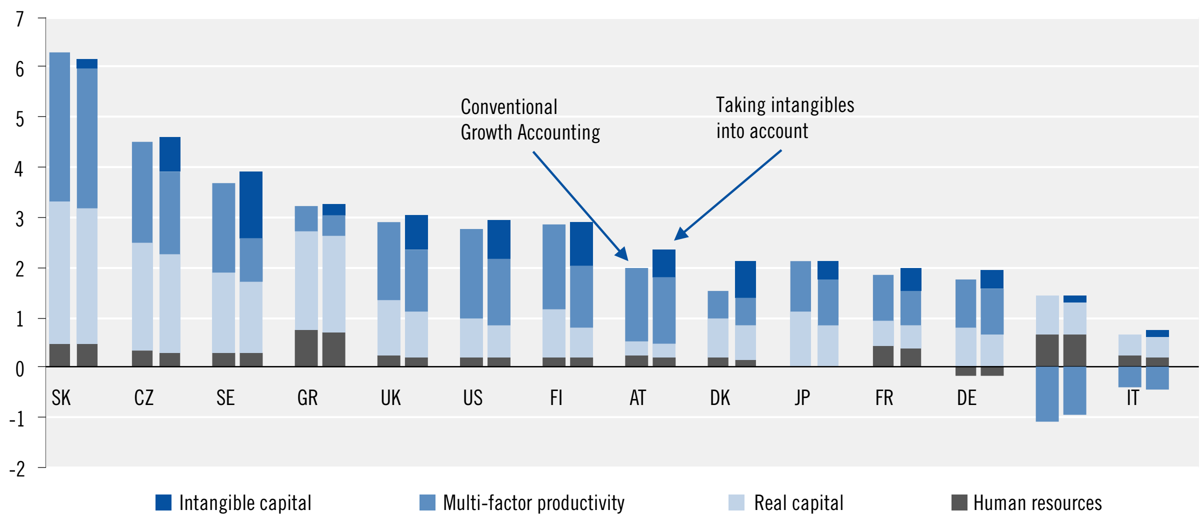
sum of investments in these *intangible assets* and MFP growth in the period from 1995 to 2006. Innovation activity in a comprehensive sense is therefore becoming a decisive and important engine of growth in highly developed national economies. Figure 36 further indicates that MFP in Austria had a particularly high share of growth in labour productivity between 1995 and 2006. The contribution of investments in intangible assets, however, played a major role, exceeding the growth contribution made by physical capital accumulation in the period under observation.

There are some investments that are difficult to measure but that are gaining importance which are determining factors in productivity growth and that can be defined as (new) engines of growth. The differences between individual countries, in terms of their ability to produce new knowledge or intellectual property rights, are very high (and exceed by far the differences in GDP per capita levels).

Figure 37 provides an overview of the intensity of invention activity and the number of international trademarks (both per million population) in selected countries. In terms of both patent applications and international trademarks, Austria is quite far above the EU average and reached – together with Finland – the solid upper third in international comparison[50]. The top country, Switzerland, is clearly a special case because, despite its small population, there are several corporate headquarters of patent- and trademark-intensive international firms (pharmaceutical industry, consumer goods) located there. It is striking that the catching-up national economies of Eastern Europe scarcely bring forward their own technological inventions (patent applications) or brands (trademarks). This also applies to the Southern European countries, although to a lesser degree.

One of the reasons why business enterprise sector R&D expenditures alone do not provide a complete picture of corporate innovation processes is the very sharp division and high degree of concentration of R&D expenditures within a few large firms (see also Chapter 1, Fig. 12). A

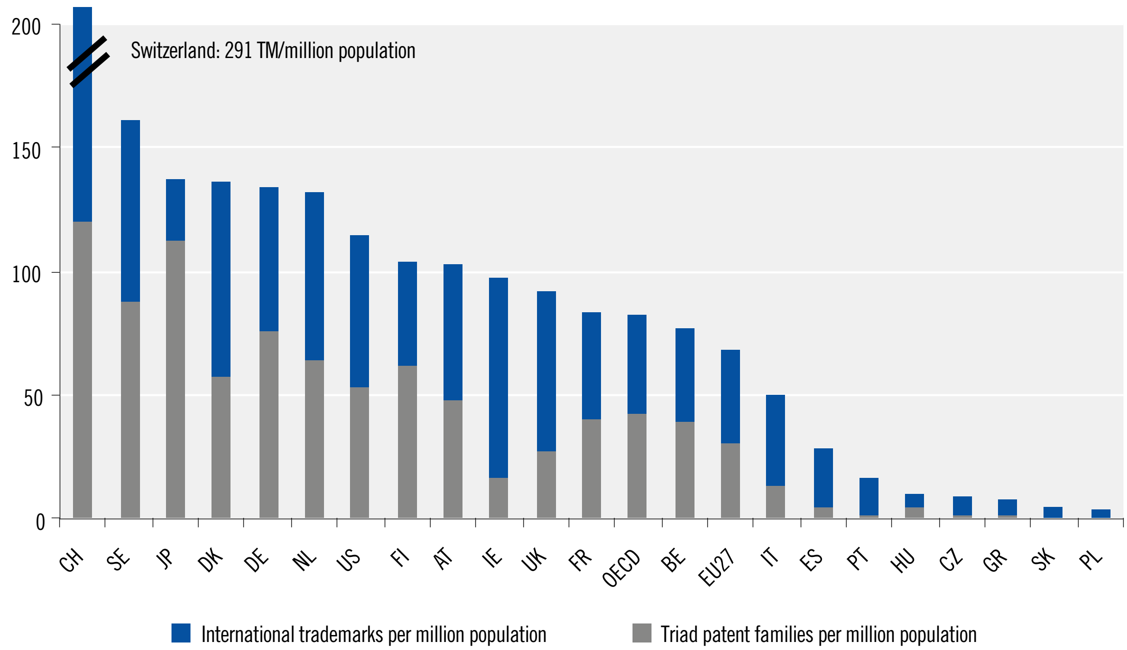
Fig. 36: Shares of growth in labour productivity, 1995–2006



Source: OECD (2010)

50 In the interest of clarity, not all countries for which data was available are presented in the graphic.

Fig. 37: Patents and trademarks (2005–2007)



Note: Triad patent families are patent applications sent to the EPO, the Japanese patent office and the U.S. patent office. International trademarks refer to trademarks that were reported to the USPTO for protection.

Source: OECD (2010)

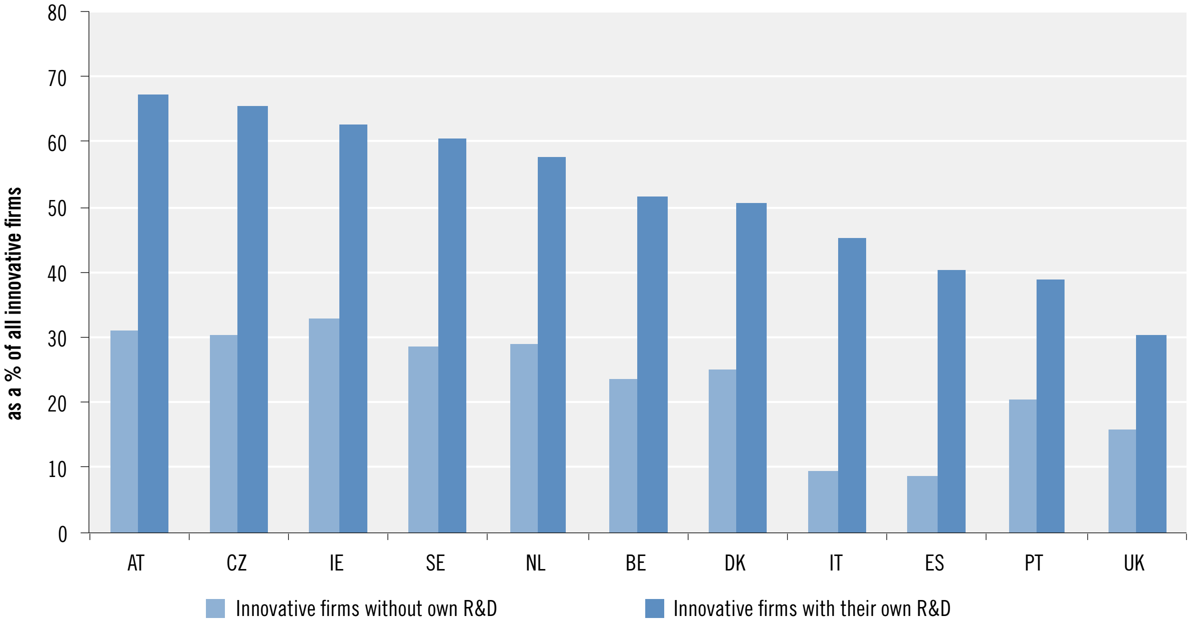
singular focus on R&D expenditures therefore does not capture the innovation activities of a number of small and medium-sized enterprises.

If the analysis however includes far more innovation activity than R&D activity, this allows for the fact that expenditures aside from research can also yield regular innovations. Recent surveys show that in some countries more than one quarter of innovative firms introduced new products or processes without doing their own R&D. A significant portion of these firms that did not conduct their own R&D created innovations that were even new market products (see Fig. 38).

If we initially examine only those innovating firms that do not perform their own R&D, then we see that these firms also brought forth new market products. In countries such as Austria, the Czech Republic, Ireland, Sweden and the Netherlands, about 30% of these firms have new market products. Finally, the innovation process must be understood in a more comprehensive sense; it cannot be limited solely to observation of research and development as defined by Frascati. This is why broader analytical methods and an extensive understanding of innovation and competitiveness are needed to facilitate the characterisation of the innovation systems of various countries. The number of innovating firms goes beyond just those firms that conduct their own R&D. The number of small and medium-sized enterprises that do not have their own independent R&D departments play an important role in the national innovation system and continually produce new market products, too. Innovative firms without their own R&D therefore cannot be automatically equated with "weak" firms.[51]

51 See also EFI (2011), pg. 74ff.

Fig. 38: Firms with new market products, 2006



Source: OECD (2010)

Every company invests on the basis of an economic calculation, and this applies to R&D as well: firms make R&D investments if they anticipate a profit that is greater than the R&D expenditure. And if this number – because of the small size of the market or low technological dynamism – is too low, then companies contemplate investment in areas relevant to innovation (outside of R&D).

The following chapter offers a differentiated view of this broad understanding of corporate innovation behaviour.

3.2 Innovation performance in European comparison

The continuous implementation of innovations is the driving force for lasting corporate success, which leads to economic growth and employment. The European Innovation Survey (Community Innovation Survey – CIS) provides a data source that permits the analysis and comparison of corporate innovation behaviour in individual countries. The results of the sixth Innovation Survey (CIS 2008) were published in December 2010. The survey provides the data basis for the following chapter, which on one hand characterises the innovation performance of Austrian firms in European comparison (e.g., with selected countries), and on the other presents specifically Austrian detailed results for a series of indicators (e.g., at the industry level) (Statistics Austria 2010).

It should be noted that the European Innovation Survey uses a subjective definition of innovation, meaning that a surveyed company decided from its (subjective) perspective whether and to what extent innovation activities were in place. This also captures those innovations that are new, at least for the firm, even if these innovations are not new market products. In addition, a broad understanding of innovation is used, as has become customary in innovation surveys. Non-technological innovations were recorded along with technological innovations (product and process innovations).[52] The CIS therefore differentiates between (i) technological, (ii) organisational innovations[53] and (iii) marketing innovations.[54]

Innovating firms in European comparison

Figure 39 shows the innovator ratio (proportion of innovating firms among all companies) for the participating countries, whereby a distinction is made among different types of innovation (and combinations thereof, as firms were able to perform innovation activities in a broad range of areas during the period under observation). In European comparison, there were decidedly large disparities with regard to the innovator ratio, with the span ranging from an 80% ratio of innovating firms in category leader Germany to just under 20% for last-place Latvia, with the European average standing at 52%. Austria has an innovator ratio of 56%, which puts it above the European average in the upper third of the rankings.

If we take a look at the different types of innovation, then we can see that in practically all countries there is a higher proportion of innovating firms that perform both technological and non-technological innovation activities. Their share of all innovating firms moves between about 40% to just about 70%. In Austria, about 55% of all innovating firms are ranked in the group that performs both technological and non-technological innovation activities. This demonstrates that innovation processes are multi-dimensional, while technological and organisational changes are more closely linked with one another. This is a circumstance that has been emphasised repeatedly in the innovation research of recent years and has also been expressed in diverse innovation policy measures that no longer aim exclusively at "hard" technologies.

For innovation activities for product and process innovations (meaning for technological innovation processes), distinctions can be made between different types of activities, with weighting assigned by monetary expenditures for individual activities. Specifically, there are distinctions made between (i) internal corporate research and experimental development (intramural R&D), (ii) awarding of R&D contracts to third parties (extramural R&D), (iii) acquisition of machines, equipment and software, and (iv) acquisition of external knowledge.[55] The results for selected countries are displayed in Figure 40.

The majority of the reference countries shown here (including Austria) assigned the greatest weight in the context of technological innovation activities to intramural R&D. Almost two-thirds (61% in Austria) of innovation expenditures went to intramural R&D; only one-fourth went to physical capital investments (acquisition of machines, equipment and software). Austria is therefore situated among a group of countries whose corporate innovation processes are characterised by own R&D; innovation incentives from "embodied technological change" (meaning the acquisition of new machines, etc.) play a smaller role in these "modern" innovation systems.

The Innovation Survey data therefore reflect the enormous increase in Austria's R&D rate (which was driven to a large extent by the strong growth in business R&D expenditures). In the

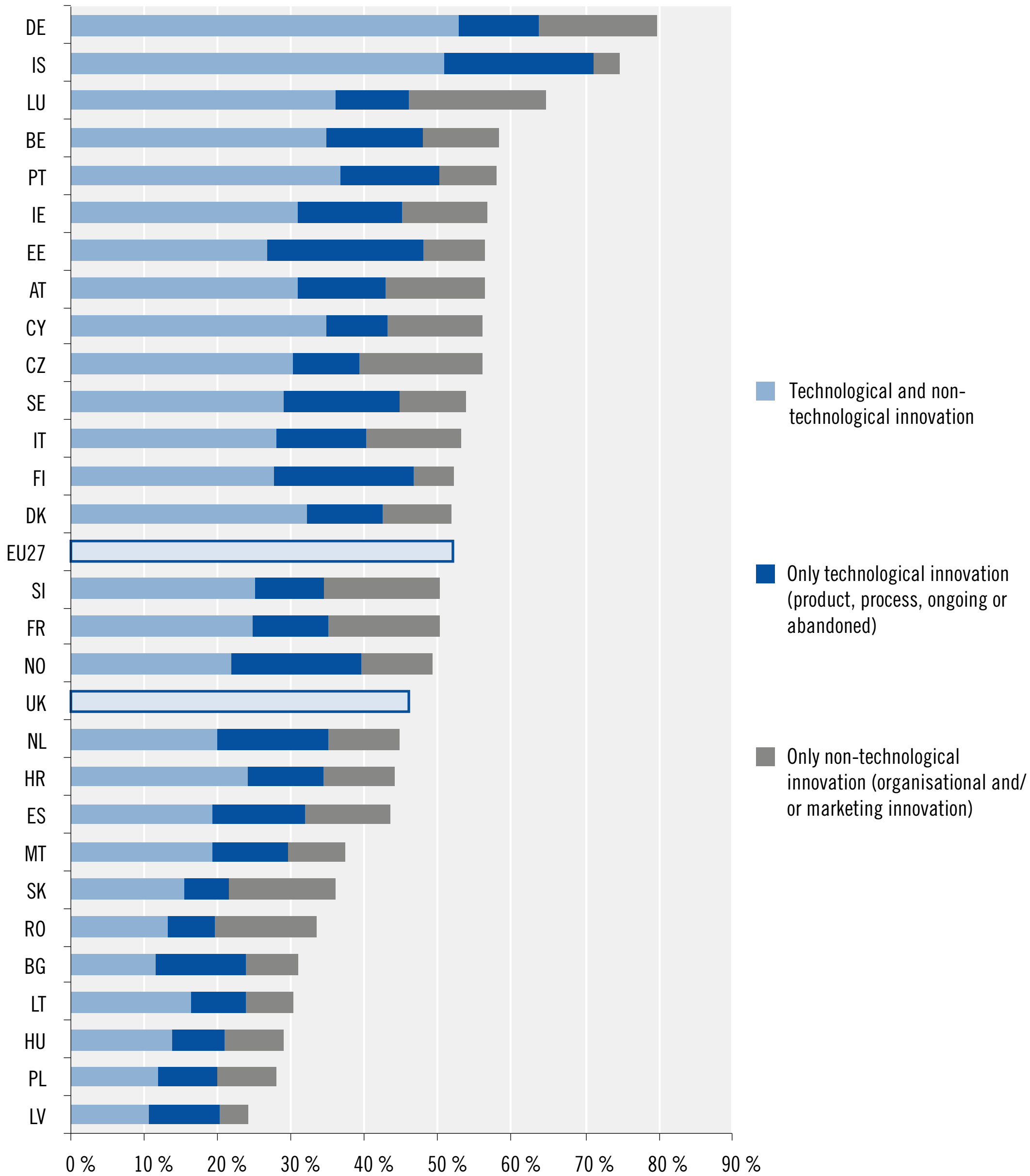
52 A **product innovation** is the introduction to market of new or significantly improved (e.g., in terms of integrated software, user friendliness, components or partial systems) goods or services. A **process innovation** is the introduction of a new or significantly improved manufacturing / process engineering, or a new or significantly improved process for providing services or for selling products.

53 **Organisational innovations** are new organisational methods in business practices (including knowledge management), in the organisation of labour or in the external relationships of a company that have not been implemented previously. Organisational innovation must be the result of a strategic decision. Mergers and corporate takeovers are not organisational innovations.

54 **Marketing innovations** are the introduction of marketing concepts or a new marketing strategy that is significantly different from a firm's existing marketing methods and has not been done before. This requires significant changes in product design or in packaging, product placement, product advertising or pricing.

55 This includes the purchase of patents and licenses, etc.

Fig. 39: Firms with innovation activities (as a % of all firms)



Note: It is not possible to differentiate between innovation types for the United Kingdom or for the EU 27.
Source: CIS 2008, calculations by Joanneum Research

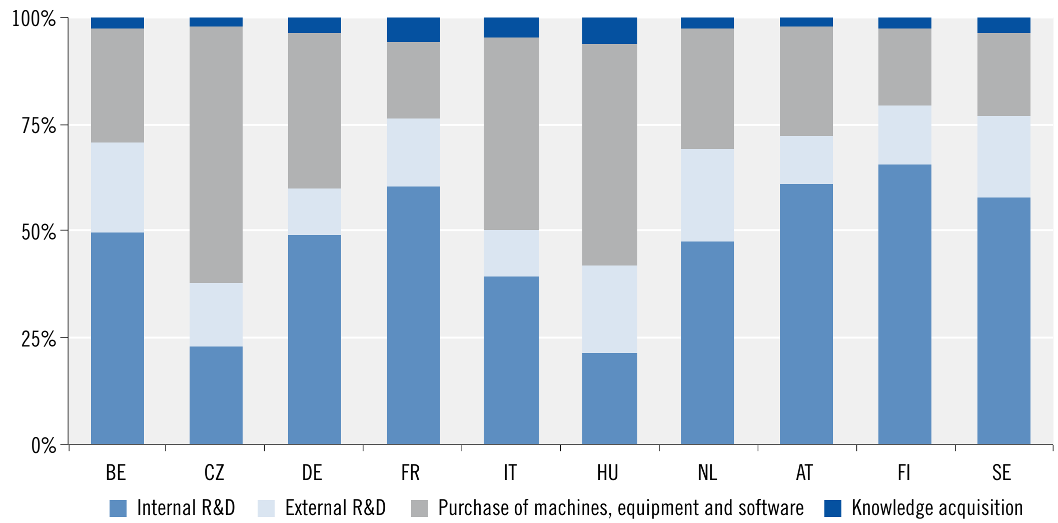
1980s and early 1990s, the Austrian innovation system was still shaped by the import of knowledge embodied in new machines. Today, Austria's shift toward a "mature", modern innovation system that continuously produces its own new knowledge can be considered as complete.

The situation here is different in the Czech Republic and Hungary[56]; their innovation systems are still in a "catching-up modernisation" phase, and the focus of corporate innovation expenditure lies accordingly on the acquisition of machines and equipment (60% and 52% respectively), with own R&D playing a comparatively minor role (only about 20-25% of innovation expenditures go to intramural R&D). Interestingly, Italy was also in this group of countries with a low share of own R&D.

Innovation cooperation

Both the innovative potential of individual stakeholders and their interaction in the form of cooperation networks are of major importance for an innovation system's performance. Intensive cooperative relationships between firms and between firms and (public) research institutions generate positive network effects that contribute to the rapid diffusion of new knowledge and innovations.[57] Ultimately, these kinds of effects lead to the genesis of innovative milieus that have a high innovative potential and intensive exchange relationships. Figure 41 shows the proportion of cooperating firms among all firms with technological innovations.[58] Just under 40% of Austrian firms with technological innovations

Fig. 40: Distribution of innovation expenditures by activity types (as a % of firms with technological innovation activities)



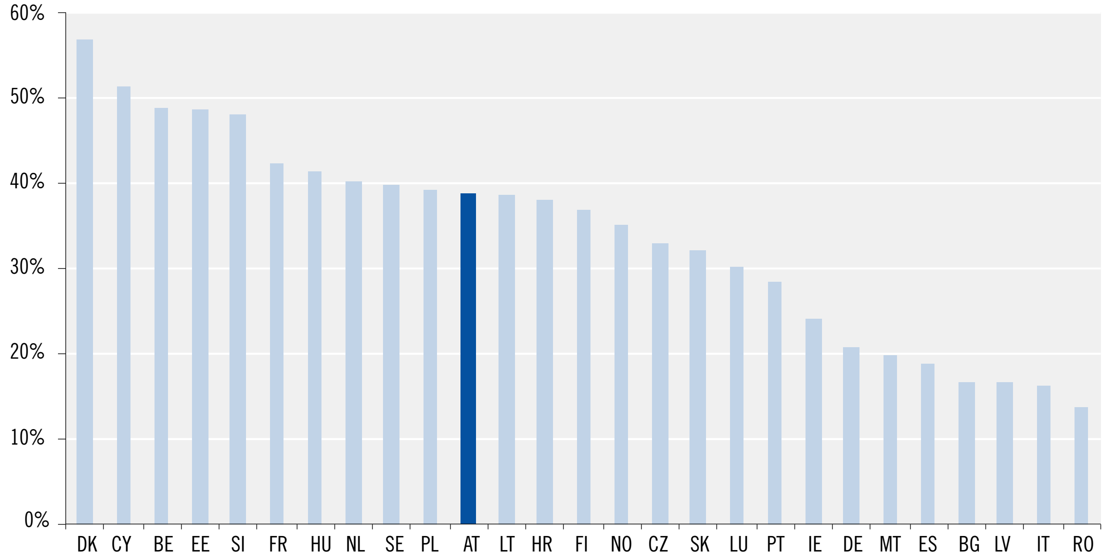
Source: CIS 2008, calculations by Joanneum Research

56 Both of these countries were selected as examples for catching-up CEE countries. There are similar patterns in Poland, Romania and in several other CEE countries (as well as the Mediterranean countries).

57 See also Chapter 4.

58 The CIS only inquires about cooperation partners for technological type of innovations. Statements in this context therefore refer to the total of firms with relevant technological innovation activities.

Fig. 41: Innovation cooperations in European comparison (as a % of all firms with technological innovations)



Source: CIS 2008, calculations by Joanneum Research

reported cooperative relationships with other stakeholders in this comparison; Austria is situated in the middle of the field.

Along with cooperation density, there continues to be a question as to which stakeholders or groups of stakeholders are involved in these cooperative relationships. In this regard there is related information in the CIS with which cooperation partners are differentiated into different categories (namely other firms within the enterprise group; suppliers; clients/customers; competitors; consulting firms/private R&D institutions; universities/universities of applied sciences, as well as public non-university research institutions).

The frequency of cooperation with these different groups of stakeholders is displayed in Figure 42 for a series of selected countries. Even if – as already mentioned – cooperation density between countries varies widely, there is a recognisable and distinctive pattern in terms of the relative importance of groups of stakeholders for innovation cooperation. Suppliers and customers are by far the most important cooperation partners in practically every country, regardless of cooperation density. In a modern economy based to a high degree on the division of labour, innovation processes are consequently organised along value creation chains, and innovations are often (and overwhelmingly) generated in an interactive rather than insular manner, and primarily in mutual relationships between suppliers and customers[59]. Next to these "vertical" cooperation networks, "horizontal" cooperations (e.g., cooperative relationships with competitors or firms in the same industry) play a minor role. Universities and institutions of higher education, as well as other public R&D institutions, are another important group of stakeholders, although their importance does not compare, in practically any countries, to the

59 The "other firms within the corporate group" group of stakeholders can also be included in these stakeholders because different subsidiaries within a corporate group are frequently organised according to the division of labour, meaning for example that subsidiary A is a supplier for subsidiary B in the same corporate group, etc.

vertical and horizontal cooperative relationships with other companies.

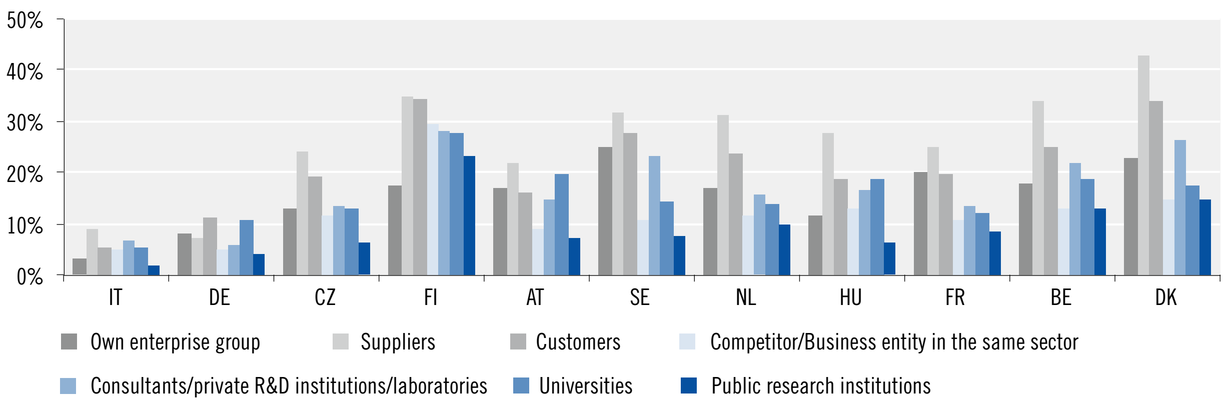
Austria does not deviate from this general pattern in its cooperative relationships, even if Austria's cooperative density does not fully reach the extent of such countries as Finland or Denmark. About 20% of innovative Austrian firms cooperate with suppliers, customers or firms within their own corporate group (in comparison, about 30-40% of firms in Finland and Denmark cooperate with suppliers or customers). Austria's relatively high cooperation density with universities and institutions of higher education is worthy of note; at 20%, it is significantly above the level found in most of the reference countries (Finland's level is close to 30%). The Austrian innovation system has obviously become characterised by a comparatively intensive exchange relationship between the business enterprise sector and the university sector. Especially in Austria, these forms of cooperative relationships have long been promoted or intensified by related technology policy programmes (e.g., competence centre programmes, Christian Doppler laboratories, and not least the Innovation-Voucher).

Non-university research institutions play a significantly more minor role in Austria as cooperation partners in corporate innovation processes than do universities; just 7% of firms reported having cooperated with these kinds of R&D institutions. It must be considered that the non-university research sector in Austria is relatively small and the number of such institutions is low. However, Austria does not depart from the general European pattern. In other reference countries, the importance of non-university research institutions lags behind that of universities and institutions of higher education. Only in Finland are non-university research institutions included near as frequently as universities to serve as cooperation partners.

Innovation funding

Funding corporate innovation activities is one of the important pillars of Austrian technology policy. This raises the question of the "range" – regardless of monetary framework[60] – that funding instruments have, e.g., whether they benefit a small group of firms or whether these instru-

Fig. 42: Cooperative relationships by groups of stakeholders (as a % of firms with technological innovations)



Source: CIS 2008, calculations by Joanneum Research

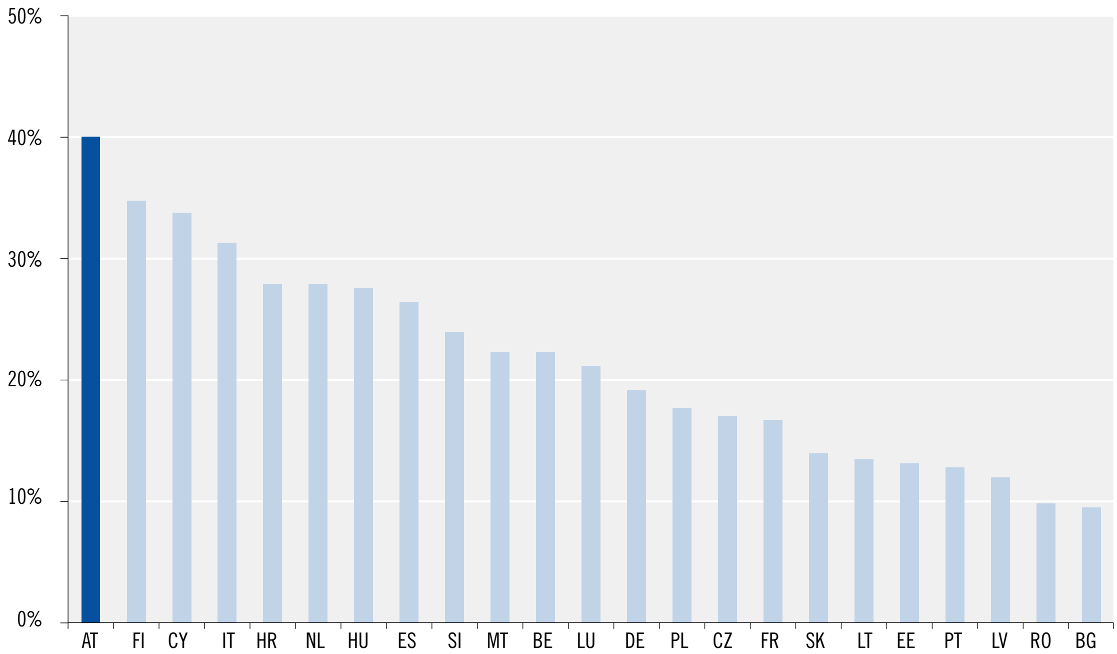
60 In contrast to publicly funded shares of firm-related R&D expenditures, there was no information regarding the funding shares of total innovation expenditures in the business enterprise sector. Austria's funding system, with a funding share of 11% of R&D expenditures, is among the leaders in the European countries.

ments reach numerous innovative firms. Figure 43 shows the results in European comparison. In Austria, about 40% of all firms with technological innovation activities report having received support measures from the public sector. Austria is at the top of all European countries in this regard – even ahead of Finland. Austria's innovation funding system therefore has a very broad range, which under the CIS definition can be attributed to the fact that innovation funding covers indirect funding as well as direct funding, e.g., this indicator also includes tax incentives such as research premiums and tax allowances.[61] This explains Austria's good performance in this indicator. This also shows that Austria is not pursuing a "picking-the-winner" strategy (with the notorious selection problem it entails, which can very easily lead to misallocations and negative lock-in effects).

3.3 Results specific to Austria

The following discussion presents selected areas of the Innovation Survey that are specific to Austria, with a focus on differences in innovation activity between industries. Figure 44 shows the innovator ratio in individual industries (with distinctions drawn between technological and non-technological innovation). In the first place, the proportion of actively innovating firms in all industries is quite high, with the exception of the water/waste and transport/storage industries; the innovator rate stands continuously at 50% or even significantly higher. In terms of the share of innovating firms, there were especially outstanding figures in the "classic" technology industries of information technology / electrical devices - electrical engineering / optics (the innovator rate here ap-

Fig. 43: Innovation funding in European comparison (as a % of all firms with technological innovation activities)



Source: CIS 2008, calculations by Joanneum Research

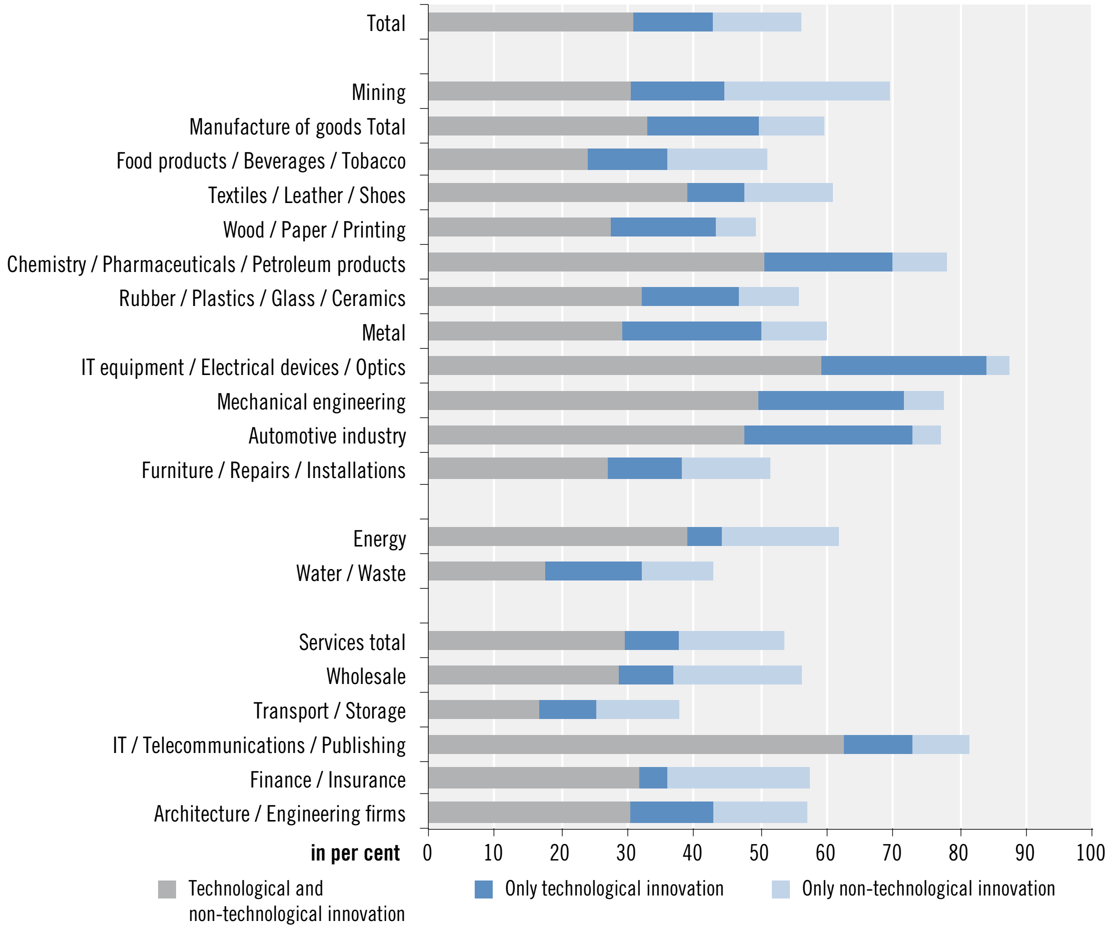
61 For this indicator, the CIS explicitly plans "to include financial support via tax credits or deductions …".

proaches 90%), the chemistry and pharmaceutical industry, mechanical engineering, machinery and the automotive industry. The IT sector (IT and telecommunications) stood out in the service sector (which has a slightly lower innovator rate than manufacturing) with a share of actively innovating firms that was slightly above 80%.

It is striking that in all industries the share of those firms that conduct both technological and non-technological innovation activities dominates. The phenomenon of multidimensionality in innovation processes is obviously distributed across all industries; even in the services segments, technological innovations – in combination with "soft" organisational innovations – were of major importance across all industries.

Austria's corporate landscape is shaped by a high proportion of small and medium-sized enterprises.[62] This raises the question of to what extent innovation behaviour among Austrian firms depends upon the size of the firm. The rela-

Fig. 44: Innovation ratio in Austria by industry (innovating firms as a % of all firms)



Source: CIS 2008, calculations by Joanneum Research

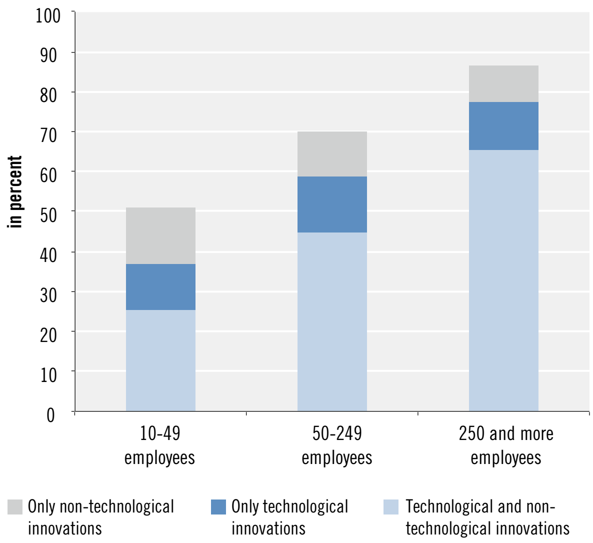
62 The major significance of small and medium-sized enterprises is not specific to Austria; this also exists in larger countries (such as Germany). The special feature of Austria is that in international comparison – and in contrast to other smaller countries, such as Switzerland, Finland, the Netherlands or Sweden – Austria's large firms are relatively "small" and that there are hardly any major corporations of note.

tionship between firm size and innovation activities is shown in Figure 45. Although there is a distinct association between firm size and innovation – the larger the company, the more likely that it will engage in innovation activities – but nonetheless about half of small firms (10 to 49 employees) are actively innovative. Overall, the large numbers of small firms contribute actively to innovation in Austria.

In addition to the innovator ratio, this raises questions about the intensity of innovation processes and the extent to which this intensity differs between industries and employment size categories. A suitable measure for capturing the intensity of innovation processes is the share of innovation expenditures in turnover, which is presented in Figure 46. There were major differences between individual industries in this regard. While innovation activities are found with relatively steady frequency in the industries listed, the relative weighting of these innovation activities is distributed very unevenly. The leader here is once more the manufacture of data processing equipment / electrical devices - electrical engineering / optics, where 11% of turnover is spent on innovation expenditures (overwhelmingly intramural and extramural R&D). There are also above-average R&D intensities in the automotive (approx. 5%) and mechanical engineering, machinery (almost 4%) industries. It is worth pointing out that the average innovation performance in manufacturing was 3.2%, which was significantly above the services sector (0.7%). The only outstanding industry in the services sector in this regard was "architecture and engineering offices" (including technical, physics-related or chemical investigation) with an innovation expenditures intensity of approximately 10%.

The association between firm size and innovation performance is shown in Figure 47. If we first assess innovation performance on the basis

Fig. 45: Innovator ratio by firm size



Source: CIS 2008, calculations by Joanneum Research

of overall innovation expenditures (= intramural & extramural R&D expenditures plus other innovation expenditures), there is no linear association between innovation performance and firm size. Although the share of innovation expenditures is highest among large firms (250 and more employees) at 2%, small firms (10 to 49 employees) still have a slightly higher share at 1.4% than do medium-sized firms (50 to 249 employees) at 1.2%. The structure of innovation expenditures, however, differs significantly by firm size. "Other innovation expenditures" clearly dominate among small firms[63], while (intramural and extramural) R&D expenditures only play a minor role for innovation processes. The situation is reversed among large firms, where the majority of overall innovation costs fall to (intramural and extramural) R&D expenditures.

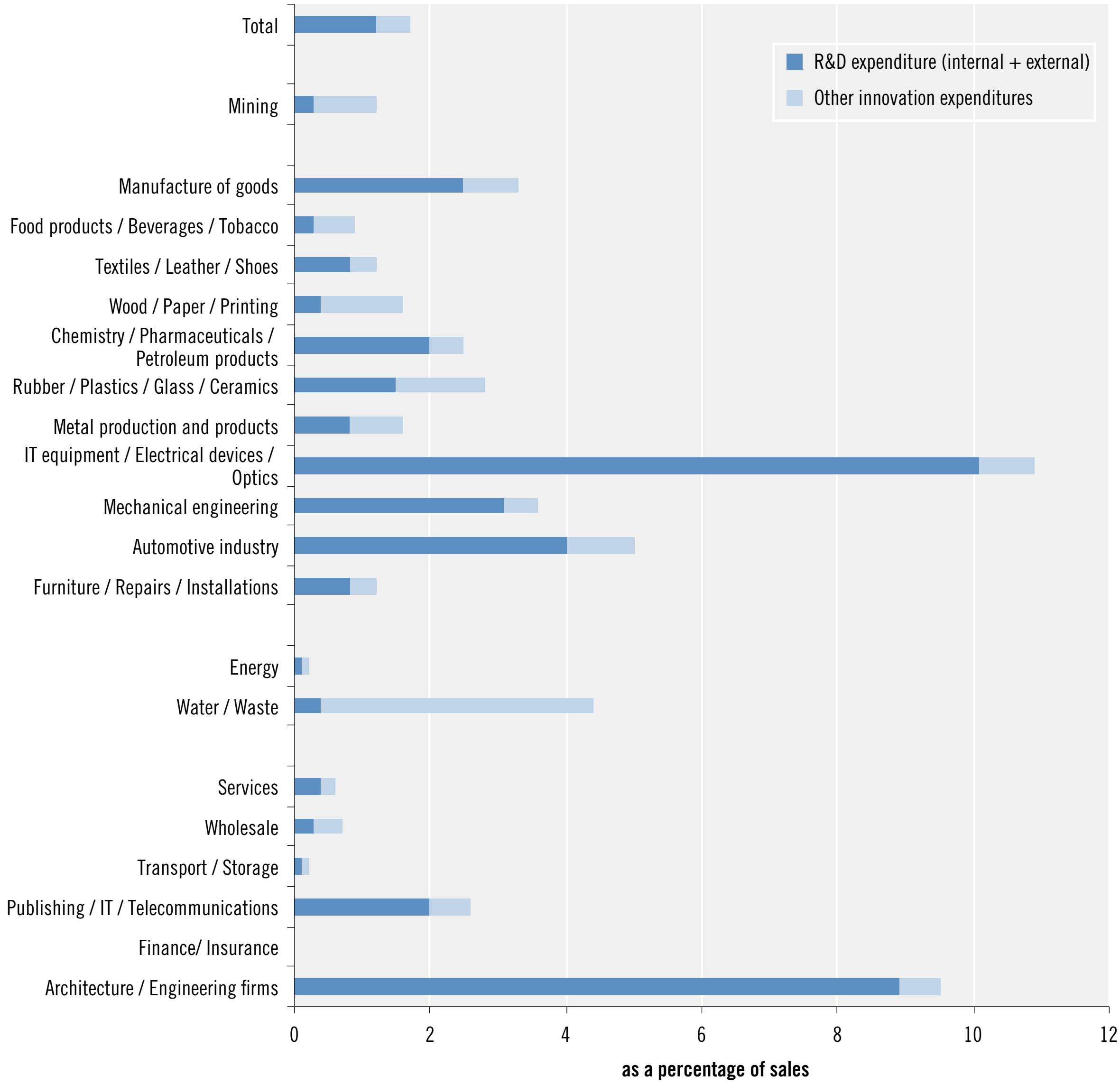
Summary

This analysis of the European Innovation Survey demonstrates that Austria occupies a good (to

63 This includes for example the acquisition of machines, resources and software for innovations, or the acquisition of patents and licenses.

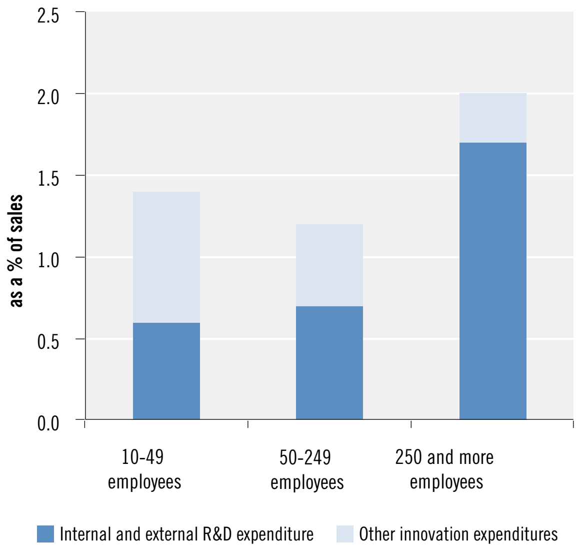
very good) position in European comparison. The share of innovating firms in Austria is significantly above the average for the EU 27, and the innovator ratio is high throughout all industries. At the same time, the composition of innovation expenditures, with its high weighting of R&D expenditures, implies a "mature" and modern innovation system in which firms are constantly creating new knowledge and placing new products and services on the market. Austria's firms are well integrated in cooperative networks with their suppliers and customers, as well as universities and institutions of higher education. Austrian economic policy has long recognised the

Fig. 46: Innovation performance by industry (share of innovation expenditures in turnover – firms with technological innovation activities)



Source: CIS 2008, calculations by Joanneum Research high importance of corporate innovations and promotes corporate innovation behaviour with appropriate instruments. This gives Austria's funding system an outstanding range, meaning that innovation is addressed extensively; Austria has the highest share of firms that benefit from innovation-specific funding measures among all EU countries.

Fig. 47: Share of innovation expenditures in turnover (by size categories)



Source: CIS 2008, calculations by Joanneum Research

3.4 Patents as indicators of technological performance

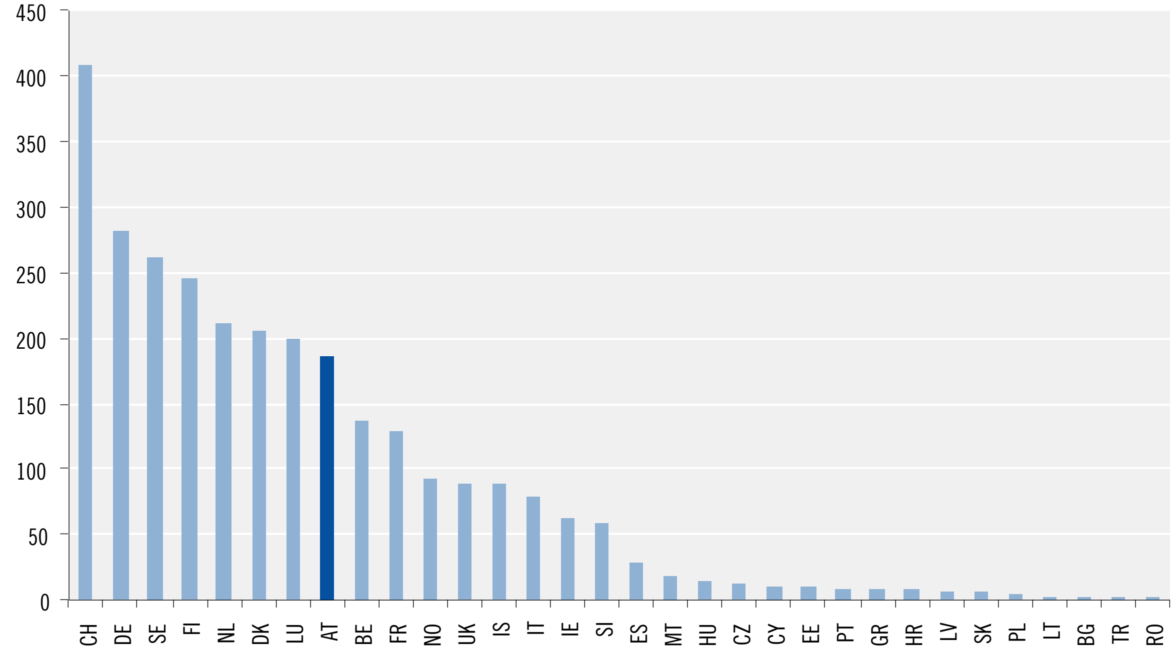
Patents are an important source of information that can be used to evaluate the technological performance of a national economy. Despite a series of limitations that curtail the use of patent data for analyses of R&D, patent applications are an important indicator that can provide a basis for establishing chronological developments and specialisations in specific areas of technology.

The following properties of patent data are particularly useful for analysing technological performance (Schmookler 1966; Griliches 1990; Schmoch and Hinze 2004; Smith 2005; Gassler 1995; Schibany et al. 2010):

- Thanks to a uniform categorisation scheme, the *International Patent Classification Code* (IPC), statements are possible regarding the rate and direction of technological progress.
- Patents are, *per definitionem*, the direct result of the invention process, and more specific inventions are expected to have commercial benefits. Because the process of obtaining patent protection requires time and investment, it can be assumed that there is an economic interest in commercialising new technological knowledge. We can also assume that normally only those patent results are reported that are considered significant, e.g. those patents for which the potential profits of patent protection are expected to compensate for the costs incurred. In addition to direct income arising from the commercialisation of monopoly demands that patent protections grant for a limited amount of time, an indirect benefit can also arise due to the 'exclusion' of potential competitors within an area of technology.
- It follows that patents are well-suited for capturing the competitive dimension of technological change.
- Patent statistics are available for long periods of time and in large volume, can be automatically processed, and therefore facilitate longitudinal analyses.

The definition of a patent and its associated level of novelty makes it clear that patents measure inventions – meaning the results of earlier phases in the innovation process (the research and development phase) – because an invention is also defined by its novelty: *"... since patents by definition involve novelty, and since invention is defined as novelty, patents capture and measure the earlier stages of a process that leads from novelty/invention, through development, testing and engineering, to full-scale innovation."* (Dosi et al. 1990, 44).

Fig. 48: Patents per million population (average 2003–2007)



Note: The graph only shows EU-27 states, Switzerland, Norway, Iceland, Croatia and Turkey. The remaining EPO member countries have fewer than one EPO patent (Liechtenstein, Monaco) or no EPO patents (Serbia, Albania, Macedonia and San Marino) in the period under observation.

Source: OECD, REGPAT database July 2011, calculations by AIT

The difference between invention and innovation is fundamental for understanding the role of patents as an indicator in the innovation process, because this difference assumes that it is inventions, not patents, that measure innovations per se (defined as commercially usable output from the entire innovation process) (Griliches 1990). Patents therefore constitute input for later phases of the innovation process.

It is equally important when analysing patent data to consider the limits of their meaningfulness (Griliches 1990; Pavitt and Patel 1995; Jaffe and Trajtenberg 2002; Smith 2005; Bessen 2008):

- Patents are more suitable as an indicator for inventions than for innovations; a patent protects a technical solution, not its application. The economic value of patents is therefore very different (Trajtenberg 2002).
- There are also other methods to protect inventions; in some industries, for example, confidentiality is as effective a protection as a patent.
- Not all inventions can be patented, especially in the services sector, where inventions often cannot be protected by patents.
- The certification procedure can lead to significant delays of up to four or five years between an invention and the granting of a patent. This delay is growing along with the increasing number and rising complexity of patent applications (Archontopoulos et al. 2007). An analysis based on patent data is therefore only possible with a certain lag time, and an analysis of current technological developments must refer at the least to complementary indicators.

The following analyses are based on the patent database of the European Patent Office (EPO) as well as the OECD's REGPAT database, which facilitates regional comparative analyses as well

(OECD 2008). The OECD's REGPAT database provides more comprehensive information and analysis options for the period from 2003 to 2007.

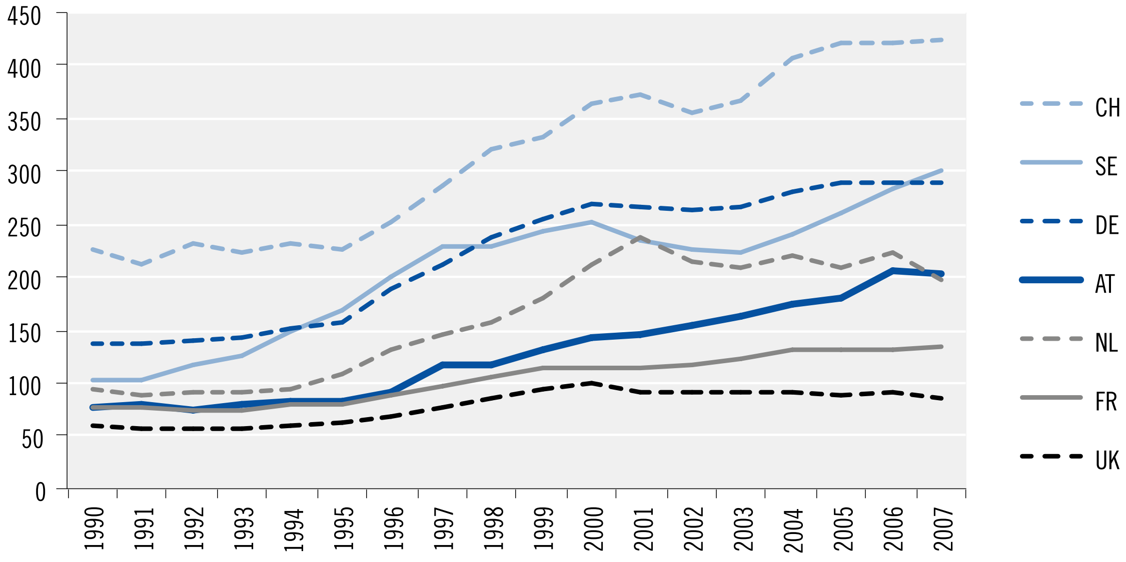
To be able to evaluate a country's technological performance, patents (=patent applications) are classified by the residence of the inventor, by country or by region. This rests on the assumption that the place of invention corresponds to the inventor's location, yet not necessarily to the location of the patent applicant (Hinze and Schmoch 2004). This means that patents by international firms are counted as domestic patents in Austria (if they name an Austrian inventor). Moreover, *fractional counts* are applied: if a patent has more than one inventor, then the patent is divided proportionally among the inventors to avoid double counting.

Figure 48 shows the average number of patents per year and per million population in the period from 2003 to 2007 for Austria and other EPO member countries. Austria is in eighth place with 186 patents per million population. The seven states with a higher number of patents per million population are Switzerland (408), Germany (283), Sweden (261), Finland (246) Netherlands (211), Denmark (205) and Luxembourg (200). All other EU states have significantly fewer patents than Austria. Belgium (137) and France (130) have the next highest patent intensity, far behind Austria.

If we look at the absolute number of patents per country and per year, then Austria is also in eighth place, or seventh place in the EU, with an average of 1,540 patents per year (2003-2007). This represents 2.8% of the total patents granted in the EU 27. With an average of 23,258 patents per year, Germany has by far the most patents: 42% of total patents granted in the EU 27.

Nearly 98% of all patents in the EU 27 are invented in just 11 countries; next to Germany and Austria, there are France (14.9%), the United Kingdom (9.8%), Italy (8.5%), the Netherlands (6.2%), Sweden (4.3%), Belgium (2.6%), Finland (2.3%), Spain (2.2%) and Denmark (2.0%). Patent activities in the EU 27, when viewed through these absolute numbers, are strongly concentrated on one hand in the largest Western and Southern European EU states, and on the other hand in

Fig. 49: Patents per million population and year (1990–2007)



Source: OECD, REGPAT database July 2011, calculations by AIT

the medium-sized and small EU states in Northern and Western Europe. The 12 new EU Member States have a total of less than half of the patents held by Austria.

Figure 49 presents the number of patents per million population and per year for selected countries over time. The following countries are included along with Austria:

- Switzerland – the country with the highest number of patents per million population.
- Germany, France and the United Kingdom – the three EU states with the highest absolute number of patents per year.
- The Netherlands and Sweden – two medium-sized EU states like Austria that had slightly more patents per million population than Austrian at the beginning of the period under observation and that posted a strong increase over time.

The significant climb among all seven of these countries is striking. Overall, the strongest increase was in Switzerland and Sweden. Switzerland was by far the top country over the entire period of observation. At the beginning of the period under observation, and for long stretches of that period, Sweden was in third place behind Germany (as in the previously shown section of 2003-2007) and was only able to place slightly ahead of Germany with a major increase in the most recent years under observation. There was a similar shift in the last year between the Netherlands and Austria, although this was impacted by a decline in patent activity in the Netherlands in 2007. Overall, the increase in France and in the United Kingdom was significantly lower. In the period from 1990 to 1996, Austrian and France had a similarly high number of patents per million population, and the United Kingdom was only slightly behind; however, this distance has increased significantly since then. In 2007 Austria had more than twice as many patents per million population than the United Kingdom, and 1.5 times as many in comparison to France.[64]

Furthermore, there were also a few differences over time. The number of patents per million population in Switzerland rose from 225 in 1995 to 374 in 2001. A similar increase began somewhat earlier in Sweden, from 102 patents in 1991 to 253 patents in 2000, which is an increase of almost 150% within just nine years. The strongest increase in Germany and the Netherlands came at about the same time as in Switzerland – from the mid-1990s to 2000. This increase in patent activity also began in Austria in the mid-1990s, although it was much more moderate than in the countries mentioned above. However, the number of patents per year in Austria has climbed continually ever since, up to the end of the period under observation, overtaking the Netherlands and closing the distance to Germany and Sweden. France, like Austria, has experienced a relatively continuous climb, although with lower rates of increase; the gap between the two countries continues to grow. The number of patents in the United Kingdom has actually decreased slightly since 2000; the distance to all other countries is becoming greater over time.

3.4.1 Technological performance at the regional level

The OECD's REGPAT database allows a comparison of Austria with other EU and non-EU states, and it also enables an analysis of differences in technological performance within Austria. Figure 50 presents the number of patents at the NUTS-3 level for the period from 2003 to 2007. There are a total of 7,674 EPO patents with Austrian inventors within this period.

To begin with, this shows that only 4 of 35 Austrian NUTS-3 regions reported over 500 patents in the entire period of time; in contrast, 14 regions had less than 100 patents.

64 Austrian initiatives such as the uni:invent programme also contributed to increasing patent activity in Austria's higher education sector.

The Austrian region with by far the highest number of patents was **Vienna** with over 1,600 patents from 2003 to 2007. This represents 21.3% of all Austrian patents. With an average of 197 patents per million population and per year, Vienna is slightly above the value of 186 patents per million population and per year for Austria.

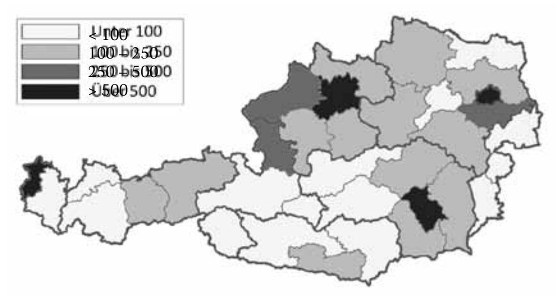
The region with the second highest absolute number of patents is the **Rhine Valley - Lake Constance Area**, which includes the political districts of Dornbirn, Feldkirch and parts of Bregenz. Although this region only included 3.3% of Austria's population in 2007, it was responsible on a relatively constant basis for about 9% of all patents, or an absolute number of 700 patents from 2003 to 2007.

All of the remaining nine NUTS-3 regions with above average patent activity are located in four areas within Austria around Vienna, Graz, Linz, Salzburg and Innsbruck:

- Four NUTS-3 regions are located in the **central region of Upper Austria** up to the city of Salzburg, the NUTS-3 regions of Innviertel, Linz-Wels and Traunviertel in Upper Austria, and the Greater Salzburg region in the state of Salzburg. About one quarter of all Austrian patents are concentrated in these four adjacent NUTS-3 regions.
- The **Graz** NUTS-3 region, which includes both the city of Graz and the Greater Graz district, reported 609 patents in the period from 2003 to 2007, which corresponds to a total of 7.9% of Austrian patents granted.
- The **Innsbruck** and the Tyrolean Unterland, with the districts of Kitzbühel, Kufstein and Schwaz, account for 6.1% of overall patents granted in Austria.
- **Vienna and Greater Vienna** are responsible for 28.1% of all Austrian patents.

A total of 72% of all Austrian patents came from these areas in 2003 to 2007. These areas also have an above-average number of patents in proportion to their populations. There are a particularly low number of patents in both the inner alpine regions outside of the aforementioned central regions (including Liezen, Tyrolean Oberland, East Tyrol, Lungau and Carinthia excluding Klagenfurt-Villach) and in rural regions, especially in the eastern part of Austria (all of Burgenland, eastern Styria, the Waldviertel and the Weinviertel).

Fig. 50: Number of patents at the regional level (NUTS-3 region, 2003–2007)



Source: OECD, REGPAT database July 2011, calculations by AIT

At the state level, Vienna comes in first with over 21% of all patents in Austria from 2003 to 2007, just ahead of Upper Austria with its 20%. Lower Austria and Styria follow with 14.5% and 14.3% respectively. Vorarlberg had 828 patents from 2003 to 2007 and a share of 10.8% of Austrian patents, which is below the values for the aforementioned states, yet in comparison with the population numbers, Vorarlberg has the highest relative number of patents. In contrast, Tyrol (7.5%), Salzburg (6.0%), Carinthia (3.9%) and Burgenland (1.6%) were of less importance both in terms of absolute numbers and in demographic comparison.

3.4.2 Technological performance at the level of individual technologies

Along with an international comparison and analysis at the regional level, patent data can also be used to assess technological performance. Each patent is classified in one of 30 technology categories using an IPC code. If a patent has several IPC codes, then it is split up proportionally to the corresponding technology categories, just like the procedure used for patents with multiple inventors.

Figure 51 shows the proportion of the 30 technology categories among all Austrian patents from 2003 to 2007 and compares these values to those of the entire EU 27. This reveals that civil engineering, building, mining have the largest shares in Austria with 8.5%, followed by electrical devices - electrical engineering (7.6%) and consumer goods and equipment (6.8%). In contrast, the most important technologies for the entire EU 27 were telecommunications (7.5%), analysis, measurement and control (7.2%), and transport (7.0%). While the relative significance of these three technologies was lower than the EU average, they are still among the eight most important technologies in Austria with at least 5% share each. Nuclear engineering (0.2%), agriculture, food (0.4%), and space technology (0.7%) have the lowest significance in Austria; these technologies are also of rather subordinate significance throughout the EU 27.

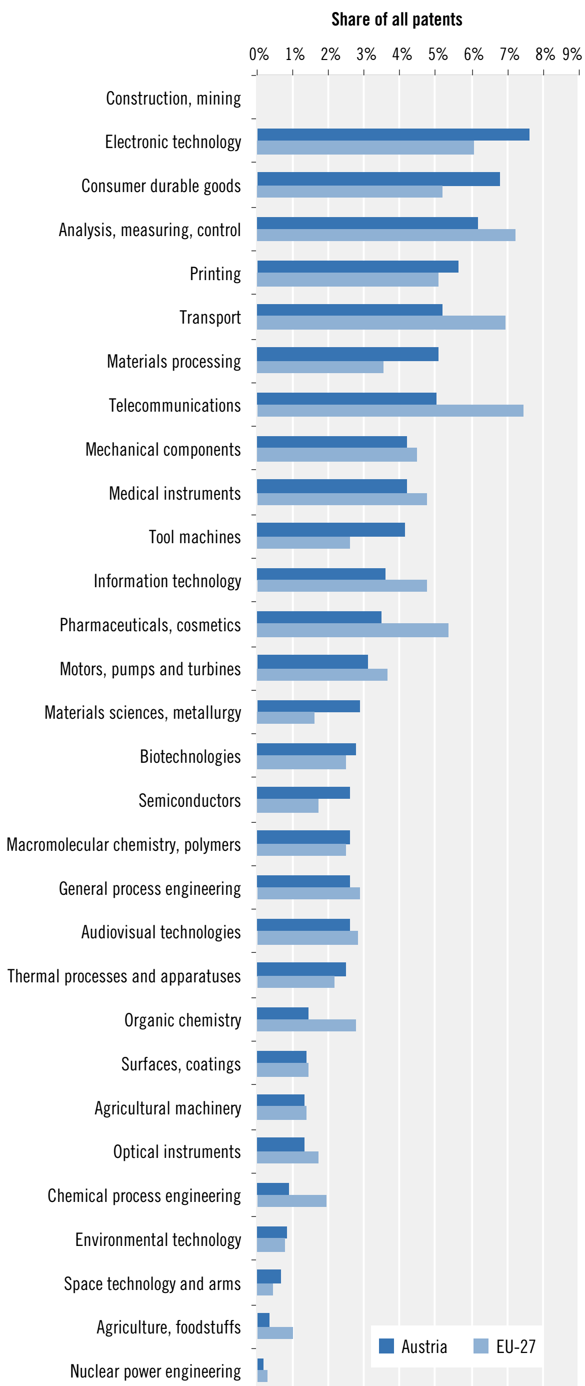
The *Revealed Comparative Advantage* Index (RCA Index) assists in the creation of a specialisation portfolio for Austria. The RCA index measures the relative specialisation of a country against a group of reference countries (in our case, the EU 27) in a certain field of technology. Formally, the RCA index is defined as follows:

$$RCA_{ij} = \frac{\frac{P_{ij}}{\sum_{i=1}^{n} P_{ij}}}{\frac{\sum_{j=1}^{k} P_{ij}}{\sum_{j=1}^{k}\sum_{i=1}^{n} P_{ij}}}$$

with
P=number of patent issuances at the EPO;
i = field of technology; j = country

An RCA value > 1 means that a country is overproportionally specialised in the field of technology concerned compared to the EU 27, meaning that a relative specialisation or technological strength exists. If the RCA value < 1, there is a technological weakness. A technology portfolio can be created using the RCA value and the proportion of technology in a country's patent activity (in reference to Patel and Pavitt 1997).

Fig. 51: Share of individual technologies in all patents (Austria and the EU 27, 2003–2007)



Source: OECD, REGPAT database July 2011, calculations by AIT

The proportions of technologies in total patent activity used to calculate the specialisation indices are presented in the y axis in Figure 52, and they correspond to the absolute significance of the respective technology in Austria. The RCA value on the x axis represents the relative significance of a technology for Austria in comparison to the EU 27. If a technology is located in the upper right quadrant, then it is one of Austria's **core technologies**; the technology has above-average prominence (in comparison to other technologies) in absolute terms, and the significance of this technology is also higher in Austria than in the EU 27. The lower right quadrant denotes **technological niches**, meaning that the technology may have a below-average significance in Austria, yet that its prominence is higher than in the EU 27. Technologies in the upper left quadrant are **background technologies**, or technologies that have an above-average absolute significance, yet have a lower prominence in Austria than in the EU 27. Technologies in the lower left quadrant are **marginal technologies** with a below-average share of patent activity in Austria and a below-average prominence in comparison to the EU 27. The chart only includes technologies with RCA values of over 1.2 or under 0.8. Technologies with values within this range have a significance that corresponds to values for the entire EU 27.

The assessment of Austria's technological portfolio reveals a total of five core technologies with varying characteristics. The clearest core technology by far is civil engineering, building, mining. As mentioned previously, this technology commands the greatest share of patent activity in Austria and is almost twice as high as the corresponding value for the EU 27. The RCA index value is 1.82. Other core technologies are machine tools (RCA value of 1.60), material processing (1.44), consumer goods and equipment (1.31) and electrical devices - electrical engineering (1.25). These five core technologies account for a total of 32.1% of all Austrian EPO patents.

Austria's three niche technologies are materials, metallurgy (RCA value of 1.82), semiconductors (1.55) and space technology, weapons (1.39). While the former two technology categories account for almost 3% of all patents, space technology and weapons is the smallest of these niches with a share of just 0.68%. These three niche technologies account for a total of 6.2% of all Austrian patents.

Austria has five technologies that can be described as marginal technologies: organic fine chemistry, nuclear engineering, chemical industry and petrol industry, basic materials chemistry, and agriculture, food all had an RCA value of 0.5 or less, as well as a share of less than 2% of all patents. Optics, the fifth marginal technology, had an RCA value of 0.77, which was significantly closer than the corresponding value for the EU 27. The five marginal technologies accounted for a total of 4.3% of all patents by Austrian inventors.

The four background technologies in Austria - transport, telecommunications, information technology and pharmaceuticals, cosmetics all had an RCA value above 0.6 and had a significant share of all patents at between 3.5% and 5.2%. The share of these technologies amounted to 17.3%. This relatively high share of four background technologies can be explained by the fact that these are all technologies that have high significance for the EU 27 in which Austria is specialised at a lower-than-average level (= RCA value > 1), yet also has an above-average share of all patents (> 1/30).

In sum, 60% of all Austrian EPO patents can be assigned clearly to the technology portfolio. The remaining 40% fall to technologies with RCA values between 0.8 and 1.2. These technologies have a comparably major significance in Austria and in the EU. The relatively large share of these technologies can be interpreted to mean that Austria's specialisations bear a generally strong resemblance to the entire EU 27.

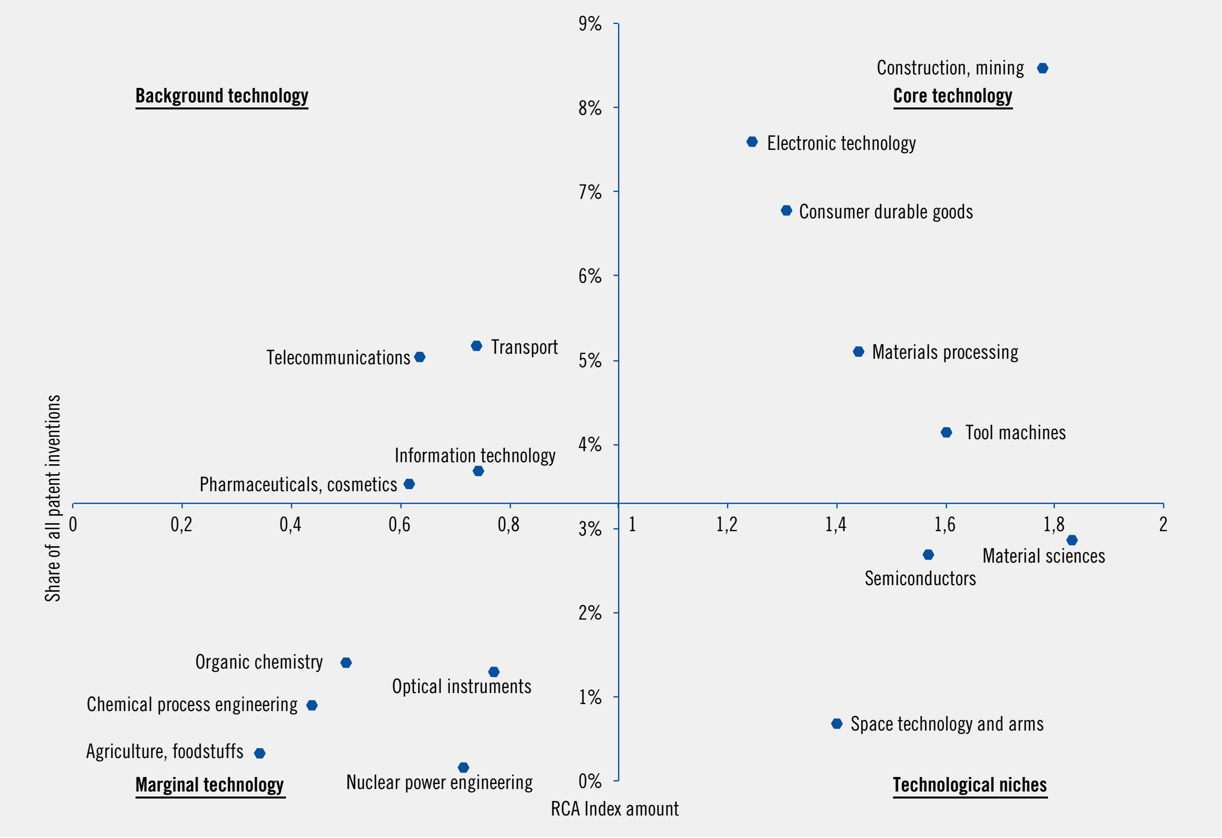
3.4.3 Technological specialisation in Austrian regions

Technological specialisations can be shown at the regional level as well as the national level. Due to the relatively low volume of patents, the NUTS-1 level is used as a basis, and distinctions are drawn between eastern Austria (Burgenland, Lower Austria, Vienna), southern Austria (Carinthia, Styria) and western Austria (Upper Austria, Salzburg, Tyrol and Vorarlberg).

This national assessment shows that a high specialisation at the national level in a few technologies is accompanied by a similarly high specialisation across the three regions, while in other cases the high national specialisation is caused exclusively by a very high specialisation in one or two NUTS-1 regions:

- Electrical devices - electrical engineering; civil engineering, building, mining; material processing; and the minor technology of space technology and weapons, all have similarly high RCA values in all three parts of Austria.
- **Eastern Austria** is highly specialised in biotechnology; audiovisual technology and to a somewhat lesser degree information technology; telecommunications; and pharmaceuticals and cosmetics. Southern and western

Fig. 52: Austria's technological profile (2003–2007)



Note: General process engineering, analysis measurement and control, biotechnologies, printing, agricultural machinery, macromolecular chemistry, polymers, mechanical components, medical engineering, motors, pumps, turbines, surfaces, coatings, thermal processes and devices, and environmental engineering have RCA values between 0.8 and 1.2 and are not included in the chart.

Source: OECD, REGPAT database July 2011, calculations by AIT

Austria has RCA values in all five technologies that are at or under 0.5, which is far below the average.

- **Southern Austria** has an extremely strong specialisation in semiconductors (RCA value of nearly 5) and another high specialisation in materials sciences and metallurgy. There was also a slight specialisation in macromolecular chemistry and polymers. In contrast to the specialisations in eastern Austria, the specialisations in southern Austria did not have values that were as low as those for the other regions.
- **Western Austria's** strongest specific specialisation is in machine tools. Civil engineering, building, mining, which is Austria's strongest overall specialisation, is of even higher relative significance in western Austria than in the rest of the country. While materials sciences and metallurgy were another specialisation that is not limited solely to western Austria, there were three more clear specialisations in consumer goods and equipment, thermal devices and processes, and surfaces and coatings.

Finally, a glance at the lower level of aggregation can more clearly illuminate the differences between the three major regions. The strongest specialisation at the NUTS-1 level is by far southern Austria's high specialisation in semiconductors. Of 203 semiconductor patents in 2003-2007, 115 had an inventor from southern Austria. While only 1.78% of all patents in eastern Austria and just 1.09% of all patents in western Austria fall to semiconductors, southern Austria's percentage is 8.23%. Almost half of all 99 semiconductor patents in Austria are accounted for in just three NUTS-3 regions in southern Austria: Graz (44), western and southern Styria (30), and Klagenfurt-Villach (25). Only the significantly larger state of Vienna, with 39 patents, has similar prominence. The five states with the lowest number of patents - Burgenland, Lower Austria, Salzburg, Tyrol and Vorarlberg - had 21 patents, which was fewer patents than the Klagenfurt-Villach region.

The strong specialisation of western and southern Austria in materials and metallurgy rests on strong patent activity in one NUTS-3 region each: the Linz-Wels region in western Austria, and eastern Upper Styria in southern Austria. This technology accounts for 22.31% of all patents in eastern Upper Styria. Western Austria's significantly above-average specialisation in machine tools can also be attributed primarily to high levels of activity in Upper Austria; more than one third of all patents in Austria have an inventor from Upper Austria. The most significant region in absolute terms is Linz-Wels; in relative terms, the percentage is highest in Steyr-Kirchdorf. The adjacent NUTS-3 regions, such as Traunviertel, Liezen and eastern Upper Styria in southern Austria, are specialised at levels significantly above the average. Additionally, there is a second area of above-average specialisation in the western part of Austria that includes Vorarlberg, which had high patent activity overall, and the Ausserfern group of districts in Tyrol.

Eastern Austria's strongest specialisation is in biotechnology. This technology accounts for 5.22% of all patents in eastern Austria, 1.24% in western Austria and 1.58% in southern Austria. More than half of all biotechnology patents in Austria have an inventor from Vienna. If we include Greater Vienna, this percentage climbs to over 60%. Four other eastern Austrian specialisations are audiovisual technology, information technology, telecommunications, pharmaceuticals and cosmetics; Vienna and Greater Vienna also have a high percentage here, with over 60% of all Austrian patents.

Summary

Measured in the number of patent inventions per million population, Austria has the eighth-highest technological performance in Europe and is ranked seventh in the EU 27. A higher number of patent inventions per million population only exists in Switzerland, Germany, Luxembourg and the Netherlands, as well as the three Nordic EU states of Sweden, Finland and Denmark. All other European states, including France and the United Kingdom, which are significant in absolute terms, as well as the Southern European and Eastern European EU states, lag significantly behind.

At the level of individual technologies, Austria has a few moderately pronounced specialisations. Austria's highest degree of specialisation is in civil engineering, building, mining, materials sciences and machine tools. In contrast, the most significant technologies for the EU – analysis, measurement and control; telecommunications and transport – are of less importance in Austria than on the EU average, yet are still among the

Table 22: Technological specialisation (NUTS-1 regions, 2003–2007)

	Eastern Austria	Southern Austria	Western Austria	Austria
Materials, metallurgy	-	++	++	+
Civil engineering, building, mining	+	+	++	+
Machine tools	-	+	++	+
Semiconductors	+	++	-	+
Material processing	+	+	+	+
Space technology, weapons	+	+	+	+
Consumer goods and equipment	-	-	+	+
Electrical devices - electrical engineering	+	+	+	+
Thermal processes and apparatuses	-	-	+	+
Biotechnology	++	-	--	+
Handling and printing	+	+	+	+
Environment, pollution	-	-	+	+
Macromolecular chemistry, polymers	--	+	+	+
Surfaces, coatings	--	-	+	-
Agricultural and food machinery and apparatus	-	+	+	-
Mechanical elements	-	-	+	-
Audiovisual technology	+	--	--	-
General technological processes	-	+	+	-
Medical engineering	-	-	+	-
Analysis, measurement, control	-	+	-	-
Engines, pumps, turbines	-	+	-	-
Optics	-	--	-	-
Information technology	+	--	--	-
Transport	-	-	-	-
Telecommunications	+	--	--	-
Pharmaceuticals, cosmetics	+	--	--	-
Organic fine chemistry	-	--	-	-
Nuclear engineering	--	--	-	-
Chemical industry and petrol industry, basic materials chemistry	--	-	--	--
Agriculture, foodstuffs	--	--	--	--

Note: Eastern Austria includes Burgenland, Lower Austria and Vienna; southern Austria includes Carinthia and Styria; western Austria includes Upper Austria, Salzburg, Tyrol and Vorarlberg
++ (RCA value ≥ 2)
\+ (RCA value ≥ 1)
– (RCA value ≥ 0.5)
–– (RCA value ≥ 0)

Source: OECD, REGPAT database July 2011, calculations by AIT

more prominent technologies. Overall, there is a pattern of specialisation that is relatively similar to that of the entire EU. There are no majorly distinctive specialisations at the national level.

In contrast, regional differences in technological performance are significantly more pronounced within Austria. Stronger patent activity in the dense urban areas around Vienna, in the Rhine Valley, Graz, Linz-Salzburg and in the Tyrolean Unterland balances out the significantly lower amounts in rural regions.

The study also showed that the five areas with the highest patent activity had very different specialisations. Vienna and Greater Vienna differed most profoundly from the other Austrian regions, with specialisations in biotechnology, audiovisual technology, information technology, telecommunications, pharmaceuticals and cosmetics – technologies that are of below-average significance in the rest of Austria. Specialisations in other dense urban areas bear a stronger resemblance to one another; there is a strikingly strong specialisation in semiconductors in the Graz area and in Klagenfurt-Villach, and Upper Styria and Upper Austria are highly specialised in materials, metallurgy and machine tools.

4 The transfer of knowledge and technology between science and industry

Well-functioning interaction between science and industry is an essential component of an effective innovation system. Universities and government research institutions provide the scientific and technical foundations for innovations that are then (further) developed and introduced by firms according to market conditions. On the other hand, scientific institutions are increasingly direct partners with business enterprises in innovation projects, whether in the context of joint research projects or as providers of specialised scientific technological services. Above all, science produces academics, hence supplying businesses with highly skilled staff. The importance of a well-functioning transfer of knowledge and technology was recognised early on in research and technology policy, and promoting transfer is therefore one of the main activities in this policy field (see Polt et al. 2001).

The relationships between science and industry in the innovation system are understood today as an interactive mutual exchange. The model of technological development emerging out of the sciences and then taken up and implemented by the business enterprise sector ("Science Push"; see Bush 1945) has been enhanced thanks to a recursive model of science and technology transfer in which science and industry provide mutual inspiration to one another (see Kline and Rosenberg 1986; Bozeman 2000; Schmoch 2003). Scientific institutions can therefore receive new stimuli from their interaction with businesses for new research questions and increase their attractiveness as practically-oriented institutes of education. Cooperation with science offers businesses access to new research results as well as the opportunity to hire new highly qualified employees.

Knowledge and technology transfer can take place both via direct cooperation and via indirect forms such as publications or scientific lectures. Transfer channels range from joint research projects, contract R&D and scientific consultancy, exchange of staff, further and continuing education, joint academic supervision of student projects up to the founding of spin-off companies, licensing and sale of new technologies developed at scientific institutions, as well as informal contacts between the firm's employees and scientists.

Even if this section focuses on knowledge and technology transfer, we should not overlook the fact that, from the perspective of the universities, direct and indirect cooperation with industry is only one of many tasks that must be balanced with the core tasks of academic education and research, along with the university's self-administration. The Federal Ministry of Science and Research's University Report 2011 provides a comprehensive assessment of the achievements and challenges of Austrian universities[65].

The purpose of this section is to evaluate the status of science and technology transfer between science and industry in Austria in international comparison. First, the chapter assesses the significance that the interaction between businesses and scientific institutions has for innovation in business, and what transfer channels are used for this interaction. Then it discusses the incentives and obstacles for an effective exchange process. The study employs various indicators that measure the extent of transfer activities via

65 BMWF (Federal Ministry of Science and Research) (2011), University Report 2011, Vienna

different transfer channels and compares the situation in Austria with the situation in other selected countries. It also addresses the prerequisites for transfer in science and business.

4.1 Importance of science for innovation in business

Science as an innovation driver

Science was and is a catalyst for important innovations and plays a major role in innovation activity in industry. Many pioneering innovations only became possible once the necessary scientific or technological foundations were in place. This applies to early basic innovations in mechanical and automobile engineering, chemistry, electrical engineering, optics and microelectronics, as well as to current innovations in biotechnology, nanotechnology and materials technology (see Mansfield 1995, 1998; Mansfield and Lee 1996; Jaffe 1989; Beise and Stahl 1999).

It is not only the implementation of new scientific findings, however, that makes for successful innovations. New products must not only stand out by virtue of being newer than existing products; they also must offer users clearly identifiable additional benefits and a reasonable price-performance ratio. The same applies for new processes: they must be superior to established processes – whether in terms of costs or quality criteria – and their introduction must be cost-efficient. Innovation projects must be designed in such a way that they balance technological requirements on one hand and while controlling costs and risk on the other. Successful innovations are characterised by the fact that they are introduced timely and in response to competitor activities, while at the same time reacting to changing environments in supply, factor and sales markets.

In their innovation activities, businesses must therefore balance (technological) novelty, customer benefit, positioning against competitors, adjustment to changing general conditions, funding possibilities and cost efficiency. Such considerations require, in addition to their own creative efforts, the utilisation of external knowledge and its incorporation into the firm's own innovation activities. The importance that innovative firms attribute to different sources of information is mirrored in the diversity of knowledge sources that play a role for innovation processes (Table 23). The major importance of internal company sources shows that their own creative work – especially systematic R&D – is almost indispensable. The most important external information sources, however, are customers. This is natural because innovations are not just (and often not at all) about bringing forth new technological solutions; innovations are primarily about the placement of new products on the market for which a demand can be generated. The second most important sources of external information are suppliers. They often offer innovative firms ready-made innovative solutions (e.g. in the form of new machines, systems, materials or components) and can thereby make a major contribution to the acceleration of the innovation process. Competitors and trade fairs are other important information sources.

Science-related information sources are assigned much less significance. Eleven per cent of Austrian firms with innovation activities in the period between 2004 and 2006[65a] indicate that scientific journals and other publications were of major importance as information sources for innovation; 8% noted that universities were important sources, and 4% named other government or public research institutions.[66]

Nevertheless, Austrian firms use science-re-

65a More current data are not available because the questions regarding information sources were not integrated into the Austrian version of the sixth Community Innovation Survey (CIS 2008).

66 A large share of firms for which scientific journals etc. are of major importance as a source of information also reported that universities and government research institutions are very important sources of information, as an evaluation of the Austrian microdata from the fifth Community Innovation Survey shows.

Table 23: Importance of information sources for innovation activities in Austrian firms (reference period: 2004–2006)

Share of all innovating firms[1)] in %	large	medium	low	none
Own firm and own corporate group	60	25	9	6
Clients and customers	48	29	16	7
Suppliers of equipment, raw materials, primary products and software	28	38	23	11
Competitors and other firms in the same sector	20	41	28	11
Professional conferences, trade fairs, exhibitions	18	42	25	15
Scientific journals and other publications	11	37	34	18
Professional associations and interest groups	9	25	36	30
Universities, universities of applied sciences and other institutions of higher education	8	22	30	40
Consulting firms, commercial laboratories and private R&D facilities	5	21	38	36
Other government and public research institutions	4	14	32	50

1 Firms with product or process innovations or ongoing or abandoned/stopped product or process innovation activities; companies with 10 or more employees in sectors (NACE 2003) 10-41, 51, 60-67, 72, 74.2, 74.3.

Source: Statistics Austria, 5. European Community Innovation Survey (CIS 2006).

Table 24 Importance of science-related information sources for innovation activities in firms by country

Share of innovating firms[1)] in % for which the source of informa tion is of major importance	AT[2)]	BE	CZ	DE	ES	FI	FR	HU	IT	NL	PL	PT	SI	SK
Scientific journals and other publications	11	7	7	8	9	4	7	8	4	5	12	7	10	7
Universities, universities of applied sciences and other institutions of higher education	8	5	3	5	4	5	2	10	3	4	5	4	5	3
Other government and public research institutions	4	4	2	2	3	2	2	4	2	2	7	3	3	1

1 Firms with product or process innovations or ongoing or abandoned/stopped product or process innovation activities in the 2006-2008 period with 10 or more employees in the economic sub- sectors (NACE 2008) 5-39, 46, 49-53, 58, 61-66, 71;
2 Reference period 2004-2006, firms in the sectors (NACE 2003) 10-41, 51, 60-67, 72, 74.2, 74.3.

Source: Eurostat, 6. European Community Innovation Survey (CIS 2008). – Statistics Austria, 5. European Community Innovation Survey (CIS 2006). – Calculations by ZEW.

lated information sources significantly more frequently than do firms in other EU countries (Table 24). The proportion of innovating firms for which scientific journals are of major importance as information sources is only higher for firms from Poland, while only 4 or 5% of innovating firms in Finland and the Netherlands consider this source of information to be of major importance. Only Hungarian firms ranked universities as an information source higher than firms from Austria, and Polish firms had the highest value for government research institutions. We must be careful, however, when interpreting these numbers because the assignment of high significance to science-related information sources for business innovation activity can arise from a firm's limited internal capacity to generate new technological knowledge.

One reason for the comparatively low importance of science-related information sources for business innovation activity is the high proportion of firms whose innovation activity is directed at the incremental improvement of existing products and processes, including the imitation of innovations by others and the acquisition of innovative ideas from third parties (which also includes process innovations that are based on the use of new process technologies developed by suppliers). This kind of innovation activity does not require recourse to new scientific findings.

However, even among the "radical" innovations, meaning fundamental innovations that are novelties on the world market, it is rare to find innovations that can be attributed directly to the utilisation of scientific sources. Leitner (2003) showed for 50 major innovations introduced by Austrian firms in the period between 1975 and 2000 that new scientific findings or current scientific research results provided the decisive impetus for only a small number (less than 10%) of these innovations. Nevertheless, around a third of firms worked together with scientific institutions in innovation processes, including joint work on fundamental technological problems and contracting out certain R&D services to specialised laboratories. Even if no new, comparably detailed studies exist, we can assume that little has changed in this basic pattern.

A second reason for the rare utilisation of science as an information source for innovations lies in the varying "proximity to science" of technology development in individual industries. Science-driven innovations, meaning the development of new products and processes on the basis of new scientific research results, are limited to relatively few high-tech industries (see Meyer-Krahmer and Schmoch 1998). These industries include the pharmaceutical industry, manufacturers of measurement and optical devices, the aerospace industry, the microelectronics industry, parts of the chemical industry (e.g., the production of pesticides or new materials) and segments of the technical services industry (software, technical laboratories). These industries however only constitute a small part of the entire business sector and represent only a small portion of innovative firms within a national economy. Nevertheless, their significance for innovation is major because they often create those "basic innovations" that determine innovation activity in several other industries and open up new paths of technological development. Microelectronics and information technology, for example, have enabled process innovations in almost every industry.

Scientific research results on which these basic innovations are built upon affect many different industries. Yet this effect is indirect, and firms that take up these innovation stimuli typically do not credit science; instead they view the innovation as a result of their own R&D activity or give credit to those stakeholders who provided the direct impetus for innovation (e.g., technology suppliers or competitors). Often a good deal of time elapses between new scientific-technological inventions and their broader commercial application (see Mansfield 1991), which makes the importance of scientific research results for current innovation among firms less obvious. Above all, however, new scientific research results can only be implemented directly into innovations in exceptional cases. As a general rule, firms must perform additional and sometimes comprehensive internal R&D work to transform scientific findings into market-ready technologies and solutions that both fulfil customer requirements and can be produced in a cost-efficient manner.

The German innovation survey attempted to quantify the importance of science as an innovation driver in comparison to other relevant information sources (inside and outside of businesses) (see Rammer et al. 2005). Measured in sales generated by new products, 1.8% of the innovations introduced in Germany in the period from 1996 to 2002 were identified as directly "science-driven", insofar as new scientific research results were indispensable for the implementation of the product innovation.[67] In the area of process innovations, a share of 5.8% was attributed to science as an information source (measured in the

67 65% of new product sales could be attributed to internal creative activity (especially R&D), 19% to customers, 5% to competitors, 4.5% to suppliers and 4.2% to regulations.

total costs saved by new processes).[68] These values are significantly below those reported by Mansfield (1991) (24% for product innovation and 7.2% for process innovation), which however refer only to selected, large and research-intensive firms in a few industries in the United States and do not include the significance of other relevant information sources. In fact, the inspirations for many innovations do not come from any single source, which means that new scientific research results are often a necessary yet not sufficient prerequisite for the development and introduction of innovations.

Science as an innovation partner

The importance of science for innovation among firms is not just limited to the supply of new research results that can be translated into commercially usable innovations. Business continues to involve science as a cooperation partner in innovation processes. Business enterprises often utilise the specialised research infrastructure of scientific institutions and integrate these institutions into their own scientific and technological services. Joint R&D projects and contracting our R&D to scientific institutions also help to reduce the costs and risk incurred by firms in the development of new technologies and creates access to complementary knowledge.

The importance of science as a cooperation partner in innovation projects is about as high as its importance as an information source for innovations. In the 2006–2008 period, 8% of all firms in Austria (with 10 or more employees in the manufacturing and selected services segments) maintained cooperative agreements with universities and other institutions of higher education (Table 25).[69] Three per cent of firms cooperated with other government research institutions. Universities and other institutions of higher education came in directly behind suppliers of equipment and materials as the second most important cooperation partner – every second firm with innovation cooperations worked with universities and other institutions of higher education – one-fifth of cooperating firms had innovation cooperation ventures with other government research institutions.

The integration of science in innovation projects is particularly widespread in industries in which innovations are especially important as a competitive parameter and in which a correspondingly high proportion of financial and staff resources are dedicated to research, innovation and the generation of new knowledge. In research-intensive manufacturing (the chemical and pharmaceutical industries, electronics industry, mechanical engineering, manufacture of vehicles), one in four firms cooperated with institutions of higher education in the 2006-2008 period, and 10% maintained innovation cooperations with other government research institutions. Two-thirds of firms with innovation cooperations had universities and other institutions of higher education as partners, and one-quarter partnered with other government research institutions. In knowledge-intensive services (software and IT services, telecommunications, engineering firms, technical laboratories, financial services, publishing houses), one in two firms works together with institutions of higher education in innovation cooperation projects, and one-sixth cooperate with other government research institutions. This makes science the most important cooperation partner for both research-intensive manufacturing and knowledge-intensive services. In other manufacturing and other services, however, suppliers of equipment and materials are the most important cooperation partner.

The willingness among Austrian firms to cooperate with scientific institutions is above average

68 55% of the decisive impetus for process innovations came from internal corporate sources, 12% from suppliers, 10% from customers, 9% from competitors and 8.2% from regulations.

69 Cooperations here include both joint cooperation in R&D projects in the context of contract or community research and cooperation in joint R&D institutions such as centres of excellence.

Table 25: Innovation cooperations of firms in Austria by cooperation partner (reference period: 2006–2008)

Share of firms[1)] that were involved with their respective partners in innovation cooperations[2)]	Research-intensive manufacturing[3)]		Other manufacturing[4)]		Knowledge-intensive services[5)]		Other services[6)]		Total	
	A	B	A	B	A	B	A	B	A	B
Own firm and own corporate group	44	17	42	6	44	11	41	4	43	7
Clients and customers	55	21	42	6	42	10	29	3	42	7
Suppliers of equipment, raw materials, primary products and software	60	23	61	8	40	10	61	7	56	9
Competitors and other firms in the same sector	20	8	23	3	30	7	20	2	23	4
Consulting firms, commercial laboratories and private R&D facilities	38	14	35	5	40	10	37	4	37	6
Universities, universities of applied sciences and other institutions of higher education	66	25	48	7	52	13	36	4	50	8
Other government and public research institutions	27	10	20	3	17	4	11	1	19	3
All partners	100	38	100	14	100	24	100	11	100	17

A: % of all cooperating firms; B: % of all firms.
Innovation cooperations: active participation by a firm together with other firms or non-commercial institutions in joint innovation activities. This need not mean that every cooperation partner draws an immediate economic advantage from the collaboration. Pure contract work in which no creative cooperation takes place is not considered as cooperation.

1) Firms with 10 or more employees. – 2) Active participation of a firm together with other firms or institutions in joint innovation activities. – 3) Sectors (NACE 2008) 19-21, 26-30. – 4) Sectors 5-18, 22-25, 31-39. – 5) Sectors 58, 61-66, 71. – 6) Sectors 46, 49-53.

Source: Statistics Austria, 6. European Community Innovation Survey (CIS 2008). – Calculations by ZEW.

in international comparison (Table 26). Only Finland shows a higher share of firms in the research-intensive manufacturing that work together with universities and other institutions of higher education on innovation projects. In knowledge-intensive services, only Belgium and Finland beat Austria in this regard. Austria also has high scores in other manufacturing and other services in international comparison. Overall, 8% of Austrian firms cooperated with institutions of higher education on innovation projects in the 2006-2008 period. The share of firms that worked together with other government research institutions on innovation projects was 3% in Austria, which was an average value for all of the sectors evaluated here. This figure also mirrors the overall lower significance of this part of the science sector in Austria. In Austria, 12% of researchers employed in the sciences work for other government research institutions, in comparison to 23% in the EU and 21% in the OECD countries.

Collaboration with scientific institutions in the context of innovation projects is not just limited to joint R&D projects. A survey conducted under the auspices of the 2008 innovation survey in Germany (see Rammer and Bethmann 2009) showed that only 40% of firms that cooperate with scientific institutions on innovation projects work together on R&D. Thirty-two per cent of cooperations were related to a phase of idea development for which personal contacts between firms and scientists played a major role, along with formal collaboration in the framework of scientific consultation. Twenty-four per cent of firms cooperating with scientific institutions used science as a scientific technology service provider for test and assessment projects, and 12% of these firms use these institutions in the context of innovation and product design. Collaboration in the context of market introduction of product innovations or the implementation of new processes take place at 10% of firms that work together with scientific institutions on innovation projects.

Science as an educator of "innovation staff"

One of science's essential roles in the innovation system is the education of highly qualified people who may later be responsible in businesses for the performance of innovation activities and whose ideas, expertise and knowledge are the foundation of every innovation process. Education represents an indirect transfer of knowledge between the two sectors that is often given too little attention in the analyses of knowledge and technology transfer systems, probably because its contribution to specific innovations in businesses is difficult to identify and quantify. Studies on the forms of cooperation between innovative firms and scientific institutions in Germany show that firms hold the the educational function of science in very high esteem (see Rammer et al. 2005). One of every two cooperating firms is involved in the joint supervision of student projects (bachelor, master and doctoral theses), and over a third of such firms use cooperation as a form of further or continuing education for their own employees. In addition, knowledge and technology transfer activities between firms and scientific institutions most often come from the initiative of company employees with a university degree. These employees typically utilise their personal contacts to scientists from their university days to establish cooperations.

The importance of highly qualified employees as a critical resource in the innovation process can also be seen in the obstacles that firms face when conducting innovation projects. In the period from 2004 to 2006, 41% of Austrian firms reported that the lack of qualified employees was of medium to major importance as an obstacle to innovation (Table 27). The lack of qualified staff came in behind high innovation costs as the second most important obstacle, significantly ahead of other restraints related to knowledge and technology transfer: the lack of technological infor-

Table 26: Innovation cooperations of firms with scientific institutions by country (reference period: 2006–2008)

Share of all firms[1] in %	Research-intensive manufacturing[2]		Other manufacturing[3]		Technical services[4]		Other services[5]		Total	
	A	B	A	B	A	B	A	B	A	B
Austria	25	10	7	3	13	4	4	1	8	3
Belgium	22	13	11	7	16	9	3	4	9	6
Denmark	18	12	8	6	8	7	4	5	8	6
Germany	18	8	6	2	11	3	1	1	7	3
Finland	29	25	12	10	17	14	4	3	13	11
France	11	8	4	3	6	4	1	1	4	3
United Kingdom	10	6	5	4	7	5	4	4	6	5
Italy	6	1	1	0	6	3	1	0	2	1
Netherlands	11	7	6	4	7	4	2	2	5	3
Norway	15	14	5	6	6	5	2	2	5	5
Sweden	15	6	6	2	8	4	3	4	6	3
Spain	6	6	1	2	6	4	0	1	2	2

A. Innovation cooperations with universities; B: Innovation cooperations with other government research institutions
1) Firms with 10 or more employees. – 2) Sectors (NACE 2008) 19-21, 26-30. – 3) Sectors 5-18, 22-25, 31-39. – 4) Sectors 58, 61-66, 71. – 5) Sectors 46, 49-53. Deviations from the definition of four sector groups due to confidentiality agreements possible for individual countries.

Source: Eurostat (CIS 2008). – Calculations by ZEW.

mation was a medium to major obstacle for 24% of firms, and 28% of firms reported difficulties in finding cooperation partners. The lack of qualified employees was a widespread obstacle to innovation in the mid-2000s, especially in research-intensive manufacturing sectors.

International comparison also shows that the lack of qualified staff in most countries was a more important hindrance than the lack of technological information or difficulties in finding a cooperation partner (Table 28). The share of firms in Austria that reported lack of qualified employees as a very significant obstacle to innovation stood at 14%, which is higher than in most other European countries (even if values were not available for most of the highly-developed countries that are strong in terms of innovation). This suggests that the supply of highly qualified staff does not fully meet demand among firms. The causes for this could vary widely. First, we must consider that the demand among businesses for qualified employees for innovation projects fluctuates with the business cycle and is higher in boom phases – as is the case here in the 2004-2006 period – because many firms take on additional innovation projects due to improved funding options and climbing demand. In Austria, firms have expanded their innovation activities in the last decade at a high pace, which can be seen in the constantly rising figures for R&D expenditure. Although the number of university graduates increased during the same period of time, the number of qualified staff with an education relevant for innovation activities – especially engineers and natural scientists – was relatively low due to decades of lower graduation rates in these disciplines.

4.2 Framework conditions for science-industry interactions

Appropriate conditions are required for a properly functioning system of knowledge and technology transfer. This includes above all an orientation towards transfer in scientific institutions and the willingness and ability among firms to pick up scientific expertise and integrate it in their innovation processes. The attractiveness of science as an innovation partner climbs with the quality of scientific research and its relevance for industrial applications (see Mansfield and Lee 1998). Interactions between science and industry are therefore often found in those disciplines that have a strong scientific and technological proximity to research in firms, such as the engineering sciences, chemistry, medicine, some areas of physics, and business administration (see Jaffe 1989; Meyer-Krahmer und Schmoch 1998).

Nevertheless, disciplines that upon first glance seem to have a tenuous relationship to commercial activity (such as the humanities or cultural studies) do have interactions with firms too,

Table 27: Importance of innovation obstacles in Austria (reference period: 2004–2006)

Share of firms[1)] in % for which the respective innovati on obstacle was of major or medium importance	research-intensive manufacturing[2)]		other manufacturing[3)]		knowledge-intensive services[4)]		other services[5)]		Total	
	A	B	A	B	A	B	A	B	A	B
Lack of qualified employees	20	35	15	29	13	27	12	23	14	27
Lack of technological information	5	24	5	25	1	16	5	16	4	20
Difficulties in finding cooperation partners	4	25	9	21	6	13	9	19	8	20

A: of major importance; B: of medium importance.
1) Firms with 10 or more employees. – 2) Sectors (ÖNACE 2003) 23-24, 29-35. – 3) Sectors 10-22, 25-28, 36-41. – 4) Sectors 65-67, 72, 74.2, 74.3. – 5) Sectors 51, 60-64.

Source: Statistics Austria, 5. European Community Innovation Survey (CIS 2006). – Calculations by ZEW.

Table 28: Importance of innovation obstacles by country (reference period: 2004–2006)

Share of firms[1)] in % for which the respective innovation obstacle was of major importance	AT	BE	CZ	ES	HU	IT	NL	PL	PT	SK
Lack of qualified employees	14	10	16	10	5	8	10	14	7	14
Lack of technological information	4	2	11	5	2	2	7	9	2	4
Difficulties in finding cooperation partners	8	4	11	8	2	3	12	16	6	8

1) Firms with 10 or more employees in the sectors (NACE 2003) 10-41, 51, 60-67, 72, 74.2, 74.3.

Source: Eurostat, 5. European Community Innovation Survey (CIS 2006). – Calculations by ZEW.

though these interactions may have less to do with joint research activities but more with other forms of knowledge exchange, as in the area of developing concepts for innovation projects or the design and marketing of innovations (see Schartinger et al. 2001). The physical proximity between firms and scientific institutions plays an even stronger role the more science is involved in innovation projects as a knowledge service provider, while collaboration in basic research typically leads firms to approach the best available scientific institutions and scientists in the relevant discipline, regardless of their location (see Rammer and Schartinger 2002; Beise and Stahl 1999). The transfer orientation of the sciences are also significantly influenced by incentives for and barriers to working together with firms. In addition to legal and administrative support provided by administrators of scientific institutions to scientists in cooperation projects, there is also the standing of knowledge and technology transfer activities within academic cultures (see Knie and Simon 2006) as well as the consideration of transfer activities in evaluations and decisions regarding funding allocation (see Schmoch 2003).

The willingness and ability of firms that use the sciences as a cooperation partner and source of knowledge depends first upon the general demand among companies for scientific expertise and second upon their internal "absorption capacities" (Cohen and Levinthal 1990). The need for collaboration with the sciences is determined essentially by corporate strategy, especially the importance of innovation as a competitive factor and the firm's position in the technology and innovation cycle. Absorption capacities describe those resources and processes in firms that are required to identify relevant external knowledge and relevant cooperation partners, to pick up knowledge from outside the firm and to utilise it productively for the firm's own activities. A central component of absorption capacity among businesses is the firm's own expertise in science and technology. This knowledge typically goes hand-in-hand with a firm's own R&D activities, as R&D both creates new knowledge and triggers learning processes that are the prerequisite for the recognition of need for external knowledge and the assessment of the utility of external knowledge (see Cohen and Levinthal 1989). Companies without their own R&D, however, can also acquire their own scientific and technological expertise by hiring qualified staff or by implementing knowledge management measures (see Rammer et al. 2012). An additional crucial prerequisite in firms for the integration of scientific institutions is an appropriate innovation and cooperation management programme, which also includes the management of intellectual property.

The following section provides a brief overview of prerequisites for transfer, both in Austrian science and among Austrian firms.

Transfer prerequisites in science

The transfer of knowledge and technology – in the sense of using and implementing research results in practice – is included in the Austrian

Universities Act as one of the tasks of Austria's universities. This "third mission" complements the traditional objectives of research and teaching (including academic education and further education and international collaboration). Knowledge and technology transfer includes both collaboration with firms in the context of innovation projects as well as all active transfer of knowledge at institutions of higher education to society at large. Knowledge and technology transfer has a long tradition in Austria as part of the universities' mission, and it is partially – as in the case of the technical universities and the University of Leoben – an integral component of institutional self-understanding and played an important role in their founding. This also applies to the universities of applied sciences established since the 1990s, which combine a university education with a (typically regionally oriented) active transfer of knowledge and technology. There are also numerous institutions among the government research institutes whose central missions are to work together with firms and to commercialise their research results. This "institutes sector" refers in particular to the cooperative sector of contract research institutes (Austrian Institute of Technology, Joanneum Research, Centres of Excellence), which were created to support cooperation and transfer between their own research, industry and technology.

The importance of knowledge and technology transfer as a university activity has gained in relevance over the last decade. This development is reflected in the establishment of professional administrative structures for the funding and support of knowledge and technology transfer activities. They provide aid to scientists in legal questions and contract structuring, and support them in the administration of cooperative projects. Furthermore, knowledge and technology transfer activities flow into the ongoing performance evaluation of universities. The development of strategies for property rights and utilisation has become part of performance contracts with universities.

Closely related to the enhancement of knowledge and technology transfer as a university task, the management of intellectual property (IP) has been professionalised at the universities. With the help of the uni:invent programme, internal utilisation structures were established that cover the entire spectrum of IP management, from the identification of utilisation-relevant new knowledge, to the development of registered inventions, to the filing of patent applications and license awarding; these structure also function as a central point of contact for firms (see Schibany and Streicher 2011). In addition, the federal government and its national contact point for intellectual property (ncp.ip) supports active shaping of intellectual property dealings with public research institutions, thereby implementing the European Commission's 2008 IP recommendations. The IPAG working group (Intellectual Property Agreement Guide)[70] is producing a manual for the legal design of R&D cooperations that should lead to a major reduction in the administrative overhead for transfer activities.

The acquisition of additional funding sources for research activities from third-party funds is an additional driver for stronger knowledge and technology transfer activities at scientific institutions in Austria. Research contracts from firms, as well as R&D cooperative ventures with firms, represent an attractive form of funding for R&D activities because such collaborations often extend over a longer period of time and thereby enable the pursuit of long-term research programmes. Scientists involved in such projects also often find opportunities for transitioning into industry. R&D income at firms can be used more flexibly, including the funding of research infrastructures. From 2008 to 2010, Austrian universities took in more than € 100 million in

70 http://www.era.gv.at/space/11442/directory/20288.html

R&D revenues from firms, which is 22% of the total corporate R&D revenues. Measured against total R&D expenditures by Austrian institutions of higher education (i. e., including R&D financed by basic funding), income from business enterprises made a contribution of over 5% in 2009.

Comprehensive funding offers for cooperative research are an essential foundation for cooperation between scientific institutions and firms, and also an important additional source of funding. Both the Austrian federal government and the states and European Commission offer various R&D programmes that financially support joint R&D projects for science and industry as well as other forms of knowledge and technology transfer.

At the federal level, this includes in particular the centre of excellence programmes K-plus, K-ind/net and COMET, COIN, Bridge, the Innovation-Voucher, as well as Research Studios Austria (RSA) and the Laura Bassi Centres of Expertise[71], which all aim for direct cooperation in the framework of R&D and innovation projects. The AplusB programme and uni:invent promote transfer via patents and the founding of spinoff companies. There is also a strong focus on knowledge and technology transfer in R&D funding from the Austrian Research Promotion Agency (FFG), which is directed both at specific and open topics, funding from the Federal Ministry for Transport, Innovation and Technology (BMVIT) for human resources and researcher mobility under the auspices of its talent promotion programme, and the Austrian Science Fund's translational research programme. The Federal Ministry of Economy, Family and Youth (BMWFJ) programme called "research expertise for industry" offers targeted structural funding measures for firms for the systematic expansion and training of existing research and innovation staff, as well as for anchoring business-relevant research topics at Austrian universities and universities of applied sciences. All of these programmes provide important incentives in science and industry to intensify the exchange of knowledge in the context of research and innovation projects.[72]

Along with the centre of excellence programmes, the Christian Doppler Research Association (CDG) provides funding for R&D infrastructures that form the framework for long-term and durable cooperation between science and business enterprises. In the Christian Doppler laboratories established at universities, scientists work for a period of seven years together with business partners on high-level scientific research questions that are relevant to firms. In 2011, there were a total of 65 Christian Doppler laboratories with a research volume of almost € 25 million.[73]

Such infrastructures facilitate trusting cooperation, the mutual exchange of knowledge and the handling of questions that arise in cooperations with regard to intellectual property rights. While very large, research-intensive firms often establish such joint R&D infrastructures on their own initiative, Austria has – in international comparison – smaller corporate structures that require public incentives for the construction of joint R&D infrastructures.

Transfer prerequisites for businesses

Companies' absorption capacities are one of the essential prerequisites for utilising science as a cooperation partner and a source of knowledge. These capacities are closely associated with R&D activities. Because only when firms have their own R&D competences will they be in the position to clearly name a need for external knowledge, identify possible sources of knowledge and work together on an eye-to-eye basis with scientific cooperation partners. The distribution of internal R&D activities is therefore an important indicator for a firm's readiness for transfer.

71 See the Austrian Research and Technology Report 2011 (p. 183 ff.) regarding the first results of the accompanying evaluation.
72 www.ffg.at; www.fwf.ac.at
73 www.cdg.ac.at

In the 2006–2008 period, 20% of all firms (with 10 or more employees) in manufacturing and selected service segments conducted intramural R&D. Twelve per cent performed R&D on a continual basis, while 8% dealt with R&D on an occasional basis. This is an average level in international comparison. Only Spain (12%) and Italy (17%) had lower R&D participation among the highly-developed industrial European countries (Tab. 29). Dutch firms attained the same value as Austria. The highest R&D participation was seen in firms in Finland (36%), Germany (31%), Belgium (28%) and Sweden (27%). While the share of Austrian firms performing R&D in the research-intensive manufacturing sector is very high at 60% and is only exceeded significantly by Germany (66%), R&D participation in other manufacturing (22%), technical services (24%) and other services (8%) were comparably low.

The ability to refer to external knowledge and integrate it into innovative activities is a second important aspect of absorption capacities, along with internal scientific and technical competences. There are three indicators on this subject in the Community Innovation Surveys (CIS), namely

- the share of firms that award R&D contracts to third parties,
- the share of firms that acquire other external knowledge (especially in the form of patents and licenses), and
- the share of firms that engage in innovation cooperations.

Austrian firms were also in the middle of the field for these indicators. Eleven per cent of firms awarded R&D contracts to third parties in 2006-2008. These contracts could be awarded to scientific institutions or to firms, although the volume of R&D contracts to other firms were clearly dominant. In 2009, only about 11% of external R&D contracts from firms in Austria were awarded to scientific institutions domestic and abroad (see Schiefer 2011). Finland, Belgium, Germany and Sweden had higher shares. Fourteen per cent of Austrian firms in the industries and size categories represented in the CIS acquired external knowledge in the form of patents, licenses and the like in 2006-2008. In the comparison group, only firms in Finland, Sweden and Germany had higher values. Seventeen per cent of firms in Austria had experience with innovation cooperation activities. This rate is higher only in Belgium and Sweden. Broken down by sector groups – and by internal R&D activities – firms in research-intensive manufacturing again had the highest values and were in the top group along with Germany, Finland and Sweden. Experience in the utilisation of external knowledge was far less widespread in technical services. The lowest values for these indicators are found in other manufacturing and in other services; Austria is in the middle of the field of the countries under observation.

If we total up those firms that either had intramural R&D activities or experience with the utilisation of external knowledge for innovation activities, then in 2008 there were a solid 4,600 firms (with 10 or more employees) in manufacturing and selected services sectors that should have those competences that enable them to engage actively in knowledge and technology transfer with the sciences. Given that almost 800 firms in Austria with whom Austrian universities have active cooperation agreements (2010), this suggests a very large potential for industry to incorporate science into innovation projects.

Experience in intellectual property management and the use of IP protective measures could also be seen as another prerequisite for effective knowledge and technology transfer among firms. To be able to profit commercially from the exchange of knowledge with scientific institutions, clear control of property rights over the research results emanating from the collaboration, as well as the professional utilisation of own property rights, is decisive. In 2004 to 2006 – more recent data is not available – 10% of firms in Austria used patents as a mechanism to protect their intellectual property. Overall, 16% of firms were able to demonstrate their experience with using patent protections (2006 and earlier), and 26%

Table 29: Intramural R&D activity in the business enterprise sector in international comparison (reference period: 2006–2008)

Share of all firms[1] in %	Research-intensive manufacturing[2]		Other manufacturing[3]		Technical services[4]		Other services[5]		Total	
	A	B	A	B	A	B	A	B	A	B
Austria	45	15	11	11	15	9	4	4	12	8
Belgium	41	14	17	15	26	16	7	9	16	12
Germany	43	23	15	19	28	18	2	2	17	14
Finland	44	17	16	18	23	21	6	12	19	17
France	34	15	12	11	18	12	5	6	13	10
Italy	27	10	9	7	15	8	3	2	11	6
Netherlands	35	8	16	8	20	8	6	4	14	6
Sweden	29	24	8	18	18	17	7	10	12	15
Spain	25	9	6	4	17	8	3	1	8	4

A:Internal R&D on a continual basis; B: Occasional performance of internal R&D
1) Firms with 10 or more employees. – 2) Sectors (NACE 2008) 19-21, 26-30. – 3) Sectors 5-18, 22-25, 31-39. – 4) Sectors 58, 61-63, 71. – 5) Sectors 46, 49-53, 64-66.

Source: Eurostat (CIS 2008). – Calculations by ZEW.

have dealt with legal protective measures in some form (which include patents as well as utility models and brands). International comparative data are only available for the highly-developed industrial European countries (Belgium, Germany, Netherlands, Norway, Spain). This suggests that the share of firms in Austria that have experience with patent law should be ranked as high. Only Germany has a higher share of firms with patent experience.

Incentives and obstacles

Compatible incentive structures are necessary for both industry and science to tap into the potential for knowledge exchange between both sectors via actual transfer activities.

In the sciences sector, incentives – including income from R&D revenues, opening up career opportunities for scientific employees, implementing own research results in commercially and socially useful applications, developing interesting research topics – face various barriers. These obstacles include time conflicts with other tasks such as basic research, teaching and participation in the (self-)administration of scientific institutions. There are also attitudes and value standards that are specific to each discipline, and these can play a role in the sense of different "science cultures" (see Knie and Simon 2006). This concerns the prestige that commercially oriented research has within the scientific community, as well as the willingness of scientists to engage with the requirements of cooperation partners from the business sector (in terms of the organisation of schedules and contents for R&D projects). The criteria that are used to evaluate scientific achievements of scientists in their own field are of major importance, such as evaluations or performance contracts. Additional barriers can arise in employment law, for example in the administrative processing of secondary employment or the temporary shift of scientists into the business sector to work on joint R&D projects. Finally, insufficient compensation for overhead costs incurred in projects financed by third-party corporate funding (and third-party funding projects in general) can lead to internal financing difficulties at scientific institutions and reluctance to engage in such third-party funding activities.

From the business enterprise sector perspective, the major incentives for working together with the science sector are access to new research results, the utilisation of specific problem-solving competences and specialised scientific and technological equipment, as well as access to qualified staff. Falk and Falk (2009) were able to show for firms in Austria that direct R&D cooperation with universities or the purchase of knowledge and technologies from universities significantly increased the number of patent filings in the business enterprise sector. The potential effects of a cooperative venture, whether boosting profit or reducing costs, are opposed by direct costs in the form of information procurement and transaction costs (including the cost of IP management) as well as indirect costs, such as the danger of unintended knowledge drain. Additional barriers could be fundamental information deficits in firms about what is on offer in the science sector and different approaches to research and innovation projects (for example in timing, as firms often need short-term results while scientific institutions place a great deal of value on the scientific and technical precision of results). The question of how to divide up intellectual property created in a cooperative venture may inhibit collaboration. The "*not invented here*" phenomenon can also play a role if the employees responsible for innovation processes within a firm are not prepared to take up external knowledge and insist on their own ways of solving problems.

The most important reason by far for firms to avoid cooperating with the science sector is that there is simply no need. A study in the context of the German CIS showed that four out of five firms named this reason without cooperating with scientific institutions (see Rammer et al. 2005). This is due first to the fact that in many industries production processes and products are further developed on the basis of technologies and approaches to innovation that only require recourse to scientific expertise or new research results in exceptional cases. This particularly af-

Table 30: Use of external knowledge for innovation activities at firms in international comparison (reference period: 2006–2008)

Share of all firms[1] in %	Research-intensive manufacturing[2]			Other manufacturing[3]			Technical services[4]			Other services[5]			Total		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Austria	31	25	38	10	12	14	13	21	24	6	10	11	11	14	17
Belgium	31	15	37	16	11	24	20	18	31	13	7	18	16	11	23
Germany	27	27	30	12	15	11	21	30	23	4	11	4	13	18	13
Finland	42	28	35	24	22	15	29	25	24	11	10	7	24	20	17
France	19	10	29	8	5	15	9	9	19	5	5	9	8	6	15
Italy	14	8	11	6	5	5	9	9	14	4	4	5	7	5	7
Netherlands	22	9	25	12	7	17	10	9	17	7	4	9	10	6	14
Sweden	26	31	33	11	19	16	10	24	21	11	14	13	12	19	18
Spain	16	1	15	5	1	5	10	2	14	3	0	3	6	1	6

A. Awarding of R&D contracts to third parties; B: Acquisition of other external knowledge (patents, licenses, etc.); C: Performance of innovation cooperations

1 Firms with 10 or more employees. – 2) Sectors (NACE 2008) 19-21, 26-30. – 3) Sectors 5-18, 22-25, 31-39. – 4) Sectors 58, 61-63, 71. – 5) Sectors 46, 49-53, 64-66.

Source: Eurostat (CIS 2008). – Calculations by ZEW.

fects several services sectors but also impacts various industries in less research-intensive manufacturing. On the other hand, there are firms in every industry that – at least temporarily – either completely do without innovation activities or pursue them exclusively on the basis of internal resources.

Additional reasons for firms to forego cooperation with the science sector is the absence of relevant supply from the sciences, or a lack of information about the services on offer. This is where intermediaries such as technology transfer agencies come in. Their tasks include the dismantling of information asymmetries between potential cooperation partners, making science services on offer more transparent, and supporting knowledge and technology transfer processes with the aid of services (such as for legal questions and contract issues). Austrian universities today all have organisational units dedicated to the promotion and support of knowledge and technology transfer, and some of them are established within a university's overall research service department. In addition to information and service offerings, these technology transfer agencies also perform, in varying intensities, active searches for commercially usable research results ("*technology scouting*") and look after professional management of intellectual property at their institution. The uni:invent programme in particular has made important contributions to the establishment of professional utilisation structures (see Schibany and Streicher 2011).

4.3 Transfer activities

Knowledge and technology exchange between science and industry can take place through very different channels. While universities and the technology transfer institutionalised there often focus on the commercialisation of new research results on the basis of patents and licensing rights, firms and scientists avail themselves of several other forms of cooperation. These include in particular

- joint research projects,
- contract research and scientific-technological consultation,
- use of joint research infrastructures,
- joint supervision of student projects,
- mobility of researchers between science and industry (including temporary staff exchange),
- education, further and continuing education of business employees at scientific institutions,
- the sale of patents or technologies, or the awarding of licenses for patents that come from scientific institutions (incl. "Material Transfer Agreements")
- and the founding of firms by scientists for the commercial use of research results ("spinoff companies").

Scientific publications and lectures at conferences by scientists represent an important form of knowledge exchange via codified knowledge. Finally, informal contacts between company employees and scientists can play a central role in knowledge exchange.
Transfer activities between science and industry in Austria are represented in the following using two groups of transfer channels:

- joint R&D projects and other forms of active cooperation,
- patents, licenses and the founding of spinoff companies.

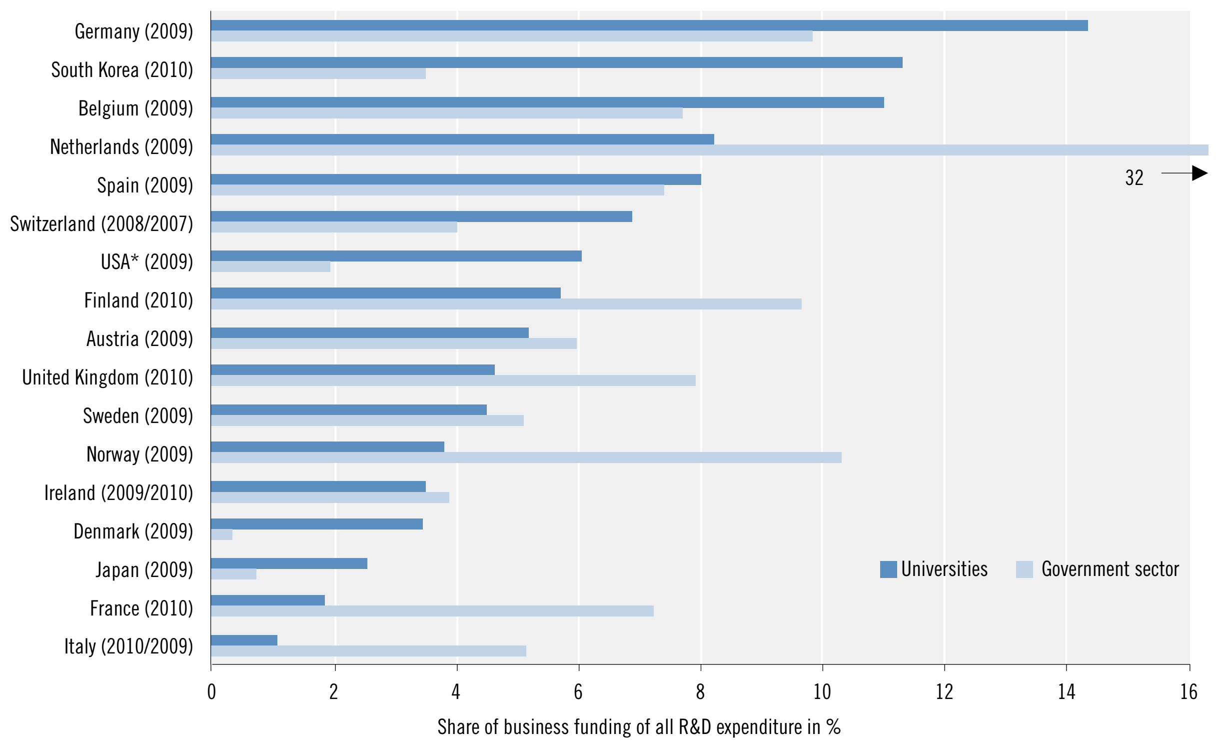
Both forms of transfer activities must be relatively observable and statistically quantifiable, and there must also be some comparable international data. The focus on these transfer channels does not mean however that they are more important than other forms of interaction, such as staff mobility, education, further and continuing education, publications and lectures, and informal contacts.

Community and contract research, cooperations

The extent of cooperation between science and industry on R&D projects provides insight into the share of R&D expenditure at scientific institutions that is financed by the business enterprise sector. With a share of over 5% of corporate third-party funding in overall R&D expenditures at universities in 2009, Austria is in the middle of the field in the group of technologically highly-developed industrial countries (Fig. 53). Germany has the highest value at 14%, and South Korea, Belgium, Netherlands and Spain had high proportions of corporate financing as well. Japan, France and Italy reported very low proportions of under 3%. In the government sector (government research institutions), Austria had a proportion of 6% corporate third-party funding in total R&D expenditures, which was also in the middle of the field of reference countries. Netherlands, Norway, Finland and Germany had the highest values, while Japan, Denmark and the USA reported very low values. International comparability, however, is limited due to different boundaries in the sector of government research institutions. In Austria, for example, the Austrian Academy of Sciences (part of the university sector), and the contract research institutions of AIT and Joanneum Research as well as the centres of excellence (they are counted in the business enterprise sector) do not belong to the government research sector, while in other countries similar institutions qualify as government research institutions.

Development over time is more informative than the level of corporate-financed R&D activities (Fig. 54). This parameter shows a significant upward trend for both universities and government research institutions in Austria. The share of corporate-financed R&D expenditures in the university sector was below 2% up until 1998,

Fig. 53: Share of R&D expenditures financed by industry in scientific institutions in selected OECD countries



* including research institutions from the "private non-profit" sector.

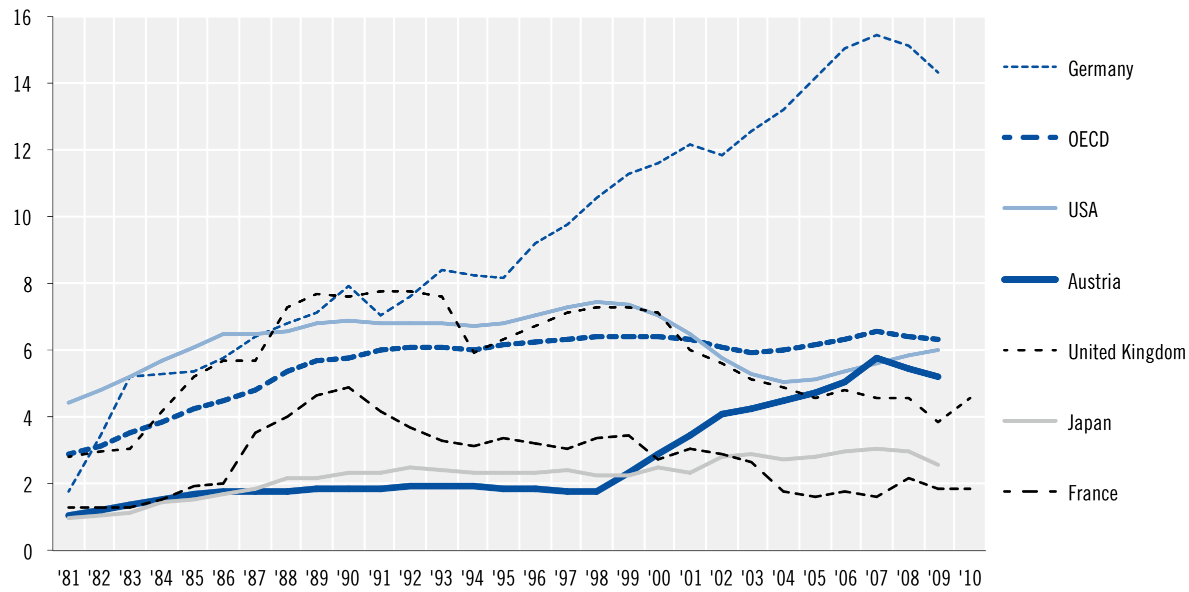
Source: OECD, MSTI 2/2011. – Calculations by ZEW.

and this share has climbed continuously ever since. The increased importance of R&D revenues from businesses in government research institutions began in 1990, and since then the proportion has climbed year on year with a major jump in 2007, although in 2009 there was a decline to the level of 2006.

In international comparison among the large national economies, only Germany had a similarly clear upward trend. In the OECD overall, the corporate share of R&D expenditure financing climbed moderately in both universities and in government research institutions until about 2000; since then, there has not been an increase in this knowledge and technology transfer indicator. Among the small to medium-sized technologically advanced industrial countries, Netherlands and Finland had development trends similar to Austria's, even if the increased importance of corporate third-party funding is in no way uniform.

Within Austrian universities, about 85% of R&D revenues that come from cooperation agreements and contracts from firms fall to six universities: The highest R&D income from businesses in 2010 accrued to the Medical University of Graz (18.9% of all R&D revenues from the business enterprise sector recorded in the Federal Ministry of Science and Research's Intellectual Capital Statements statistics, in the amount of € 107.8 million), followed by the Graz University of Technology and the Vienna University of Technology (each 14.6%), the University of Leoben (12.4%), the Medical University of Innsbruck (12.2%) and the Medical University of Vienna (11.8%) (Table 31). In terms of total R&D revenues, the University of Leoben had the highest corporate orientation of third-party-funded research (71%), and the Medical University of Graz reported over 50% corporate third-party funding. Measured in the number of scientific employees, both of these universities had the highest intensity of corporate third-party funding (€ 34,000 and € 30,000 in R&D revenues from the business enterprise sector per scientist).

Fig. 54: Development of the industry share of R&D expenditures of universities in selected OECD countries, 1981–2010



Source: OECD, MSTI 2/2011. – Calculations by ZEW.

R&D revenues from the business enterprise

Table 31: R&D income from firms and corporate cooperation partners at Austrian universities 2010

	Business enterprise R&D income[1)]			Number of cooperation partner firms[2)]		
	Share of all universities' R&D income from firms in %	Share of total R&D revenues in %	Per academic / artistic employee[3)] (in € 1,000)	Share of all corpo rate cooperations of universities in %	Share of all coopera tions in %	Per 1,000 aca demic / artistic employees[3)]
Medical University of Graz	18.9	55	30	4.3	12	65
Graz University of Technology	14.6	26	14	11.3	29	99
Vienna University of Technology	14.6	25	9	39.0	24	219
University of Leoben	12.4	71	34	0.3	5	8
Medical University of Innsbruck	12.2	40	17	0.5	2	7
Medical University of Vienna	11.8	17	6	1.1	3	5
University of Natural Resources and Life Sciences, Vienna	3.2	11	4	16.9	40	207
University of Innsbruck	3.0	9	3	0.2	1	2
University of Vienna	2.9	5	1	1.7	2	6
University of Klagenfurt	2.1	25	7	0.7	5	21
University of Salzburg	1.4	6	2	1.3	4	16
University of Graz	1.1	5	1	1.3	3	13
University of Veterinary Medicine Vienna	0.8	12	2	1.0	9	24
Vienna University of Economics and Business	0.4	5	1	9.6	17	179
University for Continuing Education Krems	0.3	12	2	5.5	51	392
University for Applied Arts Vienna	0.2	14	1	2.2	12	125
University of Art and Design Linz	0.1	25	2	1.9	37	270
University of Music and Performing Arts Graz	0.1	5	0	0.0	0	0
Mozarteum University Salzburg	0.0	12	0	0.0	0	0
Academy of Fine Arts Vienna	0.0	6	0	0.2	3	17
University of Music and Performing Arts Vienna	0.0	0	0	0.3	2	7
University of Linz*	N/A	N/A	N/A	0.8	2	9
Total**	100.0	21	6	100.0	14	59

1) Revenues from R&D projects and from projects in the development and inclusion of the arts (Intellectual Capital Statements figure 1.C.2)
2) Number of firms integrated in active cooperation contracts (Intellectual Capital Statements figure 1.C.1)
3) Professors and academic/artistic employees at full-time equivalent employment (Intellectual Capital Statements figure 2.B.1)
* incomplete data for number of cooperations with firms, no information (NA) on corporate R&D revenues.
** The summing up of "firms integrated in active cooperation contracts" may include multiple counts of individual firms.

Source: Federal Ministry of Science and Research, uni:data. – Calculations by ZEW.

sector were concentrated in three branches of science: 45% of R&D revenues in 2010 fell to the medical sciences, 35% to the technical sciences and 16% to the natural sciences. Economic and the social sciences accounted for 3% of business enterprise R&D income, and 1% fell to the agricultural sciences, including veterinary medicine.

If we look at the number of firms connected with universities by active cooperative agreements as a yardstick for the scope of knowledge and technology transfer activities, then a significantly different picture emerges. In 2010, Austrian universities reported 1,017 cooperation partners in the business enterprise sector in the Intellectual Capital Statements statistics. Of this number, 39.0% were at the Vienna University of Technology, 16.9% at the University of Natural Resources and Life Sciences, Vienna, 11.3% at the Graz University of Technology and 9.6% at the Vienna University of Economics and Business. The three medical universities, which together accounted for 43% of corporate R&D revenues, reported 4.9% of corporate cooperation partners. These differences mirror on one hand the differing sizes of R&D cooperation projects. At the medical universities, relatively few projects, in the form of clinical studies and drug development, brought in very high revenues. On the other hand, part of R&D revenues came from R&D contracts, not from cooperation projects.

Several cooperation projects with firms were not related to joint R&D projects; instead, cooperation assumed the form of scientific or technological consulting, or further and continuing education activities. Furthermore, a few universities, such as the Vienna University of Technology, did not account for cooperations in the third-party funding area by the number of cooperation partners.

Cooperation between universities and the business enterprise sector included firms from within Austria and from abroad. The Graz University of Technology and the Medical University of Vienna were able to post a solid 19% of the total R&D revenues that universities received in 2010 from firms abroad (€ 23.2 million, or 22% of total corporate R&D revenues). The two other medical universities and the Vienna University of Technology were together responsible for almost 37% of business enterprise R&D revenues from abroad. This international orientation differs substantially among the individual universities (Table 32). At the University of Graz and the University for Continuing Education Krems, this proportion stood at two-thirds, at the University of Veterinary Medicine Vienna at almost one-half, and at the Medical University of Vienna and the University of Natural Resources and Life Sciences, Vienna at one-third. Among the universities with high business enterprise R&D revenues, the Medical University of Innsbruck, the Vienna University of Technology, the Medical University of Graz and the University of Leoben reported comparatively low shares of corporate R&D revenues from abroad.

If we look at the number of firms from abroad with whom cooperative agreements exist, almost 41% of a total of 240 international cooperation partners were at the Vienna University of Technology, a solid 19% at the University of Natural Resources and Life Sciences, Vienna, almost 13% at the Graz University of Technology and 8% at the Vienna University of Economics and Business. Overall, 24% of corporate cooperation partners in 2010 were from abroad.

Inventions, patents, licensing and the founding of spinoff companies

An important element in the active transfer of technology from scientific institutions is the commercialisation of new research results via patents or start-up companies. With the aid of patents, scientific institutions can legally protect and professionally commercialise technological inventions created in the context of R&D projects, whether by selling the patents to third parties or awarding licenses for the commercial utilisation of the invention, or by bringing in patents in R&D cooperations with third parties or in newly founded firms, such as start-up companies founded by scientists from the institution.

The Universities Act 2002 (UG 2002) provided universities with the right to take up the inventions of their employees. Inventions that were created within the context of employment or educational enrolment at a university must be reported by the inventors to the university administration. The federal government established the uni:invent programme in 2004 to support as much as possible the professional man-

Table 32: Corporate R&D revenues from abroad and cooperations with firms from abroad at Austrian universities 2010

Figures in %	R&D income from business enterprises abroad		Number of corporate cooperation partners[1] from abroad	
	Share of total	Share of all R&D income from firms	Share of total	Share of all cooperations with firms
Graz University of Technology	19.4	29	12.9	27
Medical University of Vienna	19.3	35	0.4	9
Vienna University of Technology	13.2	19	40.8	25
Medical University of Innsbruck	12.3	22	0.0	0
Medical University of Graz	11.1	13	2.5	14
University of Leoben	6.0	10	0.8	67
University of Natural Resources and Life Sciences, Vienna	5.3	36	19.2	27
University of Vienna	4.0	30	1.7	24
University of Graz	3.2	65	0.0	0
University of Salzburg	1.7	27	2.9	54
University of Veterinary Medicine Vienna	1.7	44	1.3	30
University of Innsbruck	1.6	12	0.0	0
University for Continuing Education Krems	1.0	66	7.9	34
University of Klagenfurt	0.2	2	0.4	14
University for Applied Arts Vienna	0.1	17	4.2	45
Vienna University of Economics and Business	0.0	2	2.5	6
University of Art and Design Linz	0.0	4	0.4	5
University of Music and Performing Arts Graz	0.0	4	0.0	-
University of Music and Performing Arts Vienna	0.0	100	1.3	100
University of Linz*	N/A	N/A	0.8	25
Mozarteum University Salzburg	0.0	0	0.0	-
Academy of Fine Arts Vienna	0.0	0	0.0	0
Total	100.0	22	100.0	24

1) Multiple counts of firms possible if they are involved in multiple cooperation projects with partners at the same university.
*incomplete data for number of cooperations with firms, no information (NA) on corporate R&D revenues.

Source: Federal Ministry of Science and Research, uni:data. – Calculations by ZEW.

agement of inventions at Austrian universities and the patenting and commercialisation potential of inventions at universities; this programme ended in 2009. During the programme's implementation, the number of registered inventions from universities climbed to about 300 between 2006 and 2009 (Table 33). A comparison of invention activity at Austrian universities is not possible before the UG 2002 because up to that time there was no reporting obligation and the inventors alone were responsible for utilising their inventions.

Of the inventions reported from 2006 to 2009, somewhat less than 100 per year (with the exception of 2007) were created in third-party-funded projects. For inventions created by a project with third-party funding, the assessment of the patent application and further commercialisation was done together with the ordering client or cooperation partner; somewhat more than half of the rest of the inventions were recommended for a patent application. This corresponds to about 100 patent applications per year. According to figures from aws (2010), these patents have generated annual revenues of more than € 700,000 in licensing income since 2008.

Most registered inventions in the 2004–2009 period came from the Vienna University of Technology and the Graz University of Technology (about 300 each). The Medical University of Vienna, the University of Linz, the University of Innsbruck and the University of Natural Resources and Life Sciences, Vienna each had 100 or more registered inventions (Table 34). The Graz University of Technology had the highest "invention intensity" measured in terms of the number of scientists working at individual universities. The Vienna University of Technology, the University of Linz, the University of Leoben, the Medical University of Graz, the University of Natural Resources and Life Sciences, Vienna, the Medical University of Vienna, and the Medical

Table 33: Inventions registered by Austrian universities in the uni:invent programme 2004–2009

	2004	2005	2006	2007	2008	2009
Number of registered inventions	110	199	341	253	288	361
of which: registered inventions from third-party-funded projects	10	22	98	53	93	94
Number of registered inventions recommended for pickup by aws	61	97	130	87	95	154

Source: Schibany und Streicher (2011).

Table 34: Inventions registered by the programme uni:invent 2004–2009 by university

Figures in %	Number Registered inventions	Registered inventions per 1,000 scientists
Vienna University of Technology	293	162
Graz University of Technology	286	247
Medical University of Vienna	231	112
University of Linz	120	133
University of Innsbruck	110	86
University of Natural Resources and Life Sciences, Vienna	100	120
Medical University of Graz	83	123
Medical University of Innsbruck	76	100
University of Vienna	66	24
University of Leoben	49	124
University of Graz	49	47
University of Salzburg	42	52
University of Veterinary Medicine Vienna	29	69
University of Klagenfurt	10	30
University of Music and Performing Arts Graz	6	24
University of Art and Design Linz	2	28
Total	1,552	91

Source: Federal Ministry of Science and Research, uni:data. – Calculations by ZEW.

Table 35. Start-ups from AplusB centres, 2002-2010

	2002	2003	2004	2005	2006	2007	2008	2009	2010
Number of entries in AplusB centres	7	23	40	49	46	62	58	52	55
Average inventory of founding projects in AplusB centres	9	15	34	37	31	46	53	52	50
Number of start-ups from AplusB centres	7	29	53	66	70	83	105	98	101
Inventory of active commercial firms older than one and younger than five years that were founded in AplusB centres	0	5	22	63	89	107	159	178	un-published

2009 and 2010 preliminary.

Source: Austrian Research Promotion Agency (FFG): AplusB Monitoring. – Calculations by ZEW.

University of Innsbruck had high values of 100 or more inventions per 1,000 scientists in the 2004–2009 period.

Another important way in which university knowledge becomes commercially viable is by founding firms. The foundation of business enterprises by the science sector plays a significant role in founding activities in Austria. In a representative survey of start-up firms in Austria, Egeln et al. (2006) showed that the founding of spin-off companies by scientists or graduates accounted for about 12% of new companies in research- and knowledge-intensive sectors in the mid-2000s. About half of these spinoff companies directly implemented new research results that were developed at universities or government research institutions ("competence spin-offs"). This corresponded to an absolute number of about 250 start-ups per year. Somewhat more than half of the spin-offs based their business model on the specific competences of their founders, who gained this knowledge at scientific institutions ("competence spin-offs"). In comparison to Germany, for which there are survey figures collected by the same method (see Egeln et al. 2010), the share of competence spin-offs was significantly higher in the mid-2000s in Austria.

The number of spin-off companies founded in Austria climbed significantly in comparison to the second half of the 1990s. Among other factors, this reflects the activities of the AplusB programme, which was established in 2001 with the aim of improving the circumstances for academic foundation of business enterprises. The programme supports eight AplusB centres that function as incubators, advise founders and implement awareness campaigns to stimulate an entrepreneurial culture at academic institutions (see Egeln et al. 2007; Tangemann and Vössner 2010). About 400 founding projects entered the AplusB centres from 2002 to 2010, resulting in the foundation of 327 business enterprises by the end of 2010 (Table 35). Almost half of the founding projects were allocated to the electronics / IT / software industry, and around one-sixth came from the life sciences sector or environmental, energy and transportation technologies, with 10% from the materials sector. A major portion of the firms founded in the AplusB centres (by the end of 2009: about 80%) were still commercially active more than 4 years after their founding.[74]

4.4 Summary

Cooperation between science and industry has intensified significantly in Austria over the last decade. R&D revenues that universities received

74 The effect of the AplusB programme is strengthened by complementary programmes such as PreSeed (funding for pre-project phase) and seed financing (funding for founding and expansion of business enterprises in the high-technology sector).

from ordering clients and cooperation partners in the business enterprise sector have increased substantially, and today they account for over 5% of all R&D expenditures at universities.

The number of spin-off start-ups from universities has also increased, as well as revenues from license earnings from patents held by universities. The proportion of firms that refer to scientific research results or cooperate with universities in the course of their innovation activities is high in international comparison. Overall, knowledge and technology transfer in Austria has reached a high level that is similar to that of other technologically highly-developed industrial countries. In the science sector, medical and technological universities (including the University of Leoben) have particularly high transfer activity. In the business enterprise sector, the utilisation of scientific expertise is found in all industries, even if research-intensive manufacturing incorporates science into their innovation activities most powerfully.

The intensification of the relationship between science and industry is the result of several developments. First, the expansion of R&D activities in the business enterprise sector has significantly increased the demand for cooperation with scientific institutions; the climbing number of firms conducting R&D is particularly important here. With more than 3,000 firms performing internal R&D activities and another 1,500 firms demonstrating experience in the utilisation of external knowledge for innovation processes, there is major potential in the business enterprise sector for further strengthening of cooperation with the science sector. Here again, the prerequisites for transfer activities have been improved continually by the establishment of knowledge and technology transfer agencies for IP management and the creation of institutions that support start-up companies. In addition, the federal government's array of funding programmes supports cooperations between firms and scientific institutions in various ways.

The challenges in the coming years will include further increases in investment in the education of highly qualified young people and the strengthening of basic research, all while maintaining the intense relationship between science and industry. Along with science's direct contribution to innovations in the form of new research results, "knowledge transfer through individuals" has an importance that can scarcely be overemphasised for the innovation system. From a business perspective, the lack of suitably qualified staff is a much more significant barrier to innovation than access to technological knowledge or finding suitable cooperation partners. The corporate demand for academics will continue to increase, and an insufficient supply of qualified staff could become a major bottleneck for the path towards an additional increase in the total economic R&D rate. The allocation of sufficient funding to universities is indispensable for the simultaneous expansion of academic education, strengthening basic research and maintaining a high level of cooperations with firms.

The federal government's objective is to make Austria a worldwide leader in technology and innovation. To do this, the internal R&D capacities of the business enterprise sector must be expanded, and the science sector must take on a stronger role as a driver of technology. This will also transform the face of knowledge and technology transfer. While in the past the participation of scientific institutions in innovation projects was often limited to the performance of specific R&D projects, the future will see increasing volumes of long-term technology partnerships. The science sector must bring new research results and technological developments to these partnerships. This requires more basic research at the universities, a close connection to internationally leading research in the individual fields of science and technology, and new models of cooperation between science and industry.

5 Tertiary education system

All advanced national economies have displayed a trend towards knowledge intensification in nearly all value-creating activities. This is leading to increasing demand for highly qualified specialists. The pool of well-educated knowledge carriers is increasingly becoming a key factor for competitiveness and innovation ability – both at the corporate level and at the level of the overall economy.

This trend presents enormous challenges for the entire education system, which must generate human capital and relevant specialised competences. These challenges range from early funding to advanced academic or scientific qualifications. Well-educated and highly-qualified staff are a fundamental prerequisite for research and development, for innovations and their implementation, and for the transfer of scientific knowledge to industry. Academic qualifications in particular are in ever stronger global demand, and qualifications in the natural sciences and engineering disciplines are required for technical innovation processes. Given that demand for qualifications in the natural sciences and engineering will continue to increase in future, an insufficient supply of next-generation academics could become a bottleneck.

As international comparisons and the relevant indicators of the Innovation Union Scoreboard (IUS) show, investments in knowledge and education do not have short-term effects; such investments require long lead times. Past decisions are still having effects today and changes, reforms and additional investments in the education system today will only be felt later on the job markets and international competitive positioning. It is therefore important to recognise the determinants of a developing demand for specific qualifications early on and to create appropriate framework conditions. This is why the core tasks of research and technology policy include measures for the improved utilisation of available human potential, for the funding of research careers, for increasing the attractiveness of research locations for researchers from abroad, and the creation of suitable employment and framework conditions.

The Austrian Research and Technology Report 2010 discussed basic data and trends in the breadth and excellence of Austria's human capital basis (educational degrees, tertiary degrees, transfer rates).[75] The Austrian Research and Technology Report 2011 presented aspects of promoting excellence that were relevant to human resources, as well as results from studies of international mobility.[76] Chapter 1.5 of this report provides an overview of trends in human resources for research and development by sectors of performance, occupations and gender.

In light of these analyses, the following chapter focuses on the importance of Austria's universities as a central employer of researchers. Universities assume a special function in the context of the aforementioned challenges:

- As research institutions, universities generate knowledge in the broadest sense.
- The university system has a special responsi-

75 Chapter 5.2 of the Austrian Research and Technology Report 2010
76 Chapter 6.3 and 6.4 of the Austrian Research and Technology Report 2011

bility when it comes to educating highly qualified specialists.

The first part of this chapter consults R&D surveys from 2002 to 2009 to offer an overview of the development of specific staff categories and their proportion of overall research staff at universities. The second part then provides an overview of the relevant funding portfolio in human resources.

5.1 R&D staff at Austrian universities

Statistics from the OECD and Eurostat on the higher education sector always serve as the basis for international comparisons. This sector includes both universities and other research institutions and is therefore very heterogeneous in each country, regardless of which institutions are allocated to this sector and which are not. An international comparative analysis that focuses exclusively on universities is therefore only possible to a limited extent.

As Table 36 shows, with € 1.5 billion of the total of € 1.9 billion in R&D expenditures in the higher education sector in Austria the universities account for the highest share; if the university hospitals are included, this share increases to € 1.7 billion. This means that universities account for 89% of R&D expenditures in the higher education sector. The Austrian Academy of Sciences follows with almost € 105 million, which is a share of 5%.

Staff resources at universities

According to the Frascati Manual, there are different categories used for surveys of R&D employees (Fig. 55):

- "Researchers": this includes academics and

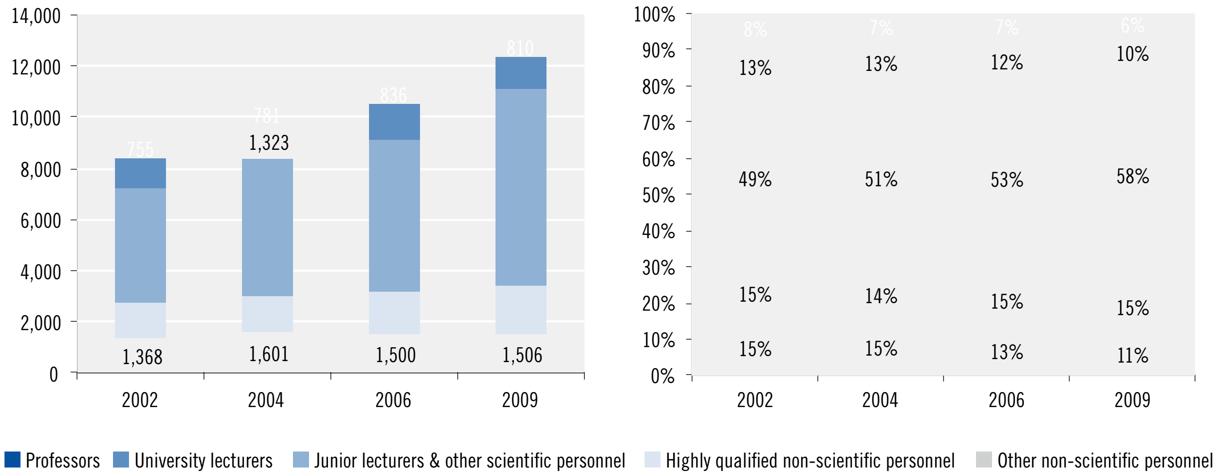
Table 36: Financing of R&D expenditure in the higher education sector 2009

Expenditures in the higher education sector	Total	Funding areas				
		Business enterprise sector	Public sector	Private non-profit sector	Abroad incl. intern. org. (without EU)	EU
	in € 1,000					
Universities (without hospitals)	1,519,766	80,037	1,369,349	5,177	19,727	45,476
University hospitals	208,010	11,055	185,780	1,177	6,558	3,440
Art universities	26,256	402	25,306	224	186	138
Austrian Academy of Sciences	104,984	367	99,044	1,068	1,000	3,505
Universities of Applied Sciences	59,431	6,078	46,333	3,350	1,294	2,376
Private universities[1]	23,607	3,499	10,907	6,680	1,680	841
University Colleges of Teacher Education	4,096	–	3,872	40	–	184
Other higher education sector[2]	5,695	50	5,626	19	–	–
Total	1,951,845	101,488	1,746,217	17,735	30,445	55,960

1 Including the University for Continuing Education Krems
2 Testing agencies at technical federal colleges and other facilities categorised within the higher education sector (summarised for reasons of confidentiality)

Source: Statistics Austria (R&D survey 2009)

Fig. 55: R&D employees at universities (incl. hospitals) by occupation (in FTE)



Source: Statistics Austria (R&D survey); Calculations by Joanneum Research

equivalent staff (professors, university lecturers and assistants, and other research staff);

- "Technicians and equivalent staff": this includes secondary school graduates and equivalent staff (e.g., engineers, skilled laboratory assistants);
- "Other supporting staff": this includes office staff, clerical staff, skilled and unskilled craftsmen and other auxiliary personnel.

According to R&D surveys by Statistics Austria, Austrian universities experienced a specific growth in individual occupational categories from 2002 to 2009; however, the universities of the arts are not included in the following analyses.

There was a significant increase in the overall number of R&D employees at universities, from 9,147 in 2002 to 13,134 FTE (full-time equivalents) in 2009. This is an increase of +44%. Research staff grew at an above-average rate of +51%, yet there was uneven development among the individual occupational categories within this larger category. While the "assistants and other supporting staff" category posted the largest increase with +70%, the "professor" and "university lecturer" categories grew by +7% and +6% respectively. The share of research staff in total staff was about 74% in 2009, while the share of professors and lecturers fell from 21% (2002) to 16% (2009). "Technicians and equivalent staff" grew from 1,382 to 1,938 FTEs, which corresponds to an increase of +40%; other supporting staff grew by 10% from 1,368 to 1,506 FTEs.

Fig. 56 presents the development of employees (scientific and non-scientific staff) for the period of 2002 to 2009 by scientific disciplines.

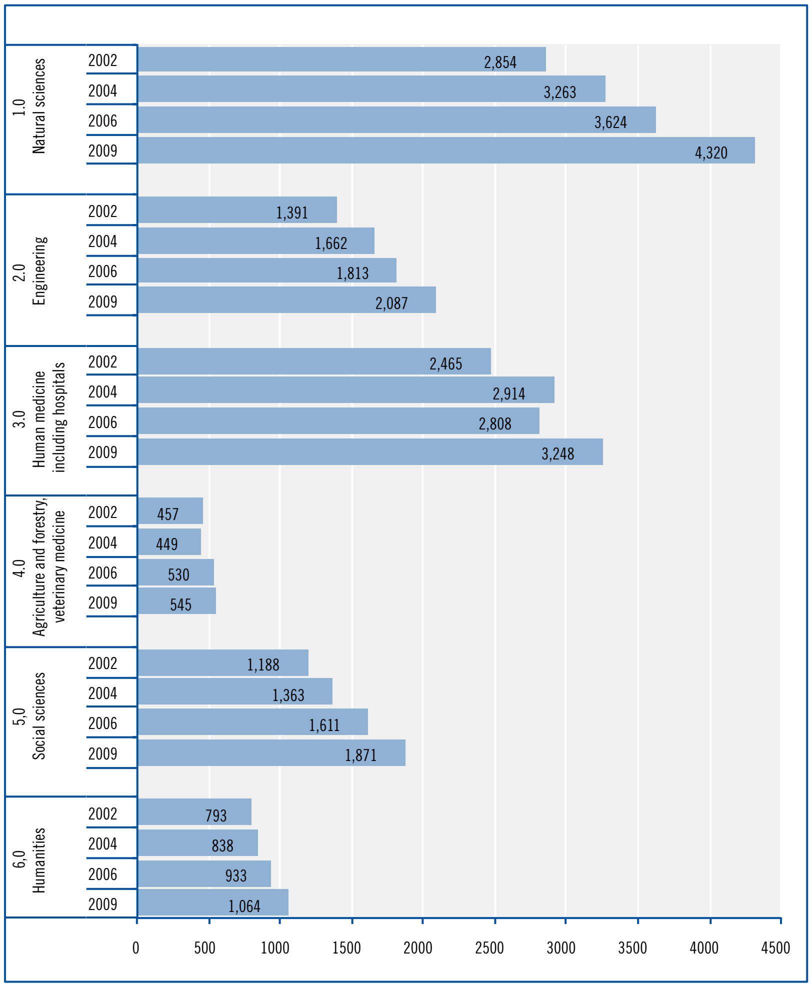
This indicates that the rates of increase in the social sciences, natural sciences and engineering were the highest at 50%. The number of employees in human medicine grew by about one-third. The slowest rates of growth were in agriculture, forestry and veterinary medicine.

Fig. 57 presents an analysis of developments on the basis of occupational categories.

As was already seen above in overall staff development, the relative share of assistants (including "other supporting staff") increased, which is reflected in the relatively lower proportion of professors. In the natural sciences and engineering, assistants and "other supporting staff" already account for two-thirds of employees in the R&D sector. The share of "other supporting

Fig. 56: R&D employees (scientific and non-scientific personnel) by academic disciplines (FTE)

	Survey year	Total personnel FTEs	2002=100
1.0 Natural sciences	2002	2853.6	100
	2004	3263.2	114
	2006	3624.2	127
	2009	4320.1	151
2.0 Engineering	2002	1390.5	100
	2004	1661.8	120
	2006	1812.9	130
	2009	2086.5	150
3.0 Human medicine including hospitals	2002	2465.1	100
	2004	2913.9	118
	2006	2808.4	114
	2009	3248.1	132
4.0 Agriculture and forestry, veterinary medicine	2002	457.3	100
	2004	448.8	98
	2006	530.4	116
	2009	545	119
5.0 Social sciences	2002	1187.7	100
	2004	1363.3	115
	2006	1610.7	136
	2009	1870.7	158
6.0 Humanities	2002	792.5	100
	2004	837.8	106
	2006	932.7	118
	2009	1063.6	134



Source: Statistics Austria (R&D survey); Calculations by Joanneum Research

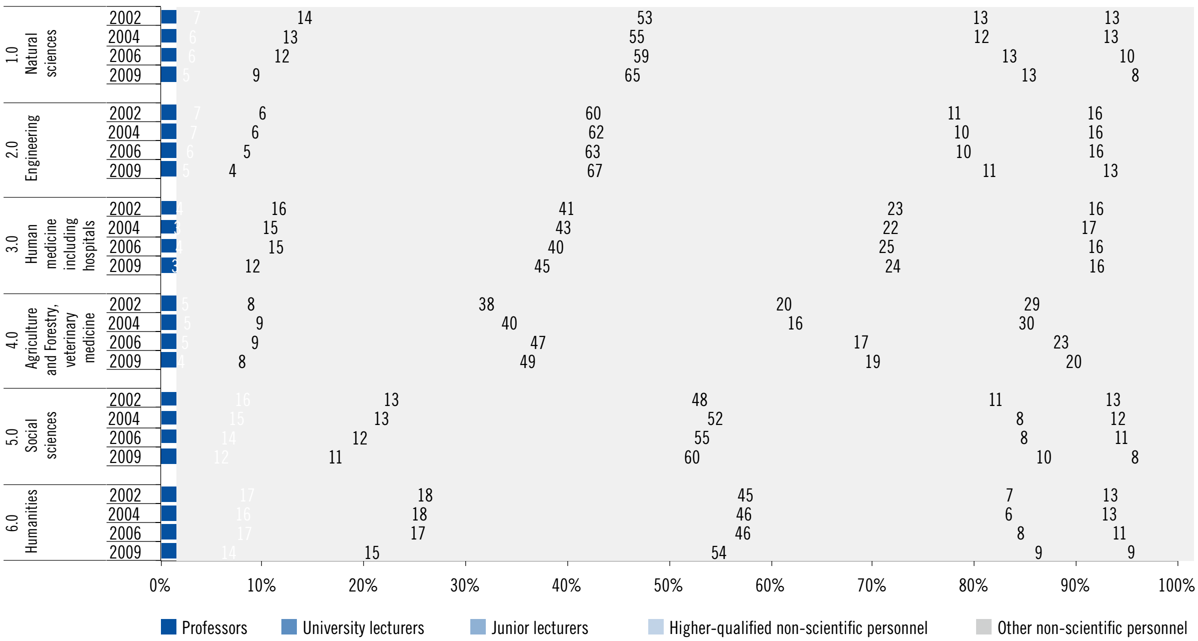
staff" also fell, and the category of "technicians and equivalent staff" retained its share. The humanities had the highest share of professors – a significant shift in proportion first became noticeable in 2009.

In general, research staff grew faster than overall employment levels, which is mirrored in the relative decrease in "supporting staff". By scientific discipline, the highest rates of growth were in the social sciences, the natural sciences and engineering. In contrast, human medicine posted the lowest increase in research staff (see Fig. 58).

Distribution of working hours

To attain a clear separation of R&D-related activities from other activities such as teaching and education, different categories of activity are also applied to R&D staff. The explicit polling of the "other activities" category, which essentially covers managerial and administrative work, ac-

Fig. 57: R&D employees by occupation and academic disciplines



Source: Statistics Austria (R&D survey); Calculations by Joanneum Research

counts for the fact that this kind of activity also serves to uphold general operations and therefore contributes to R&D, and must be included in overall R&D expenditures. Fig. 59 shows the distribution of the individual activity categories between 2002 and 2009.

This development shows that administrative activities (other activities) have declined in all occupational categories. There was also a similar development in "teaching and education". The consequence of this trend is that the share of research activity (R&D) has climbed within all occupational categories – and quite significantly in some cases. R&D activity among all research personnel, for example, rose from 50% to 59%. Professors were also able to report a slight increase in R&D activity, from 45% to 49%.

Based on the scientific disciplines, an increase in R&D activity occurred in all disciplines. The natural sciences and engineering reported the highest shares of R&D activities. The highest share of teaching and education takes place in the humanities. A remarkably high share of "other activity", however, was observed in the field of human medicine, taking up 40% of total activity in 2009.

Age distribution

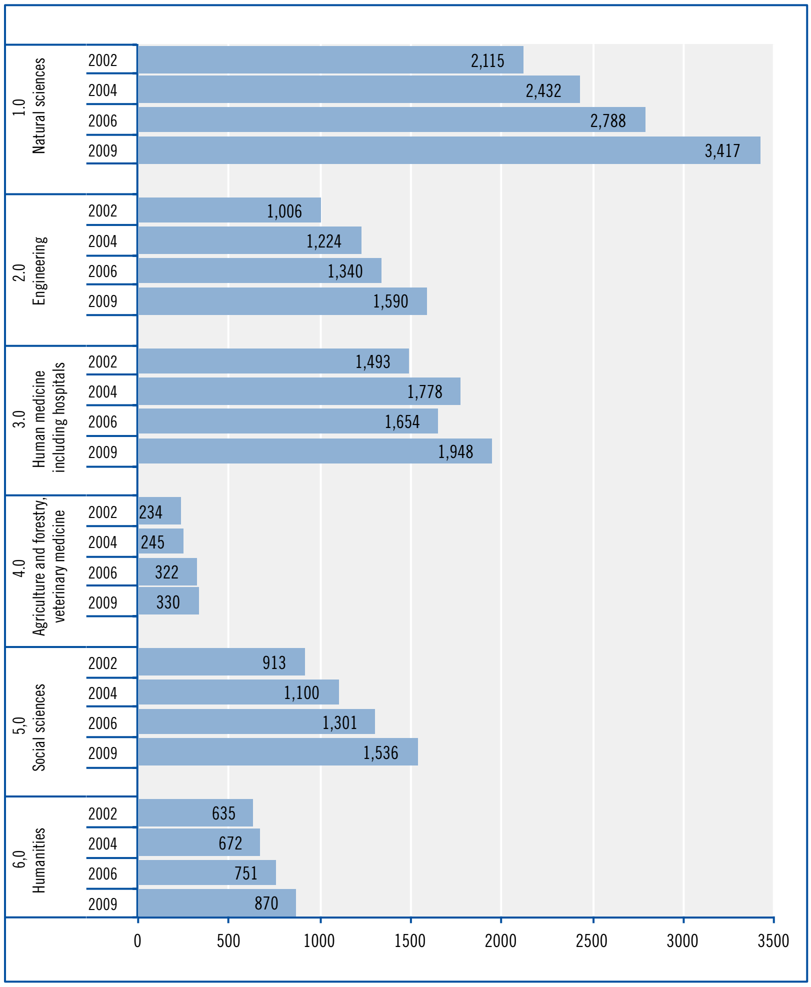
An analysis by age groups shows that the increase in overall staff was constituted primarily by the absolute and relative addition of people under 34 years of age. Overall, this age group comprised 45% of R&D staff in 2002 (measured in FTE). This proportion rose to 53% in 2009. The other age groups posted a relative yet proportional decline, although there were no absolute decreases in any age groups.

There were significant differences in age distribution by scientific disciplines. In the natural sciences and engineering, people under 35 years of age make up 60% and more of total FTE. This is a clear indication of the increasing importance of "third-party-funded positions" funded outside of global budgets.

There was a significant difference, however, in

Fig. 58: Development of scientific staff by academic disciplines (FTE)

	Survey year	Scientific personnel - FTEs	2002=100
1.0 Natural sciences	2002	2115.4	100
	2004	2432.4	115
	2006	2787.6	132
	2009	3417.4	162
2.0 Engineering	2002	1006.2	100
	2004	1224	122
	2006	1339.8	133
	2009	1590.3	158
3.0 Human medicine including hospitals	2002	1493.1	100
	2004	1778.2	119
	2006	1654.2	111
	2009	1948	130
4.0 Agriculture and forestry, veterinary medicine	2002	234.4	100
	2004	244.5	104
	2006	321.6	137
	2009	329.6	141
5.0 Social sciences	2002	913.2	100
	2004	1100.2	120
	2006	1301.4	143
	2009	1535.9	168
6.0 Humanities	2002	635.1	100
	2004	671.8	106
	2006	751.2	118
	2009	869.8	137



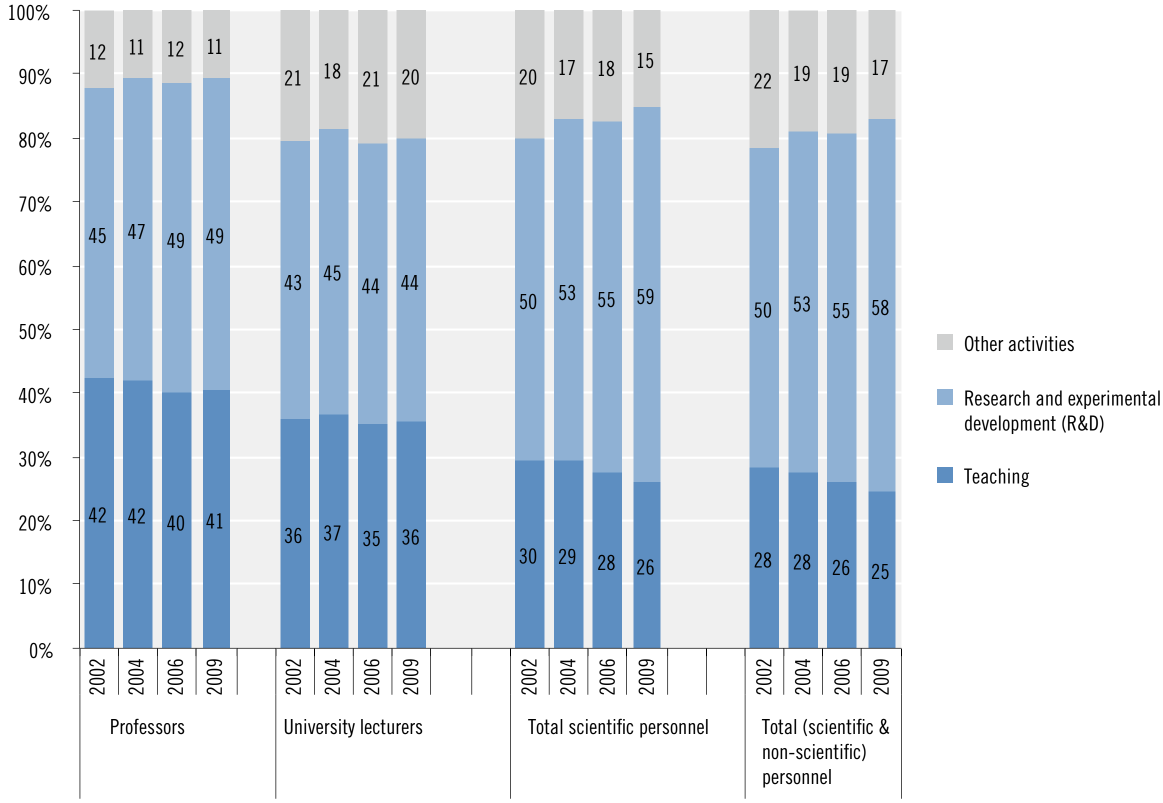
Source: Statistics Austria (R&D survey); Calculations by Joanneum Research

age distribution for the humanities. Up to 2006, the median age distribution was 45–49 years of age, while in all other disciplines the median age distribution was 35-39. There was a striking structural change in 2009: the group of people under 35 years of age increased significantly. The median has been in the 40-44 category since 2009.

In summary, the employment of highly qualified staff at central research and education institutions in a highly developed national economy has continued to climb in recent years. The age group of people under 34 posted significant gains in R&D personnel. This fulfils important prerequisites for the employment of highly qualified staff in other sectors as well.

At the same time, we must note that R&D staff financed by funds outside of the global budget (third-party-funded positions) increased continually over the period from 2002 to 2009. In 2009, the share of such positions was already over 42% and included both public third-party funding positions (such as through the Austrian Science Fund) and those financed by the private sector.

Fig. 59: Distribution of working hours by activity categories



Source: Statistics Austria (R&D survey); Calculations by Joanneum Research

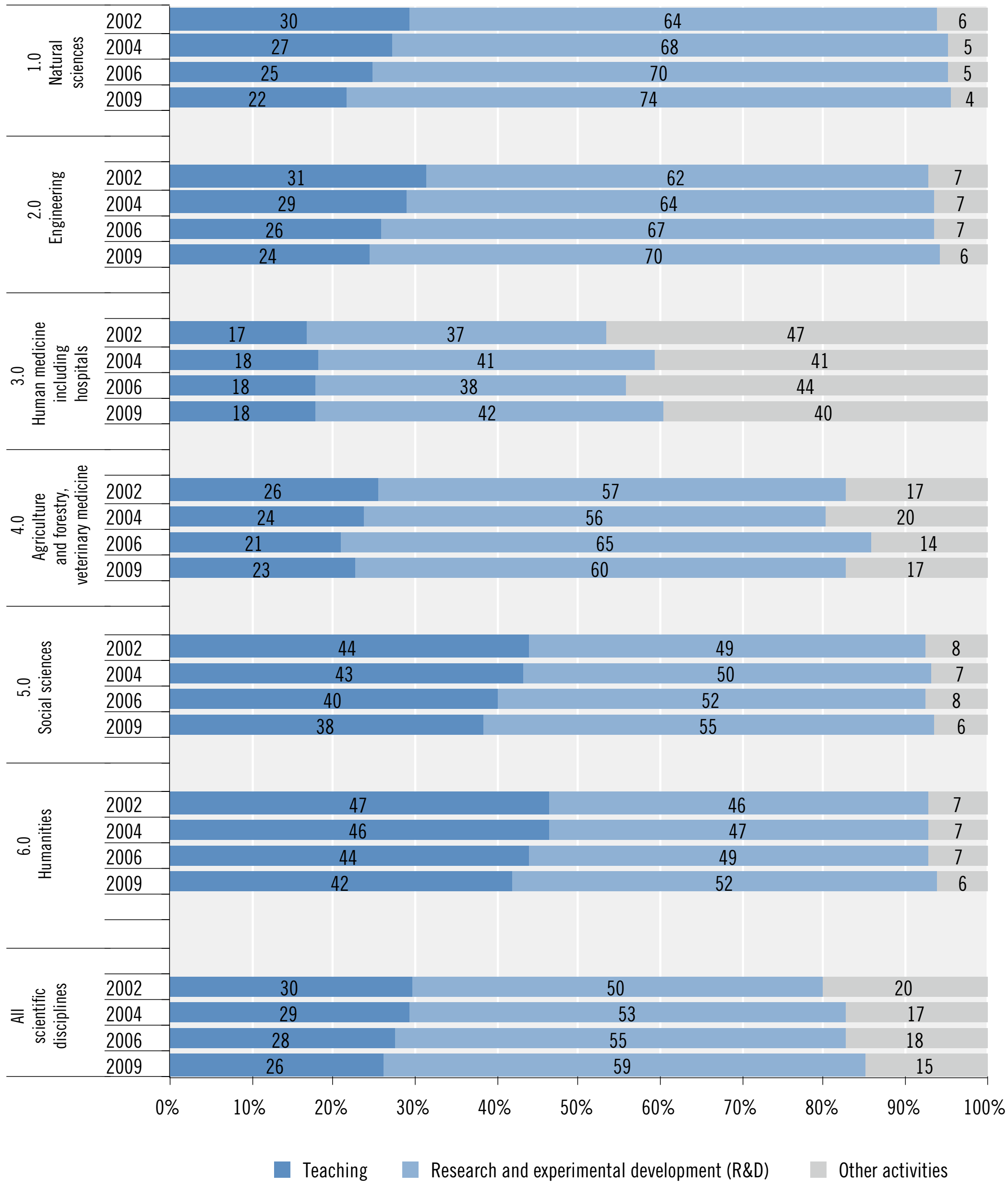
One of the most important responsibilities of RTI policy, however, is to focus on the early support of young people, thereby awakening interest in a career in research and development. Along with the already well-established ad personam support measures in the excellence programmes, Austria has also created support measures that aim in particular to promote the next generation of scientists and support measures to that effect in the secondary school sector. The following chapter introduces some of these measures.

5.2 Central funding focuses in the area of human potential

The Austrian federal government's RTI strategy stresses the importance of optimally utilising human potential. This strategy establishes, based on the result of Austria's "System Evaluation" of research support and funding, that there is an insufficient transition from the education system to the innovation system, and criticises the fact that available human potential is not being fully realised. The primary obstacles for the Austrian innovation system are a lack of interest in technological and natural science disciplines, low female participation rates in research, the failure to integrate immigrants into the education and innovation system, and an on-going, strong brain-drain to other countries. To strengthen human potential in Austria, the federal RTI strategy has established the first interdisciplinary "task force" for "human resources – research focus on people".

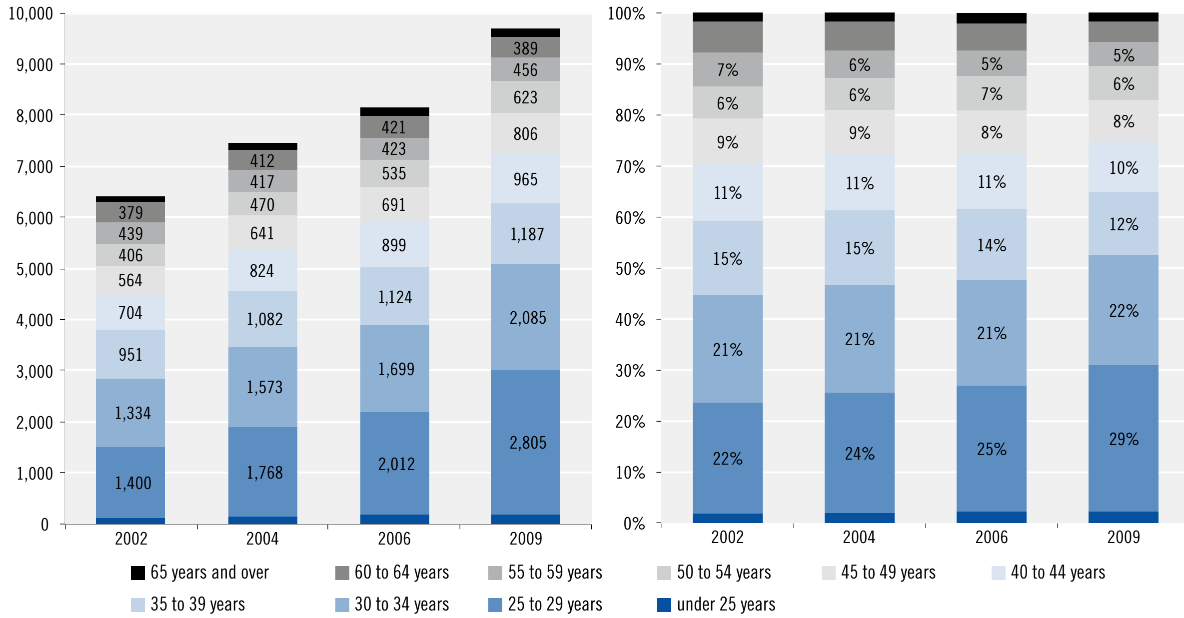
The federal government's funding plans are focusing on promoting excellence, supporting sci-

Fig. 60: Distribution of working hours by academic disciplines



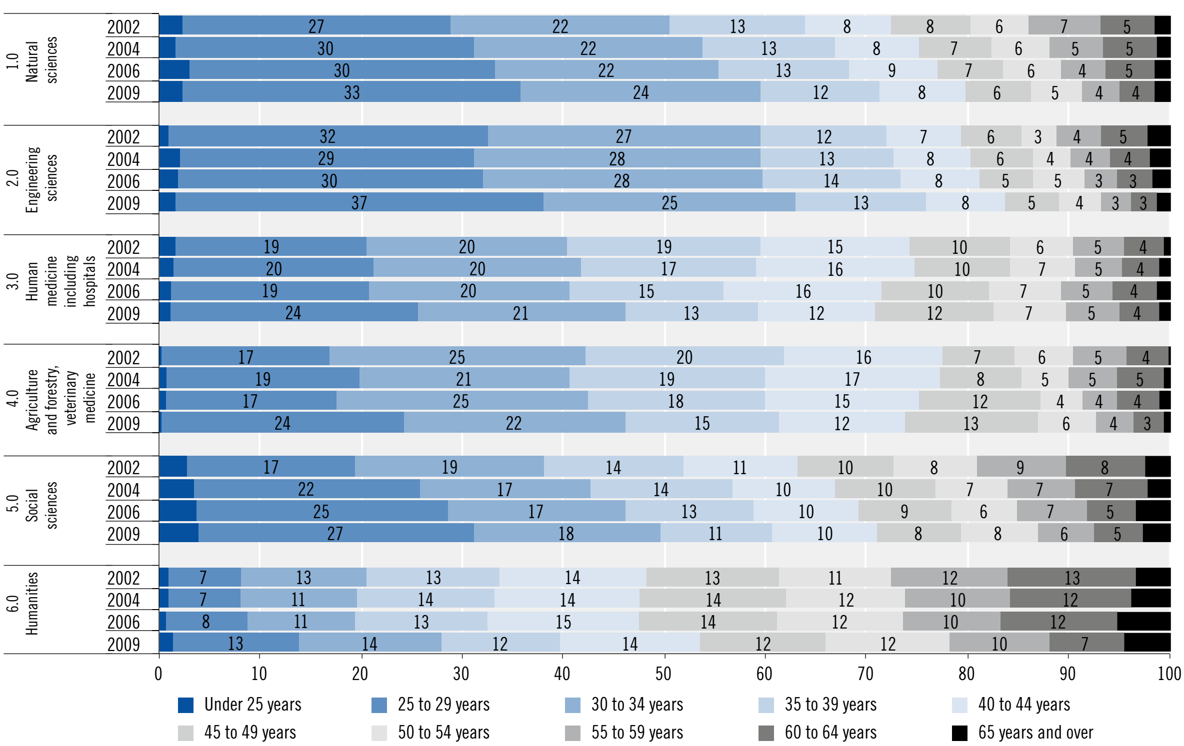
Source: Statistics Austria (R&D survey); Calculations by Joanneum Research

Fig. 61: R&D employees by age groups (FTE)



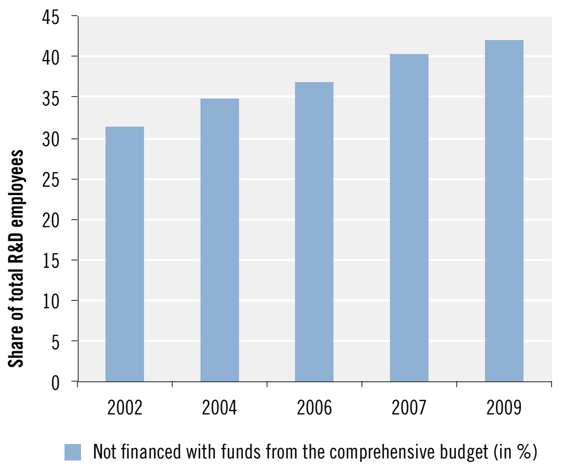
Source: Statistics Austria (R&D survey); Calculations by Joanneum Research

Fig. 62: Staff development by age groups and academic disciplines



Source: Statistics Austria (R&D survey); Calculations by Joanneum Research

Fig. 63: Share of third-party-funded positions among R&D employees (FTE)



Note: including hospitals, without University for Continuing Education Krems

Source: Statistics Austria (R&D survey); Calculations by Joanneum Research

entific talent in post-graduate education, and supporting young people in the secondary school sector. The following discussion assesses these areas in more detail.

Promoting excellence at the individual level

The promotion of scientific excellence is closely associated with the programmes of the Austrian Science Fund (FWF). In addition to single-project funding, which is open to all scientists regardless of discipline in Austria and funds projects oriented towards basic research, there are also the START programme and the Wittgenstein Prize, which are two excellence-oriented funding programmes for individuals.

The START programme focuses on people with an extraordinary international track record. Applicants can apply for funding at least two but no more than 10 years after completing their doctoral studies.[77] Members of the professoriate are excluded. The Wittgenstein Prize is an award directed towards outstanding scientists (maximum age of 55 in the year in which the candidate is nominated) who have made excellent scientific achievements and have been recognised in their international disciplinary scientific community. The researcher should be granted the highest degree of freedom and flexibility in the performance of their research, thereby facilitating extraordinary improvement in their scientific achievements.

Funding for the START programme runs from a minimum of € 800,000 to a maximum of € 1.2 million for six years, and the Wittgenstein Prize endows up to € 1.5 million per award. START and Wittgenstein prize-winners receive considerable sums of money to build up and further develop working groups with an international reputation. The success of both programmes is also evident in the fact that about one quarter of all Austrian ERC prize-winners between 2007 and 2010 were also equally successful in START and Wittgenstein[78], while Austrian Science Fund single project funding often formed a basis for successful START and Wittgenstein careers. A total of 84 START grants and 26 Wittgenstein prizes have been awarded since 1996.

Funding the next generation: doctoral candidates and post-docs

Funding the next generation of scientists is a major strategic objective of universities, and this is articulated in their performance contracts and Intellectual Capital Statements. Austria's universities strive to use aid for young talent to set their research priorities. In doctoral education, third-party-funded research projects, structured doctoral programmes and graduate schools, as

77 Exceedances are possible for child education periods, demonstrable national service or career interruptions due to severe illnesses, and for demonstrable and relevant specialised education periods (e.g., hospital education times, etc.).
78 Austrian Science Fund, Federal Ministry of Science and Research (2011), p. 4

well as stipends and grants for scientific projects all play a central role.[79]

Although the classical model of an individual, unstructured doctoral education still dominates at the majority of universities, universities are increasingly offering doctoral degrees with a fixed-term contract, that focus on working as a group of doctoral students on a specific scientific topic. **Structured doctoral programmes** include a broad yet clearly defined field that often represents one research topic at a university or is integrated in a research network. The topic of the thesis must be selected from the field of the programme.

In contrast, a **graduate school** represents an institution in which several scientists with excellent research records come together to work on a research programme, typically interdisciplinary in nature, and educate doctoral students. The Doctoral Program students are typically employed by the university, and the university views these programmes as education centres and a recruiting basis for highly qualified next-generation scientists. Such programmes enable research work in the form of a thesis and provide secure funding within a research network; this means they are also an instrument of research funding. The universities consider the introduction and continuation of Doctoral Programs as an important measure for setting their priorities and creating excellence in research. Twelve universities have developed plans or objectives regarding Doctoral Programs in their 2010-2012 performance contracts. The Austrian Science Fund supports Doctoral Programs with its funding programme – at the end of 2010, funding was provided to 31 university Doctoral Programs. Of these, 13 were in the "life sciences" area, 10 in the "natural sciences and engineering" field, and 8 in the "social sciences and humanities". In the summer semester of 2011, a total of 66 Doctoral Programs (Austrian Science Fund Doctoral Programs, initiative schools at the University of Vienna, TU Doctoral Program, fForte women's research programmes, etc.) had been established at 16 universities.

In addition to structured doctoral programmes and graduate schools, the universities have also developed special funding instruments to award research funds that are specifically for young researchers. The University Report 2011 named as exemplary the Veterinary Medicine Programme at the University of Vienna (Young Investigator Programme, post-doctoral programme), the Medical University of Graz (start-up funding, post-doc programme) and the Medical University of Innsbruck (MUI Start).

In addition to the grant options foreseen by the Austrian Student Support Act for students pursuing further scientific education, there are also Federal Ministry of Science and Research grants that are directed towards young scientists and artists and thereby contribute to international mobility among doctoral students. The Marietta Blau grants, which were established in 2009, offer outstandingly qualified doctoral students the option of spending 6 to 12 months of their studies abroad.

Funding programmes for young scientists are awarded by the Austrian Academy of Sciences (ÖAW). These include:

- The **Doctoral Fellowship Programme** of the Austrian Academy of Sciences (ÖAW), which supports young, excellent doctoral candidates from all disciplines to carry out their dissertation project within a definable period of time. The programme provides funding of € 30,000 per year over 24 or 36 months. 583 grants have been disbursed since the programme's inception.
- Up to 2011, the **doc-fforte Fellowships** were awarded to young female scientists in the dis-

79 See also in this regard the comments in the University Report 2011, p. 95ff.

ciplines of engineering, the natural sciences, medicine, life sciences and mathematics with the aim of increasing the number of doctoral degrees earned by women in these fields. The programme operated under the same conditions as the Doc Programme and awarded a total of 168 fellowships. The programme will be integrated into the Doc-Team programme as of 2012.
- The **Doc-Team** programme disburses funding for groups of 3-5 doctoral students in the humanities, social sciences and cultural studies area, providing fellowships of € 30,000 per person per year over a maximum of three years. The programme is designed to support scientific work and organisations, as well as to improve the institutional integration of doctoral students. The fellowship includes a mandatory six-month stay abroad. The programme began in 2004, and a total of 34 scientists had completed the programme by 2010.

In addition to the aforementioned grants for doctoral candidates, the ÖAW offers a limited number of fellowships to junior scientists in the natural sciences, medicine and mathematics (L'Oreal grants) as well as an AAS-CEE fellowship financed by the business enterprise sector that covers economics, law and social studies in Central and Eastern Europe.

ÖAW post-doc fellowships provide support via the APART programme (Austrian Programme for Advanced Research and Technology). The programme, which is funded by the Federal Ministry of Science and Research (at about 97%), the city of Vienna and since 2010 by the state of Styria, awards APART grants and is open to applications from all areas of research. The target audience are highly qualified scientists who want to complete their post-doctoral thesis, or a similar project. Funding amounts to € 55,000 per year for a funding period of three years. An additional € 18,000 is available upon application each year to cover material and travel costs. 277 people have received APART grants since the programme began in 1993.

In addition to the aforementioned programmes, which cover the core area of person-related funding, there are a variety of funding providers who offer grants for pre-doc and post-doc research. The Austrian database for grants and research funding (www.grants.at) offers interested parties quick access to available funding programmes and conditions for participation.

The expansion of funding measures and the widespread establishment of Doctoral Programs are providing an important and necessary stimulus in promoting a boom in qualified junior scientists. Nevertheless, according to results from the Social Survey (2009), 36% of doctoral candidates worked at a university, although such positions were not always relevant to their studies: a total of 31% of doctoral students worked in university positions that were relevant to their studies, typically in an assistant position.

Just 23% of doctoral candidates received funding, and family assistance (for the student), grants or stipends from a university were the most common forms of such funding.[80]

Funding the next generation of scientists: the secondary level

In order to dismantle barriers between school and university, enable an informed choice of study and facilitate more rapid transfer of scientific knowledge into the education system, the federal government also supports measures that target the consolidation of cooperative ventures between research and educational institutions – this should bring pupils closer to research and engineering.

The **children's and junior universities**, which are meant to excite school children and pupils

80 See Unger M. et al. (2010)

about research, are funded by the Federal Ministry of Science and Research with about € 500,000 each year. About € 3.5 million have been invested thus far, and more than 64,000 children and youths have profited from the programme since 2008. In 2011, there were 16 children's universities and similar awareness-raising measures taking place throughout Austria, bringing the world of science and research closer to children.

IMST (Innovations Make Top Schools) – is a flexible support system initiated by the Federal Ministry of Education, Arts and Culture (BMUKK) to strengthen, establish and structurally anchor a culture of innovation in mathematics, information science, natural sciences and engineering (MINT) at Austrian schools. IMST provided an important stimulus in recent years in the further structural development of the education system, while also providing inspiration in the area of curriculum and school development. This provides support for curriculum and school projects as well as regional cooperative ventures and networks.

One central point is the creation of interfaces between the education and innovation systems to give children and youths the crucial competences that they need to participate actively in an increasingly technological innovation society. To increase the number of graduates in the MINT subjects (mathematics, information science, natural sciences and engineering), the Federal Ministry for Transport, Innovation and Technology (BMVIT) has been working together with the Federal Ministry of Education, Arts and Culture since 2007 and has already funded 4,000 research internships (**talent internships**) for pupils.

Jugend Innovativ has been in place for 25 years now. It was designed by the Federal Ministry of Economy, Family and Youth (BMWFJ) and the Federal Ministry of Education, Arts and Culture to create excitement about research and development among youths between 15 and 20 years old and to awaken their creativity. Jugend Innovativ is being implemented throughout the country and is constantly being adjusted to social and political changes and challenges. There are special categories now such as climate protection and ICT, along with the usual categories of business, design, engineering and science, where young people work on technological, social or business problems and prepare innovative solution proposals in the form of a written project that is evaluated by a jury of experts and then recognised with an award.

The **Sparkling Science** programme at the Federal Ministry of Science and Research (BMWF) is central to the effort to break down barriers between schools and universities. Sparkling Science funds projects in which pupils are integrated actively into the research process. Pupils support scientists in their scientific work and also provide support in the presentation of joint research results to the public. This collaboration can take place in the form of jointly designed discipline-specific projects, Matura projects and diploma theses (at Federal Higher Education and Research Institutes) or as interdisciplinary school projects. The programme is planned through 2017 and funded by an annual budget of € 3 million. Thus far the programme has funded 168 projects and numerous scientific institutions (total of 118), partners from business and society (72 institutions), as well as 295 schools and educational centres. Sparkling Science projects have involved a total of about 15,000 pupils directly and 20,500 indirectly. All areas of science are addressed in the programme.

The **student consultation offensive** supported by the Federal Ministry of Science and Research provides a comprehensive package of measures that are meant to support pupils in their decisions regarding education. The student consultation offensive consists of three parts: (i) the "study checker" includes measures that help young people in the pre-Matura or Matura classes to select a course of study that best suits their personal interests and abilities. This consultation is done together with the Federal Ministry of Education, Arts and Culture; (ii) consultation for pupils studying for their school leaving exams is provided by the ÖH; students come directly to schools and provide information about subjects of study and everyday life as a student; (iii) small groups of pupils can visit lectures in the ÖH initiative, "Check out university", thereby gaining direct insight into the subjects that they are interested in.

5.3 The research infrastructure at Austrian universities

The research infrastructure equipment at universities is central to ensuring success in international competition. The requirements and investment needs for modern equipment, facilities and infrastructures have increased considerably in recent years for several fields of science. A current European study of the development of research costs showed that the acquisition costs for facilities and equipment, in comparison to other expense categories (staff, materials, etc.), have climbed the fastest in the last five years.[81] According to the survey of 164 research-intensive firms and research institutions, the acquisition costs for facilities and equipment rose by 52% between 2005 and 2010, a growth which can be attributed first and foremost to price increases. The costs for staff and materials, on the other hand, increased by about 40%, and these were caused primarily by growth in volumes and numbers.

In light of these developments, the following discussion presents an analysis of research infrastructure levels at Austria's 22 public universities. The Federal Ministry of Science and Research has supported university infrastructures in recent years by means of specific investment programmes. This aid is meant to assist in the modernisation of facilities and to support the research prioritisation of Austria's public universities. These funded projects were analysed in an initial study in 2010.[82]

Due to the major significance of research infrastructure for the development of universities – its importance is also reflected in the positioning of research infrastructure as a central element of the new Austrian University Plan – the first systematic assessment of the entire research infrastructure at Austria's universities was conducted in 2011 with acquisition costs of more than € 100,000 and analysed in a second study.[83] Selected findings from both of these studies are presented in the following discussion.

The specific programme for improving research infrastructure (university infrastructure programmes I-IV, modernisation of university equipment, advanced appointments to chairs) funded 394 projects between 2001 and 2010. The objectives of these programmes were:

- supporting priority setting at universities and the topics set out in the performance contracts for scientific research and for the development and inclusion of the arts,
- securing research infrastructure as a basis for university research and for cooperation with external partners,
- supporting thematic and organisational priority setting at universities in accordance with the University Act of 2002 by investing in new infrastructures and re-investing in existing ones.

In the aforementioned first study of 2010, the supported projects were evaluated to ascertain the degree to which these projects supported research prioritisation at the universities. The study allocated all projects to individual research topics on a per-university basis according to development plans and performance contracts, and then developments were assessed over time. This explored the question as to the role and importance of infrastructure projects for research prioritisation within universities as well as between universities.

The analysis differentiated between inter-university research prioritisation, meaning the bundling of resources and research activities between

81 See Leitner et al. (2011)
82 Leitner (2010)
83 Heller-Schuh, Leitner, (2012)

two or more universities, and intra-university research prioritisation, meaning a stronger orientation towards priorities at the university level. For projects at individual universities, a similar procedure was used to decide whether an infrastructure was used by multiple organisations (departments, centres, etc.) and thereby can be allocated to an inter-departmental or university priority, or if the infrastructure was used within one organisational unit, e.g. for a departmental priority.

Another of the analysis's criteria was whether an infrastructure was used directly for the expansion and establishment of a research priority (RP) or if it had the character of a basis infrastructure (BI). Projects were defined as basic infrastructure if they enabled research and teaching but did not contribute directly to setting priorities. However, they do create the foundations upon which research priorities and excellence areas can develop over time. Typically, these projects are replacement investments or are investments in the modernisation of infrastructures, classical computer equipment, musical instruments or library archiving systems.

The analysis of all infrastructure projects, which amounted to € 213.6 million[84], showed that most of the funding was used for setting research priorities between universities and within universities (€ 87.9 million) (see Fig. 64). The largest part consisted of intra-university research priorities, meaning that universities invested in infrastructures that facilitated the expansion of research priorities at the university level. This supported research prioritisation that was applied beyond departmental borders and was done by research platforms, centres or competence fields at the universities. High utilisation of these kinds of research funds is an indicator of whether a university has managed to realise university priorities and bundle strengths across departments (examples in the infrastructure programme are the Graz University of Technology, the University of Innsbruck, the University of Salzburg, the University of Natural Resources and Life Sciences of Vienna, and the Medical University of Vienna). Over the course of the programme, the proportion of such utilisation has increased, as is documented in the increasingly strategic usage of funds.

The second largest share of € 65.1 million supported the universities in research prioritisation within organisational units (RP OU) (see Fig. 64). The funding share for projects that share research infrastructures between two or more universities (RP inter) is relatively high at 17.7% (€ 37.9 million). This includes for example the construction of the Max Perutz Laboratories in Vienna, or NAWI Graz. The arts universities have a higher share of projects in the basis infrastructure category in comparison to all other universities, which is due primarily to spending on music instruments.

There was an overall thematic orientation towards projects in the natural sciences, engineering and medicine. Funds were also allocated frequently to projects in materials sciences, quantum physics, biotechnology and nanotechnology.

An analysis of funding usage throughout the programme revealed three trends in particular: first, the share of funding used for basis infrastructure declined over the course of the programme. Funds were increasingly used for supporting research priorities.

Second, funds were used with greater frequency for research topics across organisational units, and third, the proportion of inter-university projects also increased. The latest call for submissions dealt with cases of research infrastructure that support intra- and inter-university research and cooperation. All projects facilitate research prioritisation, and most of these projects have more than one institute that applies for or uses the funding. These projects are therefore in general aligned with strategic research priorities.

The Federal Ministry of Science and Research wants to use research policy to set the priorities

84 This study analysed project volumes in the amount of € 213.6 million with a total available amount of € 215.7 million.

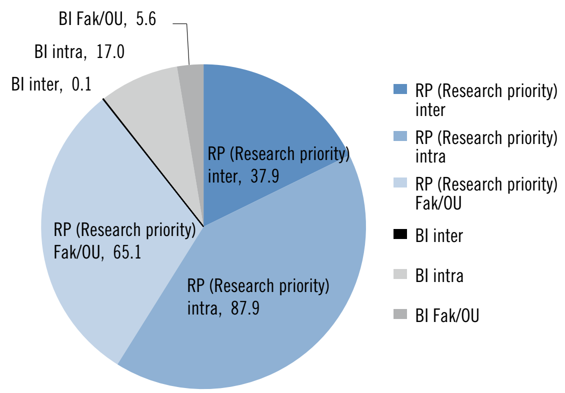
of Austrian universities and to build and expand their research infrastructure. In the light of continually climbing investment expenses, better coordination of investment planning will become necessary in future, and the modernisation and new acquisition of research infrastructures must be oriented to a greater extent towards the strategy. To support this objective, the Federal Ministry of Science and Research launched a research infrastructure survey in cooperation with the universities in spring 2011. The survey was meant to record all equipment with a purchase price of over € 100,000.

The first survey, which was completed in mid-November 2011, was used to create the first joint data basis with the universities. There were research infrastructures that were not recorded in the first survey (some figures could not be determined and required further research); these results are being entered in a second round of surveys that will be completed by May 2012. Universities of applied sciences and non-university institutions, such as the ÖAW, will be included in the survey in 2012.

The completed initial survey provides for the first time a basis for the assessment and analysis of important research infrastructure at Austrian universities. Questions focus on the number and type[85] of research infrastructures in the individual scientific disciplines [86] at the individual locations, their cooperative usage, how they were financed and estimates regarding future investment needs. The data basis for the analyses comes from a database created by the Federal Ministry of Science and Research together with the universities. This database consists of 1,198 data sets on research infrastructures with procurement costs over € 100,000 at Austria's 22 public universities.[87] The next section presents an overview of the initial findings on the number and type of research infrastructures, procurement costs in individual scientific disciplines, the type of financing and the use of research infrastructures.

Fig. 65 shows the number and type of research infrastructures at Austrian universities in the individual scientific disciplines. 861 major pieces of large-scale equipment were reported, and these

Fig. 64: Infrastructure projects funded between 2001 and 2010 by application categories [in € millions]



Abbreviations:
RP inter: Inter-university research priority
RP intra: Intra-university research priority
RP Fak/OU: Research priority of departments or organisational units
BI inter: Basis infrastructure inter-university
BI intra: Basis infrastructure intra-university
RP Fak/OU: Basis infrastructure of departments or organisational units

Source: Federal Ministry of Science and Research, calculations by AIT

85 The survey classified equipment according to different types, with distinctions made between large devices, core facilities (combination of several devices), electronic databases, interior equipment and other research infrastructure.

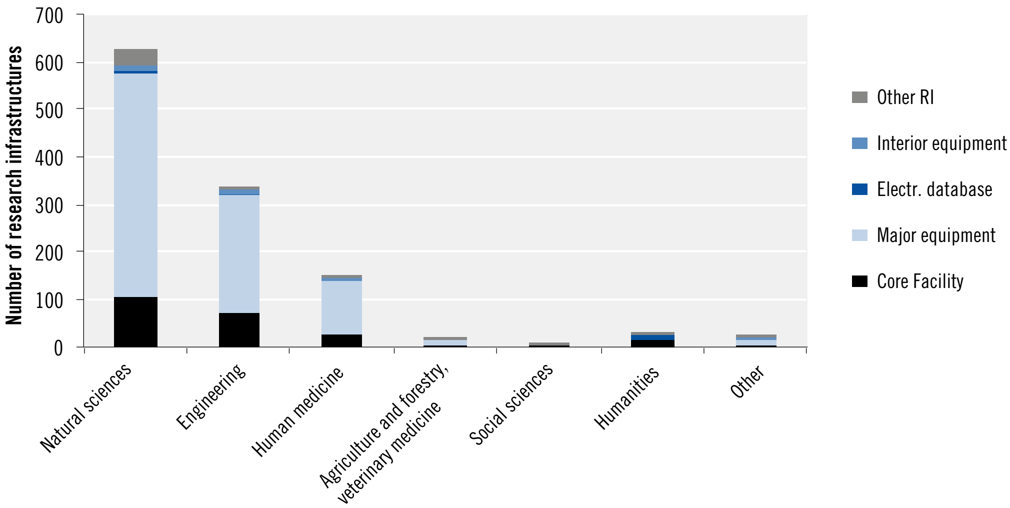
86 The Austrian system (ÖFOG, Statistics Austria 2010) was used as a reference for categorising research infrastructures by fields of science. This system assigns a scientific discipline classification at the one-, two- or four-digit level and corresponds to the two-digit Austrian Science Fund code in the 2006 classification publication (Austrian Science Fund 2006).

87 Research infrastructures were financed by funds from university global budgets, by various federal funding programmes (Federal Ministry of Science and Research (BMWF), Federal Ministry for Transport, Innovation and Technology (BMVIT), Federal Ministry of Economy, Family and Youth (BMWFJ), Austrian Science Fund (FWF), Austrian Research Promotion Agency (FFG), etc.), other third-party funding programmes under Article 27 of the University Act 2002, funds from other institutions of higher education, state or community funds, EU funding programmes (EU FP) and firms and private sponsors. Research infrastructures valued at over € 100,000 and purchased with initiative programme funds are included.

comprise the largest share of research infrastructures with 72%. 229 or 19% of all research infrastructures are core facilities. The remaining 9% of research infrastructures are 17 electronic databases, 30 interior equipment and 61 other research infrastructures. Over 600 research infrastructures at Austrian universities are allocated to the natural sciences, which is more than half of all research infrastructures (627.2 or 52%). Less than one-third of research infrastructures (338 or 28%) are being used in engineering and 129 or 12% in human medicine.

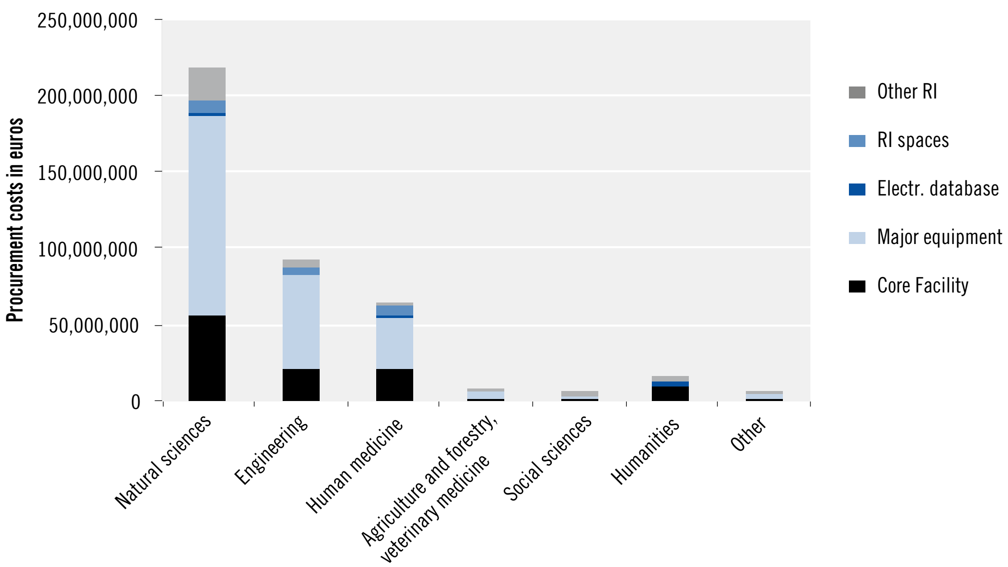
Fig. 66 shows procurement costs for research infrastructures by scientific discipline. Overall,

Fig. 65: Type of research infrastructure by scientific disciplines – all universities



Source: Federal Ministry of Science and Research, calculations by AIT; Abbreviations: RI… Research infrastructure

Fig. 66: Procurement costs for research infrastructures by scientific discipline (in €)



Source: Federal Ministry of Science and Research, calculations by AIT; Abbreviations: RI… Research infrastructure

Austrian universities reported research infrastructure investments of € 411 million: 57% (€ 235 million) was used for major equipment, 27% (€ 111 million) for core costs[88] for core facilities, 2% for electronic databases (€ 7 million), 5% (€ 19 million) for research interior equipment, and 10 % (€ 40 million) for other research infrastructures. Compared with the number of research infrastructures, investments for the core costs for individual core facilities and for other research infrastructure was higher on average than spending on large devices. The share of procurement costs in the individual scientific disciplines corresponded in general with the number of research infrastructures: 53% (€ 218 million) of procurement costs fell to the natural sciences, 23% (€ 93 million) in engineering, and 16% (€ 64 million) in human medicine.

Figures were available for the type of use for 65% of the research infrastructures reported by the universities. There are six categories of use: inside the university within the organisational unit (OU), inside the university with other OUs, in cooperation with national institutions of higher education, in cooperation with international institutions of higher education, in cooperation with firms / private investors, and in contracts.

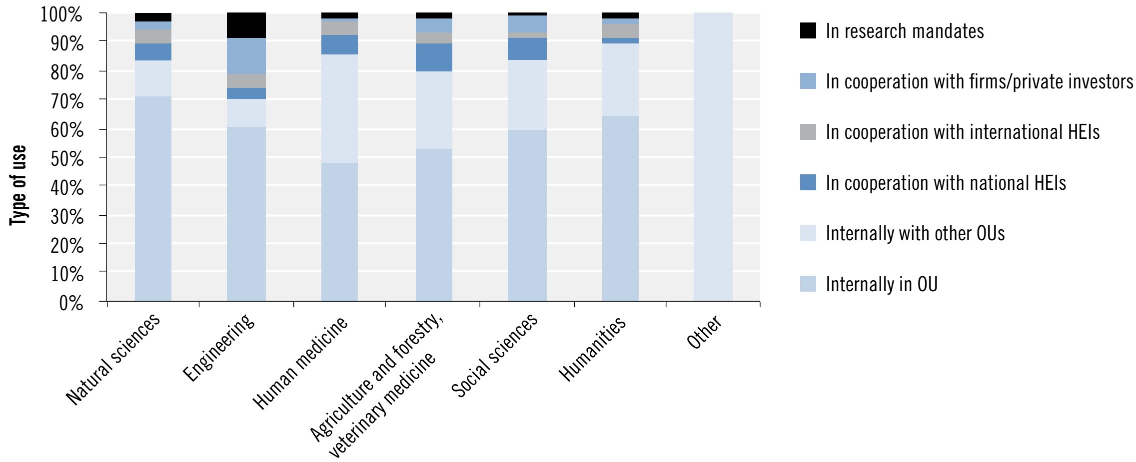
Fig. 67 illustrates type of use by scientific discipline. This reveals that joint utilisation with external partners only takes place to a limited extent: about two-thirds of research infrastructures are used within an organisational unit, and over 80% of usage takes place within the university. Usage within the organisational unit is most frequent in the natural sciences (71%), while joint usage within the university is most pronounced in the humanities (90%). The highest share of usage in cooperation with external partners (30%) is found in engineering.

Research infrastructures reported by universities that are valued over € 100,000 were purchased with various funds from the public sector, or were financed by firms and sponsors (see footnote 87). Information regarding the type of financing for procurement costs is available for 93% of the aforementioned research infrastructures. Half of funds (49% or € 164 million) for financing of procurement costs came from global budgets and another 39% or € 130 million came from Federal Ministry of Science and Research funding programmes (e.g., the initiative funding programmes). Fig. 68 shows that the shares of financing types differ among the individual scientific disciplines. In the three scientific disciplines with the highest procurement costs (natural sciences, engineering and human medicine), about half of research infrastructures are financed from global budgets; for the agricultural sciences, forestry and veterinary medicine, this share stood at 36%; for the humanities, 24%; and for the social sciences, 11%. The majority of funds in the latter three scientific disciplines were drawn from Federal Ministry of Science and Research funding programmes.

Beginning in 2011, systematic surveys of research infrastructure of all Austrian universities provided information for the first time that acts as a helpful basis for planning, both for research agendas and at the university level. The assessment of research infrastructure showed that procurement and operation costs are by far the greatest in the natural sciences, followed by engineering and human medicine. Overall, the majority of procurement costs (88%) for infrastructures with a procurement value of over € 100,000 is funded by the Federal Ministry of Science and Research (from the global budget and specific research programmes). Third-party funding has long played a comparatively minor role. The analyses also show that research infrastructures in about 20% of cases are used in cooperation with other universities, research institutions and firms. Evaluations of the infrastructures financed from initiative funds show that the cooperative

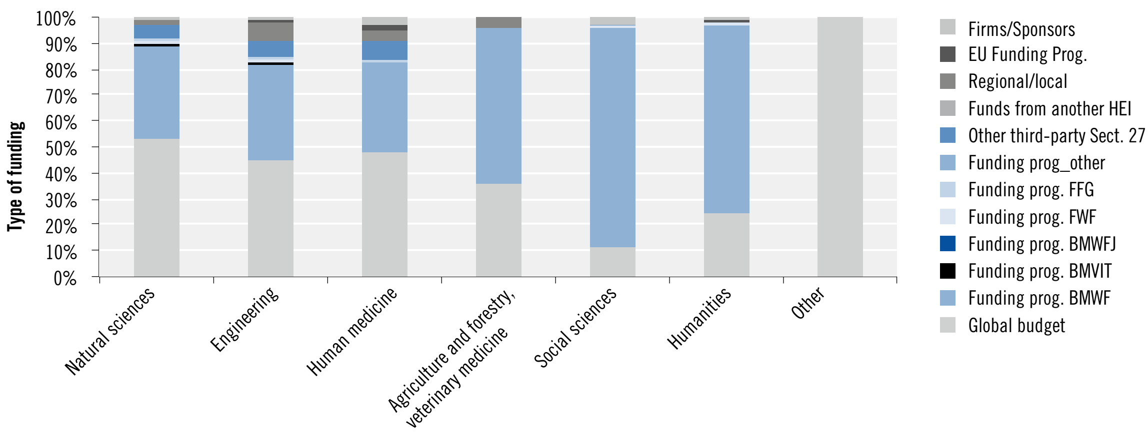
88 The core costs are the procurement costs for core facilities that are left after deducting affiliated research infrastructures over € 100,000 that are recorded under their own entries.

Fig. 67: Type of use by scientific discipline



Source: Federal Ministry of Science and Research, calculations by AIT; Abbreviations: OU… Organisational unit; HEI… Higher education institution

Fig. 68: Financing of procurement costs by scientific discipline



Source: Federal Ministry of Science and Research, calculations by AIT; Abbreviations: HEI… Higher education institution

usage of facilities and equipment with third parties has increased over time. We must assume then that this trend will be reinforced due to increasing investment requirements in future. This makes investment planning coordination necessary between the individual stakeholders. In this light, the compilation of infrastructure that began in 2011 shall continue and be updated in Spring 2012 to enable the coordination of future investment planning on a reliable data basis.

6 Evaluations

Evaluations have become, both in a legal regard and in daily practice, an important part of the life cycle of research and technology policy support measures. The primary legal basis for the process was created by the Research and Technology Promotion Act (FTF-G), the 2004 Act for Creation of the Austrian Research Promotion Agency (FFG-G), the Research Organisation Act (FOG; Reporting: Sections 6-9), and guidelines on the promotion of research based upon these laws[89] and for the funding of commercial-technical research and technology development, the so-called RTD guidelines.[90] For the first time, the Research and Technology Promotion Act (FTF-G Section 15 Para. 2) has standardised the evaluation principles at a legislative level as being a minimum requirement for the guidelines. The guidelines stipulate that "a written evaluation plan must be created for all subsidy programmes and measures based upon the RTD Guidelines. This plan must include the purpose, objectives, and procedures, as well as deadlines for verifying the achievement of the subsidy objectives, and must define appropriate indicators" (Section 2.2, page 4).

Not least thanks to this statutory basis almost all research and technology programmes now include evaluations in their programme planning (ex-ante evaluations), their programme implementation (monitoring and interim evaluations) and their programme conclusion (ex-post evaluations).

To give a periodic overview of the evaluation activity of the past years, since 2009 the new evaluations have been presented in the Austrian Research and Technology Report . The following criteria have been used for selecting which ones to present in the Austrian Research and Technology Report:

- The evaluations are primarily relevant for federal policy.
- An approved report of the evaluation is available.
- The evaluation report must be accessible to the public, i.e. the report has been published in the evaluation database of the research and technology evaluation platform.[91]

The discussion below provides brief information about the following evaluations: the evaluation of the "Headquarters Programme" (commissioned by the Federal Ministry for Transport, Innovation and Technology (BMVIT)), the interim evaluation of the Innovation-Voucher (commissioned by the Federal Ministry of Economy, Family and Youth (BMWFJ) and the BMVIT), the evaluation of the "COIN" programme (commissioned by the BMVIT and the BMWFJ), the evaluation of the "uni:invent" programme (commissioned by the Federal Ministry of Science and Research (BMWF) and the BMWFJ), and the evaluation of the Christian Doppler Research Agency CDG (commissioned by the BMWFJ).

89 Federal government guidelines on granting and executing subsidies pursuant to Sections 10–12 FOG, Federal Law Gazette No. 341/1981 No. 341/1981.

90 Guidelines for the funding the economic-technical research and technology development (RTD Guidelines) pursuant to Section 11(1) to (5) of the Research and Technology Funding Act (FTFG) of the Federal Minister for Transport, Innovation, and Technology dated 27 September 2006 (GZ 609.986/0013-III/I2/2006) and of the Federal Minister for Economics and Labour dated 28 September 2006 (GZ 97.005/0012-C1/9/2006)

91 www.fteval.at

6.1 "Headquarters Strategy" programme evaluation

Objective of the evaluation

The objective of the evaluation[92] was to reflect on the programme's development since its beginning in 2009 and to make conclusions and recommendations for the further development of the programme. The evaluation is meant to analyse the design and implementation of the funding programme, goal attainment and observable effects, and to formulate recommendations for the future based on the empirical results.

Programme objectives and basic information

The Headquarters Programme of the Federal Ministry for Transport, Innovation and Technology (BMVIT) pursues the aims of (i) making Austria more attractive as a place for businesses to build and expand their R&D activities with a headquarters function and (ii) to increase the R&D competence and R&D volume of international firms in new and existing fields that lead to a major jump in innovation and technology. R&D projects by firms that fulfil the above requirements are funded directly as an instrument for reaching these objectives. Funding processing is oriented towards the the Austrian Research Promotion Agency (FFG) basis programme procedure. Headquarters projects, however, receive better funding terms, above all in the type and scope of funding (subsidies only) and the duration of funding (several years).

Ninety Headquarters Projects were approved from 2004 to 2009. The funding volumes amounted to a total of € 114.8 million (cash value). The funded projects were distributed among 74 applicants. If we count affiliated firms as one unit, then 66 firms received Headquarters funding.

To a large extent the Headquarters Programme also funded those firms that were already in the basis programme and are among the largest funding recipients in the Austrian Research Promotion Agency's thematic programmes: nine of the ten firms that received the most Austrian Research Promotion Agency (FFG) funding in 2009 were already involved in the programme. These nine firms received 42% of the approved funds in the Headquarters Programme.

Results of the evaluation

The firms that received funding were very content and were decidedly positive about the programme. Firms offered praise in particular for the multiple years of funding, the high funding rate and the regulations governing the cooperation bonus (an extra award of 10% points to the funding rate for firms that work together with research institutions).

The Headquarters Programme, and thus the main purpose of the evaluation, was to answer a few of the central questions of RTI-relevant location policy. How and to what extent does direct funding play a role in the selection of a research location for internationally active firms, and is this funding essential for the relocation and expansion of a research site? What factors – aside from monetary funding – are relevant to R&D site selection and how do these influences interact? The evaluation provides important information in this regard.

The evaluation showed (thereby confirming a series of existing studies at the international level) that direct R&D project funding only plays a subordinate role in decisions about where to build a new facility or whether to expand existing R&D activities. The attractiveness of R&D locations is influenced primarily by the firm's history at the location, the R&D competences available there, human resources and expected synergy potentials (e.g., concentration of R&D, proximity to production facilities, access to new

92 Geyer, A., B. Tiefenthaler (2011), "Headquarters strategy programme evaluation"; final report to the Federal Ministry for Transport, Innovation and Technology, Technopolis, Vienna.

markets). Incentives on the cost side of the equation only play a role if several R&D locations can actually be compared in terms of the factors mentioned above. This may be a much rarer case than is assumed in current policy discussions.

This is why in many cases the Headquarters Programme came to ex-post funding of already on-going major R&D expansion activities. This was due to the (unrealistic) expectations regarding the effect that funding programmes have on the investment decisions of large multinational firms. These firms, however, conduct their R&D activities in alignment with their own internally defined priorities, work plans and schedules. No internationally active firm would base its strategically important or time-critical R&D decisions on external funding decisions. At the same time, however, this means that Headquarters funding typically has no significance for the start and execution of projects within firms.

If, however, the effects of Headquarters funding are to make projects faster, larger or more comprehensive, or to induce a sustainable increase in R&D expenditures, then – as the evaluation shows very clearly – there is no difference between the objectives and funding effects of the Austrian Research Promotion Agency (FFG) general programmes.

The increase of the funding rate for firms that cooperate with a research institution exhibits a classic effect caused by funding criteria: firms see themselves as prompted to 'run' cooperative ventures to increase the firm's effective funding ratio.

The evaluation demonstrates in a plausible way that internal company decisions about the construction and expansion of R&D activities were typically taken long before Headquarters funding was received. In many cases, the implementation of R&D construction and expansion measures was already in an advanced stage when the Headquarters funding began. In the supplementary reports on the Headquarters projects, firms also reported the setup and expansion of R&D competence and R&D staff, which primarily reflects the project selection criteria and cannot qualify as an effect caused by funding. This is why no additional effect could be found in the context of Headquarters funding that would have extended beyond the anticipated effects of general programme funding. Headquarters funding therefore mainly provided ex-post support for the construction and expansion of (new) R&D activities in firms.

Recommendations

The major recommendation from the evaluation of the Headquarters Programme is: "*… we cannot recommend continuing the Headquarters Programme in its current form!*"

The results of the evaluation suggest that R&D funding measures for internationally active firms should be applied primarily where R&D funding can actually make a lasting contribution to ensure and increase the attractiveness of the Austrian innovation system for firms that are strong in research. Direct project funding for internationally active firms should be linked more strongly to structural conditions, such as to the establishment of long-term strategic cooperative ventures with Austrian research institutions. This would promote the strengthening of research institutions in their commercial orientation and provide firms with well-educated professionals.

By more forcefully orienting project funding for international firms towards cooperative ventures with scientific institutions, we can expect a benefit for the location that extends far beyond the individual firms that receive funding. From a funding policy perspective, this also justifies more favourable funding conditions for the participating firms in comparison to the Austrian Research Promotion Agency's general programme. However, this would require an advance check as to whether existing instruments (such as COMET, Bridge) already offer sufficient funding opportunities. The Austrian Research Promotion Agency's general programme, from the point of view of efficiency and additionality, seems to already offer sufficient incentives to internationally active firms that are constructing or expanding their intramural R&D activities in Austria without further integration into the Austrian innovation system.

6.2 Interim evaluation of the Innovation-Voucher programme

Objective of the evaluation

The aim of the interim evaluation[93] is to reflect on the programme's development thus far and to develop recommendations for the programme's further development.

Programme objectives and basic information

A total of € 16.5 million was disbursed via this funding vehicle from November 2007 to the end of 2010. The programme was created on a Dutch prototype and began in November 2007. It is part of a range of measures taken up by the Federal Ministry for Transport, Innovation and Technology (BMVIT) and Federal Ministry of Economy, Family and Youth (BMWFJ) in cooperation with the the Austrian Research Promotion Agency (FFG) to improve offerings to Austrian small and medium-sized enterprises (SMEs).

With the Innovation-Voucher, SMEs can draw benefits from research institutions (non-university research institutions, universities of applied sciences and universities) if they need scientific expertise, and this is paid for by an Innovation-Voucher worth up to € 5000. The research institution then cashes the check at the the Austrian Research Promotion Agency (FFG).

The general objective of the Innovation-Voucher programme is to encourage SMEs to engage in regular R&D and innovation services, thereby broadening Austria's foundation of research and innovation. This general objective can be broken down into the following specific aims:

- Stimulate the exchange of knowledge between SMEs and the science sector;
- Assuage the fears of SMEs regarding scientific research institutions;
- Increase cooperation capacity and willingness between SMEs and scientific research institutions.

There were 4,407 Innovation-Voucher applications (as of 16 February 2011), of which 2,827 checks, or almost two-thirds, were approved.

The research institutions play an important role in the programme's execution: they are the ones who must assess whether the services requested by the SMEs correspond to the Austrian Research Promotion Agency (FFG) guidelines as to whether the request qualifies as a "project worthy of support". The Austrian Research Promotion Agency (FFG) performs its first assessment ex post, meaning after the conclusion of the Innovation-Voucher project and after receiving the associated documents from the research service providers. They assess not just whether the services requested by the SME and provided by the research institution were projects worthy of support, but also whether the price-performance ratio is appropriate, whether the research partner was a research institution in accordance with the special guidelines, and whether the Innovation-Voucher is still valid.

If these prerequisites are not fulfilled, then the research institution does not receive a reimbursement ex post from the Austrian Research Promotion Agency (FFG). In the event that the price-performance ratio was inappropriate, compensation is merely reduced, not completely cancelled. In any case, the research institution bears the financial risk.

Results of the evaluation

The evaluation shows that the programme can already boast several immediate results in its relatively short lifetime:

93 Good, B., B. Tiefenthaler (2011), Interim evaluation of the Innovation-Voucher programme, Technopolis, Vienna.

- Participation of new customers. A solid 80% of Innovation-Voucher applications come from SMEs that have never received funding from the Austrian Research Promotion Agency (FFG) before. This high percentage of new customers has not diminished over the life of the programme. The check has therefore not become a "customary right" or privilege for the same set of SMEs.
- Overcome the hesitance to cooperate with research institutions. A major aim of the Innovation-Voucher is to promote knowledge transfer and to break down barriers to cooperation between firms and research institutions. These objectives can be reached, even though the inhibition threshold was not very high for a significant number of SMEs if they already had experience with some form of cooperation or at least had contacts with research institutions.
- Trying out a new cooperative venture. Trying out a new cooperative venture is an important motivation for obtaining an Innovation-Voucher and an important result of the Innovation-Voucher. This creates new work relationships.

Recommendations

- The most important recommendation from the interim evaluation is: "The Innovation-Voucher programme must continue!" The following recommendations were also developed during the course of the evaluation:
- Modifying the application process: the the Austrian Research Promotion Agency (FFG) should make a binding funding commitment at the time of application. This means that the SME must provide a binding project description and a commitment to a research institution. This would mean more security for all parties involved.
- Only random sampling tests should be performed after the fact.
- The modification of the application process should also reduce delays in the disbursement of funds.
- Research institutions as programme participants: research institutions must be acknowledged and accepted as central programme participants. This means specifically that the Austrian Research Promotion Agency (FFG) should also recognise research institutions as their clients and communicates with them directly.
- Handling of non-technical innovations: applications that involve non-technical innovations should be subjected to adequate scrutiny.
- Lifting the prohibition against a subsequent cheque for the same research institution: the prohibition against a subsequent cheque for the same research institution breaks with the basic intention of the funding programme and is not advantageous for the sustainability of new cooperative ventures. It is therefore recommended that an SME be permitted to process two to three Innovation-Voucher projects with the same research institution. A subsequent order at the same research institution strengthens the cooperation between the two parties and ensures that the SME's innovation process is not interrupted.
- Keep the Innovation-Voucher amount: the evaluation demonstrated that € 5000 is a reasonable amount for the Innovation-Voucher.
- Innovation-Voucher only for small firms: the Innovation-Voucher should only be disbursed to small firms with up to 50 employees, € 50 million in turnover and € 10 million on the balance sheet.
- Do not admit any private R&D firms: because the purpose of the Innovation-Voucher is to encourage SMEs to work together with the (largely) public "knowledge infrastructure", and because SMEs rarely need to cash in the cheque at a private R&D provider, the evaluation recommends that the policy continue to **not** admit private research and consultancy firms.

6.3 Evaluation of the "COIN Cooperation & Innovation" programme

Objective of the evaluation

The evaluation[94] assessed the development of the COIN programme since its inception in 2008 and made conclusions and recommendations for the further development of the programme.

Programme objectives and basic information

The goal of the COIN programme is to improve Austria's innovation performance capacity by facilitating better and broader implementation of knowledge into innovations. COIN comprises the two programme lines "build-up" and "cooperation and networks" and includes five earlier programmes:

- FHplus and prokis focused above all on the development of institutions in non-university research, namely at universities of applied sciences and cooperative research centres. These target groups are addressed in particular in the "build-up" programme line, although other non-university research institutions are now authorised to submit applications. The programme line pursues the goal of developing and strengthening central competences and functions among providers of RDI-oriented competence in the Austrian innovation system.
- The protecNETplus (technology transfer), CIR-CE (interdisciplinary cooperative ventures) and REGplus (innovation centres) programmes focused primarily on network development. They are also situated in the "cooperation and networks" programme line. The funding of national and international cooperation and networks is meant to improve the innovation performance and innovation output of Austrian firms, especially SMEs. At the same time, the programme line is also meant to improve the ability of firms to cooperate.

The connecting link between the two programme lines is the objective of developing suitable structures for the capability of SMEs to be integrated in innovative value creation in a sustainable way.

A total of 222 projects with a planned total volume of € 190 million were submitted in the "build-up" programme line. A total of 50 projects were approved (23% of all submitted projects). The total costs according to applications for the approved projects were € 46.4 million (24% of submitted project volume). The projects received funding commitments in the total amount of € 29.8 million (cash value). Average funding per approved project was € 596,000. In the COIN build-up programme line, the available funding budget of € 30 million was almost completely spent.

A total of 171 projects with a planned total volume of € 93.4 million was submitted in the "cooperation and networks" programme line. A total of 54 projects have been approved (32% of all submitted projects). The total costs of the approved projects were € 29.8 million (32% of submitted project volume). The projects received funding commitments in the total amount of about € 17.3 million (cash value). Average funding per approved project was € 320,000. The available funding budget of € 20.3 million was not completely spent in the COIN cooperation and networks programme line.

Results of the evaluation

The evaluation emphasises that the consolidation of the former heavily target-group-oriented programmes into the two COIN programme lines, "build-up" and "cooperation and networks", was the right concept at that point in time. The design and later implementation of the new programme, however, met with a few diffi-

94 Warta, K., A. Geyer (2011), evaluation of the "COIN Cooperation & Innovation" programme, Technopolis, Vienna.

culties that have to do with the heterogeneity of target groups, primarily in the "build-up" programme line; in the "cooperation and networks" programme line, however, problems revolved around the need to more precisely articulate requirements and evaluation criteria for projects worthy of funding. This led to funding for projects with a rather low additionality of cooperative ventures and an overall lower degree of selectivity vis-a-vis other cooperation-based funding programmes.

Recommendations

The evaluation recommends the continuation of both funding vehicles under the COIN brand, even though it proposes additional focusing and sharpening of the programme concept.

COIN "build-up" should target RDI organisations that have structural significance for the Austrian innovation system and that cannot finance on their own long-term application-oriented RDI competence development in strategically important institutional fields (including concomitant infrastructure requirements); at the same time, however, these organisations show a clear potential of creating clear and sustainable added value for Austria as an RDI location by funding build-up projects. This primarily affects universities of applied sciences and, with some reservations, cooperative research institutions.

The programme documentation announced an integration of the Josef Ressel Centres in COIN after a pilot phase, but this plan should be avoided because the Centres focus less on competence build-up and more on securing long-term cooperation structures with application partners that already have RDI competence. The Josef Ressel Centres have more in common with the Christian Doppler Laboratories than they do with the COIN build-up programme.

The other COIN programme line, "cooperation and networks", should be reconceptualised. The "cooperation and networks" programme line should focus primarily on the (collective) added value of cooperation in networks, thereby strengthening its unique position among other funding options for cooperative RDI projects. The benefit of cooperation funding should also extend fundamentally beyond the participants to a broader group of SMEs, an industry or a region. The more partners view themselves as active network nodes (and not as suppliers), the more pronounced the network, which can generate spillover effects that extend beyond the COIN project.

In addition to the collective added value in the network, a project's content-based innovation value (yet not necessarily technical innovation value) should continue to be an important decision criterion for funding. This value should have a significance that goes beyond the individual players (meaning it should bring added value to the entire network).

The jury should be comprised of experts who are in a position to evaluate the collective benefits that emerge from the project. Experience has shown that programmes with juries should staff the jury with external experts (e.g., not with voting members from represented ministries, or the the Austrian Research Promotion Agency).

The participation of international partners in COIN "cooperative ventures and networks" should also be possible. From the perspective of innovation policy, it is not necessary to focus on a special orientation or opening towards specific target countries. The integration of the ERA Nets ERA-SME in COIN already points in this direction.

The past practice of the Austrian Research Promotion Agency (FFG) conducting an on-site visit during the project life has proven to be very useful. This visit represents an important element for the monitoring of the programme because it allows representatives from the funding agency to gain a direct personal impression of project's progress by speaking directly with project leaders, allowing early adjustments to be made to the project plan if necessary. This monitoring element should be retained.

6.4 Evaluation of the uni:invent programme

Objective of the evaluation

The final report[95] includes the concluding assessment of the uni:invent programme (2004-2009) and represents the completion of a supervisory and monitoring process across the life of the entire programme.

Programme objectives and basic information

The Universities Act 2002 (Article 106) creates opportunities for Austria's universities to take up employee inventions and to use the results of research projects by university employees independently. The uni:invent programme is based on these new legal options and supports universities in the development of professional IPR management. The most important basic programme points were:

- The establishment of invention consultants (innovation scouts) at participating universities. Innovation scouts support and advise scientists and university administrators in all affairs related to patenting and licensing.
- A virtual patent account was established for every university participating in the programme. This account was used to finance patent and commercialisation costs, as well as on-going patent fees for the universities.
- The Austria Wirtschaftsservice Service GmbH (aws) supported the establishment of internal university consulting structures as well as the development of an appropriate IPR service provider structure for Austrian universities.

Results of the evaluation

The summary of uni:invent's entire programme life leads us to conclude that the programme attained its objectives. Awareness-raising measures and the development of professional IPR management led to the establishment of a sustainable utilisation culture at the universities. Uni:invent set important stimuli here and was implemented at the right time (when the Universities Act 2002 came into effect), when, in accordance with its legislative purpose, "life was breathed into" Article 106 of the Universities Act 2002. AWS performed professional processing, allowing AWS to position itself well both in operative terms (as the programme processor) and as a service provider. Uni:invent was therefore able to make an important contribution to the protection, utilisation and commercialisation of intellectual property in the academic sector, thereby creating prerequisites and incentives for more strongly and sustainably anchoring the topic of transfer at the universities.

Overall, 1,552 registered inventions were reported during the programme's life. By 2006, there was an increase in registered inventions to 330; in the two subsequent years, there was a level of about 275 registrations per year. In 2009, the programme's last year, there were 343 new registrations.

These 1,552 registered inventions were submitted by 801 (initial) inventors; on average, then, each inventor creates more than 1.9 registered inventions, with a maximum number of 18 registered inventions.

The registered inventions submitted to AWS since the beginning of the uni:invent programme came from 16 universities and are assigned to 8 technology fields, with biotechnology taking the highest share at 33%, followed by chemistry and process engineering (16%) and electrical engineering (13%).

Interestingly, universities appear not to exhibit a pronounced pattern of specialisation, although biotechnology – the field with the most registered inventions – still seems to be more broadly spread out than other fields of technology.

95 Schibany, A., G. Streicher, B. Nones (2011), Intellectual property in the uni:invent programme; POLICIES Research Report no. 123-2011, Joanneum Research, Vienna.

The uni:invent programme represents an important addition in the context of Austria's currently existing funding measures at the science-industry interface. Three categories of measures are clear:

- Bringing together complementary competences in collaborations between research institutions and firms to produce new knowledge: Programmes such as COMET, CDG, Bridge, etc. set incentives for cooperation between research institutions and firms, and their structural character and substantial basic funding enable them to create an institutional foundation for cooperative ventures
- The creation of conditions conducive to the optimal utilisation of university research results: uni:invent assumed an important function in this area.
- The foundation of firms for the direct commercialisation of university developments: Noteworthy programmes in this very important area are the Austrian Research Promotion Agency (FFG) programme AplusB and start-up funding as part of the general programmes, as well as the AWS programme PreSeed, seed financing, time management and tecnet.

Experience with the uni:invent programme shows that the topic of science-industry relations in general and the topic of IPR specifically must be housed within the universities. It has been shown that innovation scouts perform a very important service for internal university awareness, information and consulting, thereby providing an important interface within the university and to the outside world. At the same time, further efforts should be made to open up the universities to thinking broadly about utilisation (in the direction of founding firms). Establishing specific incentives is possible in the following directions:

- More than anything, a career path at university is strewn with publications (as well as third-party funding). "Entrepreneurial spirit" is absolutely lacking and tends to be viewed negatively as a career option. To promote change here, there needs to be a shift in image and corresponding awareness measures. The spectrum here is broad: from anchoring basic entrepreneurial know-how in curricula, to a "foundation sabbatical" that could be dedicated to the start-up phase of a firm, to the introduction of "awards" for the best university spin-off.
- The development of clear structures and standards allows technology transfer to take place on a professional basis. Patents from university spin-offs are dealt with in very different ways. Initial, and highly successful, models are currently being established. VetWIDI, as a holding company of the University of Veterinary Medicine, serves as an incubator and receives minority shares in turn. Patents are transferred to founders in exchange for shares in the firm, far under the blocking minority and without further obligations. University holding firms are therefore a model that is highly compatible with incentives and can be used to put in place measures that lead to an increase in entrepreneurial dynamism and its concomitant positive effects on the national economy.

Recommendations

For an efficient utilisation of patents and knowledge (that extends beyond the borders of Austria), it is essential to create critical masses of scientists, technologies and expertise in order to be successful.

This evaluation therefore recommends the further expansion of clear structures and standards for exploiting previous university patent and exploitation structures developed by universities, as well as further increasing professionalisation in dealing with IPR and its utilisation. Furthermore, the evaluation recommends the creation of a central patent exploitation agency (PVA) that would serve as a point of contact for industry, as an advertiser for university research results, and be responsible for the utilisation and commercialisation of patents. The PVA must have highly specialised staff and create an appropriate image in its role as a marketer in the transfer of knowledge and technology. This could create a central point of contact and information pool for industry, thereby bringing together the entire spectrum of innovative and utilisable research results. The reasons for founding a patent exploitation agency (PVA) are based primarily in the leveraging of possible scaling effects (risk spread, cost savings, uniform outward appearance, etc.).

In summary, the evaluation recommends further public engagement in the area of knowledge and technology transfer along two lines of action: (i) to further anchor thinking about transfer and utilisation as a 'third mission', and (ii) to overcome the small structural landscape of the Austrian universities by creating a central agency for utilisation and commercialisation.

6.5 Evaluation of the Christian Doppler Research Agency (CDG)

Objective of the evaluation

The evaluation[96] consists of three areas of investigation: (i) a benefit analysis of the 30 CD laboratories, which have been in operation since 2005; (ii) a programme evaluation of the objectives and specifics of the CDG programme, and (iii) a system evaluation that positions the CDG in the research funding landscape.

Objectives of the CDG

The Christian Doppler Research Agency (CDG) is a research institution established for knowledge transfer between universities and industry and is an instrument for application-related basic research. The CDG funding programme is dedicated primarily to cooperation in the context of CD laboratories that are established for a maximum duration of seven years. The programme pursues the following economic and social policy goals:

- To strengthen application-oriented basic research;
- To strengthen Austria as an economic location (e.g., innovative potential and competitiveness of firms);
- To strengthen universities and research institutions;
- To improve the structure of the national innovation system;
- To fund junior scientists.

Results of the evaluation

The results attained from the benefit evaluation show a high degree of objective attainment for the CD laboratories that have ended since 2005. They proved themselves to be suitable structures for promoting knowledge transfer between universities and industry. A majority of surveyed CD laboratory staff (84%) confirmed the CD laboratories' (strongly) increasing influence on the general cooperative structure of university institutes and departments with the corporate landscape.

The success and high level of research activity in the academic field are particularly visible at the level of the CD laboratories in the number of articles at international conferences (about 73 per laboratory) and the awards and professor positions received (about 5 per laboratory). Furthermore, more than half of the CD laboratories surveyed reported that scientists went on to lead their own research groups. This is a major sign of the scientific qualification gained by scientists within a CD laboratory.

Staff qualifications were however not limited to "just" academic research; instead, they enabled (former) CD laboratory employees to switch

96 Alt, R., H. Berrer, J. Borrmann, P. Brunner, C. Helmenstein, C. Hierländer, L. Lobner, H. Schneider (2012), Benefits, programme and system evaluation of the Christian Doppler Research Agency; Economica Institute for Economic Research, Industry Science Institute (IWI), Vienna.

to a relevant industry (about four employees per laboratory on average). In addition to the availability of highly qualified staffers, corporate partners also profited from joint PR activities and training at the CD laboratories.

A quantitative **benefit evaluation** established a high correlation between the input of funds, which the funding provider considered to be a significant control variable, and various output quantities (number of publications, doctoral theses, patents, etc.). An analysis of the association between input and output showed that all investigated (output) indicators were positively correlated with the awarded CD laboratory budgets. This positive (linear) association suggests a positive interaction between the amount of output and the amount of input, which is particularly relevant for this programme evaluation.

The analysis of programme efficacy (**programme evaluation**) shows, on the basis of a survey of laboratory leaders and corporate partners, a high level of satisfaction with programme administration by the CDG and its different services (publicity work, supervision of CD laboratory during its lifetime, etc.). In contrast to the corporate partners, however, a not insignificant share of laboratory leaders were very critical towards the administrative costs over the life of a CD laboratory. However, (former) laboratory leaders saw little need for required improvements or adjustments to the CDG funding programme.

The expectations and targets associated with the foundation of a laboratory played a central role among laboratory leaders, above all in financial security for research projects and the associated possibility of building up and establishing their own research team and its "visibility". The most important motives for corporate partners to found a CD laboratory or to participate in a CD laboratory are:

- Securing long-term access to scientific expertise;
- Building up a strategic alliance with a university (including access to infrastructure and human resources), and
- Launching a new topic of research.

Firms reported that motives such as technology leadership, strengthening technical problem-solving competence, building up competence and access to qualified staff are all highly prized benefits of founding a CD laboratory.

The Social Network Analysis (SNA) conducted during the course of the **system evaluation**, which represents and interprets the most important networking patterns to and within the CDG family, shows that the CDG is a densely networked and heterogeneous institutional framework.

The funding programme's design follows its guiding principle: *form follows function*. If a project application is viewed as promising, yet does not fit well into the envisioned funding model, then attempts are made to develop alternative funding options or funding concepts. Individual cases sometimes call for a catch-all solution that promotes the principle that projects that have promising content yet lack organisational flexibility should not be turned away. These circumstances (e.g., if for example laboratory leader requirements are not yet fully satisfied) can lead to the founding of a pilot laboratory. This access is pioneering from an innovation policy perspective.

The CDG has developed a qualified certification procedure in recent years: to guarantee that CDG funding continues to be sufficiently selective, this reliable system of ex ante project evaluation and targeted selection processes should be continued. One aspect of this procedure is peer reviewing that includes international experts. This is a costly yet indispensable state-of-the-art approach, which is why an appropriate adjustment for current cost allowances should be considered. Adequate monetary funds for expert services should be understood not just as an incentive that ensures an intensive treatment and critical interaction with project proposals, but also as a resource that in individual cases of frequent use may be appropriate for promoting scaling effects by specialisation among peer reviewers.

Recommendations

In summary, the evaluation recommends "*the continuation of the CDG programme initiative, as the CDG funding programme is making a significant contribution to the implementation of R&D projects*". The major recommendations from the evaluation are oriented first and foremost at reducing administrative costs. This must be reduced for both laboratory leaders and firms. The evaluation has taken into account the results of a survey and numerous interviews to outline a few suggestions for improving administrative efficiency.

In conclusion, the evaluation emphasises: "*In retrospective analysis, the CDG funding programme has successfully managed to function as a catalyst for a number of successful academic and commercial innovation achievements. From a formal perspective, the programme is distinguished by its high degree of flexibility, which is appreciated equally by institutional and individual stakeholders. The programme is developing implementation competence that is of high value for the Austrian innovation system. In the future, a second raison d'être may arise for the programme – namely to institutionalise competition for funding at the interface between academia and industry, as well as to promote this interface between Austrian and international innovation systems.*"

7 Country codes

AT	Austria
BE	Belgium
BG	Bulgaria
CH	Switzerland
CN	China
CY	Cyprus
CZ	Czech Republic
DE	Germany
DK	Denmark
EE	Estonia
ES	Spain
FI	Finland
FR	France
GR	Greece
HR	Croatia
HU	Hungary
IE	Ireland
IS	Iceland
IT	Italy
JP	Japan
LT	Lithuania
LU	Luxembourg
LV	Latvia
MT	Malta
NL	Netherlands
NO	Norway
PL	Poland
PT	Portugal
RO	Romania
RS	Serbia
RU	Russia
SE	Sweden
SI	Slovenia
SK	Slovakia
TR	Turkey
UK	United Kingdom
US	United States

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Statistical Annex

1 Financing of gross domestic expenditure on R&D and research intensity 2012 (Tables 1 and 2)[97]

According to an estimate by Statistics Austria, more than € 8.6 billion are expected to be spent in Austria in 2012 on research and experimental development (R&D). This corresponds to a research intensity (gross domestic expenditure for research compared to the gross domestic product) of 2.80% Compared to 2011, the total amount of Austrian R&D expenditure has increased by 4.2% from € 8.26 billion to € 8.61 billion. For 2011 research intensity is now estimated to be 2.74%; in 2010 it was 2.79%.

Out of the entire projected research spending 2012, the Austrian firms will have the largest financing share at nearly 45% (approx. € 3.84 billion). After only a very slight increase from 2009 to 2010 and a larger increase for 2011 (5.3%), the financing by the domestic business enterprise sector is expected to rise by 2.2%.

In 2012, the R&D financing by the public sector will reach its highest level so far with € 3.38 billion - this corresponds to an increase of 7.5% compared to 2011 - and a financing share of 39.3% in the total spending for research. The federal government is contributing approx. € 2.87 billion; the states approx. € 411 million, and other public institutions such as local governments, chambers and social insurance carriers about € 102 million.

In absolute terms, this means € 1.34 billion are flowing into Austria for R&D. Financing from abroad largely comes from foreign firms, a large part of which consists of multinational corporations whose subsidiaries in Austria are conducting research and development. This also includes the returns from the EU Framework Programmes for Research, Technological Development and Demonstration. 0.6% (approx. € 47 million) are being financed by the private non-profit sector.

Based on information available to Statistics Austria concerning the development of R&D-relevant budget components and additional R&D subsidies – in particular refunds by the federal government to firms in connection with the research premium, the financing of research by the federal government in 2012 will continue to climb, up to € 2.87 billion. With an increase of 8.5% compared to 2011, the rise in financing by the federal government is slightly over the expected nominal increase of 2.2% in the gross domestic product.

The research intensity for Austria has grown substantially in the last ten years. 2001 was the

97 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 appropriations and final outlays of the federal and regional governments, Statistics Austria annually creates the "Total estimate of the Austrian Gross Domestic Expenditures for R&D." Under this annual compilation of the total estimate, any retroactive revisions or updates appear as based on the latest data. In accord with the definitions of the Frascati Manual, which is globally valid (OECD, EU) and thus guarantees international comparability, the financing of the expenditures for research and experimental development is presented as carried out in Austria. 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).

first year in which more than two percent of the economic performance were spent on R&D (2.05%). In 2007, for the first time, more than two-and-a-half percent of the GDP were spent on R&D (2.51%). Despite the economic crisis, the R&D expenditure in Austria did not decline in 2009, or declined only slightly; that year the research intensity reached 2.72% and in the following year 2010 2.79%. Although the stronger growth of the gross domestic product compared to the research spending resulted in a short-term decline in the research intensity to 2.74% in 2011, the quota in 2012 will be slightly above the level of 2010 again at 2.80%.

Austria clearly continues to outdo the research intensity of the EU-27 and is clearly above the EU average of 2.00% for the comparison year 2010 (the last year for which comparative figures are available). Finland, Sweden and Denmark have research intensities of more than 3% and Germany, at 2.82%, is still slightly ahead of Austria, which therefore has the fifth highest quota of the EU-27.

In estimating the Austrian gross domestic expenditures on R&D in 2012, the results of the R&D survey up to and including the reporting year 2009 were taken into consideration, along with the appropriations and final outlays of the federal government and the regional governments, as well as current economic data.

2 Federal R&D expenditure in 2012

2.1. The federal expenditure shown in *Table 1* for R&D carried out in Austria in 2012 is composed as described below. According to the methodology used for the R&D global estimate, the core is the total amount of Part b of Annex T in the Auxiliary Document for the Federal Finances Act 2012. The estimate also includes the funds from the National Foundation for Research, Technology, and Development available for 2012, based on the currently available information, as well as the estimates of the 2012 payout for research premiums (source for each: Federal Ministry of Finance).

2.2. In addition to its expenditures for R&D in Austria, in 2012 the federal government will pay **contributions to international organisations** aimed at research and the promotion of research amounting to € 94.7 million. They are shown in Annex T/Part a, but according to the domestic concept these are not included in the Austrian gross domestic expenditure on R&D.

2.3. The federal government expenditures summarised in **Annex T (Part a and Part b)** that impact research and which includes its research-effective share in contributions to international organisations (cf. above pt. 2.2), are traditionally included under the title **"Expenditures of the federal government for research and the promotion of research."** These correspond to what is called the "GBAORD" concept[98] that is used by the OECD and the EU on the basis of the Frascati Handbook, referring primarily to the budgets of the central government and/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.

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

In 2012 the following socioeconomic goals will receive the largest portions of federal expenditure for research and research funding:

- Funding of general knowledge advancement: 29.9%
- Funding of trade, commerce, and industry: 26.4%
- Funding of health care: 20.7%
- Funding of research covering the earth, the seas, the atmosphere, and space: 4.6%
- Funding of social and socio-economic development: 4.2%
- Funding of environmental protection: 3.8%
- Funding of agriculture and forestry: 2.7%

3. R&D expenditure of the regional governments

The research financing by the Austrian government as collated in Table 1 is listed from the state budget-based estimates of R&D expenditure reported by the offices of the state governments. The R&D expenditures of the regional hospitals are estimated annually by Statistics Austria by a methodology agreed on with the regional governments.

4. An international comparison of 2009 R&D expenditure (Table 13)

The overview table shows Austria's position compared to the other European Union member states and the OECD in terms of the most important R&D-related indices (Source: OECD, MSTI 2011-2).

List of Tables

Table 1: Global estimate for 2012: Gross domestic expenditure on R&D Financing of research and experimental development carried out in Austria in 1993–2012

Financing	1993	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
1. Gross domestic expenditure on R&D (in € millions)	**2,303.31**	**2,701.68**	**2,885.55**	**3,123.21**	**3,399.84**	**3,761.80**	**4,028.67**	**4,393.09**	**4,684.31**	**5,041.98**	**5,249.55**	**6,029.81**	**6,318.59**	**6,867.82**	**7,548.06**	**7,479.75**	**7,984.04**	**8,263.38**	**8,610.51**
of which financed by:																			
Federal government[1)]	957.12	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	1,772.06	1,916.96	2,356.78	2,297.46	2,586.43	2,645.84	2,870.01
Regional governments[2)]	129.67	153.89	159.06	167.35	142.41	206.23	248.50	280.14	171.26	291.62	207.88	330.17	219.98	263.18	354.35	273.37	405.17	403.60	410.95
Business enterprise sector[3)]	1,128.40	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	2,750.95	3,057.00	3,344.40	3,480.57	3,520.02	3,571.40	3,759.97	3,841.86
Abroad[4)]	59.69	190.10	337.00	478.21	684.63	738.91	800.10	863.30	1,001.97	1,009.26	1,016.61	1,087.51	1,163.35	1,230.24	1,240.53	1,255.93	1,282.94	1,310.54	1,338.73
Other[5)]	28.42	31.91	32.27	47.47	56.86	70.59	70.23	64.08	58.09	71.29	87.49	96.32	106.20	113.04	115.83	132.97	138.10	143.43	148.96
2. Nominal GDP[6)] (in € billions)	159.27	174.79	180.56	184.32	191.91	199.27	208.47	214.20	220.53	225.00	234.71	245.24	259.03	274.02	282.75	274.82	286.20	301.31	307.87
3. Gross domestic expenditure on R&D as a % of GDP	**1.45**	**1.55**	**1.60**	**1.69**	**1.77**	**1.89**	**1.93**	**2.05**	**2.12**	**2.24**	**2.24**	**2.46**	**2.44**	**2.51**	**2.67**	**2.72**	**2.79**	**2.74**	**2.80**

Status: 25 April 2012 Source: STATISTICS AUSTRIA (Bundesanstalt Statistik Österreich)

1) 1993, 1998, 2002, 2004, 2006, 2007 and 2009: Survey results (federal government including the Austrian Science Fund, the two research promotion funds and in 1993, 1998 and 2002 also including ITF) 1995-1997, 1999-2001, 2003, 2005, 2008 and 2010: Annex T/Part b of the Auxiliary Document for the Federal Finances Act (actual).2005: In addition: € 84.4 million National Foundation for Research, Technology and Development and € 121.3 million research premiums paid out.2008: In addition: € 91.0 million National Foundation for Research, Technology and Development and € 340.6 million research premiums paid out. (2010) In addition: € 74.6 million National Foundation for Research, Technology and Development and € 328.8 million research premiums paid out.2011: Preliminary draft of Annex T/Part b based on preliminary result 2011 (Federal Minister of Finance, as per April 2012). In addition: € 75.1 million National Foundation for Research, Technology and Development and € 335.2 million research premiums paid out.2012: Annex T/Part b of the Auxiliary Document for the Federal Finances Act 2012 (budget). In addition: € 43.1 million National Foundation for Research, Technology and Development, as well as € 450.0 million for research premiums expected to be paid out based on information currently available (**source:** BMF, April 2012).
2) 1993, 1998, 2002, 2004, 2006, 2007 and 2009: survey results. 1995-1997, 1999-2001, 2003, 2005, 2008 and 2010-2012: Based on the estimates of R&D expenditure reported by the state government offices.
3) Funding by business.1993, 1998, 2002, 2004, 2006, 2007 and 2009: survey results. 1995-1997, 1999-2001, 2003, 2005, 2008 and 2010-2012: Estimates made by Statistics Austria.
4) 1993, 1998, 2002, 2004, 2006, 2007 and 2009: survey results. 1995-1997, 1999-2001, 2003, 2005, 2008 and 2010-2012: Estimates made by Statistics Austria.
5) Financing by local governments (excluding Vienna), chambers, social insurance institutions and other public financing and from the private non-profit sector. 1993, 1998, 2002, 2004, 2006, 2007 and 2009: survey results. 1995-1997, 1999-2001, 2003, 2005, 2008 and 2010-2012: Estimates made by Statistics Austria.
6) 1993-2010: Statistics Austria. 2011: Austrian Institute of Economic Research (WIFO) on behalf of Statistics Austria. 2012 Austrian Institute of Economic Research (WIFO), economic forecast March 2012.

Table 2: Global estimate for 2012: Gross domestic expenditure on R&D Financing of research and experimental development carried out in Austria in 1993–2012 (as a percentage of GDP)

Financing	1993	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
1. Gross domestic expenditure on R&D (in % of GDP)	**1.45**	**1.55**	**1.60**	**1.69**	**1.77**	**1.89**	**1.93**	**2.05**	**2.12**	**2.24**	**2.24**	**2.46**	**2.44**	**2.51**	**2.67**	**2.72**	**2.79**	**2.74**	**2.80**
of which financed by:																			
Federal government[1)]	0.60	0.62	0.59	0.58	0.57	0.60	0.59	0.63	0.62	0.62	0.62	0.72	0.68	0.70	0.83	0.84	0.90	0.88	0.93
Regional governments[2)]	0.08	0.09	0.09	0.09	0.07	0.10	0.12	0.13	0.08	0.13	0.09	0.13	0.08	0.10	0.13	0.10	0.14	0.13	0.13
Business enterprise sector[3)]	0.71	0.71	0.71	0.73	0.74	0.78	0.81	0.86	0.95	1.01	1.05	1.12	1.18	1.22	1.23	1.28	1.25	1.25	1.25
Abroad[4)]	0.04	0.11	0.19	0.26	0.36	0.37	0.38	0.40	0.45	0.45	0.43	0.44	0.45	0.45	0.44	0.46	0.45	0.43	0.43
Other[5)]	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	0.05	0.05	0.05	0.05
2. Nominal GDP[6)] (in € billions)	**159.27**	**174.79**	**180.56**	**184.32**	**191.91**	**199.27**	**208.47**	**214.20**	**220.53**	**225.00**	**234.71**	**245.24**	**259.03**	**274.02**	**282.75**	**274.82**	**286.20**	**301.31**	**307.87**

Status: 25 April 2012 Source: STATISTICS AUSTRIA (Bundesanstalt Statistik Österreich)

Footnotes cf. Table 1.

Table 3: Federal expenditure on research and research promotion, 2009 to 2012 Breakdown of Annex T of the Auxiliary Document for the Federal Finances Act 2011 and 2012

Ministries [1]	Outlays				Budget appropriation			
	2009[2]		2010[3]		2011[3]		2012[3]	
	€ million	%	€ million	%	€ million	%	€ million	%
Federal Chancellery (BKA)[4]	1.799	*0.1*	1.973	*0.1*	2.043	*0.1*	2.408	*0.1*
Federal Ministry of the Interior (BMI)	0.758	*0.0*	0.789	*0.0*	0.804	*0.0*	0.933	*0.0*
Federal Ministry for Education, Arts and Culture (BMUKK)	55.719	*2.6*	62.380	*2.7*	62.353	*2.6*	71.101	*2.9*
Federal Ministry for Science and Research (BMWF)	1,563.797	*72.8*	1,652.719	*72.9*	1,720.972	*71.4*	1,738.025	*70.4*
Federal Ministry of Labour, Social Affairs and Consumer Protection (BMASK)	2.130	*0.1*	2.232	*0.1*	2.300	*0.1*	2.567	*0.1*
Federal Ministry for Health (BMG)	4.391	*0.2*	4.959	*0.2*	5.022	*0.2*	5.425	*0.2*
Federal Ministry for European and International Affairs (BMEIA)	1.869	*0.1*	2.147	*0.1*	2.383	*0.1*	2.383	*0.1*
Federal Ministry of Justice (BMJ)	0.114	*0.0*	0.098	*0.0*	0.130	*0.0*	0.130	*0.0*
Federal Ministry of Defence and Sports (BMLVS)	2.072	*0.1*	2.440	*0.1*	2.453	*0.1*	2.589	*0.1*
Federal Ministry of Finance (BMF)	32.045	*1.5*	31.437	*1.4*	33.204	*1.4*	34.467	*1.4*
Federal Ministry for Agriculture, Forestry, Environment and Water Management (BMLFUW)	62.915	*2.9*	60.927	*2.7*	79.440	*3.3*	86.212	*3.5*
Federal Ministry of Economy, Family and Youth	83.691	*3.9*	103.200	*4.5*	102.676	*4.3*	107.049	*4.3*
Federal Ministry for Transport, Innovation and Technology (BMVIT)	338.487	*15.7*	344.685	*15.2*	394.274	*16.4*	418.329	*16.9*
Total	**2,149.787**	***100.0***	**2,269.986**	***100.0***	**2,408.054**	**100.0**	**2,471.618**	***100.0***

Status: April 2012 Source: Statistics Austria (Bundesanstalt Statistik Österreich)

1) In accordance with the applicable version of the Act Governing Federal Ministries of 1986 (Federal Law Gazette I No. 3/2009).

2) Auxiliary Document for the Federal Finances Act of 2011.

3) Auxiliary Document for the Federal Finances Act of 2012.

4) Including the highest executive bodies.

Table 4

ANNEX T

for the Federal Finances Act of 2012.

Federal expenditure on research from 2010 to 2012

The following overviews for the years 2010 to 2012 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 expenditures on research and research promotion **(Part b, Federal research budget)**

This list of expenditure is made 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 STATISTICS AUSTRIA in its surveys about research and experimental development (R&D) surveys.
Portions of federal spending that have an impact on research can thus be found not only under expenditures on item 12 "research and science", but also under other items.

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

Statistics 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 1 2
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		Bereich-Ausgaben		Bundesvoranschlag 2012			Bundesvoranschlag 2011			Erfolg 2010		
							hievon			hievon			hievon	
		Nr.	Ugl	Bezeichnung	Anm.	Insgesamt	%	Forschung	Insgesamt	%	Forschung	Insgesamt	%	Forschung
				Bundeskanzleramt:										
1/10007	43	7800	101	Mitgliedsbeitrag für OECD		2,810	20	0,562	2,650	20	0,530	....	...	....
		7800	102	OECD-Energieagentur (Mitgliedsbeitrag)		0,235	20	0,047	0,230	20	0,046	....	...	....
		7800	*001*	*Mitgliedsbeitrag für OECD*		....	...	....	....	...	....	2,649	20	0,530
		7800	*003*	*OECD-Energieagentur (Mitgliedsbeitrag)*		....	...	....	....	...	....	0,231	20	0,046
1/10008	43	7800	100	Mitgliedsbeiträge an Institutionen im Ausland		0,185	30	0,056	....	...	....	....	...	....
		7800	103	OECD-Beiträge zu Sonderprojekten		0,010	20	0,002	0,010	20	0,002	....	...	....
		7800	*009*	*OECD-Beiträge zu Sonderprojekten*		....	...	....	....	...	....	0,020	20	0,004
				Summe Bereich 10...		3,240		0,667	2,890		0,578	2,900		0,580
				BM für europäische und internationale Angelegenheiten:										
1/12036	43	7840	030	Inst. der VN für Ausbildung und Forschung (UNITAR)		0,020	40	0,008	0,020	40	0,008	....	...	....
		7840	054	Beitrag zum Budget des EUREKA-Sekretariates		0,001	52	0,001	0,001	52	0,001	....	...	....
		7840	056	Drogenkontrollprogramm der VN (UNDCP)		0,500	20	0,100	0,500	20	0,100	....	...	....
		7841		*Drogenkontrollprogramm der VN (UNDCP)*		....	...	....	....	...	....	0,398	20	0,080
1/12037	43	7840		Internationale Atomenergie-Organisation (IAEO)		3,252	35	1,138	3,252	35	1,138	....	...	....
		7840	002	Organisation der VN für industr.Entwicklung (UNIDO)		0,940	46	0,432	0,940	46	0,432	....	...	....
		7840	003	Org. VN Erziehung,Wissensch.u.Kultur(UNESCO)		2,346	30	0,704	2,346	30	0,704	....	...	....
		7260		*Internationale Atomenergie-Organisation (IAEO)*		....	...	....	....	...	....	3,047	35	1,066
		7801		*Organisation der VN für industr.Entwicklung (UNIDO)*		....	...	....	....	...	....	0,699	46	0,322
		7802		*Organisation d.VN f.Erziehung,Wissenschaft u.Kultur (UNESCO)*		....	...	....	....	...	....	2,263	30	0,679
				Summe Bereich 12...		7,059		2,383	7,059		2,383	6,407		2,147
				BM für Arbeit, Soziales und Konsumentenschutz:										
1/21008	43	7800	030	Europarat - Teilabkommen		0,001	20	0,000	0,001	20	0,000	....	...	....
				BM für Gesundheit:										
1/24007	43	7800	040	Europ. Maul- u. Klauenseuchenkommission		0,012	50	0,006	0,012	50	0,006	....	...	....
		7800	041	Internat.Tierseuchenamt		0,130	50	0,065	0,130	50	0,065	....	...	....
		7800	042	Weltgesundheitsorganisation		3,620	30	1,086	4,220	30	1,266	....	...	....
		7802		*Weltgesundheitsorganisation*		....	...	....	....	...	....	3,030	30	0,909
		7807		*Europ. Maul- u. Klauenseuchenkommission*		....	...	....	....	...	....	0,010	50	0,005
		7808		*Internat.Tierseuchenamt*		....	...	....	....	...	....	0,115	50	0,058
1/24008	43	7800	043	Europarat Teilabkommen		0,080	20	0,016	0,088	20	0,018	....	...	....
		7802		*Europarat Teilabkommen*		....	...	....	....	...	....	0,010	20	0,002
				Summe Bereich 24...		3,842		1,173	4,450		1,355	3,165		0,974
				BM für Unterricht, Kunst und Kultur:										
1/30008	11	7800	104	OECD-Schulbauprogramm		0,030	100	0,030	0,029	100	0,029	....	...	....
		7800	*001*	*OECD-Schulbauprogramm*		....	...	....	....	...	....	0,031	100	0,031
				Summe Bereich 30...		0,030		0,030	0,029		0,029	0,031		0,031
				BM für Wissenschaft und Forschung:										
1/31117	12	7270	032	Verpflichtungen aus internationalen Abkommen		0,093	50	0,047	0,093	50	0,047	....	...	....
		7271		*Verpflichtungen aus internationalen Abkommen*		....	...	....	....	...	....	0,079	50	0,040
	43	7800	200	Beiträge an internationale Organisationen		0,700	50	0,350	0,700	50	0,350	....	...	....
		7801		*Beiträge für internationale Organisationen*		....	...	....	....	...	....	0,713	50	0,357
1/31118	12	7800	105	OECD-CERI-Mitgliedsbeitrag		0,001	100	0,001	0,001	100	0,001	....	...	....
		7271		*Verpflichtungen aus internationalen Abkommen*		....	...	....	....	...	....	0,165	50	0,083
1/31178	43	7260		Mitgliedsbeiträge an Institutionen im Inland		0,648	100	0,648	0,648	100	0,648	....	...	....

Beilage T

B U N D E S V O R A N S C H L A G   2 0 1 2
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 2012 Insgesamt	hievon %	hievon Forschung	Bundesvoranschlag 2011 Insgesamt	hievon %	hievon Forschung	Erfolg 2010 Insgesamt	hievon %	hievon Forschung
				(Fortsetzung)										
1/31178	*43*	*7263*		*Mitgliedsbeiträge*		...	...	...	...	...	...	0,694	100	0,694
1/31187	12	7800	062	ESO		5,300	100	5,300	4,900	100	4,900	...	...	...
		7805		*ESO*		...	...	...	...	...	...	3,669	100	3,669
	43	7800	063	Europ. Zentrum für mittelfristige Wettervorhersage		1,050	100	1,050	1,000	100	1,000	...	...	...
		7800	064	Molekularbiologie - Europäische Zusammenarbeit		2,700	100	2,700	2,100	100	2,100	...	...	...
		7800	065	World Meteorological Organisation		0,520	50	0,260	0,507	50	0,254	...	...	...
		7800	242	Beitrag für die CERN		16,558	100	16,558	16,893	100	16,893	...	...	...
		7801		*Beitrag für die CERN*		...	...	...	...	...	...	17,919	100	17,919
		7802		*Molekularbiologie - Europäische Zusammenarbeit*		...	...	...	...	...	...	2,289	100	2,289
		7803		*World Meteorological Organisation*		...	...	...	...	...	...	0,369	50	0,185
		7804		*Europäisches Zentrum für mittelfristige Wettervorhersage*		...	...	...	...	...	...	0,944	100	0,944
1/31188	12	7800	066	Forschungsvorhaben in internationaler Kooperation		2,100	100	2,100	3,000	100	3,000	...	...	...
		7800	200	Beiträge an internationale Organisationen		0,439	50	0,220	0,800	50	0,400	...	...	...
		7800		*Forschungsvorhaben in internationaler Kooperation*		...	...	...	...	...	...	0,036	100	0,036
		7803		*Beiträge für interationale Organisationen*		...	...	...	...	...	...	1,214	50	0,607
				Summe Bereich 31...		30,109		29,234	30,642		29,593	28,091		26,823
				BM für Wirtschaft, Jugend und Familie:										
1/40007	43	7800	100	Internationales Büro für Maße und Gewichte (BIPM)		0,132	80	0,106	0,132	80	0,106	...	...	...
				Internationale Organisation f.d. gesetzliche Meßwesen (OIML)		0,014	80	0,011	0,014	80	0,011	...	...	...
		7800	100	Internationales Institut für Kältetechnik (IIF)		0,010	80	0,008	0,010	80	0,008	...	...	...
				Internationale Union für Geodäsie und Geophysik (UGGI)		0,005	80	0,004	0,005	80	0,004	...	...	...
		7810		*Internationales Büro für Maße und Gewichte (BIPM)*	*	...	...	...	...	...	...	0,123	80	0,098
				Internationale Organisation f.d. gesetzliche Meßwesen (OIML)	*	...	...	...	...	...	...	0,013	80	0,010
				Internationales Institut für Kältetechnik (IIF)	*	...	...	...	...	...	...	0,008	80	0,006
				Internationale Union für Geodäsie und Geophysik (UGGI)	*	...	...	...	...	...	...	0,004	80	0,003
				Summe Bereich 40...		0,161		0,129	0,161		0,129	0,148		0,117
				BM für Verkehr, Innovation und Technologie:										
1/34338	12	7800	200	Beiträge an internationale Organisationen		0,060	100	0,060	0,060	100	0,060	...	...	...
		7801		*Beiträge für internat. Organisationen*		...	...	...	...	...	...	0,077	100	0,077
	43	7800	602	OECD-Energieagentur		0,050	100	0,050	0,050	100	0,050	...	...	...
1/34377	12	7800	600	ESA-Pflichtprogramme		16,939	100	16,939	16,439	100	16,439	...	...	...
		7800		*ESA - Beitrag*		...	...	...	...	...	...	14,977	100	14,977
	43	7800	601	EUMETSAT		0,001	100	0,001	0,001	100	0,001	...	...	...
		7800	602	OECD-Energieagentur		0,060	100	0,060	0,060	100	0,060	...	...	...
		7802		*OECD-Energieagentur*		...	...	...	...	...	...	0,069	100	0,069
1/34378	12	7800	601	EUMETSAT		5,350	100	5,350	4,367	100	4,367	...	...	...
		7800	603	ESA-Wahlprogramme		36,654	100	36,654	40,755	100	40,755	...	...	...
		7802		*ESA-ARIANE V*		...	...	...	...	...	...	1,962	100	1,962
		7806		*ESA-EOPP*		...	...	...	...	...	...	0,000	100	0,000
		7807		*ESA-ENVISAT*		...	...	...	...	...	...	0,030	100	0,030
		7808		*ESA-METOP*		...	...	...	...	...	...	0,010	100	0,010
		7809		*ESA-GSTP*		...	...	...	...	...	...	0,681	100	0,681
		7812		*ESA-ARTES*		...	...	...	...	...	...	9,922	100	9,922
		7813		*ESA-EOEP*		...	...	...	...	...	...	8,047	100	8,047
		7815		*Neue ESA-Programme*		...	...	...	...	...	...	5,819	100	5,819
		7816		*ESA-AURORA*		...	...	...	...	...	...	2,514	100	2,514
		7817		*ESA-ELIPS*		...	...	...	...	...	...	1,188	100	1,188
		7818		*ESA-Earth Watch GMES*		...	...	...	...	...	...	5,511	100	5,511
		7819		*ESA-GalileoSat*		...	...	...	...	...	...	0,221	100	0,221
		7840		*EUMETSAT*		...	...	...	...	...	...	3,431	100	3,431
				Summe UG 34...		59,114		59,114	61,732		61,732	54,459		54,459
1/41007	43	7800	200	Europäische Konferenz der Verkehrsminister (CEMT)	*	0,084	6	0,005	0,084	6	0,005	...	...	...

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B U N D E S V O R A N S C H L A G 2 0 1 2
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 2012 Insgesamt	hievon %	hievon Forschung	Bundesvoranschlag 2011 Insgesamt	hievon %	hievon Forschung	Erfolg 2010 Insgesamt	hievon %	hievon Forschung
				(Fortsetzung)										
1/41007	43	7800	200	Internationale Zivilluftfahrtorganisation (ICAO)	*	0,426	20	0,085	0,426	20	0,085	....	...	....
				Europäische Zivilluftfahrtskonferenz (ECAC)	*	0,038	10	0,004	0,038	10	0,004	....	...	....
		7800		*Europäische Konferenz der Verkehrsminister (CEMT)*	*	....	...	....	....	...	....	0,084	6	0,005
				Internationale Zivilluftfahrtorganisation (ICAO)	*	....	...	....	....	...	....	0,426	20	0,085
				Europäische Zivilluftfahrtskonferenz (ECAC)	*	....	...	....	....	...	....	0,038	10	0,004
1/41008	43	7800		Institutionen für den Lufttransport (ITA)	*	0,001	40	0,000	0,001	40	0,000	0,001	40	0,000
				Ständige Internat. Vereinigung f.Schiffahrtskongresse(AIPCN)	*	0,002	50	0,001	0,002	50	0,001	0,002	50	0,001
		7800	200	Institutionen für den Lufttransport (ITA)	*	0,001	40	0,000	0,001	40	0,000	....	...	....
				Ständige Internat. Vereinigung f.Schiffahrtskongresse(AIPCN)	*	0,002	50	0,001	0,002	50	0,001	....	...	....
1/41027	43	7800	200	Beiträge an internationale Organisationen		0,391	20	0,078	0,391	20	0,078	....	...	....
		7800		*Beiträge an internationale Organisationen (UIT) .*		....	...	....	....	...	....	0,379	20	0,076
1/41248	33	7800	200	Beiträge an internationale Organisationen		0,021	100	0,021	0,021	100	0,021	....	...	....
				Summe UG 41...		0,966		0,195	0,966		0,195	0,930		0,171
				Summe Bereich 41...		60,080		59,309	62,698		61,927	55,389		54,630
				BM für Land- u.Forstwirtschaft,Umwelt u.Wasserwirtschaft:										
1/42007	43	7800	080	FAO-Beiträge		3,130	50	1,565	3,130	50	1,565	....	...	....
		7801		*FAO-Beiträge ....*		....	...	....	....	...	....	3,000	50	1,500
1/42008	43	7800	100	Internationales Weinamt		0,028	50	0,014	0,028	50	0,014	....	...	....
				Europäische Vereinigung für Tierproduktion	*	0,014	50	0,007	0,014	50	0,007	....	...	....
				Europäische Pflanzenschutzorganisation	*	0,021	50	0,011	0,021	50	0,011	....	...	....
				Internationale Kommission für Be- und Entwässerungen	*	0,002	50	0,001	0,002	50	0,001	....	...	....
				Internationales Weinamt	*	....	...	....	....	...	....	0,028	50	0,014
				Europäische Vereinigung für Tierproduktion	*	....	...	....	....	...	....	0,011	50	0,006
				Europäische Pflanzenschutzorganisation	*	....	...	....	....	...	....	0,020	50	0,010
				Internationale Kommission für Be- und Entwässerungen	*	....	...	....	....	...	....	0,002	50	0,001
				Summe UG 42...		3,195		1,598	3,195		1,598	3,061		1,531
1/43007	43	7800	090	ECE-EMEP-Konvention/Grenzüberschr. Luftverunrein.		0,040	100	0,040	0,040	100	0,040	....	...	....
		7817		*ECE-EMEP-Konvention/Grenzüberschreitende Luftverunreinigung ....*		....	...	....	....	...	....	0,035	100	0,035
1/43106	21	7800	091	Umweltfonds der Vereinten Nationen		0,400	30	0,120	0,400	30	0,120	....	...	....
		7810		*Umweltfonds der Vereinten Nationen ....*		....	...	....	....	...	....	0,400	30	0,120
1/43108	21	7800		RAMSAR - Abkommen	*	0,021	50	0,011	0,021	50	0,011	0,021	50	0,011
				Wetlands Interntional		0,022	50	0,011	0,022	50	0,011	0,022	50	0,011
				Summe UG 43...		0,483		0,182	0,483		0,182	0,478		0,177
				Summe Bereich 42...		3,678		1,780	3,678		1,780	3,539		1,708
				Summe Abschnitt a)...		**108,200**		**94,705**	**111,608**		**97,774**	**99,670**		**87,010**

Beilage T

B U N D E S V O R A N S C H L A G   2 0 1 2
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.	VA-Post Ugl	Bereich-Ausgaben Bezeichnung	Anm.	Bundesvoranschlag 2012 Insgesamt	hievon %	hievon Forschung	Bundesvoranschlag 2011 Insgesamt	hievon %	hievon Forschung	Erfolg 2010 Insgesamt	hievon %	hievon Forschung
				Bundesgesetzgebung:										
1/02106	43	7330	086	Nationalfonds für Opfer des Nationalsozialismus .		3,500	5	0,175	3,500	5	0,175	3,800	5	0,190
				Bundeskanzleramt:										
1/10008	43	7260		Mitgliedsbeiträge an Institutionen im Inland		0,462	50	0,231	0,460	50	0,230	0,009	50	0,005
		7270		Werkleistungen durch Dritte		16,787	4	0,671	9,962	4	0,398	0,821	4	0,033
		7280	*300*	*Werkverträge, Veranstaltungen, Veröffentl. - Raumplanung ....*		....	...	....	....	...	....	0,390	15	0,059
		7285		*Raumordnungskonferenz ....*		....	...	....	....	...	....	0,445	50	0,223
1/1010				Staatsarchiv und Archivamt		7,993	2	0,160	7,923	2	0,158	7,291	5	0,365
1/102				Bundesstatistik		50,393	1	0,504	50,393	1	0,504	51,771	1	0,518
				Summe Bereich 10...		75,635		1,566	68,738		1,290	60,727		1,203
				BM für Inneres:										
1/1172	42			Bundeskriminalamt	*	11,662	8	0,933	10,055	8	0,804	9,865	8	0,789
				BM für Justiz:										
1/13006	12	7667	002	Institut für Rechts- und Kriminalsoziologie		0,130	100	0,130	0,130	100	0,130	....	...	....
		7667		*Institut für Rechts- und Kriminalsoziologie .....*		....	...	....	....	...	....	0,098	100	0,098
				Summe Bereich 13...		0,130		0,130	0,130		0,130	0,098		0,098
				BM für Landesverteidigung und Sport:										
1/14108	41	4691		Versuche und Erprobungen auf kriegstechn. Gebiet		0,175	10	0,018	0,245	10	0,025	0,377	10	0,038
1/144	12			Heeresgeschichtl. Museum, Militärhistorisches Institut		6,271	41	2,571	5,923	41	2,428	5,859	41	2,402
				Summe Bereich 14...		6,446		2,589	6,168		2,453	6,236		2,440
				BM für Finanzen:										
1/15008	43	6430	001	Arbeiten des WIIW		1,004	50	0,502	0,966	50	0,483	....	...	....
		6430	002	Arbeiten des WSR		1,279	50	0,640	1,230	50	0,615	....	...	....
		6430	003	Arbeiten des Wifo		3,700	50	1,850	3,600	50	1,800	....	...	....
		6441		*Arbeiten des Wifo ....*		....	...	....	....	...	....	3,542	50	1,771
		6443		*Arbeiten des WIIW ....*		....	...	....	....	...	....	0,928	50	0,464
		6444		*Arbeiten des WSR ....*		....	...	....	....	...	....	1,169	50	0,585
1/15296	43	7661	002	Institut für Finanzwissenschaft und Steuerrecht .		0,012	50	0,006	0,012	50	0,006	....	...	....
		7662	002	Institut für höhere Studien und wiss. Forschung .		3,297	50	1,649	1,601	50	0,801	....	...	....
		7663	005	Forum Alpbach		0,053	50	0,027	0,051	50	0,026	....	...	....
		7661		*Institut für Finanzwissenschaft und Steuerrecht .*		....	...	....	....	...	....	0,015	50	0,008
		7662		*Institut für höhere Studien und wiss. Forschung .*		....	...	....	....	...	....	1,437	50	0,719
		7663		*Forum Alpbach ....*		....	...	....	....	...	....	0,044	50	0,022
				Summe UG 15...		9,345		4,674	7,460		3,731	7,135		3,569
1/.....				Forschungswirksamer Lohnnebenkostenanteil	*	29,793	100	29,793	29,473	100	29,473	27,868	100	27,868
				Summe Bereich 15...		39,138		34,467	36,933		33,204	35,003		31,437
				BM für Arbeit, Soziales und Konsumentenschutz:										
1/20118	22			Arbeitsmarktpolitische Maßnahmen gemäß AMFG und AMSG		0,430	100	0,430	0,250	100	0,250	0,250	100	0,250

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B U N D E S V O R A N S C H L A G 2 0 1 2
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 2012 Insgesamt	hievon %	hievon Forschung	Bundesvoranschlag 2011 Insgesamt	hievon %	hievon Forschung	Erfolg 2010 Insgesamt	hievon %	hievon Forschung
				(Fortsetzung)										
1/20118	*12*			*Arbeitsmarktpolitische Maßnahmen gemäß AMFG und AMSG*		....	...	....	....	...	....	0,124	100	0,124
				Summe UG 20...		0,430		0,430	0,250		0,250	0,374		0,374
1/21006	12	7669	900	Zuschüsse für lfd.Aufwand an private Institutionen		0,001	100	0,001	0,001	100	0,001	....	...	....
1/21008	43	7261	001	Mitgliedsb. an Forschungsinst. Orthopädie-Technik		0,184	100	0,184	0,184	100	0,184	....	...	....
		7262	001	Beitrag Europ. Zentrum Wohlfahrtspol.u.Sozialfor.		0,619	50	0,310	0,619	50	0,310	....	...	....
		7270		Werkleistungen durch Dritte		6,850	20	1,370	6,510	20	1,302	0,108	20	0,022
		7261		*Mitgliedsbeitr. an d.Forschungsinst. f. Orthopädie-Technik*		....	...	....	....	...	....	0,186	100	0,186
		7262		*Beitrag a.d. Europ. Zentrum f. Wohlfahrtspol. u. Sozialfor.*		....	...	....	....	...	....	0,618	50	0,309
		7280		*Sonstige Leistungen v. Gewerbetreib., Firmen u. jur. Pers.*		....	...	....	....	...	....	3,555	4	0,142
	12	*7276*		*Entgelte f. sonst. Leist. v. Einzelpers./Grundsatzforschung*		....	...	....	....	...	....	0,007	100	0,007
		7281	*900*	*Sonstige Leistungen von Gew.Firm. u. jur.Pers./F*		....	...	....	....	...	....	0,046	100	0,046
		7286		*S. Leist. v. Gew., Firm. u. jur. Pers./Grundsatzforschung*		....	...	....	....	...	....	0,946	100	0,946
1/21816	43	7660	900	Zuschüsse f. lfd. Aufwand an private Institutionen		2,250	2	0,045	2,247	2	0,045	2,228	2	0,045
1/21818	43	7270		Werkleistungen durch Dritte		1,087	16	0,174	0,987	16	0,158	0,001	16	0,000
		7280		*Sonstige Leistungen v. Gewerbetreib., Firmen u. jur. Pers.*		....	...	....	....	...	....	0,779	16	0,125
1/21828		7270		Werkleistungen durch Dritte		1,069	5	0,053	1,004	5	0,050	....	...	....
		7280		*Sonstige Leistungen v. Gewerbetreib., Firmen u. jur. Pers.*		....	...	....	....	...	....	0,592	5	0,030
				Summe UG 21...		12,060		2,137	11,552		2,050	9,066		1,858
				Summe Bereich 21...		12,490		2,567	11,802		2,300	9,440		2,232
				BM für Gesundheit:										
1/24000				Zentralleitung		0,567	100	0,567	0,567	100	0,567	0,567	100	0,567
1/24107	21	7420	012	Transferzahlungen, Ernährungsagentur (Ges.m.b.H)		51,270	4	2,051	32,704	4	1,308	....	...	....
		7420		*Laufende Transferzahlungen, Ernährungsagentur (Ges.m.b.H)*		....	...	....	....	...	....	32,703	4	1,308
1/24108	21	7270		Werkleistungen durch Dritte		0,599	4	0,024	0,999	4	0,040	....	...	....
		7420	012	Transferzahlungen, Ernährungsagentur (Ges.m.b.H)		0,001	100	0,001	0,001	100	0,001	....	...	....
		7280	*100*	*Leistungen der AGES/PharmMed*		....	...	....	....	...	....	2,700	4	0,108
		7420		*Transferzahlungen, Ernährungsagentur (Ges.m.b.H)*		....	...	....	....	...	....	10,352	4	0,414
1/24206	21	7660	900	Zuschüsse f. lfd. Aufwand an private Institutionen		4,655	6	0,279	4,709	6	0,283	4,998	6	0,300
1/24208	21	7270		Werkleistungen durch Dritte		3,967	2	0,079	10,362	2	0,207	0,100	6	0,006
		7280		*Vorsorgemedizin; Grundlagenermittlung*		....	...	....	....	...	....	1,206	6	0,072
1/24226	21	7660	900	Zuschüsse f. lfd. Aufwand an private Institutionen		1,956	10	0,196	1,956	10	0,196	1,918	10	0,192
1/24228	21	7270		Suchtgiftmißbrauch; Grundlagenermittlung		0,187	10	0,019	0,187	10	0,019	0,010	10	0,001
		7280		*Sonstige Leistungen v. Gewerbetreib., Firmen u. jur. Pers.*		....	...	....	....	...	....	0,012	10	0,001
1/24316				*Veterinärwesen*		....	...	....	....	...	....	0,432	1	0,004
1/24318				Veterinärwesen		5,260	7	0,368	5,400	7	0,378	4,704	10	0,470
1/24328				Lebensmittel- und Chemiekalienkontrolle		0,419	61	0,256	0,419	61	0,256	0,340	61	0,207
1/24336				Gentechnologie		0,005	20	0,001	0,005	20	0,001	0,005	20	0,001
1/24338				Gentechnologie		0,327	70	0,229	0,327	70	0,229	0,306	70	0,214
1/24348				Strahlenschutz		0,380	48	0,182	0,380	48	0,182	0,250	48	0,120
				Summe Bereich 24...		69,593		4,252	58,016		3,667	60,603		3,985
				BM für Unterricht, Kunst und Kultur:										
1/3000	43			Zentralleitung (Verwaltungsbereich Bildung)	*	3,898	100	3,898	3,898	100	3,898	3,872	100	3,872

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BUNDESVORANSCHLAG 2012
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.	VA-Post Ugl	Bereich-Ausgaben Bezeichnung	Anm.	Bundesvoranschlag 2012 Insgesamt	hievon %	hievon Forschung	Bundesvoranschlag 2011 Insgesamt	hievon %	hievon Forschung	Erfolg 2010 Insgesamt	hievon %	hievon Forschung
				(Fortsetzung)										
1/30006	43	7669	400	Bildm.d.EU (ESF-3 nat.A) (F&E-Offensivprogramm)		0,001	100	0,001	0,001	100	0,001	....	...	....
1/3011	13			Kulturangelegenheiten		201,137	16	32,182	192,333	16	30,773	....	...	....
1/3013				Kulturangelegenheiten (zweckgeb. Gebarung)		7,104	16	1,137	7,107	16	1,137	....	...	....
1/30207	11	7340	003	Basisabgeltung (BIFIE)		18,650	80	14,920	13,000	80	10,400	....	...	....
		7340		*Basisabgeltung (BIFIE)*		....	...	....	....	...	....	15,120	80	12,096
1/30208	11			Allgemein-pädagogische Erfordernisse		27,265	4	1,079	27,265	4	1,079	21,046	5	1,079
1/3080				Technische und gewerbliche Lehranstalten	*	557,589	0	0,073	536,727	0	0,073	546,719	0	0,073
1/3083	11			Technische und gewerbl. Lehranstalten (zweckgeb. Gebarung)	*	8,198	3	0,246	8,198	3	0,246	8,622	3	0,246
1/3090				Pädagogische Hochschulen		175,038	10	17,504	146,856	10	14,686	146,705	10	14,671
1/3095				Pädagogische Hochschulen (zweckgeb. Geb.)		0,308	10	0,031	0,308	10	0,031	1,148	10	0,115
				Summe UG 30...		999,188		71,071	935,693		62,324	743,232		32,152
1/3201				*Kulturangelegenheiten*		....	...	....	....	...	....	183,933	16	29,429
1/3204	*13*			*Kulturangelegenheiten (zweckgeb. Gebarung)*		....	...	....	....	...	....	4,801	16	0,768
				Summe UG 32...		....		....	....		....	188,734		30,197
				Summe Bereich 30...		999,188		71,071	935,693		62,324	931,966		62,349
1/40233	13	0635	457	Wien 1,Burgring 5, Kunsthist.Museum,Gen.San.(BT)		0,001	23	0,000	0,001	23	0,000	....	...	....
		0635	458	Wien 1, Burgring 7, Naturhist.Museum, Gen.San.(BT)		0,001	23	0,000	0,001	23	0,000	....	...	....
				Summe Bereich 30 einschl. Bauausgaben ...		999,190		71,071	935,695		62,324	931,966		62,349
				BM für Wissenschaft und Forschung:										
1/3100				Zentralleitung		31,598	30	9,479	30,470	30	9,141	31,282	30	9,385
1/31018	12	7024	110	Normmieten		4,980	53	2,639	4,479	53	2,374	4,293	53	2,275
		7024	111	Zuschlagsmieten		0,001	53	0,001	0,001	53	0,001	....	...	....
		7024	112	Mieterinvestitionen		1,650	53	0,875	0,080	53	0,042	....	...	....
		7024	113	Betriebskosten		0,464	53	0,246	0,440	53	0,233	0,444	53	0,235
1/3103				Universitäten; Träger öffentlichen Rechts		2.830,188	46	1.301,886	2.815,888	46	1.295,308	2.677,684	46	1.231,735
1/31038	12	7342	900	Transferzahl.a.Träger öffentl. Rechts (F&E-Mittel)		20,000	100	20,000	20,000	100	20,000	24,445	100	24,445
1/31048	12	7270	000	Werkleistungen durch Dritte		0,448	46	0,206	0,815	46	0,375	....	...	....
		7353	440	Klinischer Mehraufwand (Klinikbauten)		66,771	50	33,386	50,675	50	25,338	....	...	....
		7480	403	VOEST-Alpine Medizintechnik Ges.m.b.H. (VAMED)		0,001	50	0,001	2,600	50	1,300	....	...	....
		7280	*000*	*Externe Gutachten und Projekte*		....	...	....	....	...	....	0,103	46	0,047
		7353	*400*	*Klinischer Mehraufwand (Klinikbauten)*		....	...	....	....	...	....	31,852	50	15,926
		7480	*423*	*VOEST-Alpine Medizintechnik Ges.m.b.H. (VAMED)*		....	...	....	....	...	....	6,097	50	3,049
1/31108	12	7020		Sonstige Miet- und Pachtzinse		1,134	60	0,680	1,134	60	0,680	....	...	....
		7270	900	Werkleistungen durch Dritte		18,769	22	4,129	12,555	22	2,762	....	...	....
		7686	007	Vortragstätigkeit im Ausland		0,436	60	0,262	2,200	60	1,320	....	...	....
		7020	*001*	*Institut für angewandte Systemanalyse*		....	...	....	....	...	....	0,473	100	0,473
		7271	*001*	*Fulbright-Kommission*		....	...	....	....	...	....	0,254	60	0,152
		7279	*013*	*fForte Universitäten*		....	...	....	....	...	....	0,000	100	0,000
		7280	*013*	*fForte Universitäten*		....	...	....	....	...	....	2,523	100	2,523
		7684		*Studientätigkeit im Ausland*		....	...	....	....	...	....	2,710	60	1,626
		7686		*Vortragstätigkeit im Ausland*		....	...	....	....	...	....	1,970	60	1,182
		7689		*EU-Bildungsprogramme*		....	...	....	....	...	....	2,591	60	1,555
1/3111				Wissenschaftliche Einrichtungen		0,185	30	0,056	2,326	30	0,698	5,121	30	1,536
1/31126	12			Bibliothekarische Einrichtungen		0,001	30	0,000	0,081	30	0,024	0,162	30	0,049
1/3113				Forschungsvorhaben		1,040	100	1,040	1,050	100	1,050	3,241	100	3,241
1/31146	12			Wissenschaftliche Forschung		121,930	100	121,930	121,930	100	121,930	102,480	100	102,480
1/31148	12	7332	352	Fonds zur Förd. der wissenschaftlichen Forschung		9,000	100	9,000	9,000	100	9,000	19,750	100	19,750
1/3116	12			Forschungseinrichtungen		55,060	100	55,060	49,300	100	49,300	34,988	100	34,988
1/3117	12			Österr. Akademie der Wissenschaften und Forschungsinstitute		80,871	100	80,871	80,871	100	80,871	82,556	100	82,556
1/31186	12			Forschungsvorhaben in internationaler Kooperation		5,539	100	5,539	3,539	100	3,539	8,451	100	8,451
1/31188	12	7260		Mitgliedsbeiträge an Institutionen im Inland		0,001	100	0,001	0,001	100	0,001	0,002	100	0,002
		7270		Werkleistungen durch Dritte		2,855	100	2,855	1,201	100	1,201	....	...	....
		7270	031	Med Austron		7,800	100	7,800	15,000	100	15,000	....	...	....
		7271		*IIASA-Stipendien*		....	...	....	....	...	....	0,001	100	0,001
		7274		*Verpflichtungen aus WTZA*		....	...	....	....	...	....	0,850	100	0,850

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B U N D E S V O R A N S C H L A G   2 0 1 2
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 2012 Insgesamt	hievon %	hievon Forschung	Bundesvoranschlag 2011 Insgesamt	hievon %	hievon Forschung	Erfolg 2010 Insgesamt	hievon %	hievon Forschung
				(Fortsetzung)										
1/31188	*12*	*7279*		*Entgelte für sonstige Leistungen von Einzelpersonen*		....	...	....	....	...	....	0,495	100	0,495
		7280	*001*	*Leistungen v. Gewerbetreibenden, Firmen und jur. Personen*		....	...	....	....	...	....	14,926	100	14,926
		7280	*002*	*Entgelte an universitäre Einrichtungen*		....	...	....	....	...	....	2,832	100	2,832
		7280	*003*	*Med Austron*		....	...	....	....	...	....	2,730	100	2,730
		7281		*Internationale Forschungskooperation*		....	...	....	....	...	....	0,083	100	0,083
		7282		*Vorträge, Seminare, Tagungen (Unt.)*		....	...	....	....	...	....	0,263	100	0,263
		7665		*Stiftung Dokumentationsarchiv*		....	...	....	....	...	....	0,334	100	0,334
		7681		*START-Wittgenstein-Programme*		....	...	....	....	...	....	8,945	100	8,945
1/3123				Bibliotheken		2,122	53	1,125	2,122	53	1,125	2,114	53	1,120
1/3124				Wissenschaftliche Anstalten		35,231	53	18,672	34,481	53	18,275	32,041	53	16,982
1/3125				Wissenschaftliche Anstalten (zweckgebundene Gebarung)		0,028	53	0,015	0,028	53	0,015	0,594	53	0,315
1/31606	12			Fachhochschulen, Förderungen		238,744	13	31,037	234,433	13	30,476	218,147	13	28,359
				Summe Bereich 31...		3.536,847		1.708,791	3.496,700		1.691,379	3.327,827		1.625,896
				BM für Wirtschaft, Jugend und Familie:										
1/25118	22	7270		Werkleistungen durch Dritte		0,930	20	0,186	0,997	20	0,199	....	...	....
		7270	*002*	*Entgelte für Leistungen von Einzelpersonen*		....	...	....	....	...	....	0,017	20	0,003
		7280	*002*	*Entgelte an Unternehmungen und jur. Personen*		....	...	....	....	...	....	1,179	10	0,118
1/25386	22	7664	007	Forschungsförderung gem. § 39i FLAG 1967		0,250	100	0,250	0,250	100	0,250	....	...	....
		7664		*Forschungsförderung gem. § 39i FLAG 1967*		....	...	....	....	...	....	0,105	100	0,105
1/25387	22	7420	013	Familie und Beruf Management GesmbH.		2,140	33	0,706	2,140	33	0,706	....	...	....
		7420		*Familie und Beruf Management GesmbH.*		....	...	....	....	...	....	2,140	33	0,706
1/25388	22	7270		Werkleistungen durch Dritte		1,016	39	0,396	1,016	39	0,396	0,079	39	0,031
		7280		*Entgelte an Unternehmungen und jur. Personen*		....	...	....	....	...	....	0,719	39	0,280
1/25418	11	7270		Werkleistungen durch Dritte		1,440	10	0,144	1,473	10	0,147	0,133	10	0,013
		7280		*Sonstige Leistungen v. Gewerbetreib., Firmen u. jur. Pers.*		....	...	....	....	...	....	1,295	5	0,065
				Summe UG 25...		5,776		1,682	5,876		1,698	5,667		1,321
1/3317				Technologie- und Forschungsförderung		100,800	100	100,800	96,900	100	96,900	91,934	100	91,934
1/4009				Bundesamt für Eich- und Vermessungswesen	*	86,083	0	0,200	81,782	0	0,200	85,353	0	0,200
1/40156	36	7660	900	Zuschüsse f. lfd. Aufwand an private Institutionen		0,992	10	0,099	1,086	10	0,109	2,947	10	0,295
1/40158	36	7270		Werkleistungen durch Dritte		8,278	50	4,139	7,279	50	3,640	0,149	50	0,075
		7280	*100*	*Werkleistungen von gewerbl. Betrieben, Firmen u. jur. Pers.*		....	...	....	....	...	....	4,546	50	2,273
		7282		*Werkleistungen von Betrieben, Firmen u. jur. Pers. (TV)*		....	...	....	....	...	....	0,004	100	0,004
1/4016				Klima- und Energiefonds		0,001	33	0,000	0,001	33	0,000	21,155	33	6,981
				Summe UG 40...		95,354		4,438	90,148		3,949	114,154		9,828
				Summe Bereich 40...		201,930		106,920	192,924		102,547	211,755		103,083
				BM für Verkehr, Innovation und Technologie:										
1/34133	12	0806	122	Forschungsförderungs GmbH		0,001	100	0,001	0,001	100	0,001	....	...	....
		0806	123	Austria Wirtschaftsservice GmbH		0,001	100	0,001	0,001	100	0,001	....	...	....
1/34338	12	4000		Geringwertige Wirtschaftsgüter		0,001	100	0,001	0,001	100	0,001	....	...	....
		4110		Handelswaren zur unentgeltlichen Abgabe		0,081	100	0,081	0,080	100	0,080	....	...	....
		4570		Druckwerke		0,006	100	0,006	0,006	100	0,006	0,013	100	0,013
		5710		Freie Dienstverträge Z		0,001	100	0,001	0,001	100	0,001	....	...	....
		5710	830	DGB/Freie Dienstverträge Z		0,001	100	0,001	0,001	100	0,001	....	...	....
		5710	870	DGB - Mitarbeitervorsorgek. (Fr. Dienstverträge) Z		0,001	100	0,001	0,001	100	0,001	....	...	....
		6210		Sonstige Transporte		0,002	100	0,002	0,002	100	0,002	....	...	....
		6300		Leistungen der Post		0,001	100	0,001	0,001	100	0,001	....	...	....
		7020		Sonstige Miet- und Pachtzinse		0,035	100	0,035	0,034	100	0,034	0,026	100	0,026
		7232		Repräsentationsausgaben		0,020	100	0,020	0,020	100	0,020	0,004	100	0,004

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B U N D E S V O R A N S C H L A G 2 0 1 2
Forschungswirksame Ausgaben des Bundes (*)
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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 2012 Insgesamt	hievon %	hievon Forschung	Bundesvoranschlag 2011 Insgesamt	hievon %	hievon Forschung	Erfolg 2010 Insgesamt	hievon %	hievon Forschung
				(Fortsetzung)										
1/34338	12	7260		Mitgliedsbeiträge an Institutionen im Inland		0,020	100	0,020	0,020	100	0,020	0,003	100	0,003
		7270		Werkleistungen durch Dritte		7,341	100	7,341	5,791	100	5,791	...	...	...
		7273		Rat für Forschung und Technologieentwicklung		1,800	100	1,800	1,712	100	1,712	...	...	...
		7420	016	Lfd. Transferzahlungen a. Untern. m. Bundesbet.		0,000	100	0,000	0,001	100	0,001	...	...	...
		4036		*Handelswaren zur unentgeltlichen Abgabe (Druckwerke)*		...	...	...	...	...	...	0,026	100	0,026
		7279		*Entgelte für sonstige Leistungen von Einzelpersonen*		...	...	...	...	...	...	0,102	100	0,102
		7280		*Sonstige Leistungen v. Gewerbetreib., Firmen u. jur. Pers.*		...	...	...	...	...	...	3,386	100	3,386
		7280	*001*	*Technologieschwerpunkte (Unternehmungen)*		...	...	...	...	...	...	0,141	100	0,141
		7280	*002*	*Forschungsschwerpunkte (Unternehmungen)*		...	...	...	...	...	...	0,285	100	0,285
		7280	*003*	*Entgelte an universitäre Einrichtungen*		...	...	...	...	...	...	0,035	100	0,035
		7282		*Vorträge, Seminare und Tagungen (Unternehmungen)*		...	...	...	...	...	...	0,005	100	0,005
		7283		*Rat für Forschung und Technologieentwicklung*		...	...	...	...	...	...	1,779	100	1,779
1/34346	12	7330	661	ERP-Fonds (F&E-Offensive)		0,001	100	0,001	0,054	100	0,054	...	...	...
		7420	900	Zahlungen an Untern. m. Bundesbet. (F&E-Offensive)		0,400	100	0,400	0,150	100	0,150	0,408	100	0,408
		7430	900	Forschung und Entwicklung (F&E-Offensive)		0,992	100	0,992	0,992	100	0,992	...	...	...
		7432	900	Lfd.Transfz.a.d.übr.Sektoren d. Wirtsch. (F&E Off.)		1,957	100	1,957	2,654	100	2,654	0,179	100	0,179
		7680	900	Sonst.Zuw. ohne Gegenleistung an physische Pers.		0,150	100	0,150	0,150	100	0,150	0,380	100	0,380
1/34348	12	7280	900	Werkleistungen (durch Dritte)(F&E Offensive)		4,000	100	4,000	4,100	100	4,100	3,721	100	3,721
		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)		1,998	100	1,998	2,898	100	2,898	...	...	...
		7430	900	Forschung und Entwicklung (F&E-Offensive)		0,001	100	0,001	0,001	100	0,001	...	...	...
		7279	*900*	*Rat f. Forsch. u. Technologieentw.(F&E-Offensive)*		...	...	...	...	...	...	0,054	100	0,054
		7280	*001*	*Sonst. Leist. v. Gewerbetreib.u.jur.Pers. (Technologiemill.)*		...	...	...	...	...	...	0,021	100	0,021
1/34376	12	7480	001	Forschungsschwerpunkte (Unternehmungen)		2,000	100	2,000	2,700	100	2,700	0,072	100	0,072
		7480	002	Technologieschwerpunkte (Unternehmungen)		5,500	100	5,500	5,658	100	5,658	...	...	...
		7480		*Technologieschwerpunkte (Unternehmungen)*		...	...	...	...	...	...	3,070	100	3,070
1/34378	12	7270		Werkleistungen durch Dritte		0,500	100	0,500	0,382	100	0,382	...	...	...
		7280		*Technologieschwerpunkte (Unternehmungen)*		...	...	...	...	...	...	0,406	100	0,406
1/34416	12	7425	010	AWS		0,001	100	0,001	0,001	100	0,001	...	...	...
		7425	012	AWS - Programmabwicklung		0,001	100	0,001	0,001	100	0,001	...	...	...
		7425		*AWS*		...	...	...	...	...	...	...	...	...
		7425	*002*	*AWS - Programmabwicklung*		...	...	...	...	...	...	...	...	...
1/34418	12	7425	010	AWS		0,001	100	0,001	0,001	100	0,001	...	...	...
		7425	011	AWS - Administrative Kosten		0,001	100	0,001	0,001	100	0,001	...	...	...
		7425	012	AWS - Programmabwicklung		0,001	100	0,001	0,001	100	0,001	...	...	...
1/3442	12			Technologie- u. Forschungsförderung (wissenschaftl.)/FWF		7,800	100	7,800	9,200	100	9,200	1,481	100	1,481
1/34456	12	7422	004	AIT-Austrian Institute of Technology		0,001	100	0,001	0,001	100	0,001	...	...	...
1/34458	12	7420	016	Lfd.Transferzahl.a.Untern.m.Bundesbet. (Techn.mill)		0,001	100	0,001	0,001	100	0,001	...	...	...
		7422	004	AIT-Austrian Institute of Technology		46,457	90	41,811	46,658	90	41,992	...	...	...
		7422	005	Nukleare Dienste (NES)		8,000	30	2,400	7,729	30	2,319	...	...	...
		7421		*Nukleare Dienste (NES)*		...	...	...	...	...	...	7,460	79	5,893
		7422	*000*	*AIT - laufende Transferzahlungen*		...	...	...	...	...	...	49,080	90	44,172
1/34486	12	7425	020	Forschungsförderungs GmbH		0,001	100	0,001	0,001	100	0,001	...	...	...
		7425	900	FFG - Programmabwicklung (F&E)		108,499	100	108,499	96,999	100	96,999	86,404	100	86,404
1/34488	12	7425	020	Forschungsförderungs GmbH		86,000	100	86,000	83,000	100	83,000	...	...	...
		7425	021	Leistungen der FFG (F&E)		0,001	100	0,001	0,001	100	0,001	...	...	...
		7425	022	FFG - Administrative Kosten		12,500	100	12,500	12,400	100	12,400	...	...	...
		7425	900	FFG - Programmabwicklung (F&E)		19,750	100	19,750	19,020	100	19,020	11,984	100	11,984
		7280	*005*	*Sonstige Leistungen der FFG*		...	...	...	...	...	...	2,179	80	1,743
		7425		*Leistungen des Bundes an die FFG*		...	...	...	...	...	...	94,851	100	94,851
		7425	*002*	*FFG - Administrative Kosten*		...	...	...	...	...	...	11,110	85	9,444
1/3449				Sontige Forschungsunternehmen		6,636	100	6,636	6,436	100	6,436	5,705	100	5,705
				Summe UG 34...		322,463		312,217	308,864		298,788	284,370		275,793
1/41118	33	7270		Werkleistungen durch Dritte		1,603	100	1,603	1,557	100	1,557	0,178	100	0,178
		7270	116	Spezifische Luftfahrtangelegenheiten		0,180	100	0,180	0,150	100	0,150	...	...	...
		7270	117	Wasserstrassenspezifische Angelegenheiten		0,120	100	0,120	0,127	100	0,127	...	...	...
		7270	118	Eisenbahnspezifische Angelegenheiten		0,340	100	0,340	0,671	100	0,671	...	...	...

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				(Fortsetzung)										
1/41118	33	7270	800	Elektromobilität		0,070	100	0,070	0,070	100	0,070	....	...	....
		7280	*300*	*Sonstige Verkehrsprojekte*		....	...	....	....	...	....	1,188	100	1,188
		7280	*500*	*Grundlagenuntersuchungen - Schiene*		....	...	....	....	...	....	0,017	100	0,017
		7280	*502*	*Sonstige Leistungen am Eisenbahnsektor*		....	...	....	....	...	....	0,229	35	0,080
1/41246	12	7660		Zuschüsse f. lfd. Aufwand an private Institutionen		0,145	95	0,138	0,100	95	0,095	0,154	95	0,146
	33	7480	501	Progr.Kombinierter Güterverk.Straße-Schiene-Schiff		7,950	50	3,975	2,926	50	1,463	2,422	50	1,211
1/41248	33	7270		Werkleistungen durch Dritte		0,436	80	0,349	0,170	80	0,136	....	...	....
		7280		*Sonstige Leistungen v. Gewerbetreib., Firmen u. jur. Pers.*		....	...	....	....	...	....	0,093	80	0,074
1/41256	12	7489	002	Breitbandinitiative		3,520	50	1,760	0,001	50	0,001	....	...	....
		7660		Zuschüsse f. lfd. Aufwand an private Institutionen		2,011	95	1,910	0,398	95	0,378	0,167	95	0,159
		7489		*Breitbandinitiative*		....	...	....	....	...	....	2,431	50	1,216
	36	7420	020	Kärnt. Betriebsansied.- u. Beteiligungs GmbH BABEG		0,001	50	0,001	0,001	50	0,001	....	...	....
		7480	810	IWP Gmünd/Ceske Velenice (sonst.Anlagen)		0,150	80	0,120	0,150	80	0,120	....	...	....
		7480	*800*	*IWP Gmünd/Ceske Velenice (sonst.Anlagen)*		....	...	....	....	...	....	0,028	80	0,022
1/41258	12	7270		Werkleistungen durch Dritte		0,488	80	0,390	0,295	80	0,236	....	...	....
		7280	*006*	*Sonstige Leistungen für IKT (jur. Personen)*		....	...	....	....	...	....	0,059	80	0,047
		7489		*Breitbandinitiative (admin. Aufwand)*		....	...	....	....	...	....	0,645	50	0,323
	36	5710	000	Freie Dienstverträge Z		0,001	80	0,001	0,001	80	0,001	....	...	....
		5710	830	DGB/Freie Dienstverträge Z		0,001	80	0,001	0,001	80	0,001	....	...	....
		7420		Lfd. Transfers an Unternehm. m. Bundesbeteiligung		0,146	80	0,117	0,146	80	0,117	....	...	....
		7489	001	Breitbandinitiative (admin. Aufwand)		0,001	50	0,001	0,001	50	0,001	....	...	....
		7280		*Werkverträge, Studien, Untersuchungen (jur. Personen)*		....	...	....	....	...	....	0,050	80	0,040
1/4127				Klima- und Energiefonds		91,486	39	35,680	72,776	39	28,383	28,070	33	9,263
1/4167	12			Straßenforschung		0,004	100	0,004	0,005	100	0,005	0,217	100	0,217
1/41708	32	7270		Werkleistungen durch Dritte		0,854	5	0,043	0,914	5	0,046	0,043	5	0,002
		7280		*Sonstige Leistungen v. Gewerbetreib., Firmen u. jur. Pers.*		....	...	....	....	...	....	1,584	5	0,079
				Summe UG 41...		109,507		46,803	80,460		33,559	37,575		14,262
				Summe Bereich 41...		431,970		359,020	389,324		332,347	321,945		290,055
				BM für Land- u.Forstwirtschaft,Umwelt u.Wasserwirtschaft:										
1/42000	43			Zentralleitung		0,765	100	0,765	0,616	100	0,616	0,720	100	0,720
1/42027		7420	012	Transferzahlungen, Ernährungsagentur (Ges.m.b.H)		21,802	4	0,872	21,802	4	0,872	....	...	....
		7422	003	Transfer a.d.Bundesforsch.u.Ausbildungsz. für Wald		15,500	62	9,610	15,500	62	9,610	....	...	....
		7421		*Transfer an die Ernährungsagentur GmbH*		....	...	....	....	...	....	21,802	4	0,872
		7422		*Transfer a.d.Bundesforsch.u.Ausbildungsz. für Wald*		....	...	....	....	...	....	15,500	62	9,610
1/42028		7420	012	Transferzahlungen, Ernährungsagentur (Ges.m.b.H)		0,001	4	0,000	0,001	4	0,000	....	...	....
		7420		*Laufende Transferz.a.d. österr. Ernährungsagentur GmbH*		....	...	....	....	...	....	9,302	4	0,372
1/42038		7270		Werkleistungen durch Dritte		6,199	30	1,860	4,325	30	1,298	....	...	....
	34	*7280*	*035*	*Wasserw.Planungen u.Untersuchungen, Entg.an Unternehm.*		....	...	....	....	...	....	0,907	30	0,272
		7280	*040*	*Wasserw. Unterlagen; Entgelte an Unternehmungen*		....	...	....	....	...	....	0,026	30	0,008
		7280	*900*	*Agrarische Maßnahmen*		....	...	....	....	...	....	5,463	21	1,147
1/42056	34	7660		Zuschüsse f. lfd. Aufwand an private Institutionen		0,030	50	0,015	0,030	50	0,015	....	...	....
		7660	*009*	*Sonstige Ausgaben, Institut.*		....	...	....	....	...	....	0,027	50	0,014
1/42176	12			Forschungs- und Versuchswesen		0,021	100	0,021	0,064	100	0,064	0,041	100	0,041
1/42178	12			Forschungs- und Versuchswesen		2,500	100	2,500	2,489	100	2,489	3,456	100	3,456
1/4250	11			HBLA und Bundesamt für Wein- und Obstbau	*	8,142	46	3,745	8,142	46	3,745	8,403	46	3,865
				HBLA für Gartenbau	*	5,898	10	0,590	5,898	10	0,590	7,023	10	0,702
				Höhere Bundeslehr- u. Forschungsanstalt für Landwirtschaft		15,147	50	7,574	15,147	50	7,574	14,327	50	7,164
				Höh.Bundeslehr-u. Forschungsanst.f. Landw., Landt.u.Lebensm.		14,379	25	3,595	14,379	25	3,595	13,369	25	3,342

Beilage T

B U N D E S V O R A N S C H L A G 2 0 1 2
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.	VA-Post Ugl	Bereich-Ausgaben Bezeichnung	Anm.	Bundesvoranschlag 2012 Insgesamt	hievon %	hievon Forschung	Bundesvoranschlag 2011 Insgesamt	hievon %	hievon Forschung	Erfolg 2010 Insgesamt	hievon %	hievon Forschung
				(Fortsetzung)										
1/4254	12			Bundesanstalt für Agrarwirtschaft		1,550	60	0,930	1,641	60	0,985	1,890	60	1,134
1/4255				Bundesanstalt für alpenländische Milchwirtschaft		2,951	1	0,030	3,106	1	0,031	4,578	1	0,046
1/4256	12			Bundesanstalt für Bergbauernfragen		0,884	55	0,486	0,936	55	0,515	1,073	55	0,590
1/4257				Bundesamt für Weinbau		3,317	14	0,464	3,508	14	0,491	4,345	14	0,608
1/4258	12			Bundesamt für Wasserwirtschaft		4,037	22	0,888	5,101	22	1,122	6,007	22	1,322
1/4261				Hochschule für Agrar- und Umweltpädagogik		3,643	3	0,109	2,767	3	0,083	2,801	3	0,084
1/42726	34	7700	001	Erheb.,Projekt.u.Betr.in Wäldern m.Schutz.,Invest.		0,001	10	0,000	0,001	10	0,000	....	...	....
		7700	004	Forstl. Maßnahmen, Egata/Vergaltschlawine, Invest.		0,001	10	0,000	0,001	10	0,000	0,007	10	0,001
1/42728	34	7270		Werkleistungen durch Dritte		3,498	30	1,049	3,498	30	1,049	0,114	30	0,034
		7280		*Entgelte für sonstige Leistungen von Unternehmungen ....*		....	...	....	....	...	....	3,066	30	0,920
				Summe UG 42...		110,266		35,103	108,952		34,744	124,247		36,324
1/43007	21	7420	021	Transferzahlungen an die UBA Ges.m.b.H		15,356	5	0,768	15,356	5	0,768	....	...	....
		7420		*Transferzahlungen an die UBA Ges.m.b.H ....*		....	...	....	....	...	....	15,356	5	0,768
1/4310	21			Umweltpolitische Maßnahmen		33,529	25	8,382	24,867	25	6,217	35,250	25	8,813
1/43126	21	7700	500	Investitionszuschüsse		25,850	1	0,228	17,271	1	0,228	25,060	1	0,228
1/43136	37	7700	251	Investitionsförderungen		346,331	1	3,463	338,060	1	3,381	....	...	....
		7700	*201*	*Investitionsförderungen ....*		....	...	....	....	...	....	320,447	1	3,204
1/43146	37	7700	500	Investitionszuschüsse		84,020	1	0,840	82,721	1	0,827	81,120	1	0,811
1/43158	21			Strahlenschutz		23,402	8	1,872	15,552	8	1,244	10,507	8	0,841
1/4317				Klima- und Energiefonds		84,038	39	32,775	75,001	39	29,250	22,905	33	7,559
1/4319				Forschungs- und Versuchsvorhaben		1,001	100	1,001	1,001	100	1,001	0,671	100	0,671
				Summe UG 43...		613,527		49,329	569,829		42,916	511,316		22,895
				Summe Bereich 42...		723,793		84,432	678,781		77,660	635,563		59,219
				Summe Abschnitt b)...		**6.112,324**		**2.376,913**	**5.888,766**		**2.310,280**	**5.614,828**		**2.182,976**
				Gesamtsumme...		**6.220,524**		**2.471,618**	**6.000,374**		**2.408,054**	**5.714,498**		**2.269,986**

Beilage T/Anhang

B U N D E S V O R A N S C H L A G 2 0 1 2
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
1/1172	42			Forschungsanteil: Pauschalbetrag
1/3000	43			Forschungsanteil: Pauschalbetrag
1/3080				Forschungsanteil: Pauschalbetrag.
1/3083	11			Forschungsanteil: Pauschalbetrag
1/4009				Forschungsanteil: Pauschalbetrag.
1/41007	43	7800		Teilbetrag der VA-Post.
		7800	200	Teilbetrag des VA-Kontos. Teilbetrag des VA-Kontos. Teilbetrag des VA-Kontos.
1/41008	43	7800		Teilbetrag der VA-Post.
		7800	200	Teilbetrag der VA-Post Teilbetrag des VA-Kontos.
1/42008	43	7800		Teilbetrag der VA-Post.
		7800	100	Teilbetrag des VA-Kontos. Teilbetrag des VA-Kontos. Teilbetrag des VA-Kontos.
1/4250	11			Von den übrigen landwirtschaftlichen Bundeslehranstalten werden Forschungs- und Versuchsaufgaben derzeit nicht durchgeführt.
1/43108	21	7800		Teilbetrag der VA-Post.
1/.....				F&E-Anteil an den Lohnnebenkosten der in Forschungseinrichtungen tätigen Bundesbeamten. Imputation nach OECD-Richtlinien.

Table 5: Federal expenditure in 1995 to 2012 on research and research promotion by socio-economic objectives Breakdown of Annex T of the Auxiliary Document for the Federal Finances Act (Parts a and b)

Reporting years		Total federal expenditure on R&D	of which												
			Funding of research of earth, oceans, atmosphere and space	Funding of agriculture and forestry	Funding of trade, commerce and industry	Funding of energy production, storage and distribution	Funding of transport, traffic and communications	Funding of education	Funding of health care	Funding of social and socio-economic development	Funding of environmental protection	Funding of urban and physical planning	Funding of national defence	Funding of other objectives	Funding of general knowledge advancement
1995[1)]	in € '000	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[2)]	in € '000	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[3)]	in € '000	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[4)]	in € '000	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[5)]	in € '000	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[6)]	in € '000	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[7)]	in € '000	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[8)]	in € '000	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[9)]	in € '000	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[10)]	in € '000	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[11)]	in € '000	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[12)]	in € '000	1,697,550	76,887	57,698	411,462	20,951	42,795	18,997	379,776	81,812	53,279	9,602	126	-	544,165
	in %	*100.0*	*4.5*	*3.4*	*24.2*	*1.2*	*2.5*	*1.1*	*22.4*	*4.8*	*3.1*	*0.6*	*0.0*	-	*32.2*
2007[13)]	in € '000	1,770,144	80,962	64,637	435,799	28,001	40,013	19,990	373,431	90,639	56,075	9,673	27	894	570,003
	in %	*100.0*	*4.6*	*3.7*	*24.6*	*1.6*	*2.3*	*1.1*	*21.1*	*5.1*	*3.2*	*0.5*	*0.0*	*0.1*	*32.1*
2008[14)]	in € '000	1,986,775	87,751	66,273	525,573	24,655	39,990	37,636	422,617	90,879	57,535	12,279	142	-	621,445
	in %	*100.0*	*4.4*	*3.3*	*26.5*	*1.2*	*2.0*	*1.9*	*21.3*	*4.6*	*2.9*	*0.6*	*0.0*	-	*31.3*
2009[15)]	in € '000	2,149,787	104,775	66,647	538,539	32,964	47,300	42,581	456,544	97,076	67,985	14,522	133	-	680,721
	in %	*100.0*	*4.9*	*3.1*	*25.1*	*1.5*	*2.2*	*2.0*	*21.2*	*4.5*	*3.2*	*0.7*	*0.0*	-	*31.6*
2010[16)]	in € '000	2,269,986	103,791	67,621	587,124	39,977	56,969	50,648	472,455	99,798	67,114	12,792	123	-	711,574
	in %	*100.0*	*4.6*	*3.0*	*25.9*	*1.8*	*2.5*	*2.2*	*20.8*	*4.4*	*3.0*	*0.6*	*0.0*	-	*31.2*
2011[17)]	in € '000	2,408,054	112,722	67,018	634,251	48,010	60,603	49,999	509,727	102,432	85,749	13,512	116	-	723,915
	in %	*100.0*	*4.7*	*2.8*	*26.2*	*2.0*	*2.5*	*2.1*	*21.2*	*4.3*	*3.6*	*0.6*	*0.0*	-	*30.0*
2012[17)]	in € '000	2,471,618	114,038	67,317	653,379	55,568	64,937	57,485	512,535	103,635	93,230	13,847	111	-	735,536
	in %	*100.0*	*4.6*	*2.7*	*26.4*	*2.2*	*2.6*	*2.3*	*20.7*	*4.2*	*3.8*	*0.6*	*0.0*	-	*29.9*

Status: April 2012 Source: Statistics Austria (Bundesanstalt Statistik Österreich)

1) Annex T of the Auxiliary Document for the Federal Finances Act 1997, outlays. - 2) Annex T of the Auxiliary Document for the Federal Finances Act 1998, outlays. - 3) Annex T of the Auxiliary Document for the Federal Finances Act 1999, outlays. - 4) Annex T of the Auxiliary Document for the Federal Finances Act 2000, outlays. Revised data. - 5) Annex T of the Auxiliary Document for the Federal Finances Act 2001, outlays. Revised data. - 6) Annex T of the Auxiliary Document for the Federal Finances Act 2002, outlays. - 7) Annex T of the Auxiliary Document for the Federal Finances Act 2003, outlays. - 8) Annex T of the Auxiliary Document for the Federal Finances Act 2004, outlays. - 9) Annex T of the Auxiliary Document for the Federal Finances Act 2005, outlays. - 10) Annex T of the Auxiliary Document for the Federal Finances Act 2006, outlays. Revised data. - 11) Annex T of the Auxiliary Document for the Federal Finances Act 2007, outlays. - 12) Annex T of the Auxiliary Document for the Federal Finances Act 2008, outlays. Revised data. - 13) Annex T of the Auxiliary Document for the Federal Finances Act 2009, outlays. - 14) Annex T of the Auxiliary Document for the Federal Finances Act 2010, outlays. - 15) Annex T of the Auxiliary Document for the Federal Finances Act 2011, outlays. - 16) Annex T of the Auxiliary Document for the Federal Finances Act 2012, outlays. - 17) Annex T of the Auxiliary Document for the Federal Finances Act 2012, budgeted figures.
Rounding differences.

Table 6: Federal expenditure in 2010 for research and research promotion by socioeconomic objectives and ministries Breakdown of annual values for 2010[1] from Annex T of the Auxiliary Document for the Federal Finances Act 2012 (Part a and Part b)

Ministries		Total federal expenditure on R&D	of which: Funding for research of earth, oceans, atmosphere and space	Funding of agriculture and forestry	Funding of trade, commerce and industry	Funding of energy production, storage and distribution	Funding of transport, traffic and communications	Funding of education	Funding of health care	Funding of social and socio-economic development	Funding of environmental protection	Funding of urban and physical planning	Funding of national defence	Funding of other objectives	Funding of general knowledge advancement
BKA[2]	in € '000	1,973	-	-	-	46	-	-	-	1,238	-	320	-	-	369
	in %	*100.0*	-	-	-	*2.3*	-	-	-	*62.8*	-	*16.2*	-	-	*18.7*
BMI	in € '000	789	-	-	-	-	-	-	-	789	-	-	-	-	-
	in %	*100.0*	-	-	-	-	-	-	-	*100.0*	-	-	-	-	-
BMUKK	in € '000	62,380	2,207	-	319	-	-	27,992	-	7,095	-	-	-	-	24,767
	in %	*100.0*	*3.5*	-	*0.5*	-	-	*44.9*	-	*11.4*	-	-	-	-	*39.7*
BMWF	in € '000	1,652,719	78,142	28,247	304,884	13,296	26,625	22,089	413,892	77,252	26,625	10,525	85	-	651,057
	in %	*100.0*	*4.7*	*1.7*	*18.4*	*0.8*	*1.6*	*1.3*	*25.1*	*4.7*	*1.6*	*0.6*	*0.0*	-	*39.5*
BMASK	in € '000	2,232	-	-	-	-	-	-	186	2,046	-	-	-	-	-
	in %	*100.0*	-	-	-	-	-	-	*8.3*	*91.7*	-	-	-	-	-
BMG	in € '000	4,959	-	63	-	-	-	-	4,420	2	-	-	-	-	474
	in %	*100.0*	-	*1.3*	-	-	-	-	*89.1*	*0.0*	-	-	-	-	*9.6*
BMEIA	in € '000	2,147	-	-	-	1,066	-	-	-	1,081	-	-	-	-	-
	in %	*100.0*	-	-	-	*49.7*	-	-	-	*50.3*	-	-	-	-	-
BMJ	in € '000	98	-	-	-	-	-	-	-	98	-	-	-	-	-
	in %	*100.0*	-	-	-	-	-	-	-	*100.0*	-	-	-	-	-
BMLVS	in € '000	2,440	-	-	-	-	-	-	-	-	-	-	38	-	2,402
	in %	*100.0*	-	-	-	-	-	-	-	-	-	-	*1.6*	-	*98.4*
BMF	in € '000	31,437	1,059	752	5,991	279	557	474	7,078	4,600	557	223	-	-	9,867
	in %	*100.0*	*3.4*	*2.4*	*19.1*	*0.9*	*1.8*	*1.5*	*22.5*	*14.6*	*1.8*	*0.7*	-	-	*31.3*
BMLFUW	in € '000	60,927	500	35,076	-	-	-	84	-	1,500	23,450	-	-	-	317
	in %	*100.0*	*0.8*	*57.6*	-	-	-	*0.1*	-	*2.5*	*38.5*	-	-	-	*0.5*
BMWFJ	in € '000	103,200	-	-	94,889	6,981	-	-	-	1,321	-	-	-	-	9
	in %	*100.0*	-	-	*91.9*	*6.8*	-	-	-	*1.3*	-	-	-	-	*0.0*
BMVIT	in € '000	344,685	21,883	3,483	181,041	18,309	29,787	9	46,879	2,776	16,482	1,724	-	-	22,312
	in %	*100.0*	*6.3*	*1.0*	*52.6*	*5.3*	*8.6*	*0.0*	*13.6*	*0.8*	*4.8*	*0.5*	-	-	*6.5*
Total	**in € '000**	**2,269,986**	**103,791**	**67,621**	**587,124**	**39,977**	**56,969**	**50,648**	**472,455**	**99,798**	**67,114**	**12,792**	**123**	**-**	**711,574**
	in %	***100.0***	***4.6***	***3.0***	***25.9***	***1.8***	***2.5***	***2.2***	***20.8***	***4.4***	***3.0***	***0.6***	***0.0***	**-**	***31.2***

Status: April 2012 Source: Statistics Austria

1) Outlays.

2) Including the highest executive bodies.

Table 7: Federal expenditure in 2011 for research and research promotion by socioeconomic objectives and ministries Breakdown of annual values for 2011[1] from Annex T of the Auxiliary Document for the Federal Finances Act 2012 (Part a and Part b)

Ministries		Total federal expenditure on R&D	of which: Funding of research of earth, oceans, atmosphere and space	Funding of agriculture and forestry	Funding of trade, commerce and industry	Funding of energy production, storage and distribution	Funding of transport, traffic and communications	Funding of education	Funding of health care	Funding of social and socio-economic development	Funding of environmental protection	Funding of urban and physical planning	Funding of national defence	Funding of other objectives	Funding of general knowledge advancement
BKA[2]	in € '000	2,043	-	-	-	46	-	-	-	1,209	-	628	-	-	160
	in %	*100.0*	-	-	-	*2.3*	-	-	-	*59.2*	-	*30.7*	-	-	*7.8*
BMI	in € '000	804	-	-	-	-	-	-	-	804	-	-	-	-	-
	in %	*100.0*	-	-	-	-	-	-	-	*100.0*	-	-	-	-	-
BMUKK	in € '000	62,353	2,154	-	319	-	-	26,226	-	8,215	-	-	-	-	25,439
	in %	*100.0*	*3.5*	-	*0.5*	-	-	*42.0*	-	*13.2*	-	-	-	-	*40.8*
BMWF	in € '000	1,720,972	83,149	29,592	318,056	13,939	27,883	23,146	455,470	77,310	27,883	11,007	91	-	653,446
	in %	*100.0*	*4.8*	*1.7*	*18.5*	*0.8*	*1.6*	*1.3*	*26.5*	*4.5*	*1.6*	*0.6*	*0.0*	-	*38.1*
BMASK	in € '000	2,300	-	-	-	-	-	-	184	2,116	-	-	-	-	-
	in %	*100.0*	-	-	-	-	-	-	*8.0*	*92.0*	-	-	-	-	-
BMG	in € '000	5,022	-	71	-	-	-	-	4,555	18	-	-	-	-	378
	in %	*100.0*	-	*1.4*	-	-	-	-	*90.7*	*0.4*	-	-	-	-	*7.5*
BMEIA	in € '000	2,383	-	-	-	1,138	-	-	-	1,236	-	-	-	-	9
	in %	*100.0*	-	-	-	*47.8*	-	-	-	*51.8*	-	-	-	-	*0.4*
BMJ	in € '000	130	-	-	-	-	-	-	-	130	-	-	-	-	-
	in %	*100.0*	-	-	-	-	-	-	-	*100.0*	-	-	-	-	-
BMLVS	in € '000	2,453	-	-	-	-	-	-	-	-	-	-	25	-	2,428
	in %	*100.0*	-	-	-	-	-	-	-	-	-	-	*1.0*	-	*99.0*
BMF	in € '000	33,204	1,110	785	6,329	288	604	489	7,511	4,795	604	230	-	-	10,459
	in %	*100.0*	*3.3*	*2.4*	*19.1*	*0.9*	*1.8*	*1.5*	*22.6*	*14.4*	*1.8*	*0.7*	-	-	*31.5*
BMLFUW	in € '000	79,440	424	33,142	-	-	-	83	-	1,565	43,957	-	-	-	269
	in %	*100.0*	*0.5*	*41.7*	-	-	-	*0.1*	-	*2.0*	*55.4*	-	-	-	*0.3*
BMWFJ	in € '000	102,676	-	-	100,966	-	-	-	-	1,698	-	-	-	-	12
	in %	*100.0*	-	-	*98.3*	-	-	-	-	*1.7*	-	-	-	-	*0.0*
BMVIT	in € '000	394,274	25,885	3,428	208,581	32,599	32,116	55	42,007	3,336	13,305	1,647	-	-	31,315
	in %	*100.0*	*6.6*	*0.9*	*52.9*	*8.3*	*8.1*	*0.0*	*10.7*	*0.8*	*3.4*	*0.4*	-	-	*7.9*
Total	**in € '000**	**2,408,054**	**112,722**	**67,018**	**634,251**	**48,010**	**60,603**	**49,999**	**509,727**	**102,432**	**85,749**	**13,512**	**116**	**-**	**723,915**
	in %	***100.0***	***4.7***	***2.8***	***26.2***	***2.0***	***2.5***	***2.1***	***21.2***	***4.3***	***3.6***	***0.6***	***0.0***	**-**	***30.0***

Status: April 2012 Source: Statistics Austria(Bundesanstalt Statistik Österreich)

1) Budget appropriation.

2) Including the highest executive bodies.

Table 8: Federal expenditure in 2012 for research and research promotion by socioeconomic objectives and ministries Breakdown of annual values for 2012[1] from Annex T of the Auxiliary Document for the Federal Finances Act 2012 (Part a and Part b)

Ministries		Total federal expenditure on R&D	of which: Funding of research of earth, oceans, atmosphere and space	Funding of agriculture and forestry	Funding of trade, commerce and industry	Funding of energy production, storage and distribution	Funding of transport, traffic and communications	Funding of education	Funding of health care	Funding of social and socio-economic development	Funding of environmental protection	Funding of urban and physical planning	Funding of national defence	Funding of other objectives	Funding of general knowledge advancement
BKA[2]	in € '000	2,408	-	-	-	47	-	-	-	1,297	-	902	-	-	162
	in %	*100.0*	-	-	-	*2.0*	-	-	-	*53.8*	-	*37.5*	-	-	*6.7*
BMI	in € '000	933	-	-	-	-	-	-	-	933	-	-	-	-	-
	in %	*100.0*	-	-	-	-	-	-	-	*100.0*	-	-	-	-	-
BMUKK	in € '000	71,101	2,575	-	319	-	-	33,565	-	7,895	-	-	-	-	26,747
	in %	*100.0*	*3.6*	-	*0.4*	-	-	*47.3*	-	*11.1*	-	-	-	-	*37.6*
BMWF	in € '000	1,738,025	85,049	29,736	319,935	14,005	28,022	23,258	456,002	77,513	28,022	11,060	93	-	665,330
	in %	*100.0*	*4.9*	*1.7*	*18.4*	*0.8*	*1.6*	*1.3*	*26.2*	*4.5*	*1.6*	*0.6*	*0.0*	-	*38.4*
BMASK	in € '000	2,567	-	-	-	-	-	-	184	2,383	-	-	-	-	-
	in %	*100.0*	-	-	-	-	-	-	*7.2*	*92.8*	-	-	-	-	-
BMG	in € '000	5,425	-	71	-	-	-	-	4,970	16	-	-	-	-	368
	in %	*100.0*	-	*1.3*	-	-	-	-	*91.6*	*0.3*	-	-	-	-	*6.8*
BMEIA	in € '000	2,383	-	-	-	1,138	-	-	-	1,236	-	-	-	-	9
	in %	*100.0*	-	-	-	*47.8*	-	-	-	*51.8*	-	-	-	-	*0.4*
BMJ	in € '000	130	-	-	-	-	-	-	-	130	-	-	-	-	-
	in %	*100.0*	-	-	-	-	-	-	-	*100.0*	-	-	-	-	-
BMLVS	in € '000	2,589	-	-	-	-	-	-	-	-	-	-	18	-	2,571
	in %	*100.0*	-	-	-	-	-	-	-	-	-	-	*0.7*	-	*99.3*
BMF	in € '000	34,467	1,132	804	6,406	298	596	506	7,567	5,777	596	238	-	-	10,547
	in %	*100.0*	*3.3*	*2.3*	*18.6*	*0.9*	*1.7*	*1.5*	*22.0*	*16.8*	*1.7*	*0.7*	-	-	*30.5*
BMLFUW	in € '000	86,212	336	33,039	-	-	-	109	-	1,565	50,950	-	-	-	213
	in %	*100.0*	*0.4*	*38.3*	-	-	-	*0.1*	-	*1.8*	*59.2*	-	-	-	*0.2*
BMWFJ	in € '000	107,049	-	-	105,355	-	-	-	-	1,682	-	-	-	-	12
	in %	*100.0*	-	-	*98.4*	-	-	-	-	*1.6*	-	-	-	-	*0.0*
BMVIT	in € '000	418,329	24,946	3,667	221,364	40,080	36,319	47	43,812	3,208	13,662	1,647	-	-	29,577
	in %	*100.0*	*6.0*	*0.9*	*52.7*	*9.6*	*8.7*	*0.0*	*10.5*	*0.8*	*3.3*	*0.4*	-	-	*7.1*
Total	**in € '000**	**2,471,618**	**114,038**	**67,317**	**653,379**	**55,568**	**64,937**	**57,485**	**512,535**	**103,635**	**93,230**	**13,847**	**111**	-	**735,536**
	in %	***100.0***	***4.6***	***2.7***	***26.4***	***2.2***	***2.6***	***2.3***	***20.7***	***4.2***	***3.8***	***0.6***	***0.0***	-	***29.9***

Status: April 2012 Source: Statistics Austria (Bundesanstalt Statistik Österreich)

1) Budget appropriation.

2) Including the highest executive bodies.

Table 9: General research-related university expenditure by the federal government in 1999–2012[1)]“General University Funds“

Years	General university expenditure	
	Total	R&D
	€ million	
1999	1,960.216	834.529
2000	1,956.167	842.494
2001	2,008.803	866.361
2002	2,104.550	918.817
2003	2,063.685	899.326
2004	2,091.159	980.984
2005	2,136.412	1,014.543
2006	2,157.147	1,027.270
2007	2,314.955	1,083.555
2008	2,396.291	1,133.472
2009	2,626.038	1,326.757
2010	2,777.698	1,310.745
2011	2,934.633	1,375.849
2012	2,966.854	1,389.657

Status: April 2012 Source: Statistics Austria (Bundesanstalt Statistik Österreich)

1) Based on Annex T of the Auxiliary Document for the Federal Finances Act.

Table 10: Research funding and research contracts of the federal offices in 2010 by sectors/areas of performance and awarding ministries Analysis of the federal research database[1] without "major" global financing [2]

Ministries	Partial amounts 2010	of which awarded to: Higher education sector							Government sector						Private non-profit sector			Business enterprise sector						
		Universities (including hospitals)	Art universities	Austrian Academy of Sciences	Universities of applied sciences	University Colleges of Teacher Education	Testing institutes of technical colleges	Total	Federal institutions (outside the university level)	Regional institutions	Local governments	Private non-profit facilities mostly run on public financing	Ludwig Boltzmann Gesellschaft	Total	Private non-profit sector	Individual researchers	Total	Institutes' sub-sector incl. competence centres (excluding AIT)	Austrian Institute of Technology GmbH - AIT	business sector	Total	Austrian Science Fund (FWF)	Austrian Research Promotion Agency (FFG)	Abroad
	in €	in %																						
BKA	299,563	*9.5*	-	-	-	-	-	*9.5*	-	-	-	*34.2*	-	*34.2*	-	-	-	-	-	*49.6*	*49.6*	-	-	*6.7*
BMEIA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BMASK	2,729,536	*6.7*	-	-	-	-	-	*6.7*	*49.3*	-	-	*29.4*	-	*78.7*	*0.2*	*0.1*	*0.3*	*1.4*	-	*12.9*	*14.3*	-	-	-
BMF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BMG	110,200	*100.0*	-	-	-	-	-	*100.0*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BMI	229,684	*16.3*	-	-	-	-	-	*16.3*	-	-	-	*65.1*	-	*65.1*	*8.0*	-	*8.0*	-	-	*10.6*	*10.6*	-	-	-
BMJ	162,236	-	-	-	-	-	-	-	-	-	-	*97.5*	-	*97.5*	*2.5*	-	*2.5*	-	-	-	-	-	-	-
BMLVS	269,060	*45.5*	-	-	*24.9*	-	-	*70.4*	-	-	-	-	*7.7*	*7.7*	-	*9.2*	*9.2*	-	-	*12.7*	*12.7*	-	-	-
BMLFUW	3,035,213	*50.0*	-	-	-	-	-	*50.0*	*28.2*	-	-	*10.3*	-	*38.5*	*2.7*	*0.8*	*3.5*	*3.2*	*0.1*	*4.7*	*8.0*	-	-	-
BMUKK	9,530,758	*1.6*	-	-	-	-	-	*1.6*	*94.1*	-	-	*2.5*	-	*96.6*	*1.3*	*0.2*	*1.5*	-	-	*0.3*	*0.3*	-	-	-
BMVIT	3,662,997	*2.1*	-	-	-	-	-	*2.1*	-	-	-	*20.9*	-	*20.9*	*5.2*	-	*5.2*	*60.8*	*0.7*	*7.7*	*69.2*	-	*0.7*	*1.9*
BMWFJ	512,495	*8.3*	-	-	-	-	-	*8.3*	*2.4*	-	-	*52.8*	-	*55.2*	-	-	-	*8.7*	-	*27.8*	*36.5*	-	-	-
BMWF	52,428,799	*11.3*	*0.1*	*2.8*	*0.4*	*0.0*	-	*14.6*	*1.1*	*0.2*	*0.0*	*7.6*	*0.3*	*9.2*	*1.7*	*0.4*	*2.1*	*1.2*	*0.2*	*11.0*	*12.4*	-	*11.8*	*49.9*
Total	**72,970,541**	***11.2***	***0.1***	***2.0***	***0.4***	***0.0***	**-**	***13.7***	***16.0***	***0.2***	***0.0***	***9.3***	***0.3***	***25.8***	***1.8***	***0.4***	***2.2***	***4.2***	***0.2***	***9.4***	***13.8***	**-**	***8.5***	***36.0***

Status: April 2012 Source: STATISTICS AUSTRIA (Bundesanstalt Statistik Österreich)

1) Status: November 2011.

2) i.e. excluding global financing for Funds for the Austrian Science Fund, the Austrian Research Promotion Agency (FFG), Ludwig Boltzmann Gesellschaft, Austrian Academy of Sciences, AIT Austrian Institute of Technology GmbH.

Table 11: Research funding and research contracts of the federal offices in 2010 by socio-economic objectives and awarding ministries Analysis of the federal research database[1] without "major" global financing[2]

Ministries		Partial amounts in 2010	of which: Funding for research of earth, oceans, atmosphere and space	Funding of agriculture and forestry	Funding of trade, commerce and industry	Funding of energy production, storage and distribution	Funding of transport, traffic and communications	Funding of education	Funding of health care	Funding of social and socio-economic development	Funding of environmental protection	Funding of urban and physical planning	Funding of national defence	Funding of general knowledge advancement
BKA	in €	299,563	-	-	-	-	-	-	-	281,458	-	18,105	-	-
	in %	*100.0*	-	-	-	-	-	-	-	*94.0*	-	*6.0*	-	-
BMEIA	in €	-	-	-	-	-	-	-	-	-	-	-	-	-
	in %	-	-	-	-	-	-	-	-	-	-	-	-	-
BMASK	in €	2,729,536	-	-	-	-	-	-	72,495	2,654,541	-	-	-	2,500
	in %	*100.0*	-	-	-	-	-	-	*2.7*	*97.2*	-	-	-	*0.1*
BMF	in €	-	-	-	-	-	-	-	-	-	-	-	-	-
	in %	-	-	-	-	-	-	-	-	-	-	-	-	-
BMG	in €	110,200	-	110,200	-	-	-	-	-	-	-	-	-	-
	in %	*100.0*	-	*100.0*	-	-	-	-	-	-	-	-	-	-
BMI	in €	229,684	-	-	-	-	-	-	-	204,254	-	-	-	25,430
	in %	*100.0*	-	-	-	-	-	-	-	*88.9*	-	-	-	*11.1*
BMJ	in €	162,236	-	-	-	-	-	-	-	158,236	-	-	-	4,000
	in %	*100.0*	-	-	-	-	-	-	-	*97.5*	-	-	-	*2.5*
BMLVS	in €	269,060	-	-	-	-	-	-	31,020	157,040	-	-	-	81,000
	in %	*100.0*	-	-	-	-	-	-	*11.5*	*58.4*	-	-	-	*30.1*
BMLFUW	in €	3,035,213	509,017	1,627,599	74,340	171,624	-	-	96,554	227,905	155,210	-	-	172,964
	in %	*100.0*	*16.8*	*53.6*	*2.4*	*5.7*	-	-	*3.2*	*7.5*	*5.1*	-	-	*5.7*
BMUKK	in €	9,530,758	-	-	-	-	-	8,890,036	-	150,339	-	-	-	490,383
	in %	*100.0*	-	-	-	-	-	*93.3*	-	*1.6*	-	-	-	*5.1*
BMVIT	in €	3,662,997	117,564	-	2,461,898	102,000	240,483	-	5,000	130,053	42,850	-	-	563,149
	in %	*100.0*	*3.2*	-	*67.1*	*2.8*	*6.6*	-	*0.1*	*3.6*	*1.2*	-	-	*15.4*
BMWFJ	in €	512,495	-	-	25,000	-	-	-	40,000	366,633	-	-	-	80,862
	in %	*100.0*	-	-	*4.9*	-	-	-	*7.8*	*71.5*	-	-	-	*15.8*
BMWF	in €	52,428,799	4,484,678	165,000	530,895	98,563	160,400	137,800	12,134,989	3,066,755	311,988	41,694	15,000	31,281,037
	in %	*100.0*	*8.6*	*0.3*	*1.0*	*0.2*	*0.3*	*0.3*	*23.1*	*5.8*	*0.6*	*0.1*	*0.0*	*59.7*
Total	**in €**	**72,970,541**	**5,111,259**	**1,902,799**	**3,092,133**	**372,187**	**400,883**	**9,027,836**	**12,380,058**	**7,397,214**	**510,048**	**59,799**	**15,000**	**32,701,325**
	in %	***100.0***	***7.0***	***2.6***	***4.2***	***0.5***	***0.5***	***12.4***	***17.0***	***10.1***	***0.7***	***0.1***	***0.0***	***44.9***

Status: April 2012 Source: STATISTICS AUSTRIA (Bundesanstalt Statistik Österreich)

1) Status: November 2011.

2) i.e. excluding global financing for Funds for the Austrian Science Fund (FWF), the Austrian Research Promotion Agency (FFG), Ludwig Boltzmann Gesellschaft, Austrian Academy of Sciences, AIT Austrian Institute of Technology GmbH.

Table 12: Research funding and research contracts of the federal offices in 2010 by fields of science and awarding ministries Analysis of the federal research database[1)] without "major" global financing [2)]

Ministries		Partial amounts in 2010	of which					
			1.0 Natural sciences	2.0 Engineering	3.0 Human medicine	4.0 Agriculture and forestry, veterinary medicine	5.0 Social sciences	6.0 Humanities
BKA	in €	299,563	-	-	-	-	299,563	-
	in %	*100.0*	-	-	-	-	*100.0*	-
BMEIA	in €	-	-	-	-	-	-	-
	in %	-	-	-	-	-	-	-
BMASK	in €	2,729,536	-	-	162,046	-	2,567,490	-
	in %	*100.0*	-	-	*5.9*	-	*94.1*	-
BMF	in €	-	-	-	-	-	-	-
	in %	-	-	-	-	-	-	-
BMG	in €	110,200	-	-	-	110,200	-	-
	in %	*100.0*	-	-	-	*100.0*	-	-
BMI	in €	229,684	-	-	-	-	204,254	25,430
	in %	*100.0*	-	-	-	-	*88.9*	*11.1*
BMJ	in €	162,236	-	-	-	-	158,236	4,000
	in %	*100.0*	-	-	-	-	*97.5*	*2.5*
BMLVS	in €	269,060	74,000	-	31,020	-	164,040	-
	in %	*100.0*	*27.5*	-	*11.5*	-	*61.0*	-
BMLFUW	in €	3,035,213	851,384	78,222	-	1,748,152	357,455	-
	in %	*100.0*	*28.1*	*2.6*	-	*57.5*	*11.8*	-
BMUKK	in €	9,530,758	-	132,730	-	-	9,073,235	324,793
	in %	*100.0*	-	*1.4*	-	-	*95.2*	*3.4*
BMVIT	in €	3,662,997	348,762	3,052,633	-	-	249,602	12,000
	in %	*100.0*	*9.5*	*83.4*	-	-	*6.8*	*0.3*
BMWFJ	in €	512,495	22,500	53,000	40,000	-	396,995	-
	in %	*100.0*	*4.4*	*10.3*	*7.8*	-	*77.5*	-
BMWF	in €	52,428,799	40,150,384	2,505,619	2,941,302	112,999	5,636,066	1,082,429
	in %	*100.0*	*76.6*	*4.8*	*5.6*	*0.2*	*10.7*	*2.1*
Total	**in €**	**72,970,541**	**41,447,030**	**5,822,204**	**3,174,368**	**1,971,351**	**19,106,936**	**1,448,652**
	in %	***100.0***	***56.7***	***8.0***	***4.4***	***2.7***	***26.2***	***2.0***

Status: April 2012 Source: STATISTICS AUSTRIA (Bundesanstalt Statistik Österreich)

1) Status: November 2011.

2) i.e. excluding global financing for the Austrian Science Fund (FWF), the Austrian Research Promotion Agency (FFG), Ludwig Boltzmann Gesellschaft, Austrian Academy of Sciences, AIT Austrian Institute of Technology GmbH.

Table 13: An international comparison of research and experimental development (R&D) in 2009

Country	Gross domestic expenditure on R&D as a % 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 the			
		Government	Business		Business enterprise sector	Higher education sector	Government sector	Private non-profit sector
		in %			as a % of gross domestic expenditure on R&D			
Belgium	2.03	25.3	58.6	59,756	66.3	23.8	8.9	1.0
Denmark	3.06	27.8	60.2	54,391	68.0	29.5	2.1	0.4
Germany	2.82	29.7	66.1	534,565	67.6	17.6	14.8 [o)]	. [n)]
Finland	3.92	24.0	68.1	56,069	71.4	18.9	9.1	0.6
France	2.26	38.6	52.4	390,374	61.7	20.7	16.4	1.2
Greece	0.60 [c)2)]	46.8 [1]	31.1 [1]	35,531 [c)2)]	28.6 [c)2)]	49.2 [c)2)]	20.9 [c)2)]	1.3 [c)2)]
Ireland [c)]	1.74	31.3	51.2	20,580	66.7	29.6	3.7	.
Italy	1.26	42.1	44.2	226,285	53.3	30.3	13.1	3.3
Luxembourg	1.66	24.3	70.3	4,711	75.9	8.0	16.1 [a)]	.
Netherlands	1.82	40.9	45.1	87,874	47.1	40.2	12.7 [o)]	. [n)]
Austria [4)]	**2.72**	**35.6**	**47.1**	**56,438**	**68.1**	**26.1**	**5.3**	**0.5**
Portugal	1.64	45.3	44.0	51,347	47.4	36.4	7.3	8.8
Sweden	3.61	27.5	58.8	75,849	70.4	25.1	4.4	0.1 [a)]
Spain	1.38	47.1	43.4	220,777	51.9	27.8	20.1	0.2
United Kingdom [c)]	1.85	32.6	44.5	347,486	60.4	27.9	9.2	2.5
EU 15 [b)p)]	**2.07**	**34.6**	**54.2**	**2,223,364**	**61.9**	**24.1**	**12.7**	**1.2**
Estonia	1.43	48.8	38.5	5,430	44.7	42.2	11.0	2.2
Poland	0.68	60.4	27.1	73,581	28.5	37.1	34.3	0.1
Slovak Republic	0.48	50.6	35.1	15,952	41.0	25.0	33.9 [d)]	0.0
Slovenia	1.86	35.7	58.0	12,410	64.6	14.6	20.8	0.1
Czech Republic	1.48	43.9	44.6	50,961	60.0	18.1	21.4	0.5
Hungary	1.17	42.0	46.4	29,795	57.2 [v]	20.9 [v]	20.1 [v]	.
EU 25 [b)p)]	**1.96**	**35.3**	**53.5**	**2,433,285**	**61.2**	**24.3**	**13.3**	**1.2**
Romania	0.47	54.9	34.8	28,398	40.2	24.7	34.9	0.2
EU-27 [b)p)]	**1.92**	**35.5**	**53.3**	**2,479,834**	**61.0**	**24.3**	**13.5**	**1.2**
Australia [3)]	2.24	34.5	62.0	137,138	61.3	23.9	12.2	2.6
Chile [3)]	0.39	33.8	43.7	12,571	40.4	40.8	9.7	9.1
Iceland	2.64 [p)3)]	38.8 [p)3)]	50.3 [p)3)]	3,753	54.6 [p)3)]	25.1 [p)3)]	17.8 [p)3)]	2.5 [p)3)]
Israel [d)]	4.46 [p)]	14.0 [3]	51.6 [3]	.	79.6 [p)]	13.2 [g)p)]	4.0 [p)]	3.2 [p)]
Japan	3.36	17.7 [e)]	75.3	878,418	75.8	13.4	9.2	1.6
Canada	1.92	34.1 [c)3)]	47.6	242,686 [3)]	51.7	37.6	10.1	0.6
Korea	3.56	27.4	71.1	309,063	74.3	11.1	13.0	1.6
Mexico [2)]	0.37	50.2	45.1	70,293	47.4	26.1	25.2	1.3
New Zealand	1.30	45.7	38.5	28,600	41.4	32.8	25.7	.
Norway	1.78	46.8	43.6	36,091	51.6	32.0	16.4	.
Switzerland[3)]	2.99	22.8	68.2	62,066	73.5	24.2	0.7 [h)]	1.6
Turkey	0.85	34.0	41.0	73,521	40.0	47.4	12.6	.
United States [j)]	2.90	31.3 [h)]	61.6 [o)]	.	70.3	13.5	11.7 [h)]	4.4
OECD total [b)p)]	**2.40**	**30.5**	**60.7**	**.**	**67.3**	**18.1**	**11.9**	**2.6**

Source: OECD (MSTI 2011-2), Statistics 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. - 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) 2005. - 2) 2007. - 3) 2008. - 4) Statistics Austria; Results of the 2009 survey on research and experimental development.

Full time equivalent = person year.

Table 14: Expenditure on research and experimental development 1998 to 2009 broken down by sectors of performance and sources of funds

Sectors	1998		2002		2004		2006		2007		2009	
	€ 1,000	%	€ 1,000	%	€ 1,000	%	€ 1,000	%	€ 1,000	%	€ 1,000	%
	Sectors of performance											
Total	**3,399,835**	**100.0**	**4,684,313**	**100.0**	**5,249,546**	**100.0**	**6,318,587**	**100.0**	**6,867,815**	**100.0**	**7,479,745**	**100.0**
Higher education sector [1)]	1,009,721	29.7	1,266,104	27.0	1,401,649	26.7	1,523,160	24.1	1,637,277	23.8	1,951,845	26.1
Government sector[2)]	218,951	6.4	266,428	5.7	269,832	5.1	330,232	5.2	367,300	5.3	399,093	5.3
Private non-profit sector[3)]	10,486	0.3	20,897	0.4	21,586	0.4	16,519	0.3	17,377	0.3	35,905	0.5
Business enterprise sector	2,160,678	63.6	3,130,884	66.9	3,556,479	67.8	4,448,676	70.4	4,845,861	70.6	5,092,902	68.1
of which:												
Institutes' sub-sector [4)]	187,179	5.5	261,682	5.6	347,703	6.6	428,492	6.8	468,219	6.8	482,719	6.5
Company R&D sub-sector	1,973,499	58.1	2,869,202	61.3	3,208,776	61.2	4,020,184	63.6	4,377,642	63.7	4,610,183	61.6
	Sources of funds											
Total	**3,399,835**	**100.0**	**4,684,313**	**100.0**	**5,249,546**	**100.0**	**6,318,587**	**100.0**	**6,867,815**	**100.0**	**7,479,745**	**100.0**
Public sector	1,284,576	37.8	1,574,231	33.6	1,732,185	33.0	2,071,310	32.8	2,260,857	32.9	2,661,623	35.6
Business enterprise sector	1,418,432	41.7	2,090,626	44.6	2,475,549	47.1	3,056,999	48.4	3,344,400	48.7	3,520,016	47.0
Private non-profit sector	12,200	0.4	17,491	0.4	25,201	0.5	26,928	0.4	32,316	0.5	42,179	0.6
Abroad	684,628	20.1	1,001,965	21.4	1,016,611	19.4	1,163,350	18.4	1,230,242	17.9	1,255,927	16.8
of which EU	44,308	1.3	78,281	1.7	86,974	1.7	103,862	1.6	101,094	1.5	111,470	1.5

SOURCE: STATISTICS AUSTRIA, Surveys by STATISTICS AUSTRIA. Compiled on: 20 July 2011.

1) Universities including hospitals, art universities, the Austrian Academy of Sciences, testing institutes at technical federal colleges as well as (since 2002) universities of applied sciences, private universities and the Danube University at Krems. Including University Colleges of Teacher Edication (since 2007). Including other programmes that can be attributed to the higher education sector (since 2009).

2) Federal institutions (not including those combined in the higher education sector), state, local government and chamber institutions, R&D institutions of the social insurance carriers, public sector-financed and/or controlled private non-profit institutions as well as R&D institutions of the Ludwig Boltzmann-Gesellschaft; including regional hospitals. The regional hospitals were not surveyed by questionnaire, but instead Statistics Austria prepared an estimate of their R&D expenditures based on the reports of the offices of the provincial governments.

3) Private non-profit institutions whose status is predominantly private or under civil law, sectarian or other non-public.

4) Including The Austrian Institute of Technology GmbH. Including competence centres (since 2002). 1998 including the civil engineers segment; from 2002 the segment of civil engineers has also been included in the company R&D sub-sector ("firmeneigener Bereich").

Rounding differences.

Table 15: Employees in research and experimental development 1998 to 2009 broken down by sectors of performance

Sectors of performance	1998		2002		2004		2006		2007		2009	
	FTE	%	FTE	%	FTE	%	FTE	%	FTE	%	FTE	%
Total	**31,307.6**	**100.0**	**38,893.4**	**100.0**	**42,891.3**	**100.0**	**49,377.1**	**100.0**	**53,252.2**	**100.0**	**56,437.5**	**100.0**
Higher education sector [1)]	8,670.1	27.7	9,879.0	25.4	11,501.5	26.8	12,668.2	25.7	13,613.2	25.6	15,058.5	26.7
Government sector[2)]	2,104.4	6.7	2,059.7	5.3	2,035.2	4.7	2,422.6	4.9	2,488.1	4.7	2,679.4	4.7
Private non-profit sector[3)]	148.4	0.5	227.2	0.6	212.0	0.5	160.5	0.3	162.4	0.3	396.8	0.7
Business enterprise sector	20,384.6	65.1	26,727.5	68.7	29,142.6	68.0	34,125.8	69.1	36,988.6	69.4	38,302.9	67.9
of which:												
Institutes' sub-sector [4)]	1,857.6	5.9	2,428.5	6.2	2,838.9	6.6	3,342.3	6.8	3,397.4	6.4	3,625.0	6.4
Company R&D sub-sector	18,527.0	59.2	24,299.0	62.5	26,303.7	61.4	30,783.5	62.3	33,591.2	63.0	34,677.9	61.5

SOURCE: STATISTICS AUSTRIA, Surveys by STATISTICS AUSTRIA. Compiled on: 20 July 2011. - FTE = full time equivalent (person year).

1) Universities including hospitals, art universities, the Austrian Academy of Sciences, testing institutes at technical federal colleges as well as (since 2002) universities of applied sciences, private universities and the Danube University at Krems. Including University Colleges of Teacher Edication (since 2007). Including other programmes that can be attributed to the higher education sector (since 2009).-

2) Federal institutions (not including those combined in the higher education sector), state, local government and chamber institutions, R&D institutions of the social insurance carriers, public sector-financed and/or controlled private non-profit institutions as well as R&D institutions of the Ludwig Boltzmann-Gesellschaft; without regional hospitals. The regional hospitals were not surveyed by questionnaire, but instead Statistics Austria prepared an estimate of their R&D expenditures based on the reports of the offices of the provincial governments. For this reason there is no data about employees in R&D.

3) Private non-profit institutions whose status is predominantly private or under civil law, sectarian or other non-public.

4) Including The Austrian Institute of Technology GmbH. Including competence centres (since 2002). 1998 including the civil engineers segment; from 2002 the segment of civil engineers has also been included in the company R&D sub-sector ("firmeneigener Bereich").

Rounding differences.

Table 16: Employees in research and experimental development (R&D) by headcount and full-time equivalents in 2009. Table shows the sectors of performance/survey areas and occupation

Sectors, areas	No. of units performing R&D	Total	of which		
			Scientific staff	Highly qualified non-scientific staff	Other auxiliary staff
			Headcounts		
Total	**4,513**	**96,502**	**59,341**	**26,997**	**10,164**
1. Higher education sector	**1,259**	**39,084**	**29,039**	**5,797**	**4,248**
of which:					
1.1 Universities (without hospitals)	993	28,570	21,157	4,209	3,204
1.2 University hospitals	90	5,577	3,944	855	778
1.3 Art universities	53	1,108	997	67	44
1.4 Academy of Sciences	62	1,520	1,166	341	13
1.5 Universities of applied sciences	19	1,428	1,086	209	133
1.6 Private universities[1]	25	671	500	104	67
1.7 University Colleges of Teacher Education	12	158	147	6	5
1.8 Other higher education sector [2]	5	52	42	6	4
2. Government sector[3]	**272**	**6,008**	**3,145**	**1,200**	**1,663**
of which:					
2.1 Without the regional hospitals	272	6,008	3,145	1,200	1,663
2.2 Regional hospitals	.	.	.	.	.
3. Private non-profit sector[4]	**36**	**742**	**475**	**176**	**91**
4. Business enterprise sector	**2,946**	**50,668**	**26,682**	**19,824**	**4,162**
of which:					
4.1 Institutes' sub-sector [5]	55	5,659	3,160	1,600	899
4.2 Company R&D sub-sector	2,891	45,009	23,522	18,224	3,263
			Full-time equivalents		
Total	**4,513**	**56,437.5**	**34,663.7**	**16,708.6**	**5,065.2**
1. Higher education sector	**1,259**	**15,058.5**	**11,262.0**	**2,204.3**	**1,592.2**
of which:					
1.1 Universities (without hospitals)	993	11,628.9	8,693.1	1,601.9	1,333.9
1.2 University hospitals	90	1,505.2	997.4	335.6	172.2
1.3 Art universities	53	224.6	192.4	19.9	12.3
1.4 Academy of Sciences	62	887.5	746.4	132.6	8.4
1.5 Universities of applied sciences	19	537.7	426.5	73.0	38.2
1.6 Private universities[1]	25	219.7	159.7	36.7	23.4
1.7 University Colleges of Teacher Education	12	31.1	29.3	0.8	0.9
1.8 Other higher education sector [2]	5	23.9	17.3	3.7	3.0
2. Government sector[3]	**272**	**2,679.4**	**1,559.3**	**406.3**	**713.8**
of which:					
2.1 Without the regional hospitals	272	2,679.4	1,559.3	406.3	713.8
2.2 Regional hospitals	.	.	.	.	.
3. Private non-profit sector[4]	**36**	**396.8**	**243.3**	**105.4**	**48.1**
4. Business enterprise sector	**2,946**	**38,302.9**	**21,599.0**	**13,992.7**	**2,711.2**
of which:					
4.1 Institutes' sub-sector [5]	55	3,625.0	2,264.8	840.2	520.0
4.2 Company R&D sub-sector	2,891	34,677.9	19,334.2	13,152.5	2,191.2

SOURCE: STATISTICS AUSTRIA, Survey of research and experimental development in 2009. Compiled on: 20 July 2011.

1) Including Danube University at Krems. - 2) Testing institutes at technical federal colleges as well as other programmes that can be attributed to the higher education sector (reported together to keep data confidential). - 3) Federal institutions (not including those combined in the higher education sector), state, local government and chamber institutions, R&D institutions of the social insurance carriers, public sector-financed and/or controlled private non-profit institutions as well as R&D institutions of the Ludwig Boltzmann-Gesellschaft; without regional hospitals. The regional hospitals were not surveyed by questionnaire, but instead Statistics Austria prepared an estimate of the R&D expenditures based on the reports of the offices of the provincial governments. For this reason there is no data about employees in R&D. - 4) Private non-profit institutions whose status is predominantly private or under civil law, sectarian, or other non-public. - 5) Including The Austrian Institute of Technology GmbH and competence centres.

Rounding differences.

Table 17: Employees in research and experimental development (R&D), headcounts and full-time equivalents in 2009, by sectors of performance/survey areas, occupation and gender

Sectors, areas	No. of units performing R&D	Total		of which					
				Scientific staff		Highly qualified non-scientific staff		Other auxiliary staff	
		male	female	male	female	male	female	male	female
				Headcounts					
Total	**4,513**	**66,523**	**29,979**	**42,464**	**16,877**	**19,320**	**7,677**	**4,739**	**5,425**
1. Higher education sector	**1,259**	**21,353**	**17,731**	**18,074**	**10,965**	**1,995**	**3,802**	**1,284**	**2,964**
of which:									
1.1 Universities (without hospitals)	993	16,093	12,477	13,495	7,662	1,500	2,709	1,098	2,106
1.2 University hospitals	90	2,545	3,032	2,252	1,692	163	692	130	648
1.3 Art universities	53	571	537	545	452	15	52	11	33
1.4 Academy of Sciences	62	863	657	689	477	173	168	1	12
1.5 Universities of applied sciences	19	848	580	716	370	103	106	29	104
1.6 Private universities[1]	25	337	334	290	210	34	70	13	54
1.7 University Colleges of Teacher Education	12	61	97	59	88	1	5	1	4
1.8 Other higher education sector [2]	5	35	17	28	14	6	-	1	3
2. Government sector[3]	**272**	**3,199**	**2,809**	**1,790**	**1,355**	**624**	**576**	**785**	**878**
of which:									
2.1 Without the regional hospitals	272	3,199	2,809	1,790	1,355	624	576	785	878
2.2 Regional hospitals	.	.	.	.	.	.	.	.	.
3. Private non-profit sector4[)]	**36**	**360**	**382**	**280**	**195**	**55**	**121**	**25**	**66**
4. Business enterprise sector	**2,946**	**41,611**	**9,057**	**22,320**	**4,362**	**16,646**	**3,178**	**2,645**	**1,517**
of which:									
4.1 Institutes' sub-sector [5]	55	4,036	1,623	2,511	649	1,110	490	415	484
4.2 Company R&D sub-sector	2,891	37,575	7,434	19,809	3,713	15,536	2,688	2,230	1,033
				Full-time equivalents					
Total	**4,513**	**42,371.7**	**14,065.9**	**26,898.5**	**7,765.2**	**12,806.0**	**3,902.6**	**2,667.1**	**2,398.1**
1. Higher education sector	**1,259**	**8,666.0**	**6,392.5**	**7,430.6**	**3,831.4**	**717.4**	**1,486.8**	**518.0**	**1,074.2**
of which:									
1.1 Universities (without hospitals)	993	6,906.0	4,722.9	5,884.5	2,808.7	549.7	1,052.2	471.9	862.0
1.2 University hospitals	90	641.7	863.4	555.7	441.6	59.9	275.7	26.1	146.1
1.3 Art universities	53	118.8	105.7	111.0	81.4	3.6	16.3	4.2	8.1
1.4 Academy of Sciences	62	536.4	351.1	474.9	271.5	60.5	72.1	1.0	7.5
1.5 Universities of applied sciences	19	328.8	208.9	288.1	138.4	31.8	41.3	9.0	29.2
1.6 Private universities[1]	25	106.5	113.2	93.8	65.9	8.1	28.6	4.7	18.7
1.7 University Colleges of Teacher Education	12	12.0	19.1	11.5	17.8	0.2	0.6	0.2	0.7
1.8 Other higher education sector [2]	5	15.7	8.3	11.1	6.2	3.7	-	0.9	2.1
2. Government sector[3]	**272**	**1,533.6**	**1,145.8**	**958.6**	**600.7**	**211.4**	**194.9**	**363.6**	**350.1**
of which:									
2.1 Without the regional hospitals	272	1,533.6	1,145.8	958.6	600.7	211.4	194.9	363.6	350.1
2.2 Regional hospitals	.	.	.	.	.	.	.	.	.
3. Private non-profit sector[4]	**36**	**202.4**	**194.3**	**153.2**	**90.1**	**30.6**	**74.8**	**18.7**	**29.4**
4. Business enterprise sector	**2,946**	**31,969.6**	**6,333.3**	**18,356.1**	**3,242.9**	**11,846.7**	**2,146.0**	**1,766.8**	**944.4**
of which:									
4.1 Institutes' sub-sector [5]	55	2,746.0	879.0	1,868.0	396.8	611.8	228.4	266.2	253.8
4.2 Company R&D sub-sector	2,891	29,223.6	5,454.3	16,488.1	2,846.1	11,234.9	1,917.6	1,500.6	690.6

SOURCE: STATISTICS AUSTRIA, Survey of research and experimental development in 2009. Compiled on: 20 July 2011.

1) Including Danube University at Krems. - 2) Testing institutes at technical federal colleges as well as other programmes that can be attributed to the higher education sector (reported together to keep data confidential). - 3) Federal institutions (not including those combined in the higher education sector), state, local government and chamber institutions, R&D institutions of the social insurance carriers, public sector-financed and/or controlled private non-profit institutions as well as R&D institutions of the Ludwig Boltzmann-Gesellschaft; without regional hospitals. The regional hospitals were not surveyed by questionnaire, but instead Statistics Austria prepared an estimate of the R&D expenditures based on the reports of the offices of the provincial governments. For this reason there is no data about employees in R&D. - 4) Private non-profit institutions whose status is predominantly private or under civil law, sectarian, or other non-public. - 5) Including The Austrian Institute of Technology GmbH and competence centres.

Rounding differences.

Table 18: Employees in research and experimental development (R&D) (in full-time equivalents) in all of the areas surveyed[1)] 2009 broken down by state[2)] and occupation

State	No. of units performing R&D	Full-time equivalents in R&D			
		Total	of which		
			Scientific staff	Highly qualified non-scientific staff	Other auxiliary staff
Austria	**4,513**	**56,437.5**	**34,663.7**	**16,708.6**	**5,065.2**
Burgenland	66	464.2	178.1	196.5	89.6
Carinthia	209	2,726.3	2,052.2	545.7	128.4
Lower Austria	477	4,770.9	2,262.0	2,050.9	458.0
Upper Austria	816	8,957.9	4,586.4	3,647.2	724.3
Salzburg	251	2,222.6	1,372.3	726.4	123.9
Styria	821	10,664.5	6,341.0	3,040.1	1,283.4
Tyrol	385	4,561.6	2,920.4	1,241.0	400.3
Vorarlberg	159	1,815.3	853.0	867.5	94.8
Vienna	1,329	20,254.3	14,098.3	4,393.5	1,762.5

SOURCE: STATISTICS AUSTRIA, Survey of research and experimental development in 2009. Compiled on: 20 July 2011.

1) The regional hospitals were not surveyed by questionnaire, but instead Statistics Austria prepared an estimate of the R&D expenditures based on the reports of the offices of the provincial governments. For this reason there is no data about employees in R&D.

2) Company R&D sub-sector: Regional allocation by location of company headquarters.

Rounding differences.

Table 19: Expenditure for research and experimental development (R&D) 2009 by sectors of performance/ survey areas and types of expenditure

Sectors, areas	No. of units performing R&D	Total	of which			
			Labour costs	Other current costs	Instruments and equipment	Land and buildings
		in € '000				
Total	**4,513** [4]	**7,479,745**	**3,800,479**	**3,084,213**	**461,852**	**133,201**
1. Higher education sector	**1,259**	**1,951,845**	**872,907**	**926,623**	**118,047**	**34,268**
of which:						
1.1 Universities (without hospitals)	993	1,519,766	663,824	740,512	99,619	15,811
1.2 University hospitals	90	208,010	96,204	90,557	4,065	17,184
1.3 Art universities	53	26,256	15,285	10,247	724	-
1.4 Academy of Sciences	62	104,984	48,348	50,089	5,890	657
1.5 Universities of applied sciences	19	59,431	31,251	22,894	4,969	317
1.6 Private universities[1]	25	23,607	13,829	8,073	1,412	293
1.7 University Colleges of Teacher Education	12	4,096	2,386	1,347	363	-
1.8 Other higher education sector [2]	5	5,695	1,780	2,904	1,005	6
2. Government sector[3]	**272** [4]	**399,093**	**219,475**	**153,564**	**17,109**	**8,945**
of which:						
2.1 Without the regional hospitals	272	249,956	146,714	86,685	12,011	4,546
2.2 Regional hospitals	.	149,137	72,761	66,879	5,098	4,399
3. Private non-profit sector[5]	**36**	**35,905**	**22,246**	**12,226**	**1,388**	**45**
4. Business enterprise sector	**2,946**	**5,092,902**	**2,685,851**	**1,991,800**	**325,308**	**89,943**
of which:						
4.1 Institutes' sub-sector [6]	55	482,719	255,254	191,879	33,840	1,746
4.2 Company R&D sub-sector	2,891	4,610,183	2,430,597	1,799,921	291,468	88,197

SOURCE: STATISTICS AUSTRIA, Survey of research and experimental development in 2009. Compiled on: 20 July 2011.

1) Including the Danube University at Krems.

2) Testing institutes at technical federal colleges as well as other programmes that can be attributed to the higher education sector (reported together to keep data confidential).

3) Federal institutions (not including those combined in the higher education sector), state, local government and chamber institutions, R&D institutions of the social insurance carriers, public sector-financed and/or controlled private non-profit institutions as well as R&D institutions of the Ludwig Boltzmann-Gesellschaft; including regional hospitals. The regional hospitals were not surveyed by questionnaire, but instead Statistics Austria prepared an estimate of the R&D expenditures based on the reports of the offices of the provincial governments.

4) Number of survey units not including regional hospitals.

5) Private non-profit institutions whose status is predominantly private or under civil law, sectarian, or other non-public.

6) Including The Austrian Institute of Technology GmbH and competence centres.

Table 20: Expenditure on research and experimental development (R&D) in all survey areas[1] in 2009, by state[2] and types of expenditure

State	No. of units performing R&D[3]	Total	of which			
			Labour costs	Other current costs	Instruments and equipment	Land and buildings
		in € '000				
Austria	**4,513**	**7,479,745**	**3,800,479**	**3,084,213**	**461,852**	**133,201**
Burgenland	66	49,284	25,236	17,457	2,941	3,650
Carinthia	209	389,178	179,112	187,954	19,773	2,339
Lower Austria	477	595,620	306,483	207,507	57,343	24,287
Upper Austria	816	1,134,141	582,484	475,272	60,348	16,037
Salzburg	251	242,634	136,974	89,893	14,041	1,726
Styria	821	1,334,372	692,924	557,709	69,204	14,535
Tyrol	385	683,137	285,212	303,086	53,566	41,273
Vorarlberg	159	204,788	126,074	68,802	8,660	1,252
Vienna	1,329	2,846,591	1,465,980	1,176,533	175,976	28,102

SOURCE: STATISTICS AUSTRIA, Survey of research and experimental development in 2009. Compiled on: 20 July 2011.

1) Including R&D expenditure estimate for regional hospitals.

2) In the company R&D sub-sector, the standard evaluation was performed by location of company headquarters.

3) Number of survey units not including regional hospitals.

Table 21: Expenditure for research and experimental development (R&D) 2009 by sectors of performance/ survey areas and types of research

Sectors, areas	No. of units performing R&D	Total expenditure on R&D	of which					
			Basic research		Applied research		Experimental development	
		in € '000	in € '000	in %	in € '000	in %	in € '000	in %
Total	**4,513**	**7,330,608**	**1,396,997**	**19.1**	**2,551,940**	**34.8**	**3,381,671**	**46.1**
1. Higher education sector	**1,259**	**1,951,845**	**1,019,758**	**52.3**	**769,140**	**39.4**	**162,947**	**8.3**
of which:								
1.1 Universities (without hospitals)	993	1,519,766	848,172	55.8	564,923	37.2	106,671	7.0
1.2 University hospitals	90	208,010	53,127	25.5	120,302	57.9	34,581	16.6
1.3 Art universities	53	26,256	10,410	39.6	11,499	43.8	4,347	16.6
1.4 Academy of Sciences	62	104,984	89,016	84.8	11,852	11.3	4,116	3.9
1.5 Universities of applied sciences	19	59,431	5,526	9.3	42,625	71.7	11,280	19.0
1.6 Private universities[1]	25	23,607	7,769	32.9	14,260	60.4	1,578	6.7
1.7 University Colleges of Teacher Education	12	4,096	193	4.7	3,532	86.2	371	9.1
1.8 Other higher education sector [2]	5	5,695	5,545	97.3	147	2.6	3	0.1
2. Government sector[3]	**272**	**249,956**	**80,896**	**32.4**	**147,304**	**58.9**	**21,756**	**8.7**
of which:								
2.1 Without the regional hospitals	272	249,956	80,896	32.4	147,304	58.9	21,756	8.7
2.2 Regional hospitals	.	.	.	.	.	.	.	.
3. Private non-profit sector[4]	**36**	**35,905**	**6,467**	**18.0**	**26,637**	**74.2**	**2,801**	**7.8**
4. Business enterprise sector	**2,946**	**5,092,902**	**289,876**	**5.7**	**1,608,859**	**31.6**	**3,194,167**	**62.7**
of which:								
4.1 Institutes' sub-sector [5]	55	482,719	136,377	28.3	220,031	45.5	126,311	26.2
4.2 Company R&D sub-sector	2,891	4,610,183	153,499	3.3	1,388,828	30.1	3,067,856	66.6

SOURCE: STATISTICS AUSTRIA, Survey of research and experimental development in 2009. Compiled on: 20 July 2011.

1) Including the Danube University at Krems.

2) Testing institutes at technical federal colleges as well as other programmes that can be attributed to the higher education sector (reported together to keep data confidential).

3) Federal institutions (not including those combined in the higher education sector), state, local government and chamber institutions, R&D institutions of the social insurance carriers, public sector-financed and/or controlled private non-profit institutions as well as R&D institutions of the Ludwig Boltzmann-Gesellschaft; not including regional hospitals. The regional hospitals were not surveyed by questionnaire, but instead Statistics Austria prepared an estimate of the R&D expenditures based on the reports of the offices of the provincial governments. There is no breakdown of R&D expenditure by type of research.

4) Private non-profit institutions whose status is predominantly private or under civil law, sectarian, or other non-public.

5) Including The Austrian Institute of Technology GmbH and competence centres.

Table 22: Expenditure on research and experimental development (R&D) in all survey areas[1] in 2009, by state[2] and types of research

State	No. of units performing R&D	Total expenditure for R&D[1]	of which					
			Basic research		Applied research		Experimental development	
		in € '000	in € '000	in %	in € '000	in %	in € '000	in %
Austria	**4,513**	**7,330,608**	**1,396,997**	**19.1**	**2,551,940**	**34.8**	**3,381,671**	**46.1**
Burgenland	66	47,924	2,527	5.3	19,252	40.2	26,145	54.5
Carinthia	209	379,795	20,863	5.5	94,095	24.8	264,837	69.7
Lower Austria	477	572,643	66,463	11.6	209,488	36.6	296,692	51.8
Upper Austria	816	1,124,124	118,408	10.5	422,637	37.6	583,079	51.9
Salzburg	251	238,022	61,747	25.9	82,632	34.7	93,643	39.4
Styria	821	1,307,041	296,251	22.7	480,167	36.7	530,623	40.6
Tyrol	385	665,168	188,183	28.3	237,267	35.7	239,718	36.0
Vorarlberg	159	201,269	7,557	3.8	67,633	33.6	126,079	62.6
Vienna	1,329	1,951,845	634,998	22.7	938,769	33.6	1,220,855	43.7

SOURCE: STATISTICS AUSTRIA, Survey of research and experimental development in 2009. Compiled on: 20 July 2011.

1) Not including R&D expenditure estimate for regional hospitals. The regional hospitals were not surveyed by questionnaire, but instead Statistics Austria prepared an estimate of the R&D expenditures based on the reports of the offices of the provincial governments. There is no breakdown of R&D expenditure by type of research.

2) In the company R&D sub-sector, the standard evaluation was performed by location of company headquarters.

Table 23: Expenditure on research and experimental development (R&D) in all survey areas in 2009 by state (according to the location of the headquarters/ according to the R&D location)

State	According to the location of the headquarters of the surveyed unit/of the company[1]		According to the firm's R&D location(s)[2]	
	in € '000	in %	in € '000	in %
Austria	**7,479,745**	**100.0**	**7,479,745**	**100.0**
Burgenland	49,284	0.7	44,705	0.6
Carinthia	389,178	5.2	378,293	5.1
Lower Austria	595,620	8.0	663,448	8.9
Upper Austria	1,134,141	15.2	1,198,458	16.0
Salzburg	242,634	3.2	274,207	3.7
Styria	1,334,372	17.8	1,487,137	19.9
Tyrol	683,137	9.1	680,614	9.1
Vorarlberg	204,788	2.7	204,483	2.7
Vienna	2,846,591	38.1	2,548,400	34.0

SOURCE: STATISTICS AUSTRIA, Survey of research and experimental development in 2009. Compiled on: 22 July 2011.

1) The regional classification of the units surveyed, including the businesses in the company R&D sub-sector, was done strictly according to the state in which the headquarters is located (standard evaluation).

2) In this more detailed regional evaluation, for firms in the business sector that perform R&D in more than one state the R&D expenditure is allocated to the regional governments in which the R&D locations are located. For the units surveyed in the other areas the question "R&D locations also located in other states" was not relevant.

Table 24: Financing of expenditure for research and experimental development (R&D) in 2009 by sectors of performance/ survey areas and financing sectors

R&D performed in the sectors, areas	No. of units performing R&D	Total	Business sector	Funding areas: Public sector: Total	Federal government[1)]	Regional governments[2)]	Local governments[2)]	Other [1)]	Private non-profit sector	Foreign incl. international organisations (excl. the EU)	EU
						in € '000					
Total	**4,513** [3]	**7,479,745**	**3,520,016**	**2,661,623**	**1,961,036**	**273,373**	**8,696**	**418,518**	**42,179**	**1,144,457**	**111,470**
1. Higher education sector	**1,259**	**1,951,845**	**101,488**	**1,746,217**	**1,480,930**	**38,657**	**2,375**	**224,255**	**17,735**	**30,445**	**55,960**
of which:											
1.1 Universities (without hospitals)	993	1,519,766	80,037	1,369,349	1,170,275	17,530	1,036	180,508	5,177	19,727	45,476
1.2 University hospitals	90	208,010	11,055	185,780	163,112	2,160	9	20,499	1,177	6,558	3,440
1.3 Art universities	53	26,256	402	25,306	24,030	120	32	1,124	224	186	138
1.4 Academy of Sciences	62	104,984	367	99,044	88,074	1,434	42	9,494	1,068	1,000	3,505
1.5 Universities of applied sciences	19	59,431	6,078	46,333	25,509	11,694	1,213	7,917	3,350	1,294	2,376
1.6 Private universities[4)]	25	23,607	3,499	10,907	1,431	4,892	22	4,562	6,680	1,680	841
1.7 University Colleges of Teacher Education	12	4,096	-	3,872	3,524	325	-	23	40	-	184
1.8 Other higher education sector [5)]	5	5,695	50	5,626	4,975	502	21	128	19	-	-
2. Government sector[6)]	**272** [3]	**399,093**	**23,819**	**352,016**	**136,434**	**193,414**	**3,835**	**18,333**	**2,969**	**3,809**	**16,480**
of which:											
2.1 Without the regional hospitals	272	249,956	23,819	202,879	136,434	44,277	3,835	18,333	2,969	3,809	16,480
2.2 Regional hospitals	-	149,137	-	149,137	-	149,137	-	-	-	-	-
3. Private non-profit sector[7)]	**36**	**35,905**	**3,465**	**3,108**	**1,354**	**695**	**6**	**1,053**	**18,238**	**5,356**	**5,738**
4. Business enterprise sector	**2,946**	**5,092,902**	**3,391,244**	**560,282**	**342,318**	**40,607**	**2,480**	**174,877**	**3,237**	**1,104,847**	**33,292**
of which:											
4.1 Institutes' sub-sector [8)]	55	482,719	102,232	140,795	77,197	22,417	1,864	39,317	1,016	228,601	10,075
4.2 Company R&D sub-sector	2,891	4,610,183	3,289,012	419,487	265,121	18,190	616	135,560	2,221	876,246	23,217

SOURCE: STATISTICS AUSTRIA,Survey of research and experimental development in 2009. Compiled on: 20 July 2011.

1) The funds from the Austrian Science Fund (FWF) and the R&D financing by the higher education sector are included under "Other".

2) Regional governments including Vienna. Local governments without Vienna.

3) Number of survey units not including regional hospitals.

4) Including the Danube University at Krems.

5) Testing institutes at technical federal colleges as well as other programmes that can be attributed to the higher education sector (reported together to keep data confidential).

6) Federal institutions (not including those combined in the higher education sector), state, local government and chamber institutions, R&D institutions of the social insurance carriers, public sector-financed and/or controlled private non-profit institutions as well as R&D institutions of the Ludwig Boltzmann-Gesellschaft; including regional hospitals. The regional hospitals were not surveyed by questionnaire, but instead Statistics Austria prepared an estimate of the R&D expenditures based on the reports of the offices of the provincial governments.

7) Private non-profit institutions whose status is predominantly private or under civil law, sectarian, or other non-public.

8) Including The Austrian Institute of Technology GmbH and competence centres.

Table 25: Financing of expenditure on research and experimental development (R&D) in all survey areas[1] in 2009, by state[2] and financing sectors

State	No. of units performing R&D[3]	Total	Funding areas								
			Business sector	Public sector					Private non-profit sector	Foreign incl. international organisations (excl. the EU)	EU
				Total	Federal government[4]	Regional governments[5]	Local governments[5]	Other [4]			
		in € '000									
Austria	**4,513**	**7,479,745**	**3,520,016**	**2,661,623**	**1,961,036**	**273,373**	**8,696**	**418,518**	**42,179**	**1,144,457**	**111,470**
Burgenland	66	49,284	37,968	9,266	4,464	2,344	112	2,346	-	1,761	289
Carinthia	209	389,178	153,098	94,413	54,058	20,707	1,324	18,324	553	138,432	2,682
Lower Austria	477	595,620	421,243	138,648	81,529	33,044	1,677	22,398	6,471	19,865	9,393
Upper Austria	816	1,134,141	866,673	222,011	142,776	25,047	2,035	52,153	2,251	34,964	8,242
Salzburg	251	242,634	130,106	104,352	78,394	9,340	930	15,688	1,033	2,938	4,205
Styria	821	1,334,372	493,728	502,385	356,991	54,178	1,508	89,708	1,727	313,103	23,429
Tyrol	385	683,137	305,070	304,530	236,806	29,105	225	38,394	4,423	58,707	10,407
Vorarlberg	159	204,788	160,107	31,472	13,554	12,770	197	4,951	500	11,876	833
Vienna	1,329	2,846,591	952,023	1,254,546	992,464	86,838	688	174,556	25,221	562,811	51,990

SOURCE: STATISTICS AUSTRIA, Survey of research and experimental development in 2009. Compiled on: 22 July 2011.

1) Including R&D expenditure estimate for regional hospitals.

2) In the company R&D sub-sector, the standard evaluation was performed by location of company headquarters.

3) Number of survey units not including regional hospitals.

4) The funds from the Austrian Science Fund (FWF) and the R&D financing by the higher education sector are included under "Other".

5) Regional governments including Vienna. Local governments without Vienna.

Table 26: Gross regional product (GRP), gross domestic expenditure on R&D and regional research intensity for 2009

Regions, states (NUTS 1, NUTS 2)	Gross regional product ("regional GDP")[1]	Gross domestic expenditure on R&D [2]	
	in € million	in € million	in % of GRP
Austria	**274,818**	**7,479.75**	**2.72**
Eastern Austria	**121,765**	**3,256.55**	**2.67**
Burgenland	6,304	44.71	0.71
Lower Austria	43,398	663.45	1.53
Vienna	72,063	2,548.40	3.54
Southern Austria	**49,768**	**1,865.43**	**3.75**
Carinthia	15,373	378.29	2.46
Styria	34,395	1,487.14	4.32
Western Austria	**103,283**	**2,357.76**	**2.28**
Upper Austria	46,289	1,198.46	2.59
Salzburg	19,845	274.21	1.38
Tyrol	24,395	680.61	2.79
Vorarlberg	12,754	204.48	1.60

SOURCE: STATISTICS AUSTRIA,Survey of research and experimental development in 2009. Compiled on: 27 Dec. 2011.

1) Status: 27 Dec. 2011. VGR revision date: September 2011.

2) Company R&D sub-sector: Regional allocation according to the firm's R&D location(s)

Rounding differences.

Table 27: Higher education sector[1] Employees in research and experimental development (R&D) in 2009, broken down by fields of science and occupation

Fields of science	No. of units performing R&D	Total	of which		
			Scientific staff	Highly qualified non-scientific staff	Other auxiliary staff
			Headcounts		
1.0 to 6.0 Total	**1,259**	**39,084**	**29,039**	**5,797**	**4,248**
1.0 to 4.0 Subtotal	720	27,796	19,813	4,666	3,317
1.0 Natural sciences	282	10,534	8,083	1,671	780
2.0 Engineering	199	5,978	4,595	715	668
3.0 Human medicine	179	9,748	6,209	2,007	1,532
4.0 Agriculture and forestry, veterinary medicine	60	1,536	926	273	337
5.0 and 6.0 Subtotal	539	11,288	9,226	1,131	931
5.0 Social sciences	308	6,544	5,284	669	591
6.0 Humanities	231	4,744	3,942	462	340
			Full-time equivalents		
1.0 to 6.0 Total	**1,259**	**15,058.5**	**11,262.0**	**2,204.3**	**1,592.2**
1.0 to 4.0 Subtotal	720	11,402.6	8,261.8	1,856.7	1,284.1
1.0 Natural sciences	282	4,884.3	3,865.8	648.9	369.6
2.0 Engineering	199	2,504.7	1,956.4	267.9	280.5
3.0 Human medicine	179	3,468.5	2,110.2	835.0	523.4
4.0 Agriculture and forestry, veterinary medicine	60	545.0	329.4	104.9	110.7
5.0 and 6.0 Subtotal	539	3,655.9	3,000.2	347.6	308.1
5.0 Social sciences	308	2,178.9	1,764.6	219.9	194.5
6.0 Humanities	231	1,477.0	1,235.6	127.7	113.6

SOURCE: STATISTICS AUSTRIA,Survey of research and experimental development in 2009. Compiled on: 22 July 2011.

1) Universities including hospitals, art universities, the Academy of Sciences, universities of applied sciences, private universities, the Danube University at Krems, University Colleges of Teacher Education, testing institutes at technical federal colleges as well as other programmes that can be attributed to the higher education sector.

Rounding differences.

Table 28: Higher education sector[1] Expenditure on research and experimental development (R&D) in 2009 broken down by fields of science and type of expenditure

Fields of science	No. of units performing R&D	Total	of which			
			Labour costs	Other current costs	Instruments and equipment	Land and buildings
		in € '000				
1.0 to 6.0 Total	**1,259**	**1,951,845**	**872,907**	**926,623**	**118,047**	**34,268**
1.0 to 4.0 Subtotal	720	1,479,919	642,543	700,837	102,923	33,616
1.0 Natural sciences	282	632,147	273,468	304,263	51,904	2,512
2.0 Engineering	199	297,345	135,962	129,984	30,458	941
3.0 Human medicine	179	472,032	204,219	223,838	15,785	28,190
4.0 Agriculture and forestry, veterinary medicine	60	78,395	28,894	42,752	4,776	1,973
5.0 and 6.0 Subtotal	539	471,926	230,364	225,786	15,124	652
5.0 Social sciences	308	282,744	134,973	136,734	10,641	396
6.0 Humanities	231	189,182	95,391	89,052	4,483	256

SOURCE: STATISTICS AUSTRIA, Survey of research and experimental development in 2009. Compiled on: 22 July 2011.

1) Universities including hospitals, art universities, the Academy of Sciences, universities of applied sciences, private universities, the Danube University at Krems, University Colleges of Teacher Education, testing institutes at technical federal colleges as well as other programmes that can be attributed to the higher education sector.

Table 29: Higher education sector[1] Expenditure on research and experimental development (R&D) in 2009 broken down by fields of science and type of research

Fields of science	No. of units performing R&D	Total expenditure on R&D	of which					
			Basic research		Applied research		Experimental development	
		in € '000	in € '000	in %	in € '000	in %	in € '000	in %
1.0 to 6.0 Total	**1,259**	**1,951,845**	**1,019,758**	**52.3**	**769,140**	**39.4**	**162,947**	**8.3**
1.0 to 4.0 Subtotal	720	1,479,919	746,704	50.5	589,336	39.8	143,879	9.7
1.0 Natural sciences	282	632,147	420,199	66.5	171,316	27.1	40,632	6.4
2.0 Engineering	199	297,345	91,834	30.9	168,907	56.8	36,604	12.3
3.0 Human medicine	179	472,032	199,737	42.3	212,863	45.1	59,432	12.6
4.0 Agriculture and forestry, veterinary medicine	60	78,395	34,934	44.6	36,250	46.2	7,211	9.2
5.0 and 6.0 Subtotal	539	471,926	273,054	57.9	179,804	38.1	19,068	4.0
5.0 Social sciences	308	282,744	132,276	46.8	137,948	48.8	12,520	4.4
6.0 Humanities	231	189,182	140,778	74.4	41,856	22.1	6,548	3.5

SOURCE: STATISTICS AUSTRIA, Survey of research and experimental development in 2009. Compiled on: 22 July 2011.

1) Universities including hospitals, art universities, the Academy of Sciences, universities of applied sciences, private universities, the Danube University at Krems, University Colleges of Teacher Education, testing institutes at technical federal colleges as well as other programmes that can be attributed to the higher education sector.

Table 30: Higher education sector [1] Financing of expenditure for research and experimental development (R&D) in 2009 broken down by fields of science and financing source

Fields of science	No. of units performing R&D	Total	Business sector	Funding areas							
				Public sector							
				Total	Federal government[2]	Regional governments[3]	Local governments[3]	Other [2]	Private non-profit sector	Foreign incl. international organisations (excl. the EU)	EU
				in € '000							
1.0 to 6.0 Total	**1,259**	**1,951,845**	**101,488**	**1,746,217**	**1,480,930**	**38,657**	**2,375**	**224,255**	**17,735**	**30,445**	**55,960**
1.0 to 4.0 Subtotal	720	1,479,919	93,701	1,298,011	1,074,572	29,846	1,778	191,815	11,193	27,644	49,370
1.0 Natural sciences	282	632,147	19,530	570,781	471,813	10,243	402	88,323	2,484	11,820	27,532
2.0 Engineering	199	297,345	45,254	233,435	181,909	12,507	1,342	37,677	2,425	5,371	10,860
3.0 Human medicine	179	472,032	27,990	420,020	353,894	6,773	31	59,322	5,479	9,469	9,074
4.0 Agriculture and forestry, veterinary medicine	60	78,395	927	73,775	66,956	323	3	6,493	805	984	1,904
5.0 and 6.0 Subtotal	539	471,926	7,787	448,206	406,358	8,811	597	32,440	6,542	2,801	6,590
5.0 Social sciences	308	282,744	7,302	262,125	241,480	5,216	415	15,014	5,473	2,238	5,606
6.0 Humanities	231	189,182	485	186,081	164,878	3,595	182	17,426	1,069	563	984

SOURCE: STATISTICS AUSTRIA, Survey of research and experimental development in 2009. Compiled on: 22 July 2011.

1) Universities including hospitals, art universities, the Academy of Sciences, universities of applied sciences, private universities, the Danube University at Krems, University Colleges of Teacher Education, testing institutes at technical federal colleges as well as other programmes that can be attributed to the higher education sector.

2) The funds from the Austrian Science Fund (FWF) and the R&D financing by the higher education sector are included under "Other".

3) Regional governments including Vienna. Local governments without Vienna.

Table 31: Universities[1]: Employees in research and experimental development (R&D) in full-time equivalents in 2009 broken down by fields of science and occupation

Fields of science	No. of units performing R&D	Full-time equivalents in R&D							
		Total	Scientific staff				Student employees	Highly qualified non-scientific staff	Other non-scientific staff
			Total	Professors	University lecturers, contract lecturers	Junior lecturers and other scientific staff			
1.0 to 6.0 Total									
excluding hospitals	**993**	**11,628.9**	**8,693.1**	**768.0**	**1,031.0**	**6,807.8**	**86.4**	**1,601.9**	**1,333.9**
including hospitals	**1,083**	**13,134.0**	**9,690.5**	**810.1**	**1,260.0**	**7,534.0**	**86.4**	**1,937.5**	**1,506.1**
1.0 to 4.0 Subtotal									
excluding hospitals	572	8,694.6	6,287.3	400.1	678.2	5,179.2	29.8	1,325.9	1,081.4
including hospitals	662	10,199.8	7,284.7	442.2	907.3	5,905.4	29.8	1,661.5	1,253.6
1.0 Natural sciences	255	4,320.1	3,417.3	218.7	377.8	2,809.7	11.1	546.3	356.5
2.0 Engineering	179	2,086.5	1,590.1	104.8	89.4	1,379.3	16.6	222.9	273.5
3.0 Human medicine									
excluding hospitals	78	1,742.9	950.5	53.8	169.3	727.0	0.5	451.7	340.7
hospitals	90	1,505.2	997.4	42.1	229.0	726.2	-	335.6	172.2
including hospitals	168	3,248.1	1,947.9	95.8	398.3	1,453.3	0.5	787.4	512.9
4.0 Agriculture and forestry, veterinary medicine	60	545.0	329.4	22.9	41.8	263.2	1.6	104.9	110.7
5.0 and 6.0 Subtotal	421	2,934.3	2,405.8	367.9	352.7	1,628.6	56.6	276.0	252.5
5.0 Social sciences	269	1,870.7	1,536.0	224.2	197.1	1,076.2	38.6	178.9	155.8
6.0 Humanities	152	1,063.6	869.8	143.7	155.7	552.5	18.0	97.1	96.7

SOURCE: STATISTICS AUSTRIA, Survey of research and experimental development in 2009. Compiled on: 20 July 2011.

1) Not including art universities. - rounding differences.

Table 32: Universities[1]: Employees (scientific and non-scientific staff) in 2009 broken down by fields of science and occupation. Distribution of working hours with proportionate administrative share, in percent

Fields of science	No. of surveyed units performing R&D	Total			Scientific staff: Total			Professors			University lecturers, contract lecturers			Junior lecturers and other scientific staff			Student employees			Highly qualified non-scientific staff			Other non-scientific staff		
		Teaching	Research and experimental development (R&D)	Other work	Teaching	Research and experimental development (R&D)	Other work	Teaching	Research and experimental development (R&D)	Other work	Teaching	Research and experimental development (R&D)	Other work	Teaching	Research and experimental development (R&D)	Other work	Teaching	Research and experimental development (R&D)	Other work	Teaching	Research and experimental development (R&D)	Other work	Teaching	Research and experimental development (R&D)	Other work
		Working hours (with proportionate administrative share) in %																								
1.0 to 6.0 Total																										
excluding hospitals	**993**	**26.9**	**63.6**	**9.5**	**28.4**	**65.2**	**6.4**	**42.2**	**50.5**	**7.3**	**41.9**	**51.1**	**7.0**	**22.1**	**72.0**	**5.9**	**57.0**	**28.5**	**14.5**	**18.9**	**56.9**	**24.2**	**26.9**	**62.4**	**10.7**
including hospitals	**1,083**	**24.7**	**58.1**	**17.2**	**26.1**	**58.8**	**15.1**	**40.6**	**48.8**	**10.6**	**35.5**	**44.3**	**20.2**	**20.5**	**64.9**	**14.6**	**57.0**	**28.5**	**14.5**	**17.0**	**56.9**	**26.1**	**25.3**	**55.6**	**19.1**
1.0 to 4.0 Subtotal																										
excluding hospitals	572	21.5	68.0	10.5	22.6	71.0	6.4	39.7	52.4	7.9	39.8	52.4	7.8	16.1	78.1	5.8	63.1	21.2	15.7	15.3	58.6	26.1	23.7	64.5	11.8
including hospitals	662	19.9	59.7	20.4	20.8	60.7	18.5	37.2	49.0	13.8	32.0	42.6	25.4	15.5	67.2	17.3	63.1	21.2	15.7	13.7	58.3	28.0	22.6	55.8	21.6
1.0 Natural sciences	255	21.3	71.6	7.1	21.8	73.9	4.3	39.4	53.9	6.7	41.7	52.3	6.0	14.2	82.2	3.6	72.5	20.6	6.9	16.9	60.1	23.0	24.6	70.6	4.8
2.0 Engineering	179	23.9	67.4	8.7	24.4	69.9	5.7	43.0	49.8	7.2	41.8	51.8	6.4	19.2	75.8	5.0	57.2	26.0	16.8	19.5	52.8	27.7	25.0	68.2	6.8
3.0 Human medicine																										
excluding hospitals	78	18.7	64.7	16.6	22.3	67.3	10.4	35.9	53.1	11.0	34.9	52.7	12.4	16.1	74.2	9.7	82.5	6.2	11.3	10.6	60.6	28.8	20.0	63.6	16.4
hospitals	90	15.1	34.6	50.3	15.8	31.3	52.9	22.7	29.3	48.0	19.4	26.9	53.7	13.9	33.2	52.9	-	-	-	7.6	57.1	35.3	19.3	30.2	50.5
including hospitals	168	16.5	46.1	37.4	17.8	42.4	39.8	28.2	39.3	32.5	23.7	34.1	42.2	14.6	45.8	39.6	82.5	6.2	11.3	9.3	59.0	31.7	19.6	46.4	34.0
4.0 Agriculture and forestry, veterinary medicine	60	22.8	56.5	20.7	22.8	59.9	17.3	35.2	49.8	15.0	36.6	53.4	10.0	17.8	64.1	18.1	46.2	10.4	43.4	16.0	57.8	26.2	28.2	47.1	24.7
5.0 and 6.0 Subtotal	421	39.1	53.6	7.3	39.8	53.9	6.3	44.7	48.6	6.7	45.7	48.8	5.5	36.1	57.8	6.1	51.7	34.9	13.4	33.8	49.7	16.5	38.5	54.9	6.6
5.0 Social sciences	269	37.9	54.8	7.3	38.4	55.2	6.4	43.4	49.5	7.1	45.2	49.2	5.6	34.2	59.5	6.3	57.6	32.8	9.6	33.4	51.0	15.6	38.7	54.8	6.5
6.0 Humanities	152	41.0	51.7	7.3	42.0	51.9	6.1	46.6	47.2	6.2	46.2	48.6	5.2	39.3	55.0	5.7	36.1	40.6	23.3	34.4	47.6	18.0	38.2	55.1	6.7

SOURCE: STATISTICS AUSTRIA, Survey of research and experimental development in 2009. Compiled on: 20 July 2011.

1) Not including art universities.

Table 33: Universities[1]: Scientific staff in research and experimental development in 2009 (R&D) (headcounts and full-time equivalents) broken down by fields of science, gender and age group

Fields of science, gender	Headcounts	Full-time equivalents (FTE) for R&D										
		Total	of which for employees aged									
			25 and under	25 to 29years	30 to 34 years	35 to 39 years	40 to 44 years	45 to 49 years	50 to 54 years	55 to 59 years	60 to 64 years	65 years and over
1.0 to 6.0 Total	**25,101**	**9,690.5**	**201.7**	**2,804.5**	**2,084.8**	**1,187.4**	**964.5**	**805.5**	**623.4**	**456.1**	**389.1**	**173.7**
male	**15,747**	**6,440.2**	**87.0**	**1,652.8**	**1,362.0**	**771.1**	**645.7**	**584.7**	**470.8**	**361.2**	**343.9**	**161.0**
female	**9,354**	**3,250.3**	**114.7**	**1,151.6**	**722.8**	**416.3**	**318.8**	**220.8**	**152.6**	**94.9**	**45.1**	**12.7**
1.0 Natural sciences, total	7,348	3,417.3	82.7	1,142.5	811.4	401.1	290.4	217.3	174.6	125.1	122.9	49.4
male	5,308	2,508.9	46.8	742.2	602.9	293.2	228.5	175.5	145.8	110.4	115.5	48.2
female	2,040	908.3	35.9	400.3	208.5	107.9	61.9	41.8	28.7	14.7	7.5	1.2
2.0 Engineering, total	3,681	1,590.1	25.2	581.3	394.7	207.2	124.1	84.0	66.9	46.5	41.1	19.3
male	3,000	1,339.7	14.3	471.5	340.4	168.2	104.0	77.5	62.5	43.1	39.0	19.3
female	681	250.4	10.9	109.8	54.3	39.0	20.1	6.5	4.4	3.4	2.1	-
3.0 Human medicine, total	5,865	1,947.9	22.1	474.8	402.3	254.0	228.3	226.5	140.1	101.6	75.6	22.7
male	3,273	1,064.9	6.4	181.7	184.7	142.8	134.7	157.6	99.6	75.8	62.7	19.0
female	2,592	883.0	15.6	293.1	217.6	111.2	93.7	68.9	40.5	25.8	12.9	3.8
4.0 Agriculture and forestry, veterinary medicine, total	926	329.4	1.1	78.6	72.2	50.5	40.6	43.6	19.1	11.8	10.3	1.8
male	407	170.9	0.3	26.7	29.6	24.0	24.2	30.7	15.4	10.0	8.3	1.7
female	519	158.6	0.9	51.9	42.6	26.5	16.4	12.8	3.7	1.8	1.9	0.1
5.0 Social sciences, total	4,626	1,536.0	59.2	418.2	282.7	171.8	160.3	126.1	115.7	86.4	74.9	40.6
male	2,451	881.8	16.0	190.2	154.8	94.7	93.6	82.8	82.9	65.5	64.0	37.3
female	2,175	654.2	43.2	228.0	127.9	77.1	66.7	43.4	32.8	21.0	10.9	3.3
6.0 Humanities, total	2,655	869.8	11.5	109.0	121.6	102.9	120.8	108.1	107.1	84.6	64.3	39.9
male	1,308	473.9	3.2	40.6	49.6	48.2	60.7	60.6	64.6	56.4	54.4	35.6
female	1,347	395.9	8.2	68.5	72.0	54.7	60.1	47.4	42.5	28.2	9.9	4.3

SOURCE: STATISTICS AUSTRIA, Survey of research and experimental development in 2009. Compiled on: 22 July 2011.

1) Not including art universities.

Rounding differences.

Table 34: Universities[1]: Expenditure on research and experimental development (R&D) in 2009 broken down by fields of science and type of expenditure

Fields of science	No. of units performing R&D	Total	of which			
			Labour costs	Other current costs	Instruments and equipment	Land and buildings
		in € '000				
1.0 to 6.0 Total						
excluding hospitals	**993**	**1,519,766**	**663,824**	**740,512**	**99,619**	**15,811**
including hospitals	**1,083**	**1,727,776**	**760,028**	**831,069**	**103,684**	**32,995**
1.0 to 4.0 Subtotal						
excluding hospitals	572	1,121,797	477,876	541,636	87,068	15,217
including hospitals	662	1,329,807	574,080	632,193	91,133	32,401
1.0 Natural sciences	255	555,826	241,710	266,782	45,476	1,858
2.0 Engineering	179	250,478	111,633	110,960	27,241	644
3.0 Human medicine						
excluding hospitals	78	237,098	95,639	121,142	9,575	10,742
hospitals	90	208,010	96,204	90,557	4,065	17,184
including hospitals	168	445,108	191,843	211,699	13,640	27,926
4.0 Agriculture and forestry, veterinary medicine	60	78,395	28,894	42,752	4,776	1,973
5.0 and 6.0 Subtotal	421	397,969	185,948	198,876	12,551	594
5.0 Social sciences	269	249,872	116,263	124,520	8,712	377
6.0 Humanities	152	148,097	69,685	74,356	3,839	217

SOURCE: STATISTICS AUSTRIA, Survey of research and experimental development in 2009. Compiled on: 20 July 2011.

1) Not including art universities.

Table 35: Universities[1]: Expenditure on research and experimental development (R&D) in 2009 broken down by fields of science and type of research

Fields of science	No. of units performing R&D	Total expenditure on R&D	of which					
			Basic research		Applied research		Experimental development	
		in € '000	in € '000	in %	in € '000	in %	in € '000	in %
1.0 to 6.0 Total								
excluding hospitals	**993**	**1,519,766**	**848,172**	**55.8**	**564,923**	**37.2**	**106,671**	**7.0**
including hospitals	**1,083**	**1,727,776**	**901,299**	**52.1**	**685,225**	**39.7**	**141,252**	**8.2**
1.0 to 4.0 Subtotal								
excluding hospitals	572	1,121,797	609,488	54.3	417,109	37.2	95,200	8.5
including hospitals	662	1,329,807	662,615	49.8	537,411	40.4	129,781	9.8
1.0 Natural sciences	255	555,826	356,492	64.2	162,411	29.2	36,923	6.6
2.0 Engineering	179	250,478	86,507	34.5	136,687	54.6	27,284	10.9
3.0 Human medicine								
excluding hospitals	78	237,098	131,555	55.5	81,761	34.5	23,782	10.0
hospitals	90	208,010	53,127	25.5	120,302	57.9	34,581	16.6
including hospitals	168	445,108	184,682	41.5	202,063	45.4	58,363	13.1
4.0 Agriculture and forestry, veterinary medicine	60	78,395	34,934	44.6	36,250	46.2	7,211	9.2
5.0 and 6.0 Subtotal	421	397,969	238,684	60.0	147,814	37.1	11,471	2.9
5.0 Social sciences	269	249,872	121,893	48.7	118,597	47.5	9,382	3.8
6.0 Humanities	152	148,097	116,791	78.9	29,217	19.7	2,089	1.4

SOURCE: STATISTICS AUSTRIA, Survey of research and experimental development in 2009. Compiled on: 20 July 2011.

1) Not including art universities.

Table 36: Universities[1]: Financing of expenditure for research and experimental development (R&D) in 2009 broken down by fields of science and financing source

Fields of science	No. of units performing R&D	Total	Funding areas								
			Business sector	Public sector					Private non-profit sector	Foreign incl. international organisations (excl. the EU)	EU
				Total	Federal government[2]	Regional governments[3]	Local governments[3]	Other[2]			
			in € '000								
1.0 to 6.0 Total											
excluding hospitals	**993**	**1,519,766**	**80,037**	**1,369,349**	**1,170,275**	**17,530**	**1,036**	**180,508**	**5,177**	**19,727**	**45,476**
including hospitals	**1,083**	**1,727,776**	**91,092**	**1,555,129**	**1,333,387**	**19,690**	**1,045**	**201,007**	**6,354**	**26,285**	**48,916**
1.0 to 4.0 Subtotal											
excluding hospitals	572	1,121,797	73,752	986,389	816,279	14,219	512	155,379	3,681	17,655	40,320
including hospitals	662	1,329,807	84,807	1,172,169	979,391	16,379	521	175,878	4,858	24,213	43,760
1.0 Natural sciences	255	555,826	19,061	500,468	409,445	7,530	323	83,170	1,520	9,904	24,873
2.0 Engineering	179	250,478	39,646	196,683	161,363	4,638	179	30,503	394	4,988	8,767
3.0 Human medicine											
excluding hospitals	78	237,098	14,118	215,463	178,515	1,728	7	35,213	962	1,779	4,776
hospitals	90	208,010	11,055	185,780	163,112	2,160	9	20,499	1,177	6,558	3,440
including hospitals	168	445,108	25,173	401,243	341,627	3,888	16	55,712	2,139	8,337	8,216
4.0 Agriculture and forestry, veterinary medicine	60	78,395	927	73,775	66,956	323	3	6,493	805	984	1,904
5.0 and 6.0 Subtotal	421	397,969	6,285	382,960	353,996	3,311	524	25,129	1,496	2,072	5,156
5.0 Social sciences	269	249,872	5,947	236,829	222,082	2,192	407	12,148	1,195	1,629	4,272
6.0 Humanities	152	148,097	338	146,131	131,914	1,119	117	12,981	301	443	884

SOURCE: STATISTICS AUSTRIA, Survey of research and experimental development in 2009. Compiled on: 20 July 2011.

1) Not including art universities.

2) The funds from the Austrian Science Fund (FWF) and the R&D financing by the higher education sector are included under "Other".

3) Regional governments including Vienna. Local governments without Vienna.

Table 37: Government sector[1)] Employees in research and experimental development (R&D) in 2009, broken down by fields of science and occupation

Fields of science	No. of units performing R&D	Total	of which		
			Scientific staff	Highly qualified non-scientific staff	Other auxiliary staff
	Headcounts				
1.0 to 6.0 Total	**272**	**6,008**	**3,145**	**1,200**	**1,663**
1.0 to 4.0 Subtotal	104	3,118	1,541	722	855
1.0 Natural sciences	36	1,020	550	248	222
2.0 Engineering	20	692	436	157	99
3.0 Human medicine	28	310	195	87	28
4.0 Agriculture and forestry, veterinary medicine	20	1,096	360	230	506
5.0 and 6.0 Subtotal	168	2,890	1,604	478	808
5.0 Social sciences	100	1,246	884	235	127
6.0 Humanities	68	1,644	720	243	681
	Full-time equivalents				
1.0 to 6.0 Total	**272**	**2,679.4**	**1,559.3**	**406.3**	**713.8**
1.0 to 4.0 Subtotal	104	1,521.0	808.2	264.2	448.5
1.0 Natural sciences	36	384.2	258.9	45.0	80.3
2.0 Engineering	20	346.1	257.2	54.6	34.3
3.0 Human medicine	28	119.6	78.8	30.2	10.6
4.0 Agriculture and forestry, veterinary medicine	20	671.1	213.4	134.5	323.2
5.0 and 6.0 Subtotal	168	1,158.4	751.1	142.1	265.3
5.0 Social sciences	100	573.5	442.0	86.6	44.8
6.0 Humanities	68	585.0	309.1	55.5	220.5

SOURCE: STATISTICS AUSTRIA, Survey of research and experimental development in 2009. Compiled on: 22 July 2011.

1) Federal institutions (not including those combined in the higher education sector), state, local government and chamber institutions, R&D institutions of the social insurance carriers, public sector-financed and/or controlled private non-profit institutions as well as R&D institutions of the Ludwig Boltzmann-Gesellschaft; not including regional hospitals. The regional hospitals were not surveyed by questionnaire, but instead Statistics Austria prepared an estimate of the R&D expenditures based on the reports of the offices of the provincial governments. For this reason there is no data about employees in R&D.

Rounding differences.

Table 38: Government sector[1)] Employees in research and experimental development (R&D) in 2009, broken down by legal entities and occupation

Legal entity	No. of units performing R&D	Total	of which		
			Scientific staff	Highly qualified non-scientific staff	Other auxiliary staff
			Headcounts		
Total	**272**	**6,008**	**3,145**	**1,200**	**1,663**
Federal	44	2,767	1,143	590	1,034
States (including Vienna)	36	744	277	114	353
Local governments (without Vienna)	8	131	67	22	42
Chambers	4	31	20	-	11
Social insurance institutions	-	-	-	-	-
Private non-profit institutions [2)]	145	1,893	1,313	384	196
Ludwig Boltzmann Gesellschaft	35	442	325	90	27
			Full-time equivalents		
Total	**272**	**2,679.4**	**1,559.3**	**406.3**	**713.8**
Federal	44	1,249.3	543.8	202.9	502.6
States (including Vienna)	36	212.8	97.8	17.5	97.5
Local governments (without Vienna)	8	41.4	24.9	3.0	13.5
Chambers	4	13.9	9.8	-	4.1
Social insurance institutions	-	-	-	-	-
Private non-profit institutions [2)]	145	960.8	725.9	151.6	83.3
Ludwig Boltzmann Gesellschaft	35	201.3	157.2	31.2	12.9

SOURCE: STATISTICS AUSTRIA, Survey of research and experimental development in 2009. Compiled on: 26 July 2011.

1) Federal institutions (not including those combined in the higher education sector), state, local government and chamber institutions, R&D institutions of the social insurance carriers, public sector-financed and/or controlled private non-profit institutions as well as R&D institutions of the Ludwig Boltzmann-Gesellschaft; not including regional hospitals. The regional hospitals were not surveyed by questionnaire, but instead Statistics Austria prepared an estimate of the R&D expenditures based on the reports of the offices of the provincial governments. For this reason there is no data about employees in R&D.

2) Private non-profit institutions primarily financed/supervised by the public sector.

Rounding differences.

Table 39: Government sector[1] Expenditure on research and experimental development (R&D) in 2009 broken down by fields of science and type of expenditure

Fields of science	No. of units performing R&D	Total	of which			
			Labour costs	Other current costs	Instruments and equipment	Land and buildings
		in € '000				
1.0 to 6.0 Total	**272** [2]	**399,093**	**219,475**	**153,564**	**17,109**	**8,945**
1.0 to 4.0 Subtotal	104 [2]	276,802	152,913	104,290	12,843	6,756
1.0 Natural sciences	36	41,043	20,816	15,370	3,287	1,570
2.0 Engineering	20	32,442	20,567	10,475	1,400	-
3.0 Human medicine	28 [2]	157,159	78,602	68,381	5,777	4,399
4.0 Agriculture and forestry, veterinary medicine	20	46,158	32,928	10,064	2,379	787
5.0 and 6.0 Subtotal	168	122,291	66,562	49,274	4,266	2,189
5.0 Social sciences	100	54,109	36,102	15,973	1,075	959
6.0 Humanities	68	68,182	30,460	33,301	3,191	1,230

SOURCE: STATISTICS AUSTRIA, Survey of research and experimental development in 2009. Compiled on: 22 July 2011.

1) Federal institutions (not including those combined in the higher education sector), state, local government and chamber institutions, R&D institutions of the social insurance carriers, public sector-financed and/or controlled private non-profit institutions as well as R&D institutions of the Ludwig Boltzmann-Gesellschaft; including regional hospitals. The regional hospitals were not surveyed by questionnaire, but instead Statistics Austria prepared an estimate of the R&D expenditures based on the reports of the offices of the provincial governments.

2) Number of survey units not including regional hospitals.

Table 40: Government sector[1] Expenditure on research and experimental development (R&D) in 2009 broken down by legal entities and type of expenditure

Legal entity	No. of units performing R&D	Total	of which			
			Labour costs	Other current costs	Instruments and equipment	Land and buildings
		in € '000				
Total	**272** [2]	**399,093**	**219,475**	**153,564**	**17,109**	**8,945**
Federal	44	108,348	65,306	34,165	7,584	1,293
States (including Vienna)	36 [2]	183,088	84,047	86,396	6,125	6,520
Local governments (without Vienna)	8	5,550	2,362	2,784	225	179
Chambers	4	1,472	949	523	-	-
Social insurance institutions	-	-	-	-	-	-
Private non-profit institutions [3]	145	86,659	57,192	26,261	2,253	953
Ludwig Boltzmann Gesellschaft	35	13,976	9,619	3,435	922	-

SOURCE: STATISTICS AUSTRIA, Survey of research and experimental development in 2009. Compiled on: 26 July 2011.

1) Federal institutions (not including those combined in the higher education sector), state, local government and chamber institutions, R&D institutions of the social insurance carriers, public sector-financed and/or controlled private non-profit institutions as well as R&D institutions of the Ludwig Boltzmann-Gesellschaft; including regional hospitals. The regional hospitals were not surveyed by questionnaire, but instead Statistics Austria prepared an estimate of the R&D expenditures based on the reports of the offices of the provincial governments.

2) Number of survey units not including regional hospitals.

3) Private non-profit institutions primarily financed/supervised by the public sector.

Table 41: Government sector[1] Expenditure on research and experimental development (R&D) in 2009 broken down by fields of science and type of research

Fields of science	No. of units performing R&D	Total expenditure on R&D	of which					
			Basic research		Applied research		Experimental development	
		in € '000	in € '000	in %	in € '000	in %	in € '000	in %
1.0 to 6.0 Total	**272**	**249,956**	**80,896**	**32.4**	**147,304**	**58.9**	**21,756**	**8.7**
1.0 to 4.0 Subtotal	104	127,665	26,059	20.4	82,170	64.4	19,436	15.2
1.0 Natural sciences	36	41,043	15,139	36.9	22,426	54.6	3,478	8.5
2.0 Engineering	20	32,442	3,016	9.3	20,185	62.2	9,241	28.5
3.0 Human medicine	28	8,022	1,502	18.7	5,517	68.8	1,003	12.5
4.0 Agriculture and forestry, veterinary medicine	20	46,158	6,402	13.9	34,042	73.7	5,714	12.4
5.0 and 6.0 Subtotal	168	122,291	54,837	44.8	65,134	53.3	2,320	1.9
5.0 Social sciences	100	54,109	13,615	25.2	39,426	72.8	1,068	2.0
6.0 Humanities	68	68,182	41,222	60.5	25,708	37.7	1,252	1.8

SOURCE: STATISTICS AUSTRIA, Survey of research and experimental development in 2009. Compiled on: 25 July 2011.

1) Federal institutions (not including those combined in the higher education sector), state, local government and chamber institutions, R&D institutions of the social insurance carriers, public sector-financed and/or controlled private non-profit institutions as well as R&D institutions of the Ludwig Boltzmann-Gesellschaft; not including regional hospitals. The regional hospitals were not surveyed by questionnaire, but instead Statistics Austria prepared an estimate of the R&D expenditures based on the reports of the offices of the provincial governments. There is no breakdown of R&D expenditure by type of research.

Table 42: Government sector[1] Expenditure on research and experimental development (R&D) in 2009 broken down by legal entities and type of research

Legal entity	No. of units performing R&D	Total expenditure on R&D	of which					
			Basic research		Applied research		Experimental development	
		in € '000	in € '000	in %	in € '000	in %	in € '000	in %
Total	**272**	**249,956**	**80,896**	**32.4**	**147,304**	**58.9**	**21,756**	**8.7**
Federal	44	108,348	35,552	32.8	65,343	60.3	7,453	6.9
States (including Vienna)	36	33,951	16,672	49.1	15,775	46.5	1,504	4.4
Local governments (without Vienna)	8	5,550	2,681	48.3	2,072	37.3	797	14.4
Chambers	4	1,472	494	33.6	858	58.2	120	8.2
Social insurance institutions	-	-	-	-	-	-	-	-
Private non-profit institutions [2]	145	86,659	19,393	22.4	56,506	65.2	10,760	12.4
Ludwig Boltzmann Gesellschaft	35	13,976	6,104	43.7	6,750	48.3	1,122	8.0

SOURCE: STATISTICS AUSTRIA, Survey of research and experimental development in 2009. Compiled on: 26 July 2011.

1) Federal institutions (not including those combined in the higher education sector), state, local government and chamber institutions, R&D institutions of the social insurance carriers, public sector-financed and/or controlled private non-profit institutions as well as R&D institutions of the Ludwig Boltzmann-Gesellschaft; not including regional hospitals. The regional hospitals were not surveyed by questionnaire, but instead Statistics Austria prepared an estimate of the R&D expenditures based on the reports of the offices of the provincial governments. There is no breakdown of R&D expenditure by type of research.

2) Private non-profit institutions primarily financed/supervised by the public sector.

Table 43: Government sector[1)] Financing of expenditure for research and experimental development (R&D) in 2009 broken down by fields of science and financing source

Fields of science	No. of units performing R&D	Total	Business sector	Funding areas							
				Public sector					Private non-profit sector	Foreign incl. international organisations (excl. the EU)	EU
				Total	Federal government[2)]	Regional governments[3)]	Local governments[3)]	Other [2)]			
		in € '000									
1.0 to 6.0 Total	**272** [4]	**399,093**	**23,819**	**352,016**	**136,434**	**193,414**	**3,835**	**18,333**	**2,969**	**3,809**	**16,480**
1.0 to 4.0 Subtotal	104 [4]	276,802	13,637	251,022	74,234	165,854	794	10,140	1,325	2,065	8,753
1.0 Natural sciences	36	41,043	1,798	36,225	22,327	11,539	723	1,636	367	311	2,342
2.0 Engineering	20	32,442	8,081	19,718	13,789	2,581	58	3,290	50	1,434	3,159
3.0 Human medicine	28 [4]	157,159	1,235	155,243	2,226	149,608	4	3,405	101	313	267
4.0 Agriculture and forestry, veterinary medicine	20	46,158	2,523	39,836	35,892	2,126	9	1,809	807	7	2,985
5.0 and 6.0 Subtotal	168	122,291	10,182	100,994	62,200	27,560	3,041	8,193	1,644	1,744	7,727
5.0 Social sciences	100	54,109	7,605	37,089	24,939	4,783	331	7,036	1,203	1,308	6,904
6.0 Humanities	68	68,182	2,577	63,905	37,261	22,777	2,710	1,157	441	436	823

SOURCE: STATISTICS AUSTRIA,Survey of research and experimental development in 2009. Compiled on: 25 July 2011.

1) Federal institutions (not including those combined in the higher education sector), state, local government and chamber institutions, R&D institutions of the social insurance carriers, public sector-financed and/or controlled private non-profit institutions as well as R&D institutions of the Ludwig Boltzmann-Gesellschaft; including regional hospitals. The regional hospitals were not surveyed by questionnaire, but instead Statistics Austria prepared an estimate of the R&D expenditures based on the reports of the offices of the provincial governments.

2) The funds from the Austrian Science Fund (FWF) and the R&D financing by the higher education sector are included under "Other".

3) Regional governments including Vienna. Local governments without Vienna.

4) Number of survey units not including regional hospitals.

Table 44: Government sector[1)] Financing of expenditure on research and experimental development (R&D) in 2009 broken down by legal entities and financing sources

Legal entity	No. of units performing R&D	Total	Business sector	Funding areas: Public sector: Total	Federal government[2)]	Regional governments[3)]	Local governments[3)]	Other [2)]	Private non-profit sector	Foreign incl. international organisations (excl. the EU)	EU
		in € '000									
Total	**272** [4]	**399,093**	**23,819**	**352,016**	**136,434**	**193,414**	**3,835**	**18,333**	**2,969**	**3,809**	**16,480**
Federal	44	108,348	2,778	101,054	99,213	881	32	928	860	280	3,376
Regional governments (including Vienna)	36 [4]	183,088	1,113	181,792	151	181,088	511	42	123	-	60
Local governments (without Vienna)	8	5,550	1,757	3,730	69	850	2,811	-	26	20	17
Chambers	4	1,472	8	1,464	41	41	-	1,382	-	-	-
Social insurance institutions	-	-	-	-	-	-	-	-	-	-	-
Private non-profit institutions[5)]	145	86,659	16,757	53,321	30,932	9,839	474	12,076	1,701	2,990	11,890
Ludwig Boltzmann Gesellschaft	35	13,976	1,406	10,655	6,028	715	7	3,905	259	519	1,137

SOURCE: STATISTICS AUSTRIA, Survey of research and experimental development in 2009. Compiled on: 26 July 2011.

1) Federal institutions (not including those combined in the higher education sector), state, local government and chamber institutions, R&D institutions of the social insurance carriers, public sector-financed and/or controlled private non-profit institutions as well as R&D institutions of the Ludwig Boltzmann-Gesellschaft; including regional hospitals. The regional hospitals were not surveyed by questionnaire, but instead Statistics Austria prepared an estimate of the R&D expenditures based on the reports of the offices of the provincial governments.

2) The funds from the Austrian Science Fund (FWF) and the R&D financing by the higher education sector are included under "Other".

3) Regional governments including Vienna. Local governments without Vienna.

4) Number of survey units not including regional hospitals.

5) Private non-profit institutions primarily financed/supervised by the public sector.

Table 45: Private non-profit sector[1)]: Employees in research and experimental development (R&D) in 2009, broken down by fields of science and occupation

Fields of science	No. of units performing R&D	Total	of which		
			Scientific staff	Highly qualified non-scientific staff	Other auxiliary staff
			Headcounts		
1.0 to 6.0 Total	**36**	**742**	**475**	**176**	**91**
1.0 to 4.0 Subtotal	20	633	406	149	78
1.0 Natural sciences	10	352	234	74	44
2.0 Engineering	7	170	101	41	28
3.0 Human medicine	3 [2]	111 [2]	71 [2]	34 [2]	6 [2]
4.0 Agriculture and forestry, veterinary medicine	. [2]	. [2]	. [2]	. [2]	. [2]
5.0 and 6.0 Subtotal	16	109	69	27	13
5.0 Social sciences	11	72	50	15	7
6.0 Humanities	5	37	19	12	6
			Full-time equivalents		
1.0 to 6.0 Total	**36**	**396.8**	**243.3**	**105.4**	**48.1**
1.0 to 4.0 Subtotal	20	360.7	217.0	98.9	44.8
1.0 Natural sciences	10	203.6	117.7	57.0	28.9
2.0 Engineering	7	91.6	60.1	17.7	13.8
3.0 Human medicine	3 [2]	65.6 [2]	39.2 [2]	24.2 [2]	2.1 [2]
4.0 Agriculture and forestry, veterinary medicine	. [2]	. [2]	. [2]	. [2]	. [2]
5.0 and 6.0 Subtotal	16	36.1	26.3	6.5	3.3
5.0 Social sciences	11	28.0	21.4	4.9	1.7
6.0 Humanities	5	8.1	4.9	1.5	1.6

SOURCE: STATISTICS AUSTRIA, Survey of research and experimental development in 2009. Compiled on: 25 July 2011.

1) Private non-profit institutions whose status is predominantly private or under civil law, sectarian, or other non-public.

2) In order to keep the data confidential these figures can only be reported together.

Rounding differences.

Table 46: Private non-profit sector[1)]: Expenditure on research and experimental development (R&D) in 2009 broken down by fields of science and type of expenditure

Fields of science	No. of units performing R&D	Total	of which			
			Labour costs	Other current costs	Instruments and equipment	Land and buildings
		in € '000				
1.0 to 4.0 Subtotal	20	33,281	20,576	11,329	1,331	45
1.0 Natural sciences	10	15,120	11,530	3,170	375	45
2.0 Engineering	7	10,322	5,581	4,560	181	-
3.0 Human medicine	3 [2]	7,839 [2]	3,465 [2]	3,599 [2]	775 [2]	- [2]
4.0 Agriculture and forestry, veterinary medicine	. [2]	. [2]	. [2]	. [2]	. [2]	. [2]
5.0 and 6.0 Subtotal	16	2,624	1670	897	57	-
5.0 Social sciences	11	2,270	1449	782	39	-
6.0 Humanities	5	354	221	115	18	-

SOURCE: STATISTICS AUSTRIA, Survey of research and experimental development in 2009. Compiled on: 25 July 2011.

1) Private non-profit institutions whose status is predominantly private or under civil law, sectarian, or other non-public.

2) In order to keep the data confidential these figures can only be reported together.

Table 47: Private non-profit sector[1)]: Expenditure on research and experimental development (R&D) in 2009 broken down by fields of science and type of research

Fields of science	No. of units performing R&D	Total expenditure on R&D	of which					
			Basic research		Applied research		Experimental development	
		in € '000	in € '000	in %	in € '000	in %	in € '000	in %
1.0 to 6.0 Total	**36**	**35,905**	**6,467**	**18.0**	**26,637**	**74.2**	**2,801**	**7.8**
1.0 to 4.0 Subtotal	20	33,281	5,899	17.7	25,224	75.8	2,158	6.5
1.0 Natural sciences	10	15,120	1,697	11.2	13,224	87.5	199	1.3
2.0 Engineering	7	10,322	1,974	19.1	7,385	71.6	963	9.3
3.0 Human medicine	3 [2]	7,839 [2]	2,228 [2]	28.4 [2]	4,615 [2]	58.9 [2]	996 [2]	12.7 [2]
4.0 Agriculture and forestry, veterinary medicine	. [2]	. [2]	. [2]	. [2]	. [2]	. [2]	. [2]	. [2]
5.0 and 6.0 Subtotal	16	2,624	568	21.6	1,413	53.9	643	24.5
5.0 Social sciences	11	2,270	461	20.3	1,166	51.4	643	28.3
6.0 Humanities	5	354	107	30.2	247	69.8	-	-

SOURCE: STATISTICS AUSTRIA, Survey of research and experimental development in 2009. Compiled on: 25 July 2011.

1) Private non-profit institutions whose status is predominantly private or under civil law, sectarian, or other non-public.

2) In order to keep the data confidential these figures can only be reported together.

Table 48: Private non-profit sector[1)]: Financing of expenditure for research and experimental development (R&D) in 2009 broken down by fields of science and financing source

Fields of science	No. of units performing R&D	Total	Business sector	Funding areas: Public sector: Total	Federal government[2)]	Regional governments[3)]	Local governments[3)]	Other [2)]	Private non-profit sector	Foreign incl. international organisations (excl. the EU)	EU
		in € '000									
1.0 to 6.0 Total	**36**	**35,905**	**3,465**	**3,108**	**1,354**	**695**	**6**	**1,053**	**18,238**	**5,356**	**5,738**
1.0 to 4.0 Subtotal	20	33,281	2,135	2,460	1,260	543	6	651	17,894	5,168	5,624
1.0 Natural sciences	10	15,120	860	1,200	920	64	1	215	2,987	5,073	5,000
2.0 Engineering	7	10,322	786	695	316	327	5	47	8,256	95	490
3.0 Human medicine	3 [4]	7,839 [4]	489 [4]	565 [4]	24 [4]	152 [4]	- [4]	389 [4]	6,651 [4]	- [4]	134 [4]
4.0 Agriculture and forestry, veterinary medicine	. [4]	. [4]	. [4]	. [4]	. [4]	. [4]	. [4]	. [4]	. [4]	. [4]	. [4]
5.0 and 6.0 Subtotal	16	2,624	1,330	648	94	152	-	402	344	188	114
5.0 Social sciences	11	2,270	1,118	608	72	136	-	400	317	166	61
6.0 Humanities	5	354	212	40	22	16	-	2	27	22	53

SOURCE: STATISTICS AUSTRIA,Survey of research and experimental development in 2009. Compiled on: 25 July 2011.

1) Private non-profit institutions whose status is predominantly private or under civil law, sectarian, or other non-public.

2) The funds from the Austrian Science Fund (FWF) are included under "Other".

3) Regional governments including Vienna. Local governments without Vienna.

4) In order to keep the data confidential these figures can only be reported together.

Table 49: Business enterprise sector[1)]: Employees in research and experimental development (R&D) in 2009, classified by industry, number of employees and occupation

Industry, number of employees		No. of units performing R&D	Headcounts in R&D total	Full-time equivalents in R&D			
				Total	Scientists and engineers[2]	Highly qualified non-scientific staff[3]	Other auxiliary staff
Total		**2,946**	**50,668**	**38,302.9**	**21,599.0**	**13,992.7**	**2,711.2**
IndustryIndustry							
01-03	Agriculture and forestry, fisheries	5	61	19.1	3.6	11.4	4.1
05-09	Mining and excavation of rocks and soils	10	52	22.5	5.3	16.0	1.2
10-33	Manufacture of goods	1,443	31,326	25,408.5	13,677.8	10,035.3	1,695.4
10	Food and feed products	73	493	287.8	154.5	100.4	32.9
11	Beverages	11	82	39.8	14.0	12.4	13.4
12	Tobacco processing	-	-	-	-	-	-
13	Textiles	24	188	105.2	39.5	62.0	3.7
14	Wearing apparel	4)	4)	4)	4)	4)	4)
15	Leather, leather products and shoes	11	51	36.4	18.3	17.3	0.8
16	Wood and products of wood and cork (except furniture)	50	336	157.1	66.9	72.9	17.3
17	Paper and paper products	29	210	160.0	59.5	95.5	5.0
18	Printing products; reproduction of recorded media	13	177	139.1	59.1	80.0	-
19	Coke, refined petroleum products	4)	4)	4)	4)	4)	4)
20	Chemical products	81	1,581	1,319.4	578.8	637.7	102.9
21	Pharmaceuticals, medicinal chemicals and botanical products	32	1,003	852.3	472.4	326.2	53.7
22	Rubber and plastic products	103	1,356	1,074.4	390.7	488.1	195.6
23	Glass, glass products, ceramics, and mineral products	68	918	680.1	498.4	154.2	27.5
24.1-24.3,24.51-24.52	Basic iron, steel, ferro-alloys, tubes, iron and steel casting	31	989	523.8	282.2	170.8	70.8
24.4, 24.53-24.54	Non-ferrous metals, light metal and metal alloy casting	28	502	310.6	111.7	181.8	17.1
25	Metal products	163	1,880	1,215.5	553.2	576.0	86.3
26 without 26.1	Computers, electronic and optical products (without electronic components and circuit boards)	132	2,795	2,261.9	1,358.2	863.9	39.8
26.1	Electronic components and circuit boards	33	1,711	1,628.1	1,452.0	168.6	7.5
27	Electrical equipment	104	5,869	5,404.5	3,753.9	1,439.3	211.3
28	Machinery and equipment	284	5,468	4,306.8	1,788.6	2,207.9	310.3
29	Motor vehicles, trailers and semi-trailers	45	3,015	2,781.3	1,297.2	1,150.9	333.2
30	Manufacture of other transport equipment	17	793	715.0	165.2	469.6	80.2
31	Furniture	27	178	131.2	34.8	82.8	13.6
32 without 32.5	Other goods (without medical or dental equipment and materials)	29	763	530.2	194.3	295.2	40.7
32.5	Medical or dental equipment and materials	24	420	364.1	230.4	133.4	0.3
33	Repair and installation of machines and equipment	21	291	195.8	80.5	104.8	10.5
35	Energy supply	23	221	68.6	23.9	34.7	10.0
36-39	Water supply; disposal of waste water and waste and removal of environmental pollution	14	71	21.3	8.6	9.7	3.0
41-43	Construction	70	446	216.4	93.1	99.6	23.7
45-96	Services	1,381	18,491	12,546.5	7,786.7	3,786.0	973.8
45-47	Wholesale and retail trade; repair of motor vehicles	254	2,331	1,728.3	904.0	744.0	80.3
49-53	Transport and warehousing	17	130	51.9	31.7	14.2	6.0
55-56	Hotels and restaurants	-	-	-	-	-	-
58-60	Publishing; production, rental and distribution of films and TV programmes; movie theatres; sound studios and music publishing; broadcasting	26	248	151.6	105.0	43.6	3.0
61	Telecommunications	6	434	419.5	367.0	51.5	1.0
62	Information technology services	297	3,179	1,946.1	1,038.1	794.9	113.1
63	Information services	57	503	242.6	127.2	104.9	10.5
64-66	Finance and insurance services	7	161	114.4	60.9	50.2	3.3
68; 69-75 (without 71+72)	Properties and housing; freelance, scientific and technical services (without architecture and engineering firms; technical, physical and chemical analysis; without research and development)	131	780	491.6	319.9	150.9	20.8
71	Architecture and engineering firms; technical, physical and chemical analysis	251	3,629	2,398.7	1,348.1	684.6	366.0
72.11	Research and development in the biotechnology sector	30	1,940	1,639.2	1,167.8	372.3	99.2
72.19	Other research and development in the areas of natural, engineering and agricultural sciences and medicine	231	4,729	3,152.9	2,150.8	749.4	252.7
72.20	Research and development in the areas of legal, economic and social sciences as well as the areas of language, culture and art sciences	40	200	112.0	99.9	7.0	5.0
77-82	Other economic services	19	125	63.9	37.0	14.3	12.6
84-96	Public administration, defence; social security; eduction and teaching; health and social work; art, entertainment and recreation; other services	15	102	33.9	29.4	4.2	0.3
Number of employees							
1 - 49 employees		1,739	10,446	5,989.5	3,619.5	2,112.2	257.8
50 - 249 employees		780	12,153	8,136.1	3,959.0	3,620.8	556.3
250 and more employees		427	28,069	24,177.3	14,020.5	8,259.7	1,897.1

SOURCE: STATISTICS AUSTRIA, Survey of research and experimental development in 2009. Compiled on: 18 July 2011. - 1) Includes the Institutes' sub-sector and the business enterprise sector. - 2) Academics and equivalent employees. - 3) Graduates of academic secondary schools, technicians, laboratory assistants. - 4) In order to keep the data confidential these figures cannot be reported separately, but they are included in the subtotals and totals. - rounding differences.

Table 50: Business enterprise sector[1)]: Employees in research and experimental development (R&D) in 2009, classified by industry, number of employees, occupation and gender

Industry, number of employees		No. of units performing R&D	Full-time equivalents in R&D							
			Total		Scientists and engineers[2]		Highly qualified non-scientific staff[3)]		Other auxiliary staff	
			male	female	male	female	male	female	male	female
Total		**2,946**	**31,969.6**	**6,333.3**	**18,356.1**	**3,242.9**	**11,846.7**	**2,146.0**	**1,766.8**	**944.4**
Industry										
01-03	Agriculture and forestry, fisheries	5	12.9	6.2	2.1	1.5	6.7	4.7	4.1	-
05-09	Mining and excavation of rocks and soils	10	18.5	4.0	4.9	0.4	13.4	2.6	0.2	1.0
10-33	Manufacture of goods	1,443	22,361.2	3,047.3	12,284.1	1,393.7	8,816.4	1,218.9	1,260.7	434.7
10	Food and feed products	73	195.2	92.6	109.5	45.0	68.0	32.4	17.7	15.2
11	Beverages	11	23.7	16.1	9.9	4.1	9.0	3.4	4.8	8.6
12	Tobacco processing	-	-	-	-	-	-	-	-	-
13	Textiles	24	72.7	32.5	31.3	8.2	39.2	22.8	2.2	1.5
14	Wearing apparel	4)	4)	4)	4)	4)	4)	4)	4)	4)
15	Leather, leather products and shoes	11	27.0	9.4	14.8	3.5	11.5	5.8	0.7	0.1
16	Wood and products of wood and cork (except furniture)	50	143.6	13.5	61.0	5.9	66.3	6.6	16.3	1.0
17	Paper and paper products	29	118.8	41.2	44.6	14.9	73.2	22.3	1.0	4.0
18	Printing products; reproduction of recorded media	13	120.5	18.6	45.2	13.9	75.3	4.7	-	-
19	Coke, refined petroleum products	4)	4)	4)	4)	4)	4)	4)	4)	4)
20	Chemical products	81	939.5	379.9	437.5	141.3	440.5	197.2	61.5	41.4
21	Pharmaceuticals, medicinal chemicals and botanical products	32	435.8	416.5	264.0	208.4	133.7	192.5	38.1	15.6
22	Rubber and plastic products	103	905.4	169.0	358.0	32.7	434.8	53.3	112.6	83.0
23	Glass, glass products, ceramics, and mineral products	68	570.4	109.7	420.8	77.6	126.4	27.8	23.2	4.3
24.1-24.3, 24.51-24.52	Basic iron, steel, ferro-alloys, tubes, iron and steel casting	31	470.9	52.9	262.3	19.9	153.8	17.0	54.8	16.0
24.4, 24.53-24.54	Non-ferrous metals, light metal and metal alloy casting	28	283.0	27.6	104.1	7.6	163.8	18.0	15.1	2.0
25	Metal products	163	1,154.1	61.4	526.9	26.3	551.3	24.7	75.9	10.4
26 without 26.1	Computers, electronic and optical products (without electronic components and circuit boards)	132	2,092.0	169.9	1,259.3	98.9	809.1	54.8	23.6	16.2
26.1	Electronic components and circuit boards	33	1,459.6	168.5	1,308.5	143.5	149.9	18.7	1.2	6.3
27	Electrical equipment	104	4,833.6	570.9	3,387.8	366.1	1,283.4	155.9	162.4	48.9
28	Machinery and equipment	284	4,062.9	243.9	1,732.9	55.7	2,091.6	116.3	238.4	71.9
29	Motor vehicles, trailers and semi-trailers	45	2,595.3	186.0	1,253.8	43.4	1,058.6	92.3	282.9	50.3
30	Manufacture of other transport equipment	17	678.5	36.5	156.2	9.0	450.5	19.1	71.8	8.4
31	Furniture	27	116.3	14.9	32.9	1.9	73.2	9.6	10.2	3.4
32 without 32.5	Other goods (without medical or dental equipment and materials)	29	471.3	58.9	168.1	26.2	267.2	28.0	36.0	4.7
32.5	Medical or dental equipment and materials	24	314.9	49.2	205.1	25.3	109.8	23.6	-	0.3
33	Repair and installation of machines and equipment	21	178.5	17.3	77.1	3.4	95.4	9.4	6.0	4.5
35	Energy supply	23	63.8	4.8	21.6	2.3	33.9	0.8	8.3	1.7
36-39	Water supply; disposal of waste water and waste and removal of environmental pollution	14	14.8	6.5	7.2	1.4	6.9	2.8	0.7	2.3
41-43	Construction	70	201.3	15.1	86.2	6.9	92.5	7.1	22.6	1.1
45-96	Services	1,381	9,297.1	3,249.4	5,950.0	1,836.7	2,876.9	909.1	470.2	503.6
45-47	Wholesale and retail trade; repair of motor vehicles	254	1,308.3	420.0	701.6	202.4	580.5	163.5	26.2	54.1
49-53	Transport and warehousing	17	40.0	11.9	25.3	6.4	12.7	1.5	2.0	4.0
55-56	Hotels and restaurants	-	-	-	-	-	-	-	-	-
58-60	Publishing; production, rental and distribution of films and TV programmes; movie theatres; sound studios and music publishing; broadcasting	26	132.8	18.8	91.6	13.4	39.2	4.4	2.0	1.0
61	Telecommunications	6	365.2	54.3	326.8	40.2	38.4	13.1	-	1.0
62	Information technology services	297	1,715.7	230.4	941.9	96.2	699.9	95.0	73.9	39.2
63	Information services	57	205.7	36.9	105.9	21.3	92.7	12.2	7.1	3.4
64-66	Finance and insurance services	7	77.6	36.8	48.8	12.1	27.8	22.4	1.0	2.3
68; 69-75 (without 71+72)	Properties and housing; freelance, scientific and technical services (without architecture and engineering firms; technical, physical and chemical analysis; without research and development)	131	344.7	146.9	223.4	96.5	108.5	42.4	12.8	8.0
71	Architecture and engineering firms; technical, physical and chemical analysis	251	2,003.8	394.9	1,211.9	136.2	601.6	83.0	190.3	175.6
72.11	Research and development in the biotechnology sector	30	684.6	954.6	504.6	663.2	163.9	208.4	16.1	83.0
72.19	Other research and development in the areas of natural, engineering and agricultural sciences and medicine	231	2,292.7	860.2	1,657.3	493.5	501.9	247.5	133.5	119.3
72.20	Research and development in the areas of legal, economic and social sciences as well as the areas of language, culture and art sciences	40	59.5	52.5	58.2	41.8	0.4	6.6	1.0	4.0
77-82	Other economic services	19	41.6	22.3	30.3	6.7	7.0	7.3	4.3	8.3
84-96	Public administration, defence; social security; eduction and teaching; health and social work; art, entertainment and recreation; other services	15	24.9	9.0	22.5	6.9	2.4	1.8	-	0.3
Number of employees										
1 - 49 employees		1,739	4,815.3	1,174.2	2,951.3	668.2	1,725.4	386.8	138.6	119.2
50 - 249 employees		780	6,828.3	1,307.8	3,379.7	579.3	3,079.9	540.9	368.7	187.6
250 and more employees		427	20,326.1	3,851.3	12,025.1	1,995.4	7,041.4	1,218.3	1,259.6	637.5

SOURCE: STATISTICS AUSTRIA, Survey of research and experimental development in 2009. Compiled on: 18 July 2011. - 1) Includes the Institutes' sub-sector and the business enterprise sector. - 2) Academics and equivalent employees. - 3) Graduates of academic secondary schools, technicians, laboratory assistants. - 4) In order to keep the data confidential these figures cannot be reported separately, but they are included in the subtotals and totals. - rounding differences.

Table 51: Business enterprise sector[1]: Employees in research and experimental development (R&D) and expenditure on R&D in 2009 by state[2]

State	Employees in R&D				R&D expenditure			
	according to the location of the company's headquarters		according to the firm's R&D location(s)		according to the location of the company's headquarters		according to the firm's R&D location(s)[3]	
	Headcount	in %	Headcount	in %	in € '000	in %	in € '000	in %
Austria	**50,668**	**100.0**	**50,668**	**100.0**	**5,092,902**	**100.0**	**5,092,902**	**100.0**
Burgenland	654	1.3	634	1.3	44,190	0.9	39,611	0.8
Carinthia	2,878	5.7	2,882	5.7	334,090	6.6	323,205	6.3
Lower Austria	5,837	11.5	6,373	12.6	519,196	10.2	587,024	11.5
Upper Austria	10,549	20.8	10,828	21.4	1,008,656	19.8	1,072,973	21.1
Salzburg	2,055	4.1	2,299	4.5	139,493	2.7	171,066	3.4
Styria	9,772	19.3	10,720	21.2	904,893	17.8	1,057,658	20.8
Tyrol	3,257	6.4	3,179	6.3	382,128	7.5	379,605	7.5
Vorarlberg	2,431	4.8	2,428	4.8	188,275	3.7	187,970	3.7
Vienna	13,235	26.1	11,325	22.2	1,571,981	30.8	1,273,790	24.9

SOURCE: STATISTICS AUSTRIA, Survey of research and experimental development (R&D) in 2009. Compiled on: 18 July 2011.

1) Includes the Institutes' sub-sector and the business enterprise sector.

2) The regional classification of the units in the institutes' sub-sector is done strictly according to the state in which the company has its headquarters. For the firms in the business enterprise sector, there is a classifications by the state in which the headquarters is located as well as an alternative classification by the state(s) in which the R&D location(s) can be found.

3) R&D expenditure according to R&D location(s) was calculated based on the distribution of employees in R&D at the R&D locations.

Table 52: Business enterprise sector[1]: Expenditure on research and experimental development (R&D) in 2009 broken down by industry, number of employees and type of expenditure

Industry / number of employees		No. of units performing R&D	Total	Labour costs	Other current costs	Expenditure on plants and machinery and equipment	Expenditure on buildings and property
			in € '000				
Total		**2,946**	**5,092,902**	**2,685,851**	**1,991,800**	**325,308**	**89,943**
Industry							
01-03	Agriculture and forestry, fisheries	5	1,463	624	830	9	-
05-09	Mining and excavation of rocks and soils	10	4,474	1,542	2,758	114	60
10-33	Manufacture of goods	1,443	3,435,405	1,853,915	1,302,440	196,712	82,338
10	Food and feed products	73	29,320	16,620	11,022	869	809
11	Beverages	11	2,772	2,242	425	105	-
12	Tobacco processing	-	-	-	-	-	-
13	Textiles	24	11,962	5,548	6,114	240	60
14	Wearing apparel	[2]	[2]	[2]	[2]	[2]	[2]
15	Leather, leather products and shoes	11	3,301	2,093	1,207	1	-
16	Wood and products of wood and cork (except furniture)	50	18,161	8,494	8,388	1,168	111
17	Paper and paper products	29	14,377	10,212	3,589	496	80
18	Printing products; reproduction of recorded media	13	21,194	11,378	8,257	1,539	20
19	Coke, refined petroleum products	[2]	[2]	[2]	[2]	[2]	[2]
20	Chemical products	81	171,817	86,625	49,156	17,120	18,916
21	Pharmaceuticals, medicinal chemicals and botanical products	32	192,526	59,845	89,656	24,719	18,306
22	Rubber and plastic products	103	114,275	59,514	31,867	21,364	1,530
23	Glass, glass products, ceramics, and mineral products	68	73,210	41,167	22,246	8,542	1,255
24.1-24.3,24.51-24.52	Basic iron, steel, ferro-alloys, tubes, iron and steel casting	31	93,810	35,652	48,420	7,177	2,561
24.4, 24.53-24.54	Non-ferrous metals, light metal and metal alloy casting	28	37,455	18,718	15,620	3,115	2
25	Metal products	163	127,176	79,009	37,714	9,125	1,328
26 without 26.1	Computers, electronic and optical products (without electronic components and circuit boards)	132	253,428	165,915	79,071	8,002	440
26.1	Electronic components and circuit boards	33	273,703	117,469	146,602	9,539	93
27	Electrical equipment	104	825,552	505,548	270,726	26,189	23,089
28	Machinery and equipment	284	545,191	286,660	218,723	27,574	12,234
29	Motor vehicles, trailers and semi-trailers	45	368,502	206,740	147,472	13,503	787
30	Manufacture of other transport equipment	17	105,752	51,726	44,467	9,559	-
31	Furniture	27	16,788	8,628	5,919	2,241	-
32 without 32.5	Other goods (without medical or dental equipment and materials)	29	56,632	30,209	24,733	1,532	158
32.5	Medical or dental equipment and materials	24	36,906	22,225	12,904	1,308	469
33	Repair and installation of machines and equipment	21	21,342	10,396	9,200	1,656	90
35	Energy supply	23	10,289	6,446	3,116	277	450
36-39	Water supply; disposal of waste water and waste and removal of environmental pollution	14	2,656	1,080	1,009	567	-
41-43	Construction	70	29,109	10,788	16,996	1,182	143
45-96	Services	1,381	1,609,506	811,456	664,651	126,447	6,952
45-47	Wholesale and retail trade; repair of motor vehicles	254	255,881	110,417	128,038	15,284	2,142
49-53	Transport and warehousing	17	6,652	3,431	1,119	2,102	-
55-56	Hotels and restaurants	-	-	-	-	-	-
58-60	Publishing; production, rental and distribution of films and TV programmes; movie theatres; sound studios and music publishing; broadcasting	26	11,823	8,089	3,004	613	117
61	Telecommunications	6	45,141	30,504	7,649	6,988	-
62	Information technology services	297	147,171	105,603	37,291	3,719	558
63	Information services	57	18,495	13,027	4,037	1,344	87
64-66	Finance and insurance services	7	45,199	9,165	5,441	30,593	-
68; 69-75 (without 71+72)	Properties and housing; freelance, scientific and technical services (without architecture and engineering firms; technical, physical and chemical analysis; without research and development)	131	44,357	27,202	13,234	3,848	73
71	Architecture and engineering firms; technical, physical and chemical analysis	251	384,499	187,684	174,328	20,874	1,613
72.11	Research and development in the biotechnology sector	30	311,945	122,242	170,330	19,013	360
72.19	Other research and development in the areas of natural, engineering and agricultural sciences and medicine	231	321,932	184,080	114,716	21,204	1,932
72.20	Research and development in the areas of legal, economic and social sciences as well as the areas of language, culture and art sciences	40	7,273	4,914	2,114	190	55
77-82	Other economic services	19	6,369	3,572	2,203	594	-
84-96	Public administration, defence; social security; eduction and teaching; health and social work; art, entertainment and recreation; other services	15	2,769	1,526	1,147	81	15
Number of employees							
1 - 49 employees		1,739	561,138	314,027	202,384	38,657	6,070
50 - 249 employees		780	899,444	504,703	326,878	52,114	15,749
250 and more employees		427	3,632,320	1,867,121	1,462,538	234,537	68,124

Source: STATISTICS AUSTRIA, Survey of research and experimental development (R&D) in 2009. Compiled on: 18 July 2011. - 1) Includes the business enterprise sector and Institutes' sub-sector. - 2) In order to keep the data confidential these figures cannot be reported separately, but they are included in the subtotals and totals.

Table 53: Business enterprise sector[1)]: Expenditure on research and experimental development (R&D) in 2009 broken down by industry and type of research

Industry		No. of units performing R&D	Internal R&D expenditure total	of which					
				Frontier research		Applied research		Experimental development	
			in € '000	in € '000	in %	in € '000	in %	in € '000	in %
Total		**2,946**	**5,092,902**	**289,876**	**5.7**	**1,608,859**	**31.6**	**3,194,167**	**62.7**
01-03	Agriculture and forestry, fisheries	5	1,463	4	0.3	1,184	80.9	275	18.8
05-09	Mining and excavation of rocks and soils	10	4,474	410	9.2	2,425	54.2	1,639	36.6
10-33	Manufacture of goods	1,443	3,435,405	102,039	3.0	980,700	28.5	2,352,666	68.5
10	Food and feed products	73	29,320	358	1.2	11,339	38.7	17,623	60.1
11	Beverages	11	2,772	27	1.0	643	23.2	2,102	75.8
12	Tobacco processing	-	-	-	-	-	-	-	-
13	Textiles	24	11,962	1,314	11.0	3,939	32.9	6,709	56.1
14	Wearing apparel	2)	2)	2)	2)	2)	2)	2	2
15	Leather, leather products and shoes	11	3,301	598	18.1	435	13.2	2,268	68.7
16	Wood and products of wood and cork (except furniture)	50	18,161	1,052	5.8	6,859	37.8	10,250	56.4
17	Paper and paper products	29	14,377	1,838	12.8	3,570	24.8	8,969	62.4
18	Printing products; reproduction of recorded media	13	21,194	165	0.8	3,211	15.2	17,818	84.0
19	Coke, refined petroleum products	2)	2)	2)	2)	2)	2)	2	2
20	Chemical products	81	171,817	3,135	1.8	72,579	42.2	96,103	56.0
21	Pharmaceuticals, medicinal chemicals and botanical products	32	192,526	472	0.2	104,002	54.1	88,052	45.7
22	Rubber and plastic products	103	114,275	5,149	4.5	43,368	38.0	65,758	57.5
23	Glass, glass products, ceramics, and mineral products	68	73,210	7,454	10.2	18,383	25.1	47,373	64.7
24.1-24.3,24.51-24.52	Basic iron, steel, ferro-alloys, tubes, iron and steel casting	31	93,810	13,236	14.1	27,703	29.5	52,871	56.4
24.4, 24.53-24.54	Non-ferrous metals, light metal and metal alloy casting	28	37,455	1,294	3.5	10,258	27.4	25,903	69.1
25	Metal products	163	127,176	2,624	2.1	38,693	30.4	85,859	67.5
26 without 26.1	Computers, electronic and optical products (without electronic components and circuit boards)	132	253,428	7,029	2.8	61,781	24.4	184,618	72.8
26.1	Electronic components and circuit boards	33	273,703	469	0.2	44,411	16.2	228,823	83.6
27	Electrical equipment	104	825,552	9,457	1.1	176,604	21.4	639,491	77.5
28	Machinery and equipment	284	545,191	20,100	3.7	198,559	36.4	326,532	59.9
29	Motor vehicles, trailers and semi-trailers	45	368,502	13,670	3.7	73,696	20.0	281,136	76.3
30	Manufacture of other transport equipment	17	105,752	7,015	6.6	44,121	41.7	54,616	51.7
31	Furniture	27	16,788	1,127	6.7	3,962	23.6	11,699	69.7
32 without 32.5	Other goods (without medical or dental equipment and materials)	29	56,632	718	1.3	10,812	19.1	45,102	79.6
32.5	Medical or dental equipment and materials	24	36,906	2,683	7.3	9,504	25.8	24,719	66.9
33	Repair and installation of machines and equipment	21	21,342	525	2.5	8,952	41.9	11,865	55.6
35	Energy supply	23	10,289	57	0.6	7,924	77.0	2,308	22.4
36-39	Water supply; disposal of waste water and waste and removal of environmental pollution	14	2,656	48	1.8	1,224	46.1	1,384	52.1
41-43	Construction	70	29,109	462	1.6	8,923	30.7	19,724	67.7
45-96	Services	1,381	1,609,506	186,856	11.6	606,479	37.7	816,171	50.7
45-47	Wholesale and retail trade; repair of motor vehicles	254	255,881	5,380	2.1	98,010	38.3	152,491	59.6
49-53	Transport and warehousing	17	6,652	771	11.6	3,955	59.4	1,926	29.0
55-56	Hotels and restaurants	-	-	-	-	-	-	-	-
58-60	Publishing; production, rental and distribution of films and TV programmes; movie theatres; sound studios and music publishing; broadcasting	26	11,823	852	7.2	8,027	67.9	2,944	24.9
61	Telecommunications	6	45,141	-	-	10,367	23.0	34,774	77.0
62	Information technology services	297	147,171	5,490	3.7	64,517	43.8	77,164	52.5
63	Information services	57	18,495	259	1.4	7,287	39.4	10,949	59.2
64-66	Finance and insurance services	7	45,199	1,630	3.6	41,111	91.0	2,458	5.4
68; 69-75 (without 71+72)	Properties and housing; freelance, scientific and technical services (without architecture and engineering firms; technical, physical and chemical analysis; without research and development)	131	44,357	3,572	8.1	20,325	45.8	20,460	46.1
71	Architecture and engineering firms; technical, physical and chemical analysis	251	384,499	55,863	14.5	164,109	42.7	164,527	42.8
72.11	Research and development in the biotechnology sector	30	311,945	36,117	11.6	41,077	13.2	234,751	75.2
72.19	Other research and development in the areas of natural, engineering and agricultural sciences and medicine	231	321,932	75,911	23.6	137,809	42.8	108,212	33.6
72.20	Research and development in the areas of legal, economic and social sciences as well as the areas of language, culture and art sciences	40	7,273	780	10.7	5,388	74.1	1,105	15.2
77-82	Other economic services	19	6,369	149	2.3	2,715	42.6	3,505	55.1
84-96	Public administration, defence; social security; eduction and teaching; health and social work; art, entertainment and recreation; other services	15	2,769	82	3.0	1,782	64.3	905	32.7

SOURCE: STATISTICS AUSTRIA, Survey of research and experimental development in 2009. Compiled on: 15 July 2011. - 1) Includes the business enterprise sector and Institutes' sub-sector. - 2) In order to keep the data confidential these figures cannot be reported separately, but they are included in the subtotals and totals.

Table 54: Business enterprise sector[1]: Financing of expenditure on research and experimental development (R&D) in 2009 broken down by industry and and sources of funds

	Industry	Number of units performing R&D	Total	Funding source/segments: Business enterprise sector[2];	Public sector: Federal	Public sector: Research premium	Public sector: State[3]	Public sector: Austrian Research Promotion Agency (FFG)[4]	Public sector: Other public financing[5]	Public sector: Total	Private non-profit sector	Abroad (excluding EU)[6]	EU
			in € '000										
Total		**2,946**	**5,092,902**	**3,391,244**	**87,686**	**254,632**	**40,607**	**159,434**	**17,923**	**560,282**	**3,237**	**1,104,847**	**33,292**
01-03	Agriculture and forestry, fisheries	5	1,463	1,277	-	45	79	62	-	186	-	-	-
05-09	Mining and excavation of rocks and soils	10	4,474	2,036	-	2	-	15	-	17	-	2,421	-
10-33	Manufacture of goods	1,443	3,435,405	2,438,096	7,622	187,659	9,858	83,055	2,520	290,714	376	697,040	9,179
10	Food and feed products	73	29,320	28,176	-	284	89	264	-	637	-	507	-
11	Beverages	11	2,772	2,631	-	141	-	-	-	141	-	-	-
12	Tobacco processing	-	-	-	-	-	-	-	-	-	-	-	-
13	Textiles	24	11,962	10,939	-	513	29	453	24	1,019	-	-	4
14	Wearing apparel	7)	7)	7)	7)	7)	7)	7)	7)	7)	7)	7)	7)
15	Leather, leather products and shoes	11	3,301	3,216	-	85	-	-	-	85	-	-	-
16	Wood and products of wood and cork (except furniture)	50	18,161	16,480	212	454	152	760	14	1,592	-	56	33
17	Paper and paper products	29	14,377	13,047	22	801	9	403	18	1,253	-	77	-
18	Printing products; reproduction of recorded media	13	21,194	19,942	1	166	-	1,057	-	1,224	28	-	-
19	Coke, refined petroleum products	7)	7)	7)	7)	7)	7)	7)	7)	7)	7)	7)	7)
20	Chemical products	81	171,817	153,570	13	6,283	28	4,062	240	10,626	40	7,418	163
21	Pharmaceuticals, medicinal chemicals and botanical products	32	192,526	124,634	214	14,109	64	1,606	122	16,115	155	51,593	29
22	Rubber and plastic products	103	114,275	95,405	341	3,610	514	4,839	152	9,456	-	9,135	279
23	Glass, glass products, ceramics, and mineral products	68	73,210	67,347	2	2,166	520	2,111	39	4,838	-	739	286
24.1-24.3, 24.51-24.52	Basic iron, steel, ferro-alloys, tubes, iron and steel casting	31	93,810	83,001	169	6,448	25	2,627	-	9,269	-	168	1,372
24.4, 24.53-24.54	Non-ferrous metals, light metal and metal alloy casting	28	37,455	33,484	55	2,802	20	1,094	-	3,971	-	-	-
25	Metal products	163	127,176	111,988	6	6,866	223	4,123	619	11,837	5	3,078	268
26 without 26.1	Computers, electronic and optical products (without electronic components and circuit boards)	132	253,428	191,005	661	15,095	587	9,539	104	25,986	128	34,948	1,361
26.1	Electronic components and circuit boards	33	273,703	100,473	4,540	17,262	3,153	11,460	-	36,415	-	133,830	2,985
27	Electrical equipment	104	825,552	445,692	542	40,687	1,345	13,530	136	56,240	20	322,528	1,072
28	Machinery and equipment	284	545,191	448,456	216	26,261	1,770	13,164	536	41,947	-	54,036	752
29	Motor vehicles, trailers and semi-trailers	45	368,502	273,093	520	32,446	1,012	6,664	321	40,963	-	54,058	388
30	Manufacture of other transport equipment	17	105,752	86,524	-	5,658	-	3,096	-	8,754	-	10,474	-
31	Furniture	27	16,788	16,359	-	263	40	121	5	429	-	-	-
32 without 32.5	Other goods (without medical or dental equipment and materials)	29	56,632	44,314	1	2,187	8	189	-	2,385	-	9,933	-
32.5	Medical or dental equipment and materials	24	36,906	32,117	-	1,694	16	768	160	2,638	-	2,002	149
33	Repair and installation of machines and equipment	21	21,342	16,686	107	1,240	183	616	30	2,176	-	2,460	20
35	Energy supply	23	10,289	9,586	-	410	4	156	-	570	-	-	133
36-39	Water supply; disposal of waste water and waste and removal of environmental pollution	14	2,656	2,241	111	96	-	205	-	412	-	3	-
41-43	Construction	70	29,109	25,947	55	1,599	145	1,069	171	3,039	-	105	18
45-96	Services	1,381	1,609,506	912,061	79,898	64,821	30,521	74,872	15,232	265,344	2,861	405,278	23,962
45-47	Wholesale and retail trade; repair of motor vehicles	254	255,881	120,187	327	7,675	612	9,109	403	18,126	189	116,878	501
49-53	Transport and warehousing	17	6,652	5,627	9	144	-	609	-	762	-	-	263
55-56	Hotels and restaurants	-	-	-	-	-	-	-	-	-	-	-	-
58-60	Publishing; production, rental and distribution of films & TV programmes; movie theatres; sound studios & music publishing; broadcasting	26	11,823	10,270	118	488	56	704	-	1,366	-	-	187
61	Telecommunications	6	45,141	41,316	-	3,676	13	36	-	3,725	-	-	100
62	Information technology services	297	147,171	118,781	1,337	5,468	2,209	8,747	1,298	19,059	45	6,688	2,598
63	Information services	57	18,495	14,086	-	972	535	2,058	159	3,724	-	142	543
64-66	Finance and insurance services	7	45,199	45,199	-	-	-	-	-	-	-	-	-
68; 69-75 (without 71+72)	Properties and housing; freelance, scientific and technical services (without architecture and engineering firms; technical, physical and chemical analysis; without research and development)	131	44,357	31,554	1,426	1,930	532	4,628	1,068	9,584	566	1,368	1,285
71	Architecture and engineering firms; technical, physical and chemical analysis	251	384,499	124,266	12,560	7,506	2,230	8,053	748	31,097	147	226,427	2,562
72.11	Research and development in the biotechnology sector	30	311,945	239,145	2,432	23,311	5,429	8,022	2,101	41,295	315	28,531	2,659
72.19	Other research and development in the areas of natural, engineering and agricultural sciences and medicine	231	321,932	154,814	59,213	13,489	18,682	31,718	8,012	131,114	1,389	22,873	11,742
72.20	Research and development in the areas of legal, economic and social sciences as well as the areas of language, culture and art sciences	40	7,273	2,345	1,789	31	191	217	1,361	3,589	169	621	549
77-82	Other economic services	19	6,369	3,542	100	59	7	840	30	1,036	41	1,750	-
84-96	Public administration, defence; social security; eduction and teaching; health and social work; art, entertainment & recreation; other services	15	2,769	929	587	72	25	131	52	867	-	-	973

Source: STATISTICS AUSTRIA, Survey of research and experimental development (R&D) in 2009. Compiled on: 18 July 2011. - 1) Includes the the business enterprise sector and Institutes' sub-sector. - 2) Includes firms' own capital, funds raised in the capital market, loans from public sector development funds, and funds from other domestic firms. - 3) States including Vienna. Local governments without Vienna. - 4) the Austrian Research Promotion Agency (FFG): Subsidies only; loans are included under "business enterprise sector. - 5) Includes funds from local governments, chambers, social insurance carriers, and other public financing. - 6) Includes funds of foreign firms, other foreign funding and funds of international organisations. - 7) In order to keep the data confidential these figures cannot be reported separately, but they are included in the subtotals and totals.

Table 55: Austrian Research Promotion Agency (FFG) subsidy statistics 2011 – General overview
Contracts signed in the year under review; amounts in € 1,000

Area	Programme	Projects	Participants	Stakeholders	Total costs	Funding including liability	Cash value
ALR	ASAP	20	45	35	5,646	4,071	4,071
		20	**45**	**35**	**5,646**	**4,071**	**4,071**
BP	General programme	607	643	513	409,708	233,022	112,102
	Service innovations	30	34	34	11,041	5,658	4,956
	Headquarters	25	27	23	85,566	24,915	24,915
	High-tech start-up	19	19	19	12,699	8,884	6,024
	Project start	101	101	99	606	303	303
		782	824	649	519,620	272,782	148,299
	BRIDGE	57	157	142	20,239	13,094	13,094
	EUROSTARS	12	16	16	7,832	3,972	3,972
	InnovationVoucher	624	1,248	927	3,128	3,125	3,125
		1,475	**2,245**	**1,615**	**550,818**	**292,973**	**168,490**
EIP	AF-Wiss	109	109	72	900	673	673
	TOP.EU	13	13	7	648	486	486
		122	**122**	**76**	**1,548**	**1,159**	**1,159**
SP	COIN	34	193	173	23,688	13,408	13,408
	COMET	7	228	213	93,816	27,749	27,749
	FEMtech	16	28	27	2,646	1,612	1,612
	Research Studios Austria	20	30	27	18,773	12,879	12,879
	Talents	658	658	412	2,945	1,747	1,747
		735	**1,137**	**765**	**141,869**	**57,395**	**57,395**
TP	Alpine Schutzhütten	2	2	2	120	53	53
	AT:net	19	20	20	7,379	2,576	2,576
	benefit	35	66	51	9,209	5,982	5,982
	ENERGIE DER ZUKUNFT	52	217	152	11,127	5,934	5,934
	ERA-NET ROAD	15	67	44	4,774	4,774	4,774
	FIT-IT	67	114	90	38,687	18,099	18,099
	GEN-AU	6	6	4	96	96	96
	IEA	6	9	8	646	441	441
	IV2Splus	41	155	117	18,495	12,090	12,090
	KIRAS	17	84	61	8,124	5,293	5,293
	Beacons for eMobility	4	48	46	22,951	10,831	10,831
	NANO	12	33	22	5,645	4,388	4,388
	Neue Energien 2020	81	310	218	61,983	36,453	36,453
	TAKE OFF	15	64	53	14,359	9,149	9,149
		372	**1,195**	**758**	**203,596**	**116,161**	**116,161**
Austrian Research Promotion Agency (FFG)		2,724	4,744	2,758	903,476	471,758	347,275
FFG authorisations						1,726	1,726
Austrian Research Promotion Agency (FFG) total: contracts signed						**473,484**	**349,001**

Table 56: Austrian Research Promotion Agency (FFG) funding statistics by regional government (in € 1,000)

State	Participations	Total promotion	Cash value	Cash value share
B	53	5,577	4,685	1.3%
K	235	32,899	21,198	6.1%
N	477	35,569	27,237	7.8%
O	835	115,284	73,917	21.3%
Sa	232	24,058	13,282	3.8%
ST	984	112,303	84,923	24.5%
T	214	18,297	14,204	4.1%
V	118	16,940	10,216	2.9%
VIE	1433	105,291	92,073	26.5%
Abroad	163	5,540	5,540	1.6%
Total result	4744	471,758	347,275	100.0%

Table 57: Austrian Research Promotion Agency (FFG) funding statistics by type of organisation (in € 1,000)

Type of organisation	Participations	Total promotion	Cash value	Cash value share
firms	2688	345,147	220,816	63.6%
Research institutions	768	73,935	73,784	21.2%
Universities	1048	46,228	46,228	13.3%
Intermediaries	42	2,862	2,862	0.8%
Other	198	3,586	3,586	1.0%
Total result	4744	471,758	347,275	100.0%

Table 58: Austrian Research Promotion Agency (FFG): Funded projects in the area of general programmes according to the classification of Industries (NACE 2008)

Name	NACE_2008	Projects	% Projects	Participations	Total costs	Total funding	% Total funding	Cash value	% Cash value
Agriculture, hunting and associated activities	01	10	0.7%	14	3,726	1,971	0.7%	1,733	1.0%
Services for mining and the excavation of rocks and soils	09	1	0.1%	2	320	192	0.1%	192	0.1%
Manufacture of food and feed products	10	28	1.9%	50	5,623	3,069	1.0%	2,206	1.3%
Manufacture of beverages	11	4	0.3%	5	407	261	0.1%	231	0.1%
Manufacture of textiles	13	4	0.3%	7	1,292	719	0.2%	564	0.3%
Manufacture of wearing apparel	14	5	0.3%	6	1,311	658	0.2%	265	0.2%
Manufacture of wood and of products of wood and cork, except furniture;	16	28	1.9%	48	6,211	3,527	1.2%	2,522	1.5%
Manufacture of paper and paper products	17	7	0.5%	11	2,264	1,223	0.4%	668	0.4%
Manufacture of chemical products	20	37	2.5%	44	21,925	14,603	5.0%	6,172	3.7%
Manufacture of pharmaceutical products	21	41	2.8%	51	65,848	33,517	11.4%	21,055	12.5%
Manufacture of rubber and plastic products	22	45	3.1%	67	11,112	6,767	2.3%	3,823	2.3%
Manufacture of glass, glass products, ceramics, and mineral products	23	38	2.6%	43	25,448	12,887	4.4%	6,745	4.0%
Manufacture of basic metals	24	31	2.1%	35	13,379	8,503	2.9%	4,464	2.6%
Manufacture of metal products	25	43	2.9%	68	12,947	7,551	2.6%	3,587	2.1%
Manufacture of computers, electronic and optical products	26	126	8.5%	173	115,978	58,928	20.1%	32,023	19.0%
Manufacture of electrical equipment	27	19	1.3%	25	26,709	11,604	4.0%	8,408	5.0%
Machinery and equipment	28	114	7.7%	145	71,127	38,398	13.1%	17,584	10.4%
Manufacture of motor vehicles, trailers and semi-trailers	29	30	2.0%	34	43,973	22,680	7.7%	11,997	7.1%
Manufacture of other transport equipment	30	12	0.8%	13	18,774	9,795	3.3%	4,737	2.8%
Manufacture of other products	32	32	2.2%	37	12,732	7,363	2.5%	3,719	2.2%
Repair and installation of machines and equipment	33	5	0.3%	7	2,246	860	0.3%	530	0.3%
Energy supply	35	7	0.5%	11	972	685	0.2%	473	0.3%
Collection, purification and distribution of water	36	2	0.1%	3	959	637	0.2%	232	0.1%
Waterwater disposal	37	2	0.1%	2	1,046	757	0.3%	352	0.2%
Collection, treatment and removal of waste; recycling	38	24	1.6%	37	7,538	4,472	1.5%	2,826	1.7%
Removal of environmental pollution and other waste removal	39	3	0.2%	4	896	574	0.2%	432	0.3%
Civil engineering	42	5	0.3%	8	1,140	683	0.2%	683	0.4%
Preparatory construction site work, installation engineering and other finishing trades	43	30	2.0%	55	1,299	906	0.3%	714	0.4%
Wholesale trade (except of motor vehicles and motorcycles)	46	49	3.3%	98	245	245	0.1%	245	0.1%
Retail (without trade with motor vehicles)	47	35	2.4%	70	175	175	0.1%	175	0.1%
Provisioning of information technology services	62	182	12.3%	275	62,269	31,513	10.8%	22,970	13.6%
Information services	63	57	3.9%	107	3,564	2,528	0.9%	1,885	1.1%
Administration and management of firms and businesses; management consulting	70	65	4.4%	130	325	325	0.1%	325	0.2%
Architecture and engineering firms; technical, physical and chemical analysis	71	64	4.3%	119	3,212	1,874	0.6%	1,653	1.0%
Research and development	72	50	3.4%	66	1,404	871	0.3%	829	0.5%
Health	86	16	1.1%	30	675	477	0.2%	432	0.3%
30 additional NACE codes with cash value shares < 0.1%		224	15.2%	345	1,748	1,177	0.4%	1,041	0.6%
Total result		**1,475**	**100.0%**	**2,245**	**550,818**	**292,973**	**100.0%**	**168,490**	**100.0%**

Table 59: Austrian Science Fund (FWF): Overview of the number of subsidies (2011)

Funding programme	Applications decided	New approvals	Approval rate in %
	2011	2011	2011
	Number	Number	Rate
Stand-alone projects	1,086	341	31.4%
International programmes	286	79	27.6%
Special research areas (SRAs)*	27	23	7.7%
SRAs extensions	34	30	88.2%
NRNs (national research networks)*	36	22	9.5%
NRNs extensions	36	26	72.2%
START	57	8	14.0%
START extensions	7	7	100.0%
Wittgenstein	18	2	11.1%
DKs*	7	4	23.5%
DKs extensions	5	5	100.0%
Schrödinger	144	69	47.9%
Meitner	104	38	36.5%
Firnberg	49	16	32.7%
Richter	45	11	24.4%
Translational research	52	15	28.8%
KLIF	183	15	8.2%
PEEK	49	6	12.2%
Total	**2,225**	**717**	**30.6%**
Concept applications for SRAs	13	1	
Concept applications for NRNs	21	3	
Concept applications for DKs	17	7	

*two-stage process; the figures shown here correspond to sub-projects of complete applications (2nd stage)

Translational Research Programme 2011 incl. Brain power

Table 60: Austrian Science Fund (FWF): Overview of research funding 2011 (€ million)

Funding programme	Applications decided	New approvals	Approval rate in %
	2011	2011	2011
	Total	Total	Rate
Stand-alone projects	€ 299.6	€ 87.9	29.3%
International programmes	€ 62.8	€ 14.6	23.3%
Special research areas (SRAs)*	€ 9.6	€ 7.8	15.7%
SRAs extensions	€ 10.7	€ 9.3	87.2%
NRNs*	€ 11.8	€ 7.0	10.8%
NRNs extensions	€ 10.4	€ 7.3	69.6%
START	€ 60.8	€ 4.7	7.8%
START extensions	€ 3.8	€ 3.8	100.0%
Wittgenstein	€ 27.3	€ 3.0	11.0%
DKs*	€ 17.5	€ 8.4	18.0%
DKs extensions	€ 12.7	€ 10.5	82.7%
Schrödinger	€ 14.0	€ 6.8	48.3%
Meitner	€ 12.4	€ 4.5	36.0%
Firnberg	€ 10.1	€ 3.3	32.7%
Richter	€ 12.2	€ 2.7	22.3%
Translational research	€ 17.2	€ 4.1	24.1%
KLIF	€ 38.6	€ 3.0	7.8%
PEEK	€ 14.6	€ 1.6	11.2%
Total	€ 646.1	€ 190.4	24.8%
Concept applications for SRAs	€ 50.0	€ 5.8	
Concept applications for NRNs	€ 65.2	€ 10.9	
Concept applications for DKs	€ 46.5	€ 18.2	

*two-stage process; the figures shown here correspond to sub-projects of complete applications (2nd stage)

Translational Research Programme 2011 incl. Brain power

** including publication funding, including Translational Brainpower

Table 61: Austrian Science Fund (FWF): Financed research staff 2009–2011

		2009	2010	2011
Postdocs	All	1,156	1,197	1,229
	Women	517	554	575
	Men	639	643	654
Doctoral candidates	All	1,619	1,683	1,771
	Women	671	710	745
	Men	948	973	1,026
Technical staff	All	134	122	137
	Women	95	82	98
	Men	39	40	39
Other staff	All	405	403	405
	Women	183	193	213
	Men	222	210	192
Total	All	3,314	3,405	3,542
	Women	1,466	1,539	1,631
	Men	1,848	1,866	1,911

Table 62: Austrian Science Fund (FWF): Trend of funding of life sciences (2009–2011)

	2009		2010		2011	
	Total (in € million)	Share	Total (in € million)	Share	Total (in € million)	Share
Anatomy, pathology	2.7	1.8%	1.9	1.1%	2.3	1.2%
Med. chemistry, med. physics, physiology	6.6	4.5%	10.3	6.0%	14.1	7.2%
Pharmacy, pharmacology, toxicology	1.9	1.3%	6.1	3.5%	3.7	1.9%
Hygiene, med. Microbiology	5.5	3.7%	6.0	3.5%	9.9	5.1%
Clinical medicine	2.3	1.5%	2.0	1.1%	5.1	2.6%
Surgery and anaesthesiology	0.1	0.0%	0.4	0.2%	0.3	0.2%
Psychiatry and neurology	0.6	0.4%	3.1	1.8%	3.1	1.6%
Court medicine	0.0	0.0%	0.0	0.0%	0.0	0.0%
Other areas of human medicine	0.9	0.6%	1.5	0.9%	0.7	0.4%
Veterinary medicine	0.7	0.4%	0.4	0.2%	1.4	0.7%
Biology, botany, zoology	34.0	23.0%	38.2	22.2%	43.1	22.1%
Total life sciences	**55.2**	**37.4%**	**69.8**	**40.7%**	**83.7**	**42.9%**
Total grants awarded	**147.6**	**100%**	**171.8**	**100.0%**	**195.2**	**100.0%**

Table 63: Austrian Science Fund (FWF): Trend of funding of natural sciences and engineering (2009–2011)

	2009		2010		2011	
	Total (in € million)	Share	Total (in € million)	Share	Total (in € million)	Share
Mathematics, informatics	18.2	12.3%	20.2	11.8%	27.3	14.0%
Physics, mechanics, astronomy	19.0	12.9%	21.2	12.3%	25.9	13.3%
Chemistry	7.8	5.3%	11.1	6.4%	10.3	5.3%
Geology, minerology	1.9	1.3%	4.4	2.6%	2.2	1.1%
Meteorology, climatology	2.3	1.6%	1.2	0.7%	1.0	0.5%
Hydrology, hydrography	1.2	0.8%	0.7	0.4%	0.7	0.4%
Geography	0.8	0.6%	0.9	0.5%	0.7	0.3%
Other natural sciences	2.7	1.8%	1.9	1.1%	2.1	1.1%
Mining, metallurgy	0.0	0.0%	0.6	0.4%	0.6	0.3%
Manufacture of machinery and equipment, instruments	0.3	0.2%	0.2	0.1%	0.5	0.3%
Construction engineering	0.4	0.3%	0.8	0.5%	0.1	0.1%
Architecture	0.7	0.5%	0.6	0.4%	0.2	0.1%
Electrical engineering/electronics	2.8	1.9%	0.9	0.5%	3.9	2.0%
Technical chemistry, fuel and petroleum technology	0.2	0.1%	0.4	0.2%	0.4	0.2%
Geodetics, surveying	0.2	0.1%	0.2	0.1%	0.4	0.2%
Traffic engineering, traffic planning	0.0	0.0%	0.0	0.0%	0.0	0.0%
Other engineering sciences	0.7	0.5%	1.9	1.1%	0.9	0.5%
Farming, plant cultivation and protection	0.2	0.1%	0.0	0.0%	0.2	0.1%
Horticulture, orcharding	0.0	0.0%	0.0	0.0%	0.0	0.0%
Forestry	0.2	0.1%	0.6	0.3%	0.5	0.2%
Livestock breeding, animal production	0.4	0.3%	0.3	0.2%	0.3	0.1%
Other areas of agriculture and forestry	0.0	0.0%	0.3	0.2%	0.1	0.1%
Total natural sciences and engineering	**60.1**	**40.7%**	**68.3**	**39.8%**	**78.2**	**40.1%**
Total grants awarded	**147.6**	**100%**	**171.8**	**100.0%**	**195.2**	**100.0%**

Table 64: Austrian Science Fund (FWF): Trend of funding of humanities and social sciences (2009–2011)

	2009		2010		2011	
	Total (in € million)	Share	Total (in € million)	Share	Total (in € million)	Share
Philosophy	2.1	1.4%	2.1	1.2%	1.3	0.7%
Theology	1.2	0.8%	0.8	0.5%	0.8	0.4%
Historical sciences	8.3	5.6%	8.0	4.7%	8.5	4.4%
Linguistics and literary studies	5.2	3.5%	3.6	2.1%	3.2	1.6%
Other philological and culture sciences	2.2	1.5%	1.7	1.0%	4.1	2.1%
Art sciences	2.5	1.7%	3.8	2.2%	3.7	1.9%
Other humanities	1.2	0.8%	0.8	0.5%	0.9	0.4%
Political science	0.6	0.4%	0.5	0.3%	0.6	0.3%
Jurisprudence	0.7	0.5%	0.9	0.5%	1.1	0.6%
Economics	4.3	2.9%	3.7	2.2%	3.5	1.8%
Sociology	1.5	1.0%	1.5	0.9%	1.3	0.7%
Psychology	0.7	0.5%	1.4	0.8%	2.0	1.0%
Physical planning	0.1	0.1%	0.1	0.1%	0.2	0.1%
Applied statistics	0.1	0.0%	1.8	1.1%	0.2	0.1%
Pedagogy, educational sciences	0.7	0.5%	0.7	0.4%	0.2	0.1%
Other social sciences	1.2	0.8%	2.2	1.3%	1.6	0.8%
Total humanities and social sciences	**32.3**	**21.9%**	**33.6**	**19.6%**	**33.2**	**17.0%**
Total grants awarded	**147.6**	**100%**	**171.8**	**100.0%**	**195.2**	**100.0%**

Table 65: Path from the 4th to the 7th EU Research Framework Programme

	4. FP	5. FP	6. FP	7. FP[1]
	1994-1998	1998–2002	2002–2006	Data as per 11/2011
Number of approved projects in which Austrian are participating	1,444	1,384	1,324	**1,508**
Number of approved Austrian participations	1,923	1,987	1,972	**2,095**
Number of approved projects coordinated by Austrian organisations	270	267	213	**242**
Funding for approved Austrian partner organisations and researchers for which a contract has been signed, in € millions	194	292	425	**551** [2]
Percentage of approved Austrian participations among all approved participations	2.3%	2.4%	2.6%	**2.5%**
Percentage of approved Austrian coordinators among all approved coordinators	1.7%	2.8%	3.3%	**3.5%**
Percentage of subsidies received by Austrian participations among all of the subsidies that were paid out (indicator of returns)	1.99%	2.38%	2.56%	**2.67%**
Funding received by approved Austrian participations measured against the contribution Austria makes to the EU household (return ratio)	70%	104%	117%	**128%**

Data: European Commission; **processed and calculated by:** PROVISO, a project of the BMWF, BMVIT, BMWFJ and BMLFUW

1 As of 11/2011, PROVISO only had part of the information about the results of the project negotiations. Because experience shows that there can be changes during the course of the contract negotiations (i.e. a contract for an approved project is not signed, consortiums change within a projects, the "requested" subsidy amounts are reduced), this information must be seen as a reference only.

2 The Austrian participators requested a funding sum which amounts to € 662 million in approved projects; as of 11/2011 the contractual negotiations have been completed for 86.8% of all currently approved projects. This means that € 551 million of the funding money for Austrian partner organisations are now covered by a signed contract

Source: M. Ehardt-Schmiederer, V. Postl, J. Brücker, D. Milovanović, C. Kobel, F. Hackl, J. Huber, L. Schleicher, C. Naderer,: 7. EU Framework Programme for research, technological development and demonstration (2007–2013) PROVISO overview report autumn 2011, Vienna 2011

Table 66: Austrian results in the 7th FP

	7. EU Framework Programme [1]											
	Total	AT										
		AT Total	B	K	N	UA	S	ST	T	V	VIE	n/A[2]
Projects	14,059	1,508	6	53	170	119	61	278	131	16	841	119
Participations	82,713	2,095	6	63	185	137	70	322	149	20	1,024	119
Universities, Higher education	N/A	600	0	20	22	54	38	149	97	5	389	0
Non-university research institutions	N/A	322	0	3	69	18	15	70	2	0	235	0
Large firms (over 250 employees)	N/A	118	0	16	10	19	3	36	3	6	44	0
Small and medium-sized enterprises (up to 249 employees)	N/A	248	6	22	40	35	8	57	42	6	158	0
Other categories	N/A	270	0	2	44	11	6	10	5	3	198	119
Coordinators [3]	6,979	242	0	14	20	13	10	48	16	0	121	0
Universities	N/A	92	0	0	2	5	5	21	14	0	45	0
Non-university research institutions	N/A	76	0	0	14	4	5	16	0	0	37	0
Large firms (over 250 employees)	N/A	9	0	1	0	1	0	6	0	0	1	0
Small and medium-sized enterprises (up to 249 employees)	N/A	39	0	12	3	1	0	4	2	0	17	0
Other categories	N/A	26	0	1	1	2	0	1	0	0	21	0

Data: European Commission; **processed and calculated by** PROVISO, a project of the BMWF, BMVIT, BMWFJ and BMLFUW

1 As of 11/2011, PROVISO only had part of the information about the results of the project negotiations. Because experience shows that there can be changes during the course of the contract negotiations (i.e. a contract for an approved project is not signed, consortiums change within a projects, the "requested" subsidy amounts are reduced), this information must be seen as a reference only.

2 espec. Individual researchers in the people pillar (researchers, scholarship recipients/award winners in the people pillar) and the ideas pillar (principal investigators)

3 does not include projects of the idea pillar or individual scholarships and awards of the people pillar

Source: M. Ehardt-Schmiederer, V. Postl, J. Brücker, D. Milovanović, C. Kobel, F. Hackl, J. Huber, L. Schleicher, C. Naderer,: 7. EU Framework Programme for research, technological development and demonstration (2007–2013) PROVISO overview report autumn 2011, Vienna 2011

Table 67: Overview of projects and participations in the 7th FP

	Approved projects (total)	Approved projects with AT participants	Percentage of approved projects with AT participants of approved projects (total)
Cooperation	4,429	958	21.6%
Ideas	2,265	84	3.7%
People	6,039	260	4.3%
Experts	1,326	206	15.5%
Total	**14,059**	**1,508**	**10.7%**

Data: European Commission; **processed and calculated by:** PROVISO, a project of the BMWF, BMVIT, BMWFJ and BMLFUW; **Data as per:** 11/2011

	Approved participants (total)	Approved Austrian participants	Percentage of approved projects with AT participants of approved projects (total)
Cooperation	49,685	1,376	2.8%
Ideas	4,771	106	2.2%
People	15,290	328	2.1%
Experts	12,967	285	2.2%
Total	**82,713**	**2,095**	**2.5%**

Data: European Commission; **processed and calculated by:** PROVISO, a project of the BMWF, BMVIT, BMWFJ and BMLFUW; **Data as per:** 11/2011

Source: M. Ehardt-Schmiederer, V. Postl, J. Brücker, D. Milovanović, C. Kobel, F. Hackl, J. Huber, L. Schleicher, C. Naderer,: 7. EU Framework Programme for research, technological development and demonstration (2007–2013) PROVISO overview report autumn 2011, Vienna 2011**Note**: According to the data of 11/2011, PROVISO only had a part of the information about the results of the project negotiations. Since experience shows us that there can be changes in the course of the contract negotiations, this information should be seen as a guideline only.

Table 68: ESFRI Roadmap – projects in which Austrian companies are participating in 2012 (continued on next page)

Category	Biosciences & medical research	Physics & engineering		ICT/e-infrastructure
Project	**BBMRI**	**ESRF**	**ILL 20/20**	**PRACE**
	Biobanking & **Biom**olecular **R**esources Research **I**nfrastructure	**E**uropean **S**ynchrotron **R**adiation **F**acility Upgrade	**I**nstitute **L**aue **L**angevin Upgrade	Partnership for Advanced Computing in Europe
Information				
Project contents	• Pan-European network of existing biobanks & biological sample collections and those that are being built up. • Further development of standards and methods for sample collection, sample security and data collection and data security	• Development and expansion of existing infrastructure for producing high-energy synchrotron radiation for structure research • Construction of new research laboratories • Increase in performance and quality as well as expansion of capacity	• Development and expansion of existing infrastructure for producing slow ("cold") neutrons for examining condensed matter • Increase in performance and quality • Expansion of capacity	• Pan-European HPC infrastructure in the highest performance category • currently 4 computer centres in the petaflop/s category (6 in 2013) • Association of national, regional to local computer centres according to a pyramid performance model.
Benefit to Austria	• Strengthening and international networking of Austrian biobanks and data collections • Access to standardised and comprehensive sample collections • Expansion of the research areas and questions by increasing the available number of samples	• Access to new and improved research areas • Further improvement of excellence in the area of structure research • Expansion of research areas	• Access to new and improved research areas • Further improvement of excellence in the most diverse areas of matter research • Expansion of research areas	• PRACE provides access to EU-wide HPC computer and data management resources • Access through peer review for members • Strengthen the research base for all areas that need computer calculations
Organisation & Austrian Participants	13 members (signed MoU) including Austria	19 Member States Austria ESRF member since 2002	14 Member States Austria ILL member since 1990	21 members, 2 types of membership; Univ. of Linz (regional partner)
Coordination	AT	ESRF	ILL	F/D/I/E – Headquarters: B
Status	ERIC application in final phase planned start of BBMRI-ERIC beg. 2013	Operation; ongoing implementation acc. to Timetable: 2009 – 2018	operation	Implementation phase 2010–2012
Total costs	operative Phase: ~ 2 million € / a	Build-up: ~ 241 million €	Build-up: ~ 171 million €	100 million € each (for 5 years) per country
Financing Ö	Membership fee: depends on amount of members (170–200k€/a)	ESRF membership fee: ~ 1.3 million €/a	ILL membership fee: ~ 1.7 million €/a	60,000.- € p.a. (University of Linz)

Source: BMWF

Continuation of table 68: ESFRI Roadmap – projects in which Austrian companies are participating in 2012

Category	Humanities & social sciences			
Project	**CESSDA**	**CLARIN**	**DARIAH**	**SHARE**
	Council of **E**uropean **S**ocial **S**cience **D**ata **A**rchives	**C**ommon **La**nguage **R**esources and Technology **In**frastructure	**Digit**al **R**esearch **I**nfrastructure for the **A**rts and the **H**umanities	Survey on **H**ealth, **A**geing and **R**etirement in **E**urope
Information				
Project contents	• Coordination of existing databases, data analysis • Tool development for monitoring • Educational and training activities	• Standardisation/coordination of research for the provisioning of language resources and language technologies.	• Standardisation/coordination of digital resources and technologies for the image, sound and text analysis in the arts and humanities	• Creation of a European database for health, aging and pensions in Europe
Benefit to Austria	• Strengthening of the qualitative and quantitative database in the humanities, social sciences and cultural studies. • Development and implementation of shared standards, tools, archiving instruments • Training on using the databases	• Strengthening of the technological foundation for the development of methods, tools and instruments to work with language resources, creation of technologies to process language resources	• Strengthening of the digital humanities database and methods and technologies for analysis, • Standardisation of and access to instruments, methods, state-of-the-art software, etc. for the digital humanities	• Strengthening/standardising the domestic & European database on health & aging • Access to uniformly prepared international data • Worldwide distribution and application of the European standards through a cooperation with the US.
Organisation & Austrian Participants	14 members in the preparatory phase including Austria	9 founding members including Austria	Declarations of intentions from currently 10 members, including Austria	5 members including Austria
Coordination	NO	NL	DE, ERIC headquarters: F	DE
Status	MoU signed, domestic implementation and preparation phase	ERIC founded domestic implementation phase	MoU and statutes signed, domestic implementation phase	ERIC founded Preparation of the 4th survey wave.
Total costs	2012 € 1.9 million	2012 € 1 million	2012 € 1 million	2010–2011) 2.1 million €
Financing Ö	~ 200,000.- €/a (currently no membership fee)	~ 140,000.- €/a incl. approx. 60,000€ membership fee:	~ 140,000.- €/a incl. approx. 60,000€ membership fee:	Currently no membership fee, domestic costs: ~0.5 million €/a

Source: BMWF

Table 69: CD laboratories according to universities/research institutions 2011

University/research institution	Number of CD laboratories 2011	Total laboratory budget 2011 [EUR]
Medical University of Graz	1	187,000
Medical University of Innsbruck	1	110,000
Medical University of Vienna	8	3,195,797
University of Leoben	7	1,933,735
Graz University of Technology	7	2,599,449
Vienna University of Technology	7	2,238,273
University of Natural Resources and Life Sciences, Vienna	7	2,339,551
University of Graz	1	411,410
University of Innsbruck	2	751,933
University of Linz	7	2,620,480
University of Salzburg	5	1,792,480
University of Vienna	2	542,141
University of Veterinary Medicine Vienna	3	975,086
Research Center for Non Destructive Testing GmbH	1	322,151
Max-Planck-Institut für Eisenforschung GmbH	1	458,000
Munich University of Technology	1	322,000
University of Bochum	1	441,979
University of Göttingen	1	192,500
Total	**63**	**21,433,965**

Note: the total amount of CD laboratories is 61; there are two CD laboratories with dual management at different universities

Source: CDG

Table 70: Development of the CDG (1989–2011)

Year	Expenditures of the CD laboratories [EUR]	Active CD laboratories	Active member companies
1989	247,087.64	5	
1990	1,274,681.51	7	
1991	2,150,389.16	11	
1992	3,362,572.04	16	
1993	2,789,910.10	17	
1994	3,101,676.56	18	
1995	2,991,213.85	14	
1996	2,503,324.87	15	6
1997	2,982,792.52	16	9
1998	3,108,913.38	17	13
1999	3,869,992.56	20	15
2000	3,624,962.62	18	14
2001	4,707,301.98	20	18
2002	7,295,956.92	31	40
2003	9,900,589.58	35	47
2004	10,711,821.85	37	63
2005	11,878,543.24	37	66
2006	12,840,466.34	41	79
2007	14,729,107.63	48	82
2008	17,911,783.68	58	99
2009	17,844,201.91	65	106
2010	19,768,684.38	61	110
2011	20,965,976.90	61	108

Source: CDG

Table 71: CD laboratories according to thematic clusers 2011

Thematic clusters	Number of CD laboratories 2011	Total laboratory budget 2011 [EUR]
Chemistry	6	2,329,032
Life Sciences	11	3,569,674
Manufacture of machinery and equipment, instruments	5	1,700,358
Mathematics, informatics, electronics	13	4,827,617
Medicine	11	3,617,001
Metals and alloys	12	4,262,493
Non-metal materials	3	1,127,791
Total	**61**	**21,433,965**

Source: CDG