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The emergence of the European Innovation System and its impact on the Austrian S&T system

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1. Abstract

In a brief historical perspective the emergence of the European Innovation System (EIS), expressed by the development of the European Framework Programm for Research and Technological development and Demonstration (RTD), is elaborated. At the time being, the 4th European Framework Programme for RTD (FP4) is expiring. It covers the period from 1994 until 1998 and encompasses an overall budget of approx. 15 billion ECU, which is considerably higher than the respective budgets in the late 1980s. Despite this impressive figure, the budgets for FP4 as well as for FP5 are not more than just around 4 % of the sum of all national public RTD-budgets of the 15 EU member states (EU15). Notwithstanding that, in terms of RTD expenditure, the EU is still lacking behind its main global competitors. While there is a slight but steady decreasing trend in RTD expenditures in those EU countries which already spend the largest proportion in % of GDP, most growth can be stated either in those countries starting from a relatively low base or the Nordic

countries, while the Austrian value stagnates. The differences in the distribution of RTD expenditures by socio-economic objectives between the various national governments and the European Commission are remarkable. The objectives laid down in FP4 can be regarded as an additional value for the Austrian innovation system.

Due to its specific nature, FP4 has some substantial advantages for the Austrian innovation system. First, Austria contributes roughly three per cent of the total FP4 budget, but has access to considerably more know-how. Second, the EU RTD programme is based on inter-institutional networking. This forces and facilitates the entry of industrial enterprises in research consortia and thus stimulates the co-operation between academic and enrepreneurial research efforts. Third, there are a lot of EU RTD efforts which focus directly on the active participation of SMEs, which form the overall industrial structure in Austria. The fourth advantage of the EU RTD programmes for Austria lies in its obvious and highly necessary concentration on high-tech sectors. In Austria the rate of export specialisation on goods with high RTD-input is twice as low as in the EU.

First results of the Austrian participation in FP4 show some remarkable features. Out of 4.458 project proposals with Austrian participation submitted under the different calls for proposals in FP4, 1.140 were funded by the EC (as at January ‘98). Especially successful were proposals with Austrian participants from the business sector (39 % of successful proposers), followed by participants from the universities (33 %). Concerning the different scientific and technological programmes, Austria performed well in number of specific programmes such as THERMIE, BriteEuRam, ESPRIT, BIOMED, FAIR and TSER for instance.

2. The emergence of the European Innovation System

The concept of a European Innovation System (EIS), defined as common effort of the European Union as a whole and not merely as sum of national undertakings of the EU member states, has never been far below the surface for those seeking to create a united

Europe. However, it needed a lot of years to emerge on the surface, still these days more an - partly already operationalised - idea than an elaborated conceptual policy. In the Treaty of Rome the European Commission was not endowed with explicit powers to promote research, technological development or industrial innovation policy. This left the European Commission to operate through unanimous decisions of the Council of Ministers on basis of a stop-go nature, due to the need to operate via consensus. Also DG III, responsible for industrial affairs and thus - in principle - also responsible for an active industrial structural policy, which is - next to an elaborated research and technology policy - the second major element of innovation policy, was not established until 1967. Since European countries were overtaken by excess capacities in their older then dominating industries - textiles, shipbuilding, steel, motor cars, chemicals etc. - both national and EC authorities were mainly pre-occupied by the problems of the old industries and the severe paradigmatic industrial change until the early 1980s.

In 1967 also the first meeting of the Council of Science Ministers took place and in a flurry of activity, studies to estimate the potential for Community action in six broad areas of science and technology (S&T) - transport, oceanography, metallurgy, environmental issues, data processing and telecommunications - were commissioned. However, these studies were not followed by Community actions on an broader operational level. One had to wait until November 1971, when the first hard-fact milestone in European RTD, the COST programme (European Co-operation in the field of Scientific and Technical Research), was implemented (see Krige and Guzzetti, 1997). The COST grouping centred on the Community but comprised all nineteen Western European OECD members including Austria. Because of its extensive membership it has tended to shift outside the EC framework. Beside the original six areas identified for development in 1967, COST added four more: meteorology, agriculture, food technology and medical research. COST has become a useful, if low-key, framework for the preparation and implementation of pan-European networks and projects, mainly in the field of basic research or public demand driven research challenges. The industrial participation in COST and the direct industrial impact remained rather low. In order to meet more the industrial RTD requirements, the EUREKA initiative, which embraces a similar group of European countries but enjoys a

higher-profile encouragement from the national governments, was established in the second half of the 1980s. However, until then the Commission has gained already a certain distinctive profile on it's way to establish a European Innovation System.

From a historical point of view one can consider the European Commission's efforts to upgrade the European information technology (IT) sector and the accompanying creation of the ESPRIT programme, the European Strategic Programme for Research in Information Technology, as starting point for a successful development of a European RTD policy administered by the European Commission (see Sharp, 1989). The basic economic consideration for this Community effort was the relative decline of the IT sector in Europe. As a whole, this industry supplied in 1982 just 40 per cent of the EC market and only 10 per cent of the world market. Whereas in 1975 the EC balance of payments in IT goods and services had been positive, by 1982 a large deficit had arisen. Japan meanwhile seemed to become IT industry's second world leader. The United States was far from complacent.

In recognition of the relative failures of the separate national initiatives by the French, the British and the Germans, the EC began to develop a more strategic European approach to the IT sector. The broad outline of a programme for microelectronics technology was produced in 1979-80 and agreed by the Council in November 1981. The Commission then took the unorthodox step of inviting representatives from the major European companies to establish a working group to draw up the detailed programme for ESPRIT. The idea was based on the collaboration between the major European companies and their smaller counterparts as well as universities and research institutions to carry out targeted pre-competitive research. The emphasis was not so much on directly marketable products as on developing the tools and techniques to enable those products to be made. The organisation of the programme was considered not to be a heavy-handed effort at pure 'top down' co-ordination but a much lighter 'orchestration', where the EC seeks to encourage and channel innovation in certain directions, but where the drive for innovation is basically market-led by the participants themselves. The first call for proposals went out in February 1983, and contracts began to be signed in May that year. Encouraged by the success of this pilot

phase, the Commission rapidly pushed ahead with its full plans. In the wake of ESPRIT a series of other programmes promoting new technologies has been launched.

In early spring of 1985, DG III, DG XII and DG XIII suggested to aggregate the budgets of all the Community's RTD initiatives into one 'envelope'. This was the start of the European Framework Programmes for RTD. Its current structure was determined in the Maastricht Treaty in 1992 (art. 130g), comprising four fields of 'Activities': Activity 1 is the most important one; it pools the technology oriented programmes like ESPRIT or BriteEuRam; Activity 2 serves the international third-country co-operation via the INCO programme; Activity 3 focuses on the dissemination and utilisation of research results and serves directly the European innovation challenges and Activity 4 is dedicated to upgrade the human capital in European research and to support the mobility of researchers.

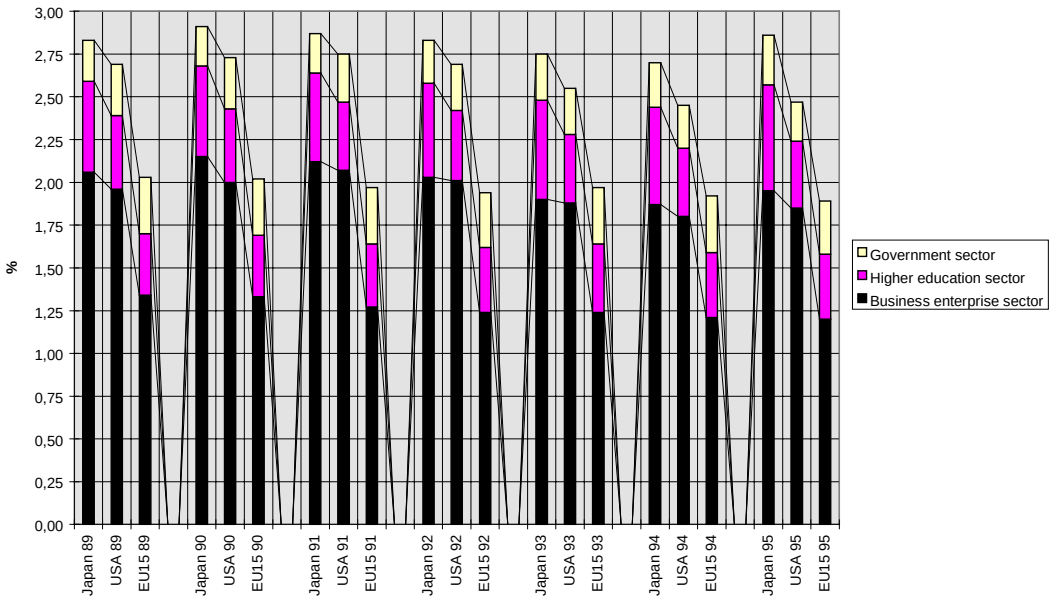
At the time being, the 4th European Framework Programme for RTD (FP4) expires. It covers the period from 1994 until 1998 and encompasses an overall budget of approx. 15 billion ECUs, which is considerably higher than the respective budgets in the late 1980s. FP 5 will start at an operational level at the beginning of next year and is going to last until 2002. According to the initial proposal of the European Commission from 14th of January 1998, the budget should have amounted to approximately 16,3 billion ECU, which would represent a 3 % increase over the budget of FP 4 in 'real' terms, i.e. expressed as a proportion of the European Union's GDP (see: EC, 1997). This increase was opposed by the European Council of Research Ministers on the 12th of February 1998 proposing 14 billion ECU as maximum coverage very much to the discontent of the European Parliament, which supports more the budget considerations of the EC (16,3 billion ECU; 17th of June 1998). Besides the undoubtedly impressive character of the amounts negotiated, the FP5 budget will in general not be more than just around 4 % of the sum of all national public RTD-budgets of the 15 member states (EU15). Moreover, in terms of RTD expenditure, the EU is still lacking behind its main global competitors, although RTD is - throughout the EU and its member countries - regarded as a driving factor behind economic growth, a source of increasing quality of products and a prime mover of

improvements in health care and environmental protection for instance and in some European countries still an important input for the defence sector.

3. The position of European RTD in a global context

In 1995, approximately 123,6 billion ECU were spent on RTD in the EU according to the last available EUROSTAT data. This figure was equivalent to about 1,9 % of the EU's gross domestic product. This fraction was well below the corresponding figures for the United States (2,6 %) and Japan (2,8 % according to the adjusted OECD figures). More than 60 % of the RTD expenditures in the EU were accounted for by the business sector, and the rest by the government and higher education sectors in roughly equal proportions in 1995.

Fig. 1: Breakdown of RTD expenditure as a % of GDP in Japan, USA and the EU by sectors



Source: EUROSTAT, 1997

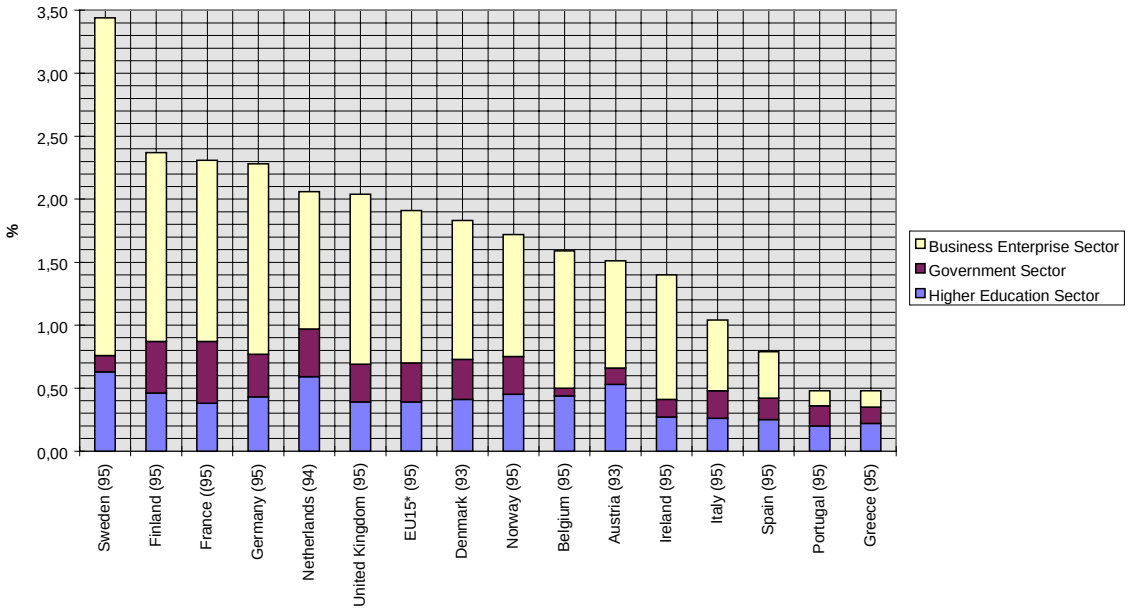
The trend for governmental budget appropriations or outlays on RTD (i.e. the amount of money that central governments have allocated to RTD in the different budget lines), however, declines slowly in the European Economic Area (EEA) as well as in the USA in

relation to the overall RTD appropriations, but increases slightly in Japan. However, it is there still on a rather low level while the business enterprise sector remains by far the most responsible sector for RTD in Japan. This sector accounts for around 70 % in Japan and in the USA, but just for around 60 % of RTD in the EU (see Fig. 1).

In 1995, the EU member states with the highest RTD expenditures in absolute terms were - not surprisingly - the three big ones, Germany, France and the UK, who together account for over 70 % of all RTD expenditures. While there is a slight but steady decreasing trend in both real terms and as a percentage of GDP in those countries which already spend the largest proportion on RTD expenditure (i.e. Germany, The Netherlands and the UK), most growth in RTD expenditure can be stated either in those countries starting from a relatively low base or the Nordic countries. Portugal and Greece both show large increases in RTD expenditure, but expressed as a % of GDP, their relative share remains very low (around 0,4 %). Latest figures for Sweden, which already invests most in RTD expenditures as a % of GDP amongst all EU15, already amount to 3,4 %. The up-grading trend can also be observed in Norway, Denmark (both 1,3 % in 1986 and 1, 7 % in 1993) and especially Finland (1,6 % in 1986 and 2,4 % in 1995).

In terms of RTD expenditure as a % of GDP, Sweden has the lead in Europe followed by Finland, France and Germany (approx. 2,4 %). Austria's respective figure is 1,5 %, thus ranking on the 10th place, followed by Italy, Ireland, Spain, Portugal and Greece (see Fig. 2). These differences between the Member States can be regarded as moderate in comparison to the USA, where the respective figure in New Mexico is 9,2 % of the regional GDP (highest) and 0,3 % in South-Dakota (lowest). In most EU15, the business sector (BES) accounts for at least 50 % of total expenditure, except in Spain, Greece and Portugal. The proportion allocated by the BES has fallen slightly compared with the situation at the end of the 1980's in all EU15 with the exception of Denmark, Greece, Ireland, Finland and Sweden. In Austria the BES contributes to approximately 55 % of the total RTD expenditures, while the Higher Education Sector contributes around 35 %. The rest is allocated in direct governmental RTD interventions (see Fig. 2).

Fig. 2: RTD expenditure as a % of GDP by sector of economy and the EU15



Source: EUROSTAT, 1997
*) Luxembourg not included

In all Member States we can also find some fairly striking disparities at the regional level. With regards to RTD expenditure, a pattern can be detected, whereby the majority of RTD expenditure is often concentrated in and around the capital of each country. The exceptions are Germany, where RTD expenditure is more evenly spread - the largest concentration is in Baden-Württemberg which accounts for less than a quarter of RTD expenditure in Germany - and - although different - Italy where the Northern regions along with Rome account for almost 70 % of total expenditure. A very high concentration in and around the capital can be observed in Denmark (67 %), Portugal (57 %), Greece (53 %), Finland (51 %) and in Austria (52 % of the total RTD expenditures of the country allocated in Vienna). The RTD expenditure by region as % of regional GDP amounts in Vienna to more than 2,5 % which is rather high even by European standards. Also Styria performs quite well, whereas the Austrian provinces Burgenland, Carinthia, Lower Austria and Vorarlberg are lacking behind in this respect, which is partly due to the fact that just small or even no university locations at all can be found in these provinces (see Schmitzer, 1997).

Government appropriations in respect to the distribution of RTD expenditures can be divided into a number of categories of socio-economic objectives as well (see Tab. 1). In this respect one can see a difference in priorities between various national governments and the European Commission. While in the EU15, 30 % of the RTD governmental expenditures are on average dedicated as a general contribution to general university funds, this rate was twice as high in Austria in 1995 (followed by Portugal 47 % and Italy 42 %). On the other hand, governmental RTD appropriations in defence contributed in the EU15 on average to 17 %, whereas the respective figure in Austria was 0 in 1995. The highest public defence allocations are in the UK (36 %) and France (30 %). Concerning the two socio-economic objectives 'higher education' and 'defence' the RTD appropriations of the European Community are quite different from the EU member states, because it has neither defence expenditures nor does it fund universities directly. Instead it focuses much more on industrial and technological objectives (especially information technologies as well as production technologies and new materials). 39,9 % of the RTD appropriations of the EC are dedicated to this sphere, whereas the respective figure for the EU15 is 9,6 % and 7,7 % in Austria. Secondly, the EC highly emphasises the production, distribution and rational utilisation of energy. It dedicates 16,2 % of its RTD appropriations to this sphere, while the corresponding figure for the EU15 is 3,6 % on average and for Austria just 0,5 %. Important in terms of RTD appropriations both in the EC and the member states is the sphere of health research (EC: 4,9 %; EU15: 5,4 %; Austria: 2,5 %) while space research is considered to be very important in the EU15 on average (6,8 %), and hereby especially in Belgium (13,4 %), France (10,6 %) and Italy (8,6 %), while it does not seem to be yet a priority in the EC (1,3 %). On the other hand the EC allocates on average - in comparison to the EU15 - considerably more RTD expenditures to infrastructure and general planning of land-use, control and care of the environment and to agricultural production and technology. However, it has to be noted, that the indicated low comparative figures for Austria are substantially underestimating the real situation, because the proportion of applied research (40 %) and experimental development (10,7 %) carried out in Austrian universities is particularly high.

Tab. 1: Appropriations by socio-economic objectives as a % of GDP in the EU15, the European Commission (FP) and Austria

Socio-economic objectives	EU15*	European Commission	Austria
General University Funds	30,6	0,0	64,8
Defence	17,0	0,0	0,0
Industrial Production and Technology	9,6	39,9	7,7
Production, Distribution and national utilisation of Energy	3,1	16,2	0,5
Production and Improvement of Human Health	5,4	4,9	2,5
Exploration and Exploitation of Space	6,4	1,3	0,0
Infrastructure and general planning of land-use	1,5	6,6	2,2
Control and Care of the Environment	2,7	5,7	2,5
Agricultural Production and Technology	3,6	5,4	3,2
Other	20,1	20	16,6

Source: EUROSTAT, 1997
*) Luxembourg not included

4. General reflections on the impact of European RTD programmes on Austria

Due to its specific nature, the European Framework Programme for RTD has some substantial advantages for the Austrian Innovation System:

First, Austria contributes roughly three per cent of the total FP4 budget, but has access to considerably much more know-how and 100 % of the programmes offered.

Second, the Framework Programme is based on networking and - more specific - on inter-institutional networking. This forces and facilitates the entry of industrial enterprises, especially small and medium sized enterprises (SMEs), in research consortia and thus stimulates the co-operation between academic and entrepreneurial research efforts. As mentioned before, the largest part of Austria's public RTD expenditures is devoted to the higher education sector. This led partly to an isolation of the universities in respect to the overall innovation needs and developments in technology markets. One could observe for quite a long time a minor need from the side of the universities to find co-operation partners and consequently external finance inputs from the entrepreneurial sector. Due to changed technology policies and innovation perceptions, but also due to governmental budget restrictions, this attitude has changed and seems to be indicated by a growing number of spin-offs. The Framework Programme of the EU, but also EUREKA for

instance, are an extraordinary means to support these new inter-institutional partnership approaches.

Third, there are a lot of EU RTD efforts which focus directly on the active participation of SMEs which form the overall structure of Austrian industries. The shared cost approach written down in the model contract for RTD by the EC, which implies a financial subsidy of up to 50 % of the costs for RTD projects, moreover means risk-sharing, which is another substantial precondition for an active participation of a SME. We do not have exact figures, but good estimations that there are not more than maximum 1000 enterprises in Austria yet that invest systematically in RTD (see Tichy, 1991). In order to approach this segment and to enable SMEs to participate in EU RTD-programmes, the Austrian Bureau for International Research and Technology Co-operation (BIT) runs for example intensive stimulation actions with the support of the European Commission, i.e. in course of the CRAFT initiative. Also the get-in-touch costs of the enterprises towards active involvement in European RTD programmes are supported in Austria by the FFF, the Industrial Research Promotion Fund.

All these efforts reflect a changed attitude in Austria's technology and innovation policy. Until the 50ies the main direct source for applied technology progress in Austria was the import of investment goods that incorporated foreign know-how. Nevertheless, Austria's economy succeeded in terms of technological up-grading also because of its relatively low-paid, but good - although traditional - educated labour force capable to adopt and imitate. Facing an accelerated global innovation pressure, the creation of an own endogenous innovation potential and the establishment of adequate means for technology transfer and applied technology development instruments have gradually been perceived as a national challenge. Defensive strategies, like isolation of specific markets from international competition, pressure on salaries and shift of national production to regions and later on countries with lower labour costs are in the long term risky, because they can lead to a loss of technological competitiveness. In contrast, the innovation strategy is an offensive one but usually more risky in the very beginning and sometimes more capital intensive. Since the mid 70ies an active structural policy appeared as a main principle in the Austrian

industry policy. Outcome of this efforts was - for instance - the establishment of the FFF in 1976, the TOP credit-line actions in 1981 and specific activities in certain technologies, like the Microelectronics-Programme in 1985 or the Biotechnology-Programme in 1987, the establishment of an innovation agency, which provides advisory services to trade and industry, especially for new businesses starting up and the creation of a number of regional innovation and technology centres mainly in co-operation with the Chambers of Commerce. Finally, in 1989 the Austrian Council of Ministers decided on a consistent - although still general - national technology policy concept (see Böck et al., 1992).

The fourth advantage of the EU RTD programmes for Austria lies in its obvious and highly necessary concentration on high-tech sectors. Since the early 80ies, the EU has increased its trade deficit in goods with high RTD-input by factor 10, while the USA could keep its position more or less and Japan even made a big jump forward towards a tremendous positive trade balance in the high-tech sector. In the sector with medium RTD input, Japan and the EU could increase their traditional positive trade balances, while the one of the USA turned into a negative one. In low-tech industry sectors, however, all three major global competitors lost market shares (see Peneder, 1995).

In Austria the rate of export specialisation on goods with high RTD-input is twice as low as in the EU. The Austrian unit values in high-tech goods, but also in medium-tech goods are considerable lower than in other small, but open European economies like Switzerland, Sweden and Finland, which of course show a different industrial structure with some very big multinational enterprises. Nevertheless, since 1970, a positive structural shift in favour of know-how intensive products can be observed in Austria. The Austrian share in exports in the technological advanced product clusters are increasing faster than

- firstly, the Austrian share in imports in this sector and
- secondly, the share in exports in this cluster of all OECD countries in average.

This development is also reflected in a long-term increase of the Austrian share in international markets of know-how intensive goods. The respective share in 1970 was 1 %, in 1980 1,2 % and in 1994 1,6 %. However, this positive trend is not in accordance with

the development in the number of European patent applications. While the EU as a whole could increase its patent applications of about 12 % compared to 1989, the respective figure for Austria was just 8 %, which all together could indicate that Austria seems to be a good industrial location for the production of know-how intensive goods, but still not yet for invention and innovation to that extent. On the other hand, the effectiveness of the - in total comparably moderate - national Austrian RTD input expressed in patent applications by RTD personnel is extremely high: In this respect, Austria occupies the leading position in the EU, applying for 29 European patents per 1000 persons actively involved in RTD. Then follows Germany (27), Finland (24), Belgium (24) and Sweden (23) (see EUROSTAT, 1997).

In Austria, the BIT has the overall responsibility for the promotion of the European RTD programmes. The BIT was founded in 1993 as an initiative of the Republic of Austria and the Austrian Federal Chamber of Commerce and is an association under Austrian law. For the time being, the BIT has about 40 employees and deals with all European RTD programmes, such as the Framework Programmes, EUREKA, COST and INTAS. As a one-stop shop, the BIT tries to realise the following main objectives:

- to promote and to realise the RTD targets of the EU;
- to increase the number of Austrian participants in European RTD programmes (and thus - on basis of a strong positive correlation between the number of submitted and funded projects - to increase the success and respective return rates);
- to support the co-ordination of national and international RTD efforts.

The instruments to achieve these goals are

- close co-operation with the Austrian delegates in the EU programmes;
- identification of potential partners for European RTD co-operation in Austria;
- creation of awareness for collaborative European RTD;
- dissemination of general and special information (direct mail; conferences; seminars; workshops; publications; presentations):
- active project generation (i.e. via special stimulation actions);
- consultancy and advise for potential applicants;

- partner search (i.e. brokerage events like COPEX'97 for the promotion of scientific east-west co-operation in the course of multilateral European RTD programmes);
- dissemination and exploitation of research results and
- technology transfer measures.

The internal structure of the BIT consists of a core team which deals with all specific programmes of Activity 1 of FP4 on one hand and several distinctive secretariats, like the EUREKA secretariat, the Secretariat for Central and Eastern Europe, the TMR and TSER Unit, the Unit for Third Country Co-operation which deals with INCO, INTAS and COST and the Austrian National Host which is active in the field of broadband communications on the other hand. The BIT also hosts the INNOVATION Relay Centre Austria (IRCA), which supports the dissemination and utilisation of scientific and technological know-how in Europe and Austria. The IRCA consists of a network of seven regional institutions, co-ordinated by the BIT. Among other common topics shared with the BIT, the IRCA is especially responsible for transfer and utilisation of technologies, advice on technology marketing, intellectual property rights, creation of technology business plans and consortia agreements, partner search etc.

As at January 1998, the successful Austrian participants in FP4 were granted with approximately 160 MECU by the EC in total, which is more than 2 billion Austrian Schilling. The rate of return is around 70 %, which is considerably higher than expected in 1994, before the start of FP4. 41,6 % of the funds are directed towards enterprises from the business sector, 35,8 % could be allocated in universities, 15,1 % in non-university research institutes and 5,7 % in other institutions. Although Austria is still a net payer, it is also - after Finland - the country with the highest growth rates in FP4 (see Hutschenreiter et al., 1998).

Up to January '98, around 4.500 project proposals - with a total of approximately 5.000 involved Austrian participants - were submitted in course of the numerous different calls for proposals in FP4 (see Tab. 2). Among them one can find 816 (18,30 %) project proposals co-ordinated by Austrian researchers. 36 % of the proposers came from the

Austrian universities, 36 % from the business sector, 18 % from non-university research institutions (such as the Austrian Academy of Sciences; the Austrian Research Centre Seibersdorf or the Joanneum Research Company) and the rest from other institutions. Out of the submitted project proposals with Austrian participation, 1.140 (25,57 %) with 1.456 (29,67 %) involved Austrian participants succeeded and were funded by the EC. Especially successful were proposals with Austrian participants from the business sector (39 % of successful proposers) comprising in total 380 Austrian enterprises (some of them even using FP4 as first entry at all in co-operative technology development programmes), followed by participants from the universities (33 %) and non-university research institutions (16 %), both below their respective share in terms of application. Enterprises formed the bulk of successful participants in programmes like THERMIE A (non-nuclear energy: 80 %), ESPRIT (information technologies: 62 %) and BriteEuRam (industrial technologies and material technologies: 65 %). On the other hand, university institutes were highly engaged in MAST (marine research and technologies: 80%), BIOMED (health research: 74 %), BIOTECH (67 %) and environmental research (52 %). The non-university research institutes whereas have a high share in TSER (socio-economics: 50 %) and FAIR (agriculture: 37 %).

Tab. 2: Austria's participation in FP4 as to January 1998

	Total Projects	**Projects co-ordinated by Austria**		**Institutional Background of Austrian Participants in %**			
	number	number	%	business sector	universities	non-university research institutions	other
Submitted proposals							
FP4 Total[1]	4.458	816	18,30	36,11	36,34	17,88	9,68
Funded Proposals							
FP4 Total[1]	1.140	201	13,80	39,29	32,97	16,48	11,26

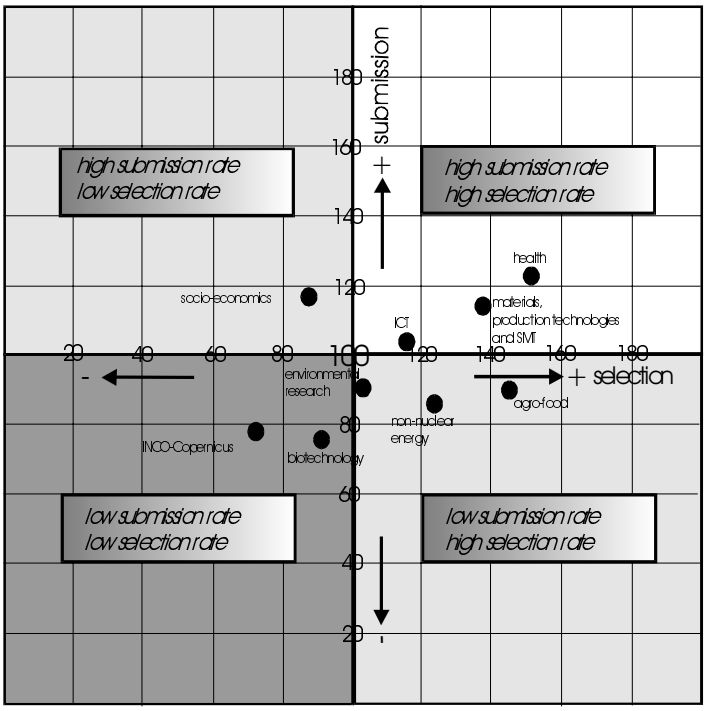
Source: BIT

1) Sum of Activity 1, 2 and 4; no data on Activity 3 available

Concerning the different specific programmes, the Austrian success rates in comparison to the average EU15 success rates are considerably higher in ESPRIT, FAIR, MAST, THERMIE B (non-nuclear energy), transport research, TSER, CRAFT-cooperative research (SME stimulation) and networks building (within Activity 4) and considerably lower in ACTS (telecommunications), nuclear safety, multimedia and accompanying

measures (within Activity 4). In all other programmes the success rates correspond more or less to EU15 average.

Fig. 4: Austria's position in FP4 related to EU15 average (= 100) by S&T sectors



Source: EC, BIT

A comparative specialisation pattern is presented in a portfolio format in Fig. 4. This format provides a good basis for a more strategic interpretation of the S&T specialisation patterns in order to design future S&T policy activities. Analogous to traditional marketing analysis, one can easily distinguish between 'cash cows' with high 'revenues' (projects selected for funding) and high 'market shares' (number of submitted projects above the EU15 average) - i.e. health research - and 'goods', which are resource intensive but performing low profitability in terms of FP4 performance (i.e. biotechnology or INCO-Copernicus; see Schuch, 1998). However, given the difficult project selection procedure and the existence of leading research units in almost all scientific sectors in almost all EU member countries, the principal question is, if the sectoral performance of individual countries in FP4 can be regarded as reliable indicator for European RTD specialisation (see Hutschenreiter et al., 1998).

To sum it up, both the European Innovation System and the Austrian performance in European RTD programmes is moving ahead. With the implementation of the Framework Programmes, the European Commission has established a strong tool for the orchestration of European science and technology efforts in specific fields of research and technologies. This instrument is complemented by other European initiatives such as COST and EUREKA, which are not covered in this article. The awareness of the utilisation of these programmes for certain specific challenges and targets has continuously risen in Austria. Beside the micro-economic benefits for the successfully participating Austrian companies and research institutions, the structural effects on the level of a macro-economic oriented S&T policy might be considerably although not yet analytically elaborated in detail. In front of this background the general considerations and remarks in the present article should be understood as an impulse for ongoing discussion and analytical deepening in view of the increasing complexity and interdependence of national and international innovation systems.

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