Austrian Research and Technology Report 2010

Report under Section 8(1) 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). The report was written by Joanneum Research (JR), the Austrian Institute of Economic Research (WIFO), Austrian Institute of Technology (AIT) and with the participation of Statistik Austria.

Authors: Andreas Schibany (Coordinator, JR), Martin Berger (JR), Eva Buchinger (AIT), Bernhard Dachs (AIT), Michael Dinges (JR), Brigitte Ecker (JR), Martin Falk (WIFO), Helmut Gassler (JR), Barbara Heller-Schuh (AIT), Reinhold Hofer (JR), Peter Huber (WIFO), Jürgen Janger (WIFO), Andreas Reinstaller (WIFO), Gerhard Streicher (JR), Fabian Unterlass (WIFO).

Imprint

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

Designed and produced by
Peter Sachartschenko & Susanne Spreitzer OEG, Vienna
Translated by: Young Translations LLC, Vienna
Cover photo: © kentoh/Fotolia.com
Printed by:
AV+Astoria Druckzentrum GmbH, 1030 Vienna

Vienna, 2010

Preface

Research, technology and innovation (RTI) are the driving forces for a sustainable increase in the performance and competitive potential of a society. Over the last ten years, Austria's investments in RTI have led to above-average growth. This successful result can be attributed to an increase in R&D spending. Austria has assumed the leading position in comparison to the OECD countries, with an increase of 0.63 percentage points as a share of gross domestic product between 2000 and 2007 (the most recent R&D statistical survey). No other country in the world has better numbers in this context.

The development of the R&D intensity for 2010 is also extremely positive. Calculations by Statistik Austria indicate a further increase in R&D expenditures, above all in federal expenditures. We may therefore assume that the R&D intensity will be approximately 2.76 % of GDP this year.

Austria's position on the European Innovation Scoreboard (EIS) also improved to first place within the group of "Innovation Followers." Austria is thereby above the average for the 27 EU member states.

Despite this unparalleled catching-up process (between 2002 and 2007, there was a 47 % increase in R&D spending, +22 % in units conducting R&D, +36 % in R&D employees and +37 % in full-time equivalent employment), there is still potential for development in such areas as human resources, mobility (see the chapter on Education and Innovation), and research infrastructures, as well as in financial support for basic research, which currently stands at around 18 % of total R&D spending.

The federal government therefore initiated a process for developing a coherent social and economic policy-related RTI strategy in 2009, which requires the collective efforts of all actors engaged in research policy. The first progress report was submitted to the council of ministers in February 2010. The focus of RTI strategy remains on the best possible development and utilisation of human capital potential and qualifications, the creation of excellent framework conditions for universities, universities of applied science, and research institutions outside of universities, as well as the realisation of optimal conditions for innovative companies.

The commitment to efficacy-oriented further development in Austrian RTI constitutes the point of departure for the formulation of specific goals and the implementation of methods to assess effectiveness. This report, produced by the Federal Ministry for Science and Research and the Federal Ministry for Transport, Innovation and Technology, offers an overview of RTI developments that includes recent analyses and comprehensive statistical material. The report delivers valuable background information for ongoing discussions about strategy and policy, as well as for those among the public who are interested in research.

Beatrix Karl

Dr. Beatrix Karl
Federal Minister of Science
and Research

Doris Bures

Doris Bures
Federal Minister for Transport,
Innovation and Technology

Content

1 Executive Summary

The Research and Technology Report 2010 is a status report to the Austrian parliament on the nation's federally funded research, technology and innovation. The report draws on current data to present an overview of specific trends in research, technology and innovation (RTI) and show how Austria measures up internationally in specific 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).

Current trend of R&D spending

According to the global estimate made by Statistik Austria, total expenditures for research and development in Austria will be € 7.805 billion in 2010. It should be emphasised that this is an estimate and/or forecast with a high degree of uncertainty, particularly given the effects of the global financial and economic crisis. Both the estimate of GDP for 2010 as well as the forecasts of R&D expenditures for the individual sources of funding are affected by this uncertainty. The preliminary nature of these results is underscored by the fact that the corresponding global estimate figures for 2008 and 2009 have since had to be revised. Based upon this revision, which was also influenced by the inclusion of final results from the 2007 R&D survey in the estimate, the effects of the crisis now appear somewhat different than their portrayal in the federal government's Research and Technology Report for 2009. According to this report, there was still a (minor) decrease of 0.14 % in total R&D expenditures in 2009 (from € 7.557 billion to € 7.546 billion). This decrease was a result of a marginal 3 % decline in R&D financing by the corporate sector (from € 3.48 billion to € 3.38 billion) and a 5.4 % decline in foreign financing (from € 1.25 billion to € 1.18 billion), while, despite a difficult budget situation, financing by the federal government increased by just under 5 % (from € 2.36 billion to € 2.47 billion.

For 2010, the situation is as follows: There was a 3.4 % increase over 2009 in total R&D expenditures in Austria, and thus the crisis-induced decline in R&D expenditures in the previous year can be made up this year. In absolute terms, 2010 will set a new high mark in R&D spending. Given the slow recovery of GDP, Austria's R&D intensity has recently increased to 2.76 %.

Over the course of the crisis, there was a change in the financing structure for R&D expenditures. A 10.9 % increase in public financing by the federal government is expected for 2010, while stagnation (plus 0.1 percentage points) is expected in the corporate sector, and a decrease is projected for financing from abroad (–0.6 percentage points).

Based upon the results of the global estimate for 2010, the effects of the global financial and economic crisis can be summarised as follows:

After having been the driving force for financing research and development in Austria for many years with its high R&D growth rates, the corporate sector abruptly lost its momentum with the onset of the crisis. There was even a decline in R&D expenditures in 2009, the period during which the crisis was at its peak. Although R&D financing by the corporate sector consolidated in 2010, it is still below the level of 2008.

Funding sources from abroad experienced a particularly strong decline in 2009 (–5.4 percentage points), which will continue in 2010 (–0.6 percentage points). This decline can be attributed to reduced financing by multinational corporations in support of their Austrian subsidiaries' R&D activities. Above all, the relatively strong decline in German GDP (German companies figure prominently among foreign companies with subsidiaries in Austria) is a contributing factor in this process.

The federal government is now assuming the leadership role with regard to the growth of R&D financing in Austria, and as a result has significantly increased its share of overall research financing in only a few years (an increase of 7 percentage points, from 28 % in 2007 to 35 % in 2010). This involvement by the public sectors minimised the decline in overall R&D expenditures on research and development in 2009.

Growth of R&D between 2002 and 2007

The complete R&D survey of 2007 by Statistik Austria enables year-to-year comparisons for the period from 2002 to 2007. This shows a 47 % overall rise in R&D spending in Austria. The corporate sector was a key contributor to this momentum, with R&D expenditures rising 55 % and the number of companies conducting research growing 30 % to 2,521. Primarily the increase in the number of companies performing research shows that the research base of the Austrian economy has expanded considerably in the last few years. This development is also supported by a significant increase in business-related R&D funding from the public sector. Through a mix of direct and indirect research funding (research premium), the public sector finances 10.3 % of the total corporate sector R&D (8.4 % of the business sub-sector) and thus holds first place among comparable OECD countries. The ratio of public financing of R&D in the corporate sector (€ 500 million) to that in the higher education sector (€ 1,446 million) was thus almost exactly 1:3 in 2007.

A structure examined for the first time in a Research and Technology Report relates to the high concentration of R&D expenditures within the corporate sector. The € 4.8 billion of overall R&D expenditure in the corporate sector was distributed among 2,521 companies, yielding an average of € 1.9 million per company conducting research. However, this figure conceals the enormous spread in the R&D expenditures: Only 334 companies (13.2 %) have R&D expenditures above this average (the median is below € 250 thousand). The four largest companies provide 20 % and 33 companies provide 50 % of the total R&D expenditures of the corporate sector. This heavy concentration is also seen on the European level.

Overall R&D employment between 2002 and 2007 rose 37 % to 53,252 full-time equivalents (FTE). The proportion of researchers fell from 62 % to 59 % in favour of more highly qualified, non-scientific personnel, whose presence grew from 26 % to 31 %. This trend, which is primarily attributable to the corporate sector, was offset in the higher education sector, where the proportion of researchers rose 45 % to just over 10,100 employees.

Austrian position in European Innovation Scoreboard

Austria's ranking in the current European Innovation Scoreboard (EIS) remains unchanged at sixth place, where it leads the group of "Innovation Followers." Also unchanged is the group of "Innovation Leaders": Sweden, Finland, Germany, the United Kingdom and Denmark. The national rankings are thus relatively stable. Current results at the level of the individual indicators are also unchanged from last year: The strengths lie primarily in the corporate sector, with above-average scores on most innovation-related indicators. The weaknesses lie in human resources, especially among graduates in technology and the sciences. The EIS 2009 also reconfirms Austria's weakness in risk financing.

Innovation-friendly public procurement as a new RTI policy tool?

The most direct approach to stimulating the demand for innovation through policymaking is in public procurement itself. State spending on goods and services in Austria is estimated at some € 50 billion (17 % of GDP), creating a significant potential for innovation within this segment of demand. The state can act as an agent of progress, demanding innovative solutions to meet its social obligations. In conjunction with political responsibilities and defined missions, public procurement delivers a diverse array of incentives for innovation. A long-term, multifaceted policy mix thus includes not only monetary control but awareness and information campaigns as well as direct and indirect effects from regulation. It is not an exaggeration to describe the government's role in creating demand as the "key to the diffusion of innovation."

Austria in the European Research Area

In recent years, Austria has established a secure place in the European Research Area. Austria's involvement in the EU Framework Programmes shows a steady increase in both participation and success rates. The average approval rate of projects coordinated by Austrians is three percentage points above the overall approval rate. Austria has also increased its share in approved funding overall. Return flow ratio measured against Austria's contribution to the EU budget has doubled since the fourth Framework Programme and has risen by 13 % since the sixth Framework Programme.

Participation in the highly distinguished, well-established and prestigious European Research Council (ERC) is yet another indicator of the performance potential of the Austrian science system and will strengthen the international visibility of Austria as a centre for research in the European competition for excellence.

Participation in the European Strategy Forum on Research Infrastructures (ESFRI) is another important image-building lever and should be regarded as essential to international presence and competitiveness.

Effect of R&D activities on corporate growth

The effect of R&D on corporate growth is highly diversified and multi-faceted, especially given the impossibility of considering many (exogenous) factors in estimating such influence. Accordingly, there is no deterministic interrelationship between R&D and corporate growth: more R&D does not necessarily mean faster growth. But without apostrophising a causal relationship, we see that the effect of R&D on growth is strongest among fast-growing companies.

An analysis of the determinants of growth for Austrian companies that conduct R&D activities leads to the conclusion that research-intensive companies have better prospects for growth than companies that invest modestly or little in research and development. This applies to growth both in terms of turnover and employment. Empirical estimates based on a cross-section of data indicate that, depending on the period, an increase in R&D intensity by 10 % (from 5 % to 5.5 %, for example, measured by the number of employees dedicated to R&D) yields increased growth in employment of up to 0.2 percentage points per year in the two subsequent years. This effect decreases over time.

Structural change in Austria

Measured in terms of value added, production and employment, structural change in Austria is proceeding at a speed on par with the international average. The winners of transformation are primarily business activities. But traditional industry sectors such as automobile manufacturing, metal production and machine construction could increase their importance.

Other sector-specific analyses also offer a very clear picture: R&D spending in the corporate sector is rising chiefly because companies are expanding their R&D spending within existing activities (economic sectors), not because they are undergoing a structural shift toward more R&D-intensive sectors. It is short-sighted to focus only on the industry-level perspective, however, for there is a high degree of diversity in the intensity with which companies within the various industries conduct research. The results point toward the need to look more closely at individual companies and their research achievements and rely less on generalised typecasting at the industry level. This applies even more as companies of supposedly low- or medium-tech industries – in their role as producers or consumers of high technology – play an important role in developing this technology.

Influence of offshoring on companies' technological performance

Outsourcing production capacities abroad is often seen as a threat and associated with the loss of jobs. A broader view, however, shows that outsourcing can also have positive effects on a country's technological performance. Offshoring companies more often invest in state-of-the-art production technologies, employ university graduates to a higher degree and are more competitive as a result. Foreign activities allow companies to protect and possibly even expand their Austrian production facilities if synergies between domestic and foreign production are utilised and the resulting market opportunities are seized.

Innovation in the Austrian construction industry

Within the Austrian national economy, construction plays a very important role. The number of construction companies comprises somewhat more than 9 % of all companies, and they account for approximately 5.5 % of turnover in the Austrian national economy. Findings show that a growing primary sales market and the company's sphere of influence have a positive effect on the inclination to innovate. There are also major differences – not only among the types of innovation but among the various construction industries.

Mobility of highly qualified employees

The mobility of the skilled workforce is a key location factor in today's knowledge-based societies. From the perspective of companies or regions, the advantages and disadvantages of mobility depend on many factors: whether there is a net inward or outward migration, whether any return migration takes place, whether skilled workers serve as "anchors" abroad, whether the expertise of immigrants can be utilised and adapted, etc. The analysis of the European employee survey of 2007 shows an overall lower sectoral mobility of HRST (human resources in science and technology), which can be traced to greater job security – relative to other employees – and, above all, a strong demand for more qualified employees. On average, between 0.4 % and 0.7 % of HRST employed in Austria immigrate from abroad each year, and some 16 % of HRST were born abroad (EU average: 8 %). Foreign HRST therefore represent an important source of knowledge transfer for Austria.

Human resources in Austria

The educational system and the degree of education in the human capital base play a central role in an innovation system: Without appropriately qualified employees, innovations can be neither developed nor implemented. Human capital is key to R&D activities, for the diffusion and absorption of knowledge and technology, for corporate start-ups and location decisions. The quality and quantity of the "peak" (researchers, science and technology graduates) and the "breadth" (quality and quantity of the skills in the workforce) are just as important as the orientation of the educational system to vocation-specific or cross-vocational skills. The Austrian educational system still has untapped potential, in both its peak and its breadth, compared to other countries. One point is that the educational system is still very vocationally oriented. The quality of the breadth is characterised by a high diffusion of performance and a failure to realise the potential of foreign-born students, while the quantity is marked by low tertiary involvement and low participation in promising, high-demand teaching professions. The quality of the peak is characterised researchers whose training is not standardised and typically not in keeping with international standards. Meanwhile, the quantity at the peak is exhibiting relatively strong growth, but there are bottlenecks, especially in engineering fields, which can be partially attributed to the extremely low quota of women in such fields.

Life Sciences in Austria

Life science applications and methods are called the technologies of the twenty-first century. Austria has joined the leading life sciences nations, especially the United States, in recognising the potential of this field of science and technology.

In 2007, there were 347 companies with a total of 28,686 employees in Austria working in life sciences. Total revenues were € 8.6 billion, with gross value added of € 3.3 billion. With 176 companies investing a total of € 814 million in R&D, the entire life sciences sector accounted for some 17 % of overall R&D spending in the corporate sector.

Outside of the corporate sector, total spending on life sciences R&D also rose to € 764 million in 2007. The higher education sector accounted for the largest share of R&D spending, with a volume of € 604 million in 2007, with both universities and clinics showing increased expenditures.

The federal government is an important source of funding for R&D activities in life sciences. Federal agencies offer a broad, well-balanced funding portfolio – with bottom-up financing of stand-alone projects through FWF and FFG complemented by targeted programmes such as GEN-AU and LISA – to support both the scientific and corporate sectors. It is characteristic of Austria that biomedical research is dominant in both the corporate sector and the scientific sector. Biomedical research not only benefits from the most R&D expenditures and thus funding (at the national and international level), it is also where the greatest number of start-ups are seen.

Public research organisations in Austria

Public research institutions constitute another important pillar of the Austrian innovation system as agents of research alongside universities and corporations. Public research institutions, thanks to their great diversity (and historical development), can be found in all R&D-relevant sectors (higher education sector, public sector, private non-profit sector and corporate sector). In 2007 they invested a total of € 934 million in R&D, accounting for 13.6 % of overall R&D spending in Austria. The primary source of funding for these institutions was the government sector (€ 523 million or 56 %), followed by funding from abroad (€ 266 million or 29 %). On the subject of funding, it should be noted that somewhat more than 10 % of funds are now going to temporarily established public research institutions (centres of excellence, CD laboratories, Ludwig Boltzmann Institutes, etc.). All told, such institutions employ over 12,200 individuals.

Evaluation of technology and innovation programmes

An international comparison of the culture of evaluation in the area of innovation policy shows that Austria possesses a unique quantity and availability of evaluation results, which strengthens the image of a transparent system of evaluation. Nevertheless, challenges are also evident in the evaluation practices – challenges that must be faced by those who commission such evaluations and those who perform them. Evaluations may be an integral part of promoting innovation and technology, but there is a danger that they may suffer the fate of fading into a background noise that is tolerated but not given much attention. Medium- to long-term analyses of the technical, economic and social efficacy of funding programmes are not widely considered in Austria.

2 Current trends in research and technology

2.1 Trends in R&D spending in Austria

2.1.1 Results of the global estimate for 2010

According to the global estimate made by Statistik Austria, total expenditures for research and development in Austria will be € 7.81 billion in 2010. It should be noted that this is an estimate and/or forecast with a high degree of uncertainty, particularly given the effects of the global financial and economic crisis. Both the estimate of GDP for 2010 as well as the forecasts of R&D expenditures for the individual sources of funding are affected by this uncertainty. The preliminary nature of these results is underscored by the fact that the corresponding global estimate figures for 2008 and 2009 have since had to be revised. Based upon this revision, which was also influenced by the inclusion of final results from the 2007 R&D survey in the estimate, the effects of the crisis now appear somewhat different than their portrayal in the federal government's Research and Technology Report for 2009. According to this report, there was still a (minor) decrease of 0.14 % in total R&D expenditures in 2009 (from € 7.557 billion to € 7.546 billion). This decrease was a result of a marginal 3 % decline in R&D financing by the corporate sector (from € 3.48 billion to € 3.38 billion) and a 5.4 % decline in funding from abroad (from € 1.25 billion to € 1.18 billion), while, despite a difficult budget situation, financing by the federal government increased by just under 5 % (from € 2.36 billion to € 2.47 billion.

For 2010, the situation is as follows: There was a 3.4 % increase over 2009 in total R&D expenditures in Austria, and thus the crisis-induced decline in R&D expenditures in the previous year can be made up this year. In absolute terms, a new record in R&D expenditures will be achieved in 2010. Given the slow recovery of GDP (nominal growth of 2 % in 2010), Austria's R&D intensity has recently increased to 2.76 %.

Over the course of the crisis, there was a change in the financing structure for R&D expenditures. A 10.9 % increase in public financing by the federal government is expected for 2010, while stagnation (plus 0.1 percentage points) is expected in the corporate sector, and a decrease is projected for financing from abroad (–0.6 percentage points). Because of tight budgets, the contribution by the regional governments (which in absolute figures of € 389.3 million plays only a minor role) is expected to decline by just under 2.1 %. Thus approximately 35 % of Austria's R&D expenditures will be financed by the federal government in 2010 (this share was 28 % in 2007, the last year before the crisis), whereas the corporate sector now accounts for 43 % (49 % in 2007) and contributions from abroad account for 15 % (18 % in 2007) of R&D expenditure financing. The remainder comes from the regional governments (5 %) and the "miscellaneous" category (approximately 2 %).

Based upon the results of the global estimate for 2010, the effects of the global financial and economic crisis can be summarised as follows:

- After having been the driving force for financing research and development in Austria for many years with its high R&D growth rates, the corporate sector abruptly lost its momentum with the onset of the crisis. There was even a decline in R&D expenditures in 2009, the period during which the crisis was at its peak. Although R&D financing by the corporate sector consolidated in 2010, it is still below the level of 2008.
- Funding from abroad experienced a particularly strong decline in 2009 (-5.4 percentage points), which will continue in 2010 (-0.6 percentage points). This decline can be attributed to reduced financing by multinational corporations in support of their Austrian subsidiaries' R&D activities. Above all, the relatively strong decline in German GDP (German companies figure prominently among foreign companies with subsidiaries in Austria) is a contributing factor in this process.
- The federal government is now assuming the leadership role with regard to the growth of R&D financing in Austria, and as a result has significantly increased its share of overall research financing in only a few years (a 7 % increase, from 28 % in 2007 to 35 % in 2010). This involvement by the public sector minimised the decline in overall R&D expenditures in 2009 (from the current perspective, this decline is only 0.14 %), and a significant increase of 3.4 % is already expected for the current year. In retrospect, an interesting dynamic can be seen in the overall trend in R&D spending (and in the sources of funding). Whereas overall R&D spending experienced an average annual growth rate of 7.8 % from 1999 to 2007, growth slowed to 4.4 % in the period of 2007-2010. The differing dynamics of the sources of funding are evident: The corporate sector, whose R&D financing volume grew by an average of 10.1 % between 1999 and 2007, significantly slowed its growth in the following period. Since 2007, on the other hand, the federal government has exhibited a stronger growth trend (with an average annual growth rate of 12.7 %).

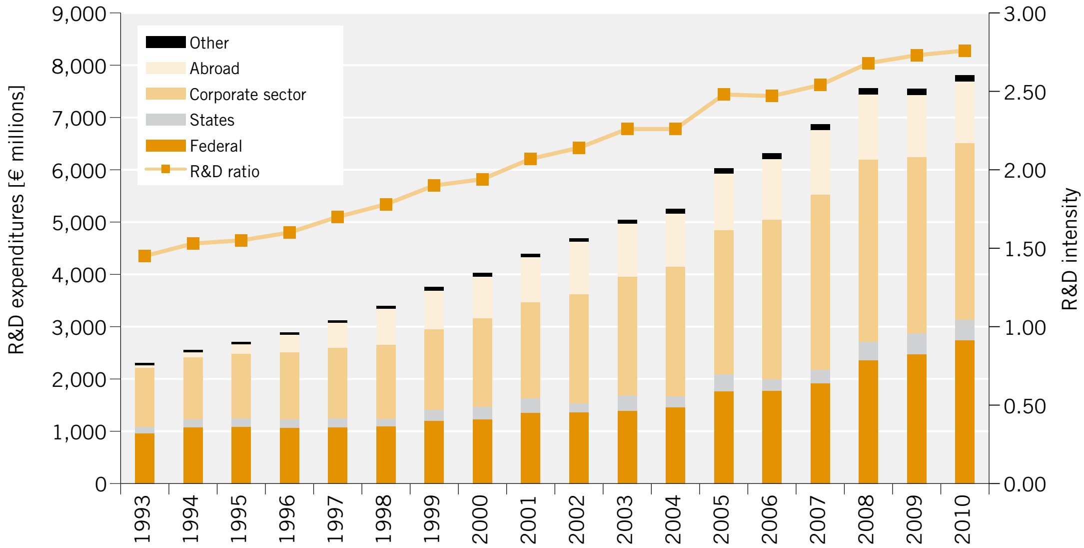
Table 1: Average annual growth rates of R&D spending by source of funding

	1999–2007	2007–2010
Gross domestic expenditure on R&D	7.8	4.4
By financing sector:		
Federal	6.0	12.7
Corporate sector	10.1	0.4
Abroad	6.6	-1.5

Source: Statistik Austria, Global Estimate 2010 – as of: 16 April 2010: calculations by Joanneum Research

- Overall, Austria was able to increase its research intensity (R&D expenditures as a percentage of GDP) even during the years of the crisis, specifically to 2.73 % in 2009 (compared to 2.68 % in 2008) and a projected 2.76 % in 2010.

Figure 1: Research and development in Austria by source of funding



Source: Statistik Austria, Global Estimate 2010 – as of: 16 April 2010

2.1.2 International comparison of R&D ratios

For the purposes of data availability and comparability, it was necessary to base an international comparison of the trend in the R&D ratios on the period from 2000 to 2007. Austria's progress is impressive, particularly with regard to the dynamic nature of the trend: Starting from a clearly below-average R&D intensity in the 1980s (1.1 % of GDP in 1981, compared to an EU15 average of 1.64 %), Austria has continuously increased the ratio, and doing so at an especially rapid rate since 1995. It surpassed the EU15 average (now 1.83 %) in 1998. Austria has also exceeded the average of the OECD states since 2004. In the period from 2000 to 2007, Austria's growth rate of +0.62 % was the strongest positive change among the countries shown in Figure 2. At the same time, it is also clear that the R&D intensity has experienced only marginal improvement in the large EU member states (Germany: +0.09 percentage points) or has even declined (France: –0.07 percentage points, United Kingdom: –0.02 percentage points).

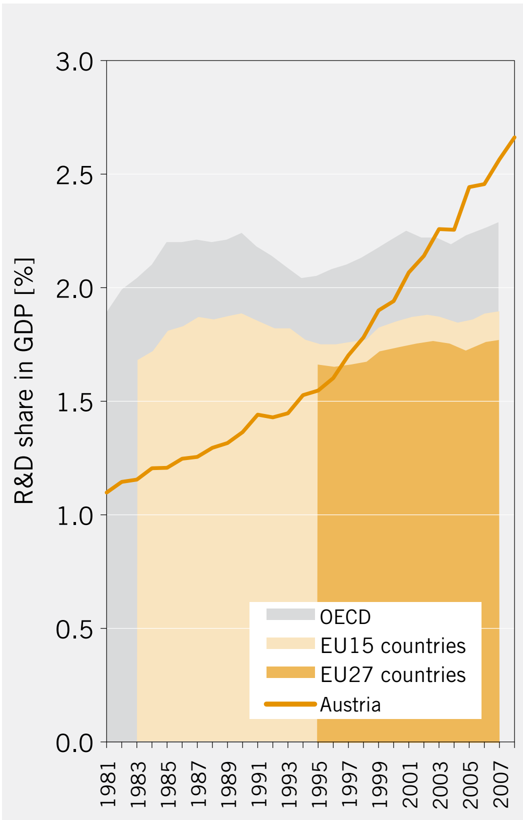
A comparison of country groups also shows that the EU15 countries are experiencing stable growth. The historic trend of the EU27 countries has also been steady, although at a lower level. In this country group as well, the R&D intensity has hardly changed (+0.03 percentage points). Thus the EU was barely able to approach its own goal at the Barcelona summit in 2002.

2.2 Financing and implementation of R&D in Austria

Background

Statistik Austria conducted a complete survey of the institutions that perform R&D in all sectors of the economy for 2007.[1] The reason

Figure 2: Development of R&D expenditures as a percentage of gross domestic product by country



	2000	2007	Δ(2007–2000)
Belgium	1.97	1.87	–0.10
Denmark	2.18 (1999)	2.55	+0.37
Germany	2.45	2.54	+0.09
Finland	3.35	3.48	+0.13
France	2.15 (1999)	2.08	–0.07
Greece	0.60	0.57	–0.03
United Kingdom	1.81	1.79	–0.02
Ireland	1.12	1.31	+0.19
Italy	1.05	1.13 (2006)	+0.08
Netherlands	1.83	1.71	–0.12
Norway	1.64 (1999)	1.64	+/–0
Austria	1.94	2.57	+0.63
Poland	0.64	0.57	–0.07
Portugal	0.76	1.18	+0.42
Sweden	3.61 (1999)	3.60	–0.01
Slovak Republic	0.65	0.46	–0.19
Spain	0.91	1.27	+0.36
Czech Republic	1.21	1.54	+0.33
Hungary	0.78	1.31	+0.19
EU27 countries	1.74	1.77	+0.03
EU15 countries	1.85	1.90	+0.05
Canada	1.91	1.88	–0.03
Japan	3.04	3.44	+0.40
Switzerland	2.53	2.90 (2004)	+0.37
USA	2.75	2.68	–0.07
OECD	2.21	2.29	+0.08
China	0.90	1.49	+0.59

Source: OECD (MSTI 2009/1); internal calculations

for the short time between two complete surveys (2006 and 2007) is the change in the Austrian R&D statistics regulation[2], which now requires complete R&D surveys in odd reporting years, beginning in 2007. This synchronised the reporting cycle to that of the corresponding EU regulation[3]. The content of the Austrian R&D statistics regulation is therefore in full compliance with the corresponding obligatory EU legal basis. As was the case in previous R&D surveys, the 2007 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.[4]

1 cf. here also Schiefer, A. (2009)
2. BGBl. II. Federal Gazette No. II. No. 150/2008 dated 8 May 2008
3 Decision No. 1608/2003/EG of the European Parliament and the Council dated July 22, 2003 for the creation and development of community statistics on science and technology; Commission Regulation No. 753/2004 dated April 22, 2004 for the implementation of Decision No. 1608/2003/EG of the European Council regarding statistics on science and technology.
4 "The Measurement of Scientific and Technological Activities. Proposed Standard Practice for Surveys on Research and Experimental Development". Frascati Manual 2002, OECD, Paris 2002.

Differentiation by sector

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

The corporate sector consists of two sub-sectors: the "business sub-sector" and the "cooperative sector". The business sub-sector is by far the most important sub-sector, and essentially consists of manufacturing companies and service companies who produce goods and services for the market with the goal of earning income or other economic benefits. Institutions included in the cooperative sector of the corporate sector are service institutions that perform research and experimental development for companies. The majority of these institutions do not have the goal of earning income or other economic benefits. The core of this segment consists of institutions, most of them organised under the laws on associations, which are members of the Association of Austrian Cooperative Research Institutions (ACR – Austrian Cooperative Research). The cooperative sector also includes: in accordance with long-standing practice of Austrian R&D statistics, the Austrian Institute of Technology (AIT; previously: Austrian Research Centres GmbH – ARC) and Joanneum Research Forschungsgesellschaft mbH, as well as the (expiring) funding initiative of the former Federal Ministry for Transport, Innovation, and Technology ("Kplus") and the Federal Ministry for Economics and Labour ("Kind") and/or the "competence centres" initiated on the basis of the successor "COMET (Competence Centres for Excellent Technologies)" program, which are designed to provide sustained support for research collaboration between business and the sciences. The survey units of the cooperative sector are assigned exclusively to the ÖNACE categories 73 ("Research and Development") and 74 ("Business-Related Services").

Table 2 below outlines the breakdown of the entire R&D expenditures for 2007 by sector of performance and source of funding.

Table 2: R&D expenditures broken down by sector of performance and source of funding (2007)

Sectors of performance	in € million	Share in %	Sources of funds	in € million	Share in %
Corporate sector	4,846	70.6	Corporate sector	3,344	48.7
Cooperative sub-sector	468	6.8	Public sector	2,261	32.9
Business sub-sector	4,378	63.7	Private non-profit sector	32	0.5
Higher education sector	1,637	23.8	Abroad	1,230	17.9
Government sector[1]	367	5.3	Foreign companies, including international organisations (without EU)	1,129	16.4
Private non-profit sector[2]	17	0.2	EU funds	101	1.5
Total	6,868	100.0	Total	6,867	100.0

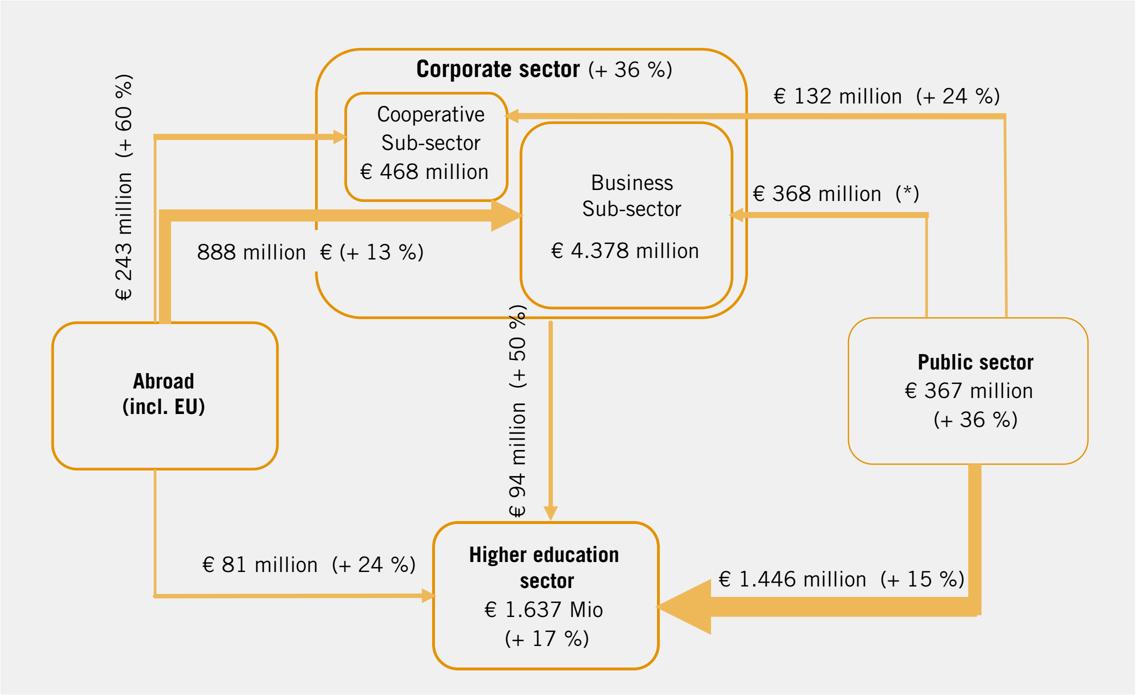
1 Federal institutions (not including those combined in the higher education sector), state, local government, and chambers of commerce, R&D institutions of the social insurance carriers, public sector-financed and/or controlled private non-profit institutions as well as R&D institutions of the Ludwig Boltzmann-Gesellschaft; including regional hospitals. The regional hospitals were not surveyed by questionnaire, but instead Statistik 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, religious, or other non-public.

Source: Statistik Austria, calculations by Joanneum Research

In order to show the interdependencies in the financing flows ("what is financed by whom"), Figure 3 presents an appropriate matrix with the following information for 2007:

- The R&D expenditures of the individual sectors of performance are shown in the boxes.
- The figures next to the arrows show the volume of financing.
- The percentages illustrate the change compared to 2004.[5]

Figure 3: Performance and financing of R&D in Austria for 2007 (versus 2004)[6]



(*) This financing flow cannot be compared with 2004. For an explanation, see the explanatory notes in the primary text. Rounded to € millions.

Source: Statistik Austria; Calculations by Joanneum Research

5 A comparison with the period 1998 through 2006 will require the use of earlier research and technology reports.
6 In the interest of clarity and due to its low proportion, the private non-profit sector was not considered in the breakdown.

The expenditures of the corporate sector for R&D thus totalled € 4,846 million (4,378+468) in 2007, reflecting a +36 % increase compared to 2004. The higher education sector, on the other hand, increased its R&D expenditures by 17 % to € 1,637 million. At almost 95 %, these two sectors provide the greatest share of the total national R&D expenditures (Table 2). How are these expenditures financed?

There are three significant financing flows. The first of these flows is the self-financing of the corporate sector, which finances the greatest share of its R&D activities itself (the public sector finances a total of € 500 million (368+132), and € 1,131 million (243+888) flow into the corporate sector from abroad). The corporate sector finances the remaining two-thirds (€ 3,214 million) itself.

In the case of direct public financing of internal company R&D, the 2006 survey recorded the research premium[7] separately for the first time and is therefore (following the concept of the Frascati Manual)[8] part of public sector financing (cf. in this regard Schiefer 2009). For this reason, one can make only a limited comparison of public sector financing based upon surveys from before 2006. According to the figures from the R&D survey, the volume of the research premium in 2007 was € 233 million, and is therefore an important source of public financing for R&D in the corporate sector. With a total volume of € 500 million (€ 233 million research premium +€ 267 million in direct funding), the public sector therefore finances just over 10 % of R&D in the corporate sector. The following table shows a detailed breakdown of the financing of the R&D expenditures in the corporate sector in 2007:

7 The research premium is an instrument of indirect research promotion. Since calendar year 2002, it has been possible for businesses to apply for a research premium (as an alternative to the research tax allowance). Because the research premium – in contrast to the two types of research tax allowance – represents a direct transfer to a company's tax account, the Frascati Manual requires this type of financing to be subsumed under the source of funding "government sector". In contrast to subsidies and other direct promotion, the research tax allowance is based upon a reduction of tax revenue and is an implicit component of the tax payment. The research tax allowance is not recorded as a public expenditure in a budgetary sense, and is not included in the complete R&D surveys made by Statistik Austria. The introduction of the research premium (the research premium was originally 3 % of R&D expenditures; the funding rate was finally raised to 8 % in 2004) as well as the gradual substitution of the research tax allowance therefore changes the situation with regard to the role (and increased participation) of the public sector in financing corporate R&D.

8 "The Measurement of Scientific and Technological Activities. Proposed Standard Practice for Surveys on Research and Experimental Development. Frascati Manual 2002, Paragr. 393, p. 114 f., OECD, Paris 2002.

Table 3: Financing of R&D expenditures in the corporate sector in 2007 (in thousands of euros)

			Cooperative sub-sector	Business bus-sector	Total
		Number of survey units performing R&D	52	2,469	2,521
Financing sectors/segments		corporate sector 1	93,461	3,120,162	3,213,623
	Public sector	Federal government 2	62,519	19,091	81,610
		Research premiums	13,338	219,422	232,760
		State	22,776	19,951	42,727
		FFG[3]	26,077	100,339	126,416
		Other public financing4	7,031	9,106	16,137
	Abroad	EU	10,171	21,003	31,174
		International organisations	856	10,464	11,320
		Foreign affiliated companies	108,767	609,378	718,145
		Other foreign companies	123,077	245,977	369,054
		Other5	146	2,749	2,895
		Total	468,219	4,377,642	4,845,861

1 Includes companies' own capital, funds raised in the capital market, loans from public sector development funds, and funds from other domestic companies;
2 Includes funds financed directly by the federal government (the federal offices), i.e. development funds (subsidies, allowances) as well as payments for research projects commissioned by the federal government. Examples of promotional programmes of the federal government include the "stimulus programmes" of the Federal Ministry for Transport, Innovation and Technology, such as "FIT-IT" (information technology) or "Sustainable Economic Management". Management of promotional programmes and processing of funding are frequently performed by outside institutions and not directly by the federal offices. Independent of the processing office, all development funds from support programmes are listed under "federal government".
3 Contains only subsidies (also including loan cost subsidies) awarded by the FFG to company research projects. These are primarily funds from the "general funding" or from the "core programmes" of the FFG or subsidies for cooperation projects under the EUREKA programme. The amounts actually paid are shown and not the "cash values". So-called "second-stage funding" to FFG-supported R&D projects from development funds of the provinces or their outsourced funds are subsumed under "states" or "Miscellaneous". In regional development areas there is the further option to cofinancing supported R&D projects from funds of the "European Fund for Regional Development" (EFRE). These funds are included in "EU". Supported loans of the FFG are contained in the "corporate sector".
4 Includes funds from local governments, chambers, social insurance carriers, and other public financing;
5 Private non-profit sector

Source: Statistik Austria, Schiefer (2009)

The second important financier of research and development in Austria is the public sector – regional administrative bodies (i.e. the federal government, regional governments, local governments, chambers, and social insurance carriers). Public sector funds primarily benefit institutions of higher education and internal research in the public sector. Compared to 2004, the R&D financing volume in the higher education sector rose by 17 % to € 1,637 million. The ratio of business R&D financing (€ 500 million) to higher education R&D financing (€ 1,446 million) is therefore 1:3.

The third important source of funding is funding from abroad. This sector comprises both the funds of foreign companies and international organisations for R&D in Austria as well as the return flows from the EU Framework Programmes. Specifically, the EU accounts for € 101 million of the total volume of € 1.23 billion from abroad. At € 54 million, the higher education sector is the primary recipient of the EU financial resources. Overall, the EU finances 1.47 % of the total Austrian R&D expenditures.

The following developments should be noted in particular:

- Of all sectors of performance, the corporate sector most clearly increased its R&D expenditures, with a growth rate of 36 % from

2004 to 2007. Within the same time period, R&D expenditures for the higher education sector increased by 17 %.

- This is also reflected in the increase of public financing for business R&D. State financing of business R&D rose from € 229 million (2004) to € 500 million (2007), which represents a 118 % increase. State financing of higher education research, by contrast, rose from € 1,262 million (2004) to € 1,446 million (2007), an increase of 15 %.
- In sum, 5 % of business R&D was financed by the state through the research premium in 2007.
- The cooperative sector reported a spending volume of € 468 million in 2007. This volume was predominantly financed by the public sector (€ 132 million) and the foreign sector (€ 243 million), which adds up to 80 %. This produces a distorted picture because in addition to the competency centres, the two largest public research institutions (Austrian Research Centres and Joanneum Research) are included in the sector, even though their financing structures are not consistent with this picture. The reason for this distortion can also be found in the criteria of statistical convention: Because of its extraordinary membership in Austrian Cooperative Research (ACR), AVL-List GmbH is also assigned to the "cooperative sector".[9]

2.3 R&D in Austria 2002 – 2007

The following chapter presents some results of the global R&D surveys conducted by Statistik Austria in 2002, 2004 and 2006 and 2007.[10] This intertemporal comparison is supplemented by international cross-sectional comparisons.[11] As the currently most up-to-date survey originates from 2007 (the results for 2009 will not be available until mid-2011), the impact of the financial crisis on the R&D expenditures is not yet evident from the data.

A comparison of the survey years 2002 to 2007 shows a clear increase in both the units doing research as well as R&D expenditure:

Table 4: Units performing research and R&D expenditure in Austria, 2002–2004–2006–2007

	Units performing R&D					Expenditures for R&D [€ millions]				
sector of performance	**2002**	**2004**	**2006**	**2007**	*(Change 2002–2007)*	**2002**	**2004**	**2006**	**2007**	*(Change 2002–2007)*
Higher education sector	969	1,038	1,162	1,207	*+25 %*	1,266	1,402	1,523	1,637	*+29 %*
Government sector	308	226	254	245	*-20 %*	266	270	330	367	*+38 %*
Private non-profit sector	71	55	40	36	*-49 %*	21	22	17	17	*-17 %*
Corporate sector	1,942	2,123	2,407	2,521	*+30 %*	3,131	3,556	4,449	4,846	*+55 %*
Total	3,290	3,442	3,863	4,009	*+22 %*	4,684	5,250	6,319	6,868	*+47 %*

Source: Statistik Austria (R&D Survey), Calculations by Joanneum Research

9 Cf: http://www.acr.at/61.0.html . And AVL-List GmbH ultimately invested approx. €81 million in R&D (11 % of revenue of €740 million) in 2008. See: www.avl.com

10 The results of the 2007 R&D survey are available to the public at: http://www.statistik.at/web_de/statistiken/forschung_und_innovation/f_und_e_in_allen_volkswirtschaftlichen_sektoren/index.html as well as:http://www.bmwf.gv.at/publikationen_und_materialien/forschung/statistiken/

11 The OECD's Main Science and Technology Indicators (MSTI).

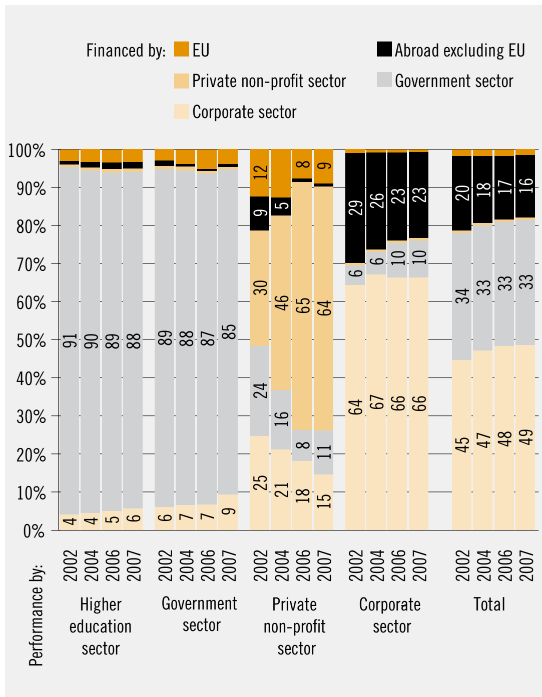
The number of units doing research rose by 22 % between 2002 and 2007 (from 3,290 to 4,009 units), R&D expenditure by +47 % (from 4.7 billion to € 6.9 billion). The corporate sector in particular increased its spending by a very significant +55 % (from € 3.1 billion to € 4.8 billion); only the private non-profit sector recorded a decline; however, this was at a very low absolute level.

2.3.1 Financing and expenditures

The financing structure of the expenditures for research and development in Austria shows on the whole only relatively slight shifts for the period 2002 through 2007.

Figure 4: R&D expenditures in € millions: 2002/2004/2006/2007 broken down by financing sector in Austria

		Financing sector					
Sectors of performance		Corporate sector	Government sector		Abroad excluding EU	EU	Total [€ millions]
Higher education sector	2002	51.3	1156.9	8.2	11.8	37.8	1266.1
	2004	62.6	1262.4	11.4	19.1	46.1	1401.6
	2006	76.8	1354.7	13.1	26.8	51.9	1523.2
	2007	93.9	1445.7	16.9	26.5	54.3	1637.3
Government sector	2002	16.0	236.8	2.0	3.9	7.8	266.4
	2004	17.8	237.3	2.7	1.9	10.3	269.8
	2006	22.5	287.3	1.8	1.9	16.8	330.2
	2007	34.3	313.6	2.7	2.7	14.0	367.3
Private non-profit sector	2002	5.2	5.0	6.3	1.9	2.6	20.9
	2004	4.6	3.4	9.9	1.0	2.7	21.6
	2006	3.0	1.3	10.8	0.1	1.3	16.5
	2007	2.6	2.0	11.2	0.1	1.6	17.4
Corporate sector	2002	2018.1	175.5	1.0	906.2	30.1	3130.9
	2004	2390.6	229.2	1.2	907.6	27.9	3556.5
	2006	2954.7	428.1	1.3	1030.7	33.9	4448.7
	2007	3213.6	499.7	1.5	1099.9	31.2	4845.9
Total	2002	2090.6	1574.2	17.5	923.7	78.3	4684.3
	2004	2475.5	1732.2	25.2	929.6	87.0	5249.5
	2006	3057.0	2071.3	26.9	1059.5	103.9	6318.6
	2007	3344.4	2260.9	32.3	1129.1	101.1	6867.8



Source: Statistik Austria (R&D Survey), Calculations by Joanneum Research

In light of these relatively stable financing structures, however, several interesting developments are evident between 2002 and 2007. The share of the government sector in financing the research expenditures of the corporate sector rose from 6 % to 10 % (a direct result of the significantly increased funding of research promotion in recent years). The share of financing from abroad dropped from 29 % to 23 % (however, in absolute numbers this does not signify a decline: the foreign financing rose from € 906 million to € 1100 million; this growth of +21 % is however significantly less than the total growth of +55 percentage points). The self-financing share of the corporate sector remained essentially stable in the range of 64–67 %.

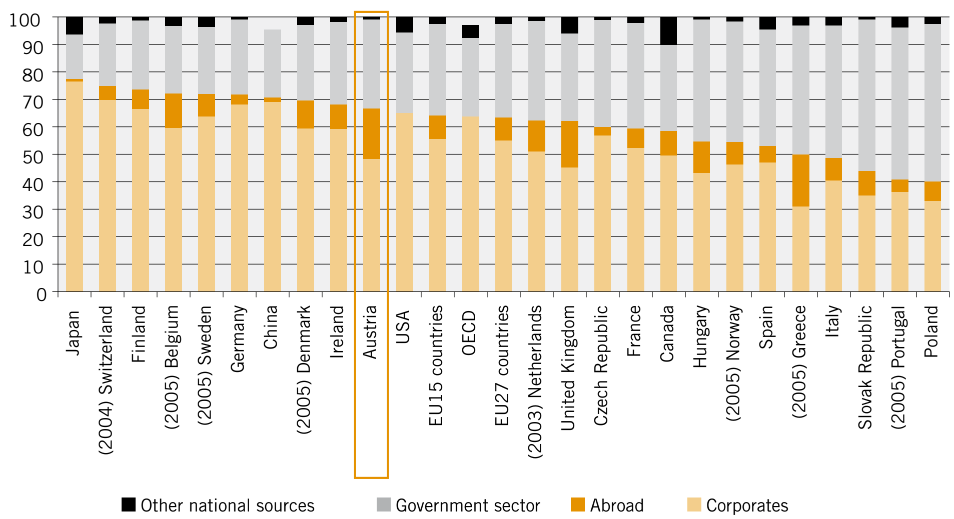
The university level and government sector are predominantly financed publicly, although the state share is declining slightly; at the same time, the business share increased quite a bit and EU shares increased slightly, although they remain in a range from 3–7 %. The private non-profit sector was the only one to experience significant shifts in its financing structure in the direction of expanding state financing. However, at less than € 20 million, the expenditures in this category account for less than 0.3 % of the total research expenditures.

In addition to achieving an R&D level of 3 % of GDP in 2010 – the pan-European level defined in Barcelona in 2002 – the "Barcelona objective" also specifically aims to increase the business share in the financing of total research expenditures to 67 %. If the statistic is taken literally, this target was missed by a wide margin; however if we focus on the content of the objective, it has already been (almost) met for some time.

The nominal business share in the financing of total research expenditures came to 49 % in 2007 and was thus somewhat higher than in 2002 (45 %) – so, even in 2007 it was a far cry from the 67 % target for the business share. On the other hand, at 16 %, Austria has a very high foreign component; however, businesses (although foreign) are almost exclusively the sole providers (research funding by the EU amounts to 1–2 % and is reported separately). Moreover, this foreign component in the financing of total R&D in Austria is in significant decline; it still amounted to 20 % in 2002. However, only the percentage share has dropped; in absolute terms, the foreign funds (excluding the EU) rose from € 924 million to € 1129 million (although at +22 %, less than half as fast as the total expenditures at a rate of +47 percentage points).

Taken together, domestic and foreign companies currently finance approximately 65 % of the total research expenditures in Austria,

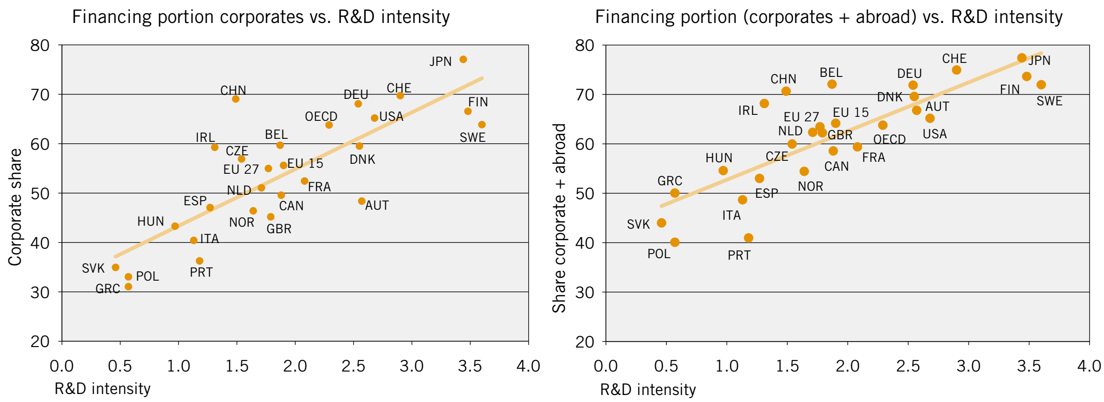
Figure 5: Financing structure of the research expenditures for 2007 by country



Source: OECD (MSTI), Calculations by Joanneum Research meaning that the two-thirds goal has almost been met.[12] Applying this type of calculation, the goal has already been (almost) met on the EU15 and EU27 level.

Japan and Switzerland have the highest business shares (or combined business and foreign shares) at 75 % each. Austria is above the average of the EU15 and EU27 (although with a significantly higher foreign share). The ranking of the countries also shows that the research intensity is strongly correlated with the corporate sector: countries with a high business share tend to have high research intensities.

Figure 6: Business share of the R&D rate for 2007 by country



Source: OECD (MSTI), Calculations by Joanneum Research

With respect to nominal pure business share only, Austria – given its R&D intensity – falls significantly short of the trend of the other countries (China is the positive exception). If foreign financing is included in the calculation, the scatter around the trendline is noticeably narrower; Austria is now (almost) perfectly on in the trend line.

Types of research

In absolute terms, between 2002 and 2007 all types of research expanded markedly: The expenditures for basic research rose overall from € 819 million (2002) to € 1,182 million (2007), reflecting a +44 % increase. The expenditures for applied research rose by +38 % and the expenditures for experimental development increased by +55 %.

12 Of course, the high financing component by foreign companies has certain implications for the research structure in Austria. Not only domestic businesses finance the research expenditures. The relatively high share of foreign businesses in the financing of R&D expenditures suggests that Austria is very attractive as a place for research.

Table 5: R&D expenditures 2002/2004/2006/2007 by research type (€ millions)

Sector	Survey year	Total	basic research	applied research	experimental development
Higher education sector	2002	**1,266.1**	618.9	503.5	143.7
	2004	**1,401.6**	687.0	583.1	131.6
	2006	**1,523.2**	746.1	638.6	138.4
	2007	**1,637.3**	812.4	681.9	143.0
Government sector	2002	**179.9**	58.0	109.0	13.0
	2004	**171.7**	59.0	100.9	11.7
	2006	**215.8**	69.5	127.7	18.6
	2007	**236.8**	79.5	139.5	17.8
Private non-profit sector	2002	**20.9**	3.7	14.2	3.0
	2004	**21.6**	5.8	12.3	3.4
	2006	**16.5**	3.7	12.1	0.8
	2007	**17.4**	6.7	8.5	2.2
Corporate sector	2002	**3,130.9**	138.4	1,100.8	1,891.7
	2004	**3,556.5**	165.3	1,210.6	2,180.6
	2006	**4,448.7**	245.2	1,415.1	2,788.4
	2007	**4,845.9**	283.4	1,554.1	3,008.3
Total	2002	**4,597.8**	818.9	1,727.4	2,051.4
	2004	**5,151.4**	917.1	1,906.9	2,327.4
	2006	**6,204.2**	1,064.5	2,193.6	2,946.1
	2007	**6,737.4**	1,182.1	2,384.0	3,171.2

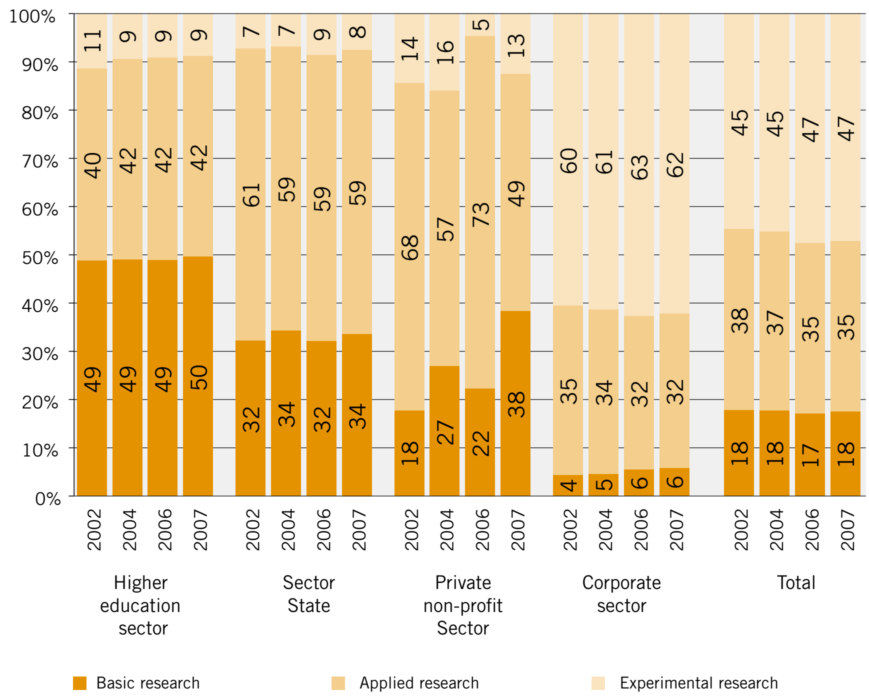
Note: No breakdown of R&D expenditures by research type is available for the regional hospitals in the government sector. For that reason, the total volume is just under that shown in Table 1.

Source: Statistik Austria (R&D Survey), Calculations by Joanneum Research

The analysis of the types of research as a function of implementing sectors shows – apart from the (for the most part almost negligible) private non-profit sector – a similarly stable structure; with a slight trend in the direction of experimental development (in the corporate sector) and – even less – in the direction of basic research (in the higher education sector).[13] Overall, the percentage of experimental development in research expenditures is at 47 %, increased somewhat since 2002 (from 45 %), primarily at the expense of applied research (from 38 % to 35 %). Basic research remained almost constant at 17–18 %. Not surprisingly, the primary sponsor of basic research is the higher education sector. Among businesses, experimental developments (more than 60 %) and applied research (roughly one third) dominate, with basic research at 4–6 % playing only a subordinate role.

13 Although a positive trend in this direction can be observed in all sectors, stagnation is generally evident in the percentage of basic research. The reason for this is that the corporate segment (which has less basic research) is growing faster than the other sectors.

Figure 7: R&D expenditures 2002/2004/2006/2007 by research type, shares

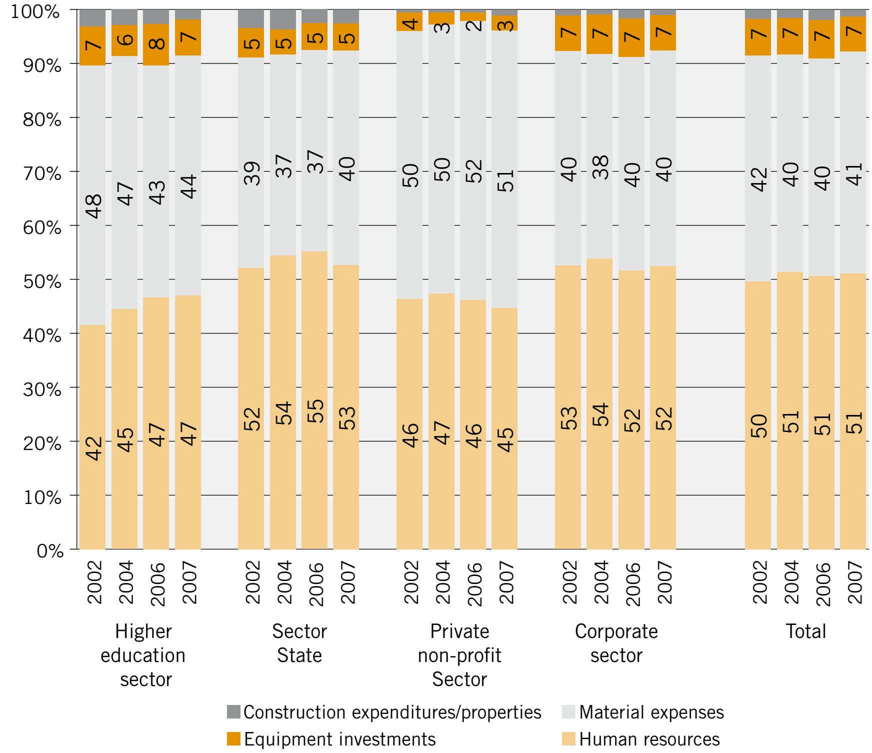


Source: Statistik Austria (R&D Survey), Calculations by Joanneum Research

Types of expenditure

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

Figure 8: R&D expenditures in 2002/2004/2006/2007 by type of expenditure



Source: Statistik Austria (R&D Survey), Calculations by Joanneum Research

2.3.2 R&D expenditures in the corporate sector

The two most important funders of research and development, the corporate and the higher education sectors, will be discussed in somewhat greater detail below. The corporate sector will be broken down into economic segments and technological intensity, the higher education sector into fields of science.[14]

14 For reasons of data availability, the definition of technology used here differs somewhat from the (customarily used) definition of the OECD; the high-tech manufacturing segment comprises the industries NACE 24, 30, 32 and 33; medium-tech manufacturing consists of industries 25–29, 31, 34, 35. The high-tech-knowledge-intensive services include NACE 72 and 73. (Please refer to the annex for a list of the industries and their categorisation).

Table 6: R&D expenditures and value added in the corporate sector, 2002 and 2007

Sector	2007						2002					
	Numbrt of survey units performing R&D Survey units	R&D expenditure	Gross value added	R&D as percentage of gross value added	Share in R&D expenditures	Share in gross value added	Number of survey units performing R&D Survey units	R&D expenditure	Gross value added	R&D as percentage of gross value added	Share in R&D expenditures	Share in gross value added
		[€ million]	[€ billion]	[%]	[%]	[%]		[€ million]	[€ billion]	[%]	[%]	[%]
Agriculture and forestry, fishing	4	1	4	0.0%	0%	2%	4	2	4	0.1%	0%	2%
Mining	9	8	1	0.8%	0%	0%	9	3	1	0.3%	0%	0%
Manufacturing	1391	3383	49	6.8%	70%	20%	1169	2273	40	5.7%	73%	20%
High-Tech	*298*	1067	7	15.0%	22%	2.9%	*229*	1029	6	18.6%	33%	2.8%
Medium Tech	*802*	2123	27	7.8%	44%	11%	*672*	1114	19	5.7%	36%	10%
Other manufacturing	*291*	193	15	1.3%	4%	6%	*268*	130	15	0.9%	4%	7%
Electricity, gas and water supply	23	9	6	0.1%	0%	3%	17	14	4	0.3%	0%	2%
Construction	71	20	18	0.1%	0%	7%	53	12	15	0.1%	0%	7%
Services	1023	1425	166	0.9%	29%	68%	690	828	135	0.6%	26%	68%
Hi-tech knowledge intensive	*498*	712	4	19.5%	15%	1.5%	*299*	373	3	11.1%	12%	1.7%
Other services	*525*	713	162	0.4%	15%	66%	*391*	455	131	0.3%	15%	66%
Total	2521	4846	245	2.0%	100%	100%	1942	3131	198	1.6%	100%	100%

Source: Statistik Austria (R&D survey, National Account), calculations by Joanneum Research

As a share of gross value added, R&D expenditures were increased from 1.6 % to 2.0 % between 2002 and 2007 (the corresponding shares in gross domestic product amount to 1.4 % and 1.8 %); an increase of the R&D component can be observed in (almost) all sectors. High-tech knowledge-intensive services recorded the highest growth by almost doubling their R&D share of gross value added from 11 % to almost 20 % (the share of total R&D expenditures in the corporate sector thus came to 15 % in 2007). This also means that the *high-tech knowledge-intensive* services for the first time saw a higher R&D intensity than high-tech manufacturing (the situation was otherwise in 2006). At 15 %, *high-tech* manufacturing saw a definite drop compared to 19 % in 2002 (as recently as 2006 this share was still higher at 23 %). Thus the share of *high-tech* manufacturing has also fallen significantly (from 33 % to 22 %, after 32 % as recently as 2006).

The main reason for this decline is to be found primarily in the radio, television and telecommunication equipment and apparatus sector (NACE 32) but excluding NACE 32.1 (manufacture of electronic components). Compared to 2006, this sector increased its R&D expenditures by 11 % to € 375 million. The remaining sector NACE 32 saw R&D expenditures decline by more than 80 %, from € 542 million in 2006 to € 90 million in 2007. The fact that the R&D expenditures in the (closely related) sector NACE 31 (electrical machinery and apparatus n.e.c.) simultaneously rose by a similar amount (from just under € 200 to € 647 million) is the result of a reclassification – which, however, is of great consequences for the technology classification, as NACE 32 but not NACE 31 is included in the *high-tech* manufacturing industry (NACE 31 is assigned to the *medium-tech* manufacturing industry). These incisive changes resulted from activity changes of the enterprises (or of one large enterprise) and the resulting reclassifications.[15] This also explains the changes in the medium-tech manufacturing industry which increased its R&D intensity to 7.8 % and its share in the total business R&D expenditures to 44 % (after 6.2 % and 34 % as recently as 2006).

All in all, this result is not the result of a major change in the industrial structure but rather the consequence of (changes in) classification.

Table 7: Financing of R&D expenditures in the corporate sector, 2007

Sector	2007											
				Public sector								
	Number of survey units performing R&D Survey units	R&D expenditure	Corporate sector	Federal government	Research premium	States	FFG	Other public financing	Combined	Private non-profit Sector	Abroad (excluding EU)	EU
		[€ million]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]
Agriculture and forestry, fishing	4	1	89.5	-	-	4.8	5.3	-	10.1	-	-	0.4
Mining	9	8	60.8	-	-	0.2	0.5	0.8	1.5	-	37.7	-
Manufacturing	1,391	3,383	73.5	0.3	5.3	0.2	2.1	0.2	8.1	0.0	18.2	0.2
High-Tech	*298*	1,067	71.2	0.6	6.3	0.3	2.6	0.2	10.1	-	18.4	0.2
Medium Tech	*802*	2,123	72.9	0.1	4.9	0.2	1.9	0.1	7.3	0.0	19.6	0.2
Other manufacturing	*291*	193	92.4	0.2	3.3	0.3	1.7	0.1	5.5	-	1.9	0.2
Electricity, gas and water supply	23	9	87.6	-	6.9	0.2	0.7	0.4	8.1	0.4	-	3.9
Construction	71	20	88.8	0.3	4.1	0.6	4.3	0.1	9.4	-	1.6	0.3
Services	1,023	1,425	48.9	5.0	3.8	2.4	3.7	0.7	15.7	0.1	33.7	1.6
Hi-tech knowledge intensive	*498*	712	55.2	9.4	3.6	4.2	5.3	1.2	23.8	0.2	18.5	2.4
Other services	*525*	713	47.4	3.5	3.8	1.8	3.2	0.6	12.9	0.1	38.3	1.4
Total	2,521	4,846	66.3	1.7	4.8	0.9	2.6	0.3	10.3	0.0	22.7	0.6

Source: Statistik Austria (R&D Survey), Calculations by Joanneum Research

A total of two-thirds of the R&D expenditures of the companies in the corporate sector were self-financed, followed by the foreign sector (somewhat under one fourth) and the public sector with 10 %. The EU plays only a marginal role in the financing of business R&D

15 This nicely illustrates the problems of classification systems that attempt to classify economic segments by their technology content – necessarily, a certain (?) degree of arbitrariness and absence of selectivity has to be accepted. This does not represent an insurmountable problem; however, conclusions based on such classification systems should always be taken with a certain degree of caution.

and the non-profit sector plays practically none at all. Aside from the quantitatively insignificant mining sector, medium-tech and high-tech manufacturing exhibit an above-average foreign share at 18 % and 20 %, respectively as do services at 34 % (in this case also, a significant shift is seen between these two areas as a consequence of the reclassification: In 2006, the corresponding shares were still 35 % and 10 %, respectively; in total, the foreign share in the manufacturing industry declined slightly from 21 % to 18 %). The service providers also receive a relatively high share of public funds (16 %) and EU funds (2 %) and a relatively small share of financing by the corporate sector (49 %).

Table 8: Expenditures for external (extramural) R&D in the business sub-sector in € millions, 2007

			Research contracts in domestic institutions							Research contracts in foreign institutions						
	R&D financed survey units	Total	Domestic affiliated companies	Other domestic companies	Univ. and Univ of applied sci.	Other government institutions	Private non-profit institutions	Cooperative R&D institutions	Combined	Foreign subsidiaries	Other foreign affiliated companies	Other foreign companies	Foreign government institutions	International organisations	Other	Combined
Agriculture and forestry, fishing	**3**	**0.3**	**-**	**0.0**	**0.2**	**0.1**	**-**	**0.0**	**0.3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Mining	**8**	**1.7**	**0.0**	**0.7**	**0.4**	**-**	**-**	**-**	**1.1**	**-**	**-**	**0.0**	**-**	**-**	**0.6**	**0.6**
Manufacturing	**653**	**669.6**	**90.2**	**122.0**	**21.3**	**3.5**	**1.4**	**8.6**	**246.9**	**154.9**	**97.6**	**164.7**	**2.9**	**0.3**	**2.5**	**422.8**
High-Tech	145	147.2	4.0	19.7	8.0	2.1	0.0	2.7	36.4	10.1	27.4	69.2	2.3	0.0	1.9	110.8
Medium Tech	374	484.9	82.0	90.4	10.8	1.2	1.2	4.2	189.8	143.4	60.6	90.1	0.5	0.1	0.4	295.1
Low Tech	134	37.5	4.2	11.9	2.5	0.2	0.2	1.7	20.7	1.4	9.5	5.4	0.1	0.2	0.2	16.9
Electricity, gas and water supply	**25**	**7.5**	**0.6**	**4.8**	**1.2**	**0.0**	**0.0**	**0.4**	**7.1**	**-**	**-**	**0.2**	**0.1**	**-**	**0.1**	**0.4**
Construction	**27**	**3.2**	**0.7**	**1.7**	**0.5**	**0.0**	**0.0**	**0.2**	**3.2**	**-**	**-**	**0.1**	**-**	**-**	**-**	**0.1**
Services	**465**	**139.3**	**31.6**	**33.9**	**16.4**	**2.2**	**2.4**	**4.5**	**91.1**	**16.4**	**6.4**	**21.6**	**0.6**	**0.7**	**2.5**	**48.2**
Hi-tech knowledge intensive	190	65.6	13.5	13.6	5.9	0.8	0.5	0.4	34.7	15.8	2.8	9.8	0.3	0.0	2.1	30.9
Other	275	73.7	18.1	20.3	10.6	1.5	1.9	4.1	56.4	0.6	3.6	11.8	0.2	0.7	0.4	17.3
Total	**1,181**	**821.7**	**123.1**	**163.1**	**40.0**	**5.8**	**3.9**	**13.6**	**349.5**	**171.3**	**104.0**	**186.6**	**3.6**	**1.0**	**5.6**	**472.1**

Source: Statistik Austria (R&D Survey), Calculations by Joanneum Research

The expenditures for external research in the business sub-sector exhibit two interesting trends: First, the expenditures of € 822 million, which are allocated for external R&D, correspond to almost one-fifth of the amount spent for performing research in the business sub-sector (€ 4.38 million, see Table 2). Second, and this is the more interesting observation, the business sub-sector allocates significantly more than half of its expenditures for external R&D to foreign institutions (€ 472 million of € 822 million, corresponding to 57 %). These € 472 million correspond to 7 % of the total R&D expenditures in Austria (€ 6.87 billion) – this implies that Austria is thus not only a recipient (at an approximately 17 % foreign share in financing), but also invests a very considerable volume of R&D funds abroad.

Table 9: Structure of expenditures for external (extramural) R&D in the business sub-sector 2007

	%-share domestic	of which:						%-share abroad	of which:					
		Domestic affiliated companies	Other domestic companies	Univ. and Univ of applied sci.	Other government institutions	Private non-profit institutions	Cooperative R&D institutions		Foreign subsidiaries	Other foreign affiliated companies	Other foreign companies	Foreign government institutions	International organisations	Other
Agriculture and forestry, fishing	**100**	**-**	**4**	**60**	**22**	**-**	**14**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Mining	**63**	**0**	**60**	**39**	**-**	**-**	**-**	**37**	**-**	**-**	**1**	**-**	**-**	**99**
Manufacturing	**37**	**37**	**49**	**9**	**1**	**1**	**3**	**63**	**37**	**23**	**39**	**1**	**0**	**1**
High-Tech	25	11	54	22	6	0	7	75	9	25	62	2	0	2
Medium Tech	39	43	48	6	1	1	2	61	49	21	31	0	0	0
Low Tech	55	20	58	12	1	1	8	45	8	57	32	1	1	1
Electricity, gas and water supply	**94**	**9**	**68**	**17**	**0**	**1**	**5**	**6**	**-**	**-**	**54**	**27**	**-**	**19**
Construction	**98**	**21**	**54**	**17**	**1**	**1**	**5**	**2**	**-**	**-**	**100**	**-**	**-**	**-**
Services	**65**	**35**	**37**	**18**	**2**	**3**	**5**	**35**	**34**	**13**	**45**	**1**	**2**	**5**
Hi-tech knowledge intensive	53	39	39	17	2	1	1	47	51	9	32	1	0	7
Other	77	32	36	19	3	3	7	23	3	21	68	1	4	2
Total	**43**	**35**	**47**	**11**	**2**	**1**	**4**	**57**	**36**	**22**	**40**	**1**	**0**	**1**

Source: Statistik Austria (R&D Survey), Calculations by Joanneum Research

On average, 57 % of the external R&D projects in the business sub-sector are allocated to foreign institutions; among these, affiliated companies represent the most important recipient (receiving 58 %). The most important domestic recipients are non-affiliated companies, receiving almost half of the domestic R&D orders, followed by affiliated companies. Universities and universities of applied science receive 11 % and cooperative R&D institutions receive 4 % of the domestic orders.

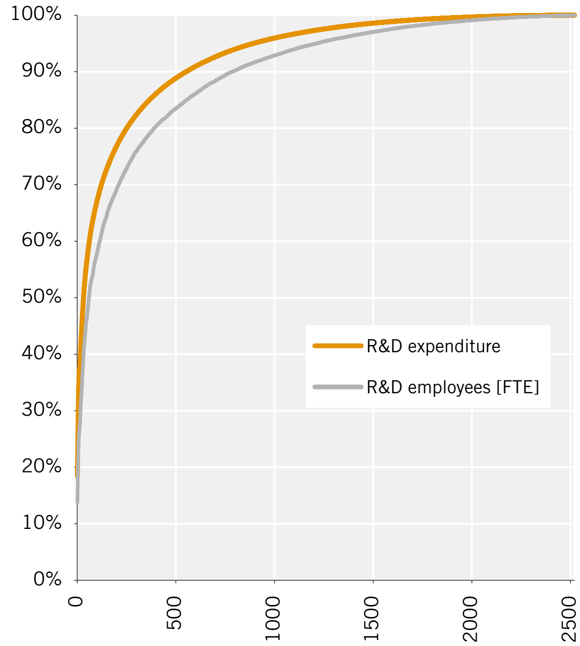
The manufacturing industry has the highest foreign share (63 %); also the foreign share tends to rise with increasing technology content, a trend that also applies to services. The share of universities and universities of applied science and of other government institutions is also the highest in high-tech industries; however, a clear correlation with the technology content cannot be observed in these areas.

The concentration of R&D expenditures in the corporate sector

A total of 2,521 units that perform R&D have been identified in the corporate sector. Their research expenditures total almost € 5 billion. However, the average of € 1.9 million R&D expenditures derived from this amount masks an enormous degree of variation in the research expenditures: Only 334 of the 2,521 companies (13.2 %) have R&D expenditures exceeding this average (the median of the R&D expenditures, i.e. the value exceeded by 50 % of the companies, is less than € 250 thousand); the four most important companies provide 20 % and 33 companies provide 50 % of the entire

R&D expenditures. Nonetheless, 751 companies record R&D expenditures of less than € 100 thousand (these companies, which constitute almost 30 % of all companies, are in total responsible for less than 0.7 % of the total R&D expenditures). This phenomenon is not specific to Austria; rather it shows the enormous influence of the "big players" in research expenditures and all corresponding indicators.

Figure 9: Concentration of R&D expenditures in the corporate sector in 2007



Share in R&D expenditures [%]	Number Unternehmen	Share of the companies
20	4	0.2
35	11	0.4
40	17	0.7
45	24	1.0
50	33	1.3
60	62	2.5
70	123	4.9
80	251	10
90	553	22
95	893	35
99	1639	65
100	2521	100

Source: Statistik Austria (R&D Survey), Calculations by Joanneum Research

The following table also underscores the significance of the large enterprises in Austria:

Table 10: R&D expenditures in the Austrian corporate sector broken down by size category, 2007

Size category	Companies performing research	R&D expenditure per employee	R&D expenditure per R&D employee	Share of R&D employees	cummulative portion of R&D expenditures	cummulative portion of basic research premium	Portion of public R&D funding (difference between R&D expenditures and basic research premium)
S (<50 emp)	1358	26.4	57.5	47%	10%	9%	13.2%
M (50-250 emp)	740	9.5	72.4	14%	18%	17%	7.8%
L (>250 emp)	423	9.1	102.6	9%	72%	73%	4.0%
Total	2521	13.2	76.8	20%	100%	100%	8.0%

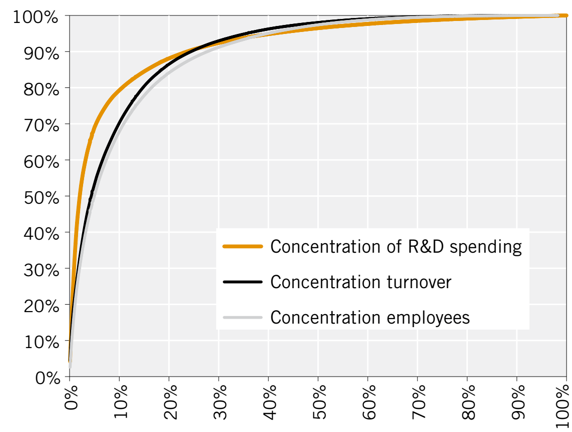
Source: Statistik Austria (R&D Survey), Calculations by Joanneum Research
emp = employees

Large enterprises with more than 250 employees account for only 17 % of companies performing research; however they do account for 71 % of the entire R&D expenditures in the corporate sector. Conversely, the research expenditures of small businesses (with fewer than 50 employees), constituting 54 % of enterprises, account for only 10 % of R&D expenditures. On the other hand, the share of public funding[16] for small businesses at more than 13 % of their research expenditures is significantly higher than for medium-sized and large enterprises (8 % and 4 %, respectively).

The data referring 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 (with regard to all employees, the R&D expenditures of the small businesses appear to be higher).

The aforementioned strong concentration of R&D expenditures on (relatively) few companies is also seen on the international level:

Figure 10: Concentration of R&D expenditures in 2007 in the top 1000 companies in the EU performing research



Source: R&D Scoreboard 2009, calculations by Joanneum Research

A strong concentration is also seen on the level of the 1000 most important businesses in the EU that perform research[17]. This concentration is also significantly higher than for sales and numbers of employees. This concentration is also significantly higher than for sales and numbers of employees. 10 % of these companies represent almost 80 % of research expenditures but only two thirds of figures for sales and numbers of employees. An arithmetic mean of the research expenditures of € 125 million per company is in contrast to a median of only € 18 million.

16 Which results from the difference between the R&D expenditures and the basis for calculating the research premium.
17 The concentration appears to be more pronounced than in Austria; however the two graphs are not directly comparable, as they include all businesses performing research in Austria but only the 1000 largest companies in the EU.

2.3.3 R&D expenditures in the higher education sector

The financing of R&D expenditures in the higher education sector is of course dominated by the public sector. On average, the public sector finances a total of 88 % of the R&D expenditures of the higher education sector.

Table 11: Financing of R&D expenditures in the higher education segment, 2007

Field of science	Number of survey units performing R&D Survey units	R&D expenditure [€ million]	Corporate sector	Public sector: Combined	Public sector: Federal	Public sector: State	Public sector: Municipalities	Public sector: Other public financing	Private non-profit Sector	Foreign (excluding EU)	EU
1.0 to 4.0 Subtotal	694	**1,244**	7%	87%	71%	3%	0%	13%	1%	2%	4%
1.0 Natural sciences	275	**512**	4%	89%	71%	3%	0%	15%	1%	2%	5%
2.0 Engineering and technology	191	**241**	15%	78%	61%	5%	1%	10%	1%	2%	5%
3.0 Medical sciences	172	**423**	6%	88%	76%	1%	0%	12%	1%	2%	2%
4.0 Agricultural sciences	56	**68**	2%	93%	85%	1%	0%	7%	1%	1%	3%
5.0 and 6.0 Subtotal	513	**393**	3%	93%	84%	3%	0%	7%	2%	1%	1%
5.0 Social sciences	299	**238**	4%	90%	83%	2%	0%	4%	2%	1%	2%
6.0 Humanities	214	**156**	1%	98%	85%	3%	0%	10%	1%	0%	0%
1.0 to 6.0 Total	1,207	**1,637**	6%	88%	74%	3%	0%	11%	1%	2%	3%

Source: Statistik Austria (R&D Survey), Calculations by Joanneum Research

At 98 %, the public-sector share is the highest in the humanities; it is the lowest in engineering at 78 %. The case is exactly the opposite for the corporate sector. At an average of 6 %, its share lies between 1 % (humanities) and 15 % (engineering); a similar ranking is seen for EU funding and the foreign sector (average of 3 % and 2 %, respectively). "Other public-sector funding" which includes the funding from the Austrian Science Fund, contributes 11 % to the research activities of the universities. However, these funding sources also have significantly different weightings. They contribute the smallest amount to the social sciences (4 %) while their highest contribution is to the natural sciences, human medicine and humanities (15 %, 12 % and 10 %). EU funds finance on average 3 % of university research, again with a strongly unequal distribution: almost 5 % in the natural and engineering sciences, less than ½ % in the humanities.

2.3.4 R&D employees

Employment (as headcount) in the R&D segment increased +36 % to almost 90,000 between 2002 and 2007; this expansion was driven by the corporate sector at +42 % and the higher education sector at +41 %. The government sector and the private non-profit segment exhibited declines (which were quite massive in the case of the non-profits at –45 percentage points). However, these two segments employ only about 7 % of all researchers.

Table 12: Employment in R&D, 2002/2004/2006/2007

sector of performance	Employees – headcounts					Employees – full-time equivalents					Ratio FTE/headcount			
	2002	2004	2006	2007	*(Change 2002–2007)*	2002	2004	2006	2007	*(Change 2002–2007)*	2002	2004	2006	2007
Higher education sector	25 072	29 358	32 715	35 269	*+41%*	9 879	11 502	12 668	13 613	*+38%*	39%	39%	39%	39%
Government sector	6 010	5 531	5 511	5 500	*-8%*	2 060	2 035	2 423	2 488	*+21%*	34%	37%	44%	45%
Private non-profit sector	623	565	404	337	*-46%*	227	212	161	162	*-29%*	36%	38%	40%	48%
Corporate sector	34 020	38 737	45 336	48 352	*+42%*	26 728	29 358	34 020	36 989	*+38%*	79%	75%	75%	76%
Total	65 725	74 191	83 966	89 458	*+36%*	38 893	42 891	49 377	53 252	*+37%*	59%	58%	59%	60%

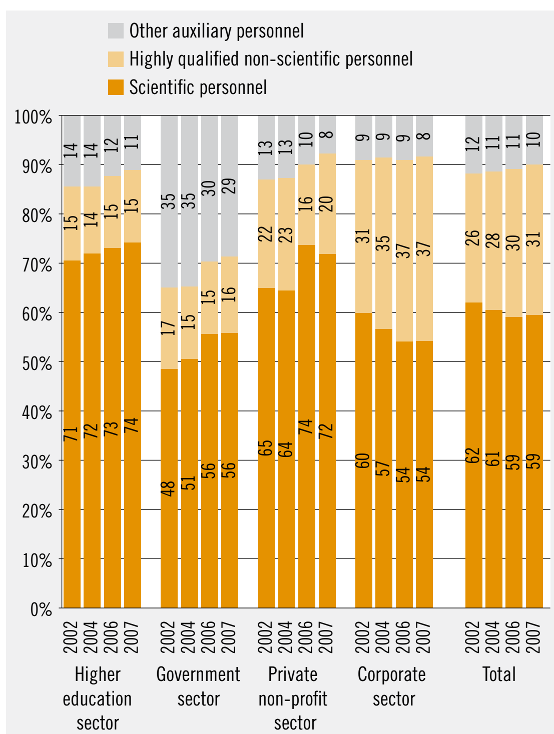
Source: Statistik Austria (R&D Survey), Calculations by Joanneum Research

Expressed as full-time equivalents (FTE), the increase was very similar at +37 % (about 53,000). The "degree of utilisation" (the ratio of full-time equivalent to headcount) of a typical R&D employee remained practically constant at approximately 60 %. This figure is highest in the corporate sector (76 %). The non-profit sector and the government sector expanded the degree of utilisation (to the current figure of somewhat less than 50 %).

Employment categories and full-time equivalents are broken down as follows:

Figure 11: R&D employment structure in FTEs in Austria for 2002/2004/2006/2007

Sector of performance	year	Scientific Human resources	Highly qualified non-scientific personnel	Other Auxiliary personnel	Total (FTE)
Higher education sector	2002	6 977	1 475	1 427	9 879
	2004	8 281	1 569	1 652	11 502
	2006	9 261	1 856	1 551	12 668
	2007	10 112	1 990	1 511	13 613
Government sector	2002	999	342	719	2 060
	2004	1 030	300	706	2 035
	2006	1 349	357	718	2 423
	2007	1 389	387	712	2 488
Private non-profit sector	2002	148	50	30	227
	2004	137	49	27	212
	2006	118	26	16	161
	2007	117	33	13	162
Corporate sector	2002	16 001	8 326	2 400	26 728
	2004	16 508	10 150	2 485	29 143
	2006	18 471	12 583	3 072	34 126
	2007	20 058	13 868	3 063	36 989
Total	2002	24 124	10 194	4 575	38 893
	2004	25 955	12 067	4 869	42 891
	2006	29 199	14 822	5 357	49 377
	2007	31 676	16 278	5 299	53 252



Source: Statistik Austria (R&D Survey), Calculations by Joanneum Research

Driven by the corporate sector, the percentage of researchers (in full-time equivalents) declined from 62 % to 59 % in favour of more highly qualified, non-scientific personnel (from 26 % to 31 %). At 74 %, the percentage of researchers is highest in the higher education sector. The private non-profit sector has also increased the percentage of researchers since 2002; this also applies to the government sector, primarily at the expense of assistant personnel in this case (the share of which was reduced from 35 % to 29 % between 2002 and 2007).

Specific to sectors and in absolute terms, the corporate sector increased the employment of researchers by 25 % (from 16,001 to 20,058). In contrast, the higher education sector (with a 29 % increase in R&D expenditures) increased the employment of highly qualified personnel by 45 % (from 6,977 to 10,112).

2.3.5 Summary

A comparison by country shows that for the period 2000 to 2007, Austria at +0.63 percentage points is able to demonstrate the highest rate of change of its R&D intensity. No country in the world exhibits a higher positive rate of change.

An intertemporal comparison also shows that the R&D expenditures in Austria rose by a total of 47 % between 2002 and 2007. The corporate sector in particular proved to be especially dynamic in this connection. The R&D expenditures rose by 55 % and the number of companies performing research rose by 30 % to 2,521 in 2007. Primarily the increase in the number of companies performing research shows that the research base of the Austrian economy has expanded considerably in the last few years. This development is also supported by a significant increase in business-related R&D funding from the public sector. Through a mix of direct and indirect research funding (research premium), the public sector finances 10.3 % of the total corporate sector R&D (8.4 % of the business sub-sector) and thus holds first place among comparable OECD countries. The ratio of the financing of business R&D (€ 500 million) to the financing of R&D in the higher education sector (€ 1,446 million) is thus exactly 1:3.

A structure examined for the first time in a Research and Technology Report relates to the high concentration of R&D expenditures within the corporate sector. The € 4.8 billion in R&D expenditures of the corporate sector breaks down to 2,521 companies, resulting in an average of € 1.9 million for each company performing research. However, this figure conceals the enormous spread in the R&D expenditures: Only 334 companies (13.2 %) have R&D expenditures above this average (the median is below € 250 thousand). The four largest companies provide 20 % and 33 companies provide 50 % of the total R&D expenditures of the corporate sector. This heavy concentration is also seen on the European level.

R&D employment as a whole rose by 37 % to a total of 53,252 (FTEs) between 2002 and 2007, with the percentage of researchers declining from 62 % to 59 %. This was to the benefit of higher qualified non-scientific personnel, the percentage of which rose from 26 % to 31 %. This development, which is primarily attributable to the corporate sector, was counteracted by the higher education sector where the percentage of researchers grew by 45 % to almost 10,100 staff.

2.4 Austria's position in the EIS

The European innovation index (European Innovation Scoreboard – EIS) is an instrument of the Lisbon process via which innovation development by the 27 EU Member States (the EU 27) and the EU itself in relation to other markets (primarily the USA and Japan) is to be depicted. This (quantifiable) performance representation is based on specific indicators that were developed over the years with the goal of obtaining a realistic picture of the innovation development.[18]

An improved database and constant further development of the analytical methods have resulted in an increase in comparability between the countries and accordingly the validity of the EIS over time. Despite these improvements, however, we must keep the limitations of an indicator-based depiction of an innovation system in mind, especially when the individual indicators used in the EIS 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 influencing variables can be acquired using quantifiable indicators. However, considering these limits, the EIS has proved to be a suitable instrument for tracing developments and positioning them in specific contexts. See Schibany and Streicher for a comprehensive discussion of these aspects (2008).

During 2008, a very intensive discussion took place concerning the methodological improvement of the EIS as well as improved data generation and accordingly its comparability.[19] This discussion took emerging criticism into account and the ideas discussed in a workshop[20] were included in the development of a new indicator set and new methods of analysis (see Hollanders and van Cruysen 2008). EIS 2008 was thus partially based on new indicators which increasingly take into account the non-technological aspects of innovation and its database is now more stable, transparent and comprehensible. The trend developments in EIS 2008 also became more meaningful, as they no longer refer to the EU average but rather the 5-year averages of the absolute values are calculated. These innovations have been carried forward in the 2009 EIS that is now to hand. The methods underlying the 2009 EIS are therefore no different to those applied in the 2008 EIS.

2.4.1 Austria in the SII

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 five countries (Sweden, Finland, Germany, Denmark and the UK) with an innovation level significantly higher than the EU 27 average. The innovation followers group includes Austria,

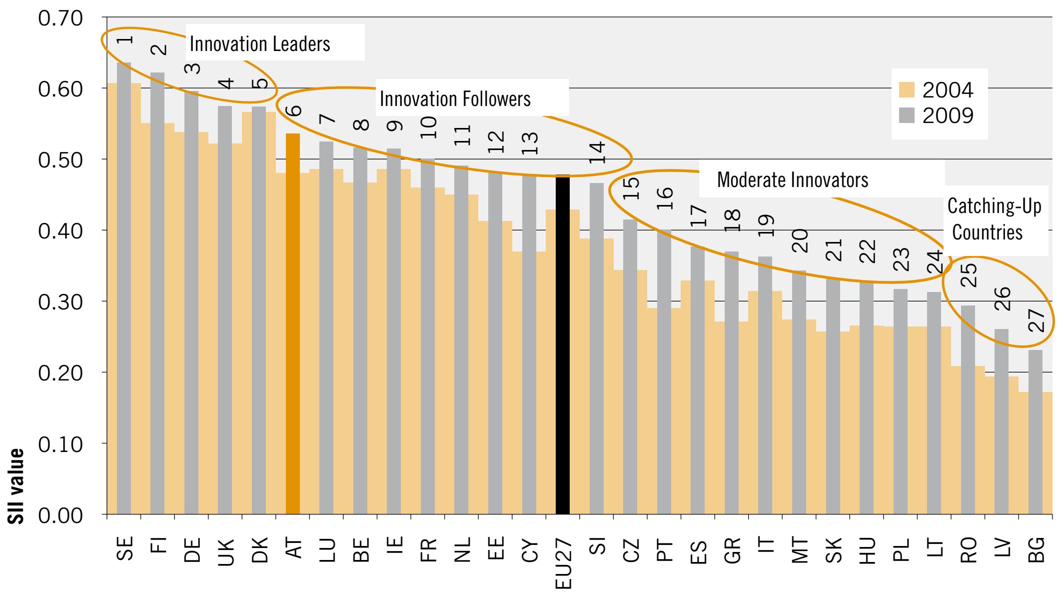
18 A comprehensive discussion on the EIS may be found in the 2008 Research and Technology Report (pp. 17 et seq.) and the 2009 Research and Technology Report (pp. 26 et seq.).

19 Austria has actively participated in this discussion. Based on a study commissioned by BMWF, BMVIT and BMWFJ (Schibany, Streicher, Gassler 2007), BMWFJ sent an approved comment with regard to proposed changes to the European Innovation Scoreboard to the European Commission in April 2008.

20 "Improving the European Innovation Scoreboard"; 16 June 2008, Brussels.

Ireland, Luxembourg, Belgium, France, the Netherlands, Estonia, Cyprus and Slovenia, nine countries that are close or even just above the EU 27 average (Estonia, Cyprus and Slovenia are newcomers to this group).

Figure 12: Comparison between countries based on EIS 2009 (including comparison with EIS 2004)



Source: InnoMetrics; calculations by Joanneum Research

The moderate innovators group includes the Czech Republic, Portugal, Spain, Greece, Italy, Malta, Slovakia, Hungary, Poland and Lithuania (placed 15–24); catching up countries (bearing in mind that all countries have raised their SII figures since 2004, including the leaders and followers, so that catching up may yet take some time) includes Romania, Latvia and Bulgaria, all of which are significantly below the EU 27 average.

As we have already mentioned, these groups are quite stable; changes in the relative positioning primarily take place within these groups. Austria succeeded in improving its position within the followers group; currently it occupies (by a whisker) the top spot in this group.[21]

2.4.2 The individual indicators

At the level of individual indicators, the EIS has a total of 29 indicators split into three groups:

- *Enablers*, which encompass human resources and financing, and form the external basis for innovations in companies;

21 Even though the absolute SII figure and accordingly the absolute positioning must be viewed with caution – the uncertainties in the individual indicators are too big.

- *Firm Activities,* which covers major company-specific activities leading to innovations (such as firm investment, linkages & entrepreneurship, and throughputs);
- *Outputs*, which encompasses the output side (such as proportion of innovative companies or economic effects).

A glance at the individual indicators (in the figure below, the Austrian values are shown together with the minimums and maximums of the EU 27, each based on the average for the available EU 27) shows that Austria is more or less significantly below the EU 27 average for only fewer than one-third, namely seven, of the individual indicators; for another seven, Austria is within a range of +/- 10 % of the average.

The profile that arises of Austria's strengths and weaknesses is familiar:

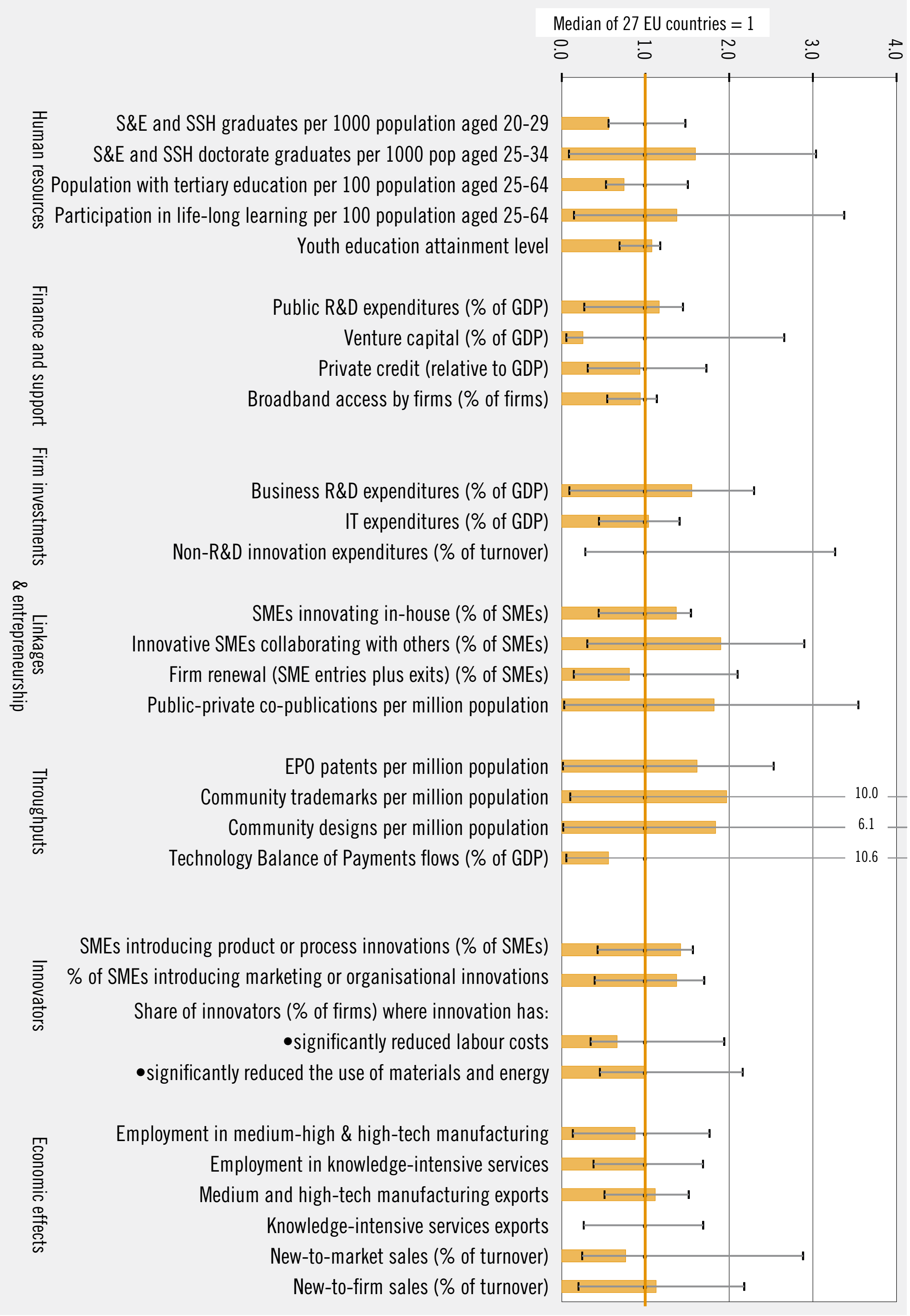
In human resources, the indicators point towards the relatively low proportion of academically trained people (in particular the indicator regarding new bachelor's and master's degrees in science is at the lower end of the EU 27's range. Interestingly, and in contrast to this position, the number of new doctorates is significantly higher than the EU 27 average. In absolute terms, this means that Austria has one doctorate for only 14 master's degrees – this is the best value among the EU 27 where the average is one doctorate for 39 master's degrees.

Two further indicators relate to high tech: the relatively low availability of venture capital and the relatively poor showing for the *technology balance of payments flows* indicator. This indicator reflects the aggregate of technology imports (e.g. payments for licence fees) and exports (e.g. receipts for licence fees) as a proportion of GDP and so is not really a "balance sheet" in the conventional sense but has to be seen rather as an indicator recording international flows of technology.[22]

There are strengths to be seen especially in the business sub-sector (R&D expenditures, innovations and collaborations, and innovations in products, processes and organisation) as there are in throughputs such as patents, trademarks and design. With the indicators that relate to "economic effects" – level of employments and exports in the medium- and high-tech manufactured goods sector and in the knowledge-intensive services comprising sales of new products – Austria is right on the average for the EU 27.

22 Even viewed as a financial statement (income/expenditure) this indicator can give a distorted picture. This is because a negative technology balance of payments can undoubtedly be seen as a sign of a high degree of ability to absorb technology. In addition, the meaningfulness of this indicator is distorted by the high level of intra-company cash flows. That means that strategic decisions within corporate groups (intra-group payments of licence fees help to optimise taxes due) ultimately determine the figure attributed to this indicator.

Figure 13: Detailed results of EIS 2009; Austria vs. minimum/maximum of the EU 27 (Index EU 27=1)



Source: InnoMetrics, calculations by Joanneum Research

2.5 Innovation-friendly public procurement as a new RTI policy tool?

2.5.1 Procurement volumes

Public procurement is an important economic factor, representing nearly one fifth of GDP on average in the EU.[23] Procurement has found a place on the agenda of innovation policy, not least due to the large volumes involved – some € 50 billion annually (Table 13) in Austria alone. Several groups of experts in the EU have addressed this topic in recent years. What they found is an urgent need to use public procurement to advance research and development, given the untapped potential still available here for implementation of the Lisbon Strategy[24] (EC 2004 :21; EC 2005 :5; EC 2006a :6). The thinking is that mobilising even a small portion of the procurement volume could achieve significant innovation effects. From an innovation policy perspective, this means utilising idle resources.

Table 13: Estimated volume of public procurement in Austria

	€ millions
Gross domestic product 2008	281,867
thereof 17%*	47,917
Federal spending acc. to budget 2008**	69,869

* Procurement-related percentage according to EU estimate (EC 2007c)
** Includes health and social welfare, public administration, roads/transit, education/instruction, research/science, defence, financing

Sources: (SA 2010), (BMF 2008)

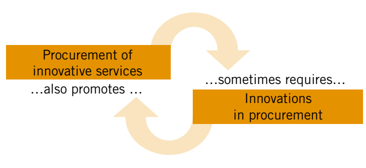
2.5.2 Subject: innovative and innovation-friendly public procurement

Innovative procurement is distinct from innovation-friendly procurement: the former involves innovations in the procurement process, while the latter focuses on the procurement of innovative services (Figure 14). When the procurer purchases something that is new on the market or solicits bids to address problems whose solution requires the development of new goods or services, we speak of innovation-friendly procurement.

A combination of the two forms is natural, since innovation-friendly procurement often requires innovations in the corresponding procurement processes.

Public buyers (procurers) include the federal government, the states and communities, and quasi-governmental institutions (BGBl 2006/17). The latter category encompasses both institutions that have been established to fulfil responsibilities of common interest and are at least partially endowed with legal rights and obligations as well as institutions that are financed largely with public funds or subject to significant government oversight.

Figure 14: Innovative and innovation-friendly procurement



Source: (BMWA 2007: 13)

23 It is estimated that public procurement accounts for an average of 17 % of GDP among EU member states and thus 35 % of public spending (EC 2007c: 4)
24 Especially regarding the so-called Barcelona target for R&D spending of 3 % of GDP (EC 2002).

2.5.3 Legal basis: European and "new" Austrian procurement laws

The Austrian Public Procurement Act (Bundesvergabegesetz, BGBl 2006/17), including its annexes (and the corresponding amendments of 2007 and 2009; BGB 2007/86 and 2010/15), came into effect on 1 February 2006. The law was created primarily to meet the deadline for implementation of the corresponding European guidelines (Public Procurement Directive with sector-specific directive: EU 2004/17; EU 2004/18). What's new and important about the European Public Procurement Directive of 2004 and Austria's Public Procurement Act of 2006 from the perspective of innovation policy is that they explicitly cite and define the scope of several key terms that make it possible to design public procurement with a greater focus on innovation. This makes it more likely than before that the bidders/suppliers will be brought into the procurement process. The key points are as follows.

- Choice of procurement procedure:[25] It is possible to conduct technical dialogues ("competitive dialogue") with potential bidders before the actual procurement process, for example, to find out what kind of innovation is even possible.
- Choice of performance specification:[26] If the call for bids does not cite the intended solutions but instead names the functional needs of the procurer, this significantly expands the leeway for creativity on the part of the bidders/suppliers.
- Option of an alternative bid:[27] Finally, the procurement can integrate incentives for bids that include additional/alternative innovative (more affordable, more effective or more environmentally friendly) solutions.

Shortly after the laws (EU, Austria) took effect, discussions focused on the competitive dialogue, but attention is now centred around the option of the functional call for bids in combination with the various other possible procurement procedures.

2.5.4 Security: public procurement between risk prevention and innovative tendencies

Despite the more "innovation-friendly" provisions outlined above, public procurement is and has been highly regulated – both by law and through the corporate governance policies of the public procurers. The Public Procurement Act, for example, states that in public procurement processes, the contract must be awarded to the bid that is either most technically-economically effective and/or the most cost-effective. Just to make it possible to analyse the bids comparatively and shield oneself against any subsequent lawsuits, calls for bids are sometimes issued in great detail and con-

25 The following procedures are available: open procedure; non-open procedure (limited number of applicants invited to submit a bid); negotiated procedure (optional negotiations on entire order content after bids are submitted); master agreement; dynamic procurement system (service is purchased from one participant in the dynamic procurement system after special request to submit bid); competitive dialogue (buyer conducts a dialogue with a limited number of companies with the objective of identifying solutions for specific needs/requirements of the buyer based on which the applicants are asked to submit bids); direct procurement. BGBl (2006/17: 25)

26 Definition according to the Public Procurement Act: A constructive performance specification lists the individual services to be performed in an index. A functional performance specification lists the performance and functional requirements. BGBl (2006/17: Section 95)

27 An alternative bid is a proposal by the bidder for an alternative service to what was specified in the call for bids. BGBl (2006/17: Section 2)

tain a variety of technical specifications based on the procurer's experience.

It is therefore in the nature of public procurement to preserve structures and shun risk, because it is part of the genuine responsibility of procurers to protect themselves against risks of all types. This leads to a tendency to resort to what has worked in the past and the necessity, when in doubt, to handle risk and liability issues in such a way as to ensure proof of due diligence in dealing with public funds in the event of any litigation or involvement of the Federal Public Procurement Office (BVA)[28], Court of Auditors, etc.

2.5.5 Political players: responsibilities and activities of the economic and transportation ministry

The Federal Ministry of Economy, Family and Youth (BMWFJ, formerly BMWA) is responsible for key aspects of implementation of the Public Procurement Act (BGBI 2006/17). For example, (a) it serves as a national reporting centre for statistical listings (reporting obligation of procurers); (b) it reports to the Federal Chancellor and is responsible for reporting to the European Commission; (c) it must publicise decisions/announcements of the European Commission in the Federal Gazette; (d) it was responsible for establishing the Federal Public Procurement Office and, together with the federal government, exercises joint oversight; and (e) it must help coordinate any arbitration proceedings.

As part of its responsibilities, the Ministry of Economy authored the 2007 procurement guide "procure_inno: Praxisorientierter Practical Guide to Innovation-Friendly Public Procurement and Contact Awarding." The aim of the guide was and is to point out "[...] possibilities for implementing some of the yet unrealised potential in procurement [...]" (BMWA 2007: 3). It is designed to educate professionals about the legal requirements and provide procurers with professional tips on innovation-friendly processes and procedures, thereby making a general contribution to an innovative procurement culture. The guide focuses primarily on the recommendations of the EU Guide to Innovative Solutions in Public Procurement (EC 2007a) from an Austrian perspective.

Complementing the general activities and responsibilities of the Ministry of Economics, the Ministry for Transport, Innovation and Technology (BMVIT) focuses on companies of the federal government for whose shared administration it is responsible. ASFINAG, ÖBB and VIA DONAU are three examples of such high-volume procurers. In 2008/2009, the Federal Ministry for Transport, Innovation and Technology (BMVIT) commissioned a study on good practices of innovation-friendly public procurement that identified good practices in Austria and abroad (Buchinger and Steindl 2009a; see next section for results). The year 2009 also saw the launch of a dialogue with major infrastructure operators on innovation-oriented infrastructure policy and a discussion

28 The BVA gets involved for the purposes of protecting rights at the federal level only if it receives a petition from a bidder/supplier. It does not automatically review public procurement processes. See current BVA statistics of activities (2009).

of innovation policy options in public procurement. This was received with great interest among infrastructure operators and will be continued.

2.5.6 Good practice: learning from examples in Austria and abroad

There are already a variety of public procurements in Austria and abroad that exhibit aspects of innovation-friendly good practice. There follows a representative list of examples from across the broad spectrum:

- "Sustainable Public Procurement Programme" in the Netherlands
- "Low-Carbon Vehicle Procurement Programme" in England
- "National Plan of Action for Greener Public Procurement" in Austria
- "Green Electricity Act" in Austria for public procurement of environmentally friendly electricity29
- Public procurement of a road toll system in Austria "ASFINAG Electronic Truck Toll"
- Procurement of "ÖROK Online Atlas", a tool for presenting and analysing land use
- Procurement in public construction projects "Ludesch/Vorarlberg Community centre"
- Procurement of buses for public transit in Austria "ÖBB Fleet Replacement"
- Procurement of a weather early warning system for trains in Austria "ÖBB INFRA Weather"

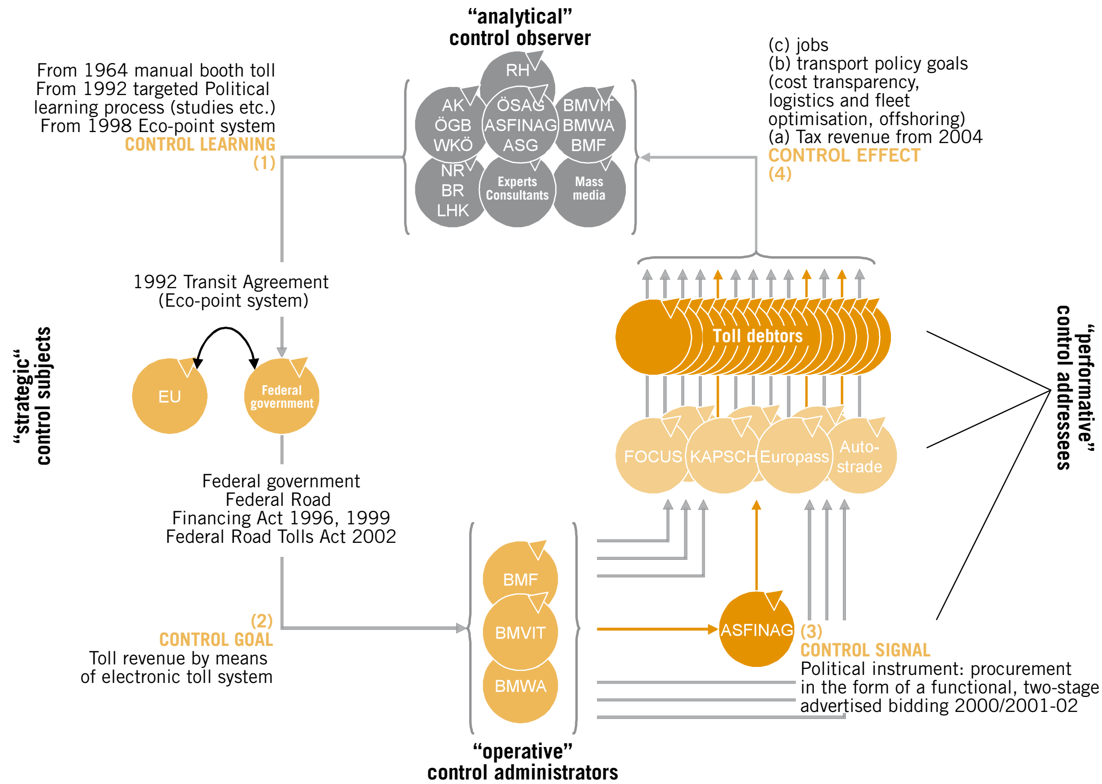
You can read about the individual aspects of good practice in these examples in the corresponding reports.[30] For better understanding, Figure 15 shows an overview of one of these examples.[31] The introduction of a comprehensive radio-controlled toll system in Austria can be considered a good practice of innovation-friendly public procurement because it represents the initiation and achievement of a systemic innovation with a considerable degree of complexity. The primary aspects of good practice in this example are reliability and on-time operational capability. At the time bids were solicited, there were two feasible technologies: global positioning system (GPS), which is used in Germany, and dedicated short-range communication (DSRC), which is used in Austria. But Germany, unlike Austria, experienced significant problems with the timely completion of the toll system. Since ASFINAG financing was the central motivation for introducing a toll system (Figure 15), it was important that the system be operational on schedule so that toll income would be flowing on schedule.

29 Even if the Green Electricity Act is currently the subject of critical debate (regarding the disruption of competition, amendments, the amount of feed-in tariffs, the extent of funding, etc.), we cite it here as a good practice because the tool in general is of interest and the law itself has induced measurable technology development and diffusion effects.

30 For the examples cited here, see (BMWA 2007; Buchinger und Steindl 2009); for further examples, see (Edler et al. 2005; Georghiou 2007).

31 For specific information on the effects of the good practice examples examined here, see (Buchinger 2009a).

Figure 15: Initiation, implementation and effect of innovation-friendly public procurement as illustrated by the truck toll in Austria



RH Rechnungshof (Court of Auditors)
LHK Landeshauptleutekonferenz (conference of state governors)
BR Bundesrat (upper house of parliament)
NR Nationalrat (lower house of parliament)

Source: (Buchinger and Steindl 2009a: 46)

The examples cited above have some very distinct good practice characteristics. Nevertheless, it is possible to generalise some of these characteristics. On this basis and in light of what the legal and institutional options permit, it is possible to formulate at least the following four core principles.

Principle 1: deliver a clear benefit to the procurer

All intended positive effects for society as a whole notwithstanding (environmental, health and safety missions, jobs, competitiveness, etc.), the benefits of innovation-friendly public procurement must clearly extend to procurers themselves as well. It's possible, of course to issue innovation-specific procurement requirements in exercising the role of owner or majority shareholder of quasi-governmental companies. But such requirements will only be executed effectively if they have a clearly positive resonance in the current account balance / performance agreement. Innovation-friendly public procurement must be worthwhile for the procurer.

Principle 2: set moderate objectives and implement policy professionally

The probability of success increases the more moderate the stated objectives in a pilot programme are: desirability vs. feasibility. This is fundamentally and especially true for innovation-related procurement processes, since here you have a particularly pronounced tension between caution on the one hand and the risk of innovation on the other. One possibility for dealing productively with this tension is an incremental process – the phased introduction of programmes. Professional implementation includes both preparatory analyses and the installation of capable and appropriately equipped project management.

Principle 3: create the requirements for risk-benefit sharing

The risk and benefit of innovation-friendly public procurement should be shared among procurers, bidders and any public subsidisers ("public good"). This is a difficult requirement in that both risk and benefit calculations are associated with uncertainties, and the parties involved will arrive at different estimates based on their varying interests and levels of expertise. One possibility for sharing/reducing risk is pre-competitive procurement (see details in next section).

Principle 4: involve the relevant players

To assess the risk and benefit of innovation-friendly public procurement in the first place and develop useful calculations for risk-benefit sharing, it is essential to coordinate and integrate the relevant players at the earliest possible stage. The variety of available (electronic) platforms, dialogue forums, etc., can prove useful if they offer a sufficiently neutral and creativity-friendly space for interactive brainstorming and critical review.

2.5.7 Overcoming market fragmentation and establishing lead markets

A high-profile debate is taking place on the idea of overcoming market fragmentation through so-called "lead markets." The European Commission spearheaded the "Lead Market Initiative for Europe" in December 2007. Its goal is first to identify fast-growing global markets of social and economic importance and then open these markets to European companies through concentrated policy initiatives. "[…] identifying areas where concerted action through key policy instruments and framework conditions, coherent and coordinated policy making by relevant public authorities, as well as enhanced cooperation between key stakeholders can speed up market development, without interfering with competitive forces." (EC 2007b: 2) This is to be achieved by applying the following principles (EC 2007b: 3):

- Ensure that the needs of global markets are taken into account, thereby maximising the market potential.
- Push for acceptance of EU standards in non-EU markets, especially where global trends (such as the environment) are concerned.
- Facilitate the market launch of products and services by reducing the associated costs and bundling demand.

So far, the EU initiative has identified six fields where it intends to establish lead markets (EC 2007b): eHealth, protective textiles, sustainable construction, recycling, bio-based products and renewable energies. The process of identifying these six fields was participatory, involving above all industry (European Technology Platforms) but also the relevant government ministers and users.

The Lead Market Initiative emphasises that the primary aim is not to apply standards, regulations, massive funding and the like to create artificial markets. Ideally, no additional budgets should be needed at all. Instead, the idea is to (a) rethink the priorities of existing funds/subsidies and (b) exploit the potential of public procurement. Nevertheless, legal regulations and standards should be employed in support of the initiative.

2.5.8 Commercial and pre-commercial procurement and policy mix

As is clear from the case studies and the details on commercial procurement, a wide array of policy instruments can be used to stimulate innovation-friendly public procurement. But since influence on commercial procurement is by its very nature subject to strict limitations and commercial procurement tends to focus more on dispersing innovation than on generating innovation, the focus of the discussion at the European level is on the area of pre-commercial procurement (EC 2005; EC 2006b; EC 2007c).

Pre-commercial procurement refers to R&D orders at market conditions. This means that the incurred R&D costs are paid by the procurer or a procurer consortium (i.e., no funding). Whereas commercial procurement relates to goods / services / system applications that are already marketable or nearly so, pre-commercial procurement deals with the start-up phase (research and development in the form of procurement-related R&D orders). A key advantage of pre-commercial procurement is that it reduces the innovation risk at procurement since it happens upstream from the procurement itself. It is also possible to reduce the innovation risk of pre-commercial procurement by awarding multiple R&D contracts simultaneously, for example, and identifying the optimal solutions incrementally through interim evaluations and selections. Bidders and procurers can also reach agreements on cost-benefit sharing (preferred licensing for co-bidding R&D contractors and the buyer or buyers).

From the perspective of antitrust law, it is important that R&D be explicitly exempted from the extensive regulations of public procurement. In the EU procurement guideline – which initially follows the WTO agreement in excepting R&D procurements – there is, however, one restriction that must be noted (and which accordingly is also found in Austrian law):[32] R&D is exempt only if the results do not benefit the procurer exclusively but have the character of a public good. So pre-commercial procurement can take place within

32 See (WTO 1994a; WTO 1994b; EU 2004/17; EU 2004/18; BGBl 2006/17).

procurement law when it involves R&D contracts at market prices and the results only benefit the buyer. But it can also fall outside the scope of procurement law if the procurer does not alone profit from the R&D and may not even bear all the costs. The latter point is promising in the case of procurer cooperatives and/or standardisation.

2.5.9 Principle of good practice: long-term and multi-faceted policy mix

The prominent role assumed by public procurement in the debate surrounding the formation of lead markets is justified by the significant hurdle to bringing the ideas to market. This can be counteracted both through pre-commercial procurement – which must first be fully exhausted, however – and with R&D allowances (for prototypes, pilot applications and demo systems under the label of experimental development). On the other hand, creating a market with sufficiently stable expectations for a large number of bidders requires a magnitude that individual customers are seldom equipped to meet. Lead markets are therefore useful in complementing pre-commercial procurements and procurement-related R&D&I allowances.

And so overall, the stimulation of innovation-friendly public procurement can draw upon a mix of commercial and pre-commercial procurement and procurement-related allowances.[33] The political context is a key factor, even if the leeway for innovative bidders/suppliers is ultimately defined in the calls for bids. Depending on the technology or problem to be addressed, a well-balanced policy mix should include the following:

- Mission statements (white papers, strategies, plans of action) and legal regulations should balance the expectations of various players over an extended period of time and provide them with reliable planning conditions.
- Pre-commercial procurement and R&D allowances should pave the way for innovative procurements that may still lie far in the future.
- Large procurement volumes (lead markets) should be reached through procurer coordination, government investment programmes and the like.
- The infrastructure and funding for pilot applications, large-scale test beds and demo projects should be made available.

2.5.10 Summary

The preliminary answer to the question of whether public procurement is an appropriate tool for innovation policy is "yes." This finding is based on a series of examples, a select few of which are outlined here. But this is a conditional "yes", for it would be wrong to overestimate the possibilities of innovation-friendly public procurement. Procurement in general – and public procurement to an even greater degree – seeks by its very nature to preserve known structures and shun risk. So in-

33 See details on innovation policy options in Austria (Buchinger 2009b).

novation-friendly public procurement runs the risk of stumbling over the inherent "risk tension" – the risk of innovation vs. the security of procurement – and thus over the inherent conflict of objectives.

The first step in overcoming or reducing this "risk tension" is a clear statement of political intent. The case studies illustrate the type of such a statement of intent: Mission statements in the form of strategy papers and national plans of action play a role in green procurement, for example, while laws play a role in toll systems and green electricity. Voluntary standards affect sustainable procurement, and policy programmes pertain to nearly all examples. There is no predetermined ideal form. Various procedures may be appropriate, depending on the technological field and the situation at the outset. What's critical, however, is that the statement of political intent be appropriate to establish reliable expectations and assure stability when it comes to the content and timeline.

3 Austria in the European Research Area

3.1 Austria's participation in the European Framework Programmes

In formulating its EU2020 strategy, the European Union has set itself the task of thoroughly overcoming the current economic crisis on a lasting basis. A forward-looking research, technology and innovation policy is seen as the main driver here with the aim of forming a common European Research Area (ERA). The European Framework Programmes for Research and Technological Development are considered to be the key instrument for realising the European Research Area.

The main aims of the 6th Framework Programme (FP6) and its specific working programmes were the integration, reinforcement and structuring of the European Research Area. The 6th EU Framework Programme (2002–2006) had a total budget of € 17.9 billion, of which € 16.6 billion were paid out in the form of funding.[34] 56,000 project proposals with 390,000 potential participations were submitted, of which projects with 74,400 participations were approved. An initial report by the group of experts set up to evaluate the results of FP6 has been available since February 2009 (Rietschel et al. 2009). This generally assessed the results of the 6th Framework Programme to be positive and substantial. However, some programme initiatives and instruments were judged to be merely a moderate success.

In January 2007,the 7th Framework Programme (FP7) for Research and Technological Development started. This has a term of seven years (2007 to 2013) and a total budget of € 50.521 billion. A further € 2.751 billion are intended over the next five years for nuclear research under the EURATOM Programme. As the European Union's main instrument for funding research, FP7 is also the largest multilateral research funding programme in the world. As with its precursor, it bundles all EU initiatives with relevance to research under one roof and plays a decisive role in achieving targets in terms of growth, competitiveness and employment (European Commission 2008a).

The plan is for FP7 to follow on the success of FP6 in creating a European Research Area and features a high degree of continuity in respect of research topics and instruments. Some of the criticisms raised in evaluating FP6 were already discussed ahead of FP7 and taken partly into account in its conceptualisation. Besides simplifying the application procedure, lengthening the term to give more certainty in planning, a significantly higher budget (63 % rise on the previous programme) and various ways of simplifying administration, the setting up of a European Research Council for

34 Unless stated otherwise, the source of the data used in this chapter on Austria's participation in the 6th and 7th Framework Programmes is PROVISO (Ehardt-Schmiederer et al. 2009a; Ehardt-Schmiederer et al. 2009b)

promoting basic research is particularly worthy of note. Additional innovations relate to the creation of Joint Technology Initiatives (JTIs), ERA-NET Plus, Joint Programming Initiatives and various measures under Art. 169 of the EU Treaty (European Parliament 2006a).

FP7 consists mainly of four specific programmes: "Cooperation", "Ideas", "People", and "Capacities". Building on FP6's "thematic priorities", "Cooperation" is the programme that forms FP7's focus, taking up almost two-thirds of the total budget (€ 32.4 billion). The goal is for Europe to achieve technological leadership in key scientific and technological areas. To this end cross-border cooperative research projects into ten core topics laid down in accordance with political considerations (healthcare, energy, transport, ICT, etc.) will be promoted (CORDIS 2010e).

The "Ideas" programme is a new addition and, with a budget of € 7.5 billion, will incentivise creativity and top performance in European research. As a programme open to any themes it should also promote targeted basic research by both young scientists (starting grants) as well as established ones with significant research achievements (advanced grants). It will be structured and implemented by the newly created European Research Council (ERC) (CORDIS 2010b).

The "People" programme follows on from FP6's very successful "Human Resources and Mobility" programme but with a budget that is almost three times as high (€ 4.7 billion) as FP6 (CORDIS 2010a). The goal is to develop and strengthen the human resources potential in European research and technology. This programme will promote both education and training as well as global and sectoral mobility of scientists in all fields of research (CORDIS 2010d).

The "Capacities" programme is intended to reinforce the research and innovation Capacities in Europe and contribute to optimal implementation of the potential of all the research infrastructure in Europe. With a budget of € 4.1 billion, overlapping topics will be promoted. These include establishing newexamples of research infrastructure in Europe as well as improving existing ones. They are also intended to improve the research capacity of SMEs. The funds set aside for the two sub-programmes have been raised substantially compared to FP6 (CORDIS 2010a, 2010c).

3.1.1 Austria's participation in the 7th European Research Framework Programmes

Up to November 2009, 126 tenders had been completed in FP7. More than 43,200 valid project proposals with more than 230,000 participations had been submitted and evaluated, and 6,806 project proposals with 45,392 participations considered worth promoting. Austrian partner organisations are represented in 813 projects with 1,137 participations[35], i.e. in 11.9 % of all projects applying for funding and 2.5 % of all approved participations (see Table 14). By comparison, Austria's share of projects in FP6 stood at 13.5 % and of participations at 2.6 % (Ehardt-Schmiederer et al. 2009a). The Austrian share of approved par-

35 More than one Austrian organisation can participate in one project.

Table 14: Austria's participation in the 4th to the 7th Framework Programme

	4. FP 1994-1998	5. FP 1998-2002	6. FP 2002-2006	7. FP 2007-2013 as at 11/2009
Percentage of approved Austrian participations among all approved participations	2.3%	2.4%	2.6%	2.5%
Percentage of approved Austrian coordinators among all coordinators	1.7%	2.8%	3.3%	3.5%
Austrian share of granted funds	1.99%	2.38%	2.56%	2.61%
Return flow ratio measured against Austria's contribution to the EU budget*	70%	104%	117%	130%

* European Commission 2008; the figures used for FP7 represent the average for 2007 and 2008

Source: European Commission, processed and calculated by PROVISO

ticipations by participants from the EU 27 (2.9 %) was higher than Austria's share in total research personnel in the EU 27 (2.5 % – see Eurostat 2010 on this).

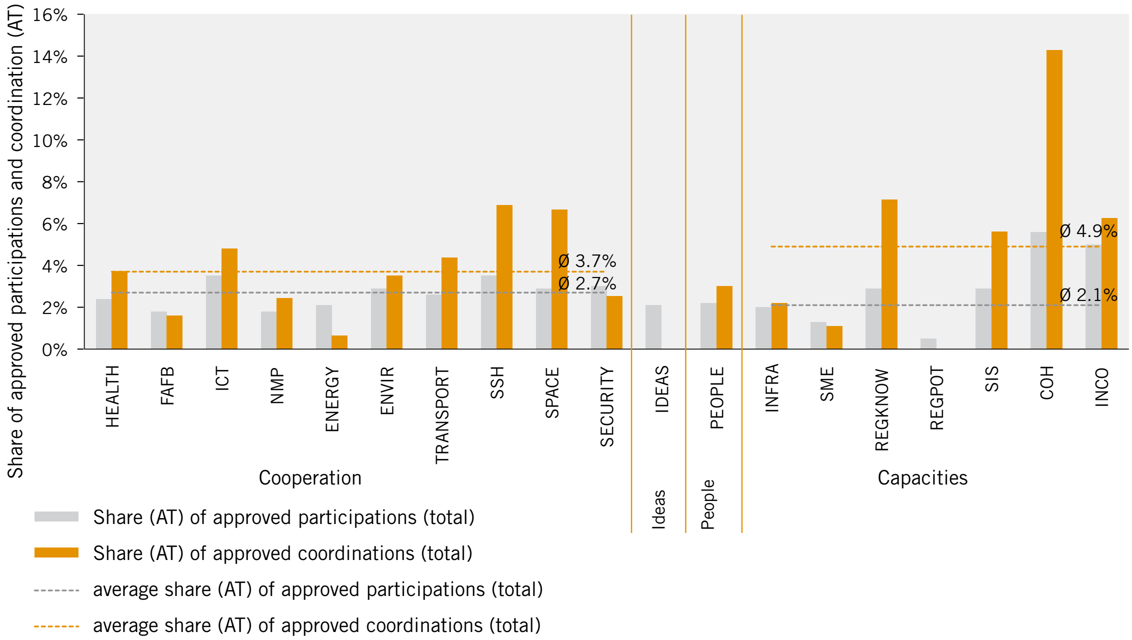
A two-stage application and evaluation procedure is recommended in the evaluation report on FP6 in view of the decline in the success rate for proposals since FP5[36] (Rietschel et al. 2009). In specific tenders under various subprogrammes, such as Food, Agriculture, Fisheries and Biotechnology, Nanosciences, nanotechnologies, materials & new production technologies, Energy , Ideas and People, two-stage procedures have already been introduced in FP7. At the first stage, applicants are called upon to submit a brief sketch of the project on selected criteria and points (outline items) in accordance with the requirements of the respective tender. Only projects selected for a second submission stage after being evaluated can make a full application. The Commission does not include first-stage applications in its calculations and calculates an average approval rate of 21.6 % for FP7 (European Commission 2009). Taking all valid first- and second-stage project applications into account, the average approval rate currently stands at 15.7 % (Ehardt-Schmiederer et al. 2009b).

Austrian participants have been successful in the applications for projects that they have coordinated.[37] Every project proposal coordinated by Austrian partners in the Cooperation programme was approved (20.1 %) – this is significantly higher than the average approval rate for coordinated projects (15.6 %). Applications by Austrian coordinators in the People (20.9 %) and Capacities (15.8 %) programmes have been roughly average.[38]

Figure 16 shows the proportion of Austrian project participations and project coordinations broken down by field. Austria is mainly

36 FP5 approval rate: 26 %; FP6 approval rate: 18 %
37 Data on the success rate for Austrian participations are currently only available for projects coordinated by Austrian organisations. With two-stage evaluation procedures, the European Commission does not systematically collect data on the first-stage consortia; data is only available on the coordinators under the Cooperation, People and Capacities programmes (Ehardt-Schmiederer et al. 2009b).
38 Total approval rate for coordinated projects: Cooperation: 15.6 %, People: 23.3 %, Capacities: 16.6 %. These calculations take all project (first and second stage) applications into account.

Figure 16: Austrian share in participations and coordinations in FP7 projects by field



Abbreviated names of the programmes: HEALTH (healthcare), FAFB (Food, Agriculture and Fisheries, and Biotechnology), ICT (Information and communication technologies), NMP (Nanosciences, nanotechnologies, materials & new production technologies), ENERGY (energy), ENVIR (Environment), SESH (Socio-economic sciences and the Humanities), INFRA (Research infrastructures), SME (Research for the benefit of SMEs), REGKNOW (Regions of knowledge), REGPOT (Research potential of Convergence Regions), SIS (Science in society), COH (Support to the coherent development of research policies), INCO (International cooperation)

Source: European Commission, processed and calculated by PROVISO, as at November 2009

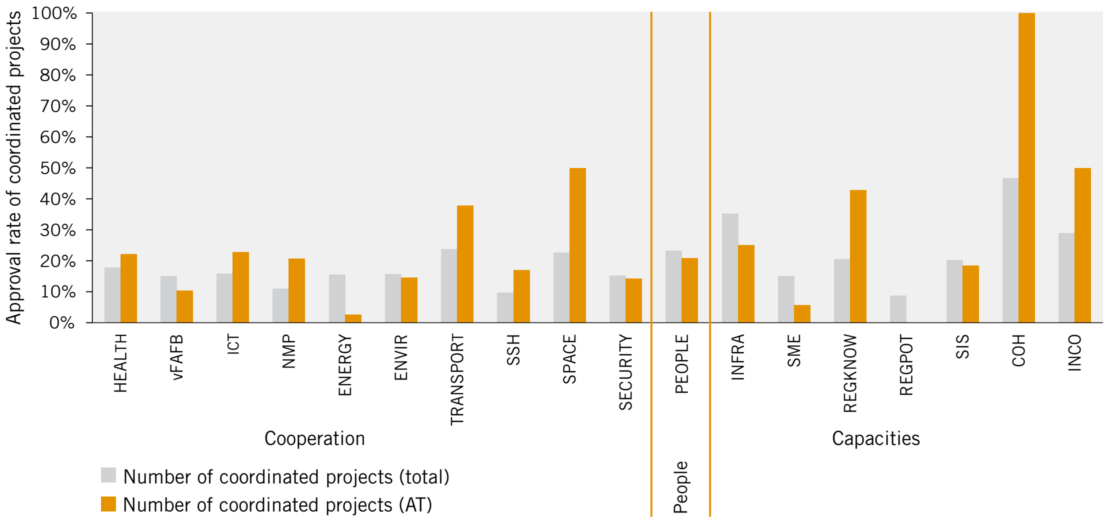
represented strongly in the same fields in FP7 as it was in FP6. The shares of Austrian participations in Energy – down from 3.7 % to 2.1 % – and Research for the benefit of SMEs down from 2.9 % to 1.3 % – both declined in FP7. Of the total of 44 approved ERA-NETs and ERA-NET Plus initiatives for coordinating promotional programmes at national and regional level in FP7, Austria is tied into 26 ERA-NET initiatives (59 %).

Figure 17 compares the success rate of project applications in which Austrian organisations are responsible for coordination with the overall success rate for coordinated projects.[39] 137 approved projects are being coordinated from Austria, which means that the share of projects coordinated by Austrian institutions is continuing to rise (Table 14). 2.8 % of the projects in FP5 and 3.3 % of the projects in FP6 were coordinated by Austrian organisations. Austrian players had above-average success in attracting projects in six out of ten fields in the Cooperation programme. Compared to this, the success rate

39 Projects in the Ideas programme do not have any coordinator; of the 2,656 approved projects in the People programme, 599, as research networks, have a coordinator.

in the Capacities programme was mostly below average – apart from those fields with a low funding volume, such as Regions of knowledge (REGKNOW), Support to the coherent development of research policies (COH) and International cooperation.

Figure 17: Approval rate for FP7 projects under Austrian coordination by field



Abbreviated names of the programmes: see Fig. 16
Number of coordinated projects (total): HEALTH: n=430; FAFB: n=188; ICT: n=832; NMP: n=247; ENERGY: n=154; ENVIR: n=199; TRANSPORT: n=320; SSH: n=131; SPACE: n=45; SECURITY: n=79; PEOPLE: n=599; INFRA: n=137; SME: n=275; REGKNOW: n=42; REGPOT: n=106; SIS: n=89; COH: n=7; INCO: n=48
Number of coordinated projects (Austria): HEALTH: n=16; FAFB: n=3; ICT: n=40; NMP: n=6; ENERGY: n=1; ENVIR: n=7; TRANSPORT: n=14; SSH: n=9; SPACE: n=3; SECURITY: n=2; PEOPLE: n=18; INFRA: n=3; SME: n=3; REGKNOW: n=3; REGPOT: n=0; SIS: n=5; COH: n=1; INCO: n=3

Source: European Commission, processed and calculated by PROVISO, as at November 2009

It may generally be assumed that Austria is strong (high success rate, high participation, lots of project coordinators) in those fields where it has been possible at specialist level to build up contacts and networks at European level. Austrian players are members in relevant stakeholder organisations and partners in Technology Platforms, and contribute to the preparation and formulation of working programmes under the Framework Programmes. Austria is also frequently represented in the various fields where research funding programmes exist at national level that are frequently used by smaller research service providers.

By contrast, Austrian participation is lower when the focus of the programmes does not tally with domestic skills. For instance, experts found that the reason behind the decline in participations in the ENERGY field lay in a change in the orientation of the programme compared to FP6. FP7 tenders up to now have accordingly offered Austrian research partners fewer "hooks" as they now focus more on the development of large-scale technology in the energy sector, such as capturing and storing CO2, clean coal technology and intelligent grids; and, to a lesser extent, on fields where Austrian players can play to their strengths, such as research into bio-energy and bio-fuels.

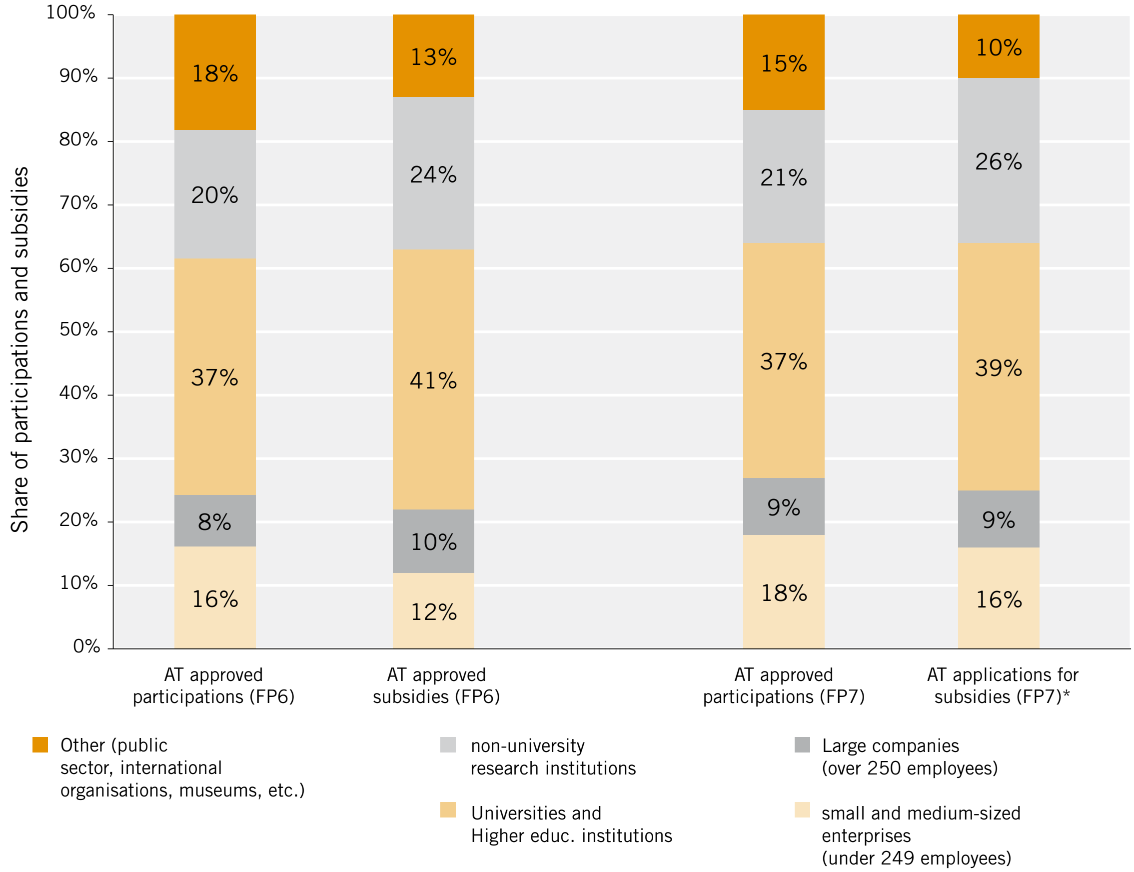
3.1.2 Participation by category of player

The evaluation report on FP6 refers to the continuous fall in participation by partners from industry since the 4th Research Framework Programme and notes that the aim of stimulating Europe's competitiveness has not really been achieved (Rietschel et al. 2009). The experts have established that some sectors of the European economy, such as the aeronautic and automotive sectors, are in good shape. But in other fields, such as the pharmaceutical industry, those who carried out the evaluation see the programmes as being insufficiently effective, despite special themes being tendered for in the specific programmes aimed at promoting relevant research in these fields. According to the group of experts, there are indications that for a number of sectors participation in the FPs is too time-consuming (a lot of bureaucracy, tiresome delays in making applications and approving orders, etc.), developments too slow and the contractual conditions on intellectual property rights and copyright insufficiently attractive for them to draw any advantage from participating in the activities of the Framework Programmes. In strongly competitive fields collaborative research is always accompanied by concerns that information from existing knowledge bases will drain off to collaboration partners and competitive advantages will be lost.

As in FP6, the European Parliament again formulated the goal for FP7 of at least 15 % of available funds going to SMEs[40] (European Parliament 2006a). At 16 %, participation by Austrian SMEs was already higher than overall participation (14.3 %) (Ehardt-Schmiederer 2009) in FP6 , albeit only 12 % of the granted funds were applied for via SME participations. As Figure 18 shows, the share of participation by partners from Austrian industry, particularly those from SMEs, has risen further in FP7. With an SME share of 16 % of funds applied for, the goal of 15 % formulated by the European Parliament appears to be well exceeded. Participation by Austrian SMEs is significantly higher than 15 % in Energy, Health, ICT and Research for the benefit of SMEs and regions of knowledge.

40 SMEs in FP7 are defined as all companies with less than 250 employees, annual sales of less than €50 million or total assets at year-end of less than €43 million (European Parliament 2006b; European Commission 2003).

Figure 18: Distribution of participations and funding by category of organisation (Austria)



* Funding here means the funding applied for the approved projects. Changes in the course of contractual negotiations are not taken into account.

Source: European Commission, processed and calculated by PROVISO, as at November 2009

The high level of participation by Austrian universities remains as high as for FP6[41]; they are particularly well represented in Food, Agriculture, Fisheries and Biotechnology (FAFB), Health, Information & communication technology (ICT) and Nanosciences (NMP). In respect of the share in requested funds, they are still two percentage points behind the figure for FP6.

The share of the participation by Austrian research institutions, as well as the funds applied for, was higher than for FP6. Almost two thirds of the Austrian participations in the Socio-economic Sciences and Humanities (SSH)

41 The categories for organisations in FP7 participations currently being provided by the European Commission are incomplete or incorrect. PROVISO controls and standardises the Austrian participations in respect of categories of organisation: a comparison with overall participation is accordingly not possible at the present time.

relate to public research institutions; their shares in SPACE and SECURITY are also above average.

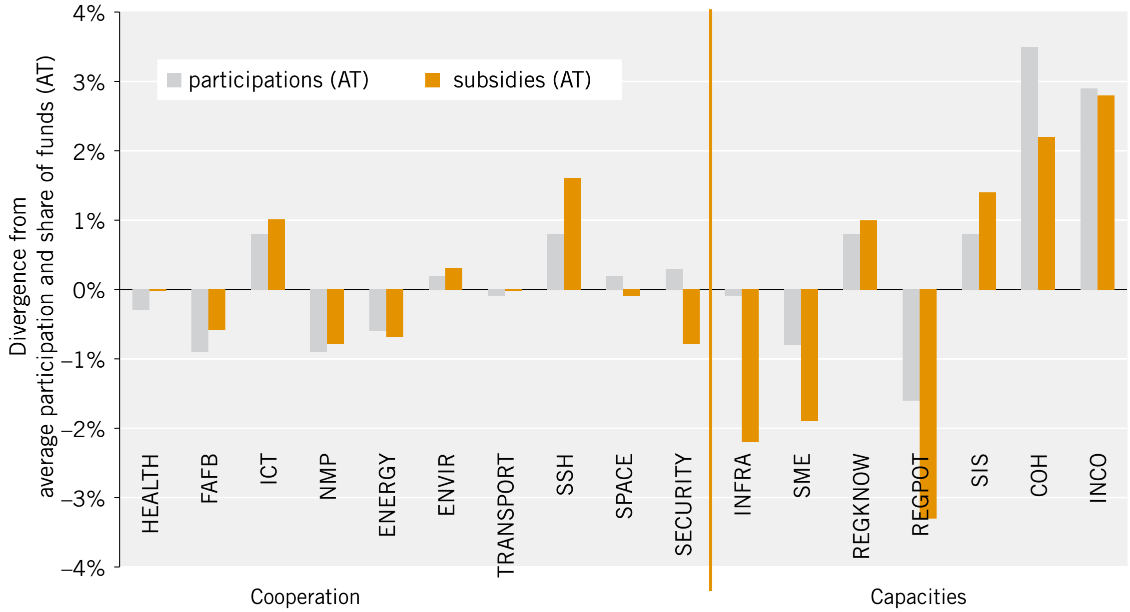
The low level of big Austrian companies coordinating projects may be taken as an indication that this is not very attractive to them. Whilst they have a share of 9 % in the Austrian participations, they were only responsible for 4 % of the coordination of coordinated Austrian projects. This trend is not seen with SMEs, where their share in the coordination of coordinated Austrian projects is equal to their share in approved Austrian participations (18 %). By contrast, the frequency with which Austrian research institutions take on the role of project coordinator is disproportionately high: with a participation of 21 %, they coordinate 31 % of Austrian projects.

3.1.3 Specialisation of the Austrian participations

Figure 19 shows the fields where Austria is strong within the individual sub-programmes in FP7. It takes the share of Austrian organisations in the individual FP7 fields and compares it with Austria's overall share in FP7 for approved participations/funds.

In Information & communication technology (ICT), Socio-economic Sciences and Humanities (SSH) and, under the Capacities programme, in Regions of knowledge (REGKNOW) and Science in society (SIS), Austria not only participates to an above-average extent but the approved funds are even higher to a significant degree. In the sub-programmes comprising support to the coherent development of research policies (COH) and international cooperation (INCO), Austria's participation is also above average but a comparison shows that the funding applied for is proportionately lower. The difference is even bigger in SECURITY. Despite proportionately above-average participation, the funding applied for is significantly below average. In contrast to this, Austrian participants in the Health programme were awarded an above-average amount of funds despite below-average participation.

Figure 19: Fields that Austria has concentrated on in the 7th Framework Programme; divergence between average participation and share of funds



* funding here means the funding applied for in connection with the approved projects. Changes in the course of contractual negotiations are not taken into account. Abbreviated names of the programmes: see Fig. 16

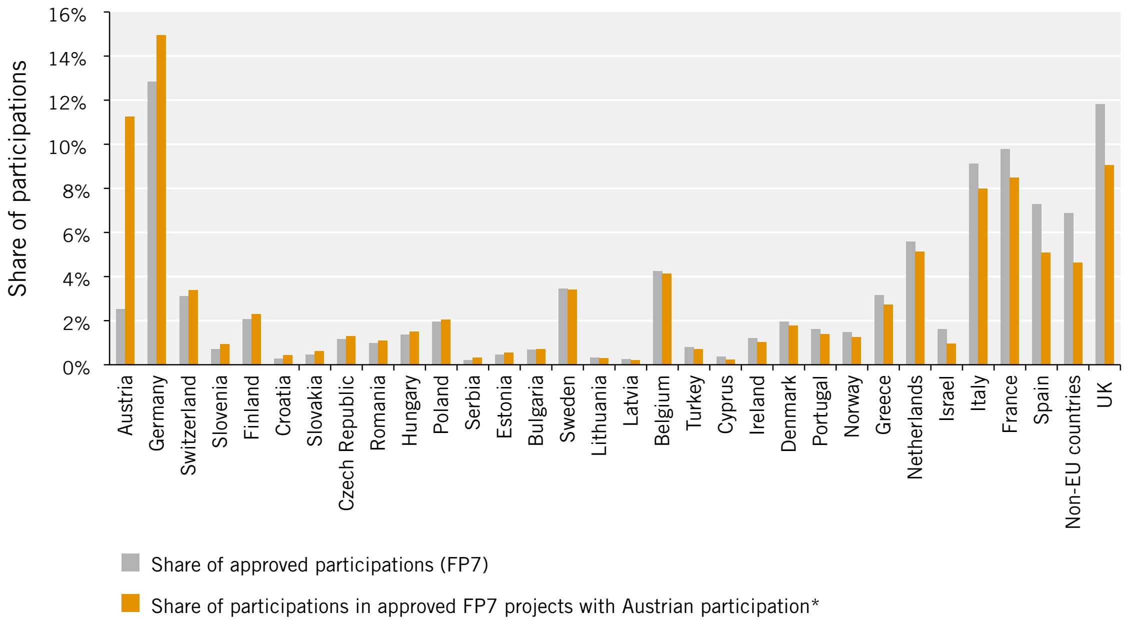
Source: European Commission, processed and calculated by PROVISO, as at November 2009

Information & communication technology, as well as socio-economic sciences and humanities, were also amongst Austria's strengths in FP6. Austria also demonstrated above-average success in FP6 in Nanosciences, Transport, Energy and SME-specific research (SME). In the provisional figures for FP7, this specialisation demonstrated in FP6 cannot (yet) be seen.

3.1.4 Structure of international cooperation in the Framework Programme

As in FP6, for most of the participations, in which projects have Austrian partners, the players come from Germany (15 %), Austria (11.3 %), the UK (9.1 %), France (8.5 %) and Italy (8 %). In Figure 20 a comparison with the overall participation of individual countries shows that Austrian players cooperate to a disproportionately high extent with partners from their own country and from Germany. This conforms to the results of earlier studies, which declare that geographical proximity and a common language are a substantial factor in selecting collaboration partners in the European Framework programmes (Scherngell und Barber 2009; Nokkala et al. 2008). Participations that lie just above the average are those from Switzerland, Slovenia, western Balkan countries (Croatia and Serbia) and Central and Eastern European states (Slovakia, the Czech Republic, Romania, Hungary and Poland). As in earlier Framework Programmes, Austrian participants are amongst the most frequent collaboration partners for participants from Central and South-Eastern Europe (Paier und Roediger-Schluga 2006). Participations from the UK, non-EU countries, Spain, France and Italy are significantly lower than their overall participation in consortia involving Austrian participation.

Figure 20: collaboration partners of Austrian players



* the chart shows countries with at least 100 participations in FP7

Source: European Commission, processed and calculated by PROVISO, as at November 2009

Overall, the proportion of international collaborations has steadily increased since FP5. 5.6 % of all participations in FP6 come from outside Europe ("non-EU countries") while their share in FP7 already stands at 6.8 %. As a study on the role of international collaboration in the Framework Programmes shows, however, cooperation with non-EU countries nevertheless appears to be less attractive to European industrial partners. Non-EU countries are only rarely integrated into Networks of Excellence[42] and connections with, especially, countries with strong growth are weak (Edler 2008).

Against this background, those evaluating FP6 recommend the development of stronger international global cooperation extending beyond Europe's borders and, at the same time, a differentiated and strategic vision for research cooperation with specific, clearly defined groups of countries. This involves three kinds of cooperation: 1) cooperation with developing

42 Networks of Excellence, NoE: funding instrument since FP6 for the long-term and sustainable linkage between outstanding research institutions and departments in a particular field.

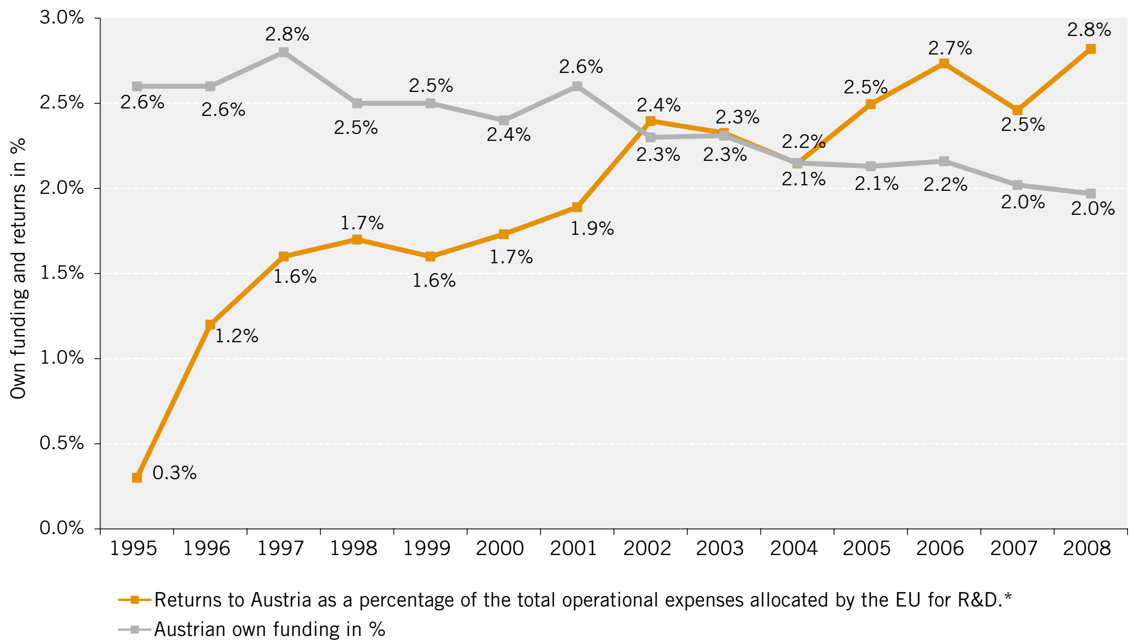
countries on development-related issues where European research is a world leader; 2) cooperation with countries enjoying strong economic growth (India, China and Brazil) and 3) cooperation with industrialised countries outside the EU, such as the USA and Japan (Rietschel et al. 2009).

In project consortia involving Austrian participation, the proportion of participants from non-EU countries has also risen significantly in FP7: from 1.9 % in FP6 to 4.6 % in FP7. Most collaborations with Austrian players take place with partners from Russia (67 participations) followed by the USA (47 participations), China (40 participations), Ukraine (30 participations) and Australia (26 participations). Intensifying cooperation with countries from outside Europe appears to be possible: participants from non-EU countries are disproportionately lowly represented in projects with Austrian participants.

3.1.5 Funds and Returns

28.5 % of the total budget available under FP7of € 50,521 billion has in principle been approved for the 126 tenders so far submitted for funding.[43] The share of approved funding for

Figure 21: Annual returns to Austria in research and technological development compared to the Austrian share in EU funding



* for 2007 and 2008, the returns relate solely to the EU Framework Programmes

Source: European Commission 2008, processed and calculated by PROVISO, as at November 2009

43 funding here means the funding applied for in connection with the approved projects. As at November 2009, information is only partially to hand on the results of negotiations on the individual projects; as the contractual negotiations can lead to changes, the figures in this chapter should be taken as indications (Ehardt-Schmiederer et al. 2009b).

Austrian researchers stands at 2.61 %. This is equivalent to approved funding amounting to some € 342 million, which will be paid out as annual returns to Austrian organisations over the coming years depending on the terms of the individual projects.

Figure 21 shows that the proportion of returns to Austria measured against total operational expenditures by the EU on R&D has risen continuously in recent years. Since 2005 it has been significantly higher than the Austrian share in annual funds paid into the overall EU budget.

The reason for the slight dip in this upward trend in 2007 compared to the previous and the following year is that in various fields with strong Austrian participation, such as TRANSPORT, funds intended for 2007 were not granted until 2008. In 2008 the share in returns paid out amounted to 2.82 % or a return ratio of 142.9 % of Austria's funding of the overall EU budget.

3.1.6 Summary

Austria's participation in the EU research Framework Programmes has continued to develop in a positive way since the 4th Framework Programme. The share of the Austrian participation in participations overall has risen continuously and currently stands at 2.5 %. The share of projects managed by Austrian coordinators has also climbed from 1.7 % in FP4 to 3.5 % in FP7. In addition, the approval rate for projects coordinated by Austrian players averages around three percentage points higher than the overall approval rate. With Austrian participation staying the same, Austrian players have also succeeded in raising the Austrian share in total approved funds. The return ratio measured against the Austrian contribution to the EU budget, has almost doubled since FP4 and grew by 13 % compared to FP6.

Austrian SMEs and research institutions have positioned themselves very well in the 7th Framework Programme. Both in respect of the numbers of their participations and the funds awarded to them, the figures have grown significantly compared to FP6. Administrative simplifications in the application for and processing of projects in FP7 and improved financing terms for research institutions and SMEs may now be having some effect. But another major aspect is that substantial capacity has been built up here in research management to coordinate and administer EU fundedresearch projects.

Finally, it should be noted that Austrian players are increasingly using the Framework Programmes for international collaborations outside Europe's borders. As FP7 progresses, it remains to be seen whether the fields where Austria showed strength in FP6 are repeated in FP7.

3.2 The European Research Council (ERC)

For years the European Community had endeavoured to set up a Europe-wide initiative (as a supplement to all the thematically-oriented Framework Programmes) for the purpose of supporting competitive scientific research

44 The Internet link is: http://erc.europa.eu/

(basic research) according to the bottom-up principle. On 2 February 2007 this effort became a reality with the establishment of the European Research Council (ERC)[44] which is regarded as one of the most significant innovations of the Seventh Framework Programme of the European Commission for Research and Technological Development (for the period 2007–2013). With a budget totalling € 7.5 billion, the ERC is funded via the "Ideas" programme. The budget is not uniformly distributed over a seven year period but is instead subject to progressive increases. While 10.8 % of the total budget for new applications was available in 2009, this funding volume will rise to 15.1 % in 2010 and 17.8 % in 2011.[45]

The ERC targets individual researcher teams that are exclusively assessed and approved based on the scientific excellence of the applicant and the research project using an international peer review process. The ERC Scientific Council, whose members include 22 renowned scientists from a broad range of disciplines[46], is responsible for management and acts independently of the European Commission and the EU member states. In addition to selecting the experts (currently 25 international panels of experts have been established for the assessment and approval process), the Scientific Council is also responsible for programme development.

The ERC has two lines of support: the ERC Starting Grant, which is targeted to junior scientists and enables funding of up to € 2 million, and the ERC Advanced Grant, which is targeted to already established researchers and supports them with up to € 2.5 million in funding (in exceptional cases even up to € 3.5 million). Both lines of support are openly granted to researchers from all disciplines and any nationality for a maximum of five years; the funding is also explicitly granted for the development and expansion of locations in Europe.[47] With regard to the submission of applications by Austrian junior scientists, the submission of a duplicate application in connection with the START programme of the FWF and the ERC Starting Grant is mandatory.

The ERC started with the first announcement of the Starting Grant in 2007 – with an enormous display of interest from the scientific community. More than 9,000 project proposals were submitted of which approximately 300 could be approved – mainly due to the limited budget. Numerous member states such as France, Hungary, Italy, Luxembourg, Spain, Switzerland, Sweden and the Flemish region of Belgium then decided to recognise the rating of the evaluated project applicants by supporting them with national development funds.[48] To date, the ERC has made six announcements: the announcements of the Starting Grant (StG) in 2007 and 2009, the announcements of the Advanced Grant (AdG) in 2008 and 2009, and the announcements of the

45 See ERC (2009), page 10.
46 The Chair of the Scientific Council, Helga Nowotny of Austria, serves simultaneously as president of the ERC.
47 EU member states and states associated with the Framework Programme such as Albania, Croatia, Israel, Norway, Switzerland and Turkey.
48 See, among others, Vilke-Freiberga et al. (2009).

Coordination and Support Actions (Support) also in 2008 and 2009. The latter provide funding for projects and studies for the ongoing monitoring, evaluation and development of future strategies of the ERC.

The results of the 2007 to 2009 requests for submission show that among the host institutions[49], the United Kingdom (159 grants) is the most popular, followed by France, (105), Germany (88) and the Netherlands (65). In comparison, Germany (109 grants), Italy (93), United Kingdom (93) and France (92) are the leaders with regard to nationality of the parties receiving funding. Austria exhibits a balanced position. With 21 approved host institutions, Austria is in 10th place. With regard to nationality of the scientists receiving funding, Austria is in 11th place among the EU27 countries with 16 scientists receiving funding and its position is thus comparable with countries such as Sweden, Belgium or Finland.[50]

Table 15: Summary of Austrian results to date (excluding AdG 2009*)

Announcement	Austrian host institutions (HO)		Austrian researchers (PI)		Austrian host institutions (HO2)**	
	evaluated	approved	evaluated	approved	evaluated	approved
StG 2007	148	4	131	5	15	0
StG 2009	52	7***	43	3	2	0
AdG 2008	41	9***	35	8	5	1
Support 2008	1	0	-	-	1	1
Support 2009	1	1	-	-	1	0
Total	243	21	209	16	24	2

* AdG 2009: According to current information from the European Commission, seven Austrian host institutions have been approved to date. Overall, 1,584 projects were submitted under this announcement; of that number, 236 can expect to be funded.

** HO2: Host institutions providing additional infrastructure via EU project funds or additional research services.

*** Portability: One researcher (PI) each in the 2009 StG and 2008 AdG announcements switched from a foreign to an Austrian host institution (HO).

Source: European Commission data, processed by PROVISO

To date, 243 Austrian host institutions (presented in Table 15) have been evaluated; of that number, 21 have been approved, reflecting an approval rate of 8.6 %. With regard to Austrian researchers, a total of 209 project applications have been evaluated, of which 16 were approved. Half of them received their funding under the Advanced Grant in 2008. In contrast, the number of approved Austrian host institutions that provide additional infrastructure or perform additional research services via EU project funds is substantially lower. Only two institutions were approved, each of them in 2008.

Of the total 20 approved Austrian host institutions of the StG 2007, StG 2009 and AdG 2008 announcements (presented in Table 16), a total of 11 Austrian host institutions with research-

49 The ERC provides funding for individuals; the applicant is responsible for choosing the research institution for his or her project proposal, i.e. the applicant must name the preferred research or host institution in the application and include a statement from the host institution declaring that it will accept the researcher.

50 Source: BMWF, Status: 19/02/2010

ers of Austrian nationality and 9 Austrian host institutions with researchers of other nationality were approved. In addition, 6 non-Austrian host institutions with Austrian researchers were approved. A total of 209 project applications from Austrian researchers were thus evaluated, 14 of which were approved. The most successful Austrian host institutions were the University of Vienna with 7 grants (2 Starting Grants and 5 Advanced Grants) and the Austrian Academy of Sciences with 5 grants (2 Starting Grants and 3 Advanced Grants), followed by the Research Institute for Molecular Pathology and the Technical University of Vienna with three grants each.

Table 16: Summary of Austrian results to date (excluding support and AdG 2009*)

Announcement	Austrian host institutions (HO) with researchers (PI) of Austrian nationality		Austrian host institutions (HO) with researchers (PI) of other nationality		Total Austrian host institutions (HO)		Non-Austrian host institutions (HO) with Austrian researchers (PI)		Total Austrian researchers (PI)	
	evaluated	approved	evaluated	approved	evaluated	approved	evaluated	approved	evaluated	approved
StG 2007	89	2	59	2	148	4	42	3	131	3
StG 2009	29	3**	23	4	52	7	14	1	43	5
AdG 2008	26	6	x15	3**	41	9	9	2	35	6
Total	**144**	**11**	**97**	**9**	**241**	**20**	**65**	**6**	**209**	**14**

* One Austrian host institution each was approved in the Support 2008 and Support 2009 announcements (Support 2008 one HO2, Support 2009 one HO)
AdG 2009: According to current information from the European Commission, seven Austrian host institutions have been approved to date. Overall, 1,584 projects were submitted under this announcement; of that number, 236 can expect to be funded.
** Portability: On researcher of non-Austrian nationality switched from a foreign to an Austrian host institution (HO) in the AdG 2008 announcement; one researcher (PI) of Austrian nationality switched from a foreign to an Austrian institution in the StG 2009 announcement.

Source: European Commission data, processed by PROVISO

With regard to the funding volume of the approved projects (presented in Table 17), Austria has thus far been able to obtain € 4.56 million in the first announcement of the Starting Grant, € 8.91 million in the second announcement of the same and € 18.53 million in the announcement of the Advanced Grant in 2008; the latter share reflects 3.4 % of the total funding sum of this round of announcements.

With regard to the second announcement of the Advanced Grant, a funding sum of approximately € 12.65 million is expected for Austria; however, confirmation of this figure from the European Commission is still awaited. On the other hand, Austria has been able to achieve a large share (already confirmed by the European Commission) in the Support 2009 announcement, with Austria's share of the total funding volume coming to 24 %.

Table 17: Funding of the approved projects in EUR millions

Announcement	Budget as per the working programme of the European Commission	EU funding (total)	EU funding (Austria)	Share of funding to Austria in the total
StG 2007	335.03	333.81*	4.56*	1.4%
StG 2009	295.80	364.96**	8.91*	2.4%
AdG 2008	516.95	540.37*	18.53*	3.4%
AdG 2009	489.50	N/A***	12,65****	N/A
Support 2008	2.50	1.01*	0.06*	5.9%
Support 2009	2.50	0.75*	0.18*	24.0%

* Contractually fixed funding (the approved projects are contractually fixed at 100% and 99% for AdG 2008)
** Requested funding of the approved projects (contracts are currently still being negotiated)
*** Budget as per the working programme of the European Commission (€489.5 million) No figures have been announced thus far concerning the funding requested in the AdG 2009 announcement.
**** AdG 2009: No details have been announced yet concerning the requested funding; the information concerning the funding requested originates from the records of the FFG.

Source: European Commission data, processed by PROVISO

Although ERC projects can be carried out at any research institution in Europe, the first announcements indicate only a low amount of migration. There are hardly any applicants from the U.S. and persons who file project applications from the U.S. are usually returning European citizens.[51] Nonetheless, the ERC is regarded as a successfully established, respected institution whose funding programmes have intensified the competition in the science system. Researchers compete not only globally for the prestigious and financially attractive funding, obtaining an ERC grant is also seen as an indicator of the performance potential and the international attractiveness of places and systems for research in international competition. The ERC grants thus serve as a positive signal of attractive research institutions by strengthening their international visibility through successful outcomes in the European competition for excellence. All in all, the goal of ERC third-party funds is not to replace the national funding sources (even in future) but to enrich them in a prominent place. Against this backdrop, it will therefore prove to be useful in future for the ERC to operate as a learning organisation and keep the funding as flexible as possible.[52]

3.3 The Participation of Austria in the European Research Infrastructures

In April 2002, the "European Strategy Forum on Research Infrastructures" (ESFRI)[53] was constituted based on an initiative of the European Commission as a multidisciplinary platform for the EU countries for the development and discussion of projects in the area of the research infrastructures. This concerned both classical large-scale research institutions (such as the European X-Ray Laser Project X-FEL , the Extremely Large Telescope E-ELT,

51 See ERC (2009), page 30.
52 See, among others, COM (2008).
53 The Internet link is:http://cordis.europa.eu/esfri/

or supercomputers), as well as databases distributed but coordinated throughout Europe for the social sciences, environmental sciences and biological sciences, or virtual libraries. Despite the great successes that Europe has achieved in recent decades in the planning, establishment and operation of large research institutions (e.g. CERN, ESRF, ESO), in light of the global competition, it appears to be reasonable and necessary to take on additional projects that cannot be financed nationally on an EU-wide basis. As the financing of the projects is always the key point, today it is not only necessary to respond to questions relating to the balance of the various sciences, the establishment, continuation/upgrading, but also the reasonable lifetime and closure of individual (large research) institutions on a European level.[54]

ESFRI has no funding sources of its own and also provides no direct financing recommendations, but it assumes a significant role for the future appearance of the European Research Area via the decision-making process with its comprehensive, bottom-up structure. Its strategic position outside of the Seventh EU Framework Programme is supplemented by the programme "Research Infrastructures" in the "Capacities" segment of the Framework Programme. Among other things, the 3-year "preparatory phases" for all projects are financially supported from the Framework Programme. The top priority is stronger integration of Europe on the level of infrastructure institutions. To this end, ESFRI enables national stakeholders[55] to support previously identified research infrastructures of a pan-European interest as well as to establish new research infrastructures as needed. After a wide-ranging (encompassing all research areas) and intensive preparatory phase, the EU Ministers of Science in June 2004 proposed the development of a European roadmap for the establishment of the next generation of large research institutions with a pan-European impact within the framework of ESFRI.

The first roadmap with 35 projects was presented in 2006; an expansion to 44 projects was presented in 2008. All listed projects are already well on the way to implementation and could be rapidly implemented with financing commitments from interested EU member states.

Table 18 below shows the diversity and the financial dimensions of the infrastructure projects. The ESFRI roadmap for 2008 includes 44 projects in seven knowledge clusters: social and human sciences, environmental sciences, energy, biological and medical sciences, material sciences and analytics, physics and engineering, as well as e-infrastructures. It can be assumed that many of these planned projects or those currently being established or expanded will advance to European infrastructure institutions for research in the years to come. A complete implementation of the roadmap would mean an amount to be invested of approximately € 18 billion distributed over about 10 years and would strengthen not only science but also the economy.

54 See in this regard http://www.bmwf.gv.at/eu_internationales/eu_forschung/esfri/.
55 Austria is represented by national delegates of the BMWF.

Table 18: Overview of the ESFRI projects for 2008

	Projects	Construction costs (€ millions)	Operation costs (€ millions/year)	First possible operations or upgrade	Description
Social Sciences and Humanities	CESSDA	30	3	2013	Facility to provide and facilitate access of researchers to high quality data for social sciences
	CLARIN	104	7.6	2014	Research infrastructure to make language resources and technology available and useful to scholars of all disciplines
	DARIAH	12	4	2013	Digital infrastructure to study source materials in cultural heritage institutions
	European Social Survey	54**	9**	2008	Upgrade of the European Social Survey, set up in 2001 to monitor long-term changes in social values
	SHARE	11.6	0.3	2008	Data infrastructure for empiric economic and social science analysis of ongoing changes due to population ageing
Environmental Sciences	AURORA BOREALIS	635	32.5	2014	Europeal polar research icebreaker
	COPAL (ex EUFAR)	50	3 (+ 6000 €/ hour)	2012	Long range aircraft for tropospheric research
	EISCAT_3D Upgrade	60-250	4-10	2015	Upgrade of the EISCAT facility for ionospheric and space weather research
	EMSO	160	32	2013	Multidisciplinary Seafloor Observatory
	EPOS	500	80	2018	Infrastructure for the study of tectonics and Earth surface dynamics
	EURO-ARGO (GLOBAL)	80	7.3	2011	Ocean observing buoy system
	IAGOS	15	0.5-1	2012	Climate change observation from commercial aircraft
	ICOS	128	14	2012	Integrated carbon observation system
	LIFEWATCH	370	71	2019	Infrastructure for research on the protection, management and sustainable use of biodiversity
	SIAEOS	50	9.5	2012	Upgrade of the Svalbard Integrated Arctic Earth Observing System
Energy	ECCSEL	81	6	2011	European Carbon Dioxide and Storage Laboratory infrastructure
	HiPER	800	under discussion	2020+	High power long pulse laser for fast ignition fusion
	IFMIF (GLOBAL)	1000	150-80	2020	International Fusion Materials Irradiation Facility
	JHR	500	24-33	2014	High flux reactor for fission reactors materials testing

	Projects	Construction costs (€ millions)	Operation costs (€ millions/year)	First possible operations or upgrade	Description
Biological and Medical Sciences	BBMRI	170	15	2013	Bio-banking and biomolecular resources research infrastructure
	EATRIS	255	50	2013	European advanced translational research infrastructure in medicine
	ECRIN	50	5	2014	Pan-European infrastructure for clinical trials and biotherapy
	ELIXIR (GLOBAL)	470	100	2012	Upgrade of the European Life-science infrastructure for biological information
	EMBRC	100	60	2018	European marine biological resource centre
	EU-OPENSCREEN	40	40	2012	European Infrastructure of Open Screening Platforms for chemical biology
	EuroBioImaging	370	160	2012	Research infrastructure for imaging technologies in biological and biomedical sciences
	High Security BLS4 Laboratory	174	24	2018	Upgrade of the High Security Laboratories for the study of level 4 pathogens
	Infrafrontier	270	36	2010	European infrastructure for phenotyping and archiving of model mammalian genomes
	INSTRUCT	300	25	2012	Integrated Structural Biology Infrastructure
Materials and Analytical Facilities	EMFL	120	8***	2015	European Magnetic Field Laboratory
	ESRF Upgrade	238	83	2009-2014	Upgrade of the European Synchrotron Radiation Facility
	EuroFel (ex-IRUV-FEL)	1200-1600	120-160	2007-2020	Complementary Free Electron Lasers in the Infrared to soft X-ray range
	European Spallation Source	1300	110	2019-2020	European Spallation Source for neutron spectroscopy
	European XFEL	1043	84	2014	Hard X-ray Free Electron Laser in Hamburg
	ILL20/20 Upgrade	171	5***	2007-2017	Upgrade of the European Neutron Spectroscopy Facility
Physical Sciences and Engineering	CTA	150	10	2013	Cherenkov Telescope Array for Gamma-ray astronomy
	E-ELT	950	30	2018	European Extremely Large Telescope for optical astronomy
	ELI	400	50	2015	Extreme Light Intensity short pulse laser
	FAIR	1187	120	2016	Facility for Antiproton and Ion Research
	KM3NeT	200	5	2016	Kilometre Cube Neutrino Telescope
	PRINS	1400	300	2009-2015	Pan-European Research Infrastructure for Nano-structures
	SKA (GLOBAL)	1500	100-150	2016	Square Kilometre Array for radio-astronomy
	SPIRAL2	196	6.6	2014	Facility for the production and study of rare isotope radioactive beams
e-Infrastructures	PRACE (ex EU-HPC)	200-400*	50-100	2009-2010	Partnership for Advanced Computing in Europe

* Estimated costs to renew the high-end infrastructure every 2–3 years
** For the integrated construction/ operation process over 6 years
*** Additional to current operation costs

Construction "started", meaning funding and agreements almost in place (ECRIN, ELIXIR (GLOBAL), Infrafrontier, EuroFel (ex-IRUV-FEL), PRACE (ex EU-HPC))

Advanced preparation for construction but agreements and funding not yet in place (ESRF Upgrade, European XFEL, ILL20/20 Upgrade, FAIR, SPIRAL2)

Source: EC (2008), page. 12f.

In view of the enormous breadth of range of the social sciences and humanities as well as the biological and medical sciences and even the e-infrastructures, the roadmap has attracted global attention. The goal of the member states with regard to this roadmap is, based on existing excellence and policy priorities with regard to binding financing, to ensure that the national research and innovation system has access to top international research institutions and with quality assured by regular evaluations. Thus the interest of the member states and the states participating in the Framework Programme is not only focused on increased participation in the European Research and Economic Area, but also the ambition to create an attractive environment for the best heads and best organisations and in so doing, counteract the brain drain. Specifically, the research infrastructure (or access to it) is seen as crucial for the educational and research standard and the performance of the universities and institutions outside of universities; i.e. to be able to educate more human capital at a world-class level in future and increase the appeal or competitiveness of the national innovation system, it is necessary to constantly expand the national infrastructure along with the associated *enabling technologies* such as supercomputers, data storage and networks, systems for structural analysis on the micro and nano level, etc. and secure access to top international research institutions.[56]

As of March 2010, Austria is participating in ESRF Upgrade, ILL20/20 Upgrade, BBMRI under already existing memberships and will come to a decision on E-ELT before the end of this year. Participation in CLARIN, CESSDA and SHARE is planned; participation in FAIR has currently been suspended for budgetary reasons. It is without question that Austria's participation in numerous other new research institutions is seen as essential both for building up the national image as well as Austria's international presence and competitiveness and accordingly for the attractiveness of Austria on the global "knowledge map." For Austria as a place to do science and research, other significant projects should be named in this regard, for example COPAL, Life Watch, EATRIS, ECRIN, INSTRUCT, X-FEL, CTI, ELI, and PRACE. This dynamic list does not claim to be complete but instead still needs to be discussed and made a priority for research policy. All of these projects should serve to enhance scientific excellence and accordingly the attractiveness and sustainability of Austria as a place to perform research and are seen in this light as indispensable.

56 See Weselka (2009).

4 Aspects of Innovation in the Corporate Sector

4.1 Influence of R&D activities on corporate growth in Austria

As described in Chapter 2, the corporate sector has contributed significantly to an increase in overall R&D intensity. The share of R&D expenditures in the corporate sector stands at 1.7 % of GDP, a figure that has doubled since 1993.

With the climbing R&D intensity in the corporate sector, the question has again arisen as to the effects of R&D expenditures at the national and corporate levels. The following questions are under consideration:

- What influence do expenditures on research and development have on changes in turnover and/or employment among Austrian businesses?
- Do growth effects from R&D activities benefit companies to the same degree, or do specific groups of companies reap greater or lesser profits from R&D? For example, are there observable differences, in terms of R&D growth effects, between quickly and slowly growing companies?
- Is the relationship between R&D activities and corporate growth stable over time, or are there indications of rising or falling R&D growth effects?

In order to answer these research questions, Falk's study (2009) relies on the funding database of the Austrian Research Promotion Society (FFG), which was made accessible in an anonymous form. This database is perfectly suited for empirical analysis. With a sample size of up to 1500 companies conducting R&D (excluding universities and public research institutions) per year, the database provides a representative data source for companies engaged in R&D in Austria. The connection between R&D activities and corporate growth is first assessed by using descriptive statistics and a simple empirical evaluation. Then an analysis follows which considers whether the influence of R&D activities differs between quickly and slowly growing companies.

4.1.1 Brief review of the literature

Investments in R&D serve as a prerequisite for innovative products and services as well as new production methods, thereby acting as a catalyst for economic growth and the creation of new jobs. In order to be able to determine the potential effects of corporate R&D activities, different approaches are followed: first, the relationship between R&D activities and corporate growth in subsequent years can be evaluated. Second, R&D rate of return can be determined. R&D rate of return is the profit that a company derives from its R&D expenditures; this amount can be identified by comparing growth in productivity with R&D intensity (see Wieser 2005).[57] For Austria, there has been no empirical evidence available analysing the rate of R&D return on the firm level. One reason for this are the high data requirements. To calculate improvements in productivity, detailed data about factor inputs (workforce, outlay and capital stock) and their costs must be available, which is difficult at the corporate level.

Another approach is to examine the chain of effects, from research and development investment to successful innovation to productivity. This approach simultaneously evaluates the determinant factors of R&D activity, the relationship between R&D and successful innovation, and the effects of successful innovation on productivity. On the basis of the fourth innovation survey in Austria, Berger (2009) comes to the conclusion that an increase in R&D activities per employee leads to a significant increase in turnover with new products. This again leads to an increase in productivity. The magnitude of the effect is relatively high if it is set in relation to the share of expenditures for R&D (average R&D intensity for companies). However, because of the cross-sectional nature of the data, restraint is advised with regard to causal interpretations of these relationships. R&D activities typically only have an effect after a certain delay. To account for this effect, data for several years is required. A sample that only concentrates on one single point in time (cross-section) cannot fulfil this requirement.

In the following, the relationship between R&D activities in the first year of the period under observation and corporate growth in subsequent years will be assessed on the basis of data for several years. In the literature, however, there are numerous empirical studies on the determining factors for corporate growth (for Austria, for example, see Schwarz et al. 2005); nonetheless, studies on the relationship between R&D activities and corporate growth are rare, at least for Austria. For other industrial states, there are a number of studies on the influence of R&D activities on corporate growth. And finally, in addition to studies on the basis of national corporate data, there is also a study for a group of EU countries.[58] On the basis of a European innovation survey for 16 EU countries (including Austria), Hölzl (2008) comes to the conclusion that fast-growing companies have on average a higher R&D intensity than companies with average or below-average growth rates (see also Coad-Rao 2008 for American industrial companies). This result applies in particular to the EU-15 countries, i.e. those countries that were already EU members prior to 2004. An additional study (commissioned by the European Commission) concludes that small,

57 Alternatively, the R&D rate of return can be determined using estimates of a production function with the R&D capital stock as the explanatory variable (cf O'Mahony, Vecchi, 2008).

58 See for example Del Monte, Papagni (2003) for Italy, Nurmi (2004) for Finland, Yang,-Huang (2005) for Taiwan and Yasuda (2005) for Japan.

young and technology-intensive companies show the highest growth rates (European Commission 2003).

One deficiency of many of these studies, however, is that neither services nor small companies (with less than 10 employees) are included. Small companies frequently have high R&D intensity and should definitely be included. This analysis includes both small companies with less than 10 employees and service providers. Furthermore, most studies only observe average effects. This is based upon the implicit assumption that R&D growth effects are the same for all companies. Moreover, the delayed effect of R&D is considered either insufficiently or not at all.

4.1.2 Relationship between R&D intensity and corporate growth

The following box briefly describes the data upon which the analysis is based.

Data basis
The empirical analysis represented here is based on the database of the FFG general programmes. This data was provided to WIFO in anonymous form for the period of time between 1995 and 2007. The companies included here are those which conduct R&D and have applied for research funding. The FFG funding database contains the following variables: (i) total turnover (in thousand €), (ii) export share of turnover in %, (iii) number of dependent employees (full-time equivalent), (iv) number of R&D employees (full-time equivalent), (v) expenditures for research and development (in thousand €), and (vi) cash flow (in thousand €). Each company that submits a funding request must provide this data for the last three years. Companies, community research institutions, individual researchers and professional associations with less than 1 million € in turnover do not have to provide information on cash flow. This database contains the two most important variables for corporate R&D: the number of R&D employees and the amount of R&D expenditure. R&D collaborations, research institutions, universities and intermediaries were excluded from the sample. This dataset is distinctive for its inclusion of small companies with less than 10 employees.

Table 19 provides a descriptive overview of the variables used. The median (middle distribution value) of the average growth rate in employment lies between 2.3 % and 4.6 % per year, depending on the period of time. The average rate of growth in turnover is between 8.4 % and 10.6 %.

Table 19: Key corporate performance indicators

Period	Average rate if growth for employment / year (median)	Average rate of growth for turnover / year (median)	Point in time	Employment in base year (median)	R%D personnel intensity (median)	R&D expenditures/turnover	Share of companies that were founded in the three years immediately preceding the sample year	# of assessments
1996-1998	3.4	8.4	1996	67	7.9	4.1	17	619
1998-2000	4.6	9.5	1998	57	8.3	4.0	18	698
2000-2002	3.2	6.5	2000	54	8.0	4.7	22	704
2002-2004	2.3	8.0	2003	53	9.5	4.8	21	830
2004-2006	4.0	10.6	2004	49	10.5	5.2	18	822

Note: Employment in the base year refers to the years 1996, 1998, 2000, 2002 and 2004. This also applies for R&D personnel intensity (R&D employees as a percentage of total employment figures) and the R&D expenditure ratio. # refers to the number of company analyses. All quantitative variables are measured as a median, meaning that half of the firms have a higher value than the median and the other half have a lower value. For the growth rate in employment and turnover, the average value per year was calculated first for each company before the determination of the median.

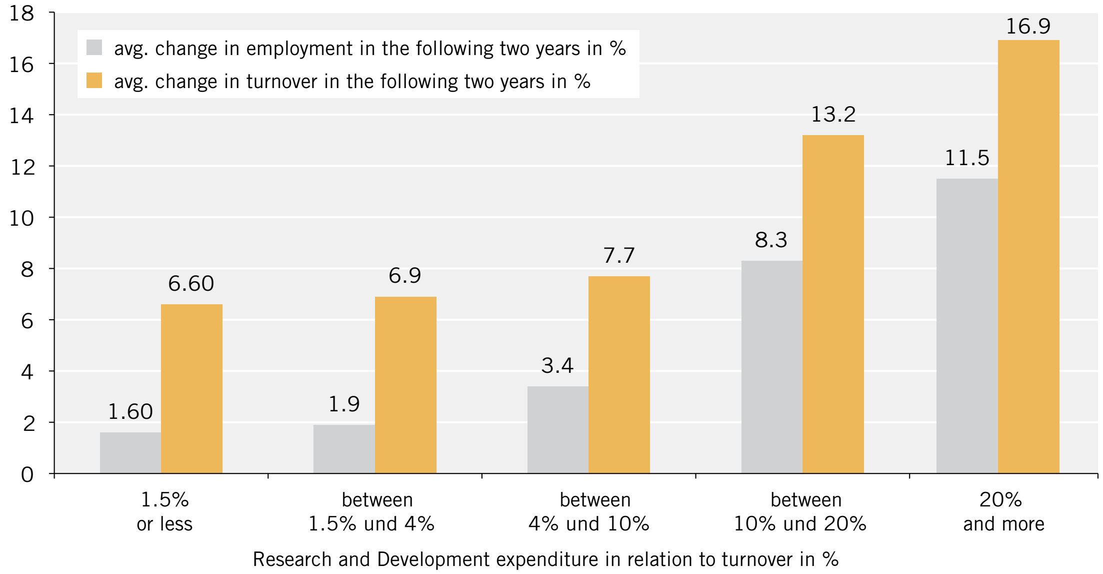
Source: FFG database; calculations by WIFO

Companies in the FFG database that conduct research demonstrate significantly higher dynamism, both in terms of employment and growth, than the average for companies overall (which includes companies that do and do not conduct R&D). In comparison, the average growth rate in employment in the Amadeus database, which is based on about ten thousand companies per year in the same period of time, stands at little more than 0 %.[59]

If the average growth in employment and turnover between 1995 and 2006 is set in relation to average R&D intensity (split into five categories), then we see that companies with an average R&D intensity of 20 % or more grow on average seven times as fast as companies with an R&D intensity of 1.5 % or less (Figure 22). This correlation is similar whenever the growth rates for turnover are used instead of those for employment.

59 A median of zero means that, for this group of companies, rising and falling employment numbers cancel each other out. The median value describes the distribution of corporate growth rates better than the average value. Our own calculations on the basis of the AMADEUS database (European corporate database containing financial information on over 13 million companies in 42 European countries) show that average employment growth rates in the companies assessed is positive and corresponds to the aggregated development.

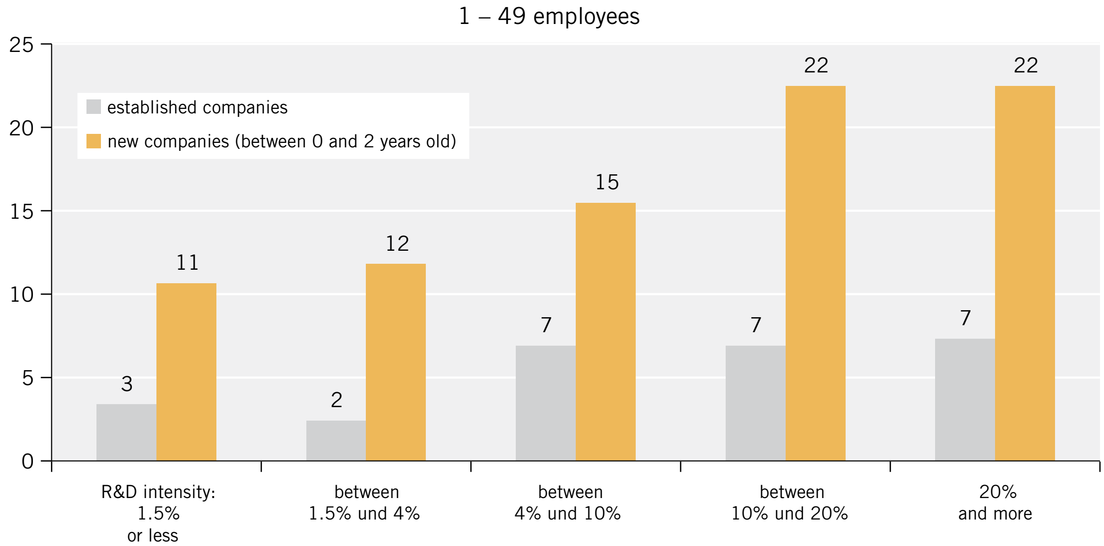
Figure 22: Relationship between growth (in employment and turnover) and R&D intensity in the base year (1995–2006)



Source: FFG database; calculations by WIFO

Simultaneous consideration of company age also results in the same pattern: the higher the R&D intensity, the higher the employment growth in the next two years (Figure 23). This applies to both established and young companies. The sample here is limited to companies with up to 49 employees because there are very few newly founded companies that already have 50 or more employees within their first three years. For example, in this group, young companies with an R&D intensity of 20 % or more grow twice as fast as companies with an R&D intensity of 1.5 % or less.

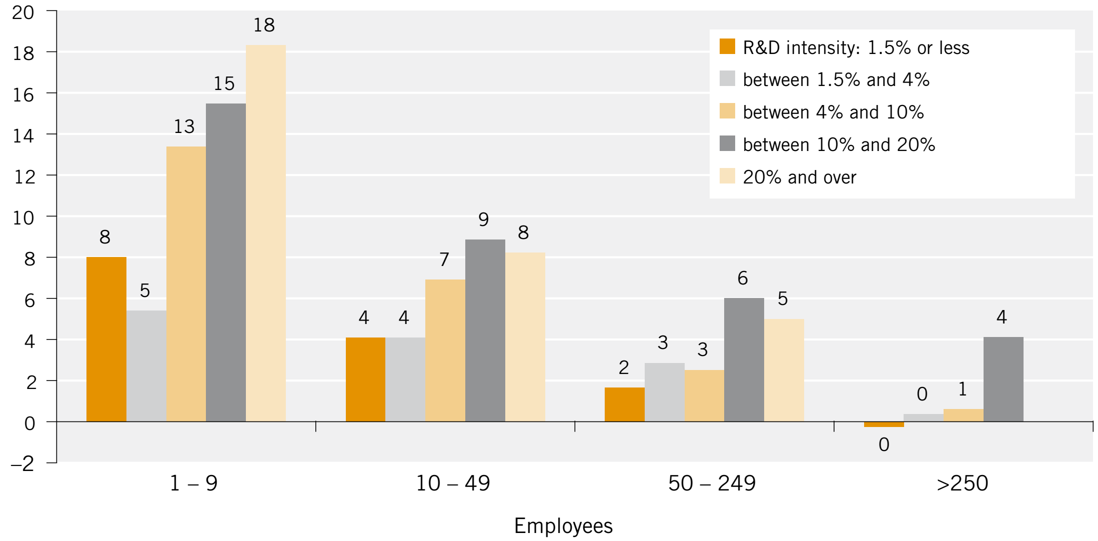
Figure 23: Relationship between changes in employment (in %), company age and R&D intensity (1995–2006)



Source: FFG database; calculations by WIFO

The positive correlation between R&D intensity and employment development is also observable in the individual company size classes (Figure 24). Companies are categorised into four groups: (i) 9 or less employees, (ii) less than 50 employees, (iii) medium-sized companies with between 50 and 249 employees, and (iv) large companies with 250 or more employees. In the group of large companies with 250 or more employees and a high R&D intensity (between 10 % and 20 %), the annual growth rate for employment was on average 4 % from 1995 to 2006. On the other hand, companies with a lower R&D intensity (1.5 % or lower) experienced stagnant growth for the same period. For companies with 50–249 employees and 10–49 employees, R&D intensive companies had employment growth rates twice as high as companies with the lowest R&D intensity.

Figure 24: Relationship between changes in employment (in %) in the two subsequent years, organised by company size and R&D intensity



Source: FFG database; calculations by WIFO

4.1.3 Estimated results

The descriptive statistics show that, in the period under observation, corporate growth depends on R&D intensity, company size and company age. These results, which establish the relationship of R&D expenditures to turnover, average annual growth in turnover and employment for each company, are supplemented in the following by the results of an empirical evaluation. Three different delayed effects are considered here, because R&D activities frequently affect turnover and employment growth only after a delay. Typically, there is a long chain of effects between R&D activities and corporate growth, beginning with research, continuing on to product development, and ending with increasing sales of new products or the implementation of new cost-saving technologies. On the basis of Finnish data, Rouvinen (2002) found that R&D activities only result in higher output after four or five years.

As an alternative to R&D expenditure intensity, the share of R&D employees in the total workforce is used. This is often described as R&D personnel intensity. An important question is whether the influence of R&D activities remained stable in the period under observation. In order to assess this, estimates were created for different periods of time.

The main result of the estimates is that in almost all specifications of R&D intensity in the base year there was a significant influence on employment growth in the next two years. This means that employment growth on average turned out to be higher the more that a company invested in research and development at the beginning of the period under observation relative to turnover.

According to the estimates, a doubling of R&D personnel intensity (for example, from 5 % to 10 %) led to an increase in employment growth by up to two percentage points per year. The results scarcely change if different delayed effects were used, or if, instead of R&D personnel intensity, the relationship of R&D to turnover was employed. An important result is that the R&D growth effects in the periods 2002–2004 and 2004–2006 were significantly lower than in 1996–2002. The correlation, however, remains significant in the most recent period as well.

Additional estimations show that R&D intensity affects employment growth differently. For the selected periods of time, R&D growth effects are highest for fast-growing companies and lowest for shrinking companies. R&D has no influence on stagnant or shrinking companies. This is the case for somewhat less than one-third of the companies assessed. Thus, there is no deterministic correlation between R&D and corporate growth: more R&D does not necessarily mean faster growth. For the overwhelming majority of the companies evaluated, however, R&D activities have a positive effect. Overall, R&D effects on employment are very low for a majority of the companies and only really meaningful for the group of fast-growing companies.

4.1.4 Summary

Companies with R&D activities are expected to create several jobs. Research on this topic is scarce for Austria. An analysis of the determinants of growth for Austrian companies that conduct R&D activities leads to the conclusion that research-intensive companies have better prospects for growth than companies that invest modestly or little in research and development. This applies to growth both in terms of turnover and employment. This effect was demonstrated in all of the periods under observation.

Empirical evaluations on the basis of cross-sectional data suggest that, depending on the period of time, an increase in R&D intensity (measured in terms of R&D personnel intensity) by 10 % (for example, from 5 % to 5.5 %) led to an increase in employment growth in the next two years by up to 0.2 percentage points per year, although the effect decreased over time. A conclusive evaluation of sinking R&D growth effects over time, however, is not possible, as it would be necessary to clarify whether these differences could be attributed to other factors (i.e., variables that were not considered). This aspect requires further research. Another point is that a reverse causality appears plausible: just as R&D activities can stimulate company growth, high company growth can lead to an increase in the R&D intensity. The problem of reverse causality is somewhat alleviated here because the R&D intensity was delayed by two years. In general, the causality question can be clarified by using panel data methods. To do this, however, additional comprehensive tests must be conducted. Another aspect that needs to be considered in this context is that the growth effects of the R&D intensity can depend on company age. It is quite possible that the effect of R&D can decline as the age of the company increases. On the other hand, established companies have the advantage of having several years of experience in R&D and introducing new products to market. This is another area where research is needed. Estimates for the individual points of distribution indicate high heterogeneity in R&D growth effects. This means that R&D growth effects are highest among fast-growing companies. In the sample of Austrian companies under evaluation, research-intensive companies are the most dynamic in terms of employment and turnover.

4.2 Structural change in Austria and R&D intensity at the corporate level

The performance of an innovation system manifests itself among other things in the ability to adapt to structural changes that result from new technologies, shifting market dynamics and new competitive conditions.[60] These changes must be implemented in such a way that the innovation system's existing strengths are preserved while at the same time building innovative power in emerging fields.

In this context, this chapter assesses the speed and direction of structural change in Austria at the industry level. An international comparison is provided for the years 1995–2005, analysing which sectors profit from structural change and how quickly these transformations occur. This is followed by an analysis of the extent to which structural change has contributed to an increase in the corporate R&D intensity during the period 1998–2006 and the degree to which this development deviates from other countries. This analysis shows that the increase in Austria's R&D intensity is driven more strongly by the expansion of R&D activities within existing economic sectors than by a shift to R&D-intensive economic sectors.

An analysis at the industry level, however, is insufficient because the companies within a sector operate in very different ways. R&D intensity also differs significantly, not just between industries but also between individual companies. This heterogeneity can only be accounted for by using company-related (micro-) data. For this reason, the final section examines the extent to which the assignment of companies to technology classes on the basis of their industry affiliation (a typical practice), as well as their average R&D intensity, produces a distorted image of reality. For this, the actual R&D intensity of companies (at the micro level) will be contrasted with their affiliation to a technology class (according to industry classification) and assessed over time.

4.2.1 Speed and direction of structural change

First, we will review whether the tempo of structural change in Austria differs significantly from other countries, thereby indicating weaknesses in terms of adaptability. The United Nations' Index of Compositional Structural Change (ICSC) is an appropriate methodologi-

60 This chapter is based for the most part on the study prepared by Joanneum Research, ZEW and Technopolis entitled "Das deutsche Forschungs- und Innovationssystem – Ein internationaler Systemvergleich zur Rolle von Wissenschaft, Interaktionen und Governance für die technologische Leistungsfähigkeit", commissioned by the German Commission of Experts on Research and Innovation.

cal approach (cf. Box 1). This is calculated for Austria and countries selected for comparison on the basis of sector changes in production, value added and employment for the period 1995–2005.

Method for measuring the speed of structural change

To measure the speed of structural change, Mayerhofer (2004: 436; see also 2007: 85) uses the United Nations' Index of Compositional Structural Change (ICSC). This index determines the difference between employment in the observation and baseline points in time, and sums up their totals. The higher the ICSC, the faster the speed at which structural change proceeds.

$$ICSC_i = \frac{1}{2} \bullet \sum_{j=1}^{m} \left| s_{ijt} - s_{ij0} \right|$$

where s: share of employment, value added or production; i: region; j: economic sector; 0,t observation points in time

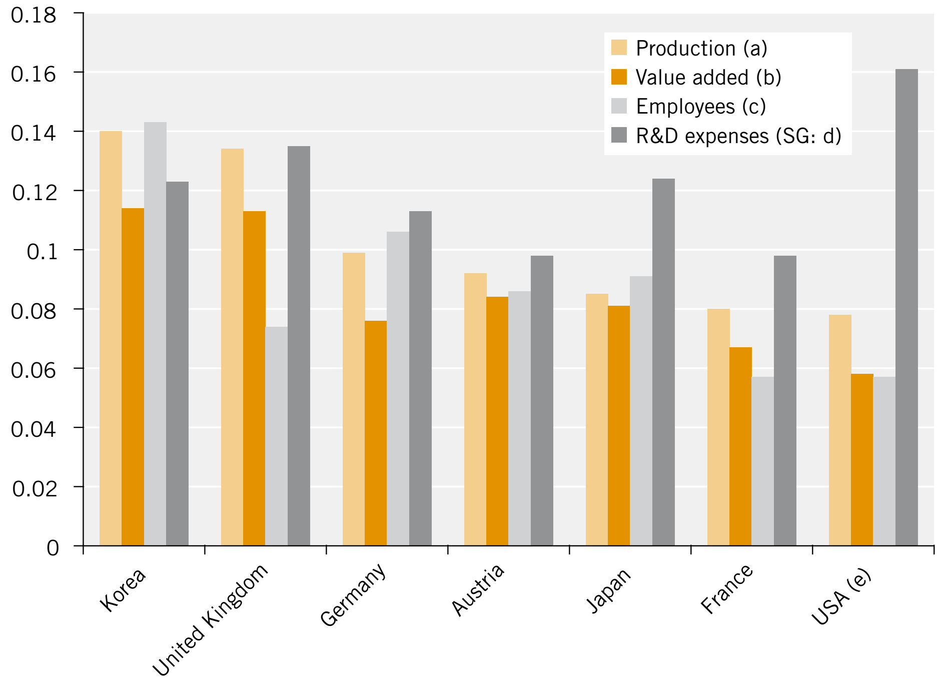
The ICSC for production, value added and employment shows that structural change in Austria was rapid on average. South Korea and the United Kingdom had the highest dynamism. The other countries follow at a distance; structures in the USA and France changed at the slowest pace.

The ICSC provides a significantly different picture for R&D expenditures in manufacturing.[61] This is where the USA had the fastest transformation. In contrast, Austria and France had the least significant structural shifts. The proportion of individual industries in total R&D spending has remained comparatively stable throughout the decade.

It is important to note that the methodology is limited; internationally comparable data is only available in a relatively highly aggregated format at the level of two-digit economic sectors, which means that changes at more granular levels could not be measured. Thus, for example, a reduction in production capacity in the ship building industry and a simultaneous increase in aircraft and spacecraft production capacity could go unnoticed because both branches are categorised in the "transport equipment" industry. Furthermore, although the analysis determines the dynamic of structural differences between points in time, it remains 'blind' as to the 'direction' of this structural change. In this analysis, a shift in economic activities from the agricultural sector to instrument technology is equivalent to a shift in the opposite direction. Of course, this is important for the performance and future competitiveness of an innovation system. For this reason, the following represents which economic sectors have profited from structural change.

61 Service were not included due to gaps in the data. The following industry sectors were used (NACE Rev 1.1): Foodstuffs/tobacco (15–16), textiles/apparel/leather (17–19), wood/paper/printing/publishing, mineral oil etc.(23), chemicals excl. pharmaceuticals (24x), pharmaceuticals (2423), rubber/plastic (25), glass/ceramic/non-metalic mineral products (26), metal products (27), metal processing (28), machinery (29), office machinery and computers (30), electrical machinery and generators (31), radio, TV and communication equipment (32), medical, precision and optical instruments (33), vehicles, trailers and semi-trailers (34), aircraft and spacecraft (353), other vehicle manufacture (35x).

Figure 25: Speed of structural change measured by a) value added, b) gainfully employed persons (1995–2006) and c) R&D spending in manufacturing (1998–2006)



(a) Gross value added at respective base prices (millions in national currency and/or euros) based on 56 economic sectors (NACE Rev 1.1); Data EU-KLEMS 3/2008
(b) Gross value added at respective base prices (millions in national currency and/or euros) based on 50 economic sectors (NACE Rev 1.1); Data EU-KLEMS 3/2008
(c) based on 58 economic sectors (NACE Rev 1.1), Data EU-KLEMS 3/2008
(d) Data OECD ANBERD 2009 in national currency at constant prices; assignment according to primary activity, with the exception of France and the United Kingdom (product field)
(e) SIC classification

Calculated by Joanneum Research

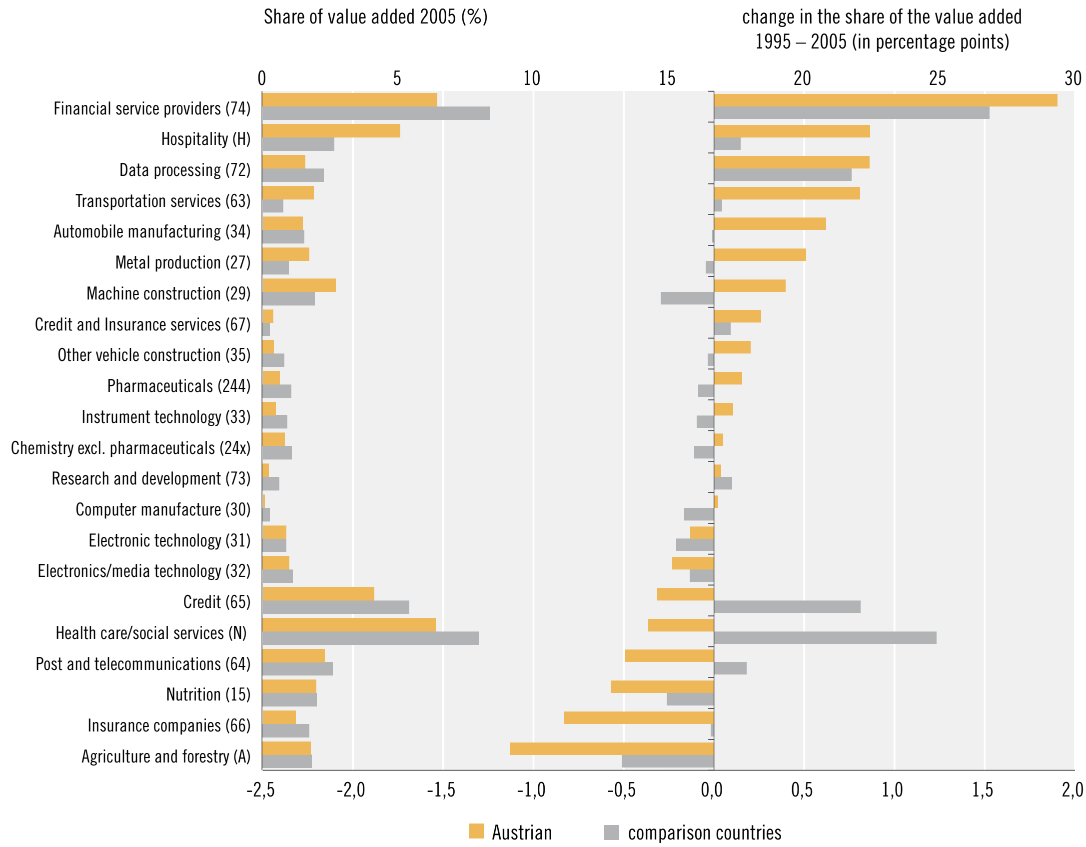
4.2.2 Winners and losers

Service providers are clearly the winners in Austria's structural change. In addition to data processing and other corporate services designated as 'knowledge-intensive', hotels and restaurants and transportation services also significantly expanded their share of value added from 1995 to 2005 – and more in Austria than in the countries under comparison (Figure 26). Within the manufacturing sector, automobile manufacturing, metal production and machine construction also posted gains. In the so-called high-tech industries, the pharmaceutical industry and instrument technology[62] experienced slight growth, contrary to the international trend. However, the proportion of computer manufacturing[63] stagnated, and shares in electronics and media technology[64] sank. While the financial intermediation industry and the health and social work sector experienced significant growth

62 Precision and optical instruments
63 Office machinery and computers
64 Radio, television and communication equipment and apparatus

in the countries under comparison, this was not the case in Austria. On the contrary – both of these sectors, along with the insurance industry, were losers in structural change. This also applies to the food industry, as well as agriculture and forestry.

Figure 26: Proportion and change in the share of selected economic branches in value added in 2005 or 1995–2005



Comparison countries are USA, Germany, the United Kingdom, France, Japan and South Korea

Source: EU-KLEMS 2008, Calculations by Joanneum Research

Above all, data processing, machine construction, sales and repair, and research and development increased their share of R&D spending (Table 20).

The worst loser was the electronics and media technology industry, with a loss of almost seven percentage points; nonetheless, the industry still retains the highest share of R&D in Austria. In the other high-tech sectors, instrument technology and pharmaceuticals were able to slightly increase their shares, while aircraft and spacecraft manufacturing and computer manufacturing were nearly stagnant.

Automotive engineering, the chemical industry (excluding pharmaceuticals) and other corporate services providers experienced slight losses.

Table 20: Proportion and change in share for selected economic branches in R&D spending in 2006 or 1998–2006

	Proportion of all R&D spending 2006 (%)	Proportion of share of all R&D spending 1998-2005 (percentage points)
Data processing (72)	4.5	2.9
Machine construction (29)	10.9	2.3
Wholesale and retail trade, repair (50-52)	4.6	2.1
Research and development (73)	9.2	1.9
Instrument technology (33)	3.1	0.9
Pharmaceuticals (2423)	6.2	0.5
Metal production (27)	2.8	0.2
Transport equipment overall (35)	2.6	0.0
Metal products (28)	2.2	-0.1
Electronic technology (31)	4.4	-0.1
Rubber/plastics (25)	2.0	-0.1
Aircraft and spacecraft construction (353)	0.7	-0.2
Automobile manufacturing (34)	8.2	-0.2
Coke/petroleum products (23)	0.4	-0.5
Credit and insurance companies	0.7	-0.6
Glass/ceramics (26)	1.4	-0.6
Financial service providers (74)	7.8	-0.8
Chemistry excl. pharmaceuticals (24x)	2.8	-0.8
Electronics/media technology (32)	19.8	-6.9

Source: OECD ANBERD 2009; figures for comparison countries not presented because of various data gaps; calculations by Joanneum Research

4.2.3 Contribution of structural change to the increase in the R&D intensity

A change in a country's R&D intensity over time can have different causes: first, an R&D intensity climbs whenever structural change leads to industries with higher R&D spending gaining in importance (structural effect); second, if companies invest more in R&D without a resultant structural change (intensity effect).

In order to determine the effects produced by different types of changes, the shift-share analysis method is used (Box 2). This analysis enables statements about the extent to which structural change takes place in R&D-intensive industries and/or the degree to which industries manage to work in a more research-intensive manner. The analysis is based on OECD data (ANBERD) for 1998–2006. What is problematic, however, is that these databases, even though they were produced for the purposes of international comparison, have various data gaps that affect recent data as well. Since a complete data basis is indispensable for international comparative analysis, economic branches were aggregated into 20 sectors.[65]

Method for comparison of R&D ratios over time

The total R&D intensity (or intensity) can be defined as the quotient of R&D spending (x) and value added (y) at a point in time (t). This corresponds to the total of sector (i) R&D ratios, which are weighted in accordance with their share of total value added:

$$(1)\quad \frac{x}{y} = \sum_{i=1}^{N} \left(\frac{x_i}{y_i}\right) \cdot \frac{y_i}{y}$$

A change in the total R&D intensity can be broken down into three components:

$$(2)\quad \left(\frac{x}{y}\right)_t - \left(\frac{x}{y}\right)_{t-1} = \sum_{i=1}^{N} \left(\frac{x_{it-1}}{y_{it-1}}\right) \cdot \left[\left(\frac{y_{it}}{y_t}\right) - \left(\frac{y_{it-1}}{y_{t-1}}\right)\right] \quad \text{Structural effect}$$

$$+ \sum_{i=1}^{N} \left[\left(\frac{x_{it}}{y_{it}}\right) - \left(\frac{x_{it-1}}{y_{it-1}}\right)\right] \cdot \left(\frac{y_{it-1}}{y_{t-1}}\right) \quad \text{Intensity effect}$$

$$+ \sum_{i=1}^{N} \left[\left(\frac{x_{it}}{y_{it}}\right) - \left(\frac{x_{it-1}}{y_{it-1}}\right)\right] \cdot \left[\left(\frac{y_{it}}{y_t}\right) - \left(\frac{y_{it-1}}{y_{t-1}}\right)\right] \quad \text{Interaction effect}$$

- Structural effect This measures the contribution that results from a changed economic structure while the R&D intensity within the sectors is held constant (ceteris paribus). For example, this can determine whether an increase in the total R&D intensity can be attributed to an increase in the share of value added from R&D-intensive industries (structural change).
- Intensity effect (or diffusion effect): This determines the contribution made by changed R&D ratios for sectors while the economic structure is held constant (ceteris paribus). This can therefore determine whether the R&D intensity in individual industries has increased, and – within the same economic structure – whether this led to an increase in the total R&D intensity.
- Interaction effect: This combines the structural and intensity effects and determines the degree to which structural change is occurring in sectors with climbing R&D ratios. Therefore, this effect increases as the share of value added grows in sectors with rising R&D ratios. (see Leo et al. 2006: 24).

The analysis reacts sensitively to the extent to which the lack of detailed data for R&D expenditures and value added had to be aggregated into sectors for individual countries ('lowest common denominator') or the degree to which sectors are identically delimited between data sources (BERD vs. value added). For example, the OECD ANBERD 2006 data lacks several pieces of information at the detailed levels, especially regarding services – particularly at earlier points in time, which makes the analysis more difficult.

---

65 To do this, the most exact classification available was used, wherein single industry branches are broken down into three-digit levels (e.g. aeronautics and space industry), while others are only available as a very vague aggregat (services). Some industrial branches could not even be included in the analysis due to lack of data. All in all, the evluation is based on the following 20 groups of industrial branches (NACE rev. 1.1): Food products, tobacco (15–16), textiles, apparel, leather manufacture (17–19), wood, paper and printing (20–22), coke, mineral oil processing (23), chemicals excluding pharmaceuticals (24x), pharmaceutical products (2423), manufacture of rubber and plastic wares (25), glass, ceramics (26) manufacture of metal products (28), manufacture and processing of metals (27), machinery (29), manufacture of office machines, computers (30), electrical machinery and generators (31), radio, TV and communication equipment (32), medical, precision and optical instruments (33), vehicles, trailers and semi-trailers (34), aircraft and spacecraft (353), other vehicle manufacture excluding aircraft and spacecraft (35x), energy and water supply (40–41), services (50–99).

The results show that the structural effect is less than the intensity effect in Austria and for all other evaluated countries aside from Germany (Table 21). Structural change, then, typically plays a less significant role in the development of R&D ratios than does the intensification of R&D expenditures within the sectors. It is remarkable that Austria, along with South Korea and Germany, is one of the countries where structural change has made a positive contribution to climbing R&D ratios. A further effect is that of the interaction effect, or the structural change in industries with rising R&D intensities (see Box 2). This only contributes positively to increases in the R&D intensity in South Korea. In Austria, although the interaction effect is negative, it is less prominent in international comparison.

Because the degree of detail for the economic branches affects the precision of the analysis, the results were checked by calculating the effects for Austria while including 33 economic branches, the maximum number available.[66] This approach confirms the prior results, albeit the structural effect is stronger (0.249) and the intensity effect weaker (0.556), which was to be expected because of the more exact economic branch classification. The interaction effect increases slightly and changes its sign from negative to positive (0.027).

Table 21: Components of the change in the corporate R&D intensity 1998–2006 in % (selected countries)

	BERD R&D intensity 1998	Difference 2006-1998*	Structural effect	Intensity effect	Interaction effect
South Korea	1.65	1.085	0.402	0.663	0.020
Austria	**1.13**	**0.676**	**0.087**	**0.616**	**-0.027**
Japan	2.14	0.489	-0.134	1.553	-0.930
Germany	1.54	0.320	0.289	0.073	-0.041
France	1.33	-0.012	-0.257	0.385	-0.140
USA	1.92	-0.033	-0.288	0.380	-0.125
United Kingdom	1.15	-0.060	-0.188	0.206	-0.078

Data source: BERD: OECD MSTI (2009); R&D spending in economic branches: OECD ANBERD (2009); Value added at relevant base prices: OECD STAN (2009), * Difference refers to calculations for the shift-share analysis and does not correspond to the difference that is found in the OECD MSTI, for example; calculations by Joanneum Research

66 NACE classes taken into account (rev. 1.1): 15, 16, 17, 18, 19, 20, 21, 22, 23, 24X:, 2423:, 25, 26, 27131:, 27232:, 28, 29, 30, 31, 32, 33, 34, 353, 35x, 36, 40–41, 45, 50–52, 60–64, 65–67, 72, 73, 74, 75–99

4.2.4 Exactly how R&D intensive are Austrian high-tech companies?

The assignment of companies to technology intensity classes is done via economic branch assignment. The OECD differentiates manufacturing sectors on the basis of direct R&D intensity (measured as the proportion of R&D spending in terms of production or value added) and indirect R&D intensity (intermediate inputs) (Hatzichronoglou 1997). The latest classification relies on data for direct R&D intensity for 12 OECD countries during the period 1991–1999 (OECD 2009:32, OECD 2005a: 167ff).[67] It differentiates between four technology intensities. The assignment of economic sectors to these technology classes is found in the appendix.

OECD technology intensity classes

	Median share of R&D expenditure on production
high technology	over 5%
medium to high tech	between 2 and 5%
Medium to low tech	between 0.5 and 2%
Low tech	less than 0.5%).

Source: Hatzichronoglou 1997; OECD 2005b:182f.

For Table 22, manufacturing companies were grouped because of their economic branch into technology intensity classes (OECD classification) and employment size classes on the basis of performance and structural statistics from Statistik Austria. Also, they were assigned to an intensity class that corresponds to their actual R&D intensity (proportion of internal R&D expenditure in terms of turnover). The data basis used here was the R&D survey by Statistik Austria.

In 2007 in Austria, there were almost 29,000 manufacturing companies, approximately 1,400 of which reported internal R&D expenditure. This means that only 5 % of all companies in the manufacturing sector are conducting internal research and development[68] (Table 22). A cause for the low proportion of companies performing R&D is company size: around 74 % of all companies in the manufacturing sector are very small firms with less than 10 employees. Not even 1 % of these companies reported R&D spending. The more employees a company has, the more likely they are to conduct internal research and development: 3 % of companies with 10–19 employees, 10 % of companies with 20–49 employees, 37 % of companies with 50–249 employees, and 74 % of large companies with 250 or more employees, conduct R&D (Table 22). This size effect is also discernible in all technology intensity classes.

67 Recently Eurostat and the Joint Research Center recalculated the direct (based on ANBERG data 1987–2004 für 19 OECD countries and the EU) and above all the indirect R&D intensity (based on input-output data from the year 2000 for 18 countries). Although the classification of the sectors to the various technology classes remains stable, the individual sectors show a different order of average R&D intensity. In addition the following new class boundaries were suggested; they refer however to the total R&D intensity (i.e. the sum of direct and indirect R&D intensity). They are <1 % for low-tech segments, 1 %–2.5 % for low-medium-tech segments, 2.5 %–7 % for medium-high tech segments and over 7 % for high tech. The direct R&D intensity in the high-tech sector was indeed over 7 % (Loschky 2008). If this boundary were used, the share of companies in the high-tech sector in Table 22 and Figure 27 would probably be even smaller.

68 Because it was mandatory for all companies potentially performing R&D in Austria to answer the R&D survey we can assume that hardly any companies performing R&D would remain 'undiscovered'. Nevertheless it is possible that, particularly among the small and new companies, there is a slight under-recording.

Table 22: Proportion of companies in the manufacturing sector according to technology intensity (OECD), size and R&D intensity (2007)

Technology intensity class (OECD)	Size category (Employees)	without R&D	with R&D	R&D intensity (internal R&D expenditure/turnover)			
				0.5%	>=0,5%-<=2%	>2%-<=5%	>5%
High-Tech	**Total**	**89.0**	**11.0**	**0.2**	**1.0**	**1.6**	**8.2**
(Proportion: 7%)	1-9	96.2	3.8	0.0	0.1	0.3	3.4
	10-19	78.9	21.1	0.0	0.0	2.2	18.9
	20-49	63.5	36.5	0.0	5.2	4.3	27.0
	50-249	32.1	67.9	3.7	13.6	14.8	35.8
	250 and over	14.3	85.7	2.9	5.7	20.0	57.1
Medium-High-Tech	**Total**	**85.2**	**14.8**	**1.2**	**4.6**	**4.4**	**4.6**
(Proportion: 12%)	1-9	98.4	1.6	0.0	0.2	0.1	1.3
	10-19	91.4	8.6	0.2	1.8	1.5	5.1
	20-49	73.6	26.4	1.8	7.9	7.1	9.5
	50-249	46.1	53.9	7.0	16.8	19.5	10.5
	250 and over	18.4	81.6	4.3	31.9	25.2	20.2
Medium-Low-Tech	**Total**	**94.7**	**5.3**	**1.2**	**2.0**	**1.2**	**0.8**
(Proportion: 23%)	1-9	99.7	0.3	0.0	0.0	0.0	0.2
	10-19	97.2	2.8	0.3	0.5	0.9	1.1
	20-49	91.5	8.5	0.9	3.4	1.5	2.7
	50-249	63.9	36.1	10.7	14.3	8.5	2.7
	250 and over	24.2	75.8	19.7	31.8	19.7	4.5
Low-Tech	**Total**	**98.3**	**1.7**	**0.6**	**0.7**	**0.4**	**0.1**
(Proportion: 57%)	1-9	99.9	0.1	0.0	0.0	0.0	0.0
	10-19	99.3	0.7	0.1	0.3	0.1	0.2
	20-49	95.7	4.3	0.3	1.9	1.9	0.4
	50-249	77.1	22.9	9.6	8.2	4.2	0.8
	250 and over	39.5	60.5	27.9	22.5	7.8	2.3
All companies in the manufacturing sector	**Total**	**95.2**	**4.8**	**0.8**	**1.5**	**1.1**	**1.4**
(Proportion: 100%)	1-9	99.4	0.6	0.0	0.1	0.0	0.5
	10-19	96.6	3.4	0.2	0.5	0.6	2.1
	20-49	89.2	10.8	0.7	3.5	2.8	3.9
	50-249	62.7	37.3	8.9	12.5	10.0	5.8
	250 and over	25.7	74.3	15.3	27.2	18.3	13.5

The distribution of technology intensity classes shows that only 7 % of all companies in the manufacturing sector belong to the high-tech sector according to their economic branch categorisation, and 12 % to the medium-/high-tech sector. The overwhelming majority, namely 80 %, are found in the low to medium or low-tech sector.

Furthermore, Table 22 demonstrates impressively that the simplified categorisation on the basis of aggregated economic branches (and their average R&D intensity) only reflects reality to a very limited extent and does not do justice to the major heterogeneity in the corporate segment. Thus, for example, 89 % of companies in the high-tech sector actually do not conduct any R&D at all. Only 8 % of companies have an R&D intensity that corresponds to the definition of high technology. In the medium- to high-tech sector, 15 % of companies conduct R&D – more than in the high-tech sector. However, around 40 % of these companies have a real R&D intensity that is somewhat smaller than is to be expected from companies in this technology intensity class.

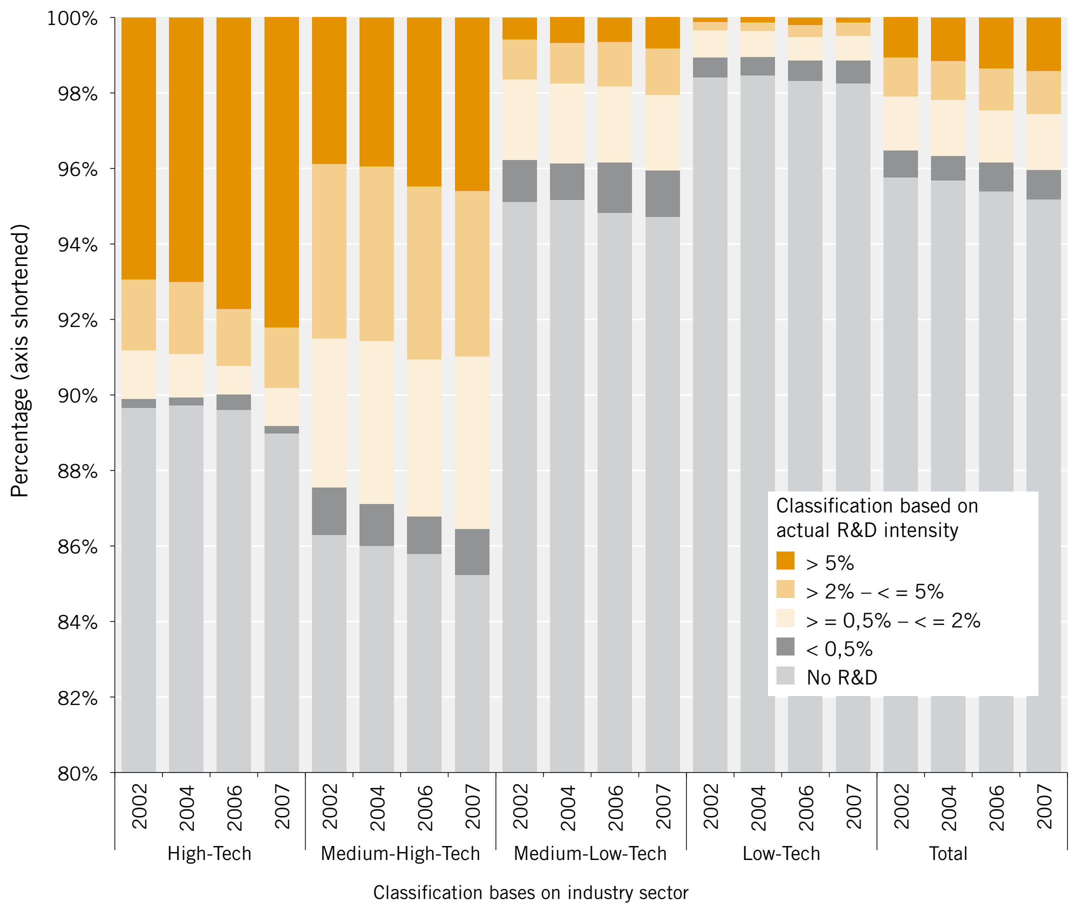
On the other hand, there is a noteworthy share of companies in the low-tech sector that perform intensive R&D: 0.5 % of companies in the low-tech sector (and thereby more than a quarter of all companies conducting R&D in this sector) invest over 2 % of their turnover in research and development. For companies in the medium/low technology sector, the proportions are even higher: 2 % of companies (and thereby 39 % of companies performing R&D) spend more than 2 % of their turnover on internal R&D.

Such 'mis-classifications' between actual and assumed (due to industry affiliation) R&D intensity are of course not limited to Austria only (for Germany, see Kirner 2009, Polt et al. 2009).

Regarding development over time, Figure 27 shows that from 2002 to 2007, the proportion of companies in all technology intensity classes conducting R&D increased, even if only marginally so in the low-tech sector. Growth in the high-tech and middle-high-tech sectors was the most significant. Here, the proportion of companies with high R&D intensity (> 5 %) grew in particular. While 6.9 % of high-tech companies had an R&D intensity of over 5 % in 2002, this proportion increased to 8.2 % by 2007. This proportion increased from 3.9 % to 4.6 % in the medium-high-tech sector.

These (aggregated) results agree with the results of the first shift-share analysis, according to which the rising R&D intensity of Austria's corporate segment was a result primarily of intensification within economic branches, not from a structural change. With the exception of the low-tech sector, all technology intensity classes profited from this development.

Figure 27: R&D intensity for manufacturing companies by technology intensity 2002–2007



Source: Special evaluation of surveys on research and experimental development and of structure and performance statistics 2002-2007, Statistik Austria 2009, calculations by Joanneum Research

4.2.5 Technological policy implications

A technology policy focus on high-tech industries and 'neglect' of low-tech industries is problematic in general (Schibany et al. 2007a), particularly so if this evident heterogeneity is taken into account.

R&D is only one (though still important) source for knowledge intensity (von Tunzelmann and Acha 2005, Hirsch-Kreinsen et al. 2005, 2008), and the low- and medium-tech sectors consistently constitute the largest portion of a national economy in terms of employment and value added. This is why technological renewal in these sectors may be decisive for economic growth (Robertson and Patel 2007). High-tech sectors, in contrast, are responsible for only a small portion of economic activity, but they promise high dynamism and positive effects on other economic areas. However, we must assume an interdependence between the high- and low-tech sectors rather than a one-sided dependency:

On one hand, low-tech companies rely on

rapid diffusion of new technologies from the high-tech sector to maintain their competitiveness and growth, so that the former can pre-empt international competitors with new products, lower costs and improved processes. In order to be able to implement such technologies, however, they must have the necessary technological expertise. Robertson and Patel (2007) empirically prove this assumption by using patents reported by companies with low R&D intensity. Two exemplary cases for this are the increasing utilisation of findings in the biotech sector in the food industry (Robertson and Patel 2007) and the use of nanotechnology in the textile industry (Paschen et al. 2004). A patent analysis by Mendonça (2009) demonstrates that new technological knowledge does not emerge exclusively in the high-tech sector; rather, low-tech companies seem to have played an important role as 'high-tech developers'. Mendonça's conclusion was that "[...] focusing on 'high technologies' is not reducible to sponsoring 'high-tech industries' [...]" (Mendonça 2009: 480).

On the other hand, however, high-tech companies depend on low-tech companies because the latter provide the primary demand for the former's products and innovations. Because the size of the market and the speed and rate of diffusion decide whether and how quickly high-tech companies can amortise their high costs for R&D and achieve effects of scale, low-tech sectors exercise a decisive influence on the expectations of high-tech firms with regard to future profits from R&D investments and, indirectly, on future R&D spending. Also, low-tech companies are often 'lead users' for high-tech products, which, because of the low-tech companies' own R&D efforts, constitute a practical field of application for high-tech innovations. Low-tech companies also contribute to the improvement and broader application of high-tech innovations with their own expansions and feedback (Robertson and Patel 2007). This interdependence between sectors was confirmed empirically by Hauknes and Knell (2009).

Furthermore, (the need for) high-tech incentives as economic stimulus must take into consideration the fact that the output of the high-tech industry is of course not limited by national borders; it is available globally (Robertson and Patel 2007). The situation is made more difficult by the fact that modern business is shaped to an extraordinarily strong degree by international division of labour and spatially disparate chains of value creation (Gereffi 1999, Gereffi and Korzeniewicz 1994) or global production networks (Ernst 2002, Ernst and Kim 2002, Henderson et al. 2002). Often, the international division of labour leads to a pattern in which knowledge-intensive research and development work is conducted in advanced 'industrialised nations'. The results of this work are then transferred to less costly emerging nations for mass production and the generation of scale effects, whether by subsidiaries of (multinational) companies or by outsourcing to suppliers or original equipment manufacturers (see Hobday 1995a,b, 2000). If this is the case, a country may possess high levels of high-tech knowledge, but none of the corresponding domestic value added or employment.

Finally, it may also be important to point out that a high-tech-centred strategy of 'picking winners' is problematic, because "the limits to targeting specific growth sectors may soon be reached because productivity-enhancing knowledge is generated so widely in modern developed economies. Promoting a widespread awareness of new technological possibilities may be every bit as important as developing new technologies" (Robertson and Patel 2007: 720).

4.2.6 Summary

Measured in terms of value added, production and employment, structural change in Austria is proceeding at a speed on par with the international average. The winners of transformation are primarily business activities. But traditional industry sectors such as automobile manufacturing, metal production and machine construction could increase their importance.

In contrast, however, structural changes in R&D spending in the manufacturing sector shows a certain complacency. This exhibits less dynamism than in the countries under comparison. Further analyses accordingly come to the result that the increase in the operative R&D intensity in Austria is caused above all by the fact that companies are expanding their R&D spending within existing activities (economic branches) and not by the fact that they are conducting structural shifts to more R&D-intensive business areas. The R&D intensity in the corporate sector in past years demonstrates, however, that significant increases were possible, even without structural modifications to R&D spending. At the industry level, winners of such modifications are primarily in the knowledge-intensive service sectors (data processing, research and development), trade and machine construction.

The analysis of micro-data, and the comparison of actual and assumed R&D intensity (based on industry classification), impressively illuminates how 'raw' the pattern of this classification is. There are both numerous companies with R&D expenditures within the high-tech sector and a noteworthy proportion of research-intensive companies in business areas of ostensibly low R&D intensity. In fact, the group of medium-to-high and high-tech companies had more significant growth in R&D intensive companies than the low-tech sector. Nevertheless, these results indicate the necessity of more closely observing individual companies and their research performance, rather than relying (only) on the broadly defined classification at the industry level. This is even more relevant as businesses in the allegedly low- and medium-tech industries, acting as producers or users of high-technology, play a major role in the development of these technologies.

4.3 Offshoring and the technological performance of Austrian firms

4.3.1 Background

One of the most important economic trends of the last three decades has been the geographic fragmentation and extension of value-added chains through relocations of production to other countries (also known as offshoring or international outsourcing). Firms are increasingly reducing their vertical integration and are having intermediary products – that were previously produced internally – produced by own or third-party firms abroad.

The extensive foreign investments of Austrian companies during the last 10 years have made offshoring an important topic for economic policy in Austria. The most recent figures from the Austrian National Bank (Dell'mour 2009) indicate that 573,300 persons were employed by Austrian-owned companies abroad in late 2007, most of them in Central and Eastern Europe. The lower wage costs at foreign locations are the most important motivating factor for relocations of production. However, relocations of production are also of an expansive nature when companies attempt to open up new markets through relocations.

The foreign involvement of Austrian companies is not always seen as positive. The public discussion of relocations of production is often dominated by job loss anxieties. While the impact of relocations on labour market policy is discussed intensively, little is known about the consequences of this development for innovation and technology policy.

Based on the results of a company survey, this report examines whether there is a relationship between the relocation of production activities and innovative activity and the technological performance of Austrian companies and whether relocations strengthen or weaken the innovative strength of companies.

4.3.2 Arguments from the literature

Relocations of production, the international expansion of companies and their impacts on employment and growth in the country of origin have been intensively examined in the economic literature (Lipsey 2002; Barba Navaretti and Falzoni 2004). Much less attention has been devoted to the relationship between relocations of production and the development of a company's technological performance. However, the literature does contain several arguments that can also be applied in this connection.

The observation that offshoring and the international expansion of companies are not a zero-sum game but are rather a dynamic growth process suggests a positive correlation (Markusen and Maskus 2001; Lipsey 2002; Markusen 2002; Barba Navaretti and Venables 2004). Offshoring frequently goes hand in hand with capacity expansions, the opening of new markets and accordingly corporate growth. Pfaffermayr (2004) shows, for example, that foreign production activities of expansive Austrian firms are no substitute for domestic production. Foreign activities rather strengthen growth in Austria if the relocations of production are accompanied by an expansion of production capacity.

If companies increase their worldwide sales in the course of expanding, the demand within the corporation for activities such as research and product development, design, marketing, etc. may be significantly increased. Such corporate functions are frequently based at the company's main headquarters, so that the intensity of innovation and technology in Austria rises.

As a consequence of the offshoring, R&D, innovation and also capital-intensive and knowledge-intensive stages of production are concentrated in the country of origin while labour-intensive stages are mainly expanded in low-wage countries. In many cases, relocations of production thus result in a new division of labour within the company. Evidence of such a development is provided by a number of empirical studies documenting that international outsourcing has led to an increase in the share of higher qualifications in the company's overall employment in the country of origin (Egger and Egger 2003; Hansson 2005; Egger and Egger 2006). Similarly, we can assume that the involvement of innovative production technologies was expanded in the country of origin.

The positive correlation between relocations and domestic technology intensity can be further increased by selection effects. The foreign trade literature argues that only the most productive companies expand their activities via direct investments, while less productive firms export, licence or limit themselves to the country of origin (Head and Ries 2003; Helpman et al. 2004). The reason for the higher productivity of companies active abroad lies in their superior resources and intangible assets that are in turn frequently the result of higher R&D and innovation intensity. Internationally active companies are thus possibly more innovative from the start than rivals limited to the home market and therefore also more strongly involved in innovative production technologies.

However, a number of arguments also suggest a *negative* relationship. When modern production technologies have primarily a labour-saving impact, companies can achieve cost reductions more simply by relocating to low-wage countries than by using modern production technologies. As a consequence, the use of these production technologies could decrease, the technological competences of the company in the country of origin could be lowered and accordingly the innovative capacity of the company could diminish.

The second argument for a negative relationship is that the production activities of a company are often an important source of innovations (Leonard-Barton 1992; Von Hippel and Tyre 1995; Pisano 1996). As a consequence, the technological capabilities of a company rise in line with increased production experience. Ketokivi and Ali-Yrkkö (2009, page 50) even describe the possibility of a separation of R&D and production activities as a 'post-industrial myth', especially when it comes to knowledge-intensive industries.

An outsourcing of production activities could therefore also result in weakening a company's innovative capacity if the outsourcing leads to a decline in production activities in the country of origin and learning processes from production activities are interrupted.

In summary, the literature contains arguments that suggest both a positive and a negative relationship between offshoring and the development of a company's technological performance. The primary question here seems to be whether the company can also grow when involved in outsourcing. In the following chapter, we will empirically review the relationship between offshoring and the technological performance of companies based on current data.

4.3.3 Scope of relocations to other countries

The relationship between offshoring and technological capability is reviewed below based on the results of the European Manufacturing Survey 2009. The survey is a collaborative project of the Austrian Institute of Technology and the German Fraunhofer Institute for Systems and Innovation Research (ISI). As part of the survey, 309 manufacturing companies In Austria were interviewed.

Relocations or offshoring are defined as the transfer of parts of the domestic production activities to companies owned by the company or under foreign ownership abroad. Of the companies surveyed, 15 % undertook such a relocation in the years 2007 to mid-2009. In comparison, the offshoring rate of the surveyed companies came to 20.2 % in the period 1999–2006. Of those companies that outsourced between 2007 and 2009, 70 % of them had already taken this step between 1999 and 2006.

The frequency of offshoring increases continuously as company size increases. Approximately 14 % of small companies with fewer than 50 employees are involved in outsourcing, while the number is 40 % for large companies with more than 500 employees. The reason for this is on the one hand that large companies often already have foreign locations and on the other that they have more financial resources to finance the costs of foreign investments and hedge possible risks.

Lower personnel costs are the dominant motivating factor of the offshoring companies, followed by a lack of qualified personnel, the desire for market development and proximity to key customers. The target countries for offshoring are (consistent with the motivating factors) primarily low-wage countries. More than 60 % of the countries mentioned are countries of the EU10+2[69], for example Hungary, Czech Republic, Romania and Poland. However, about one-fifth of the countries mentioned are in the EU15, primarily Germany and Italy, which are not necessarily low-wage countries. At 6 %, the share of Asian countries is significantly lower.

Industries in which offshoring is especially frequent are the automotive industry, machinery and equipment, electronics, and manufacturers of medical, measurement and control technology. In contrast, there were comparatively few offshoring companies in the period 2007–09 in the food industry, textile and apparel industry and other sectors that are normally classified as low or medium technology industries. However, many of these companies already outsourced production activities in the period 1999–2006.

4.3.4 Offshoring and technological performance of companies

The relevance of relocations of production for technological performance can be seen in the industry structure. Offshoring industries are key users of advanced process technologies and are responsible for a significant portion of the R&D expenditures of the Austrian corporate sector. It is therefore important to understand the differences between companies that have relocated parts of their production and those that have not done any offshoring.

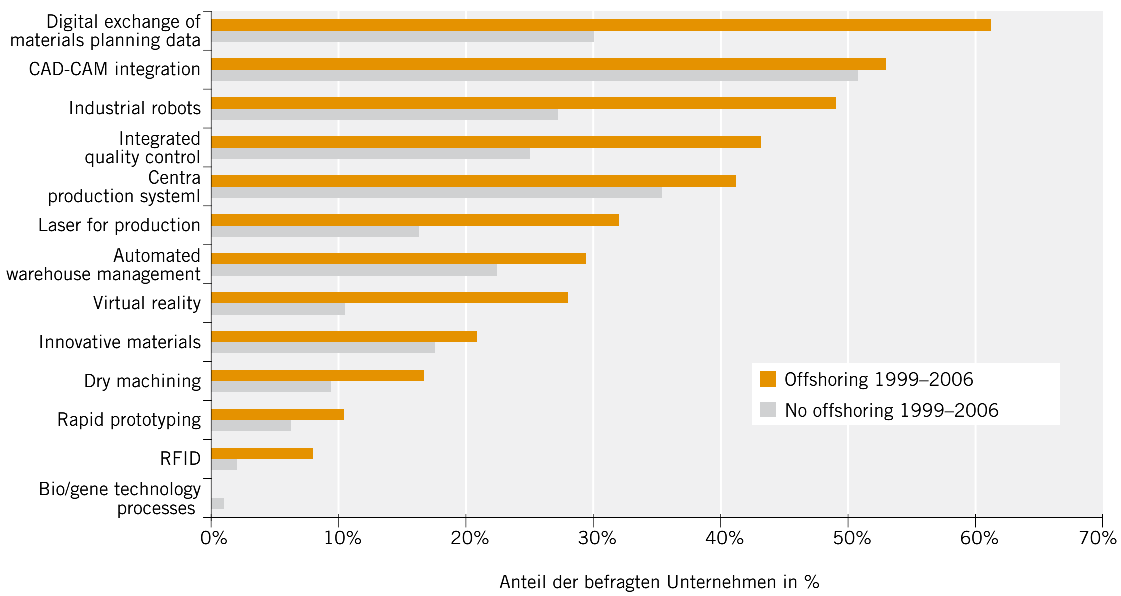
First, the differences between offshoring and non-offshoring companies in the diffusion of various production technologies in 2009 will be investigated. Diffusion is measured based on the proportion of companies using a specif-

69 The countries of the last and next to last round of accessions.

ic technology. The reference period for offshoring is 1999 – 2006. All technologies investigated (except one) have a higher diffusion in companies that have done offshoring in this period (Figure 28).

The differences in the rate of diffusion of the particular technology between offshoring and non-offshoring companies are significant in five of 13 cases at a maximum 10 % margin of error. Significant differences are found, for example in the use of industrial robots, the digital exchange of materials planning data or the use of lasers in production. All three technologies are associated with instances of offshoring; the digital exchange of materials planning data supports the integration of the supplier network, thus making it possible for production to be distributed to several locations Lasers and industrial robots are used, for instance with the objective of increasing the flexibility of the production process and being able to respond rapidly to changes in demand (Kleine et al. 2007). Their increased use is accordingly an indication of the flexible specialisation of activities in the country of origin.

Figure 28: Rate of diffusion of various production technologies in companies with and without relocations of production, 2009



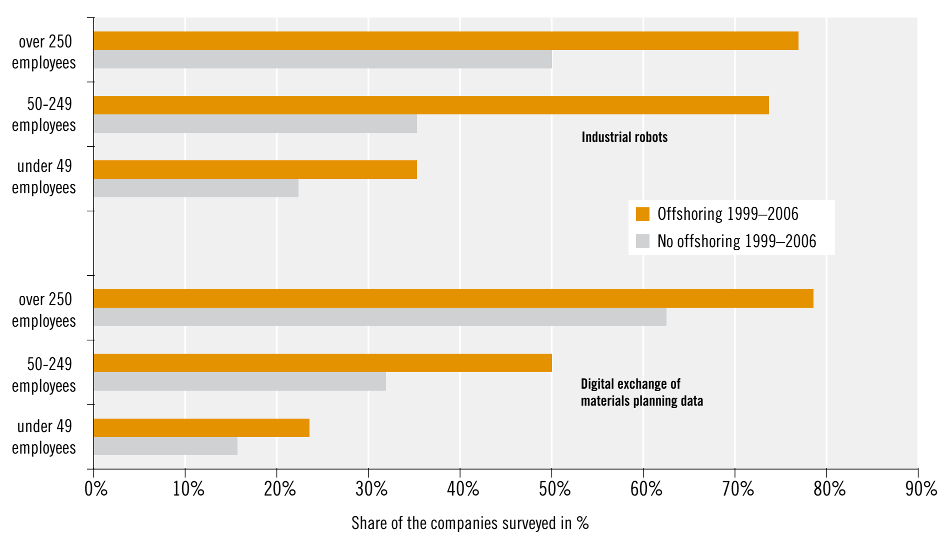
Source: EMS Survey Austria 2009, Austrian Institute of Technology

A comparison of the first use of various technologies points out additional significant differences between both groups. Offshoring companies employ various production technologies not only more frequently but also earlier. The difference between both groups is on average several years. On average, offshoring companies used industrial robots for the first time in 1996 while non-offshoring companies on average did not make such an investment until 2001. Similarly large differences are seen in rapid prototyping, CAD-CAM integration and innovative materials. The head start of offshoring companies is significantly less in laser technologies, automated warehouse management and production control systems.

However, when interpreting this, it should be considered that technologies such as lasers, industrial robots and production control systems are costly, capital-intensive capital goods that are typically used more frequently by large companies. The relationship between relocations of production and use of technology is therefore (at least in part) caused by company size and not brought about by the decision to relocate.

Figure 29 shows this relationship based on two of the technologies investigated. The figure compares the rate of diffusion of industrial robots and of techniques for the digital exchange of materials planning data between offshoring and non-offshoring companies in different size categories. The two technologies are widely disseminated in all size categories among offshoring companies. In addition, the influence of company size on the diffusion of the technologies can be seen. The percentage of companies that use these technologies is higher in the size category of more than 250 employees than in the size category of 50 to 249 employees, which in turn has a higher percentage than the size category of 49 and fewer employees. The differences described above between offshoring and non-offshoring companies can thus also be traced in part to company size.

Figure 29: Diffusion rate of industrial robots and technologies for the digital exchange of materials planning data in companies with and without relocations of production in 2009, various size categories



Source: EMS Survey Austria 2009, Austrian Institute of Technology

The assumption that the relationship between investments in modern production technologies and offshoring is influenced significantly by company size can be tested additionally using a regression analysis for all technologies. It is seen that for six of the 13 technologies, a significant correlation exists between a positive decision to relocate between 1999 and 2006 and use of technology. If we expand the model to include number of employees as an independent variable, only three of the 13 technologies display a significant relationship between offshoring and use of technology that goes beyond company size (Table 23). In addition to company size, the sector presumably also has a significant influence on the relationships investigated here.

Table 23: Results of the regression analysis between use of technology, company size and the decision to relocate, significance of the coefficients

	Model 1	Model 2	
	Offshoring 1999-2006	Number of employees	Offshoring 1999-2006
CAD-CAM integration			
Industrial robots	***	***	
Integrated quality control	**	***	
RFID	*	*	
Automated warehouse management		***	
Lasers	**		*
Dry machining		**	
Rapid prototyping		***	
Bio/gene technology processes			
Innovative materials			
Digital exchange of materials planning data with customers and suppliers	***	***	***
Centralised production control system		***	
Virtual reality	***	*	**

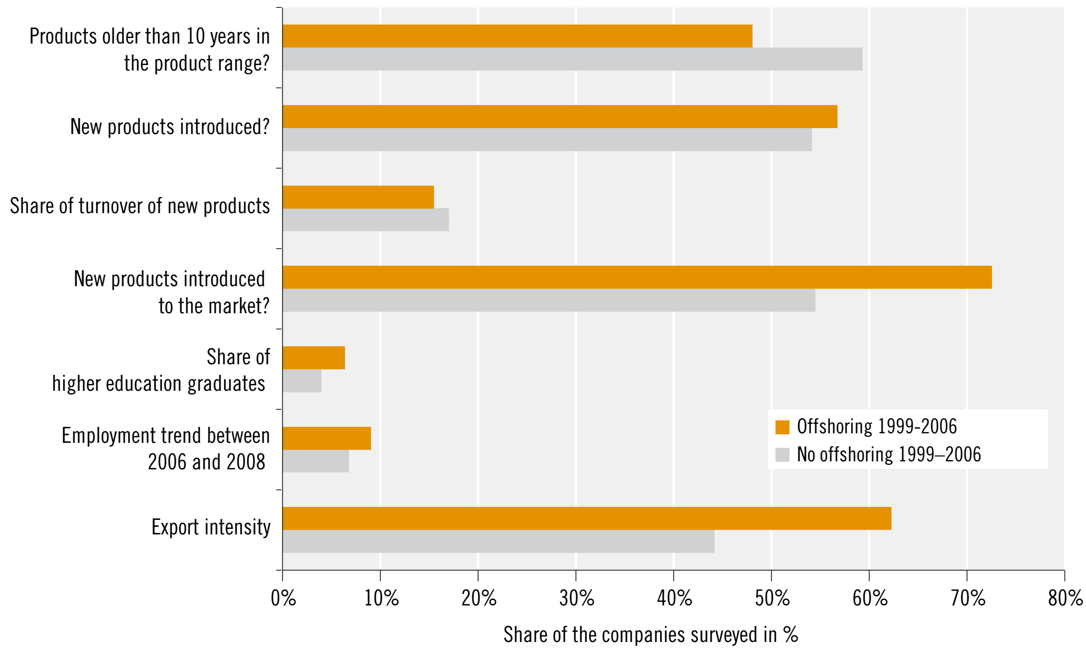
Model 1: Probit regression with the use of various technologies as a dependent variable and the relocation decision of 1999–2006 as an independent variable. Model 2: Probit regression with the use of various technologies as a dependent variable and the logarithm of the number of employees and the relocation decision of 1999–2006 as independent variables.

Source: EMS Survey Austria 2009, Austrian Institute of Technology

Significant differences between offshoring and non-offshoring companies are also seen in other innovation-related and technology-related variables (Figure 30). Companies that have implemented offshoring launch new products to the market more frequently, more rarely produce products that have been in their product line longer than 10 years and employ more university graduates.
These results are in line with other empirical studies that document a qualitative change in the company towards a more highly qualified workforce and more innovative activities at the main headquarters as a consequence of relocations of production and international expansion. The offshoring companies frequently focus on more highly qualified responsibilities such as the development of new products, marketing and other service activities or more capital-intensive production steps.
Finally, the expansive nature of offshoring is also reflected in the circumstance that companies that outsourced production activities between 1999 and 2006 grew faster between 2006

and 2008 than companies that did not outsource. An explanation for this could be the stronger tendency of offshoring companies to innovate which compensated for the employment losses of the offshoring due to faster growth of the business and accordingly higher employment growth as a whole. This effect could have been intensified by a higher tendency to export and a higher educational level of the employees, both of which can be found to a greater extent in offshoring companies.

Figure 30: Indicators of innovative behaviour of companies with and without relocations of production in 2008



Source: EMS Survey Austria 2009, Austrian Institute of Technology

4.3.5 Summary

During the past years, Austrian corporations have been relocating production activities abroad to a substantial degree. However, these relocations have not had an adverse impact on the country's technological performance. To the contrary, outsourcing companies invest more frequently in modern production technologies and on average make these investments earlier than companies that do not outsource production activities. Furthermore, outsourcing companies employ a higher number of university graduates and launch new products to the market more frequently. Despite offshoring, employment in offshoring companies has grown more rapidly in the years 2006–2008.

These results can be explained in part by company size. But there is also a relationship between offshoring and technological performance, which goes beyond size. Explanations for this relationship include a higher productivity of internationally active companies and changes in the internal division of labour within the companies in the course of the international expansion.

The correlation between innovation, company growth and relocations of production is an indication that internationalisation should not only be seen as a threat but also an opportunity for Austria as a place to do business. Companies can safeguard their Austrian production sites through foreign activities and perhaps even expand them if complementarities between domestic and foreign production are made use of and the resulting market opportunities are seized.

4.4 Determinants of innovation behaviour among Austrian construction firms

The construction sector differs profoundly from other industries in terms of its innovation opportunities and types, while within the construction industry there are major differences as well (for example, between construction companies and construction suppliers). On the other hand, the construction sector is often perceived as less innovative and technologically backward. This can be attributed to poor values for the indicators traditionally used to measure innovation (i.e., R&D intensity, patents, etc.), especially in comparison to other industries.

Innovation, however, is on one hand a decisive mechanism for increasing productivity and the (corporate) growth associated with it; on the other hand, it is a very complex process that is not limited to the invention of new products or processes. Whether a company is innovative or can be at all depends on a broad range of factors. This chapter is based on a study by Unterlass (2009) that permits initial insights into the interaction of innovation-relevant factors and their influence on the innovation behaviour of construction companies in Austria. The study, however, only offers a glimpse of the complexity of innovation processes. Because of the state of the data, the analysis concentrates on factors that influence the likelihood of whether or not a company will introduce new products or processes. It does not, however, make any statements about economic success or failure, or the economic significance of innovations.

4.4.1 The significance of the construction industry in Austria

Within the Austrian national economy, construction plays a very important role. As is clear from Table 24, approximately 10 % of employees in Austria were employed in construction in 2007[70]. This number only includes those construction industries that are categorised as construction under the standard classification (NACE code). If, for example, we were to include construction material production or the housing industry, the share of construction industries would be even higher. The number of construction companies comprises somewhat more than 9 % of all companies, and they account for approximately 5.5 % of turnover in the Austrian national economy.

70 The current numbers on innovation are only available for 2007.

Table 24: The Austrian construction industry in inter-industry comparison, 2007

		All sectors	Manufacturing	Electricity, gas and water supply	Construction	Corporate services sector
Employees	Total	2,611,293	638,050	30,537	261,861	1,674,688
	in R&D	36,988	25,741	65	181	10,859
	Share	1.42%	4.03%	0.21%	0.07%	0.65%
companies	Total	294,099	28,844	1,595	26,965	236,350
	R&D	2,521	1,391	23	71	1,005
	Share	0.86%	4.82%	1.44%	0.26%	0.43%
Gross value added*	in € 1,000	162,797,470	48,323,431	5,690,304	13,641,828	94,274,383
Spending on R&D	in € 1,000	4,845,861	3,383,191	8,755	19,900	1,414,632
R&D / gross value added	Share	2.98%	7.00%	0.15%	0.15%	1.50%

Source: Statistik Austria, Performance and Structural Statistics 2007, or Survey on Research and Experimental Development 2007; * – not including VAT;

From the perspective of innovation, construction plays a relatively minor role in terms of statistical NACE classification. Only about 0.4 % of total Austrian R&D spending is invested in construction. This corresponds to only 0.15 % of gross value added, while, for example, the comparable ratio for manufacturing is about 7 % and is on average almost 3 % for all sectors. The number of companies that are actively pursuing research and development is also comparatively low. While only 0.26 % of construction companies perform R&D, the figures for service providers and manufacturing are 0.43 % and 4.82 % respectively. The statistics on innovation activities in the construction industry do not comprehensively reflect the industry's significance in the Austrian national economy.

4.2.2 Peculiarities of innovation in construction

The literature on innovation focuses its approach on manufacturing, while other sectors, such as services, are only now becoming important for innovation research. Therefore, concepts of innovation, innovative behaviour and especially types of innovation, are all adapted to the characteristics of manufacturing. Construction, however, deviates strongly from manufacturing. Therefore it is difficult to apply to the construction industry concepts proven in manufacturing. For example, in biotechnology, a great deal of money is invested in research laboratories, and patents are registered; in construction, this is rarely the case. In comparison to other sectors, the construction sector exhibits a relatively low level of innovation intensity, as Table 24 shows for Austria, or Cleff and Rudolph-Cleff (2001) for Germany.

The following special features of construction, in terms of the industry's innovation behaviour, are found in the scientific literature:

- Maturity: after significant developments in the past, the construction industry is developing primarily through incremental improvements (learning by doing) at this time (Sturges, Egbu and Bates, 1999).
- Internal heterogeneity: the individual branches of construction differ powerfully from one another in their modes of innovation (as well as in their innovation performance) (Bowley 1962).
- Statistical distortion: construction-specific repair and maintenance are statistically counted for construction, but not construction material supply or manufacturing; these are distributed instead to various manufacturing sectors. On the other hand, in the automobile industry, for example, auto repair shops are classified separately from auto production. Repairs of existing vehicles, however, tends to be much less innovative than the manufacture of new products, as old technology is only replaced with old technology (Winch 2003).
- Interruption of learning processes: In construction, configurations and construction sites in which construction companies work with installers, etc., are constantly changing. The construction sector in most countries is primarily dominated by several small companies, which rarely leads to one construction firm building an entire project. Most of the time, a principal contractor issues sub-contracts to specialised partner companies, such as installers (Anderson 2005, Barlow 2000, Blayse and Manley 2004, Dubois and Gadde 2002, Gann and Salter 2000).
- Durability of buildings: on one hand, the fact that construction projects are meant to have a long life weakens impulses for innovative experimentation. On the other hand, it is difficult for companies that have previously been successful in terms of innovation to convince their project partners of the sense and advantage of something new, particularly whenever the final assessment of such innovation is only possible years later. Aspects such as the speed of wear and tear, etc., are not immediately visible (see Blayse and Manley 2004).
- Dependence on innovative outlays by other industries: for example, developments in machine construction have had major effects on the earth-moving machines used in construction (see Tatum, Vorster and Klingler 2006, Arditi, Kale and Tangkar 1997).

4.4.3 The innovation behaviour of Austrian construction companies

The foundational study by Unterlass (2009) is based on a July 2008 WIFO survey on the topic of innovation and sustainability in Austrian construction. 200 companies in construction and construction-related industries (suppliers, planners, housing industry, materials producers) participated in a telephone survey. In its analysis, the study distinguishes between three types of innovation: (i) product innovation – the introduction of a new or significantly improved product or service to the market;

(ii) technical process innovation – the introduction of new or significantly improved processes for the production of goods or service delivery; and (iii) management innovations – the application of new or significantly changed corporate structures or management methods for the optimised exploitation of knowledge, or to increase the efficiency of workflows in the company. The empirical results of this study are presented in the following.

Table 25: Innovators by construction sector

	Innovators						Total
	Product		Techn. processes		Sales processes		
Construction planning	9	(64.29%)	5	(35.71%)	7	(50%)	14
Construction supply	53	(65.43%)	51	(62.2%)	42	(51.85%)	81
Building construction	37	(50%)	28	(37.33%)	33	(44.59%)	74
Property development	14	(63.64%)	15	(68.18%)	10	(45.45%)	22
Other	2	(33.33%)	5	(71.43%)	2	(33.33%)	6
Total	115	(58.38%)	104	(52%)	94	(47.72%)	197

Source: WIFO survey, WIFO calculations; the percentages are derived from the number of innovators within each construction sector as a share of the total number of companies (in the 'total' column) within each sector. The line totals (excl. total) do not result in the total number of companies (total), because a company can exhibit multiple types of innovation at the same time.

Number of innovators in construction

According to the literature, construction is stigmatised as lacking innovation because of the low number of innovators and low innovation spending. In Table 25, innovators are itemised as a portion of the total population in the construction industry. The comparison with the services and manufacturing segments does not correspond to the picture painted by the literature. The sample drawn here from the Austrian construction industry includes over 58 % product innovators, while comparable figures from the innovation survey of 2006 (see Statistik Austria 2008, 56) were 38.4 % for manufacturing and 33.9 % for services.

The result, however, is only conditionally comparable to the existing literature or other statistics (see Table 24), which build upon standardised sector classifications. The literature is directed at the construction sector in its form as a statistical unit (corresponding to the NACE classification). In this study, however, relevant areas are included for analysis, even though these areas are typically assigned statistically to manufacturing or the services segment. This applies especially for construction suppliers, but companies engaged in building construction also have a relatively high proportion of innovators (50 %) working on product innovation. This result, however, makes no claims with regard to the degree or intensity of new products, nor about the amount of investment in innovation.

Competition as an incentive for innovation

Competition is one of the central reasons why companies innovate. Regardless of the industry, the innovation literature assumes that competition is a fundamental prerequisite that motivates companies to assume the costs of innovation projects in the first place. This is also the case in the Austrian construction industry. Companies that report that they can improve their competitiveness through innovation activities are also more likely to be innovative than comparable companies. On the other hand, too much competitive pressure reduces the incentives for investing in innovation. The likelihood that an Austrian construction company is innovative decreases by two-thirds as soon as the company believes it is under too much competitive pressure. The results appear therefore to suggest that competition in Austrian construction is an important incentive for innovation, as long as competition is not too fierce. Extreme competitive pressure turns the incentive into a disincentive.[71]

Developments in the primary sales market provide stimuli

Developments in a company's primary sales market influence the incentives for investing in innovation. If a company finds itself in a growing primary sales market, it is more likely to invest in the costs of bringing innovation projects to market in a profitable manner. This also applies to the construction industry. In all three types of innovation, in product and process innovation as well, companies whose primary sales market is growing are more likely to introduce new products or processes. In comparison to companies in a stagnant primary sales market, the likelihood that a company will be innovative is twice as high.

On the other hand, a shrinking primary sales market can also positively affect innovation behaviour. Austrian construction companies that are confronted with a shrinking market attempt to reduce their costs with management innovations to remain competitive. Therefore, the probability that a company will be innovative in terms of management innovations increases whenever the company encounters the pressure of a shrinking market.

A larger sphere of action increases the probability of innovation

While innovation in the manufacturing and service sectors does not depend on their geographical orientation, for all three types of innovation in the construction sector, companies with a larger sphere of action (meaning a national to international orientation) are more likely to engage in innovation than those that are locally oriented. On the other hand, production industry firms and service providers that are part of a multinational corporation are more innovative than comparable Austrian companies. With one exception (management innovation), this does not apply in the construction sector, though. Furthermore, company size, measured in terms of the number of employees, has no influence on the probability that a company will innovate.

71 This result agrees with what Aghion and others found (2005), that there is a relation between competition and innovation. In their terminology they speak of an inverse U-shape, where the positive effect of rising competition turns around negatively when the competition is too high.

Company strategies play a central role

According to economic theory, entrepreneurial capabilities and organisation structure are key determinants for a company's innovation performance. This is confirmed in the empirical results provided here for corporate strategy. Those construction companies that actively strive to stay technologically up-to-date, and independently attempt to introduce new products, services and/or processes, are more likely to achieve this aim. On the other hand, passive companies that only react to the behaviour and developments of their competitors are significantly less innovative with their products. This only applies to a limited extent for process innovation. Simply having an active strategy for introducing new processes and behaviour is also correlated with an increased likelihood that new processes will be introduced.

Public funding and regulation increase the probability of innovation

The empirical results of Unterlass's study (2009) show a positive correlation between legally prescribed norms and the probability of process innovation in the construction industry. Ceteris paribus, companies whose sphere of activity is influenced by legal norms are three times more likely to be innovative than those companies that remain uninfluenced by such norms. For product innovation, however, there is no significant correlation.

Furthermore, Austrian construction companies that do not use public subsidy instruments for innovation are less innovative. This applies for all types of innovation, although the effect on product innovation is articulated most. Without funding, the probability of successful innovation decreases to one-fifth. For product innovation, research tax allowances or research premiums, as well as direct funding, have a strong, positive effect on the likelihood of innovation, and in many cases funding made innovation possible in the first place or expanded the scope of projects

Cooperation has positive effects on innovation in the construction industry

Cooperation tends to have a positive effect on innovation probability among construction companies. There are sometimes major differences between the individual types of innovation for which cooperation partners make positive contributions. While working together with competitors correlates positively for product innovation, technical process innovation correlates positively for competitors, subsidy-granting institutions and management innovation, for consulting firms. In contrast, companies that work with consulting firms are less likely to engage in technical process innovation, and those that cooperate with private research institutions are less likely to create new sales processes. Integration in research projects of any type has a particularly positive correlation with management innovations. Among companies that are not engaged in cooperative ventures, the probability of introducing new sales processes is only two-fifths of the comparative figure for those companies that at least have one cooperation partner. All in all, the positive correlation of cooperation on one hand and innovation performance on the other cannot be confirmed in general, but some cooperation partnerships create quite positive effects.

Weak evidence for dependence on innovative outlays

In the literature, a predominant thesis holds that construction is dependent on innovative achievements from other industries. In the study by Unterlass (2009), the indicators used to assess this thesis include spending on external R&D, the purchase of machines and resources, the acquisition of external knowledge and the role of suppliers as cooperation partners or as sources of innovation. Overall, the study's results only weakly suggest a confirmation of the hypothesis. Externally conducted research and development activities raise the likelihood of innovation for innovation in products and technical processes. The purchase of machines and resources has no statistical correlation with product innovation probability, but it does double the likelihood of process innovation. The results for the three other variables are insignificant. The estimated results for these individual variables even run counter to the thesis.

Major differences between innovation types, but also between individual construction sectors

Lastly, the correlations between influential factors and the innovativeness of Austrian construction companies vary widely, depending on the type of innovation as well as the construction sectors themselves. A glance at innovation activities, for example, reveals that successful product innovation has a significantly positive correlation with internal company R&D spending, and is very closely related to the external awarding of R&D orders. Technical process innovation is also positively correlated, though to a lesser extent, with externally awarded R&D contracts, the purchase of machines or resources, product design measures or participation in research networks. Sales process innovation, however, depends on continuing education measures and the purchase of machines, and to a lesser degree on internal R&D and product design projects.

The differences between the individual construction sectors are also seen in the proportion of innovative companies within the total number of construction companies. As shown in Table 25, there are major differences between the construction sectors. In general, it seems that companies engaged in construction have comparatively low proportions of innovators, while construction supply firms have the largest share of innovators.

4.4.4 Summary

Unterlass's study (2009) provides the first insights into the determinant factors of innovation behaviour among Austrian construction companies. We assessed the influence of diverse, innovation-relevant factors on the probability that a construction company will be innovative or not. Current hypotheses in the literature on innovation were analysed and expanded to include specific conditions from the construction industry. The results of the study are displayed in tabular form in Table 26.

Table 26: Summary of the estimated results

Type of innovation	Basic equation														Innovation activities								Personnel management				
	Percentage of university graduates	Company size (Employees)	Growing primary sales market	Shrinking primary sales market	Multinational corporate group	Primary sales markets: regional	Primary sales markets: national	Primary sales markets: international	High competitive pressure	Competition in conditions	Competition in products and processes	Improvement of competitive position	Construction supply and materials production	Planning, real estate development	Internal R&D	External R&D	Acquisition of machinery and equipment	Acquisition of external knowledge	Continuing education measures	Product design	Research networks	Other	New hiring of specialists	Measures for finding, promoting and retaining	Continuing education measures	Development of own ideas	Establishment of interdisciplinary project teams
Product			+		(+)	(+)	+++	+++	--	++	+	++	+	+++	++	+++	(+)	(-)	(-)		(+)	+++	(+)	--		(-)	(+)
Techn. processes	(-)	(+)	+	(+)	(+)	(+)	(+)	++		(+)	(+)	(+)	(+)	(+)	(+)	++	+	(-)		+	+	+++	+		+	(+)	(+)
Mgmt. processes			+	++	+	+	+++	(+)		(-)		+			+		++		++	+	(+)	+++	(+)	(+)	+	+	(-)

Type of innovation	Research funding						Obstacles to innovation													Corporate strategy							
	Research tax allowance / Research premiums	Direct funding	Enabled project start	Enabled project expansion	Increased technological demand	No funding instruments	High financial risk	High innovation costs	Lack of financing sources	Organ. problems within the company	Internal resistance	Lack of qualified personnel	Lack of technological information	Lack of market information	Regulatory framework, norms	Lack of customer acceptance	Long administrative procedures	Search for partners	Market dominance by established companies	Technological leadership	Cost leadership	New products / services	Customised solutions	New processes/systems	Reaction to competitors	Individual market segments	Alliances
Product	+++	+++	+++	+++		---	+	(-)	(-)		(-)	(+)	(-)	+++	(-)	(-)	(-)	(-)		+	(+)	+++		+++	--		(-)
Techn. processes				(+)	+++	-	(-)	(-)	--	(-)	(-)	++	(-)	(-)	++	--	(-)	--		(+)	(-)	(-)	(+)	+++	(+)	(-)	(+)
Mgmt. processes				+++	(+)	-	(+)	(-)	(+)	(-)	(-)	(+)	(-)	(+)	++	--	(+)	(-)	(-)	(+)		(-)	(+)	+++	(+)	(+)	(-)

Type of innovation	Sources of innovation											Information channels				Cooperation partners										
	From the company itself	Suppliers	Customers	Ordering client	Competition	Cooperation partners	Consultant	Public research institutions	Private research institutions	Funding institutions	Associations and chambers	Conferences, trade fairs	Technical literature	Personal contacts	Internet	Suppliers	Customers	Ordering client	Competition	Cooperation partners	Consultant	Public research institutions	Private research institutions	Funding institutions	Associations and chambers	None
Product	--	(-)		(-)	(-)	(+)		+++	(+)	+++		(+)	(+)	(+)	(+)	(-)	(-)	(+)	++	++	(+)	(+)	(-)	(+)	(-)	--
Techn. processes	(-)	(-)		(-)		+	(-)	(+)	(+)		+++	(+)	(+)	(+)	+	(+)		(+)	+++	(+)	--	(+)	(-)	+++	(+)	-
Mgmt. processes	(+)		(-)		(-)	(-)	+	(-)	(-)	(-)	(+)	(+)	(+)	(+)	++	(+)		(+)	(+)	+	+++	(+)	--		(+)	--

Source: WIFO-Survey – WIFO calculations; +++ / --- … very strong, significantly positive / negative correlation; ++ / -- …strong, significantly positive / negative correlation; + / – … significantly positive / negative correlation; (+) / (-) … insignificant, yet still positive / negative correlation;

The core findings can be summarised as follows:

- The analysis identifies major differences, sometimes extreme, in the correlations between the analysed factors and innovation likelihood among companies. This applies for the comparison (i) of the construction industry with the manufacturing and services segments, (ii) of different construction industries, and (iii) the individual types of innovation within the construction industry.
- Competition that is too intense reduces incentives for investing in new products and processes. An active corporate strategy for technology leadership as a reaction to competition is particularly important for successful product innovation.
- Positive future prospects in a growing primary sales market correlate positively with all kinds of innovation, while a shrinking market correlates with increased management innovation.
- The greater the company's sphere of action (international versus local orientation), the more likely that the company will engage in successful innovation.
- Public funding increases the likelihood of successful innovation in every form. Process innovation seem to be a by-product of funding that is focused on product innovation. Regulation (legal minimum standards) increase the likelihood that a construction company will introduce new processes.
- Company size, measured by the number of employees, does not correlate with the innovation probability. The number of academics in a company also seems to be irrelevant.
- The number of innovators in the sample is quite remarkable in comparison to other industries. We must take into account, however, the relatively small sample size as well as the inclusion of companies that statistically are not assigned to construction (NACE classification), but rather to the manufacturing and service segments. This says nothing about the extent or intensity of new developments, but merely about whether a company innovates or not.
- Research cooperation agreements have different effects on individual types of innovation, depending on the type of cooperation partner.
- The results appear to confirm the construction industry's dependence on the innovation achievements of other industries.

5 Education and Innovation

5.1 International comparison of the mobility of a highly qualified labour force

In modern knowledge societies, whose primary sources are the local advantages in innovation and technological progress, the mobility of a highly qualified labour force is one of the most important determinants for competitiveness. Because a large proportion of non-codified knowledge cannot be protected by copyright and is intrinsically linked to highly qualified labour force, the mobility of this labour force automatically leads to a knowledge transfer (Almeida, Kogut 1999, Hoti et al. 2006, Kaiser et al. 2008 for empirical evidence). From the perspective of an individual company (or even a region), this can be both an advantage and a disadvantage, because on the one hand the knowledge basis of a company (or a region) is reduced by the emigration of qualified employees, while on the other hand it can be strengthened by the immigration of persons bearing such knowledge.[72] From the perspective of the economy as a whole, however, recent research results indicate positive effects on competitiveness resulting from the mobility of knowledge carriers (Saxenian 2000, Fallick et al. 2005).

The question of whether this mobility, particularly international mobility, is predominantly advantageous or disadvantageous for a specific country, however, depends not only upon mobility balances, but also on the structure and type of immigration and emigration. For example, temporary emigration of highly qualified workers can definitely lead to a gain in competitiveness on the part of the home country if these temporary emigrants make use of the capabilities and information that they have gained upon return to their homeland. Similarly, even permanent emigration can lead to an increase in competitiveness if the emigrants function as "anchor persons" for domestic knowledge networks, thus facilitating or accelerating knowledge transfer into the home region. The advantages of highly qualified immigration for the host country also depend upon whether and to what extent the host country is able to assimilate and use the knowledge intrinsically linked to the emigrants, and adapt it to local circumstances if necessary.

Against this background, this chapter will examine the mobility of human resources in sciences and technology in Austria, and will compare it with that found in other EU countries. The data basis for this study is the European Labour Force Survey (ELFS) for 2007.

72 cf. Zucker, Darby, and Torero (2002), Moen (2005), Almeida et al. (2003), Song et al. (2003), Hunt and Gauthier-Loiselle (2008), and Hierländer et al. (2009) as empirical evidence for the positive effects of highly qualified immigration on various determinants of competitiveness of the recipient countries.

Firstly, the change between industry sectors[73] will be studied, as well as the transnational changes in employment. Secondly, the mobility of these two groups will be compared with those of the remaining labour force. We will show how intersectoral and geographical mobility varies between these groups depending upon sex, age, nationality, skill level, and industry sector.

When the term "Human Resources in Science and Technology" (HRST) is defined by education (HRST-EDU) it includes all persons with a tertiary education (ISCED 5 or 6[74]), and when it is defined by profession (HRST-OCC) it includes all persons who work either in academic professions (ISCO 2[75]) or as technicians and in equivalent professions (ISCO 3[76]). In principle, these definitions by education and profession overlap, since the type of education is a prerequisite for certain professional groups. However, there is no guarantee that a person with a tertiary educational certificate will fulfil the criteria of HRST, nor does the classification by professional group include only the group of the persons assigned to HRST. In its narrowest definition (HRST-Core), however, this term includes only persons classified as HRST based upon the criteria of both education and profession. Thus this term can also be used to analyse the mobility of persons with higher educational degrees (through differentiation by education – HRST-EDU).[77] At the same time, this delimitation also offers the option of extending the definition of highly qualified workers by means of their profession (HRST-OCC) and ultimately basing it upon a more narrowly defined group (HRST-Core), in which a closer association with the country's research performance can be assumed than in the other two definitions.

5.1.1 Data

The source of data for this chapter is a special tabulation of the 2007 ELFS, which was provided by EUROSTAT (IDEA Consult 2010, for a more detailed presentation of the data set). The ELFS is a survey among households in the EU 27 countries. It presents detailed data on the industry sectors and residences of the surveyed workers, regarding residence (at the level of EU countries) and/or of industry sectors of employment (at NACE 1-digit level),

73 At the level of NACE 1-letter classification: A – Agriculture and Forestry; B – Fishing and Fisheries; C – Mining, Quarrying, Mineral Extraction; D – Manufacturing; E – Energy and Water Supply; F – Construction; G – Retail; H – Hotels and Hospitality; I – Transport and Communications; J – Banking and Insurance; K –real estate, renting, performance of business-related services; L – Public Administration, National Defence, Social Security; M – Education; N – Healthcare, Veterinary and Social Services; O – Other Public and Private Services; P – Private Households; Q – Extraterritorial Organisations and Associations;

74 The ISCED classification subdivides the educational system into categories based upon level of education. ISCED 5 includes all studies at universities and schools of applied sciences (Bachelors, Masters, Post-graduate) as well as complete courses of study at academies, colleges, and pedagogical universities. These subject areas require a matriculation examination. In addition, building craftsmen schools and industrial master schools are classified in ISCED 5. ISCED 6 covers all doctoral studies.

75 The ISCO classification allocates professional groups according to their tasks and functions. ISCO 2 covers all professions that contribute to the expansion of knowledge, which apply scientific or artistic theories and concepts, or which give instruction in the specified fields. In principle, completion of a secondary education is a prerequisite for this group of professions.

76 ISCO 3 covers technical and equivalent professions that performed primarily technical tasks related to research or the application of scientific or artistic concepts and methods. This group requires a secondary education.

77 This also enables comparability with studies on the mobility of highly qualified workers in Europe.

as well as the labour market status (by ILO definition[78]), in the year prior to the survey for all persons surveyed.

This data set therefore offers a complete picture of the industry sector and/or transnational mobility of the surveyed labour force in the EU. The LFS is a random sample survey, however, in which smaller sample sizes in the surveyed group can lead to significant random fluctuations. For this reason, EUROSTAT specifies a limit for each national LFS below which the random sample size must be considered too low to permit reliable statements. For this reason, it is recommended that such values not be reported. This study follows that suggestion. Thus values for which a higher random sample error is to be expected are shown in brackets throughout, which is also in accordance with the EUROSTAT suggestions.[79]

The data set used also has other limitations. These are due to missing information. In the national LFSs for Ireland and Bulgaria, the retrospective information on positions held one year earlier is missing, and in the Swedish survey, more than 25 % of the persons surveyed do not answer this question. These countries are therefore excluded from the study. In addition, 0.4 % of the persons questioned in the entire survey do not make any statement regarding their current profession, and 0.2 % fail to state their highest completed level of education.[80] Because these population groups cannot be defined in terms of their status as HRST, these persons were excluded from the study. This results in an exclusion of approximately 0.5 % of the total observations.[81]

Figure 31 shows the proportion of HRST employees above the age of 15 according to various differentiations in the EU countries analysed here. Overall, according to the available cleaned data, 207.7 million persons above the age of 15 were employed in the EU in the year 2007.[82] Of these persons, on average for the countries analysed here, 17.1 % were employed as HRST in the core definition (HRST-Core), 26 % had a tertiary education certificate and were therefore HRST according to the education definition (HRST-EDU), and 30 % worked in academic professions or as technicians and in equivalent professions. They were therefore HRST according to the professional definition (HRST-OCC).

78 For the group of the population who are persons of working age (15–64 years), the definition of the International Labour Organisation (ILO) distinguishes between the labour force (employed and unemployed) and inactive non-earners. The group of nonearners includes persons currently within the educational system, those who are ill or unable to work, retired persons, persons involved in childcare and other caretaking, etc.

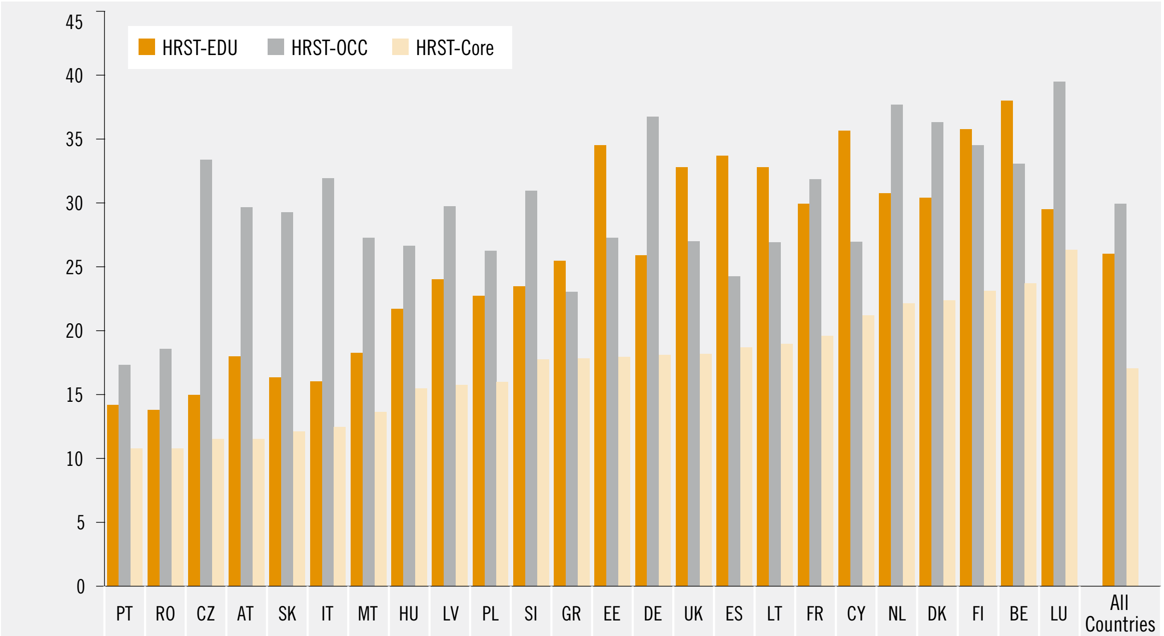
79 See http://circa.europa.eu/irc/dsis/employment/info/data/eu_lfs/index.htm for the definition of these threshold values.

80 There are also clusters of nonresponse problems in several countries for the retrospective questions. These problems occur primarily in Germany, Netherlands, and United Kingdom. These countries are included in the analysis, with nonresponse being itemised as its own response category.

81 In addition, there are also limitations that result from different coding practices in individual countries (particularly for professions). This limitation cannot be addressed in this chapter.

82 After the excluded cases are taken into account, this corresponds precisely to the employment level shown in the official statistics as well.

Figure 31: Proportion of HRST by EU country in 2007 (as% of employed persons)



	PT	RO	CZ	AT	SK	IT	MT	HU	LV	PL	SI	GR	EE	DE	UK	ES	LT	FR	CY	NL	DK	FI	BE	LU	All Countries
HRST-EDU	14.2	13.8	15.0	18.0	16.4	16.0	18.3	21.7	24.0	22.7	23.5	25.5	34.5	25.9	32.8	33.7	32.8	29.9	35.7	30.7	30.4	35.8	38.0	29.5	26.0
HRST-OCC	17.3	18.6	33.4	29.7	29.3	32.0	27.3	26.6	29.8	26.2	31.0	23.1	27.3	36.8	27.0	24.3	26.9	31.8	27.0	37.7	36.3	34.5	33.1	39.5	29.9
HRST-Core	10.8	10.8	11.5	11.5	12.1	12.5	13.6	15.5	15.8	16.0	17.7	17.8	18.0	18.1	18.2	18.7	19.0	19.6	21.2	22.1	22.4	23.1	23.7	26.3	17.1

Note: Basis: Employees above the age of 15, excluding Bulgaria, Ireland, Sweden, and persons with unknown profession or education, HRST-EDU = Employees with tertiary education, HRST-OCC = Employees in the academic professions (ISCO 2), or technicians and equivalent professions (ISCO 3), HRST-Core = Employees with tertiary education certificate and academic professions or technicians and equivalent professions.

Source: EU-AKE

According to these data, Austria is a country with a low proportion of core-definition HRST when compared to the rest of the EU. Only 11.5 % of employees in 2007 corresponded to the definition of HRST in a narrower sense. This was the fourth-lowest proportion among all of the EU countries studied here, ranking only above Portugal, Rumania, and the Czech Republic. This low proportion can be attributed primarily to the low proportion of graduates from higher education institutions in employment, which at 18 % is significantly below the EU average, and in the sixth-to-last position among the EU countries studied here (ahead of Portugal, Romania, Czech Republic, Slovakia, and Italy). By contrast, the 30 % proportion of HRST by definition of profession is only slightly below average. Here Austria is in the middle of the field (in twelfth place) among the studied EU countries.

In many areas, the structure of HRST in Austria (above all in the core definition) corresponds to that of the EU as a whole (Table 27). Because of their longer education times HRST employees in a broader sense are older when compared to other employees (with the proportion of persons under 25 in Austria being somewhat lower than the EU average, although the proportion of those over 45 is somewhat higher) and HRST employees in the narrower sense work much more frequently in education and in non-market services than do other employees (and less frequently in manufacturing and in market services). This holds also for the EU in general. Nevertheless, there are also some special characteristics of Austrian HRST. In particular, the proportion of women in the EU who are HRST in the narrower sense is higher than the proportion of men, whereas in Austria this is exactly the opposite. This therefore indicates significantly greater differences between the sexes for HRST in Austria compared to the other EU countries, a fact which is also confirmed in all other partial definitions of HRST. Moreover, the number of foreign citizens as a proportion of HRST is significantly higher in Austria than the EU average. This can be attributed to significantly higher proportions of foreigners overall in Austria, however.

Table 27: Comparison of employment structure in the HRST and the overall economy (2007)

	All other employees		HRST-Core		HRST-EDU		HRST-OCC	
	EU	Austria	EU	Austria	EU	Austria	EU	Austria
Sex								
Men	56.9	55.0	48.6	53.5	51.5	60.2	49.1	52.2
Women	43.1	45.0	51.4	46.5	48.5	39.8	50.9	47.8
Age in years								
Under 25	11.5	15.2	3.6	1.9	4.6	1.8	6.2	9.3
25-34	10.7	10.5	14.6	11.3	14.5	10.5	12.8	12.1
35-45	25.6	25.0	31.3	31.7	31.4	31.2	28.9	28.7
45-64	47.0	45.9	45.5	49.8	44.7	50.8	47.5	46.0
65 or older	5.1	3.5	5.0	5.4	4.9	5.6	4.6	3.8
Nationality								
Citizen	93.6	89.8	96.3	89.8	95.0	89.3	96.5	92.7
Foreigner	6.4	10.2	3.7	10.2	5.0	10.7	3.5	7.3
Education								
ISCED 2 or lower	27.5	19.7	0.0	0.0	0.0	0.0	4.9	4.3
ISCED 3-4	61.7	73.0	0.0	0.0	0.0	0.0	38.1	56.8
ISCED 5 or higher	10.8	7.3	100.0	100.0	100.0	100.0	57.0	38.9
Sector of Employment								
Manufacturing	37.3	35.4	14.7	14.6	19.2	25.0	17.5	18.9
Market services	38.9	42.5	28.7	28.3	34.3	31.0	32.9	38.5
Education	3.4	2.7	23.8	24.7	17.1	17.2	17.0	13.5
Non-market services	20.4	19.4	32.8	32.4	29.4	26.8	32.6	29.1

Note: Basis: Employees above the age of 15, excluding Bulgaria, Ireland, Sweden, and persons with unknown profession or education, HRST-EDU = Employees with tertiary education, HRST-OCC = Employees in the academic professions (ISCO 2), or technicians and equivalent professions (ISCO 3), HRST-Core = Employees with tertiary education certificate and academic professions or technicians and equivalent professions.

Source: EU-AKE

The structure of employees with a tertiary education (HRST-EDU) follows these distinctions. Here also, the differences between the sexes and the proportion of foreigners in Austria are significantly higher than in the EU average, and these employees in Austria are also somewhat older on average than in the EU. The employees in the academic professions, technicians, and persons in equivalent professions (HRST-OCC), on the other hand, are younger in Austria than in the EU average. The proportion of persons under the age of 25 in these professions is more than 9 % in Austria, compared to 6 % in the other EU countries. This can be attributed, however, to the higher proportion of employees in the intermediate qualification segment (ISCED 3–4) and the associated shorter education times within this group. On the whole, employees with an intermediate education level in Austria represent more than 56 % of employees in the academic, technical, and equivalent professions, while this number is only 38 % in the EU average (cf. Table 27). In a more detailed examination (Table 28), it is clear that this difference can be attributed primarily to a high proportion of persons with an educational level of ISCO Group 4 (AHS, BHS) relative to the EU among those in the academic professions, but even more pronounced among technicians. This applies above all to academics with a post-graduate degree or equivalent qualification.

Table 28: Employment structure in HRST defined by profession (HRST-OCC) and highest completed education level (2007)

	Austria			EU		
	Academic professions	Technician or equivalent professions	Total	Academic professions	Technician or equivalent professions	Total
ISCED 2 or lower	-	7.0	4.9	1.7	9.3	5.7
ISCED 3	8.1	51.9	37.3	12.7	49.2	32.2
ISCED 4	6.6	25.2	19.0	1.2	4.4	2.9
ISCED 5	73.2	15.2	34.6	80.4	36.9	57.2
ISCED 6	11.4	(0.7)	4.3	3.9	0.2	1.9

Note: Basis: Employees above the age of 15, excluding Bulgaria, Ireland, Sweden, and persons with unknown profession or education, HRST-OCC = Employees in the academic professions (ISCO 2), or technicians and equivalent professions (ISCO 3), ISCO 2 or lower = Compulsory school or lower, ISCO 3=Apprenticeship, vocational medium-level technical school, ISCO 4=AHS BHS, ISCO 5=University and university-affiliated education, ISCO 6 =Doctoral program.

Source: EU-AKE

On the whole, therefore, a comparison of Austria's HRST with those in the EU indicates a below-average proportion of HRST relative to total employment. This is particularly true if HRST are differentiated by education. Nevertheless, this difference can be attributed primarily to differing educational systems within the EU. If the comparison is made based upon classification by professional groups (HRST-OCC), then Austria's HRST are not below average. Many of the professions assigned to HRST in Austria are practiced by persons with an intermediate education level. There is also a significantly higher proportion of foreigners among HRST in Austria. This can be explained, however, by the generally higher proportion of foreigners in Austria. The only difference between HRST in Austria and those in the EU average that remains difficult to explain is the significantly lower proportion of women among HRST in Austria, a figure that is largely independent of the measurement method employed.

5.1.2 Comparison of HRST mobility in Europe

Mobility between employment and unemployment or inactivity

One indicator for mobility behaviour is the proportion of HRST employees in 2007 who were employed, unemployed, or not earning[83] in the previous year (Table 29). Here HRST in both Austria and the EU average differ most significantly from other employees in that there is a high proportion of persons who were also employed in the previous year. Depending upon the definition of HRST, between 90 and 91 % of HRST employees in 2006 were also employed in 2007, and only 1 % to 2 % were unemployed. Among the other employees, a maximum of 88 % were employed, and between 2.5 % and 3.5 % were unemployed. These figures therefore reflect the lower unemployment risk and the greater demand for highly qualified workers.

Nevertheless, the number of transitions from education into employment as HRST is somewhat lower in Austria (with the exception of HRST as defined by profession) than for other workers, and corresponds approximately to that of other workers in the EU. Thus the overall number of workers moving from education into employment as HRST within one year is not higher in the EU or Austria than in the other employment areas.[84]

The most conspicuous differences between Austria and the EU average are found in this study, however, primarily in entries into the labour force from inactivity (cf note 83). The proportion of HRST that transfers within one year from inactivitiy to employment is significantly higher in Austria (between 4 % and 5 % of employees) than the EU average (between 1 % and 2 %). [85]This high proportion of transition from inactivity is not specific to the HRST labour markets, however, but is instead a general characteristic of the Austrian labour market, because entries into the labour market from inactivity in Austria are significantly higher than in the other EU countries for all other workers as well, and with 6.3 % (the same as in the EU) is even higher than the HRST figure.[86]

83 As defined by the International Labour Organisation, the group of non-earners (or inactive persons) does not include the unemployed. Non-participants are those persons who are unable to work and are not unemployed, but rather are not seeking work due to education or continuing training, illness or inability to work, retirement, raising children or caring for the elderly or disabled, or for other reasons. (cf. also footnote 78)

84 HRST leaving the educational system are significantly better qualified, however. Among HRST-Core and HRST-EDU, the proportion of academics among these persons by definition is 100 %, and is more than 40 % in HRST-OCC.

85 This conspicuously high proportion of transitions from inactivity in Austria is also confirmed in a comparison between EU countries. Among the EU countries, only Finland, the Czech Republic, and Slovakia exhibit similarly high transition rates from inactivity. In these countries also, however, this is not specific to HRST, but relates to all other employees as well.

86 The major importance of entry into the labour market by workers from inactivity is a phenomenon that is well-documented in the literature of the Austrian labour market (Hofer, Pichelmann, Schuh, 2001), and can be explained primarily by a high degree of seasonality, as well as the high degree of labour supply responsiveness to the business environment.

Table 29: Employees as HRST and in the overall economy by labour market status one year prior (2007)

	Employment	Unemployment	Education	Other inactivity	No response
			Non-HRST		
Austria	87.2	2.5	4.0	6.3	0.0
EU	88.2	3.5	3.1	2.4	2.8
			HRST-Core		
Austria	91.4	1.4	2.9	4.3	0.0
EU	91.3	1.6	3.0	1.5	2.6
			HRST-EDU		
Austria	91.2	1.6	2.6	4.7	0.0
EU	90.2	2.0	3.1	1.6	3.0
			HRST-OCC		
Austria	89.3	1.7	4.2	4.8	0.0
EU	90.9	1.8	3.0	1.6	2.7

Note: Basis: Employees above the age of 15, excluding Bulgaria, Ireland, Sweden, and persons with unknown profession or education, HRST-EDU = Employees with tertiary education, HRST-OCC = Employees in the academic professions (ISCO 2), or technicians and equivalent professions (ISCO 3), HRST-Core = Employees with tertiary education certificate and academic professions or technicians and equivalent professions.

Source: EU-AKE

In conclusion, therefore, it can be stated that HRST have an overall lower probability of transition from unemployment and inactivity into employment, but a higher probability of remaining in employment, when compared to other employees in the EU. This confirms the high demand for these workers. There is a high transition probability from inactivity specifically for Austria compared to the rest of Europe. This is still lower than among other employees, however, and can be attributed primarily to the specific characteristics of the Austrian labour market.

Sector mobility

The high probability of HRST remaining in employment, however, does not necessarily signify a lower level of labour force mobility, because the employment relationship in the previous year could quite possibly have been with another company. Table 30 therefore shows the proportion of employees who changed their NACE 1-letter industry sector of employment in the past year (this proportion is stated as the percentage of employees who were employed in both years). On the whole, the sector mobility of HRST measured in this way is not higher than that of other employees. In the EU average, 6.4 % of all employees were mobile across sectors within one year. For HRST as more narrowly defined, it was only 5.2 % , and for employees in the academic professions, technicians, and persons in equivalent professions it was 5.4 %. Only employed female academicians had a percentage that was somewhat higher (6.7 %) than that of other employees. Because of the high demand for these workers, these results as a whole therefore indicate greater employment stability for HRST than for persons in other professions.

This applies for Austria as well. Here, how-

Table 30: Proportions of employees in HRST and in the overall economy with change of sectors 2007

	All	HRST-Core	HRST-EDU	HRST-OCC
Austria				
Total	4.9	3.7	4.3	4.0
Sex				
Men	4.5	3.3	3.9	3.9
Women	5.7	4.1	4.7	4.0
Age in years				
Under 35	8.2	(8.1)	8.8	7.3
35-44	5.6	6.1	5.9	5.3
45 or older	3.4	(1.5)	2.5	2.1
Industry Sector				
Manufacturing	2.9	3.6	2.3	3.2
Market services	8.7	7.8	9.2	6.8
Non-market services	2.1	(1.6)	(1.9)	1.6
EU				
Total	6.4	5.2	6.7	5.4
Sex				
Men	6.8	5.9	7.1	6.0
Women	7.8	5.3	7.2	5.3
Age in years				
Under 35	11.0	10.2	12.5	9.2
35-44	7.6	6.5	8.1	6.3
45 or older	5.8	3.7	5.0	4.3
Industry Sector				
Manufacturing	7.3	4.5	4.7	4.2
Market services	10.0	12.4	14.3	11.2
Non-market services	3.8	2.5	3.1	2.6

Note: Basis: Employees above the age of 15, excluding Bulgaria, Ireland, Sweden, and persons with unknown profession or education, Figures in brackets will sign high random sample error due to low number of cases, – = Figure cannot be reported because number of cases is too low, HRST-EDU=Employees with tertiary education, HRST-OCC = Employees in the academic professions (ISCO 2), or technicians and equivalent professions (ISCO 3), HRST-Core = Employees with tertiary education certificate and academic professions or technicians and equivalent professions.

Source: EU-AKE

ever, HRST are consistently less mobile than other employees, regardless of the selected definition. Moreover, it is also consistently evident across all definitions that Austria has a lower sector mobility among HRST than is the case for the European average. This stylised fact, however, involves a general characteristic of the Austrian labour market, which offers significantly greater employment stability overall than in other EU countries. In Austria, only 4.9 % of all workers changed their industry sector of employment within one year[87], compared to an EU average of 6.4 %.

HRST in Austria and in the EU also differ in only minor aspects with regard to the structure of mobile labour force, aside from the lower sector mobility in all groups in Austria. As in the EU, in Austria younger HRST (of whom between 7 % and 8 % change their sector of employment each year) as well as HRST in market services (with between 7 % and 9 % of this group changing their sector) are the most mobile groups, whereas older workers and HRST in the manufacturing industries are the least mobile workers.

One conspicuous difference between Austrian HRST and those in other European countries, however, lies in the differences in sectoral mobility rates between the sexes. Whereas in the EU, male HRST in most definitions (all with the exception of definition by profession) are more mobile than female HRST, male HRST in Austria are less mobile than women. This difference is specific to HRST in Austria. Among all other workers in Austria, as in the EU, women are the more mobile group, presumably also because of the more frequent career interruptions by women for caretaking duties.

5.1.3 International Mobility

The sectoral mobility among HRST is not necessarily greater than that of any other workers in Austria or in the other EU countries studied here. A complete assessment of HRST mobility must also include their regional mobility, however. Within the scope of the separate analysis of the ELFS presented here, this can be achieved using data from the survey respondents regarding residence in the prior year. Here HRST who state that they resided in another country one year prior to the date of the survey are classified as internationally mobile.

Table 31: Proportion of employees who are mobile across national borders, by EU country

	All	HRST-Core	HRST-EDU	HRST-OCC
Austria	0.28	(0.59)	0.68	0.35
Belgium	0.34	(0.43)	0.49	(0.35)
Cyprus	2.72	2.50	2.51	2.15
Czech Republic	0.16	0.13	0.18	0.13
Germany	0.21	0.43	0.37	0.26
Denmark	0.39	(0.48)	0.52	0.42
Spain	0.38	0.26	0.42	0.25
France	0.31	0.38	0.51	0.37
Italy	0.08	-	(0.11)	0.03
Luxembourg	0.50	(1.24)	(1.10)	(0.88)
United Kingdom	0.70	0.47	0.55	0.71
EU	0.28	0.30	0.37	0.27

Note: Basis: Employees above the age of 15, excluding Bulgaria, Ireland, Sweden, and persons with unknown profession or education, Figures in brackets will sign high random sample error due to low number of cases, – = Figure cannot be reported because number of cases is too low, HRST-EDU=Employees with tertiary education, HRST-OCC = Employees in the academic professions (ISCO 2), or technicians and equivalent professions (ISCO 3), HRST-Core = Employees with tertiary education certificate and academic professions or technicians and equivalent professions.

Source: EU-AKE

87 Industry sector of employment within the meaning of the NACE 1-letter classification, cf. footnote 73.

If one considers this mobility indicator, then (consistent with many other studies on migration in Europe, cf. Stimpson 2008), the low level of transnational mobility in Europe becomes evident, regardless of whether HRST or all employees are considered. Among all employees in the EU countries studied here, only 0.28 % lived in a different country (EU or non-EU) one year prior to the date of the survey. Among HRST, transnational mobility throughout the EU is somewhat higher than among other employees. The highest international mobility rates are achieved by persons with a tertiary education certificate (HRST-EDU), while these mobility rates for employees in academic professions or working as technicians and in equivalent professions (HRST-OCC) are even lower throughout the EU than in the other professional groups (Table 31).

Moreover, the higher mobility rates among HRST affect almost all of the countries for which sufficient observations are available to make reliable statements, and in almost all definitions of HRST. The transnational mobility for individual groups of HRST is lower than for the rest of the population only in Cyprus, Czech Republic, Spain, and United Kingdom. Austria proves to be a country in which above all the immigration of HRST as defined by education is higher than average. Almost 0.7 % of those residing in Austria in 2007 with a tertiary education certificate (HRST-EDU) still resided abroad one year prior to the survey, whereas in the EU this number was 0.4 %. This greater mobility of HRST to Austria, however, also applies to all other definitions of HRST.

5.1.4 Foreign-born HRST in Austria

These figures presented before demonstrate lower international mobility among HRST, as among all other employees in the EU, but somewhat higher mobility to Austria. However, the figures presented in Table 31 are based upon a sample size that for most countries appears to be rather impractical for a broader analysis by demographic characteristics of mobile HRST, because this would lead to very large random samples fluctuations. Somewhat more reliable statements can be achieved if one considers the number of foreign-born HRST in the EU (Table 32).[88]

According to these figures, Austria is a country in which the proportion of foreign-born HRST is clearly higher than in the EU average, but in which the proportion of HRST relative to all foreign-born employees is rather low, at least compared with the rest of Europe. Approximately 16 % of the most narrowly defined HRST Core who are working in Austria were born abroad. This proportion is higher only in Spain and Luxembourg (which is a significant outlier among European countries in this regard), and the average is only 9 % for the EU countries studied here. At the same time, however, only 10.3 % of all foreign-born employees in Austria in 2007 were HRST in the narrowest sense. Similarly,

88 In this analysis, however, Germany must also be excluded from consideration in addition to Bulgaria, Ireland, and Sweden because the question of place of birth was not included in the German LFS. Moreover, too few foreign-born workers live in Malta and Romania to permit representative statements in this regard. These countries are therefore not shown separately.

in this year 16.7 % of the employed academics (HRST-EDU) were born abroad, which corresponds to the third-highest proportion among all of the EU countries shown in Table 32, behind Estonia [89], Luxembourg, and Cyprus. At the same time, only 17 % of all foreign-born employees in Austria in 2007 were academics. This proportion was lower only in Greece, Italy, and Romania.

The discrepancy between the high proportion of foreigners among the HRST and the small proportion of foreign-born HRST in Austria is somewhat smaller among employees in the academic professions or technicians and equivalent professions (HRST-OCC). In 2007, 11.6 % of all employees in these professions in Austria were foreign-born. This is also the second-highest proportion among the EU countries shown in Table 32. The proportion of foreign-born persons in these professional groups relative to all foreign-born persons (19.4 %) is only somewhat below the EU average, however, and in only eighth-to-last place among the EU countries studied.

Table 32: Proportion of foreign-born HRST by EU country 2007

	Proportion of all employees			Portion of all foreign-born persons		
	HRST-Core	HRST-OCC	HRST-EDU	HRST-Core	HRST-OCC	HRST-EDU
Austria	15.9	11.6	16.7	10.3	19.4	17.0
Belgium	9.6	7.4	9.3	15.5	21.5	31.0
Cyprus	18.4	11.5	18.2	13.0	14.7	30.7
Czech Republic	2.0	1.6	2.8	13.9	23.7	18.4
Denmark	6.6	5.6	6.5	16.5	25.8	25.0
Estonia	15.3	11.9	16.9	13.5	18.3	33.0
Spain	16.5	7.7	12.0	7.7	10.5	22.7
Finland	2.8	2.7	2.3	14.9	27.9	25.1
France	11.2	8.5	9.8	12.5	20.9	22.9
Greece	8.6	2.3	5.0	4.4	5.8	14.2
Hungary	1.8	2.2	2.6	18.3	26.2	25.8
Italy	8.9	3.8	7.4	6.3	12.8	12.4
Lithuania	4.6	3.8	4.1	12.6	19.4	25.6
Luxembourg	46.3	46.7	57.1	24.1	30.2	27.6
Latvia	13.5	11.3	13.8	11.1	22.1	21.8
Netherlands	10.3	8.6	9.1	15.4	26.4	23.2
Poland	0.3	0.6	0.6	27.3	36.2	33.5
Portugal	7.8	9.7	13.4	13.5	18.6	21.0
Romania	8.0	5.6	4.8	9.8	19.1	12.8
Slovakia	0.6	0.9	1.0	19.3	36.5	22.9
United Kingdom	11.8	13.5	12.8	16.5	25.7	29.5
EU 27	9.0	6.9	9.1	13.8	21.8	23.1

Note: Basis: Employees above the age of 15, excluding Bulgaria, Germany, Ireland, Sweden, and persons with unknown profession or education, HRST-EDU = Employees with tertiary education, HRST-OCC = Employees in the academic professions (ISCO 2), or technicians and equivalent professions (ISCO 3), HRST-Core = Employees with tertiary education certificate and academic professions or technicians and equivalent professions. Figures from Malta and Romania were not reported because of low random sample sizes.

Source: EU-AKE

89 The high proportion of foreign-born workers in Estonia can be attributed primarily to a high proportion of Russian immigrants in this country.

The structure of foreign-born HRST according to various definitions in Austria therefore largely mirrors the structure of native-born HRST: As with native-born employees, the proportion of foreign-born employees in Austria, above all the proportion of persons with a tertiary education, is significantly below the EU average. Also as with the native-born employees, this margin shrinks as soon as HRST are defined by profession. The low proportion of academics among those immigrating to Austria is also determined by the specific characteristics of the demand for labour in Austria.

With regard to the demographic structure, however, the foreign-born HRST in Austria are distinguished somewhat from other foreign-born workers. Foreign-born HRST are somewhat older than the average foreigners, and are also more frequently male (particularly academics). Depending upon the definition of HRST, between 35 % and 40 % of foreign-born HRST are 45 years old or older, and up to 60 % of foreign-born academics in Austria are male (Table 33). Among the other foreign-born persons, however, the proportion of those over 45 is approximately 32 %, and the proportion of males is 54.7 %. In addition, as could be expected, foreign-born HRST are significantly better educated than the average foreign-born persons.

Table 33: Foreign-born HRST and other employees by education, sex, age, industry sector of employment, place of birth, and length of stay (as% of total population, 2007)

	All		HRST-Core		HRST-EDU		HRST-OCC	
	Entire European Union							
Place of birth	EU	Austria	EU	Austria	EU	Austria	EU	Austria
				Sex				
Men	56.0	54.7	49.8	55.8	51.2	58.5	51.2	50.5
Women	44.0	45.3	50.2	44.2	48.8	41.5	48.8	49.5
				Age in years				
Under 35	38.0	36.6	33.2	28.3	35.1	29.2	35.1	35.1
35-44	30.5	31.8	30.3	27.9	31.8	29.2	31.8	28.5
45 or older	31.6	31.6	36.4	43.8	33.1	41.6	33.1	36.5
				Education				
ISCED 2 or lower	32.8	31.1	-	-	-	-	5.9	7.7
ISCED 3-4	41.2	50.0	-	-	-	-	31.2	39.0
ISCED 5 or higher	26.0	18.9	-	-	-	-	62.9	53.3
				Industry Sector				
Manufacturing	30.3	32.2	11.4	16.0	17.5	22.0	14.2	18.4
Market services	41.5	46.1	33.5	30.0	42.1	36.8	35.6	35.3
Non-market services	28.2	21.7	55.1	54.0	40.3	41.2	50.2	46.3
				Length of Stay				
10 years or more	57.0	69.6	68.9	61.5	60.4	61.4	68.6	64.6
1 to 9 years	42.5	30.4	30.4	38.5	39.0	38.7	30.8	35.4
				Region of Birth				
EU 15	18.3	17.8	27.9	45.0	22.8	37.8	27.0	39.0
EU 12	11.7	17.8	5.8	20.7	8.6	19.4	6.6	22.1
ROW	70.1	64.4	66.3	34.3	68.6	42.8	66.4	38.9

Note: Basis: Employees above the age of 15, excluding Bulgaria, Germany, Ireland, Sweden, and persons with unknown profession or education, – = Figure cannot be reported because sample size is too small, HRST-EDU = Employees with tertiary education, HRST-OCC = Employees in the academic professions (ISCO 2), or technicians and equivalent professions (ISCO 3), HRST-Core = Employees with tertiary education certificate and academic professions or technicians and equivalent professions. Figures from Malta and Romania were not reported because of low random sample sizes.

Source: EU-AKE

Compared to the EU average, foreign-born HRST in Austria are likewise somewhat older and (with the exception of employees in academic professions or technicians and equivalent professions (HRST-OCC)) more frequently male, and employees in academic or technical and equivalent professions are also more strongly concentrated in the intermediate education segment. The most conspicuous differences here, however, exist with regard to the length of stay in the host country and the home country structure. Despite a longer average length of stay than all foreign-born persons in the EU, foreign-born HRST in Austria have a significantly shorter length of stay than in other EU countries. Between 35 % and 40 % (compared to 30 % to 40 % in the EU average) of foreign-born HRST have lived in Austria for less than 10 years. Moreover, a significantly higher proportion of foreign-born HRST in Austria (approximately one-fifth, compared to one-tenth in the EU average) come from the new EU member states. This therefore reflects both the short history of highly qualified immigration to Austria (and a significant improvement in the qualification structure in recent years) as well as the important role that migration from the new EU member states played in this development after the opening of Eastern Europe at the end of the 1980s.

At the same time, however, Austria, like most smaller EU countries, is a country in which a significant proportion of HRST born in Austria reside outside the country. According to the results of the 2007 ELFS, approximately 0.8 % of all persons born in Austria and employed in the European Union worked in other countries in 2007. Among HRST in the narrowest sense (HRST-Core), however, this figure was 2.0 % of all HRST born in Austria, and 2.3 % of all Austrian-born academics (HRST-EDU). Compared to the EU average, these figures are indeed below average, but they are at least in the upper middle segment of the EU countries studied here in terms of HRST in the narrower sense (7th place) and academics (6th place).[90]

5.1.5 Summary

This chapter compares the sectoral and international mobility of Human Resources in Science and Technology (HRST) in Austria with that of other countries. The comparison shows that Austria is a country in which the number of HRST is below average compared to other EU countries if HRST are differentiated by education. Nevertheless, this difference can be attributed primarily to differing educational systems within the EU. If the comparison is made based upon classification by professional group, then the number of HRST in Austria is not below average. In contrast to other EU countries, the dual educational system means that many of the professions in Austria classified as HRST are practiced by persons with intermediate education levels. Nevertheless, it is conspicuous that, largely independent of the

90 Compared to other data sources, such as those of the OECD, which are based upon global emigration of Austrians, however, and moreover date from 2001, the proportion of Austrian-born HRST who live outside of Austria is significantly lower in this dataset. This can be attributed either to the fact that many Austrians emigrate to countries (particularly Germany) that cannot be analysed here, or that there has been only a very low level of emigration from Austria in recent years.

measurement method used, there is a significantly lower proportion of women among HRST in Austria.

Overall, the sectoral mobility of HRST in the EU countries studied here is lower than that of other workers. This underscores the higher job safety of HRST compared to other workers, which can be attributed primarily to the strong demand for more highly qualified workers. Another result of this comparably higher demand relative to other workers is that only a small number of HRST become unemployed or refrain from offering their services on the labour market. Accordingly, transitions of HRST from unemployment or inactivity are rather rare compared to that of other workers. Austria is distinguished from the other EU countries in this regard by a higher level of job stability (and thus lower sectoral mobility) and also higher levels of HRST entry into the labour force from inactivity. These specific characteristics apply not only for HRST, however, but even more strongly for all other workers as well, and are therefore the result of generally greater employment stability in Austria based upon the low unemployment rate and the strong seasonal and business-cycle related fluctuations in labour supply.

There is also a significantly higher proportion of foreigners among HRST in Austria. This can be explained by the generally higher proportion of foreigners in Austria. Depending upon the measurement method used, between 0.4 % and 0.7 % of HRST employed in Austria immigrate from abroad each year. This applies to only 0.3 % of employed HRST on average for the EU countries studied here. In addition, between 16 % and 17 % of HRST in Austria were born abroad (the average for EU countries is only between 7 % and 9 %). These foreign-born HRST often live for only a short time in Austria (between 35 % and 40 % live in Austria for less than 10 years, compared to approximately 30 % in the EU average), and a significantly higher proportion come from the new EU member states. Foreign HRST therefore represent an important source of knowledge transfer for Austria.

At the same time, the proportion of HRST relative to all foreign-born employees is very low in Austria, at least compared to the rest of Europe. In 2007, only 10.3 % of all foreign-born employees in Austria (compared to 13.8 % in EU average) were HRST as most narrowly defined. Similarly, only 17 % of all foreign-born employees in Austria in that year were academics. This proportion was lower only in Greece, Italy, and Slovakia. This low proportion of academics among those immigrating to Austria may be driven, at least in part, by the specific characteristics of labour demand in Austria, because the discrepancy between the high proportion of foreigners among HRST and the low proportion of foreign-born HRST in Austria is significantly smaller if one considers the employees in academic professions and technicians and equivalent professions. 16.7 % of all employees in these professions in Austria in 2007 were foreign-born. This was the second-highest proportion among the EU countries studied. The proportion of foreign-born persons in these professional groups relative to all foreign-born persons (19.4 %) is only somewhat below the EU average and in only seventh-to-last place among the EU countries studied.

5.2 Human resources in Austria

5.2.1 Education and innovation

There is a very direct relationship between innovation and human capital, or the abilities and knowledge of the employed population. Without appropriately qualified employees, innovations can be neither developed nor implemented. The interactions are described as partly causal and partly complementary. In recent years, the literature has examined the following aspects closely:

- Productivity: Higher participation in tertiary education leads causally to higher productivity growth, as for example via the channel of complementarity between investments in tertiary education and investments in research and development (Aghion et al. 2005);[91]
- **Technology adoption:** Human capital, in the sense of the average level of education among the population, promotes economic growth by easing the adoption of new technologies (Ciccone and Papaioannu, 2008) or accelerating it (Benhabib and Spiegel, 1994).
- **Human capital in a catching-up process:** While a broad, professionally oriented education at the secondary level is efficient for a national economy that is in the process of catching up, tertiary education is playing an increasingly important role in national economic growth at the cutting edge of technology (Aghion et al. 2006).
- **Determinants of labour demand:** Companies that use advanced technology overwhelmingly require highly qualified employees. Organisational change, technology and human capital are complementary in modern companies and are leading to a decrease in demand for less qualified employees (Caroli and van Reenen, 2001).

These results indicate the increasing significance of both overall educational levels and tertiary education in highly developed economies. *Expanding the broad human resource base* for innovation thus has a positive effect on growth and employment, and becomes more important as a country becomes more developed.

If, however, we examine the effect of performance by persons who are employed in the development and implementation of technological innovations – the *human resources for R&D, i.e. for innovation activities in a narrow sense* – recent literature has made the following findings:

- There is a positive correlation between R&D spending and employment qualifications as measured in average number of years of education (Falk and Unterlass 2006).
- The quality of (university) research leads to external effects in the corporate sector that consistently promote radical innovation and structural change in the medium term;
- This also influences decisions as to where to locate corporate research centres (Abramovsky et al. 2007), R&D spending, and patent registration by businesses that are with-

91 Secondary education refers to the time between completing grade school and the school leaving exam or the completion of vocational training. Tertiary education comes after the school leaving exam, it takes place at universities in either short or long studies.

in driving distance of universities (Jaffe, 1989).

- The presence of prominent scientists leads to the founding of new companies. What counts here is the physical presence of these scientists, not the diffusion of their scientific ideas. Prominent scientists within the same discipline are also concentrated geographically (Darby and Zucker 2007).
- Increases in R&D funding that are not accompanied by an increase in the number of researchers leads to an increase in researcher salaries rather than in R&D activities (Romer, 2000).

These results are of particular importance for Austria, as a deep structural change towards education-intensive industries has affected the corporate sector over the past twenty years. Peneder (2008) shows that the share of value added in sectors with particularly high training intensity increased from 10.5 % (1985) to 13.1 % and 15.6 % (2005); the share in the sectors with particularly high innovation intensity grew from 7.3 % (1985) to 8.0 % (1995) and 9.2 % in 2005.[92] Accordingly, demand for highly qualified employees (school leaving examination or higher) grew by 50 % between 1990 and 2004. The demand for people with mid-level qualifications (vocational school and apprenticeships) has only risen by 3 % in the same period, while the demand for less qualified employees (compulsory school certificate) has gone down by 26 % (see Peneder et al. 2006). Recent data suggest that this trend continued up to the financial crisis of 2009. It is anticipated that this trend has intensified since and will continue to do so. Therefore, the development of human capital, both for innovation activities in a broad sense and for R&D activities in a narrow sense, has been assigned a central role for growth and innovation in Austria.

5.2.2 Human resources for broad innovation activities in Austria in international comparison

The human resources for innovation activities in a broad sense is understood here as the general level of qualifications among employed persons. Given the significance of human resources for innovation and growth in Austria, the question arises as to whether the Austrian education system is preparing people, both in terms of sufficient quality and quantity, for a successful innovation system. As the study by Janger (2009) emphasises, we must remember that questions about the numbers required for the near to medium-term future are notoriously difficult to answer, resulting primarily in speculation. Qualitative comparisons, however, have become somewhat easier thanks to many recent international comparative studies.

Quantity of human resources for broad innovation activities

Table 34 presents a few important indicators for evaluating the question of the extent to which the education system provides highly

92 There is a structural gab relative to the EU 15 countries. It has continued to grow, despite the major changes in the group of sectors with a high training intensity from 3.6 percentage points (1985) to 4.1 percentage points (2005) (cf als BMWF and BMVIT 2009).

qualified employees to the Austrian innovation system. Human resources for broader innovation activities here refer to profession-specific higher secondary education as well as tertiary programmes outside of natural science and technical curricula (business administration studies, for example, are included among the human resources for innovation). Column (1) shows that, in international comparison, Austria has a higher proportion of people 25–34 years old who complete upper secondary level education, not least because of the apprenticeship that is scored as upper secondary studies. Column (2) shows that the proportion of pupils in Austria that are admitted to university studies is very low in international comparison. In the final result, participation in tertiary education in Austria (columns 3 and 4) appears to be lower than in OECD countries of comparable size.[93] In the final result, participation in tertiary education in Austria (columns 3 and 4) appears to be lower than in OECD countries of comparable size. Participation is rising over time, although very slowly.

Table 34: Indicators for the breadth of human resources – quantity

	(1)	(2)		(3)	(4)	(5)
	Proportion of 25-34-year-olds who have completed upper secondary education[1]	Completion rates for upper secondary programmes with university preparation,[1]**	Entry rates in tertiary studies (of longer type)[1]	Proportion of population of typical age cohorts (20-29 years) with tertiary degree (ISCED 5A/6)[1]	Proportion of population (25-64) with tertiary degree[1]	Lifelong learning: Percentage of the adult population between 25 and 64 years of age who have participated in further and continuing education,[2] *
	2007	2007	2007	2007	2007	2008
Austria	87	41.5	38.9	22.1	18	13.2
Germany	85	41.3	34.4	23.4	24	7.9
Switzerland	90	26.4	39	31.4	31	27.9
Denmark	85	55.2	57.5	47.3	32	30.2
Finland	90	96.8	71.2	48.5	36	23.1
Sweden	91	73.6	73.1	39.9	31	32.4
OECD	79	61	56	38.7	28	unpublished
EU 19	81	62.6	55.2	36.7	24	10.9

Notes: * Value for Sweden 2007; ** Including ISCED 4A (higher professional education schools)

Source: [1] OECD Education at a Glance 2009; [2] Eurostat Structural Indicators

These numbers have become the focus of increasingly intense scrutiny in Austria, particularly because of problems of classification (especially for the higher professional education schools (BHS)), and most recently in the context of preparing a national qualification framework. If we include BHS, such as commercial academies (HAK) and technical federal colleges (HTL), then tertiary participation among 25- to 34-year-olds increases to the OECD average of 27 % (Janger and Leibfritz 2007).

There are three key things to keep in mind,

93 In Switzerland, the entry rates to tertiary programmes are clearly above the completion rates of higher secondary programmes (e.g. the entrance exam for the university after completing an apprenticeship). This is due to the permeability between the types of education.

though. First, innovation leaders such as Finland, Sweden, Japan, South Korea, Canada and the USA achieve values between 40 and 50 %.[94] It remains unclear, for example, whether a business college (HAK) is really equivalent to a three-year university study in economics. More studies would be necessary to compare the use and requirement profiles for school leaving qualifications and careers. Austrian pupils who attend a business college (HAK) or a higher technical education institute (HTL) demonstrate a stronger occupational orientation and stronger specialisation at a significantly earlier age than pupils in other countries who first attain a general education at the secondary level and then complete a three-year specialisation at a university. In the same professions, therefore, HTL graduates will choose different approaches to problem-solving than those with tertiary education. In any case, less general skills are being taught in the professional education schools. These general skills are important for fundamental innovation and for countries that are approaching the top of the technological group. Studies have concluded that the stronger teaching of such skills in the USA is responsible for innovation-related economic growth differences vis-a-vis continental Europe (Krueger and Kumar 2004). Students at university come into contact with teachers who are engaged in research (the keyword here is research-led teaching), which is scarcely the case in BHS, at least at this magnitude. We should therefore expect that a university degree strongly favours knowledge-expanding research activities in comparison with professional education schools. BHS graduates are overwhelmingly categorised as "technicians" and university graduates as "scientists" according to the ISCO classification (Schneeberger 2007).

Lastly, BHS pupils attend tertiary education institutions more and more frequently (the transfer rates are rising; see the university planning prognosis, chapter 3.9.2 in the university report 2008). This means that pupils themselves apparently believe that a BHS degree is not equivalent to a university degree.[95]

With regard to the importance of different educational degrees for innovation (and not only for income and employment profiles), we should cast doubt on the equivalency of occupation-related training at the upper secondary level and tertiary education.

In terms of the use of further education during the course of one's professional life, Austria is average (see column 5 in Table 34) but lags far behind the top innovation countries such as Sweden and Finland. The indicator, however, only measures the use of further education in the four weeks before the survey for the indicator. Also, there is a significant correlation between the highest level of education attained and the later use of further education, so that people who brought higher school leaving qualification to their subsequent education are more likely to be recorded. Therefore, the significance of this indicator in the context of innovation should be assessed as minimal; it

94 i.e. even after adding the (short) BHS educations and the long, Austrian tertiary studies the levels of the frontrunners are not achieved; these frontrunners also offer a mixture of shorter and longer tertiary studies.
95 Even if the transfer rates from the BHS to higher education were to rise to 100 %, from an innovation perspective there would still be a difference to the countries that make more general skills accessible on a secondary level.

probably reflects lower Austrian tertiary graduation rates.

Quality of human resources for broad innovation activities

Table 35 summarises a few important indicators from the PISA survey. The evaluation of basic education quality on the basis of the PISA results yields a very clear picture.[96] Column (1) in Table 35 shows that the skills of Austrian pupils after the fifth grade are average to slightly above average in an OECD comparison: average in reading and mathematics, and slightly, but significantly, above average in the natural sciences.

Table 35: Indicators for the breadth of human resources – quality

	(1) PISA mean values in reading, natural sciences and mathematics [1]			(2) Gender differences in PISA points for mathematics, natural sciences, reading [1]*				(3) Difference between boys and girls for instrumental motivation (OECD index)[3]
	2006			2006				2006
	Natural science	Mathematics	Reading	Mathematics	Comprehension of scientific questions	Explain phenomena scientifically	Reading	
Austria	511	505	490	23	-22	19	-45	0.58
Germany	516	504	495	20	-16	21	-42	0.44
Switzerland	512	530	499	13	-10	18	-31	0.7
Denmark	496	513	494	10	-11	21	-30	0.38
Finland	563	548	547	12	-26	9	-51	0.32
Sweden	503	502	507	5	-16	12	-40	0.3
OECD	500	498	492	_	_	_	_	0.25

	(4) Differences in performance (PISA points) in mathematics between children with and without migration backgrounds [1]		(5) Proportion (%) of pupils without migration background in the lowest performance levels. Mathematics[1]	(6) Proportion of pupils in occupation-related secondary education[2]	
	2006		2006	2006	
	First generation vs. domestic	Second generation vs. domestic		pre-occupational orientation	career oriented
Austria	-65	-81	15.6	6.6	70.7
Germany	-65	-78	13	unpublished	57.4
Switzerland	-88	-62	9.3	unpublished	64.8
Denmark	-80	-63	13.6	unpublished	47.7
Finland	unpublished	unpublished	X	unpublished	66.7
Sweden	-64	-42	14.3	1	56.2
OECD	-49	-45	X	3.9	43.8

Note: * Natural sciences were the key topic of the 2006 study and were subdivided into the sub-topics "recognition of natural science questions", "explanation of natural science phenomena", and one other; in most countries, the difference between boys and girls was not significant across all three sub-topics.

Source: [1] OECD Pisa Study 2006; [2] OECD Education at a Glance 2009; [3] OECD Education at a Glance 2007

96 The PISA test can not cover all capabilities relevant for innovation nor all tasks of the secondary school system. But it still helps to compare the performance of different school systems on a few very important dimensions. The results presented here are based on the PISA outcome of 2006. The results of the most recent PISA tests in 2009 will most likely not be available until the fall of 2010.

Column (2) shows that girls are significantly better in reading than boys, yet are significantly worse than boys in mathematics (especially in PISA 2006, although mathematics was not a key topic). In the 2006 PISA survey, Austria had the widest disparity between boys' and girls' performance in mathematics for all OECD countries. In the natural sciences, which were the key subject for 2006, there were no significant differences overall between boys and girls, except in sub-topics (girls are better at recognising natural scientific questions, while boys were better at the natural scientific explanation of phenomena).

A major difference between boys and girls was in the lower instrumental motivation (see column 3) among girls in mathematics and the natural sciences, meaning that girls ascribed no significance to these two subjects for their later professional life (Schreiner, 2007a). "Apparently, Austria is not managing, whether in coursework or in the home environment, to inform young people of the high importance and opportunities within natural scientific and technological careers" (Schreiner 2007b, p. 69). Instrumental motivation, however, shows only a limited correlation with PISA performance, but, according to studies, it does serve as an important determinant of later choices in education and occupation (OECD, 2007b).

The performance of pupils with a migration background (13 % of all pupils) is significantly poorer than the performance of those with no migration background (see column 4); in the 2003 PISA survey, performance improved marginally between first-generation and second-generation children, but in the 2006 PISA survey this indicator worsened. Their poor performance is influenced by the socioeconomic status of their parents because their parents overwhelming come from poor educational backgrounds (Schreiner, 2007b). In general, Austria's performance in the PISA study is not changed by pupils with a migration background; characteristics such as strong performance distribution also affect pupils without a migration background (OECD, 2007b). Column (5) shows, for example, that, for pupils without migration backgrounds, the proportion of pupils below or at level 1 in mathematics in Austria is relatively high (see also OECD 2006, Table 6.2a).

The proportion of pupils in the occupation-related educational tracks of the upper secondary level (i.e., apprenticeship) is far above the OECD average in Austria, and the proportion of pupils in general programmes (i.e., AHS) is far below the average (see column 6). Therefore, the Austrian education system is a priori significantly less oriented toward increasing the proportion of people with degrees in the tertiary sector.

5.2.3 *Human resources for R&D in Austria in international comparison*

"Human resources for R&D" are those people who are directly involved in the conception of innovations, as for example in the form of active research and development. The educational institutions for this group of people is represented in the following on the basis of a few indicators.

Human resources for R&D – Quantity

Column (1) in Table 36 shows that Austria ranks lower than strong innovation countries such as Finland, Sweden, or Switzerland in terms of the number of students per 1,000 inhabitants in the age group from 20 to 29 years who completed science and engineering degrees. However, development is headed upwards in Austria and in the EU (in contrast to the USA, where this indicator is stagnating). HTL graduates can also be counted for the Austrian level, which would bring Austria to the European average. As mentioned above, though, no functional equivalence in terms of research and innovation activities can be assumed.

Table 36: : Indicators for human resources in R&D – quantity

	(1)				(2)			(3)	(4)	
	Graduates (ISCED 5-6) in mathematics, science and technology[1]				Proportion of tertiary degrees among women as a share of all degrees, mathematics and computer science in comparison with the average over all courses of study (ISCED 5A/6**) [2]			Higher research studies (doctorate)[2]	Researchers per 1000 employees[3]	
	Total per 1000 of the population between 20 and 29 years of age		Female graduates per 1000 of the female population between 20 and 29 years of age		All subjects: academic degree	Mathematics and information science	Engineering sciences		Total	Proportion corporate sector
	2000	2007	2000	2007		2007		2007	2007	
Austria	7.20	11.1	2.9	5.3	54	20	23	1.8	7.7	63.64%
Germany	8.20	11.4	3.6	6.9	52	33	22	2.3	7.1	60.56%
Switzerland*	15.10	17.9	4.6	6.4	51	15	16	3.3	6.1	49.18%
Denmark	11.70	16.4	6.8	11.9	62	25	31	1.3	10.2	61.76%
Sweden	11.60	13.6	8.9	11.1	65	31	29	3.3	10.5	64.76%
Finland	16.00	18.8	7.6	9.2	64	34	22	2.9	15.6	56.41%
OECD	unpublished	unpublished	unpublished	unpublished	58	27	26	1.5	7.4	64.86%
EU15/EU19	10.1	unpublished	6.3		60	27	27	1.7	unpublished	unpublished

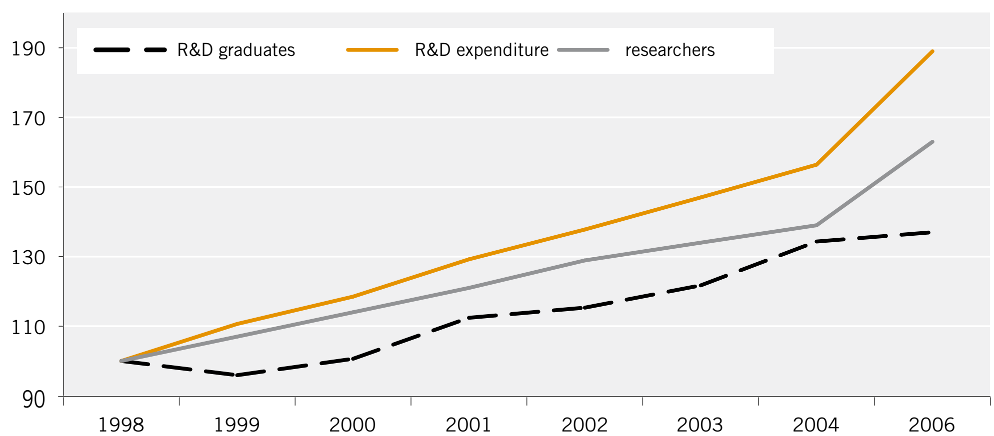
Notes: * Switzerland: value for 2000 corresponds to 2002; ** ISCED 5A/6: Tertiary university sector and higher research programmes

Source: [1]: Eurostat Database; [2]: OECD Education at Glance 2009, Table 3.6; [3]: OECD STI Scoreboard 2009

The low instrumental motivation of girls in school (see prior section) is actually reflected in the choice of study (columns 1 and 2). Development according to discipline differs – in the life sciences, the number of degrees among women has climbed massively since 2000, above the number of men; in the engineering sciences, however, the disparity grew between the number of degrees granted to men and women. In general, the proportion of women with tertiary degrees in mathematics and engineering sciences is below the OECD average and below the values for countries with high innovation performance, such as Sweden or Denmark. The proportion of graduates in science and engineering courses of study as a share of all courses of study is relatively high in Austria. The generally low graduation rate for students in science and engineering courses of study is caused more by low participation in tertiary education and less by a lack of interest in these courses of study (especially by men).

The proportion of completed doctoral degrees (see Table 36, column 3) is high in international comparison relative to the overall low tertiary degree rate (see Table 34, columns 3 and 4). This would seem to suggest a relatively high potential for research and development activities. However, the traditional Austrian course of study for doctoral candidates cannot be considered the same as a research-oriented Ph.D. programme; Austrian programmes often do not equip graduates for independent research that is successful in terms of the expansion of knowledge (Janger and Pechar 2008; BMWF, BMVIT, BMWFJ, Chapter 3.3, 2008).[97] In Austria, the Habilitation, or the second dissertation, is understood as a sign that one is ready to engage in research. The rather low number of researchers per 1,000 inhabitants (see Table 36 column 4) confirms the thesis that doctoral studies in Austria are often not completed for the purpose of preparing for an academic career. A survey of doctoral candidates revealed that only about one-third of them associated doctoral studies with a career in the sciences, although there were major differences between disciplines (BMWF, BMVIT, BMWFJ, Chapter 3.3, 2008).

Figure 32: Comparison of growth in R&D spending and the number of researchers and graduates of science and engineering programmes (index basis, 1998=100), 1998–2006

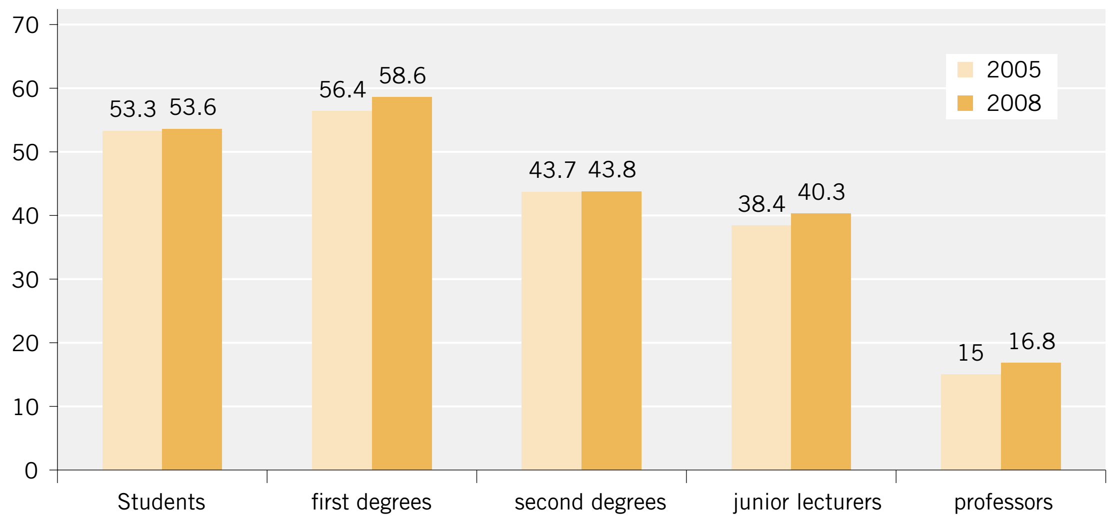


Source: OECD, Eurostat, WIFO calculations (see Janger 2009).

97 Some doctoral studies are currently being transferred to Ph.D. studies. According to information supplied by the BMWF, as at the beginning of 2010 38 % of all doctoral studies are now Ph.D. studies. However, there is no date when the "classic" doctoral studies will legally no longer be offered. Even when transferring to the Ph.D. system one must realise that there are also many different organisational possibilities for Ph.D. studies that can affect the quality of the researcher's education (Janger and Pechar, 2008).

The comparison of growth development in the number of researchers and overall Austrian R&D spending allows us to conclude that the supply of researchers has reacted to the rapid rise in R&D spending. The opening bifurcation can only be explained partially by moderate salary increases. [98] Rising R&D spending may have not led to a simple expansion in "researcher salaries", but rather to a real expansion of research and development efforts. Developments in the number of graduates from science and engineering programmes cannot keep up with the growth in the number of researchers. Greater numbers of graduates could therefore pursue research careers at an earlier time, or researchers will be recruited increasingly from abroad ("top talent imports"). Here, however, studies have shown that Austria has only imported a low number of highly qualified individuals (see Bock-Schappelwein-Bremberger-Huber 2008, BMWF and BMVIT 2009): For the complete Austrian labour market, not only for researchers, the data confirms that although many foreigners study in Austria, rather less highly qualified individuals come to Austria to live there, while at the same time there is a high emigration rate among highly qualified Austrians.

Figure 33: Proportion of women among students, graduates, junior lecturers and professors, 2005 vs. 2008



Source: BMWF, WIFO bar graph.

A comparison of the number of female researchers (from a head-count perspective) among all researchers shows that this proportion increased from 19 to 26 % between 1998 and 2007. What is striking, however, is the low number of women in higher positions. At the universities, although women completed 58.6 % of first degrees and 43.8 % of second degrees in 2008, only 40.3 % became junior lecturers and 16.8 % professors (BMWF, 2008; see

98 The R&D expenditures are shown nominally, not in real terms.

Figure 33). Only one-fifth of all Science Fund (FWF) applications are submitted by women, while their proportion among FWF project employees stands at 40 % (BMWF and BMVIT, 2008). Nonetheless, these numbers have increased significantly in recent years, which should result in further advantageous structural shifts in the future. Generational change alone will not dissolve this unequal distribution, as similar developments in the humanities suggest; there, the number of female graduates rose sharply in the 1970s, but the number of female professors remains very low at only 18 % (Kozeluh 2008). Overall, the numbers suggest that the potential for women at top positions has not yet been exhausted.

The comparison of growth development in R&D spending and in human resources in R&D in Figure 32 raises the major question of whether in future the number of female graduates from science and engineering courses of study will be sufficient to absorb R&D spending in such a way that translates increases in R&D spending into an actual expansion of R&D activities. This is particularly important, as the proportion of total human resources in science and technology in terms of employment in manufacturing in Austria stands only at 22.2 % (services 35.1 %), a value lower than for countries such as Sweden (manufacturing 26.1 %, services 43.9 %), Switzerland (manufacturing 29 %, services 41.7 %), Denmark (manufacturing 25.8 %, services 38.8 %), Germany (manufacturing 23.5 %, services 43.2 %) and Finland (manufacturing 25.8 %, services 39.6 %) (OECD 2009).[99] Data on R&D increases also show that R&D personnel composition in Austria, above all in the services industries, are moving quickly in the direction of people with university degrees or doctoral degrees (see Statistical Annex).

human resources for R&D – quality

The proportion of Austrian pupils in both top-level groups of the PISA study, despite the highly segmented school system, did not achieve the highest values for mathematics or natural sciences (Schreiner, 2007). Only 3 % pupils with a migration background reached either of these top groups, which is the lowest value among the countries assessed (for comparison: Germany 4.8 %, France 5.8 %, Sweden 11.2 %, Switzerland 11.4 %; OECD 2007b).

Little can be said empirically about the quality of tertiary undergraduate education in science and engineering fields of study, as corresponding PISA-style comparisons do not exist. At the tertiary level, a distinction can still be drawn between occupation-related and general university programmes (ISCED 5B vs. 5A). The share of occupation-related programmes is relatively low in Austria, since these programmes are overwhelmingly situated at the secondary level. The labour market culture of a country, however, cannot be measured, leaving unanswered the question of the extent to which companies require specific courses of study for specific careers. This will affect the selection of problem-solving approaches and the diver-

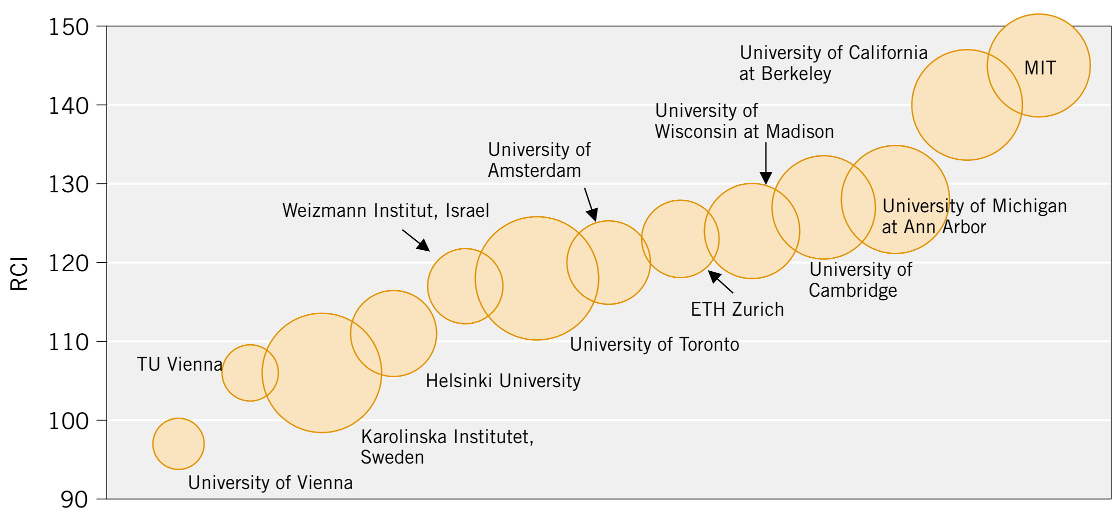
99 The OECD definition of human resources in science and technology goes beyond people with a tertiary education however; it is a broadly defined "pinnacle".

sity of opportunities within businesses. Detailed studies are required for this topic.

There are significantly more indices on the quality of researcher education and on the conditions for attracting and retaining the most talented researchers. First, as mentioned earlier, the traditional Austrian course of doctoral studies often does not correspond to the international standard of an educational system geared toward preparing candidates for an academic career. This trend, however, is being mitigated by the appearance of doctoral colleges and third-party-financed doctoral programmes, as well as the transition to the Bologna architecture with its higher-order Ph.D. studies. According to a recent study (Janger and Pechar 2008), the most important elements for recruiting the most talented doctoral students are an international approach to recruiting and the academic reputation of the researchers responsible for supervising candidates. Peer effects are an important element for the quality of doctoral study: doctoral candidates profit from the quality of their colleagues. The quality of university research therefore affects the talent pool in question as well as the quality of researcher education.

Figure 34 displays some universities according to their relative citation index and their worldwide share of publications (size of the circle). The two strongest Austrian institutions in terms of research – the University of Vienna and the Technical University of Vienna – produce research, in both qualitative and quantitative terms, that stands in the lower-middle field in international comparison

Figure 34: Publication quantity and quality (RCI) by universities, 1998–2002*



Source: CEST Scientometrics Research Portfolios: Universities and Colleges Participating in the Champions League. Diagrams and Profiles 1998-2002 (2004). * The x axis corresponds to the RCI ranking (1-13) of the universities assesses and is only shown to improve readability.

(Janger and Pechar, 2008[100]; BMWF and BMVIT 2009). Additionally, there are relatively few researchers whose work is cited at the high-frequency rates that would attract young scholars: according to the latest ISI analysis[101], there are a total of 20 such researchers, or 2.4 researchers per one million inhabitants (April 2010). Within the EU 15 states, only Italy, Greece, Ireland, Portugal and Spain are behind Austria. In the USA and Switzerland, there are 15.3 and 13.5 highly cited scientists per million inhabitants (respectively) – almost six times as many as in Austria (Reinstaller et al. 2008; BMWF and BMVIT 2009).

In order to attract the most talented young post-doc researchers or assistant professors to Austria, and retain them, conditions can be improved in the form of opportunities for early, independent research and comprehensive career models beginning with an international competitive selection process for assistant professors (Janger and Pechar, 2008). Although the new collective agreement offers comprehensive career models, it does not extend to full professorships, which require an competitive selection process. In international systems, tenure track positions are primarily awarded after an international, competitive hiring process. The Austrian collective agreement for university employees does not include such a provision.

5.2.4 Summary

The scientific literature shows that human capital and education systems are central to the functioning of innovation systems. Without appropriately qualified employees, innovations can be neither developed nor implemented. Human capital plays an essential role in R&D activities, the diffusion and absorption of knowledge and technologies, for founding new companies, decisions about company location, etc. The quality and quantity of the human resources for R&D (researchers, graduates of science and engineering programmes) and the human resources for innovation (quality and quantity of skills among the employed population) are just as important as the orientation of the education system towards occupation-related or general skills.

The study by Janger (2009), which was produced in the context of a systematic evaluation of research promotion and financing in Austria, argues that the Austrian system of education still has potential that can be realised, both at the level of human resources in R&D and human resources in innovation in a broad sense, in international comparison. An important fact here is that the system is very strongly concentrated on vocational training. The quality of human resources in innovation in a broad sense is characterised by variance of

100 Even if Austrian research is being underestimated, for example due to a language bias, the underestimation can not explain the distance to the top international universities.
101 ISI Web of Knowledge. ISI Highly Cited Scientists, period of the analysis from 1981 to 2007.

performance as well as a failure to unlock the potential of pupils with a migration background; quantity is marked by low participation in both tertiary education and jobs requiring vocational training that have a promising future. The quality of the human resources in R&D is characterised by the non-uniform education of researchers, which mostly does not correspond to international standards; the quantity of human resources in R&D, by contrast, is undergoing a relatively strong growth phase. There are, however, bottlenecks, as for example in engineering courses of study, which can be attributed partially to the very low participation of women in such programmes.

Janger (2009) recommends reforms at an early childhood age, when the efficacy of interventions (i.e., uniform federal quality standards) are highest. The increase in tertiary participation, as well as efforts to include more women in science and engineering professions, must also be strengthened via reforms of the pre-university school system. For internationally competitive research education, comprehensive Ph.D. studies are required; for tenure track positions, there should be an international hiring process, meaning that the appointment would take place at the assistant professor level, not at the full professor level. Starting earlier with the international hiring process and the removal of the Habilitation (replaced by a tenure evaluation) would also help to increase the number of women in professor positions.[102] With increasing international hiring, the Habilitation is viewed increasingly as an obstacle for potential Austrian candidates.

Adjustments to the education system would increase the effectiveness of several specific promotional programmes that are aimed at R&D activities, diffusion and absorption, the number of women in the natural sciences and technology, the founding of new technology-oriented companies, support for SME innovation activities, etc. Efforts to exploit quality potential in university research could remain ineffective without adjusting the framework conditions.

With regard to the sustained success of sectors that are often described as "low-tech" or "medium-tech", Janger (2009) warns against radical education system reform in terms of vocational training – massive, short-term shifts away from vocational secondary education to inter-occupational tertiary education would probably be ineffective. At least the choice of apprenticeships should be shifted strongly in the direction of future labour market demand.

102 The AQA is currently conducting a project on quality development of managing appointments on Austrian universities.

6 Life Sciences in Austria

6.1 Definition

The term **life sciences** includes all fields of science that engage in the research of living things and all of their associated processes and structures. This includes, for example, such fields of knowledge and technology as biology, molecular biology, biotechnology and biomedicine, as well as systems biology, diversity research, and pharmacogenomics, just to name a few.

Within life sciences, the discipline of **biotechnology** has developed quickly in recent years and is widely viewed as having the potential to become a key technology of the twenty-first century. Biotechnology focuses not only on previously unresolved questions within the realm of medicine, thereby offering new and efficient approaches for diagnosis and therapy, but also to generate applications from the discipline's high technological developmental capacity for a wide variety of uses in industrial production, agriculture and the environment. The market for a broad palette of products has changed, and so has international and national innovation policy, which attempts, in its overall approach, to take into account the potential contribution of this sector to key goals such as health, economic growth, the creation of jobs, coping with an aging population, and sustainable development.

The most recent OECD definition of biotechnology describes the field as:
"the application of science and technology to living organisms, as well as parts, products and models thereof, to alter living or non-living materials for the production of knowledge, goods and services."[103]

This definition demonstrates how comprehensive the field is, and it is therefore not surprising that the usage of this term, both in the literature and in practice, can diverge significantly. In order to be able to proceed systematically and represent this system, it is common to employ a colour scheme. This colour scheme represents a categorisation of areas of application, and can therefore serve as an initial point of approach to a general description of industry branches that are assigned to the field of biotechnology. Following Jörg et al. (2006, p. 17), this can be represented as follows:

- **Red biotechnology** identifies the research and application of biotechnological methods in medicine, from diagnostics to therapies (medicine and pharmaceuticals).
- **Green biotechnology** describes the research and application of biotechnological methods in plant breeding, agriculture and food production.
- **White biotechnology** describes the research and application of biotechnological methods

103 OECD Biotechnology Statistics (2009), p. 9. See also the listed definitions there of individual biotechnologies.

for the optimisation of industrial processes by using biomolecules or microorganisms. This include, among other things, cell factors, bio-catalysts, biomass and enzyme production.
- **Grey biotechnology** describes the research and application of biotechnological methods in the field of environmental protection, waste disposal and the control of environmental degradation. This field also deals with the integration of biotechnology with non-biological technologies.[104]
- **Blue biotechnology** describes the research and application of biotechnological methods in aquatic organisms. Because this descriptor is used only for origins, overlaps between the areas of application are not unusual for red and white biotechnology.

Unlike the corporate sector, in the **scientific sector** the term "**life sciences**" incorporates a number of fields of science, as mentioned earlier. A valid international definition with clear boundaries could not be found. In order to approach this field and enable statistical analysis, we adopted the approach utilised for the knowledge sector by the Austrian Science Fund FWF. Based on the Austrian system of classifying fields of science used by Statistik Austria, the FWF employs a categorisation of scientific branches at first-tier and second-tier levels in order to make the diverse field of "life sciences in the knowledge sector" easier to deal with from an operational perspective. Specifically, the rubric of life sciences encompasses the entire first-tier 3 (human medicine) and the second-tier 14 (biology, botany, zoology) and 45 (veterinary medicine).

6.2 Life Sciences in Austria

The life sciences – not least because of a long tradition in bioscientific research – have become a significant economic factor in Austria, and they play an important role in the overall spectrum of research. From 2000 to 2009, the European Patent Office granted 39,962 biotech patents[105] to Austria; in 2007 alone, this number stood at 5,511.[106]

6.2.1 The corporate sector in the life sciences

The life sciences field plays a significant role for the entire corporate sector. Overall, this sector (which is not easy to assess statistically, since there is no clearly defined statistical categorisation) includes 347 companies and a total of more than 28,000 employees. Turnover in 2007 stood at more than 8.6 billion euros, with gross value added of over 3.3 million euros. What is striking about these financial figures, however, is that small- to mid-sized companies are prevalent (270 companies have less than 50 employees); in terms of other figures, though, large companies dominate. Seventy percent of employees (19,975) are employed by 30 large companies (which only constitute 9 % of all companies active in the life sciences). These large companies also have higher turnover per employee (317,000 euros).

104 Cf also Braun (2005).
105 Patents relating to biotechnology according to the OECD definition.
106 Cf the second report of the Biopatent Monitoring Committee (2009), p. 21f.

Table 37: Life sciences in the corporate sector, 2007

Size categories	Number of companies	Employees	Percent women	Turnover [€ '000]	Gross investments [€ '000]	Gross value added at factor costs [in € '000]
< 50 employees	272	3,102	49	757,765	45,154	216,749
50–249 employees	47	5,609	42	1,592,463	119,325	490,464
250+ employees	28	19,975	36	6,331,925	425,620	2,670,690
Total	347	28,686	38	8,682,153	590,099	3,377,903

Source: Statistik Austria, own calculations.

The corporate sector has also exhibited strengths in the area of research and development. The 176 companies identified in this sector invested approximately 814 million euros in R&D in 2007. The life sciences sector constitutes ca. 17 % of overall R&D spending in the corporate sector (4,846 million euros). At 9.4 %, the research intensity is moderate in terms of turnover. Overall, just over 5,000 people are employed in R&D. There is also a high concentration here: 15 % of the companies (27) account for 70 % of R&D spending.

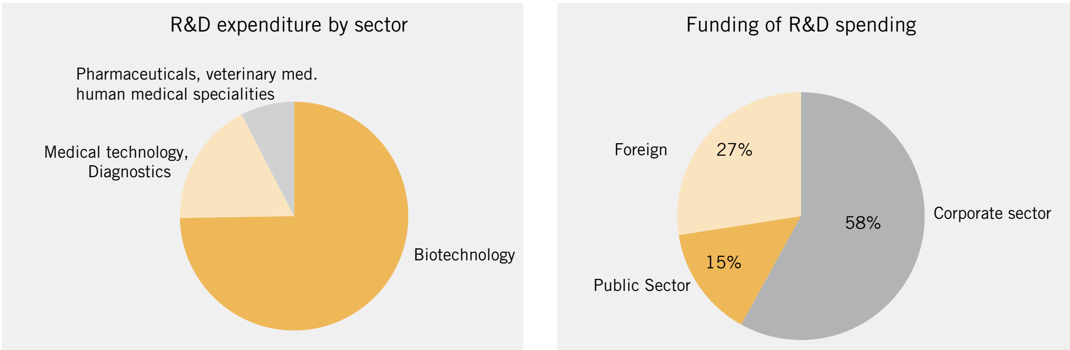
Table 38: R&D for companies in the life sciences, 2007

Size categories	Units performing R&D	Expenditure on internal R&D [€ '000]	employees (FTE)	Employees (Headcount)	Percent women (Headcount)
< 50 employees	118	80,920	792	1,075	41
50–249 employees	31	157,601	891	1,160	46
250+ employees	27	575,398	3,326	3,764	40
Total	176	813,919	5,009	5,999	42

Source: Statistik Austria, own calculations.

Three-quarters of R&D spending are in the biotech sector (608 million euros). Just under 60 % of R&D spending is financed by the corporate sector itself, and 27 % of financing comes from international sources. In terms of proportion, the 150 million euros provided by international companies plays the greatest role.

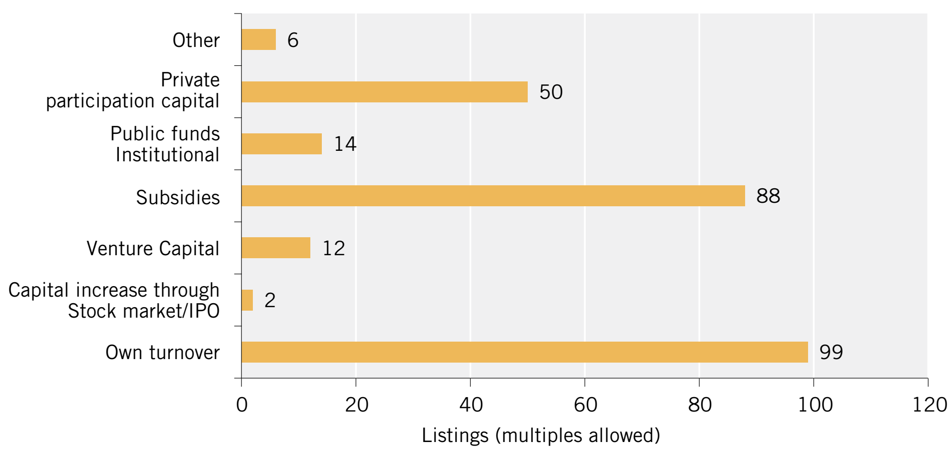
Figure 35: Characteristics of R&D spending, 2007



Source: Statistik Austria, own calculations.

In terms of new companies in the life sciences in Austria, most of the pharmaceutical companies were founded before 1999, while a majority of biotech companies were founded in the last ten years. Financing for this development – as Figure 36 shows – came primarily from equity capital resources (own turnover, private investment capital) and funding from public institutions.[107] In contrast, foreign and risk capital plays a subordinate role in new company start-ups in Austria; this is certainly attributable to the significantly below-average availability of venture capital and the comparatively conservative capital markets in Austria.[108]

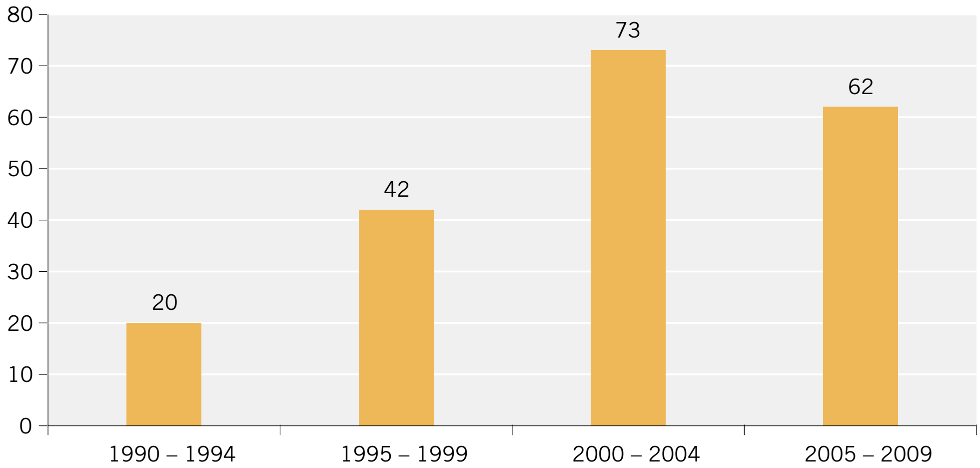
Figure 36: Financing of life sciences companies in Austria



Source: aws and Wellacher Consulting

107 The information is based on a survey commissioned by the BMWF in 2009 and done by the aws and Wellacher Consulting, 128 companies performing research and/or producing from the areas of pharmaceuticals, biotech and medical technology were questioned.
108 Cf also EC (2009), which points of the VC-dependence of biotech companies particularly from a strategic point of view.

Figure 37: Number of new company start-ups in biotech and pharmaceuticals in Vienna



Source: LISA VR (2009)

As a centre of research, Vienna is the foremost city in the corporate landscape.

On the basis of the dynamism of new company start-ups – represented in Figure 37 – it is also clear that, since 2000, over 130 companies in biotech and pharmaceuticals have been founded in Vienna; this positive development is primarily attributable to the successful establishment of life sciences clusters in the Vienna region. According to Jörg et al. (2006), most new start-ups are based in the biotechnology segment, in which the medical field obviously dominates; 75 % of biotech companies are categorised in the red biotechnology segment, in which oncology, immunology, inflammatory response, infectious diseases and neurobiology are particularly strong. If the positive developments in the biotech scene in and around Vienna are quite comparable with other established locations, such as the greater Munich area, Austria (which remains quite new in this regard in international comparison) has high market risk, not least because of its relatively high share of small new companies with a narrow product portfolio and companies that are still preparing for market entry. The latter can be explained primarily by the fact that, at the level of individual companies, there has long been little potential for risk distribution, and the number of leading companies with strong regional anchoring remains small. Those biotech companies that are already on the market provide a completely positive effect on the value of Austria as a site of technology and innovation; the majority of these companies assume not only growing turnover but also increasing spending for research and development in the future.

6.2.2 The scientific sector in the life sciences

As mentioned above, the field of life sciences is comprised of a series of fields of science. Following the statistical methodology of the Austrian Science Fund FWF, the knowledge sector of the life sciences is represented at the second-tier level 14 (biology, botany, zoology) and 45 (veterinary medicine), as well as the overall first-tier 3 (human medicine).[109] R&D surveys by Statistik Austria, conducted in 2004, 2006 and 2007, are used as baseline data.

Table 39 represents developments in R&D spending according to sectors of performance. This shows that the overall spending for R&D in the life sciences rose from 642.1 million euros in 2004 to 763.7 million euros in 2007. The higher education sector had the highest share of R&D spending, with a volume of 604.4 million euros in 2007; both universities and clinics demonstrated rising volumes of spending. In contrast, the Austrian Academy of Sciences did not experience this constant increase in R&D spending in the life sciences during the years shown. R&D spending climbed from 2004 to 2006 by 9.2 million euros, and then sank in the following year by 3.7 million euros. The reasons for this may be associated with the expansion phase of the Life Sciences Institute of the Academy of Sciences during this period. The two other sectors were less dominant; this is shown in the government sector.[110] 2007 research spending in the life sciences reached a total of 151.3 million euros, while R&D spending in the non-profit sector totalled 8 million euros.

Table 39: R&D spending (in millions of euros) in the knowledge sector for life sciences according to sectors of performance, 2004/06/07

	Biology, botany, zoology			Human medicine			Veterinary medicine			Total		
	2004	2006	2007	2004	2006	2007	2004	2006	2007	2004	2006	2007
1. Higher education sector	**123.0**	**142.6**	**150.3**	**374.8**	**396.9**	**423.1**	**29.2**	**32.0**	**31.0**	**527.0**	**571.4**	**604.4**
of which universities	98.1	108.9	124.9	180.9	187.6	210.1	29.2	32.0	31.0	308.2	328.4	366.0
hospitals	-	-	-	184.0	193.9	194.9	-	-	-	184.0	193.9	194.9
ÖAW	24.9	32.0	25.4	4.2	6.4	9.2	-	-	-	29.1	38.4	34.7
2. Government sector*	**5.8**	**11.7**	**12.9**	**103.5**	**121.4**	**138.3**	**-**	**0.0**	**0.1**	**109.3**	**133.1**	**151.3**
of which LBG	0.0	1.0	1.1	4.4	5.8	6.7	-	-	-	4.4	6.8	7.8
3. Private non-profit sector	**0.2**	**0.7**	**0.8**	**5.7**	**4.5**	**7.1**	**-**	**-**	**0.1**	**5.9**	**5.3**	**8.0**
TOTAL	**129.0**	**155.0**	**164.0**	**484.0**	**522.8**	**568.5**	**29.2**	**32.0**	**31.2**	**642.1**	**709.8**	**763.7**

* Including R&D spending by regional hospitals in the area of human medicine.

Source: Statistik Austria, calculations by Joanneum Research

109 The framework of the selection is – as opposed to the corporate sector – the statistical data capture on a two-digit level; the science branches are depicted comprehensively. Attention must be paid to the fact the life science activities outside the three named scientific branches have not been recorded or presented as such.

110 The government sector includes, in addition to the federal institutions and facilities of the states, local governments, chambers and social insurance carriers, also private non-profit institutions financed or controlled by the public.

The pattern of R&D spending shows that the scientific branch of human medicine (including additional clinical expenses) experienced the highest growth in R&D spending across all sectors, from 484 million euros in 2004 to 568.5 million euros in 2007, followed by biology, botany and zoology with a total of 164 million euros. These latter fields also exhibited a trend toward increased spending. If we look more closely at human medicine (shown in Table 40), 31.5 % of total R&D spending in 2007 flowed into clinical medicine, almost 22 % into medical chemistry, medical physics and physiology, and 11.5 % into hygiene and medical microbiology. While Austrian universities and clinics are engaged in a broad array of activities within human medicine, the Ludwig Boltzmann Gesellschaft (LBG) and its R&D spending are at the centre of the first-tier scientific branches; the Austrian Academy of Science and the private non-profit sector are dominant in only one scientific branch, namely the second-tier 3.2, "medical chemistry, medical physics and physiology."

Table 40: Shares of R&D spending in the knowledge sector for life sciences within human medicine, according to sectors of performance, 2007

	3.1 Anatomy, pathology	3.2. Med. chemistry, Med. physics, physiology	3.3 Pharmacy, pharmacology, toxicology	3.4 Hygiene, medical microbiology	3.5 Clinical medicine (excl. surgery and psychiatry)	3.6 Surgery and anaesthesiology	3.7 Psychiatry and neurology	3.8 Forensic medicine	3.9 Other and interdisciplinary human medicine
1. Higher education sector	6.5%	20.1%	8.0%	11.9%	32.0%	8.3%	6.0%	3.1%	4.2%
of which universities	13.1%	33.2%	12.7%	23.3%	-	1.5%	3.7%	6.2%	6.4%
hospitals**	-	1.8%	3.6%	0.8%	68.3%	16.4%	9.0%	-	-
ÖAW	-	100.0%	-	-	-	-	-	-	-
2. Government sector*	4.9%	37.2%	-	0.2%	34.3%	4.4%	1.8%	-	17.2%
of which LBG	3.3%	43.9%	-	0.1%	37.1%	5.2%	2.1%	-	8.4%
3. Private non-profit sector	-	100.0%	-	-	-	-	-	-	-
TOTAL 2007	**6.4%**	**21.7%**	**7.7%**	**11.5%**	**31.5%**	**8.1%**	**5.9%**	**3.0%**	**4.3%**
TOTAL 2006	7%	19%	7%	11%	33%	10%	6%	3%	5%
TOTAL 2004	8%	20%	8%	10%	33%	9%	6%	2%	4%

* Without regional hospitals, ** Including additional clinical expenses

Source: Statistik Austria, calculations by Joanneum Research

Table 41: Financing structure for R&D spending on life sciences according to sectors of performance, 2007

	Financed by:									
		Public sector								
	Corporate sector	Federal	State	Municipalities	Other	Total	Private non-profit sector	Abroad (excluding EU)	EU	TOTAL
1. Higher education sector	**5.0%**	**76.1%**	**1.3%**	**0.0%**	**12.0%**	**89.4%**	**0.9%**	**1.9%**	**2.7%**	**100.0%**
of which universities	4.8%	74.8%	1.1%	0.0%	14.7%	90.6%	0.6%	1.2%	2.8%	100.0%
hospitals	5.8%	79.5%	0.6%	0.0%	8.6%	88.7%	0.3%	3.1%	2.1%	100.0%
ÖAW	0.7%	87.7%	1.5%	-	3.4%	92.6%	0.3%	0.4%	6.0%	100.0%
2. Government sector*	**1.0%**	**4.9%**	**90.3%**	**0.6%**	**2.3%**	**98.2%**	**0.2%**	**0.2%**	**0.4%**	**100.0%**
of which LBG	17.2%	37.8%	0.7%	0.4%	34.4%	73.3%	0.4%	2.9%	6.2%	100.0%
3. Private non-profit sector	**2.5%**	**2.3%**	**0.5%**	**0.2%**	**4.4%**	**7.4%**	**87.9%**	**0.0%**	**2.2%**	**100.0%**
TOTAL	**4.2%**	**61.2%**	**18.9%**	**0.1%**	**10.0%**	**90.3%**	**1.7%**	**1.6%**	**2.3%**	**100.0%**

* Including regional hospitals

Source: Statistik Austria, calculations by Joanneum Research

The federal government bears the highest portion of R&D spending in the life sciences in all sectors of performance (see Table 41), financing 74.8 % of R&D spending at universities, 79.5 % at clinics and 87.7 % at the Austrian Academy of Sciences in 2007. The federal government plays a more limited role than the Ludwig Boltzmann Gesellschaft, which provided more than 17 % of financing for R&D spending in the corporate sector. These numbers reflect in general the various financing models of the scientific and research institutions named above. In terms of the share of R&D spending financing via EU financial instruments, the Ludwig Boltzmann Gesellschaft – in comparison to universities and clinics – has a higher share (6.2 %); this is the same for the Austrian Academy of Sciences.

Although basic research in life sciences is performed primarily at universities and university clinics, the research landscape is rounded out by private research institutes, extra-university institutions, temporarily subsidised research groups such as the Ludwig Boltzmann Institutes, the Christian Doppler laboratories, and centres of excellence. More often, research groups are integrated in existing research institutions, mostly universities, and they strive to enhance international visibility and strengthen collaboration by building up networks. The Campus Vienna Biocentre (CVBC) in Vienna exemplifies the fact that, as a scientific and technological field, life sciences is distinguished by interdisciplinarity and cross-site cooperation. The history of the Vienna location goes back to 1988, when Boehringer Ingelheim founded the Institute for Molecular Pathology (IMP); this world-renowned research institution is still financially supported by Ingelheim. In the following years, the University of Vienna and the Medical University of Vienna situated a majority of their molecular biology research on-campus, which led to the founding of a joint organisation, the Max F. Perutz Laboratories (MFPL). In the meantime, more than a dozen academic institutions – among them the Institute for Molecular Biology (IMBA) and the Gregor Mendel Institute for Molecular Plant Biology (GMI) – have moved to the CVBC, as have established companies. Both knowledge-driving research groups and start-ups with promising potential conduct research at the CVBC. In addition to the CVBC, other life science centres in Vienna have won international acclaim, such as the Medical University at the AKH (General Hospital Vienna), the Muthgasse Technology Centre at the University of Agriculture, and the University of Veterinary Medicine Vienna.[111] Overall, it is clear that, as in the corporate sector, Vienna is considered the predestined location for research and science in life sciences. In 2007, more than half of R&D spending (52.2 %) was spent in Vienna, which is also where the Ludwig Boltzmann Gesellschaft and the Austrian Academy of Sciences, among others, concentrate their R&D spending.

In addition to Vienna, the regional governments of Styria and Tyrol are also accruing an increasingly significant role in life sciences in Austria. In both states, universities and clinics in particular drive R&D activities forward in the life sciences and provide an institutional home for researchers (the University of Graz, the Medical University of Graz, the Technical University of Graz, the Medical University of Innsbruck, and the University of Innsbruck). Furthermore, there are a series of other life sciences hot-spots in Styria (a large number of excellence projects and centres of excellence, such as the K2 Centre for Industrial Biotechnology or the K1 Centre for Pharmaceutical Engineering) and in Tyrol, such as the K1 Centre ONCOTYROL and the Private University for the Health Sciences, Medical Information Sciences and Technology (UMIT).

Moreover, the regional governments of Lower Austria, Salzburg and Upper Austria are also conducting activities in this area. In these states, the centre of the life sciences are also located at the universities (Danube University Krems, the University of Salzburg, the Paracelsus Medical Private University in Salzburg, the University of Linz, and the University of Applied Science Hagenberg Campus). In this overview, we should also mention the Institute of Science and Technology (IST Austria), which is still under construction, and the Austrian Institute of Technology (AIT), which also dedicates one of its research foci to the life sciences.

The most significant research institutions in the life sciences are the Austrian Academy of Sciences (ÖAW), the Ludwig Boltzmann Gesellschaft (LBG) and the Christian Doppler Gesellschaft (CDG). Organised into a philosophical-historical class (humanities) and a mathematical-natural scientific class – the latter employed a total of 1,020 full-time equivalent personnel in 2008 – the Austrian Academy of Sciences has already established itself in the field of life sciences. The IMBA and GMI, both

111 cf. Lang 2009, p. 23.

research institutions located at the Campus Vienna Biocentre, as well as the Research Centre for Molecular Medicine (CeMM) located at the AKH, are some of the internationally renowned pioneers in life sciences research.[112] The baseline budget for the Austrian Academy of Sciences is funded 100 % by the federal government; the Austrian Academy of Sciences is therefore assigned to the higher education sector, not least because it is understood as an organisation that both teaches and conducts research.

After its restructuring in 2004, the Ludwig Boltzmann Gesellschaft today has 20 institutes and eight clusters, of which six institutes (such as the LBI for Cancer Research or the LBI for Health Technology Assessment) and two clusters (the Oncology Cluster and the Translational Oncology Cluster) are assigned to the life sciences field. The Ludwig Boltzmann Gesellschaft is financed approximately 40 % by basic subsidies from the federal government and the city of Vienna plus 60 % by contributions from partner organisations and third parties. The Ludwig Boltzmann Gesellschaft employed a total of 243 people (full-time equivalent) in 2008.[113]

The Christian Doppler Gesellschaft (CDG) is distinguished by its per definitionem support of basic research oriented toward application, thereby placing the CDG at the interface between business and science. This integration of basic research and its application in the corporate field is done in Christian Doppler laboratories (CD-Laboratories) that are established at universities or extra-university research institutions for a maximum of seven years. The prerequisite for such an institution is a company with a specific need for knowledge and expertise derived from basic research, as well as a research group that has experienced scientific leadership. The laboratory budget is a maximum of 600,000 euros per year, while the CD-Laboratories are financed by up to 50 % by public funds. Currently, there are a total of 60 CD-Laboratories with about 600 employees, of which there are five international CD-Laboratories in Germany and two international CD-Modules in Hanover, Germany and Davos, Switzerland.[114]

In the field of life sciences, the CDG founded a total of 17 CD-Laboratories from 2002 to 2009; in 2008, it founded five new CD-Laboratories, a high point for the organisation. The CD-Laboratory with the highest annual average budget is the CD-Laboratory for proteome analysis, with 500,000 euros, followed by the CD-Laboratory for allergy research with 480,000 euros and the CD-Laboratory for infection biology with 460,000 euros. The last of these has the highest average employment rate with 11 employees.

112 Cf ÖAW (2007) and (2009).
113 Cf LBG (2008).
114 Cf LBG (2009).

Table 42: CD-Laboratories in the life sciences, 2002–2009

Name of CD laboratory	Start	End	State	Annual budget (average)	Employees (average)
Genomics and bioinformatics	11 / 2002	10 / 2009	Tirol	€430,000	6
Mycotoxin research	12 / 2002	11 / 2009	Lower Austria	€340,000	8
Gene therapeutic vector development	12 / 2003	8 / 2011	Vienna	€420,000	8
Proteome analysis	5 / 2005	4 / 2012	Vienna	€500,000	6
Receptor biotechnology	7 / 2005	12 / 2012	Vienna	€400,000	6
Allergy research	1 / 2006	12 / 2012	Vienna	€480,000	5
Infection biology of the gastrointestinal tract	8 / 2006	7 / 2013	Tirol	€200,000	3
Molecular food analysis	11 / 2006	10 / 2013	Vienna	€280,000	7
Analytics of allergenic food contaminants	10 / 2007	9 / 2014	Lower Austria	€230,000	4
Molecular carcinoma chemoprevention	10 / 2007	9 / 2014	Vienna	€230,000	6
Immun modulation	1 / 2008	12 / 2014	Vienna	€370,000	6
Nanoscopic methods in biophysics	1 / 2008	12 / 2014	Upper Austria	€170,000	3
Biotechnology of fungi	2 / 2008	1 / 2015	Germany	€330,000	5
Infection biology	3 / 2008	2 / 2015	Vienna	€460,000	11
Lactic acid bacteria changed by genetic engineering	11 / 2008	10 / 2015	Vienna	€330,000	5
Antibody engineering	3 / 2009	2 / 2016	Vienna	€365,000	6
Development of allergen chips	4 / 2009	3 / 2016	Vienna	€240,000	5

Source: CDG (2010), graphics by Joanneum Research

Overall – as Table 42 shows – there are 17 CD-Laboratories with an annual budget total of 5.78 million euros and with research groups employing a total of 100 people in the field of life sciences. The majority, or 71 % of employees, work at a total of 11 CD-Laboratories in Vienna; the states of Tyrol and Lower Austria each have two laboratories, with a corresponding share of 9–12 % of employees and about 10 % of the annual overall budget. It is also worth pointing out that an international CD-Laboratory located in Germany is also active in the life sciences.

In 2007, a total of 4,859 employees (full-time equivalent) were working in R&D in the life sciences in the scientific facsector. It is clear from Table 43 that the higher education sector, with its total of 4,577 employees in 2007 (an increase of 518 employees over 2004), represents over 90 % of all employees. The highest gains in personnel occurred at universities in the areas of biology, botany and zoology (from 782 in 2004 to 1,053 in 2007); by comparison, the human medicine field only experienced a slight increase in human capital in R&D. Although the number of employees in R&D at universities climbed slightly from 2004 to 2007 (from 1,508 to 1,665 employees), the clinics experienced a slight decline in numbers (from 1,406 to 1,352 employees). The Austrian Academy of Sciences increased its number of personnel in R&D, in biology, botany and zoology as well as human medicine; the number of employees in human medicine more than doubled from 2004 to 2007 (from 28 to 65 employees). This growth is based in the expansion and development of the life sciences research institutions at the Austrian Academy of Sciences, which were founded at the beginning of the decade. There was also an upward trend in R&D personnel in the federal and private non-profit sectors; human medicine was also the largest scientific branch here and employed the most personnel.

Table 43: Employees (full-time equivalent) in the knowledge sector in R&D in the life sciences according to sectors of performance, 2004/06/07

	Biology, botany, zoology			Human medicine			Veterinary medicine			Total		
	2004	2006	2007	2004	2006	2007	2004	2006	2007	2004	2006	2007
1. Higher education sector	**863**	**1,048**	**1,190**	**2,983**	**2,935**	**3,170**	**214**	**212**	**218**	**4,059**	**4,195**	**4,577**
Universities	782	920	1,053	1,508	1,475	1,665	214	212	218	2,504	2,607	2,936
hospitals	-	-	-	1,406	1,333	1,352	-	-	-	1,406	1,333	1,352
ÖAW	80	121	137	28	52	65	-	-	-	108	173	202
2. Government sector*	**69**	**94**	**86**	**82**	**100**	**116**	**-**	**0**	**2**	**150**	**195**	**204**
of which LBG	1	16	17	71	85	101	-	-	-	72	100	118
3. Private non-profit sector	**3**	**11**	**14**	**48**	**52**	**63**	**-**	**-**	**1**	**50**	**62**	**78**
TOTAL	**934**	**1,153**	**1,290**	**3,112**	**3,087**	**3,348**	**214**	**212**	**220**	**4,260**	**4,452**	**4,859**

* Excluding regional hospitals

Source: Statistik Austria, calculations by Joanneum Research

Table 44: Employment share of the knowledge sector in R&D in the life sciences within human medicine according to sectors of performance, 2007

	3.1 Anatomy, pathology	3.2. Med. chemistry, Med. Physics Physiology	3.3 Pharmacy, pharmacology, toxicology	3.4 Hygiene, medical microbiology	3.5 Clinical medicine (excl. surgery and psychiatry)	3.6 Surgery and anaesthesiology	3.7 Psychiatry and neurology	3.8 Forensic medicine	3.9 Other and interdisciplinary human medicine Human medicine
1. Higher education sector	7.2%	25.1%	8.5%	6.6%	29.4%	9.0%	6.9%	2.1%	5.1%
Universities	13.8%	41.6%	14.6%	11.6%	-	1.7%	5.5%	4.0%	7.3%
hospitals	-	1.7%	2.1%	1.2%	66.7%	19.0%	9.2%	-	-
ÖAW	-	100.0%	-	-	-	-	-	-	-
2. Government sector*	4.2%	35.5%	-	0.4%	36.7%	8.2%	1.7%	-	13.2%
of which LBG	3.0%	40.7%	-	0.3%	38.1%	9.4%	2.0%	-	6.6%
3. Private non-profit sector	-	100.0%	-	-	-	-	-	-	-
TOTAL 2007	**7.0%**	**26.8%**	**8.1%**	**6.3%**	**29.1%**	**8.8%**	**6.6%**	**2.0%**	**5.3%**
TOTAL 2006	6.9%	24.3%	8.4%	5.5%	30.8%	9.4%	7.1%	2.1%	5.6%
TOTAL 2004	7.6%	23.5%	8.1%	8.3%	29.9%	10.0%	6.6%	1.8%	4.3%

* Excluding regional hospitals

Source: Statistik Austria, calculations by Joanneum Research

Starting in 2007 within the field of human medicine, 29.1 % of all R&D employees were classified under clinical medicine, followed by 26.8 % in medical chemistry, medical physics and physiology. The universities and clinics play a crucial role here; although they had a broad distribution of employees, they were focused on individual scientific branches: 41.6 % of R&D university personnel were employed in the area of medical chemistry, medical physics and physiology, followed by 14.6 % in pharmaceuticals, pharmacology and toxicology, 13.8 % in anatomy and pathology. Two-thirds of R&D personnel in clinics belong to clinical medicine, followed by 19 % in surgery and anaesthesiology. The Austrian Academy of Sciences had an even stronger focus; here (and in the private non-profit sector) the share of R&D employment in medical chemistry, medical physics and physiology was 100 %, which mirrors the basic-research-oriented character of the Academy. The Ludwig Boltzmann Gesellschaft also exhibited a strong emphasis in this scientific branch with a share of R&D employment at 40.7 %, followed by 38.1 % in clinical medicine.

Table 45: Share of women in the knowledge sector in R&D in the life sciences according to sectors of performance, 2007

	Scientific personnel (academics etc.)		People with school leaving exams, technician, laboratorians		Other Auxiliary personnel		Total personnel	
	Employees	Share female	Employees	Share female	Employees	Share female	Employees	Share female
1. Higher education sector	**2,918**	**44.6%**	**1,009**	**76.5%**	**650**	**68.4%**	**4,577**	**55.0%**
of which universities	1,799	45.6%	660	74.1%	476	62.2%	2,936	54.7%
hospitals	882	41.0%	306	82.3%	164	85.5%	1,352	55.8%
ÖAW	176	53.0%	23	73.9%	4	73.7%	202	55.7%
2. Government sector*	**131**	**38.9%**	**40**	**65.0%**	**33**	**54.3%**	**204**	**46.5%**
of which LBG	80	43.5%	30	77.5%	8	62.5%	118	53.6%
3. Private non-profit sector	**51**	**59.2%**	**24**	**78.8%**	**3**	**87.5%**	**78**	**66.3%**
TOTAL	**3,100**	**44.6%**	**1,072**	**76.1%**	**686**	**67.8%**	**4,858**	**54.9%**

* Excluding regional hospitals

Source: Statistik Austria, calculations by Joanneum Research

Regarding the proportion of women in the knowledge sector in life sciences R&D (shown in Table 45), the total share of female employees, at almost 55 % in 2007, is above average (in comparison, the proportion of women in overall research is 38 %). It is remarkable that the proportion of women in R&D – throughout all sectors of performance – is significantly higher than for researchers, with lower qualifications. This means that the proportion of women in R&D is between two-thirds and three-quarters of all personnel in the category of "graduates of academic secondary schools, technicians and laboratory assistants" and in the category of "auxiliary personnel".

6.3 National funding agencies and programmes in the life sciences sector

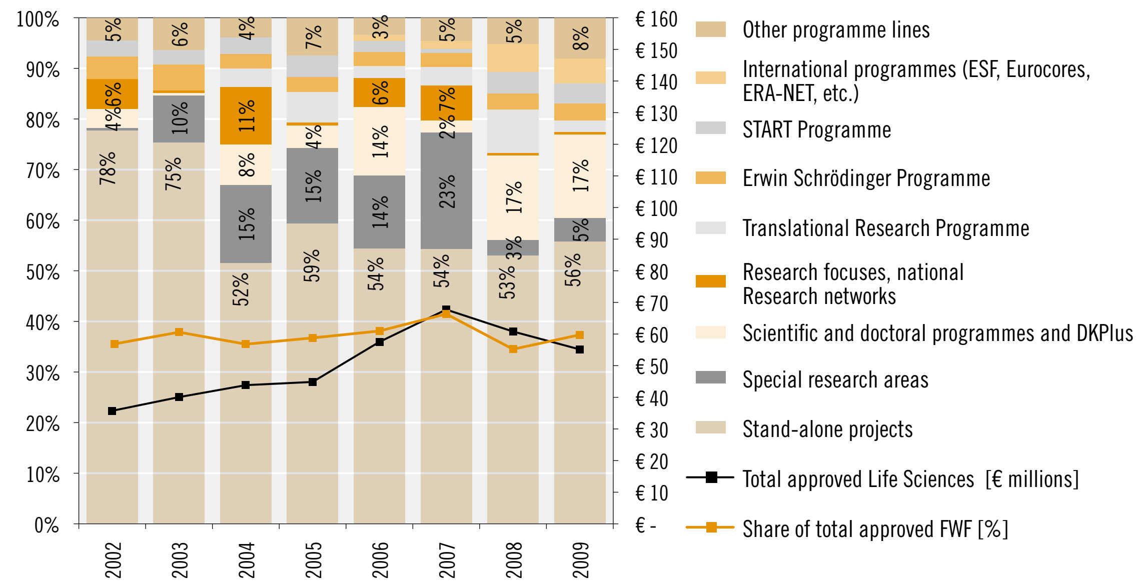
In its Strategy 2020, the Council for Research and Technology Development (RFTE) points out that the life sciences accounted for the largest total amount of development funds in 2007. If the definition used by the RFTE is followed, then the funding agencies FFG, FWF, aws and CDG, the public research institution AIT, Ludwig Boltzmann Gesellschaft and Austrian Academy of Sciences, together invested almost EUR 104 million in development funds in the life sciences in 2007. This is followed by development funds for other themes such as nano and material (EUR 63 million) and information and communication technologies (EUR 62 million).[115] Life sciences is thus clearly in first place in thematic research promotion. In view of that, the most important funding programmes of the three agencies (FWF, FFG and aws) in the life sciences sector and their development will be described briefly below.

6.3.1 The Science Fund (FWF)

The Austrian Science Fund (FWF) focuses on the funding of basic research-oriented projects in the science sector, supplemented by a series of programmes to support scientific careers. As Figure 38 shows, the grants awarded in the life sciences sector rose from just under € 36 million in 2002 to more than € 67.7 million in 2007. In the last two years there was finally a decrease – with the result that grants awarded for the life sciences declined to € 55.1 million in 2009, reflecting an approximately 36 % share of the total grants awarded by FWF.

115 Cf.RFT (2009), p. 48.

Figure 38: Grants awarded by FWF and the share of programme lines for the life sciences, 2002–2009



Source: FWF, Calculations by Joanneum Research

According to the budgetary allocation in FWF's funding portfolio, stand-alone projects account for the greatest share of grants awarded for the life sciences, although the amount became lower than before starting in 2004. In 2009, their share of total grants awarded came to 56 %, followed by the scientific and doctoral programmes and DKPlus with a 17 % share. In contrast, the share of other programmes is lower, with special research programmes accounting for a 5 % share in 2009, down from a 23 % share in 2007. However, the budget for these programmes was also reduced in the last two years. Other programmes such as the Erwin Schrödinger Programme and the START Programme account for a lower share with regard to grants awarded due, of course to the lower budget of these programmes.

The analysis based on fields of science (Table 46) shows that veterinary medicine accounted for a minimal share of the annual grants awarded by FWF from 2002 to 2009. In contrast, the fields of science of biology, botany and zoology exhibited a rising trend and in 2009 accounted for a 61.6 % share of annual grants awarded in the life sciences. On the other hand, grants approved in the fields of science of human medicine are trending downwards. While human medicine accounted for a 50.2 % share of annual grants awarded in 2005, its share declined in the following years to 37.2 % in 2009. Within human medicine, the individual disciplines are subject to significant fluctuations, although all disciplines show a downward trend. The disciplines with the highest shares of annual grants awarded in 2009 are medical chemistry, medical physics and physiology at 12 % and hygiene and medical microbiology at 10 %.

Table 46: Shares of the fields of science in the life sciences sector of the annual grants awarded by FWF, 2002–2009

	2002	2003	2004	2005	2006	2007	2008	2009
Biology, botany, zoology	38.7%	57.5%	54.0%	49.5%	55.7%	53.5%	68.0%	61.6%
Human medicine	59.3%	42.0%	45.7%	50.2%	43.4%	46.3%	31.1%	37.2%
Anatomy, pathology	2.9%	3.3%	3.7%	6.4%	2.4%	4.0%	5.4%	4.9%
Med. chemistry, med. physics, physiology	22.0%	19.2%	15.5%	15.4%	20.1%	17.4%	10.9%	12.0%
Pharmacy, pharmacology, toxicology	5.7%	4.4%	3.8%	3.7%	4.6%	5.1%	2.7%	3.5%
Hygiene, med. microbiology	10.2%	7.1%	14.0%	12.0%	7.1%	11.6%	5.0%	10.0%
Clinical medicine	11.1%	3.5%	4.5%	8.5%	3.3%	2.8%	3.7%	4.1%
Surgery and anaesthesiology	0.7%	0.6%	0.3%	0.8%	0.2%	0.1%	0.4%	0.1%
Psychiatry and neurology	5.0%	3.1%	3.2%	2.5%	5.0%	3.6%	1.8%	1.1%
Forensic medicine	-	0.0%	0.0%	-	-	-	-	-
Other and interdisciplinary human medicine	1.7%	0.8%	0.8%	1.0%	0.8%	1.8%	1.2%	1.6%
Veterinary medicine	2.0%	0.4%	0.3%	0.3%	0.9%	0.2%	0.9%	1.2%

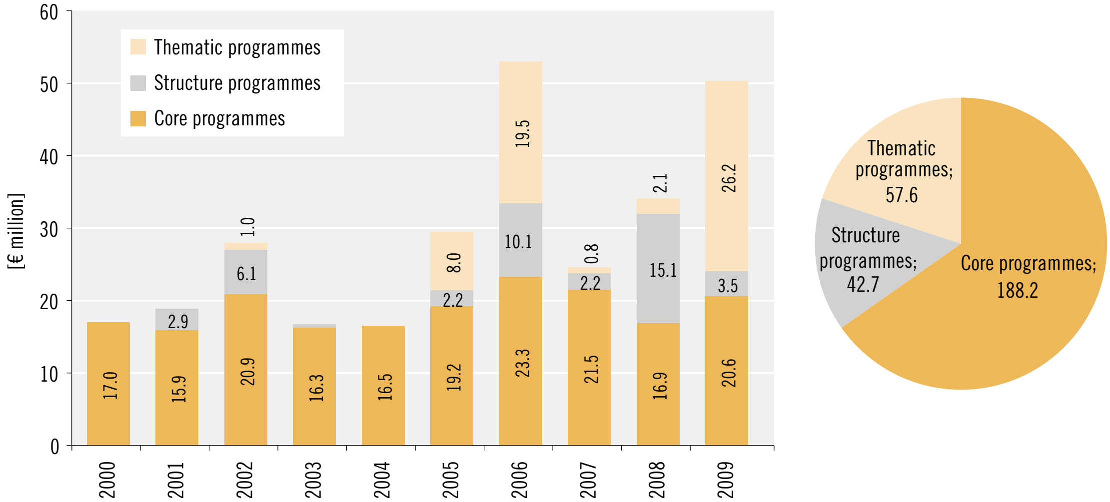
Source: FWF, Calculations by Joanneum Research

6.3.2 The Austrian Research Promotion Agency (FFG)

As the national funding agency for application-oriented and economically focused research, the Austrian Research Promotion Agency (FFG) offers a wide range of funding and services for the continued expansion of research and development, including in the life sciences, and for the development of market-ready products and services. In line with this, under the thematic programme, FFG also supports the Austrian genome research programme GEN-AU , for which it received a commission from the Federal Ministry of Science and Research (BMWF).[116]

166 See the following section.

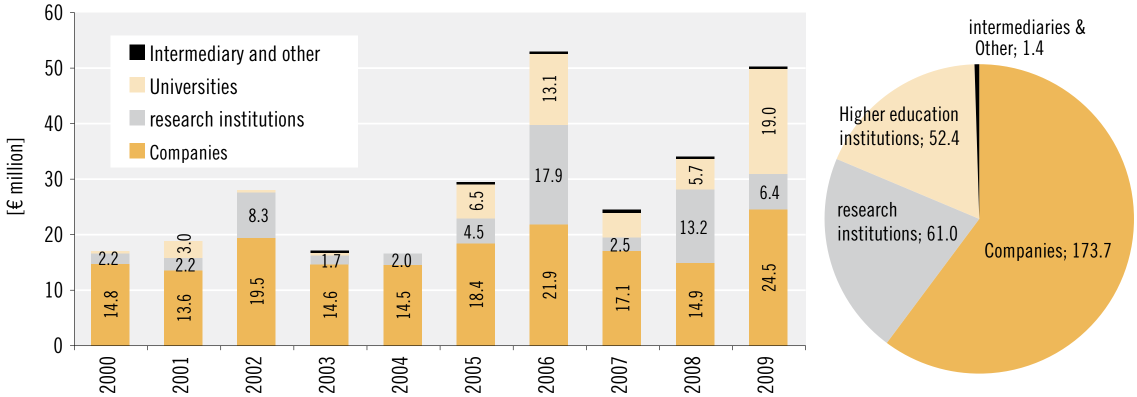
Figure 39: FFG development funds in the life sciences sector by programme, 2000–2009



Source: FFG, own data

The cumulative sum of development funds from FFG for the life sciences (described in Figure 39) totalled € 288.8 million in the period 2000 to 2009, thus tripling FFG's funding volume for the life sciences during these years. The support of stand-alone projects under the basic programme accounted for two-thirds (€ 188.2 million) of this general funding volume. Their share of the total development funds in the life sciences remained relatively constant to slightly increasing over the years. In comparison, the development funds of the thematic programme and the structural programme have risen since 2005, although rather spottily. Thus, the thematic programmes recorded their highest funding level of € 26.2 million in the life sciences in 2009. In comparison, the structural programmes reached their maximum of € 15.1 million in 2008. The reason for these fluctuations in the life sciences sector of the thematic programmes is the three-year announcement cycle of the Austrian genome research programme GEN-AU.

Figure 40: FFG development funds in the life sciences sector by recipient, 2000–2009



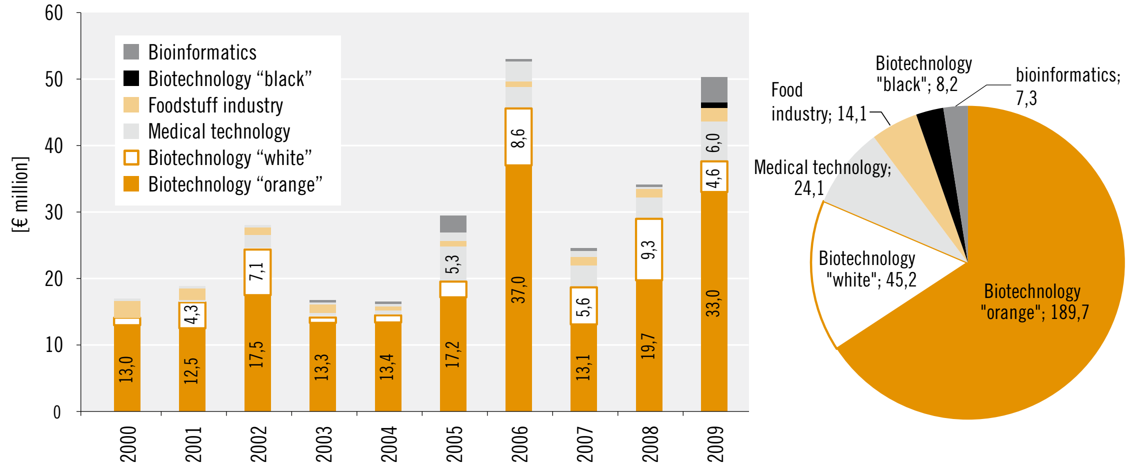
Source: FFG, own data

Corporations are the leading recipients in the distribution of FFG development funds for the life sciences in the period 2000 to 2009 (shown in Figure 38) with a total share of € 173.7 million (60 %), followed by the research institutions at € 61 million and the universities at € 52.4 million. Corporations thus succeeded in obtaining the highest funding volume in the life sciences at € 24.5 million and in retrospect show a definitely fluctuating but entirely stable level of capital inflows from FFG. In contrast, the FFG development funds in favour of the research institutions and universities are seen as more dynamic. Both institutions have recorded noticeable growth in the life sciences since 2005. The universities achieved a funding volume of € 19 million in 2009, approaching that of the corporations. It may be assumed that this development is also due to the Austrian genome research programme GEN-AU, especially due to the fact that the research projects of this programme are more strongly oriented to basic research and must accordingly be assigned to the universities and research institutions.

With regard to areas of application[117] of the funded life sciences sector, approximately two-thirds of all FFG development funds (€ 189.7 million) went to red biotechnology in the period from 2000 to 2009, followed by € 45.2 million to white biotechnology and € 24.1 million to medical technology. Red biotechnology recorded the highest increase with its funding inflows rising from € 13 million in 2000 to € 33 million in 2009. The significance of white biotechnology has also increased over the years while, on the other hand green biotechnology and bioinformatics have not attracted attention until the last three years and have thus increasingly decided to apply for FFG development funds.

117 See FFG (2008) for a definition of the areas of application: green biotechnology: agriculture; red biotechnology: medicine and pharmacy; blue biotechnology: products from the sea; white biotechnology: industrial applications (products and processes) of biotechnology; and grey biotechnology: waste management.

Figure 41: FFG development funds in life sciences by area of application, 2000–2009



Source: FFG, own data

The genome research programme GEN-AU

To build up and strengthen genome research in Austria over the long term, the programme GEN-AU was initiated in 2001 and was commissioned by the Federal Ministry of Science and Research.[118] FFG is responsible for the programme management. The goal is to support in particular the interdisciplinary collaboration between outstanding experts from a broad range of fields of science in order to take into account the systematic requirements of the fields to be researched. The programme is directed to universities, research institutions, corporations performing research as well as partnerships and associations. The term of GEN-AU has been set at ten years (from 2001 to 2012). With a project life broken down into three phases of three years each, GEN-AU has a current budget of approximately € 80 million which finances five programme lines. A brief description of these programme lines follows[119]:

- **ELSA projects**: academic and/or industrial research groups; interdisciplinary research of ethical, legal, social and economic aspects of genome research as well as the impacts of genome research on policy and society; term: maximum three years;
- **Interdisciplinary joint projects:** at least three academic and/or industrial research groups, including at least one academic partner; interdisciplinary cooperation on a common biological question; term: maximum three years;
- **Pilot projects:** one up to two research groups; proof of a research hypothesis in the area of a technology or a biological question ("proof of principle"); term: maximum one year.
- **Networks**: at least three academic and/or industrial research groups, including at least

118 The Internet link is: www.gen-au.at.
119 See FFG (2009a).

one academic partner; interdisciplinary development of technologies and methods, bundling of expertise as well as training and educational platforms; infrastructure services for the joint projects; term: maximum three years;
- **International projects:** international consortium; GEN-AU finances the national component; one-stage application process; term: maximum three years.

The large-scale GEN-AU projects (networks and joint projects) are evaluated in two stages with both external experts and high-ranking advisory council members providing comments which are than weighted by the advisory council and strategically ranked. The BMWF approves the projects based on this ranking and the funding available for the particular announcement. The entire programme must be sustainably designed, i.e. an explicit objective is to make Austrian genome research internationally competitive through promotion of excellence and improve access to EU funding. With regard to international integration, Austria participates in four ERA-NETs (system biology, pathogenomics, science to society and plant genomics) and in transnational initiatives (medical system biology, ELSA-GEN and Austrian-Chinese cooperation). Furthermore, GEN-AU is characterised by the following initiatives and measures[120]:

- **Integrated technology transfer programme:** to support of technology at universities, and to enhance industry-science-linkages;
- **Promotion of women:** bonus for women in leadership positions; allowance for childcare costs for GEN-AU employees;
- **Support of mobility:** for scientists who learn new technologies in foreign high-tech laboratories and transfer them to Austria;
- **Aid for young talents:** project track for the support of high potentials in leadership positions; in addition, a GEN-AU summer school (high-level holiday work experience) is held every year. By the end of 2008, the number of participants totalled 410.
- **ELSA (ethical, legal, social aspects of genome research):** integrated programme line for the research of the interactions of genome research with society;
- **Public relations work:** to improve public acceptance of genome research, promotion of transparency.

While the first GEN-AU programme phase has already been completed, the second phase (started in early 2006) is currently coming to a conclusion. As a reflection of the more recent developments in research, it proved to be necessary to adjust the funding concept from phase to phase. While funding in the first phase focused on the development of clusters with critical mass for top level international research and the establishment of networks in the fields of bioinformatics and proteomics, in the second phase, a greater emphasis was placed on infrastructure projects (networks), the system biology was established and the international cooperation was advanced. Accordingly, the number of networks (shown in Table 47) rose from two with a funding volume of € 3.7 mil-

120 See FFG (2009a).

lion in phase I to four projects with a funding volume of € 8.8 million in phase II. Finally, the goal of the third phase started in spring 2009 is to advance the integration of system biology and establish priorities in the area of sustainability (stable research infrastructures), infrastructure and internationality. In light of this, the number of international projects has been increased to eleven with a funding volume totalling € 2.4 million. In addition, 34 applications relating to international calls for submission are currently being evaluated.

Table 47: Supported projects / submissions in phases I–III of GEN-AU

	Phase I (2001-2006)		Phase II (2004-2009)		Phase III (2009-2012)	
	Number	Funding sum [€ millions]	Number	Funding sum [€ millions]	Number	Funding sum [€ millions]
Joint projects	4	16.4	8	16.5	4	9
Networks	2	3.7	4	8.8	6	9
Pilot projects	11	5.6	12	1.5	-	-
ELSA projects	6	1.5	6	2	3	0.8
International projects	-	-	5	1.2	11	2.4*
Funding volume per phase		**28.2**		**30**		**21.2**

*34 applications from international calls for submission are currently being evaluated.

Source: FFG

In the first two programme phases, a total of 58 projects with a funding volume of € 58.2 million were funded, making it possible to finance approximately 300 full time equivalents with a high percentage of young researchers. The share of women is about 40 %. Furthermore, the scientific output of the programme is very successful. In the first two programme phases, more than 350 scientific publications were written, 30 patent applications were filed, EU initiatives were coordinated and numerous awards were received (including two Wittgenstein Awards). Universities with an inflow of two-thirds of all development funds were the largest funding recipients of the GEN-AU programme, followed by industry at 18 % and research institutions at 16 %.

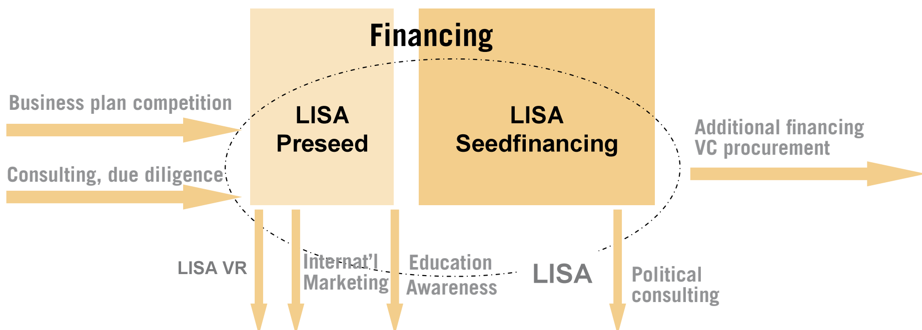
6.3.3 The Austria Business Service with the programme Life Sciences Austria

Die Austria Wirtschaftsservice GmbH (aws) is the development bank for business-related economic development. Its responsibility is to promote business financing on the one hand and to provide information for businesses on the other hand. As a special bank of the federal government, aws supports businesses through guarantees, low-interest loans, grants, equity financing and in the form of consulting services. By doing so, the knowledge and technology field of life sciences holds a position of high importance in the aws funding portfolio. aws approved a total of 803 life sciences projects with a funding volume of € 426 million (nominal) in the years 1998 to 2009.[121]

121 The cited level of funding is based on an analysis of approved projects for which the formal approval date falls in the period from 1 January 1998 to 13 December 2009; the approved nominal funding sum was considered in each case.

To strengthen Austria as a place to perform life sciences research and to increase the research capacities in the economy by advancing technology transfer, the BMWFJ commissioned the creation of the programme Life Sciences Austria (LISA) as a successor programme of the biotechnology impulse programme (1999 – 2002, LISA from 2002). In the high technology sector and in life sciences in particular, the demands on science, corporations and funding institutions are very complex. For that reason Life Sciences Austria is seen as the central interface and contact point for all questions relating to the life sciences specific to corporate and project funding. In addition to specific support and financing measures, awareness and training bring responsibilities such as cluster management and international location marketing to the forefront of the activities. In this regard, Figure 42 illustrates the different operating levels of LISA.[122]

Figure 42: The operating levels of LISA



Source: AWS

Financing instruments

Under LISA, two financing instruments are available: LISA-PreSeed, start-up financing (with maximum funding of € 200,000) for all persons who (based on initial, promising scientific data) would like to establish a business. In this first phase the highest priority is to support the provision of a scientific proof of principle. As seen in Table 48, a total of 29 PreSeed projects were recommended for funding in the period 2003 to 2009. Of the 29 projects funded since 2003, 23 have already been completed. Except for 2 projects, all have resulted in business start-ups. Ten companies received further financing with LISA seed financing and eleven with business angels and venture capital. 67 % of the projects financed by PreSeed originated in universities.

The funding instrument seed financing makes it possible to support high technology companies with a maximum of € 1 million in the start-up phase. As Table 48 shows, the annually approved number of seed financing projects ranges between four and six projects, a total of € 26.9 million having been committed between 1999 and 2009. Of the 50 companies recommended, 29 were subsequently able to

122 See also Schibany et al. (2006), p. 18.

acquire equity; 9 companies were able to conclude asset and trade deals. Once a company has completed the start-up phase, the possibility exists for obtaining funding from aws in the growth phase with financing instruments such as the double equity program, guarantee instruments or erp loans.

Table 48: Number of projects in connection with PreSeed and seed financing, 1998–2009

Number of projects	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007*	2008	2009
PreSeed						2	4	5	8	0	6	4
Seed financing	1	3	4	5	6	4	5	6	7	0	5	4

* In 2007, the negotiations concerning the guidelines and the engagement agreement were not concluded on time; for that reason, there were no formally committed development funds in that year. This was compensated for the years before and after.

Source: AWS

Table 49: Incoming projects, 2003–2009

Number of incoming projects	2003	2004	2005	2006	2007	2008	2009
Project assessments	61	52	50	12	89	74	12
Consultations	14	16	30	32	21	31	29
Start-up consulting	23	10	20	16	12	8	13

Source: AWS

The number of incoming projects (shown in Table 49) shows that the consulting services in particular have levelled off at a high level.

Additional activities in connection with LISA

In addition to providing direct support and consulting in start-up and development processes, LISA is also operationally active on other levels. LISA regularly offers events on themes specific to current life sciences. Examples include a workshop on translational research in 2009, in the ARGE LISA Vienna Region educational activities in connection with lectures at universities and universities of applied science, training courses for potential company founders in connection with business seminars and life sciences circles as an informal and networking event. Additional examples include comprehensive awareness measures such as the business plan competition for life sciences (BOB) which is being held for the fifth time in 2010 under the auspices of LISA. The goal is to motivate scientists, students and creative minds from universities and non-university institutions to venture into entrepreneurship and support them professionally in doing so. Sponsors from the pharmaceutical industry and business, the AplusB centres and international partners support this competition under which a total of 211 projects were submitted since its founding in 2000 and monetary awards totalling € 170,000 were distributed. Furthermore, 41 companies were started up based on the ideas submitted to the BOB.

In order to increase visibility on an international level and to ensure that Austria remains a location for the life sciences on a long-term basis, LISA International Location Marketing was created in October 2007 at the recommendation of the Council for Research and Technology Development as an umbrella brand for the external image of all Austrian life sciences activities. In this connection, LISA is supported by important regional cluster partners such as ARGE LISA Vienna Region, the Tyrolean Future Foundation, Human Technology Styria and the Health Cluster of Upper Austria as well as the technology programme of Lower Austria/ ecoplus. LISA is thus not only available as a point of contact for interested parties from all over the world, it also enables young companies in particular and research institutions to operate in the international market. Since its implementation almost three years ago, LISA has presented 117 companies, startups and university spin-offs through presentations at 27 international biotech and medical technology exhibitions.

6.4 Life Sciences International

6.4.1 The biotechnology sector: an international comparison

An overview of the international significance of the biotechnology sector requires international statistics such as those of the OECD Biotechnology Statistics 2009 which contain the following key data:

A total of 3,377 biotech companies existed in the EU in 2006 (US: 3,301). With regard to the number of companies, the EU[123] is ranked first, even ahead of the US, followed by Japan with 1,007 companies.

Company size varies at a high level throughout, although the majority of the biotech companies employ fewer than 50 persons. It is also the case that the majority of the biotech companies are active in research and development.

With a total of 2,744 companies performing R&D in the biotechnology sector, the USA alone exhibits the highest input in this field, followed by Canada with 532, Germany with 496 and France with 461 companies active in biotech R&D. [124] The R&D budget of companies in the USA is accordingly high. The R&D expenditures of the American corporate sector totalled $25 billion in 2006, far ahead of individual countries such as France ($2.3 billion), Canada ($1.4 billion) and Germany ($1.2 billion). In this context it should be noted that specifically in the USA and France, a biotech scene dominates in which multinational companies play a leadership role in generic R&D. This is also seen in the fact that large companies account for almost 75 % of all business-related R&D expenditures in those two countries.

It is characteristic that biotech companies are usually specialised in one technical field. According to data from the OECD Biotechnology Statistics 2009, 45 % of all companies that are active in biotechnology are specialised in (human and veterinary) medicine, followed by

123 It may be assumed that the actual number of companies of the EU is higher, as the OECD data had only 15 EU member countries available for the purpose of analysis.

124 It should be noted in this connection that no data for the United Kingdom are present in the OECD Biotechnology Statistics 2009, although the UK is traditionally the strongest European nation in the life sciences sector.

11 % active in agriculture, 10 % in the production of foods and beverages, 8 % in the environment, 6 % in industrial manufacturing processes and 5 % in bioinformatics. In five countries, the medical sector dominates, for example in Sweden where 89 % of all biotech companies are specialised in medicine, followed by Austria (80 %), Canada (58 %) and Belgium (53 %).

Consistent with its leadership role, the USA also has the highest level of employment in the biotech sector[125]. A total of 1.36 million persons were employed in biotech companies with R&D activities in 2006, followed by France with 237,444 employees and Korea with 130,767. The employment in biotechnology R&D companies is accordingly high in those countries. The USA reports a total of 150,000 researchers in its biotech companies active in R&D; in comparison France reports 25,946 and Switzerland 12,970. The USA's leadership role is finally also reflected in sales revenues. American biotech companies active in R&D generated an average of $168 million in 2006, compared with an average of $83 million for Canadian biotech companies.

In contrast to the constantly rising sales revenues and employment figures in recent years, the OECD Science, Technology and Industry Scoreboard 2009 reports a decline in patent applications filed in the biotech sector since 2000 under the Patent Cooperation Treaty (PCT[126]) from 11,800 patent applications in 2000 to 9,481 applications in 2006, reflecting an annual rate of decline of 3.6 %. The more stringent criteria for the patenting of genetic inventions observed in some countries can be seen as a substantial cause for this. Apart from that, the USA also holds the predominant position in this area; 43.5 % of all patents filed for under the PCT originated from the USA in 2006, followed by Japan with an 11 % share and Germany with 6.7 %. The BRIICS states (Brazil, Russia, India, Indonesia, China and South Africa) have shown a catching-up process in this area. In 2006, approximately 4 % of all patents filed for under the PCT were developed in those countries, primarily in China which already has a 1.9 % share.

The Ernst & Young Biotechnology Report published in 2009 also shows that the emerging countries are endeavouring to follow up the leading nations, specifically in the biotech sector. Accordingly, the global biotechnology sector not only succeeded in bucking the global market turbulence in 2008, the sales of the biotech companies rose, particularly in the Asia-Pacific region by a significant 25 %, driven by robust growth in the Australian market. In contrast, it is seen as non-conducive that the biotech sector is increasingly coming under pressure due to the pronounced systemic financing squeeze. The biotech sector saw a considerable decline in the raising of capital in 2008. Companies in North, Central and South America as well as Europe raised only $16 bil-

125 Information with regard to employment level was recorded in headcounts or full time equivalent.

126 The Patent Cooperation Treaty (PCT) is an international treaty. This treaty makes it possible for association members, i.e. natural persons or legal entities, who are either members of a contracting state or have their domicile in a contracting state, to apply for a patent for all contracting states by filing a single patent application at the International Office of the WIPO or another approved office (e.g. European Patent Office).

lion in capital, reflecting a 46 % decline compared to the previous year. Venture capital financing also declined. After a record year in 2007, it fell by 19 % to approximately $6 billion in 2008. At the same time, a healthy trend was seen in business transactions. Mergers and acquisitions (M&A) in the biotech sector reached a peak of $28.5 billion in the USA. In comparison, this figure rose to $ 5 billion in Europe. According to the Ernst & Young Biotechnology Report 2009, these developments reflect four paradigm-shifting trends that have the potential to reshape the healthcare landscape and create new opportunities: the development of high-quality generics, the fundamental healthcare reform in the USA, personalised medicine, globalisation, and accordingly the influence of emerging countries.

6.4.3 Austria's participation in the 6th and 7th European Research Framework Programmes

The European Council and the European Parliament have already recognised the significance and potential of the biosciences and biotechnology. In line with that, they adopted a strategy as early as 2002 which not only pursues a broad, flexible approach but also contains a 30-point action plan (roadmap) for the Commission, the other EU bodies and other stakeholders. The goal is to include the biosciences and biotechnology in the implementation of innovation strategies, take up a number of targeted technology-specific actions and enhance the cooperation with the member states and stakeholders. On this basis, specific programmes with priorities for life sciences are set up in the 6th and 7th European Research Framework Programmes.[127]

A separate thematic focus was devoted to the sector biosciences, genomics and biotechnology in the health services (LIFESCIHEALTH – LSH) in the 6th European Research Programme (RP) running from 2002 to 2006. This thematic focus is included in the specific programme Integrating and Strengthening the European Research Area. A budget totalling € 2,514 million was made available to the programme LIFESCIHEALTH, reflecting a 14.1 % share of the 6th FP's total budget.[128] Under LIFESCIHEALTH, Austria submitted 426 project proposals for evaluation. Of these, 117 projects were recommended for funding, reflecting an average approval rate of 27.5 %. This puts Austria above the overall approval rate (25.3 %) in this specific programme and the country is ranked 10th for approved projects within the EU. Overall, Austria succeeded in acquiring a funding volume of € 52.6 million under LIFESCIHEALTH.[129]

Both on the Austrian and on the overall level, the most successful projects were application-oriented concepts and the application of genome knowledge and technologies; the highest share of approved projects with Austrian participation was in cancer research at 28 %.

127 Cf KOM (2007).
128 See, Ehardt-Schmiederer et al. (2009).
129 These participation numbers in LSH in the 6th RP are based on Kobel 2008.

The majority of the projects were submitted under STREP (specifically targeted research projects), followed by IP (integrated projects). Austria achieved the highest share of approved projects within the instrument NoE (Networks of Excellence) at 38 % and CA (Coordination Actions) at 29 %. With regard to the coordination of LSH projects, a total of 89 projects with Austrian coordinators were evaluated. Of these, 23 were successful. From a regional perspective, Viennese funding recipients were the most successful, with 55 % of the approved participants coming from Vienna, followed by Tyrol with 21 % and Styria with 14 %.

It is not surprising that most of the participations submitted (360) originated in the higher education sector with an approval rate of 26.7 %. With a 17 % share of the successful participations, the Medical University of Vienna was most frequently represented in approved projects. With regard to the other sectors, small and medium-sized enterprises accounted for 16 % of participations approved for Austria. In comparison, the non-university sector followed at 12 %. Accordingly, the dominating position of the universities is also reflected in the acquired budget. The universities succeeded in obtaining 49 % of the approved development funds. For the Austrian return flows in all of the 6th RP, this means that the universities were able to obtain more development funds under LIFESCIHEALTH than industry.

Consequently, a thematic focus under the programme HEALTH is also a part of the 7th RP with a term running from 2007 to 2013. While there have been two calls so far, all approved projects from the first call have already been contractually stipulated as have as many as 98 % from the second announcement. A total of 1,757 projects were approved for evaluation with organisations from Austria participating in 293 of them. Partner organisations from Austria participate in 54 of the 324 approved projects, meaning that Austria is a participant in every 6th approved project in the first announcement of HEALTH. With regard to coordination, 50 project proposals from Austria were submitted and evaluated. Eleven of them were successful, with 3.4 % of the successful coordinators being from Austria. To date, the approved funding of the contractually stipulated Austrian partner organisations comes to € 34.8 million, reflecting a 2.8 % share of the total approved funding sum of the first announcement of HEALTH.[130]

Furthermore, the EU explicitly promotes basic research, which also takes place in the life sciences sector, by means of the European Research Council established in the 7th RP. By doing so, 67 projects with Austrian participation were submitted in the funding line Starting Grant 2009. Of these, seven projects were successful including six Austrian host institutions and three Austrian researchers approved. In comparison, eight projects with Austrian participation in the life sciences sector were

130 These figures relating to participations in HEALTH are based on Boulmé (2010).
131 See Ehardt-Schmiederer (2009), page 46 et seq.

approved in connection with the Starting Grant 2007 announcement and seven in connection with the Advanced Grant 2008 announcement.[131]

6.5 Summary

Following the leading countries in the life sciences, primarily the USA, Austria has recognised the potential of bioscience applications and methods as 21st century technologies.

In 2007, there were 347 companies with a total of 28,686 employees in Austria working in life sciences. Total revenues were € 8.6 billion, with gross value added of € 3.3 billion. With 176 companies investing a total of € 814 million in R&D, the entire life sciences sector accounted for some 17 % of overall R&D spending in the corporate sector.

Outside of the corporate sector, total spending on life sciences R&D also rose to € 764 million in 2007. The higher education sector accounted for the highest share of R&D expenditures with a volume of € 604 million in 2007, with both universities and hospitals recording a rising volume of expenditures.

The federal government is an important source of funding for R&D activities in life sciences. With a broad, well coordinated funding portfolio – on the one hand through bottom-up financing of stand-alone projects by means of the FWF and the FFG and on the other hand through specific thematic programmes such as GEN-AU and LISA – it supports both the scientific and the corporate sector. It is characteristic of Austria that biomedical research is dominant in both the corporate sector and the scientific sector. Thus, biomedical research of today benefits from high R&D expenditures as well as substantial subsidies (at the national and international level), and finally it is also worth noting that the biotech sector generated a considerable number of start-ups.

7 Public research organisations in Austria

In recent years, public research institutions (PRI) have garnered increased attention at the European and international level. Up to now, these organisations have been somewhat overlooked relative to their more publicly acknowledged research counterparts in the university and corporate sectors[132], yet most PRI fund their activities largely through public sources – both institutional base funding and competitive grants.

One possible reason why PRI have escaped the spotlight can be found in the problem of classifying them statistically. The very diversity of their appearance, which ultimately stems from their historical development, prevents them from getting the attention they warrant as research players. Given the lack of any officially assigned definition, PRI can be classified in all sectors of R&D statistics (higher education sector, public sector, private nonprofit sector and corporate sector).

Current attempts to classify PRI are best represented by the ongoing efforts of an OECD working group[133] that provides the following definition[134]:

National entities, irrespective of their legal status (organised under public or private law):

- *whose primary goals are to conduct fundamental research, industrial research, experimental development, training, consulting and service provision, and to disseminate their results by way of training, publication and technology transfer; and*
- *whose profits (if any) are reinvested in these activities, the dissemination of their results, or training; and*
- *which are either totally or to a substantial share publicly owned, and/or are funded primarily from public sources via base funding (block grants) or through contract-based research, and/or are regulated, so as to achieve primarily public missions.*

The roles of the various PRI are the subject of discussion in the OECD context[135] and at the European[136], national[137] and regional levels[138]. This broad-based interest is due at least in part to the allocation of sometimes substantial public funds. Another key reason, however, is that universities and corporations present a

132 Participations in international organisations such as ESO, CERN, IAEO and IIASA are not examined in this section. The emphasis here is on institutions that play a significant role at the federal level.
133 Committee for Science and Technology Policy (CSTP), Working Party on Research Institutes and Human Resources (RIHR).
134 Cf. OECD (2009a), p. 29.
135 Cf. OECD (2009b).
136 Cf. Leijten (2007), EARTO (2008), EURAB (2005).
137 Cf. Hillebrand et al. (2008).
138 Cf. Hofer et al. (2007).

much more unified picture of their activities as researchers than the group of PRI – thanks in large part to the specific functions and roles they assume in innovation systems. But PRI also represent a significant share of national research activities, though there is generally a wide deviation between countries with a large PRI sector, such as Germany and France, and countries with a smaller PRI sector, such as Austria. The organisations can be oriented to a varying degree toward basic research (this is more pronounced in France and Germany, for example) or have a stronger sectoral significance (as in Finland[139] or Portugal) or even be focused on public needs (as in Denmark)[140]. In addition, new funding programmes increasingly show a great affinity for the activities and the image of the (permanent) PRI. These observations can ultimately also explain the recent reorganisation efforts among PRI in nearly all European countries.

According to the OECD definition above, PRI in Austria from the R&D statistics performance sectors (see also Chapter 2) can be classified as follows:

Table 50: Allocation of PRI to R&D sectors of performance[141]

Sector	Sub-sector	Comments
Higher education sector	Austrian Academy of Sciences (ÖAW)	Christian Doppler Research Agency (CDG)[a]
Government sector	Other State	Institutions not already allocated to the higher education sector, including: institutions of the federal government (including federal agencies and museums), institutions of the Austrian states (including state regional hospitals), institutions of the local communities, R&D units of the state social security institutions and professional associations
	Private non-profit[c]	institutions that are mostly financed or controlled by the public sector including Arsenal Research, Salzburg Research, WIFO, IHS
	Ludwig Boltzmann Gesellschaft	Institutes and clusters
Private non-profit sector		Associations and institutions not largely financed through public funds
Corporate sector	COOP[d]	Cooperative sector with institutions such as Austrian Cooperative Research (ACR), Austrian Institute of Technology (AIT) and JOANNEUM RESEARCH (JR)[e]
	Centres of excellence	Centres in the centre of excellence programme (K_plus, K_ind, COMET)

a The CD laboratories are not classified as a separate category in the statistics but assigned to the hosting institutions (universities or public research institutions). The primary rationale for possibly classifying CDG among the PRI is the non-university funding by corporations and public funds. But the actual research of the CD laboratories is conducted almost exclusively at the universities. The Institute of Science and Technology Austria (ISTA) was not included in the 2007 statistics but will now also be assigned to the higher education sector.
b Regional hospital data is not based on questionnaires, however. Instead, reports from state government offices are used to produce an estimate.
c Private non-profit institutions. This category includes private, non-profit institutions funded and/or controlled by the government.
d COOP: cooperative-like institutions.
e Research Studios Austria were also assigned to the cooperative sector. AVL is also assigned to this group on the basis of its special membership in ACR (invested some €81 million in R&D in 2008 – 11% of its revenues of €740 million). See www.avl.com.

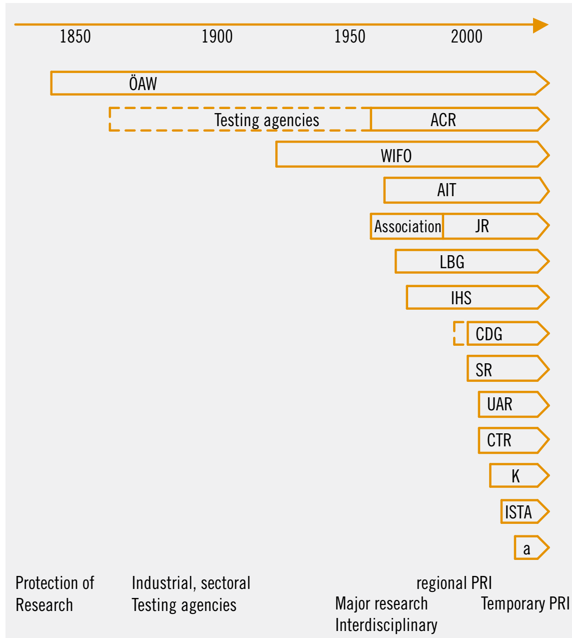
Source: Statistik Austria, presentation by Joanneum Research

139 Cf. Hyytinen et al. (2009).
140 Cf. Sörlin et al. (2009).
141 The other tables are based on this same sub-sector breakdown.

7.1 Historical developments

A historical examination reveals that non-university organisations often have very long-standing traditions but are also very strongly affected by the conditions and patterns of reasoning of the current policies (of research and innovation). Moreover, they are often founded almost in waves (and based on the international zeitgeist). Understanding the existing structures thus depends on understanding the context of the unfolding patterns for justifying public interventions in research and innovation. In the 19th century, the aim initially was to ensure independent basic research free from outside intervention (founding of Academy of Sciences). Later came the (sectoral) industrial demand for testing and standardisation (founding of testing institutes). The post-WWII era initially saw the establishment of major institutions for nuclear research (today's Austrian Institute of Technology), regional efforts (such as the modern Joanneum Research) and interdisciplinary institutions, especially in the fields of human medicine, social sciences and humanities (Ludwig Boltzmann Gesellschaft). The strengthening of the link between science and research was ultimately the primary motivation in the 1990s for establishing new institutions – at the regional level (Salzburg Research, Upper Austria Research, etc.) but increasingly in temporary forms as well (Christian Doppler laboratories, Kplus centres, Kind/net networks, etc.) with the participation of the permanent organisations. The introduction of performance agreements with the permanent PRI is intended not only to enhance efficiency and effectiveness but also to define development goals and budgetary limits for better control.

Figure 43: Historical development of PRI in Austria



Legend: ÖAW (Austrian Academy of Sciences), ACR (Austrian Cooperative Research), WIFO (Austrian Institute of Economic Research), AIT (Austrian Institute of Technology), JR (Joanneum Research), LBG (Ludwig Boltzmann Gesellschaft), IHS (Institute for Higher Studies), CDG (Christian Doppler Research Association), SR (Salzburg Research), UAR (Upper Austria Research), CTR (Carinthian Tech Research), K (represents Kplus / Kind/net centres and networks – currently COMET), ISTA (Institute of Science and Technology Austria), a. (represents all temporary institutions such as Research Studios Austria, Josef Ressel centres, Laura Bassi centres of expertise)

Source: presentation by Joanneum Research

The Austrian Academy of Sciences[142], a scholarly society, is the oldest public research institution. It was founded as the "Imperial Academy of Sciences in Vienna" by imperial commission on May 14, 1847. It is devoted to research in humanities and natural sciences and guided by the principle of scientific freedom.

142 Cf. www.oeaw.ac.at

The Academy also initiated the founding of the Central Institute of Meteorology and Geomagnetism in 1851 and established the internationally renowned Institute for Radium Research in 1909. Today, the Academy is the leading non-university, academic research institution. It primarily supports excellent research institutions that are active in fields with an emphasis on interdisciplinary research complementing the work of universities. The Academy, by its legal mandate (§2 AkkWissG 1921), is devoted to promoting science in every respect and is entitled to the protection and support of the federal government in the pursuit of this mission.

The emerging Institute of Science and Technology Austria (ISTA), founded in 2006 and currently filling its first professorships, aims to play a leading role in basic research.

One unique aspect of these two institutions is their distinct legal basis: "Federal Law of October 14, 1921, pertaining to the Academy of Sciences in Vienna" (BGBl. no. 569/1921 in its current version) and "Federal Law on the Institute of Science and Technology – Austria" (BGBl. I no. 69/2006 in its current version), while the state financial investment in other PRI is grounded in the Research and Technology Funding Act (BGBl. I no. 11/2006 in its current version) or the Research Organisation Act (BGBl. I no. 74/2004 in its current version).

Next in a historical perspective are the predecessors of today's Austrian Cooperative Research Institute (ACR)[143] – for example, the Testing Agency for the Wood and Paper Industry, founded back in 1866. Such technical testing agencies were the first coordinated industry research activities, and some of them were incorporated into ACR when it was established in 1954.

In keeping contemporary trends, 1956 saw the creation of the Austrian Society for the Study of Atomic Energy – the predecessor oftoday's Austrian Institute of Technology (AIT).[144] The former atomic research institute gave rise to what is now Austria's largest cooperative, non-university applied research organisation (integrating Arsenal Research). These institutions, which belong to the group of RTOs[145], were also increasingly subject to reorganisations and adjustments – most recently from the aforementioned establishment of temporary institutions.

The predecessor to today's Joanneum Research[146] – also an applied research organisation – emerged in Styria at about the same time (1954).

Finally, regional RTOs dedicated primarily to applied research and experimental development were founded in the 1990s: Salzburg Research, Carinthian Tech Research and Upper Austria Research.

Some economic institutions also have a longer history, such as today's Austrian Institute of Economic Research (WIFO)[147], founded in 1927 by Friedrich August von Hayek and

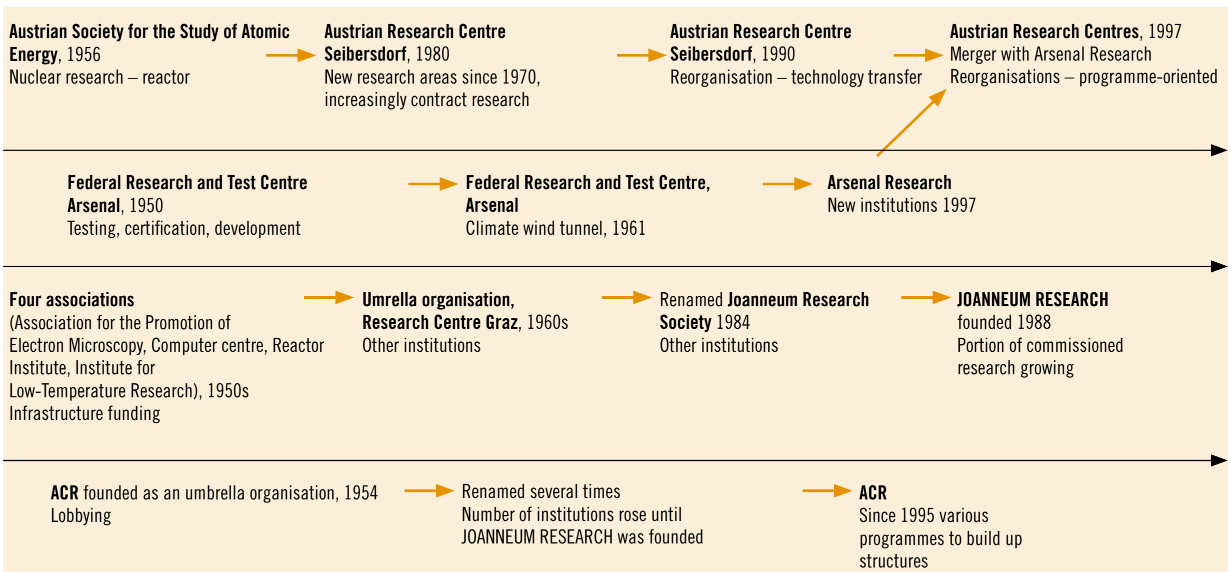
143 Cf. www.acr.at; cf. Pichler et al. (2007), pp. 112 ff.
144 Cf. Pichler et al. (2007), pp. 116 ff.; cf. Hillebrand et al. (2008), part 2, pp. 7 ff.
145 RTOs (research and technology organizations) are public research organizations engaged primarily in contract research: "… which as their predominant activity provide research and development, technology and innovation services to enterprises, governments and other clients", EURAB (2005), p. 5.
146 Cf. www.joanneum.at.
147 Cf. www.oeaw.ac.at

Ludwig von Mises, or the Institute for Advanced Studies (IHS), founded in 1963 by Paul Lazarsfeld and Oskar Morgenstern[148].

The Ludwig Boltzmann Gesellschaft[149], founded in 1960[150], financed institutions in the arts, social sciences and humanities that were typically based at universities as small, publicly funded institutions. Following a reorganisation in 2002, today's Ludwig Boltzmann institutes also have a temporary character.

Besides the institutions named above, a variety of often smaller PRI were founded that receive public base funding and frequently have an association-like structure (such as the International Research Center for Cultural Studies – IFK, the Institute of Human Sciences – IWM and the Erwin Schrödinger International Institute for Mathematical Physics – ESI, to name but a few).

Figure 44: Development of RTOs in Austria after the Second World War



While the institutions named above were run as permanent institutions (including LBG until its reorganisation), a new approach to organizing public research was implemented during the final decade of the 20th century through funding programmes: the introduction of temporary, institute-like organisations. The prototype for this is the Christian Doppler Research Association (CDG), which began establishing research laboratories at universities under a PPP model (public-private partnership) back in 1995, supporting demand-driven basic and applied research.

Also influential were the centres of excel-

148 Cf. www.ihs.ac.at
149 Cf. www.lbg.ac.at
150 For background history, cf. Pichler et al. (2007).

lence programmes (Kplus, Kind/net), launched in 1998 and consolidated today in the COMET programme. The objective of these centres of excellence, which represent the largest temporary institutions, is to bring together scientific and economic expertise to achieve technological superiority for Austrian businesses and strengthen Austria as a research location.

Other initiatives involving temporary research organisations include more recent programmes such as Research Studios Austria, founded in 2002 and reorganised in 2008, with its focus on the application of university research in specific fields of industrial research. Also in this category are the Josef Ressel centres, introduced in 2007 at universities of applied science and implemented especially to support SME and their research needs, and the Laura Bassi centres of expertise, dedicated to promoting the careers of female scientists in applied basic research and providing incentives for a contemporary culture of research.

The federal government is involved to a varying degree in financing and controlling all of the aforementioned institutions. This involves not only institutional base financing – often defined through service contracts (as with the regional PRI Joanneum Research and Salzburg Research) – and the organisation of research and innovation funding programmes (such as the centre of excellence programme COMET or the Josef Ressel and Laura Bassi centres of expertise), but also committee personnel or their nominations in the PRI by representatives of the ministries (such as with ÖAW, ISTA, AIT or CDG). The following ministerial assignments apply[151].

Table 51: Ministerial assignment of PRI

PRI	Assigned to	Remarks
ÖAW	BMWF	Financing
LBG	BMWF	Financing
ISTA	BMWF	Partial financing
AIT	BMVIT	Financing, sits on Supervisory Board
COMET	BMVIT, BMWFJ	Operated by FFG
ACR	BMWFJ	Supporting cooperation – formerly prokis program
CDG	BMWFJ	Financing (master agreement), seat and veto on CDG board of trustees
Josef Ressel Centres	BMWFJ	Operated by FFG
Laura Bassi Centres	BMWFJ	Operated by FFG
Research Studios Austria	BMWFJ	Operated by FFG

Source: compilation by Joanneum Research

151 The data has been limited in order to show various types of involvement. It does not show the immediately assigned federal agencies, for example.

7.2 Scope and structure of PRI in Austria

Listing the PRI according to the above assignments[152] shows overall funding of these institutions at € 934 million in 2007, which corresponds to 13.6 % of total R&D expenditures in Austria. The primary source of funding for these institutions was the government (€ 523 million or 56 %), followed by funding from abroad (€ 266 million or 29 %).

Table 52: R&D financing flows to PRI, 2007

	Total	Public sector		Private non-profit Sector		Corporate sector		Abroad	
	in € 1,000	in € 1,000	in %	in € 1,000	in %	in € 1,000	in %	in € 1,000	in %
1. Higher education sector	**1,637,277**	**1,445,665**	**88.3**	**16,870**	**1.0**	**93,919**	**5.7**	**80,823**	**4.9**
Academy of Sciences	81,475	75,370	92.5	969	1.2	495	0.6	4,641	5.7
2. Government sector	**367,300**	**313,555**	**85.4**	**2,737**	**0.7**	**34,307**	**9.3**	**16,701**	**4.5**
Other State	283,377	260,554	91.9	711	0.3	18,367	6.5	3,745	1.3
Private non-profit, publically controlled/funded	72,299	44,872	62.1	1,963	2.7	14,326	19.8	11,138	15.4
LBG	11,624	8,129	69.9	63	0.5	1,614	13.9	1,818	15.6
3. Private non-profit sector	**17,377**	**1,987**	**11.4**	**11,160**	**64.2**	**2,551**	**14.7**	**1,679**	**9.7**
4. Corporate sector	**4,845,861**	**499,650**	**10.3**	**1,549**	**0.0**	**3,213,623**	**66.3**	**1,131,039**	**23.3**
COOP (without centres of excellence)	389,244	86,284	22.2	58	0.0	65,399	16.8	237,503	61.0
Centres of excellence	78,975	45,457	57.6	30	0.0	28,062	35.5	5,426	6.9
PRI	**934,371**	**522,653**	**55.9**	**14,954**	**1.6**	**130,814**	**14.0**	**265,950**	**28.5**
Total	**6,867,815**	**2,260,857**	**32.9**	**32,316**	**0.5**	**3,344,400**	**48.7**	**1,230,242**	**17.9**
Share of PRI in total, in %	13.6	23.1		46.3		3.9		21.6	

Source: Statistik Austria, calculations by Joanneum Research

Of the total of € 934 million in funding for PRI, 42 % goes to the sub-sector of COOP, 30 % to the government sector (including regional hospitals), 9 % to the Academy of Sciences, 8 % to the centres of excellence, 7 % to private not-for-profit institutions[153] (including organisations such as WIFO and IHS) and the remainder to LBG (Ludwig Boltzmann Gesellschaft) and the private non-profit sector.

The non-university sector garners 23 % of overall state funding and 4 % of all R&D funds from the corporate sector. But financing from the corporate sector must be broken down to the level of the individual PRI, because it accounts for 36 % among centres of excellence but only 1 % at the Academy of Sciences. The activity pattern of the organisation is the determining factor.

A detailed examination of public-sector funding (broken down to the individual levels) shows that the largest share (€ 256 million) comes from federal funds, corresponding to 49 % of overall public funding for PRI, followed by the states[154], which contribute € 205 million (39 %).

The high share (73 %) of federal funds in the

152 Cf Table 50: PRI corresponds to the total from the Academy of Sciences (from the higher education sector), the government sector, the private non-profit sector and the cooperative sector (divided into the sub-sectors of COOP and centres of excellence).
153 Private, non-profit institutions funded and/or controlled by the government.
154 It should be noted here that this also includes the shares of R&D funding for regional hospitals. This can also be seen in the high share (65 %) of funding by the states in the category "Other government", which includes the regional hospitals.

COOP sub-sector is noteworthy, while the centres of excellence exhibit the highest percentage (40 %) of all funding shares for PRI from the pro-research agencies FFG and FWF. The visibly very low level of funding by FWF can be entirely explained by the activities typically present in PRI, which are simply not very focused on basic research (except for the Academy of Sciences).

Table 53: R&D financing flows from the public sector to PRI, 2007[155]

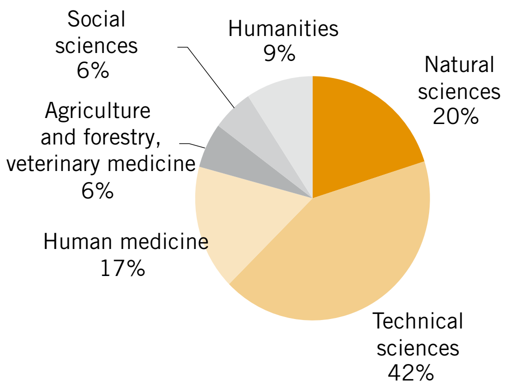
	Total	Federal		State		FFG		FWF		Municipalities		Other	
	in € 1,000	in € 1,000	in %	in € 1,000	in %	in € 1,000	in %	in € 1,000	in %	in € 1,000	in %	in € 1,000	in %
1. Higher education sector	**1,445,665**	**1,218,155**	**84.3**	**43,010**	**3.0**					**2,562**	**0.2**	**181,938**	**12.6**
Academy of Sciences	75,370	62,323	82.7	4,586	6.1	88	0.1	1,443	1.9	5,991	7.9	939	1.2
2. Government sector	**313,555**	**116,758**	**37.2**	**176,884**	**56.4**					**4,509**	**1.4**	**15,404**	**4.9**
Other State	260,554	85,984	33.0	168,941	64.8	66	0.0	200	0.1	4,116	1.6	1,247	0.5
Private non-profit, publically controlled/funded	44,872	25,927	57.8	7,745	17.3	5,355	11.9	361	0.8	349	0.8	5,135	11.4
LBG	8,129	4,847	59.6	198	2.4	56	0.7	30	0.4	44	0.5	2,954	36.3
3. Private non-profit Sector	**1,987**	**575**	**28.9**	**560**	**28.2**					**84**	**4.2**	**768**	**38.7**
4. Corporate sector	**499,650**	**314,370**	**62.9**	**42,727**	**8.6**					**1,502**	**0.3**	**141,051**	**28.2**
COOP (without centres of excellence)	86,284	62,955	73.0	10,524	12.2	7,988	9.3	1,679	1.9	171	0.2	2,967	3.4
Centres of excellence	45,457	12,902	28.4	12,252	27.0	18,089	39.8	137	0.3	690	1.5	1,387	3.1
PRI	**522,653**	**255,513**	**48.9**	**200,308**	**38.3**	**37,545**	**7.2**	**2408**	**0.5**	**5,454**	**1.0**	**14,458**	**2.8**
Total	**2,260,857**	**1,649,858**	**73.0**	**263,181**	**11.6**					**8,657**	**0.4**	**339,161**	**15.0**
Share of PRI in total, in %	23.1	15.5		76.1						63.0		4.3	

Source: Statistik Austria, calculations by Joanneum Research

A look at the distribution of funds by fields of science quickly reveals the areas of emphasis (cf. Figure 45): About two thirds of funds to PRI go to the areas of engineering (42 %) and natural sciences (20 %). The remaining third is divided nearly equally among human medicine and the categories of social sciences / humanities on the one hand and agriculture / forestry / veterinary medicine on the other.

155 The FFG and FWF figures were extracted from the "Other" figures in a special tabulation for PRI by Statistik Austria. Financing flows from FFG and FWF to universities and corporations are also included in the published statistics of both funding agencies.

Figure 45: Breakdown of PRI funding by fields of science, 2007



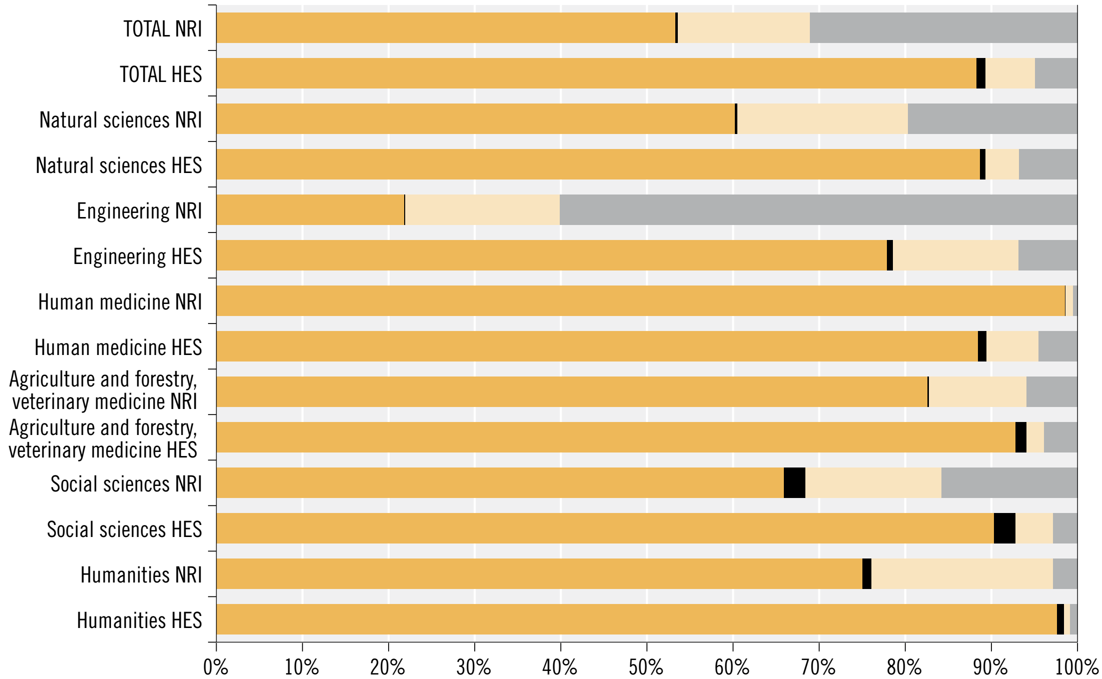
Note: PRI excluding the Academy of Sciences

Source: Statistik Austria, calculations by Joanneum Research

A comparison with the organisations from the higher education sector (including the Academy of Sciences[156]) very clearly illustrates the differences in financing flows between PRI and the higher education sector, due not least to the difference in their mandates. PRI have higher shares of funding from the corporate sector and lower shares from the public sector in all fields of science except human medicine[157]. Also noteworthy is that the PRI have an extremely high share of funding for engineering from abroad.[158] This characteristic of the financing flows reflects both the "bridge functions" of public research and the specific mandates (such as testing and certifications). An underlying division of labour between university and non-university institutions does not seem to be an inaccurate assumption. Interestingly, these differentiations also appear in areas where one would not immediately expect them, such as in the social sciences and humanities. While the social sciences include larger research institutions such as the Austrian Institute of Economic Research (WIFO), this is not readily apparent for the area of humanities.

156 The Academy of Sciences has a structure quite similar to that of the universities.
157 Clinical research in the field of pharmaceutical approval might be seen here.
158 Here it is important to point again to the composition of the COOP group, which also includes the company AVL.

Figure 46: PRI–HES funding shares by fields of science, 2007



Source: Statistik Austria, calculations by Joanneum Research

7.3 Employment

Among the 89,458 employees (individuals) working in R&D in Austria, 14 % (12,272) are employed in PRI. They constitute about a third of overall personnel in the higher education sector but only about one fifth of researchers.

Noteworthy is the especially high percentage of other auxiliary personnel (26 %) and the low percentage of higher-qualified, non-scientific personnel, while the percentage of researchers (13 %) corresponds almost exactly to the overall percentage. The percentages are very similar when measured in full-time equivalents, with a shift between researchers and higher-qualified, non-scientific personnel. The latter may well be an indication of a higher rate of part-time employment, especially in the area of higher-qualified, non-scientific personnel.

The employment structure also reflects the activity pattern of the individual PRI categories. While the Academy of Sciences has 80 % researchers among its 1,281 employees (above the average in the higher education sector), the other government NRI[159] with their 3,448 employees overall have the lowest percentage of scientific personal (40 %) but the highest percentage of other auxiliary personnel (40 %), not least because of the institutions (federal in-

159 Without the regional hospitals

stitutes, museums) run by these organisations. What's striking here is the structural discrepancy between permanent and temporary PRI seen in the COOP sector: While the centres of excellence have 70 % researchers, the COOP sub-sector has only 51 %. The figures for other auxiliary personnel are almost exactly the opposite.

Table 54: Employment structure in PRI, individuals and FTE, 2007

	Total	Researchers		Technicians		Other personnel	
	Individuals	Individuals	in %	Individuals	in %	Individuals	in %
1. Higher education sector	**35,269**	**25,967**	**73.6**	**5,251**	**14.9**	**4,051**	**11.5**
Academy of Sciences	1,281	1,028	80.2	238	18.6	15	1.2
2. Government sector	**5,500**	**2,783**	**50.6**	**1,120**	**20.4**	**1,597**	**29.0**
Other Government	3,448	1,391	40.3	695	20.2	1,362	39.5
Private non-profit, publically controlled/funded	1,665	1,110	66.7	345	20.7	210	12.6
LBG	387	282	72.9	80	20.7	25	6.5
3. Private non-profit sector	**337**	**225**	**66.8**	**69**	**20.5**	**43**	**12.8**
4. Corporate sector	**48,352**	**24,615**	**50.9**	**19,183**	**39.7**	**4,554**	**9.4**
COOP (without centres of excellence)	3,805	1,939	51.0	981	25.8	885	23.3
K centres / networks	1,349	951	70.5	309	22.9	89	6.6
PRI	**12,272**	**6,926**	**56.4**	**2,717**	**22.1**	**2,629**	**21.4**
TOTAL	**89,458**	**53,590**	**59.9**	**25,623**	**28.6**	**10,245**	**11.5**
Share of PRI in total, in %	13.7	12.9		10.6		25.7	

	Total	Researchers		Technicians		Other personnel	
	in FTE	in FTE	in %	in FTE	in %	in FTE	in %
1. Higher education sector	**13,613.2**	**10,112.0**	**74.3**	**1,990.1**	**14.6**	**1,511.1**	**11.1**
Academy of Sciences	715.5	633.6	88.6	73.2	10.2	8.8	1.2
2. Government sector	**2,488.1**	**1,389.0**	**55.8**	**387.2**	**15.6**	**711.9**	**28.6**
Other Government	1,477.6	639.3	43.3	228.9	15.5	609.4	41.2
Private non-profit, publically controlled/funded	832.7	617.4	74.1	123.1	14.8	92.1	11.1
LBG	177.9	132.3	74.4	35.1	19.7	10.5	5.9
3. Private non-profit sector	**162.4**	**116.7**	**71.9**	**33.1**	**20.4**	**12.6**	**7.8**
4. Corporate sector	**36,988.6**	**20,057.8**	**54.2**	**13,867.6**	**37.5**	**3,063.2**	**8.3**
COOP (without centres of excellence)	2,561.0	1,417.0	55.3	554.1	21.6	589.8	23.0
K centres / networks	836.4	655.6	78.4	133.2	15.9	47.7	5.7
PRI	**6,764**	**4,212**	**62.3**	**1,181**	**17.5**	**1,371**	**20.3**
TOTAL	**53,252.2**	**31,675.6**	**59.5**	**16,277.9**	**30.6**	**5,298.8**	**10.0**
Share of PRI in total, in %	12.7	13.3		7.3		25.9	

Source: Statistik Austria, calculations by Joanneum Research

7.4 Types of research

An analysis of research expenditure by type of research reveals the activity patterns of PRI. Overall, PRI represent nearly a quarter of basic research, some 17 % of applied research and about 4 % of experimental development for an overall share of 12 %. This illustrates their significant position in the areas of basic research and applied research.

The Academy of Sciences is the institution most involved in basic research with a share of 83 %. This puts it in first place in the higher education sector[160] as well, but even the COOP institutions and centres of excellence still account for an over 25 % share of basic research.

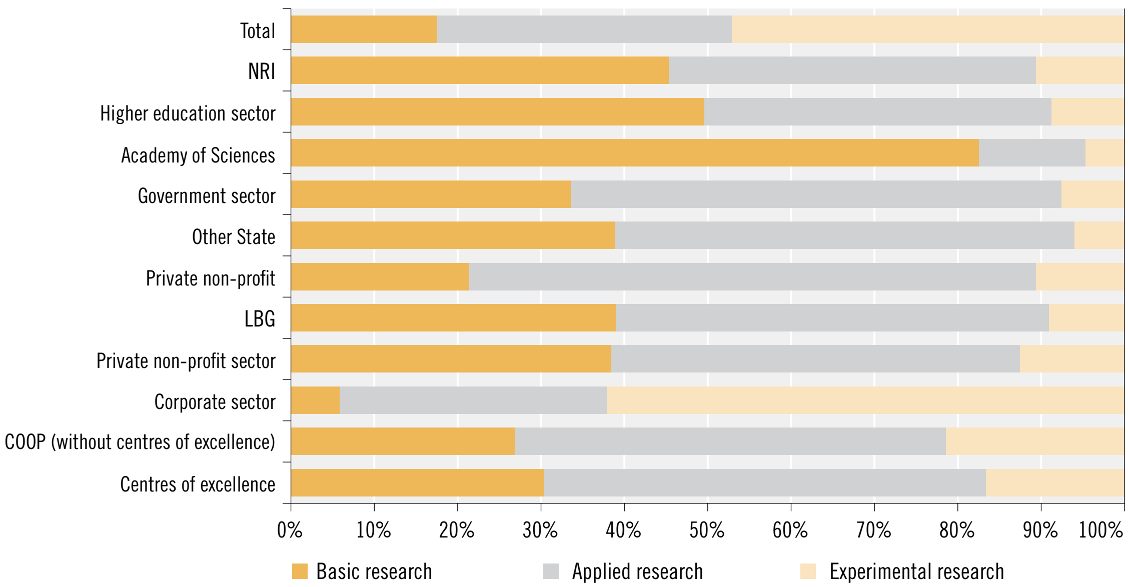
Table 55: Expenditure by research type, 2007

	Total expenditure on R&D	Basic research		Applied research		Experimental development	
	in € 1,000	in € 1,000	in %	in € 1,000	in %	in € 1,000	in %
1. Higher education sector	**1,637,277**	**812,441**	**49.7**	**681,882**	**41.6**	**142,954**	**8.7**
Academy of Sciences	81,475	67,237	82.5	10,438	12.8	3,800	4.7
2. Government sector	**236,835**	**79,536**	**33.6**	**139,488**	**58.9**	**17,811**	**7.5**
Other Government	152,912	59,534	38.9	84,275	55.1	9,103	6.0
Private non-profit, publically controlled/funded	72,299	15,470	21.4	49,171	68.0	7,658	10.6
LBG	11,624	4,532	39.0	6,042	52.0	1,050	9.0
3. Private non-profit sector	**17,377**	**6,681**	**38.4**	**8,521**	**49.1**	**2,175**	**12.5**
4. Corporate sector	**4,845,861**	**283,417**	**5.8**	**1,554,138**	**32.1**	**3,008,306**	**62.1**
COOP (without centres of excellence)	389,244	104,784	26.9	201,189	51.7	83,271	21.4
Centres of excellence	78,975	23,945	30.3	41,911	53.1	13,119	16.6
PRI	**803,906**	**282,183**	**35.1**	**401,547**	**49.9**	**120,176**	**14.9**
Total	**6,737,350**	**1,182,075**	**17.5**	**2,384,029**	**35.4**	**3,171,246**	**47.1**
Share of PRI in total, in %	11.9	23.8		16.8		3.7	

Source: Statistik Austria, calculations by Joanneum Research

160 Which includes the Austrian Academy of Sciences, universities, universities of applied science, pedagogical universities, university clinics and private universities.

Figure 47: Breakdown of expenditures by research type, in percent, 2007



Source: Statistik Austria, calculations by Joanneum Research

Applied research is also a domain of PRI. Among the listed PRI, those in the government sector and cooperative sub-sector of the corporate sector are particularly visible as the main pillars of applied research – in stark contrast to the corporate sector, which clearly emphasizes experimental development. This also reveals a certain distribution of labour that has not yet been further analysed.

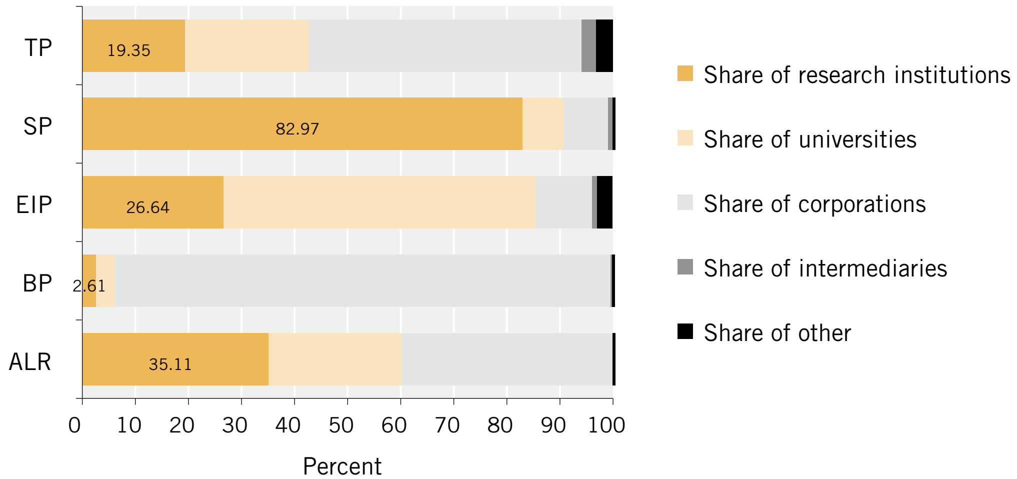
7.5 Share of funding

Table 49 already presented initial data on the participation of PRI in funding from FFG and FWF. FFG reports total funding of some € 150 million for research institutions[162] in 2008[161], representing a share of nearly 28 %. This makes them the second-most important recipients of funding from FFG programmes

161 Includes cooperative research institutions, non-university institutions and centres of excellence as defined by FFG.
162 Cf. FFG (2009), Facts, Figures, Data 2008, p. 21. (http://www.ffg.at/getdownload.php?id=3547)

after corporations. A breakdown by areas of funding compared to the universities shows strong participation in the area of structural programmes and a strong position in aeronautics and space programmes (cf. Figure 48).

Figure 48: Share of FFG funding programmes, 2008



Notes: TP = thematic programmes, SP = structural programmes, EIP = European and international programmes, BP = general programmes, ALR = Aeronautics and Space Agency

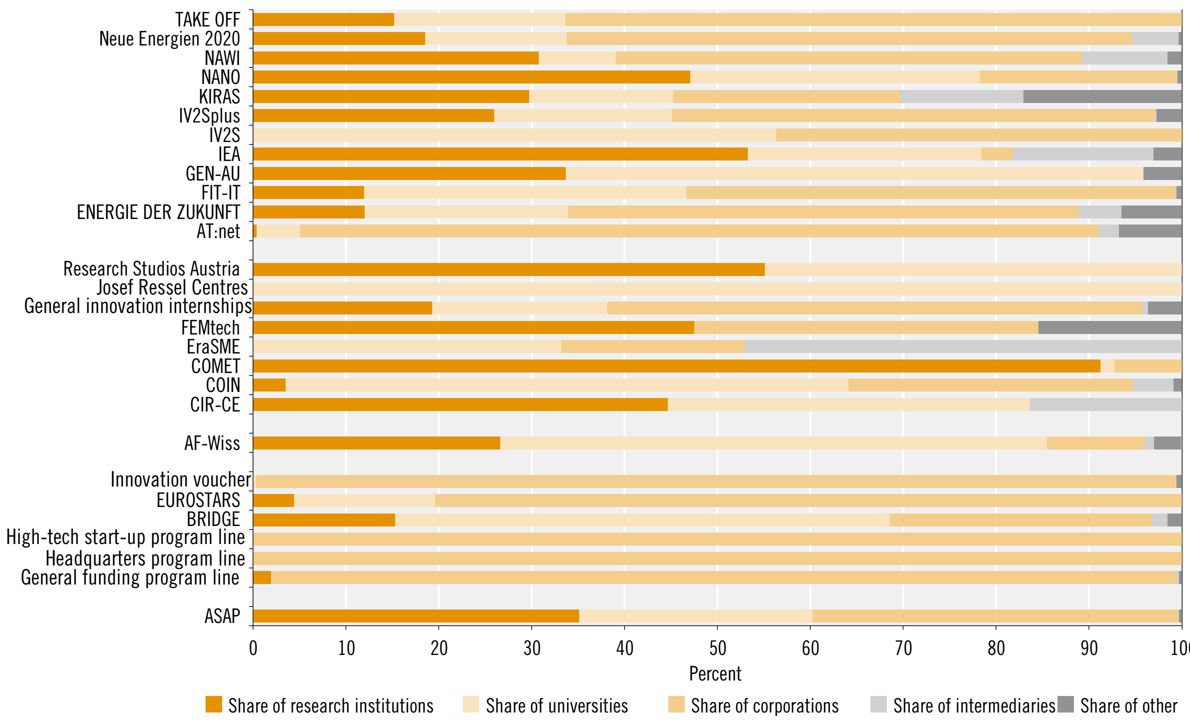
Source: FFG, calculations by Joanneum Research

A detailed view by individual programme underscores and deepens this picture and reveals high percentages among PRI for structural programmes. Most significant here are the some € 114 million in the COMET programme alongside the high shares in the Research Studios Austria, FEMtech and CIR-CE programmes. Among the thematic programmes, on the other hand, it is the programmes NANO and GEN-AU and the International Energy Agency (IEA) where PRI are highly involved.

This relatively high level of participation in programmes administered by FFG is contrasted by somewhat lower levels of participation in FWF funding. For example, some 11 % of (autonomous) FWF funding was given to PRI in 2008 (excluding the Austrian Academy of Sciences, which alone comes to about 11 %).[163]

When it comes to participation in the European Framework Programme, however, PRI are major players. A comparison of Austrian participations in the 7th EU Research Framework Programme[164] as of November 2009 shows an application rate of 26 % with 21 % of participations and 31 % of coordinators in the pillars of cooperation and capacities. This puts PRI at the same level of coordinators as the universities.[165]

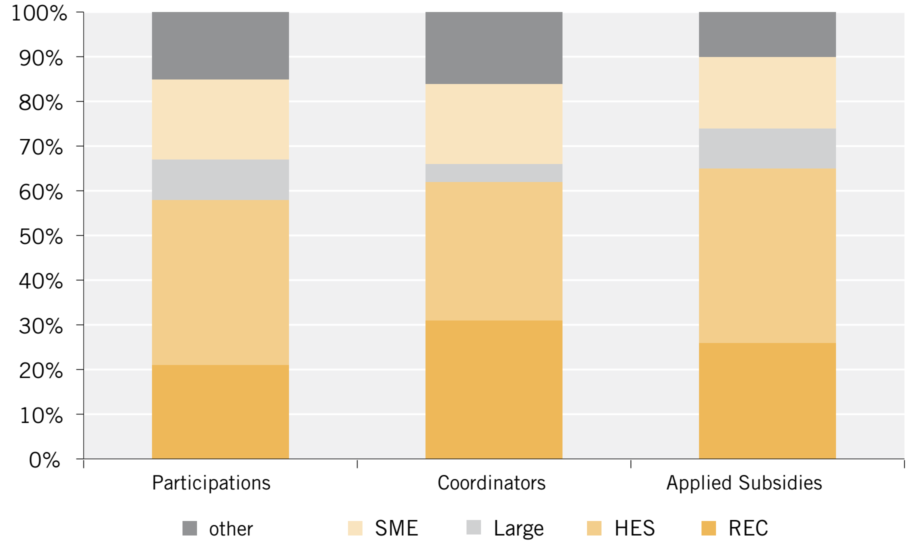
Figure 49: Participation in FFG programmes, 2008



Source: FFG, calculations by Joanneum Research

163 Cf. FWF (2009), Statistics Booklet 2008. (http://www.fwf.ac.at/de/public_relations/publikationen/publikationen.html)
164 Cf. Ehardt-Schmiederer et al. (2009b), 7th Framework Programme for Research, Technological Development and Demonstration (2007–2013), PROVISO summary report, fall 2009.
165 A look at the sources of funding, however, clearly contrasts EU funding of some €18 million for PRI with funding of some €50 million for universities.

Figure 50: Participation in 7th FP by player, November 2009



Note: HES = higher education services (colleges and universities), REC = public research centres, "Large" = companies with more than 250 employees, SME = small and medium-sized businesses of up to 249 employees, "Other" = museums, international organisations, EU institutions, public sector

Source: Proviso, calculations by Joanneum Research

7.6 Summary

Public research institutions (PRI) – given their share of nearly 14 % of overall R&D spending and their institutional nature – constitute a significant and specific element of the Austrian innovation system.

As regards funding, it should be noted that somewhat more than 10 % of PRI funds are now going to temporarily established PRI (centres of excellence, CD laboratories, Ludwig Boltzmann Institutes, etc.).[166] In addition, centres of excellence may also have funds from existing (permanent) PRI, so the estimated scope may be slightly low. This trend toward temporary institutions is also evident in the participation in FFG programmes, where one sees both the temporary PRI (COMET, Research Studios Austria) and the general pressure for PRI to obtain competitive grants.

What's especially apparent is the significant role in the field of engineering and natural sciences, where PRI are often more thoroughly involved than universities.

Although the group of PRI only slightly differs from the average of all Austrian R&D institutions when it comes to spending structures, there is a great distinction within the category. This is evident in the expenditures by research type, where specialisations emerge (such as the focus on basic research by the Austrian Academy of Sciences).

166 A comparison between the permanent organizations (AIT, Joanneum Research, etc.) from the COOP sub-sector (without AVL) and the temporary PRI (which are largely focused on collaborations between science and economics) show that the temporary institutions have already attained nearly half the size – measured in R&D expenditures – of the permanent institutions.

8 Evaluations of technology and innovation programmes in Austria

Austria's catch-up process in public and private investments in R&D was accompanied by a number of measures with the goal of supporting more efficient, more transparent and more robust evidence-based policy-making. In addition to a far-reaching delegation of programme management of RTI support programmes to agencies (FFG, FWF, aws) and professionalisation of the funding decisions within the agencies, external evaluations have become an integral component of RTI policy in the last 15 years. In addition to the evaluation of individual support programmes of the federal ministries, a system evaluation of the entire research promotion and financing was carried out with the goal of analysing the mode of operation of research promotion instruments and their interaction and determining a possible need for action.[167] The Austrian Research and Technology Report 2009 also focused on the existing evaluation culture in terms of the legal framework and the use of evaluations on the level of projects, programmes, institutions and the total system. Further contributing to this content, the following chapter highlights the existing evaluation practice of specific innovation promotion measures with regard to selection process, scheduling, objectives, thematic areas to be addressed, methods applied, quality and benefit.

The descriptions are based on data and analyses carried out by an international project consortium in connection with INNO-APPRAISAL (www.proinno-europe.eu), an initiative of the European Commission (DG Enterprise).[168] The goal of INNO-APPRAISAL was to perform an assessment of the evaluation practice of the member states of the European Union in the area of innovation policy and discuss the benefit of evaluations for policy-making. Based on information on innovation and technology support measures in the Trendchart database (now PRO-INNO Policy Measure), the project team gathered evaluations, monitoring reports and impact analyses prepared in the EU member states in the period 2002–2007.

Using a standardised survey, the evaluations performed by evaluation experts and programme managers were characterised and made accessible for analysis. The INNO-Appraisal database comprises 171 evaluations from the EU-25 member states which can be assigned to the support measures of the Trendchart database. Austria accounts for 34 evaluations, representing the largest share of evalua-

167 The main findings of the system evaluation were summarised in the Technology Report 2009, chapter 2 (p. 60 – 79).
168 Project consortium: MIoIR – Manchester Institute of Innovation Research (project management), ATLANTIS Consulting S.A., Joanneum Research, Fraunhofer Institute Systems and Innovation Research, Wise Guys Ltd.

tions in the database. With 18 evaluations, Germany has the second highest representation in the database.

The large number of evaluations available in Austria is due on the one hand to the large number of direct support measures. On the other hand, Austria is the only EU member state having a collecting agency for evaluations. The Research and Technology Evaluation platform (fteval), an institutional network of ministries, agencies and funding agencies commissioned to promote evaluation culture in Austria, regularly publishes evaluation results in its Internet forum. Moreover, in 2007, the fteval platform issued a compendium summarising the evaluations completed in the RTI area up to that time, making the public accessibility and transparency of evaluation results significantly higher in Austria than in other European countries.

8.1 Assessment of evaluated support measures

The assessment of the evaluated support measures follows the typology used in Trendchart, differentiating between target groups and modality of the support measure. Multiple citations of modalities and target groups were possible; however, they were limited to a maximum of three. Table 52 compares the evaluated policy measures in Austria compared to the support measures of the reference countries. The majority of the evaluated support measures combine two to three promotion modalities.

The characterisation of the support measures presents a largely homogeneous picture of the support measures in Austria and the other countries of the database. Direct, monetary support for innovation projects constitutes the core of the measures evaluated. The number of evaluated measures for the promotion of mobility, the creation of start-ups, and intermediary innovation promotion structures is limited in all countries. Compared to the other countries, however Austria has a relatively small number of evaluated network and cluster measures in the sample. The evaluation of the indirect, tax-incentivised R&D promotion that was performed as part of the system evaluation (Aiginger et al. 2009), could not be considered as it was not published until after the data collection in INNO-APPRAISAL.

Also, only slight differences can be determined between Austria and the other countries with regard to the target groups. The majority of the evaluated support measures are directed to both companies and scientific institutions. The measures thus also include elements of the cooperation of science and business, although this is not the predominant objective. The number of support measures directed exclusively to SMEs is small, although SMEs hold a significant position of importance in the Austrian economy. Also the share of the evaluated sector-specific support measures is smaller than in the reference countries.

Table 56: Characterisation of the evaluated support measures

Modality of the evaluated support measures	Austria		Other countries	
	Number	%	Number	%
Indirect measures	0	0%	7	6%
Direct financial support	17	53%	71	61%
Non-R&D-related support	9	28%	36	31%
Creation of intermediary institutions	3	9%	8	7%
Mobility of R&D employees	1	3%	12	10%
Creation of start-ups	2	6%	11	9%
Networks & clusters	2	6%	43	37%
Science-business cooperation	6	19%	31	26%
Support for acceptance and diffusion of innovations	11	34%	21	18%
Target group of the measures	**Number**	**%**	**Number**	**%**
University/PRO	21	66%	81	69%
All companies	19	59%	67	57%
Limited to SMEs	5	16%	29	25%
Sectors	3	9%	26	22%
Regions	2	6%	21	18%
Other	1	3%	25	21%
Number of valid cases (evaluations)	32		117	

Source: INNO-APPRAISAL

8.2 Basic characteristics and granting practice of evaluations in Austria

The information of the INNO-APPRAISAL database reflects basic characteristics of the granting practice of evaluations in the RTI segment. About three fourths of the evaluations were already included in the development phase of the support measures. As the RTD Guidelines existing since 2006 establish that the planning of an evaluation concept including quantifiable indicators is mandatory, it must be assumed that the number of the planned evaluations will continue to rise.

With regard to contracting policy, it must be stated that the overwhelming majority of the evaluations are carried out by external evaluators. In the entire database, there are no self-evaluations in the area of innovation policy that were made publicly accessible. Three evaluations pursue an approach that includes both elements of self-evaluation as well as such external evaluation.

In contrast to the reference countries in which evaluations are for the most part contracted via public announcements (15 % in Austria vs. 53 % in the reference countries), closed tendering procedures in the form of a "non-public procedure without prior announcement" and a "negotiating procedure without prior announcement" are preferred in Austria (58 % in Austria vs. 8 % in the reference countries). In both tendering procedures, a limited number of suitable bidders is invited to tender. The preferred tendering procedure is also reflected in the financial volume of the recorded evaluations: With an average volume of € 55,000, this should be seen as moderate, which not least may also be substantiated in the high frequency of evaluation projects.

The evaluations performed in Austria furthermore have a primarily formative character; they are used in a relatively early phase of the programme implementation in order to improve or stabilise the existing programmes for the purpose of a learning process. Formative evaluations are carried out over the course of the programme, usually in the form of concurrent evaluations and interim evaluation (Table 57). The demand for interim evaluations has risen sharply in recent years, which is not least due to the binding provisions of the RTD Guidelines and the recommendations of the Council for Research and Technology Development. However, the ministries responsible for programmes also have a need for internal planning and budget decision-making information that provides an accounting of the benefit and effectiveness of support programmes in order to secure the financing of support programmes for further planning periods.

Table 57: Points in time and objectives of the evaluations in Austria (2002–2007)

Objective Point in time	Summative	Formative	Both	Other	Total
Ex ante	0	5	0	0	5
Concurrent	1	2	1	0	4
Interim	4	10	4	0	18
Ex post	5	0	0	0	5
Other	0	1	0	1	2
Total	10	18	5	1	34

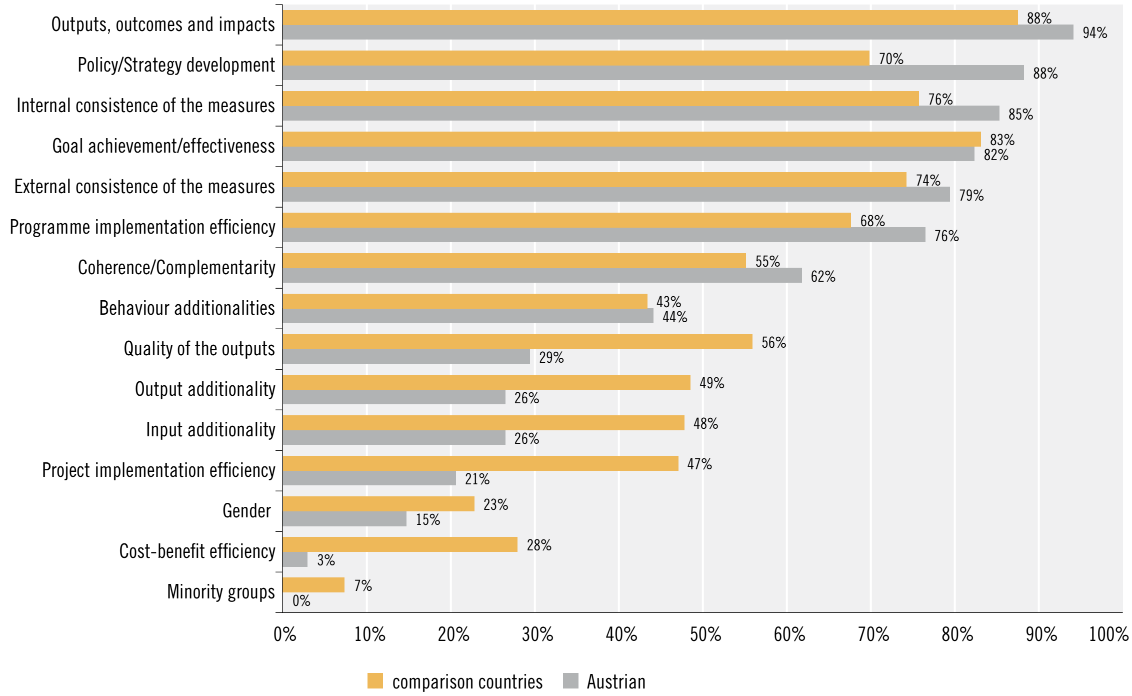
Source: INNO-APPRAISAL

Despite an increasing demand for accounting and justification with regard to resources used, there are relatively few evaluations and impact analyses that have a summative (summarising, conclusively evaluating) character and provide information concerning the quality of research results, medium-term economic impacts and long-term socio-economic impacts. This is in particular due to the fact that programmes are evaluated during the programme period; however, normally too little time has passed since the introduction of programmes to carry out quantitative impact analyses as well. In addition, the funding cases are often limited by the large number of existing programmes. Quantitative analytic methods (bibliometric analyses, patent analyses, input-output models, etc.) are often unrewarding; impact analyses can only be carried out as examples using qualitative analyses of case studies and focus groups.

8.2.1 Thematic areas addressed

The situation described above is also reflected in the thematic areas addressed and methods applied. Themes such as outputs/outcomes and impacts of the supported measures are addressed in nearly all evaluations; however, input and output additionalities and the quality of the outputs are considered in only about a quarter of the evaluations and thus significantly less often than in the reference countries.

Figure 51: Thematic areas addressed in the evaluations



Source: INNO-APPRAISAL

In addition to direct outputs, the areas of policy and strategy development and the internal consistency of support measures are considered. The thematic area of "behavioural additionalities" is also represented prominently in the international comparison. This is attributable to the formative evaluation access and the large representation of interim evaluations. In contrast to input and in particular output additionalities, behavioural additionalities (e.g. change in collaborative behaviour of the participating institutions) can already be recorded after a few years, for example in the course of implementing cooperative projects. For economic and social impact analyses above and beyond this, generally too little time has passed since the programme start to generate valid information.

Table 58: Consideration of different impact dimensions of programmes

		Austria		Reference countries	
Scientific	Limited to participants	4	12%	19	14%
	Above and beyond	3	9%	41	30%
Technological	Limited to participants	6	18%	32	23%
	Above and beyond	3	9%	54	39%
Economic	Limited to participants	8	24%	36	26%
	Above and beyond	4	12%	78	57%
Social	Limited to participants	0	0%	8	6%
	Above and beyond	1	3%	60	44%
Environment	Limited to participants	2	6%	5	4%
	Above and beyond	0	0%	34	25%

Source: INNO-APPRAISAL

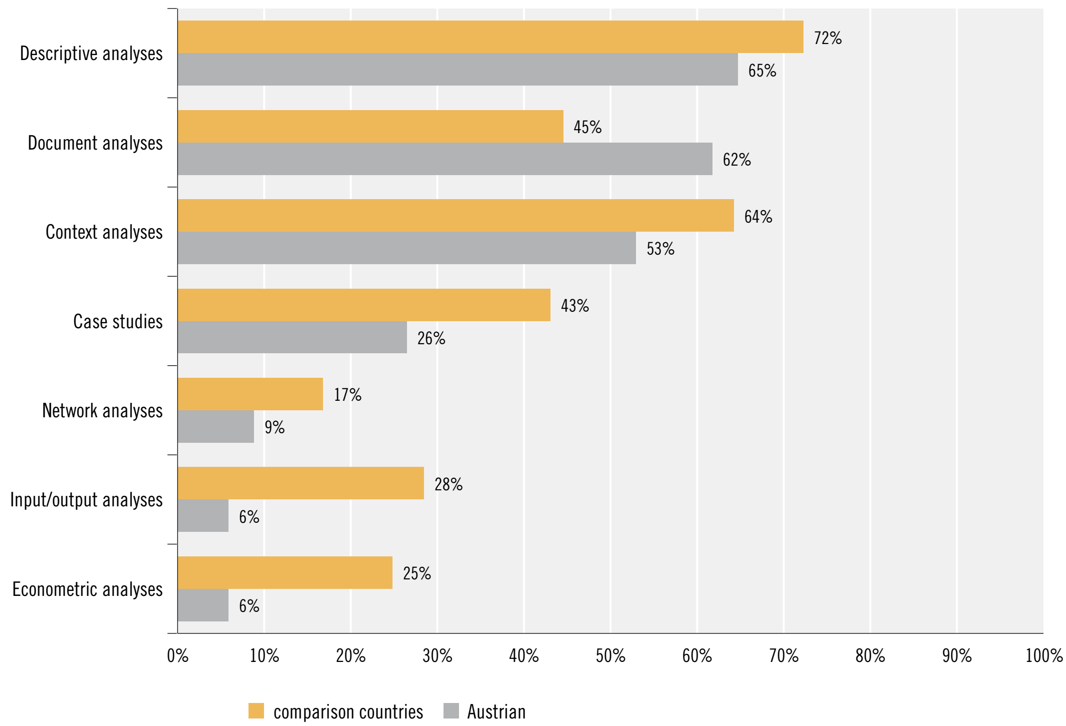
The INNO-APPRAISAL database also records if evaluations generate information concerning medium-term to long-term impacts with regard to the participants of a support measure and above and beyond it. It is shown that medium-term to long-term scientific, technological, economic and social effects are considered less frequently in Austrian evaluations than in the reference countries. When medium-term to long-term impacts are recorded, they are more likely to refer to direct impacts with regard to participating institutions than further reaching, societal effects. Evaluations perform basic output counts; however beyond that they provide hardly any information concerning the development of the effects of the measures, which would of course require a longer-term interest on the part of policy-makers in past support measures.

8.2.2 Methods for data generation and data analysis

With respect to methods applied for forming a database for performing evaluations, hardly any difference can be detected in the international comparison. Interviews, data from the existing programme monitoring and existing programme documents and existing surveys make up the core of evaluation projects. Furthermore, evaluations of surveys of the programme participants and focus groups and workshops with participating institutions take place in more than 50 % of the Austrian evaluations.

Surveys of institutions that have not participated in the funding programme are used in only one fifth of the evaluations. They would be needed in particular for impact analyses, for example for the use of control group analyses.

Figure 52: Applied analytical methods



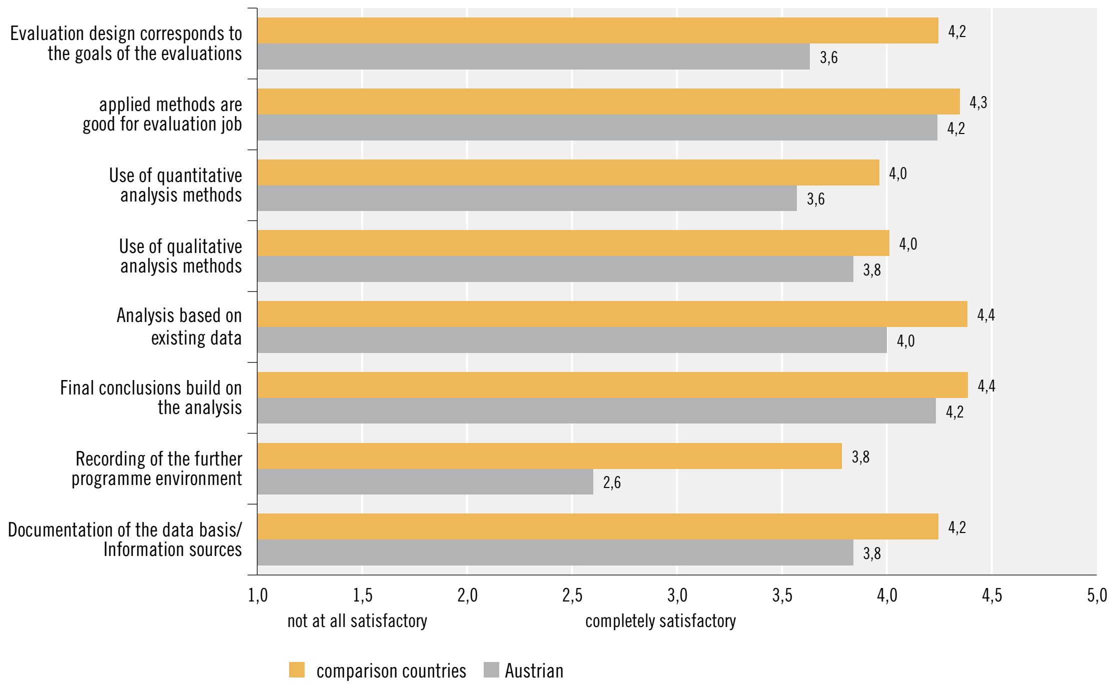
Source: INNO-APPRAISAL

As both quantitative and qualitative data are generated in the course of evaluations, a mix of quantitative and qualitative methods is generally used. In this regard, Zinöcker (2007) refers to strong development tendencies, as logic charts, logit/probit analyses, matched pair analyses and network analyses were used for the first time in the last few years. However, it must be noted that the majority of the evaluations are only based on descriptive statistics and document analyses. Econometric analyses, input-output models, control group and network analyses are only used on an isolated basis and significantly less often than in the reference countries. Also noteworthy is the astoundingly low use of case studies in Austria, as they can provide both a picture of the programme impact as well as the efficiency of the programme implementation in a qualitative manner, in particular in the course of performing interim evaluations.

8.2.3 Quality and usefulness of the evaluations

Despite the broad limitation to descriptive statistics and document analyses, the persons responsible for the programmes consistently rate the quality of the evaluations as good. The applied methods are seen as appropriate with regard to the objectives of the evaluations. As the evaluations place a focus on qualitative evaluation methods, the application of the quantitative methods is less satisfactory than that of the qualitative methods. In the international comparison, the evaluation of the Austrian respondents tends to be below the level of the reference countries; however significant differences can be seen only for the categories "Analysis based on existing data", "Evaluation design consistent with the objectives of the evaluations", and the "Consideration of the broader programme context."

Figure 53: Quality of the evaluations



Source: INNO-APPRAISAL

Not only in Austria is the usefulness of the evaluation results seen with a low amount of optimism. This applies in particular with regard to "Changes of the design of the existing programmes." Not only poor recommendations may be responsible for this but also incorrect timing of the evaluations with regard to programme planning phases in which changes in the programme design and the programme administration are possible. This hypothesis is supported by the observation that the persons responsible for the programme see a relatively high benefit with regard to the orientation of future programmes. In addition, the Policy Mix Review Team finds fault that there are no mechanisms in Austria to ensure that the results of evaluations are included in policy formulation and implementation.[169]

169 CREST Policy Mix Expert Group: Country Report Austria, 2008, p. 17.

Table 59: Usefulness of the recommendations in evaluations

	Austria	Reference countries
Internal usefulness	1 = not at all useful 5 = very useful	
Recommendations were useful for the (re-)design of the measure	2.6	3.3
Recommendations were useful for the management/implementation of the measure	3.3	3.3
External usefulness		
Recommendations were useful for the design/management/implementation of future programmes/measures	3.4	3.6
Recommendations were helpful for the design/management/implementation of future programmes/measures	2.2	2.3
Recommendations support the ongoing process of policy formulation and implementation	3.0	2.9

Source: INNO-APPRAISAL

8.2.4 Consequences of evaluations

In contrast to the expert opinion of the CREST Policy Mix Team, it can be said that based on the INNO-APPRAISAL database, evaluations do indeed have consequences in Austria. As a consequence of the 19 analysed interim evaluations, 2 funding programmes were stopped, basic changes were carried out in 3 additional ones and 8 more support measures were subjected to a minor re-design. In a few cases, evaluation results also led to changes in other measures. This indicates that evaluations take into account the rest of the funding environment of the corresponding sector, at least in some cases.

Table 60: Points in time and consequences of evaluations

	Termination	Large re-design	Small re-design	Expansion	Re-design of other measures	Total
	No.	No.	No.	No.	No.	No.
Ex ante	0	1	1	1	1	4
Concurrent	0	0	3	1	0	4
Interim	2	3	8	4	2	19
Ex post	0	0	0	0	1	1
Other	0	1	1	1	0	3
Total	2	5	13	7	4	31

Source: INNO-APPRAISAL

8.2.5 Summary

In sum, the meta-evaluation of the evaluation culture in the area of innovation policy in Austria paints a diverse picture. While the quantity and availability of evaluation results in Europe are unique and reinforce the picture of an extremely transparent evaluation system, the results of the study as discussed also point to challenges that the customers and providers of evaluations must face.

A certain "evaluation fatigue" was observed already in the Austrian Research and Technology Report 2009. Challenges, in particular relating to the implementation of evaluation results, are detected and they could also be due to the high number of evaluations. An assessment of the evaluation practice in Austria compared internationally underscores the relevance of the findings to date: Evaluations may be an integral part of promoting innovation and technology, but there is a danger that they may suffer the fate of fading into a background noise that is tolerated but not given much attention. Not only the sheer number of evaluations is responsible for this. Based on the analyses referred to, the evaluations are homogeneous with regard to objectives, applied methods and impact dimensions taken into account. There is little diversity and innovation in the evaluations performed.

- Formative interim evaluations with a strong focus on programme management and internal programme logic dominate.
- The direct outputs of the support measures are taken into account; however due to the early use of evaluations (often as early as 2-3 years after the programme start), it is often impossible to provide valid information concerning the quality of the work performed and the medium-term to long-term development of the effects. While 50 % of the internationally available evaluations address aspects of input and output additionality (and could thus provide crucial information about the impact of the support measure), only 25 % of the Austrian evaluations deal with these themes.
- Medium- to long-term analyses of the technical, economic and social efficacy of funding programmes are not widely considered in Austria. Due to the early use of evaluations, correspondingly advanced, quantitative evaluation methods are restricted to a small number of support measures. Austria also lags behind other countries in the use of methods that make the development of effects comprehensible in a qualitative manner.

The result is often more of the same, which ultimately breeds lethargy and discontent. To counteract this danger, it is all the more necessary to discuss and determine the need for and the planning periods of evaluations. Evaluations should not become a routine but instead should be used to meet specific needs.

Annex

Table X: OECD/Eurostat classification by technology and knowledge intensity, 3-digit level

High technology sector
24.4 Manufacture of pharmaceuticals, 30.0 Manufacture of office, accounting and computing machines, 32.1 Manufacture of electronic valves, tubes and components, 32.2 Manufacture of TV, radio transmitters and line apparatus, 32.3 Manufacture of TV and radio receivers, sound and video goods, 33.1 Manufacture of medical appliances, instruments and control equipment 33.2 Manufacture of instruments and appliances for measuring, checking, testing, navigating and other purposes, 33.3 Manufacture of industrial process control equipment, 33.4 Manufacture of optical instruments and photographic equipment, 33.5 Manufacture of watches and clocks, 35.3 Aircraft and spacecraft

Medium-high technology sector
24.1 Manufacturing of chemicals and chemical products, 24.2 Manufacturing of extermination and agricultural control chemicals, 24.3 Manufacturing of paints, printer's ink and luting agents, 24.5 Manufacturing of soaps, washing, cleaning and personal hygiene products, 24.6 Manufacturing of other chemical products, 24.7 Manufacturing of synthetic fibres, 29.1 Manufacturing of machines for the production and use of mechanical energy (not including engines for air and road vehicles), 29.2 Manufacturing of other machines for various uses, 29.3 Manufacturing of agricultural and forestry machines, 29.4 Manufacturing of machine tools, 29.5 Manufacturing of machines for other economic branches, 29.6 Manufacturing of weapons and munition, 29.7 Manufacturing of household equipment, 31.1 Manufacturing of electrical motors, generators and transformers, 31.2 Manufacturing of electricity distribution and control apparatus, 31.3 Manufacturing of insulated wire and cable, 31.4 Manufacturing of accumulators, primary cells and primary batteries, 31.5 Manufacturing of electric lamps and lighting equipment, 31.6 Manufacturing of other electrical equipment, 34.1 Manufacturing of motor vehicles and motor vehicle engines, 34.2 Manufacturing of motor vehicle bodies, body shells and trailers, 34.3 Manufacturing of parts and accessories for motor vehicles and motor vehicle engines, 35.2 Railway and tramway locomotives and rolling stock, 35.4 Manufacturing of transport equipment, 35.5 Transport equipment.

Medium-low technology sector
23.1 Coke, 23.2 Petroleum processing, 23.3 Manufacturing and processing of nuclear fuel, 25.1 Manufacturing of rubber products, 25.2 Manufacturing of plastic products, 26.1 Manufacturing and processing of glass, 26.2 Ceramics (not including bricks and building ceramics), 26.3 Manufacturing of ceramic wall and floor tiles and plates, 26.4 Bricks, Manufacturing of other building ceramics, 26.5 Manufacturing of cement, lime and fired plaster, 26.6 Manufacturing of concrete, cement and plaster wares, 26.7 Handling and processing of natural stones, 26.8 Manufacturing of other mineral products, 27.1 Production of raw iron, steel and ferro-alloys, 27.2 Manufacturing of pipes, 27.3 Other initial processing of iron and steel, 27.4 Production and initial processing of non-ferrous metals, 27.5 Metal casting industry, 28.1 Steel and light metal construction, 28.2 Boilers and the construction of containers (not including the productions of steam boilers), 28.3 Manufacturing of steam boilers (not including central heating boilers), 28.4 Manufacturing of forged, moulded, drawn and stamped parts, rolled rings and pulverised metal products, 28.5 surface refining, heat treatment and mechanics, 28.6 Manufacturing of cutting tools, tools, locks and fittings, 28.7 Manufacturing of other iron, tin and metal wares, 35.1 Ships

Low technology sector
15.1 Slaughterhouses and meat processing, 15.2 Fish processing, 15.3 Fruit and vegetable processing, 15.4 Manufacture of plant- and animal-based oils and fats,15.5 Milk processing; Manufacture of ice cream, 15.6 Meal and hulling mills, manufacture of starch and starch products, 15.7 Manufacture of feed, 15.8 Manufacture of other food and luxury products, 15.9 Manufacture of beverages, 16.0 Tobacco processing, 17.1 Textile processing and spinning, 17.2 Weaving, 17.3 Textile finishing, 17.4 Manufacture of decorated textile products (excluding clothing), 17.5 Manufacture of other textile products (excluding knitted goods), 17.6 Manufacture of knitted materials, 17.7 Manufacture of finished knitted goods, 18.1 Manufacture of leather clothing, 18.2 Manufacture of clothing (excluding leather clothing), 18.3 Finishing of colours for hides and skins, manufacture of furs, 19.1 Leather production, 19.2 Leather processing (excluding manufacture of leather clothing and shoes), 19.3 Manufacture of shoes, 20.1 Sawmills, planing mills and wood treatment plants, 20.2 Veneer, plywood, fibre board and chipboard plants, 20.3 Manufacture of construction parts, expansion elements and complete components made of wood, 20.4 Manufacture of packaging materials and storage containers made of wood, 20.5 Manufacture of wooden goods, such as cork, braided and basket wares, 21.1 Manufacture of wood pulp, cellulose, paper, cardboard and paperboard, 21.2 Paper, cardboard and paperboard processing, 22.1 Publishing, 22.2 Printing, 22.3 Duplication of recorded sound, image and data carriers, 36.1 Manufacture of furniture, 36.2 Manufacture of jewellery and similar products, 36.3 Manufacture of music instruments, 36.4 Manufacture of sporting goods, 36.5 Manufacture of toys, 36.6 Manufacture of other products, 37.1 Recycling of scrap, 37.2 Recycling of non-metallic waste materials

Source: Statistik Austria

9 Literature

Abramovsky, L, Harrison, R., Simpson, H. (2007), University Research and the Location of Business R&D, Economic Journal, 2007, 117(519), pp. C114-C141.

Acs, Z.J., Parsons, W., Tracy, S. (2008), High–Impact Firms: Gazelles Revisited (manuscript), In S.O.o. Advocacy (Ed.), SBA Reports, Washington, D.C.: SBA Office of Advocacy, 2008.

Aghion P., Meghir, C., Vandenbussche, J. (2006), Distance to Frontier, Growth, and the Composition of Human Capital, Journal of Economic Growth, 6/2006, 11(2), pp. 97-127.

Aghion Philippe, Bloom Nick, Blundell Richard, Griffith Rachel, Howitt Peter (2005), Competition and Innovation: An Inverted-U Relationship, in: The Quarterly Journal of Economics 120/2, 701-728

Aghion, Ph., Boustan, L., Hoxby, C., Vandenbussche, J. (2005), Exploiting States Mistakes to Identify the Causal Impact of Higher Education on Growth. UCLA Economics Online Paper, 2005, 386, http://www.econ.ucla.edu/people/papers/Boustan/Boustan386.pdf.

Almeida, P., Kogut, B. (1999), Localisation of Knowledge and the Mobility of Engineers in Regional Networks, Management Science, 45, 1999, pp. 905-916.

Almeida, P.; Dokko, G.; Rosenkopf, L. (2003), Startup Size and the Mechanisms of External Learning: Increasing Opportunity and Decreasing Ability? Research Policy, 32(2), 2003, pp. 301-15.

Anderson Frances (2005), Measuring Innovation in Construction, in: Manseau André, Shields Rob (2005), Building tomorrow. Innovation in Construction and Engineering, Ashgate, Aldershot – Burlington, 57-80

Arditi David, Kale Serdar, Tangkar Martino (1997), Innovation in Construction Equipment and its Flow into the Construction Industry, in: Journal of Construction Engineering and Management 123/4, 371-378

AWS (2008): LISA Annual Report 2008, Vienna.

AWS and Wellacher Consulting (2009): Der Life Science Markt in Österreich, Vienna.

Barba Navaretti, G. und Falzoni, A. M. (2004) "Home Country Effects of Foreign Direct Investment" in: Barba Navaretti, G. und Venables, A. J. (Eds.) Multinational Firms in the World Economy Princeton and Oxford, Princeton University Press, pp. 217-239.

Barba Navaretti, G. und Venables, A. J. (Eds.) Multinational Firms in the World Economy Princeton and Oxford, Princeton University Press, pp. 217-239.

Barlow James (2000), Innovation and learning in complex offshore construction projects, in: Research Policy 29, 973-989

Benhabib, J., Spiegel,M. (1994), The Role of Human Capital in Economic Development: Evidence from Aggregate Cross-Country and Regional U.S. Data", Journal of Monetary Economics 1994, 34, pp. 143-173.

Berger, M. (2009), Welcher Zusammenhang besteht zwischen Innovationen und Produktivität? Eine Analyse des österreichischen Community Innovation Survey im internationalen Vergleich, Wirtschaftspolitische Blätter 56, 2009, 3, pp. 495-516.

BGBl (2006/17), Bundesvergabegesetz 2006, Federal Law Gazette for the Republic of Austria, Vienna.

BGBl (2007/86). Änderung des Bundesvergabegesetzes 2006. Vienna, Federal Law Gazette for the Republic of Austria.

BGBl (2010/15). Änderung des Bundesvergabegesetzes 2006. Vienna, Federal Law Gazette for the Republic of Austria.

Biopatent Monitoring Komitee (2009): Second Report of the Biopatent Committee, presented by the Federal Minister of Transport, Innovation and Technology,http://www.parlament.gv.at/PG/DE/XXIV/III/III_00074/imfname_160738.pdf

Blayse A. M., Manley K. (2004), Key influences on construction innovation, in: Construction Innovation 4, 143-154

Blecha, K., Hillebrand, G., Spiesberger, M., Schuch, K., Buchinger, E., Fröhlich, J. (2008), Corporate Governance der RTOs. GFF Studie, Governance-Modelle nationaler Forschungsinfrastrukturen zur strategischen Ausrichtung der RTOs. Vienna.

(http://www.bmvit.gv.at/service/publikationen/innovation/downloads/corporate_governance_ergebnisbericht.pdf)
BMF (Federal Ministry of Finance) (2008), Budget 2008 auf einen Blick, Federal Ministry of Finance, Vienna.
BMWA (Federal Ministry of Economics and Labour) (2007), procure_inno: Praxisorientierter Practical Guide to Innovation-Friendly Public Procurement and Contact Awarding, Vienna.
BMWF (Federal Ministry of Science and Research) (2008), Universitätsbericht 2008, Vienna
BMWF (Federal Ministry of Science and Research) and BMVIT (Federal Ministry of Transport, Innovation and Technology) (2009), Austrian Research and Technology Report 2009, Vienna.
BMWF (Federal Ministry of Science and Research) ESFRI (European Strategy Forum on Research Infrastructures), http://www.bmwf.gv.at/eu_internationales/eu_forschung/esfri/.
Bock-Schappelwein, J., Bremberger, C., Huber, P. (2008), Zuwanderung von Hochqualifizierten nach Österreich, Studie im Rahmen des Forschungsdialogs, WIFO, Vienna, 2008.
Boulmé, F. (2010): Allgemeine Informationen zu HEALTH, Proviso-Auswertung, Vienna.
Bowley M. (1962), Innovations in Building Materials, London – Gerald Duckworth
Braun, R. (2005): Umwelt + Bio + Technologien – Neue Anforderungen und Entwicklungen, Impulsreferat im Rahmen des Fachdialogs Innovation am 3. Februar 2005, Tulln.
Brinkmeier M und Schank T (2005) Network Statistics. In Brandes U und Erlebach T (eds.) Network Analysis. Methodological Foundations, pp. 293-316. Springer, Berlin, Heidelberg and New York
Buchinger, E. (2009a), Innovationsfördernde öffentliche Beschaffung: Initiierung, Effekte, Lernen, Austrian Institue of Technology (Study commissioned by the Chamber of Labour), Vienna.
Buchinger, E. (2009a), Innovationsfördernde öffentliche Beschaffung: Innovationspolitische Optionen, Austrian Institute of Technology (Study commissioned by the BMVIT), Vienna.
Buchinger, E. (2009a), Innovationsfördernde öffentliche Beschaffung: Ein neues Instrument der Innovationspolitik? Austrian Institute of Technology (Study commissioned by the BMVIT), Vienna.
BVA (2009), Siebenter Tätigkeitsbericht des Bundesvergabeamtes. Vienna, 2008, Federal Procurement Office
Caroli, E., Van Reenen, J. (2001), Skill-Biased Organizational Change? Evidence From A Panel Of British And French Establishments, The Quarterly Journal of Economics, MIT Press, vol. 116(4), 2001, November, pp. 1449-1492.
CDG (2009): Die CDG auf einen Blick, Factsheet, Vienna.
Ciccone, A., Papaioannou, E. (2008), Human capital, the structure of production and growth, Review of Economic and Statistics, being printed, 2008.
Cleff Thomas, Rudolph-Cleff Annette (2001), Innovation and Innovation Policy in the German Construction Sector, in: Manseau André, Seaden George (2001), Innovation in Construction. An International Review of Public Policies, Taylor and Francis – Spon Press, London
Coad, A. and Rao, R. (2008), Innovation and firm growth in high-tech sectors: A quantile regression approach, Research Policy, 2008, 37 (4), pp. 633–648.
Del Monte, A. and Papagni, E. (2003), R&D and The Growth of Firms: Empirical Analysis of A Panel of Italian Firms, Research Policy, 2003, 32, pp. 1003–1014.
COM (2008), Communication from the Commission to the Council and the European Parliament on the Methodology and Terms of Reference to be used for the Review to be carried out by independent experts concerning the European Research Council structures and mechanisms, 26.08.2008, Brussels.
CORDIS (2010a), FP6 Budget, http://cordis.europa.eu/fp6/budget.htm, downloaded on 9.1.2010, last updated 28.12.2006.
CORDIS (2010b), Ideen, http://cordis.europa.eu/fp7/ideas/home_de.html, downloaded on 9.1.2010, last updated 19.11.2009.
CORDIS (2010c), Kapazitäten, http://cordis.europa.eu/fp7/capacities/home_de.html, downloaded on 9.1.2010, last updated 19.12.2007.
CORDIS (2010d), Menschen, http://cordis.europa.eu/fp7/people/home_de.html, downloaded on 9.1.2010, last updated 1.12.2008.
CORDIS (2010e), Zusammenarbeit, http://cordis.europa.eu/fp7/cooperation/home_de.html, downloaded on 9.1.2010, last updated 1.2.2008.
Darby, M., Zucker, L. (2007), Star Scientists, Innovation and Regional and National Immigration, NBER Working Paper 13547, 2007.
Dell'mour, R. (2009), Direktinvestitionen 2007. Österreichische Direktinvestitionen im Ausland und ausländische Direktinvestitionen in Österreich, Austrian National Bank, Vienna.

Dubois Anna, Gadde Lars-Erik (2002), The construction industry as a looesly coupled system. Implications for productivity and innovation, in: Construction Management and Economics 20, 621-631

Dulaimi Mohammed Fadhil, Ling Florence Y.Y., Ofori George, De Silva Nayanthara (2002), Enhancing integration and innovation in construction, in: Building Research & Information 30/4, 237-247

EARTO (2008), Research and Technology Organisations in the evolving European Research Area. Brussels. (http://www.earto.eu/fileadmin/content/03_Publications/RTOs_and_the_Evolving_European_Research_Area_WhitePaperFinal.pdf)

EC (2002), More research for Europe: Towards 3 % of GDP, European Commission, Brussels.

EC (2004), Facing the challenge: The Lisbon strategy for growth and employment, European Commission [High Level Group, Chair W. Kok], Brussels.

EC (2005), Public procurement for research and innovation, European Commission [Expert Group Report, Chair R. Wilkinson], Brussels.

EC (2006a), Creating an innovative Europe, European Commission [Expert Group Report, Chair E. Aho], Brussels.

EC (2006b), Pre-commercial procurement of innovation: A missing link in the European innovation cycle, European Commission, Brussels.

EC (2007a), Guide on dealing with innovative solutions in public procurement: 10 elements of good practice, European Commission, Brussels.

EC (2007b), A lead market initiative for Europe, European Commission, Brussels.

EC (2006b), Pre-commercial procurement of innovation: Driving innovation to ensure sustainable high quality public services in Europe, European Commission, Brussels.

Edler, J. (2008), The role of international collaboration in the Framework Programme: Expert analysis in support of the ex post evaluation of FP6. Background Paper to the Evaluation of the Sixth Framework Programme. Manchester: Manchester Institute of Innovation Research.

Edler, J., Tsipouri, L., Hommen, L. und Rigby, J. (2005), Innovation and public procurement: Review and issues at stake, ISI Fraunhofer Institute Systems and Innovation Research, Karlsruhe.

Egger, H. and Egger, P. (2003), Outsourcing and skill-specific employment in a small economy: Austria after the fall of the Iron Curtain, Oxford Economic Papers, 55, pp. 625-643. 625-643.

Egger, H. and Egger, P. (2006), International Outsourcing and the Productivity of Low-Skilled labour in the EU, Economic Inquiry, 44(1), pp. 198-108.

Ehardt-Schmiederer, M. (2009), PROVISO-Information: Österreich und die EU-Rahmenprogramme AIrps1844eha080109, February 2009.

Ehardt-Schmiederer, M., Postl, V., Wimmer, B., Schoder-Kienbeck, M., Brücker, J., Schleicher, L., Kobel, C., Boulmé, F. and Milanovic, D. (2009a), 6th EU-Rahmenprogramm für Forschung, technologische Entwicklung und Demonstration (2002-2006) PROVISO-Bericht – Herbst 2009. Vienna.

Ehardt-Schmiederer, M., Wimmer, B., Postl, V., Kobel, C., Brücker, J., Schoder-Kienbeck, M., Schleicher, L., Boulmé, F. und Milanovic, D. (2009b), 7th EU-Rahmenprogramm für Forschung, technologische Entwicklung und Demonstration (2007-2013) PROVISO-Bericht – Fall 2009. Vienna.

ERC (2009): Activities & achievements in 2008, Annual Report, Luxembourg.

Ernst & Young (2009): Beyond borders: Global biotechnology report, Zurich, Boston.

Ernst, D & Kim, L (2002), Global production networks, knowledge diffusion, and local capability formation, Research Policy 31(8-9), 1417-29.

Ernst, D (2002), Global Production Networks and the Changing Geography of Innovation systems. Implications for Developing Countries, Economics of Innovation and New Technology 11(6), 497-523.

EU (2004/17), Directive of the European Parliament and of the Council coordinating the procurement procedures of entities operating in the water, energy, transport and postal services sectors, Official Journal of the European Union, Brussels.

EU (2004/18), Directive of the European Parliament and of the Council on the coordination of procedures for the award of public works contracts, public supply contracts and public service contracts., Official Journal of the European Union, Brussels.

EURAB (2005), Research and technology organisations (RTOs) and ERA. Brussels. (http://ec.europa.eu/research/eurab/pdf/eurab_05_037_wg4fr_dec2005_en.pdf)

Europäische Kommission (2003), Empfehlung der Kommission vom 6. Mai 2003 betreffend die Definition der Kleinstunternehmen sowie der kleinen und mittleren Unternehmen. Amtsblatt der Europäischen Union L 124/36 vom 20.5.2003. Brussels.

Europäische Kommission (2008a), EU Haushalt 2008

Finanzbericht. Luxembourg, European Union Office of Publications.
European Commission, KMU in Europa 2003 (2003), Beobachtungsnetz der europäischen KMU; Report 2003/No. 7.
Europäisches Parlament (2006a), Beschluss Nr. 1982/2006/EG des Europäischen Parlaments und des Rates vom 18. Dezember 2006 über das Siebte Rahmenprogramm der Europäischen Gemeinschaft für Forschung, technologische Entwicklung und Demonstration (2007 bis 2013). Amtsblatt der Europäischen Union L 412/1 vom 30.12.2006.
Europäisches Parlament (2006b), Verordnung (EG) NR. 1906/2006 des Europäischen Parlmanebts und des Rates vom 18. Dezember 2006 zur Festlegung der Regeln für die Beteiligung von Unternehmen, Forschungszentren und Hochschulen an Maßnahmen des Siebten Rahmenprogramms sowie für die Verbreitung der Forschungsergebnisses (2007-2013). Amtsblatt der Europäischen Union L 391/1 vom 30.12.2006. Brussels.
European Commission (2009), Second FP7 Monitoring Report. Monitoring Report 2008. 1 October 2009.
European Commission (2009),: The financing of biopharmaceutical product development in Europe, Study on the competitiveness of the European biotechnology industry, final report, http://ec.europa.eu/enterprise/newsroom/cf/document.cfm?action=display&doc_id=5546&userservice_id=1&request.id=0
European Communities (EC) (2006), European Roadmap for research infrastructures: Report 2006, Luxembourg.
European Communities (EC) (2008), European Roadmap for research infrastructures: Report 2008, Luxembourg.
Eurostat (2010), Forschungspersonal insgesamt, nach Leistungssektor – [tsc00003]. http://epp.eurostat.ec.europa.eu/portal/page/portal/science_technology_innovation/data/main_tables#, Downloaded on 11.3.2010, last updated 11.3.2010.
Falk, M. (2009), Einfluss der Forschungs- und Entwicklungsaktivitäten auf das Unternehmenswachstum in Österreich, WIFO-Monatsberichte 3/2009, pp. 181-194.
Falk, M., Unterlass, F. (2006), Determinanten des Wirtschaftswachstums im OECD-Raum, in: Aiginger, K., Tichy, G., Walterskirchen, E. "WIFO-White Paper: Mehr Beschäftigung durch Wachstum auf Basis von Innovation und Qualifikation", Teilstudie 1.
Fallick, Brice; Fleischmann, Charles A; Rebitzer, James A. (2005), Job Hopping in Silicon Valley: Some Evidence Concerning the Micro-Foundations of a High Technology Cluster, National Bureau of Economic Research, Inc, NBER Working Papers: 11710 / 2005
FFG (2008), Life Sciences: Die wichtigsten Förderprogramme im Überblick, FFG Fokus, Vienna.
FFG (2009), Zahlen, Daten, Fakten (Facts, Figures, Data) 2008, Vienna. http://www.ffg.at/getdownload.php?id=3547
FFG (2009a), Das österreichische Genomforschungsprogramm GEN-AU, Factsheet, Vienna.
FFG (2009b), Genomforschung in Österreich – GEN-AU, Factsheet, Vienna.
FWF (2009), Statistics Booklet 2008. Vienna. (http://www.fwf.ac.at/de/downloads/pdf/fwf-statistics-booklet-2008.pdf)
Gann David M. (2001), Putting academic ideas into practice. Technological progress and the absorptive capacity of construction organizations, in: Construction Management and Economics 19, 321-330
Gann David M., Salter Ammon J. (2000), Innovation in project-based, service-enhanced firms. The construction of complex products and systems, in: Research Policy 29, 955-972
Georghiou, L. (2007), Demanding innovation: Lead markets, public procurement and innovation, NESTA National Endowment for Science, Technology and the Arts, London.
Gereffi, G & Korzeniewicz, M (1994), Commodity chains and global capitalism, Contributions in economics and economic history; 149, Greenwood Press, Westport, Conn.
Gereffi, G (1999), A Commodity Chains Framework for Analysing Global Industries, paper presented to Background Notes for Workshop on the Spreading of the Gains from Globalisation, 15th – 17th September 1999, Institute of Development Studies University of Sussex Brighton, UK.
Hansson, P. (2005), Skill upgrading and production transfer within Swedish multinationals, Scandinavian Journal of Economics, 107(4), pp. 673-692.
Hatzichronoglou, T. (1997), Revision of the High-Technology Sector and Product Classification, OECD Science, Technology and Industry Working Papers, 1997/2, OECD Publishing. http://puck.sourceoecd.org/vl=3735130/cl=18/nw=1/rpsv/cgi-bin/wppdf?file=5lgsjhvj7nkj.pdf
Hauknes, J., Knell, M. (2009), Embodied knowledge and sectoral linkages: An input–output approach

to the interaction of high- and low-tech industries, Research Policy 38(3), pp. 459–469.

Head, K. und Ries, J. (2003), Heterogeneity and the FDI versus Export Decision of Japanese Manufacturers. NBER Working Paper. 10052.

Helpman, E., Melitz, M. J. und Yeaple, S. R. (2004), Export Versus FDI with Heterogeneous Firms, American Economic Review, 94(1), pp. 300-316.

Henderson, J, Dicken, P, Hess, M, Coe, N & Yeung, HW (2002), Global production networks and the analysis of economic development, Review of international political economy 9(3), 436-64.

Hierländer, R., Huber, P., Iara, A., Landesmann, M., Nowotny, K., O'Mahony, M., Nowotny, K., Robinson, C., Stehrer, R. (2009), Migration, Skills and Productivity, Background paper for the Competitiveness Report of the European Commission 2009

Hirsch-Kreinsen, H., Jacobson, D. (Eds.) (2008), Innovation in Low-tech Firms and Industries, Cheltenham: Edward Elgar

Hirsch-Kreinsen, H., Jacobson, D., Laestadius, S. (Eds.) (2005), Low-tech Innovation in the Knowledge Economy. P. Lang: Frankfurt am Main.

Hobday, M (1995a), Innovation in East Asia: the challenge to Japan, Elgar, Aldershot

Hobday, M (1995b), East Asian latecomer firms: learning the technology of electronics, World Development 23(7), 1171-93.

Hobday, M (2000), East versus Southeast Asia innovation systems: comparing OEM- and TNC-led growth in electronics, in L Kim & RR Nelson (eds), Technology, Learning, & Innovation – Experiences of Newly Industrializing Economies, Cambridge University Press, Cambridge, 129-69.

Hofer, H.; Pichelmann, K.; Schuh, A-U. (2001), Price and Quantity Adjustments in the Austrian Labour Market, Applied Economics, 33(5), 2001, pp. 581-92.

Hofer, R., Nones, B., Jantscher, E., Polt, W., Wiedenhofer, H. (2007), Europäischer Benchmark der Entwicklungstrends außeruniversitärer Forschungsinstitutionen. Final Report. Study commissioned by the state of Styria. Vienna.

Hollanders, H., (2007), Innovation modes. Evidence on the sector level. Europe Innova Sectoral Innovation Watch deliverable WP4. European Commission, Brussels.

Hollanders, H., A. van Cruysen (2008), Rethinking the European Innovation Scoreboard: A New Methodology for 2008-2010; MERIT. http://www.proinno-europe.eu/page/eis-2008-thematic-papers

Hölzl, W. (2008), Is the R&D Behaviour of Fast Growing SMEs Different? Evidence from CIS III Data for 16 Countries, WIFO Working Papers, 327/2008, Small Buisness Economics, forthcoming. Hölzl, W., Friesenbichler, K., "Final Sector Report Gazelles", In E. Innova (ed.), Sector Reports, Vienna, WIFO, 2008.

Hölzl, W., Peneder, M. and Silva-Porto M. (2008), The economics of entrepreneurial activity and SMEs: policy implications for the EU, Background Report, Competitiveness Report 2008.

Hoti, S., AcAleer, M., Slottje D. (2006), Intellectual Property Litigation in the USA, Journal of Economic Surveys, 20, 2006, pp. 715-729.

http://ec.europa.eu/biotechnology/docs/com_2007_175_de.pdf

Hunt, J.; Gauthier-Loiselle, M. (2008), How Much Does Immigration Boost Innovation?, National Bureau of Economic Research, NBER Working Papers: 14312, 2008.

Hyytinen, K., Loikkanen, T., Konttinen, J., Nieminen, M. (2009), The role of public research organisations in the change of the national innovation system in Finland. (http://www.minedu.fi/export/sites/default/OPM/Tiede/setu/liitteet/Setu_6-2009.pdf)

Idea Consult (2010), Study on Mobility patterns and career paths Industry Researchers (Final version), manuscript, Brussels, 2010.

Jaffe, A.B. (1989), Real Effects of Academic Research, The American Economic Review, 1989, 79(5.), pp. 957-970.

Janger J. (2009), Report 1: situation Teilbericht der Systemevaluierung der österreichischen Forschungsförderung und -finanzierung im Auftrag des BMVIT und des BMWFJ.

Janger, J., Leibfritz, W. (2007),Boosting Austria's innovation Performance, OECD Economics Department Working Papers N. 580, 2007.

Janger, J., Pechar, H. (2008), Organisatorische Rahmenbedingungen für die Entstehung und Nachhaltigkeit wissenschaftlicher Qualität an Österreichs Universitäten, Studie im Rahmen des Forschungsdialogs, WIFO-Universität Klagenfurt, Vienna, 2008.

Jörg, L., Endemann, M., Streicher, J., Rammer, A., Hinze, S., Roloff, N., Gaisser, S. (2006), Life Science – Standort Wien im Vergleich, commissioned by MA 27 EU-Strategie und Wirtschaftsentwicklung, Vienna.

Jovanovic, B. (1982), Selection and the Industry Evolution, Econometrica, 1982, 50, pp. 649–670.

Kaiser U., Kongsted H.C., Ronde T. (2008), Labour Mobility and Patenting Activity, Centre for Applied Microeconomics, Kopenhagen, Working Paper 2008-07, 2008.

Ketokivi, M. und Ali-Yrkkö, J. (2009), Unbundling R&D and Manufacturing: Postindustrial Myth or Economic Reality?, Review of Policy Research, 26(1-2), pp. 35-54.

Kirner, E., Kinkel, S:, Jaeger, A. (2009), Innovation paths and the innovation performance of low-technology firms — An empirical analysis of German industry, Research Policy 38(3), pp. 447–458.

Kleine, O., Kinkel, S. und Jäger, A. (2007), Flexibilität durch Technologieeinsatz? Nutzung und Erfolgswirkung flexibilitätsfördernder Technologien, Mitteilungen aus der ISI-Erhebung zur Modernisierung der Produktion No. 44, Karlsruhe.

Kobel, C. (2008), Biowissenschaften, Genomik und Biotechnologie im Dienste der Gesundheit (LSH) 2002-2006, Proviso-Programmbericht, as of August 2008, Vienna.

KOM (2007), Mitteilung der Kommission an den Rat, das Europäische Parlament, den Europäischen Wirtschafts- und Sozialausschuss und den Ausschuss der Regionen zur Halbzeitüberprüfung der Strategie für Biowissenschaften und Biotechnologie, 10.04.2007, Brussels,

Krueger, Dirk, and Krishna B. Kumar. (2004), US-Europe differences in technology-driven growth: quantifying the role of education." Journal of Monetary Economics 51:161-190.

Lang, R. (2009), Grenzenlose Biotech, Austria Innovativ, 5/2009, Vienna.

Leijten, J. (2007), The future of RTOs: a few likely scenarios. In: EU Commission, The Future of Key Research Actors in the European Research Area. Brussels, pp. 119-138. (ftp://ftp.cordis.europa.eu/pub/foresight/docs/thefutureofkeyactors-working-papers_en_09_web.pdf)

Leo, H., Falk, R., Friesenbichler K. S., Hölzl, W. (2006), WIFO White Paper: Mehr Beschäftigung durch Wachstum auf Basis von Innovation und Qualifikation", Teilstudie 1. Teilstudie 8: Forschung und Innovation als Motor des Wachstums. Vienna.

Leonard-Barton, D. (1992), The factory as a learning laboratory, Sloan Management Review, 34(1), pp. 23-38.

Lipsey, R. E. (2002), Home and Host Country Effects of FDI, NBER Working Paper. Cambridge, MA. 9293.

LISA VR (2009), Life Sciences in Wien, Factsheet, October 2009, Vienna.

Loschky, A. (2008), Reviewing the Nomenclature for High- Technology Trade – The Sectoral Approach, presented at the 1st Meeting of the Working Party on International Trade in Gooods and Trade in Service Statistics, OECD, 22-24 September 2008, Paris

Ludwig Boltzmann Gesellschaft (2008), Jahresbericht 2008, Vienna.

Malerba Franco (2004), Sectoral Systems of Innovation. Concepts, Issues and Analyses of Six Major Sectors in Europe, Cambridge – Cambridge University Press

Markusen, J. R. (2002), Multinational Firms and the Theory of International Trade, MIT Press. Cambridge [Mass.] and London.

Markusen, J. R. und Maskus, K. E. (2001), General-Equilibrium Approaches to the Multinational Firm: A Review of Theory and Evidence, NBER Working Paper. 8334.

Mayerhofer, P. (2004), Wien in der internationalen Städtekonkurrenz – Entwicklung und Potentiale in einem veränderten Umfeld, WIFO Monatsberichte 5/2004, pp. 425-438.

Mayerhofer, P. (2007), De-Industrialisierung in Wien(?) Zur abnehmenden Bedeutung der Sachgütererzeugung für das Wiener Beschäftigungssystem: Umfang, Gründe, Wirkungsmechanismen, Vienna: WIFO, http://www.wifo.ac.at/wwa/servlet/wwa.upload.DownloadServlet/bdoc/S_2007_DEINDUSTRIALISIERUNG_33120$.PDF

Mendonça, S. (2009), Brave old world: Accounting for 'high-tech' knowledge in 'low-tech' industries, Research Policy 38(3), pp. 470–482.

Moen, Jarle (2005), Is Mobility of Technical Personnel a Source of R&D Spillovers?, Journal of labour Economics, vol. 23, no. 1, January 2005, pp. 81-114

Nam C. H., Tatum C. B. (1997), Leaders and champions for construction innovation, in: Construction Management Economics 15, 259-270

Neurath, W., Gottmann E. und K. Müller (2010), European Research Council, BMWF-Papier, Stand 19.02.2010, Vienna.

Nokkala, T., Heller-Schuh, B., Paier, M. und Wagner-Luptacik, P. (2008), Internal integration and collaboration in European R&D projects. 1st ICC Conference on Network Modelling and Economic Systems. Lisbon, Portugal.

Nurmi, S. (2004), Plant Size, Age and Growth in Finnish Manufacturing, Finnish Economic Papers 2004, 17, pp. 3-17.

O'Mahony, M., Michela V., R&D (2009), knowledge spillovers and company productivity performance, Research Policy, 2009, 1, S.35-44.

OECD (2005a), Measuring Globalisation – OECD Handbook of Economic Globalisation Indicators, Paris: OECD

OECD (2005b), OECD Science, Technology and Industry Scoreboard 2005, Paris: OECD

OECD (2007a), PISA 2006. Science competence for tomorrows world, Paris: OECD, Vol. 1 Analysis; Vol. 2. Data.

OECD (2007b), Education at a Glance 2007, Paris: OECD

OECD (2007b), Education at a Glance 2007, Paris: OECD

OECD (2005b), OECD Science, Technology and Industry Scoreboard 2005, Paris: OECD

OECD (2009), Science, Technology and Industry Scoreboard 2009. Paris: OECD

OECD (2009a), Working Party on Research Institutions and Human Resources: Analysing the transformation of public research institutions. DSTI/STP/RIHR(2009)5, 30 April 2009

OECD (2009b), Working Party on Research Institutes and Human Resources, Country context note on public research organisations: Austria. January 2009.

OECD Biotechnology Statistics (2009), http://www.oecd.org/dataoecd/4/23/42833898.pdf

OECD Science, Technology and Industry Scoreboard (2009), http://www.oecdilibrary.org/oecd/sites/sti_scoreboard-2009-en/02/08/index.html?contentType=/ns/Chapter,/ns/StatisticalPublication&itemId=/content/serial/20725345

Österreichische Akademie der Wissenschaften (Austrian Academy of Sciences)(2007), Tätigkeitsbericht 2006-2007, Vienna.

Österreichische Akademie der Wissenschaften (Austrian Academy of Sciences)(2009), Wissen – eine Bilanz 2008, Vienna.

Paier, M. und Roediger-Schluga, T. (2006), Cooperation with Austrian enterprises and research organisations. In Gesellschaft zur Förderung der Forschung (Ed.), Research and Development in South Eastern Europe. Vienna, Graz, 117-163.

Paschen, H., Coenen, C., Fleischer, T., Grünwald, R., Oertel, D., Revermann, C. (2004), Nanotechnologie: Forschung, Entwicklung, Anwendung, .Berlin: Springer.

Peneder, M. (2007), Entrepreneurship and technological innovation. An integrated taxonomy of firms and sectors. Europe Innova Sectoral Innovation Watch deliverable WP4. European Commission, Brussels.

Peneder, M. (2008), Was bleibt vom Österreich-Paradoxon? Wachstum und Strukturwandel in der Wissensökonomie,Studie des WIFO im Auftrag des Bundesministeriums für Wissenschaft und Forschung im Rahmen des Österreichischen Forschungsdialogs, Vienna, 2008.

Peneder, M., Falk, M., Hölzl, W., Kaniovski, S., Kratena, K. (2006), WIFO-White Paper: Mehr Beschäftigung durch Wachstum auf Basis von Innovation und Qualifikation", Teilstudie 1. Teilstudie 3: Wachstum, Strukturwandel und Produktivität. Disaggregierte Wachstumsbeiträge für Österreich von 1990 bis 2004, WIFO, Vienna, 2006, pp. 1-40.

Pfaffermayr, M. (2004), Export orientation, foreign affiliates, and the growth of Austrian manufacturing firms, Journal of Economic Behaviour & Organization, 54, pp. 411–423.

Pichler, R., Stampfer, M., Hofer, R. (2007), Forschung, Geld und Politik. Innsbruck,

Pisano, G. (1996), Learning-before-doing in the development of new process technology, Research Policy, 25(7), pp. 1097-1119.

Polt, W., Berger, M., Boekholt, P., Cremers, K., Egeln, J., Gassler, H., Hofer, R., Rammer, C. (2009), Das deutsche Forschungs- und Innovationssystem – Ein internationaler Systemvergleich zur Rolle von Wissenschaft, Interaktionen und Governance für die technologische Leistungsfähigkeit – Study commissioned by the Commission of Experts on Research and Innovation

Reinstaller A., Unterlass F., Prean J. (2008), Gibt es ein europäisches Paradoxon in Österreich? Die Beziehung zwischen Wissenschaft und ihrer industriellen Nutzung, Study as part of the Research Dialogue, WIFO, Vienna, 2008c.

RFT (2005): Strategie für die Entwicklung der Life Sciences in Österreich, Council Recommendation of 8 July 2005, Vienna.

RFT (2009): Strategie 2020, Vienna.

Rietschel, E. T., Arnold, E., Čenys, A., Dearing, A., Feller, I., Joussaume, S., Kaloudis, A., Lange, L., Langer, J., Ley, V., Mustonen, R., Pooley, D. and Stame, N. (2009), Evaluation of the Sixth Framework Programmes for Research and Technological Development 2002-2006. Report of the Expert Group. February 2009.

Robertson, P. L., Patel, P. R. (2007), New wine in old bottles: Technological diffusion in developed economies, Research Policy, 36(5), pp. 708-721.

Roediger-Schluga T und Barber M (2006), The structure of R&D collaboration networks in the European Framework Programmes, Unu-MERIT working paper series 2006-36, Maastricht

Romer, P. M. (2000), Should the government subsidize supply or demand in the market for scientists and engineers?, NBER working paper no. 7723, 2000.

Rouvinen P. (2002), R&D-Productivity Dynamics: Causality, Lags, and "Dry Holes", Journal of Applied Economics, 2002, 0, pp. 123-156.

SA, 2010, Statistisches Jahrbuch 2010, Statistik Austria. Vienna.

Sarshar M., Amaratunga D. (2004), Improving project processes. Best practice case study, in: Construction Innovation 4, 69-82

Saxenian, AnnaLee, (2000), Inside-Out: Regional Networks and Industrial Adaptation in Silicon Valley and Route 128, Systems of innovation: Growth, competitiveness and employment. 1, 2000, pp.201-220.

Scherngell, T. and Barber, M. (2009), Spatial interaction modelling of cross-region R&D collaborations: empirical evidence from the 5th EU Framework Programme. Papers in Regional Science, 88(3), 531-547.

Schibany, A., G. Streicher (2008), The European Innovation Scoreboard: drowning by numbers?; Science and Public Policy, 35(10), 717-732.

Schibany, A., G. Streicher (2007), The European Innovation Scoreboard: Vom Nutzen und Nachteil indikatorgeleiteter Länderrankings; InTeReg Research Report Nr. 65-2007, Joanneum Research.

Schibany, A., Gassler, H., Streicher, G. (2007a), High tech or not tech – Vom fehlenden Strukturwandel und anderen Sorgen, InTeReg Working Paper No. 35-2007, Vienna: Joanneum Research, http://www.joanneum.at/uploads/tx_publicationlibrary/WP35_High_Tech_WP.pdf

Schibany, A., Jörg, L., Nones, B. and H. Gassler (2006), Zwischenevaluierung der aws-Technologieprogramme, Final report, commissioned by the Federal Ministry of Economics and Labour, Vienna.

Schiefer, A. (2009), Forschung und experimentelle Entwicklung (F&E) im Unternehmenssektor 2007, Teil 1, 2; Statistische Nachrichten 11/12 2009.

Schreiner, C. (2007a), ‚Mathematik-Kompetenz im internationalen Vergleich, in: PISA 2006. Internationaler Vergleich von SchülerInnenleistungen. Erste Ergebnisse, Graz: Leykam 2007, pp. 48-55.

Schreiner, C. (2007), PISA 2006, Internationaler Vergleich von SchülerInnenleistungen. Erste Ergebnisse, Graz: Leykam 2007.

Schreiner, C. (2007b), Zusammenfassung, in: PISA 2006. Internationaler Vergleich von SchülerInnenleistungen. Erste Ergebnisse, Graz: Leykam 2007, pp. 68-71.

Schwarz, E.J., Ehrmann, Th., Breitenecker, R.J. (2005), Erfolgsdeterminanten junger Unternehmen in Österreich: eine empirische Untersuchung zum Beschäftigungswachstum. In: ZfB – Zeitschrift für Betriebswirtschaft, (2005), 75 (11), pp. 1077-1098. Storey, D. J., Understanding the Small Business Sector, London, New York, 1994.

Sexton Martin, Barret Peter (2006), Innovation in Small, Project-Based Construction Firms, in: British Journal of Management 17, 331-346

Sexton Martin, Barrett Peter (2003a), A literature synthesis of innovation in small construction firms. Insights, ambiguities and questions, in: Construction Management and Economics 21, 613-622

Sexton Martin, Barret Peter (2006), Innovation in Small, Project-Based Construction Firms, in: Construction Management and Economics 21, 623-633

Song L, Almeida P., Wu, G. (2003), Learning-by-Hiring: When is mobility more likely to facilitate inter-firm knowledge transfer, Management Science, 49, 2003, pp. 351-365.

Sörlin, S., Arnold, E., Andersen, B., Honoré, J., Jørnø, P., Leppävuori E., Storvik, K. (2009), A Step Beyond: International Evaluation of the GTS Institute System in Denmark. (http://bedreinnovation.dk/_publikationer/AStepBeyond_web_1.pdf)

Statisitk Austria (2008), Innovation 2004-2006, Vienna

Statistik Austria (2009), Volkswirtschaftliche Gesamtrechnungen – Bruttoinlandsprodukt nach Wirtschaftsbereichen.

Stimpson, A. (2000), Preliminary results from HRWT Mobility analysis, Manuscript, 2000.

Sturges J. L., Egbu C., Bates B. (1999), Innovation in Construction Management 17, 331-346

Tatum C. B., Vorster Michael, Klingler Mac (2006), Innovations in Earthmoving Equipment. New Forms and Their Evolution, in: Journal of Construction Engineering and Management 132/9, 987-997

Unterlass Fabian (2009), Innovation und Nachhaltigkeit im Bausektor – Welche Faktoren beeinflussen Unternehmen, neue Produkte und/oder Prozesse einzuführen? Study as part of the research programme line "Haus der Zukunft" of the Research Promotion Agency (FFG).

Vilke-Freiberga, V., Sainsbury, L., Mény, Y., Schioppa, F.K.P., Röller, L.-H. and E. Zerhouni (2009), Towards a world class Frontier Research Organisation, Review of the European Research Council's Structures and Mechanisms, 23 July 2009.

Von Hippel, E. und Tyre, M. J. (1995), How learning by doing is done: problem identification in novel process equipment, Research Policy, 24(1), pp. 1-14.

von Tunzelmann, N., Acha, V. (2005), Innovation in "low-tech" Industries, In: Fagerberg, J., Mowery, D.C., Nelson, R.R. (eds.) The Oxford Handbook of Innovation, Oxford: Oxford University Press, pp. 407–432.

Watts DJ und Strogatz SH (1998), Collective dynamics of 'small-world' networks, Nature 393, 440-42.

Weselka, D. (2009), Der Forschung eine Basis geben, economy No. 79 p. 11.

Wieser, R. (2005), Research and Development Productivity and Spillovers: Empirical Evidence at the Firm Level, Journal of Economic Surveys, 2005, 19(4), pp. 587–621.

Winch Graham M. (2003), How innovative is construction? Comparing aggregated data on construction innovation and other sectors. A case of apples and pears. Note, in: Construction Management and Economics 21, 651-654

WTO (1994a), Agreement on government procurement, World Trade Organization, Geneva.

WTO (1994a), Agreement on government procurement, World Trade Organization, Geneva.

Yang, C.H., Huang,C.H. (2005), R&D, Size and Firm Growth in Taiwan's Electronics Industry, Small Business Economics, 2005, 25(5), pp.477–487.

Yasuda, T. (2005), Firm growth, size, age and behavior in Japanese manufacturing, Small Business Economics, 2005, 24 (1), pp. 1-15.

Zinöcker, K. (2007), Evaluating Austria's R&D Policies. Some Personal Comments, in: Platform Research and Technology Policy Evaluation und Austrian Council for Research and Technology Development (Hg.): "Evaluation of Austrian Research and Technology Policies – A summary of Austrian Evaluation Studies from 2003 to 2007", Vienna.

Zucker, L., M. Darby, M. Torero (2002), labour Mobility from Academe to Commerce, Journal of labour Economics, 20(3):629-60.

Statistical Annex

1 Financing of gross domestic expenditure on R&D and research rate 2010 (Tables 1 and 1a)[1]

According to the most recent estimates by Statistik Austria, approximately €7.805 billion will be spent in Austria on research and experimental development (R&D) in 2010. Compared to 2009, the total amount of Austrian R&D spending has increased by 3.4 %, reaching 2.76 % of gross domestic product (GDP).

Of the total research spending for 2010, 43.3 % (approx. €3.38 billion), or the largest share of such spending, is being financed by businesses. The public sector is contributing 41.2 % (approx. €3.22 billion total; approx. €2.74 billion from the federal government, approx. €389 million from the refional governments, and approx. €85 million from other public institutions such as local governments, chambers and social insurance carriers). 15 % is being financed by international investors and 0.4 % (approx. €34 million) by the private non-profit sector. The greatest share of financing from abroad (approximately €1.17 billion) originates from European companies affiliated with domestic companies that have chosen Austria as a research site and includes the return flows from the EU Framework Programmes for research, technological development and demonstration.

For comparison, the gross domestic expenditures for R&D are expressed as a percentage of gross domestic product ("research intensity"). For Austria, this indicator has risen from 1.10 % in 1981 to 2.76 % in 2010 and has clearly exceeded the EU average in recent years. The most current pan-European comparison data are available for 2008, showing an average for the European Union (EU-27) of 1.90 % and 2.68 % for Austria.

The final results of Statistik Austria's survey on research and experimental development for 2007, as well as recent economic data, were considered in the estimate of Austrian gross domestic expenditure for R&D.

R&D financing from the corporate sector in 2010 will remain at this level after a decline in 2009; at €3.38 billion, it will only slightly exceed the survey results from 2007 (€3.34 billion).

As the greatest share of R&D financing from abroad originates from European companies affiliated with domestic companies, the economic forecasts suggest that a far more severe decline is likely. After a 5.4 % decline in R&D funds in 2009, current data suggests that another decrease – however slight – should be expected. Research funds from abroad, which are projected to be €1.17 billion for 2010, are 0.6 % under 2009 and 4.5 % under the result from the reporting year 2007.

Based on information available to Statistik Austria concerning the development of R&D-relevant budget components and additional R&D funding – in particular refunds by the federal government to companies in connection with the research premium, the financing of research by the federal government in 2010 will continue to climb, up to €2.74 billion. From 2007 to 2010, public research financing from the federal government has grown annually at a rate of 12.7 %, with 2010 expenditures increasing at 10.9 % over 2009.

1 On the basis of the results of the R&D statistical surveys and other currently available documents and information, in particular the R&D related estimates and yearend closing data of the national government and the states, Statistik Austria annually creates the "Total estimate of the Austrian Gross Domestic Expenditures for R&D." Under this annual creation 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).

2. Federal R&D spending in 2010

2.1. The federal expenditure shown in Table 1 for R&D carried out in Austria in 2010 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 of the Auxiliary Document for the Federal Finances Act 2010. The estimate also includes the funds from the National Foundation for Research, Technology, and Development available for 2010 as well as the estimates of the payout for research premiums expected for 2010 which are based on the information available in mid-April 2010 (Source: Federal Minister of Finance).

2.2. In addition to its expenditures for R&D in Austria, in 2010 the federal government will pay **contributions to international organisations** aimed at research and the promotion of research amounting to €71.4 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's expenditures for research, as presented in **Part a and Part b of the Annex T** of the Auxiliary Document for the Federal Finances Act, (see Table 3), which include the expenditures for contributions to international organisations, (see 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 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 the states. In contrast to the domestic model these budgets include research-oriented contributions to international organisations and form the basis for the classification of R&D budget data (in a classification required by the EU and OECD for reporting) according to socio-economic goals.

In 2010 the following socio-economic goals will receive the largest portions of federal spending for research and research funding:

- General knowledge advancement: 30.4 %
- Promotion of trade, commerce, and industry: 26.0 %
- Promotion of health care: 21.6 %
- Promotion of social and socio-economic development: 4.6 %
- Promotion of research on the earth, seas, atmosphere, and space 4.5 %
- Promotion of environmental protection: 3.6 %
- Promotion of agriculture and forestry: 2.9 %

3. R&D expenditures by the Austrian states

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

4. An international comparison of 2007 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 2009-2).

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

List of Tables

Table 1: Global estimate for 2010: Gross domestic expenditure on R&D financing of research and experimental development carried out in Austria in 1993–2010

Financing	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
1. Gross domestic expenditure on R&D (in € million)	2,303.31	2,550.73	2,701.68	2,885.55	3,123.21	3,399.83	3,761.80	4,028.67	4,393.09	4,684.31	5,041.98	**5,249.55**	**6,029.81**	**6,318.59**	**6,867.82**	**7,557.00**	**7,546.15**	**7,805.13**
of which financed by:																		
Federal government [1]	957.12	1,075.14	1,092.28	1,066.46	1,077.59	1,097.51	1,200.82	1,225.42	1,350.70	1,362.37	1,394.86	1,462.02	1,764.86	1,772.06	1,916.96	2,356.78	2,472.71	2,741.32
State governments [2]	129.67	158.69	153.89	159.06	167.35	142.41	206.23	248.50	280.14	171.26	291.62	207.88	330.17	219.98	263.18	354.35	397.62	389.33
Corporate sector [3]	1,128.40	1,179.42	1,233.50	1,290.76	1,352.59	1,418.43	1,545.25	1,684.42	1,834.87	2,090.62	2,274.95	2,475.55	2,750.95	3,057.00	3,344.40	3,481.31	3,377.92	3,381.23
Abroad [4]	59.69	106.52	190.10	337.00	478.21	684.63	738.91	800.10	863.30	1,001.97	1,009.26	1,016.61	1,087.51	1,163.35	1,230.24	1,248.72	1,181.15	1,174.31
Other [5]	28.42	30.96	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	115.84	116.75	118.94
2. Nominal GDP [6] (in € billion)	159.16	167.01	174.61	180.15	183.48	190.85	197.98	207.53	**212.50**	**218.85**	**223.30**	**232.78**	**243.58**	**256.16**	**270.78**	**281.87**	**276.89**	**282.42**
3. Gross domestic expenditure on R&D as a% of GDP	1.45	1.53	1.55	1.60	1.70	1.78	1.90	1.94	2.07	2.14	2.26	2.26	2.48	2.47	2.54	2.68	2.73	2.76

Status: 16 April 2010
Source: STATISTIK AUSTRIA (Bundesanstalt Statistik Österreich)

1) 1993, 1998, 2002, 2004 and 2007: Survey results (federal government including the Austrian Science Fund, the two research promotion funds and in 1993, 1998 and 2002 also including ITF)1994–1997, 1999–2001, 2003 and 2005: Annex T/Part b of the Auxiliary Document for the Federal Finances Act (actual).
2005. Also included (not part of Annex T) were: €84.4 million National Foundation for Research, Technology and Development and €121.3 million research premiums paid out under Federal Law Gazette II no. 506/2002.
2008: Annex T/Part b of the Auxiliary Document for the Federal Finances Act 2010(actual). Also included (not part of Annex T) were: €91.0 million National Foundation for Research, Technology and Development and €340.6 million research premiums paid out.
2009: Preliminary draft of Annex T/Part b based on preliminary result 2009 (Federal Minister of Finance, as per April 2010). Also included (not part of Annex T) were: €67.5 million National Foundation for Research, Technology and Development and €337.8 million research premiums paid out.
2010: Annex T/Part b of the Auxiliary Document for the Federal Finances Act 2010(budget). Also included (not part of Annex T) were: €62.0 million National Foundation for Research, Technology and Development, as well as €338.0 million for research premiums expected to be paid out based on information currently available (source: Federal Minister of Finance).
2) 1993, 1998, 2002, 2004 and 2007: survey results. 1994–1997, 1999–2001, 2003, 2005 and 2008–2010: based on the estimates of R&D expenditure reported by the state government offices.
3) Financing by business. 1993, 1998, 2002, 2004, 2006 and 2007: survey results. 1994–1997, 1999–2001, 2003, 2005 and 2008–2010: Estimates by Statistik Austria on the basis of results of the R&D surveys conducted by Statistik Austria in all economic sectors and, until 1993, by the Austrian Chamber of Commerce in the industrial sector.
4) 1993, 1998, 2002, 2004 and 2007: survey results. 1994–1997, 1999–2001, 2003, 2005 and 2008–2010: estimates made by Statistik Austria. From 1995 including returns from the EU Framework Programmes for Research, Technological Development and Demonstration.
5) Financing by local governments (excluding Vienna), chambers, social insurance institutions and other public financing and from the private non-profit sector. 1993, 1998, 2002, 2004, 2006 and 2007: survey results. 1994–1997, 1999–2001, 2003, 2005 and 2008–2010: estimates made by Statistik Austria.
6) 1993–2009 Statistik Austria. 2010: Austrian Institute of Economic Research (WIFO), economic forecast March 2010.

Table 2: Global estimate for 2010: Gross domestic expenditure on R&D financing of research and experimental development carried out in Austria in 1993–2010 (in percent of GDP)

Financing	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
1. Gross domestic expenditure on R&D (as a% of GDP)	1.45	1.53	1.55	1.60	1.70	1.78	1.90	1.94	2.07	2.14	2.26	2.26	2.48	2.47	2.54	2.68	2.73	**2.76**
of which financed by:																		
Federal government [1]	0.60	0.64	0.63	0.59	0.59	0.58	0.61	0.59	0.64	0.62	0.62	0.63	0.72	0.69	0.71	0.84	0.89	0.97
State governments [2]	0.08	0.10	0.09	0.09	0.09	0.07	0.10	0.12	0.13	0.08	0.13	0.09	0.14	0.09	0.10	0.13	0.14	0.14
Corporate sector [3]	0.71	0.71	0.71	0.72	0.74	0.74	0.78	0.81	0.86	0.96	1.02	1.06	1.13	1.19	1.24	1.24	1.22	1.20
Abroad [4]	0.04	0.06	0.11	0.19	0.26	0.36	0.37	0.39	0.41	0.46	0.45	0.44	0.45	0.45	0.45	0.44	0.43	0.42
Other [5]	0.02	0.02	0.02	0.02	0.03	0.03	0.04	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.04
2. Nominal GDP [6] (in € billion)	159.16	167.01	174.61	180.15	183.48	190.85	197.98	207.53	212.50	218.85	223.30	232.78	243.58	256.16	270.78	281.87	276.89	**282.42**

Status: 16 April 2010
Source: STATISTIK AUSTRIA (Bundesanstalt Statistik Österreich)

Footnotes cf. Table 1.

Table 3

Annex T

of the Auxiliary Document for the Federal Finances Act of 2010

Federal expenditure on research from 2008 to 2010 by ministry

The following overviews for 2008–2010 are divided into two sections:

1. Contributions from federal funds paid to international organisations aimed at research and the promotion of research (Part a)

2 Other federal expenditure on research and research promotion (Part b, federal research budget)

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

Research-effective shares of federal expenditure are thus to be found not only in the expenditure on Item 12 "research and science", but also in other items.

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

Statistik Austria (Bundesanstalt Statistik Österreich)

Beilage T

B U N D E S V O R A N S C H L A G   2 0 1 0
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.	VA-Post Ugl	Bereich-Ausgaben Bezeichnung	Anm.	Bundesvoranschlag 2010 Insgesamt	hievon %	hievon Forschung	Bundesvoranschlag 2009 Insgesamt	hievon %	hievon Forschung	Erfolg 2008 Insgesamt	hievon %	hievon Forschung
				Bundeskanzleramt:										
1/10007	43	7800	001	Mitgliedsbeitrag für OECD		3,150	20	0,630	3,100	20	0,620	2,902	20	0,580
		7800	003	OECD-Energieagentur (Mitgliedsbeitrag)		0,230	20	0,046	0,230	20	0,046	0,232	20	0,046
1/10008	43	7800	009	OECD-Beiträge zu Sonderprojekten		0,020	20	0,004	0,020	20	0,004	0,026	20	0,005
				Summe Bereich 10...		3,400		0,680	3,350		0,670	3,160		0,631
				BM für europäische und internationale Angelegenheiten:										
1/12036	43	7801		Institut der VN für Ausbildung und Forschung (UNITAR)		0,030	40	0,012	0,030	40	0,012	0,020	40	0,008
		7831		Beitrag zum Budget des EUREKA-Sekretariates		0,001	52	0,001	0,001	52	0,001	....	...	....
		7841		Drogenkontrollprogramm der VN (UNDCP)		0,550	20	0,110	0,550	20	0,110	0,350	20	0,070
1/12037	43	7260		Internationale Atomenergie-Organisation (IAEO)		3,000	35	1,050	3,000	35	1,050	2,736	35	0,958
		7801		Organisation der VN für industr.Entwicklung (UNIDO)		0,940	46	0,432	0,940	46	0,432	....	...	....
		7802		Organisation d.VN f.Erziehung,Wissenschaft u.Kultur (UNESCO)		1,000	30	0,300	1,000	30	0,300	3,340	30	1,002
				Summe Bereich 12...		5,521		1,905	5,521		1,905	6,446		2,038
				BM für Arbeit, Soziales und Konsumentenschutz:										
1/21008	43	7802		Europarat - Teilabkommen		0,001	20	0,000	0,001	20	0,000	....	...	....
				BM für Gesundheit:										
1/24007	43	7802		Weltgesundheitsorganisation		3,698	30	1,109	3,698	30	1,109	2,809	30	0,843
		7807		Europ. Maul- u. Klauenseuchenkommission		0,010	50	0,005	0,010	50	0,005	0,009	50	0,005
		7808		Internat.Tierseuchenamt		0,108	50	0,054	0,108	50	0,054	0,109	50	0,055
1/24008	43	7802		Europarat Teilabkommen		0,165	20	0,033	0,165	20	0,033	0,034	20	0,007
				Summe Bereich 24...		3,981		1,201	3,981		1,201	2,961		0,910
				BM für Unterricht, Kunst und Kultur:										
1/30008	11	7800	001	OECD-Schulbauprogramm		0,028	100	0,028	0,027	100	0,027	0,028	100	0,028
				BM für Wissenschaft und Forschung:										
1/31117	12	7271		Verpflichtungen aus internationalen Abkommen		0,092	50	0,046	0,092	50	0,046	0,007	50	0,004
	43	7801		Beiträge für internationale Organisationen		0,700	50	0,350	0,700	50	0,350	0,673	50	0,337
1/31118	12	7271		Verpflichtungen aus internationalen Abkommen		0,564	50	0,282	0,564	50	0,282	0,597	50	0,299
		7800		OECD-CERI-Mitgliedsbeitrag		0,001	100	0,001	0,001	100	0,001	....	...	....
1/31178	43	7263		Mitgliedsbeiträge		0,648	100	0,648	0,648	100	0,648	0,648	100	0,648
1/31187	12	7805		ESO		4,900	100	4,900	4,777	100	4,777	....	...	....
	43	7801		Beitrag für die CERN		16,893	100	16,893	16,724	100	16,724	14,616	100	14,616
		7802		Molekularbiologie - Europäische Zusammenarbeit		2,100	100	2,100	2,100	100	2,100	2,081	100	2,081
		7803		World Meteorological Organisation		0,400	50	0,200	0,400	50	0,200	0,340	50	0,170
		7804		Europäisches Zentrum für mittelfristige Wettervorhersage		1,000	100	1,000	1,000	100	1,000	0,863	100	0,863
1/31188	12	7803		Beiträge für interationale Organisationen		0,800	50	0,400	0,800	50	0,400	0,664	50	0,332
	43	7281		Internationale Forschungskooperation		0,000	100	0,000	0,000	100	0,000	0,000	100	0,000
				Summe Bereich 31...		28,098		26,820	27,806		26,528	20,489		19,350
				BM für Wirtschaft, Jugend und Familie:										
1/40007	43	7810		Internationales Büro für Maße und Gewichte (BIPM)	*	0,123	80	0,098	0,123	80	0,098	0,123	80	0,098
				Internationale Organisation f.d. gesetzliche Meßwesen (OIML)	*	0,013	80	0,010	0,013	80	0,010	0,013	80	0,010
				Internationales Institut für Kältetechnik (IIF)	*	0,008	80	0,006	0,008	80	0,006	0,008	80	0,006

Beilage T

B U N D E S V O R A N S C H L A G   2 0 1 0
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 2010 Insgesamt	hievon %	hievon Forschung	Bundesvoranschlag 2009 Insgesamt	hievon %	hievon Forschung	Erfolg 2008 Insgesamt	hievon %	hievon Forschung
				(Fortsetzung)										
1/40007	43	7810		Internationale Union für Geodäsie und Geophysik (UGGI)	*	0,004	80	0,003	0,004	80	0,003	0,004	80	0,003
		7801		*Beitrag zur internationalen Arbeitsorganisation*		....	...	....	....	...	....	2,116	8	0,169
				Summe Bereich 40...		0,148		0,117	0,148		0,117	2,264		0,286
				BM für Verkehr, Innovation und Technologie:										
1/34337	*12*	*7800*		*ESA - Beitrag*		....	...	....	....	...	....	14,933	100	14,933
	43	*7801*		*EUMETSAT*		....	...	....	....	...	....	2,877	100	2,877
		7802		*OECD-Energieagentur*		....	...	....	....	...	....	0,065	100	0,065
1/34338	12	7801		Beiträge für internat. Organisationen		0,060	100	0,060	0,060	100	0,060	0,083	50	0,042
	43	7800		OECD-Energieagentur (Beitrag zu den Projektkosten)		0,050	100	0,050	0,050	100	0,050	0,002	100	0,002
1/34377	12	7800		ESA - Beitrag		15,969	100	15,969	15,569	100	15,569	....	...	....
	43	7801		EUMETSAT		0,001	100	0,001	0,001	100	0,001	....	...	....
		7802		OECD-Energieagentur		0,060	100	0,060	0,060	100	0,060	....	...	....
1/34378	12	7802		ESA-ARIANE V		0,571	100	0,571	0,571	100	0,571	0,659	100	0,659
		7803		ESA-DRTMArtemis		0,076	100	0,076	0,076	100	0,076	....	...	....
		7806		ESA-EOPP		0,165	100	0,165	0,165	100	0,165	....	...	....
		7807		ESA-ENVISAT		0,750	100	0,750	0,750	100	0,750	....	...	....
		7808		ESA-METOP		0,001	100	0,001	0,001	100	0,001	....	...	....
		7809		ESA-GSTP		2,000	100	2,000	2,000	100	2,000	2,500	100	2,500
		7810		ESA-FESTIP		0,001	100	0,001	0,001	100	0,001	....	...	....
		7811		ESA-MSG		0,075	100	0,075	0,075	100	0,075	....	...	....
		7812		ESA-ARTES		1,201	100	1,201	1,201	100	1,201	4,203	100	4,203
		7813		ESA-EOEP		3,582	100	3,582	3,582	100	3,582	3,107	100	3,107
		7815		Neue ESA-Programme		1,542	100	1,542	1,942	100	1,942	3,044	100	3,044
		7816		ESA-AURORA		1,000	100	1,000	1,000	100	1,000	0,733	100	0,733
		7817		ESA-ELIPS		0,300	100	0,300	0,300	100	0,300	0,495	100	0,495
		7818		ESA-Earth Watch GMES		1,169	100	1,169	1,169	100	1,169	1,053	100	1,053
		7819		ESA-GalileoSat		6,000	100	6,000	6,000	100	6,000	2,774	100	2,774
		7840		EUMETSAT		4,067	100	4,067	4,067	100	4,067	....	...	....
				Summe UG 34...		38,640		38,640	38,640		38,640	36,528		36,487
1/41007	43	7800		Europäische Konferenz der Verkehrsminister (CEMT)	*	0,084	6	0,005	0,084	6	0,005	0,082	6	0,005
				Internationale Zivilluftfahrtorganisation (ICAO)	*	0,426	20	0,085	0,379	20	0,076	0,426	20	0,085
				Europäische Zivilluftfahrtskonferenz (ECAC)	*	0,038	10	0,004	0,038	10	0,004	0,035	10	0,004
1/41008	43	7800		Institution für den Lufttransport (ITA)	*	0,001	40	0,000	0,001	40	0,000	0,000	40	0,000
				Ständige Internat. Vereinigung f.Schiffahrtskongresse(AIPCN)	*	0,002	50	0,001	0,002	50	0,001	0,000	50	0,000
1/41027	43	7800		Beiträge an internationale Organisationen (UIT)	*	0,391	20	0,078	0,391	20	0,078	0,152	20	0,030
1/41248	33	7800		Beiträge an internationale Organisationen		0,025	100	0,025	0,025	100	0,025	0,015	100	0,015
				Summe UG 41...		0,967		0,198	0,920		0,189	0,710		0,139
				Summe Bereich 41...		39,607		38,838	39,560		38,829	37,238		36,626
				BM für Land- u.Forstwirtschaft,Umwelt u.Wasserwirtschaft:										
1/42007	43	7801		FAO-Beiträge		3,130	50	1,565	3,100	50	1,550	2,981	50	1,491
1/42008	43	7800		Internationales Weinamt	*	0,028	50	0,014	0,028	50	0,014	0,028	50	0,014
				Europäische Vereinigung für Tierproduktion	*	0,011	50	0,006	0,011	50	0,006	0,013	50	0,007
				Europäische Pflanzenschutzorganisation	*	0,020	50	0,010	0,020	50	0,010	0,020	50	0,010
				Internationale Kommission für Be- und Entwässerungen	*	0,002	50	0,001	0,002	50	0,001	0,002	50	0,001
				Summe UG 42...		3,191		1,596	3,161		1,581	3,044		1,523
1/43007	43	7817		ECE-EMEP-Konvention/Grenzüberschreitende Luftverunreinigung		0,051	100	0,051	0,051	100	0,051	0,031	100	0,031
1/43106	21	7810		Umweltfonds der Vereinten Nationen		0,523	30	0,157	0,523	30	0,157	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

Beilage T

B U N D E S V O R A N S C H L A G   2 0 1 0
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.	VA-Post Ugl	Bereich-Ausgaben Bezeichnung	Anm.	Bundesvoranschlag 2010 Insgesamt	hievon %	hievon Forschung	Bundesvoranschlag 2009 Insgesamt	hievon %	hievon Forschung	Erfolg 2008 Insgesamt	hievon %	hievon Forschung
				(Fortsetzung)										
1/43108	21	7800		Wetlands Interntional		0,022	50	0,011	0,022	50	0,011	....	...	....
				Summe UG 43...		0,617		0,230	0,617		0,230	0,452		0,162
				Summe Bereich 42...		3,808		1,826	3,778		1,811	3,496		1,685
				Summe Abschnitt a)...		**84,592**		**71,415**	**84,172**		**71,088**	**76,082**		**61,554**

Beilage T

B U N D E S V O R A N S C H L A G   2 0 1 0
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 2010 Insgesamt	hievon %	hievon Forschung	Bundesvoranschlag 2009 Insgesamt	hievon %	hievon Forschung	Erfolg 2008 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	....	...	....
				Bundeskanzleramt:										
1/10008	43	7280	300	Werkverträge, Veranstaltungen, Veröffentl. - Raumplanung		0,850	15	0,128	0,650	15	0,098	0,256	15	0,038
		7285		Raumordnungskonferenz		0,450	50	0,225	0,450	50	0,225	0,443	50	0,222
1/101				*Dienststellen ....*		....	...	....	....	...	....	11,343	1	0,113
1/1010				Staatsarchiv und Archivamt		7,098	5	0,355	7,106	5	0,355	7,032	1	0,070
1/102				Bundesstatistik		50,393	1	0,504	50,393	1	0,504	57,651	1	0,577
				Summe Bereich 10...		58,791		1,212	58,599		1,182	76,725		1,020
				BM für Inneres:										
1/1172	42			Bundeskriminalamt	*	8,504	8	0,680	8,534	8	0,683	8,667	8	0,693
				BM für Justiz:										
1/13006	12	7667		Institut für Rechts- und Kriminalsoziologie		0,130	100	0,130	0,130	100	0,130	0,103	100	0,103
				BM für Landesverteidigung und Sport:										
1/14108	41	4691		Versuche und Erprobungen auf kriegstechnischen Gebiet		0,250	10	0,025	0,679	10	0,068	0,497	10	0,050
1/144	12			Heeresgeschichtl. Museum, Militärhistorisches Institut		5,782	41	2,371	5,463	41	2,240	4,177	41	1,713
	22			*Heeresgeschichtl. Museum, Militärhistorisches Institut ....*		....	...	....	....	...	....	0,003	41	0,001
				Summe Bereich 14...		6,032		2,396	6,142		2,308	4,677		1,764
				BM für Finanzen:										
1/15008	43	6441		Arbeiten des Wifo		3,630	50	1,815	3,490	50	1,745	3,389	50	1,695
		6443		Arbeiten des WIIW		0,928	50	0,464	0,893	50	0,447	0,867	50	0,434
		6444		Arbeiten des WSR		1,183	50	0,592	1,137	50	0,569	1,102	50	0,551
1/15296	43	7661		Institut für Finanzwissenschaft und Steuerrecht .		0,011	50	0,006	0,011	50	0,006	0,011	50	0,006
		7662		Institut für höhere Studien und wiss. Forschung .		1,189	50	0,595	1,143	50	0,572	1,110	50	0,555
		7663		Forum Alpbach		0,049	50	0,025	0,047	50	0,024	0,044	50	0,022
				Summe UG 15...		6,990		3,497	6,721		3,363	6,523		3,263
1/.....				Forschungswirksamer Lohnnebenkostenanteil	*	29,534	100	29,534	29,735	100	29,735	29,697	100	29,697
				Summe Bereich 15...		36,524		33,031	36,456		33,098	36,220		32,960
				BM für Arbeit, Soziales und Konsumentenschutz:										
1/20118	12			Arbeitsmarktpolitische Maßnahmen gemäß AMFG und AMSG		0,250	100	0,250	0,250	100	0,250	0,205	100	0,205
1/21006	12	7669	900	Subventionen an private Institutionen/Forschung .		0,001	100	0,001	0,001	100	0,001	0,030	100	0,030
1/21008	12	4035	900	Handelswaren zur unentgeltlichen Abgabe/F		0,001	100	0,001	0,001	100	0,001	....	...	....
		7271	900	Entgelte f. sonst. Leistungen an Einzelpers./F ..		0,001	100	0,001	0,001	100	0,001	....	...	....
		7276		Entgelte f. sonst. Leist. v. Einzelpers./Grundsatzforschung		0,001	100	0,001	0,001	100	0,001	....	...	....
		7281	900	Sonstige Leistungen von Gew.Firm. u. jur.Pers./F		0,001	100	0,001	0,001	100	0,001	....	...	....
		7286		S. Leist. v. Gew., Firm. u. jur. Pers./Grundsatzforschung		1,123	100	1,123	1,091	100	1,091	1,012	100	1,012
	43	7261		Mitgliedsbeitr. an d.Forschungsinst. f. Orthopädie-Technik		0,190	100	0,190	0,184	100	0,184	0,179	100	0,179

Beilage T

B U N D E S V O R A N S C H L A G 2 0 1 0
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 2010 Insgesamt	hievon %	hievon Forschung	Bundesvoranschlag 2009 Insgesamt	hievon %	hievon Forschung	Erfolg 2008 Insgesamt	hievon %	hievon Forschung
				(Fortsetzung)										
1/21008	43	7262		Beitrag a.d. Europ. Zentrum f. Wohlfahrtstpol. u. Sozialfor.		0,619	50	0,310	0,619	50	0,310	0,687	50	0,344
		7280		Sonstige Leistungen v. Gewerbetreib., Firmen u. jur. Pers.		4,951	4	0,198	5,385	4	0,215	4,882	4	0,195
1/21816	43	7660	900	Subventionen an private Institutionen		2,268	2	0,045	2,268	2	0,045	....	...	....
1/21818		7280		Sonstige Leistungen v. Gewerbetreib., Firmen u. jur. Pers.		0,736	16	0,118	0,736	16	0,118	0,696	4	0,028
1/21828		7280		Sonstige Leistungen v. Gewerbetreib., Firmen u. jur. Pers.		0,945	5	0,047	0,945	5	0,047	0,599	9	0,054
				Summe UG 21...		10,837		2,036	11,233		2,015	8,085		1,842
				Summe Bereich 21...		11,087		2,286	11,483		2,265	8,290		2,047
				BM für Gesundheit:										
1/24000				Zentralleitung		0,605	100	0,605	0,605	100	0,605	0,605	100	0,605
1/24107	21	7420		Laufende Transferzahlungen, Ernährungsagentur (Ges.m.b.H)		32,704	4	1,308	32,704	4	1,308	37,503	4	1,500
1/24206	21	7660	900	Subventionen an sonstige private Institutionen		4,824	6	0,289	4,824	6	0,289	4,733	6	0,284
		7663	900	Ludwig Boltzmann-Gesellschaft		0,050	100	0,050	0,050	100	0,050	0,159	100	0,159
1/24208	21	7270		) (		0,098	6	0,006	0,098	6	0,006	0,066	6	0,004
		7280		)Vorsorgemedizin; Grundlagenermittlung (		3,060	6	0,184	1,340	6	0,080	0,930	6	0,056
1/24226	21	7660	900	Subventionen an sonstige private Institutionen		1,956	10	0,196	1,956	10	0,196	1,929	10	0,193
1/24228	21	7270		)Suchtgiftmißbrauch; Grundlagenermittlung (		0,010	10	0,001	0,010	10	0,001	0,006	10	0,001
		7280		) (		0,246	10	0,025	0,246	10	0,025	0,008	10	0,001
1/24316				Veterinärwesen		0,456	1	0,005	1,956	0	0,005	0,360	1	0,004
1/24318				Veterinärwesen		6,035	10	0,604	6,035	4	0,241	6,676	10	0,668
1/24328				Lebensmittel- und Chemiekalienkontrolle		0,419	61	0,256	0,419	61	0,256	0,269	58	0,156
1/24336				Gentechnologie		0,005	20	0,001	0,005	20	0,001	0,005	0	0,000
1/24338				Gentechnologie		0,327	70	0,229	0,327	70	0,229	0,295	96	0,283
1/24348				Strahlenschutz		0,380	48	0,182	0,380	48	0,182	0,182	68	0,124
				Summe Bereich 24...		51,175		3,941	50,955		3,474	53,726		4,038
				BM für Unterricht, Kunst und Kultur:										
1/3000	43			Zentralleitung (Verwaltungsbereich Bildung)	*	4,285	100	4,285	4,285	100	4,285	4,285	100	4,285
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	....	...	....
1/30207	11	7340		Basisabgeltung (BIFIE)		6,500	80	5,200	6,500	80	5,200	....	...	....
1/30208	11			Allgemein-pädagogische Erfordernisse		37,530	3	1,079	37,530	3	1,079	27,040	4	1,079
1/3080				Technische und gewerbliche Lehranstalten	*	550,356	0	0,073	547,071	0	0,073	517,734	0	0,073
1/3083	11			Technische und gewerbl. Lehranstalten (zweckgeb. Gebarung)	*	8,198	3	0,246	8,198	3	0,246	8,591	3	0,254
1/3090				Pädagogische Hochschulen		150,067	10	15,007	144,339	10	14,434	135,323	10	13,532
				Summe UG 30...		756,937		25,891	747,924		25,318	692,973		19,223
1/3201				Kulturangelegenheiten		192,920	20	38,584	204,767	20	40,953	175,725	20	35,145
1/3204	13			Kulturangelegenheiten (zweckgeb. Gebarung)		7,107	20	1,421	7,107	20	1,421	5,264	20	1,053
				Summe UG 32...		200,027		40,005	211,874		42,374	180,989		36,198
				Summe Bereich 30...		956,964		65,896	959,798		67,692	873,962		55,421
1/40233	13	0635	457	Wien 1,Burgring 5, Kunsthist.Museum,Gen.San.(BT)		0,100	23	0,023	0,100	23	0,023	2,437	23	0,561
		0635	458	Wien 1, Burgring 7, Naturhist.Museum, Gen.San. (BT)		1,500	23	0,345	1,500	23	0,345	....	...	....
		0635	464	Wien 14,Mariahilferstr.212,Techn.Mus., Gen.San.u.Erweiterung		0,001	23	0,000	0,001	23	0,000	....	...	....
				Summe Bereich 30 einschl. Bauausgaben ...		958,565		66,264	961,399		68,060	876,399		55,982

Beilage T

B U N D E S V O R A N S C H L A G 2 0 1 0
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 2010 Insgesamt	hievon %	Forschung	Bundesvoranschlag 2009 Insgesamt	hievon %	Forschung	Erfolg 2008 Insgesamt	hievon %	Forschung
				BM für Wissenschaft und Forschung:										
1/3100				Zentralleitung		31,027	30	9,308	30,636	30	9,191	29,721	30	8,916
1/31018	12	7024	110	Normmieten		4,290	44	1,888	4,290	44	1,888	3,895	44	1,714
		7024	111	Zuschlagsmieten		0,001	44	0,000	0,001	44	0,000	....	...	....
		7024	112	Mieterinvestitionen		0,080	44	0,035	0,001	44	0,000	....	...	....
		7024	113	Betriebskosten		0,440	44	0,194	0,420	44	0,185	0,398	44	0,175
1/3103				Universitäten; Träger öffentlichen Rechts		2.713,088	46	1.248,020	2.521,162	46	1.159,735	2.270,562	46	1.044,459
1/31038	12	7342	900	F&E-Mittel		43,000	100	43,000	43,000	100	43,000	0,830	100	0,830
		7347	*900*	*Universitäts - Infrastruktur (F&E Offensive)*		....	...	....	....	...	....	20,373	100	20,373
1/31048	12	7280	000	Externe Gutachten und Projekte		0,815	46	0,375	1,040	46	0,478	0,527	46	0,242
		7353	400	Klinischer Mehraufwand (Klinikbauten)		79,845	50	39,923	28,392	50	14,196	47,998	50	23,999
		7480	423	VOEST-Alpine Medizintechnik Ges.m.b.H. (VAMED)		2,600	50	1,300	10,000	50	5,000	20,967	50	10,484
1/31108	12	7020	001	Institut für angewandte Systemanalyse		0,778	100	0,778	0,728	100	0,728	0,766	100	0,766
		7271	001	Fulbright-Kommission		0,560	60	0,336	0,560	60	0,336	0,254	60	0,152
		7279	013	fForte Universitäten		0,017	100	0,017	0,037	100	0,037	....	...	....
		7280	013	fForte Universitäten		2,400	100	2,400	2,000	100	2,000	1,826	100	1,826
		7330	052	Hertha Firnberg Programm		1,425	100	1,425	1,440	100	1,440	1,852	100	1,852
		7684		Studientätigkeit im Ausland		1,001	60	0,601	1,001	60	0,601	1,851	60	1,111
		7686		Vortragstätigkeit im Ausland		2,200	60	1,320	2,200	60	1,320	2,756	60	1,654
		7689		EU-Bildungsprogramme		2,000	60	1,200	2,000	60	1,200	2,000	60	1,200
		7340	*090*	*Universitätszentrum für Weiterbildung (Krems)*		....	...	....	....	...	....	0,006	15	0,001
1/3111				Wissenschaftliche Einrichtungen		4,861	30	1,458	4,938	30	1,481	4,297	30	1,289
1/31126	12			Bibliothekarische Einrichtungen		0,162	30	0,049	0,165	30	0,050	0,172	30	0,052
1/3113				Forschungsvorhaben		5,520	100	5,520	1,990	100	1,990	2,338	100	2,338
1/31146	12			Wissenschaftliche Forschung		102,480	100	102,480	104,580	100	104,580	5,278	100	5,278
1/31148	12	7332	252	Excellenz Wissenschaft		19,750	100	19,750	9,650	100	9,650	17,240	100	17,240
1/3116	12			Forschungseinrichtungen		51,001	100	51,001	16,176	100	16,176	31,117	100	31,117
1/3117	12			Österr. Akademie der Wissenschaften und Forschungsinstitute		80,871	100	80,871	80,285	100	80,285	72,524	100	72,524
1/31186	12			Forschungsvorhaben in internationaler Kooperation		11,092	100	11,092	7,270	100	7,270	3,397	100	3,397
1/31188	12	7260		Mitgliedsbeiträge an Institutionen im Inland		0,001	100	0,001	0,001	100	0,001	....	...	....
		7271		IIASA-Stipendien		0,004	100	0,004	0,004	100	0,004	0,004	100	0,004
		7274		Verpflichtungen aus WTZA		0,400	100	0,400	0,400	100	0,400	0,300	100	0,300
		7275		Stimulierung bilat. Wiss.beziehungen (EP)		0,001	100	0,001	0,001	100	0,001	....	...	....
		7279		Entgelte für sonstige Leistungen von Einzelpersonen		0,500	100	0,500	0,500	100	0,500	0,434	100	0,434
		7280	001	Leistungen v. Gewerbetreibenden, Firmen und jur. Personen		23,172	100	23,172	9,033	100	9,033	9,913	100	9,913
		7280	002	Entgelte an universitäre Einrichtungen		0,300	100	0,300	0,300	100	0,300	0,182	100	0,182
		7280	003	Med Austron		12,498	100	12,498	4,552	100	4,552	....	...	....
		7282		Vorträge, Seminare, Tagungen (Unt.)		0,500	100	0,500	0,500	100	0,500	0,471	100	0,471
		7284		Internationales Forschungszentrum		0,001	100	0,001	0,001	100	0,001	....	...	....
		7285		Stimulierung bilat. Wiss.beziehungen (Unt.)		0,050	100	0,050	0,050	100	0,050	0,047	100	0,047
		7665		Stiftung Dokumentationsarchiv		0,167	100	0,167	0,167	100	0,167	0,167	100	0,167
		7681		START-Wittgenstein-Programme		9,200	100	9,200	9,200	100	9,200	....	...	....
		7279	*900*	*Leistungen von Einzelpersonen (F&E-Offensive)*		....	...	....	....	...	....	0,136	100	0,136
		7280	*900*	*Leist.v.Gewerbetr.,Firmen u. jur.Pers. (F&E-Offensive)*		....	...	....	....	...	....	22,845	100	22,845
1/3123				Bibliotheken		2,096	44	0,922	2,104	44	0,926	2,620	44	1,153
1/3124				Wissenschaftliche Anstalten		34,113	44	15,010	33,487	44	14,734	30,439	44	13,393
1/3125				Wissenschaftliche Anstalten (zweckgebundene Gebarung)		0,028	44	0,012	0,028	44	0,012	0,002	44	0,001
1/31606	12			Fachhochschulen, Förderungen		215,058	13	27,958	188,893	13	24,556	177,397	13	23,062
				Summe Bereich 31...		3.459,393		1.715,037	3.123,183		1.527,754	2.787,902		1.325,097
				BM für Wirtschaft, Jugend und Familie:										
1/25118	22	7270	002	Entgelte für Leistungen von Einzelpersonen		0,074	20	0,015	0,074	20	0,015	0,035	20	0,007
		7280	002	Entgelte an Unternehmungen und jur. Personen		0,923	10	0,092	0,923	10	0,092	1,376	10	0,138
1/25386	22	7664		Forschungsförderung gem. § 39i FLAG 1967		0,250	100	0,250	0,250	100	0,250	0,088	100	0,088
1/25418	11	7270		Entgelte für sonstige Werkleistungen von Einzelpersonen		0,313	10	0,031	0,313	10	0,031	0,153	10	0,015

Beilage T

B U N D E S V O R A N S C H L A G 2 0 1 0
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 2010 Insgesamt	hievon %	hievon Forschung	Bundesvoranschlag 2009 Insgesamt	hievon %	hievon Forschung	Erfolg 2008 Insgesamt	hievon %	hievon Forschung
				(Fortsetzung)										
1/25418	11	7280		Sonstige Leistungen v. Gewerbetreib., Firmen u. jur. Pers.		1,190	5	0,060	1,190	5	0,060	1,139	5	0,057
				Summe UG 25...		2,750		0,448	2,750		0,448	2,791		0,305
1/3317				Technologie- und Forschungsförderung		104,600	100	104,600	79,800	100	79,800	75,143	100	75,143
1/4009				Bundesamt für Eich- und Vermessungswesen	*	84,971	0	0,200	84,318	0	0,200	78,619	0	0,200
1/40156	36	7660	900	Zuschüsse an Institutionen nicht Invest.		1,576	10	0,158	1,199	10	0,120	4,359	10	0,436
1/40158	36	7270		Entgelte für sonstige Werkleistungen von Einzelpersonen		0,230	50	0,115	0,230	50	0,115	0,220	50	0,110
		7280	100	Werkleistungen von gewerbl. Betrieben, Firmen u. jur. Pers.		5,598	50	2,799	5,534	50	2,767	3,675	50	1,838
		7282		Werkleistungen von Betrieben, Firmen u. jur. Pers. (TV)		0,050	100	0,050	0,050	100	0,050	0,004	100	0,004
1/4016				Klima- und Energiefonds		0,001	33	0,000	0,001	33	0,000	3,129	33	1,033
				Summe UG 40...		92,426		3,322	91,332		3,252	90,006		3,621
				Summe Bereich 40...		199,776		108,370	173,882		83,500	167,940		79,069
				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	....	...	....
		0806	362	Kärntner Betriebsansiedlungs- und Beteiligungs GmbH (BABEG)		0,000	100	0,000	0,000	100	0,000	....	...	....
1/34336				*Forschungs- und Technologietransfer*		....	...	....	0,000	100	0,000	4,004	100	4,004
1/34338	12	4000		Geringwertige Wirtschaftsgüter		0,001	100	0,001	0,001	100	0,001	....	...	....
		4035		Handelswaren zur unentgeltlichen Abgabe		0,001	100	0,001	0,001	100	0,001	0,016	100	0,016
		4036		Handelswaren zur unentgeltlichen Abgabe (Druckwerke)		0,080	100	0,080	0,080	100	0,080	0,135	100	0,135
		4570		Forschungspublikationen		0,006	100	0,006	0,006	100	0,006	0,002	100	0,002
		5710		Werkverträge Z		0,001	100	0,001	0,001	100	0,001	....	...	....
		5710	830	Dienstgeberbeiträge/ÜB (Werkverträge) Z		0,001	100	0,001	0,001	100	0,001	....	...	....
		5710	870	DG - Mitarbeitervorsorgekassen (Werkverträge) Z		0,001	100	0,001	0,001	100	0,001	....	...	....
		6210		Sonstige Transporte		0,002	100	0,002	0,002	100	0,002	0,006	100	0,006
		6300		Leistungen der Post		0,001	100	0,001	0,001	100	0,001	....	...	....
		7020		Sonstige Miet- und Pachtzinse		0,035	100	0,035	0,035	100	0,035	0,039	100	0,039
		7232		Repräsentationsausgaben(geb. Post)		0,020	100	0,020	0,020	100	0,020	0,038	100	0,038
		7260		Mitgliedsbeiträge an Institutionen im Inland		0,020	100	0,020	0,020	100	0,020	0,001	100	0,001
		7272		Vorträge, Seminare und Tagungen (Einzelpersonen)		0,001	100	0,001	0,001	100	0,001	....	...	....
		7279		Entgelte für sonstige Leistungen von Einzelpersonen		0,050	100	0,050	0,050	100	0,050	0,102	100	0,102
		7279	001	Technologieschwerpunkte (Einzelpersonen)		0,010	100	0,010	0,010	100	0,010	0,002	100	0,002
		7279	002	Forschungsschwerpunkte (Einzelpersonen)		0,080	100	0,080	0,080	100	0,080	0,016	100	0,016
		7280		Sonstige Leistungen v. Gewerbetreib., Firmen u. jur. Pers.		3,857	100	3,857	2,857	100	2,857	5,555	100	5,555
		7280	001	Technologieschwerpunkte (Unternehmungen)		0,783	100	0,783	0,783	100	0,783	0,272	100	0,272
		7280	002	Forschungsschwerpunkte (Unternehmungen)		0,740	100	0,740	0,740	100	0,740	0,497	100	0,497
		7280	003	Entgelte an universitäre Einrichtungen		0,050	100	0,050	0,050	100	0,050	0,228	100	0,228
		7282		Vorträge, Seminare und Tagungen (Unternehmungen)		0,020	100	0,020	0,020	100	0,020	0,108	100	0,108
		7283		Rat für Forschung und Technologieentwicklung		1,712	100	1,712	1,712	100	1,712	1,627	100	1,627
		7420		Laufende Transferzahlungen an Untern. mit Bundesbet.		0,200	100	0,200	0,200	100	0,200	....	...	....
	43	7280	004	Umweltprojekt Donaubecken		0,001	100	0,001	0,001	100	0,001	....	...	....
1/34346	12	7330	661	ERP-Fonds (F&E-Offensive)		0,554	100	0,554	0,554	100	0,554	....	...	....
		7420	000	Laufende Transferz.an Untern.m.Bundesbet. (Technologiemill.)		0,001	100	0,001	0,001	100	0,001	....	...	....
		7420	900	Zahlungen an Untern. m. Bundesbet. (F&E-Offensive)		0,150	100	0,150	0,150	100	0,150	0,196	100	0,196
		7430	000	Lauf. Transferz.a.d.übrigen Sektoren d.Wirtsch.(Tech.mill.)		0,001	100	0,001	0,001	100	0,001	....	...	....
		7430	900	Forschung und Entwicklung (F&E-Offensive)		0,992	100	0,992	0,992	100	0,992	....	...	....
		7431		Fachhochschulen-Kooperationen (Technologiemilliarde)		0,001	100	0,001	0,001	100	0,001	....	...	....

B U N D E S V O R A N S C H L A G   2 0 1 0

Beilage T

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 2010 Insgesamt	hievon %	hievon Forschung	Bundesvoranschlag 2009 Insgesamt	hievon %	hievon Forschung	Erfolg 2008 Insgesamt	hievon %	hievon Forschung
				(Fortsetzung)									
1/34346	12	7432	900	Lauf.Transfz. a.d.übr.Sektoren d. Wirtsch. (F&E Offensive)	1,150	100	1,150	1,150	100	1,150	0,133	100	0,133
		7670		Verein zur Förderung der wiss. Forschung (Technologiemill.)	0,001	100	0,001	0,001	100	0,001	....	...	....
		7680	900	Phys.Pers.-Förd.beitr. (nicht Invest.) (F&E-Offensive)	0,150	100	0,150	0,150	100	0,150	0,319	100	0,319
1/34348	12	7279	900	Einzelpers. - Entgelte f. sonst. Leistungen (F&E-Offensive)	0,100	100	0,100	0,100	100	0,100	0,087	100	0,087
		7280	001	Sonst. Leist. v. Gewerbetreib.u.jur.Pers. (Technologiemill.)	0,001	100	0,001	0,001	100	0,001	....	...	....
		7280	900	Leist.v. Gewerbetr., Firm.u. jur. Pers. (F&E-Offensive)	4,000	100	4,000	4,000	100	4,000	4,512	100	4,512
		7283	900	Rat f. Forschung u. Technologieentw. (F&E-Offensive)	0,001	100	0,001	0,001	100	0,001	0,206	100	0,206
		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)	2,895	100	2,895	2,895	100	2,895	....	...	....
		7430	900	Forschung und Entwicklung (F&E-Offensive)	0,001	100	0,001	0,001	100	0,001	....	...	....
		7480		Impulsprogramme (Technologiemilliarde)	0,001	100	0,001	0,001	100	0,001	....	...	....
1/34376	12	7480		Technologieschwerpunkte (Unternehmungen)	6,239	100	6,239	6,239	100	6,239	2,198	100	2,198
		7480	001	Forschungsschwerpunkte (Unternehmungen)	2,861	100	2,861	2,861	100	2,861	0,174	100	0,174
1/34378	12	7279	000	Technologieschwerpunkte (Einzelpersonen)	0,001	100	0,001	0,001	100	0,001	....	...	....
		7279	001	Forschungsschwerpunkte (Einzelpersonen)	0,001	100	0,001	0,001	100	0,001	....	...	....
		7280		Technologieschwerpunkte (Unternehmungen)	0,594	100	0,594	0,594	100	0,594	0,443	100	0,443
		7280	001	Forschungsschwerpunkte (Unternehmungen)	0,086	100	0,086	0,086	100	0,086	....	...	....
1/34416	12	7425		AWS	0,001	100	0,001	0,001	100	0,001	....	...	....
		7425	002	AWS - Programmabwicklung	0,001	100	0,001	0,001	100	0,001	....	...	....
1/34418	12	7425		AWS	0,001	100	0,001	0,001	100	0,001	....	...	....
		7425	001	AWS - Administrative Kosten	0,001	100	0,001	0,001	100	0,001	....	...	....
		7425	002	AWS - Programmabwicklung	0,001	100	0,001	0,001	100	0,001	....	...	....
1/3442	12			Technologie- u. Forschungsförderung (wissenschaftl.)/FWF	7,708	100	7,708	10,121	100	10,121	93,595	100	93,595
1/34456	12	7426		ARC-Zuschüsse für nicht investitionsfördernde Maßnahmen	45,852	90	41,267	44,852	90	40,367	41,855	85	35,577
		7426	001	ARC - Forschungsprogramme	0,001	100	0,001	0,001	100	0,001	....	...	....
		7426	002	ARC - Technologietransfer	0,001	100	0,001	0,001	100	0,001	....	...	....
		7476		ARC - Investitionskostenzuschuss	3,225	85	2,741	3,225	85	2,741	3,225	85	2,741
		7686		ARC - Humanressourcen-Programm	0,001	100	0,001	0,001	100	0,001	....	...	....
1/34458	12	7420		Lauf. Transferzahl. an Unternehmungen mit Bundesbeteiligung	0,001	95	0,001	0,001	95	0,001	0,058	95	0,055
		7421		ARC-Nukleare Dienste (NES)	7,459	79	5,893	8,009	79	6,327	7,680	79	6,067
1/34486	12	7425	000	Forschungsförderungs GmbH	0,001	100	0,001	0,001	100	0,001	....	...	....
		7425	900	FFG - Programmabwicklung (F&E)	97,839	100	97,839	98,359	100	98,359	67,391	100	67,391
1/34488	12	7280	005	Sonstige Leistungen der FFG	0,653	80	0,522	0,653	80	0,522	1,653	80	1,322
		7425		Leistungen des Bundes an die FFG	58,310	100	58,310	58,635	100	58,635	84,498	100	84,498
		7425	001	Leistungen der FFG (F&E)	0,001	100	0,001	0,001	100	0,001	0,402	100	0,402
		7425	002	FFG - Administrative Kosten	11,600	85	9,860	11,600	85	9,860	8,912	85	7,575
		7425	900	FFG - Programmabwicklung (F&E)	46,949	100	46,949	42,279	100	42,279	40,834	100	40,834
1/3449				Sontige Forschungsunternehmen	6,436	100	6,436	6,436	100	6,436	1,276	100	1,276
				Summe UG 34...	313,499		304,993	310,637		302,115	372,295		362,249
1/41118	12	7280	600	Unfallforschung	0,001	100	0,001	0,001	100	0,001	....	...	....
	33	7280	300	Sonstige Verkehrsprojekte	1,462	100	1,462	1,462	100	1,462	1,297	100	1,297
		7280	301	Generalverkehrsplan	0,012	20	0,002	0,012	20	0,002	0,008	20	0,002
		7280	500	Grundlagenuntersuchungen - Schiene	0,002	100	0,002	0,002	100	0,002	....	...	....
		7280	502	Sonstige Leistungen am Eisenbahnsektor	0,690	35	0,242	0,690	35	0,242	0,689	35	0,241
1/41246	12	7660		Sonstige Subventionen	0,260	95	0,247	0,260	95	0,247	0,156	95	0,148
	33	7480	501	Programm Kombinierter Güterverkehr Straße-Schiene-Schiff	2,672	50	1,336	2,672	50	1,336	3,584	50	1,792
1/41248	33	7279		Entgelte für sonstige Leistungen von Einzelpersonen	0,092	80	0,074	0,092	80	0,074	0,002	80	0,002
		7280		Sonstige Leistungen v. Gewerbetreib., Firmen u. jur. Pers.	0,080	80	0,064	0,080	80	0,064	0,118	80	0,094
1/41256	12	7489		Breitbandinitiative	0,001	50	0,001	9,100	50	4,550	2,073	50	1,037
		7660		Sonstige Förderungen	0,266	95	0,253	0,267	95	0,254	0,264	95	0,251
	36	7420		Kärntner Betriebsansiedlungs- u. Beteiligungs GmbH BABEG	0,001	50	0,001	0,001	50	0,001	....	...	....
		7480	800	IWP Gmünd/Ceske Velenice (sonst.Anlagen)	0,300	80	0,240	0,300	80	0,240	....	...	....

Beilage T

B U N D E S V O R A N S C H L A G   2 0 1 0
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 2010 Insgesamt	Bundesvoranschlag 2010 hievon %	Bundesvoranschlag 2010 hievon Forschung	Bundesvoranschlag 2009 Insgesamt	Bundesvoranschlag 2009 hievon %	Bundesvoranschlag 2009 hievon Forschung	Erfolg 2008 Insgesamt	Erfolg 2008 hievon %	Erfolg 2008 hievon Forschung
				(Fortsetzung)										
1/41258	12	7270	006	Sonstige Leistungen für IKT (Einzelpersonen)		0,030	80	0,024	0,030	80	0,024	....	...	....
		7280	006	Sonstige Leistungen für IKT (jur. Personen)		0,068	80	0,054	0,070	80	0,056	0,098	80	0,078
		7489		Breitbandinitiative (admin. Aufwand)		0,001	50	0,001	0,001	50	0,001	0,400	50	0,200
	36	5710	000	Werkverträge Z		0,001	80	0,001	0,001	80	0,001	....	...	....
		5710	830	Dienstgeberbeiträge/ÜB (Werkverträge) Z		0,001	80	0,001	0,001	80	0,001	....	...	....
		7279		Werkverträge, Studien, Untersuchungen (Einzelpersonen)		0,001	80	0,001	0,001	80	0,001	....	...	....
		7280		Werkverträge, Studien, Untersuchungen (jur. Personen)		0,292	80	0,234	0,292	80	0,234	0,164	80	0,131
		7420		Lfd. Transferz. an Unternehmungen mit Bundesbeteiligung		0,064	80	0,051	0,064	80	0,051	....	...	....
		7489	001	Breitband admin.		0,001	50	0,001	0,899	50	0,450	....	...	....
1/4127				Klima- und Energiefonds		75,000	33	24,750	75,000	33	24,750	2,312	33	0,763
1/4167	12			Straßenforschung		0,005	100	0,005	0,005	100	0,005	0,481	100	0,481
1/41708	32	7280		Sonstige Leistungen v. Gewerbetreib., Firmen u. jur. Pers.		0,960	5	0,048	0,960	5	0,048	3,201	5	0,160
				Summe UG 41...		82,263		29,096	92,263		34,097	14,847		6,677
				Summe Bereich 41...		395,762		334,089	402,900		336,212	387,142		368,926
				BM für Land- u.Forstwirtschaft,Umwelt u.Wasserwirtschaft:										
1/42000	43			Zentralleitung		0,717	100	0,717	0,711	100	0,711	0,675	100	0,675
1/42027		7421		Transfer an die Ernährungsagentur GmbH		21,802	4	0,872	21,802	4	0,872	25,002	4	1,000
		7422		Transfer a.d.Bundesforsch.u.Ausbildungsz. für Wald		15,500	62	9,610	15,500	62	9,610	15,500	62	9,610
1/42028		7420		Laufende Transferz.a.d. österr. Ernährungsagentur GmbH		0,001	4	0,000	0,001	4	0,000	0,012	4	0,000
1/42038	34	7280	035	Wasserw.Planungen u.Untersuchungen, Entg.an Unternehm.		0,644	30	0,193	0,644	30	0,193	0,920	30	0,276
		7280	039	Wasserw.Grundsatzkonzepte, Entg. an Unternehmungen		0,020	30	0,006	0,020	30	0,006	....	...	....
		7280	040	Wasserw. Unterlagen; Entgelte an Unternehmungen		0,100	30	0,030	0,100	30	0,030	0,003	30	0,001
		7280	900	Agrarische Maßnahmen		4,781	24	1,147	4,781	24	1,147	6,381	18	1,149
1/42056	34	7660	009	Sonstige Ausgaben, Institut.		0,030	50	0,015	0,030	50	0,015	0,026	50	0,013
1/42176	12			Forschungs- und Versuchswesen		0,064	100	0,064	0,064	100	0,064	0,064	100	0,064
1/42178	12			Forschungs- und Versuchswesen		2,489	100	2,489	2,489	100	2,489	3,814	100	3,814
1/4250	11			HBLA und Bundesamt für Wein- und Obstbau	*	8,403	46	3,865	8,403	46	3,865	7,768	46	3,573
				HBLA für Gartenbau	*	7,023	10	0,702	7,023	10	0,702	5,080	10	0,508
				Höhere Bundeslehr- u. Forschungsanstalt für Landwirtschaft		14,327	50	7,164	14,327	50	7,164	15,152	50	7,576
				Höh.Bundeslehr-u. Forschungsanst.f. Landw., Landt.u.Lebensm.		13,369	25	3,342	13,369	25	3,342	16,536	25	4,134
1/4254	12			Bundesanstalt für Agrarwirtschaft		1,823	60	1,094	1,813	60	1,088	1,616	60	0,970
1/4255				Bundesanstalt für alpenländische Milchwirtschaft		3,106	1	0,031	3,082	1	0,031	3,852	1	0,039
1/4256	12			Bundesanstalt für Bergbauernfragen		1,040	55	0,572	1,034	55	0,569	0,858	55	0,472
1/4257				Bundesamt für Weinbau		3,820	14	0,535	3,820	14	0,535	3,977	14	0,557
1/4258	12			Bundesamt für Wasserwirtschaft		5,278	22	1,161	5,278	22	1,161	5,762	22	1,268
1/4261				Hochschule für Agrar- und Umweltpädagogik		2,554	3	0,077	2,494	3	0,075	2,412	3	0,072
1/42726	34	7700	001	Erhebungen,Projekt.u.Betreuung in Wäldern m.Schutzw.,Invest.		0,010	10	0,001	0,010	10	0,001	0,002	10	0,000
		7700	004	Forstliche Maßnahmen, Egata/Vergaltschlawine, Invest		0,001	10	0,000	0,001	10	0,000	....	...	....
1/42728	34	7270		Entgelte für sonstige Leistungen von Einzelpersonen		0,081	30	0,024	0,081	30	0,024	0,031	30	0,009
		7280		Entgelte für sonstige Leistungen von Unternehmungen		3,403	30	1,021	3,403	30	1,021	3,155	30	0,947
				Summe UG 42...		110,386		34,732	110,280		34,715	118,598		36,727
1/43007	21	7420		Transferzahlungen an die UBA Ges.m.b.H		15,356	5	0,768	15,356	5	0,768	15,356	5	0,768
1/4310	21			Umweltpolitische Maßnahmen		28,766	25	7,192	27,302	25	6,826	40,192	25	10,048
1/43126	21	7700	500	Investitionszuschüsse		24,388	1	0,228	18,200	1	0,228	30,645	1	0,228
1/43136	37	7700	201	Investitionsförderungen		348,700	1	3,487	327,681	1	3,277	306,672	0	1,236
1/43138	37	7280	000	Entgelte an Unternehmungen (Maßnahmen gem. UFG)		0,230	100	0,230	0,230	100	0,230	0,044	100	0,044

Beilage T

B U N D E S V O R A N S C H L A G 2 0 1 0
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 2010 Insgesamt	hievon %	hievon Forschung	Bundesvoranschlag 2009 Insgesamt	hievon %	hievon Forschung	Erfolg 2008 Insgesamt	hievon %	hievon Forschung
				(Fortsetzung)										
1/43146	37	7700	500	Investitionszuschüsse		86,926	1	0,869	87,879	1	0,879	74,520	1	0,438
1/43158	21			Strahlenschutz		11,853	8	0,948	10,553	8	0,844	8,026	8	0,642
1/4317				Klima- und Energiefonds		75,001	33	24,750	75,001	33	24,750	10,277	33	3,391
1/4319				Forschungs- und Versuchsvorhaben		0,501	100	0,501	0,501	100	0,501	....	...	....
				Summe UG 43...		591,721		38,973	562,703		38,303	485,732		16,795
				Summe Bereich 42...		702,107		73,705	672,983		73,018	604,330		53,522
				Summe Abschnitt b)...		**5.891,346**		**2.341,316**	**5.510,146**		**2.131,859**	**5.012,121**		**1.925,221**
				Gesamtsumme...		**5.975,938**		**2.412,731**	**5.594,318**		**2.202,947**	**5.088,203**		**1.986,775**

Beilage T/Anhang

B U N D E S V O R A N S C H L A G 2 0 1 0
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.
1/41008	43	7800		Teilbetrag der VA-Post.
1/41027	43	7800		Teilbetrag der VA-Post.
1/42008	43	7800		Teilbetrag der VA-Post.
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 4: Federal expenditure on research and research promotion, 2007 to 2010

Ministries [1]	Breakdown of Annex T of the Auxiliary Document for the Federal Finances Act 2009 and 2010							
	Actual outlay				Budget appropriation			
	2007[2]		2008[3]		2009[3]		2010[3]	
	€ million	%	€ million	%	€ million	%	€ million	%
Federal Chancellery (BKA)4)	1.576	0.1	1.651	0.1	2.027	0.1	2.067	0.1
Federal Ministry of the Interior (BMI)	0.576	0.0	0.693	0.0	0.683	0.0	0.680	0.0
Federal Ministry for Education, Art and Culture (BMUKK)	39.947	2.3	56.010	2.8	68.087	3.1	66.292	2.7
Federal Ministry for Science and Research (BMWF)	1 244,693	70.2	1 344,447	67.6	1 554,282	70.6	1 741,857	72.2
Federal Ministry for Social Affairs and Consumer Protection (BMSK)	1.568	0.1	1.842	0.1	.	.	.	.
Federal Ministry for Labour, Social Affairs and Consumer Protection	.	.	.	.	2.265	0.1	2.286	0.1
Federal Ministry for Health, Family and Youth (BMGFJ)	5.261	0.3	5.253	0.3	.	.	.	.
Federal Ministry for Health	.	.	.	.	4.675	0.2	5.142	0.2
Federal Ministry for European and International Affairs (BMEIA)	1.727	0.1	2.038	0.1	1.905	0.1	1.905	0.1
Federal Ministry of Justice (BMJ)	0.098	0.0	0.103	0.0	0.130	0.0	0.130	0.0
Federal Ministry of Defence (BML)	1.674	0.1	1.764	0.1	.	.	.	.
Federal Ministry of Defence and Sports	.	.	.	.	2.308	0.1	2.396	0.1
Federal Ministry of Finance (BMF)	33.162	1.9	32.960	1.7	33.098	1.5	33.031	1.4
Federal Ministry for Agriculture, Forestry, Environment and Water Management (BMLFUW)	51.077	2.9	55.207	2.8	74.829	3.4	75.531	3.1
Federal Ministry for Economics and Labour	60.255	3.4	79.255	4.0	.	.	.	.
Federal Ministry of Economy, Family and Youth	.	.	.	.	83.617	3.8	108.487	4.5
Federal Ministry for Transport, Innovation and Technology (BMVIT)	328.530	18.6	405.552	20.4	375.041	17.0	372.927	15.5
Total	1 770,144	100.0	1 986,775	100.0	2 202,947	100.0	2 412,731	100.0

Status: April 2010
Source: **Statistik Austria** (Bundesanstalt Statistik Österreich)

1) In accordance with the applicable version of the Act Governing Federal Ministries of 1986 (2007, 2008: Federal Law Gazette I No. 6/2007; 2009, 2010: Federal Law Gazette I No. 3/2009).
2) Auxiliary Document for the Federal Finances Act of 2009.
3) Auxiliary Document for the Federal Finances Act of 2010.
4) 2009 2010: including the highest executive bodies.

Table 5: Federal expenditure in 1993-2010 for research and research promotion by socioeconomic objectives

Reporting years		Total federal expenditure for R&D	Analysis of Annex T of the Auxiliary Document for the Federal Finances Act (Parts a and b) – of which: Promotion of research on the earth, seas, atmosphere, and space	Promotion of agriculture and forestry	Promotion of trade, commerce, and industry	Promotion of energy production, storage and distribution	Promotion of transport, traffic and communications	Promotion of education	Promotion of health	Promotion of social and socio-economic development	Promotion of environmental protection	Promotion of urban and physical planning	Promotion of national defence	Promotion of other objectives	Promotion of general knowledge advancement
1993[1]	in € 1,000	1 063 049	48 743	48 585	153 961	18 381	27 194	14 308	262 368	69 792	51 015	6 080	20	9 353	353 250
	in %	100.0	4.6	4.6	14.5	1.7	2.6	1.3	24.7	6.6	4.8	0.6	0.0	0.9	*33.1*
1994[2]	in € 1,000	1 151 932	50 916	49 590	177 759	21 797	36 287	14 997	273 868	78 242	52 342	5 747	137	10 767	379 484
	in %	100.0	4.4	4.3	15.4	1.9	3.2	1.3	23.8	6.8	4.5	0.5	0.0	0.9	*33.0*
1995[3]	in € 1,000	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[4]	in € 1,000	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[5]	in € 1,000	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[6]	in € 1,000	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[7]	in € 1,000	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[8]	in € 1,000	1 287 326	86 343	79 177	194 247	21 365	29 644	14 299	291 038	89 881	43 301	10 006	336	11502	416 187
	in %	100.0	6.7	6.2	15.1	1.7	2.3	1.1	22.6	7.0	3.4	0.8	0.0	0.9	*32.2*
2001[9]	in € 1,000	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[10]	in € 1,000	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[11]	in € 1,000	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[12]	in € 1,000	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[13]	in € 1,000	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[14]	in € 1,000	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[15]	in € 1,000	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[16]	in € 1,000	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[17]	in € 1,000	2 202 947	103 609	67 938	576 980	49 304	44 029	45 963	464 539	106 250	83 354	13 706	166	-	647 109
	in %	100.0	4.7	3.1	26.2	2.2	2.0	2.1	21.1	4.8	3.8	0.6	*0.0*	-	29.4
2010[17]	in € 1,000	2 412 731	108 011	70 193	627 234	50 145	40 574	48 073	520 938	110 323	85 815	14 626	137	-	736 662
	in %	100.0	4.5	2.9	26.0	2.1	1.7	2.0	21.6	4.6	3.6	0.6	*0.0*	-	30.4

Status: April 2010

Source: **Statistik Austria** (Bundesanstalt Statistik Österreich)

1) Annex T of the Auxiliary Document for the Federal Finances Act 1995, actual outlay. Revised data. – 2) Annex T of the Auxiliary Document for the Federal Finances Act 1996, actual outlay. – 3) Annex T of the Auxiliary Document for the Federal Finances Act 1997, actual outlay. – 4) Annex T of the Auxiliary Document for the Federal Finances Act 1998, actual outlay. – 5) Annex T of the Auxiliary Document for the Federal Finances Act 1999, actual outlay. – 6) Annex T of the Auxiliary Document for the Federal Finances Act 2000, actual outlay. Revised data. – 7) Annex T of the Auxiliary Document for the Federal Finances Act 2001, actual outlay. Revised data. – 8) Annex T of the Auxiliary Document for the Federal Finances Act 2002, actual outlay. – 9) Annex T of the Auxiliary Document for the Federal Finances Act 2003, actual outlay. – 10) Annex T of the Auxiliary Document for the Federal Finances Act 2004, actual outlay. – 11) Annex T of the Auxiliary Document for the Federal Finances Act 2005, actual outlay. – 12) Annex T of the Auxiliary Document for the Federal Finances Act 2006, actual outlay. Revised data. – 13) Annex T of the Auxiliary Document for the Federal Finances Act 2007, actual outlay. – 14) Annex T of the Auxiliary Document for the Federal Finances Act 2008, actual outlay. Revised data. – 15) Annex T of the Auxiliary Document for the Federal Finances Act 2009, actual outlay. – 16) Annex T of the Auxiliary Document for the Federal Finances Act 2010, actual outlay. – 17) Annex T of the Auxiliary Document for the Federal Finances Act 2010, budget appropriation.
rounding differences.

Table 6: Federal expenditure in 2008 for research and research promotion by socioeconomic objectives and ministries

Ministries		Total federal expenditure for R&D	Breakdown of annual values for 2008 1) from Annex T of the Auxiliary Document for the Federal Finances Act 2010 (Part a and Part b)												
			of which												
			Promotion of research on the earth, seas, atmosphere, and space	Promotion of agriculture and forestry	Promotion of trade, commerce, and industry	Promotion of energy production, storage and distribution	Promotion of transport, traffic and communications	Promotion of education	Promotion of health	Promotion of social and socio-economic development	Promotion of environmental protection	Promotion of urban and physical planning	Promotion of national defence	Promotion of other objectives	Promotion of general knowledge advancement
BKA	in € 1,000	1 651	-	-	-	46	-	-	-	1 157	-	260	-	-	188
	in %	100.0	-	-	-	2.8	-	-	-	70.1	-	15.7	-	-	11.4
BMI	in € 1,000	693	-	-	-	-	-	-	-	693	-	-	-	-	-
	in %	100.0	-	-	-	-	-	-	-	100.0	-	-	-	-	-
BMUKK	in € 1,000	56 010	2 530	-	327	-	-	18 924	-	8 961	-	-	-	-	25 268
	in %	100.0	4.5	-	0.6	-	-	33.8	-	16.0	-	-	-	-	45.1
BMWF	in € 1,000	1 344 447	65 696	25 891	239 200	6 552	19 610	17 273	359 690	62 405	24 555	11 354	92	-	512 129
	in %	100.0	4.9	1.9	17.8	0.5	1.5	1.3	26.8	4.6	1.8	0.8	0.0	-	38.1
BMSK	in € 1,000	1 842	-	-	-	-	-	-	179	1 663	-	-	-	-	-
	in %	100.0	-	-	-	-	-	-	9.7	90.3	-	-	-	-	-
BMGFJ	in € 1,000	5 253	-	60	-	-	-	-	4 209	312	-	-	-	-	672
	in %	100.0	-	1.1	-	-	-	-	80.2	5.9	-	-	-	-	12.8
BMEIA	in € 1,000	2 038	-	-	-	958	-	-	-	1 072	-	-	-	-	8
	in %	100.0	-	-	-	47.0	-	-	-	52.6	-	-	-	-	0.4
BMJ	in € 1,000	103	-	-	-	-	-	-	-	103	-	-	-	-	-
	in %	100.0	-	-	-	-	-	-	-	100.0	-	-	-	-	-
BML	in € 1,000	1 764	-	-	-	-	-	-	-	-	-	-	50	-	1 714
	in %	100.0	-	-	-	-	-	-	-	-	-	-	2.8	-	97.2
BMF	in € 1,000	32 960	1 640	865	5 882	220	558	422	7 867	4 443	673	282	-	-	10 108
	in %	100.0	5.0	2.6	17.8	0.7	1.7	1.3	23.9	13.5	2.0	0.9	-	-	30.6
BMLFUW	in € 1,000	55 207	392	35 787	-	-	-	72	-	1 491	17 095	-	-	-	370
	in %	100.0	0.7	64.8	-	-	-	0.1	-	2.7	31.0	-	-	-	0.7
(BMWA)	in € 1,000	79 255	-	-	77 845	1033	-	-	-	374	-	-	-	-	3
	in %	100.0	-	-	98.2	1.3	-	-	-	0.5	-	-	-	-	0.0
BMVIT	in € 1,000	405 552	17 493	3 670	202 319	15 846	19 822	945	50 672	8 205	15 212	383	-	-	70 985
	in %	100.0	4.3	0.9	49.9	3.9	4.9	0.2	12.5	2.0	3.8	0.1	-	-	17.5
Total	in € 1,000	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

Source: Statistik Austria (Bundesanstalt Statistik Österreich)

Table 7: Federal expenditure in 2009 for research and research promotion by socioeconomic objectives and ministries

Ministries		Total federal expenditure for R&D	Breakdown of annual values for 2009 1) from Annex T of the Auxiliary Document for the Federal Finances Act 2010 (Part a and Part b) – of which: Promotion of research on the earth, seas, atmosphere, and space	Promotion of agriculture and forestry	Promotion of trade, commerce, and industry	Promotion of energy production, storage and distribution	Promotion of transport, traffic and communications	Promotion of education	Promotion of health	Promotion of social and socio-economic development	Promotion of environmental protection	Promotion of urban and physical planning	Promotion of national defence	Promotion of other objectives	Promotion of general knowledge advancement
BKA[2]	in € 1,000	2 027	-	-	-	46	-	-	-	1 299	-	323	-	-	359
	in %	100.0	-	-	-	2.3	-	-	-	64.1	-	15.9	-	-	17.7
BMI	in € 1,000	683	-	-	-	-	-	-	-	683	-	-	-	-	-
	in %	100.0	-	-	-	-	-	-	-	100.0	-	-	-	-	-
BMUKK	in € 1,000	68 087	3 130	-	319	-	-	25 026	-	11 414	-	-	-	-	28 198
	in %	100.0	*4.6*	-	0.5	-	-	36.8	-	16.8	-	-	-	-	41.3
BMWF	in € 1,000	1 554 282	84 685	30 465	271 044	8 016	23 819	19 954	416 844	80 646	27 891	12 684	98	-	578 136
	in %	100.0	5.4	2.0	17.4	0.5	1.5	1.3	26.8	5.2	1.8	0.8	*0.0*	-	37.3
BMASK	in € 1,000	2 265	-	-	-	-	-	-	184	2 081	-	-	-	-	-
	in %	100.0	-	-	-	-	-	-	8.1	*91.9*	-	-	-	-	-
BMG	in € 1,000	4 675	-	59	-	-	-	-	4 337	33	-	-	-	-	246
	in %	100.0	-	1.3	-	-	-	-	92.7	*0.7*	-	-	-	-	5.3
BMEIA	in € 1,000	1 905	-	-	-	1 050	-	-	-	842	-	-	-	-	13
	in %	100.0	-	-	-	55.1	-	-	-	44.2	-	-	-	-	0.7
BMJ	in € 1,000	130	-	-	-	-	-	-	-	130	-	-	-	-	-
	in %	100.0	-	-	-	-	-	-	-	100.0	-	-	-	-	-
BMLVS	in € 1,000	2 308	-	-	-	-	-	-	-	-	-	-	68	-	2 240
	in %	100.0	-	-	-	-	-	-	-	-	-	-	2.9	-	97.1
BMF	in € 1,000	33 098	1 635	862	5 917	208	565	416	7 880	4 553	684	268	-	-	10 110
	in %	100.0	4.9	2.6	17.9	0.6	1.7	1.3	23.8	13.8	2.1	*0.8*	-	-	30.5
BMLFUW	in € 1,000	74 829	359	33 858	-	-	-	75	-	1 550	38 648	-	-	-	339
	in %	100.0	0.5	*45.2*	-	-	-	0.1	-	2.1	*51.6*	-	-	-	0.5
BMWFJ	in € 1,000	83 617	-	-	83 160	-	-	-	-	448	-	-	-	-	9
	in %	100.0	-	-	99.5	-	-	-	-	0.5	-	-	-	-	0.0
BMVIT	in € 1,000	375 041	13 800	2 694	216 540	39 984	19 645	492	35 294	2 571	16 131	431	-	-	27 459
	in %	100.0	3.7	0.7	57.8	10.7	5.2	0.1	9.4	0.7	4.3	*0.1*	-	-	7.3
Total	in € 1,000	2 202 947	103 609	67 938	576 980	49 304	44 029	45 963	464 539	106 250	83 354	13 706	166	-	**647 109**
	in %	100.0	4.7	3.1	26.2	2.2	2.0	2.1	21.1	4.8	3.8	0.6	*0.0*	-	29.4

Source: Statistik Austria (Bundesanstalt Statistik Österreich)

Table 8: Federal expenditure in 2010 for research and research promotion by socioeconomic objectives and ministries

Ministries		Total federal expenditure for R&D	Breakdown of annual values for 2010 [1] from Annex T of the Auxiliary Document for the Federal Finances Act 2010 (Part a and Part b) – of which: Promotion of research on the earth, seas, atmosphere, and space	Promotion of agriculture and forestry	Promotion of trade, commerce, and industry	Promotion of energy production, storage and distribution	Promotion of transport, traffic and communications	Promotion of education	Promotion of health	Promotion of social and socio-economic development	Promotion of environmental protection	Promotion of urban and physical planning	Promotion of national defence	Promotion of other objectives	Promotion of general knowledge advancement
BKA[2]	in € 1,000	2 067	-	-	-	46	-	-	-	1 309	-	353	-	-	359
	in %	100.0	-	-	-	2.2	-	-	-	63.3	-	17.1	-	-	17.4
BMI	in € 1,000	680	-	-	-	-	-	-	-	680	-	-	-	-	-
	in %	100.0	-	-	-	-	-	-	-	100.0	-	-	-	-	-
BMUKK	in € 1,000	66 292	3 123	-	319	-	-	25 600	-	10 218	-	-	-	-	27 032
	in %	100.0	*4.7*	-	0.5	-	-	38.6	-	15.4	-	-	-	-	40.8
BMWF	in € 1,000	1 741 857	89 487	32 696	291 831	8 601	25 560	21 497	473 065	85 893	29 938	13 567	112	-	669 610
	in %	100.0	5.1	1.9	16.8	0.5	1.5	1.2	27.2	4.9	1.7	0.8	*0.0*	-	38.4
BMASK	in € 1,000	2 286	-	-	-	-	-	-	190	2 096	-	-	-	-	-
	in %	100.0	-	-	-	-	-	-	8.3	*91.7*	-	-	-	-	-
BMG	in € 1,000	5 142	-	59	-	-	-	-	4 441	33	-	-	-	-	609
	in %	100.0	-	1.1	-	-	-	-	86.5	*0.6*	-	-	-	-	11.8
BMEIA	in € 1,000	1 905	-	-	-	1 050	-	-	-	842	-	-	-	-	13
	in %	100.0	-	-	-	55.1	-	-	-	44.2	-	-	-	-	0.7
BMJ	in € 1,000	130	-	-	-	-	-	-	-	130	-	-	-	-	-
	in %	100.0	-	-	-	-	-	-	-	100.0	-	-	-	-	-
BMLVS	in € 1,000	2 396	-	-	-	-	-	-	-	-	-	-	25	-	2 371
	in %	100.0	-	-	-	-	-	-	-	-	-	-	1.0	-	99.0
BMF	in € 1,000	33 031	1 625	856	5 877	207	561	413	7 827	4 679	679	266	-	-	10 041
	in %	100.0	4.9	2.6	17.8	0.6	1.7	1.3	23.7	14.2	2.1	*0.8*	-	-	30.3
BMLFUW	in € 1,000	75 531	359	33 873	-	-	-	77	-	1 565	39 318	-	-	-	339
	in %	100.0	0.5	*44.8*	-	-	-	0.1	-	2.1	*52.1*	-	-	-	0.4
BMWFJ	in € 1,000	108 487	-	-	108 030	-	-	-	-	448	-	-	-	-	9
	in %	100.0	-	-	99.6	-	-	-	-	0.4	-	-	-	-	0.0
BMVIT	in € 1,000	372 927	13 417	2 709	221 177	40 241	14 453	486	35 415	2 430	15 880	440	-	-	26 279
	in %	100.0	3.6	0.7	59.3	10.8	3.9	0.1	9.5	0.7	4.3	*0.1*	-	-	7.0
Total	in € 1,000	2 412 731	108 011	70 193	627 234	50 145	40 574	48 073	520 938	110 323	85 815	14 626	137	-	**736 662**
	in %	100.0	4.5	2.9	26.0	2.1	1.7	2.0	21.6	4.6	3.6	0.6	*0.0*	-	30.4

Status: April 2010
Source: **Statistik Austria** (Bundesanstalt Statistik Österreich)

[1].Budget. – [2] including the highest executive bodies.

Table 9: General research-related university expenditure by the federal government in 1999–2010[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	2 637.851	1 255.162
2010	2 873.985	1 365.751

Status: April 2010
Source: Statistik Austria (Bundesanstalt Statistik Österreich)

1) Based on Annex T of the Auxiliary Documents for the Federal Finances Act .
1999–2008 (both actual); 2009 and 2010 (both budget).

Table 10: Research promotion schemes and contracts awarded by the federal government in 2008, broken down by recipients (by economic sectors/areas) and awarding ministries

Ministries	Partial amounts 2008	Analysis of the facts documentation on federal offices in 2008[1] not including "major" global promotion schemes [2]																						
		of which awarded to																						
		Higher education sector							Government sector						Private non-profit sector			Corporate sector						
		Universities (including university hospitals)	Art universities	Austrian Academy of Sciences	Universities of Applied Science	Pedagogical universities	Testing institutes of technical colleges	Total	Federal institutions (excluding higher education sector)	State institutions	Chambers	Private non-profit facilities mostly run on public financing	Ludwig Boltzmann Gesellschaft	Total	Private non-profit sector	Individual researchers	Total	Cooperative sector including competence centres (excluding ARC)	Austrian Research Centres GmbH – ARC	Business sub-sector	Total	Fonds zur Förderung der Wissenschaftlichen Forschung (Austrian Science Fund)	Österreichische Forschungsförderungsgesellschaft mbH	Abroad
	in €	in %																						
BKA	290 728	1.7	-	-	-	-	-	1.7	-	-	-	86.9	-	86.9	-	11.4	11.4	-	-	-	-	-	-	-
BMASK	1 488 976	6.1	-	-	-	-	-	6.1	68.5	-	-	12.5	-	81.0	4.8	2.0	6.8	2.0	-	2.8	4.8	-	-	*1.3*
BMEIA	47 327	-	-	-	-	-	-	-	-	-	-	100.0	-	100.0	-	-	-	-	-	-	-	-	-	-
BMF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BMG	1 286 560	70.4	-	-	-	-	-	70.4	5.1	-	-	8.5	0.1	13.7	5.6	2.9	8.5	-	3.5	3.9	7.4	-	-	-
BMI	412 398	-	-	-	-	-	-	-	-	-	-	99.5	-	99.5	-	-	-	-	-	-	-	-	-	*0.5*
BMJ	60 000	-	-	-	-	-	-	-	-	-	-	100.0	-	100.0	-	-	-	-	-	-	-	-	-	-
BMLFUW	4 053 492	54.1	0.5	-	-	-	-	54.6	17.1	-	-	11.1	1.8	30.0	1.4	0.8	2.2	-	4.5	8.7	13.2	-	-	-
BMLVS	72 500	19.3	-	-	-	-	-	19.3	-	-	-	15.9	-	15.9	-	15.2	15.2	-	-	49.6	49.6	-	-	-
BMUKK	3 668 333	-	-	-	-	-	-	-	96.8	-	-	1.1	-	97.9	1.6	-	1.6	-	-	0.5	0.5	-	-	-
BMVIT	8 662 151	2.5	-	0.3	0.2	-	-	3.0	-	-	-	16.9	-	16.9	5.9	-	5.9	27.1	0.7	45.2	73.0	-	1.0	*0.2*
BMWF	46 920 478	17.6	0.3	15.9	0.3	0.0	0.1	34.2	0.2	0.0	0.0	10.0	0.3	10.5	4.9	1.4	6.3	2.0	0.2	4.6	6.8	-	1.1	*41.1*
BMWFJ	956 327	-	-	-	1.8	-	-	1.8	17.9	-	-	8.5	-	26.4	3.9	-	3.9	4.2	-	62.4	66.6	-	1.3	-
Total	67 919 270	17.3	0.2	11.0	0.2	0.0	0.0	28.7	8.2	0.0	0.0	11.6	0.3	20.1	4.7	1.1	5.8	5.0	0.6	10.5	16.1	-	0.9	***28.4***

Source: Statistik Austria (Bundesanstalt Statistik Österreich)

Table 11: Research promotion schemes and contracts awarded by the federal government in 2008, broken down by recipients, socio-economic objectives and awarding ministries

Ministries		Partial amounts 2008	Analysis of the facts documentation on federal offices in 2008[1] not including "major" global promotion schemes[2]											
			of which											
			Promotion of research on the earth, seas, atmosphere, and space	Promotion of agriculture and forestry	Promotion of trade, commerce, and industry	Promotion of energy production, storage and distribution	Promotion of transport, traffic and communica-tions	Promotion of education	Promotion of health	Promotion of social and socio-economic development	Promotion of environmental protection	Promotion of urban and phy-sical planning	Promotion of national defence	Promotion of general knowledge advancement
BKA	in €	290 728	-	-	-	10 000	-	-	4 976	275 752	-	-	-	-
	in %	100.0	-	-	-	3.4	-	-	1.7	94.9	-	-	-	-
BMASK	in €	1 488 976	-	-	-	-	-	-	20 000	1 462 976	-	-	-	6 000
	in %	100.0	-	-	-	-	-	-	1.3	98.3	-	-	-	0.4
BMEIA	in €	47 327	-	-	-	-	-	-	-	-	-	-	-	47 327
	in %	100.0	-	-	-	-	-	-	-	-	-	-	-	100.0
BMF	in €	-	-	-	-	-	-	-	-	-	-	-	-	-
	in %	-	-	-	-	-	-	-	-	-	-	-	-	-
BMG	in €	1 286 560	7 275	770 317	49 269	-	-	-	244 031	203 668	-	-	-	12 000
	in %	100.0	0.6	59.9	3.8	-	-	-	19.0	15.8	-	-	-	0.9
BMI	in €	412 398	-	-	-	-	-	-	-	412 398	-	-	-	-
	in %	100.0	-	-	-	-	-	-	-	100.0	-	-	-	-
BMJ	in €	60 000	-	-	-	-	-	-	-	55 000	-	-	-	5 000
	in %	100.0	-	-	-	-	-	-	-	91.7	-	-	-	8.3
BMLFUW	in €	4 053 492	200 512	2 756 407	102 223	168 446	-	-	169 963	216 250	142 006	6 443	-	291 242
	in %	100.0	4.9	68.0	2.5	4.2	-	-	4.2	5.3	3.5	0.2	-	7.2
BMLVS	in €	72 500	-	-	-	-	-	-	-	26 500	-	-	-	46 000
	in %	100.0	-	-	-	-	-	-	-	36.6	-	-	-	63.4
BMUKK	in €	3 668 333	-	-	-	-	-	3 137 085	-	-	-	-	-	531 248
	in %	100.0	-	-	-	-	-	85.5	-	-	-	-	-	14.5
BMVIT	in €	8 662 151	238 753	17 000	2 760 807	601 539	3 891 541	-	-	423 787	66 900	-	-	661 824
	in %	100.0	2.8	0.2	31.9	6.9	44.9	-	-	4.9	0.8	-	-	7.6
BMWF	in €	46 920 478	2 165 665	375 503	497 798	60 000	121 116	148 454	9 936 991	5 638 249	429 201	392 433	-	27 155 068
	in %	100.0	4.6	0.8	1.1	0.1	0.3	0.3	21.2	12.0	0.9	0.8	-	57.9
BMWFJ	in €	956 327	-	-	20 000	14 243	-	12 756	-	819 775	4 043	18 600	-	66 910
	in %	100.0	-	-	2.1	1.5	-	1.3	-	85.8	0.4	1.9	-	7.0
Total	in €	**67 919 270**	2 612 205	3 919 227	3 430 097	854 228	4 012 657	3 298 295	10 375 961	9 534 355	642 150	417 476	-	28 822 619
	in %	100.0	3.8	5.8	5.1	1.3	5.9	4.9	15.3	14.0	0.9	0.6	-	42.4

Status: April 2010
Source: Statistik Austria (Bundesanstalt Statistik Österreich)

1) Excerpt from the federal research database (as of October 2009).
2) i.e. excluding global financing for: Fonds zur Förderung der wissenschaftlichen Forschung, Österreichische Forschungsförderungsgesellschaft mbH, Ludwig Boltzmann Gesellschaft, Österreichische Akademie der Wissenschaften, Austrian Research Centers GmbH – ARC.

Table 12: Research promotion schemes and contracts awarded by the federal government in 2008, broken down by scientific branches and awarding ministries

Ministries		Partial amounts 2008	Analysis of the facts documentation on federal offices in 2008[1] not including "major" global promotion schemes[2]					
			of which					
			1.0 Natural sciences	2.0 Engineering and technology	3.0 Medical sciences	4.0 Agricultural sciences	5.0 Social sciences	6.0 Humanities
BKA	in €	290 728	-	10 000	16 974	-	263 754	-
	in %	*100.0*	-	*3.4*	*5.8*	-	*90.8*	-
BMASK	in €	1 488 976	-	-	20 000	-	1 468 976	-
	in %	*100.0*	-	-	*1.3*	-	*98.7*	-
BMEIA	in €	47 327	-	-	-	-	47 327	-
	in %	*100.0*	-	-	-	-	*100.0*	-
BMF	in €	-	-	-	-	-	-	-
	in %	-	-	-	-	-	-	-
BMG	in €	1 286 560	212 300	-	93 000	777 592	203 668	-
	in %	*100.0*	*16.5*	-	*7.2*	*60.5*	*15.8*	-
BMI	in €	412 398	-	-	-	-	410 398	2 000
	in %	*100.0*	-	-	-	-	*99.5*	*0.5*
BMJ	in €	60 000	-	-	-	-	55 000	5 000
	in %	*100.0*	-	-	-	-	*91.7*	*8.3*
BMLFUW	in €	4 053 492	798 111	225 389	-	2 721 103	308 889	-
	in %	*100.0*	*19.7*	*5.6*	-	*67.1*	*7.6*	-
BMLVS	in €	72 500	36 000	-	-	-	36 500	-
	in %	*100.0*	*49.7*	-	-	-	*50.3*	-
BMUKK	in €	3 668 333	-	-	-	-	3 137 085	531 248
	in %	*100.0*	-	-	-	-	*85.5*	*14.5*
BMVIT	in €	8 662 151	553 400	7 462 717	-	17 000	626 034	3 000
	in %	*100.0*	*6.4*	*86.2*	-	*0.2*	*7.2*	*0.0*
BMWF	in €	46 920 478	30 968 665	962 202	5 621 416	27 613	6 704 041	2 636 541
	in %	*100.0*	*65.9*	*2.1*	*12.0*	*0.1*	*14.3*	*5.6*
BMWFJ	in €	956 327	14 043	14 243	-	-	885 499	42 542
	in %	*100.0*	*1.5*	*1.5*	-	-	*92.6*	*4.4*
Total	**in €**	**67 919 270**	**32 582 519**	**8 674 551**	**5 751 390**	**3 543 308**	**14 147 171**	**3 220 331**
	in %	*100.0*	*48.0*	*12.8*	*8.5*	*5.2*	*20.8*	*4.7*

Status: April 2010
Source: Statistik Austria (Bundesanstalt Statistik Österreich)

1) Excerpt from the federal research database (as of October 2009).
2) i.e. excluding global financing for: Fonds zur Förderung der wissenschaftlichen Forschung, Österreichische Forschungsförderungsgesellschaft mbH, Ludwig Boltzmann Gesellschaft, Österreichische Akademie der Wissenschaften, Austrian Research Centers GmbH – ARC.

Table 13: An international comparison of research and experimental development (R&D) in 2007

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			
		State	Business		corporate sector	Higher education sector	Government sector	Private non-profit sector
		%			as a% of gross domestic expenditure on R&D			
Belgium	1.90	22.2	61.4	57,963	69.5	21.1	8.1	1.3
Denmark [a]	2.55	26.0	60.6	46,897	69.5	26.7	3.3	0.5
Germany	2.53	27.7	67.9	506,450	70.0	16.1	13.9 [o]	. [N]
Finland	3.47	24.1	68.2	56,243	72.3	18.7	8.5	0.6
France	2.04 [p]	38.3 [p]	52.1 [p]	372,326	63.3 [p]	19.8 [p]	15.8 [p]	1.2 [P]
Greece	0.58 [c]	46.8 [3]	31.1 [3]	35,629 [c]	26.9 [c]	50.4 [c]	21.4 [c]	1.3 [C]
Ireland [p]	1.28	32.2	49.6	18,212	65.9	27.1	7.0	.
Italy	1.18	44.3	42.0	208,376	51.9	30.1	14.5	3.5
Luxembourg	1.57 [p]	18.0 [c,p]	76.3 [c,p]	4,605 [c]	83.9 [p]	3.0 [p]	13.1 [p]	0.0 [P]
Netherlands	1.71 [p]	36.2 [1]	51.1 [1]	88,584 [p]	56.5 [p]	30.6 [p]	12.9 [o,p]	. [N]
Austria [5]	2.54	32.9	48.7	53,252	70.6	23.8	5.3	0.3
Portugal	1.21	44.6	47.0	35,334	51.2	29.8	9.4	9.7
Sweden	3.61	22.2	64.0	76,827 [a]	73.7	21.3	4.8	0.2 [A]
Spain	1.27	43.7	45.5	201,108	55.9	26.4	17.6	0.2
United Kingdom	1.82	30.2	46.7	349,360 [c]	63.4	25.6	8.8	2.2
EU 15 [b]	1.90	32.7	55.6	2,111,166	64.3	22.4	12.1	1.2
Poland	0.57	58.6	34.3	75,309	30.4	33.9	35.4	0.3
Slovak Republic	0.46	53.9	35.6	15,421	39.6	25.0	35.4 [d]	0.1
Slovenia	1.45	35.6	58.3	10,369	59.8	15.6	24.5	0.1
Czech Republic	1.54	41.2	54.0	49,192	61.9	16.9	20.8	0.4
Hungary	0.97	44.4	43.9	25,954	50.3 [v]	23.4 [v]	24.2 [v]	.
EU 25 [b]	1.80	33.4	55.0	2,313,578	63.5	22.6	12.7	1.2
Romania	0.52	67.1	26.9	28,977	41.6	24.1	34.0	0.3
EU-27 [b]	1.77	33.6	54.9	2,359,495	63.3	22.6	12.9	1.2
Australia [4]	2.06	37.3	58.3	126,070	58.3	25.1	13.7	2.8
Iceland	2.70	38.8	50.4	2,982	54.6	25.1	17.8	2.5
Japan	3.44	15.6 [e]	77.7	937,865	77.9	12.6	7.8	1.8
Canada	1.90	32.9 [c]	47.8	224,106 [c,p,4]	54.5	34.9	10.0	0.6
Korea [g]	3.21	24.8	73.7	269,409	76.2	10.7	11.7	1.5
Mexico	0.37	50.2	45.1	70,293	47.4	26.1	25.2	1.3
New Zealand	1.21	42.7	40.1	24,700	42.7	30.1	27.3	.
Norway	1.64	44.9	45.3	34,086	53.3	31.4 [a]	15.3 [a]	.
Switzerland [2]	2.90	22.7	69.7	52,250	73.7	22.9	1.1 [h]	2.3
Turkey	0.72	47.1	48.5	63,377	41.3	48.2	10.6	.
United States [j]	2.66	28.3	66.2 [o]	.	72.2	13.1	10.9 [h]	3.8
OECD total [b]	2.28	28.1	64.2	.	69.6	17.0	10.9	2.4

Source: OECD (MSTI 2009-2), Statistik Austria (Bundesanstalt Statistik Österreich)

a) Break in the time series. – b) Estimate by the OECD Secretariat (based on national sources). – c) National estimate, where necessary the OECD Secretariat has adjusted them to meet the OECD standards. – d) R&D expenditure on national defence not included. – e) Results of national surveys. Figures have been adjusted by the OECD Secretariat to fit the OECD standards. – 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) 2003. – 2) 2004. – 3) 2005. – 4) 2006. – 5) Statistik Austria; Results of the 2007 survey on research and experimental development.

Full time equivalent = person year.

Table 14: Expenditure on research and experimental development 1993 to 2007[1)] broken down by sectors of performance and financing sectors

Sectors	1993 € 1,000	1993 %	1998 € 1,000	1998 %	2002 € 1,000	2002 %	2004 € 1,000	2004 %	2006 € 1,000	2006 %	2007 € 1,000	2007 %
sectors of performance												
Total	**2,303,311** 1)	100.0	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***
Higher education sector 2)	805,315 1)	35.0	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
Government sector 3)	204,575 1)	8.9	218,951	6.4	266,428	5.7	269,832	5.1	330,232	5.2	367,300	5.3
Private non-profit sector 4)	6,029	0.3	10,486	0.3	20,897	0.4	21,586	0.4	16,519	0.3	17,377	0.3
Corporate sector	1,287,391 1)	55.8	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
of which:												
cooperative sub-sector 5)	107,379	4.7	187,179	5.5	261,682	5.6	347,703	6.6	428,492	6.8	468,219	6.8
business sub-sector	1,180,012 1)	51.1	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*
Sources of funds												
Total	**2,303,311** 1)	100.0	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***
Public sector	1,105,355 1)	48.0	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
Corporate sector	1,128,399	49.0	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
Private non-profit sector	9,864	0.4	12,200	0.4	17,491	0.4	25,201	0.5	26,928	0.4	32,316	0.5
Abroad	59,693	2.6	684,628	20.1	1,001,965	21.4	1,016,611	19.4	1,163,350	18.4	1,230,242	17.9
of which EU	.	.	44,308	1.3	78,281	1.7	86,974	1.7	103,862	1.6	101,094	*1.5*

Source: STATISTIK AUSTRIA, Surveys by STATISTIK AUSTRIA. Compiled on: 27 Oct. 2009

rounding differences. – 1) 1993 including other R&D expenditures not included in the survey that were financed by the public sector. – 2) Universities including hospitals, art universities, the Austrian Academy of Sciences, testing institutes at technical federal colleges as well as (since 2002) universities of applied science, private universities and the Danube University at Krems. 2007 including pedagogical universities. – 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 Statistik Austria prepared an estimate of their R&D expenditures based on the reports of the offices of the provincial governments. – 4) Private non-profit institutions whose status is predominantly private or under civil law, religious or other non-public. – 5) Including Austrian Research Centers GmbH (ARC) in Seibersdorf. Including centres of excellence (since 2002). 1993 including the civil engineers segment and the segment of power plant companies; since the 1998 R&D survey the power plant companies have been included in the business sub-sector; from 2002 the segment of civil engineers has also been included in the business sub-sector.

Table 15: Employees in research and experimental development 1993 to 2007 broken down by sectors of performance

sectors of performance	1993 FTE	1993 %	1998 FTE	1998 %	2002 FTE	2002 %	2004 FTE	2004 %	2006 FTE	2006 %	2007 FTE	2007 %
Total	24,457.7	100.0	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***
Higher education sector 1)	7,135.7	29.2	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
Government sector 2)	2,107.3	8.6	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
Private non-profit sector 3)	100.4	0.4	148.4	0.5	227.2	0.6	212.0	0.5	160.5	0.3	162.4	0.3
Corporate sector	15,114.4	61.8	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
of which:												
cooperative sub-sector 4)	1,355.6	5.5	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
business sub-sector	13,758.7	56.3	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*

Source: STATISTIK AUSTRIA. Compiled on: 02 Sept. 2009

FTE = full-time equivalent (person year). – rounding differences. – 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 science, private universities and the Danube University at Krems. 2007 including pedagogical universities. – 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 Statistik 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, religious or other non-public. – 4) Including Austrian Research Centers GmbH (ARC) in Seibersdorf Including centres of excellence (since 2002). 1993 including the civil engineers segment and the segment of power plant companies; since the 1998 R&D survey the power plant companies have been included in the business sub-sector; from 2002 the segment of civil engineers has also been included in the business sub-sector.

Table 16: Employees in research and experimental development (R&D) by headcount and full-time equivalents in 2007. Table shows the sectors of performance/survey areas and employment categories

Sectors, areas	Units performing R&D	Total	of which		
			researchers	Technicians	Other personnel
			Headcounts		
Total	4,009	89,458	**53,590**	25,623	10,245
1. Higher education sector	1,207	35,269	25,967	5,251	**4,051**
of which:					
1.1 Universities (without hospitals)	962	25,825	18,842	3,870	3,113
1.2 University hospitals	88	5,501	3,965	801	735
1.3 Art universities	46	907	795	57	55
1.4 Academy of Sciences	62	1,281	1,028	238	15
1.5 Universities of applied science	17	1,148	864	195	89
1.6 Private universities [1]	23	525	397	86	42
1.7 Pedagogical universities	9	82	76	4	2
2. Government sector[2]	245	5,500	2,783	1,120	**1,597**
of which:					
2.1 Without the regional hospitals	245	5,500	2,783	1,120	1,597
2.2 regional hospitals	.	.	.	.	.
3. Private non-profit sector[3]	36	337	225	69	43
4. Corporate sector	2,521	48,352	24,615	19,183	**4,554**
of which:					
4.1 cooperative sub-sector [4]	52	5,154	2,890	1,290	974
4.2 Business sub-sector	2,469	43,198	21,725	17,893	3,580
			Full time equivalents		
Total	4,009	53,252.2	31,675.6	16,277.9	5,298.8
1. Higher education sector	1,207	13,613.2	10,112.0	1,990.1	**1,511.1**
of which:					
1.1 Universities (without hospitals)	962	10,730.8	7,946.1	1,496.5	1,288.3
1.2 University hospitals	88	1,352.0	882.4	305.5	164.1
1.3 Art universities	46	192.4	167.7	15.0	9.8
1.4 Academy of Sciences	62	715.5	633.6	73.2	8.8
1.5 Universities of applied science	17	433.9	338.4	70.0	25.5
1.6 Private universities[1]	23	174.5	131.1	28.9	14.4
1.7 Pedagogical universities	9	14.2	12.8	1.0	0.4
2. Government sector[2]	245	2,488.1	1,389.0	387.2	**711.9**
of which:					
2.1 Without regional hospitals	245	2,488.1	1,389.1	387.1	711.9
2.2 regional hospitals	.	.	.	.	.
3. Private non-profit sector[3]	36	162.4	116.7	33.1	12.6
4. Corporate sector	2,521	36,988.6	20,057.8	13,867.6	**3,063.2**
of which:					
4.1 cooperative sub-sector [4]	52	3,397.4	2,072.6	687.3	637.5
4.2 Business sub-sector	2,469	33,591.2	17,985.2	13,180.3	2,425.7

Source: STATISTIK AUSTRIA, Survey on research and experimental development 2007. Compiled on: 03 Sept. 2009

1) Including the Danube University at Krems. – 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 Statistik 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. – 3) Private non-profit institutions whose status is predominantly private or under civil law, religious or other non-public. – 4) Including ARC Seibersdorf Research GmbH and centres of excellence. – rounding differences.

Table 17: Employees in research and experimental development (R&D), headcounts and full-time equivalents in 2007, by sectors of performance/survey areas, occupation and gender

Sectors, areas	No. of units performing R&D	Total		of which					
				Researchers		Technicians		Other personnel	
		male	female	male	female	male	female	male	female
				Headcounts					
Total	4,009	62,887	26,571	39,418	14,172	18,524	7,099	4,945	5,300
1. Higher education sector	1,207	19,476	**15,793**	16,502	9,465	1,813	3,438	1,161	**2,890**
of which:									
1.1 Universities (without hospitals)	962	14,679	11,146	12,244	6,598	1,428	2,442	1,007	2,106
1.2 University hospitals	88	2,589	2,912	2,350	1,615	139	662	100	635
1.3 Art universities	46	478	429	448	347	11	46	19	36
1.4 Academy of Sciences	62	715	566	598	430	116	122	1	14
1.5 Universities of applied science	17	715	433	590	274	98	97	27	62
1.6 Private universities [1]	23	265	260	238	159	20	66	7	35
1.7 Pedagogical universities	9	35	47	34	42	1	3	-	2
2. Government sector[2]	245	3,024	2,476	1,689	1,094	571	549	764	**833**
of which:									
2.1 Without the regional hospitals	245	3,024	2,476	1,689	1,094	571	549	764	833
2.2 regional hospitals	.	.	.	.	.	.	.	.	.
3. Private non-profit sector[3]	36	147	190	117	108	21	48	9	34
4. Corporate sector	2,521	40,240	8,112	21,110	3,505	16,119	3,064	3,011	**1,543**
of which:									
4.1 cooperative sub-sector [4]	52	3,748	1,406	2,328	562	946	344	474	500
4.2 business sub-sector	2,469	36,492	6,706	18,782	2,943	15,173	2,720	2,537	1,043
				Full-time equivalents					
Total	4,009	40,634.8	12,617.5	25,154.6	6,521.0	12,605.1	3,672.8	2,875.1	2,423.7
1. Higher education sector	1,207	7,960.2	5,653.0	6,812.1	3,299.9	672.1	1,318.0	476.0	**1,035.1**
of which:									
1.1 Universities (without hospitals)	962	6,455.5	4,275.4	5,471.2	2,474.9	545.6	950.9	438.6	849.6
1.2 University hospitals	88	598.0	753.9	520.3	362.1	54.0	251.5	23.7	140.3
1.3 Art universities	46	102.4	90.0	97.7	70.0	2.2	12.8	2.5	7.3
1.4 Academy of Sciences	62	425.1	290.4	397.2	236.4	26.9	46.3	1.0	7.8
1.5 Universities of applied science	17	285.5	148.3	242.9	95.6	35.1	34.9	7.6	17.9
1.6 Private universities [1]	23	88.4	86.1	77.6	53.5	8.2	20.8	2.6	11.8
1.7 Pedagogical universities	9	5.3	8.8	5.3	7.6	0.1	0.9	-	0.4
2. Government sector[2]	245	1,471.2	1,016.9	903.1	485.9	199.9	187.3	368.3	**343.7**
of which:									
2.1 Without regional hospitals	245	1,471.2	1,016.9	903.1	485.9	199.9	187.3	368.3	343.6
2.2 regional hospitals	.	.	.	.	.	.	.	.	.
3. Private non-profit sector[3]	36	67.3	95.1	57.3	59.5	8.4	24.7	1.6	11.0
4. Corporate sector	2,521	31,136.0	5,852.5	17,382.1	2,675.7	11,724.7	2,142.8	2,029.2	**1,034.0**
of which:									
4.1 cooperative sub-sector [4]	52	2,579.2	818.1	1,709.7	362.9	526.2	161.0	343.3	294.2
4.2 Company-owned businesses	2,469	28,556.8	5,034.4	15,672.4	2,312.8	11,198.5	1,981.8	1,685.9	739.8

Source: STATISTIK AUSTRIA, Survey of research and experimental development 2007. Compiled on: 03 Sept. 2009

1) Including the Danube University at Krems. – 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 Statistik 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. – 3) Private non-profit institutions whose status is predominantly private or under civil law, religious or other non-public. – 4) Including ARC Seibersdorf Research GmbH and centres of excellence. – rounding differences.

Table 18: Employees in research and experimental development (in full-time equivalents) in all of the areas surveyed[1)] 2007 broken down by state[2)] and occupation

State	No. of units performing R&D	Full-time equivalents in R&D			
		Total	of which		
			Researchers	Technicians	Other personnel
Austria	4,009	53,252.2	31,675.6	16,277.9	**5,298.8**
Burgenland	59	385.3	191.1	137.2	57.0
Carinthia	193	2,525.6	1,851.1	533.5	141.1
Lower Austria	411	4,274.0	1,984.7	1,768.0	521.3
Upper Austria	710	8,021.3	4,109.0	3,180.0	732.3
Salzburg	227	1,953.5	1,209.8	594.5	149.3
Styria	719	9,995.5	5,690.5	2,922.2	1,382.8
Tirol	342	4,076.9	2,595.8	1,125.9	355.2
Vorarlberg	142	1,568.3	751.3	753.1	63.9
Vienna	1,206	20,451.8	13,292.2	5,263.6	1,896.0

Source: STATISTIK AUSTRIA, Survey of research and experimental development 2007. Compiled on: 03/09/2009

1) The regional hospitals were not surveyed by questionnaire, but instead Statistik 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) business sub-sector: – 2) Regional allocation by location of company headquarters. – rounding differences.

Table 19: Expenditure for research and experimental development (R&D) 2007 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 € 1,000				
Total	**4,009** [3)]	6,867,815	3,513,143	2,818,566	449,192	86,914
1. Higher education sector	1,207	1,637,277	770,086	727,474	110,543	**29,174**
of which:						
1.1 Universities (without hospitals)	962	1,270,452	601,650	574,360	92,508	1,934
1.2 University hospitals	88	194,927	82,846	81,633	4,958	25,490
1.3 Art universities	46	22,066	12,912	8,277	877	-
1.4 Academy of Sciences	62	81,475	36,656	36,644	6,694	1,481
1.5 Universities of applied science	17	48,901	23,709	19,996	4,933	263
1.6 Private universities [1)]	23	17,963	11,221	6,280	456	6
1.7 Pedagogical universities	9	1,493	1,092	284	117	-
2. Government sector[2)]	**245** [3)]	367,300	193,392	146,087	18,410	**9,411**
of which:						
2.1 Without the regional hospitals	245	236,835	128,065	89,889	13,880	5,001
2.2 regional hospitals	.	130,465	65,327	56,198	4,530	4,410
3. Private non-profit sector[4)]	**36**	17,377	7,763	8,942	480	192
4. Corporate sector	2,521	4,845,861	2,541,902	1,936,063	319,759	**48,137**
of which:						
4.1 Cooperative sub-sector [5)]	52	468,219	230,412	210,919	23,990	2,898
4.2 Business sub-sector	2,469	4,377,642	2,311,490	1,725,144	295,769	45,239

Source: STATISTIK AUSTRIA, Survey of research and experimental development 2007. Compiled on: 08 Sept. 2009

1) Including the Danube University at Krems. – 2) Federal institutions (not including those combined in the hgiher 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 Statistik Austria prepared an estimate of the R&D expenditures based on the reports of the offices of the provincial governments. – 3) Number of survey units not including regional hospitals. – 4) Private non-profit institutions whose status is predominantly private or under civil law, religious or other non-public. – 5) Including ARC Seibersdorf Research GmbH and centres of excellence.

Table 20: Expenditure on research and experimental development (R&D) in all survey areas[1)] in 2007, 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 € 1,000				
Austria	4,009	6,867,815	3,513,143	2,818,566	449,192	**86,914**
Burgenland	59	37,458	21,615	11,570	4,089	184
Carinthia	193	417,343	191,269	183,249	41,594	1,231
Lower Austria	411	514,866	262,275	200,516	36,139	15,936
Upper Austria	710	1,044,582	508,000	440,764	85,725	10,093
Salzburg	227	210,027	119,604	73,150	12,974	4,299
Styria	719	1,278,536	633,320	537,451	89,987	17,778
Tirol	342	573,778	254,379	263,970	42,453	12,976
Vorarlberg	142	173,229	105,735	55,955	9,532	2,007
Vienna	1,206	2,617,996	1,416,946	1,051,941	126,699	22,410

Source: STATISTIK AUSTRIA, Survey of research and experimental development 2007. Compiled on: 29 Sept. 2009

– 1) Including R&D expenditure estimate for regional hospitals. – 2) In the business sub-sector,the location of the company's headquarters is usually used. – 3) Number of survey units not including regional hospitals.

Table 21: Expenditure for research and experimental development (R&D) 2007 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 € 1,000	in € 1,000	in %	in € 1,000	in %	in € 1,000	in %
Total	4,009	6,737,350	1,182,075	17.5	2,384,029	35.4	3,171,246	47.1
1. Higher education sector	1,207	1,637,277	812,441	49.7	681,882	41.6	142,954	**8.7**
of which:								
1.1 Universities (without hospitals)	962	1,270,452	676,201	53.2	500,318	39.4	93,933	7.4
1.2 University hospitals	88	194,927	51,246	26.3	115,145	59.1	28,536	14.6
1.3 Art universities	46	22,066	8,520	38.6	9,865	44.7	3,681	16.7
1.4 Academy of Sciences	62	81,475	67,237	82.5	10,438	12.8	3,800	4.7
1.5 Universities of applied science	17	48,901	2,433	5.0	34,700	70.9	11,768	24.1
1.6 Private universities[1)]	23	17,963	6,740	37.5	10,274	57.2	949	5.3
1.7 Pedagogical universities	9	1,493	64	4.3	1,142	76.5	287	19.2
2. Government sector[2)]	245	236,835	79,536	33.6	139,488	58.9	17,811	**7.5**
of which:								
2.1 Without the regional hospitals	245	236,835	79,536	33.6	139,488	58.9	17,811	7.5
2.2 regional hospitals	.	.	.		.		.	
3. Private non-profit sector[3)]	36	17,377	6,681	38.4	8,521	49.1	2,175	12.5
4. Corporate sector	2,521	4,845,861	283,417	5.8	1,554,138	32.1	3,008,306	**62.1**
of which:								
4.1 Cooperative sub-sector[4)]	52	468,219	128,729	27.5	243,100	51.9	96,390	20.6
4.2 Business sub-sector	2,469	4,377,642	154,688	3.5	1,311,038	29.9	2,911,916	66.6

Source: STATISTIK AUSTRIA, Survey of research and experimental development 2007. Compiled on: 27 Oct. 2009

1) Including the Danube University at Krems. – 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 Statistik 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 expenses by type of research. – 3) Private non-profit institutions whose status is predominantly private or under civil law, religious or other non-public. – 4) Including ARC Seibersdorf Research GmbH and centres of excellence.

Table 22: Expenditure on research and experimental development (R&D) in all survey areas[1] in 2007, by state[2] and types of research

State	No. of units performing R&D	Total expenditure on R&D [1]	of which					
			Basic research		applied research		experimental development	
		in € 1,000	in € 1,000	in %	in € 1,000	in %	in € 1,000	in %
Austria	4,009	6,737,350	1,182,075	17.5	2,384,029	35.4	3,171,246	**47.1**
Burgenland	59	36,231	2,203	6.1	16,030	44.2	17,998	49.7
Carinthia	193	409,637	21,309	5.2	70,914	17.3	317,414	77.5
Lower Austria	411	496,822	56,811	11.4	194,881	39.2	245,130	49.4
Upper Austria	710	1,036,010	93,169	9.0	406,165	39.2	536,676	51.8
Salzburg	227	205,838	52,820	25.7	67,256	32.7	85,762	41.6
Styria	719	1,253,784	266,494	21.3	459,083	36.6	528,207	42.1
Tirol	342	557,630	159,241	28.6	207,589	37.2	190,800	34.2
Vorarlberg	142	170,100	8,132	4.8	50,487	29.7	111,481	65.5
Vienna	1,206	2,571,298	521,896	20.3	911,624	35.5	1,137,778	44.2

Source: STATISTIK AUSTRIA, Survey of research and experimental development 2007. Compiled on: 27 Oct. 2009

1) Not including R&D expenditure estimate for regional hospitals. The regional hospitals were not surveyed by questionnaire, but instead Statistik 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 expenses by type of research. – 2) In the business sub-sector, the location of the company's headquarters is usually used.

Table 23: Expenditure on research and experimental development (R&D) in all survey areas in 2007 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 company's R&D location(s)[2]	
	in € 1,000	in %	in € 1,000	in %
Austria	6,867,815	100.0	6,867,815	**100.0**
Burgenland	37,458	0.5	35,615	0.5
Carinthia	417,343	6.1	379,025	5.5
Lower Austria	514,866	7.5	576,344	8.4
Upper Austria	1,044,582	15.2	1,084,887	15.8
Salzburg	210,027	3.1	241,376	3.5
Styria	1,278,536	18.6	1,460,064	21.3
Tirol	573,778	8.4	571,368	8.3
Vorarlberg	173,229	2.5	172,489	2.5
Vienna	2,617,996	38.1	2,346,647	34.2

Source: STATISTIK AUSTRIA, Survey of research and experimental development 2007. Compiled on: 27 Oct. 2009

1) The regional classification of the units surveyed and of the private businesses was done strictly according to the state in which the headquarters is located (standard evaluation). – 2) In this more detailed regional evaluation, for private businesses that perform R&D in more than one state the R&D expenditure is allocated to the states 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 2007 by sectors of performance/ survey areas and financing sectors

R&D performed in the sectors, areas	No. of units performing R&D	Total	Financing source								
			Corporate sector	Public sector					Private non-profit sector	Foreign companies, including international organisations (without EU)	EU
				Combined	Federal government[1]	States[2]	Local governments[2]	Other[1]			
		in € 1,000									
Total	**4,009**[5]	6,867,815	3,344,400	2,260,857	1,649,858	263,181	8,657	339,161	32,316	1,129,148	101,094
1. Higher education sector	1,207	1,637,277	93,919	1,445,665	1,218,155	43,010	2,562	181,938	16,870	26,499	**54,324**
of which:											
1.1 Universities (without hospitals)	962	1,270,452	75,009	1,126,851	954,546	21,614	856	149,835	6,813	17,217	44,562
1.2 University hospitals	88	194,927	11,215	172,986	154,999	1,172	16	16,799	620	6,035	4,071
1.3 Art universities	46	22,066	265	21,515	20,582	165	21	747	115	111	60
1.4 Academy of Sciences	62	81,475	495	75,370	62,323	4,586	88	8,373	969	1,523	3,118
1.5 Universities of applied science	17	48,901	5,132	38,899	22,143	10,808	1,485	4,463	2,912	372	1,586
1.6 Private universities[3]	23	17,963	1,803	8,584	2,102	4,665	96	1,721	5,411	1,241	924
1.7 Pedagogical universities	9	1,493	-	1,460	1,460	-	-	-	30	-	3
2. Government sector[4]	**245**[5]	367,300	34,307	313,555	116,758	176,884	4,509	15,404	2,737	2,658	**14,043**
of which:											
2.1 Without the regional hospitals	245	236,835	34,307	183,090	116,758	46,419	4,509	15,404	2,737	2,658	14,043
2.2 regional hospitals	-	130,465	-	130,465	-	130,465	-	-	-	-	-
3. Private non-profit Sector[6]	**36**	17,377	2,551	1,987	575	560	84	768	11,160	126	1,553
4. Corporate sector	2,521	4,845,861	3,213,623	499,650	314,370	42,727	1,502	141,051	1,549	1,099,865	**31,174**
of which:											
4.1 Cooperative sub-sector[7]	52	468,219	93,461	131,741	75,857	22,776	861	32,247	88	232,758	10,171
4.2 Businesses sub-sector	2,469	4,377,642	3,120,162	367,909	238,513	19,951	641	108,804	1,461	867,107	21,003

Source: STATISTIK AUSTRIA, Survey of research and experimental development 2007. Compiled on: 27 Oct. 2009

1) The funds from the research promotion funds and the R&D financing by the higher education sector are included under "Other". – 2) States including Vienna. Local governments without Vienna. – 3) Including the Danube University at Krems. – 4) Federal institutions (not including those combined in the hgiher 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 Statistik Austria prepared an estimate of the R&D expenditures based on the reports of the offices of the provincial governments. – 5) Number of survey units not including regional hospitals. – 6) Private non-profit institutions whose status is predominantly private or under civil law, religious or other non-public. – 7) Including ARC Seibersdorf Research GmbH and centres of excellence.

Table 25: Expenditure on research and experimental development (R&D) in all survey areas [1] in 2007, by state[2] and types of research

State	No. of units performing R&D [3]	Total	Financing source								
			Corporate sector	Public sector					Private non-profit sector	Foreign companies, including international organisations (without EU)	EU
				Combined	Federal government [4]	States [5]	Local governments [5]	Other [4]			
		in € 1,000									
Austria	4,009	6,867,815	3,344,400	2,260,857	1,649,858	263,181	8,657	339,161	32,316	1,129,148	**101,094**
Burgenland	59	37,458	27,878	7,341	2,729	2,360	94	2,158	35	1,876	328
Carinthia	193	417,343	177,964	82,957	48,797	14,868	1,651	17,641	350	154,315	1,757
Lower Austria	411	514,866	377,429	112,379	73,211	24,781	625	13,762	3,924	17,207	3,927
Upper Austria	710	1,044,582	808,995	181,675	109,925	28,075	1,858	41,817	1,361	44,502	8,049
Salzburg	227	210,027	115,848	85,926	62,635	10,308	1,453	11,530	1,264	3,608	3,381
Styria	719	1,278,536	489,889	459,170	317,734	65,164	1,603	74,669	1,718	305,823	21,936
Tirol	342	573,778	265,018	259,252	205,558	23,546	379	29,769	5,253	33,902	10,353
Vorarlberg	142	173,229	134,515	23,849	9,241	10,500	359	3,749	253	13,934	678
Vienna	1,206	2,617,996	946,864	1,048,308	820,028	83,579	635	144,066	18,158	553,981	50,685

Source: STATISTIK AUSTRIA, Survey of research and experimental development 2007. Compiled on: 27 Oct. 2009

– 1) Including R&D expenditure estimate for regional hospitals. – 2) In the business sub-sector, the location of the company's headquarters is usually used. – 3) Number of survey units not including regional hospitals. – 4) The funds from the research promotion funds and the R&D financing by the higher education sector are included under “Other”. – 5) States including Vienna. Local governments without Vienna.

Table 26: Gross regional product (GRP), gross domestic expenditure on R&D and regional research intensitys for 2007

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	270,782	6,867.82	2.54
Eastern Austria	120,650	2,958.61	***2.45***
Burgenland	6,059	35.62	0.59
Lower Austria	42,303	576.34	1.36
Vienna	72,288	2,346.65	*3.25*
Southern Austria	49,472	1,839.09	*3.72*
Carinthia	15,563	379.03	2.44
Styria	33,909	1,460.06	*4.31*
Western Austria	100,661	2,070.12	***2.06***
Upper Austria	44,748	1,084.89	2.42
Salzburg	19,618	241.38	1.23
Tirol	23,866	571.37	2.39
Vorarlberg	12,429	172.49	*1.39*

Source: STATISTIK AUSTRIA. Compiled on: 22 Dec. 2009

1) as at 22 Dec. 2009 – 2) Business sub-sector: Regional allocation according to the company's R&D location(s) – rounding differences.

Table 27: Higher education sector: [1] Employees in research and experimental development (R&D) in 2007, broken down by field of science and occupation

Field of science	No. of units performing R&D	Total	of which		
			Researchers	Technicians	Other personnel
			Headcounts		
1.0 to 6.0 Total	1,207	35,269	25,967	5,251	**4,051**
1.0 to 4.0 Subtotal	694	24,989	17,664	4,214	3,111
1.0 Natural sciences	275	9,299	7,019	1,531	749
2.0 Engineering and technology	191	4,960	3,733	628	599
3.0 Medical sciences	172	9,559	6,243	1,866	1,450
4.0 Agricultural sciences	56	1,171	669	189	313
5.0 and 6.0 Subtotal	513	10,280	8,303	1,037	940
5.0 Social sciences	299	6,093	4,884	639	570
6.0 Humanities	214	4,187	3,419	398	370
			Full-time equivalents		
1.0 to 6.0 Total	1,207	13,613.2	10,112.0	1,990.1	**1,511.1**
1.0 to 4.0 Subtotal	694	10258.4	7367.3	1684.7	1206.4
1.0 Natural sciences	275	4,485.1	3,518.8	598.9	367.4
2.0 Engineering and technology	191	2,101.2	1,611.1	230.6	259.5
3.0 Medical sciences	172	3,169.6	1,941.3	768.9	459.4
4.0 Agricultural sciences	56	502.5	296.0	86.4	120.1
5.0 and 6.0 Subtotal	513	3,354.8	2,744.8	305.3	304.7
5.0 Social sciences	299	2,005.3	1,618.5	193.4	193.4
6.0 Humanities	214	1,349.5	1,126.3	111.9	111.4

Source: STATISTIK AUSTRIA**,** Survey of research and experimental development 2007. Compiled on: 27 Aug. 2009

1) Universities includinguniversity hospitals, art universities, the Austrian Academy of Sciences, universities of applied science, private universities, the Danube University at Krems, pedagogical universities. – rounding differences.

Table 28: Higher education sector:[1)] Expenditure on research and experimental development (R&D) in 2007 broken down by field of science and type of expenditure

Field of science	No. of units performing R&D	Total	of which			
			Labour costs	Other current costs	Instruments and equipment	Land and buildings
		in € 1,000				
1.0 to 6.0 Total	1,207	1,637,277	770,086	727,474	110,543	**29,174**
1.0 to 4.0 Subtotal	694	1,243,831	565,112	556,957	92,943	28,819
1.0 Natural sciences	275	511,573	243,618	220,758	45,312	1,885
2.0 Engineering and technology	191	241,128	114,188	97,936	28,545	459
3.0 Medical sciences	172	423,118	181,723	198,923	16,531	25,941
4.0 Agricultural sciences	56	68,012	25,583	39,340	2,555	534
5.0 and 6.0 Subtotal	513	393,446	204,974	170,517	17,600	355
5.0 Social sciences	299	237,680	120,122	105,526	11,766	266
6.0 Humanities	214	155,766	84,852	64,991	5,834	89

Source: STATISTIK AUSTRIA, Survey of research and experimental development 2007. Compiled on: 11 Sept. 2009

1) Universities includinguniversity hospitals, art universities, the Austrian Academy of Sciences, universities of applied science, private universities, the Danube University at Krems, pedagogical universities.

Table 29: Higher education sector:[1)] Expenditure on research and experimental development (R&D) in 2007 broken down by field of science and type of research

Field of science	No. of units performing R&D	Total expenditure on R&D	of which					
			Basic research		applied research		experimental development	
		in € 1,000	in € 1,000	in %	in € 1,000	in %	in € 1,000	in %
1.0 to 6.0 Total	1,207	1,637,277	812,441	49.7	681,882	41.6	142,954	**8.7**
1.0 to 4.0 Subtotal	694	1,243,831	589,673	47.4	528,263	42.5	125,895	10.1
1.0 Natural sciences	275	511,573	318,000	62.1	158,013	30.9	35,560	7.0
2.0 Engineering and technology	191	241,128	73,416	30.4	135,937	56.4	31,775	13.2
3.0 Medical sciences	172	423,118	172,458	40.8	198,666	46.9	51,994	12.3
4.0 Agricultural sciences	56	68,012	25,799	37.9	35,647	52.4	6,566	9.7
5.0 and 6.0 Subtotal	513	393,446	222,768	56.7	153,619	39.0	17,059	4.3
5.0 Social sciences	299	237,680	107,321	45.2	118,452	49.8	11,907	5.0
6.0 Humanities	214	155,766	115,447	74.1	35,167	22.6	5,152	3.3

Source: STATISTIK AUSTRIA, Survey of research and experimental development 2007. Compiled on: 27 Oct. 2009

1) Universities includinguniversity hospitals, art universities, the Austrian Academy of Sciences, universities of applied science, private universities, the Danube University at Krems, pedagogical universities.

Table 30: Higher education sector:[1] Financing of expenditure for research and experimental development (R&D) in 2007 broken down by field of science and financing source

Field of science	No. of units performing R&D	Financing source									
		Total	Corporate sector	Public sector					Private non-profit sector	Foreign companies, including international organisations (without EU)	EU
				Combined	Federal government[2]	States[3]	Local governments[3]	Other[2]			
		in € 1,000									
1.0 to 6.0 Total	1,207	1,637,277	93,919	1,445,665	1,218,155	43,010	2,562	181,938	16,870	26,499	**54,324**
1.0 to 4.0 Subtotal	694	1,243,831	82,353	1,078,939	888,239	32,525	1,811	156,364	9,729	24,312	48,498
1.0 Natural sciences	275	511,573	20,108	453,669	362,567	14,843	262	75,997	3,172	9,835	24,789
2.0 Engineering and technology	191	241,128	35,140	187,752	147,968	13,027	1,439	25,318	1,729	4,519	11,988
3.0 Medical sciences	172	423,118	25,735	374,401	319,756	4,273	106	50,266	3,939	9,261	9,782
4.0 Agricultural sciences	56	68,012	1,370	63,117	57,948	382	4	4,783	889	697	1,939
5.0 and 6.0 Subtotal	513	393,446	11,566	366,726	329,916	10,485	751	25,574	7,141	2,187	5,826
5.0 Social sciences	299	237,680	10,492	214,678	197,588	5,939	492	10,659	5,850	1,545	5,115
6.0 Humanities	214	155,766	1,074	152,048	132,328	4,546	259	14,915	1,291	642	711

Source: STATISTIK AUSTRIA, Survey of research and experimental development 2007. Compiled on: 27 Oct. 2009

1) Universities including university hospitals, art universities, the Austrian Academy of Sciences, universities of applied science, private universities, the Danube University at Krems, pedagogical universities. – 2) The funds from the research promotion funds and the R&D financing by the higher education sector are included under "Other". – 3) States including Vienna. Local governments without Vienna.

Table 31: Universities[1]: Employees in research and experimental development (R&D) in full-time equivalents in 2007 broken down by field of science and occupation

Field of science	No. of units performing R&D	Full-time equivalents in R&D								
		Total	Researchers						Technicians	Other non-scientific personnel
			Combined	Professors	University lecturers	Junior lecturers	Assistants and demonstrators	Other researchers		
1.0 to 6.0 Total										
excluding hospitals	962	10,730.8	7,946.1	784.5	1,085.3	1,841.8	56.6	4,177.9	1,496.5	1,288.3
including hospitals	1,050	12,082.8	8,828.5	829.3	1,314.7	2,122.6	56.6	4,505.2	1,802.0	**1,452.3**
1.0 to 4.0 Subtotal										
excluding hospitals	561	8,023.9	5,737.0	415.4	724.5	1,069.8	16.5	3,510.8	1,268.0	1,018.9
including hospitals	649	9,375.8	6,619.4	460.2	953.9	1,350.6	16.5	3,838.2	1,573.5	1,182.9
1.0 Natural sciences	252	3,969.7	3,069.5	224.7	404.5	479.1	4.9	1,956.3	542.4	357.9
2.0 Engineering and technology	177	1,886.3	1,426.5	105.9	98.1	328.4	10.6	883.5	207.0	252.8
3.0 Medical sciences										
excluding hospitals	76	1,665.4	945.1	63.7	180.4	186.7	0.2	514.1	432.2	288.1
hospitals	88	1,352.0	882.4	44.8	229.5	280.8	-	327.4	305.5	164.1
including hospitals	164	3,017.3	1,827.4	108.5	409.9	467.4	0.2	841.4	737.7	452.2
4.0 Agricultural sciences	56	502.5	296.0	21.2	41.5	75.7	0.8	156.9	86.4	120.1
5.0 and 6.0 Subtotal	401	2,706.9	2,209.1	369.1	360.8	772.0	40.1	667.0	228.5	269.4
5.0 Social sciences	261	1,709.0	1,395.1	219.7	203.6	568.3	31.2	372.3	143.0	171.0
6.0 Humanities	140	997.9	814.0	149.4	157.2	203.7	9.0	294.7	85.5	98.4

Source: STATISTIK AUSTRIA, Survey of research and experimental development 2007. Compiled on: 27 Aug. 2009

1) Not including art universities. – rounding differences.

Table 32: Universities[1]: Employees (scientific and non-scientific personnel) in 2007 broken down by field of science and occupation. Distribution of working hours with proportionate administrative share, in percent

Field of science	No. of units performing R&D	Total			Researchers: Combined			Researchers: Professors			Researchers: University lecturers			Researchers: Junior lecturers			Researchers: Assistants and demonstrators			Researchers: Other scientific personnel			Tech-nicians			Other non-scientific personnel		
		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	Teaching	Research and experimental development (R&D)	Other work
		Working hours (with proportionate administrative share) in %																										
1.0 to 6.0 Total																												
excluding hospitals	**962**	**27.7**	**61.9**	**10.4**	**29.3**	**63.4**	**7.3**	**41.5**	**50.5**	**8.0**	**41.7**	**50.7**	**7.6**	**37.0**	**53.5**	**9.5**	**65.1**	**21.7**	**13.2**	**12.1**	**82.8**	**5.1**	**19.4**	**56.6**	**24.0**	**27.9**	**59.4**	**12.7**
including hospitals	**1,050**	**25.1**	**56.1**	**18.8**	**26.4**	**56.7**	**16.9**	**39.8**	**48.7**	**11.5**	**35.5**	**43.7**	**20.8**	**29.6**	**42.3**	**28.1**	**65.1**	**21.7**	**13.2**	**11.5**	**82.3**	**6.2**	**17.6**	**56.0**	**26.4**	**26.0**	**53.1**	**20.9**
1.0 to 4.0 Subtotal																												
excluding hospitals	561	22.3	66.4	11.3	23.5	69.1	7.4	39.2	52.1	8.7	40.1	51.9	8.0	34.5	54.6	10.9	74.0	13.6	12.4	6.4	88.7	4.9	15.8	58.7	25.5	24.8	61.1	14.1
including hospitals	649	20.3	57.5	22.2	21.0	58.4	20.6	36.5	48.7	14.8	32.3	42.1	25.6	25.0	38.2	36.8	74.0	13.6	12.4	6.3	87.5	6.2	14.4	57.6	28.0	23.3	52.9	23.8
1.0 Natural sciences	252	22.3	70.4	7.3	22.8	72.0	5.2	38.9	53.7	7.4	41.8	51.8	6.4	35.0	58.1	6.9	79.6	11.2	9.2	5.7	90.7	3.6	18.0	63.1	18.9	24.9	69.3	5.8
2.0 Engineering and technology	177	25.2	64.2	10.6	26.1	67.1	6.8	42.9	49.3	7.8	41.8	51.3	6.9	39.6	53.3	7.1	62.2	18.6	19.2	8.6	85.7	5.7	19.3	48.4	32.3	26.0	64.7	9.3
3.0 Medical sciences																												
excluding hospitals	76	18.5	63.0	18.5	21.2	66.8	12.0	33.4	53.4	13.2	36.0	52.1	11.9	25.8	53.6	20.6	98.7	1.2	0.1	4.3	88.8	6.9	10.9	59.7	29.4	21.2	56.7	22.1
hospitals	88	14.2	31.8	54.0	14.3	28.4	57.3	21.4	29.2	49.4	19.4	25.7	54.9	13.1	17.5	69.4	-	-	-	5.2	76.1	18.7	9.3	53.3	37.4	19.0	28.9	52.1
including hospitals	164	15.9	43.8	40.3	16.5	40.7	42.8	26.8	40.0	33.2	24.2	33.3	42.5	15.4	24.0	60.6	98.7	1.2	0.1	4.6	83.6	11.8	10.2	56.9	32.9	20.0	42.0	38.0
4.0 Agricultural sciences	56	24.6	56.8	18.6	24.2	60.5	15.3	37.9	48.8	13.3	37.4	53.1	9.5	30.2	44.3	25.5	79.7	20.1	0.2	8.0	82.6	9.4	17.0	58.7	24.3	30.1	47.9	22.0
5.0 and 6.0 Subtotal	401	39.8	51.9	8.3	40.5	52.2	7.3	43.8	48.8	7.4	44.6	48.6	6.8	40.4	51.8	7.8	56.9	29.2	13.9	32.8	61.1	6.1	35.2	47.1	17.7	38.0	54.1	7.9
5.0 Social sciences	261	38.9	52.6	8.5	39.5	53.1	7.4	43.6	48.7	7.7	44.6	48.8	6.6	40.4	52.1	7.5	59.2	29.8	11.0	26.0	66.9	7.1	34.5	47.3	18.2	38.5	52.9	8.6
6.0 Humanities	140	41.2	50.9	7.9	42.1	50.8	7.1	44.3	48.7	7.0	44.7	48.3	7.0	40.4	51.1	8.5	49.5	27.1	23.4	39.8	55.2	5.0	36.3	46.8	16.9	37.2	56.1	6.7

Source: STATISTIK AUSTRIA, Survey of research and experimental development 2007. Compiled on: 03 Sept. 2009

1) Not including art universities.

Table 33: Universities[1]: Researchers in research and experimental development in 2007 (headcounts and full-time equivalents) broken down by field of science, gender and age group

Field of science, gender	Headcounts	Full-time equivalents (FTE) for R&D										
		Total	of which for employees aged									
			25 and under	25 to 29 years	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	22,807	8,828.5	176.1	2,367.4	1,881.4	1,148.6	951.6	716.5	565.7	419.4	407.5	194.3
male	14,594	5,991.5	78.0	1,409.2	1,227.6	752.8	665.5	520.0	444.2	350.9	359.9	183.3
female	8,213	2,837.0	98.1	958.2	653.8	395.8	286.0	196.4	121.5	68.5	47.6	**11.0**
1.0 Natural sciences, total	6,308	3,069.5	59.2	991.2	725.7	364.1	273.8	195.1	159.6	114.6	139.7	46.6
male	4,662	2,290.0	31.3	655.3	531.2	278.0	213.6	160.6	137.1	106.7	130.1	46.1
female	1,646	779.5	27.9	336.0	194.4	86.1	60.2	34.5	22.5	7.9	9.6	0.6
2.0 Engineering and technology, total	3,247	1,426.5	25.7	453.8	384.4	192.8	115.5	70.6	72.1	40.8	44.4	26.4
male	2,678	1,214.9	14.4	376.3	326.8	159.4	100.9	64.7	65.7	39.7	41.0	26.0
female	569	211.6	11.3	77.4	57.6	33.5	14.5	6.0	6.4	1.1	3.4	0.4
3.0 Medical sciences, total	6,014	1,827.4	25.7	428.8	363.7	253.4	252.8	190.7	124.2	93.3	71.1	23.8
male	3,470	1,034.2	7.2	165.0	173.3	141.4	167.1	132.9	91.6	73.3	60.6	21.8
female	2,544	793.3	18.5	263.8	190.4	112.0	85.7	57.8	32.7	20.0	10.5	2.0
4.0 Agricultural sciences, total	669	296.0	1.5	55.2	65.4	51.5	43.4	38.3	15.8	11.7	9.7	3.5
male	314	151.7	-	14.6	26.7	25.8	25.4	28.0	11.4	9.2	7.5	3.1
female	355	144.3	1.5	40.6	38.7	25.7	18.0	10.3	4.4	2.5	2.2	0.4
5.0 Social sciences, total	4,222	1,395.1	57.6	357.9	246.8	172.1	143.6	117.1	94.0	87.0	76.3	42.8
male	2,281	822.8	22.8	165.7	131.4	88.1	89.2	76.4	73.3	69.4	64.1	42.4
female	1,941	572.3	34.8	192.2	115.4	84.0	54.4	40.8	20.7	17.6	12.2	0.4
6.0 Humanities, total	2,347	814.0	6.4	80.5	95.6	114.7	122.6	104.6	100.1	72.1	66.4	51.2
male	1,189	478.0	2.3	32.3	38.2	60.2	69.2	57.6	65.2	52.6	56.6	43.9
female	1,158	336.0	4.2	48.2	57.3	54.5	53.4	47.1	34.9	19.4	9.8	7.3

Source: STATISTIK AUSTRIA, Survey of research and experimental development 2007. Compiled on: 2 Sept. 2009

1) Not including art universities. – rounding differences.

Table 34: Universities[1)]: Expenditure on research and experimental development in 2007 broken down by field of science and type of expenditure

Field of science	No. of units performing R&D	Total	of which			
			Labour costs	Other current costs	Instruments and equipment	Land and buildings
		in € 1,000				
1.0 to 6.0 Total						
excluding hospitals	962	1,270,452	601,650	574,360	92,508	1,934
including hospitals	1,050	1,465,379	684,496	655,993	97,466	**27,424**
1.0 to 4.0 Subtotal						
excluding hospitals	561	944,973	435,522	429,728	77,985	1,738
including hospitals	649	1,139,900	518,368	511,361	82,943	27,228
1.0 Natural sciences	252	454,690	218,083	195,612	40,575	420
2.0 Engineering and technology	177	212,158	101,461	84,696	25,651	350
3.0 Medical sciences						
excluding hospitals	76	210,113	90,395	110,080	9,204	434
hospitals	88	194,927	82,846	81,633	4,958	25,490
including hospitals	164	405,040	173,241	191,713	14,162	25,924
4.0 Agricultural sciences	56	68,012	25,583	39,340	2,555	534
5.0 and 6.0 Subtotal	401	325,479	166,128	144,632	14,523	196
5.0 Social sciences	261	204,258	102,705	91,855	9,586	112
6.0 Humanities	140	121,221	63,423	52,777	4,937	84

Source: STATISTIK AUSTRIA, Survey of research and experimental development 2007. Compiled on: 8 Sept. 2009

1) Not including art universities.

Table 35: Universities[1)]: Expenditure on research and experimental development in 2007 broken down by field of science and type of research

Field of science	No. of units performing R&D	Total expenditure on R&D	of which					
			Basic research		applied research		experimental development	
		in € 1,000	in € 1,000	in %	in € 1,000	in %	in € 1,000	in %
1.0 to 6.0 Total								
excluding hospitals	962	1,270,452	676,201	53.2	500,318	39.4	93,933	7.4
including hospitals	1,050	1,465,379	727,447	49.6	615,463	42.0	122,469	**8.4**
1.0 to 4.0 Subtotal								
excluding hospitals	561	944,973	481,218	50.9	378,806	40.1	84,949	9.0
including hospitals	649	1,139,900	532,464	46.7	493,951	43.3	113,485	10.0
1.0 Natural sciences	252	454,690	273,472	60.1	149,996	33.0	31,222	6.9
2.0 Engineering and technology	177	212,158	71,138	33.5	117,034	55.2	23,986	11.3
3.0 Medical sciences								
excluding hospitals	76	210,113	110,809	52.7	76,129	36.2	23,175	11.0
hospitals	88	194,927	51,246	26.3	115,145	59.1	28,536	14.6
including hospitals	164	405,040	162,055	40.0	191,274	47.2	51,711	12.8
4.0 Agricultural sciences	56	68,012	25,799	37.9	35,647	52.4	6,566	9.7
5.0 and 6.0 Subtotal	401	325,479	194,983	59.9	121,512	37.3	8,984	2.8
5.0 Social sciences	261	204,258	99,795	48.9	96,735	47.4	7,728	3.8
6.0 Humanities	140	121,221	95,188	78.5	24,777	20.4	1,256	1.0

Source: STATISTIK AUSTRIA, Survey of research and experimental development 2007. Compiled on: 27 Oct. 2009

1) Not including art universities.

Table 36: Universities[1]: Financing of expenditure for research and experimental development (R&D) in 2007 broken down by field of science and financing source

Field of science	No. of units performing R&D	Financing source									
		Total	Corporate sector	Public sector					Private non-profit sector	Foreign companies, including international organisations (without EU)	EU
				Combined	Federal government 2)	States 3)	Local governments 3)	Other 2)			
		in € 1,000									
1.0 to 6.0 Total											
excluding hospitals	962	1,270,452	75,009	1,126,851	954,546	21,614	856	149,835	6,813	17,217	44,562
including hospitals	1,050	1,465,379	86,224	1,299,837	1,109,545	22,786	872	166,634	7,433	23,252	**48,633**
1.0 to 4.0 Subtotal											
excluding hospitals	561	944,973	65,113	818,794	671,062	17,733	565	129,434	5,312	15,559	40,195
including hospitals	649	1,139,900	76,328	991,780	826,061	18,905	581	146,233	5,932	21,594	44,266
1.0 Natural sciences	252	454,690	18,024	402,959	322,555	9,828	262	70,314	2,869	8,512	22,326
2.0 Engineering and technology	177	212,158	32,993	163,221	134,064	6,295	296	22,566	603	4,386	10,955
3.0 Medical sciences											
excluding hospitals	76	210,113	12,726	189,497	156,495	1,228	3	31,771	951	1,964	4,975
hospitals	88	194,927	11,215	172,986	154,999	1,172	16	16,799	620	6,035	4,071
including hospitals	164	405,040	23,941	362,483	311,494	2,400	19	48,570	1,571	7,999	9,046
4.0 Agricultural sciences	56	68,012	1,370	63,117	57,948	382	4	4,783	889	697	1,939
5.0 and 6.0 Subtotal	401	325,479	9,896	308,057	283,484	3,881	291	20,401	1,501	1,658	4,367
5.0 Social sciences	261	204,258	9,155	189,348	177,734	2,627	147	8,840	933	1,108	3,714
6.0 Humanities	140	121,221	741	118,709	105,750	1,254	144	11,561	568	550	653

Source: STATISTIK AUSTRIA, Survey of research and experimental development 2007. Compiled on: 27 Oct. 2009

1) Not including art universities. – 2) The funds from the research promotion funds and the R&D financing by the higher education sector are included under "Other". – 3) States including Vienna. Local governments without Vienna.

Table 37: Government sector:[1] Employees in research and experimental development (R&D) in 2007, broken down by field of science and occupation

Field of science	No. of units performing R&D	Total	of which		
			Researchers	Technicians	Other personnel
			Headcounts		
1.0 to 6.0 Total	**245**	**5,500**	**2,783**	**1,120**	**1,597**
1.0 to 4.0 Subtotal	100	2,894	1,358	665	871
1.0 Natural sciences	33	907	477	214	216
2.0 Engineering and technology	15	641	372	140	129
3.0 Medical sciences	31	247	155	72	20
4.0 Agricultural sciences	21	1,099	354	239	506
5.0 and 6.0 Subtotal	145	2,606	1,425	455	726
5.0 Social sciences	76	1,002	702	192	108
6.0 Humanities	69	1,604	723	263	618
			Full-time equivalents		
1.0 to 6.0 Total	**245**	**2,488.1**	**1,389.0**	**387.2**	**711.9**
1.0 to 4.0 Subtotal	100	1,399.0	708.5	252.2	438.2
1.0 Natural sciences	33	380.1	237.3	67.6	75.3
2.0 Engineering and technology	15	288.8	206.8	38.6	43.4
3.0 Medical sciences	31	115.9	73.4	31.4	11.1
4.0 Agricultural sciences	21	614.1	191.0	114.6	308.4
5.0 and 6.0 Subtotal	145	1,089.2	680.5	134.9	273.7
5.0 Social sciences	76	466.0	352.1	72.8	41.1
6.0 Humanities	69	623.2	328.4	62.1	232.7

Source: STATISTIK AUSTRIA, Survey of research and experimental development 2007. Compiled on: 03 Sept. 2009

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; without regional hospitals. The regional hospitals were not surveyed by questionnaire, but instead Statistik 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 2007, broken down by legal entities and occupation

Legal entity	No. of units performing R&D	Total	of which		
			Researchers	Technicians	Other personnel
			Headcounts		
Total	**245**	**5,500**	**2,783**	**1,120**	**1,597**
Federal	44	2,530	1,029	553	948
States (including Vienna)	34	735	264	114	357
Local governments (without Vienna)	8	149	78	27	44
Chambers [2]	5	34	20	1	13
Social insurance institutions [2]	.	.	.	.	.
Private non-profit institutions [3]	115	1,665	1,110	345	210
Ludwig Boltzmann Gesellschaft	39	387	282	80	25
			Full-time equivalents		
Total	**245**	**2,488.1**	**1,389.0**	**387.2**	**711.9**
Federal	44	1,189.7	490.9	204.3	494.6
States (including Vienna)	34	215.9	102.0	16.6	97.3
Local governments (without Vienna)	8	58.7	37.2	7.2	14.3
Chambers [2]	5	13.4	9.3	0.9	3.2
Social insurance institutions [2]	.	.	.	.	.
Private non-profit institutions [3]	115	832.7	617.4	123.1	92.1
Ludwig Boltzmann Gesellschaft	39	177.9	132.3	35.1	10.5

Source: STATISTIK AUSTRIA, Survey of research and experimental development 2007. Compiled on: 03 Sept. 2009

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; without regional hospitals. The regional hospitals were not surveyed by questionnaire, but instead Statistik 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) In order to keep the data confidential these figures can only be reported together. – 3) Private non-profit institutions primarily financed/supervised by the public sector. – rounding differences.

Table 39: Government sector:[1] Expenditure on research and experimental development in 2007 broken down by field of science and type of expenditure

Field of science	No. of units performing R&D	Total	of which			
			Labour costs	Other current costs	Instruments and equipment	Land and buildings
		in € 1,000				
1.0 to 6.0 Total	**245 [2]**	**367,300**	**193,392**	**146,087**	**18,410**	**9,411**
1.0 to 4.0 Subtotal	100 [2]	247,875	133,907	94,656	12,701	6,611
1.0 Natural sciences	33	43,383	19,257	19,508	4,058	560
2.0 Engineering and technology	15	25,335	16,485	7,685	1,128	37
3.0 Medical sciences	31 [2]	138,305	70,694	58,131	5,066	4,414
4.0 Agricultural sciences	21	40,852	27,471	9,332	2,449	1,600
5.0 and 6.0 Subtotal	145	119,425	59,485	51,431	5,709	2,800
5.0 Social sciences	76	42,146	28,977	12,068	531	570
6.0 Humanities	69	77,279	30,508	39,363	5,178	2,230

Source: STATISTIK AUSTRIA, Survey of research and experimental development 2007. Compiled on: 11 Sept. 2009

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 Statistik 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 2007 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 € 1,000				
Total	**245 [2]**	**367,300**	**193,392**	**146,087**	**18,410**	**9,411**
Federal	44	105,752	57,257	36,276	9,758	2,461
States (including Vienna)	34 [2]	169,744	76,257	82,533	5,709	5,245
Local governments (without Vienna)	8	6,708	2,526	2,652	396	1,134
Chambers	5 [4]	1,173 [4]	931 [4]	242 [4]	- [4]	- [4]
Social insurance institutions	. [4]	. [4]	. [4]	. [4]	. [4]	. [4]
Private non-profit institutions [3]	115	72,299	48,588	21,192	2,008	511
Ludwig Boltzmann Gesellschaft	39	11,624	7,833	3,192	539	60

Source: STATISTIK AUSTRIA, Survey of research and experimental development 2007. Compiled on: 27 Oct. 2009

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 Statistik 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. – 4) In order to keep the data confidential these figures can only be reported together.

Table 41: Government sector:[1] Expenditure on research and experimental development (R&D) in 2007 broken down by field of science and type of research

Field of science	No. of units performing R&D	Total expenditure on R&D	of which					
			Basic research		applied research		experimental development	
		in € 1,000	in € 1,000	in %	in € 1,000	in %	in € 1,000	in %
1.0 to 6.0 Total	245	236,835	79,536	33.6	139,488	58.9	17,811	**7.5**
1.0 to 4.0 Subtotal	100	117,410	21,855	18.6	79,562	67.8	15,993	13.6
1.0 Natural sciences	33	43,383	15,896	36.6	24,505	56.5	2,982	6.9
2.0 Engineering and technology	15	25,335	1,843	7.3	17,149	67.7	6,343	25.0
3.0 Medical sciences	31	7,840	1,339	17.1	5,450	69.5	1,051	13.4
4.0 Agricultural sciences	21	40,852	2,777	6.8	32,458	79.5	5,617	13.7
5.0 and 6.0 Subtotal	145	119,425	57,681	48.3	59,926	50.2	1,818	1.5
5.0 Social sciences	76	42,146	8,699	20.6	32,317	76.7	1,130	2.7
6.0 Humanities	69	77,279	48,982	63.4	27,609	35.7	688	0.9

Source: STATISTIK AUSTRIA, Survey of research and experimental development 2007. Compiled on: 27 Oct. 2009

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; without regional hospitals. The regional hospitals were not surveyed by questionnaire, but instead Statistik 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 expenses by type of research.

Table 42: Government sector:[1] Expenditure on research and experimental development (R&D) in 2007 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 € 1,000	in € 1,000	in %	in € 1,000	in %	in € 1,000	in %
Total	**245**	236,835	79,536	33.6	139,488	58.9	17,811	7.5
Federal	44	105,752	37,045	35.0	61,450	58.1	7,257	6.9
States (including Vienna)	34	39,279	18,829	47.9	19,707	50.2	743	1.9
Local governments (without Vienna)	8	6,708	3,559	53.1	2,208	32.9	941	14.0
Chambers	5 [3]	1,173 [3]	101 [3]	8.6 [3]	910 [3]	77.6 [3]	162 [3]	13.8 [3]
Social insurance institutions	. [3]	. [3]	. [3]	. [3]	. [3]	. [3]	. [3]	. [3]
Private non-profit institutions [2]	115	72,299	15,470	21.4	49,171	68.0	7,658	10.6
Ludwig Boltzmann Gesellschaft	39	11,624	4,532	39.0	6,042	52.0	1,050	9.0

Source: STATISTIK AUSTRIA, Survey of research and experimental development 2007. Compiled on: 27 Oct. 2009

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; without regional hospitals. The regional hospitals were not surveyed by questionnaire, but instead Statistik 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 expenses by type of research. – 2) Private non-profit institutions primarily financed/supervised by the public sector. – 3) In order to keep the data confidential these figures can only be reported together.

Table 43: Government sector:[1] Financing of expenditure for research and experimental development (R&D) in 2007 broken down by field of science and financing source

Field of science	No. of units performing R&D	Financing source									
		Total	Corporate sector	Public sector					Private non-profit sector	Foreign companies, including internati-onal organisations (without EU)	EU
				Combined	Federal government [2]	States [3]	Local govern-ments[3]	Other [2]			
		in € 1,000									
1.0 to 6.0 Total	**245** [4]	367,300	34,307	313,555	116,758	176,884	4,509	15,404	2,737	2,658	**14,043**
1.0 to 4.0 Subtotal	100 [4]	247,875	12,082	226,909	68,418	147,700	1,971	8,820	806	1,114	6,964
1.0 Natural sciences	33	43,383	1,283	39,191	22,850	13,348	1,823	1,170	437	457	2,015
2.0 Engineering and technology	15	25,335	7,607	15,067	9,232	1,412	68	4,355	202	402	2,057
3.0 Medical sciences	31 [4]	138,305	1,106	136,401	2,566	130,651	32	3,152	68	252	478
4.0 Agricultural sciences	21	40,852	2,086	36,250	33,770	2,289	48	143	99	3	2,414
5.0 and 6.0 Subtotal	145	119,425	22,225	86,646	48,340	29,184	2,538	6,584	1,931	1,544	7,079
5.0 Social sciences	76	42,146	5,915	28,638	18,936	4,674	141	4,887	1,161	871	5,561
6.0 Humanities	69	77,279	16,310	58,008	29,404	24,510	2,397	1,697	770	673	1,518

Source: STATISTIK AUSTRIA, Survey of research and experimental development 2007. Compiled on: 27 Oct. 2009

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 Statistik 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 research promotion funds and the R&D financing by the higher education sector are included under "Other". – 3) States 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 2007 broken down by legal entities and financing sources

Legal entity	No. of units performing R&D	Financing source									
		Total	Corporate sector	Public sector					Private non-profit sector	Foreign companies, including international organisations (without EU)	EU
				Combined	Federal government [2]	States [3]	Local govern-ments[3]	Other [2]			
		in € 1,000									
Total	**245** [4]	**367,300**	34,307	313,555	116,758	176,884	4,509	15,404	2,737	2,658	14,043
Federal	44	105,752	15,647	86,048	85,385	216	9	438	438	683	2,936
States (including Vienna)	34 [4]	169,744	1,444	167,965	37	167,099	782	47	252	0	83
Local governments (without Vienna)	8	6,708	1,157	5,487	525	1,601	3,325	36	21	4	39
Chambers	5 [6]	1,173 [6]	119 [6]	1,054 [6]	37 [6]	25 [6]	- [6]	992 [6]	- [6]	- [6]	- [6]
Social insurance institutions	. [6]	. [6]	. [6]	. [6]	. [6]	. [6]	. [6]	. [6]	. [6]	. [6]	. [6]
Private non-profit institutions [5]	115	72,299	14,326	44,872	25,927	7,745	349	10,851	1,963	1,652	9,486
Ludwig Boltzmann Gesellschaft	39	11,624	1,614	8,129	4,847	198	44	3,040	63	319	1,499

Source: STATISTIK AUSTRIA, Survey of research and experimental development 2007. Compiled on: 27 Oct. 2009

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 Statistik 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 research promotion funds and the R&D financing by the higher education sector are included under "Other". – 3) States 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. – 6) In order to keep the data confidential these figures can only be reported together.

Table 45: Private non-profit sector:[1] Employees in research and experimental development (R&D) in 2007, broken down by field of science and occupation

Field of science	No. of units performing R&D	Total	of which		
			Researchers	Technicians	Other personnel
			Headcounts		
1.0 to 6.0 Total	**36**	337	225	69	43
1.0 to 4.0 Subtotal	17	211	140	48	23
1.0 Natural sciences	5	38	27	4	7
2.0 Engineering and technology	8	84	53	20	11
3.0 Medical sciences	4 [2]	89 [2]	60 [2]	24 [2]	5 [2]
4.0 Agricultural sciences	. [2]	. [2]	. [2]	. [2]	. [2]
5.0 and 6.0 Subtotal	19	126	85	21	20
5.0 Social sciences	14	105	71	16	18
6.0 Humanities	5	21	14	5	2
			Full-time equivalents		
1.0 to 6.0 Total	**36**	162.4	116.7	33.1	12.6
1.0 to 4.0 Subtotal	17	120.2	83.7	29.3	7.2
1.0 Natural sciences	5	14.7	11.0	1.6	2.2
2.0 Engineering and technology	8	38.9	30.2	5.7	3.0
3.0 Medical sciences	4 [2]	66.6 [2]	42.6 [2]	22.1 [2]	2.0 [2]
4.0 Agricultural sciences	. [2]	. [2]	. [2]	. [2]	. [2]
5.0 and 6.0 Subtotal	19	42.2	33.0	3.8	5.4
5.0 Social sciences	14	38.1	30.1	3.0	5.0
6.0 Humanities	5	4.1	3.0	0.8	0.4

Source: STATISTIK AUSTRIA, Survey of research and experimental development 2007. Compiled on: 03 Sept. 2009

1) Private non-profit institutions whose status is predominantly private or under civil law, religious, 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 2007 broken down by field of science and type of expenditure

Field of science	No. of units performing R&D	Total	of which			
			Labour costs	Other current costs	Instruments and equipment	Land and buildings
		in € 1,000				
1.0 to 6.0 Total	**36**	17,377	7,763	8,942	480	192
1.0 to 4.0 Subtotal	17	14,238	5,848	7,751	447	192
1.0 Natural sciences	5	880	447	379	54	-
2.0 Engineering and technology	8	5,856	2,059	3,697	100	-
3.0 Medical sciences	4[2]	7,502[2]	3,342[2]	3,675[2]	293[2]	192[2]
4.0 Agricultural sciences	.[2]	.[2]	.[2]	.[2]	.[2]	.[2]
5.0 and 6.0 Subtotal	19	3,139	1,915	1,191	33	-
5.0 Social sciences	14	2,979	1,815	1,134	30	-
6.0 Humanities	5	160	100	57	3	-

Source: STATISTIK AUSTRIA, Survey of research and experimental development 2007. Compiled on: 11 Sept. 2009

1) Private non-profit institutions whose status is predominantly private or under civil law, religious, 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 2007 broken down by field of science and type of research

Field of science	No. of units performing R&D	Total expenditure on R&D	of which					
			Basic research		Applied research		Experimental development	
		in € 1,000	in € 1,000	in %	in € 1,000	in %	in € 1,000	in %
1.0 to 6.0 Total	**36**	17,377	6,681	38.4	8,521	49.1	2,175	12.5
1.0 to 4.0 Subtotal	17	14,238	5,741	40.3	6,928	48.7	1,569	11.0
1.0 Natural sciences	5	880	765	86.9	115	13.1	-	-
2.0 Engineering and technology	8	5,856	1,666	28.4	3,629	62.0	561	9.6
3.0 Medical sciences	4[2]	7,502[2]	3,310[2]	44.2[2]	3,184[2]	42.4[2]	1,008[2]	13.4[2]
4.0 Agricultural sciences	.[2]	.[2]	.[2]	.[2]	.[2]	.[2]	.[2]	.[2]
5.0 and 6.0 Subtotal	19	3,139	940	29.9	1,593	50.8	606	19.3
5.0 Social sciences	14	2,979	907	30.4	1,569	52.7	503	16.9
6.0 Humanities	5	160	33	20.6	24	15.0	103	64.4

Source: STATISTIK AUSTRIA, Survey of research and experimental development 2007. Compiled on: 27 Oct. 2009

1) Private non-profit institutions whose status is predominantly private or under civil law, religious, 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 2007 broken down by field of science and financing source

Field of science	No. of units performing R&D	Financing source									
		Total	Corporate sector	Public sector					Private non-profit sector	Foreign companies, including international organisations (without EU)	EU
				Combined	Federal government[2]	States[3]	Local governments[3]	Other[2]			
		in € 1,000									
1.0 to 6.0 Total	**36**	17,377	2,551	1,987	575	560	84	768	11,160	126	1,553
1.0 to 4.0 Subtotal	17	14,238	967	1,137	338	297	64	438	10,755	52	1,327
1.0 Natural sciences	5	880	65	103	17	61	25	-	709	3	-
2.0 Engineering and technology	8	5,856	671	447	123	226	39	59	3,539	49	1,150
3.0 Medical sciences	4[4]	7,502[4]	231[4]	587[4]	198[4]	10[4]	-	379[4]	6,507[4]	-[4]	177[4]
4.0 Agricultural sciences	.[4]	.[4]	.[4]	.[4]	.[4]	.[4]	.	.[4]	.[4]	.[4]	.[4]
5.0 and 6.0 Subtotal	19	3,139	1,584	850	237	263	20	330	405	74	226
5.0 Social sciences	14	2,979	1,462	833	237	246	20	330	384	74	226
6.0 Humanities	5	160	122	17	-	17	-	-	21	-	-

Source: STATISTIK AUSTRIA, Survey of research and experimental development 2007. Compiled on: 27 Oct. 2009

1) Private non-profit institutions whose status is predominantly private or under civil law, religious, or other non-public. – 2) The funds from the research promotion funds are included under "Other". – 3) States including Vienna. Local governments without Vienna. – 4) In order to keep the data confidential these figures can only be reported together.

Table 49: Corporate sector:[1] Employees in research and experimental development (R&D) in 2007, classified by industry, number of employees and occupation

Industry/ number of employees		No. of units performing R&D	Total headcounts in R&D	Full-time equivalents in R&D			
				Total	Scientists and engineers[2],	Technicians[3]	Other scientific personnel
Total		**2,521**	**48,352**	**36,988.6**	**20,057.8**	**13,867.6**	**3,063.2**
Industry							
01+02+05	Agriculture and forestry, fishing	4	64	15.5	5.6	9.8	0.1
10-14	Mining and quarrying of rocks and soils	9	90	53.4	10.6	42.3	0.5
15-37	Manufacturing	1,391	31,621	25,741.1	13,483.5	10,235.3	2,022.3
15	Foods and luxury foods, beverages	93	545	268.1	159.7	86.8	21.6
16	Tobacco processing	.[4]	.[4]	.[4]	.[4]	.[4]	.[4]
17	Textiles and textile products (without apparel)	28	338	254.8	92.8	132.1	29.9
18+19	Apparel, leather, footwear	15	78	48.5	17.7	25.9	4.9
20	Wood (without furniture production)	49	271	129.1	58.3	49.7	21.1
21	Pulp, paper and paper products	25	167	128.7	54.4	66.7	7.6
22	Publishing, printing and reproduction of recorded media	13	151	106.4	38.8	62.6	5.0
23	Manufacture of coke, refined petroleum products, nuclear fuel	.[4]	.[4]	.[4]	.[4]	.[4]	.[4]
24 without 24.4	Chemicals and chemical products (except pharmaceuticals)	76	1,484	1,235.0	467.6	669.6	97.8
24.4	Pharmaceuticals, medicinal chemicals and botanical products	31	1,754	1,521.2	951.1	440.9	129.2
25	Rubber and plastic products	92	1,322	1,008.3	357.3	475.2	175.8
26	Other non-metallic mineral products	63	866	693.2	514.5	141.9	36.8
27.1-27.3 and 27.51/52	Basic iron, steel, ferro-alloys, tubes, iron and steel casting	28	827	455.5	238.9	157.9	58.7
27.4+27.53/54	Non-ferrous metals, light and heavy metal casting	27	466	253.9	114.4	115.8	23.7
28	Metal products	140	1,470	842.7	320.6	442.3	79.8
29	Machinery and equipment	312	6,047	4,848.6	1,988.2	2,406.3	454.1
30	Office machinery and computers	14	238	202.9	92.1	109.3	1.5
31	Electrical machinery and apparatus n.e.c.	79	5,232	4,676.4	3,194.8	1,365.1	116.5
32 without 32.1	Radio, television and communication equipment and apparatus(without electronic components)	25	978	930.9	379.3	463.0	88.6
32.1	Electronic components	35	1,988	1,897.0	1,639.8	232.3	24.9
33 without 33.1	Precision and optical instruments	83	1,258	906.1	477.3	409.8	19.0
33.1	Medical instruments	34	683	596.6	371.7	184.3	40.6
34	Motor vehicles, trailers and semi-trailers	44	2,987	2,819.3	1,234.3	1,146.3	438.7
35	Manufacture of other transport equipment	17	1,253	976.2	329.1	548.4	98.7
36 without 36.1	Manufacturing n.e.c.	27	721	545.2	198.6	319.1	27.5
36.1	Furniture	35	399	311.9	168.7	127.3	15.9
37	Recycling	3	8	1.6	0.2	0.9	0.5
40+41	Electricity, gas and water supply	23	213	65.5	28.9	25.7	10.9
45	Construction	71	357	181.2	80.0	81.5	19.7
50-93	Services	1,023	16,007	10,931.9	6,449.2	3,473.0	1,009.7
50-52	Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	199	1,790	1,373.5	645.6	629.3	98.6
55	Hotels and restaurants	-	-	-	-	-	-
60-64	Transport, storage and communication	27	587	506.0	440.8	45.5	19.7
65-67	Financial intermediation	6	143	80.5	48.7	31.8	-
70+71+74	Real estate, renting and business-related services	275	3,791	2,506.5	1,450.4	675.3	380.8
72 without 72.2	Computer and related activities (without software consultancy and supply)	45	897	575.9	254.0	276.6	45.3
72.2	Software consultancy and supply	241	3,535	2,192.0	1,265.6	881.5	44.9
73	Research and development	212	5,090	3,624.7	2,322.1	901.7	400.9
75-93	Public administration, education, health and other community, social and personal service activities	18	174	72.7	22.0	31.2	19.5
Number of employees							
1–49 employees		1,358	8,466	5,038.6	2,951.4	1,796.2	290.9
50–249 employees		740	10,950	7,296.8	3,728.8	3,073.8	494.1
250 and more employees		423	28,936	24,653.2	13,377.5	8,997.6	2,278.1

Source: STATISTIK AUSTRIA, Survey of research and experimental development 2007. Compiled on: 28 Aug. 2009

1) Includes the cooperative sub-sector and the business sub-sector. – 2) University graduates 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: Corporate sector:[1] Scientists, engineers in research and experimental development RR&D) in 2007 broken down by industry, education and gender

Industry		Number of survey units performing R&D	Full-time equivalents in R&D														
			Total		of which												
					Level of university education completed: Doctorate		Completed university or university of applied sciences education: postgraduate (masters)		Non-university post-secondary education or university education not completed		Master craftsman examination or foreman courses		School leaving examination, medium-level technical school, vocational training completed		Other education	
			male	female	male	female	male	female	male	female	male	female	male	female	male	female
Total		**2,521**	**17,382.1**	**2,675.7**	**2,704.8**	**623.1**	**7,632.3**	**1,025.6**	**468.6**	**143.9**	**446.4**	**21.4**	**5,622.5**	**652.5**	**507.6**	**209.2**
01+02+05	Agriculture and forestry, fishing	4	3.1	2.5	0.5	0.5	1.7	2.0	-	-	0.5	-	0.3	-	0.1	-
10-14	Mining and quarrying of rocks and soils	9	9.8	0.8	2.1	-	6.7	0.6	-	-	0.7	-	0.3	0.2	-	-
15-37	Manufacturing	1,391	11,932.5	1,551.0	1,464.3	293.2	4,832.7	478.2	297.4	99.2	394.9	18.4	4,507.3	478.1	435.9	183.9
15	Foods and luxury foods, beverages	93	112.8	46.9	16.6	2.7	35.5	31.0	4.0	1.3	26.7	2.3	28.1	7.0	1.9	2.6
16	Tobacco processing	.[2]	.[2]	.[2]	.[2]	.[2]	.[2]	.[2]	.[2]	.[2]	.[2]	.[2]	.[2]	.[2]	.[2]	.[2]
17	Textiles and textile products (without apparel)	28	73.4	19.4	5.0	4.0	15.3	5.8	-	4.0	5.3	0.3	46.8	4.6	1.0	0.7
18+19	Apparel, leather, footwear	15	14.5	3.2	2.0	-	1.5	1.1	-	-	5.0	-	1.5	2.1	4.5	-
20	Wood (without furniture production)	49	56.4	1.9	4.3	-	23.9	0.9	4.0	-	7.9	-	15.3	1.0	1.0	-
21	Pulp, paper and paper products	25	39.2	15.2	12.2	3.0	11.8	7.0	2.7	1.0	5.7	-	6.8	3.2	-	1.0
22	Publishing, printing and reproduction of recorded media	13	34.3	4.5	6.9	1.0	20.1	3.0	2.0	-	1.6	0.5	2.7	-	1.0	-
23	Manufacture of coke, refined petroleum products, nuclear fuel	.[2]	.[2]	.[2]	.[2]	.[2]	.[2]	.[2]	.[2]	.[2]	.[2]	.[2]	.[2]	.[2]	.[2]	.[2]
24 without 24.4	Chemicals and chemical products (except pharmaceuticals)	76	366.0	101.6	184.6	39.2	82.3	34.3	25.1	7.7	8.7	2.5	60.3	13.9	5.0	4.0
24.4	Pharmaceuticals, medicinal chemicals and botanical products	31	440.5	510.6	249.2	150.1	28.9	80.1	27.2	54.7	16.0	9.0	75.3	123.5	43.9	93.2
25	Rubber and plastic products	92	326.7	30.6	24.9	0.1	141.1	15.1	9.8	4.3	19.6	-	128.5	9.0	2.8	2.1
26	Other non-metallic mineral products	63	433.4	81.1	31.4	5.3	76.6	10.9	7.1	0.8	2.4	-	118.4	7.8	197.5	56.3
27.1-27.3 and 27.51/52	Basic iron, steel, ferro-alloys, tubes, iron and steel casting	28	222.6	16.3	59.2	2.7	89.1	11.2	1.0	-	3.9	-	64.8	2.4	4.6	-
27.4+27.53/54	Non-ferrous metals, light and heavy metal casting	27	107.4	7.0	18.2	2.0	39.6	1.0	3.8	1.0	3.7	-	40.1	3.0	2.0	-
28	Metal products	140	300.4	20.2	33.7	5.4	70.8	2.3	11.3	0.3	41.5	0.8	137.0	9.2	6.1	2.2
29	Machinery and equipment	312	1,901.9	86.3	151.1	6.7	806.8	41.7	51.0	6.0	86.3	-	774.6	27.7	32.1	4.2
30	Office machinery and computers	14	86.4	5.7	5.1	0.7	38.4	3.5	22.4	1.0	3.0	-	14.5	0.5	3.0	-
31	Devices for the generation & distribution of electricity and the like	79	2,961.2	233.6	183.2	13.9	1,199.0	69.3	28.2	11.6	35.3	-	1,494.0	136.5	21.5	2.3
32 without 32.1	Radio, television and communication equipment and apparatus(without electronic components)	25	352.5	26.8	18.5	4.0	150.5	13.3	4.7	-	1.0	-	176.8	9.5	1.0	-
32.1	Electronic components	35	1,463.1	176.7	245.7	31.5	809.5	74.4	2.0	1.0	18.4	-	380.5	67.8	7.0	2.0
33 without 33.1	Precision and optical instruments	83	453.4	23.9	59.4	8.0	212.4	12.1	15.5	0.8	8.7	1.0	149.5	2.0	7.9	-
33.1	Medical instruments	34	323.8	47.9	45.5	5.9	173.1	18.5	1.2	0.5	6.3	-	63.0	11.7	34.7	11.3
34	Motor vehicles, trailers and semi-trailers	44	1,195.6	38.7	61.5	3.0	562.3	19.7	45.5	-	34.1	-	447.8	16.0	44.4	-
35	Manufacture of other transport equipment	17	316.1	13.0	27.0	2.0	142.8	3.0	9.0	-	40.4	2.0	92.9	5.0	4.0	1.0
36 without 36.1	Jewellery, musical instruments, sports good, games and toys, other manufacturing n.e.c.	27	176.5	22.1	10.0	-	62.3	13.0	19.9	1.2	7.6	-	70.7	7.9	6.0	-
36.1	Furniture	35	158.9	9.8	0.1	-	35.1	3.0	-	-	5.6	-	115.1	5.8	3.0	1.0
37	Recycling	3	0.2	-	-	-	-	-	-	-	0.2	-	-	-	-	-
40+41	Electricity, gas and water supply	23	25.5	3.4	4.1	-	11.5	1.1	-	-	4.0	-	1.9	0.3	4.0	2.0
45	Construction	71	74.2	5.8	5.9	1.0	33.4	1.3	8.2	0.3	4.5	-	21.4	2.0	0.8	1.2
50-93	Services	1,023	5,337.0	1,112.2	1,227.9	328.4	2,746.3	542.4	163.0	44.4	41.8	3.0	1,091.3	171.9	66.8	22.1
50-52	Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	199	490.6	155.0	142.3	42.1	161.5	72.8	17.9	5.4	20.0	-	133.7	33.1	15.2	1.6
55	Hotels and restaurants	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
60-64	Transport, storage and communication	27	367.5	73.3	16.9	1.2	99.9	16.6	7.0	1.0	1.7	-	229.0	46.5	13.0	8.0
65-67	Financial intermediation	6	38.5	10.2	19.0	3.5	19.5	6.7	-	-	-	-	-	-	-	-
70+71+74	Real estate, renting and business-related services	275	1,303.0	147.4	214.8	21.5	825.2	103.0	8.2	2.4	15.9	-	231.4	19.5	7.6	1.0
72 without 72.2	Computer and related activities (without software consultancy and supply)	45	227.4	26.6	31.9	4.0	88.0	10.6	28.8	5.0	-	-	74.6	5.8	4.1	1.2
72.2	Software consultancy and supply	241	1,154.8	110.8	131.3	13.8	602.7	59.1	50.1	3.1	1.8	3.0	351.2	25.3	17.7	6.5
73	Research and development	212	1,736.6	585.5	665.3	241.9	941.8	272.6	48.5	26.5	2.4	-	69.4	40.6	9.2	3.8
75-93	Public administration, education, health and other community, social and personal service activities	18	18.6	3.4	6.3	0.3	7.8	1.1	2.5	1.0	-	-	2.0	1.0	-	-

Source: STATISTIK AUSTRIA, Survey of research and experimental development 2007. Compiled on: 28 Sept. 2009

1) Includes the business sub-sector and the cooperative 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. – rounding differences.

Table 51: Corporate sector:[1] Employees in research and experimental development (R&D) and expenditure on R&D in 2007 by state[2]

State	Employees in R&D				R&D expenditure			
	by location of company headquarters		by company's R&D location(s)		by location of company head-quarters		by company's R&D location(s)[3]	
	Headcount	in %	Headcount	in %	in € 1,000	in %	in € 1,000	in %
Austria	**48,352**	**100.0**	**48,352**	**100.0**	**4,845,861**	**100.0**	**4,845,861**	**100.0**
Burgenland	490	1.0	468	1.0	33,181	0.7	31,338	0.6
Carinthia	2,677	5.5	2,603	5.4	373,317	7.7	334,999	6.9
Lower Austria	5,149	10.6	5,639	11.7	468,013	9.7	529,491	10.9
Upper Austria	9,608	19.9	9,875	20.4	941,051	19.4	981,356	20.3
Salzburg	1,725	3.6	1,987	4.1	125,035	2.6	156,384	3.2
Styria	9,248	19.1	10,462	21.6	895,127	18.5	1,076,655	22.2
Tirol	2,902	6.0	2,841	5.9	307,421	6.3	305,011	6.3
Vorarlberg	2,001	4.1	1,993	4.1	159,631	3.3	158,891	3.3
Vienna	14,552	30.1	12,484	25.8	1,543,085	31.8	1,271,736	26.2

Source: STATISTIK AUSTRIA, Survey of research and experimental development (R&D) 2007. Compiled on: 22 Sept. 2009

1) Includes the business sub-sector and the cooperative sub-sector. – 2) The regional classification of the units in the cooperative area is done strictly according to the state in which the company has its headquarters. For the companies in the corporate 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: Corporate sector:[1] Expenditure on research and experimental development (R&D) in 2007 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 € 1,000				
Total		2,521	4,845.861	2,541.902	1,936.063	319,759	48,137
Industry							
01+02+05	Agriculture and forestry, fishing	4	1,367	641	604	110	12
10-14	Mining and quarrying of rocks and soils	9	7,635	4,681	2,427	489	38
15-37	Manufacturing	1,391	3,383,191	1,811,962	1,312,494	224,417	34,318
15	Foods and luxury foods, beverages	93	22,833	15,227	4,667	2,544	395
16	Tobacco processing	.[2])	.[2])	.[2])	.[2])	.[2])	.[2])
17	Textiles and textile products (without apparel)	28	27,667	17,319	9,614	684	50
18+19	Apparel, leather, footwear	15	4,787	2,450	1,853	345	139
20	Wood (without furniture production)	49	13,563	7,118	3,998	2,312	135
21	Pulp, paper and paper products	25	12,794	7,676	3,909	1,209	-
22	Publishing, printing and reproduction of recorded media	13	17,822	8,124	8,756	927	15
23	Manufacture of coke, refined petroleum products, nuclear fuel	.[2])	.[2])	.[2])	.[2])	.[2])	.[2])
24 without 24.4	Chemicals and chemical products (except pharmaceuticals)	76	142,383	74,474	55,097	9,820	2,992
24.4	Pharmaceuticals, medicinal chemicals and botanical products	31	280,123	101,770	160,940	15,291	2,122
25	Rubber and plastic products	92	107,365	54,262	29,279	22,886	938
26	Other non-metallic mineral products	63	72,729	39,908	20,306	11,906	609
27.1-27.3 and 27.51/52	Basic iron, steel, ferro-alloys, tubes, iron and steel casting	28	80,622	32,156	40,635	7,690	141
27.4+27.53/54	Non-ferrous metals, light and heavy metal casting	27	36,431	17,820	14,942	3,669	-
28	Metal products	140	101,196	54,996	39,525	6,017	658
29	Machinery and equipment	312	553,420	321,593	191,390	35,411	5,026
30	Office machinery and computers	14	19,645	14,393	4,502	712	38
31	Electrical machinery and apparatus n.e.c.	79	646,953	426,550	186,100	21,169	13,134
32 without 32.1	Radio, television and communication equipment and apparatus(without electronic components)	25	90,078	63,027	22,665	4,310	76
32.1	Electronic components	35	375,806	148,225	191,951	35,055	575
33 without 33.1	Precision and optical instruments	83	86,545	52,599	27,492	4,928	1,526
33.1	Medical instruments	34	72,882	37,352	27,866	7,015	649
34	Motor vehicles, trailers and semi-trailers	44	401,181	199,239	175,351	21,739	4,852
35	Manufacture of other transport equipment	17	122,717	61,002	57,936	3,563	216
36 without 36.1	Jewellery, musical instruments, sports good, games and toys, other manufacturing n.e.c.	27	48,374	28,635	17,553	2,186	-
36.1	Furniture	35	28,742	19,883	6,655	2,172	32
37	Recycling	3	257	51	35	171	-
40+41	Electricity, gas and water supply	23	8,755	5,346	1,366	625	1,418
45	Construction	71	19,900	7,938	8,667	3,275	20
50-93	Services	1,023	1,425,013	711,334	610,505	90,843	12,331
50-52	Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	199	224,906	93,469	111,018	18,024	2,395
55	Hotels and restaurants	-	-	-	-	-	-
60-64	Transport, storage and communication	27	51,848	37,515	9,863	4,470	-
65-67	Financial intermediation	6	8,386	5,347	2,573	466	-
70+71+74	Real estate, renting and business-related services	275	417,008	188,231	199,926	27,407	1,444
72 without 72.2	Computer and related activities (without software consultancy and supply)	45	56,229	36,308	15,144	4,747	30
72.2	Software consultancy and supply	241	198,606	137,269	55,821	5,185	331
73	Research and development	212	457,649	208,897	211,773	28,854	8,125
75-93	Public administration, education, health and other community, social and personal service activities	18	10,381	4,298	4,387	1,690	6
Number of employees							
1–49 employees		1,358	481,537	263,604	168,009	39,803	10,121
50–249 employees		740	862,104	462,946	332,795	54,339	12,024
250 and more employees		423	3,502,220	1,815,352	1,435,259	225,617	25,992

Source: STATISTIK AUSTRIA, Survey of research and experimental development (R&D) 2007. Compiled on: 15 Sept. 2009

1) Includes the business sub-sector and the cooperative 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: Corporate sector:[1] Expenditure on research and experimental development (R&D) in 2007 broken down by industry and type of research

Industry		No. of units performing R&D	Total internal R&D expenditure	of which					
				Basic research		Applied research		Experimental development	
			in € 1,000	in € 1,000	in %	in € 1,000	in %	in € 1,000	in %
Total		2,521	4,845,861	283,417	5.8	1,554,138	32.1	3,008,306	**62.1**
01+02+05	Agriculture and forestry, fishing	4	1,367	-	-	1,199	87.7	168	12.3
10-14	Mining and quarrying of rocks and soils	9	7,635	711	9.3	3,566	46.7	3,358	44.0
15-37	Manufacturing	1,391	3,383,191	112,610	3.3	912,465	27.0	2,358,116	69.7
15	Foods and luxury foods, beverages	93	22,833	560	2.5	7,754	34.0	14,519	63.6
16	Tobacco processing	.[2]	.[2]	.[2]	.[2]	.[2]	.[2]	.[2]	.[2]
17	Textiles and textile products (without apparel)	28	27,667	1,403	5.1	4,896	17.7	21,368	77.2
18+19	Apparel, leather, footwear	15	4,787	265	5.5	893	18.7	3,629	75.8
20	Wood (without furniture production)	49	13,563	771	5.7	3,404	25.1	9,388	69.2
21	Pulp, paper and paper products	25	12,794	1,272	9.9	3,770	29.5	7,752	60.6
22	Publishing, printing and reproduction of recorded media	13	17,822	89	0.5	914	5.1	16,819	94.4
23	Manufacture of coke, refined petroleum products, nuclear fuel	.[2]	.[2]	.[2]	.[2]	.[2]	.[2]	.[2]	.[2]
24 without 24.4	Chemicals and chemical products (except pharmaceuticals)	76	142,383	6,519	4.6	52,268	36.7	83,596	58.7
24.4	Pharmaceuticals, medicinal chemicals and botanical products	31	280,123	247	0.1	89,917	32.1	189,959	67.8
25	Rubber and plastic products	92	107,365	4,045	3.8	37,138	34.6	66,182	61.6
26	Other non-metallic mineral products	63	72,729	7,084	9.7	17,126	23.5	48,519	66.7
27.1-27.3 and 27.51/52	Basic iron, steel, ferro-alloys, tubes, iron and steel casting	28	80,622	7,413	9.2	23,718	29.4	49,491	61.4
27.4+27.53/54	Non-ferrous metals, light and heavy metal casting	27	36,431	1,297	3.6	12,095	33.2	23,039	63.2
28	Metal products	140	101,196	2,410	2.4	37,058	36.6	61,728	61.0
29	Machinery and equipment	312	553,420	24,210	4.4	177,048	32.0	352,162	63.6
30	Office machinery and computers	14	19,645	269	1.4	3,781	19.2	15,595	79.4
31	Devices for the generation & distribution of electricity and the like	79	646,953	5,284	0.8	142,494	22.0	499,175	77.2
32 without 32.1	Radio, television and communication equipment and apparatus(without electronic components)	25	90,078	1,735	1.9	37,879	42.1	50,464	56.0
32.1	Electronic components	35	375,806	7,702	2.0	62,385	16.6	305,719	81.4
33 without 33.1	Precision and optical instruments	83	86,545	4,518	5.2	33,351	38.5	48,676	56.2
33.1	Medical instruments	34	72,882	2,660	3.6	9,397	12.9	60,825	83.5
34	Motor vehicles, trailers and semi-trailers	44	401,181	13,085	3.3	82,319	20.5	305,777	76.2
35	Manufacture of other transport equipment	17	122,717	16,066	13.1	47,748	38.9	58,903	48.0
36 without 36.1	Jewellery, musical instruments, sports good, games and toys, other manufacturing n.e.c.	27	48,374	2,302	4.8	15,364	31.8	30,708	63.5
36.1	Furniture	35	28,742	904	3.1	5,330	18.5	22,508	78.3
37	Recycling	3	257	-	-	-	-	257	100
40+41	Electricity, gas and water supply	23	8,755	8	0.1	7,556	86.3	1,191	13.6
45	Construction	71	19,900	306	1.5	5,372	27.0	14,222	71.5
50-93	Services	1,023	1,425,013	169,782	11.9	623,980	43.8	631,251	44.3
50-52	Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	199	224,906	5,243	2.3	97,967	43.6	121,696	54.1
55	Hotels and restaurants	-	-	-	-	-	-	-	-
60-64	Transport, storage and communication	27	51,848	643	1.2	9,420	18.2	41,785	80.6
65-67	Financial intermediation	6	8,386	-	-	7,082	84.5	1,304	15.5
70+71+74	Real estate, renting and business-related services	275	417,008	60,624	14.5	187,593	45.0	168,791	40.5
72 without 72.2	Computer and related activities (without software consultancy and supply)	45	56,229	3,802	6.8	14,865	26.4	37,562	66.8
72.2	Software consultancy and supply	241	198,606	6,575	3.3	81,963	41.3	110,068	55.4
73	Research and development	212	457,649	92,786	20.3	221,105	48.3	143,758	31.4
75-93	Public administration, education, health and other community, social and personal service activities	18	10,381	109	1.0	3,985	38.4	6,287	60.6

Source: STATISTIK AUSTRIA, Survey of research and experimental development (R&D) 2007. Compiled on: 21 Oct. 2009

1) Includes the business sub-sector and the cooperative 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: Corporate sector:[1] Financing of expenditure for research and experimental development (R&D) in 2007 broken down by industry and financing sector

Industry		Number of survey units performing R&D	Total	Financing sectors/segments: Corporate sector [2]	Public sector: Federal	Public sector: Research premiums	Public sector: States [3]	Public sector: FFG [4]	Public sector: Other Public funding [5]	Public sector: Combined	Private non-profit sector	Abroad (excluding EU)[6]	EU
			in € 1,000										
Total		**2,521**	**4,845,861**	**3,213,623**	**81,610**	**232,760**	**42,727**	**126,416**	**16,137**	**499,650**	**1,549**	**1,099,865**	**31,174**
01+02+05	Agriculture and forestry, fishing	4	1,367	1,224	-	-	65	73	-	138	-	-	5
10-14	Mining and quarrying of rocks and soils	9	7,635	4,642	-	-	18	35	58	111	-	2,882	-
15-37	Manufacturing	1,391	3,383,191	2,485,489	9,681	177,809	7,860	72,635	5,659	273,644	50	616,268	7,740
15	Foods and luxury foods, beverages	93	22,833	21,411	-	462	142	751	33	1,388	-	-	34
16	Tobacco processing	.[7]	.[7]	.[7]	.[7]	.[7]	.[7]	.[7]	.[7]	.[7]	.[7]	.[7]	.[7]
17	Textiles and textile products (without apparel)	28	27,667	25,976	8	624	152	907	-	1,691	-	-	-
18+19	Apparel, leather, footwear	15	4,787	4,512	-	216	21	38	-	275	-	-	-
20	Wood (without furniture production)	49	13,563	11,708	273	425	227	562	49	1,536	-	-	319
21	Pulp, paper and paper products	25	12,794	11,509	-	485	34	65	53	637	-	648	-
22	Publishing, printing and reproduction of recorded media	13	17,822	17,276	-	309	-	206	20	535	-	-	11
23	Manufacture of coke, refined petroleum products, nuclear fuel	.[7]	.[7]	.[7]	.[7]	.[7]	.[7]	.[7]	.[7]	.[7]	.[7]	.[7]	.[7]
24 without 24.4	Chemicals and chemical products (except pharmaceuticals)	76	142,383	128,668	34	5,116	258	3,457	54	8,919	-	4,370	426
24.4	Pharmaceuticals, medicinal chemicals and botanical products	31	280,123	225,671	-	23,381	93	3,265	469	27,208	-	27,210	34
25	Rubber and plastic products	92	107,365	84,730	368	3,016	621	4,651	110	8,766	15	13,560	294
26	Other non-metallic mineral products	63	72,729	68,167	89	1,302	261	2,217	10	3,879	-	598	85
27.1-27.3 and 27.51/52	Basic iron, steel, ferro-alloys, tubes, iron and steel casting	28	80,622	70,855	380	4,659	1,247	2,250	67	8,603	-	39	1,125
27.4+27.53/54	Non-ferrous metals, light and heavy metal casting	27	36,431	34,174	7	1,795	207	233	-	2,242	15	-	-
28	Metal products	140	101,196	90,597	152	4,339	134	2,535	309	7,469	-	2,871	259
29	Machinery and equipment	312	553,420	467,074	221	20,821	794	12,015	1,857	35,708	20	49,815	803
30	Office machinery and computers	14	19,645	17,910	28	739	11	851	46	1,675	-	60	-
31	Electrical machinery and apparatus n.e.c.	79	646,953	324,883	186	28,659	666	11,807	147	41,465	-	278,683	1,922
32 without 32.1	Radio, television and communication equipment and apparatus(without electronic components)	25	90,078	82,740	522	4,782	78	1,702	35	7,119	-	205	14
32.1	Electronic components	35	375,806	185,769	3,356	24,936	1,421	11,955	1,404	43,072	-	146,106	859
33 without 33.1	Precision and optical instruments	83	86,545	73,829	125	4,241	477	4,633	120	9,596	-	2,462	658
33.1	Medical instruments	34	72,882	45,614	2,433	4,525	659	2,198	537	10,352	-	16,427	489
34	Motor vehicles, trailers and semi-trailers	44	401,181	300,773	252	33,452	351	3,338	313	37,706	-	62,297	405
35	Manufacture of other transport equipment	17	122,717	105,543	1,202	5,721	-	2,315	-	9,238	-	7,936	-
36 without 36.1	Jewellery, musical instruments, sports good, games and toys, other manufacturing n.e.c.	27	48,374	43,074	45	1,731	-	529	14	2,319	-	2,981	-
36.1	Furniture	35	28,742	27,243	-	1,323	6	155	12	1,496	-	-	3
37	Recycling	3	257	257	-	-	-	-	-	-	-	-	-
40+41	Electricity, gas and water supply	23	8,755	7,667	-	600	15	58	38	711	33	-	344
45	Construction	71	19,900	17,664	54	820	122	852	17	1,865	-	310	61
50-93	Services	1,023	1,425,013	696,937	71,875	53,531	34,647	52,763	10,365	223,181	1,466	480,405	23,024
50-52	Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	199	224,906	100,707	539	5,860	1,283	5,996	329	14,007	-	109,969	223
55	Hotels and restaurants	-	-	-	-	-	-	-	-	-	-	-	-
60-64	Transport, storage and communication	27	51,848	45,154	270	3,628	1,359	744	60	6,061	-	4	629
65-67	Financial intermediation	6	8,386	8,209	-	-	-	177	-	177	-	-	-
70+71+74	Real estate renting and business-related services	275	417,008	141,573	3,234	17,723	1,720	7,952	1,015	31,644	196	238,840	4,755
72 without 72.2	Computer and related activities (without software consultancy and supply)	45	56,229	50,900	15	3,186	192	1,474	21	4,888	100	-	341
72.2	Software consultancy and supply	241	198,606	137,813	1,497	7,545	1,292	6,332	728	17,394	580	41,396	1,423
73	Research and development	212	457,649	204,736	65,531	15,172	28,630	29,917	7,696	146,946	590	90,196	15,181
75-93	Public administration, education, health and other community, social and personal service activities	18	10,381	7,845	789	417	171	171	516	2,064	-	-	472

Source: STATISTIK AUSTRIA, Survey of research and experimental development (R&D) 2007. Compiled on: 1 Oct. 2009

1) Includes the business sub-sector and the cooperative sub-sector. – 2) Includes companies' own capital, funds raised in the capital market, loans from public sector development funds and funds from other domestic companies. – 3) States including Vienna. Local governments without Vienna. – 4) Österreichische Forschungsförderungsgesellschaft: Subsidies only; loans are included under "corporate sector". – 5) Includes funds from local governments, chambers, social insurance carriers and other public financing. – 6) Includes funds of foreign companies, other funding from abroad 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: FFG: Funding statistics 2009 – General overview (contracts compiled during the reporting year)

in € 1,000							
Area	Programme	Projects	Participations	Actors	Total costs	Total funding	Cash value
ALR	ASAP	43	100	61	12,887	9,919	9,919
		43	100	61	12,887	9,919	9,919
BP	General funding programme line	790	824	640	497,613	263,527	130,514
	Headquarter programme line	33	39	37	87,759	26,083	26,083
	High-tech start-up programme line	34	34	34	16,333	11,405	8,071
	BRIDGE	54	147	132	18,225	11,146	11,146
	EUROSTARS	12	13	13	5,483	2,991	2,991
	Innovation voucher	806	1,611	1,117	4,020	4,020	4,020
		1,729	2,668	1,825	629,433	319,173	182,826
EIP	AF-Wiss	305	305	98	2,297	1,726	1,726
		305	305	98	2,297	1,726	1,726
SP	AplusB	1	1	1	4,449	1,475	1,475
	brainpower austria	6	6	1	250	250	250
	COIN	43	183	160	28,086	17,652	17,652
	COMET	13	115	114	28,090	9,057	9,057
	FEMtech	25	56	54	4,316	2,829	2,829
	generation innovation internships	390	390	258	1,336	836	836
	Josef Ressel Centres	2	15	15	1,278	511	511
	Research Studios Austria	2	2	2	1,598	1,028	1,028
	wfFORTE	2	12	12	2,971	1,762	1,762
		484	780	555	72,374	35,400	35,400
TP	Alpine Schutzhütten	17	17	17	1,655	615	615
	AT:net	58	66	62	19,955	4,695	4,695
	benefit	34	62	49	8,990	5,758	5,758
	ENERGIE DER ZUKUNFT	50	145	100	14,675	8,312	8,312
	ENR SOR1 – ERANET ROAD	5	28	23	1,484	1,484	1,484
	FIT-IT	49	90	77	38,073	15,912	15,912
	GEN-AU	31	76	42	27,338	21,450	21,450
	IEA	5	5	5	462	462	462
	IV2Splus	49	189	129	25,771	13,544	13,544
	KIRAS	20	84	66	14,747	11,366	11,366
	NANO	30	121	82	18,271	14,015	14,015
	NAWI	28	83	70	5,157	4,059	4,059
	Neue Energien 2020	120	355	257	54,930	28,824	28,824
	TAKE OFF	15	46	34	14,995	7,697	7,697
		511	1,367	887	246,504	138,191	**138,191**
FFG		**3,072**	**5,220**	**2,913**	**963,495**	**504,409**	**368,062**
FFG authorisations		69	75	52	3,156	3,156	3,156
Total operational funds:		3,141	5,295	**2,965**	966,650	507,565	**371,218**

Table 56: FFG: Subsidised projects in 2008 according to the classification of economic activities (NACE)

Name	NACE 2008	Projects	% Projects	Participations	Total costs	Total funding (incl. loans and liabilities)	% Total promotion	Cash value	% Cash value
Agriculture, hunting and associated activities	01	12	0.5%	18	3,285	1,588	0.3%	1,448	0.5%
Forestry and logging	02	3	0.1%	8	551	394	0.1%	394	0.1%
Manufacture of food and feed products	10	34	1.4%	53	9,059	4,478	1.0%	3,105	1.0%
Manufacture of textiles	13	3	0.1%	3	1,195	673	0.1%	426	0.1%
Manufacture of wearing apparel	14	4	0.2%	15	4,357	1,773	0.4%	1,121	0.3%
Manufacture of wood, basket and cork products (without furniture)	16	22	0.9%	32	5,812	3,813	0.8%	2,106	0.7%
Manufacture of paper and paper products	17	9	0.4%	12	862	508	0.1%	463	0.1%
Manufacture of printed products; reproduction of recorded media	18	5	0.2%	8	951	557	0.1%	430	0.1%
Manufacture of chemical products	20	57	2.3%	96	28,638	17,686	3.9%	9,293	2.9%
Manufacture of pharmaceutical products	21	48	2.0%	64	56,674	32,018	7.0%	16,779	5.2%
Manufacture of rubber and plastic products	22	52	2.1%	91	11,945	7,722	1.7%	5,511	1.7%
Manufacture of glass, glass products, ceramics, and mineral products	23	47	1.9%	78	26,747	13,538	3.0%	7,372	2.3%
Manufacture of basic metals	24	31	1.3%	44	19,165	12,210	2.7%	5,883	1.8%
Manufacture of metal products	25	58	2.4%	97	19,388	10,483	2.3%	5,198	1.6%
Manufacture of computing machines, electronic and optical products	26	189	7.7%	286	175,545	78,973	17.3%	50,221	15.6%
Manufacture of electrical equipment	27	29	1.2%	45	29,470	11,702	2.6%	7,942	2.5%
Machinery and equipment	28	163	6.6%	209	81,136	42,813	9.4%	23,397	7.3%
Manufacture of motor vehicles, trailers and semi-trailers	29	48	2.0%	99	52,292	25,291	5.5%	17,888	5.6%
Manufacture of other transport equipment	30	64	2.6%	136	53,846	26,699	5.8%	23,018	7.2%
Manufacture of other products	32	34	1.4%	47	10,126	5,859	1.3%	3,022	0.9%
Repair and installation of machines and equipment	33	15	0.6%	25	15,957	10,535	2.3%	4,852	1.5%
Electricity, gas, steam and hot water supply	35	43	1.7%	95	19,669	8,084	1.8%	7,547	2.3%
Collection, purification and distribution of water	36	5	0.2%	12	742	450	0.1%	387	0.1%
Collection, treatment and removal of waste; recycling	38	12	0.5%	17	3,808	2,303	0.5%	1,444	0.4%
Building construction	41	14	0.6%	37	5,403	3,869	0.8%	3,198	1.0%
Civil engineering	42	8	0.3%	13	1,375	794	0.2%	704	0.2%
Preparatory construction site work, installation engineering and other finishing trades	43	74	3.0%	180	12,989	6,272	1.4%	5,959	1.9%
Wholesale trade (except of motor vehicles and motorcycles)	46	62	2.5%	122	385	361	0.1%	330	0.1%
Lodging	55	20	0.8%	24	1,654	621	0.1%	621	0.2%
Telecommunications	61	5	0.2%	7	1,688	426	0.1%	426	0.1%
Provisioning of information technology services	62	252	10.2%	384	70,015	40,230	8.8%	27,678	8.6%
Information services	63	87	3.5%	165	3,310	2,203	0.5%	1,826	0.6%
Administration and management of corporations and businesses; management consulting	70	91	3.7%	182	450	450	0.1%	450	0.1%
Architecture and engineering firms; technical, physical and chemical analysis	71	77	3.1%	178	13,101	4,955	1.1%	4,591	1.4%
Research and development	72	501	20.4%	921	95,742	67,338	14.7%	66,802	20.8%
Other freelance, scientific and technical activities	74	54	2.2%	110	5,342	3,732	0.8%	3,732	1.2%
Building services; Gardening and landscaping	81	4	0.2%	9	441	335	0.1%	335	0.1%
Other financial services for companies and private persons	82	16	0.7%	32	1,628	607	0.1%	607	0.2%
Education	85	12	0.5%	21	2,997	853	0.2%	853	0.3%
Health	86	10	0.4%	13	1,504	737	0.2%	737	0.2%
Other primarily personal services	96	16	0.7%	37	873	413	0.1%	413	0.1%
Additional: 32 NACE codes with shares under 0.1% of total promotion		169	6.9%	330	6,434	3,457	0.8%	2,946	0.9%
With NACE classification		2,459	100%	4,355	856,551	457,804	100%	321,457	*100%*
without classification		613		865	106,943	46,605		46,605	
Total result		3,072		5,220	963,495	**504,409**		368,062	

Table 57: FFG: Funding statistics 2009 by state (amounts in € 1,000)

	Participations	Total funding	Cash values	Cash values in %
Burgenland	73	4,985	4,352	1.2%
Carinthia	256	22,191	18,541	5.0%
Lower Austria	569	39,843	30,487	8.3%
Upper Austria	807	132,030	75,803	20.6%
Salzburg	273	18,686	10,953	3.0%
Styria	1,061	119,932	93,837	25.5%
Tirol	246	25,981	19,554	5.3%
Vorarlberg	134	12,343	7,365	2.0%
Vienna	1,713	125,541	104,293	28.3%
Abroad	88	2,877	2,877	0.8%
Total	5,220	504,409	**368,062**	100.0%

Table 58: FFG: Funding statistics 2009 by type of organisation (amounts in € 1,000)

	Participations	Total promotion (subsidies, loans and liabilities)	Cash values	Cash values in %
companies	2,904	378,007	244,198	66.3%
research institutions	892	47,536	45,397	12.3%
Universities	1,189	71,224	71,224	19.4%
Intermediaries	51	3,269	2,869	0.8%
Other	184	4,373	4,373	1.2%
Total	5,220	504,409	**368,062**	100.0%

Table 59: FWF: Approvals by research locations (€ million) 2009

a) University research locations:	stand-alone projects	SFB	SFB extension	NFN	NFN extension	International programmes	DK-plus	DK-plus extension	Schrödinger	Meitner	Translational Brainpower	Richter	TRP	Publication funding	PEEK	START	START extension	Wittgenstein	Firnberg	proVISION	Total	%	Total 2008	%
University of Vienna	18.32	1.60	0.56	0.08	1.52	2.48	4.36	1.46	0.67	1.43	0.00	1.92	0.62	0.14	0.00	0.53	1.80	0.00	0.63	0.00	38.12	*25.8%*	39.17	*22.2%*
University of Graz	5.34	0.04	0.00	0.02	0.00	0.13	2.29	0.00	0.32	0.17	0.00	0.24	0.01	0.02	0.00	0.00	0.60	0.00	0.01	0.00	9.19	*6.2%*	13.75	*7.8%*
University of Innsbruck	5.74	0.03	0.00	0.04	0.00	0.53	2.07	0.00	0.47	0.40	0.00	0.15	0.01	0.02	0.00	0.60	0.00	0.00	0.40	0.00	10.45	*7.1%*	17.83	*10.1%*
Medical University of Vienna	7.04	0.04	0.36	0.00	0.00	0.97	0.03	1.57	0.59	0.02	0.00	0.01	0.50	0.00	0.09	0.00	0.00	0.00	0.39	0.00	11.63	*7.9%*	11.50	*6.5%*
Medical University of Graz	0.42	0.03	0.00	0.00	0.00	0.11	2.16	0.00	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.94	*2.0%*	1.11	*0.6%*
Medical University of Innsbruck	3.83	0.05	0.00	0.01	0.00	0.09	0.51	0.00	0.13	0.13	0.00	0.00	0.21	0.00	0.00	1.10	0.60	0.00	0.39	0.00	7.04	*4.8%*	5.68	*3.2%*
University of Salzburg	3.56	0.00	0.00	0.01	0.00	0.08	0.03	0.00	0.13	0.13	0.00	0.01	0.22	0.04	0.00	0.00	0.00	0.00	0.01	0.00	4.22	*2.9%*	7.86	*4.5%*
Vienna University of Technology	7.66	1.87	1.31	0.03	0.00	1.29	0.02	0.00	0.10	0.39	0.00	0.44	0.27	0.03	0.10	0.51	0.00	0.00	0.20	0.00	14.23	*9.6%*	17.47	*9.9%*
Graz University of Technology	1.65	0.20	0.00	0.02	0.00	0.25	1.18	0.00	0.11	0.13	0.00	0.00	0.28	0.00	0.00	0.00	0.00	0.00	0.19	0.00	4.02	*2.7%*	8.39	*4.8%*
Montanuniversität Leoben	0.02	0.00	0.00	0.02	0.00	0.00	0.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.63	*0.4%*	1.56	*0.9%*
University of Natural Resources and Applied Life Sciences, Vienna	4.95	0.02	0.00	0.00	0.00	0.27	2.61	0.00	0.23	0.01	0.32	0.47	0.20	0.00	0.00	0.00	0.00	0.00	0.01	0.00	9.10	*6.2%*	10.07	*5.7%*
University of Veterinary Medicine Vienna	2.27	0.00	1.63	0.00	0.00	0.00	1.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.82	*3.9%*	1.60	*0.9%*
Vienna University of Economics and Business Administration	0.34	0.01	0.00	0.00	0.00	0.01	0.02	0.00	0.00	0.00	0.00	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.59	*0.4%*	2.20	*1.2%*
University of Linz	1.35	0.00	1.56	0.05	0.00	0.86	0.10	0.00	0.13	0.01	0.00	0.00	0.17	0.00	0.00	0.60	0.00	1.40	0.38	0.00	6.61	*4.5%*	6.78	*3.8%*
University of Klagenfurt	0.11	0.00	0.00	0.00	0.00	0.61	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.73	*0.5%*	1.73	*1.0%*
Academy of Fine Arts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.21	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.29	*0.2%*	0.20	*0.1%*
Vienna University for Applied Arts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.58	0.00	0.00	0.00	0.00	0.00	0.59	*0.4%*	0.31	*0.2%*
Graz University of Music and Performing Arts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.26	*0.2%*	0.09	*0.0%*
University of Music and Performing Arts, Vienna	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.26	*0.2%*	0.45	*0.3%*
Linz University of Art and Industrial Design	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.00	0.00	0.00	0.00	0.00	0.21	*0.1%*	-	-
b) Non-university rand other research locations*																								
Austrian Academy of Sciences	5.84	0.01	0.00	0.02	0.22	0.38	0.02	0.10	0.08	0.16	0.00	0.00	0.01	0.06	0.00	0.00	0.00	0.00	0.00	0.00	6.90	*4.7%*	12.61	*7.2%*
Other research locations*	7.89	0.27	0.62	0.02	0.22	1.41	0.26	0.00	0.25	0.28	0.00	0.20	0.56	0.13	0.29	0.00	0.00	1.40	0.00	0.00	13.80	*9.3%*	15.73	*8.9%*
Total	**76.33**	**4.18**	**6.04**	**0.31**	**1.96**	**9.48**	**18.16**	**3.13**	**3.50**	**3.26**	**0.32**	**3.67**	**3.27**	**0.46**	**1.77**	**3.34**	**3.00**	**2.80**	**2.63**	**0.00**	**147.62**	***100.0%***	**176.08**	***100.0%***

* also includes universities abroad
incl. 2,200 euro supplementary approvals from Nano Programme and Erwin Schrödinger return programme

Table 60: FWF: Overview of research funding (€ million)

Funding programme	New applications					Funding approvals				
	2009					2009				
	Total	Women	Percent women	Men	Percent men	Total	Women	Percent women	Men	Percent men
stand-alone projects	€238.19	€60.90	25.6%	€177.30	74.4%	€76.33	€18.78	24.6%	€57.55	75.4%
SFB*	€4.89	€0.00	0.0%	€4.89	100.0%	€4.18	€0.03	0.7%	€4.15	99.3%
SFB extension	-	-	-	-	-	€6.04	€0.36	-	€5.68	-
NFN*	€6.42	€0.57	8.9%	€5.84	91.1%	€0.31	€0.05	16.2%	€0.26	83.8%
NFN extension	-	-	-	-	-	€1.96	€0.64	-	€1.33	-
International programmes	€50.14	€8.89	17.7%	€41.25	82.3%	€9.48	€0.81	8.6%	€8.67	91.4%
DK-plus*	€19.46	€2.19	11.3%	€17.27	88.7%	€18.16	€2.05	11.3%	€16.11	88.7%
DK-plus extension	-	-	-	-	-	€3.13	€0.00	-	€3.13	-
Schrödinger	€7.84	€3.61	46.1%	€4.23	53.9%	€3.50	€1.61	45.9%	€1.89	54.1%
Meitner	€7.76	€3.42	44.1%	€4.34	55.9%	€3.26	€1.28	39.2%	€1.98	60.8%
Translational Brainpower	€2.15	€0.68	31.7%	€1.47	68.3%	€0.32	€0.00	0.0%	€0.32	100.0%
Richter	€11.44	€11.44	100.0%	€0.00	0.0%	€3.67	€3.67	100.0%	€0.00	-
TRP	€29.98	€7.03	23.4%	€22.95	76.6%	€3.27	€0.45	13.9%	€2.82	86.1%
Publication funding	€0.87	€0.33	37.4%	€0.54	62.6%	€0.46	€0.23	49.2%	€0.24	50.8%
PEEK	€14.80	€6.10	41.2%	€8.71	58.8%	€1.77	€1.01	-	€0.75	-
START	€103.67	€27.87	26.9%	€75.80	73.1%	€3.34	€1.13	33.9%	€2.21	66.1%
START extension	-	-	-	-	-	€3.00	€0.00	-	€3.00	-
Wittgenstein	€60.00	€13.50	22.5%	€46.50	77.5%	€2.80	€0.00	0.0%	€2.80	100.0%
Firnberg	€10.19	€10.19	100.0%	€0.00	0.0%	€2.63	€2.63	100.0%	€0.00	0.0%
proVISION	-	-	-	-	-	-	-	-	-	-
Total	€567.81	**€156.72**	27.6%	€411.10	72.4%	€147.62	**€34.74**	23.5%	€112.88	76.5%

* 2-stage process; the figures shown here correspond to sub-projects of complete applications (2- stage)
Publication funding: independent publications, translation costs, refereed publications
International programmes: international programmes, procurement of international cooperations etc.

Table 61: FWF: Research personnel funded by the FWF

Post docs		All	Women	**Men**
	2009	951	388	563
	2008	830	320	510
	2007	860	327	533
Doctoral candidates		All	Women	**Men**
	2009	1619	671	948
	2008	1526	625	901
	2007	1359	609	750
Erwin Schrödinger Grants		All	Women	**Men**
	2009	86	34	52
	2008	102	35	67
	2007	111	37	74
Lise Meitner positions		All	Women	**Men**
	2009	42	19	23
	2008	45	17	28
	2007	45	11	34
Hertha Firnberg positions		All	Women	**Men**
	2009	41	41	0
	2008	40	40	0
	2007	46	46	0
Elise Richter positions		All	Women	**Men**
	2009	35	35	0
	2008	29	29	0
	2007	24	24	0
Charlotte Bühler positions		All	Women	**Men**
	2009	0	0	0
	2008	0	0	0
	2007	3	3	0
Impulse projects		All	Women	**Men**
	2009	1	0	1
	2008	7	2	5
	2007	13	3	10
Technical employees		All	Women	**Men**
	2009	134	95	39
	2008	123	90	33
	2007	118	70	48
Other employees		All	Women	**Men**
	2009	405	183	222
	2008	331	166	165
	2007	574	215	359
Total		All	Women	**Men**
	2009	3314	1466	1848
	2008	3033	1324	1709
	2007	3153	1345	1808

Reporting date: 31 Dec. 2009

Table 62: FWF: Approvals of stand-alone projects by major discipline clusters 2009

	2009	Share
Life Science	30.76	40.3%
Natural science and technology	28.32	37.1%
Humanities and social sciences	17.24	22.6%
Total	76.33	100.0%

Table 63: aws: Overview of performance in consultation and service 2009

	Projects [Number]				Consulting and services (€'000)	Additional measures (€ '000)	Total Support	
	2009	%	2008	%	2009	2009	2009	%
High-technology consultation, mentoring and mediation	697	48.7	621	50.3	2399	2143	4542	54.2
Know-how, research and patent management	726	50.7	593	48	1528	1382	2910	34.7
Government consulting[1]		0	10	0.8				0
Processing, consulting: EU structure funds	8	0.6	11	0.9	933		933	11.1
Total	1431	100	1235	100	4860	3525	8385	100

1 The accounting method was adjusted because of contract changes

Table 64: aws: High technology: Consultation, support and mediation (2009)

	Projects [Number]				Consulting and services [EUR '000]	Additional measures (€ '000) [EUR '000]	Total Support [EUR '000]	
	2009	%	2008	%	2009	2009	2009	%r
Jugend Innovativ	437	62.7	296	47.7	763	-	763	16.8
Government Innovation Prize	33	4.7	30	4.8	274	-	274	6
Life Science Austria	54	7.7	114	18.4	262	1274	1536	33.8
Business Angels investment broker	38	5.5	54	8.6	250	-	250	5.5
Seed financing for high-tech start-ups	134	19.3	126	20.3	850	198	1048	23.1
ImpulsProgramm creativwirtschaft	1	0.1	1	0.2	-	671	671	14.8
Total	697	100	621	100	2399	2143	4542	100