BioPolis – Inventory and analysis of national public policies that stimulate research in biotechnology, its exploitation and commercialisation by industry in Europe in the period 2002-2005

National Report of Austria

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Summary

The Austrian scientific community enjoyed increased financial support during the period under review. As part of its ambitious plan to meet the Lisbon goal of 3% GERD as a share of GDP, the federal government significantly increased spending for R&D since 2001. Important steps towards the realisation of this goal were two special public expenditure programmes (Offensivprogramme I & II) which injected additional 1 100M EUR into the Austrian innovation system between 2001 and 2006. However, in order to actually reach the Lisbon objective, Austrian GERD will have to increase by an estimated 7-9% annually until 2010.

Apart from the encouraging development of the public funding made available for R&D, a structural deficit of the innovation system still needs to be adequately addressed, as the private sector's share of R&D spending merely reached 43% on average, roughly 12 percentage points below the EU15 share.

Austria's public R&D funding regime has repeatedly been characterised as highly complex, fragmented and, due to considerable overlap and insufficient coordination, not as efficient as it could be. Since 2000, these structural problems have been addressed through far-reaching institutional reforms. At the level of the research promotion agencies, numerous actors, mainly in the areas of applied research and valorisation, were merged with either existing or newly established institutions. Most notably, in 2004, the Austrian Research Promotion Agency (FFG) was created, integrating four formerly independent agencies, including the Industrial Research Promotion Fund (FFF) and the Bureau for Innovation and Technology (BIT). Already two years earlier, four different funding schemes for the business sector were combined by establishing the Austria Wirtschaftsservice GmbH (AWS). The reforms within the Austrian Science Fund (FWF), the country's chief funding agency for basic scientific research, were mainly targeted towards the improvement of internal structures and processes.

An important element of the federal government's overarching national strategic framework to enhance competitiveness by improving the country's knowledge-base and innovativeness was the establishment of the Austrian Council for Research and Technology development (RFT) in 2000. The Council advises the government and submits influential strategic recommendations with regard to funding priorities and structural changes in the national S&T system. The RFT clearly improved the strategic focus of the national S&T policy. Nevertheless, at the programme and instrument level, overlap and a lack of coordination – both within the funding intermediaries as well between them – can still be observed. Existing programmes with very similar objectives could be streamlined and/or pooled together in order to reduce fragmentation and organisational duplication, and in order to increase transparency for applicants. Moreover, the broad issue of policy coordination is augmented by the regional dimension as some of the Länder have become active players in the innovation system. And at the ministerial level, the inefficient distribution of central S&T competencies between three federal ministries has been repeatedly addressed, but the issue is still not resolved.

Biotechnology research in Austria is mainly conducted within academia. The universities with strongholds in biotechnology-related fields are the universities in Vienna, Innsbruck and Graz. The existence of renowned faculties in areas such as biology, medical sciences or pharmaceutics had stimulating effects on the development of regional life science/biotechnology clusters; the most important of which being Vienna where several research institutes are based. In addition to the already existing non-university research institutes such as Boehringer Ingelheim's Institute of Molecular Pathology (IMP) and the Novartis Institute for Biomedical Research (NIBR), the Austrian Academy of Sciences significantly accentuated its biotechnology portfolio by the founding of three new basic research institutes (Institute of Molecular Biotechnology, IMBA, Gregor Mendel Institute of Molecular Plant Biology, GMI, and the Center for Molecular Medicine, CeMM, all of which located in Vienna).

The size of the biotechnology industry is considerably smaller than in other European countries – such as Switzerland, for instance – that are considered to belong to the top performers. Arguably, Austria's biotechnology industry is lacking the presence of leading multinational corporations in the chemical-pharmaceutical sector which provide strong market demand for biotechnology products and applications.

Traditionally, Austria's thematic biotechnology strongholds are in the areas of medical sciences – particularly immunology –, pharmaceutics and agriculture. The bibliometric analysis by and large confirms this general pattern. The areas with the strongest growth rates between the periods 1994/96–2002/04 were food and plant biotechnology – both starting from low levels –; but the already strong health biotechnology experienced significant growth between the two periods as well.

The performance indicators also show that the quality of Austrian biotechnology research is internationally outstanding. By and large, Austria holds a median position with regard to knowledge transmission and application.

At the turn of the century Austria not only stepped up its efforts to advance basic and applied research in general, but increased the public promotion of life sciences and biotechnology as well. This was particularly reflected by the introduction of two major biotechnology-specific programmes (GEN-AU and LISA) and the special funding for the creation of new research institutes. While the Austrian Genome Research Programme GEN-AU has been specifically designed to foster basic scientific research, the programme Life Sciences Austria (LISA) has its focus on the commercial utilisation of life sciences and biotechnology. Apart from these two most important biotechnology-specific programmes, which promoted this research field with 30M and 15M EUR, respectively during the period covered by BioPolis, the bulk of funds are made available through non-policy-directed schemes (142.82M EUR in total) and policy-directed generic programmes (142.7M EUR in total). For instance, under the umbrella Structural Programmes, the FFG operates a large number of instruments that aim to sustain and facilitate networks, cooperation, clusters und knowledge transfer mechanisms. The total amount of public funding (national and regional) spent for biotechnology between 2002 and 2005 was 394M EUR.

1. Introduction and background

1.1 General introduction

With a population of 8.1M, the Republic of Austria is one of the small EU Member States. However, in terms of GDP per capita (in PPS), the central European country with its well-developed market economy and welfare state ranges roughly 20% above the EU25 and slightly above the EU15 average.[1] In the period between 2002 and 2005, Austria enjoyed a mean annual growth rate of 1.7% (EU25: 1.6%, EU15: 1.5%). The small open economy, which is mainly based on services and industrial production (65% and 33% of GDP, respectively), displays the typical characteristics of a modern industrialised service economy and is increasingly dependent upon a scientific knowledge base.

Austria's gross expenditure on research and development (GERD) reached 5 770M EUR or 2.35% of GDP in 2005, up from 4 680M EUR in 2002. In the course of the last four years, Austrian GERD experienced quite impressive annual growth rates: in 2002, R&D investments increased by 6.6% compared to the previous year, in 2003 by 6.3%, in 2004 by 7.5% and in 2005 by 8%. In comparison, the spending on research and development in the EU25 merely climbed by 4.1% in 2002 and by 1.9% in 2003. The sharp rise in Austrian GERD reflects the country's ambitious plan to reach the Lisbon objective of 3% R&D spending. If successful, Austria would be among the few European countries to actually attain the Lisbon goal by 2010. However, in order to stay on course, it is estimated that Austria will have to increase its gross domestic R&D expenditure by a minimum of 7-9% annually (Austrian Council 2005a: 40)[2].

The growth in GERD since 2002 is largely based on increased public funding. Most notably in this respect, with the "Offensivprogramm F&E I" (2001-2003) and "Offensivprogramm F&E II" (2004-2006) the federal government introduced two large expenditure programmes in order to stimulate economic growth, thereby injecting additional 1 100M EUR into the Austrian innovation system (BMBWK et al. 2005: 8)[3]. In sum, the public sector spent 2 120M EUR on R&D in 2005; over 82% of the total amount was accounted for by the federal level. The comparatively low share of domestic industrial contributions to total GERD which has been repeatedly identified in the past (Reiss 1999: AU-7)[4], remains basically unchanged. Between 2002 and 2005, the percentage of GERD financed by the private sector reached an average of around 43%, roughly 12 percentage

1 The macro-economic data are taken from the Eurostat online database, structural indicators (URL: <http://epp.eurostat.cec.eu.int>, 29.07.2005).

2 Austrian Council (2005a) Strategie 2010, Perspektiven für Forschung, Technologie und Innovation in Österreich, Rat für Forschung und Technologieentwicklung, Wien.

3 BMBWK, BMVIT, BMWA (ed.) (2005) Österreichischer Forschungs- und Technologiebericht 2005: Lagebericht gem. § 8 (2) FOG über die aus Bundesmitteln geförderte Forschung, Technologie und Innovation in Österreich, Bundesministerium für Bildung, Wissenschaft und Kultur, Wien.

4 Reiss, T. (1999), National Report of Austria. In: Europäische Kommission / GD Wissenschaft, Forschung und Entwicklung / RTD actions - Biotechnology (DG XII/E.1) u.a.: Inventory of public biotechnology R&D programmes in Europe: Volume 2: National Reports (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland), Office for Official Publications of the EC, Luxembourg (European Commission: Studies), p. AU-1-AU30.

points below the EU25 and EU15 shares. Up to now, the tax incentives for R&D investments which have been introduced as part of the first "Offensivprogramm" apparently have not contributed to increase or at least sustain industry's share of total GERD. Thus, Austria is still a far cry from reaching the Barcelona goal of a 2/3-share of R&D spending by the private sector. If Austria will increase GERD as planned without significantly raising industry's share during the next few years, the existing imbalance between public and private expenditure on R&D will be further amplified.

On a more positive note, the percentage of R&D financed from abroad is among the highest in Europe, ranging from an Austrian all-time high of 21.4% in 2002 to 20.1% in 2005. Countries with similar high levels of foreign contributions to domestic GERD are Latvia (35.6%), the UK (20.5%), Iceland (18.3%) or Estonia (14.3%) (all in 2002). By comparison, R&D expenditures financed from abroad in the EU25 account for approximately 7.5% of total GERD. Nevertheless, it has to be taken into account that the attractiveness of an economy for foreign R&D investments is not only based on factors such as the knowledge base, the availability and price of human capital or the prevailing market conditions. For instance, high foreign shares might simply be indicative of a certain weakness of domestic industrial research. Geographic and cultural proximity, a common language, similar legal institutions and a history of well established business relations are additional aspects that can enhance companies' inclination to establish research departments abroad. This seems to be an important factor as German and Swiss companies are major sources for industrial research in Austria (BMBWK et al. 2005: 58-63). The country's success in attracting international corporations' R&D investments has been particularly relevant for the biotechnology sector. One of the chief examples is Boehringer Ingelheim and its Institut für Molekulare Pathologie (IMP) in Vienna, employing more than 260 people in R&D. Other important international players in Austria's biotech scene are Aventis Pharma, Baxter, Eli Lilly, Novartis (Sandoz) and Roche Diagnostics (BIT 2004)[5].

As an economic factor, life sciences in Austria are of considerable and growing importance. About 90 companies and 170 research institutes (university and non-university, public and private) are currently active in biotechnology-related areas, employing more than 10.000 people. In terms of volume, the bio-pharmaceutics sector accounted for 2 500M EUR turnover in 2001 (Austrian Council 2005b: 5f.)[6].

Austria's biotechnology research landscape is clearly dominated by academic, university-based activities. Regional concentrations are to be found in Vienna, followed by the cities of Innsbruck (Tyrol) and Graz (Styria). Thematically, Austria's biotechnology strongholds are the medical sciences (mainly immunology), pharmaceutics and agricultural research.

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5 BIT – Bureau for International Research and Technology Cooperation, LISA – Life Science Austria (2005) Bio-Tech in Austria, Directory of Austrian Biotech Companies, URL: <http://www.bit.ac.at/lifescihealth/Doks/BCD.pdf>, 22-08-2005.

6 Austrian Council (2005b) Strategie für die Entwicklung der Life Sciences in Österreich, Ratsempfehlung, Rat für Forschung und Technologieentwicklung, Wien, URL: http://www.rat-fte.at/UserFiles/File/empf_050812_lifesciences_strategie_endg.pdf, 29.08.2005.

1.2 Characteristics of national S&T and innovation system

The institutional setting of Austria's innovation system has experienced notable organisational reforms and a reshuffling of responsibilities between 2000 and 2004. By instigating this sweeping reform process, the relevant policy actors sought to redress some of the most pivotal deficiencies in the R&D policy regime. Backed by numerous policy studies (e.g., Reiss 1999; Strobel/Reiss 2003[7]), the policy community largely agreed that the innovation system suffered from a highly fragmented and inefficient institutional structure, too many, mostly poorly co-ordinated policy instruments and a lack of strategic focus.

In a first step, the competencies for science and technology at the federal level were partly disentangled and rearranged in order to establish a more effective division of labour between the institutional actors involved:

(1) Responsibilities for universities, higher education, basic research, research institutions and international co-ordination are now concentrated at the Federal Ministry of Education, Science and Culture (BMBWK). In addition, with the enactment of a new university law in 2002 the public universities have been granted a higher degree of autonomy and are now able to operate more in the manner of private enterprises.

(2) The policy areas of research and development in the enterprise sector and the jurisdiction over institutions promoting applied research are distributed between the Federal Ministry of Transport, Innovation and Technology (BMVIT) and the Federal Ministry of Economics and Labour (BMWA), thus creating overlap in some areas. These ministries, together with the BMBWK, are clearly the major players with regard to science and technology policy, accounting for over 80% of the federal expenditure in this area. The concentration of R&D policy competencies in two instead of three federal ministries is currently still on the reform agenda of parts of the national policy community (cf. Austrian Council 2005a: 37); substantial inertia of the bureaucracies concerned has so far impeded a more coherent appropriation of responsibilities. Other departments, such as the Federal Ministry of Agriculture and Environment (BMLFUW) or the Federal Ministry for Health and Women (BMGF) contribute to Austria's innovation system indirectly, mainly by commissioning mission-oriented and applied research. However, they are usually not involved in designing the broad research and innovation policies.

7 Strobel, O., Reiss, T. (2003) Efficiency of Innovation Policies: Biotechnology in Austria (1994-2001), in: Reiss, T.; Calvert, J.; Dominguez Lacasa, I.; Enzing, C.; van der Giessen, A.; Hinze, S.; Kern, S.; Mangematin, V.; Nesta, L.; Patel, P.; Senker, J. (2003): Efficiency of Innovation Policies in High Technology Sectors in Europe (EPOHITE), National Case Studies, Office for Official Publications of the European Communities, Luxembourg, p. 1-28.

Influential player: Austrian Council for Research and Technology Development

Another decisive measure to restructure the national policy approach to research and innovation was the creation of the Austrian Council for Research and Technology Development (RFT) in 2000 (BMBWK et al. 2003: 116-122)[8]. The founding of the RFT by the federal government has to be understood as an integral element of Austria's national strategic framework to enhance international competitiveness by improving the country's knowledge-base. The in the meantime fully independent council advises the federal government, the ministries and the Länder in all matters related to research, technology and innovation; its proposals have proven to be highly influential for the development of national initiatives and programmes. For instance, the RFT authored the National Research and Innovation Plan in 2002 which spelled out the main features of the research and innovation policy for the ensuing years. Furthermore, the high-level advisory body played a leading role in the development of strategic priorities and spending guidelines for the "Offensivprogramm F&E II".

Research promotion agencies: consolidation processes

At the level of the research promotion agencies various measures were implemented aiming to reduce organisational fragmentation and to improve over-all performance of the funding system. Most importantly in this respect was the creation of the Austrian Research Promotion Agency (FFG) in 2004, an institutional reform which contributed to the long overdue consolidation of the national support structures for applied research and technology in the enterprise sector. The FFG now integrates four formerly independent institutions within a common organisational entity: the Industrial Research Promotion Fund (FFF), the Bureau for Innovation and Technology (BIT), the Technology Impulse Agency (TIG) and the Austrian Space Agency (ASA) (BMBWK et al. 2004: 81-84)[9]. Despite this important reorganisation, the legacies of the formerly independent institutions will continue to be present for the time being, for instance, in numerous older programmes and instruments.

Already in 2002, four different funding schemes for the business sector were merged by creating the Austria Wirtschaftsservice GmbH (AWS). The AWS fulfils functions of a government-owned bank and administers the delivery of grants awarded to companies. Three fields of activity are covered by this funding institution: research and technology, start-ups, regional policy and internationalisation. In addition, the AWS manages the independent ERP-Funds.

Another major player within the research scene is the Austrian Science Fund (FWF), which is committed to the promotion of basic scientific research. The reforms of the FWF

8 BMBWK, BMVIT, BMWA (ed.) (2003) Österreichischer Forschungs- und Technologiebericht 2003: Bericht der Bundesregierung an den Nationalrat gem. § 8 (2) FOG über die Lage und Bedürfnisse von Forschung, Technologie und Innovation in Österreich, Bundesministerium für Bildung, Wissenschaft und Kultur, Wien.

9 BMBWK, BMVIT, BMWA (ed.) (2004) Österreichischer Forschungs- und Technologiebericht 2004: Lagebericht gem. § 8 (2) FOG über die aus Bundesmitteln geförderte Forschung, Technologie und Innovation in Österreich, Bundesministerium für Bildung, Wissenschaft und Kultur, Wien.

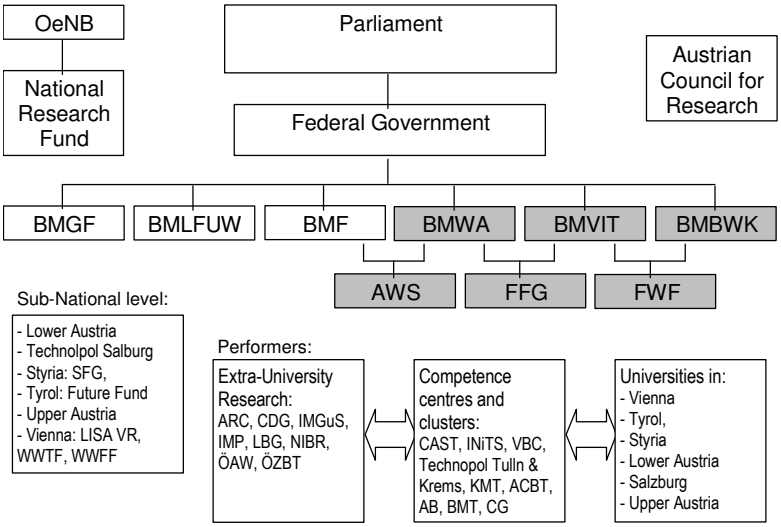
were mainly intended to increase efficiency, streamline the governance structures and improve the co-operation with other research promotion agencies.

An additional source of funding has been opened up by the establishment of the National Foundation for Research in 2004. The new institution in the Austrian innovation system annually makes available approximately 125M EUR to federal research promotion agencies; the RFT submits recommendations on how to distribute the funds (BMBWK et al. 2005: 8).

Austrian Länder

The sub-national level contributes to the Austrian innovation system as well. The governments of the nine Länder spent roughly 380M EUR for R&D in 2005 (federal level: 1 740M EUR) (BMBWK et al. 2005: 95). A large portion of these funds are tied to promotion programmes that are designed and implemented by the federal ministries and their affiliated agencies. Most regional activities concentrate on the establishment and support of clusters and competence centres. A number of federal programmes, such as K*plus*, RIF2000 or K-ind/K-net, have been introduced in order to promote regional cluster development, centres of competence and the establishment of R&D networks. In these cases the respective Länder participate both financially and administratively with regard to the centres located within their jurisdictions. Depending on the regional strategy and the resources available, most of the sub-national governments have implemented additional programmes to foster their regional innovation systems. Examples for successful regional development are the automotive clusters in Styria and Upper Austria. In the area of biotechnology, regional support activities are mainly to be found in Vienna, Styria and Tyrol. Figure 1.1 gives an overview over Austria's public funding regime in the area of S&T and the main biotechnology research performers.

Figure 1.1: Biotechnology promotion in Austria – institutional landscape



Source: BioPolis Research

1.3 National support and framework conditions for biotechnology

During the 1990s, biotechnology was not treated as a prioritised funding area in Austria. As the bulk of public funding for biotechnology is carried out via bottom-up schemes and open calls, biotechnology-specific funding existed during the previous decade only to a very limited extent. According to Inventory (1999: AU-11, AU-13), the two most important funding agencies FWF and FFF (now FFG) supported biotechnology merely with 4% and between 6% and 8% of their annual budgets, respectively. These shares increased significantly for the period 2002-2005, as the FWF and FFG supported biotechnology-related activities with approximately 10 to 15% of their total funding budgets.[10] More determined efforts to promote biotechnology were launched in the late 1990s and at the beginning of this decade. The two most prominent biotechnology-specific programmes that were initiated in this period are the Impuls-Programm Biotechnologie of 1999, which was replaced by the succession programme Life Science Austria (LISA) in 2002, and the Austrian Genome Research Programme (GEN-AU), which started in 2000/2001 (see 2.3.1 and 2.3.4).

Austrian Council: strategy blueprints

Until quite recently, the Austrian research policy was lacking a coherent biotechnology funding strategy. The structural deficiencies of the policy regime and the fragmented institutional landscape that have been identified as major shortcomings of the innovation system in general were affecting the biotechnology sector as well. As external pressure increased following Austria's EU-membership in 1995, due to the requirements of the 5th and 6th framework programmes and the Lisbon process, the policy actors eventually came up with a more focused approach to the funding of R&D in general and biotechnology in particular. The recommendations of the RFT regarding the allocation of the funds of the second "Offensivprogramm" reflected the increased goal-orientation in the governance of Austrian research funding: biotechnology is now among the six scientific key areas to be supported with priority. About 30% of the special funds have been earmarked for this research field, accounting for the second largest allotment after the promotion of information and communication technologies (Austrian Council 2005: 7c)[11].

Furthermore, the council identified five strategic functions to be promoted across all six research areas. The most important one is the development and consolidation of industrial research capacities and the cooperation between science and industry (e.g., research clusters, SME initiatives, establishment of group research centres, high-tech start-ups, technology transfer). Within each of the six scientific key areas, roughly 60% of the funds should be geared towards this objective. Other cross-sectional goals set by the RFT are the development and consolidation of research capacities in science (20%), promotion of human resources (10%) and increased internationalization (8%) (Austrian Council 2005c: 6f.). In order to substantiate the support for biotechnology, the RFT spelled out a

10 Calculations: BioPolis research, based on the data kindly provided by various representatives of the FWF and FFG. Detailed information on the sums spent for biotechnology is presented in chapters 2 and 4.
11 Austrian Council (2005c) Tätigkeitsbericht 2003-2004, Rat für Forschung und Technologieentwicklung, Wien.

more detailed development strategy for this high-tech sector in 2005. The recommendations, which were devised by a high-level working group composed of key representatives of the Austrian biotechnology policy community, call for resolute "political leadership" to overcome existing restraints and to improve the framework conditions for biotechnology in Austria. One of the central elements of the proposed strategy is the intensified development of successful clusters. However, in order for a small economy to succeed internationally, the country's local concentrations in the biotechnology area should seek nation-wide cooperation and present themselves under a single umbrella brand name on the international markets (Austrian Council 2005c: 6f.).

Public acceptance

According to a recent Eurobarometer (European Commission 2005: 73-97)[12] survey, Austrians by and large are receptive to the advances of new technologies. A large majority of the population holds very positive views on a number of technology fields such as solar energy, new medical developments or the Internet, displaying over-all conformity with the opinions of most European citizens. However, the survey data also signals a pronounced rejection of new technologies in several controversial areas, including nuclear energy and nanotechnology. With regard to biotechnology and genetic engineering, only a minority of the Austrian respondents is of the opinion that these technologies will have positive effects on society (43%), whereas all other European populations are clearly more optimistic on this issue (EU25: 65%).

Regulatory framework

The pronounced scepticism towards biotechnology in general and green biotechnology in particular is partly echoed by several political initiatives and (non-)decisions at the federal level. The Austrian government is at the forefront of adopting tight regulations on the application of and placing legal bans on genetically modified food and agricultural products. In 2004, the federal ministry responsible for agriculture and the environment (BMLFUW) presented its national charter for GMO-free foods; and at the European level, the Austrian government, backed by the Länder governments, has repeatedly lobbied for the introduction and prolongation of hedge clauses on genetically modified corn. This resistance to accept GMO and derivates in agriculture and foods is also related to Austria's comparatively large share of organic production in the country's farming sector. While Parliament and the federal government seemed to be quite active with regard to the enactment of restrictions to the application of biotechnology in certain areas, the compulsory implementation of the EU directive on biopatents into national law was achieved in May 2005 after considerable delays. It is expected that new directive will enhance legal security for enterprises conducting research in this area.

With regard to genetic engineering in the area of medical applications, an amendment to the existing law on genetic engineering (Gentechnikgesetz) was enacted in October 2005. The reform introduced new definitions of genetic analyses as a response to the latest

12 European Commission (2005) Social Values, Science and Technology (Special Eurobarometer 225/Wave 63.1 – TNS Opinion & Social, Directorate General Press and Communication, Brussels.

scientific developments, and simplified authorisation procedures of gene therapies and analyses.

1.4 Main biotechnology research actors in Austria

Biotechnology research in Austria is still primarily an academic undertaking. More than 70% of all biotechnology-related R&D activities in Austria are performed in the academic world, whereas non-university institutions and industry cover roughly 10% each (Austrian Council 2005b: 44). As shown in Table 1.1, the most universities conducting research in the field of biotechnology are concentrated in Vienna, followed by Tyrol (Innsbruck) and Styria (Graz).

Table 1.1: Austrian universities conducting biotechnology research

Land	**University**
Lower Austria	Danube University Krems
Salzburg	Paracelsus Private Medical University University of Salzburg
Styria	Medical University of Graz Technical University Graz University of Graz
Tyrol	Innsbruck Medical University Medical Informatics and Technology in Innsbruck University for Health Sciences (private) University of Innsbruck
Upper Austria	University of Linz
Vienna	Medical University of Vienna University of Natural Resources and Applied Life Sciences BOKU (the Institute for Agrobiotechnology (IFA) is institutionally linked to BOKU) University of Veterinary Medicine University of Vienna Vienna University of Technology

Source: BioPolis Research

Biotechnology research outside of academia is conducted within different institutional settings. For instance, among the publicly funded institutes are four research centres of the Austrian Academy of Sciences (ÖAW) With the Institute for Medical Genome Research and Systems Biology (IMGuS), which is currently being set up, an additional non-university research location will soon be participating in Austria's life sciences research scene. Important industrial research institutes are Boehringer Ingelheim's Institute of Molecular Pathology (IMP) and the Novartis Institute for Biomedical Research (NIBR), both located in Vienna. The non-profit associations Ludwig Bolzmann Gesellschaft (LBG) and the Christian Doppler Gesellschaft operate numerous research institutes and laboratories throughout the country; their funding originates both from public as well as private sources. Table 1.2 gives an overview over the non-university research institutions in Austria.

Table 1.2: Non-university biotechnology R&D

Research institutes (public and private)
Austrian Academy of Sciences (ÖAW): IBA, IMBA, GMI, CeMM
Austrian Centre for Biomodels and Transgenetics (ÖZBT)
Austrian Research Centers (ARC)
Christian Doppler Gesellschaft (CDG, 37 laboratories)
Institute for Medical Genome Research and Systems Biology (IMGuS)
Institute of Molecular Pathology (IMP)
Ludwig Bolzmann Gesellschaft (LBG, 6 institutes)
Novartis Institute for Biomedical Research (NIBR)

Source: BioPolis Research

Both industrial research and non-university research institutions have gained a larger share in over-all biotechnology activities during the past few years. These developments have been encouraged by fostering existing regional strongholds and the facilitation of biotech clusters and networks by applying a broad range of policy instruments. In all these cases, renowned university faculties in the areas of biology, medical sciences, chemistry and pharmaceutics etc. had stimulating effects on the development of the clusters. The by far most important location for biotechnology is the city of Vienna, which hosts several research clusters and institutions (cf. Jörg et al. 2006: 33-58[13]; Fischl 2004)[14]. About 50% of all biotechnology-related R&D activities in Austria are concentrated in the Vienna region (Austrian Council 2005b: 44). The central hub is the Campus Vienna Biocenter (VBC) which currently consists of 16 members – enterprises, start-ups, industrial research facilities and university institutes – and employs approximately 700 scientists (Technopol/ABE 2003)[15]. Two other Viennese clusters are the Center for Applied Life Sciences near the BOKU and the institutions located in proximity of the General Hospital (AKH). Notable regional concentrations outside the capital region are to be found in Graz (Styria), and Innsbruck (Tyrol), conducting roughly 28% and 14% of all R&D activities, respectively (Austrian Council 2005b: 44). Table 1.3 lists the most prominent biotechnology locations in Austria.

Traditionally, Austria's life sciences strongholds are the areas of medical sciences – particularly immunology –, pharmaceutics and agriculture. According to data gathered by the Austrian Council (2005b: 44), about 60% of all biotechnology-related R&D activities are conducted in the area of medical sciences (including medical engineering). The other research areas such as agricultural, platform, bio process and environmental biotechnology all account for less than 10% each.

13 Jörg, L., Endemann, M., Streicher, J., Rammer, A., Gaisser, S., Roloff, N., Hinze, S. (2006) Life Science – Standort Wien im Vergleich, Endbericht, Technopolis GmbH, Wien.

14 Fischl, Iris (2004) Der "Campus Vienna Biocenter": Zur politischen Strategie der Clusterbildung in der Biotechnologie, ARC systems research GmbH, 2004 (ARC-(OEFZS)-Berichte 0034), Seibersdorf, Diplomarbeit, Wien, Univ., Fakultät für Human- und Sozialwissenschaften.

15 Technopol Brussels, ABE (2003) Biotechnology Sector Report: SMEs & Scientific research, Partners for Life, The European Life Sciences Network for SMEs, <http://www.ffg.at/getdownload.php?id=191>, 01-07-2005.

Table 1.3: Local concentrations of biotechnology R&D

Biotechnology centres	**City/Land**
AB Centre – Research Centre Applied Biocatalysis	Graz, Styria
Austrian Center of Biopharmaceutical Technology (ACBT)	Tyrol and Vienna
Campus Vienna Biocenter (VBC)	Vienna
Center for Applied Life Sciences	Vienna
General Hospital (AKH)	Vienna
Health Cluster (GC)	Linz, Upper Austria
Medical Competence Centre Tyrol (KMT)	Innsbruck, Tyrol
Technopol Krems	Krems, Lower Austria
Technopol Tulln	Tulln, Lower Austria

Source: BioPolis Research

2. Funding of biotechnology R&D, transfer and commercialisation

2.1 Introduction

This report reviews the funding of biotechnology research and commercialisation. In the report it is distinguished between policy-directed funding and non-policy-directed funding of biotechnology.

Policy-directed funding includes funding which was directed by explicit policy decision making about installing an instrument, such as specific R&D programmes, programmes encouraging collaboration, industrial research grants, support for centres of excellence, support for commercialization of research, support for start-ups, programmes encouraging mobility of researchers, programmes with open calls, etc. This policy-directed funding can include biotechnology-specific policy instruments and generic policy instruments. Biotechnology-specific policy instruments are instruments that have been specifically set up to stimulate biotechnology. Generic policy instruments are instruments that are not dedicated to a specific technology, but which in principle stimulate all technologies, also including biotechnology. In the BioPolis project, only those generic instruments are included if a reference is made to (the stimulation of) biotechnology activities in the policy of the funding organisation that runs the program, or of the ministry/government department that funds the funding organisations or that runs the program itself.

Non-policy-directed funding of research includes funding which is part of the structural governmental support for scientific education, research and research infrastructure. This type of funding is mainly given through block grants to universities and (government) research institutes, the open-call system of research councils etc. Research councils, research institutes and government research institutes develop their own programmes through which biotechnology may be supported. In the BioPolis project only the funds for block grants to (government) research institutes and through the open-call systems of research councils are included.

In this chapter the funding of biotechnology research through policy and non-policy-directed instruments and of biotechnology commercialisation through policy-directed activities are presented. The data were collected through desk research (publications, documents, websites of national and regional public funding organisations and/or governmental departments), surveys of representatives of funding organisations that manage the generic and biotech-specific programs and interviews with representatives of organisations that are involved in non-policy-directed and policy-directed funding. The funding organisations' website addresses and the names of contact persons that have kindly participated in the survey and/or have been interviewed can be found in Annex 3 (List of Contact Persons) and Annex 4 (References). Section 2.2 presents the non-policy-directed funding and section 2.3 the policy-directed funding. Those Austrian charities which play a certain role in the funding of biotechnology research will be dealt with in section 2.4. The final section provides a short overview over the European funding of biotechnology research in Austria through the 6th Framework Program.

2.2 Non-policy-directed funding of biotechnology research

BMBWK

During the period under review, the federal government's non-policy-directed funding in support of biotechnology research was mainly designed and administered by the BMBWK. Among the ministry's non-policy-directed activities, two measures stimulating biotechnology have been identified. The University Infrastructure Programmes (Universitätsinfrastrukturprogramme), which were financed by the special funds of the two "Offensivprogramme", sought to enhance the scientific research infrastructure – mainly in laboratories – at Austrian universities. Roughly one quarter of the total sum of 140.6M EUR was granted to departments and institutes conducting research in the biotechnology field. The programme Fast-Track Professorships (Vorziehprofessuren) aimed to enhance the competitiveness and the research capacities of Austrian universities as well. However, instead of directing monies towards the improvement of the research infrastructure, the overarching policy goal was to be reached by accelerating the academic careers of promising young scientists. Of the 77 new research positions which were approved of, twelve fell into biotechnology-related disciplines. 5.1M EUR of the total sum of 32.7M EUR were spent in favour of scientists working in the field of biotechnology.

FWF

Austria's most important source for the funding of basic research is the FWF's support for stand-alone projects (Einzelförderung). Through this open call system, Austrian scientists received grants worth of 268.52M EUR during the period under review. Biotechnology-related projects accounted for roughly 37.59M EUR or 14% of the total amount.

Of the 30M EUR prize monies for scientific excellence that have been made available through START and Wittgenstein by the BMBWK, 9M EUR were awarded to life science researchers. The FWF administers the two programmes.

FFG

During the review period, the FFG supported biotechnology research through a non-policy-directed programme designed to fund master and PhD theses which are being carried out in cooperation with companies. Between 2002 and 2005, a total of 35.4M EUR were directed towards young researchers in this programme, of which about 3% in the area of biotechnology. The funding is based on an open competition.

Austrian Academy of Sciences (ÖAW): new research institutes

The Austrian Academy of Sciences (ÖAW), a publicly funded non-profit research promotion institution currently operating 60 research centres in Austria, has significantly accentuated its activities in the field of biotechnology by founding three new basic research institutions in 2001: the Institute of Molecular Biotechnology (IMBA), Gregor

Mendel Institute of Molecular Plant Biology (GMI) and the Center for Molecular Medicine (CeMM), all of which located in Vienna. Especially the founding of IMBA and, to a lesser extent, the creation of the CeMM enjoyed the political backing of the federal government, namely the Chancellor, as part of the national attempts to improve Vienna's competitive position relative to the biotechnology cluster in Munich. The Republic of Austria funded these three new institutes and the existing ÖAW-institutes focusing on biotechnology with more than 22.1M EUR during the period under consideration; a considerable additional sum was contributed by commercial partners. Between 2002 and 2005, the total biotechnology relevant budget of all three institutes was 41M EUR. About 15 to 17% of the ÖAW's basic funding is directed towards biotechnology-related research.

CDG and LBG – regular institutional funding

In the area of non-governmental, extra-university research related to biotechnology, two organisations play an important role in the Austrian research scene: the Christian Doppler Gesellschaft (CDG) and the Ludwig Bolzmann Gesellschaft (LBG). Both non-profit associations operate numerous institutes and laboratories throughout Austria. The research activities of the CDG are usually co-financed by equal shares from industry and the Republic of Austria. The seven CDG laboratories conducting research in the area of biotechnology disposed of a total budget of 5.71M EUR between 2002 and 2005. Of the more than 100 institutes that belong to the LBG, six are active in the area of life sciences, mainly in the field of medical sciences. These institutes have been funded with 2.02M EUR during the period under consideration.

Austrian Länder: Upper Austria and Salzburg

In two Länder, non-policy-directed measures contribute to Austrian biotechnology research. In Upper Austria, Research and development is mainly supported through the promotion agency Upper Austrian Research, which is owned by the Land. Between 2002 and 2005, biotech-related research – mainly industrial biotechnology – received funds worth of 4M EUR, largely through Upper Austria's strategy programme 2000Plus. The most important research location for biotechnology is Linz. With the new initiative Innovative Upper Austria 2010 (Innovatives Oberösterreich 2010) beginning in 2006, the Land will increase its efforts to support biotechnology, as life sciences will be one of the five main target technologies.

The Land Salzburg was not implementing any specific biotechnology funding policies during the reporting period. However, the regional government spent about 4.5M EUR between 2003 and 2005 for extraordinary purposes: in 2005, Salzburg made an endowment for a chair in structural biology worth of 1.5M EUR. In addition, the government supported the Laboratory for Haemato-Oncological Research (Hämato-Onkologisches Forschungslabor) at the St. Johannes Hospital and the Research Center Bio Sciences (Biowissenschaftliches Forschungszentrum) with a total sum of 3M EUR.

Table 2.1 Non-policy-directed funding of biotechnology research

Funding organisation	**Public Research Institutions / Response Mode programs**	**Period**	**Funds in M EUR**
National			
BMBWK	University Infrastructure Programmes I-III	2002-2005	32.8
BMBWK	Fast-Track Professorships	2002-2003	5.1
CDG	Institutional funding	2002-2003	5.71
FWF	Stand-alone Projects	2002-2005	37.59
FWF	START	2002-2005	6
FWF	Wittgenstein	2002-2005	3
FFG	Support for Young Researchers	2002-2005	1.1
LBG	Institutional funding	2002-2003	2.02
ÖAW	Institutional funding/investments	2002-2005	41
National Total			*134.32*
Regional			
Upper Austria/UAR	2000Plus	2002-2005	4
Land Salzburg	Research centers	2003-2005	3
Land Salzburg	Chair in Structural Biology	2005	1.5
Regional Total			*8.5*
Grand Total			**142.82**

Source: BioPolis Research

2.3 Policy-directed funding of biotechnology research and commercialisation

Judging from the number of individual programmes and the total amount of funding, generic policy measures are of great importance in the Austrian innovation system. Moreover, during the period under consideration, the number of individual programmes proliferated and the total amount of funding increased significantly. In consequence, biotechnology-related research reaped some of the benefits deriving from the generally intensified efforts to support R&D.

Table 2.2 National and regional public policy-directed biotechnology stimulating instruments during the period 2002-2005

Instrument	**Funding organisation**	**Budget in M EUR**	**% of total**	**Use of DF/SF**
National				
Generic				
*Aplus*B - Academia plus Business	FFG	2.4	0.96	
Brainpower Austria	FFG	1.2	0.48	
BRIDGE - Das Brückenschlagprogramm	FFG	3	1.19	
Doktoratskollegs FWF	FWF	2.7	1.07	
Energiesysteme der Zukunft	FFG	2.2	0.88	

Instrument	Funding organisation	Budget in M EUR	% of total	Use of DF/SF
Impulse Projects - Scientists for the economy	FWF	1.6	0.64	
K-ind / K-net (Industrial Competence Centres and Networks)	FFG	7.1	2.83	
K*plus*	FFG	17.5	6.97	
Lebensmittel Initiative	FFG	2	0.8	
NANO Initiative	FFG	3	1.19	
Nano- und Mikrotechnologie Netzwerk	AWS	0.6	0.24	
Nationale Forschungsnetzwerke NFN (FWF)	FWF	2.5	1	
PFEIL 05	BMLFUW	5.9	2.35	
prokis04	ACR, FFG	1.5	0.6	
RIF2000 (Regionale Impulsfoerderung)	FFG	0.52	0.21	
Spezialforschungsbereiche SFB (FWF)	FWF	3.6	1.43	
Stand der Ethik in den Wissenschaften in Österreich		0.04	0.02	
Start-up	FFG	40	15.92	
Tecma	AWS	0.48	0.19	
TRAFO – Transdisziplinäres Forschen		0.16	0.06	
Translational Research Programme	FWF	3.8	1.51	
Uni:Invent	AWS	3	1.19	
Biotech specific				
Contracted Research on Consumer Protection (BMGF)	BMGF	2.1	0.84	
dialog<>gentechnik	dialog<>gentechnik	1.55	0.62	
Forschungskooperation Biowissenschaften	ÖAW	41.06	16.35	
GEN-AU - Genome Research in Austria	BMBWK	30.8	12.26	
Life Science Austria (LISA) - Preseed and Seedfinancing	AWS	15.17	6.04	
Regional				
Generic				
Technopol (Lower Austria)	Wirtschaftsfoerderungs- und Strukturverbesserungsfonds Niederoesterreich	9.6	3.82	
Tiroler Zukunftsstiftung (Tyrol)	Tiroler Zukunftsstiftung/State of Tyrol	15.1	6.01	
Vienna Science Chairs (Vienna)	Vienna Science and Technology Fund (WWTF)	3	1.19	
ZIT - Zentrum für Innovation und Technology (Vienna)	ZIT	10	3.98	

Instrument	Funding organisation	Budget in M EUR	% of total	Use of DF/SF
Zukunftsfonds Steiermark (Styria)	Zukunftsfonds Steiermark	3.4	1.35	
Biotech specific				
Biowissenschaftliches Forschungszentrum (Salzburg)	Land Salzburg	1.5	0.6	
Life Science Austria - Vienna Region (LISA VR)	AWS & ZIT	1.6	0.64	
Life Sciences Project Calls (Vienna)	WWTF	10	3.98	
Stiftungsprofessur für Strukturbiologie des Landes Salzburg (Salzburg)	Land Salzburg	1.5	0.6	
Total		**251.18**	**100**	

Source: BioPolis Research

The involvement of Austrian research groups in the Sixth European Framework Programme will be presented in chapter 2.5.

2.3.1 Instruments of the federal ministries

BMBWK

The BMBWK is responsible for about two-thirds of the federal government's research budget (BMBWK et al. 2005: 96). The lion's share of these resources falls into the category of non-directed funding (mainly lump sums for universities). Two programmes with fairly limited relevance for the area under consideration have been designed for research in social sciences and the humanities. The programme TRAFO (transdisziplinäres Forschen) wants to support transdisciplinary projects and Standing of Ethics in Austria's Sciences (Stand der Ethik in den Wissenschaften in Österreich) intends to review and assess the ethical dimension in Austrian sciences. In both programmes minor components deal with monitoring social acceptance of biotechnology.

GEN-AU

In 2001, the BMBWK launched the Austrian Genome Research Programme GEN-AU. The total budget for the programme, which is one of the few biotechnology-specific instruments in Austria, with a planned running time of nine years adds up to nearly 100M EUR.[16] GEN-AU was designed to strengthen Austrian genome research, thereby fostering the quality of basic scientific research. An important secondary objective is to encourage networking among the participating scientists and relevant stakeholders. In this

16 The information regarding GEN-AU are largely based on BMBWK (2005) and correspondence and phone interviews with E. Tischelmayer, BMBWK.

sense, the programme is part of the attempts to develop an efficient funding structure in and a more focused approach to biotechnology research (BMBWK 2005: 10)[17].

Just as most research funding schemes aim to support economic development more or less explicitly, the Austrian Genome Research Programme set ambitious goals in this respect as well, seeking to generate up to 30 spin-offs during the programme's running time (ibid.: 69). In a number of aspects GEN-AU can be regarded as a novelty in Austria's research policy regime. Most importantly, it is currently the only thematic top-down programme. Largely without operational involvement of intermediary promotion agencies, GEN-AU is implemented and managed directly at the ministerial level. Professional input is channelled into the decision-making processes mainly through a high-level scientific advisory board. The board's chief responsibility is the appraisal and selection of the individual research projects. However, due to the comparatively extensive competencies assigned to the board with regard to the design of the scientific strategy, thematic focus and project governance, it functions not only as a scientific jury but also as a powerful steering committee (ibid.: 55).

The support activities within GEN-AU are grouped into five different project types. At the heart of the programme are the so-called cooperative projects in which interdisciplinary research is carried out, each involving at least four different working groups from academia and/or industry. During the first programme phase (2001-2004) four cooperative projects were funded with a total sum of 16.4M EUR. The project call specified five research themes: analysis of structure and sequence of genomes, expression analysis, functional analyses, bioinformatics, and links between genome research and related scientific disciplines (ibid.: 15).

Network, pilot and associated projects, accounting for 9.9M EUR altogether during the first programme phase, fulfil largely supplementary functions within GEN-AU. For instance, from the outset the BMBWK intended to put strong emphasis on bioinformatics and proteomics. As these research areas were underrepresented among the proposals for the first call, the ministry decided to foster these selected technologies through the network projects. In those cases in which the proposals are either considered not to be ripe to be funded as full-blown cooperative projects or touch upon promising side-aspects, GEN-AU offers funding for these particular undertakings through relatively small pilot projects. Within Genome Research Austria, international cooperation is supported as well. The associated projects finance the few initiatives involving Austrian and international partners.

Apart from biotechnology research in the natural sciences, GEN-AU also deals with the broader societal and legal implications of biotechnology with its accompanying research projects ELSA (ethical, legal and social aspects). During phase one 1.52M EUR or 5.5% of the total programme expenditures were made available for ELSA projects.

17 BMBWK (ed.) (2005) GEN-AU – Österreichisches Genomforschungsprogramm, Programmmanagementevaluierung, Bundesministerium für Bildung, Wissenschaft und Kultur, Wien.

In addition to the support of scientific research which lies at the core of the programme, GEN-AU also aims to improve the availability of human resources. Two measures within the programme have been designed to address this objective: the Mobility Programme and the Summer Schools. The Mobility Programme targets junior scientists involved in the GEN-AU projects by sponsoring visits at international research institutions for a limited period. The Summer Schools have been designed for high-school students. The rationality of this measure is twofold: on the one hand, pupils ought to be introduced to the research field, and, in the long run, eventually increase the share of university students in life sciences. On the other hand, it is hoped that participation in the summer schools will contribute to the social acceptance of biotechnology. These and other activities concerning public acceptance and awareness are organized in close cooperation with independent partners such as dialog<>gentechnik and the public relations agency Science Communications. Certain functions with regard to IPR and the commercial realisation of research results originating from the GEN-AU projects are provided by the external partner AWS through its programmes tecma, Uni:invent and LISA (see 2.3.4).

dialog<>gentechnik

The independent association Dialogue Genetics (dialog<>gentechnik) aims to inform about genetics and engage the public in a discourse on the pros and cons of the technology. The organisation was designed to function as an interface between science and the public in order to contribute to public deliberation on economic, societal and ethical questions surrounding genetics and its applications. During the period under investigation, dialog<>gentechnik disposed of a budget of 1.55M EUR, originating from numerous public sources. Included in this amount are 130T EUR coming from the ELSA part of the GEN-AU programme. (In order to avoid double counting, the sum is not included in the budget for GEN-AU.)

Other federal ministries

The Federal Ministry for Health and Women (BMGF) is undertaking biotechnology-related research activities with a specific focus on biosafety and risk assessment since 1996. In this broad area, the ministry spent 2.1M EUR for contracted research between 2002 and 2005. A large part of the research focused on the safety of the application of genetic engineering techniques, as required by the federal law in genetics. The activities included, among other topics related to biosafety, the description and analysis of developments in genomic research and of the establishment of bio and gene banks.

To a large extent, the BMLFUW operates its own research activities quite independently from the common research promotion structures. PFEIL 05 defines the framework within which the ministry's contracted research is implemented. Of the total sum of 117.4M EUR that were spent during the reporting period, 5.9M EUR were assigned to biotechnology-related projects, most of which focusing on bio-safety and risk assessment. The research commissioned by the BMGF follows similar principles, concentrating on consumer protection and bio-safety as well. The ministry assigned research contracts worth of 2.1M EUR in the area of biotechnology between 2002 and 2005.

The bulk of the federal ministries' policy-directed research support activities are operated and administered by the research promotion and funding agencies FWF, FFG and AWS. Usually the policy actors of the federal government set the agendas, develop the funding schemes – mostly in close cooperation with the relevant experts of the agencies – and finally authorise the affiliated promotion agencies to execute the support actions ("agencification"). Apart from the programmes carried out on behalf of a federal ministry, the agencies realise numerous self-governed funding activities as well.

2.3.2 Instruments of the Austrian Science Fund (FWF)

The formal responsibility for the Austrian Science Fund (FWF) lies jointly with the BMVIT and the BMBWK. In 2004, the agency funded research with the total sum of 106M EUR through its self-governed programmes (FWF 2005: 23ff.)[18]. During the reporting period, the FWF was not operating any programmes specifically dedicated to biotechnology. Nevertheless, basic research in this area was supported with significant funds – both through commissioned and self-governed programmes.

On behalf of the BMVIT, the FWF operated the intersectoral mobility and human resources programme Impulse Projects – Scientists for Business (Impulseprojekte - ForscherInnen für die Wirtschaft), which supported scientists working in the field of biotechnology with 1.6M EUR or 31% of the total programme budget between 2002 and 2005. Since 2005, the Translational Research programme intends to close the funding gap between basic and applied research. The new programme offers support for activities at universities and companies alike that transfer and adapt results from basic research to specific applications; it is managed in close cooperation with the FFG's partner programme BRIDGE. Almost 40% of the programme's 10M EUR annual funds promote projects related to biotechnology.

With a thematic focus on nanotechnology, the BMVIT's NANO Initiative also funded biotechnology-related research. Through this programme, which aims to foster thematically oriented research networks and clusters, the FWF supported basic biotechnology research with 3M EUR (about 12% of the total programme budget administered by the FWF).

In terms of total expenditure, biotechnology benefits to a much larger extent from the FWF's independent programmes which are financed by unconditional block grants of the federal government and funds of the Austrian Central Bank (OeNB)/National Foundation for Research. Apart form the agency's most important instrument, the funding of standalone projects (Einzelförderung) based on an open-call system (see 2.2), three thematically unspecific priority research programmes (Spezialforschungsbereiche, Doktoratskollegs and Nationale Forschungsnetzwerke), contributed to Austria's biotechnological knowledge-base as well. Of the total sum of 92.48M EUR for these three programmes for the years 2002 to 2005, about 7.5M EUR had been allocated for activities in the area of biotechnology.

18 FWF (2005) Jahresbericht 2004. Wir stärken die Wissenschaften in Österreich, Dem Bundesministerium für Verkehr, Innovation und Technologie gemäß § 4 Abs. 1 FTFG vorgelegt, Wien.

2.3.3 Instruments of the Austrian Research Promotion Agency (FFG)

The Austrian Research Promotion Agency (FFG), which falls under the joint jurisdiction of the BMVIT and the BMWA, concentrates on applied and industry-oriented research. In 2004, the agency channelled funds worth of over 104M EUR into the Austrian innovation system. If loans and guarantees are included, the sum increases to nearly 190M EUR (FFG 2005: 15, 44)[19]. During the period under review, the total amount of funds and loans maid available by the FFG and its predecessor agencies amounted to 738M EUR; moreover, the agency also enjoyed substantial annual funding budget increases between 13 and 18%. As in the case of the FWF, the FFG did not operate any programmes specifically targeting biotechnology. Nonetheless, biotechnology-related research receives support from various programmes and initiatives carried out by the agency. The large number of programmes, sometimes with very similar objectives, is in part the legacy of the pronounced institutional fragmentation that existed prior to the reorganization of the industrial research promotion landscape in 2004. The FFG's funding instruments are grouped into three main programme lines: Basic programmes which support individual projects, structural programmes aiming to improve the general conditions for research and innovation, and thematically driven programmes targeting selected technologies.

Basic Programmes

Beginning with the first call in 2005, BRIDGE is the most recent programme within the FFG's basic programme line. Just like its FWF partner programme Translational Research, BRIDGE offered support for projects that promise to accelerate the viable application of basic research results. About 20% of the total funding of 15M EUR in 2005 for individual projects was biotechnology related. The programme Foodstuffs Initiative (Lebensmittel Initiative), another basic programme, ran out in 2003. With its focus on supporting applied research of SMEs in the food sector, biotechnology was supported with roughly 2M EUR during the reporting period – a fairly small share considering the total programme budget of 29M EUR in 2002 and 2003.

One of the FFG's core functions is to foster Austria's economic development. Hence, the research promotion agency provides support to start-ups that are knowledge-intensive and technology-based. The Start-up programme offers a wide range of financial and non-financial support to young businesses such as feasibility studies, technology ratings, and contacts to venture capital. Most importantly, the FFG sponsors certain R&D projects with up to 50%. About one fifth of the total programme costs of Start-up were spent in favour of businesses operating in the biotechnology field. In order to improve knowledge transfer between academia and industry, the FFG's support programme for Junior Scientists (Nachwuchsförderung) sponsors scientific theses being carried out in companies. However, of the 35.4M EUR budget only 3% were associated with expenditures for biotechnology-related research.

19 FFG (2005) Jahresbericht 2004, Österreichische Forschungsförderungsgesellschaft mbH, Wien.

Structural Programmes

With its programme line Structural Programmes (Strukturprogramme) the FFG seeks to advance the infrastructure of science and research capabilities. The programmes that are relevant for the biotechnology sector have mainly been designed to sustain and facilitate networks, cooperation, local concentrations and knowledge transfer mechanisms within the innovation system.

The programmes K-ind/K-net (Industrial Competence Centres and Networks) and K*plus* promote competence centres and networks with a proven record in R&D. The purpose of the centres is to advance, develop and transfer application-oriented technological knowledge and to bridge the gap between science and industry. Of the 22 competence centres funded by the twin programmes K-ind/K-net, four of which are biotechnology relevant, accounting for roughly 12% of the total budget of 60M EUR between 2002 and 2005. K*plus*, which has more accentuated focus on knowledge creation and scientific research, supports one centre – the AB competence centre of applied biocatalysis in Graz – conducting research in the field of industrial biotechnology out of a total number of 18. The share for biotechnology-related research amounts to 17.5M EUR or approximately 7% of the programme budget.

Another programme with a specific focus on regional activities is RIF2000 (Regionale Impulsförderung) which supports already existing local impulse centres throughout Austria. The centres largely concentrate on providing infrastructure and services to innovative small and medium sized companies. However, within the programme a shift from subsidising material infrastructures to promoting R&D competencies has taken place more recently. About 520 000 EUR of the programme's total budget of 8M EUR was dedicated to biotechnology-related support activities during the period under investigation.

The programme A*plus*B (Academia plus Business) puts special emphasis on the promotion of innovative, technology-oriented spin-offs from the academic sector by providing professional and financial support for scientists in the process of turning research results into viable business ideas. The thematically open programme supported biotechnology-related spin-offs in specifically established A*plus*B centres with a sum of 2.3M EUR or 38% of the total budget during the period investigated. Two of the six A*plus*B centres are presently active in biotechnology research: CAST (Center for Academic Spin-offs Tyrol) in Innsbruck and INiTS – University Start-up Service (Universitärer Gründerservice) in Vienna.

Through its programme Brainpower Austria, the FFG puts special emphasis on scientific human resourced. Brainpower provides a broad range of services aiming to support scientists a various stages of their careers such as information exchange, networking opportunities, and consulting. Moreover, financial support for Austrian scientists currently working abroad and who are considering returning to Austria is offered. In the years 2004 and 2005, scientists focusing on biotechnology-related topics were supported with approximately 1.2 M EUR or 2/3 of the total programme budget.

The technology transfer programme protec2002+ has been introduced to promote innovation processes specifically among SMEs. The aspects covered by the programme include the utilisation of external sources of knowledge in R&D, the improvement of innovation management, the creation of cooperation models and networks with the aim of raising the innovative potential among the involved actors. The biotechnology share of the activities under protec2002+ was, however, quite low: Only 160 000 EUR of the 35M EUR budget was allocated in this R&D field. A considerably higher share of the funding budget was distributed to life sciences in prokis04 (programme to promote competence, innovativeness and structural improvement of cooperative research). Prokis04 made available 1.5M EUR or 15% of the total programme budget for research activities in the field of biotechnology. Though thematically open, the programme benefits were limited to the Austrian Cooperative Research institutes (ACR), an association of non-profit organisations conducting industry-oriented applied research.

Thematic Programmes

Two of the currently seven thematically oriented programmes of the FFG include biotechnology research. Energy Systems of Tomorrow (Energiesysteme der Zukunft) is one of the three sub programmes of the impulse programme Technologies for Sustainable Development (Nachhaltiges Wirtschaften) which has been initiated by the BMVIT in 2003. The activities sponsored by the initiative concentrate on innovative R&D and the implementation of pilot projects. About one third of the programme's budget of 6.08M EUR was spent in favour of biotechnology-related projects during the reporting period. The second thematic programme with some relevance for biotechnology research is the NANO Initiative. Starting in 2004, the programme aiming to advance nanoscale sciences and nanotechnologies has supported biotechnology with approximately 3M EUR, which equals 12% of the total programme budget for 2004 and 2005. The activities covered by the NANO Initiative are quite broad, including cluster development, creation of networks, training, and feasibility studies.

2.3.4 Instruments of the Austria Wirtschaftsservice (AWS)

The federally owned AWS, which awards grants and issues loans to Austrian companies, advises businesses and mediates the processes of technological innovation, is an influential intermediary promotion institution situated at the interface of the networks of actors involved in the industrial application of innovative technologies and the sector providing financial as well as non-financial resources for business development.

With regard to generic policy measures that are relevant for the Austrian biotechnology scene, three programmes have been identified. The Nano and Micro Technology Network (Nano- und Mikrotechnologienetzwerk) was initiated by the BMWA in close cooperation with the FFG's NANO Initiative. The programme focuses on regional networks, aiming to bundle numerous activities at Austrian universities and companies in order to establish a platform for interdisciplinary cooperation. The main goal of the initiative was to increase the number of product ideas with innovative features. Between 2003 and 2005,

about 30% of the total programme expenditure of 6M EUR was dedicated to life science networks.

Uni:invent aims to increase the number of registered patents of Austrian universities and the general awareness of the economic importance of turning scientific results and inventions into patents. The programme is dedicated to support Austrian universities in all aspects relating to IPR and technology transfer, including education, training and consulting of the academic community, awareness activities, evaluation, patenting and commercial exploitation of inventions made at universities. The funding covers patenting expenses as well. In total, 9M EUR were spent for the programme during the period under consideration, 4.5M EUR of which in the area of biotechnology. Similarly, tecma offers grants and loans to non-university inventors in the processes of patent registration and patent utilization. Prior to the implementation of Uni:invent in 2004, tecma also covered the IPR promotion activities in academia. Biotechnology was supported by tecma with approximately 0.5M EUR or 10% of the total programme budget.

Life Sciences Austria (LISA)

Life Sciences Austria (LISA) concentrates specifically on the commercial utilization of biotechnology. The AWS introduced LISA in 2002, the successor programme of the Impulsprogramm Biotechnologie which was launched in 1999. During the reporting period, the programme expenditures amounted to 15.2M EUR, including costs for administration, services, prizes, and subsidies. The activities that are performed through LISA fall into two main categories: consultancy and financial services.

In order to promote economic realization of research findings, the AWS offers assistance in business plan development, market analysis, patenting and licensing, establishment of business contacts, access to venture-capital networks and business training. With the annual business plan competition Best of Biotech (BOB), which is operated under LISA, it is sought to identify innovative business ideas and provide scientists with an additional incentive to translate their discoveries into commercial applications.

On the financial side, LISA offers pre-seed financing (up to 100 000 EUR subsidies for proof of principle) and seed-financing (up to 500 000 EUR for long-term loans for start-ups). Between 2002 and 2005, companies in the early stage of development were supported with subsidies and loans worth of 12.7M EUR. Growing and expanding life science companies were supported with 8.3M EUR in loans. Furthermore, the AWS issued guarantees worth of 30M EUR for biotechnology outside the LISA umbrella.[20]

LISA also cooperates with regional initiatives supporting life sciences. An important formal link to the City of Vienna has been established by the joint working group LISA Vienna Region in which numerous stakeholders participate (see regional policy level). Close informal links between LISA and the life sciences initiatives in Styria and the Tyrol exist as well.

20 Both loans and guarantees are not included in the summary tables for the purpose of this report.

2.3.5 Instruments at the sub-national level

The research promotion activities at the sub-national level are an important ingredient in Austria's biotechnology scene. Depending upon the specific region, the observer is confronted with a multiplicity of programmes, research facilities and public and private actors from all levels of government, making it at times difficult to grasp the organisational logic. Policy actors are thus faced with the challenge of coordination, the avoidance of overlap, and the integration of conflicting agendas. At the same time, the vertical collaboration has its merits because it allows the bringing together of local experiences and needs with the specific perspectives of national policy-makers.

Vienna region

As has already been pointed out, the most vibrant concentration of biotechnology R&D in Austria is located in Vienna and the greater Vienna region. The city council contributes to the regional innovation system with various instruments and institutions. The Vienna Science and Technology Fund (WWTF), a non-profit fund established in 2001 by the City of Vienna and a private foundation, puts special emphasis on life sciences. Biotechnology-related research was supported via two main actions: within the generic funding initiative Vienna Science Chairs two professorships in bioinformatics were set up in 2004/2005 with a WWTF endowment of 1.5M EUR each. Moreover, the WWTF has issued two Life Science Project Calls (2003 and 2005). In total, 10M EUR were granted to individual projects. Another player in the Viennese R&D funding regime is the Center for Innovation and Technology (ZIT), a subsidiary of the publicly funded Vienna Business Agency (WWFF). ZIT has supported biotechnology-related R&D through its generic programmes, mostly via open calls for industry-based research, with 10M EUR during the reporting period. In addition, ZIT funded the life science scene through its special Life Science Calls which had been issued in 2002 and 2004. This represents over one third of the total funds which have been distributed by the ZIT, thus underlining the high importance of biotechnology for Viennese decision-makers.

The most prominent biotechnology-specific programme at the sub-national level is Life Science Austria – Vienna Region (LISA VR). The programme which makes use of the well established brand name LISA of the federal level is a joint initiative of AWS and ZIT. LISA VR wants to position itself in the regional biotechnology support structure as the chief contact point ("one-stop-shop") for businesses and researchers seeking advice and funding. Apart from serving as a coordination and information relay centre assisting researchers and businesses to access the available federal and regional funding schemes, LISA VR offers consulting and training and is active in local cluster management. Furthermore, the programme contributes to public relations in the biotechnology scene and provides opportunities for companies to participate in international life science congresses and trade fairs. The total costs for LISA VR between 2002 and 2005 have amounted to 1.6M EUR.

Tyrol

The Bundesland Tyrol performs its location development activities mainly through the Tyrolean Future Foundation (Tiroler Zukunftsstiftung). The fund owned by the Land Tyrol intends to foster appropriate structures to enhance technology transfer, support start-ups and attract businesses to settle in the region. Biotechnology is one of the scientific-commercial strongholds in Tyrol. The Zukunfsstiftung contributes to the development of life sciences primarily by participating in federal programmes supporting competence centres (A*plus*B, K-ind/K-net, K*plus*). Between 2002 and 2005, biotechnology-related activities were funded with a sum of 15.1M EUR or 50% of the Zukunftsstiftung's total budget, underlining the high significance of the sector for Tyrol. Important biotechnology competence centres are the Austrian Center of Biopharmaceutical Technologies (ACBT) and the Medical Competence Center Tyrol (KMT), which also operates the network initiative Life Science Cluster Tirol.

Styria

Styria promotes R&D through two organisations: the Styrian Business Promotion Agency (SFG) and the Future Fund Styria (Zukunftsfonds Steiermark). The Future Fund was designed to promote innovative projects and improve the economic structure of Styria. Great value is placed on strengthening the research sector. Within the quite broad range of different scientific disciplines covered by the Future Fund, life sciences were supported with 3.4M EUR, an equivalent of 14% of its total promotional activities. The SFG supported biotechnology-related R&D mainly through services and advice, aiming to foster cluster developments. As in the case of Tyrol, the majority of biotechnology support activities in Styria are associated with either competence centres or clusters, which in turn are mostly supported by federal programmes. Apart from the research centre Applied Biocatalysis (AB) which received funding from the Land within the K*plus* programme, Styria started to build up its Human Technology Cluster in 2004.

Lower Austria

Lower Austria's chief organizational entity for business and research promotion is the Fund of Economic Development and Structural Improvement Lower Austria (Wirtschaftsförderungs- und Strukturverbesserungsfonds Niederösterreich). Beginning in 2004, the fund's Technopol programme supported biotechnology with 9.6M EUR or roughly 80% of the total programme budget. The approach of Technopol is to concentrate the resources in three locations, two of which are highly relevant for biotechnology: The Technopol in Krems with its focus on biomedicine and the Technopol Tulln which specialises in green biotechnology.

The other Austrian Länder

The remaining Länder Burgenland, Carinthia and Vorarlberg did not report any notable promotional activities in the area of biotechnology. The reason for the absence of noteworthy R&D in this sector can mainly be attributed to the lack of universities with medi-

cal science and biology departments in these regions. Upper Austria and the Land Salzburg supported biotechnology through non-policy-directed funding (see 2.2).

2.4 Charities

Turning to non-profit organisations with a focus on biotechnology, the publicly funded Dialogue Genetics (dialog<>gentechnik) could be treated as a charity. However, as the bulk of its biotechnology-related activities are financed by public sources, it was decided to deal with dialog<>gentechnik in section 2.3.1.

Other non-profit organisations do not play a significant role in the promotion and the financing of biotechnology-related activities in Austria.

2.5 Participation in the Sixth Framework Programme

Austrian researchers were relatively active in the biotechnology-/life science-related projects funded through the Sixth Framework Programme. As to be expected, the bulk of these activities were concentrated in the life sciences, genomics and biotechnology for health category (233 projects and 34 coordination actions). This involvement represents 2.7% and 4.5% of the European totals in this thematic area, respectively. Compared to a top life science performer such as Switzerland, Austrian researchers clearly display a higher degree of the active participation via coordination activities.

The other two scientific areas – bionanotechnologies and food quality and safety – clearly have been less prominent with regard to Austrian FP 6 participation.

Table 2.4: Austrian involvement in biotechnology/life sciences programmes of the Sixth Framework Programme

Sixth Framework Programme[1] Thematic priority	**Participations as coordinator**	**Participations as member of the project team**[2]
1. Life sciences, genomics and biotechnology for health	34 (4.5%)	233 (2.7%)
2. Nanotechnologies, section bionanotechnology	0	1 (0.9%)
5. Food quality and safety	1 (1.1%)	34 (2.1%)

[1] First and second call, all types of projects

[2] Persons/groups can participate in more projects, resulting in more participation

Source: BioPolis Research

3. Performance of the national biotechnology innovation system

3.1 Introduction

This chapter analyses the performance of the Austrian biotechnology innovation system for two or three time periods – depending on data availability – as shown by a range of indicators for scientific and commercialisation performance. In order to avoid capturing erratic trends, each time period includes several years. National trends are benchmarked against the performance of the EU Member States and the US.

The presentation of the performance is structured along the four main areas of the innovation system: the knowledge base, processes of knowledge transmission and application, industrial development and markets for biotechnology-based products. For each area data are shown for a number of different indicators for Austria, the USA and EU25 (or EU15). The EU-values have been chosen as reference in each indicator. The absolute figures that are used to calculate the values for the indicators presented and the sources for the data can be found in Annex 5. In principle, for each indicator data are presented for three periods. The periods chosen can vary considerably between the indicators; Table A.5.1 presents for each indicator the specific years for each period and provides additional background information.

3.2 Performance in creating a knowledge base and supporting the availability of human resources

With regard to biotechnology publications pMC, the country displays values clearly above those of EU25, but below US performance rates. In absolute figures (pMC), Austria ranks in the upper half (rank 12) of the EU25. Europe's top performers in this category are Switzerland, Sweden and Denmark. Over the three time periods covered, a steady increase of biotechnology publications can be identified. However, these gains are not above average relative to Austria's overall increase in scientific productivity (cf. total publications).

Austria's data on biotechnology publications per public R&D expenditures in this scientific area outperform the EU15 nearly by factor five. Taking into account that the private sector's share of GERD is traditionally low in Austria, this indicator seems to support the notion that public research funding is used quite efficiently. Alternatively, the excellent performance may also be the result of Austrian universities' high scientific productivity, as block grants for universities and public research institutes were not included in the Inventory report (European Commission 1999)[21].

21 European Commission, DG Research, RTD actions – Biotechnology (DG XII/E.1) u.a. (1999a) Inventory of public biotechnology R&D programmes in Europe: Volume 1: Analytical Report, Office for Official Publications of the EC, Luxembourg (European Commission: Studies). / European Commission, DG Research, RTD actions – Biotechnology (DG XII/E.1) u.a. (1999b) Inventory of public biotechnology R&D programmes in Europe: Volume 2: National Reports (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland), Office for Official Publications of the EC, Luxembourg (European Commission: Studies).

Between 12 and 13% of Austria's scientific publications fall into the category of biotechnology. Highest European shares are achieved by countries such as Finland (16% in 2002-2004), Iceland (20% in 1998-2000) or Luxemburg (21% in 1998-2000). Compared to the reference regions, the Austrian data corresponds nearly perfectly with the EU25 level and ranges slightly below the US. The trend across the three time periods indicates only marginal variations in relation to EU25.

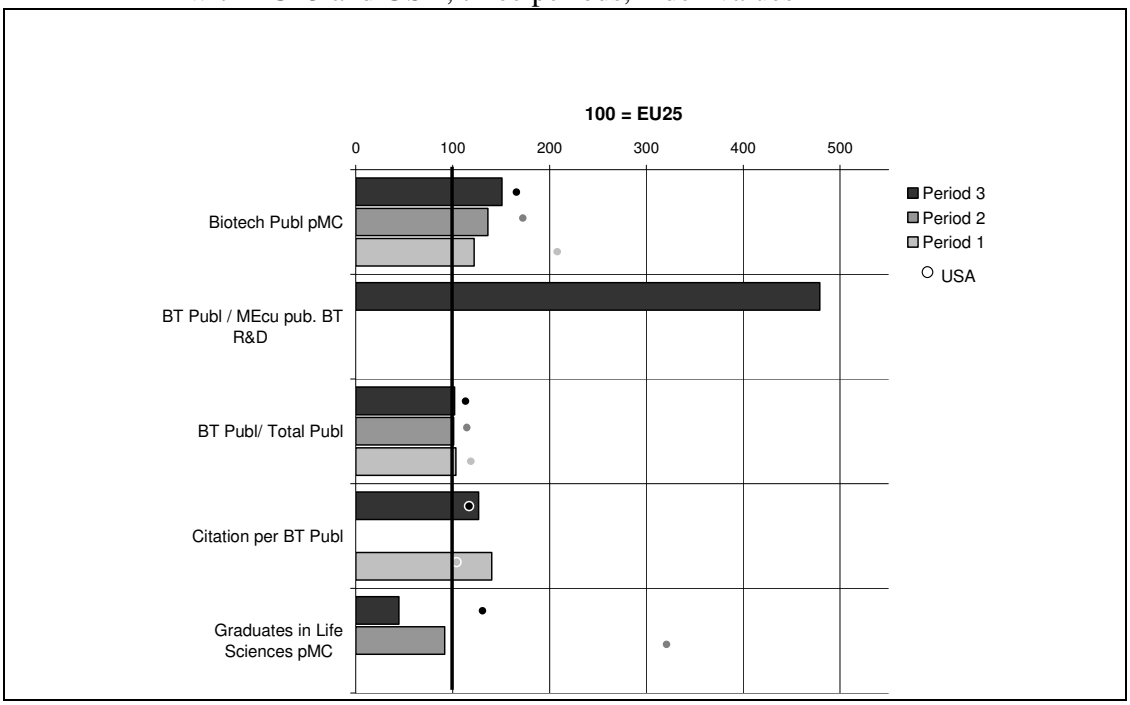
Austrian citation rates per biotechnology publication show a quite good performance: the country outperforms both the EU25 and the US; however, between the two periods covered, a slight downward trend can be identified. Within Europe, Austria ranks fifth after top performers such as Iceland, Ireland, Switzerland, and Norway (comparison based on time period 2002-2004). Nevertheless, this indicator should be interpreted with some caution as the applied calculation method tends to depreciate large countries with a high number of total publications, resulting in a so-called "small country effect".[22]

With regard to graduates in life sciences, the country performs considerably below the EU17 and US levels – particularly during the second time period. Over the course of the two periods (1998 and 2002) covered, Austria's relative backlog even amplified significantly. However, if absolute figures are taken into account, the number of doctorates in life sciences increased from 622 to 677. In the long run, this marked underperformance relative to the reference regions might result in problematic shortages of skilled researchers in the area of life sciences.

Taken all together, Austria performs quite well in creating a knowledge base. The country's biotechnology research scene, by and large, clearly stands out in terms of quality, not so much in terms of quantity.

22 For a discussion of the problem, see Annex 5, Table A.5.1, indicator 5.

Chart 3.1: The biotechnology knowledge base indicators for Austria, comparison with EU25 and USA, three periods, index values



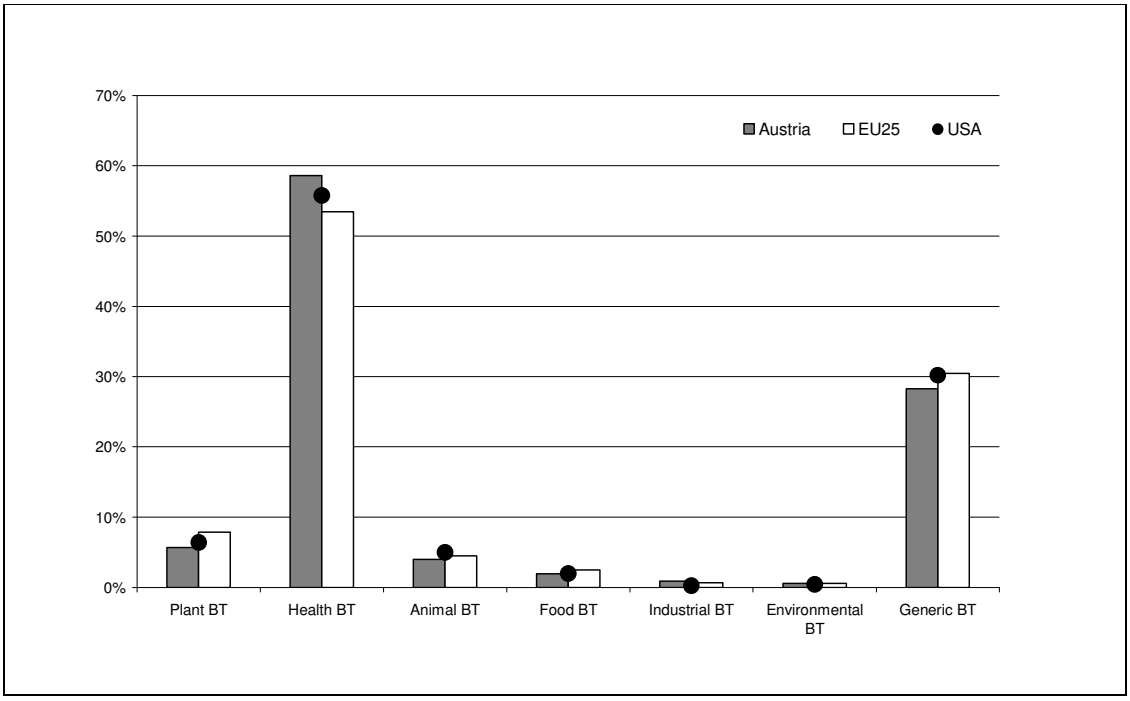
Source: BioPolis Research

Data: Science Citation Index

Note: The European reference region for indicator 2 (BT Publ./M Ecu pub. BT R&D) is EU15.

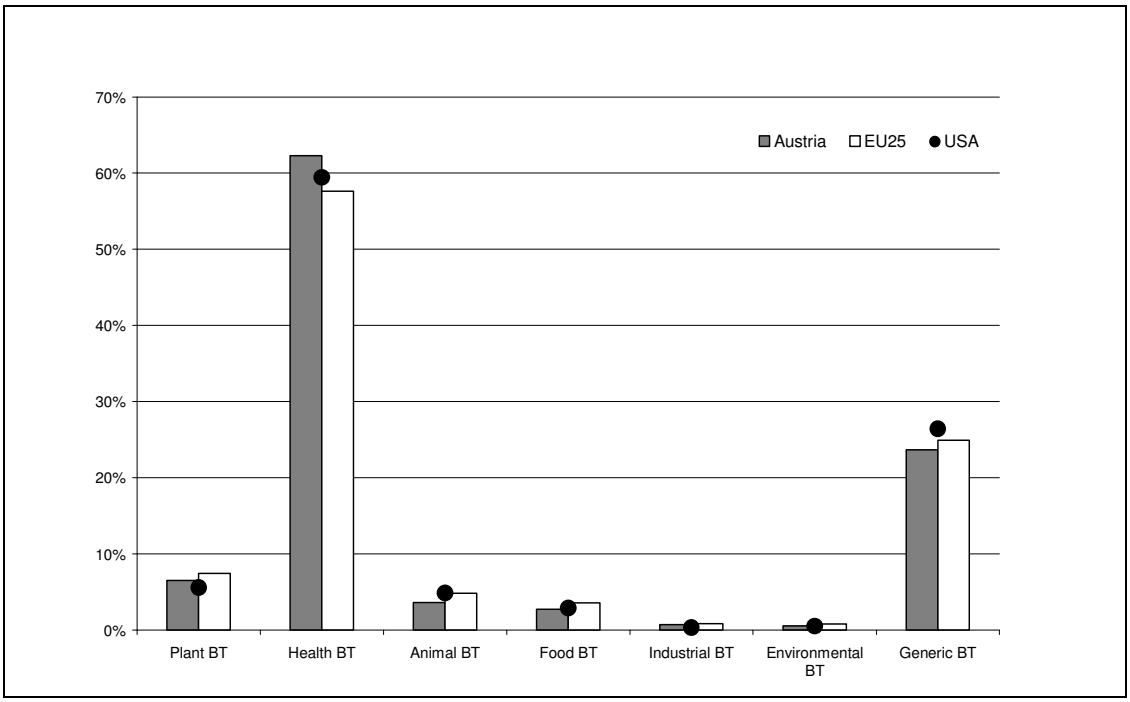
The bibliometric analysis of Austrian publication activities reveals two main strongholds: in both time periods the health (between 59 and 62%) and generic (between 24 and 28%) biotechnology domains were to by far most dominant areas in Austria's biotechnology research scene. The relative strength of all subfields remained largely unchanged over the two time periods. Compared with the reference regions, Austrian publication activities are by and large in line with those of the two reference regions. In the area of health biotechnology, Austria slightly outperforms the EU25 and the US, and with regard to generic biotechnology, Austrian scientists publish a bit less than their colleagues from the reference regions.

Chart 3.2.1: Share of subfields (in%) of total biotechnology publication for Austria in comparison with EU25 and USA (1994-1996)



Source: BioPolis Research
Data: Science Citation Index

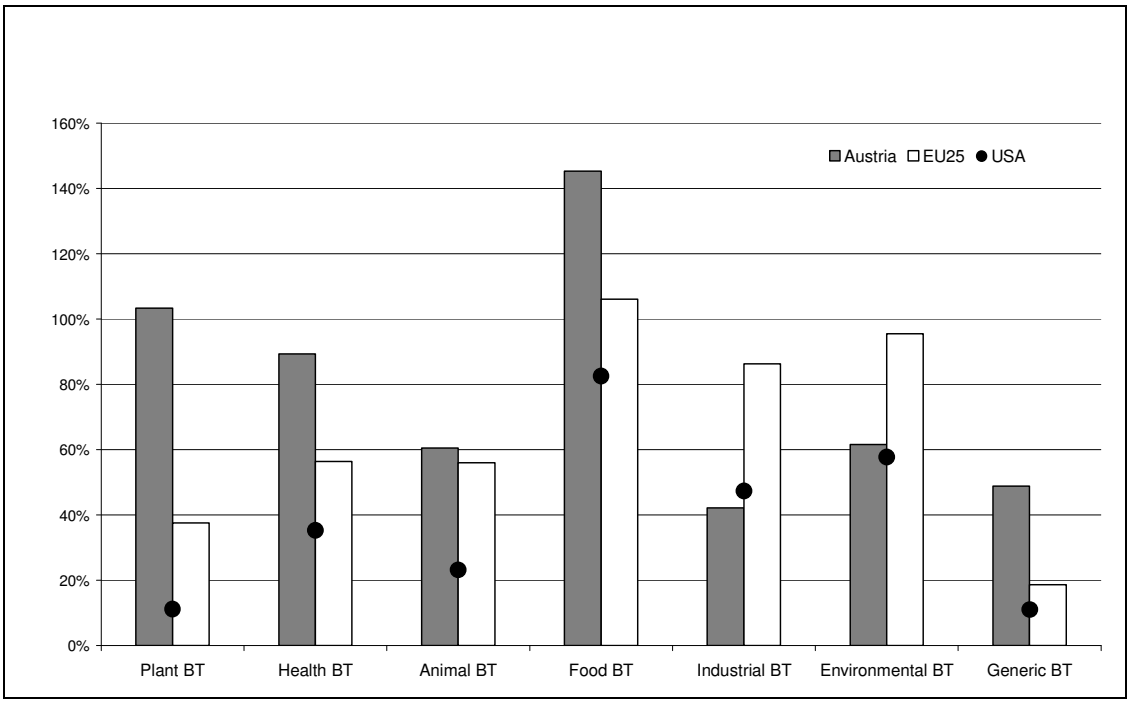
Chart 3.2.2: Share of subfields (in%) of total biotechnology publication for Austria in comparison with EU25 and USA (2002-2004)



Source: BioPolis Research
Data: Science Citation Index

Between 1994/96 and 2002/04, Austria experienced the most pronounced increases of publication activities in the subfields of food (+145%) and plant (+103%) biotechnology. In both areas, however, the absolute number of publications in the period 1994/96 was very small. The third largest growth rate occurred in the already very important health (+89%) area. In comparison, Austria deviated from the patterns displayed by the two reference regions. For instance, Austrian scientists increased their publication activities significantly in the areas of plant and health biotechnology, whereas EU25 and US rates grew with lower margins. On the other hand, industrial and environmental biotechnology publications were particularly on the rise in EU25, but clearly to a lesser extent in Austria.

Chart 3.3: Biotechnology subfields growth rates for Austria in comparison with EU25 and USA (1994-1996 and 2002-2004)



Source: BioPolis Research

Data: Science Citation Index

3.3 Performance in knowledge transmission and application

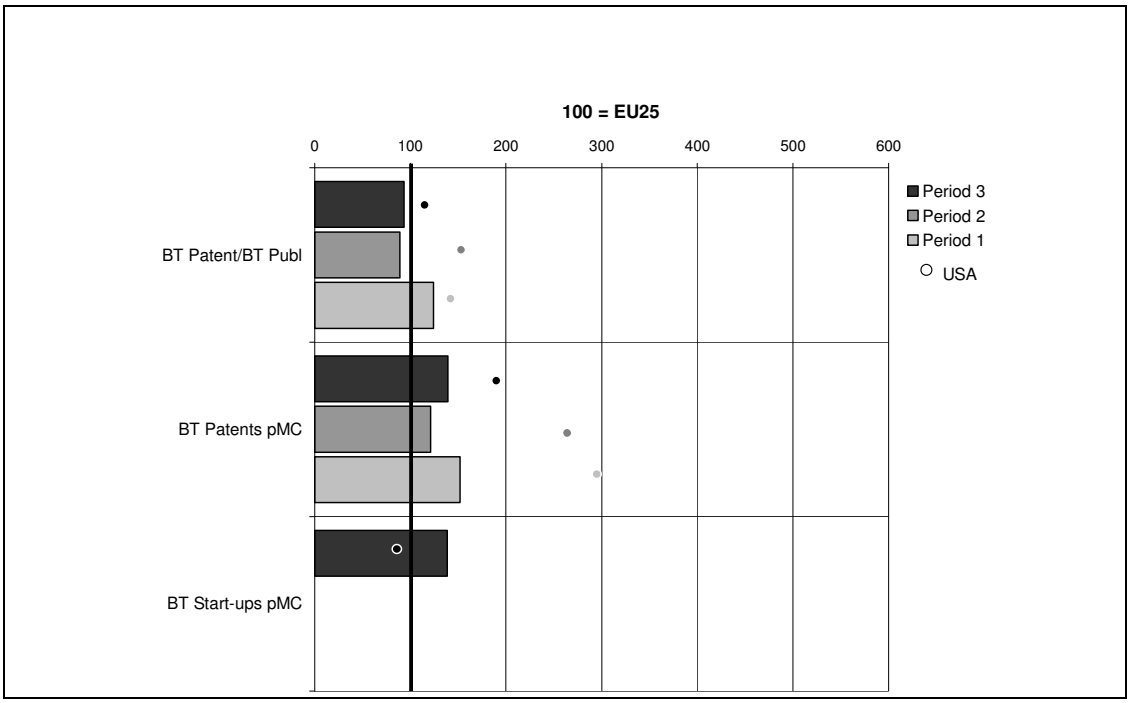
The first of the three indicators – biotechnology patents per biotechnology publication – which are being presented in order to inform about a country's performance with regard to knowledge transmission and application, reveals that relative the EU25, Austrian per-

formance decreased from a quite impressive above average rate in period one (1994-1996) to below average showing in the two succeeding periods. In absolute terms however, the patents/publication ratio remained stable during the first two periods (0.06) and increased slightly in the third one (0.07). During the most recent period covered (2001-2003), Austria held a medium position, ranking eleventh after top performers such as Iceland, Denmark or Germany. The data suggests that despite its measurable improvements concerning knowledge transmission, Austria still needs to build up more momentum in order to match EU25 levels.

The Austrian situation with regard to biotechnology patents pMC is clearly less problematic. On the contrary, Austria outperforms EU25 in all three periods, and fares slightly better than EU15. Austria ranks twelfth behind countries such as Iceland and Denmark, but in front of Norway or France. In absolute terms, Austrian patenting activities increased considerably: 133 (17 pMC) patents in the first period, 192 (24 pMC) in the second and 251 (31 pMC) in the third. Nevertheless, Austria applied for nearly three times less patents than its Alpine neighbour Switzerland.

With two biotechnology start-ups pMC in the period 2001–2003, Austria holds a medium position. Top performer Denmark reached 8.4, and the second best performer Switzerland reported four start-ups pMC. Due to the small number of cases reported, this indicator should be interpreted with caution.

Chart 3.4: Performance indicators for biotechnology knowledge transmission and applications, three periods, Austria in comparison with EU25 and USA



Source: BioPolis Research

Data: Database of European Patents (Host Questel Orbit , EPPATENT), Database of International Patent Applications (WOPATENT), EuropaBio

Note: The European reference region for indicator 11 (number of biotech start-ups pMC) is EU15.

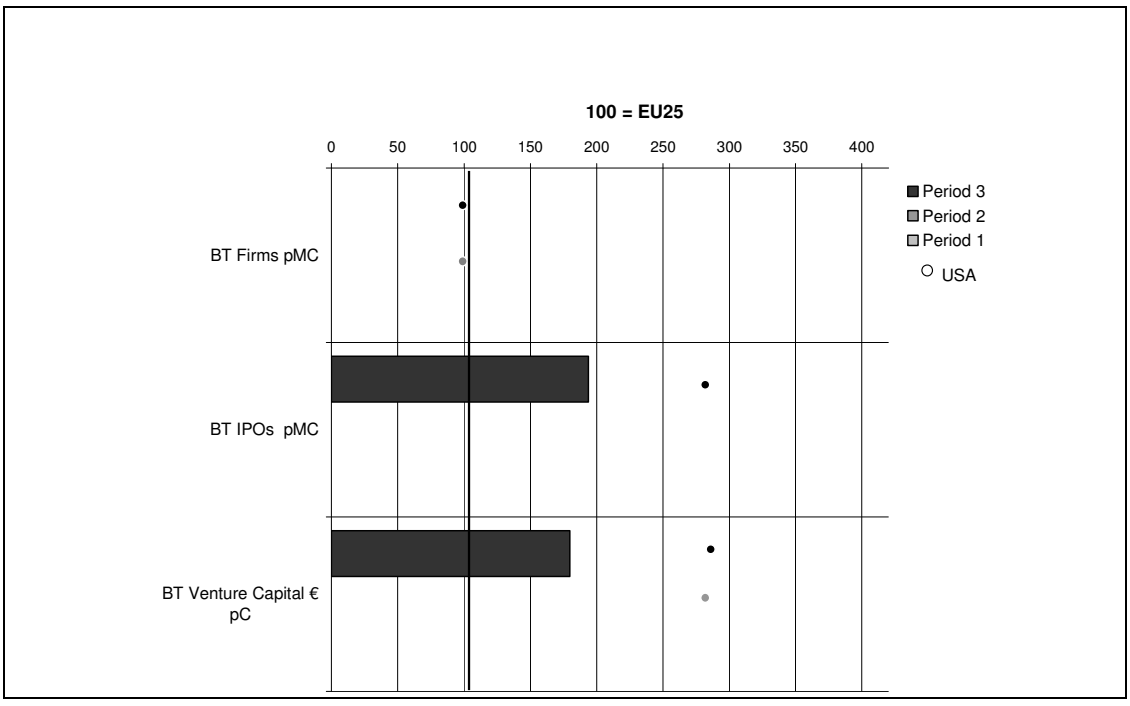
3.4 Industrial development

In the case of Austria, no data on the number of biotechnology companies pMC was available for the two selected years (2001 and 2004). In 2003 however, 39 companies (5 pMC) were reported.

With regard to the second indicator focusing on industrial development, one IPO was reported in Austria for the period 2002 to 2005. This represents 3.4% of all IPOs issued in the EU25 during the period under investigation. Other countries with the same number of IPOs between 2002 and 2005 were Sweden, Denmark or Ireland.

Concerning the amount of venture capital in biotechnology companies, data was only available for the second time period (2004). Compared to the EU25 level, Austria outperformed the reference region nearly by factor two. But with 6M EUR venture capital pMC in 2004, Austria was dwarfed by Switzerland's 17M pMC. The sudden and surprising increase of venture capital has been caused by a single, particularly large investment. Thus, this extraordinary high performance rate should not be overstated.

Chart 3.5: Performance indicators for Austria's industrial development for the three periods, in comparison with EU25 and USA

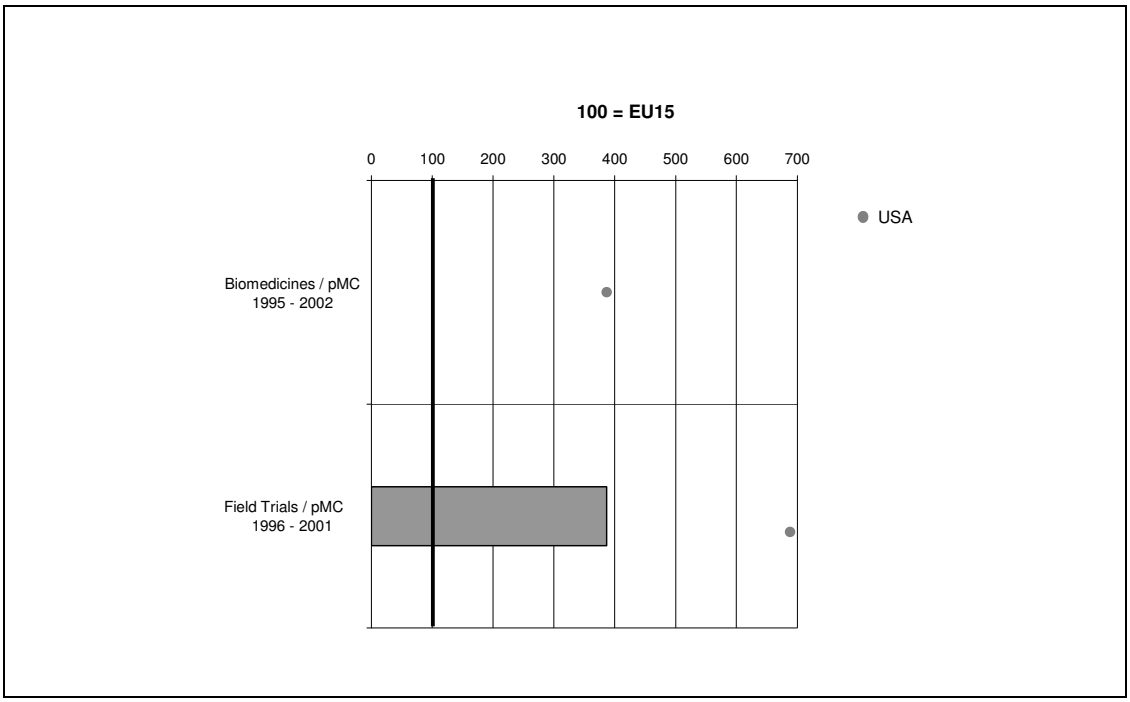


Source: Benchmarking of public biotechnology policy 2005, Biotechnology Innovation Scoreboard 2002, BioPolis Research

3.5 Market conditions

During the time period 1995-2002, no biomedicines were reported from Austria. With regard to biotechnology-related field trials as an indicator for the industrial development, Austria performed remarkably well relative to EU15. However, due to very small numbers, these figures have to be interpreted with some caution. Between 1996 and 2001, Austria reported a total number three field trials. Countries such as France, Belgium or Sweden carried out seven trials during the same period.

Chart 3.6: Performance indicators for Austria's Market Conditions, in comparison with EU25 and USA



Source: BioPolis Research

Data: Ernst &Young Beyond Borders (report 2002, 2003, 2004, 2005), Websites of the London Stock Exchange, the Frankfurt Stock Exchange, Euronext, Nasdaq, Burril & Company

4. Conclusions

4.1 Introduction

This concluding chapter provides an overview over the main characteristics of the policy-directed instruments that have been operated by the Austrian governments in the period 2002-2005 to stimulate biotechnology R&D, technology transfer and commercialisation, including research on social, ethical and legal aspects of biotechnology. The overview summarises the funding of biotechnology in terms of the types of policy instruments used, the policy goals addressed, the research application areas funded and the activities that are stimulated. It also provides a comparison with the period 1994-1998 which has been analysed in the Inventory Report (European Commission 1999a, b)[23].

Table 4.1 summarises the public expenditure totals for the period 2002-2005 by two main categories (research and commercialisation). In addition, totals for sub-categories such as generic and specific funding schemes operated by the national and regional levels respectively are listed. The ensuing Table 4.2 gives information about the main recipients of the promotion activities and general co-financing requirements. Tables 4.3 through 4.5 give overviews over the policy goals, the biotechnology application areas and the activities covered by each of the policy instruments that have been relevant for biotechnology promotion activities between 2002 and 2005. While the shown funding patterns for the policy goals, application areas and activities deliver useful indications of priorities, promotional styles and perhaps certain lacunae, the aggregated budgets for each of the categories should be interpreted with due caution. In most instances, the reported budget shares had to be based on informed approximations of the programme officers of the funding agencies and ministries because the BioPolis classifications are not in accordance with the internal accounting and budgeting systems of the institutions providing the funding data. Furthermore, particularly with regard to Table 4.5 (coverage of biotechnology activities), the reported funding totals tend to be sketchy because making coherent assignments of specified budgets for individual activities was not always feasible.

4.2 Public funding of biotechnology through policy instruments

In the period 2002-2005, public institutions promoted biotechnology-related activities in Austria with a total sum of 394M EUR. 142.82M EUR or about 36% of the total funds were spent through non-policy-directed funding schemes guided towards research. Policy-directed research funding accounted for the second largest single entry, constituting 27.3% of the total public expenditures. Within this category, biotechnology-

23 European Commission, DG Research, RTD actions - Biotechnology (DG XII/E.1) et al. (1999a) Inventory of public biotechnology R&D programmes in Europe: Volume 1: Analytical Report, Office for Official Publications of the EC, Luxembourg, (European Commission: Studies).
European Commission, DG Research, RTD actions - Biotechnology (DG XII/E.1) et al. (1999b) Inventory of public biotechnology R&D programmes in Europe: Volume 2: National Reports (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland), Office for Official Publications of the EC, Luxembourg, (European Commission: Studies).

specific instruments received roughly 50% more funds than the generic instruments. Commercialisation was promoted with 135.23M EUR or 34.3% of the total.

Table 4.1 Public funding of biotechnology through non-policy-directed and policy-directed instruments in the period 2002-2005 (in M EUR)

	Total
RESEARCH	
1. *Non-policy-directed (national and regional)*	
Public Research Institutions	90.03
Response Mode	43.79
Other*	9
Total	**142.82**
2a. *Policy-directed Generic*	
National	31.3
Regional	10.3
Total	**41.6**
2b. *Policy-directed Biotech-specific*	
National	58
Regional	8
Total	**66**
COMMERCIALISATION	
1a*. Policy-directed Generic*	
National	70.3
Regional	30.8
Total	**101.1**
1b. *Policy-directed Biotech-specific*	
National	27.53
Regional	6.6
Total	**34.13**
OTHER	
National	8.35
Regional	
Total	**8.35**
GRAND TOTALS	***394.00***

* including START and Wittgenstein which are administered by the FWF.

Source: BioPolis Research

4.3 Specific features of the instruments

Table 4.2 indicates that Austrian funding activities promoting biotechnology – both as generic and specific instruments – do not only cover public research organisations, but are open to the business sector at a large extent.

On the national level, 14 of the 26 instruments support at least one additional type of recipient next to PROs. Ten of the 26 are exclusively directed towards public research institutions, whereas only two instruments are designed to promote research and innovation in the private sector.

Moreover, 14 of the national instruments demand a financial contribution to the total project budget from the recipients. The required shares range between 15 and 50 percent. In all these cases, the instruments aim to foster cooperation between academia and industry.
Four of the instruments require financial contributions from the subnational level. In these cases, the programmes promote activities with a strong regional focus, such as the support of competence centres or clusters.

Table 4.2 Participants/recipients and co-financing requirements of policy-directed programs that fund biotech activities in the period 2002-2005

Instrument	Funding agency	Participants/Recipients			Financial contribution required (%)	
		PROs	SMEs	LFs	Recipients	Other public authorities
National						
Generic						
A*plus*B	FFG	√	√		√	√
Brainpower Austria						
BRIDGE - Das Brückenschlagprogramm	FFG	√	√	√	√	
Doktoratskollegs FWF	FWF	√				
Energiesysteme der Zukunft	FFG	√	√	√	√	
Impulse Projects - Scientists for the economy	FWF		√	√	√	
K-ind / K-net	FFG	√	√	√	√	√
Kplus	FFG	√	√	√	√	√
Lebensmittel Initiative	FFG	√	√	√	√	
NANO Initiative	FFG	√	√	√	√	
Nano- und Mikrotechnologie Netzwerk	AWS	√	√	√	√	
Nationale Forschungsnetzwerke NFN	FWF	√				
PFEIL 05		√				
prokis04	ACR, FFG	√			√	
RIF2000	FFG	√	√		√	√
Spezialforschungsbereiche SFB	FWF	√				
Stand der Ethik in den Wissenschaften in Österreich		√				
Start-up	FFG		√		√	
Tecma	AWS	√	√			
TRAFO - Transdisziplinäres Forschen		√				
Translational Research Programme	FWF	√				

Instrument	Funding agency	Participants/Recipients			Financial contribution required (%)	
		PROs	SMEs	LFs	Recipients	Other public authorities
Uni:Invent	AWS	√				
Biotech specific						
Contracted Research on Consumer Protection	BMGF	√				
Forschungskooperation Biowissenschaften	ÖAW	√	√	√		
GEN-AU	BMBWK	√	√	√	√	
LISA - Preseed and Seedfinancing	AWS	√	√	√		
Regional						
Generic						
Technopol (Lower Austria)	Wirtschaftsfoerderungs- und Strukturverbesserungsfonds Niederoesterreich	√	√	√	√	
Tiroler Zukunftsstiftung (Tyrol)	Tiroler Zukunftsstiftung/State of Tyrol		√		√	
Vienna Science Chairs (Vienna)	WWTF	√			√	
ZIT - Zentrum für Innovation und Technology (Vienna)	ZIT		√	√	√	
Technopol (Lower Austria)	Wirtschaftsfoerderungs- und Strukturverbesserungsfonds Niederoesterreich	√	√	√	√	
Tiroler Zukunftsstiftung (Tyrol)	Tiroler Zukunftsstiftung/State of Tyrol		√		√	
Vienna Science Chairs (Vienna)	WWTF	√			√	
ZIT - Zentrum für Innovation und Technology (Vienna)	ZIT		√	√	√	
Technopol (Lower Austria)	Wirtschaftsfoerderungs- und Strukturverbesserungsfonds Niederoesterreich	√	√	√	√	
Tiroler Zukunftsstiftung (Tyrol)	Tiroler Zukunftsstiftung/State of Tyrol		√		√	
Zukunftsfonds Steiermark (Styria)	Zukunftsfonds Steiermark	√	√	√		
Biotech specific						
Biowissenschaftliches Forschungszentrum (Salzburg)	Land Salzburg	√				
Life Sciences Project Calls (Vienna)	WWTF	√			√	
LISA VR	AWS & ZIT	√	√	√		
Stiftungsprofessur für	Land Salzburg	√				

Instrument	Funding agency	Participants/Recipients			Financial contribution required (%)	
		PROs	SMEs	LFs	Recipients	Other public authorities
Strukturbiologie des Landes Salzburg (Salzburg)						

Note: the public information and discourse activity dialog<>gentechnik is not included in Table 4.2 because the instrument did not make available funding to biotechnology actors.

Source: BioPolis Research

4.4 Policy goals

Judging from the funding amounts distributed across the ten policy goals, industry-oriented research (policy goal 2), knowledge transmission from academia to industry (5) and basic biotechnology research (1) are the top three policy priorities in Austria's biotechnology promotion strategy. The three policy goals with the lowest budget shares are biosafety (10), social acceptance (8) and knowledge flow among scientific disciplines (3). If the individual expenditures for policy goals are grouped into the five policy areas defined by BioPolis[24], policy areas 1 and 2 are supported quite evenly with 43.2% and 42% of the total expenditures, respectively.

A closer look at the national level reveals that the generic instruments put a stronger emphasis on knowledge transfer and application (about 50% of the total national expenditures for generic instruments), whereas national biotechnology-specific programmes promote areas 1 and 2 with about the same shares (23% and 21.4%, respectively).

The regional funding activities compensate for the lower level of national funding policy area 1. Large regional biotechnology-specific expenditures are directed towards policy goal 1, mainly to support research centres and universities with special funding.

Taken together, Austria's promotion of biotechnology applies a quite balanced funding approach. As the national level is focusing its expenditures more pronounced on knowledge transfer and application, the research promotion institutions seems to have drawn the right conclusions from identified weaknesses in this area, without being enticed to neglect the knowledge base.

24 The policy area 1 "creation of knowledge base and human resources" is composed of policy goals 1 to 4, policy area 2 "knowledge transfer and application" includes policy goals 5 to 7 and 9. The remaining policy goals 8 and 10 constitute policy areas of their own.

Table 4.3 Coverage of policy goals and funding by goal by policy-directed instruments in the period 2002-2005 (in M EUR)

	Policy goals									
	1*	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
National										
Generic										
A*plus*B					√		√			
Brainpower Austria				√						
BRIDGE	√	√			√					
Doktoratskollegs FWF	√			√						
Energiesysteme der Zukunft		√			√				√	
Impulse Projects - Scientists for the economy				√	√				√	
K-ind / K-net		√			√					
K*plus*		√			√				√	
Lebensmittel Initiative		√			√					
NANO Initiative		√	√	√	√					
Nano- und Mikrotechnologie Netzwerk			√		√					
Nationale Forschungsnetzwerke NFN	√									
PFEIL 05		√						√		
prokis04			√	√	√					
RIF2000					√		√			
Spezialforschungsbereiche SFB	√		√							
Stand der Ethik in den Wissenschaften in Österreich								√		
Start-up						√	√		√	
Tecma					√	√				
TRAFO								√		
Translational Research Programme	√	√			√					
Uni:Invent					√					
Total	6.85	16.65	4.05	3.75	21.48	12	17.25	3.2	19.6	–
Biotech specific										
Contracted Research on Consumer Protection										√
dialog<>gentechnik								√		
Forschungskooperation Biowissenschaften	√	√			√					
GEN-AU	√	√	√	√	√	√	√	√		
LISA – Preseed and Seedfinancing					√	√	√			

	Policy goals									
	1*	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Total	32	20	3	3	8.66	5.17	13.7	3.05	–	2.1
Regional										
Generic										
Technopol (Lower Austria)					√		√		√	
Tiroler Zukunftsstiftung (Tyrol)		√			√		√		√	
Vienna Science Chairs (Vienna)	√			√						
ZIT - Zentrum für Innovation und Technology (Vienna)		√			√		√		√	
Zukunftsfonds Steiermark (Styria)		√			√					
Total	1.5	7.3	–	1.5	11.4	–	9.7	–	9.7	–
Biotech specific										
Biowissenschaftliches Forschungszentrum (Salzburg)	√									
LISA VR					√		√			
Life Sciences Project Calls (Vienna)		√			√					
Stiftungsprofessur für Strukturbiologie des Landes Salzburg (Salzburg)	√			√						
Total	2.25	5	–	0.75	5.4	–	1.2	–	–	–
Grand Total	42.6	48.95	7.05	9	46.94	17.17	41.85	6.25	29.3	2.1
% of GrandTotal	17.0	19.5	2.8	3.6	18.7	6.8	16.7	2.5	11.7	0.8

* Legend:
1 = High level of biotechnology research
2 = High level of industry-oriented (and applied) research
3 = Knowledge flow and collaboration among scientific disciplines
4 = Availability of human resources
5 = Transmission of knowledge from academia to industry and its application to industrial resources
6 = The adoption of biotechnology for new industrial applications
7 = Firm creation
8 = Social acceptance of biotechnology
9 = Business investment in R&D
10= Bio-safety, Risk assessment

Note: The figures in this table should be read as merely indicative of the relative expenditure allocated to the various policy goals. Since many goals overlap in one instrument, the split of expenditure between goals is only a rough estimate and/or informed guess. On the other, it is important to bear in mind that instruments of some goals (e.g., social acceptance programmes) may require less expenditure than others even if they are set as a policy priority.

Source: BioPolis Research

4.5 Biotechnology research application areas

According to the budget data provided by the programme officers, the largest share of biotechnology-related funding – about 40 % of the total expenditures – is directed towards the "general" application area. One of the explanations for this dominance is that many instruments aiming to promote valorisation by funding competence centres, knowledge transfer or by providing services do not differentiate between different biotechnology application areas. As a consequence, the general application area also serves as a residual category for those cases in which detailed information about the recipient's R&D focus is not readily available. Thus, as the application area is quite uncertain, the category "general" has been excluded from the overview of Table 4.4.

With a share of roughly 35 %, health biotechnology is the most important designation for funding, followed by basic biotechnology with 30 %%. The application areas receiving the least funding are animal, food and environmental biotechnology. Similarly, activities concerning ethical, legal and social aspects of biotechnology only supported with merely 2.7 % of the total expenditures.

The distribution of funds across the eight application areas confirms by and large the general output performance pattern presented in chapter 3.2.

Table 4.4 Coverage of biotech application areas and funding through policy-directed instruments by biotech application area in the period 2002-2005 (in M EUR)

	Biotechnology Application Areas							
	1*	**2**	**3**	**4**	**5**	**6**	**7**	**8**
National								
Generic								
*Aplus*B	√		√	√				
Brainpower Austria								
BRIDGE							√	
Doktoratskollegs FWF								
Energiesysteme der Zukunft						√		
Impulse Projects - Scientists for the economy	√	√	√	√	√		√	
K-ind / K-net				√				
K*plus*						√		
Lebensmittel Initiative					√			
NANO Initiative				√				
Nano- und Mikrotechnologie Netzwerk	√			√	√	√	√	
Nationale Forschungsnetzwerke NFN								

	Biotechnology Application Areas							
	1*	**2**	**3**	**4**	**5**	**6**	**7**	**8**
PFEIL 05	√	√	√	√	√			√
prokis04				√	√			
RIF2000								
Spezialforschungs-bereiche SFB								
Stand der Ethik in den Wissenschaften in Österreich								√
Start-up								
Tecma								
TRAFO								√
Translational Research Programme	√			√	√	√	√	
Uni:Invent								
Total	3.4	0.4	3.1	12.25	4.55	19.18	1.88	0.7
Biotech specific								
Contracted Research on Consumer Protection			√	√	√			√
dialog<>gentechnik								√
Forschungskooperation Biowissenschaften	√	√		√	√		√	
GEN-AU	√						√	√
LISA - Preseed and Seedfinancing								
Total	8.81	n.a.	0.4	20.4	1	–	39.65	3.35
Regional								
Generic								
Technopol (Lower Austria)	√		√	√				
Tiroler Zukunftsstiftung (Tyrol)				√				
Vienna Science Chairs (Vienna)							√	
ZIT - Zentrum für Innovation und Technology (Vienna)								
Zukunftsfonds Steiermark (Styria)			√	√	√	√		
Total	3.0	–	3.2	20.6	0.3	1.0	3	–
Biotech specific								
Biowissenschaftliches Forschungszentrum (Salzburg)								
LISA VR								
Life Sciences Project Calls (Vienna)								
Stiftungsprofessur für Strukturbiologie des Landes Salzburg (Salzburg)								

	Biotechnology Application Areas							
	1*	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Total	–	–	–	–	–	–	13.35	–
Grand Total	15.21	0.4	6.7	53.25	5.85	20.18	44.53	4.05

* Legend:
1 = Plant biotechnology
2 = Animal biotechnology
3 = Environmental biotechnology
4 = Health biotechnology
5 = Food biotechnology
6 = Industrial biotechnology
7 = Basic biotechnology
8 = Ethical, legal, social aspects of biotechnology

Note: Figures in the table should be understood as rough estimates of expenditure in a given application area.

Source: BioPolis Research

4.6 Stimulation of biotechnology activities through the instruments

According to the data presented in Table 4.5, the top three activities of the instruments covered by BioPolis are the support of collaborative research between industry and public research organisations (activity 8), financial support for start-ups (13) and applied research (2). Those activities with the lowest share of funding are non-financial incentives for business investment (18), creation of incubators (15) and technology transfer offices (10). Even though one instrument covered activity 16 (awareness of biotechnology by companies not yet active in biotechnology), a budget figure is not available.

Table 4.5 Coverage and funding of biotech activities in the period 2002-2005 through policy-directed instruments (in M EUR)

	Biotechnology activities																		
	1*	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
National																			
Generic																			
*Aplus*B													√		√			√	
BRIDGE	√	√					√	√											
Doktoratskollegs FWF	√					√													
Energiesysteme der Zukunft		√		√													√	√	
Impulse Projects - Scientists for the economy		√					√										√		
K-ind / K-net		√	√					√	√										
K*plus*		√	√					√											
Lebensmittel Initiative		√					√	√											
NANO Initiative	√	√	√	√				√											
Nano- und Mikrotechnologie Netzwerk				√				√								√			
Nationale Forschungsnetzwerke NFN	√		√	√															
PFEIL 05		√		√															√
prokis04				√				√											
RIF2000								√			√				√				
Spezialforschungsbereiche SFB	√		√	√															
Stand der Ethik in den Wissenschaften in Österreich																			√

	Biotechnology activities																		
	1*	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
Start-up								√					√	√					
Tecma										√		√							
TRAFO																			√
Translational Research Programme	√	√										√							
Uni:Invent										√		√							
Total *	4.95	13.1	9	4.4	–	1.2	1.6	23.57	2	0.74	0.17	3.74	16.6	13	0.56	n.a.	1.4	0.4	2.2
Biotech specific																			
Contracted Research on Consumer Protection		√																	
dialog<>gentechnik																			√
Forschungskooperation Biowissenschaften	√	√						√	√										
GEN-AU	√	√		√		√								√					
Life Science Austria (LISA) - Preceed and Seedfinancing												√	√	√					
Total	n.a.	2.1	–	n.a.	–	n.a.	–	–	–	–	–	1.17	12	2	–	–	–	–	1.55
Regional																			
Generic																			
Technopol (Lower Austria)		√	√					√	√		√						√		
Tiroler Zukunftsstiftung (Tyrol)			√	√				√	√	√		√	√						
Vienna Science Chairs (Vienna)	√			√															
ZIT - Zentrum für Innovation und		√						√					√				√		

	Biotechnology activities																		
	1*	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
Technology (Vienna)																			
Zukunftsfonds Steiermark (Styria)		√			√														
Total	1.5	7.3	1.6	1.5	1.7	–	–	5.6	1.6	–	1.6	n.a.	n.a.	–	–	–	3.6	–	–
Biotech specific																			
Biowissenschaft-liches Forschungs-zentrum (Salzburg)	√								√										
LISA VR														√					
Life Sciences Pro-ject Calls (Vienna)		√										√							
Stiftungsprofessur für Strukturbiologie des Landes Salz-burg (Salzburg)	√																		
Total	2.25	5	–	–	–	–	–	29.17	0.75	–	–	5	–	1.6	0.56	–	–	–	–
Grand Total	8.7	27.5	10.6	5.9	1.7	1.2	1.6	29.17	4.35	0.74	1.77	9.91	28.6	16.6	0.56	n.a.	5	0.4	3.75

* Legend:

1 Basic research
2 Applied research
3 Centres of excellence
4 Research network
5 Mobility of researchers among disciplines
6 Biotechnology training
7 Mobility of researchers between academia and industry
8 Collaborative research between industry and public research organisations
9 Set up research institute/centre of industrial interest
10 Technology transfer office
11 Science and technology park
12 Protection of IPR in public research organisations
13 Financial support for start-ups
14 Non-financial support for start-ups
15 Creation of incubators
16 Awareness of biotech by companies not yet active in it.
17 Grants for industrial research
18 Other incentives for business investment
19 Support for public discourse activities

Note: Figures in the table should be understood as rough estimates of expenditure for a given activity.

Source: BioPolis Research

4.7 Dynamics: comparison with period 1994-1998

A comparison of public funding expenditures between the two time periods 1994-1998 (European Commission 1999a,b or "Inventory") and 2002-2005 (BioPolis) has to be carried out with great caution as the data collection criteria between the two periods changed considerably. This is not only the case for the decisive factors concerning which public funding activities are to be considered for the analysis in the first place (Table 4.6), but also for the delineation of the different biotechnology application areas. Moreover, the Inventory study did not use the same categorisation of policy goals as it is being applied in BioPolis. Thus, the comparison presented in Table 4.7 should be interpreted with caution as well.

Consequently, differences in the amounts of public funds allocated and the distribution pattern of policy goals in Inventory and BioPolis need not necessarily reflect a shift in funding priorities.

Table 4.6 indicates that total expenditures for the promotion of biotechnology have increased significantly between the two time periods. According to the data, the average total funding on the national level in 2002-2005 was more than eight times higher than during the period 1994-1998. However, it should be noted that compared to Inventory, BioPolis collected more generic instruments, resulting in an overall higher amount of expenditures during the latter period.

Table 4.6 Comparison of biotechnology funding through non-policy-directed and policy-directed instruments in the periods 1994-1998 and 2002-2005

Funding	Average total funding per annum for biotechnology research in 1994-1998	Average total funding per annum for biotechnology research in 2002-2005
National	10.17M ECU	82.45M EUR
Regional	n.a.	16.05M EUR
Total	10.17M ECU	98.5M EUR

Note: This table combines total funds of non-policy-directed funding, policy-directed instruments and commercialisation instruments.

Source: BioPolis Research

With regard to the changing presence of policy goals between the two time periods compared in Table 4.7, two differences are most obvious:

(1) In the latter time period (2002-2005), not only the coverage of policy goals increased quite impressively, but the intensity of the coverage was amplified as well. One explanation for the surge in policy goal coverage is a result of the broader collection strategy applied in BioPolis. However, the improved policy goal coverage also indicates – at least to some extent – a proliferation of funding instruments in Austria's S&T system. On the one hand, the stronger emphasis on applied R&D, knowledge transmission and commercialisation is to be welcomed as an adequate response to weaknesses of the innovation system. On the other hand, the large number of instruments obviously addressing certain policy goals might also be indicative of fragmentation, a lack of focus, overlap and, as a consequence, reduced efficiency.

(2) During the 1994-1998 period, all policy-directed instruments were generic. In 2002-2005, generic instruments were still more common, but biotechnology-specific programmes – such as GEN-AU and LISA – have been initiated. This stronger emphasis on the promotion of biotechnology is reflected by the coverage of policy goals with a biotechnology-specific orientation.

Table 4.7 Coverage of policy goals by the policy-directed instruments in the periods 1994-1998 and 2002-2005

Presence of instruments					
Policy areas	**Policy goals**	**1994-1998**		**2002-2005**	
		G*	**S****	**G**	**S**
1. Creation of knowledge base and human resources	1. To promote high level of biotechnology basic research	√		√	√
	2. To promote high level of industry-oriented (and applied) research	√		√	√
	3. To support knowledge flow and collaboration among scientific disciplines			√	
	4. To assure availability of human resources	√		√	√
2. Knowledge transmission and application	5. To facilitate transmission of knowledge from academia to the industry and its application for industrial purposes	√		√	√
	6. To stimulate the adoption of biotechnology for new industrial applications			√	√
	7. To assist firm creation			√	√
3. Market	8. To monitor and improve the social acceptance of biotechnology			√	√
4. Industrial development	9. To encourage business investment in R&D			√	

* G = generic instruments; ** S= Biotechnology-specific instruments

Source: BioPolis Research

Funding of biotechnology areas

Keeping the limitations concerning the comparability of the two time periods in mind, the data suggests that funding for basic biotechnology remained largely at the same level (around 20%). Similarly, the overall funding intensities in the areas of plant and environmental biotechnology changed insignificantly between the two periods. Health-related activities clearly enjoyed increased funding during the later period (from roughly 10 to 20%), whereas animal biotechnology was reduced. Also, the support for non-technical areas of biotechnology seemed to have been cut down significantly – from 16% in 1994-1998 to merely 1.5% in 2002-2005. However, particularly the definition of this last application area was narrowed down in BioPolis, explaining the differences in funding intensity to a large degree.

5. Future developments

Extensive changes in Austria's public biotechnology promotion activities do not seem to be on the horizon for the next few years. Generally, biotechnology and life sciences will continue to be considered as one of the six scientific fields with extraordinary scientific and economic perspectives for the future.

The governance focus of the upcoming years will most likely follow the lines spelled out in the RFT's 2005 strategy paper for the development of the Austrian life sciences. These recommendations, which largely apply a piecemeal approach, include actions such as the development of a unified international representation of Austrian life sciences under a single label, increased efforts to enhance human resources, improvement of the regulatory framework conditions and better support for start-ups and newly established businesses (Austrian Council 2005b).

The development and introduction of new instruments – generic or specific –, which might be of relevance for biotechnology, have not been on the agenda at the time of the editorial deadline of this national report. For the immediate years to come, the attention of policy makers will be strongly directed towards the finalisation of the broad organisational reforms which have been instigated since 2000. By and large, the formal part of the institutional consolidation has been implemented. These reforms now need to be incorporated into the day-to-day routines and mind-sets of the institutions and actors concerned. Most importantly, the strategic and managerial coordination of the different promotion agencies still shows some leeway for improvement. In addition, a reduction of the ongoing fragmentation at the level of funding instruments needs to be addressed as well. Also, as some of the Länder are becoming more and more active players in the national innovation system, vertical coordination between the different levels of government and horizontal cooperation between the Länder will be of growing importance.

The issue of the distribution of the major S&T competencies between three federal ministries is still not resolved. It remains to be seen whether the RFT's recommendation to partly disentangle the overlapping policy responsibilities by concentrating the relevant competencies in two ministries (Austrian Council 2005a: 37) will be acted upon.

Annex 1 List of Tables

Annex 2 List of charts and figures

Annex 3 List of contact persons

Name, first name	Institution	Contact date(s)
Badura, Heinrich	BMBWK	08-06-2005
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Goebl, Reinhard	BMVIT	14-07-2005
Gohm, Harald	Tyrolean Future Fund	26-07-2005
Haas, Michael	BMGF	15-07-2005
Hammerschmid, Sonja	AWS	11-07-2005
Harjung, Margit	BMVIT	06-07-2005
Hartl, Hubert	BMGF	26-07-2005
Heilmann-Sennhenn, Claudia	ÖAW	19-07-2005
Höglinger, Otmar	Upper Austrian Research	25-07-2005
Höllinger, Sigurd	BMBWK	10-06-2005
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Mandl, Josef	BMWA	01-07-2005
Mandl, Mario	FWF	02-08-2005
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Matzinger, Sabine	BMWA	09-08-2005
Mayer, Birgit	FFG	07-07-2005
Müller-Niklas, Gerald	FFG	11-07-2005
Nagl, Alexandra	Styria	26-07-2005
Novak, Rudolf	FWF	11-07-2005
Oberraufner, Gerit	FWF	02-08-2005
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Pilch, Martin	BMWA	09-08-2005
Pogany, Alexander	BMVIT	05-07-2005
Priedl, Irma	Lower Austria	22-07-2005
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Schmidt, Reinhard	FWF	02-08-2005
Schmöller, Silvia	BMWA	13-06-2005
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Tebb, Graham	FWF	02-08-2005
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Titscher, Stefan	BMBWK	09-06-2005
Unterer, Ulrike	BMWA	09-08-2005
Unterholzner, Philipp	Tyrolean Future Fund	29-07-2005
Vcelouch, Monika	FFG	04-07-2005
Winter, Michaela	BMWA	04-07-2005
Wizany, Karl	BMWA	24-06-2005
Wurz, Gerald	FWF	28-07-2005
Zaininger, Peter	BMVIT	01-07-2005
Zieger, Gisela	BMBWK	09-06-2005

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BMBWK	http://www.bmbwk.gv.at/forschung/index.xml
BMVIT	http://www.bmvit.gv.at/en/index.html
BMWA	http://www.bmwa.gv.at/EN/default.htm
FFG	http://www.ffg.at
FWF	http://www.fwf.ac.at/en/index.asp
RFT	http://www.rat-fte.at
Statistics Austria	http://www.statistik.at/index_englisch.shtml

Annex 5 Performance

Introduction

This Annex includes the data that was used to develop the indicators discussed in Chapter 3. Chapter 3 describes four sets of indicators used to measure the performance of the national biotechnology system of innovation, in terms of:

1. Creating a knowledge base and supporting the availability of human resources: Charts 3.1, 3.2.1, 3.2.2 and 3.3
2. Knowledge transmission and application: Chart 3.4
3. Industrial development: Chart 3.5
4. Market conditions: Chart 3.6

The indicators aim to capture trends in performance and compare the national situation with that of a reference region. To present trends in performance, most indicators are provided for three or two different time periods, depending on data availability. To avoid capturing erratic trends, each time period includes several years, again depending on data availability. Information on which years have been captured for each period and comments concerning the index used can be found in the last two columns of Table A5.1.

Table A5.1. Performance indicators, charts, comments and time periods

	Indicator	Chart	Comments	Time periods
Ind. 1	Biotech publications per million capita (pMC)	3.1	Index: Reference Region EU25 =100 and US data for comparison	(1) 1994-1996, (2) 1998-2000, (3) 2002-2004
Ind. 2	Biotech publications per BT public R&D expenditure	3.1	Only for those countries included in the inventory Index: Reference Region EU25 =100	BT Pub. 2002-2004 / Total Pub. Expenditure 1994-1998 M Ecu
Ind. 3	BT patents / BT publications	3.4	Index: Reference Region EU25 =100 and US data for comparison	(1) 1994-1996 (2) 1998-2000 (3) 2001-2003
Ind. 4	BT publications / Total pub.	3.1	Index: Reference Region EU25 =100 and US data for comparison	(1) 1994-1996 (2) 1998-2000 (3) 2002-2004
Ind. 5	Citations to BT publications	3.1	Index: Reference Region EU25 =100 and US data for comparison Small country effect	(1) 1994-1998 (3) 2000-2004
Ind. 6	Graduates in life sciences pMC	3.1	Index: Reference Region EU17 =100 and US data for	(2) 1998 (3) 2002

	Indicator	Chart	Comments	Time periods
			comparison	
Ind. 7	BT publications in subfields, as % of total BT publications	3.2.1	Data in % EU25 and US data for comparison	1994-1996
		3.2.2		2002-2004
Ind. 8	Growth rate of BT publications in subfields	3.3	EU25 and US data for comparison Small field effect	Growth rate between 1994-96 (period 1) and 2002-04 (period 3)
Ind. 9	Biotech patent applications pMC	3.4	EU25 and US data for comparison	(1) 1994-1996 (2) 1998-2000 (3) 2001-2003
Ind. 10	Number of biotechnology companies pMC	3.5	European (data available) and US data for comparison	(2) 2001 (3) 2004
Ind. 11	Number of biotech start-ups pMC	3.4	European (data available) and US data for comparison	(3) 2001-2003 (only one period)
Ind. 12	Number of biotech IPOs pMC	3.5	European (data available) and US data for comparison	(3) 2002-2005
Ind. 13	Venture capital in € pC	3.5	European (data available) and US data for comparison	(2) 2002 (3) 2004
Ind. 14	BT acceptance index	No Chart - Discussed in text of chapter 3	Source: BT Policy Benchmarking 2005. The biotechnology acceptance index is a composite index and draws on questions Q.12, Q.13.1 and Q14.01 and Q14.09 of the Eurobarometer 58.0	2002
Ind. 15	Eurobarometer 225	No Chart - discussed in text of chapter 3	See section 3.3 and sections 3.4.1, 3.4.2, and 3.4.3 of the Special Eurobarometer 225[25]	2005
Ind. 16	Biomedicines	3.6	Source: BT Policy Benchmarking 2005 Index: Reference Region EU15 =100 US data for comparison	1995-2002
Ind. 17	Field trials	3.6	Source: Biotechnology Innovation Scoreboard 2002 Index: Reference Region EU15 =100	1996-2001

25 http://europa.eu.int/comm/public_opinion/archives/ebs/ebs_225_report_en.pdf

	Indicator	Chart	Comments	Time periods
			US data for comparison	

The following methodological issues are related to some of the indicators:

- Indicator 3 (Patent BT / Publications BT) replaces the indicator *BT publications basic research/ BT publications applied research*. Results of the EPOHITE project have shown that the original indicator does not differ significantly in the case of old EU member states. This might be the result of methodological problems associated with the indicator, since the definition of basic and applied research is based on a journal classification made by SCI. The explanatory power of this indicator is therefore questionable.
- To calculate the citation rate first the publications for the period 1994-1996 (set 1) were searched and all the publications in 1994-1998 that cited any publications in set 1 (set 2). Citation rate has been calculated by (number of publications in set 2) / (number of publications in set 1). However, many of the articles in set 2 cited not only one article in set 1 and these duplicated citations are not taken into account in our calculation. For example, if there are 2 articles in set 1 and they each has one citation but cited by the same article, there is only 1 article in set 2. The citation rate for the 2 articles in set 1 is 0.5 instead of 1. This depreciation is more obvious in countries with more publications such as USA and EU25 since the possibility to cite multiple articles in set 1 is large. Accordingly the citation rates of USA and EU25 are a bit underestimated.
- The indicator 'Citations to BT publications' seems to have a 'small country effect' bias. Small countries show a relatively large citation rate. A possible explanation might be that, as far as number of publications is concerned, larger countries usually have a larger 'middle quality' share of research results (in terms of impact) while smaller countries usually have a 'low in number but good in quality' publications impact. This can be explained by the concentration of resources allocated to selected research groups in small countries. Small countries may concentrate resources in outstanding research units. Accordingly, fewer publications may have greater impact.
- The EU25=100 index is applicable in the indicator 'Graduates in life sciences pMC' since data was only available for 17 member states.
- For those countries starting from zero in period 1 (1994/1996), the growth rate of BT publications in subfields was set to 100% if the number of publications in period 3 (2002-2004) was larger than zero. On the other hand, if the country reduced the number of publications to zero in the period 2002-2004, the growth rate was -100%.Given that a relative growth rate was used, small fields tended to have relatively larger growth rates.
- To benchmark each country we chose EU25 (or EU15 if data was not fully available) as the reference region. In those cases where data for EU25 or EU15 were not available, the reference corresponds to the sum of national data available. Moreover, to ease the presentation of indicators with different scales in a given chart, an index value was used.

Raw data for the Charts in chapter 3

Raw data for Chart 3.1. BT publications per million capita (pMC): absolute and indexed

	BT publications			Population (million)		
	94-96	**98-00**	**02-04**	**1996**	**2000**	**2004**
EU25	97521	128716	145646	447	451	457
Austria	2118	3109	3912	8	8	8
USA	119802	135508	154402	264	276	292
	BT publications/pMC			**Index EU25=100**		
	94-96	**98-00**	**02-04**	**94-96**	**98-00**	**02-04**
EU25	218	285	319	100	100	100
Austria	266	389	481	122	136	151
USA	454	492	529	208	172	166

Source: BioPolis Research
Publication data: Science Citation Index (through online database vendor STN International)
Population data: EUROSTAT and OECD

Raw data for Chart 3.1. BT publications per BT public R&D expenditure

	BT publi-cations	**Non-policy-directed funding**	**Policy-directed funding**		**Total public spend-ing on BT (M Ecu)**	**BT publica-tions/ M Ecu BT public expenditure**	**Index**
			Biotech specific	**Generic**			
	2002-2004	**1994-1998**	**1994-1998**	**1994-1998**	**1994-1998**	**2002-2004/ 1994-1998**	
EU25	145646				n.a.		
Austria	3912	50,87	0	0	51	77	479
USA	154402				n.a.		n.a.

Source: BioPolis Research
Publication data: Science Citation Index (through online database vendor STN International)
BT public expenditures in research: Inventory Project, Table 3.4 Executive Summary

Raw data for Chart 3.1. BT publications, as share of total publications: absolute and indexed values

	BT publications			Total publications		
	94-96	**98-00**	**02-04**	**94-96**	**98-00**	**02-04**
EU25	97521	128716	145646	860652	1024327	1117392
Austria	2118	3109	3912	18092	24435	29401
USA	119802	135508	154402	889506	941191	1045894
	Share of BT publication			**Index EU25=100**		
	94-96	**98-00**	**02-04**	**94-96**	**98-00**	**02-04**
EU25	11%	13%	13%	100	100	100
Austria	12%	13%	13%	103	101	102

USA	13%	14%	15%	119	115	113

Source: BioPolis Research
Publication data: Science Citation Index (through online database vendor STN International)

Raw data for Chart 3.1. Citations to BT publications: absolute and indexed values

	Citations to BT publications		Index EU25=100	
	94-98	00-04	94-98	00-04
EU25	6,14	7,28	100	100
Austria	8,60	9,24	140	127
USA	6,39	8,54	96	105

Source: BioPolis Research
Citations data: Science Citation Index (through online database vendor STN International)

Raw data for Chart 3.1. Graduates in life sciences pMC: absolute and indexed values

	Graduates in Life Sciences		Population (million)	
	1998 / 1999	2002	1998 / 1999	2002
EU17	46,859**	81316	552**	431
Austria	622	677	8	8
USA	75253*	70950	276*	288
	Graduates pMC		Index EU17=100	
	1998 / 1999	2002	1998 / 1999	2002
EU17	85**	189	100	100
Austria	78	84	92	44
USA	273*	246	321	131

Index EU17=100 for 1998 is EU16, because for Portugal no data available
* data for 1998; ** data for 1999
Source: BioPolis Research
Graduates data OECD Education Database
Population source for US is the OECD

Raw data for Chart 3.2.1. BT publications in subfields, as share of total number of BT publications for the period 1994-1996

	1994-1996							
	Total	Plant	Health	Animal	Food	Indus-trial	Environ-mental	Generic
EU25	100%	8%	53%	5%	3%	1%	1%	30%
Austria	100%	6%	59%	4%	2%	1%	1%	28%
USA	100%	6%	56%	5%	2%	0%	0%	30%

Source: BioPolis Research
Publication data: Science Citation Index (through online database vendor STN International)

Raw data for Chart 3.2.2. BT publications in subfields, as share of total number of BT publications for the period 2002-2004

	2002-2004							
	Total	**Plant**	**Health**	**Animal**	**Food**	**Indus-trial**	**Environ-mental**	**Generic**
EU25	100%	7%	58%	5%	4%	1%	1%	25%
Austria	100%	6%	62%	4%	3%	1%	1%	24%
USA	100%	6%	59%	5%	3%	0%	1%	26%

Source: BioPolis Research
Publication data: Science Citation Index (through online database vendor STN International)

Raw data for Chart 3.2.1 BT publications in subfields for the period 1994-1996

	1994-1996							
	Total	**Plant**	**Health**	**Animal**	**Food**	**Indus-trial**	**Environ-mental**	**Generic**
EU25	97217	7629	51944	4375	2434	624	576	29635
Austria	2144	122	1256	86	42	19	13	606
USA	111686	7118	62274	5580	2230	296	459	33729

Source: BioPolis Research
Publication data: Science Citation Index (through online database vendor STN International)

Raw data for Chart 3.2.2. BT publications in subfields for the period 2002-2004

	2002-2004							
	Total	**Plant**	**Health**	**Animal**	**Food**	**Indus-trial**	**Environ-mental**	**Generic**
EU25	140984	10494	81220	6821	5017	1162	1126	35144
Austria	3816	248	2377	138	103	27	21	902
USA	141680	7910	84234	6872	4070	436	724	37434

Source: BioPolis Research
Publication data: Science Citation Index (through online database vendor STN International)

Raw data for Chart 3.3. Growth rate of BT publications in subfields between 1994-96 and 2002-04

	1994-1996/2002-2004						
	Plant	**Health**	**Animal**	**Food**	**Industrial**	**Environ-mental**	**Generic**
EU25	38%	56%	56%	106%	86%	95%	19%
Austria	103%	89%	60%	145%	42%	62%	49%
USA	11%	35%	23%	83%	47%	58%	11%

Source: BioPolis Research
Publication data: Science Citation Index (through online database vendor STN International)

Raw data for Chart 3.4. BT Patents pMC: absolute and indexed values

	BT patents			Population (million)		
	94-96	**98-00**	**01-03**	**1996**	**2000**	**2003**
EU25	4924	8921	10119	447	451	455
Austria	133	192	251	8	8	8
USA	8590	14396	12348	264	276	292*
	BT patents/pMC			**Index**		
	94-96	**98-00**	**01-03**	**94-96**	**98-00**	**01-03**
EU25	11	20	22	100	100	100
Austria	17	24	31	152	121	139
USA	33	52	42	295	264	190

Source: BioPolis Research
Publication data: Science Citation Index (through online database vendor STN International)
Patent data: EPPATENT, WOPATENT (online database vendor Questel Orbit)

Raw data for Chart 3.4. BT Patents per BT publications: absolute and indexed values

	BT patents			BT publications		
	94-96	**98-00**	**01-03**	**94-96**	**98-00**	**01-03**
EU25	4924	8921	10119	97521	128716	140219
Austria	133	192	251	2118	3109	3727
USA	8590	14396	12348	119802	135508	148853
	BT patents/ BT publications			**Index EU25=100**		
	94-96	**98-00**	**01-03**	**94-96**	**98-00**	**01-03**
EU25	0,05	0,07	0,07	100	100	100
Austria	0,06	0,06	0,07	124	89	93
USA	0,07	0,11	0,08	142	153	115

Source: BioPolis Research
Publication data: Science Citation Index (through online database vendor STN International)
Patent data: EPPATENT, WOPATENT (online database vendor Questel Orbit)

Raw data for Chart 3.5. Number of BT companies pMC for years 2001-2004: absolute and indexed values

	BT companies				Population in T			
	2001	**2002**	**2003**	**2004**	**2001**	**2002**	**2003**	**2004**
Europe	1879	1878	1861	1815	452016	452641	454580	456863
EU Available	1643	1650	1782	1605	319337	319484	408602	322210
Austria	n.a.	n.a.	39	n.a.			8102	
USA	1457	1472	1473	1444	285102	287941	290789	291685
	BT companies pMC				**Index**			
	2001	**2002**	**2003**	**2004**	**2001**	**2002**	**2003**	**2004**
Europe								
EU Available	5	5	4	5	100	100	100	100
Austria			5		n.a.	n.a.	110	n.a.
USA	5,11045	5,112158	5,06553	4,95054	99	99	116	99

Note: EU Available is the result of the sum of available EU Member States
Source: BioPolis Research
Biotech companies data: Ernst and Young 2002-2004[26], EuropaBio

Raw data for Chart 3.5. BT start-ups pMC for the period 2001-2003 and year 2003: absolute and indexed values

	BT start-ups		**Population in T**	
	2001-2003	**2003**	**2003**	
Europe (EU15 - Cyprus - Greece + Norway + Switzerland)	523	132	367051	
Austria	16	5	8102	
USA	355	83	290789	
	Biotech start-up/pMC	**Index**	**Biotech start-up/pMC**	**Index**
	2001-2003	**2001-2003**	**2003**	**2003**
Europe (EU15 - Cyprus - Greece + Norway + Switzerland)	1.4	100	0.36	100
Austria	0.62	172	2.0	139
USA	1.2	86	0.29	79

Source: BioPolis Research
Start-ups data: EuropaBio

Raw data for Chart 3.5. Number of BT IPO's pMC: absolute and indexed values

	BT IPO	**Population T**				
	2002-2005	**2002**	**2003**	**2004**	**2005**	**2002-2005**
EU Available	29	452927	454869	457154	461593	456636
Austria	1	8065	8102	8140	8207	8129
USA	52	287941	290789	291685		290138
	IPO /pMC	**Index**				
	2002-2005	**2002-2005**				
EU Available	0.00	100				
Austria	0.00	194				
USA	0.00	282				

Note: EU Available is the result of the sum of available EU Member States
Source: BioPolis Research
IPO data: Ernst and Young 2002-2006, London Stock Exchange, Frankfurt Stock Exchange, Euronext, Nasdaq, Burril & Company

26 Ernst&Young (2003) Endurance, The European Biotechnology Report 2003, Ernst & Young, London.

Raw data for Chart 3.5. Venture capital pC: absolute and indexed values

	Venture capital in biotechnology companies M EUR			Population in T		
	2002	**2002**	**2002**	**2002**	**2003**	**2004**
Europe	1100	920	2800			
EU Available	890	883	1111	315584	319663	325131
Austria	n.a.	46	50		8102	8140
USA	2288	2498	2855	287941	290789	291685
	Venture capital in EUR/pTC			**Index**		
	2002	**2003**	**2004**	**2002**	**2003**	**2004**
Europe						
EU Available	2.8	2.8	3.4	100	100	100
Austria	n.a.	6	6	n.a.	208	180
USA	8	9	10	282	311	286

Source: BioPolis Research
VC data: E&Y Beyond Borders 2002, 2003, 2004, 2005

Raw data for Chart 3.6. Number of Biomedicines pMC

	Biomedicines	**Population (Million)**	**Biomedicines / pMC**	**Index**
	1995-2002	**2002**		**1995-2002**
EU15	39	378	0.10	100
Austria	0	8	0.00	0
USA	115	289	0.40	387

Note: EU15 is the result of the sum of the 15 old EU Member States
Source: BioPolis Research
Number of medicines: Benchmarking of public biotechnology policy 2005

Raw data for Chart 3.6. Number of field trial pMC

	Field trials	**Population in M**	**Field trials pMC**	**Index**
	1996-2001	**2001**	**1996-2001**	**1996-2001**
EU15	1334	379	4	100
Austria	3	8	0	11
USA	6745	278	24	688

Note: EU15 is the result of the sum of the 15 old EU Member States
Source: BioPolis Research
Field trails: Biotechnology Innovation Scoreboard 2002

Raw data for biotechnology acceptance. Data are mentioned in the text of Chapter 3.

BT acceptance index 2002		
	Index average	**N (sample size)**
EU15*	100.29	16828
Austria	100.89	1001

*Weighted Average according to the weight "W13" of the Eurobarometer 58.2, which considers population differences among countries and corrects for inconsistencies in the national samples
Source: BioPolis Research
BT acceptance index: Benchmarking of public biotechnology policy 2005

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Euronext	http://www.euronext.com/
Nasdaq	http://www.nasdaq.com/
Burril & Company	http://www.burrillandco.com/
EuropaBio	http://www.europabio.org/
EUROSTAT	http://epp.eurostat.cec.eu.int/
OECD Education Database	http://www.oecd.org/
OECD Statistics	http://www.oecd.org/
STN International	http://www.stn-international.de/
Questel Orbit	http://www.questel.orbit.com/index.htm

Annex 6 Abbreviations

AB	Angewandte Biokatalyse Kompetenzzentrum GmbH	Research Centre Applied Biocatalysis
ACBT		Austrian Center for Biopharmaceutical Technology
AKH	Allgemeines Krankenhaus	General Hospital
ARC		Austrian Research Centers
AWS	Austria Wirtschaftsservice GmbH	
BMF	Bundesministerium für Finanzen	Federal Ministry of Finance
BMBWK	Bundesministerium für Bildung, Wissenschaft und Kultur	Federal Ministry of Education, Science and Culture
BMWA	Bundesministeriums für Wirtschaft und Arbeit	Federal Ministry of Economics and Labour
BMVIT	Das Bundesministerium für Verkehr, Innovation und Technologie	Federal Ministry of Transport, Innovation and Technology
BMLFUW	Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft	Federal Ministry of Agriculture and Environment
BMGF	Bundesministerium für Gesundheit und Frauen	Federal Ministry for Health and Women
CAST		Center for Academic Spin-offs Tyrol
CeMM	Forschungszentrum für Molekulare Medizin GmbH	Center for Molecular Medicine
CG	Gesundheitsclsuter Oberösterreich	Health technology cluster Upper Austria
ERP		European Recovery Program
FFG	Österreichische Forschungsförderungsgesellschaft GmbH	Austrian Research Promotion Agency
FP	Rahmenprogramm	Framework Programme
FWF	Fonds zur Förderung der wissenschaftlichen Forschung	Austrian Science Fund
GEN-AU	Genomforschungsprogramm Austria	Austrian Genome Research Programme
GMI	Gregor-Mendel-Institut für molekulare Pflanzenbiologie GmbH	Gregor Mendel Institute of Molecular Plant Biology
GMO		genetically modified organism
IBA	Institut für Biomedizinische Alternsforschung	Institute for Biomedical Aging Research
IFA	Forschungsinstitut für Agrarbiotechnologie	Institute for Agrobiotechnology

IMBA		Institute of Molecular Biotechnology
IMP	Forschungsinstitut für Molekulare Pathologie	Institute of Molecular Pathology
IMGuS	Institut für Medizinische Genom-Forschung und Systembiologie	Institute for Medical Genome Research and Systems Biology
KMT	Kompetenzzentrum Medizin Tirol	Medical Competence Centre Tyrol
n.a.		not available
NIBR		Novartis Institute for Biomedical Research
LISA		Life Sciences Austria
LISA VR		Life Sciences Austria Vienna Region
ÖAW	Österreichische Akademie der Wissenschaften	Austria Academy of Sciences
OeNB	Österreichische Nationalbank	Austrian Central Bank
ÖZBT	Österreichisches Zentrum für Biomodelle und Transgenetik	Austrian Centre for Biomodels and Transgenetics
PRO		public research organisation
RFT	Rat für Forschung und Technologieentwicklung	Austrian Council for Research and Technology Development
SFG	Steirische Wirtschaftsförderung	Styrian Business Promotion Agency
SME		small and/or medium sized enterprise
VBC	Vienna BioCenter	Campus Vienna Biocenter
WWFF	Wiener Wirtschaftsförderungsfonds	Vienna Business Agency
WWTF	Wiener Wissenschafts-, Forschungs- und Technologiefonds	Vienna Science and Technology Fund
ZIT	Zentrum für Innovation und Technologie	Center for Innovation and Technology