Office of the Government of CR
Research and Development Council

ANALYSIS OF THE EXISTING STATE OF RESEARCH AND DEVELOPMENT IN THE CZECH REPUBLIC AND A COMPARISON WITH THE SITUATION ABROAD – 2005

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The Preface

In 2005, “Analysis of the existing state of research and development in the Czech Republic and a comparison with the situation abroad” worked out for the third time. The annual preparation of such analyses and their submission to the Government is imposed upon the Research and Development Council by Act 130/2002 Coll. on research and development support from public funds. This analysis being presented to broad public continues the tradition of analyses from 2003 and 2004. Data were updated, some of them were put more precisely in compliance with national and international databases, and small formal modifications were made. The use of venture capital being analysed in a separate chapter in 2004, is now part of the chapter on competitiveness (Chapter F). Basic economic indicators used to be part of the first chapter on basic indicators of research and development; now they are attached as Annex P.I. After a one-year intermission the chapter on remarkable achievements in research and development was introduced again (Chapter I). In harmony with international trends, an increased emphasis is put on evaluation of competitiveness and innovation performance. The Government took notice of the 2005 Analysis in its Resolution No. 1518 of 23 November 2005.

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A. Basic indicators of research and development

This part of the analysis compares the basic indicators of research and development (R&D) that are periodically ascertained by national bureaus of statistics in accordance with the internationally renowned "Frascati Manual"[1] on measurement and evaluation of scientific and technological activities, which was prepared by the Organisation for Economic Co-operation and Development (OECD) as a handbook for standardization of statistical indicators of research and development at international level. On regular basis the renowned international organisations (Eurostat, OECD) collect these data which are further compiled into internationally comparable indicators. Twice a year OECD publishes "Main Science and Technology Indicators (MSTI)" being the main source of data for this chapter.[2]

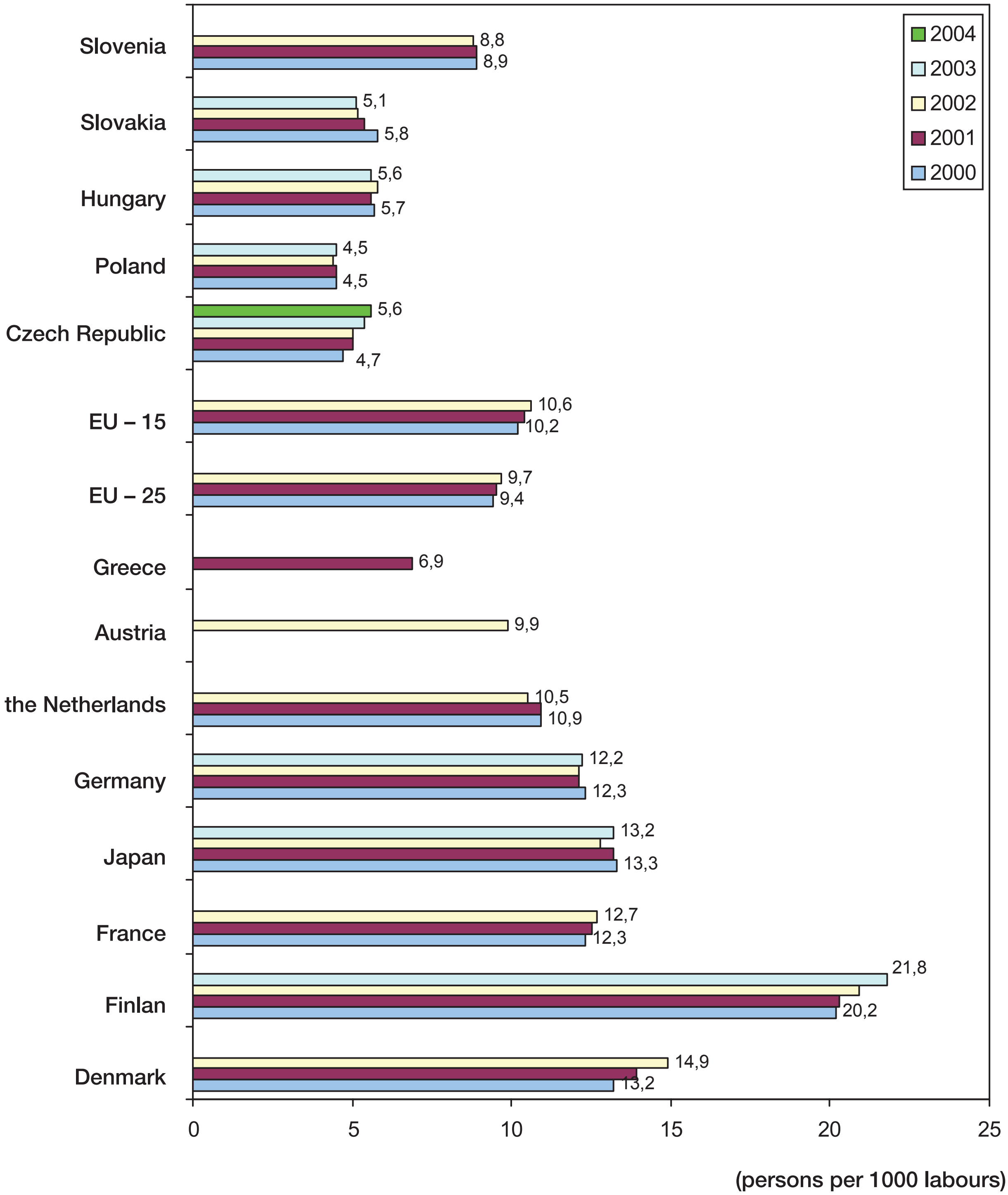
The structure of Part A is similar to that of the R&D Analysis approved by the Government in December 2004[3]. Basic indicators of economic performance in selected countries being part of this Chapter A in 2003 and 2004 are attached separately as Annex I. The indicators within Part A are subdividet into three main parts:

- Human resources for R&D and innovation - 4 graphs in total
- Expenditures on R&D by their main sources – 6 graphs in total
- Structure of the R&D funds utilization in main sectors: – 3 graphs in total

Some data differ from data given in the 2004 R&D Analysis. Changes are based upon specifications made by OECD, Eurostat and the Czech Bureau of Statistics.

1 Frascati Manual 2002, OECD, Paris 2002 - www.oecd.org, Czech translation provided by the Research and Development Council
2 MSTI: 2005/1 edition, OECD, Paris 2004 – www.oecd.org
3 Resolution of the Government of CR No.1208 of 1 December 2004.

A.1.1 Number of R&D employees (FTE) (persons per 1000 labours)



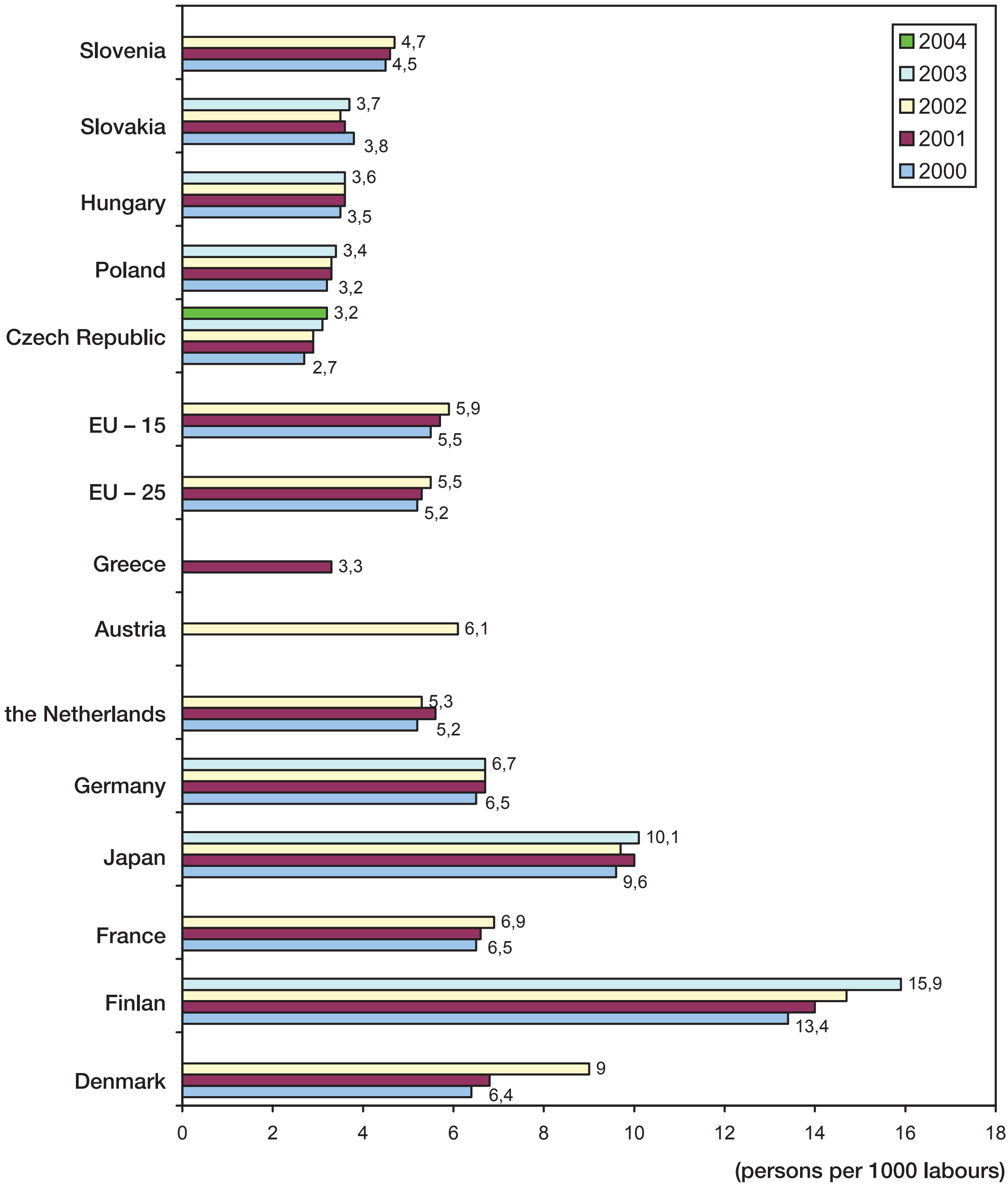
Source: OECD, Main Science and Technology Indicators, May 2005 and CBS 2005

Commentary:

1. The R&D employees mean the research workers performing directly the research and development, together with auxiliary, technical, administrative and other employees in the R&D workplaces. Among the R&D employees there belong also employees procuring direct services to research and development activities like e.g. R&D managers, clerical workers, secretaries, etc. And on the contrary, those who carry out indirect services like e.g. factory canteen employees, security guards are excluded for this purpose. The official OECD statistics monitor two ratio indicators for international comparison: number of R&D employees per 1000 of all employees and per 1000 labours. The category of employees includes all persons being fifteen years old and older, and paid within the employment. The formal relation to employment means particularly the employment, contract on freelance and contract for work. On the other hand, the category of labours includes all persons being fifteen years old and older and meeting the requirements for being classified into the employed or unemployed. For most of the monitored countries data are available on the number of R&D employees per 1000 labours.
2. In most of the international comparisons the number of R&D employees is converted according to the Frascati Manual methodology to the full time dedicated to research and development activities (hereinafter referred to as FTE – Full Time Equivalent). This indicator is the best one for describing the actual time dedicated to research and development activities on the part of R&D employees. One R&D employee in FTE is equal to one year of work (full time) of an employee attending one-hundred-percent to the research and development activity. For employees concerned also with another activity than research and development only the relevant part of their working capacity is included thus avoiding the overestimation of data on the number of employees attending to research and development.. The FTE indicator includes in itself also the number of persons working for the reporting unit on the grounds of a contract of basis or contract for work converted according to the methodology applicable for FTE.
3. The markedly highest relative numbers of R&D employees are reported by Finland (21.8 persons per 1000 labours in 2003). Out of the monitored countries, the relative numbers of employees higher than the EU-15 average are reported by Denmark (14.9 persons per 1000 labours in 2003), Japan, Germany, France and the Netherlands.
4. In Finland, Denmark, France and the Czech Republic, the relative numbers of R&D employees have been rising throughout the whole monitored period; in other monitored countries the numbers of R&D employees have been stagnating or going down.
5. In the monitored new Member States and Greece, the numbers of R&D employees significantly lag behind both the EU-15 and EU-25 averages. Although the Czech Republic experienced an increase in the number of R&D employees from 4.7 (in 2000) to 5.6 persons per 1000 labours (in 2004) in the monitored period, it still lags behind Slovenia. The decline in the relative number of R&D employees continues in Slovakia to 5.1 persons per 1000 labours in 2003. The lowest figure of all monitored countries is reported by Poland (4.5 persons per 1000 labours in 2003).
6. The relative numbers of employees basically correlate with the amount of total R&D expenditures in individual countries as confirmed in the second part of Chapter A of the Analysis. The countries having higher R&D expenditures report higher numbers of R&D employees, and vice versa.

4 Example: If a pedagogic worker is employed half time and dedicates only half of his/her working time to research and development, with the rest dedicated to other activities (pedagogic activity), then the value of this employee for activity in research and development measured by means of FTE is equal to 0.5 . 0.5 = 0.25.

A.1.2 Number of research workers (FTE) (persons per 1000 labours)



Source: OECD, Main Science and Technology Indicators, May 2005 and CBS 2005

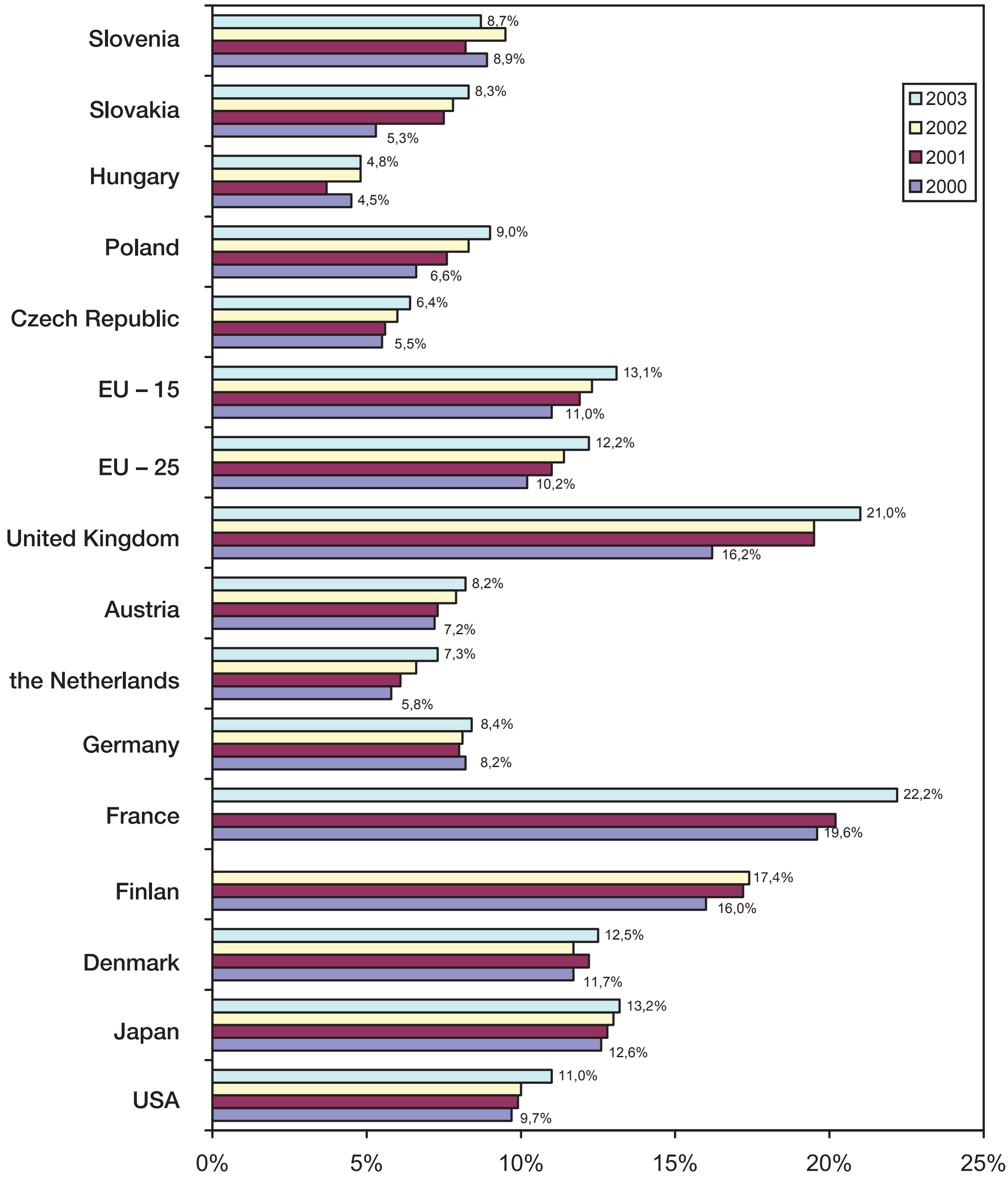
Note: Data for USA are not available for the monitored period. In 1999, USA reported the number of research workers as 9.3 persons per 1000 labours.

Commentary:

1. The research workers are concerned with the concept or creation of new knowledge, products, processes, methods and systems, or manage such projects. They represent the most important group of R&D employees. They are mostly employees classified in the main class 2 (Scientific and special intellectual workers) and sub-group 1237 (Managers of research and development departments) of the applicable Classification of occupations - extended (KZAM-R). It is the most frequently used international indicator for comparison of human resources being active in research and development. Otherwise the note on methodology (2) to the Graph A.1.1 applies to this indicator as well.
2. Both the EU-15 average (5.9 persons per 1000 labours in 2003) and EU-25 average (5.5 persons per 1000 labours) are again significantly exceeded by Finland (15.9 in 2003)[5], Japan (10.1 in 2003) and Denmark (9 persons per 1000 labours in 2002).
3. New EU Member States, with the exception of Slovakia, significantly lag behind the EU-25 average. The lowest number of research workers is reported by the Czech Republic (3.2 persons per 1000 labours in 2004). At the same time the R&D expenditures in the Czech Republic are higher than in Slovakia, Hungary and Poland (see also point 6 of the Commentary to Graph A.1.1).
4. The numbers of research workers dynamically grow in Denmark. The figure for Finland is influenced by different methodology, see the footnote 5. The growth is reported by France and the Czech Republic. In other monitored countries the numbers of research workers basically stagnate.
5. It results from comparison of figures between Graphs A.1.2 and A 1.1 that in most of the monitored countries the research workers themselves amount to ca 50 to 60 per cent of the overall number of R&D employees. Only Japan and Finland differ with their shares of research workers being over 70 per cent (76.5 % and 73 % respectively in 2003). It testifies to the somehow different organizational arrangement of research and development in Japan and lower "provision" of the Japanese research with auxiliary and technical workers. This fact is confirmed also by Japanese analytical materials on research and development.

5 The figure for Finland must be approached with a certain amount of caution. MSTI 2005/1 mentions that this is the number of R&D employees with university education.

A.1.3 Share of the Science&Engineering[6] graduates in the tertiary level of education out of inhabitants of the 20-29 years age category (in per cent)



Source: Eurostat, June 2005

6 In accordance with the International Standard Classification of Education ISCED 97 it covers following educational subjects: biological sciences 42, physical and chemical sciences 44, mathematical sciences and statistics 46, informatics and computing technology 48, technical sciences and technically oriented crafts 52, production and manufacturing industries 54, architecture and civil engineering 58.

Commentary:

1. This quotient represents very frequently used indicator for evaluation and mutual comparison of research and innovation policies and the overall competitiveness (EU, the United States, Japan, papers for the annual meetings of the World Economic Forum). Sometimes the indicator is used in the form of a share in the total number of university graduates of the same age category between 20 and 29 years. This fact does not mean any underestimation of the social science studies. The graduates in the Science&Engineering study programmes at universities are considered, however, the basic potential for activity in that part of research and development that is able to influence the competitiveness most.
2. The average figures for EU-15 (13.1 % in 2003) and EU-25 (12.2 % in 2003) were not too different and relatively fast growing in the monitored period.
3. The EU-25 average was exceded in 2003 only by France (22.2 %), United Kingdom (21 %), Finland (17.4 %) and Japan (13.2 %).
4. In the new member states, and surprisingly also in the Netherlands, Germany and Austria, the share of these graduates is significantly below the EU-25 average. The Czech Republic has the second lowest share of graduates in the Science&Engineering study programmes of the monitored countries (6.4 % in 2003); lower being only in Hungary (4.8 % in 2003). The situation in the Czech Republic should gradually improve after 2005 by application of the Bologna model of university studies.
5. With the exception of Slovenia and Hungary, the numbers of graduates in the Science&Engineering study programmes are growing in all monitored countries.
6. The situation particularly in countries with a small amount of inhabitants with university education or low share of young people studying at universities respectively, seems somewhat different when the number of students in Science&Engineering study programmes is expressed as a share in the overall number of university students of the same age category; see the following table. Even certain methodological distortions are not excluded (different classification codes of study subjects, persons graduating in several study programmes are counted only once).

Share of Science&Engineering students in the overall number of university students in 2001 (ISCED – categories 5B, 5A and 6) (%)

Czech Republic	Denmark	Finland	Japan	Hungary	Germany	The Netherlands	Poland	Slovakia	Slovenia	United Kingdom
31.3	20.8	36.8	21.9	20.4	29.1	16.5	19.9	28.3	22.5	27.9

Source: European Commission – COM (2003) 685, final wording

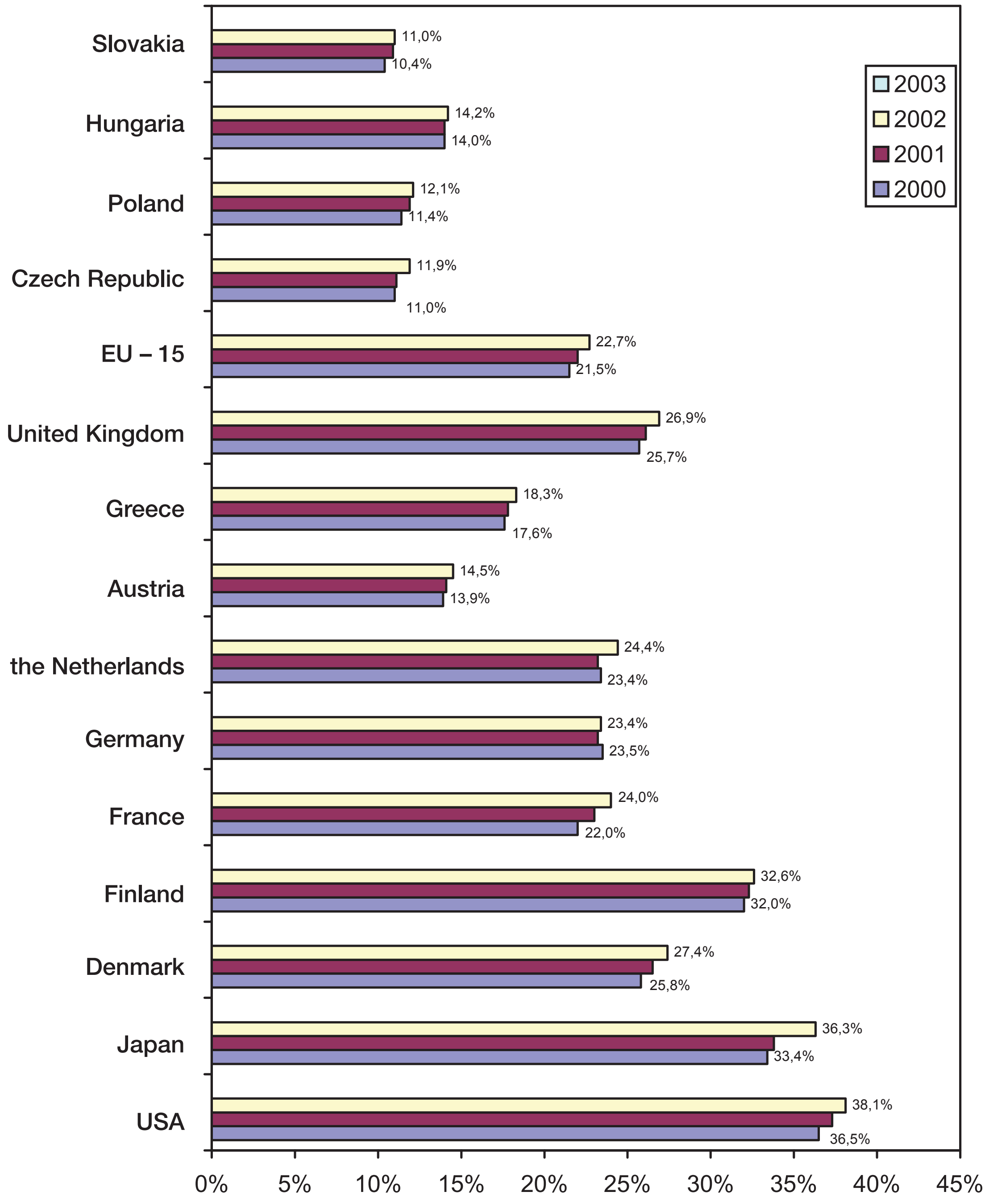
The differences between the monitored countries are not so marked as when expressed by share in the numbers of inhabitants of respective age category. The highest share of the monitored countries is reported by Finland (36.8 %), followed by the Czech Republic (31.3 %) and Germany (29.1 %).

7. The table below depicts the trend of the number of students and tertiary education graduates in Science&Engineering study programmes in the Czech Republic.

	Students					Graduates				
	2000	2001	2002	2003	2004	2000	2001	2002	2003	2004
Science&Engineering study programmes in total	75 394	80 193	85 463	93 026	98 375	8 855	9 351	9 850	10 286	11 782
Tertiary education in total	235 903	249 693	271 349	300 375	323 841	36 771	37 844	38 542	38 627	45 454

Source: CBS, September 2005

A.1.4 Share of inhabitants with completed tertiary level of education[7] in the total number of inhabitants of the 25 – 64 years age categories (in per cent)



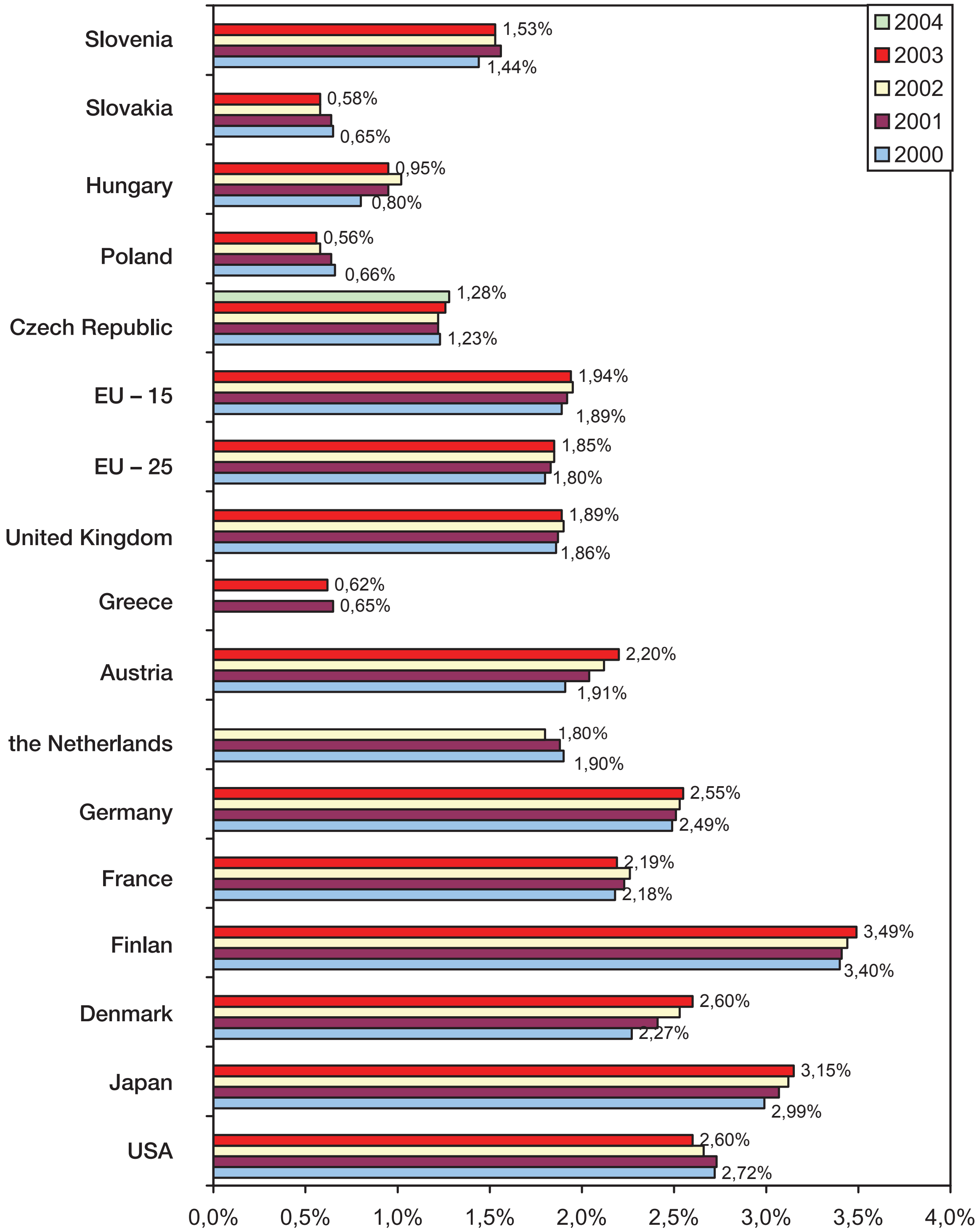
Source: OECD, Education at a Glance, 2004

7 The tertiary level of education according to the International Standard Classification of Education ISCED 97 followed by all OECD countries covers the categories 5A, 5B and 6, to which most of the educational programmes are classified that follow after the school leaving examinations and last for at least two years of presentation studies. In the Czech Republic, the tertiary level of education includes the education at universities, colleges (in the past also studies after the school leaving examinations), last two years of studies at academy of music, etc. In the Czech conditions the so called long, typically university master study programmes prevail in the tertiary education (ISCED category 5A) enabling graduates further studies in the doctorate study programmes (ISCED category 6; leading to Ph. D. title).

Commentary:

1. The graph depicts another very frequently used indicator for evaluation of potential capacities of human resources for research and development and use of their results
2. The average figure for EU-15 countries increased from 21.5 % in 2000 to 22.7 % in 2002. This value is significantly exceeded by the United States (38.1 % in 2003), Japan (36.3 %), Finland (32.6 %) and Denmark (27.4 %).
3. In new EU Member States, Greece and surprisingly in Austria, the share of inhabitants with completed tertiary education is lower than the EU-15 average. Slovakia (11.0 % in 2003) and the Czech Republic (11.9 % in 2003) occupy the last places in the group of monitored countries.
4. Without a significant increase in the number of university students and their success rates in the Czech Republic, no marked positive changes in the amount of graduates the Science&Engineering study programmes can be expected.
5. The shares of inhabitants having tertiary education grow relatively fast in France, Japan and the Czech Republic. In other monitored countries the shares grow a little more slowly, even stagnate in Hungary and Germany.

A.2.1 Total R&D expenditures (% of GDP)



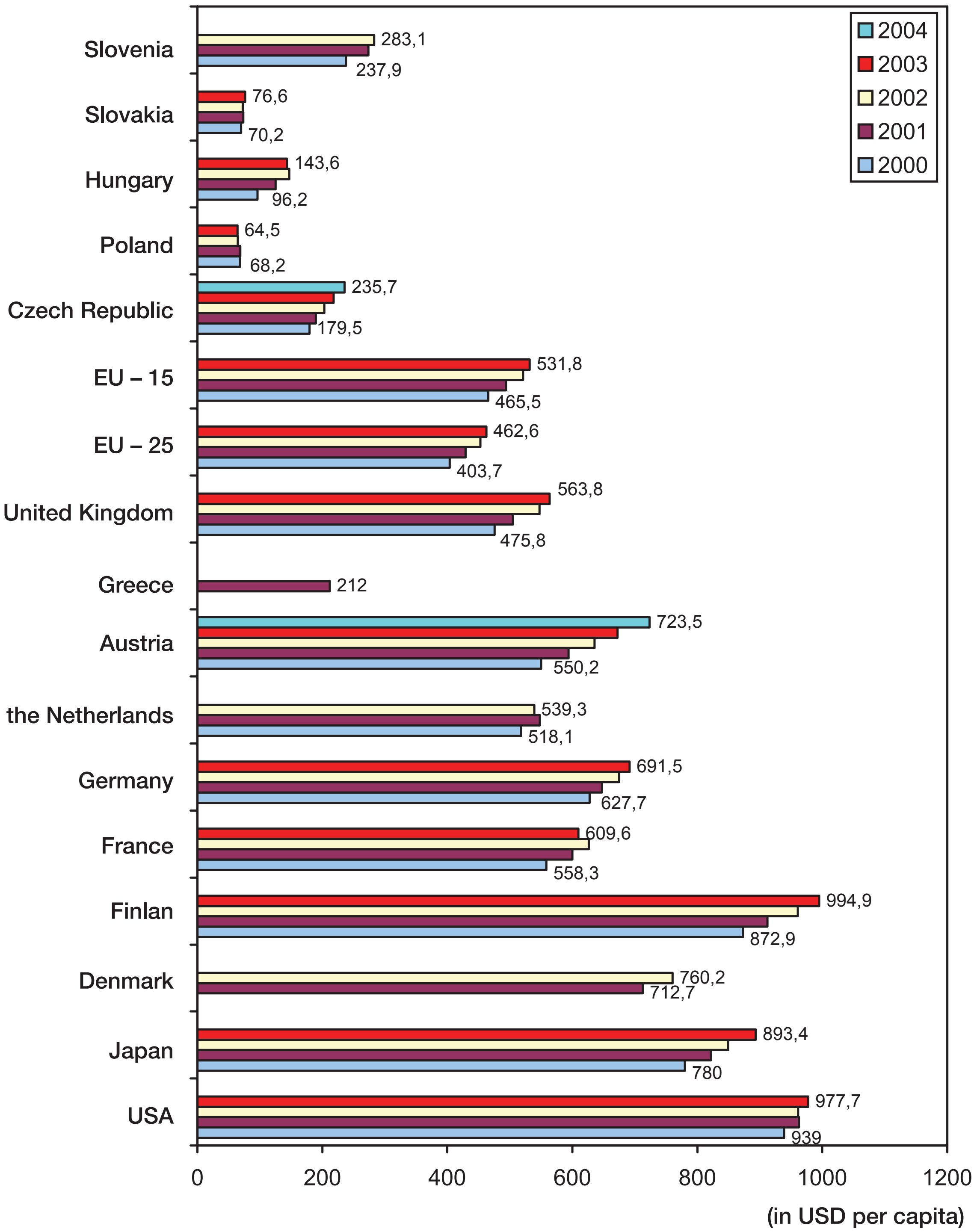
Source: OECD, Main Science and Technology Indicators, May 2005
Eurostat, June 2005 (Denmark, the years 2000 and 2003; Greece 2003 and Slovenia 2003) and CBS 2005

Commentary:

1. Total R&D expenditure (GERD – gross expenditure on R&D)[8] is the most popular and most frequently used indicator in the international comparison of research and development. These expenditures represent the overall expenditures funded from public, private (business or non-business) and foreign sources.
2. In the monitored period between 2000 and 2003 the total R&D expenditures in EU-15 experienced a moderate increase from 1.89 % in 2000 to 1.94 % of GDP in 2003. Similarly growing were the expenditures in EU-25 countries from 1.8 % of GDP in 2000 to 1.85 % of GDP in 2003.
3. The EU-25 and EU-15 values are markedly exceeded by Finland (3.49 % GDP in 2003), Japan (3.15 %), USA (2.6 %), Denmark (also 2.6 %) and Germany (2.55 %).
4. New EU Member States and Greece considerably lag behind the EU-25 average. It is a bit of surprise that expenditures in the Netherlands (1.8 % of GDP in 2002) are lower that the figure for EU-25.
5. As for the expenditure dynamics, the fastest growing are the expenditures in Hungary, Austria and Denmark. In Finland, after a dynamic increase in the second half of the 1990´s, the growth slowed down, but in 2003 the expenditures attained a remarkable amount of 3.49 % of GPD. Growth in other monitored countries is much slower. In the United Kingdom, Greece and France the expenditures stagnate. In Slovakia, Poland and the Netherlands the expenditures decline, as well as in the United States. The target set on the 2002 Spring European Council meeting in Barcelona - the expenditures in the level of 3 % of GDP - will be fulfilled by only a few EU Member States. At present it is already exceeded by Finland and Sweden not mentioned in the graph.
6. In 2003, the total R&D expenditures in the Czech Republic attained the level of 66 % of expenditures in EU-15. This value corresponds relatively well with the level of GDP per capita amounting in the Czech Republic to ca 63 % of the EU-15 value (see Graph P.I.2 of the Annex) It is generally known that the developed "richer" countries spend more on research and development than the countries less developed. Relatively close correlation exists in the OECD member states between the level of R&D expenditures in % of GDP and relative GDP per head.

8 The international OECD and Eurostat terminology knows total R&D expenditures under the abbreviation GERD (Gross Expenditure on R&D) representing the overall (gross) domestic expenditure on research and development in compliance with the Frascati Manual 2002 methodology.

A.2.2 Total R&D expenditures (in USD per capita; current prices, PPP)

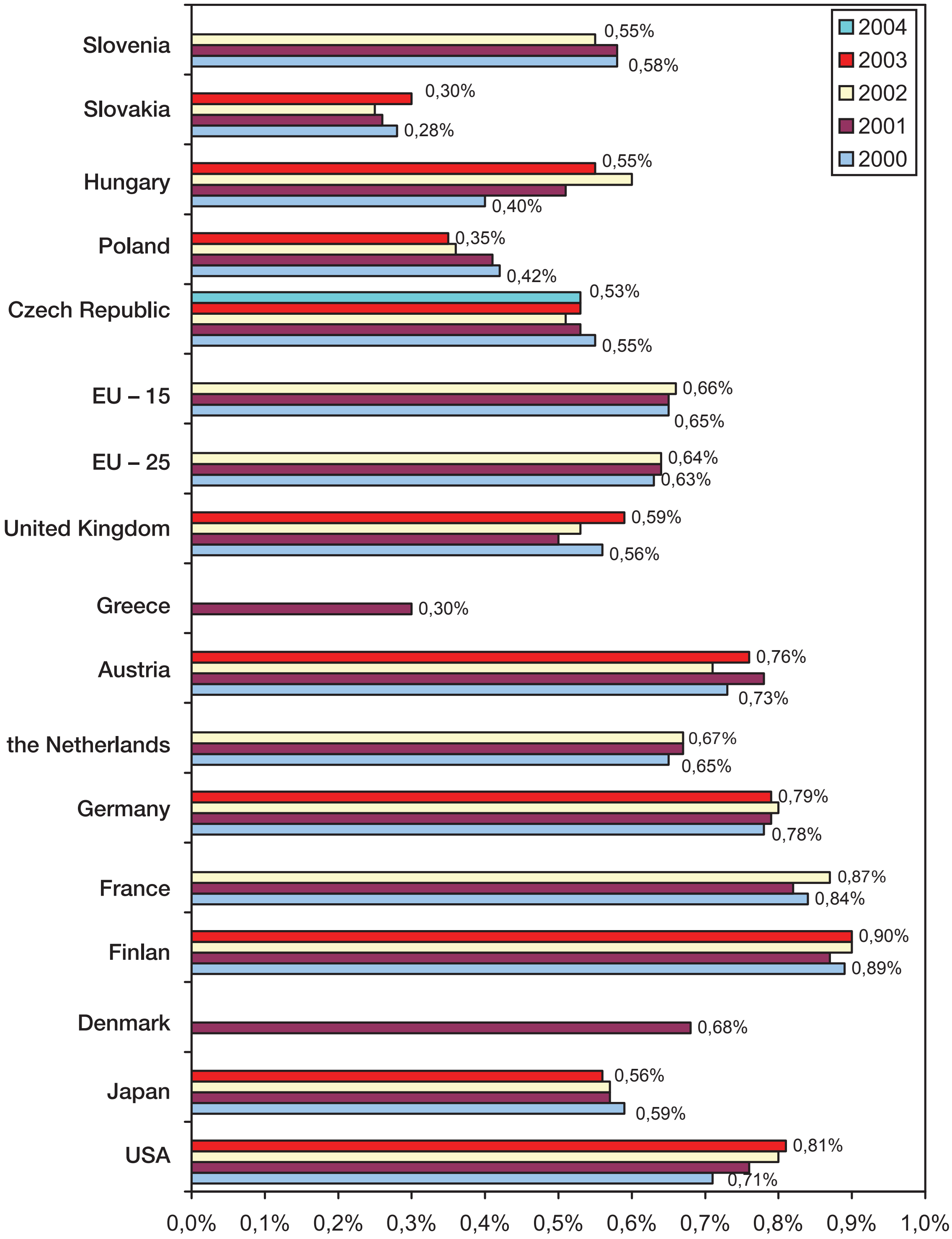


Source: OECD, Main Science and Technology Indicators, May 2005 and CBS 2005

Commentary:

1. The indicator of total R&D expenditures in per cent of GDP gives only incomplete information. The really spent funds depend on the amount of GDP. Therefore the analytical materials use another indicator – total R&D expenditures in USD per one inhabitant of the country in question. As a rule this indicator is given in currency of the respective country converted to USD using the purchasing power parity (PPP). At this conversion a small distortion may occur because some inputs to research and development (apparatuses, materials, etc.) are generally bought in abroad according to the official rate of exchange of the currency in question. Nevertheless, the indicator is considered to be highly objective. The chart values are given in current prices of respective years.
2. The R&D expenditures in EU-15 rose from 465.5 USD per capita in 2000 to 531.8 USD per capita in 2003; EU-25 expenditures rose from 403.7 USD per capita to 462.6 USD per within the same period.
3. Markedly highest are expenditures in the United States (977.7 USD per capita in 2003), then in Finland (994.9 USD per capita in 2003) and Japan (893.4 USD per capita in 2003). Remarkably high are also the R&D expenditures in Austria (723.5 USD per capita in 2004).
4. The lagging behind of the monitored new member states and Greece in R&D expenditures is more marked due to the lower GDP levels than in the indicator of % of GDP according to the previous Graph A.2.1. The expenditures in Slovakia rise only slowly; in Poland they go down.
5. Out of the monitored new Member States, the highest expenditures are reported by Slovenia (283.1 USD per capita in 2002), followed by the Czech Republic (235.7 USD per capita in 2004) and Hungary (143.6 USD per capita in 2003). The Czech R&D expenditures in 2003 (217.9 USD per capita) attained only 47 % of the EU-25 level (462.6 USD per capita), or 34 % of the Austrian level (723.5 USD per capita).
6. The amount of R&D expenditures in USD per capita must be taken into account when interpreting the values of such indicators like the number of patents, number of scientific publications and their citations. The lagging of the Czech Republic in the numbers of publications, citations and patents behind the monitored EU-15 Member Sates will not be so immensel in many cases when taking into account the actual amount of R&D expenditures. On the other hand, the lagging behind Hungary in certain efficiency indicators will be higher when taking into account the actual amount of R&D expenditures.

A.2.3 Public R&D expenditures (in per cent of GDP)

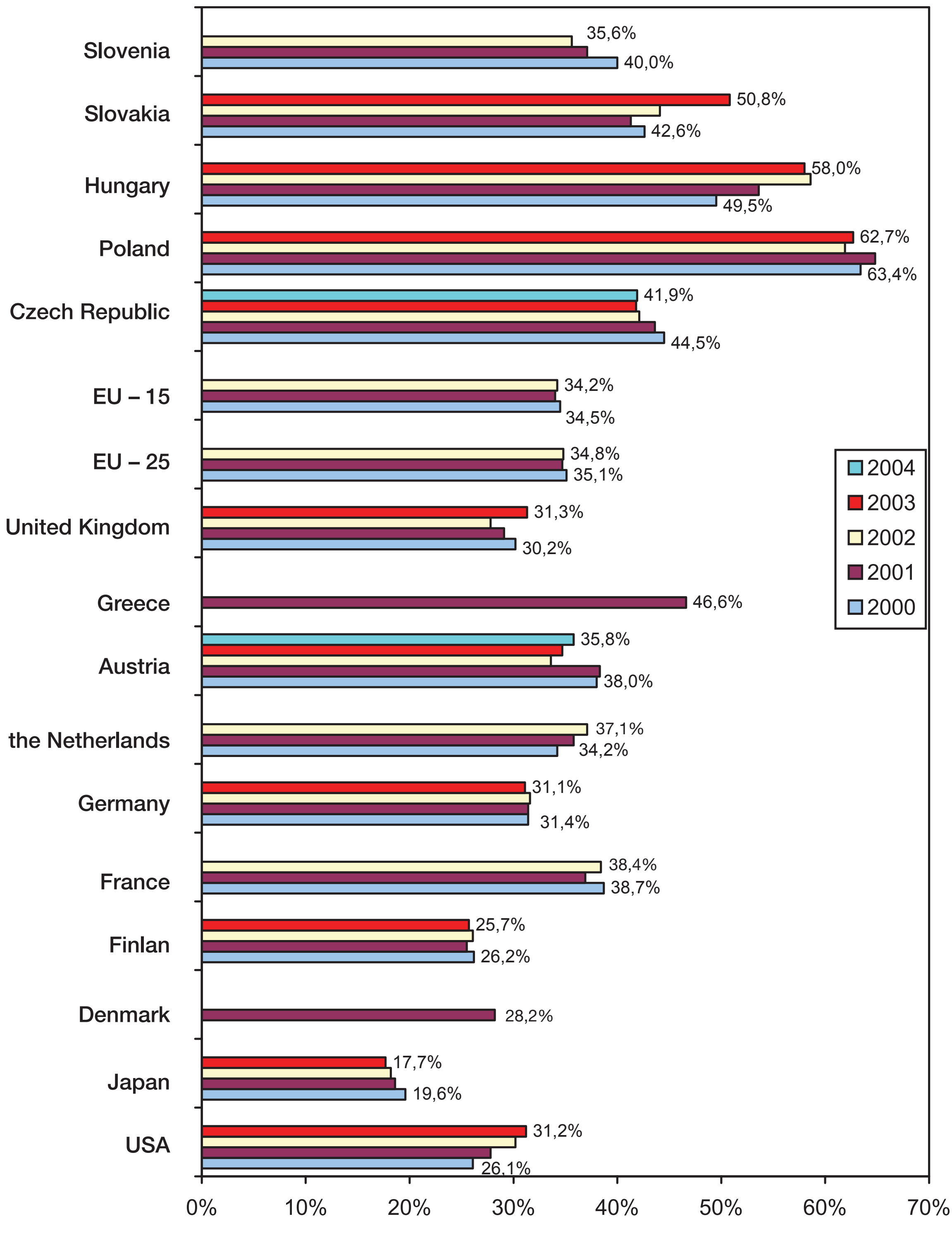


Source: OECD, Main Science and Technology Indicators, May 2005, CBS and its recalculations

Commentary:

1. Public expenditures are the expenditures of the state budget and budgets of lower administrative units of respective countries (federal lands, regions, counties, etc). The importance of this indicator is growing in context with evaluation of fulfilment of the Lisbon strategy (specified in Barcelona in 2002), according to which the overall R&D expenditures should attain the level of 3 % of GDP by 2010, of this one third from public sources.
2. Public R&D expenditures funded from EU-15 public resources went up from 0.65 % of GDP in 2000 to 0.66 % in 2002; with EU-25 from 0.63 % of GDP to 0.64 % of GDP. Data for 2003 and 2004 are not yet available.
3. The highest level is attained by Finland (0.9 % of GDP in 2003), followed by USA (0.81 % of GDP in 2003) and France (0.87 % in 2002), which are countries with high overall amounts of R&D expenditures.
4. Out of the new EU Member States, Hungary reported the highest public expenditures (0.55 % of GDP in 2003) at a remarkable growth (0.4 % of HDP in 2000). It is felcowed by Slovenia (0.55 % of GDP in 2002) and the Czech Republic (0.53 % of GDP in 2003). The R&D expenditures of Slovakia fell down relatively quickly over the monitored period.
5. Out of the monitored countries, the level of public expenditures of EU-15 and EU-25 is significantly exceeded by Finland (0.9 % of GDP in 2003), France (0.87 % of GDP) and USA (0.81 % GDP). All monitored EU-15 countries, with the exception of Greece, exceed the expenditure levels of both EU-15 and EU-25.
6. In all monitored new EU Member States, the public R&D expenditures are lower than the EU-15 and EU-25 averages. The highest R&D expenditures are in Hungary (0.55 % of GDP in 2003) and in the Czech Republic (0.53 % of GDP also in 2003).
7. The differences in public expenditures between the old and new member states when evaluated by share of GDP are relatively small ones. It is, however, necessary to take into account the different amounts of gross domestic products. In such case we will arrive at more marked differences in expenditures evaluated e.g. by monetary units per one inhabitant (e.g. USD per head).
8. Over the monitored period, the public R&D expenditures grew significantly only in USA and Hungary. In Hungary, after increasing to 0.6 % of GDP in 2002 the expenditures fell to 0.55 % of GDP in 2003. In other monitored countries the public R&D expenditures stagnate or go down. Even here it is necessary to take note of the fact that gross domestic products in monitored countries mostly grow by 2 to 4 % each year. And so even when the indicator of R&D expenditures in % of GDP stagnates, the expenditures expressed in e.g. USD per capita increase.

A.2.4 Share of public funds in total R&D expenditures (in per cent)

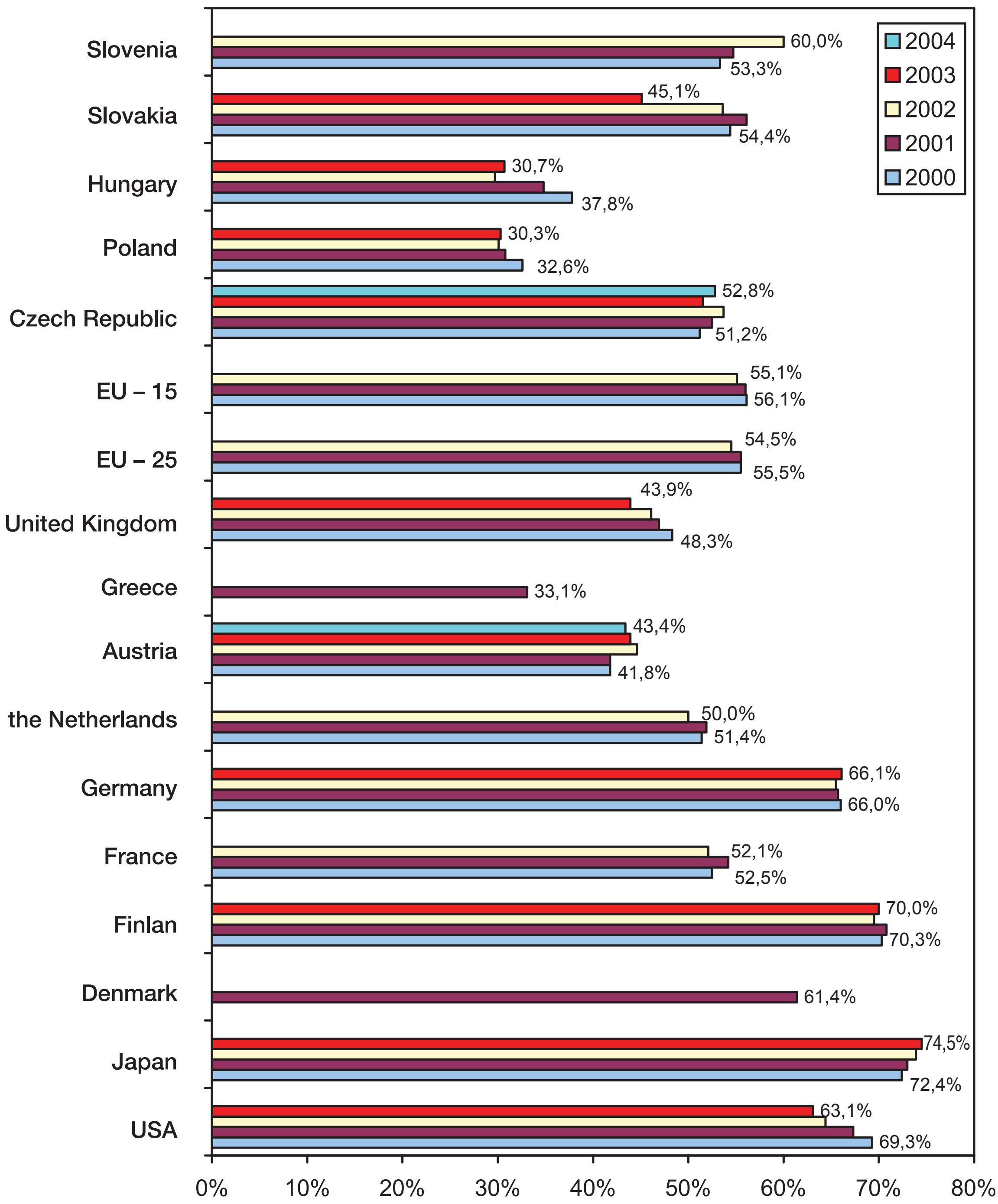


Source: OECD, Main Science and Technology Indicators, May 2005 and CBS 2005

Commentary:

1. This indicator gives account on the degree of liberalism of the economy (scope of the private sector) and is influenced by the structure of economy, particularly the share of large enterprises, and structure of the research base. The conception materials on research and development in abroad often express the opinion that the optimum share of public funds moves in the range from 30 % to 40 % of the total R&D expenditures. The already mentioned EU Lisbon Strategy anticipates the total R&D expenditures in the amount of 3 % of GDP, of this 1 % from public funds and 2 % from private funds.
2. In both EU-15 and EU-25 countries, the share of public expenditures in total R&D expenditures between 2000 and 2002 moved in the range of 34–35 % being a little over this “ideal” one third.
3. With the exception of Greece (46.6 % in 2001), France (38.4 % in 2002), the Netherlands and Austria, other monitored EU-15 countries report the share of public resources lower than EU-15 and EU-25 averages. Relatively high share of public resources in France is due to high expenditures spent on the so called “defence research” that is in France like in other countries funded predominantly from the state budget. The lowest share of public R&D expenditures shows Japan (17.7 % in 2003).
4. In the monitored new member states, the share of public expenditures is significantly higher than in EU-25 and EU-15. The highest share is in Poland (62.7 % in 2003) and Hungary (58 % also in 2003). The lowest share of public expenditures was reported by Slovenia (35.6 % in 2002) approaching with this figure the level of EU as a whole. In the Czech Republic, the share of public expenditures declined in the monitored period; in 2004 it amounted to 41.9 %.
5. As far as the trend of shares of public R&D expenditures in the monitored period is concerned, in most of the countries these expenditures stagnate. The exception is the United States with the share growing from 26.1 % in 2000 to 31.2 % and the Netherlands, Hungary and Slovakia.

A.2.5 Share of private funds in total R&D expenditures (in per cent)

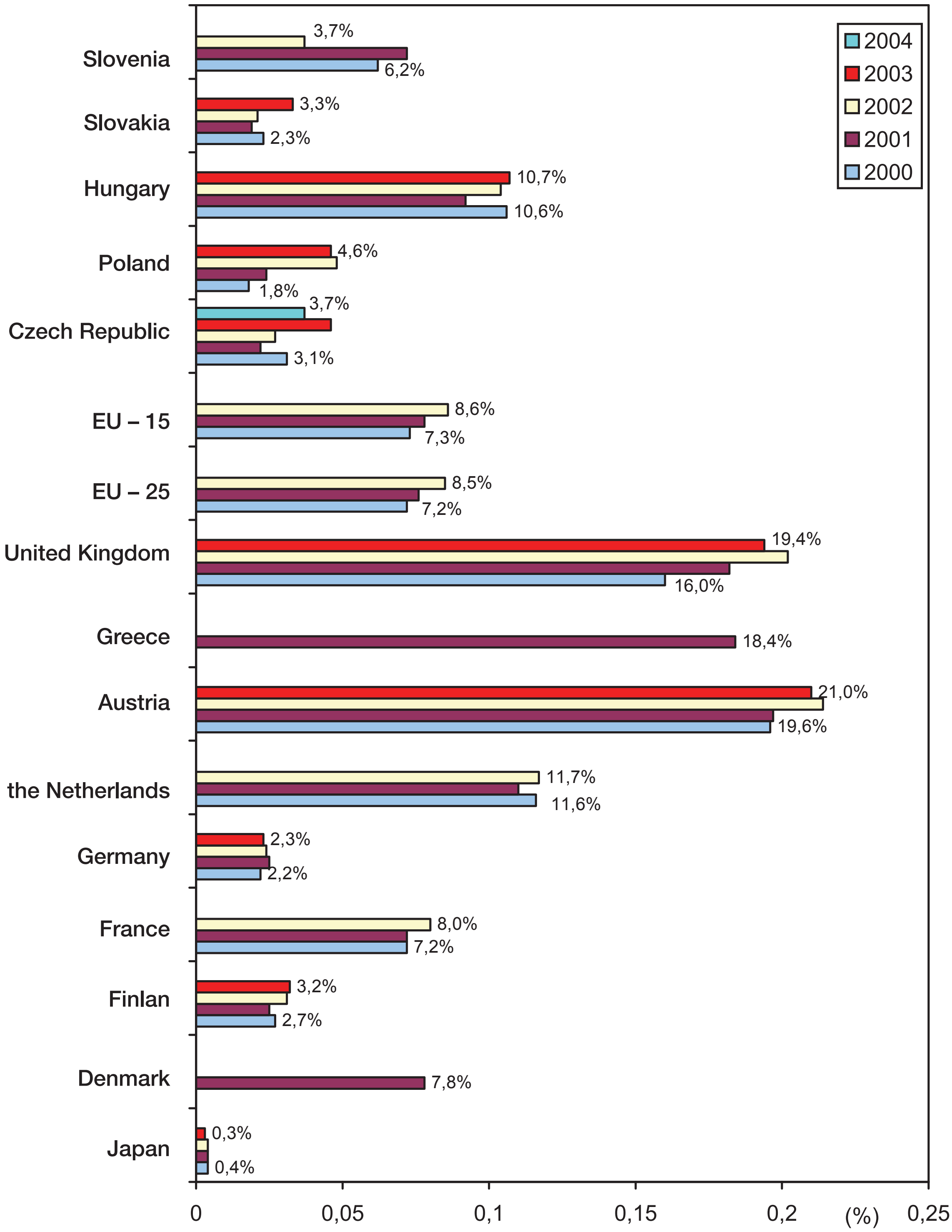


Source: OECD, Main Science and Technology Indicators, May 2005 and CBS 2005

Commentary:

1. The values of private funds shares in the total R&D expenditures for most of the countries, or more exactly for countries with low support of research and development from abroad, logically supplement the values given in Graph A.2.3. In most of the monitored countries the private funds are the largest source of finance for the R&D support. The same applies to the increase and decrease in the private funds shares. The share of public funds is falling down in most countries, while the private funds share is going up.
2. In EU-15 as a whole, the share of private funds declined from 56.1 % in 2000 to 55.1 % in 2002. In EU-25 it also declined in the same period from 55.5 % to 54.5 %. Data for years 2003 and 2004 are not yet available.
3. The higher share of private funds in total R&D expenditures than the EU-15 or EU-25 respectively is reported by Japan (74.5 % in 2003), Finland (70 % also in 2003), followed by Germany, USA, Denmark and Slovenia. In all of these countries there are large enterprises applying modern technologies with exceptionally high R&D expenditures.
4. In new member states, in Greece and surprisingly in Austria and United Kingdom the shares of private resources in total R&D expenditures are substantially lower than the EU-15 and EU-25 figures. The reason for this relatively low share of private funds in the United Kingdom is a high share of defence research funded from the state budget and high share of resources from abroad as depicted in the following Graph A.2.6. The lowest share of private funds of the monitored countries is reported by Poland (30.3 % in 2003). The Czech Republic with its share of private funds in the amount of 52.8 % approaches the share values of EU-25 and EU-15.
5. The amount of private R&D expenditures is influenced also by the structure of tax systems. In many countries the expenditures of enterprises are motivated by indirect instruments of support, e.g. tax relieves. In the Czech Republic, a positive development can be expected with the possibility to include the R&D expenditures as an tax deductible.
6. In most of the countries, the shares stagnated or declined in the monitored period. The greatest decline took place in USA from 69.3 % in 2000 to 63.1 % in 2003, followed by Slovakia and the United Kingdom. The private expenditures rose only in Slovenia.

A.2.6 Share of foreign funds in total R&D expenditures (in per cent)

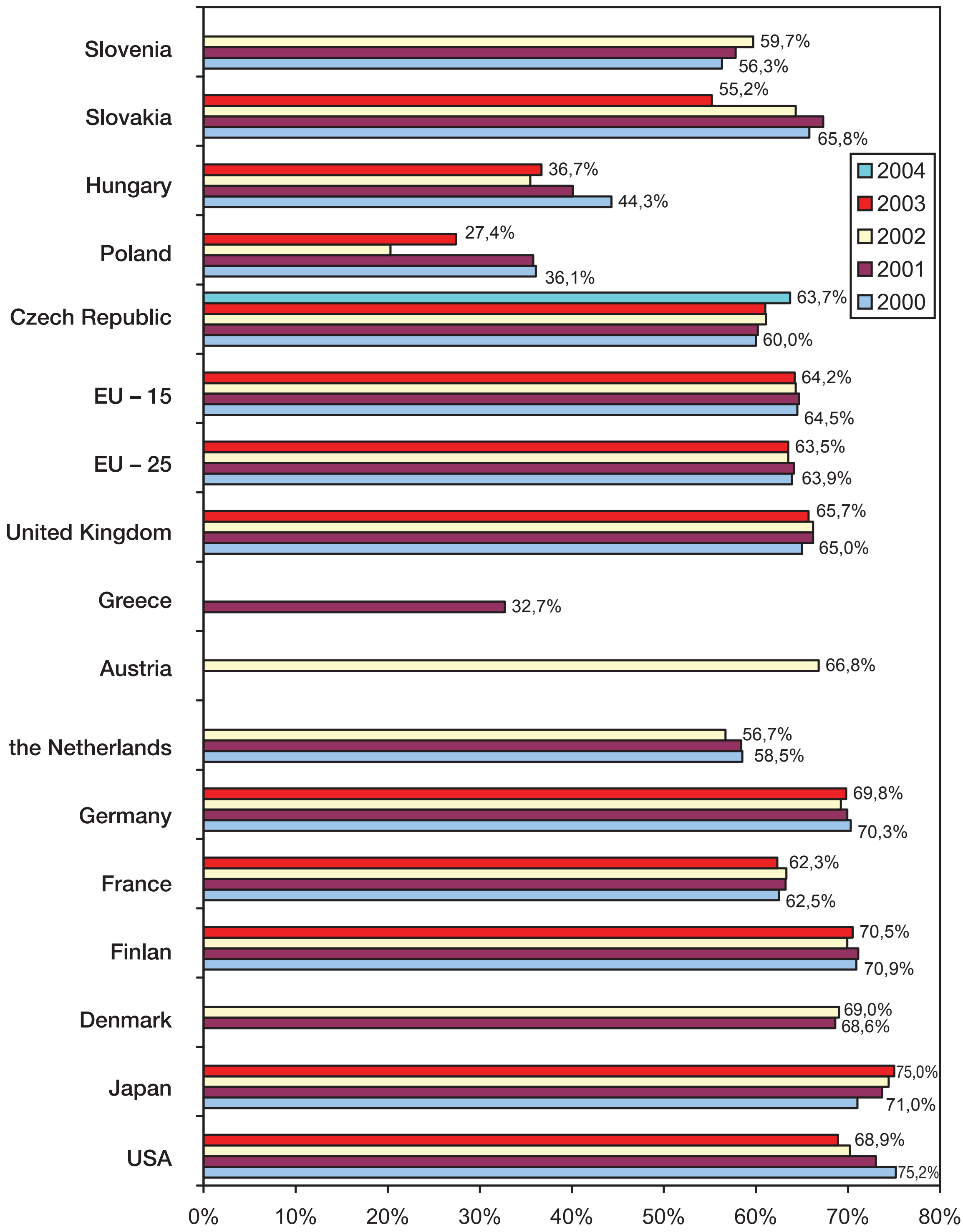


Source: OECD MSTI 2004/1 and CBS

Commentary:

1. The foreign funds are the third most important source of R&D financing. The share of the fourth source being the private nonbusiness nonprofit sources (private foundations, etc.) is marginal, except for the United States. The foreign funds include both private funds and public funds (EU programmes, other international programmes, etc.).
2. In EU-15, the share of foreign funds increased from 7.3 % in 2000 to 8.6 % in 2002; in EU-25 it increased in the same period from 7.2 % to 8,5 %. Data for 2003 and 2004 are not yet available. There are no substantial differences between the old and new member states. In both groups there are states with the above average and below average shares of foreign funds in overall R&D expenditures.
3. The highest shares of foreign funds are reported by Austria (21 % in 2003), United Kingdom (19.4 % also in 2003) and Greece (18.4 % in 2001). The ten per cent level is also exceeded by the Netherlands. In the new EU Member States, the highest share of foreign funds is reported by Hungary (10.7 % in 2003). In the countries mentioned under this point, the expenditures are particularly those of large foreign and multinational enterprises having their branches in these countries.
4. The share of foreign funds lower than 5 % of the overall expenditures is reported by Slovenia, Slovakia, Poland, Czech Republic, Germany, Japan and Finland.
5. In the Czech Republic, the share of foreign funds had experienced a promising growth until 2003 to 4.6 %. In 2004, the share declined to 3.7 %. This decline is, inter alia, produced by "administrative and technical" conditions for funding or co-funding from foreign sources (provision of a share from Czech sources, non-recognition of VAT as a cost item of research, etc.)
6. The lowest share of foreign funds of all is reported by Japan (0.3 % in 2003). The reason is a very low share of branches of foreign enterprises and a considerably limited scope of direct foreign co-operation in research and development financed from foreign funds.

A.3.1 Share of R&D funds used in private sector in the total R&D expenditures (in per cent)



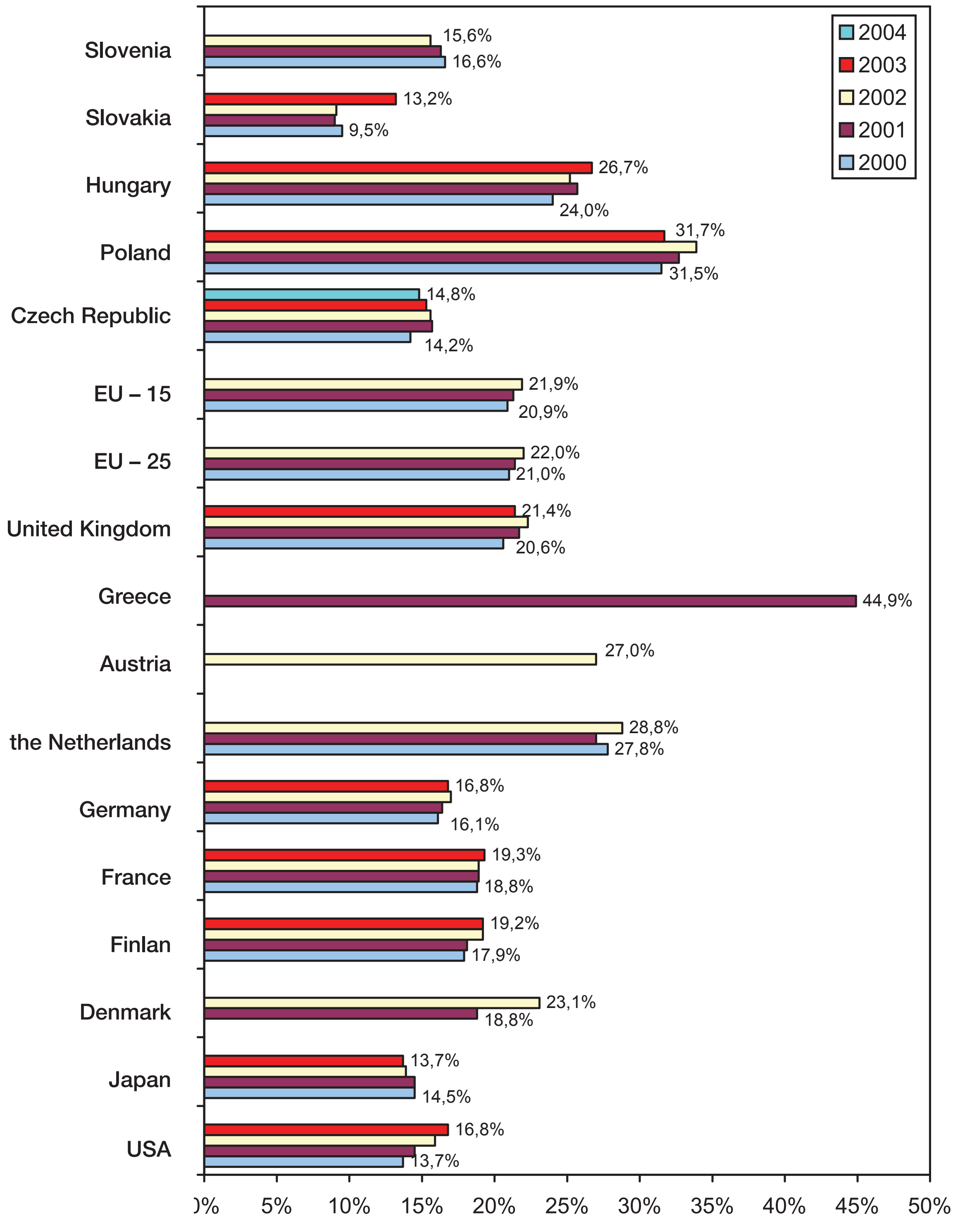
Source: OECD, Main Science and Technology Indicators, May 2005 and CBS 2005

Commentary:

1. The foreign analyses and statistics monitor three user sectors (sectors providing R&D: private or business sector, universities and government sector). The government sector largely includes research organisations of a non-business character supported from public funds. In the Czech Republic, the government sector includes the institutions of the Academy of Sciences of the CR and departmental research institutions.
2. In most of the OECD member states, the majority of funds spent on research and development is directed into the private sphere (R&D expenditures spent in business sector – international abbreviation BERD[9]). In a major part of countries mentioned in the graph, the share of business sector in the total use of R&D expenditures is higher than 60 % or approaching this limit. The exceptions are only Hungary, Poland and Greece with their shares moving around 30 %.
3. Within EU-15, the share of business sector moderately decreased from 64.5 % in 2000 to 64.2 % in 2003; with similar moderate decrease within EU-25 from 63.9 % in 2000 to 63.5 % in 2003.
4. Japan reports the highest share of funds spent in business sector (75 % in 2003), followed by Finland (70.5 % in 2003) and Germany (69.8 % in 2003).
5. The lowest shares of the total R&D funds spent in business sector are reported by Poland (27.4 % in 2003) and Greece (32.7 % in 2001). The industry of both these countries has a low portion of research-demanding branches. It follows from the next graphs that Greece has the highest share of funds spent at universities (see Graph A.3.2) and Poland in the government sector (see Graph A.3.3).
6. In the Czech Republic the share of R&D funds spent in business sector slightly grew from 60 % in 2000 to 63.7 % in 2004 and is at the level of EU-25.
7. In most of the monitored countries, the share of funds spent on research and development in the private sphere has not changed substantially. It is growing in the Czech Republic and Japan, while going down in Slovakia, Hungary and USA; in USA from 75.2 % in 2000 to 68.9 % in 2003.

9 The international OECD and Eurostat terminology identifies the R&D expenditures realised/used/consumed in business sector under the abbreviation BERD (Business Expenditure on R&D) in compliance with the Frascati Manual 2002 methodology.

A.3.2 Share of R&D funds used at universities in the total R&D expenditures (in per cent)

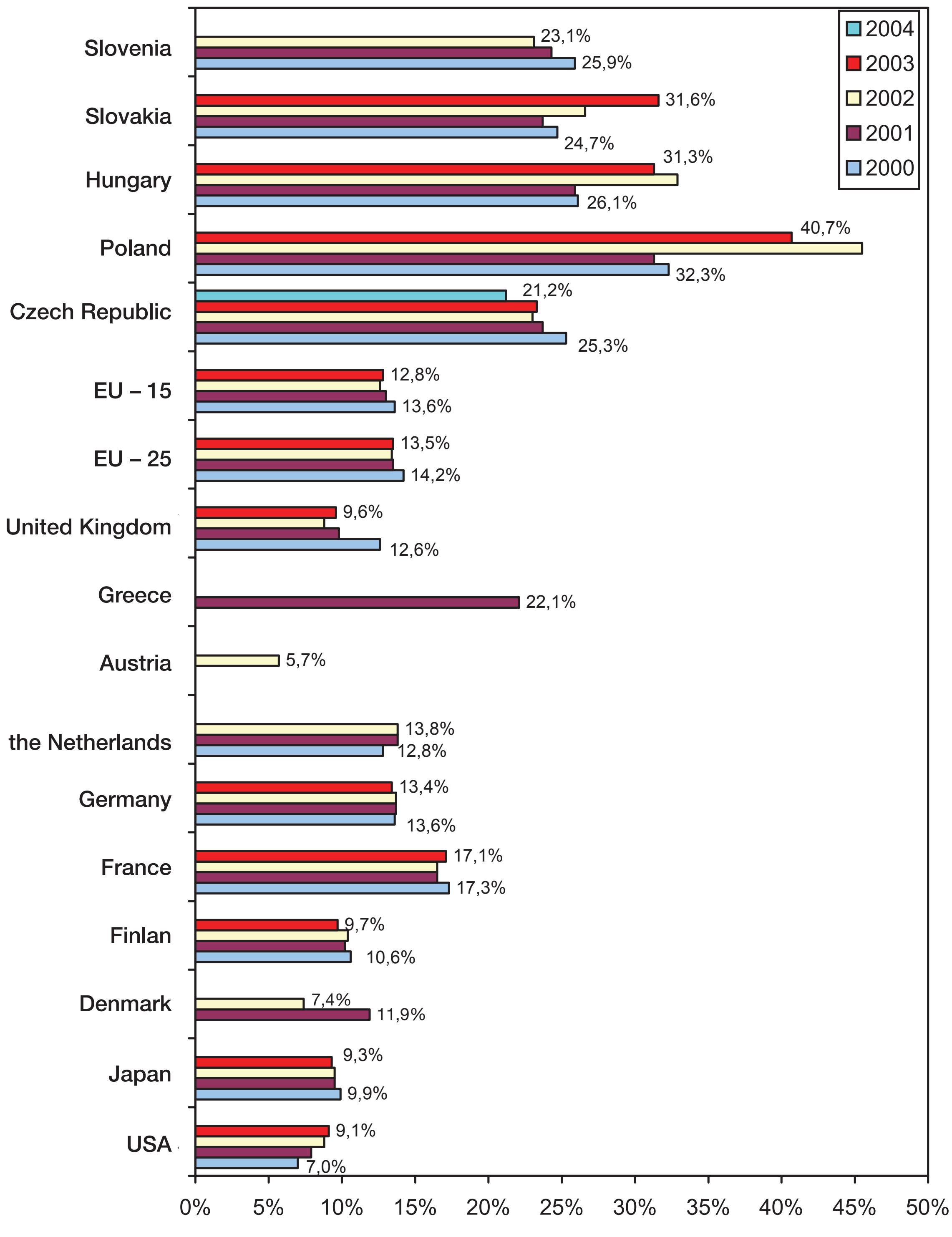


Source: OECD, Main Science and Technology Indicators, May 2005 and CBS 2005

Commentary:

1. All over the world the universities belong among important sectors performing research and development. The benefit and necessity of uniting the research with university education are not doubted anywhere in the world. The shares of universities in the total R&D support differ according to various countries. First and foremost, they are influenced by the development and tradition until now, structure of both the research base and industry, or the share of R&D-demanding industrial sectors respectively.
2. Within EU-15, the share of use of total R&D funds at universities increased from 20.9 % in 2000 to 21.9 % in 2002; within EU-25 it also slightly increased from 21 % in 2000 to 21.9 % in 2002. Data for 2003 and 2004 are not yet available.
3. The highest share of EU-15 countries is reported by Greece (44.9 % in 2001), followed by Poland (31.7 % in 2003) and the Netherlands (28.8 % in 2002).
4. The lowest share of monitored countries is in Slovakia (13.2 % in 2003), Japan (13.7 % in 2003) and the Czech Republic (14.8 % in 2004). The non-European advanced countries, namely the United States and Japan, report very low shares of funds spent at universities, in both countries deeply below 20 %. Out of the monitored countries, less is reported only by Slovakia (13.2 % in 2003).
5. In the Czech Republic, the share of universities is slightly decreasing (from 15.5 % in 2001 to 14.8 % in 2004). The share of Czech universities is still significantly lower than the average of EU-25 as a whole – the above mentioned 21.9 % in 2002.
6. In most of the monitored countries, the share of universities did not change in any substantial manner in the evaluated period. It increased in Slovakia, Hungary, USA, Finland and Denmark. It slightly decreased in Slovenia and Japan.

A.3.3 Share of R&D funds used in the public (government) sector in total R&D expenditures (in per cent)



Source: OECD, Main Science and Technology Indicators, May 2005 and CBS 2005

Commentary:

1. According to the OECD methodology explained in a great detail in the so called Frascati Manual, the government sector means the public research organisations having all types of legal forms. The Czech government sector includes the institutions of the Academy of Sciences of CR and departmental research institutions. The statements about the dependency of the evaluated sector's share on the development, traditions, structures of research and industry mentioned in point 1 of the Commentary to Graph A.3.2 apply also to the public (government) sector.
2. Within EU-15, the share of public sector slightly decreased from 13.6 % in 2000 to 12.8 % in 2003. Similar decrease took place also in EU-25 from 14.2 % in 2000 to 13.5 % in 2003. In all monitored EU-15 countries, with the exception of Greece, the share of R&D funds spent in public sector is lower than 20 %. On the other hand, this share in all monitored new EU Member States is higher than 20 %.
3. Disregarding Austria, for which only one figure is available, the lowest shares of public sector are then reported by Denmark (7.4 % in 2002), USA (9.1 % in 2003) and United Kingdom (9.6 % in 2003).
4. The highest shares of public R&D sector shows Poland (40.7 % in 2003), followed by Slovakia (31.6 % in 2003) and Hungary (31.3 % in 2003).
5. The Czech Republic belongs among countries with a relatively higher share of public R&D sector. The share of this sector decreased from 25.3 % in 2000 to 21.2 % in 2004
6. With the exception of Poland, Slovakia and to a certain extent also Hungary, USA and the Netherlands, where the shares of public sector rise, in other monitored countries these shares stagnate or slightly go down. For Denmark experiencing decrease, data for only two years are available. The decrease in the above countries results from the already mentioned liberalism of economy and efforts to redistribute fewer funds through the state budget.
7. It is not possible to make any definite conclusions about the optimal size of public R&D sector. But the reality is that in the countries of the so called Eastern Block the research and development at universities was considerably restrained; universities had to fulfil different tasks. On the contrary, the public (government) R&D sector developed greatly. The second indisputable fact is that this public (government) R&D sector exists in all OECD countries and is funded largely from public funds.

B. Analysis of R&D support from public funds

In accordance with Act No. 130/2002 Coll. on research and development support the Research and Development Council compiles, inter alia, the draft medium-term outlooks of research and development support and estimates of total R&D expenditures in individual budgetary chapters and their distribution. In exercising this authority, the Research and Development Council in co-operation with the Ministry of Finance collects, analyses and interprets data on medium-term expenditure outlooks and state budgets for respective years.

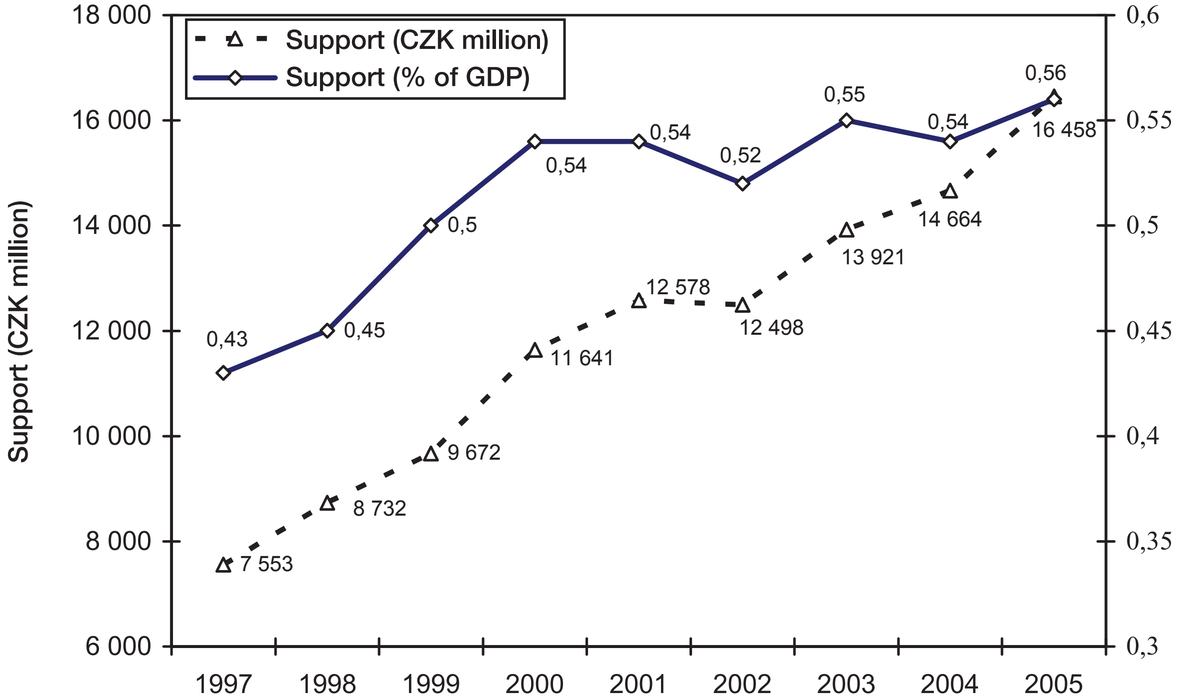
In this chapter the presented R&D analysis has the same structure as the 2004 R&D Analysis approved by the Government in its Resolution No.1208 of 1 December 2004. The evaluated period was advanced by one year, now 1998 – 2005 (the last analysed period was 1997 – 2004). The financial volumes for 2005 represent the expected expenditures according to act on the state budget for 2005. When compared with the 2004 R&D Analysis, some values for 2004 were specified according to the additionally made amendments to the 2004 state budget.

Data on the R&D public support in this part slightly differ from information in the previous Part A, which are based upon data ascertained by enquiries of the Czech Bureau of Statistics (CBS), while the source for Part B data remains the state budget and medium-term outlooks. Differences between data of statistical bureaus and ministries of finance occur in most of the countries. For 2005, five graphs have been included in the analysis:

- Trend of state R&D expenditures (CZK mil and % of GDP)
- Trend of state subsidies extended to research and development by selected providers (CZK mil)
- Trend of institutional support extended to research by selected providers (CZK mil)
- Trend of targeted support extended to research and development by selected providers (CZK mil)
- R&D expenditures – shares of targeted and institutional support in the overall state R&D expenditures (%)

The group of selected providers is the same as last year and includes the Academy of Sciences of the Czech Republic (AV ČR), Grant Agency of the Czech Republic (GA ČR), Ministry of Industry and Trade (MPO), Ministry of Education, Youth and Sport (MŠMT), Ministry of Health (MZ), Ministry of Agriculture (MZe), and Ministry of Environment (MŽP).

B.1 Trend of state R&D expenditures (CZK mil and % of GDP)



Source: State Budget of the Czech Republic, 1997—2005

Note: The figures referring to % of GDP and state R&D expenditures are based on data published by the Ministry of Finance. The latter differ from data promulgated by the Czech Bureau of Statistics (CBS) that are used in Part A of the Analysis. Expenditures in CZK million are reported in current prices of respective years.

Commentary:

1. Data on R&D support in % of GDP in 1997-2003 differ from data mentioned in Part A of the 2003 R&D Analysis. The changes were due to the GDP amounts revision carried out by the Czech Bureau of Statistics (CBS) in July 2004. The GDP values increased against the original values, while the values of R&D support in % of GDP decreased.
2. The state R&D expenditures expressed as the standard indicator of % of GDP had been rising till 2000; between 1998 and 2000 their rise was a relatively dynamic one. In 2000, they reached 0.54 % of GDP. In 2002, the share fell down to 0.52 % of GDP and in 2003 it increased to 0.55 %. After a slight decrease to 0.54 % of GDP, the share increased again to 0.56 % being the highest value in the monitored period so far.
3. According to the Government Resolution of 29 June 2005 concerning the R&D state budget expenditures in 2006 and outlooks for 2007 and 2008, an additional increase in this share can be envisaged in these years.
4. Evidently, the target to reach expenditures of 0.7 % of GDP being repeatedly declared by the Government will not be met until 2008. The Czech Republic, as well as some other EU Member States, will not be able to achieve the target set on the 2002 Spring European Council Meeting in Barcelona - to raise the overall R&D expenditures to the level of 3 % of GDP, of this 1 % from public funds and 2 % from private (corporate) funds - by 2010. The stagnation in 2001 and falls

in 2002 and 2004 resulted from the fact that the Government and individual departments started to prefer as their budgetary priorities solution of actual problems to creation of conditions for an economic growth in the future.

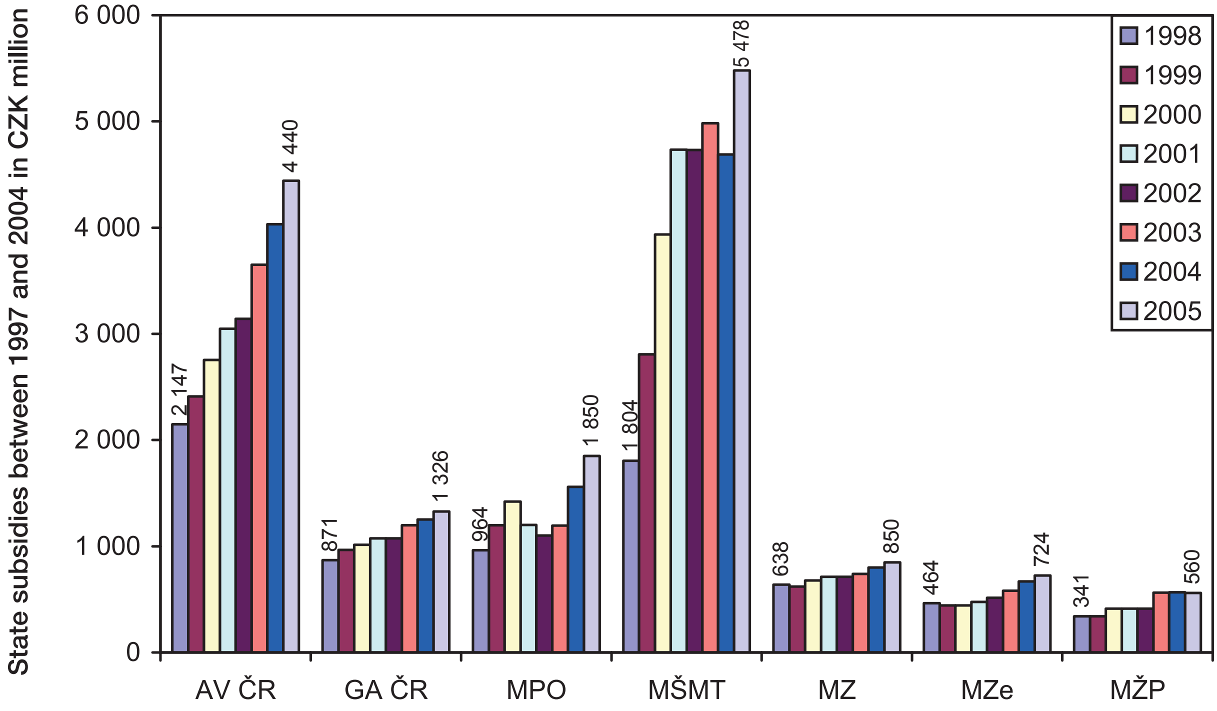
5. If we evaluate the state R&D support by the expenditures growth in real amounts and in current prices, the situation looks much more favourable.

The growth of the state R&D expenditures (in % of expenditures of the preceding year)

1998	1999	2000	2001	2002	2003	2004	2005
15.1	10.9	27.6	8.7	-6.4	11.4	5.3	12.2

6. With the exception of 2002, when a significant decline in comparison with the preceding year took place, in all other monitored years the expenditures experienced a dynamic growth, even in 2004 with the growth of 5.3 % against 2003. The increments are higher than in many other EU countries, including the countries of the former EU-15. In the Czech Republic, the dynamics of the state R&D expenditures growth is higher than the dynamics of the GDP growth over the monitored period.

B.2 Trend of state subsidies extended to research and development by selected providers (CZK million)



Source: State budget of the Czech Republic, 1998—2005

Note: AV ČR – Academy of Sciences of the Czech Republic, GA ČR – Grant Agency of the Czech Republic, MPO – Ministry of Industry and Trade, MŠMT – Ministry of Education, Youth and Sport, MZ – Ministry of Health, MZe – Ministry of Agriculture, MŽP – Ministry of Environment. Expenditures in CZK million are reported in current prices of respective years.

Commentary:

1. The highest R&D expenditures in 2005 are reported by MŠMT (CZK 5.478 bil.), followed by AV ČR (CZK 4.440 bil.) and MPO (CZK 1.850 bil.). Less than CZK 1 bil. is spent for research and development by MZ, MZe and MŽP (only CZK 0.560 bil.).
2. The table below shows the shares of seven monitored departments (AV ČR, GA ČR, MPO, MŠMT, MZ, MZe, MŽP) and four largest R&D support providers (AV ČR, GA ČR, MPO, MŠMT) in the overall state subsidies being extended to research and development in CR.

Departments	Shares of selected departments in overall state R&D support (%)	
	1998	**2005**
AV ČR, GA ČR, MPO, MŠMT, MZ, MZe, MŽP	82	92,5
AV ČR, GA ČR, MPO, MŠMT	66.2	79.6

While the concentration of R&D support with four largest providers increased from 66.2 % in 1998 to 79.6 % in 2005, its diversification into more than two dozens of providers is still too high and causes many problems.

3. The R&D expenditures were increasing with all providers over the monitored period. The largest growth was experienced by MŠMT and AV ČR.

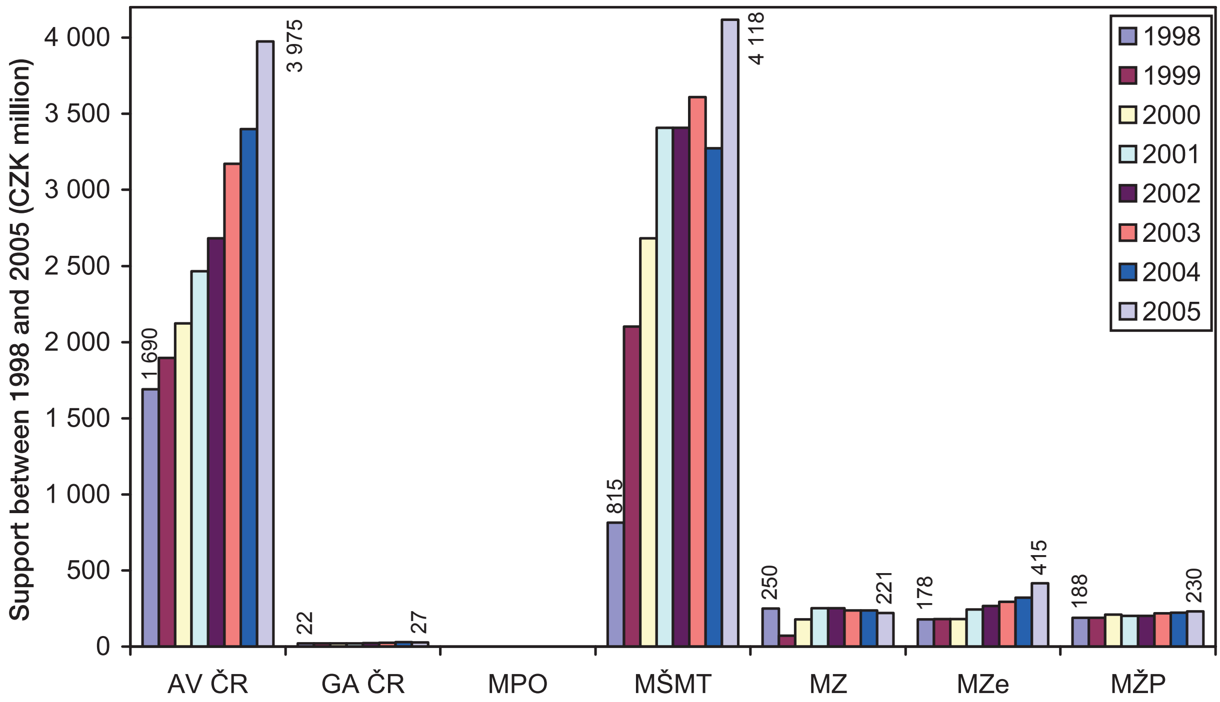
The growth of R&D expenditures for 1998-2005 period with selected providers (in % of 1998 expenditures)

AV ČR	GA ČR	MPO	MŠMT	MZ	MZe	MŽP
106.8	52.2	91.2	203.6	33.6	56.0	64.2

The dynamic growth in R&D expenditures of MŠMT was experienced in the period from 1997 to 2001 in compliance with defined priorities of the R&D support, then the amount of support stagnated, with another significant increase in 2005. The expenditures of MŠMT until 2005 had increased by 203.6 % when compared with 1998 expenditures.

4. The dynamic and relatively even growth is experienced by the expenditures of AV ČR. In 2005, the expenditures were higher by 106.8 in comparison with 1998 figures. After several years of certain stagnation in MPO expenditures (until 2003), their present growth is a dynamic one. The MPO expenditures in 2005 are increased by more than 90 % of expenditures in 1998.
5. The growth of expenditures in other monitored departments and the Grant Agency is significantly slower.

B.3 Trend of institutional support extended to research by selected providers (CZK million)



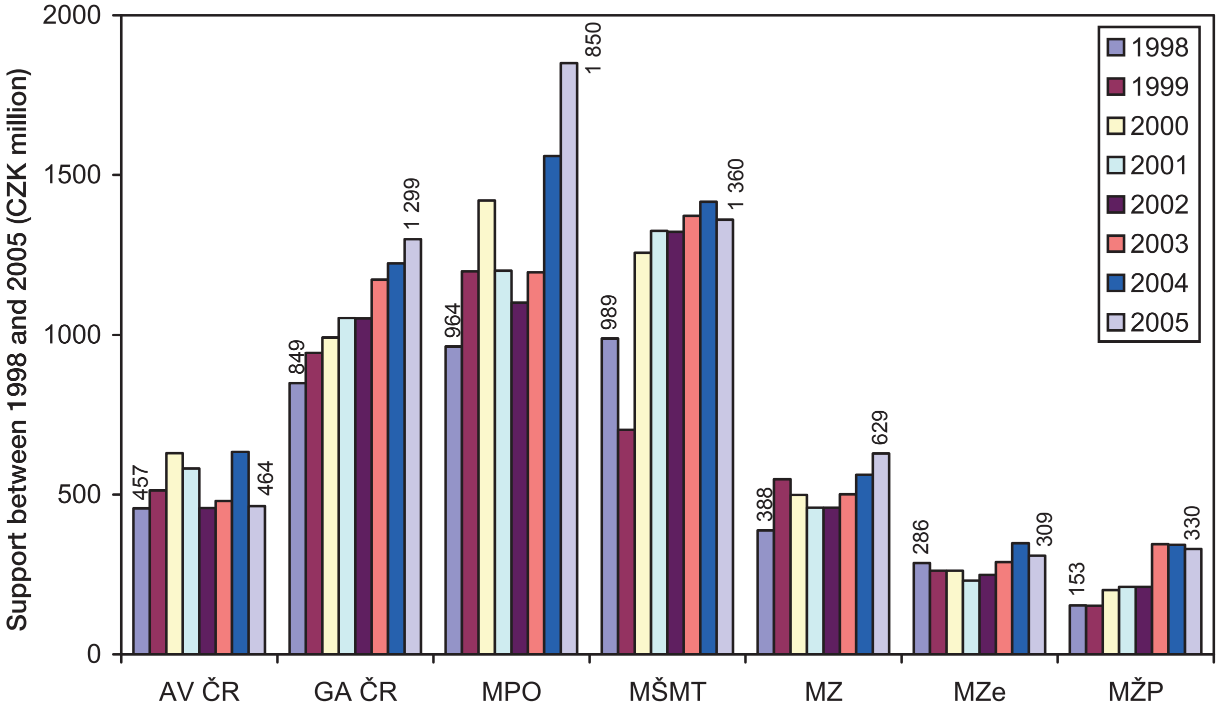
Source: State budget of the Czech Republic, 1997-2004

Note: AV ČR – Academy of Sciences of the Czech Republic, GA ČR – Grant Agency of the Czech Republic, MPO – Ministry of Industry and Trade, MŠMT – Ministry of Education, Youth and Sport, MZ – Ministry of Health, MZe – Ministry of Agriculture, MŽP – Ministry of Environment. Expenditures in CZK million are reported in current prices of respective years

Commentary:

1. The institutional support of research until 1998 had acquired the form of a subsidy to contributory and budgetary R&D organisations of respective providers. Since 1999, this support has been provided on the grounds of research plans. With MŠMT this institutional support has additional three forms: specific research on universities, research plans of private entities (see also point 4 of the Commentary) and support to certain activities of international co-operation.
2. The highest institutional support of research and development is coming from the budgets of MŠMT (CZK 4.118 bil. in 2005) and AV ČR (CZK 3.975 bil. in 2005). With other monitored departments this institutional support is significantly lower. MPO has no “departmental” research organisations and does not extend any institutional support to research and development. The institutional resources of GA ČR are intended for covering its own administrative cost.
3. The institutional support extended by AV ČR and MŠMT have been increasing over the monitored years (for MŠMT with exception of 2001–2004). The significant increase in the institutional support with AV ČR and MŠMT occurred in 2005 in connection with initiation of new series of research plans. The first series of research plans starting in 1999 was terminated in 2004.

B.4. Trend of targeted support extended to research and development by selected providers (CZK million)



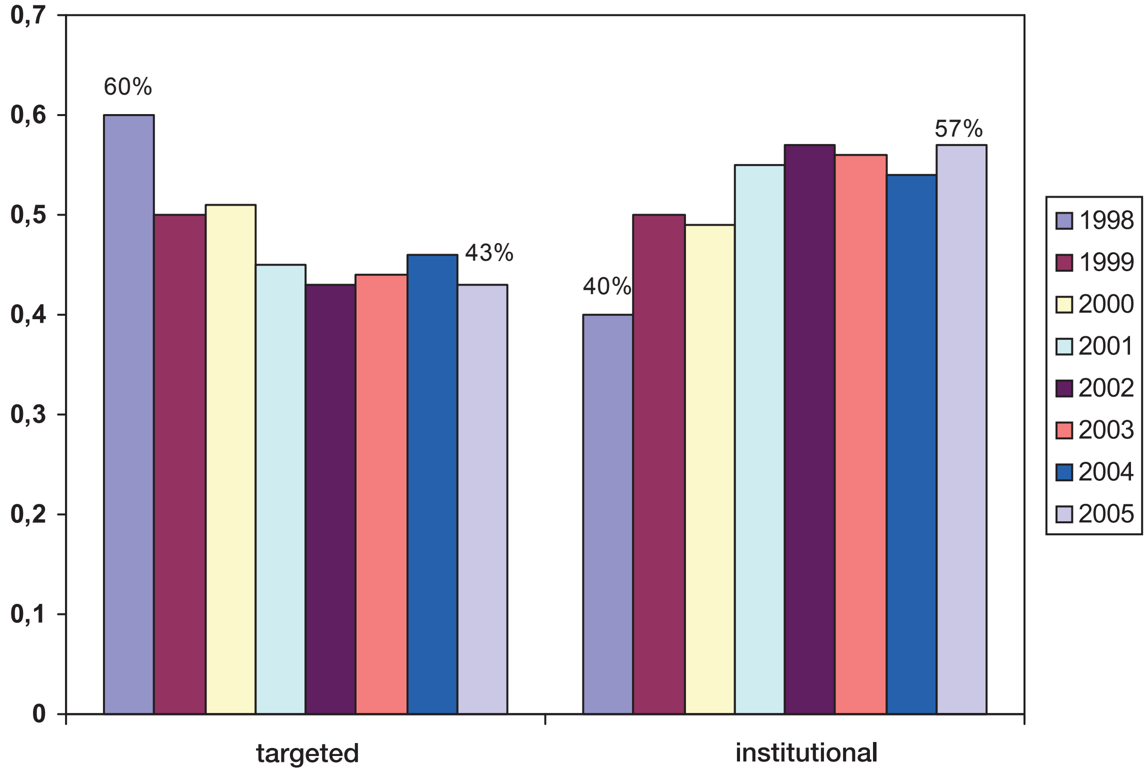
Source: State budget of the Czech Republic, 1998-2005

Note: AV ČR – Academy of Sciences of the Czech Republic, GA ČR – Grant Agency of the Czech Republic, MPO – Ministry of Industry and Trade, MŠMT – Ministry of Education, Youth and Sport, MZ – Ministry of Health, MZe – Ministry of Agriculture, MŽP – Ministry of Environment. Expenditures in CZK million are reported in current prices of respective years.

Commentary:

1. Targeted support of research and development is extended to R&D projects on the basis of the public tender results and public contracts in research and development. GA ČR and AV ČR provide support to grant projects. Other providers, including AV ČR, support projects that are part of their announced R&D programmes.
2. The highest targeted support is provided by MPO (CZK 1.850 bil. in 2005), followed by MŠMT (CZK 1.360 bil. in 2005) and GA ČR (CZK 1.299 bil. also in 2005). The lowest targeted support is provided by MZe (CZK 0.309 bil. in 2005). The reason is that a substantial part of research and development for fields falling under the competence of the Ministry of Agriculture is conducted in departmental institutes of the ministry being supported at the institutional level.
3. The targeted support extended by GA ČR has experienced a steady growth throughout the monitored period. As concerns AV ČR, it basically stagnates with the exception of certain years and moves in the range from ca CZK 450 to 650 million per year. A decisive part of these funds is provided by AV ČR in the form of institutional support.
4. The targeted support of other providers grows by a somewhat slower pace than is the pace of growth in the overall research and development support from public funds.

B.5 R&D expenditures – shares of targeted and institutional support in the overall state R&D expenditures (%)



Source: State budget of the Czech Republic, 1998-2005

Commentary:

1. The targeted R&D support decreased in the monitored period from 60 % of the overall public support in 1998 to 43 % in 2005. The institutional support increased from 40 % in 1998 to 57 % in 2005. The proportion of both forms of support nearly got reversed in the given period.
2. In general, the targeted support of research and development is considered to be more suitable than the institutional one, but with a full respect for necessity of a certain portion of institutional support. For the targeted support, the evaluation of draft R&D projects and their results is easier and more objective that the evaluation of institutional support on the basis of research plans.
3. Measures are being prepared for the next period, which should correct the unfavourable trend of the monitored period, while maintaining the already mentioned significant share of institutional support. It is also necessary to take into account the attained results. For the targeted funding, the volume of which will grow more rapidly than that of the institutional funding, it is desirable to support large and long-term projects.

C. Analysis of R&D Information System data (R&D IS)

The Research and Development Information System (R&D IS) is administered by the Research and Development Council and operated by the Office of the Government of the Czech Republic. The scope of data supplied to R&D IS, the purpose of R&D IS and other basic requirements are regulated by Act No. 130/2002 Coll. on research and development support and Decree of the Government No. 267/2002 on the Research and Development Information System.

The R&D IS database integrates four information fields: "Central register of R&D projects" (CEP), "Central register of research plans" (CEZ), "Information register of R&D results" (RIV) and "Register of public tenders in R&D" (VES).

This part of R&D analysis has a structure similar to the corresponding part of the analysis being submitted to the Government in 2004. Three new graphs were added with commentaries. Data valid for 2004 were added (for CEP, CEZ and RIV) and the monitored period for CEP and CEZ was advanced by one year (now 2001–2004). Some data of CEP and CEZ slightly differ from data contained in the last analysis. The reason for varying data within the same monitored year is the additional modification of data in some departments and correction of certain discrepancies in supplied data discovered during the R&D IS database audit as provided by law. The graphs with related commentaries analyse the main parameters of two basic forms of R&D support in the Czech Republic, i.e. targeted support of R&D projects and institutional support of R&D at higher education institutions (universities), institutes of the Academy of Sciences of the Czech Republic and research institutes of departmental ministries.

This part of analysis contains thirteen graphs:

- Number of R&D projects classified by sector between 2001 and 2004
- R&D projects classified by sector between 2001 and 2004 pursuant to the amount of funds
- Number of R&D projects pursuant to the amount of targeted support between 2001 and 2004
- Number of R&D projects pursuant to the age of principal investigators between 2001 and 2004
- Number of research plans classified by sector between 2001 and 2004
- Research plans classified by sector between 2001 and 2004 pursuant to the amount of funds
- Number of research plans pursuant to the amount of institutional support between 2001 and 2004
- Number of research plans pursuant to the age of principal investigators between 2001 and 2004
- Number of registered R&D results classified pursuant to the type of a result and year of application
- Number of R&D results registered between 1998 and 2004, classified pursuant to the categories of recipients and type of a result
- Trend of institutional funding of research plans by regions between 2001 and 2004 (the graph is divided into two graphs for two groups of regions)
- Trend of targeted funding of research and development by regions between 2001 and 2004 (the graph is divided into two graphs for two groups of regions)
- Shares of non-public sources in the overall targeted support of research and development by categories of recipients between 2002 and 2004

During more than ten years of the R&D IS existence, data on all important aspects of the state support extended to research and development have been collected; from the primary registration of projects (CEP) since 1993 when the grant system of project funding was launched, through the first steps in the collection of publications (RIP) in 1995, first granting of research plans in 1998 connected with their registration (CEZ), development of collection of results in the information area (RIV) since 1998, registration of public tenders in research and development (VES) since 2000 to the registration and processing of materials for the draft R&D state budget (State Budget - data supplied into R&D IS database until 2003).

The unavoidable and natural exchange of data structures (34 different data structures in total) have been taking place, during which the integration of new data with the historical ones was always made without interrupting the operations of R&D IS.

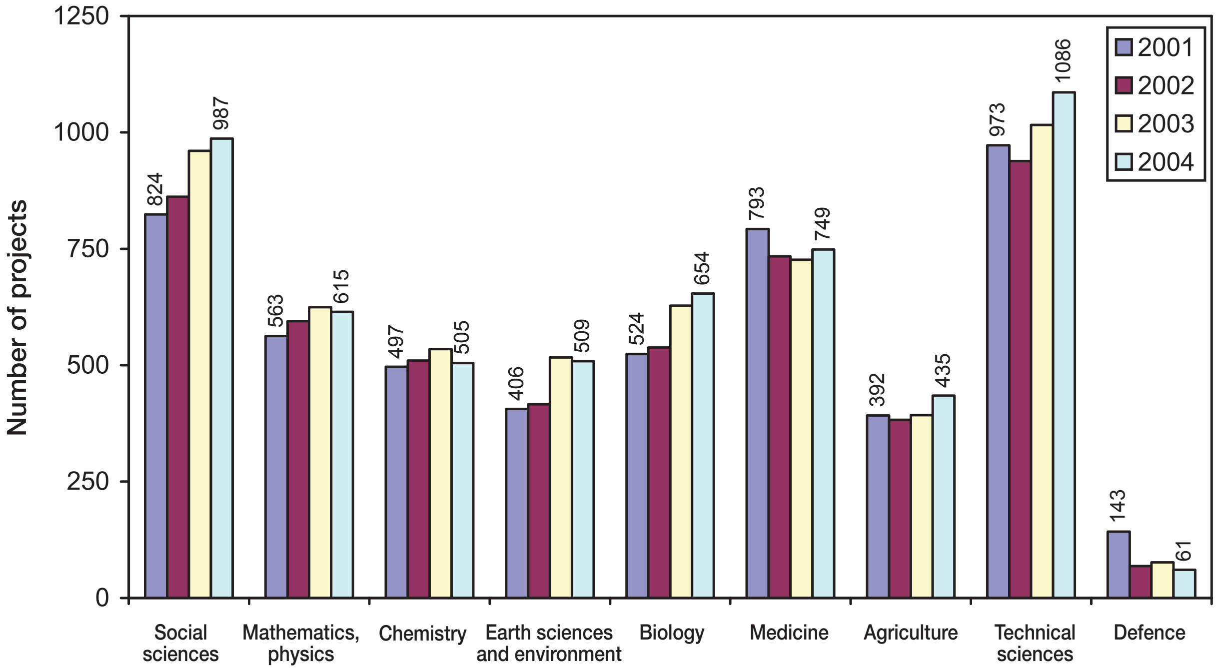
Supporting registers have been maintained continuously, e.g. the register of subjects active in research and development or the register of activities (programmes and grants), including their history. The collection of data was never interrupted and now this data complex makes up genuine information richness.

There exist strong links between the individual information fields and only by employing them a complex and true picture of the state R&D support can be drawn. This was enabled by modification of the existing information system in 2001, as well as its reconstruction in 2005.

Since 2004, CEP, CEZ and RIV data have been used, inter alia, as a basic source of information for the system of R&D evaluation approved by the Government by its Resolution No.644 of 23 June 2004. The evaluation methodology under this system was given to the resorts in July 2005; the outputs from R&D IS according to the first phase of the R&D institutions effectiveness evaluation will be prepared for use.

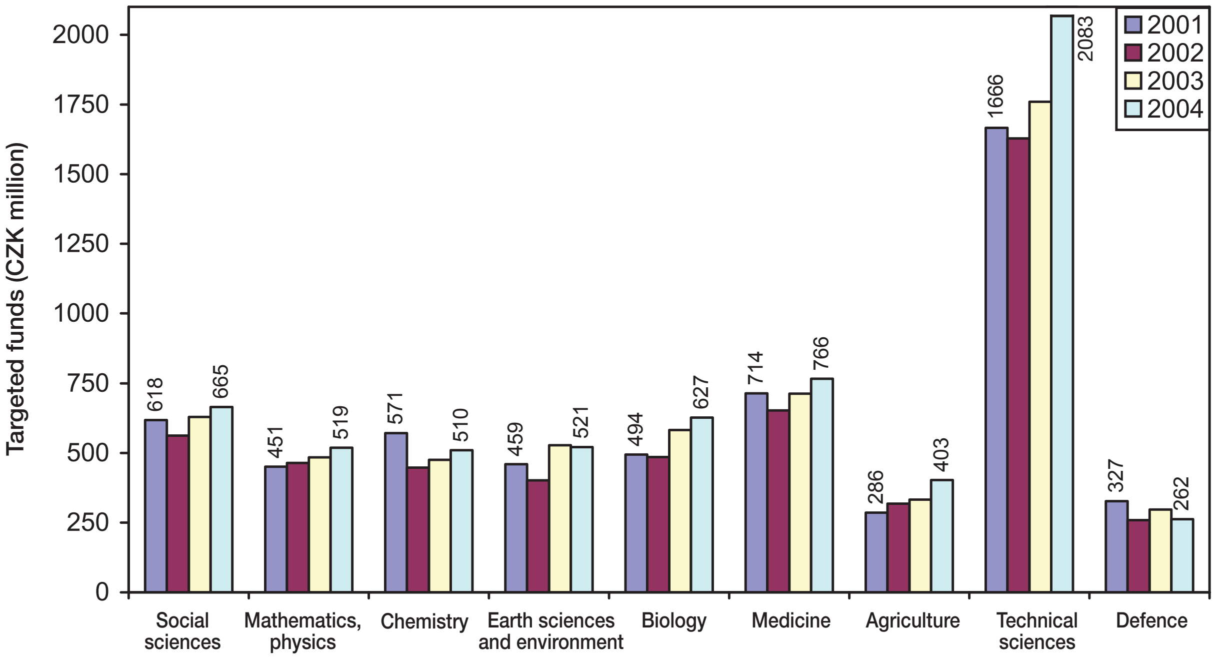
New possibilities of R&D IS will be utilized when producing a detailed report in the first half of 2006.

C.1 Number of R&D projects classified by sector between 2001 and 2004



Source: R&D IS, Central Register of R&D Projects (CEP)

C.2 R&D projects classified by sector between 2001 and 2004 pursuant to the amount of funds



Source: R&D IS, Central Register of R&D Projects (CEP)

Commentary:

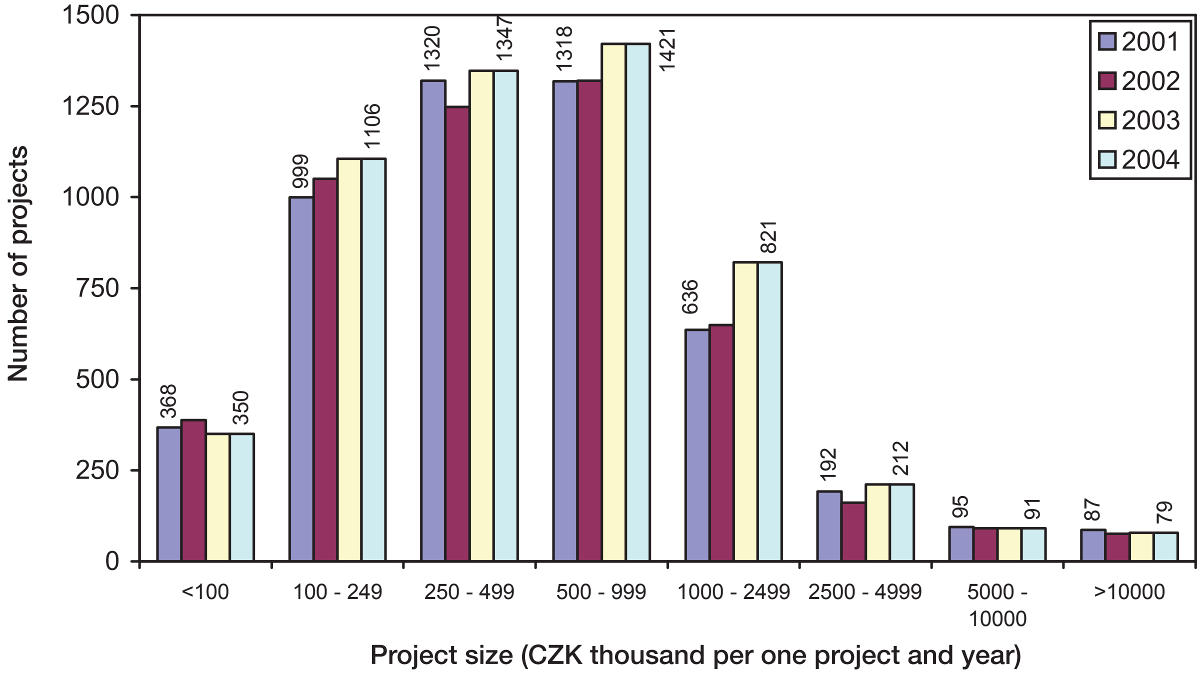
1. The Graphs C.1 a C.2 make possible to form an idea on the trend of average expenditures (cost) per one R&D project and compare it with the EU trends. In the last years, the efforts are manifested in EU as a whole and in many EU Member States to increase the extend of R&D projects and create the so called critical amount of capacities (both human and financial resources).
2. Most projects were solved in technical sciences (1,086 projects in 2004) and social sciences (987 projects also in 2004); least in defence (61 projects in 2004).
3. In the monitored period 2001–2004, the number of projects in biology and social sciences was experiencing a steady growth. The growth in technical sciences and biology is the fastest. The growth in Earth sciences and environment was significant as well, despite a decrease in 2004. In other fields there were various, predominantly moderate changes in the number of projects. The figures for chemistry basically stagnated in the monitored period at the level of 500 supported R&D projects annually.
4. Most funds on R&D projects are spent in technical sciences (CZK 1.083 billion in 2004) and medicine (CZK 0.766 billion in 2004). With the exception of agriculture and defence, ca CZK 0.5 billion per year is spent on other sectors.
5. With the exception of medicine and defence the number of R&D projects has been slightly increasing, or stagnating respectively (agriculture). Six sectors experienced a moderate growth in project expenditures (cost) between 2001 and 2003, while the chemistry and defence experienced a decrease.

6. The following table depicts the average expenditures (cost) on R&D projects in CZK million between 2001 and 2003.

Sector	2001	2003	2004
Social sciences	0.750	0.655	0.674
Mathematics, physics	0.801	0.778	0.844
Chemistry	1.141	0.893	1.010
Earth science and environment	1.130	1.021	1.024
Biology	0.943	0.934	0.959
Medicine	0.900	0.982	1.023
Agriculture	0.726	0.840	0.926
Technical science	1.712	1.739	1.918
Defence	2.287	3.857	4.295

7. With the exception of social and technical sciences and defence, the average annual expenditures (cost) per project move around CZK 1 million. In technical sciences, the average size of R&D projects approached the level of CZK 2 million/year and in defence it exceeded CZK 4 million/year in 2004.
8. With the exception of social sciences in all other sectors the average size of projects can be qualified as small when compared with abroad. The projects do not establish conditions for creation of necessary critical amount of capacities (human and financial resources). The projects being too small still mean an extraordinary burden both for the research workers preparing draft projects and working out opinions to draft projects of other submitters, and for the state administration evaluating and selecting projects, concluding project contracts and evaluating its results

C.3 Number of R&D projects pursuant to the amount of targeted support between 2001 and 2004

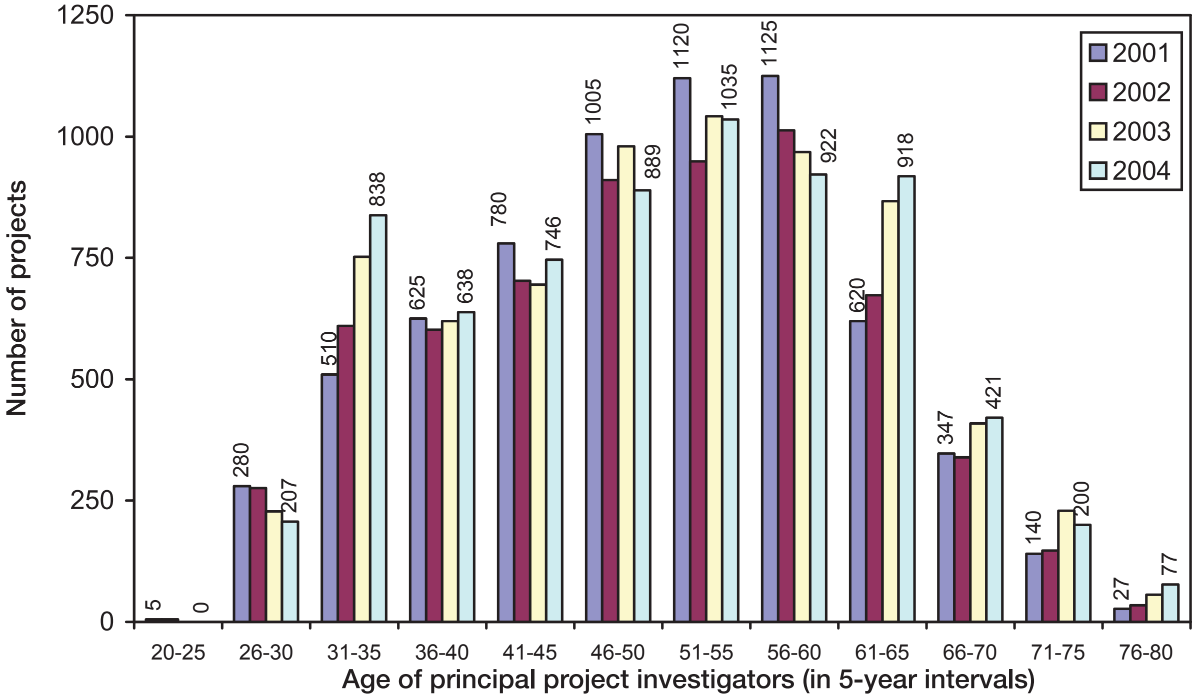


Source: R&D IS, Central Register of R&D Projects (CEP)

Commentary:

1. Graph C.3 confirms the conclusions made in the commentary on the previous Graphs C.1 and C.2. The number of projects in individual size categories remained in 2004 practically the same as in 2003.
2. The largest number of projects falls under the category CZK 0.5–0.999 mil/year. (1,421 projects in 2004), the smallest number under the category over CZK 10 mil/year (79 projects in 2004).
3. The number of projects with expenditures (cost) under CZK 100 thousand per project moderately decreases, but still remains very high (343 projects in 2003). Special programmes of support to young research projects announced and coordinated by GA ČR, AV ČR and MŠMT contributed to the maintenance of such relatively high number of projects.
4. In 2001, the share of projects with annual expenditures (cost) lower than CZK 1 million per project amounted to 78.9 % of the total number of 5,075 projects. In 2004, this share fell down to 77.8 % of 5,427 projects in total. The share of projects having expenditures (cost) of CZK 2.5 million and more went down from 7.4 % in 2001 to 7 % in 2004.
5. It can be summarized that the targeted support of research and development in the Czech Republic is fragmented into a too large number of small R&D projects. Such fragmentation of support is one of the main causes of the high administrative demands of the targeted R&D support and obviously one of possible causes of the limited scope of top quality R&D results applicable in practice. And such fragmentation of targeted support is caused, inter alia, by a relatively large number of entities providing this support.

C.4 Number of R&D projects pursuant to the age of principal investigators between 2001 and 2004



Source: R&D IS, Central Register of Research and Development Projects (CEP)

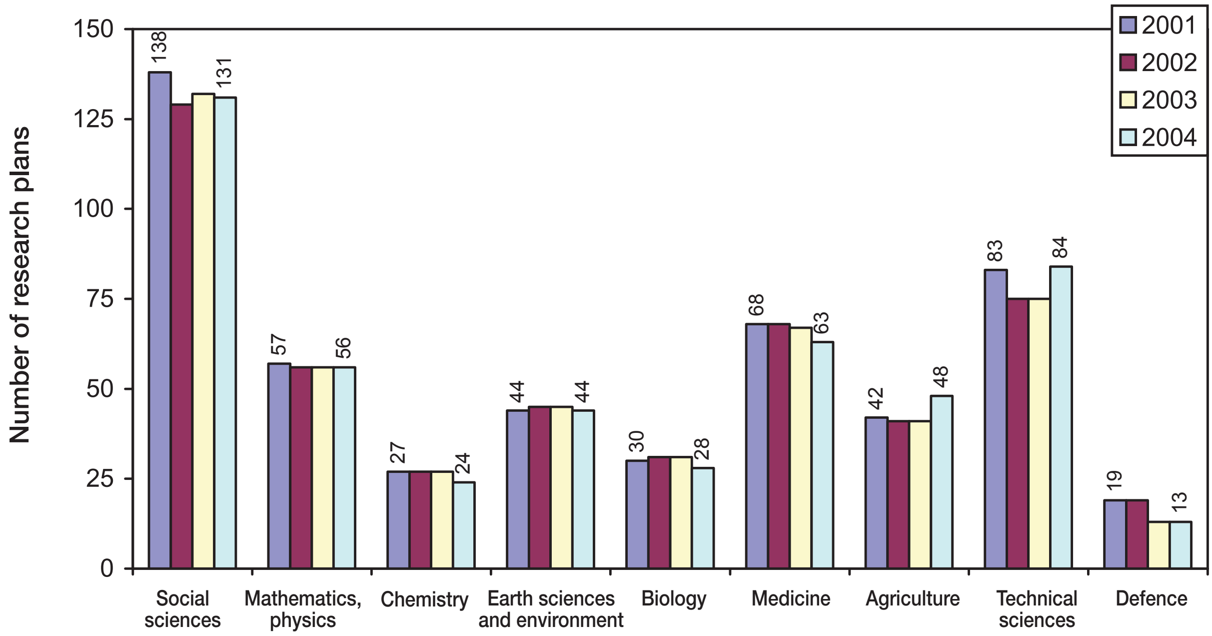
Commentary:

1. The basically one-peak curve of the average age of principal investigators in 2001 with maximum of 1,125 projects led by investigators between 56 and 60 years changed into a two-peak curve.
2. In 2004, the largest number of projects was led by investigators of the 51 – 55 years category (1,035 projects); the smallest number was in the 76 – 80 years category. The gratifying increase in the number of projects with the age of a principal investigator in the category between 31 and 35 years (from 510 projects in 2001 to 838 projects in 2004) is yet accompanied by even more significant growth in the number of projects led by investigators in the age category of 61 – 65 years (from 620 to 918 projects), as well as in all three higher age categories.
3. The increase in the number of projects with the age of a principal investigator between 31 and 35 years was stimulated by new programmes for young researchers being introduced by the Academy of Sciences of CR, Ministry of Education, Youth and Sport and Grant Agency of CR.
4. The table below shows the shares of projects led by investigators under 45 years of age incl. and shares of projects led by investigators over 61 years of age between 2001 and 2004 in the total number of projects.

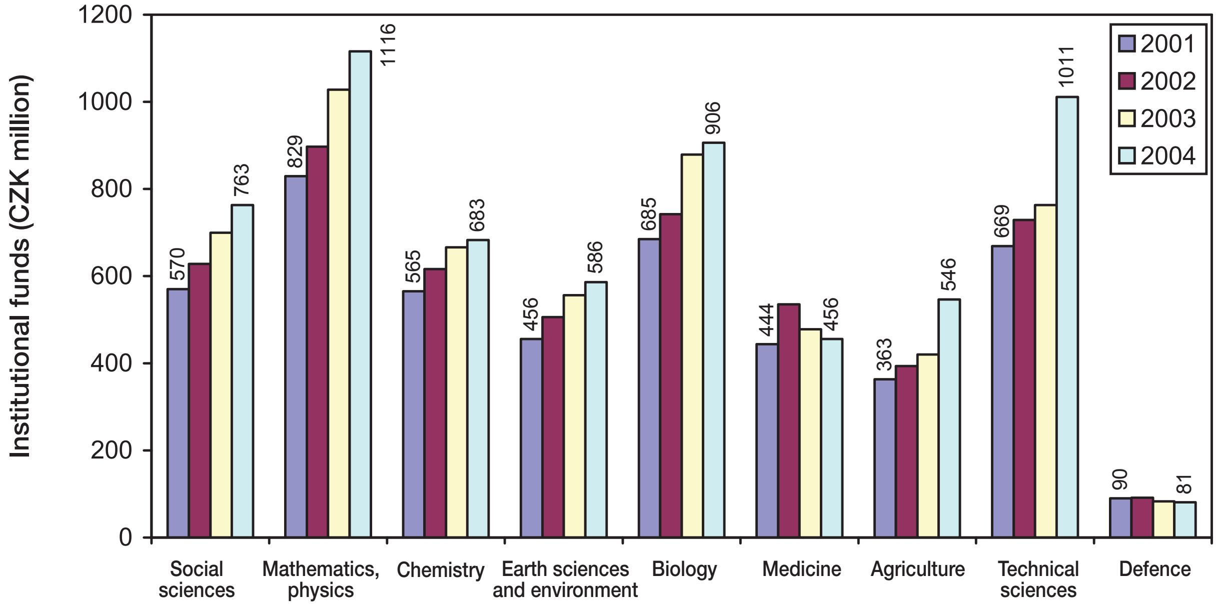
	Shares of projects with age of principal investigators (%)	
	2001	2004
under 45 years	33.4	35.2
61 years and more	17.2	23.4

5. The age structure of the research base is not developing well. The situation is more serious if we take notice of the size of projects being analysed in the previous Graph C.3. The R&D projects with average expenditures (cost) up to CZK 1 million per project, i.e. in general projects for very small teams, do not need to be led by senior research workers. Even for the future, the age structure improvement remains among the most serious tasks of the National Research and Development Policy in the Czech Republic.

C.5 Number of research plans classified by sector between 2001 and 2003



C.6 Research plans classified by sector between 2001 and 2003 pursuant to the amount of institutional support



Source: R&D IS, Central Register of Research Plans (CEZ)

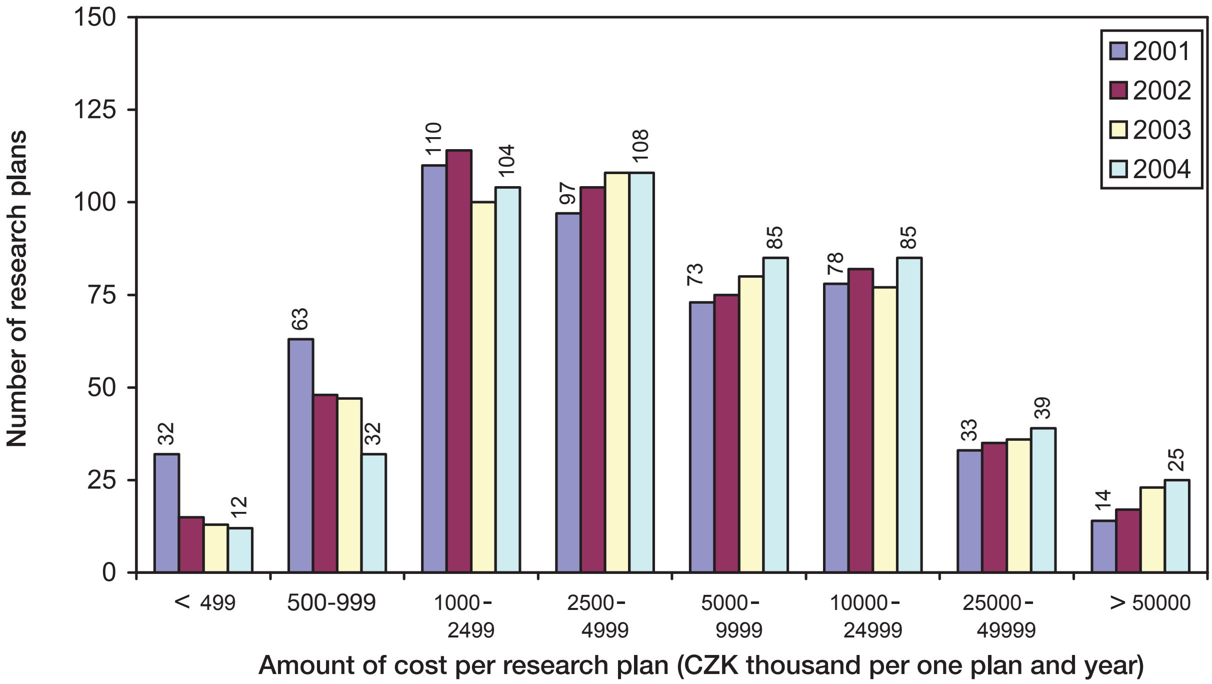
Commentary:

1. The graphs illustrate classification for all providers, including MŠMT.
2. As far as the number of research plans is concerned, no marked changes occurred in this field. Basically all research plans that were initiated in 1999 continued their work. Some departments additionally specified data on the number of research plans. Some details slightly differ from those referred to in the 2003 R&D Analysis. No marked turns can be expected until 2005, when solution of new series of research plans starts.
3. With the exception of defence and medicine, other monitored areas experienced an increase in their institutional support; the highest being in mathematics and physics, biology and social sciences. The rise in support during the monitored period mostly complies with the approved research plans. The institutional support given to technical sciences increased in 2004 due to initiation of research plans with several private non-profit entities.
4. The following table depicts the average cost of research plans in CZK million between 2001 and 2004.

Sector	2001	2004
Social sciences	4.1	5.8
Mathematics, physics	14.5	19.9
Chemistry	20.9	27.6
Earth sciences and environment	10.4	13.3
Biology	22.8	32.3
Medicine	6.5	7.2
Agriculture	8.5	11.4
Technical sciences	8.1	12.0
Defence	3.7	6.2

   The increased average cost of research plans in 2004 against 2001 corresponds with the approved support growth and the already mentioned initiation of several research plans with private non-profit entities in 2004.
5. The highest increase in average cost of research plans experienced fields like defence, technical sciences and biology.
6. It is evident that individual evaluated sectors have different demands on apparatuses, equipment, consumption material, etc. and it is not possible to determine any single optimum amount of annual expenditures (cost) per research plan. Nevertheless it can be noted that in three of the monitored sectors the average expenditures (cost) per research plan were lower than CZK 10 million. These plans can be marked as small, and with the exception of social sciences it is justified to believe that within their frameworks no critical amounts of capacities (financial and human resources, etc.) were created needful for quick and effective attainment of any meaningful results. In 2003, the average value of CZK 20 mil per one plan was exceeded only by chemistry and biology. As far as the amount of financial support is concerned when compared with abroad, a considerable part of research plans in the Czech Republic reaches the size of larger R&D projects.

C.7 Number of research plans pursuant to the amount of institutional support between 2001 and 2004

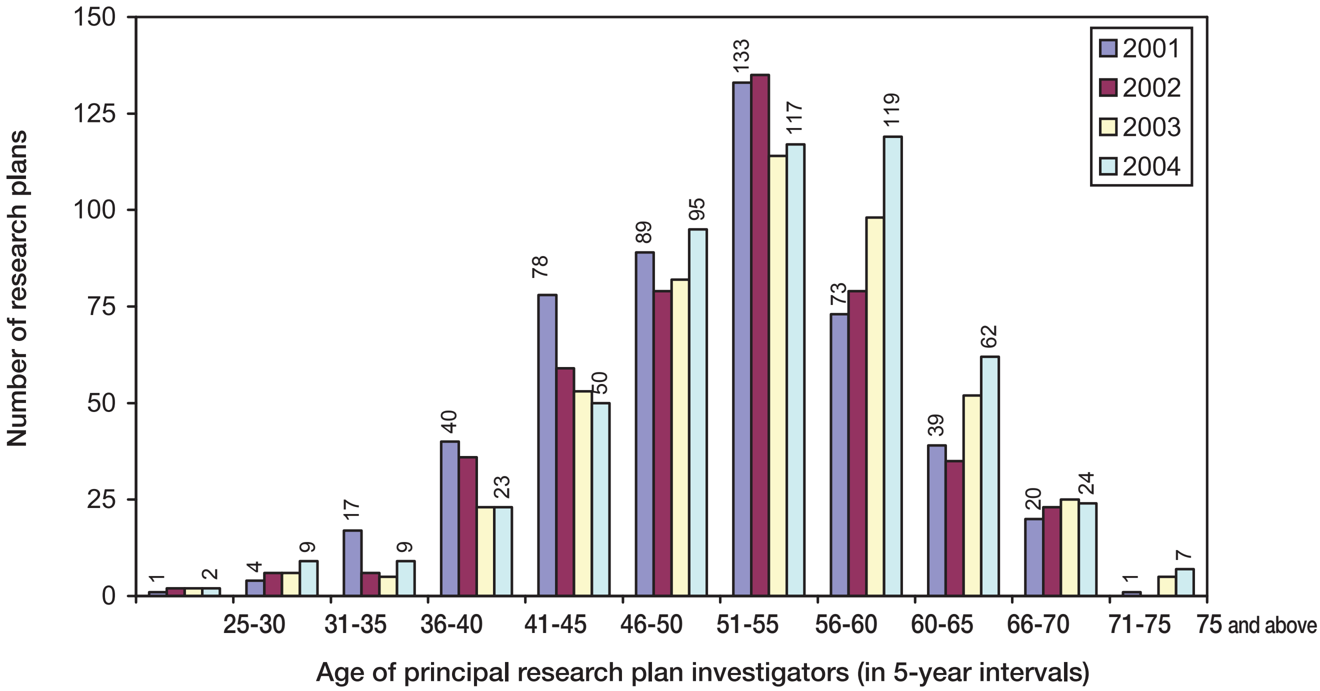


Source: R&D IS, Central Register of Research Plans (CEZ)

Commentary:

1. The graph confirms the data in Graphs C.5 and C.6 with possible conclusions that while the number of research plans declines, their cost rises. The numbers of research plans with cost up to CZK 2.5 mil per plan slightly decreased between 2001 and 2003, and numbers of plans with higher cost rather increased. As already mentioned before, both declines and rises are given by the amount of approved funds for research plans being planned for respective years.
2. In 2004, the share of research plans with cost up to CZK 5 mil per plan amounted to 55.2 % of the total number 480 research plans. In the same year, the share of research plans with cost over CZK 10 mil per plan amounted to 30.4 %.
3. It is evidently justified to say that also the institutional support to research and development is from a considerable part fragmented into research plans of low cost with all the negative impacts of such fragmentation (insufficient concentration of resources, high administrative and control demands).

C.8 Number of research plans pursuant to the age of principal investigators between 2001 and 2004

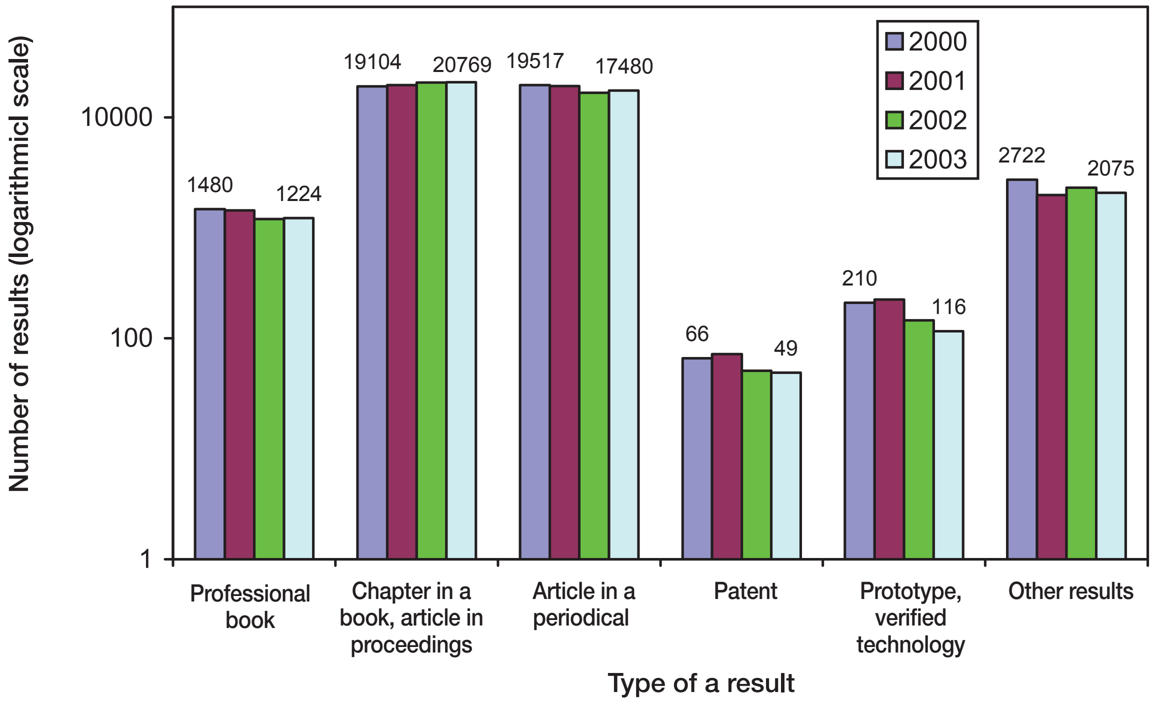


Source: R&D IS, Central Register of Research Plans (CEZ)

Commentary:

1. Seemingly considerable changes occur in certain age categories; e.g. decrease in the number of principal investigators in the category 56 to 60 years with increase in the category 61 to 65 years. But it is only a result of natural ageing, because replacements in the person of principal investigator of a research plan are not too frequent.
2. In 2004, the research plans were mostly led by investigators from the age categories of 61 to 65 years (119) and 55 to 60 years (117). The least number was in the group of three categories from 25 to 40 years (in total 20 in 2004) and in the category over 75 years (7 also in 2004).
3. The age structure of principal investigators of research plans confirms the thesis of the alarming pace of the scientific and research base ageing mentioned in the commentary to the Graph C.4. In 2003, the numbers of principal investigators in the age categories of 41 to 45 years, 46 to 50 years and 56 to 60 years declined when compared with 2002, whereas in categories of 61 to 65 years and older they rose. The main reason for these changes is the natural ageing as mentioned before.
4. Out of the total number of 517 principal investigators in 2004 only 8.3 % (43 principal investigators) were younger than 46 years, or 18 % (93 principal investigators) younger than 51 years respectively. On the contrary, nearly 41 % of principal investigators were older than 60 years.

C.9 Number of registered R&D results classified pursuant to the type of a result and year of application



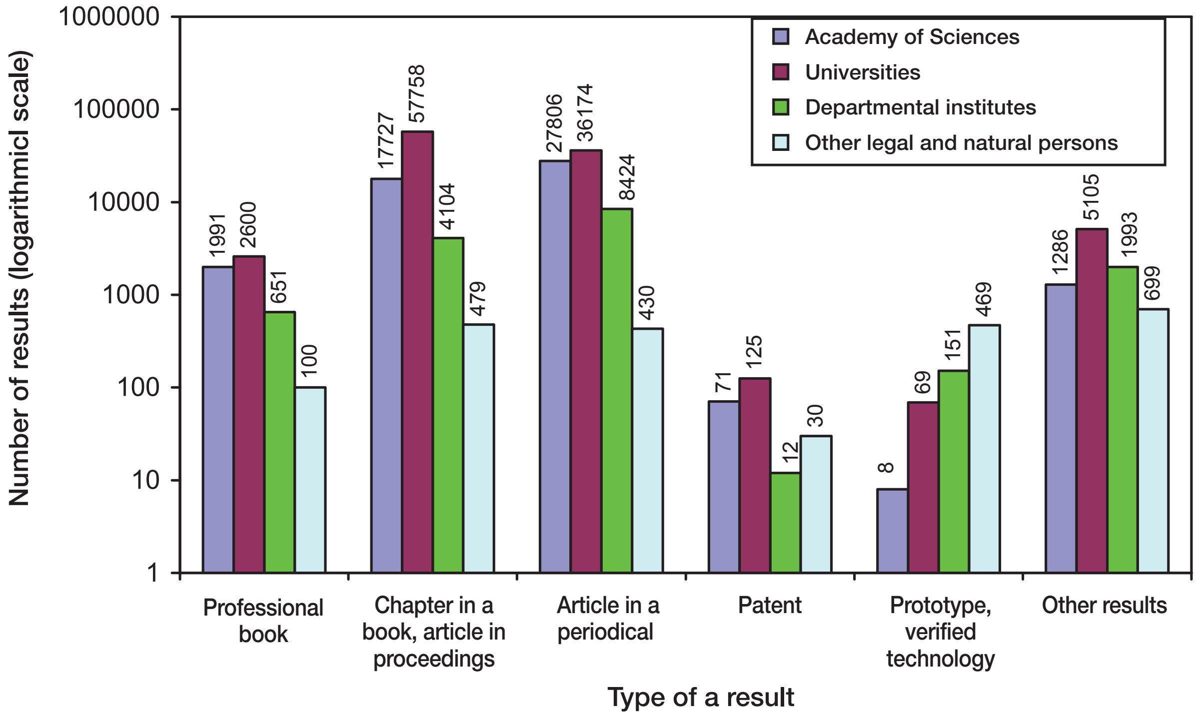
Source: R&D IS, Information Register of R&D Results (RIV)

Commentary:

1. The graph columns depict the sums of registered results of all R&D projects and research plans in respective years between 2000 and 2003 in following categories of results: professional books (monographs, etc.), chapters in professional books and articles in proceedings, articles in professional periodicals, invention applications (patents), prototypes and verified technologies. The graph does not mention two other categories being registered in the RIV register: presentation activities and research reports – registered in case of results of projects awarded as public contracts under Act No. 199/1994 Coll., as subsequently amended, and initiated through 2002. The numbers of results are given in thousands.
2. The publication results significantly dominate: articles in periodicals and chapters in professional books or proceedings. The number of patents, prototypes and verified technologies is absolutely insufficient.
3. In 2003, most R&D results have the form of chapter in a book or article in proceedings (20 769 chapters or articles in proceedings) and article in a periodical (17 480 articles). Forty nine applications of inventions (patents) being results of research and development with state support were filed in 2005, i.e. by more than one quarter less than in 2000. The publication results significantly dominate: articles in periodicals and chapters in professional books or proceedings. The number of patents, prototypes and verified technologies is absolutely insufficient. The decisive part of research and development supported from public funds behaves like basic research publishing most of its results.

4. Another unpleasant fact is that with the exception of chapters in books and articles in proceedings in other categories the numbers of registered results decreased between 2000 and 2003. This applies also to the category of articles in periodicals. Considering the fact that with the exception of 2002, with decline in public R&D expenditures against the previous year by 6.4 %, in other years the public expenditures have been increasing each year by 5 % (see Graph B.1 and point 5 of the Commentary), it is possible to note the decreasing effectiveness of research and development supported from public funds. But the statement made in the previous sentence is based only on evaluation of the number of R&D results that speaks nothing about their quality.
5. The needful change is expected as a result of the new system of research and development evaluation based on the methodology approved by the Government in its Resolution No.644 of 23 June 2004. The methodology was then specified in the Government Resolution No. 432 of 13 April 2005 when approving the material titled “Summary evaluation of results of R&D programmes finished between 2000 and 2003”. The consistent application of “Methodology for evaluation of research and development and its results in 2005”, including the strengthened dependence between the amount of public support and accomplished results, should contribute to the enhancement of research and development efficiency and effectiveness in the Czech Republic.

C.10 Number of R&D results registered between 2000 and 2003, classified pursuant to the categories of recipients and type of a result



Source: R&D IS, Information Register of R&D Results (RIV)

Commentary:

1. This graph, the vertical axis of which applies a logarithmicl scale, analyses data depicted in the previous Graph C.9 in more details. Again it refers to the total number of results registered between 2000 and 2003. The numbers of patents, verified prototypes and technologies are very low. The results are given separately for each of the main categories of the public support recipients: the Academy of Sciences of the Czech Republic, higher education institutions (universities), budgetary and contributory organisations, incl. departmental institutes (i.e. institutes of the resort ministries) and for other legal and natural persons.
2. If disregarding the capacities of individual categories of recipients (R&D sectors), then universities report most results in following groups: professional book, chapter in a professional book or article in proceedings, article in a periodical, patents and other results. Other legal and natural persons (largely the business sector) are the best – which is absolutely logical – in the group “prototypes and verified technology”. Surprisingly, the most patents are reported by universities. AV ČR takes second place in following categories of results: professional book, chapter in a professional book or article in proceedings, article in a periodical, and patents.
3. Somewhat different looks the evaluation when taking notice of personal capacities of individual R&D sectors. The publication “Research and Development Indicators for 2002 (Code: 9601-03)“ and similar publication for 2003 (Code 9801-04) of the Czech Bureau of Statistics reports following numbers of research workers after conversion to the full-time equivalent (FTE):

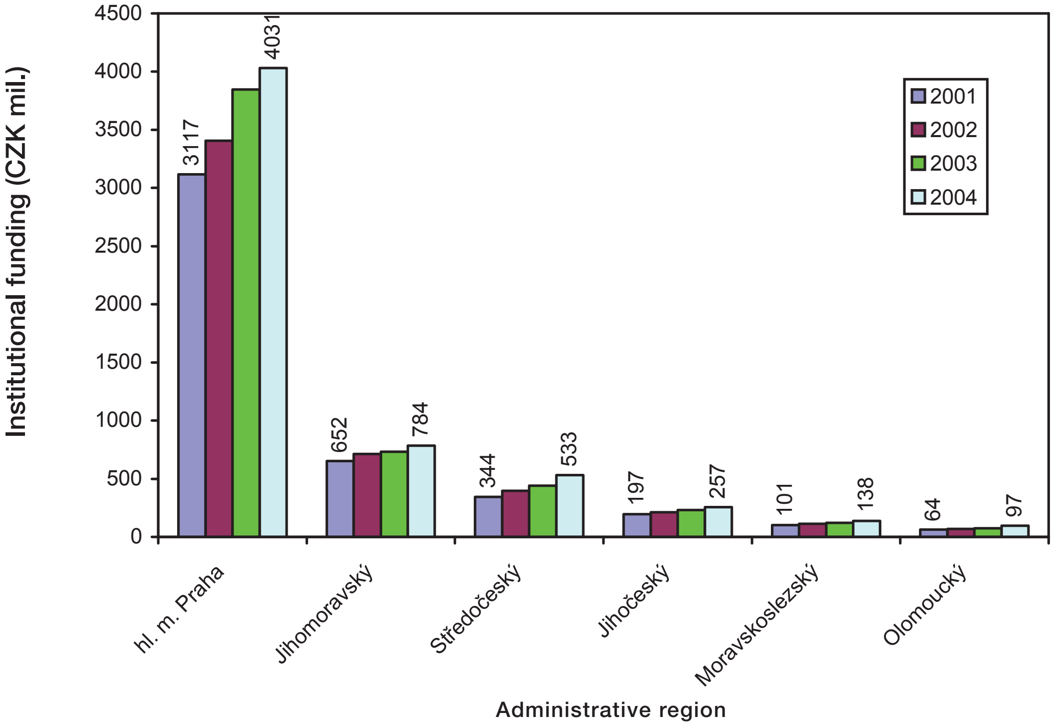
	2001	2002	2003
Business sector	5 753	6 191	6 558
vládní sektory	4 837	4 429	4 833
Universities	4 249	4 283	4 318

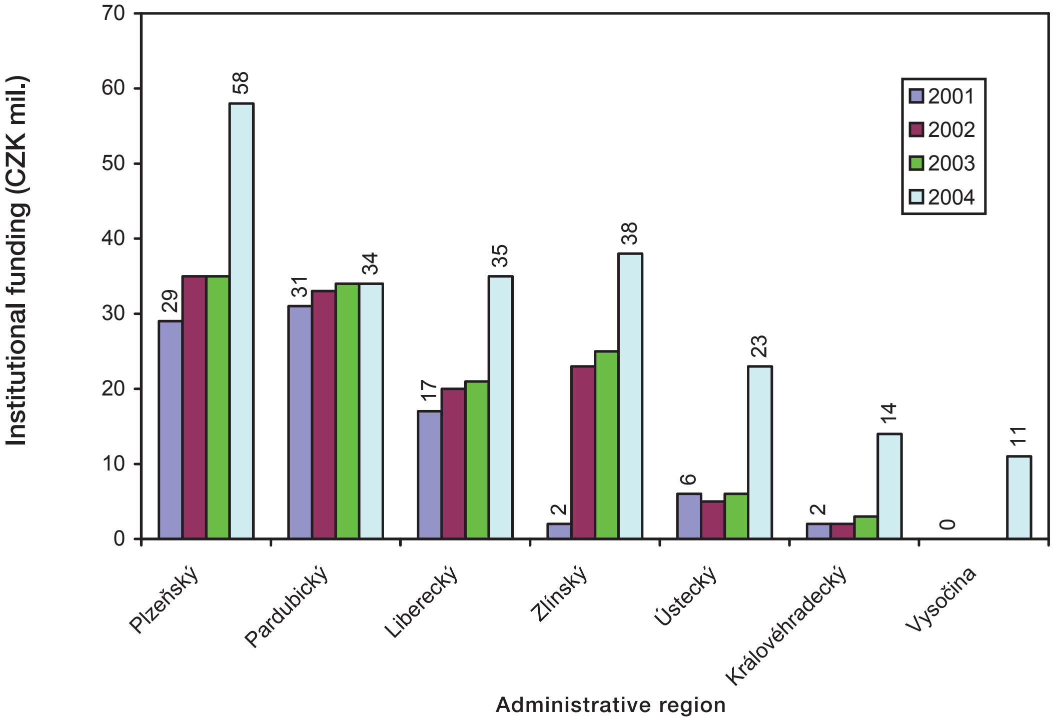
The government sector includes research workers of the Academy of Sciences of the Czech Republic and departmental research institutes of the state administration agencies. It can be concluded from the annual reports of the Academy of Sciences of the Czech Republic, which report the number of workers with a rather different methodology (conversion to the average annual number of workers) than CBS that personal capacities of the Academy institutes make up ca 84 % of the government sector capacities, which would correspond to ca 3 700 research workers. When converted to one research worker the differences between the efficiency of universities and that of the Academy of Sciences of CR would be lower in all categories of results. Even so the universities would keep their primacy[1].

Unsatisfactory is the fact that the category of other legal and physical persons (business sector) reports the least number of patents at high number of R&D workers. It is, however, necessary to take into account that the information register of results contains only those results being accomplished with the state R&D support.

1 No simplified conclusions on the performance of resorts in question can be derived from this. Any objective evaluation would also require the evaluation of the quality of publications.

C.11 Trend of institutional funding of research plans by regions between 2001 and 2004





Source: R&D IS, Central Register of Research Plans (CEZ)

Commentary:

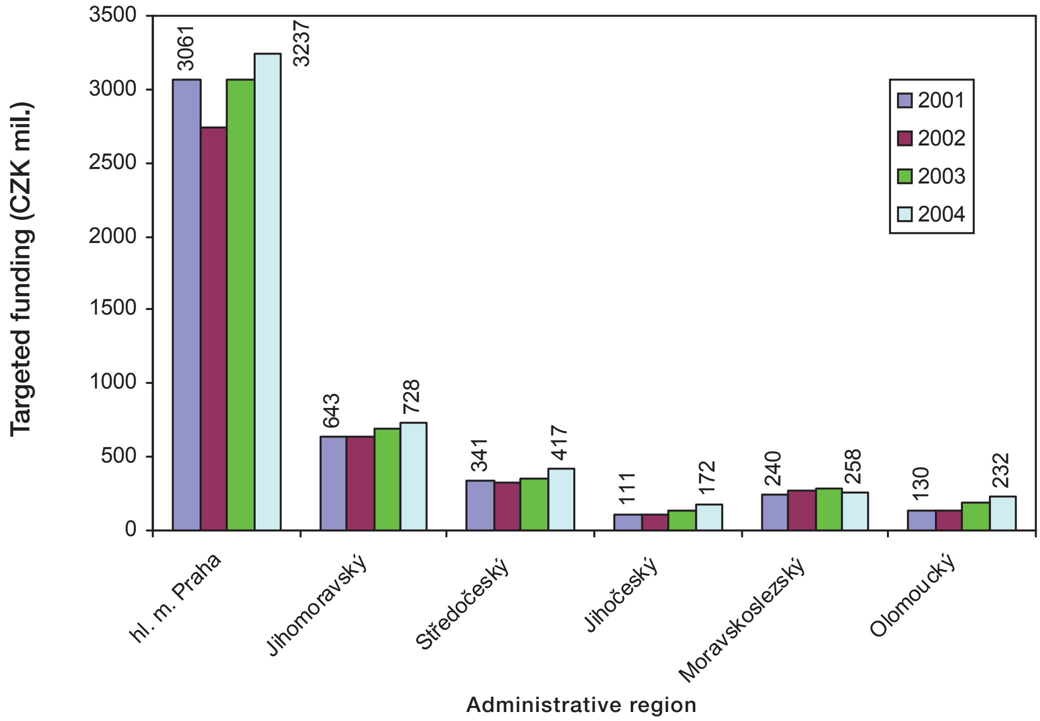
1. The graph evaluates only allocation of institutional funding extended to research plans, for which the decisive part of institutional funding funds is used. The remaining smaller part is used to support specific research at universities, settle certain payments to international R&D institutions and administrative cost of R&D funds providers
2. With regard to considerable differences in the amount of institutional funding of research plans in individual regions, data are divided into two graphs having various scales. The first graph shows the trend of institutional funding during the monitored period 2001-2004 for six regions with annual funding exceeding CZK 100 million or approaching this level. The second graph is for seven regions with annual support up to CZK 50 million or little higher. No institutional support is extended to Karlovarský Region.
3. Markedly highest is the amount of institutional funding directed to the capital of Prague (4,031 bil. in 2004) and Jihomoravský Region (CZK 0,784 bil. in 2004). The least institutional funding in 2004 was directed to Vysočina Region (CZK 11 mil.) and Královéhradecký Region (CZK 14 mil.).
4. Considerable increase in institutional funding to research plans in 2004 took place in Zlínský, Královéhradecký and Ústecký Regions; but from low values of this funding in 2001. Continual growth of support is experienced also in the capital of Prague.
5. The table below depicts the shares of the capital of Prague, the capital of Prague plus Jihomoravský Region and first three regions with the highest amounts of institutional funding to research plans in the overall institutional support extended to research plans in the Czech Republic.

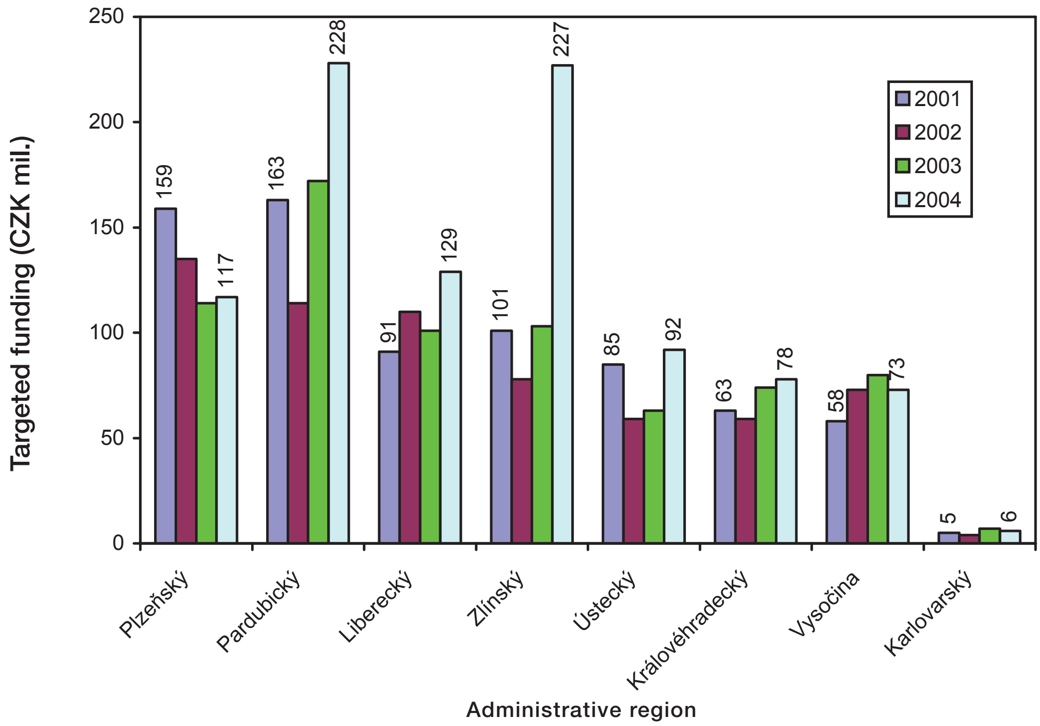
Regions	Shares in the overall institutional support extended to research plans (%)			
	2001	2002	2003	2004
Capital of Prague	68.3	67.7	69.0	66.6
Capital of Prague plus Jihomoravský Region	82.6	82.0	82.2	80.5
Capital of Prague plus Jihomoravský Region plus Středočeský Region	90.1	89.9	90.1	88.3

The share of the capital of Prague in the overall institutional support to research plans decreased from 68.3 % in 2001 to 66.6 % in 2004. In 2004, the share of Prague, Jihomoravský and Středočeský Regions amounted to nearly 90 % of the overall institutional support to research plans.

6. Very unevenly distributed institutional funding to research plans is immediately connected with the unevenly distributed R&D capacities in CR. The prevailing part of research organisations reside in Prague and Brno. This is a serious, not easily solvable problem having links to arrival of investors, labour market, unemployment, etc. The relocation of capacities does not come into question. The only possible solution is to build R&D capacities, step by step, in individual regions, established by regional self-governments, if possible, and with utilization of EU funds. Higher education institutions in regional capitals need to be motivated to higher research activity.

C.12 Trend of targeted funding of research and development by regions between 2001 and 2004





Source: R&D IS, Central Register of Research Plans (CEP)

Commentary:

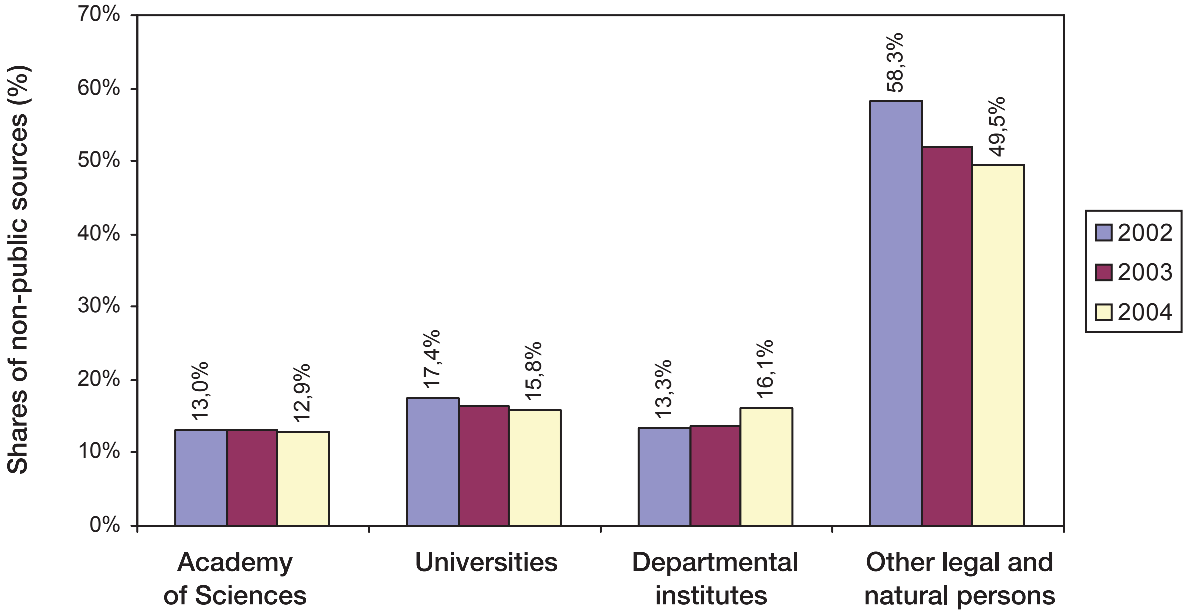
1. Data are again divided into two graphs with different scales. The regions are separated similarly as in the case of institutional support. The first graph includes data for the capital of Prague and Jihomoravský, Středočeský, Jihočeský, Moravskoslezský, and Olomoucký Regions. The second graph includes data for Plzeňský, Pardubický, Liberecký, Zlínský, Ústecký, Královéhradecký, Vysočina, and Karlovarský Regions.
2. And again, the markedly highest amount of targeted funding is going to the capital of Prague (CZK 3.237 bil. in 2004) and Jihomoravský Region (CZK 0.728 bil. in 2004). The least targeted support in 2004 went to Karlovarský (CZK 11 mil.) and Vysočina (CZK 73 mil.) Regions.
3. The highest relative increases in targeted R&D support were reported by Zlínský (225 %) and Olomoucký (178 %) Regions. The targeted support significantly decreased in Plzeňský Region (from CZK 159 mil. in 2001 to CZK 117 mil. in 2004). Other regions experienced a slight growth of targeted support between 2001 and 2004. In many regions, including Prague, the targeted support considerably declined between 2001 and 2002.
4. The table below depicts the shares of the capital of Prague, the Capital of Prague plus Jihomoravský Region and first three regions with the highest amounts of targeted support in the overall targeted support of research plans in the Czech Republic.

Regions	Shares in the overall targeted R&D support (%)			
	2001	2002	2003	2004
Capital of Prague	54.1	51.1	50.0	48.0
Capital of Prague plus Jihomoravský Region	65.4	62.8	61.2	58.8
Capital of Prague plus Jihomoravský Region plus Středočeský Regions	71.5	68.7	66.9	65.0

The share of the capital of Prague in the overall targeted support declined step by step from 54.1 % in 2001 to 48.0 % in 2004. The targeted support in other two groups (capital of Prague plus Jihomoravský Region) and (capital of Prague plus Jihomoravský Region plus Středočeský Region) went through similar development. In 2004, the share of Prague, Jihomoravský and Středočeský Regions amounted to 65.0 % of the overall targeted R&D support.

5. The share of these three regions (Capital of Prague and Jihomoravský and Středočeský Regions) in the overall targeted support in 2004 is lower than with the institutional support (67.5 %), see table to point 4 of the previous graph. Yet the share declines in the monitored period, it is still high.

C.13 Shares of non-public sources in the overall targeted support of research and development by categories of recipients between 2002 and 2004 (%)



Source: R&D IS, Central Register of Research Plans (CEP)

Commentary:

1. To a decisive extent, the non-public sources come from the business sphere. The share of sources from private non-profit entities (foundations, etc.) is only minor.
2. The share of non-public sources in the overall targeted support extended to R&D projects solved in the Academy of Sciences of CR stagnates on ca 13 %. The share of universities slightly decreased from 17.4 % in 2002 to 15.8 % in 2004. The share of departmental institutes slightly increased from 13.3 % to 16.1 %. The share of other legal and natural persons declined more significantly from 58.3 % in 2002 to 49.5 % in 2004.
3. Considering the shortness of the monitored period (2002–2004), no principal conclusions can be derived from these facts. Yet for individual categories, it is possible to state as follows:
   a. The share of non-public funds in the targeted R&D support in AV ČR basically complies with the fact that mostly projects of basic research are solved within the Academy.
   b. The share of non-public funds in the targeted R&D support at universities basically corresponds with the situation abroad.
   c. The share of non-public funds in the targeted R&D support in departmental institutes is low. It is, however, necessary to take account of the fact that departmental institutes exist only for the fields of agriculture, health, environment and other fields mostly belonging among public services and goods.
   d. The share of non-public funds in the targeted R&D support at other legal and natural persons is surprisingly low. Unfavourable is also the relatively considerable decline in this share. An increased attention will be dedicated to this issue in the 2006 R&D Analysis.

D. Bibliometric analysis of R&D results

Over the last few years the bibliometric analysis, i.e. evaluation of the number of publications and their citations, despite all reservations against its objectivity, methodology and other aspects, has become an integral part of documents evaluating the level of research in the member countries of OECD, and certainly the European Union. In abroad, the development of methodology of the bibliometric evaluation and interpretation of its results comes within the domain of large groups of experts, and frequent conferences and workshops are held on this issue. The renowned scientific periodicals in abroad publish regular top tens of research workers in individual scientific disciplines according to the number of their publications or citations. Published are the lists of top workplaces in individual scientific disciplines.

The most common and used source of data for bibliometric evaluation are information acquired and arranged by the Institute for Science Information – ISI (now Thomson ISI®) in the United States. This Institute monitors and regularly evaluates several thousands of scientific periodicals all over the world. Considering the time, personal, and therefore financial demands, the Institute provides information and products for their processing largely against payment.

The approach of the professional public to the bibliometric analysis in the Czech Republic has been and still is rather a reserved one. But it can be stated, however, that the aversion against bibliometric evaluation is rather loosing its strength. The bibliometric evaluation on the level of states was part of Analyses submitted to the Government and approved by it in 1999, 2002 and 2003. The representatives of research workplaces from the corporate sphere, who were active in the working groups for preparation of the Analyses in question, guarantee that the Analyses were made in a professional and objective manner and discovered results were not interpreted in a bureaucratic way.

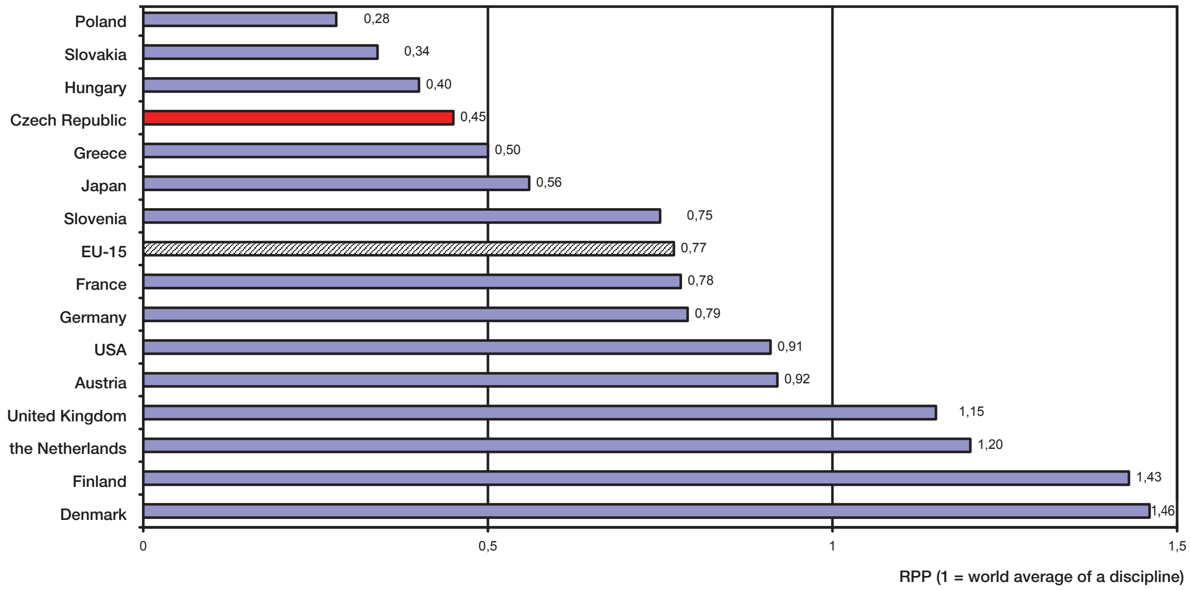
Bibliometric analyses of R&D results in 2004 and 2005 are based upon the product of ISI Thomson "National Science Indicators, 1998–2004, Standard Version", being made available by the Research and Development Council for both years. The standard version contains numbers of publications and citations in periodicals monitored by Thomson ISI. At present, monitored are ca 5,900 professional periodicals in natural sciences, 1,700 in social sciences and 1,130 in humanity and art sciences. All monitored periodicals have established a system of professional reviews. Certainly, they are not all the professional periodicals being published in the world, but this set of periodicals monitored by Thomson ISI is representative enough for evaluation of the level. Publications and citation from more than 170 countries are evaluated. The Czech Republic has been included in evaluation since 1994. The Standard version evaluates publications and citations in 24 scientific disciplines, with the more detailed and expensive Deluxe version providing evaluation in 105 partial scientific disciplines.

Each of 23 scientific disciplines plus one multidiscipline is defined by a set of periodicals according to the Thomson ISI methodology. Articles published in multidisciplinary periodicals like e.g. Science&Nature are assigned to concrete scientific disciplines. Thus defined disciplines in many cases more or less differ from scientific disciplines according to the methodology of science. For example, researchers from agricultural sciences publish their results also in other periodicals than those assigned to this discipline. Exactly speaking, this is the evaluation of a "bibliometric discipline" and not of a scientific discipline as such. See the note after the set of graphs D.3.2.

The presented analysis evaluates:

- Comparison of selected countries and the Czech Republic by relative number of publications included in NSI databases
- Comparison of selected countries and the Czech Republic by relative number of citations included in NSI databases
- Comparison of selected countries and the Czech Republic by relative citation index of a country
- Trend of the relative citation index of the Czech Republic between 1994 and 2004
- Comparison of scientific disciplines in the Czech Republic and selected countries by relative citation index of a discipline between 2000 and 2004
- Trend of the relative citation index of disciplines and number of publications in the Czech Republic between 2000 and 2004

D.1 Comparison of selected countries and the Czech Republic by relative publications production (annual average 2000-2004)



Source: Thomson ISI® National Science Indicators (NSI), 1981-2004

Definition: RPP stands as abbreviation for indicator of the relative publications production indicating the number of publications produced by the research of a particular country per 1 000 inhabitants of that country.

Note: Detailed definition of indicators and the evaluation methodology are available at HYPERLINK „http://www.thomson.com/scientific/stientific/jsp" www.thomson.com/scientific/stientific/jsp

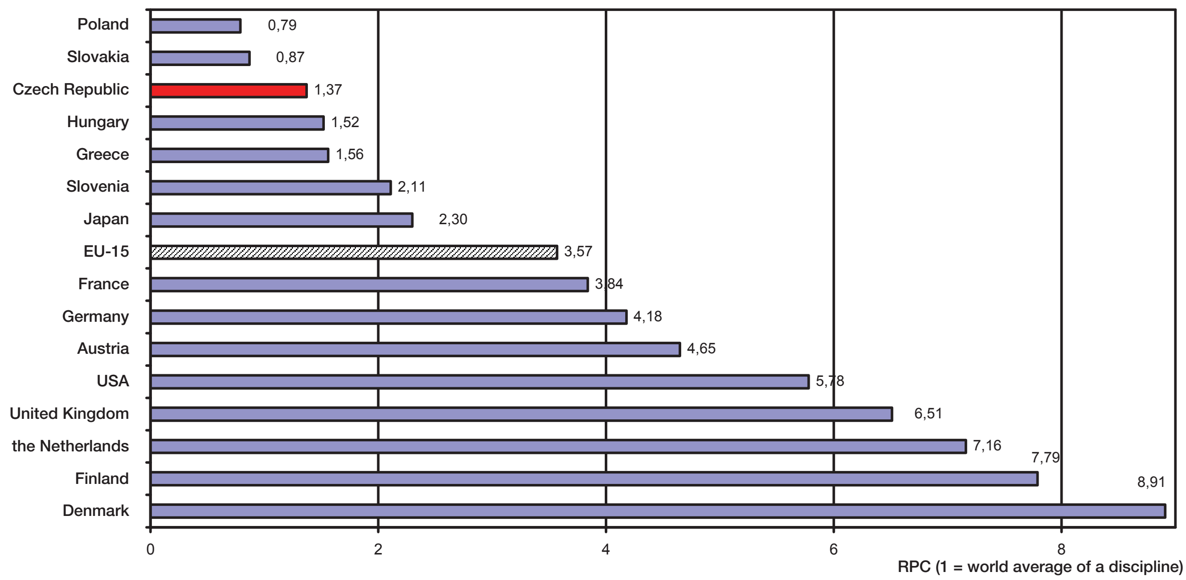
Commentary:

1. The professional research publications production indicator enables to compare bibliographic outputs of that part of research of a particular country the main result of which is a new knowledge diffused through a professional research publication. These are particularly those parts of research classified in the Manual Frascati (Evaluation of scientific and technological activities, OECD, Paris 2002) as basic research and a portion of the applied research. The indicator of simple publications production discriminates smaller countries having smaller scope of research than the bigger ones. Therefore it is more just to use for comparison of countries the indicator of the relative publications production implementing the correction to the size of each country by conversion to 1,000 inhabitants of that country. The publications production is a quantitative indicator speaking nothing about their quality.
2. In our case the Czech Republic is compared within the group of 15 selected countries and EU by the RPP indicator. Among those selected are great powers, technologically advanced European countries, countries with highly effective science, technology and innovation, neighbouring countries, and Greece. The average value of this indicator for EU may serve as a comparison standard.
3. Of the monitored countries all EU-15 countries are above the EU-15 average (0.77), all new EU Member States are below this average. More than one publication per 1000 inhabitants and year

is reported by Denmark (1.46 publication/1000 inhabitants and year), Finland, the Netherlands and the United Kingdom.

4. In the monitored period the Czech Republic occupied last-but-five place as classified by value of the RPP indicator arranged in the descending order within the group of 15 selected countries and one region, with RPP = 0.45. This is a little more than half the value reported as the EU average (RPP = 0.74). Poland reports a significantly lower value of the RPP indicator. When compared with the 2004 R&D analysis evaluating the annual average for 1999–2003, the values of indicators for both the Czech Republic and EU-15 slightly increased (with the Czech Republic from 0.42 to 0.45, with EU-15 from 0.74 to 0.77). Therefore the gap between the Czech Republic and EU-15 average remained basically the same.
5. It is necessary to say that comparisons based on the conversion to 1,000 inhabitants are not absolutely objective in case of more significant differences in the number of research workers, or R&D expenditures respectively. Graph A.1.2 in Chapter A shows that the Czech Republic has ca 2 times less research workers than is the EU-15 average. If we convert the publications production to the number of research workers then the Czech Republic with its RPP value = 0.90 moderately outdoes the EU-15 average with RPP = 0.74.
6. Remarkable are the RPP values for Denmark, Finland and the Netherlands reaching nearly double the average of the EU countries. These countries have an advanced and fully functional research system that together with a high quality management and effective funding enables the above-average results to be attained not only in the basic and applied researches.
7. Relatively low value for Japan confirms the lower share of basic research in R&D in Japan on one hand, with different habits of this part of Japanese research and development with increased copyright protection and lower publication activity on the other. Though the share of basic research has been growing over recent years, the relative publications production indicator will increase only after several years.

D.2 Comparison of selected countries and the Czech Republic by relative production of citations (annual average 2000-2004)



Source: Thomson ISI® National Science Indicators (NSI),1981–2004

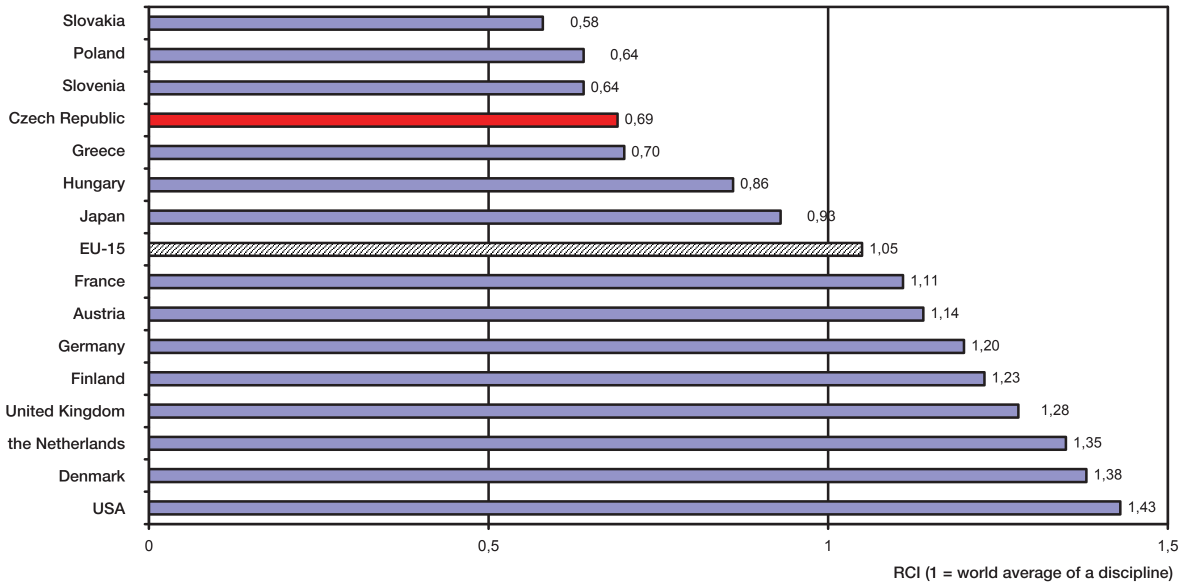
Definition: RPC stands as abbreviation for indicator of the relative production of citations that indicates the number of citations of those publications that were produced by the research of a particular country per 1 000 inhabitants of that country.

Note: Detailed definition of indicators and the evaluation methodology are available at HYPERLINK „http://www.thomson.com/scientific/stientific/jsp“ www.thomson.com/scientific/stientific/jsp

Commentary:

1. For evaluation of the publication’s quality the number of its citations is used that with certain limitations (e.g. it is not possible to compare together the number of citations of publications in different disciplines) speaks about the interest of the scientific community in the given work. Similarly as with the production of publications the indicator of the total production of citations would discriminate small countries and therefore the indicator of relative production of citations is used.
2. Like with the relative publications production, in this indicator all new EU Member States, as well as Greece and Japan, are markedly below the EU-15 average. The differences between three best and three worst countries are significantly larger than with the indicator of the relative publications production. In other words, the lagging of new EU Member States behind the EU-15 leaders is significantly higher.
3. The Czech Republic, Slovakia and Poland close the table of 15 selected countries and EU made in the descending order as classified by value of the RPC indicator.
4. For this indicator the same methodological reserves apply as towards the relative publications production indicator (item 5 of the Commentary to the previous Graph D.1). When we compare the average of EU-15 and the Czech Republic after conversion to the number of research workers, we get the RPC value for the Czech Republic ca 2.7. This lagging behind the EU-15 average (RPC = 3.57) is then lower, yet still significant.
5. Similarly as with the relative publications production, the highest ranks are occupied by Denmark, Finland and the Netherlands with the value of RPC indicator more than double the value of the EU countries average. Publication activities in these counties are on a very high level, with a long tradition in the Netherlands and Denmark.
6. As far as the Graphs D.1 and D.2 and the Czech Republic are concerned, it can be said that when respecting the number of research workers, the production of publications is somewhat higher than the EU-15 average. In the production of citations, which means the quality of publications, the Czech performance is below the EU-15 average.

D.3.1 Comparison of selected countries and the Czech Republic by relative citation index of a country (period 2000–2004)



Source: Thomson ISI® National Science Indicators (NSI),1981–2004

Definition: RCI stands as abbreviation for the relative citation impact of a given country (region) defined as the citation impact of a given country (region) divided by the citation impact of the Thomson ISI world database (citation register). The citation impact of a given country (region) indicates the average number of citations per publication produced by research of a given country (region) in 2000 – 2004, irrespective of the difference of disciplines. The RCI indicator compares the level of bibliometric quality of publications of a given country (region) with the average level of bibliometric quality of publications of the Thomson ISI world database given for 1999 - 2003.

The value of RCI = 1 means that the given country (region) has the same level of bibliometric quality of publications as is the average bibliometric quality of publications of the Thomson ISI database. RCI > 1 indicates a level being higher than the average, RCI < 1 indicates a level being lower than the average.

Note: Detailed definition of indicators and the evaluation methodology are available at HYPERLINK „http://www.thomson.com/scientific/stientific/jsp“ www.thomson.com/scientific/stientific/jsp

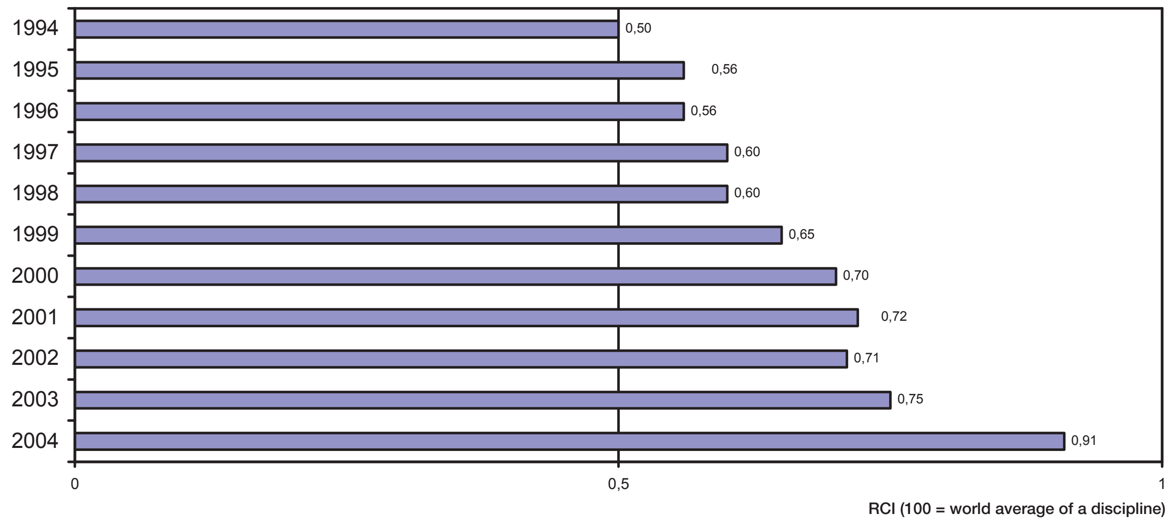
Commentary:

1. To allow for a direct comparison of the bibliometric quality of publications without the necessity of conversion to the number of inhabitants (that brings a certain distortion because of different share of scientists in individual countries) the most frequently used indicator of ***relative citation impact*** is introduced. In this case it is the relative citation impact of a given country (see the definition); the citation impact of a discipline is based upon the same principle (see below).
2. The results of monitored countries are similar as for the indicators D.1 a D.2 above. The value of RCI for the new EU Member States, Greece and Japan is lower than the value for the world database as a whole. And on the other hand, the countries of EU-15 and USA report higher figu-res.
3. The Czech Republic, followed by Slovenia, Poland and Slovakia closes the group of 15 selected countries and the EU region ranking according to the decreasing value of RCI. The list is headed

by the United States having their value of the RCI indicator high above the average, followed by Denmark and the Netherlands. These countries are so different as far as their geography and population are concerned, but what is common to them both is that they are leading countries in the level of research performance in many disciplines.

4. In the period 2000 – 2004, the bibliometric quality of publications, and of the basic research in particular, for the countries of EU as a whole (1.07) was close to the average level of bibliometric quality of all publications irrespective of the difference of disciplines of the world database (the world standard). The Czech Republic arrives only at 65 % of this level, while Denmark reports 138 % and the United States 143 % of the world standard.
5. Other selected advanced countries as the United Kingdom, Finland, Germany, Austria and France report the values of the RCI indicator above the average. The causes of the backwardness of Japan are mentioned in point 7 of the Commentary to Graph D.1.

D.3.2 Trend of the relative citation index of the Czech Republic between 1994 and 2004



Source: Thomson ISI® National Science Indicators (NSI),1981–2004

Definition: Annual bibliometric quality of publications is expressed by the RCI indicator (for definition of the RCI indicator see Graph D.3.1) for publications and their citations produced by the research of the Czech Republic for each given year.

Note: Detailed definition of indicators and the evaluation methodology are available at HYPERLINK „http://www.thomson.com/scientific/stientific/jsp“ www.thomson.com/scientific/stientific/jsp

Commentary:

1. In Thomson ISI product the indicator has increased between 1994 and 2003 by one or two hundredths, e.g. for 2000 the last year's product gave the value 0.68, while in this year's product the indicator is 0.70.
2. The time dependence of the RCI indicator for the Czech Republic for 1994 is equal to one half of the world standard (state of the Thomson ISI database). Since then the value of RCI for the Czech Republic has been experiencing a steady growth each year until nowadays (with the exception of 2002) and for 2004 it is equal to 0.91.
3. A conclusion can be deduced that the ever increasing bibliometric quality of publications reflects the structural changes made particularly in the field of basic research in the course of transformation of the Czech research and development at the beginning of the 1990´s. The emphasis is evidently laid upon the quality of the research made, the effective publication policy is maintained and the international collaboration rises above all due to the involvement of our research workers in the EU framework programmes.

D.3.3 Comparison of scientific disciplines in the Czech Republic and selected countries pursuant to the relative citation index of a discipline in 2000–2004

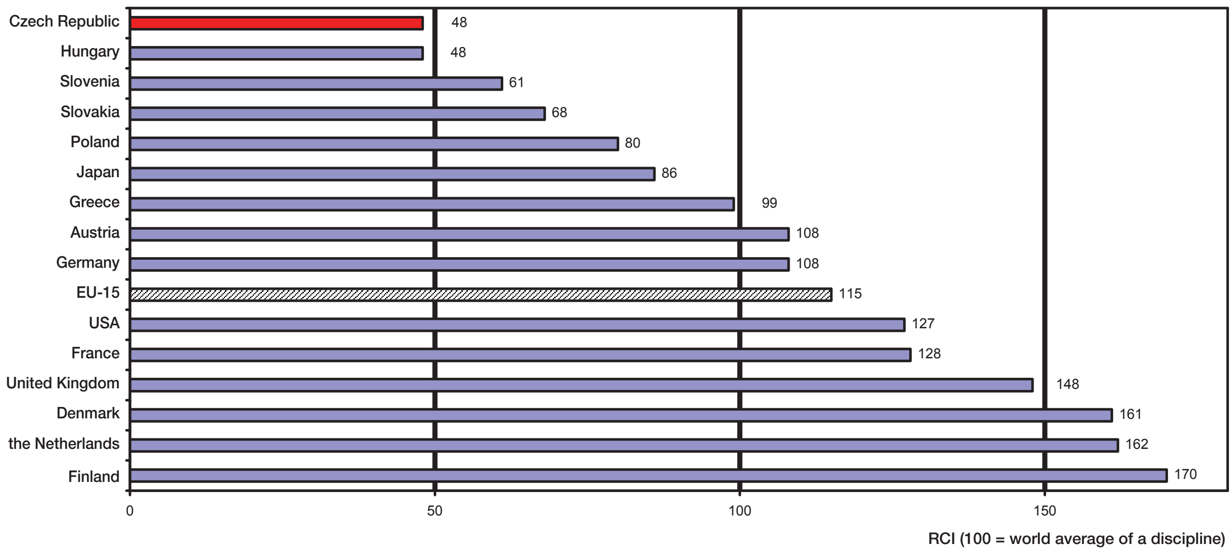
Source: Thomson ISI® National Science Indicators (NSI),1981–2004

Definition: RCIO stands as abbreviation for the relative citation impact of a discipline of a country defined as the citation impact of a discipline of the given country (region) divided by the citation impact of the same discipline of the world database (citation register) of Thomson ISI. It refers to publications and their citations produced by research of a given discipline in the Czech Republic in a given period. The RCIO indicator compares the level of bibliometric quality of publications of a given discipline in a particular country (region) with the level of the world average bibliometric quality of publications of the same discipline in the given time period.

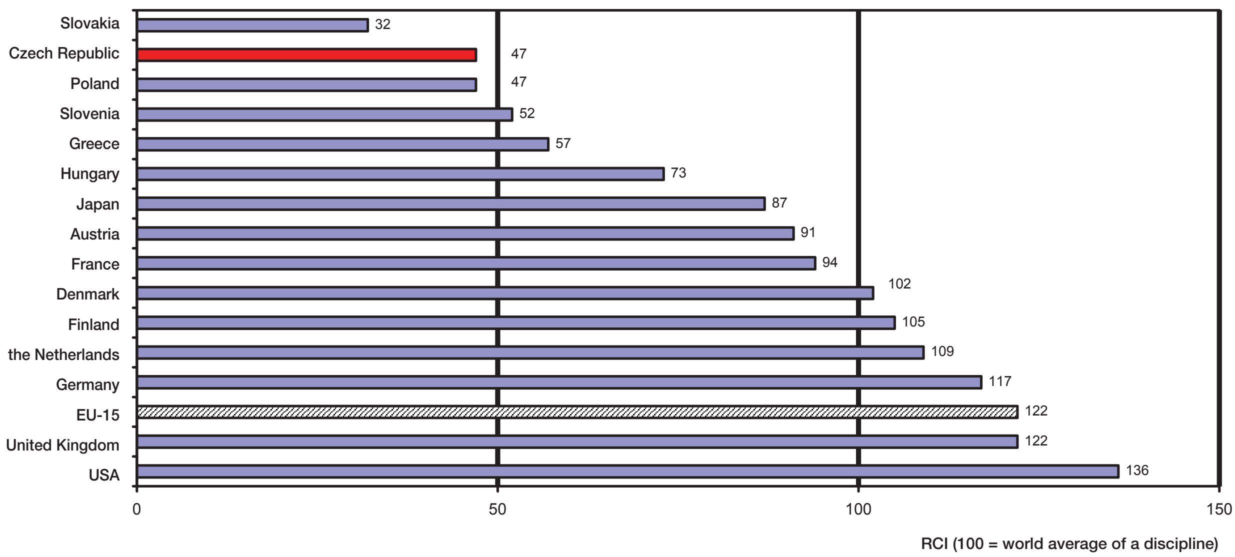
RCIO = 100 means that the discipline in a particular country (region) has the same level of bibliometric quality of publications as is that of the world average bibliometric quality of publications of the same discipline. RCIO > 100 means the level higher than average, while RCIO < 100 means the level lower than average.

Note: Detailed definition of indicators and the evaluation methodology are available at HYPERLINK „http://www.thomson.com/scientific/stientific/jsp“ www.thomson.com/scientific/stientific/jsp

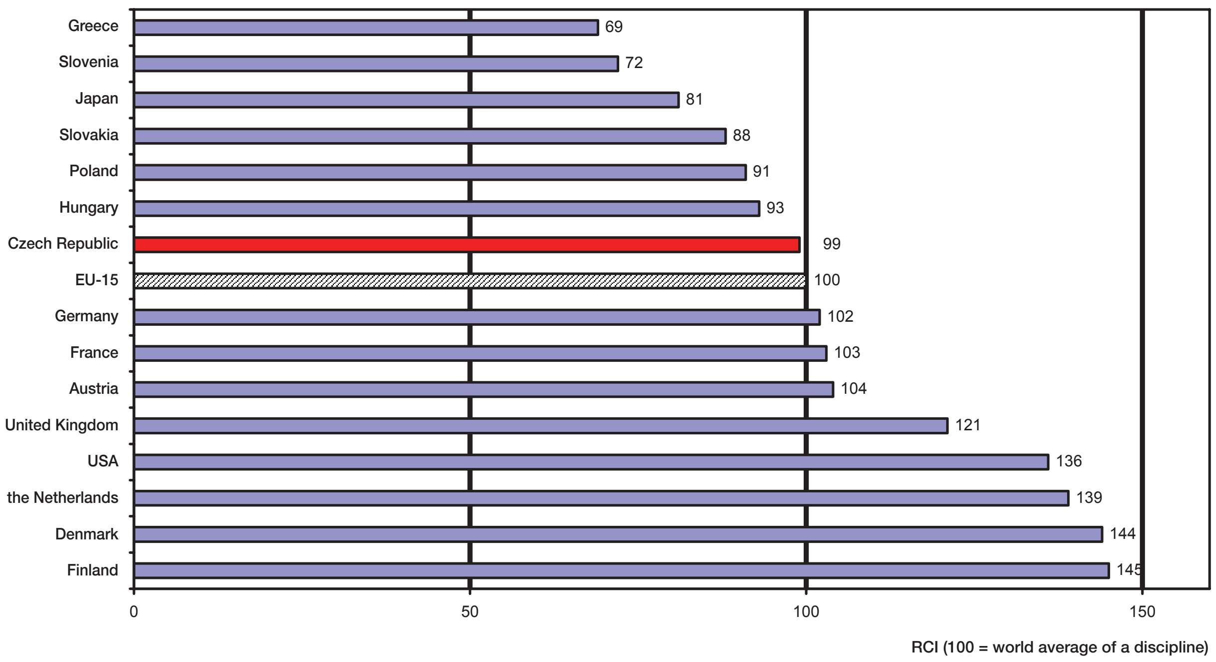
RCIO – Agricultural sciences



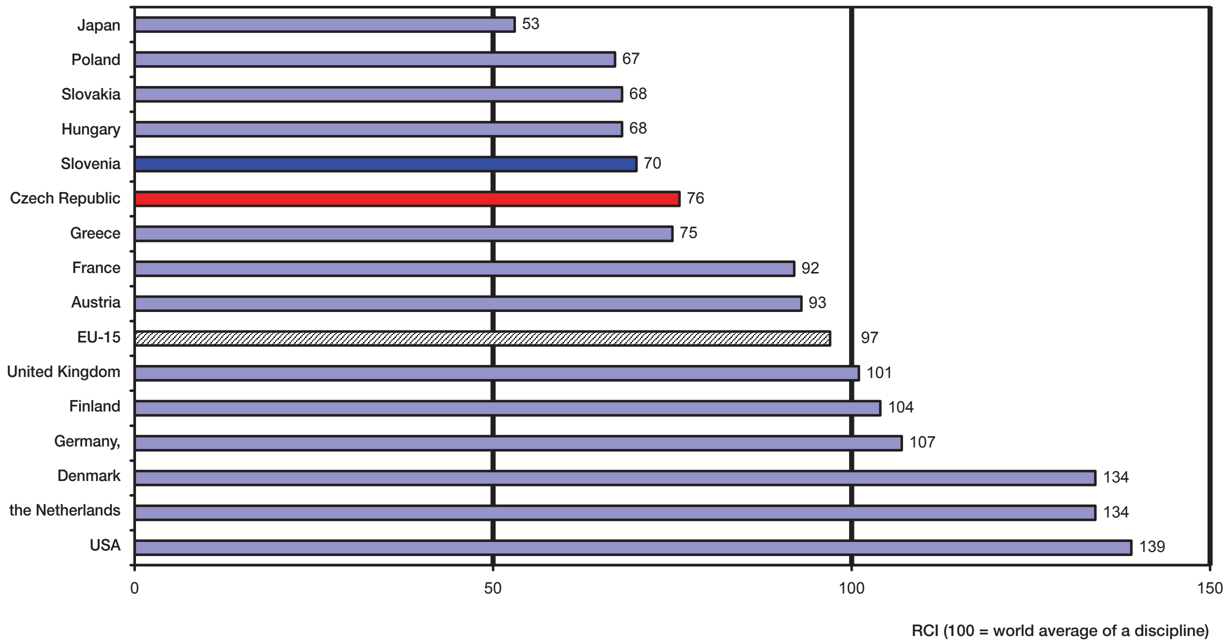
RCIO – Biology and biochemistry



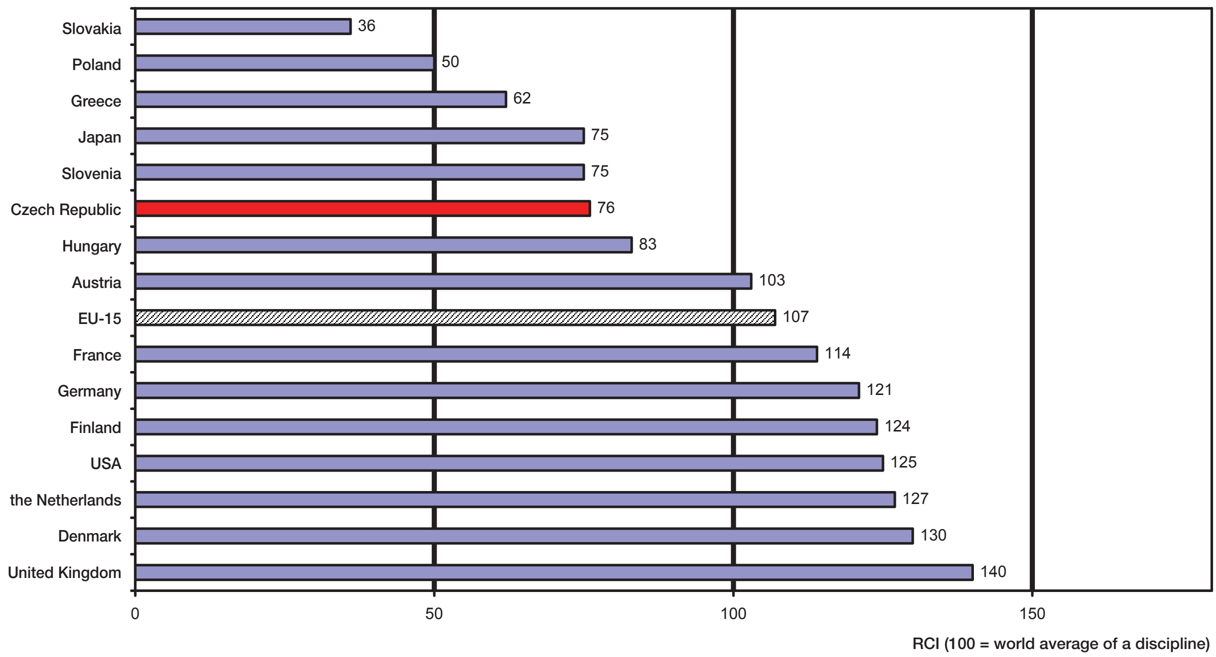
RCIO – Clinical medicine



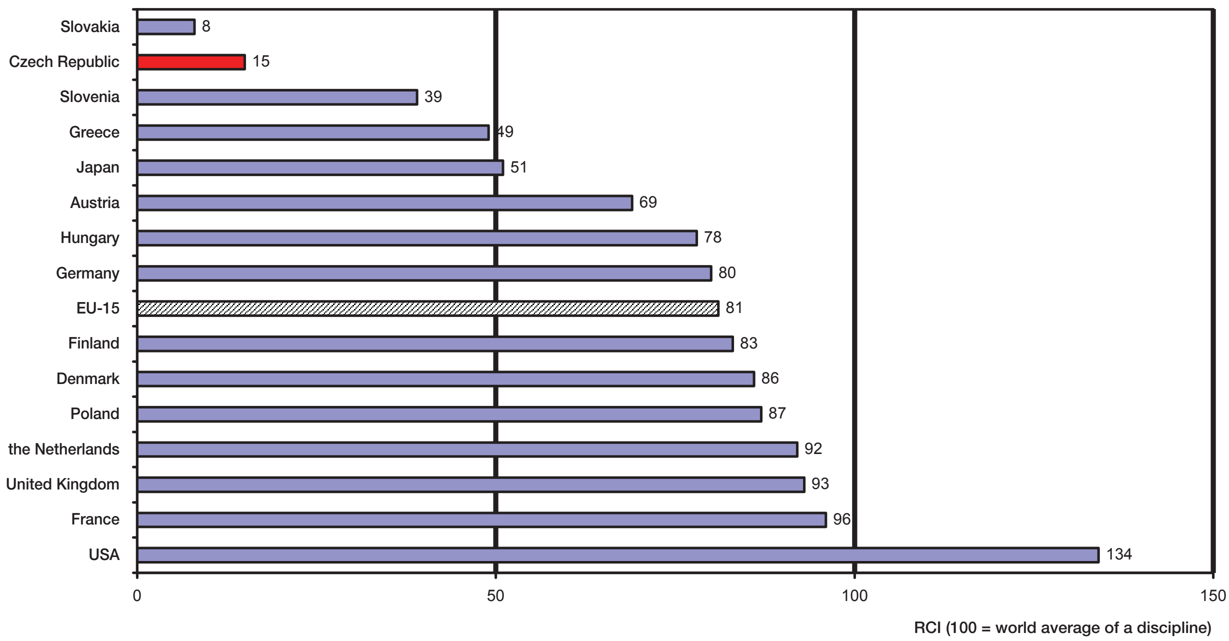
RCIO – Computer sciences



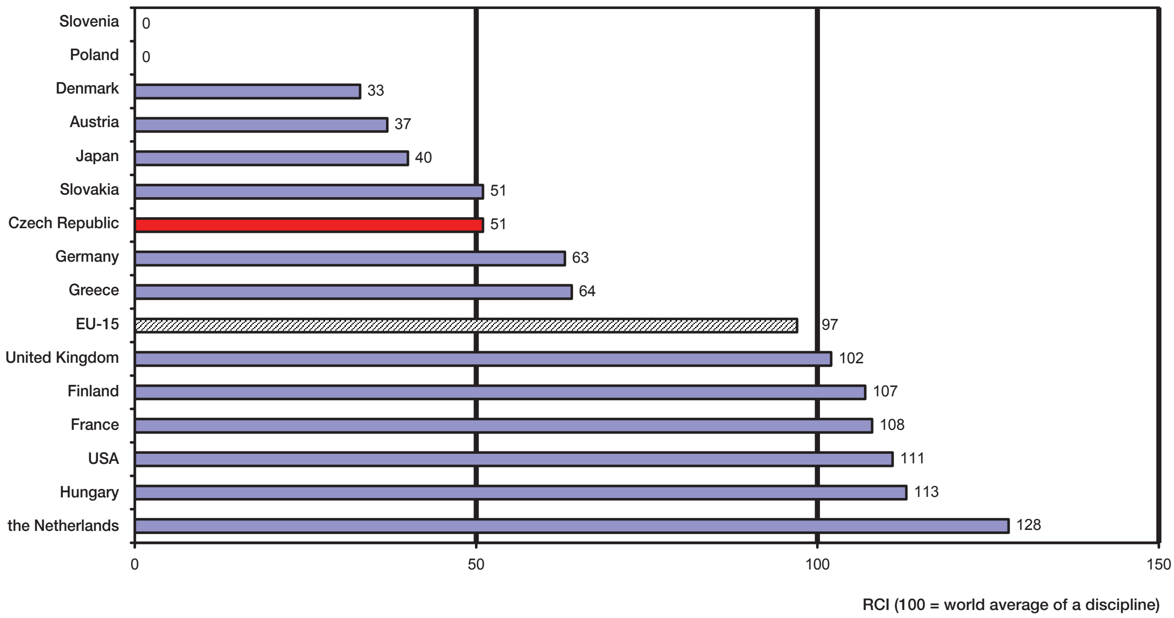
RCIO – Ecology and environment



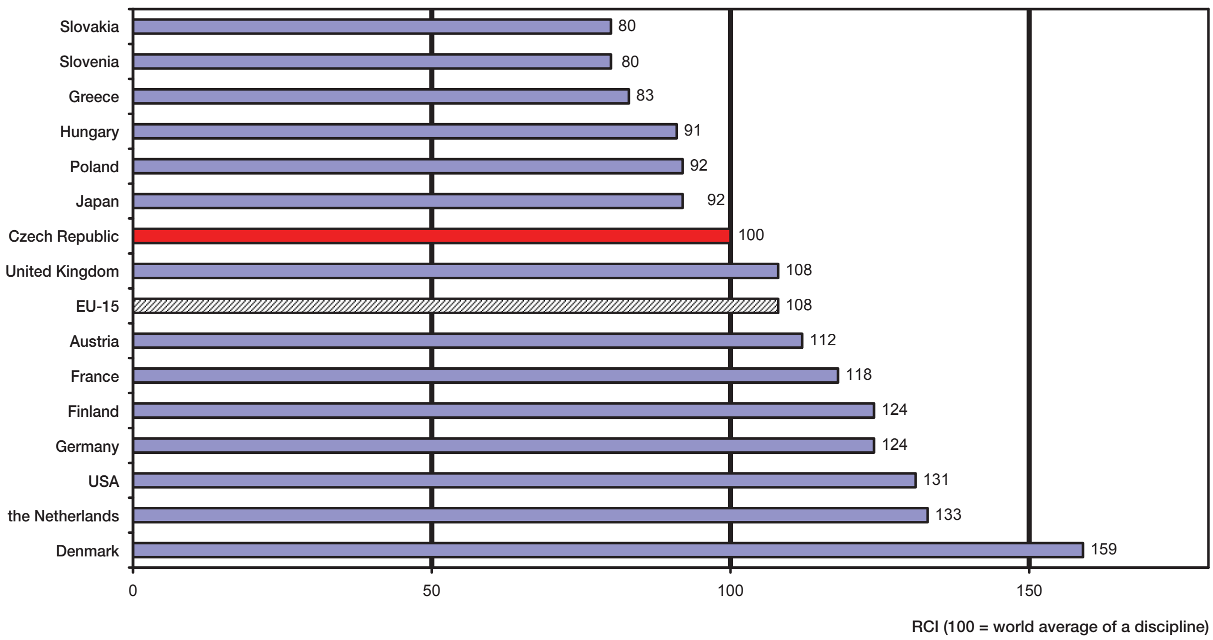
RCIO – Economy and trade



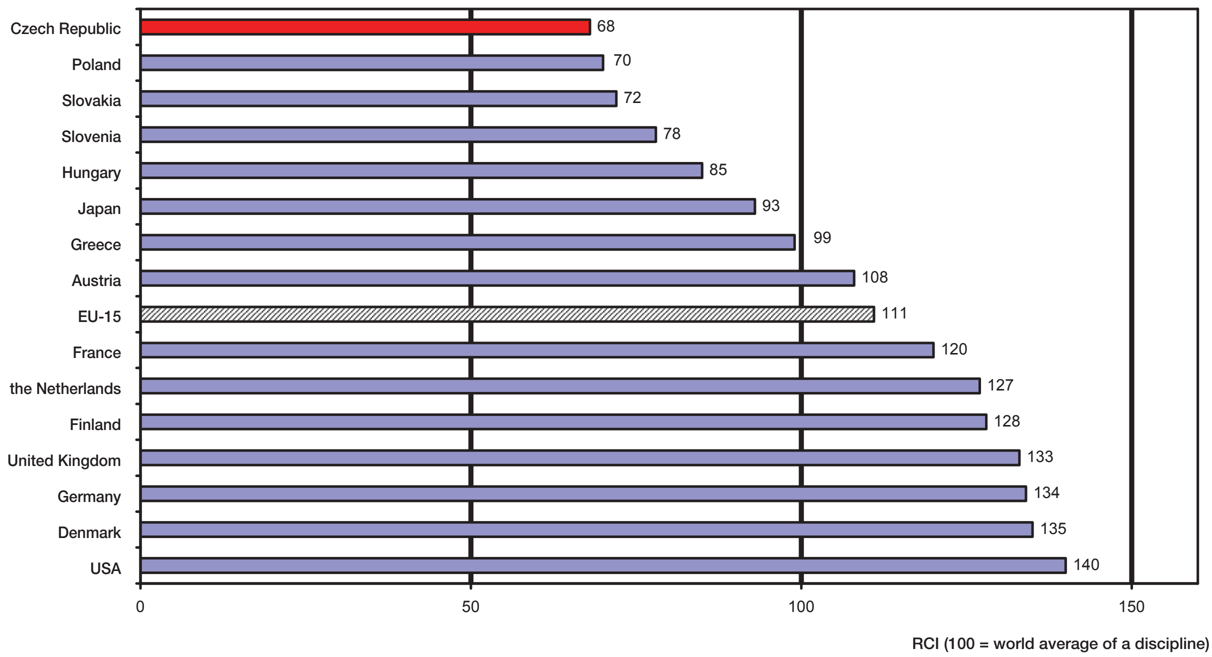
RCIO - Education



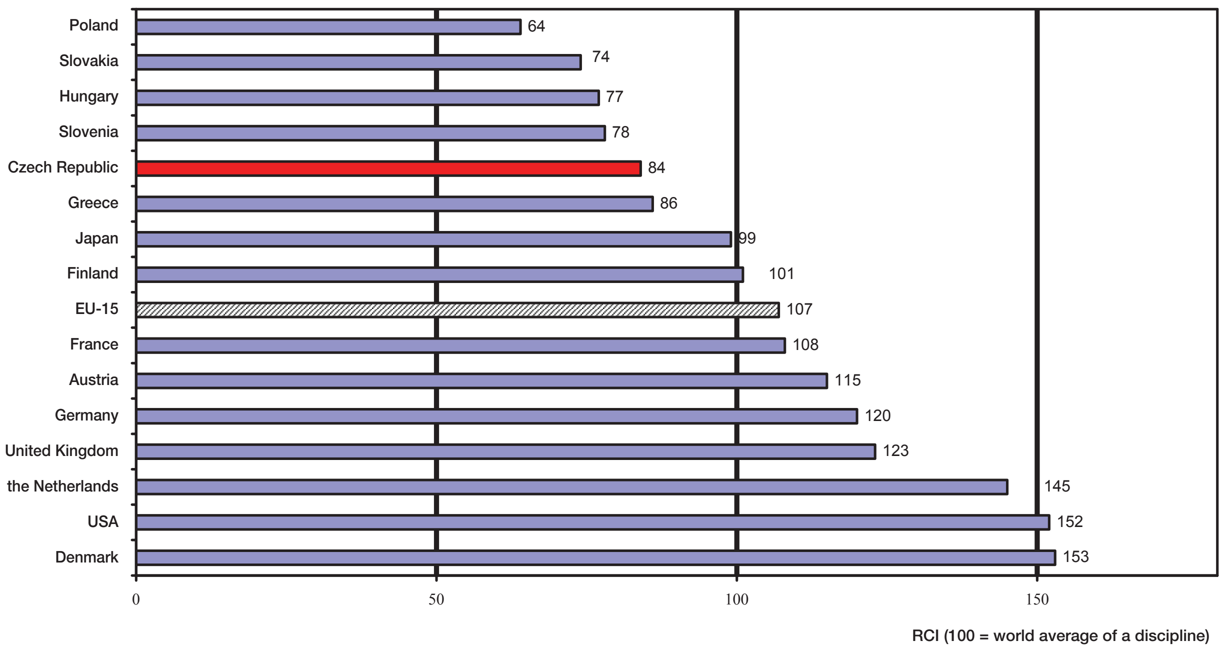
RCIO – Technical sciences



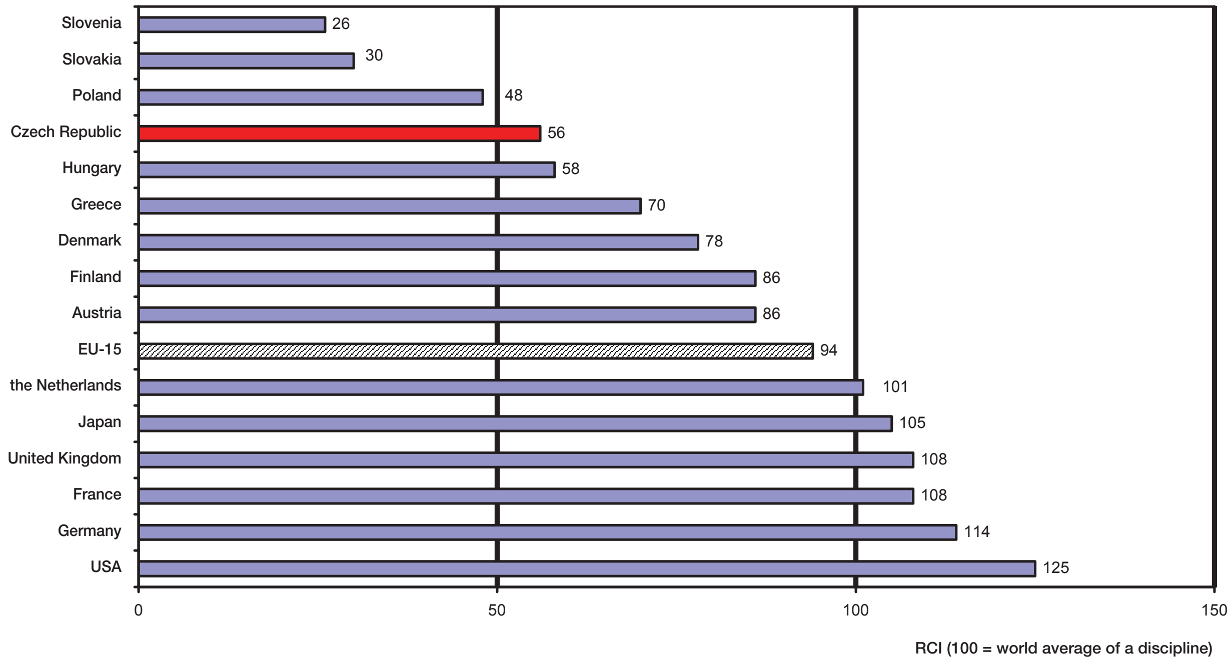
RCIO – Earth sciences



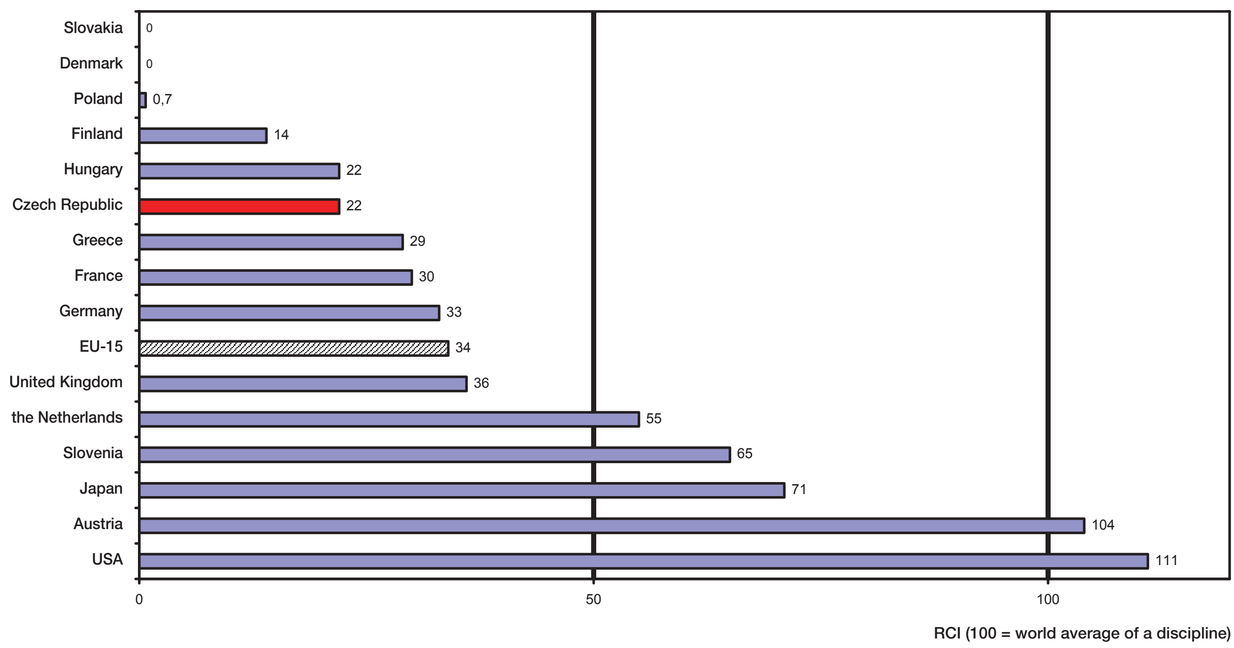
RCIO - Chemistry



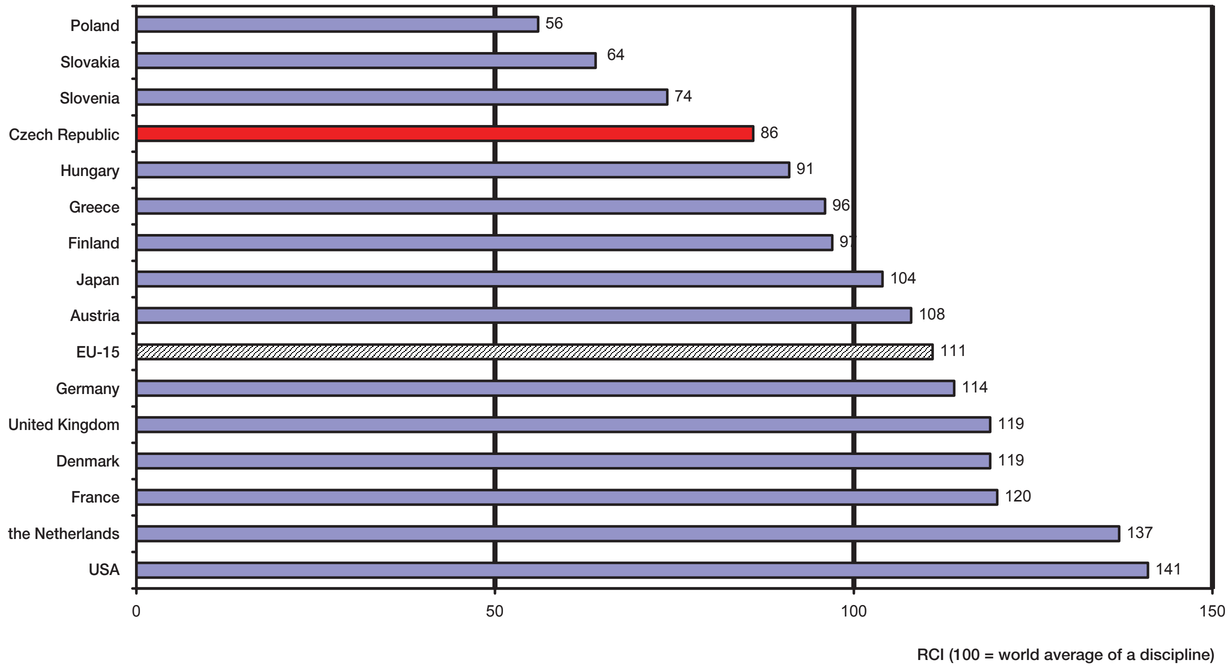
RCIO - Immunology



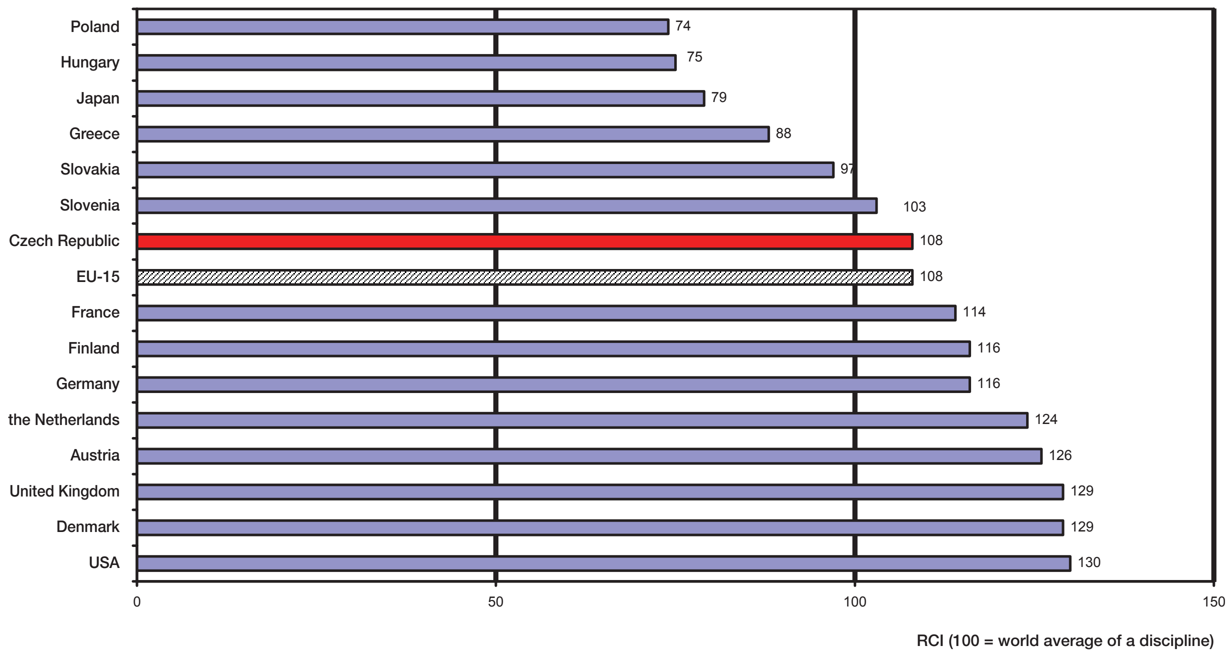
RCIO – Legal sciences



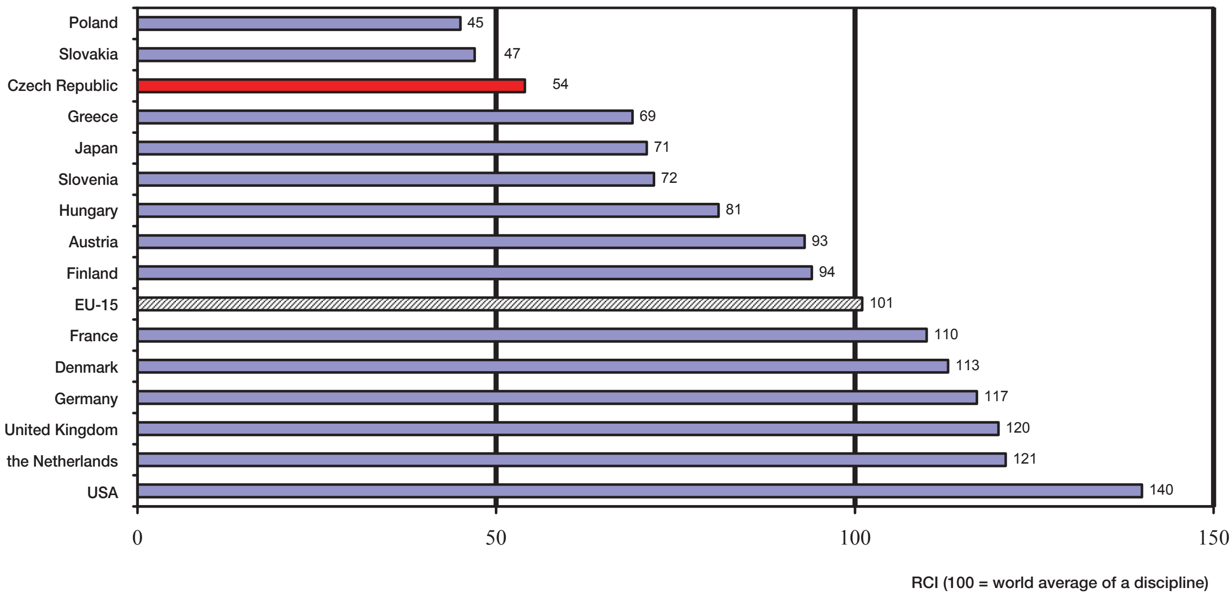
RCIO – Material sciences



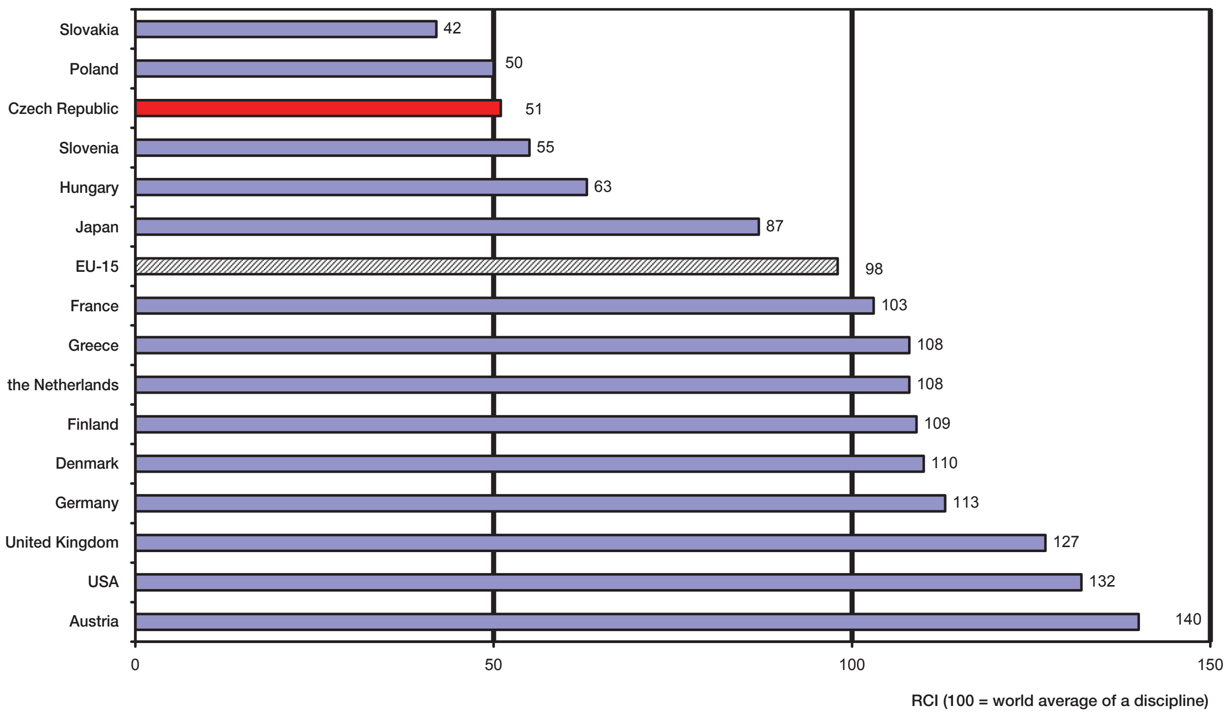
RCIO - Mathematics



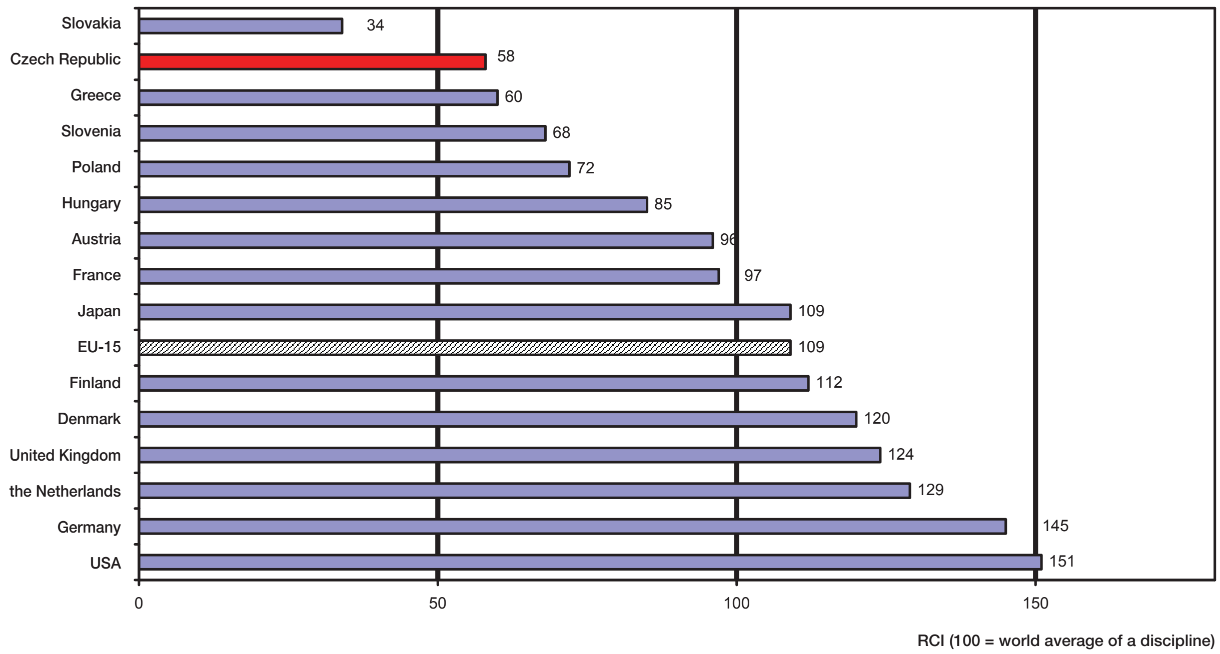
RCIO - Microbiology



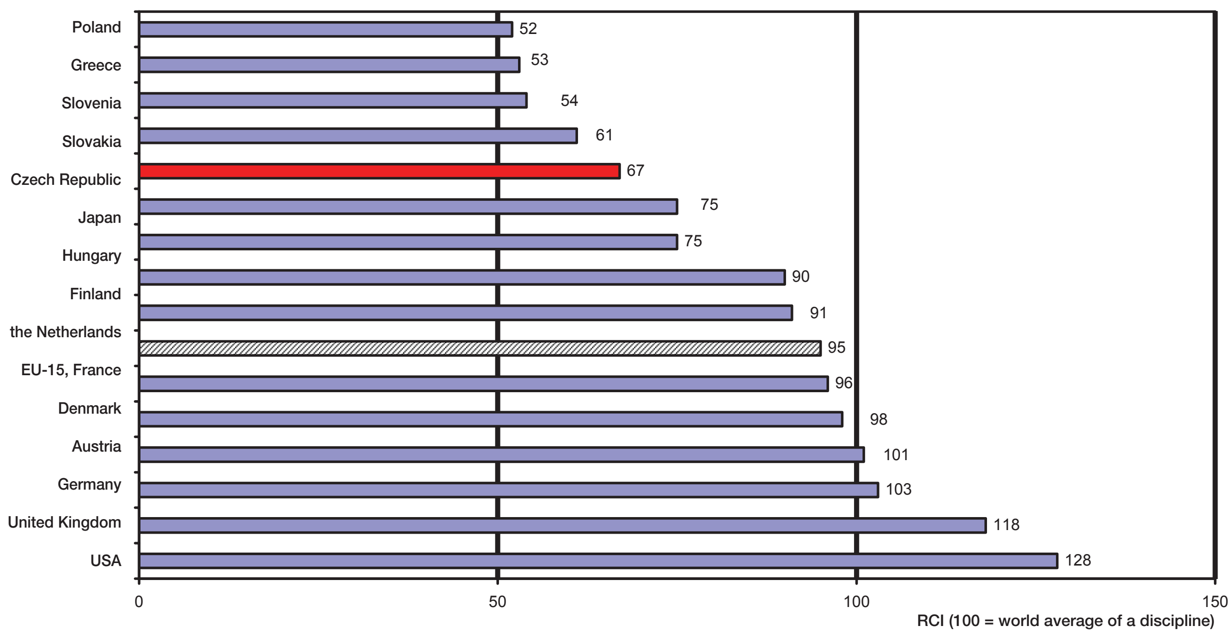
RCIO – Molecular biology and genetics



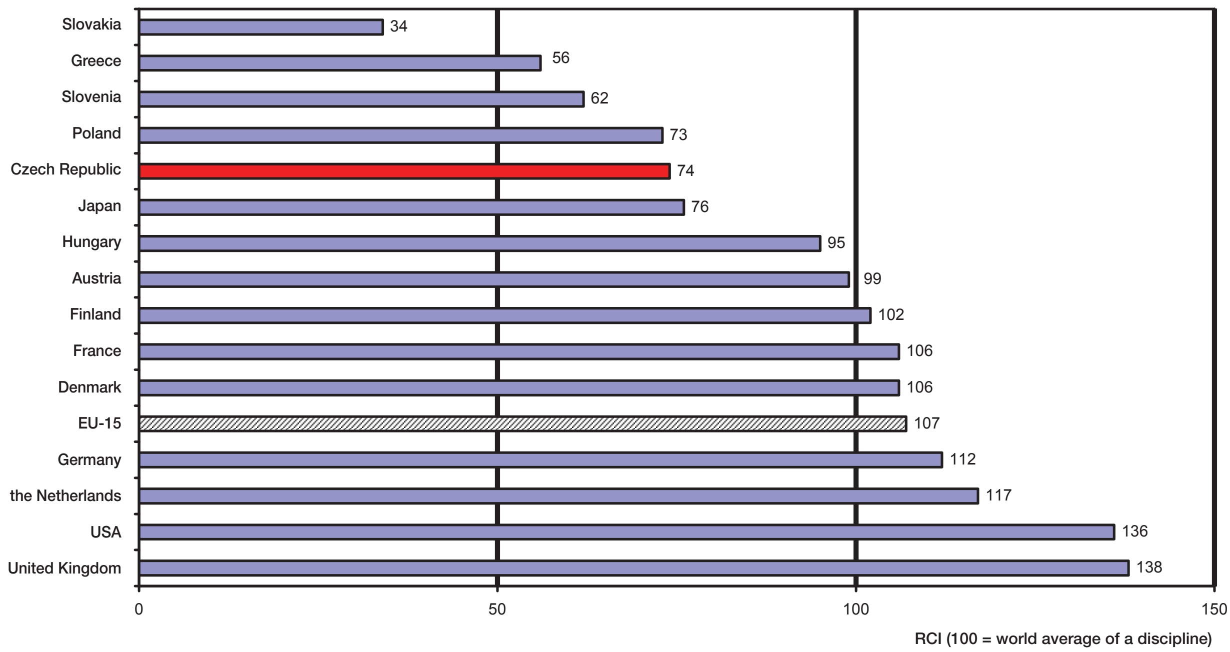
RCIO – Multidisciplinary Sciences



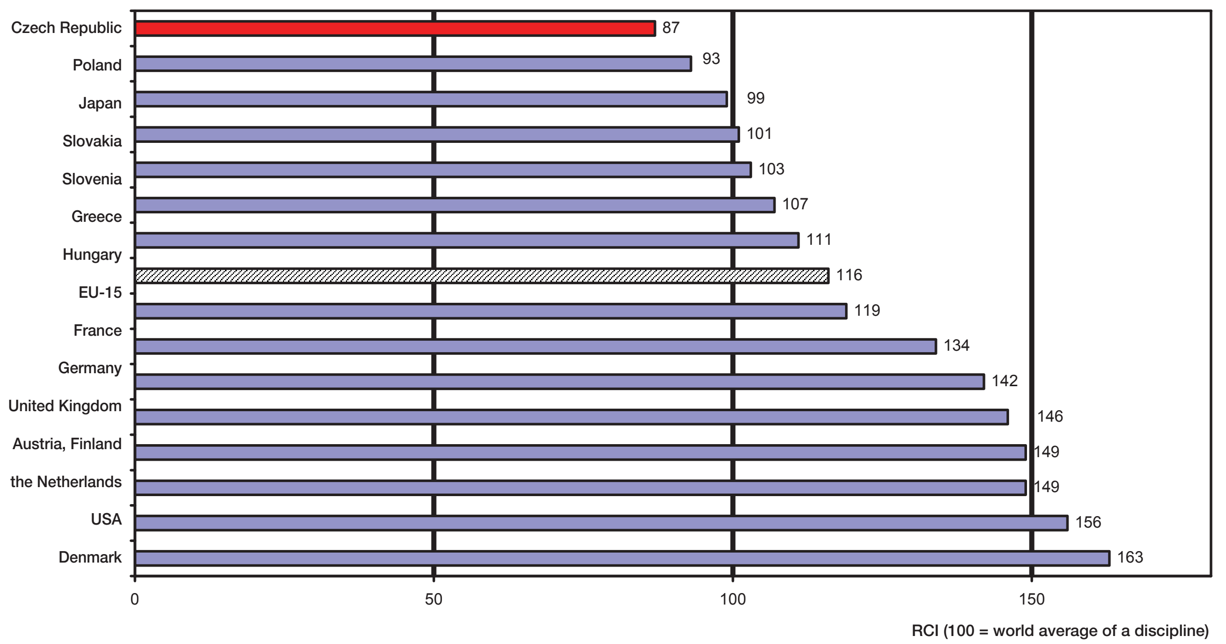
RCIO – Neurosciences and behavioural sciences



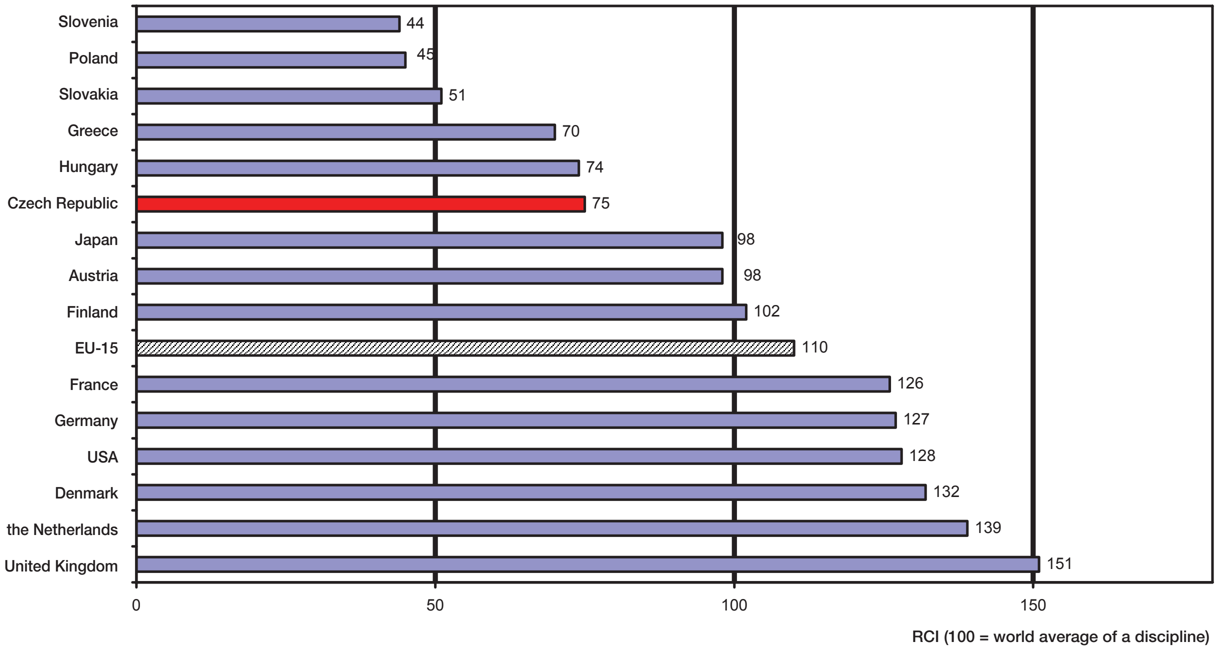
RCIO - Pharmacology



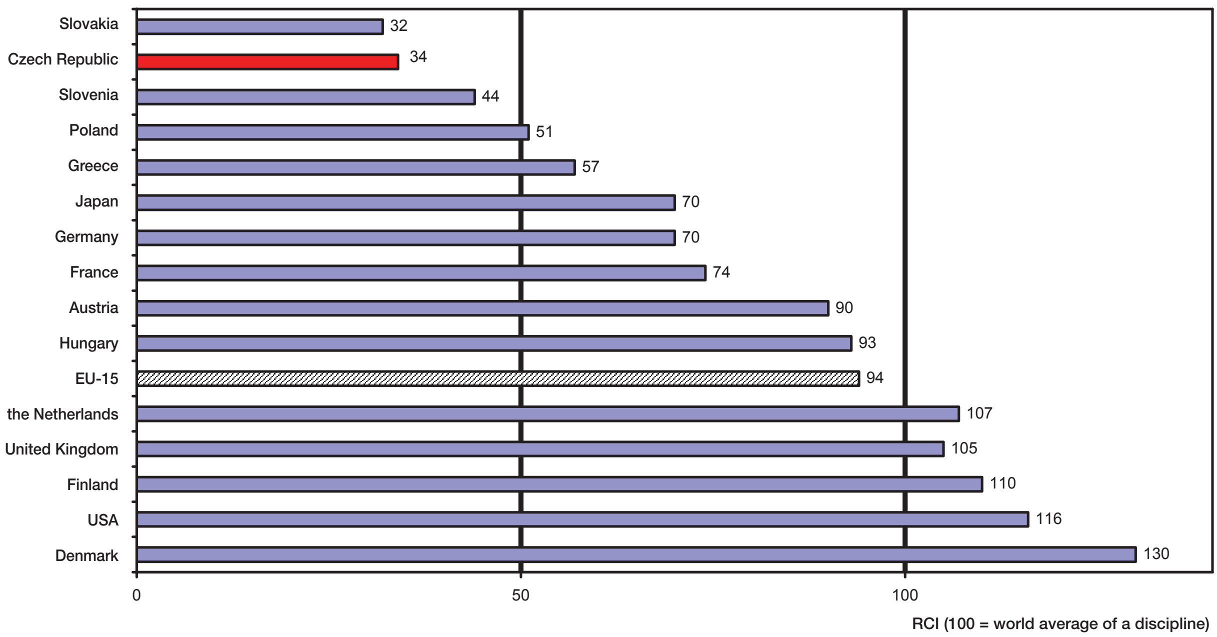
RCIO - Physics



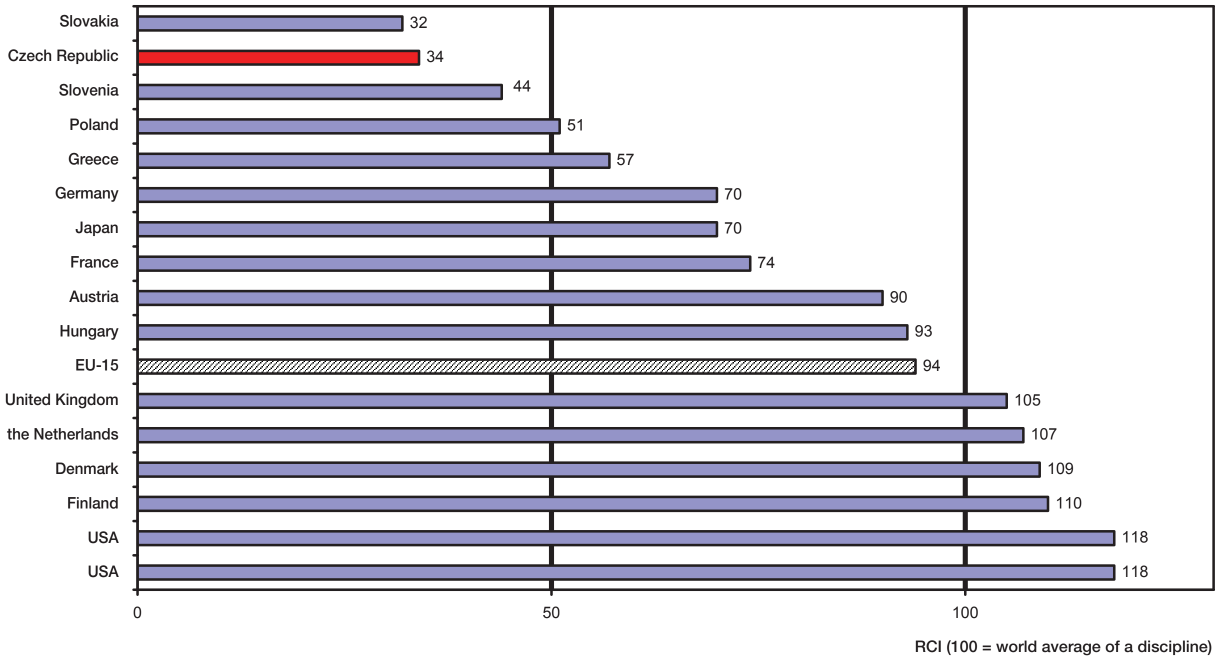
RCIO–Botany and zoology



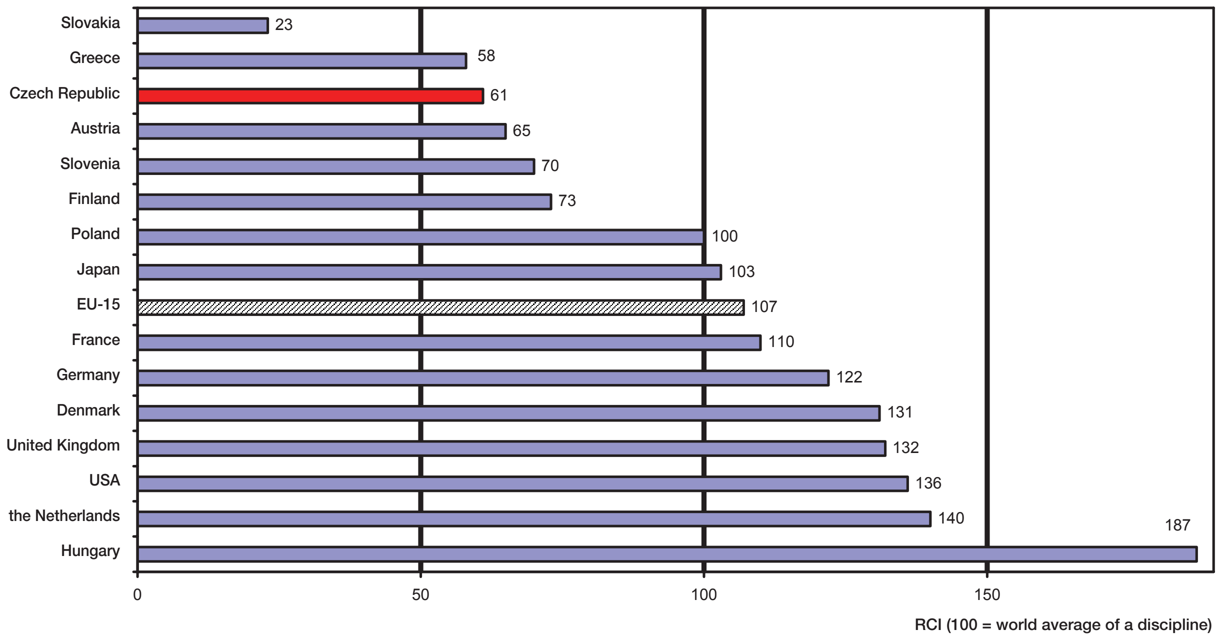
RCIO – Psychology and psychiatry



RCIO – Social sciences



RCIO – Space sciences



Note: Within the NSI product, the classification of disciplines is based on the categorization used with certain ISI modifications in Current Contents periodical. Individual publications are subdivided by disciplines upon the reference of periodicals, in which they are published. In the applied NSI instrument (standard version) each periodical is classified into one of 24 disciplines. Therefore the definition of disciplines is bibliometric by its purpose and it is not based strictly upon the definition of a discipline used in the scientific methodology.

Commentary:

1. Twenty four disciplines are evaluated by the RCI indicator. The "ranking" balance was the basis for the table below showing the "frequency of places".

Country	Number of	
	First three places	Last three places
USA	20	
The Netherlands	13	
Denmark	11	2
United Kingdom	8	
Czech Republic	-	11
Slovenia	-	11
Poland	-	15
Slovakia	-	19

   The dominance of USA is no surprise. Also the rankings of the Netherlands, Denmark and the United Kingdom correspond with the overall indicators of relative publications production (Graph D.1) and relative production of citations (Graph D.2).

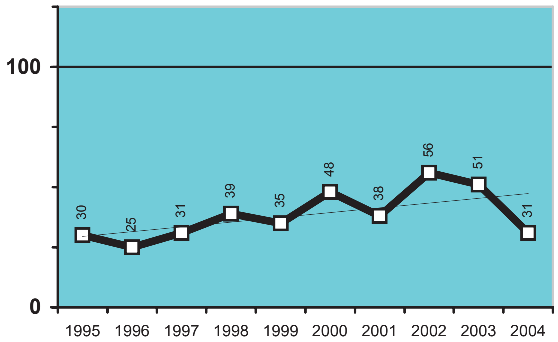
2. Among 24 disciplines in the Czech Republic monitored by the above criteria the leading positions are taken by three disciplines with the RCIO value around 100. These are mathematics (108), technical sciences (100) and clinical medicine (99). Other three disciplines show the RCIO value higher than three quarters of the world average - physics (87), material sciences (86) and chemistry (84). But the distance from the most advanced countries is noticeable; these three disciplines (considered in the Czech Republic as being on a very good level) exceed only slightly one half of the value of the leading countries. For example, in physics the Czech Republic occupies the last place among countries included in the 2005 R&D analysis.
3. The level of this indicator for another 6 disciplines lies deeply below the average – lower than one half of the world standard (and ca one third of the most advanced countries value). Among them are agricultural sciences (48), biology and biochemistry (47), social sciences (34), psychology and psychiatry (34), with economy (16) taking last place.
4. For disciplines like education (51) and legal sciences (22), it is very difficult to make any comparisons at all considering the extremely low number of included publications (annually less than 5 – see D.3.4).

D.3.4 Trend of the relative citation index of disciplines and number of publications in the Czech Republic in 1995 – 2004

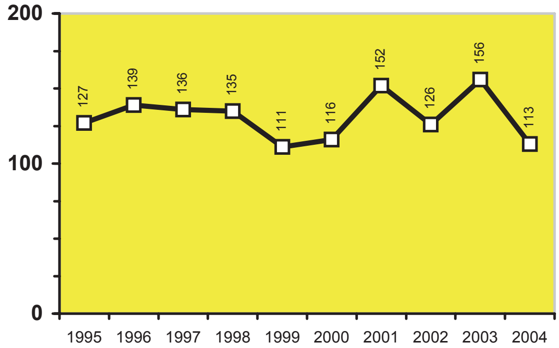
Commentary:

1. Essential for the characteristics of bibliometric quality of publications in any discipline is not only the comparison of the relative citation impact of this discipline in the Czech Republic with values of this indicator in the selected countries (see Graphs D.3.3), but also the trend of this indicator in the course of past ten years. The left column shows the RCIO values for 24 disciplines, while the right column reports the number of publications in a particular discipline (the less the number of publications, the less the evidentiary capacity of RCIO values – one or a few of frequently cited publications then increases the image of high quality of this discipline as a whole). See also the point 4 of the Commentary to Graphs D.3.3. The low number of publications is the very cause of considerable changes of RCIO for education and legal sciences.
2. Most of the disciplines with a significantly positive trend of RCIO value are at the same time the disciplines with its high absolute value – clinical medicine, technical sciences and material sciences. In mathematics, the RCIO value basically stagnates, but at high level. Other disciplines with high absolute values of RCIO experience a slower pace of growth (chemistry, physics), yet with a considerable number of publications. In summary, it can be said that according to the above criteria these disciplines belong among the best in the Czech Republic.
3. A considerable high rate of growth, but from low starting values, report ecology, botany and zoology and neurosciences. Somewhat lower, yet still good pace of growth have the Earth sciences, Space sciences and (with high fluctuations between the years) psychology and psychiatry. Step by step, these disciplines are reducing the quantitative distance from the advanced countries.
4. Computer sciences are difficult to evaluate. In 1998, the RCIO indicator was enormously high, in 1999, 2000 and 2002 it fell against the previous years and since 2002 it has been growing again. It will be necessary to evaluate its trend over a longer term.
5. For the remaining disciplines, the bibliometric quality of publications grows only slightly in the monitored period, moreover from low starting values, or even decreases and the gap widens. This does not mean that there are no top teams in these disciplines in the Czech Republic publishing works at world level, but most of the publications in these disciplines have only a minor publicity in the world.

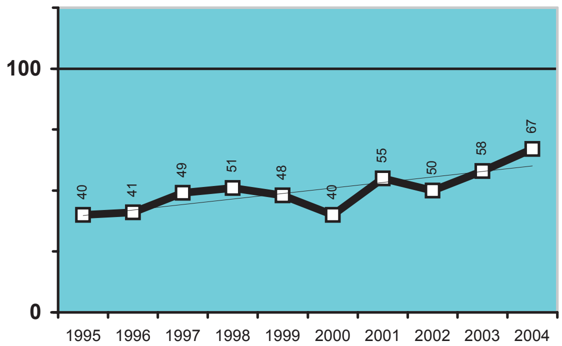
Agricultural sciences - RCIO



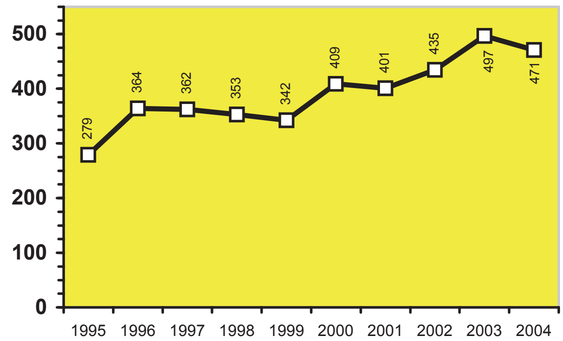
number of publications



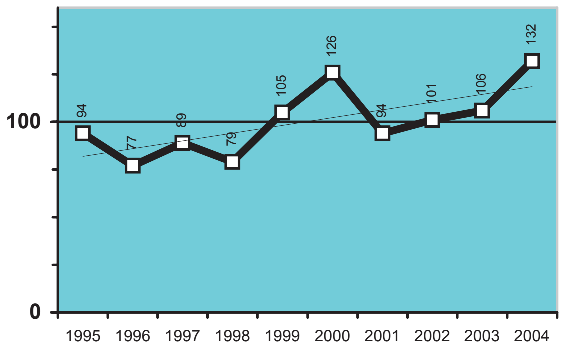
Biology and biochemistry - RCIO



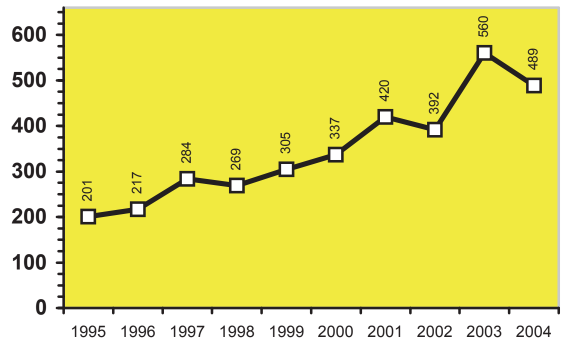
number of publications



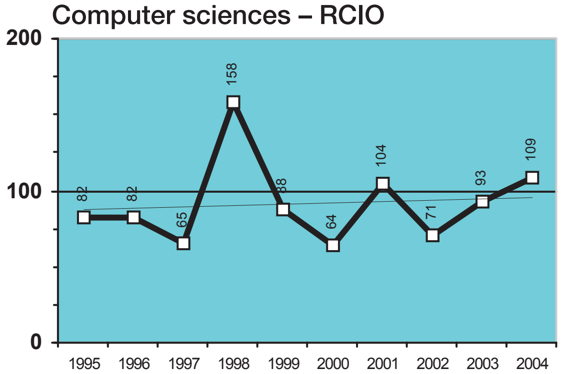
Clinical medicine - RCIO



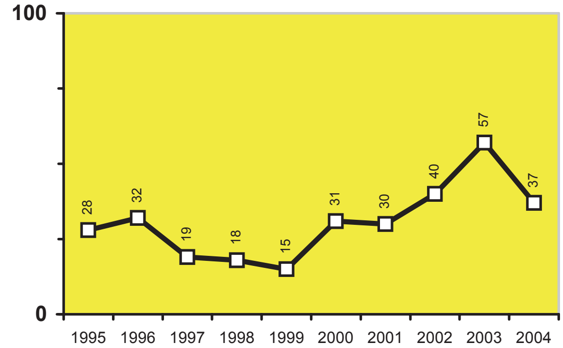
number of publications



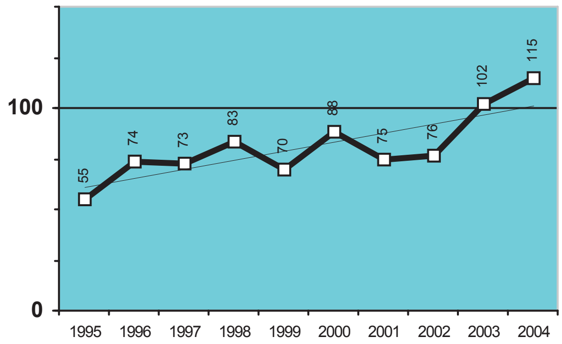
Computer sciences – RCIO



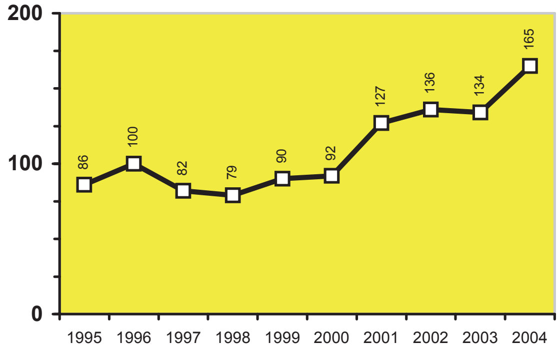
number of publications



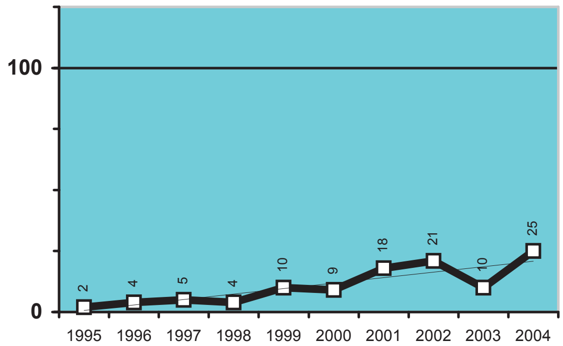
Ecology and environment - RCIO



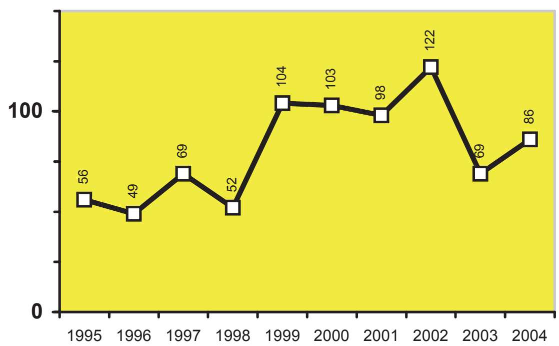
number of publications



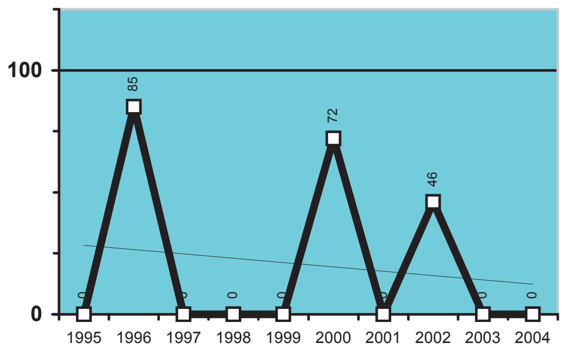
Economy and trade – RCIO



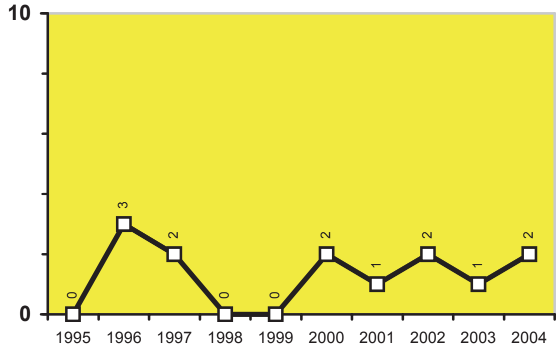
number of publications



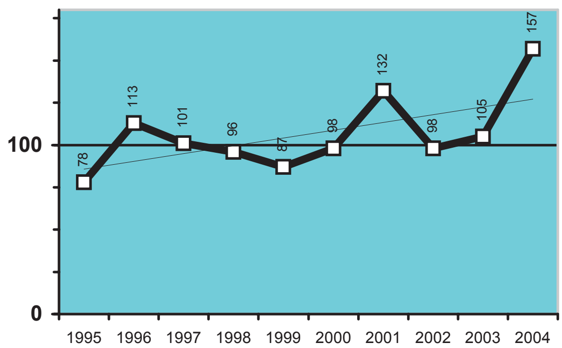
Education – RCIO



number of publications



Technical sciences – RCIO



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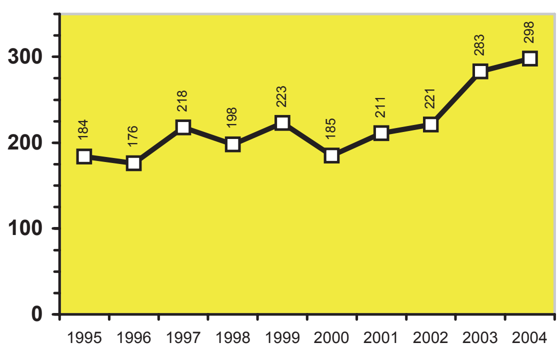
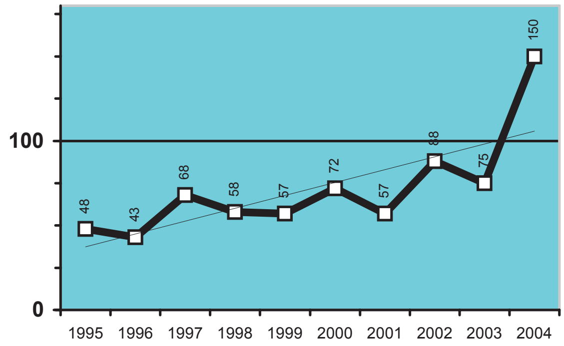


Earth sciences – RCIO



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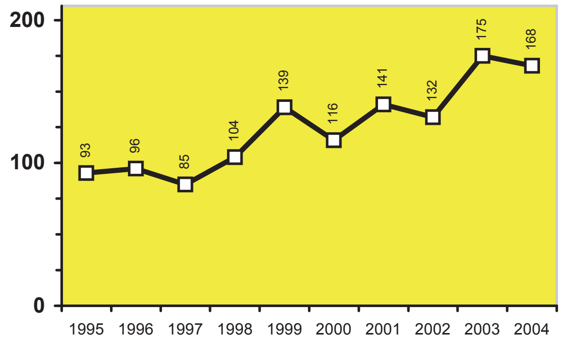
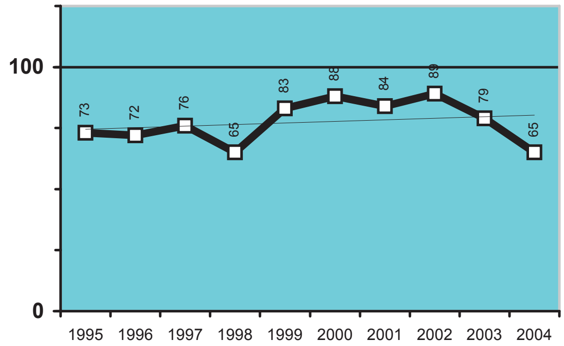


Chemistry – RCIO



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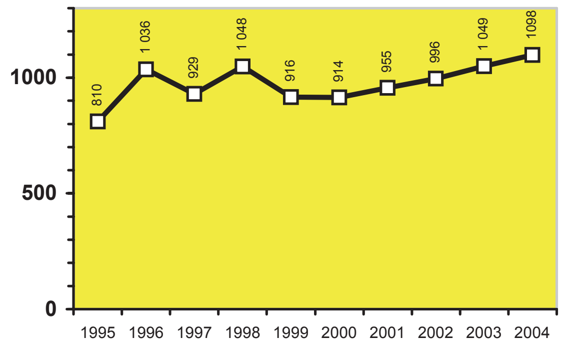
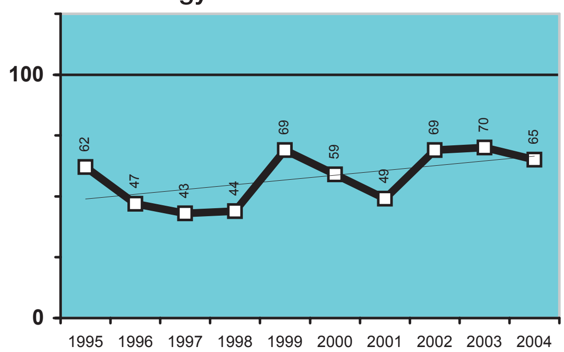
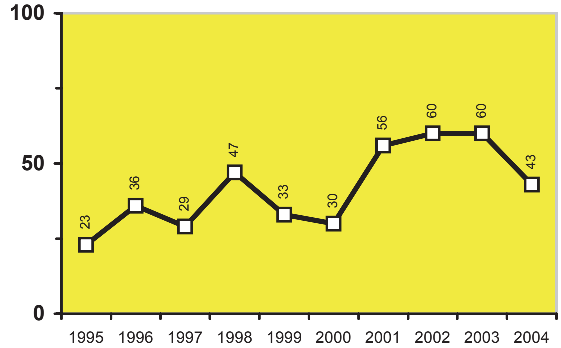


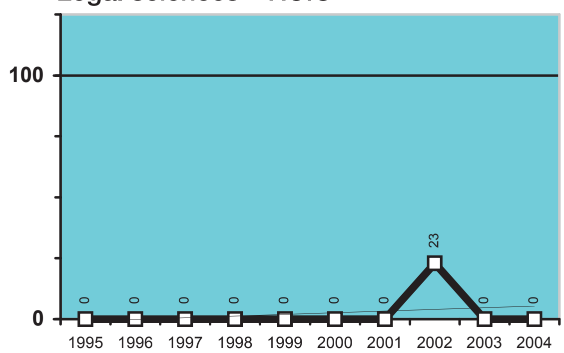
Immunology – RCIO



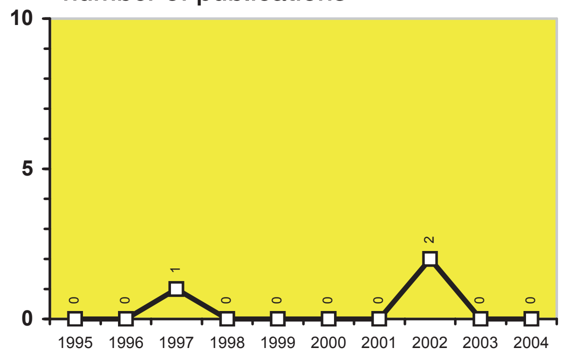
number of publications



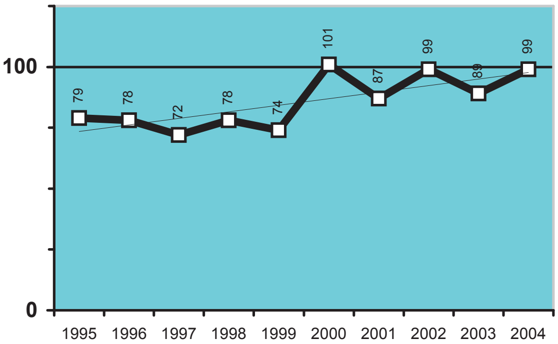
Legal sciences – RCIO



number of publications



Material sciences – RCIO



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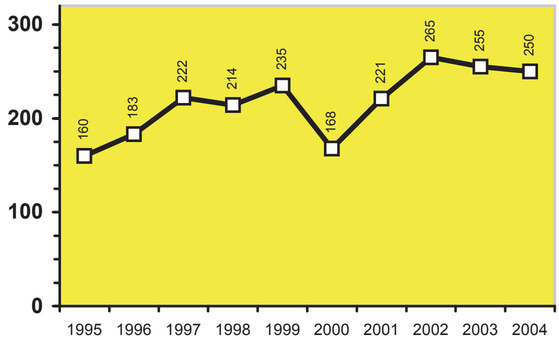
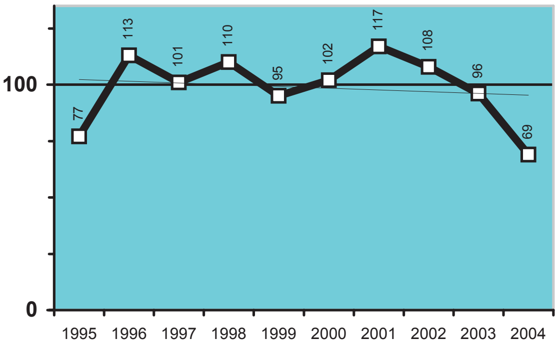


Mathematics – RCIO



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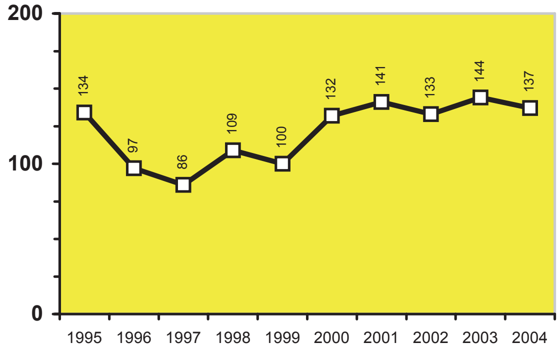
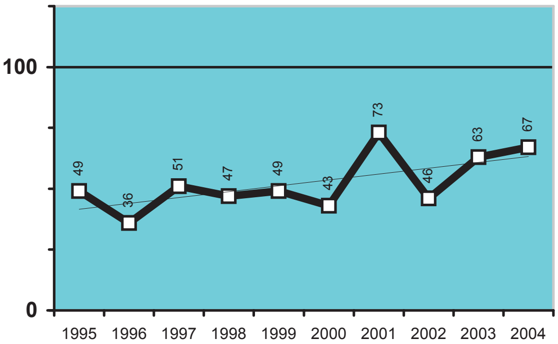


Microbiology – RCIO



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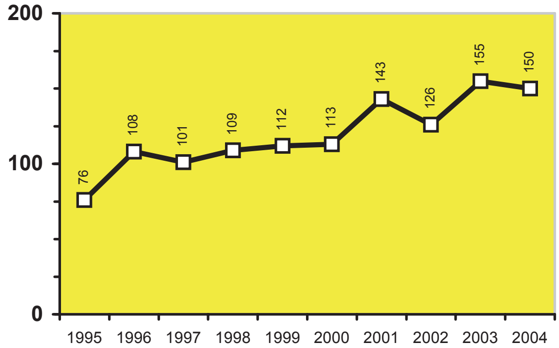
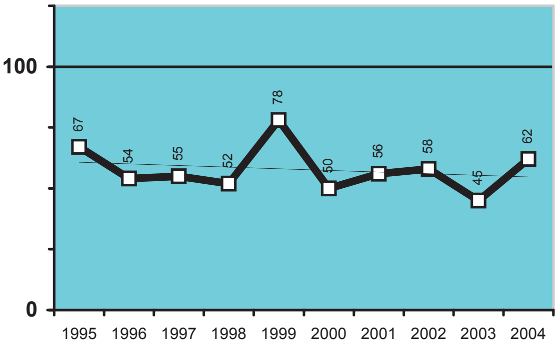


Molecular biology and genetics – RCIO



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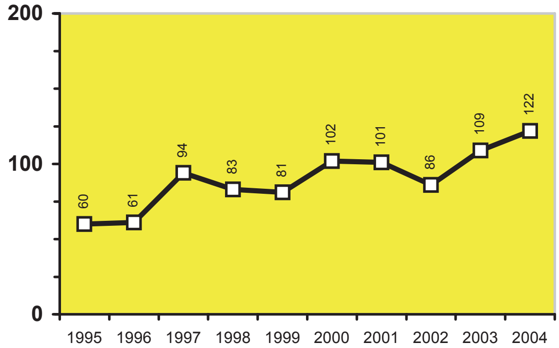
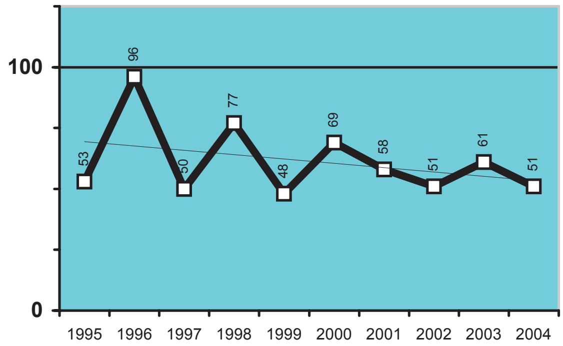


Multidisciplines – RCIO



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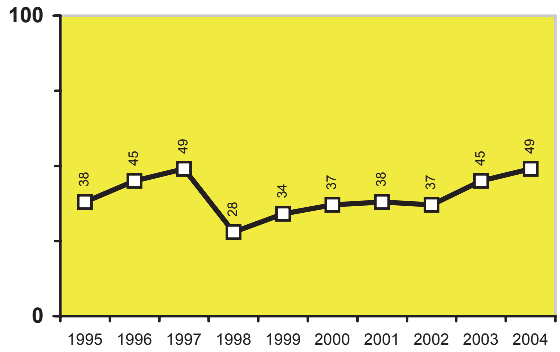
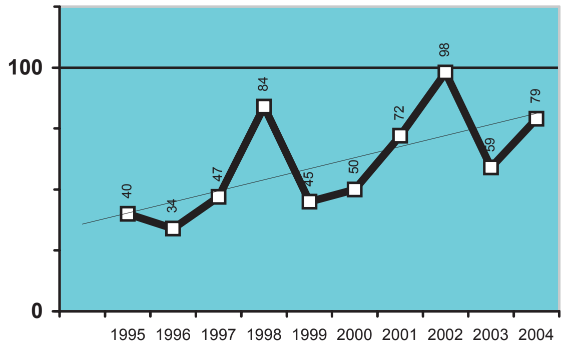
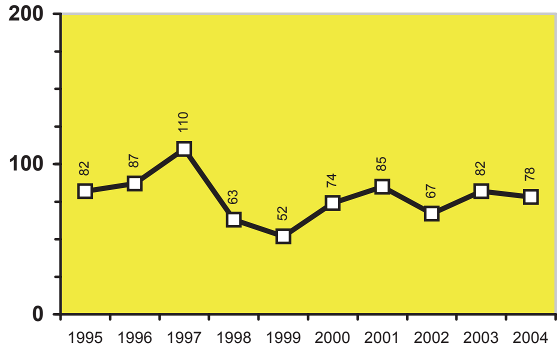


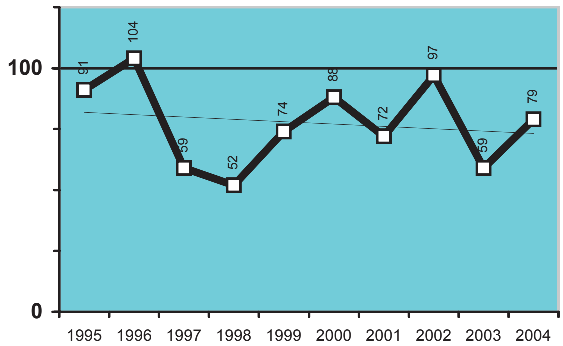
Neurosciences and behavioural sciences – RCIO



number of publications



Pharmacology – RCIO



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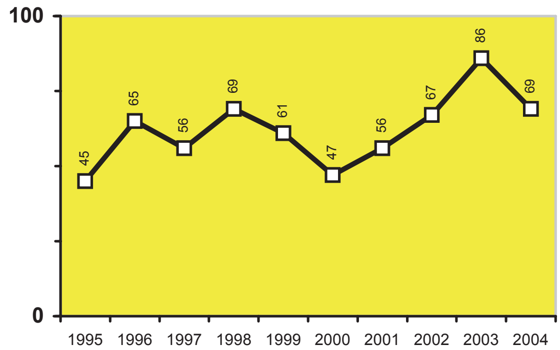
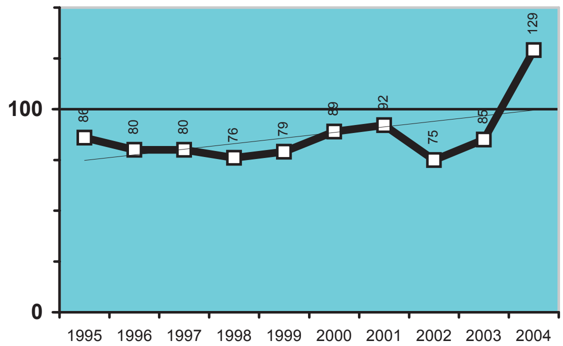
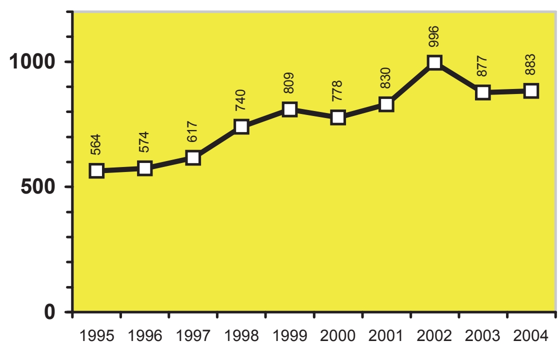


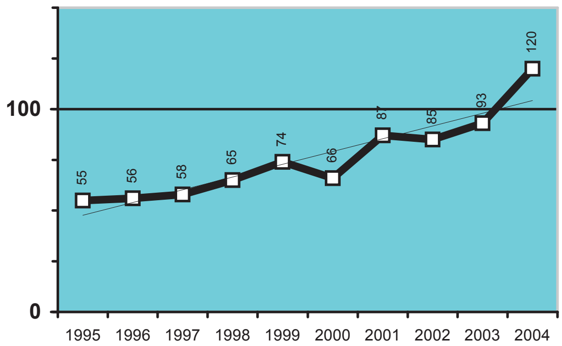
Physics – RCIO



number of publications



Botany and zoology – RCIO



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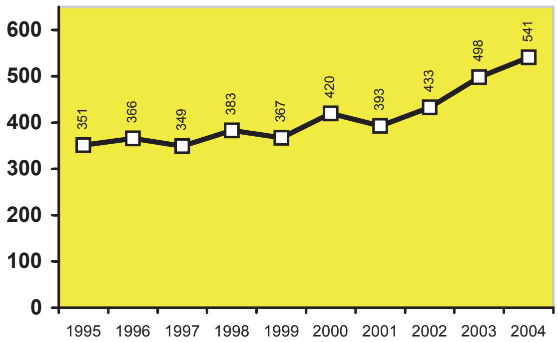
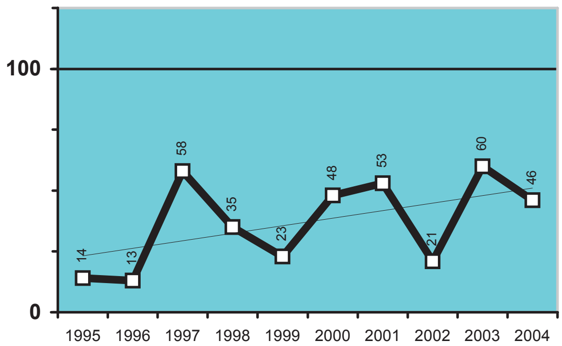
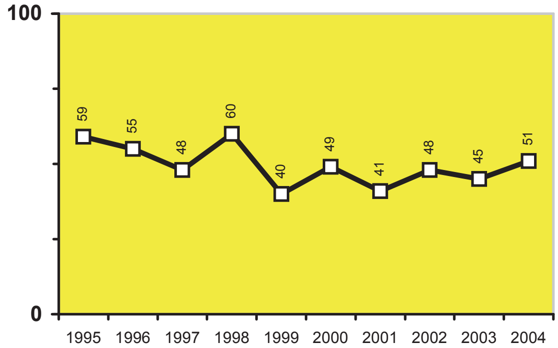


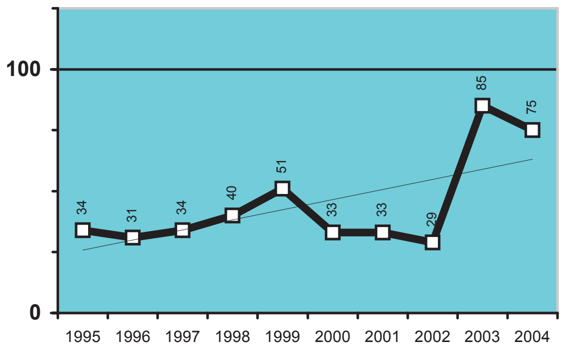
Psychology and psychiatry – RCIO



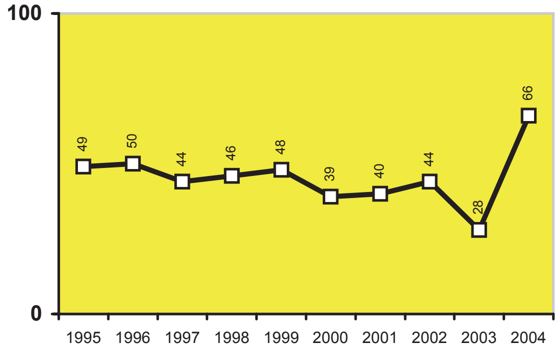
number of publications



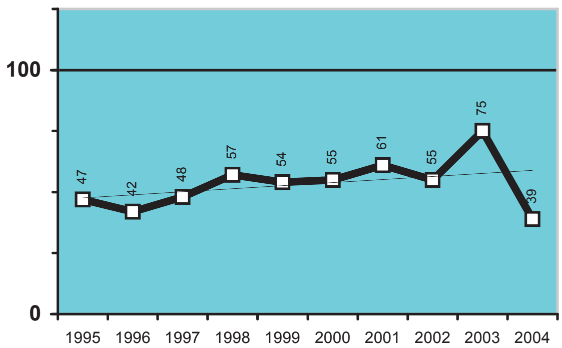
Social sciences – RCIO



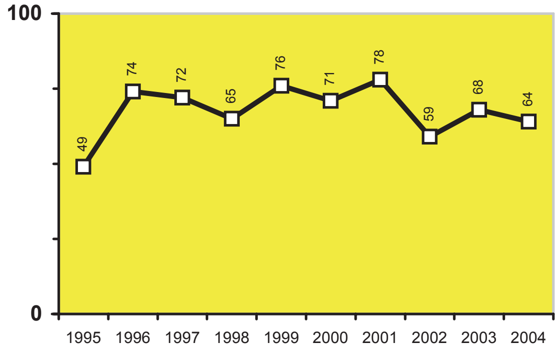
number of publications



Space sciences – RCIO



number of publications



Source: Thomson ISI® National Science Indicators (NSI),1981–2004

E. Patent applications, granted patents

A patent is a legal instrument to protect invention. A patent gives its owner exclusive rights in a limited area and for a limited period of time to utilise the invention commercially. Without his/her consent no third party may make, market or otherwise utilise the subject of invention. The countervalue is then the publishing of invention details.

At present, there are two systems protecting the inventions in Europe: the system of European patents and national patent systems. The first one is based upon the Munich Convention of 1973. The national patent systems are based upon the national patent rights of respective countries. In both systems it is possible to use the Patent Cooperation Treaty (PCT), with essential part of the patent granting procedure taking place at international level.

The European Patent Convention was signed in October 1973 in Munich and became operative on October 7, 1977. The Munich Treaty established a single system for patent granting for all treaty states, on the basis of which the applicant may acquire the invention protection, with one patent application and by common procedure, in all treaty states that he/she identifies in the European patent application[1]. By the European patent granting the invention is protected in the same way as with national patents. The European Patent Convention set up the European Patent Organisation (as its legislative body) and the European Patent Office (as its executive body)[2].

The already mentioned Patent Cooperation Treaty (PCT) was signed on June 19, 1970 in Washington. It took effect on January 28, 1978. According to PCT, the international application has the same effect in all treaty states as the national application. The PCT administrator is the World Intellectual Property Organisation – WIPO. At present, WIPO has 179 member countries[3]. Of them, 128 are PCT member countries. Within the so called international phase of the procedure, the object of international application is subjected to search on the state of the art, and/or the preliminary inquiry on patentability, if necessary. These are then used in the so called national or regional phase of procedure before national or regional patent offices (e.g. EPO), where the procedure on granting of national or regional patents is finished[4].

Besides the already existing systems, the introduction of the Community patent at the EU level has been prepared for many years now (based originally on the 1975 Luxembourg Convention). Its adoption is obstructed by certain live questions, particularly as far as the language regime is concerned. Its adoption would create a unitary (common) and autonomous system of patents for the whole EU.

From a decisive part, invention is the product of research and development. And so the numbers of inventions represent a significant indicator for evaluation of R&D results. The numbers of patent applications with the European Patent Office and Japanese Patent Office, and numbers of patents granted by the United States Patent and Trademark Office, the so called triad patents, are reported by OECD in its “Main Science and Technology Indicators“ published twice a year. The numbers of patent applications with the European Patent Office and USPTO belong among the basic structural EU indicators for evaluation of research and development. The numbers of invention applications with the Industrial Property Office in CR, the patent applications with EPO and USPTO, as well as patents granted by these offices form a regular content of R&D analyses in the Czech Republic.

This chapter follows up with the 2004 analysis. It contains new data on the numbers of patents being applied (invention applications) in 2004 with the Industrial Property Office (IPO) of CR, European Patent Office (EPO) and U.S. Patent and Trademark Office (USPTO) and on the numbers of patents being granted by these offices. In many cases data from 2002 – 2003 were put more precisely. Data were taken from the annual reports of respective patent offices for 2004. The Czech patent act terminology is maintained that uses the term “invention application”, as well as the EPO and USPTO terminologies that use the name “patent application”.

Data are in compliance with both the OECD and Eurostat methodology for R&D evaluation as converted to one million inhabitants of respective country. The numbers of patents as converted to the number of research workers appear only sporadically. The OECD data from Main Science and Technology Indicators 2005/1 were not used; it contains data only by 2002.

At present, also in connection with the introduction of the European Patent, various studies are being produced and published on the suitability of the indicator of number of patent applications or granted patents for evaluation of R&D efficiency. The studies draw the attention to a different approach to patents in the United States and Europe, problems with patenting biotechnological inventions or computer-produced inventions, the difference between methodologies of OECD and certain EU countries. The studies warn of a very reserved approach to patenting of inventions taken by small and medium-sized enterprises, and on the contrary the so called strategic patenting by large supranational companies. By this strategy the supranational companies build a wide portfolio of patents with the aim to block their competitors. Frequent studies were made on the possibilities to evaluate the level (quality) of patents. The usefulness of the “number of patents (applied or granted)” indicator is not disputed; the efforts work towards unification of the evaluation methodology.

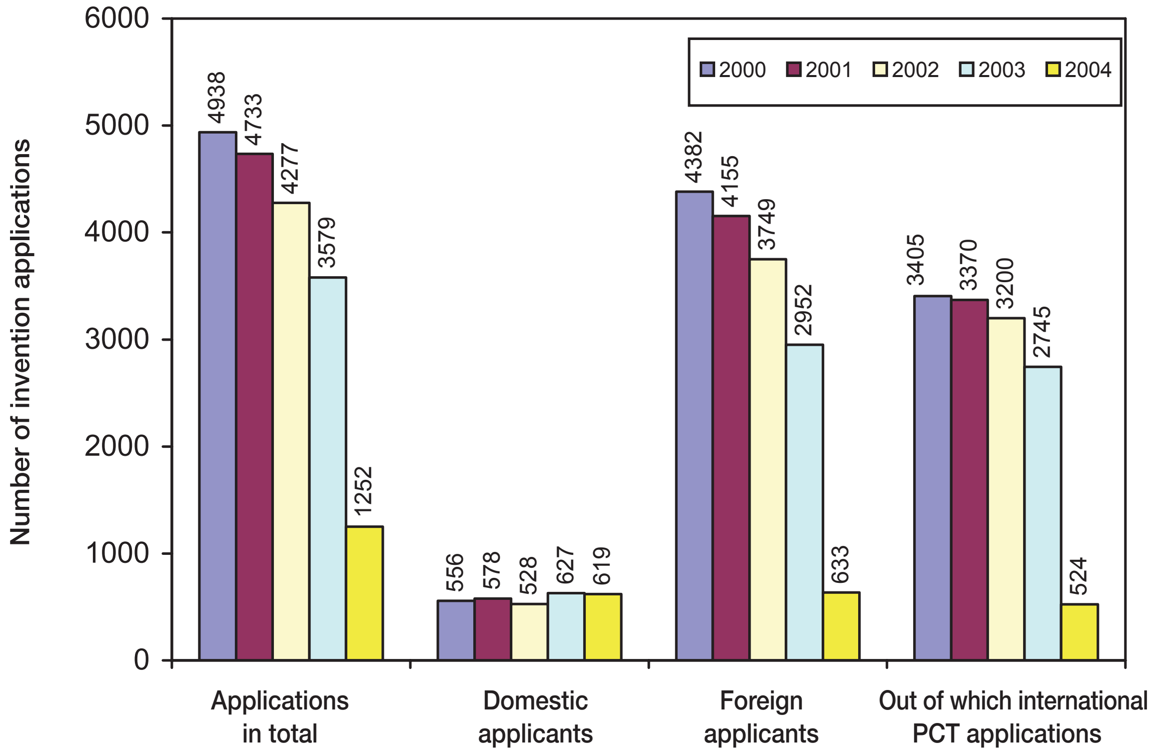
The following seven graphs and one table show the trends of selected indicators. The graphs report the total numbers of applications and granted patents without distinguishing the level of technology.

- Invention applications filed in the Czech Republic, total numbers of applications;
- Invention applications filed in the Czech Republic, total numbers of applications of selected countries;
- Patents granted in the Czech Republic, total numbers of patents granted to selected countries;
- Patent applications filed with the European Patent Office (EPO), relative numbers per one million inhabitants;
- Patents granted by EPO, relative numbers per one million inhabitants;
- Patent applications filed with USPTO, relative numbers per one million inhabitants;
- Patents granted by USPTO, relative numbers per one million inhabitants.

Both the Czech Republic and other new member states significantly lag behind the EU-15 countries, with the exception of Greece. This lagging behind has several reasons. Among them may be the insufficient level of R&D results; the lack of interest, abilities or resources of the patented results authors or their lacking confidence that they could reach any more significant economic results by this patenting. It is also necessary to take into account the fact that the EPO and USPTO fees are relatively higher for applicants from the new member states than for those from EU-15 countries, the United States or Japan. This lagging behind also testifies to the unsatisfactory coordination between universities, government research sector and business sphere.

1 Typically, it takes a little longer than four years to grant a patent. For other information on the procedure for granting European patent see the notes on methodology in the Eurostat reference data bank New Cronos “Theme 9; patent area“.
2 See the web page of the European Patent Office (EPO) http://www.european-patent-office.org.
3 See the list of members on http://www.wipo.org/membres/membres/index.html.
4 For additional information on PCT system see the notes on methodology in the Eurostat reference data bank NewCronos, Theme 9, patent area.

E.1 Invention applications filed in the Czech Republic (number)



Source: IPO Yearbook 2003

Note: International PCT applications – invention applications being filed on the basis of the Patent Cooperation Treaty (PCT) and entering the national phase of procedure before the Industrial Property Office (IPO)

Commentary:

1. Starting from 2002, as a result of the Czech Republic acceding to the European Patent Convention (with effect from July 1, 2002), there has occurred the expected decline in the number of foreign invention applications, and therefore in the total number of invention applications filed in the Czech Republic. Especially significant decline in the number of invention applications, except for applications of domestic applicants, came in 2004. The total number of applications fell from 3,579 in 2003 to 1,252 in 2004 by reason of decline in the number of applications of foreign applicants from 2,952 in 2003 to 633 in 2004. Similar trends can be observed for all the member countries to the Convention.
2. The reported data will loose gradually their reporting value. The decline seen in the foreign invention applications filed in the Czech Republic has no direct link to the attractiveness of the Czech Republic for the foreign scientific, industrial and business public. It is due to the fact that part of the national competence was passed to the European regional body (European Patent Office – EPO). The globalization of economy forces the subjects to seek wider territorial protection; the interest in protection within only one state goes down. This is confirmed, inter alia, by data in following table taken from the IPO Yearbook 2004 and preliminary data for the first half of 2005.

European patents with effect in the Czech Republic

	2003	2004	1st half of 2005
Number	18	876	1 744
Of this: validated	3	102	256

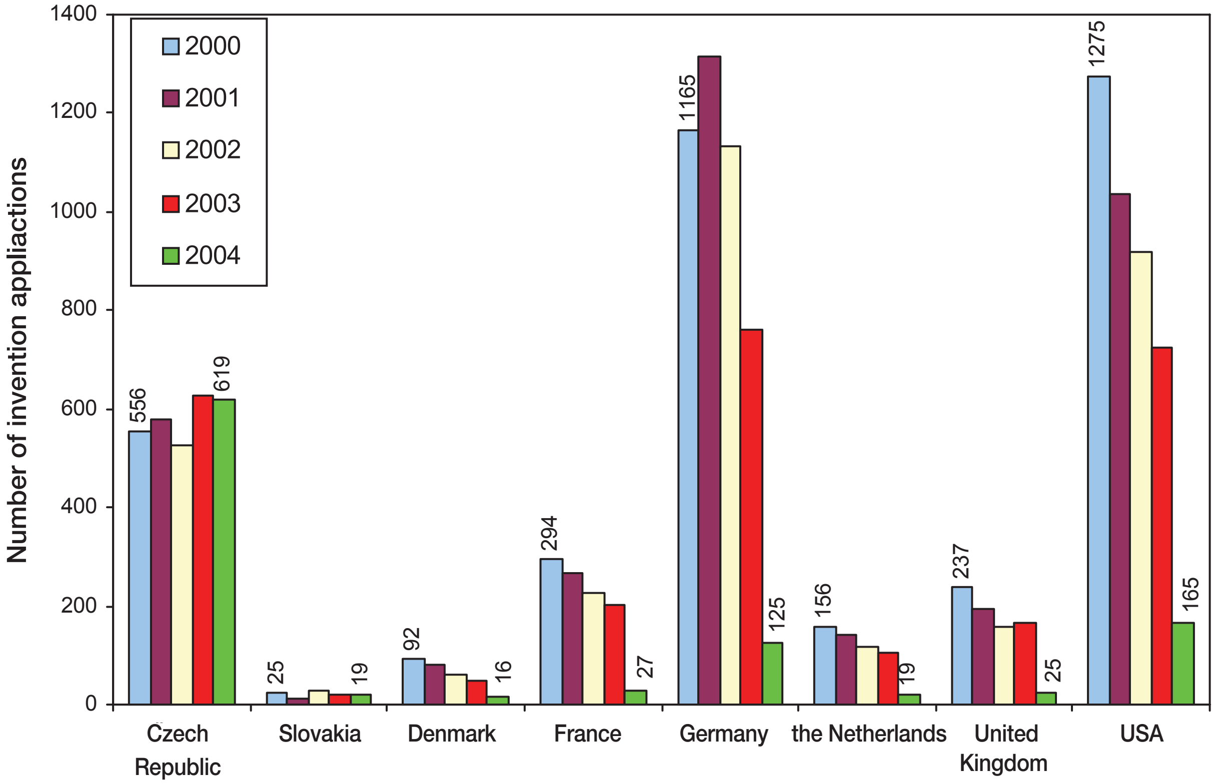
3. Also the number of patent applications with EPO increases, in which the Czech Republic is designated as a country where the protection of rights is required. The table is again taken from the IPO Yearbook 2004.

European patent applications, in which Czech Republic is designated

	2002	2003
Number	25 298	50 419

4. The number of applications of domestic applicants fell only little in 2004 when compared with 2003 (from 627 applications to 619). But it is necessary to mention that already in 1998 the domestic applicants filed 626 applications.

E.2 Invention applications filed in the Czech Republic (number)

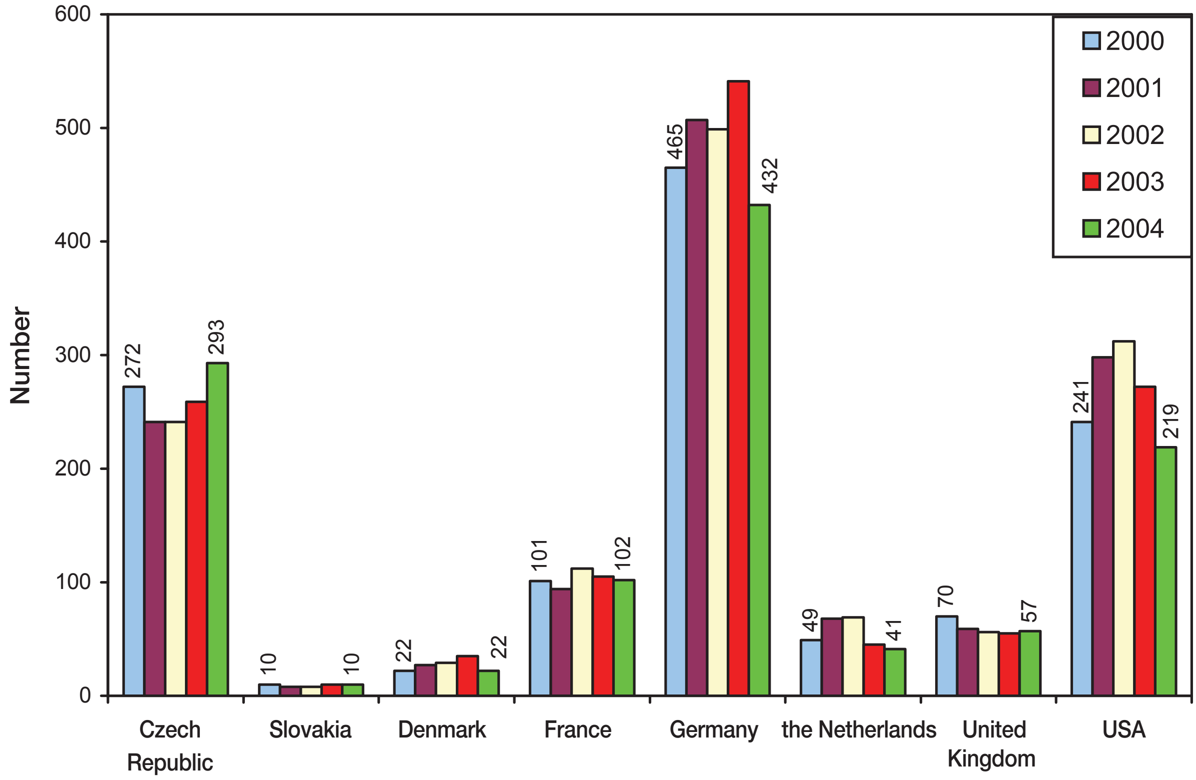


Source: IPO Yearbook 2004

Commentary:

1. No objective conclusions on the inventiveness and innovative potential of the applicant countries can be elicit from information on the trend of the number of invention applications and patents granted by national patent offices of small or medium-sized countries. Certain conclusions can be deduced only on the trends with respective categories of applicants (domestic applicants, applicants from selected countries, etc.).
2. The numbers of invention applications of entities residing in the Czech Republic had been slightly increasing until 2003, with the exception of 2001. The year 2004 meant a moderate decrease in the number of applications in comparison with 2003. The numbers of applications of entities from Slovakia basically stagnate on a low level around 20 applications a year.
3. The numbers of invention applications of entities from other monitored countries are rapidly decreasing. Especially significant decrease took place in 2004. In 2000, the numbers of invention applications from Germany and the United States were more than double the number of invention applications of Czech entities. In 2004, their numbers fell under the level of applications of entities residing in the Czech Republic; Czech Republic 619 applications, Germany 125 applications and the United States 165 applications.
4. The reasons for such decrease were mentioned in the commentary on the previous Graph E.1.

E.3 Patents granted in the Czech Republic (number)

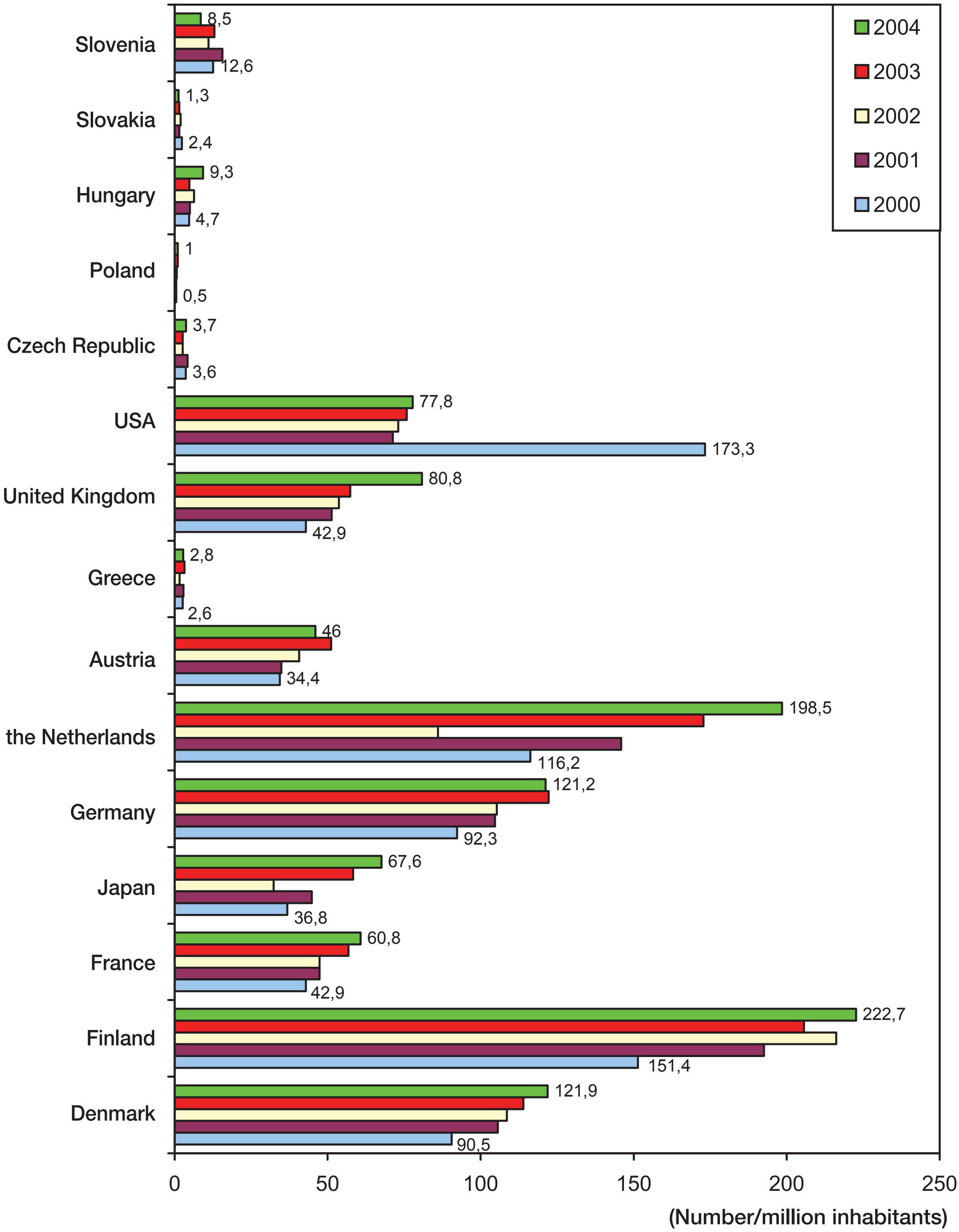


Source: IPO Yearbook 2004

Commentary:

1. The average term of invention application procedure is strongly affected by the system of the so called postponed inquiry and is 5 years. The number of really granted patents is less than half the number of invention applications. For example in 2004, 3,763 patent applications went through the patent inquiry, whereas only in 40 % of cases the patent was granted.
2. After decline in 2001 and stagnation in 2002, the number of patents granted to Czech entities is going up. In 2004, 293 patens were granted to entities residing in the Czech Republic.
3. The numbers of patents granted to the leading foreign applicants – Germany and the United States – had increased until 2003 (Germany) or 2002 respectively (USA), then they have been decreasing. In case of entities residing in Germany, the number of patents granted in 2004 remains higher than the number of patents granted to entities residing in the Czech Republic (Germany – 432 patents, CR – 293 patents). The numbers of patents granted to entities from other selected countries stagnate or slightly decline.

E.4 Patent applications filed with EPO (number of applications per one million inhabitants)



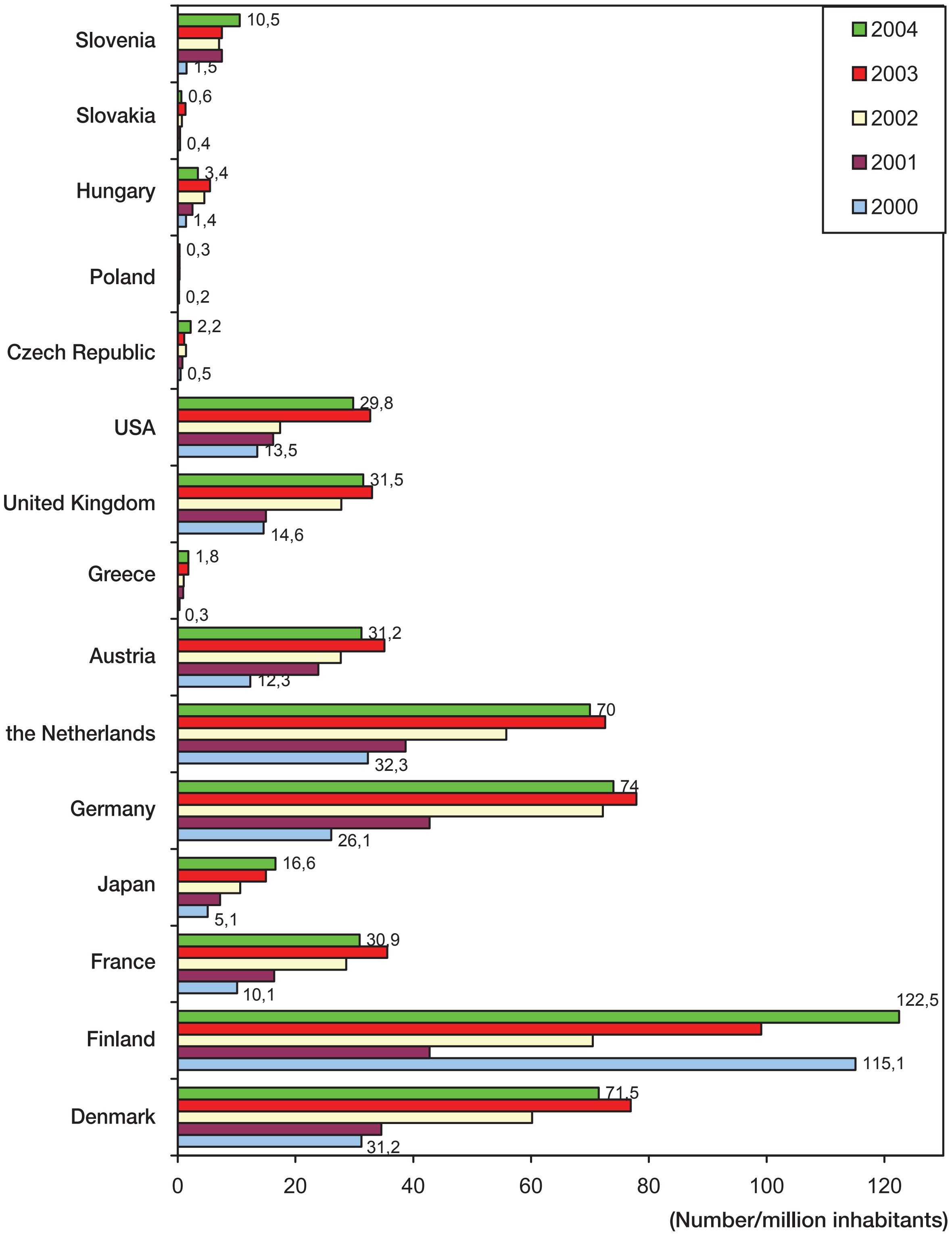
Commentary:

1. The patent applications and patents granted by the European Patent Office are included in regular evaluations of research and development made by OECD[5].
2. The inventiveness and innovative potential of individual countries can be inferred from the number of applications and patents granted at the leading patent offices like the European Patent Office (EPO), U.S. Patent and Trademark Office (USPTO) and the Japan Patent Office (JPO).
3. More than 100 patent applications per one million inhabitants in 2004 were filed by entities from Finland (222.7), the Netherlands (198.5), Denmark (121.9) and Germany (121.2). In 2004, Finland outdid the countries on third and fourth places by more than one hundred patent applications per one million inhabitants.
4. The Czech Republic, as well as other countries that became the EU members in 2004, significantly lags behind other monitored countries. Similar situation is in Greece. Most patent applications among these countries were reported in 2004 by Hungary (9.3), followed by Slovenia (8.5) and the Czech Republic (3.7).
5. Apparently the entities from Japan and USA give their preferences to and apply patents particularly through USPTO and Japan Patent Office (JPO) (see also Graphs E.6 and E.7).
6. The numbers of patent applications mostly grew in all monitored countries of EU-15 in the evaluated period. The highest growth dynamics is reported by the Netherlands - from 116.2 applications per million inhabitants in 2000 to 198.5 applications per million inhabitants.
7. Of the monitored new member countries, the numbers of patent applications grew in Hungary and Poland, while in others they stagnate or decline.
8. The countries having a high number of applications and granted patents stand also at the forefront of evaluation of the overall competitiveness (see Chapter F).

Source: European Patent Office Yearbooks, 2000 to 2004, Section of Statistics – total numbers of applications; Research and Development Council – conversions to one million inhabitants according to Eurostat/U.S.Bureau of the Census; June 2004

5 Main Science and Technology Indicators (MSTI), OECD.

E.5 Patents granted by EPO (number of patents per one million inhabitants)

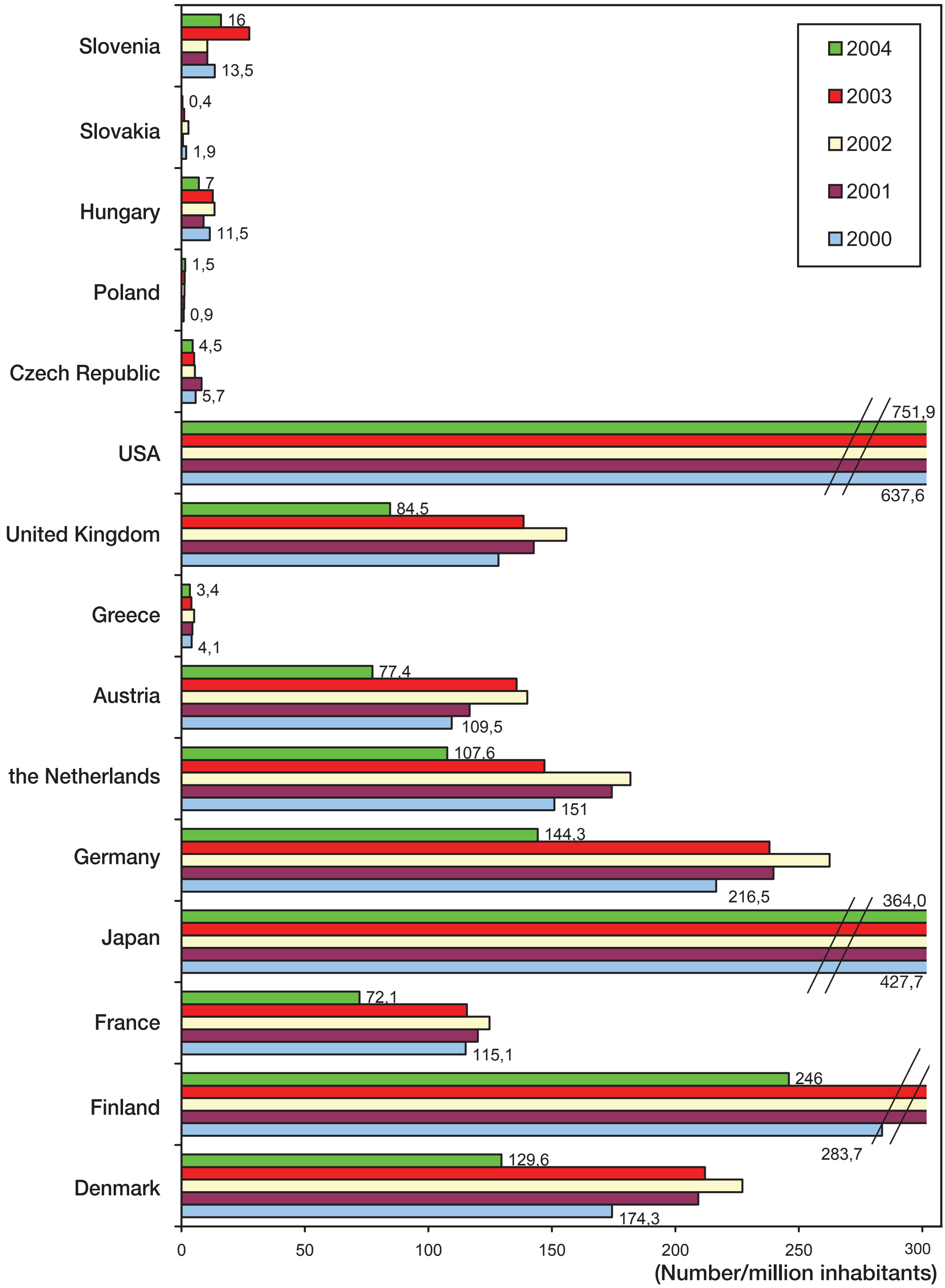


Source: European Patent Office Yearbooks, 2000 to 2004, Section of Statistics – total numbers of applications; Research and Development Council – conversions to one million inhabitants according to: Eurostat/U.S.Bureau of the Census; June 2004

Commentary:

1. In general, the numbers of patents actually granted at EPO are in compliance with the numbers of patents applied. Basically the same is also the ranking of countries. With the exception of 2000, Finland takes first place in all other years of the monitored period, followed by Germany on second place. Finland got over the level of 100 granted patents per million inhabitants in 2000 (115.1) and in 2004 (122.5); it approached this level in 2003 (99.1).
2. The new EU Member States and Greece again significantly lag behind the monitored economically advanced countries; the same situation like with the number of patent applications. Slovenia reports the most granted patents out of the new EU Member States (10.5 patents/ million inhabitants in 2004), followed by Hungary (3.4 patents/million inhabitants 2003). With the exception of Poland and Slovakia, all monitored new EU Member States report more granted patents than Greece. Considering the very low numbers of patents granted to entities from new Member States it is not possible to make any objective conclusions on the development in the monitored period between 2000 and 2004.
3. After years of steady growth in the number of granted patents between 2000 and 2003, most EU-15 countries experienced a slight decrease in 2004.

E.6 Patent applications filed with USPTO (number of applications per one million inhabitants)

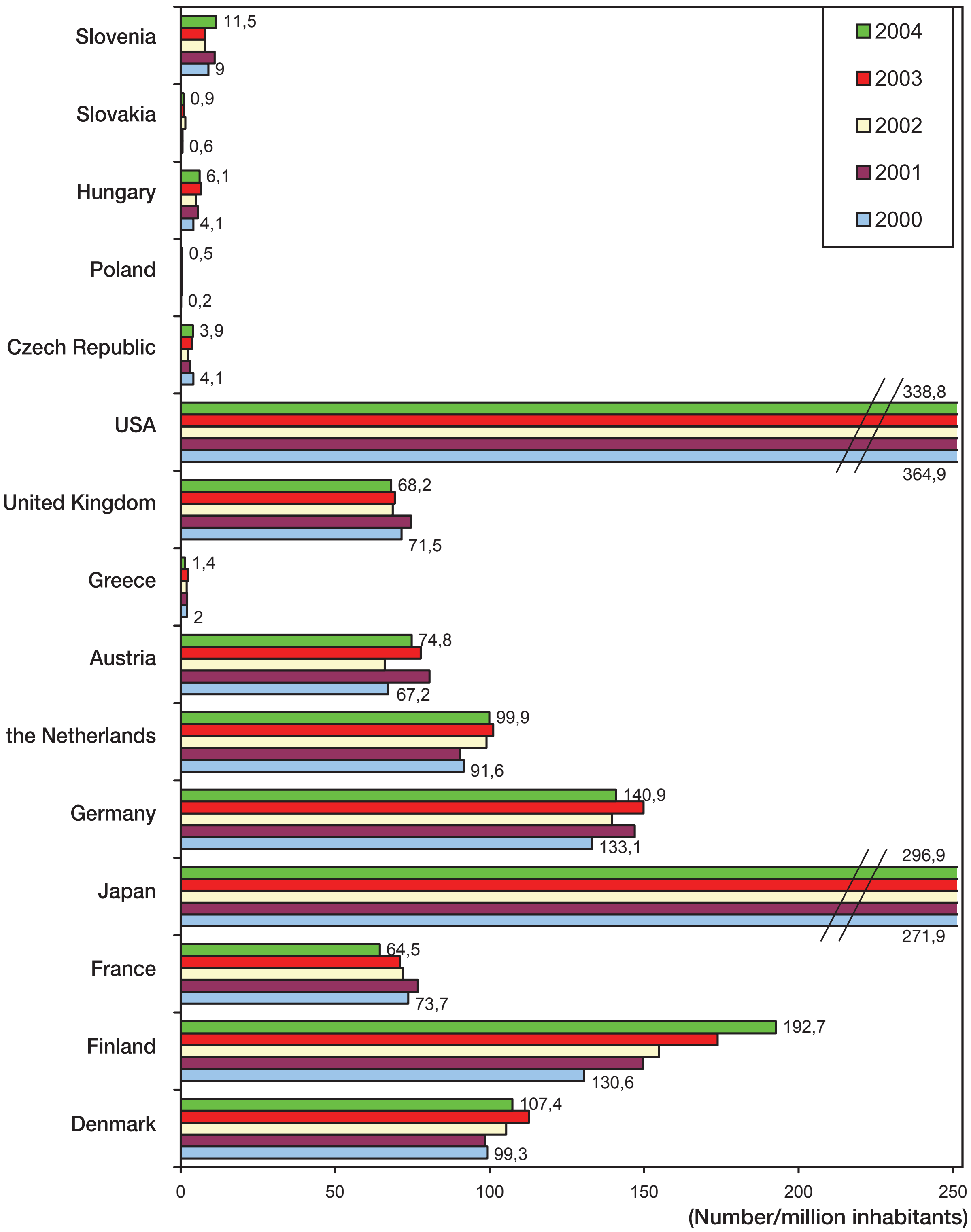


Source: Number of granted patents according to the United States Patent and Trademark Office "Performance and Accountability Report Fiscal Year 2004". Research and Development Council – conversions to one million inhabitants according to Eurostat/U.S.Bureau of the Census; June 2004

Commentary:

1. Data for 2004 are only preliminary. Data for 2000–2002 slightly differ from data given in the 2004 R&D Analysis. Data for 2003 were mostly increased against data in the 2004 R&D Analysis.
2. The relative numbers of patents applied through USPTO by applicants from the monitored countries can be interpreted in the main similarly to the patent applications with EPO. The economically advanced countries dominate. As expected, the applicants from the United States stand at the forefront (applications with the national patent office) with 751.9 applications/million inhabitants in 2004, followed by Japan with 364 applications/million inhabitants in 2004. In addition, more than 110 applications/million inhabitants are reported by Finland, Germany, Denmark, and the Netherlands.
3. Slovenia is the best among the monitored new EU Member States with 16 patent applications/million inhabitants in 2004, followed by Hungary with 7 applications/million inhabitants and the Czech Republic with 4.5 patents/million inhabitants.
4. With the exception of USA and Slovenia, all monitored countries experienced a decrease in the number of patent applications in 2004 against 2003. Particularly significant decrease in the number of applications took place in France, Germany and Austria. It can be, however, expected that when put more precisely, the numbers of patent applications in 2004 will be higher. Similar increase in the final number of patent applications against the preliminary figures took place also in 2003 (see also point 1 of the Commentary).

E.7 Patents granted by USPTO (number of patents per one million inhabitants)



Source: Number of granted patents according to the United States Patent and Trademark Office "Performance and Accountability Report Fiscal Year 2003". Research and Development Council – conversions to one million inhabitants according to Eurostat/U.S.Bureau of the Census; June 2004

Commentary:

1. Data for 2004 are only preliminary. Data for 2000–2003 slightly differ from data given in 2004 R&D Analysis.
2. The numbers of patents granted by USPTO can be to a certain extent interpreted similarly to the numbers of patent applications through USPTO. Maybe only the ratio of patents granted to patents applied is more favourable for the best European countries than for USA and Japan, being due, inter alia, to the fact that only pre-selected and pre-examined inventions are applied in abroad.
3. Finland was dominant among the monitored European countries throughout the whole period between 2000 and 2004 (with 192.7 granted patents/million inhabitants in 2004), followed by Germany and Denmark.
4. Slovenia is again the most successful of the new EU Member States, followed by Hungary and the Czech Republic. In the number of granted patents these three countries attain better results than Greece.
5. The rise in the number of patents having been granted to Finnish entities is very dynamic; from 130.6 patents/million inhabitants in 2000 to 192.7 patents/million inhabitants in 2004. In other monitored countries of EU-15 the rise is only a moderate one, in case of France and United Kingdom the numbers went down.

F. Competitiveness, innovation

In recent years, the importance of research, development and innovation for maintenance and development of competitiveness of both enterprises and national economies has been constantly growing. This is, inter alia, evidenced by the Lisbon strategy updating and preparation of national reform programmes, preparation of new EU framework programme "Competitiveness and Innovation", and relevant concept and strategic documents discussed by the Czech government in 2005 – "Strategy of Economic Growth of CR" and "National Innovation Policy of CR for 2005-2010".

The multicriterion evaluations of competitiveness of national economies resulting in compilation of various top lists of countries are intended mostly for the needs of foreign investors (telling them where to invest), but at the same time they represent for each country a sort of label for perceiving its credibility, reputation and willingness to conform to the global economy rules. Such evaluations establish the competition of the states in favour of the investing economic subjects.

Following two regular annual multicriterion evaluations of competitiveness are the most renowned in the world: Global Competitiveness Report published jointly by the World Economic Forum and Harvard University, and World Competitiveness Yearbook published by the International Institute for Management Development (IMD) in Lausanne.

The evaluations are partly based on "hard" data taken from the international, national and regional statistics and partly on "soft" data acquired from questionnaire surveys (respondents being the representatives of top management of companies active in a particular country, selected experts). Soft data, the share of which rises with the growth of indicators used for evaluation, report basically on the perception of a certain aspect of competitiveness by particular respondents. The risks of distortion lie particularly in the fact that each respondent evaluates the competitiveness of only one country. There can be various reserves as to the evaluation, but it must be taken into account that this way the Czech Republic is perceived and evaluated abroad.

Certain problem of time series applied is that over the last few years both the numbers of monitored countries and numbers of ascertained and measured criteria (indicators) have been gradually enlarged.

In the long term the Czech Republic finds itself on a dividing line between the developed and developing countries. Its position had been moderately rising until 2002, but then it declined in 2003. This is to a certain extent caused also by an ever-growing share of "soft" data which depends on the degree of criticalness applied by respondents in a respective country. The position of Czech Republic is favourably influenced by technological level of its economy and macroeconomic indicators, while down to lower places it is pulled primarily by functioning and strategy of business and particularly unfavourable perception of the quality of public institutions, connected also with the image of massive proliferous corruption.

A certain form of evaluation of competitiveness in a selected area represents the evaluation of the innovation efficiency and innovation potential of national economies of EU Member States and Candidate Countries (European Innovation Scoreboard).

The structure of the chapter is similar to the 2004 R&D Analysis. In addition, the chapter newly includes data on use of venture capital. In the last year's analysis this issue occupied the separate chapter F.

Following documents were used for its compilation:

- Global Competitiveness Report 2004–2005, document for World Economic Forum (WEF);
- World Competitiveness Report 2004–2005, document of the Swiss Institute for Management Development (IMD);
- European Innovation Scoreboard 2004, SEC (2004) 1475, Brussels 19. 11. 2004.

F.1 Competitiveness according to the Global Competitiveness Report – for the World Economic Forum

It has been compiled for the World Economic Forum annual meetings since 1979. The compilation of the last issue published in 2005 involved the work of more than 2000 experts from all over the world. For the Czech Republic, the partner organisation is CMC Graduate School of Business in Čelákovice. One hundred and four countries were evaluated. The methodology is a relatively complex one going through a gradual evolution.

The competitiveness is measured by several dozens of criteria in total; the share of survey questions is relatively high.

The Current Competitiveness Index and Growth Competitiveness Index are defined. The total Growth Competitiveness Index is calculated from three component indexes: the public institutions level, the macroeconomic environment level, and the technology level.

The component index of the public institutions level is composed of two sub-indexes: contracts and law – 4 criteria (4 survey questions); corruption – 3 criteria (3 survey questions).

The component index of the macroeconomic environment level is composed of two sub-indexes: macroeconomic stability – 7 criteria (2 survey questions, 5 quantitative figures), government waste – 1 criterion (1 survey question); the component index of the macroeconomic environment level also includes the country's investment rating as of March 2004.

The component index of the technology level is composed of three sub-indexes: innovation – 6 criteria (4 survey questions, 2 quantitative figures); information and communication technology (ICT) – 10 criteria (5 survey questions, 5 quantitative figures); technology transfer – 2 criteria (2 survey questions). So the technology level is evaluated by 18 criteria in total.

Countries are divided into two groups: group of "core innovators" reporting more than 15 patents granted by the U.S. Patent and Trademark Office (USPTO) per 1 million inhabitants in 2003; and other countries (with the Czech Republic) that innovate mostly through imported innovations often connected with foreign investments. For each of the above groups the technology index is calculated in a slightly different way. For details on the methodology see HYPERLINK „http://www.weforum.org" www.weforum.org.

F.1.1 Total Growth Competitiveness Index – 2001 to 2004 (rankings in the list of 104 countries[1])

	2001	2002	2003	2004
Finland	1	1	1	1
Denmark	14	4	4	5
France	20	28	26	27
Germany	17	14	13	13
The Netherlands	8	13	12	12
Austria	18	18	17	17
Greece	36	31	35	37
United Kingdom	12	11	15	11
Czech Republic	37	36	39	40
Hungary	28	29	33	39
Poland	41	50	45	60
Slovakia	40	46	43	43
Slovenia	31	26	31	33
USA	2	2	2	2
Japan	21	16	11	9

1 In 2001 and 2003 the number of evaluated countries was smaller; 102 countries in 2003

Commentary:

1. The winners are the same throughout the whole evaluated period: 1. Finland; 2. USA. There occurred no substantial changes in most of the monitored countries. The gradual and marked improvement shows Japan, from 21st place in 2001 to 9th place in 2004. The position of Hungary has been getting gradually worse; from 28th place in 2001 to 39th place in 2004. Poland has experienced the largest change from 45th place in 2002 to 60th place in 2004.
2. The evaluation of the Czech Republic remains nearly the same; it is moving with a tendency to decrease slightly within the range from 36th place in 2002 to 40th place in 2004.
3. Slovenia is the best among the monitored countries that became the EU members in 2004 (33rd place), followed by Hungary (39th place) and the Czech Republic (40th place). With the exception of Slovakia, the positions of all monitored new Member States worsened in 2004 against 2003.

F.1.2 Total Growth Competitiveness Index and component indexes in 2004 (rankings in the list of 104 countries)

	Total Index	Public Institutions	Macro-economy	Technology
Finland	1	3	3	3
Denmark	5	1	4	6
France	27	25	25	30
Germany	13	11	26	12
The Netherlands	12	13	7	16
Austria	17	15	10	22
Greece	37	44	31	38
United Kingdom	11	7	8	18
Czech Republic	40	51	41	19
Hungary	39	37	55	29
Poland	60	80	51	45
Slovakia	43	49	54	28
Slovenia	33	31	39	26
USA	2	21	15	1
Japan	9	16	29	5

Commentary:

1. Total index is determined from three component indexes of “public institutions”, “macroeconomy” and “technology”.
2. In 2004, Finland took the third place in all three component indexes and Denmark always took place in the top ten: public institutions – 1st place; macroeconomy – 4th place; and technology – 6th place.
3. Evaluation according to these three indexes appears to be relatively stable in France, followed by the Netherlands, United Kingdom and Austria. And on the contrary, great differences are reported by all new EU Member States, with the exception of Slovenia, and surprisingly also by USA and Japan. USA finishing second in total index, and even first in technology index, are taking 21st place as far as the public institutions index is concerned.
4. In the evaluation of the technology level a great weight is given to the indicator of foreign investments. These are relatively high in the Czech Republic and due to them the Czech Republic takes 19th place in the component technology index. USA maintains its leading position in the technology index over the long-term.
5. According to the public institutions index, the winner is Denmark. Out of the monitored countries, the places in the top ten are taken only by Finland (2nd) and United Kingdom (7th). The worst position with a steep decline occupies Poland (from 58th place down to 80th place between the years). In this index, a great weight is given to the survey evaluation of corruption spread in respective countries.
6. According to the macroeconomy index, the best among the monitored countries is Finland (3rd). Places in the top ten are taken also by Denmark (4th), the Netherlands (7th) and United Kingdom. The worst ranked of the monitored countries is Slovakia (50th).

F.1.3 Technology Index and its three sub-indexes in 2004 (rankings in the list of 104 countries)

	Technology (in total)	Innovation	ICT	Technology Transfer
Finland	3	3	5	-
Denmark	6	9	2	-
France	30	20	22	-
Germany	12	10	16	-
The Netherlands	16	15	10	-
Austria	22	16	19	-
Greece	38	28	37	38
United Kingdom	18	14	14	-
Czech Republic	19	43	28	7
Hungary	29	35	34	10
Poland	45	31	44	41
Slovakia	28	44	40	2
Slovenia	26	23	26	46
USA	1	1	7	-
Japan	5	4	15	-

Commentary:

1. Technology index is evaluated by three sub-indexes: innovation, information and communication technology – ICT and technology transfer. The transfer technology sub-index, given mostly by the volume of foreign investments in a particular country, is evaluated only for countries reporting less than 10 patents granted by the U.S. Patent and Trademark Office (USPTO). Out of the monitored countries this index is determined for Greece and new Member States.
2. As far as the innovation sub-index is concerned, USA takes first place. Places in the top ten are occupied by Finland (3rd), Japan (4^{th}) and Denmark (9^{th}). The worst ranked country is Slovakia (44^{th}), with the Czech Republic only one place better (43^{rd}). Slovenia is the best ranking country of the new EU Member States (23^{rd})
3. In the information and communication technology sub-index Denmark is the best country of the monitored ones. Places in the top ten were taken also by Finland (5^{th}) and USA (7^{th} place). Slovakia is again the worst (44^{th}). With its 28th place the Czech Republic is relatively well positioned; of the monitored new EU Member States it was outdone only by Slovenia (26^{th})
4. In the technology transfer sub-index being basically determined by the amount of direct foreign investments, Slovakia (2^{nd}) is the best one of the evaluated countries, followed by the Czech Republic (7^{th}). When compared with 2003, Slovakia took a great leap forward (2003 – 16^{th} place; 2004 – 2^{nd} place). The Czech Republic went down from 5th place in 2003 to 7th place in 2004.

F.2 Competitiveness according to the World Competitiveness Yearbook 2004 of the Swiss IMD

The Swiss International Institute for Management Development (IMD) evaluated the competitiveness of 60 countries and regional economies by more than 320 criteria arranged into four blocks: economic performance – 83 criteria; government efficiency – 77 criteria; business efficiency – 69 criteria; infrastructure – 94 criteria. When compared with the competitiveness evaluation for the World Economic Forum, the Swiss IMD institute uses more quantitative criteria; nevertheless the share of survey "soft" data in evaluation is relatively high.

The infrastructure is divided into five sub-groups: basic infrastructure; technological infrastructure; scientific infrastructure; health and environment and education.

The infrastructure of science is measured by 21 criteria (17 quantitative; 4 survey questions); technological infrastructure has 22 criteria (18 quantitative; 4 survey questions). For the details on methodology see HYPERLINK „http://www.imd.ch/wcy/tour" www.imd.ch/wcy/tour.

The Institute cooperates with research workplaces in 60 countries and regions worldwide. In the Czech Republic it cooperates with CERGE-EI – the joint workplace of the Charles University in Prague and Economics Institute of the Academy of Sciences of the Czech Republic.

F.2.1 Total competitiveness (rankings in the group of 60 countries[1])

	2001	2002	2003	2004	2005
Finland	5	3	3	8	8
Denmark	15	6	6	7	7
France	25	25	23	30	30
Germany	13	17	20	21	21
The Netherlands	6	4	13	15	15
Austria	14	15	14	13	13
Greece	31	36	42	44	44
United Kingdom	17	16	19	22	22
Czech Republic	35	32	35	43	43
Hungary	30	30	34	42	42
Poland	47	45	55	57	57
Slovakia	41	38	46	40	40
Slovenia	38	35	40	45	45
USA	1	1	1	1	1
Japan	23	27	25	23	23

1) 60 countries were evaluated only in 2004 and 2005; in the previous years the numbers were smaller.

Commentary:

1. IMD is arriving at somewhat different results – other ranking of countries – than experts for the World Economic Forum meetings. In all five years of evaluation, Finland was in the top ten – in 2002 and 2003 on the third place, in 2004 it went down to the eighth place and remained there also in 2005. At the forefront there is – like in the evaluation for the World Economic Forum - Denmark, with the exception of 2001 (15th place), in 2004 and 2005 it took the seventh place.
2. In comparison with the evaluation made for the World Economic Forum, changes in the rankings between individual years are significantly less marked.
3. IMD also differs in evaluation of the position of Japan. Experts for the World Economic Forum arrived at a conclusion on a gradual marked improvement of its total competitiveness; in 2004 already on the ninth place. In the opinion of IMD this improvement is very slow it represents, rather stagnation on 23rd place.
4. The monitored new EU Member States report a slightly different ranking against the evaluation for the World Economic Forum. In 2005, Slovakia held the best position among the monitored new member states (40th), closely followed by Hungary (42nd) and the Czech Republic (43rd), with Poland being the worst ranking (57th). With the exception of Slovakia, all monitored new member states experienced a significantly worsening of their positions between 2002 and 2005.

F.3 European Innovation Scoreboard

This Scoreboard is published annually by the European Commission. The Scoreboard and its methodology were developed on the grounds of the European Council request announced on the Lisbon spring meeting in 2000. It should contribute to the so called open method of coordination of national policies within EU. The European Innovation Scoreboard is an effective tool for benchmarking innovation policies.

The methodology is going through gradual adaptations. In 2003, the EU-15 Member States, Candidate and Associated Countries, USA and Japan were evaluated by means of 28 indicators divided into four basic groups. The evaluation was made for individual indicators and their trends; measured was also the total innovation index and its trends. Basically same was the method of evaluation in 2004; with 22 indicators. Excluded were independent indicators on innovation in small and medium-sized enterprises (SMEs) in services in the group "Transmission and application of knowledge". Data on innovation in services were included in data on innovation in manufacturing. The indicator of share of SMEs with non-technology innovation was added. Similar consolidation took place in the group "Innovation finance, outputs, markets". In addition, the indicators of increases in the number of SMEs in manufacturing and services were excluded.

Values of most of the indicators were for 2003. Some countries did not have all indicators available.

The target is not to determine the ranking of countries, but to search for the causes both of success and backwardness, and ways for applying the best approaches while respecting the specificity of each country.

The following table gives four groups of indicators used for 2004 evaluation.

Human Resources	Knowledge creation	Transmission and application of knowledge	Innovation financing, outputs, markets
New Science&Engineering graduates	Public R&D expenditures	SMEs innovating in-house (manufacturing and services)	High-tech venture capital investment
Population with tertiary education	Business expenditure on R&D	SMEs involved in innovation co-operation (manufacturing and services)	New capital raised on stock markets
Participation in life-long learning	EPO high-tech patent applications	Innovation expenditures (manufacturing and services)	Percentage of "new to market" product sales (manufacturing and services)
Employment in medium-high and high-tech manufacturing	USPTO high-tech patent applications	SMEs involved in non-technology innovation	Percentage of "new to firm" product sales (manufacturing and services)
Employment in high-tech services	EPO patent applications		Internet access and use
	USPTO patent applications		ICT expenditures
			Percent of manufacturing value-added from high technology[a])

The meaning of indicators for individual groups of indicators is mentioned below. For precise definitions and explanation of methodology see http://trendchart.cordis.lu

a) Economic Value Added (EVA) - indicator very frequently used abroad for measuring the performance of enterprises. EVA is defined as a difference between profit/loss after taxation and cost of capital.

F.3.1 Human resources

	EU 15	EU 25	FI	DK	FR	DE	NL	AT	GR	UK	CZ	HU	SK	SI	US	JP
New Science&Engineering graduates [b)]	12.4	**11.3**	**17.2**	12.2	**20.2**	*8.1*	*6.6*	*5.3*	*3.7*	**19.5**	*5.7*	*4.8*	*7.8*	*9.5*	10.2	13.0
Population with tertiary education [c)]	21.8	**20.4**	**33.2**	**31.9**	23.1	24.3	24.9	*16.5*	17.8	**30.6**	12.0	15.4	11.8	17.8	**38.1**	**36.3**
Life-long learning [d)]	9.7	**9.0**	**17.6**	**18.9**	*7.4*	*6.0*	**16.5**	7.9	*3.7*	**21.3**	*5.4*	*6.0*	*4.8*	**15.1**	-	-
Employment in medium-high and high-tech manufacturing[e)]	7.10	6.60	6.85	6.12	6.50	**11.04**	*4.06*	6.21	*1.99*	6.27	**8.71**	8.27	8.00	**8.94**	*4.65*	-
Employment in high-tech services[f)]	3.49	**3.19**	**4.68**	**4.50**	4.07	3.32	3.72	3.32	*1.75*	**4.40**	3.18	3.14	*2.54*	*2.67*	-	-

Bold letters: by more than 20 % better than the EU-15 average
Italics: by more than 20 % worse than the EU-15 average
Normal letters: in the EU-15 average zone, plus minus 20 %

b) Share of Science&Engineering graduates in the overall number of inhabitants of 20-29 years age class (in %)
c) Share of population with tertiary education in the overall number of inhabitants of 25–64 years age class (in %).
d) Share of employees taking part in any life-long learning activity in last four weeks preceding the survey in the overall number of employees of 25–64 years age class (in %).
e) Share in the overall employment in the manufacturing industry (in %).
f) Share in the overall employment in services (in %).

Commentary:

1. In the area of human resources, Finland and United Kingdom have 4 indicators with value by more than 20 % higher than the EU average; Denmark has 3 such indicators, and Slovenia 2.
2. Most S&E graduates are reported by France (20.2 %), closely followed by United Kingdom (19.5 %). More than 30 % of population with tertiary education in 25-64 years age class is in the United States (38.1 %) and Japan (36.3 %), followed by Finland, Denmark and United Kingdom. The highest share of employees participating in the life-long learning is reported by United Kingdom (21.3 %). By more than 20 % higher employment in medium high and high-tech manufacturing than the EU average is in Germany (11.04 %), Slovenia (8.94 %) and the Czech Republic (8.71 %). By more than 20 % higher employment in high-tech services than the EU average is in Finland (4.68 %), Denmark and United Kingdom.
3. Of the monitored four new EU Member States (Czech Republic, Hungary, Slovakia and Slovenia) the above average figure (by 20 % higher than the EU average) is reported only by Slovenia for indicators of life-long learning and employment in the medium high and high-tech manufacturing and the Czech Republic, also for the indicator of employment in the medium-high and high-tech manufacturing.
4. Most indicators with level by more than 20 % lower than the EU-15 average is reported by Slovakia (4 indicators), followed by the Czech Republic and Hungary (3 indicators).

F.3.2 Knowledge creation

	EU 15	EU 25	FI	DK	FR	DE	NL	AT	GR	UK	CZ	HU	SK	SI	US	JP
Public R&D expenditures (% of GDP)	0.69	**0.67**	**1.04**	0.77	**0.83**	0.77	0.79	0.65	*0.43*	0.61	*0.47*	0.66	*0.26*	0.62	**0.86**	0.80
Business expenditure on R&D (% of GDP)	1.30	**1.27**	**2.37**	**1.75**	1.36	**1.73**	1.03	**1.13**	*0.21*	**1.26**	*0.75*	*0.36*	*0.31*	*0.91*	**1.90**	**2.32**
EPO high-tech patent applications[9)]	30.9	**26.0**	**120.2**	**44.9**	31.8	**46.5**	**93.0**	*23.6*	*1.41*	32.0	*0.5*	*4.0*	*0.9*	*3.4*	**48.4**	**40.4**
PTO high-tech patent applications[9)]	11.2	**9.4**	**51.4**	**16.4**	12.1	**15.6**	**15.4**	*6.5*	*0.2*	**14.0**	*0.2*	*0.5*	*0.0*	*1.5*	**76.4**	**75.4**
EPO patent applications[9)]	158.5	**133.6**	**310.9**	**214.8**	147.2	**301.0**	**278.9**	174.8	*8.1*	128.7	*10.9*	*18.3*	*4.3*	*32.8*	154.5	166.7
USPTO patent applications[9)]	71.3	**59.9**	**158.6**	83.8	68.1	**137.2**	**86.6**	65.4	*1.9*	64.5	*3.9*	*4.9*	*1.9*	*8.4*	**301.4**	**273.9**

Bold letters: by more than 20 % better than the EU-15 average
Italics: by more than 20 % worse than the EU-15 average
Normal letters: in the EU-15 average zone, plus minus 20 %

9) Patent applications (number per one million inhabitants)

Commentary:

1. In the area of knowledge creation, Finland reports all 6 indicators to be higher by more than 20 % than the EU average; Denmark, Germany and the Netherlands have 5 such indicators; USA and Japan 4 indicators. Moreover, Finland (with the exception of all USPTO patent applications and USPTO high-tech patent applications) reaches the highest values with other four indicators of all monitored countries.
2. France reports only one above average indicator, the public R&D expenditures. Other indicators move in the zone of EU-15 plus minus 20 %.
3. In all indicators the Czech Republic and Slovakia lag behind the EU average by more than 20 %; similar situation is in Greece. The most marked backwardness exists in all categories of patents. With the public R&D expenditures, Hungary and Slovenia are on the level of EU-15 plus minus 20 %.

F.3.3 Transmission and application of knowledge

	EU 15	EU 25	FI	DK	FR	DE	NL	AT	GR	UK	CZ	HU	SK	SI	US	JP
SMEs innovating in-house (manufacturing and services)[h)]	32.1	37.1	37.6	*16.1*	29.2	**46.2**	34.1	35.5	*17.5*	22.4	24.6	-	*12.5*	*18.3*	-	-
SMEs involved in innovation co-operation (manufacturing and services)[i)]	7.1	6.9	**20.0**	**15.8**	**9.3**	**9.2**	**9.6**	**8.8**	6.3	7.7	6.2	-	*3.3*	7.6	-	-
Innovation expenditures (manufacturing and services)[j)]	2.17	2.15	2.50	*0.54*	2.53	**2.72**	*1.50*	-	2.08	1.83	*1.07*	*1.40*	-	*1.28*	-	-
SMEs involved in non-technology innovation[k)]		49	47	*26*	*23*	**65**	38	58	**59**	-	*39*	*29*	*10*	**61**	-	-

Bold letters: by more than 20 % better than the EU-15 average
Italics: by more than 20 % worse than the EU-15 average
Normal letters: in the EU-15 average zone, plus minus 20 %

[h)] SMEs – small and medium-sized enterprises.
[i)] Shares of SMEs of a respective category in the overall number of SMEs in manufacturing and services (in %).
[j)] Innovation expenditures in % of all turnovers in manufacturing and services.
[k)] Share of SMEs involved in non-technology innovation in the overall number of SMEs (%).

Commentary:

1. All data come from the third survey on innovations CIS 3 (Community Innovation Survey–3) completed by the European Commission in 2003. Data were published in New Cronos/Science and technology.
2. In the area of transmission and application of knowledge, Germany reports all 4 indicators with values by more than 20 % higher than the EU average; Finland, Denmark, France, the Netherlands and Austria have one such indicator – SMEs involved in innovation cooperation. Among new EU Member States only Slovenia reports an above average indicator – SMEs involved in non-technology innovation.
3. It is surprising that with other three indicators Denmark reports values by more than 20 % lower than the EU-15 average. The Netherlands being top ranked in various evaluations of competitiveness reports below average figure of innovation expenditures in manufacturing and services.
4. For three indicators the Czech Republic reports figures by 20 % lower than the EU-15 average. For the indicator SMEs involved in innovation co-operation the Czech figure is only average.

F.3.4 Innovations: finance, outputs, markets

	EU 15	EU 25	FI	DK	FR	DE	NL	AT	GR	UK	CZ	HU	SK	SI	US	JP
High-tech venture capital investment[l)]	50.8	(--)	49.0	**69.8**	57.4	**63.4**	*34.0*	*34.9*	51.5	45.7	*27.8*	*8.0*	50.0	-	-	-
New capital raised on stock markets (% of GDP)	0.025	0.025	**0.065**	**0.063**	0.029	0.021	0.027	*0.013*	*0.008*	**0.038**	**0.001**	0.002	0.002	-	0.072	-
Percentage of "new to market" product sales (manufacturing and services)[m)]	5.9	5.9	**14.5**	6.6	5.7	6.2	5.6	4.6	2.9	1.9	7.2	1.4	6.6	5.3	-	-
Percentage of "new to firm" product sales (manufacturing and services)[n)]	17.2	16.9	17.5	13.5	*11.7*	**23.4**	13.8	*13.2*	*8.9*	15.1	7.3	*4.9*	*6.2*	*4.9*	-	-
Internet access and use[o)] 2003 EIS0	0.51	-	**0.76**	**0.93**	0.5	**0.66**	**0.74**	**0.68**	*0.05*	0.53	*0.13*	-	-	0.33	0.73	**0.88**
ICT expenditures (% of GDP)	6.2	(--)	6.6	6.5	5.9	6.1	7.1	6.1	5.0	**7.5**	**9.2**	**9.4**	**8.9**	6.8	6.3	6.1
Percent of manufacturing value-added from high technology[p)]	14.1	12.7	**24.9**	15.0	**18.3**	11.9	12.1	11.5	*6.3*	**18.8**	*7.1*	16.0	*5.2*	13.3	**23.0**	**18.7**

Bold letters: by more than 20 % better than the EU-15 average
Italics: by more than 20 % worse than the EU-15 average
Normal letters: in the EU-15 average zone, plus minus 20 %

[l)] Share in the overall venture capital investments (v %).
[m)] Share of "new to market" product sales in the overall manufacturing and services turnover (in %).
[n)] Share of "new to firm" product sales in the overall manufacturing and services turnover (in %)
[o)] Composite indicator: of share (%) of households connected to Internet in the overall number of households (accesses) and of share (%) of SMEs with own web page in the overall number of SMEs (use).
[p)] Share in the overall manufacturing value added (in %). Economic Value Added (EVA) - indicator very frequently used in abroad for measuring the performance of enterprises. EVA is defined as a difference between operations profit/loss after taxation and cost of capital.

Commentary:

1. **The area of innovation finance, innovation outputs and innovation markets is measured by 7 indicators; last year there were 11 indicators. Indicators for services were consolidated with manufacturing indicators. Excluded were indicators of increases in the number of SMEs in manufacturing and services. Data for most of the indicators were obtained by the above survey of the European Commission in enterprises. Data on the venture capital investments were obtained from the interest associations of venture capital companies.**
2. **Like in the previous two areas Finland has the best results. For four out of 7 indicators, Finland reaches values by more than 20 % higher than the EU-15 average. Denmark, Germany and United Kingdom exceed this limit with 3 indicators.**
3. **For all countries the values are given for the indicator of information and communication technologies (in % of GDP). Above average values are accomplished by Hungary (9.4 % of GDP), the Czech Republic (9.2 % of GDP) and Slovakia (8.9 % of GDP). For the Internet assess and computer use data are absent for Hungary and Slovakia.**
4. **The highest share of manufacturing value-added from high technology is reported by Finland (24.9 %) and USA (23.0 %). Higher shares than 18 % report United Kingdom, Japan and France. Slovenia (13.3 %) is the best among the new Member States. The Czech Republic with share of 7.1 % does not reach the EU-15 average minus 20 %.**

F.3.5 Comparison with the EU-15 average

	Number of measured indicators	Number of indicators better than EU-15 plus 20 %	Number of indicators in zone EU-15 plus or minus 20 %	Number of indicators worse than EU-15 minus 20 %
Finland	22	15	7	0
Denmark	22	11	10	1
France	22	5	14	3
Germany	22	13	7	2
The Netherlands	22	7	11	4
Austria	21	2	11	8
Greece	22	1	5	16
United Kingdom	21	8	11	2
Czech Republic	22	3	2	17
Hungary	19	1	5	13
Slovakia	20	1	4	15
Slovenia	20	3	7	10
USA	13	9	3	1
Japan	11	7	4	0

Commentary:

1. This table is a certain recapitulation of information in the previous four tables F.3.1 to F.3.4. Four columns for the evaluated countries show the overall numbers of measured indicators, numbers of indicators being better by more than 20 % than the EU-15 average, numbers of indicators in the zone of the EU-15 average plus minus 20 % and numbers of indicators being worse by more than 20 % than the EU-15 average.
2. More than half of indicators higher than the EU-15 average plus 20 % is reported by Finland (15 out of 22) and Germany (13 out of 22). For USA and Japan significantly fewer indicators were evaluated. Both countries, however, report more than half of above average indicators - USA (9 out of 13) and Japan (7 out of 11).
3. Very low numbers of above average indicators are reported by all new EU Member States and Greece: Slovenia 3 out of 20 and the Czech Republic 3 out of 22. The same applies also to indicators in the zone of the EU-15 average plus minus 20 %. The numbers of indicators worse than the EU-15 average minus 20 % are very high with the new Member States – the Czech Republic (17 out of 22), Slovakia (15 out of 20) and Hungary (13 out of 19).

F.4 Use of venture capital for business development

In 2004 R&D Analysis, the venture capital issue was compiled into a separate chapter. Two indicators were evaluated in tables and commentaries:

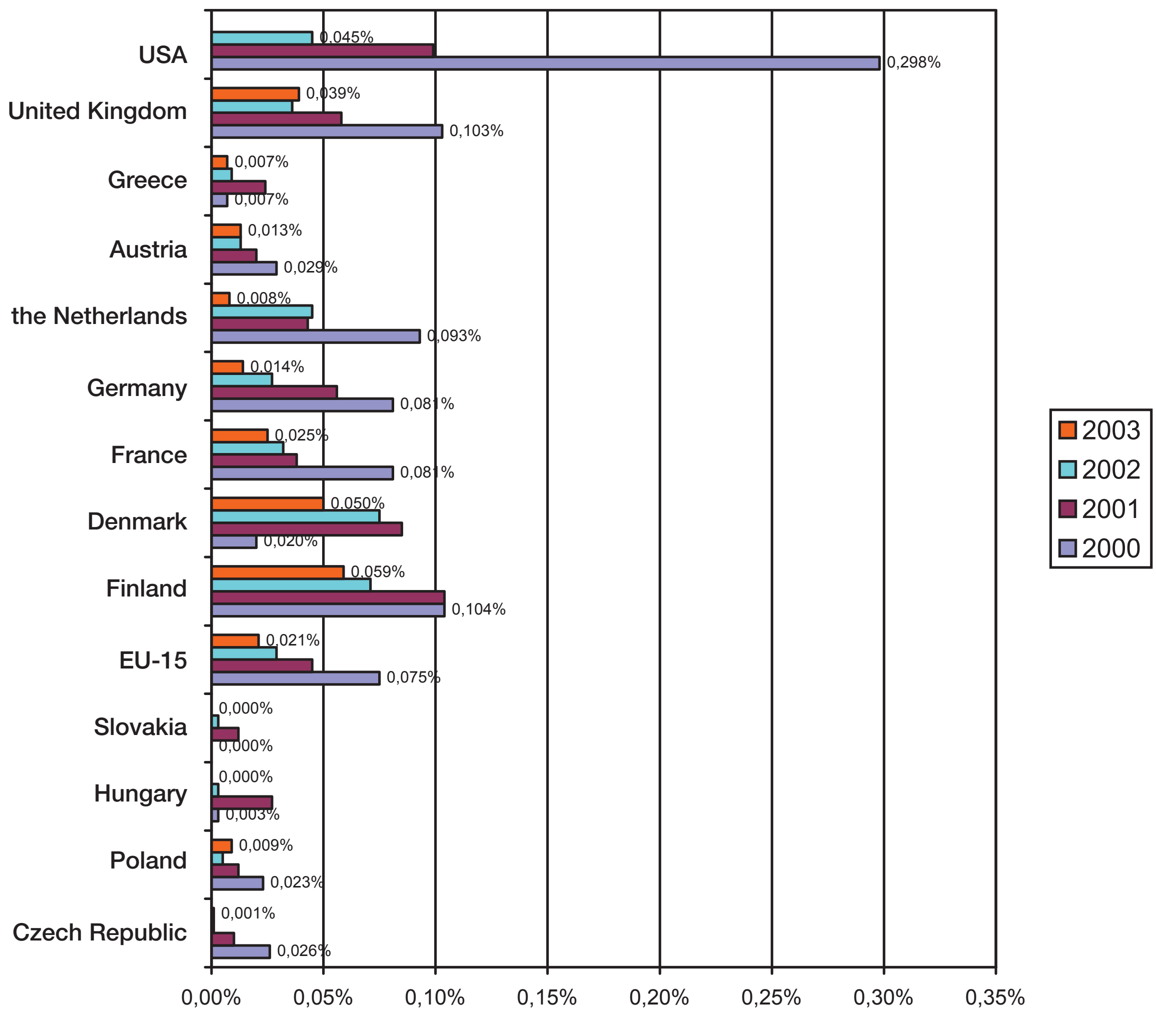
- Use of venture capital for early stages of business (establishment of new enterprises and their early development) between 1998 and 2002 (% of GDP);
- Use of venture capital for expansion stages between 1998 and 2002 (% of GDP).

Despite all efforts made by the EU bodies, the venture capital investments into the seed and start up phases remain in decline, while investments into expansion phases rather stagnate after their decrease in 2000. In the 2005 R&D Analysis, both indicators of the venture capital use are included as a part of the chapter "Competitiveness, innovation". Data for 2003 are available for evaluation as they are the last published data.

The following definition of the term venture capital is taken from the 2004 R&D Analysis.

Various **definitions of venture capital** usually agree on its common definition to be a tool for financing enterprises (companies) not publicly traded on stock markets by form of investments into creation or increase in their basic capital. This financing provides capital necessary for starting up the activity, its development, expansion or buyout of the whole company. Venture capital as strictly defined includes the investments of initial capital into the seed and start up phases of the firm and capital investments into the expansion phase. The venture capital investors search for new companies and new business activities promising considerable increase in the value of the invested means in the future, even when their financing is risky. These new companies are established mostly in high-tech industries and in the knowledge-intensive sectors of economy. Together with funds making possible the implementation of new ideas and further growth, the venture capital investor brings also know-how and management support. The venture capital investors are mostly the venture capital funds.

F.4.1 Use of venture capital for early stages of business (% of GDP)

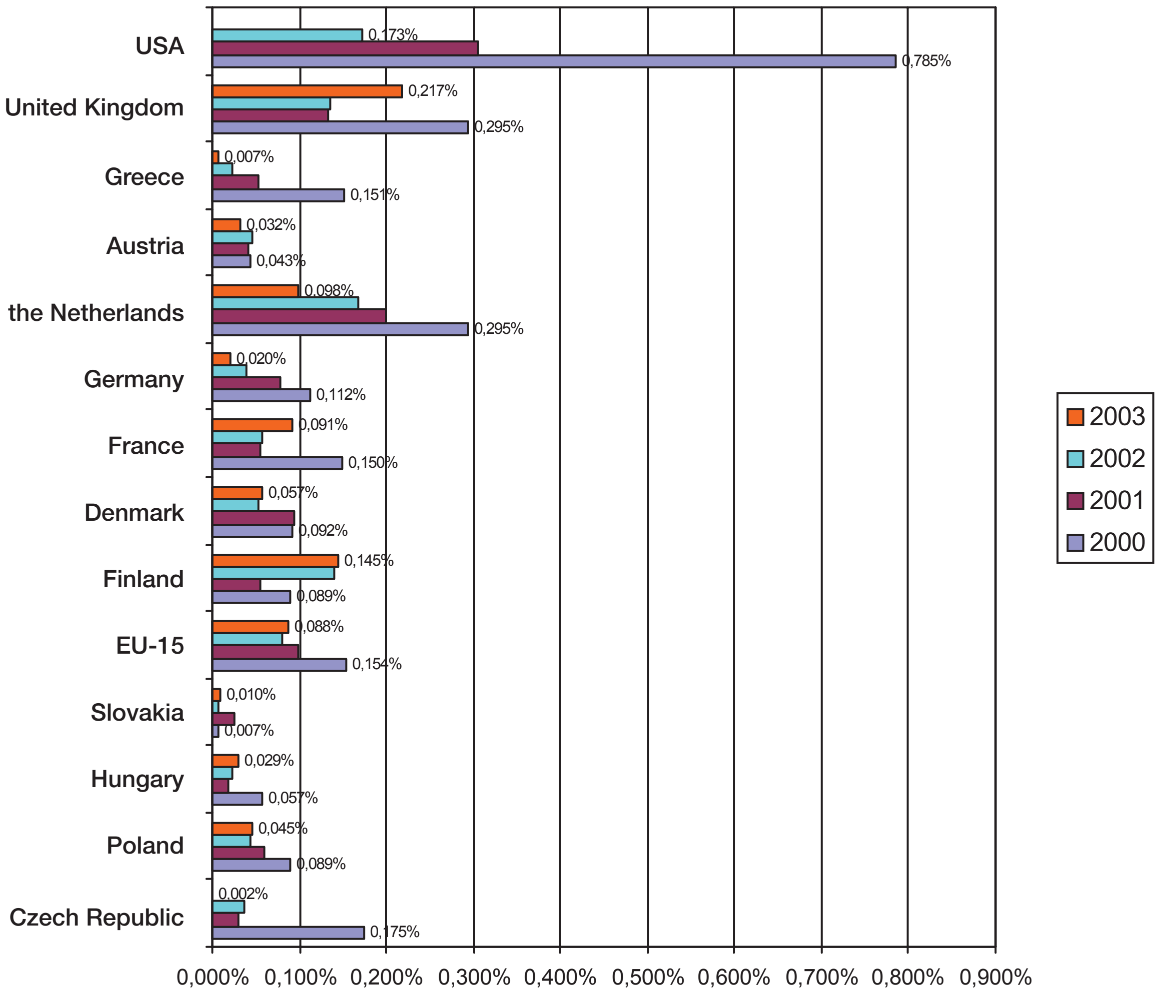


Source: Eurostat; original source: EVCA, Price Waterhouse Coopers

Commentary:

1. In all monitored countries the investments of venture capital into early stages of business declined during the period under review; in new EU Member States down to zero or values close to zero. A massive decline was experienced also in the United States, from nearly 0.3 % of GDP in 2000 to 0.045 % of GDP in 2002. Data for venture capital investments in USA for 2003 are not available.
2. The highest share of use of venture capital in the early stages of business among the monitored countries is reported by Finland (0.059 % of GDP in 2003) and Denmark (0.05 % of GDP in 2003).
3. Lowering of venture capital investments into early stages of business is evidently connected with the so called "crisis of new economy" at the turn of millennium. The decline confirms also the opinions of representatives of funds and venture capital companies about the risk being too high in the early stages, with mostly limited amount of necessary capital.

F.4.2 Use of venture capital for expansion stages (% of GDP)



Source: Eurostat; original source: EVCA, Price Waterhouse Coopers

Commentary:

1. Though the venture capital investments into business expansion are higher than into early stages, also this area went through an overall decline in the volume of investments in the monitored period when compared with the year 2000, mostly followed by stagnation.
2. The highest share of use of venture capital among the monitored countries is reported by United Kingdom (0.217 % of GDP in 2003). After decline in 2001 and 2002, the venture capital investments returned to the level of 2000. Data for venture capital investments in USA for 2003 are not available; between 2000 and 2002 the investments significantly declined from 0.785 % of GDP in 2000 to 0.173 % of GDP in 2002.
3. Eleven out of 13 monitored countries and EU-15 as a whole experienced more or less decline in venture capital investments when compared with 2000. Venture capital investments rose only in Finland (from 0.089 % of GHP in 2000 to 0.145 % of GDP in 2003) and Slovakia.

4. Significant decline in venture capital investments into business expansion took place in the Czech Republic (from 0.175 % of GDP in 2000 to 0.002 % in 2003). In 2000, the Czech Republic occupied the fourth place among the monitored countries. The level of venture capital investments was higher than in the EU-15 as a whole. In 2003, the Czech Republic was rated last among these countries.
5. The venture capital investments in the Czech Republic are aimed at later stages of company development and into traditional industries. The main barriers are the unfavourable legal and tax environment, small market in high-tech business and companies with little ability to attain fast growth.
6. The activities of the so called "business angels" investors are only minimal in the Czech Republic; pooling of these investors for the purpose of joint large investments is absolutely lacking.

G. Implementation of the National Research and Development Policy

By its Resolution No.5 of 7 January 2004 the Government approved the National Policy of Research and Development of the Czech Republic for the years 2004 – 2008 (NR&DP). This policy set basic thematic and system research priorities, as well as the main drawbacks in this area, and indicated instruments and measures for its implementation. It was being established in conditions when the Czech Republic, as a country acceding to EU, was undertaking many binding tasks at fulfilment of the Lisbon strategy through the Barcelona objectives. The most crucial of these objectives, which should guarantee the growth of competitiveness while maintaining the social cohesion, was to secure the increase of research and development investment to 3 % of GDP by 2010; of this 1% should come from public resources and adequate framework conditions should motivate private investment in research in the remaining amount, i.e. 2 % of GDP.

The Czech Republic is being incorporated into the implementation process in the time of the ongoing public finance reform that made itself felt in a relatively sober characteristic of starting points and medium term horizons of Czech research; the reason being especially the restriction of public spending. Besides the undoubted necessity to define priorities and support them with a view to maintain a high-quality and applicable research at least in some areas, the national policy emphasised understandably also the framework actions for ensuring especially 2 % of GDP from private resources, which is a measure relatively independent on the state budget. The main framework actions leading to fulfilment of the given targets were then described in the particular paragraphs of the National Research and Development Policy.

Tasks resulting from NR&DP were developed in following materials

(for their characteristics see the text below):

- National Research Programme II;
- Accession of CR to the EC material: Investing in Research: an action plan for Europe;
- Evaluation of the indirect R&D support instruments;
- Bill for act on public research institutions;
- Bill for act on human embryonic stem cell research;
- Operational Programme Human Resources Development (OP HRD) - Measure 3.2:
Promotion of tertiary education, research and development;
- Research Ethics Framework;
- Departmental concepts of research and development;
- Regional concepts of research and development;
- Long-term main research directions;
- Evaluation of research and development and its results.

Several working groups were established on MŠMT to support the NR&DP implementation:

- Council of the National Research Programme;
- Working Group for Coordination of National Research Programme;
- Working Group for Coordination of Departmental Concepts;
- Working Group for Coordination of Regional Concepts;
- Working Group for Human Embryonic Stem Cell Research;
- Working Group For Preparation of NRP II;
- Working Group for Preparation of Material “Research Ethics Framework”.

In preparation of documents relating to NR&DP, e.g. act on human embryonic stem cell research and Research Ethics Framework, a public discussion took place on the website of MŠMT. The Research and Development Information System was made accessible on the state administration website HYPERLINK „http://www.vyzkum.cz“ www.vyzkum.cz containing the Register of public R&D tenders (VES), Central register of research plans (CEZ), Central register of R&D projects (CEP) and Information register of R&D results (RIV).

At its 2005 Spring session the European Council[1] submitted that competitiveness of EU Member States does not grow at rates as expected and approved the proposals for reviewing and refocusing the Lisbon strategy. The circle of priorities was narrowed, to which the Union is to concentrate. There remain research and development, innovation support and creation of an investor-friendly environment. At present, the efforts of the European Council are directed towards rapid takeoff of the revised Lisbon Strategy

The National Research and Development Policy must respond to this development. The Government Resolution No. 661 of 1 June 2005 on the long-term main directions of research and development imposed on the minister of education, youth and sport to submit to the Government the updated NR&DP with projected changes that took place in research and development during 2004-2005 both in the Czech Republic and the European Union.

Characteristics of materials based on NR&DP

National Research Programme II

The National Research Programme II (NRP II) implements thematic and system priorities of NR&DP through thematic and cross-sectional programmes. The preparation, management and implementation of NRP II are governed by Sections 4 to 6 and Section 33 of Act No. 130/2002 Coll. on research and development support and Government Resolution No. 417 of 28 April 2003 approving the accelerated preparation of NRP II. The reason why accelerate the NRP II preparation was the effort to provide enough time for selection of NRP II priorities, thus create conditions for its timely announcement. Because NRP II covered the industrial research as well, the public resources for NRP II were concentrated into the budgetary chapters of MŠMT and Ministry of Industry and Trade (MPO). For NRP II MŠMT partly fulfils the role of a coordinator of this national programme as a whole, and partly the role of one of its providers. MPO is in the position of a provider in compliance with its competences given in Section 13 (f) of Act No. 2/1969 Coll.

The National Research Programme II was put together by competent technical units of MŠMT in collaboration with the Research and Development Council (RDC), which established the evaluation indicators for NRP II. Determination of the thematic contents of individual programme parts was based upon materials prepared by the Technology Centre of AV ČR (TC AV ČR) and Centre for Social and Economic Strategies (CESES-FSV) UK. The professional assistance of the Council of National Research Policy, the professional advisory body for the minister of education, youth and sport proved good at preparation of NRP II. This working group consists of representatives of respective present providers and other institutions (MŠMT, RDC, AV ČR, MŽP, MPO, MPSV, MZ, MZe, MD and MF), as well as representatives of the professional and user spheres (Technology Centre of AV ČR, Association of Research Organisations, Czech Rectors Conference, Council of Universities and Association of Innovative Entrepreneurship).

In the first year of its existence, CZK 935 million is expected to be earmarked for NRP II in compliance with the Government resolution. Only approximately 10% of all public funds is earmarked within NRP II for fulfilment of system priorities. Therefore it is calculated upon the system priorities of NR&DP for 2004 – 2008 being implemented not only by cross-sectional programmes of NRP II, but also by means of other instruments, namely the structural funds and certain departmental programmes. The accession of CR into EU did not change the conditions of the NRP II process in any dramatic way against the previous national programme, because by gradual inclusion into the European Research Area the accession of foreign subjects of research and development into NRP I has been already allowed under certain conditions.

[1] European Council 22 and 23 March 2005 Presidency conclusions 7619/1/05 Rev 1 II. Relaunching the Lisbon Strategy

On January 1, 2007 the contributory organisations in research and development will be transformed into public research institutions. This transformation of contributory organisations should not have any impact on running of NRP II. If necessary, the appropriate contracts and forms for draft projects or project evaluation will be updated during the NRP II process.

The National Research Programme II covers research priorities for 2006–2011. It was adopted by Government Resolution No. 272/2005 of 9 March 2005 and then notified to the European Commission. The programme will start in the course of 2006.

Accession of CR to the EC material: Investing in Research: an action plan for Europe

The NR&DP determined the research and development strategy for our country in the medium-term horizon. It concentrated particularly on setting the national research and development priorities and indicated instruments for their implementation at the national level. It also accepted the international aspects, namely the Lisbon strategy aimed at attainment of a highly competitive economy within EU based on knowledge and capable of steady growth while maintaining the social cohesion. Research and development was marked as a driving force behind this strategy and should be supported more intensively from public and private funds. The Barcelona objectives should be achieved by 2010: at national level 1 % of GDP for public R&D funding and 2 % of GDP for private R&D funding. Besides the Communication of the European Commission “More research for Europe: towards 3 % of GDP“ COM (2002) 499, the most significant document of the European Commission on investing to research supporting the Lisbon strategy is the Communication “Investing in Research: an action plan for Europe“ COM (2003) 226 (hereinafter referred to as the “Action plan for Europe”). This communication contained many actions creating quality framework conditions necessary for establishment of a favourable investment environment in research and development. The Council of the European Union approved the main mission of this action plan in its Resolution of 22 September 2003. By this resolution it urges member states to ensure the fulfilment of concrete actions of the Action plan for Europe. The current national policy has made provisions for many objectives of the Action plan fro Europe and proposed 22 measures applying its strategy to domestic conditions.

The Action plan contains 80 actions in total to support research and development. For successful achievement of its aims it is not necessary to start with all actions immediately. It was, however, necessary to initiate discussion on what are the key actions and determine the way of their implementation.

Through its representatives in the European structures (ECOFIN and Competitiveness Council) the Czech Republic can promote development of financial instruments supporting both directly and indirectly the R&D expenditures. In the light of the Community Support Framework it is necessary to monitor the utilization of operational programmes, namely the Operational Programme Industry and Enterprise (OPIE) and the Operational Programme Human Resources Development (OPHRD) aimed e.g. at regional development of infrastructure, enterprise innovation and establishment of conditions stimulating the labour force mobility within the European Research Area.

The Government approved the accession to the Action plan by its Resolution No. 513 of 26 May 2004. In its Resolution No. 43 of 12 January 2005 the Government approved the priority actions in the accession of the Czech Republic to the document “Investing in Research: an action plan for Europe”, COM (2003) 226 and imposed the enforcement of these actions at the national level.

Evaluation of indirect instruments of R&D support

In conformity with the tasks of NR&DP, MŠMT submitted a study to the Government monitoring the possibilities of introducing indirect instruments of R&D support in the Czech Republic.

The states support the research and development and implementation of its results in the innovation process in various forms, e.g. subsidies to institutions, public tenders for the most successful projects and grants, preferential credits, etc. The direct support of research and development (and innovation) has certain disadvantages, e.g. high administrative demands, necessity to have quality background in the form of R&D policy and sophisticated system of allocation of R&D support. Last, but not least it implies the risk of clientelism. Specific group are the so called indirect instruments of R&D support making possible to individual subjects to use their own sources for R&D support under preferential terms. Their scope is relatively broad and with their properties they may be a suitable complementation to direct support.

The Barcelona criteria specifying the fulfilment of the Lisbon EU strategy envisage that investments in research and development from private sources will be double the amount of support from public funds. In addition to the generally high level of education and research and favourable entrepreneurial climate, the indirect instruments of R&D support (hereinafter referred to as “IIR&D”) are the main motivation for such approach to research and development on the part of private sector.

If the European Union considers IIR&D to be useful and effective means available for the fulfilment of the Lisbon strategy objective, this should apply doubly to the Czech Republic. But the situation in the Czech Republic is specific to a certain extent (low demand for R&D results on the part of industry, low engagement of foreign investors in building R&D capacities in CR, poor orientation of academic sphere to industrially or practically usable R&D results). On the ground of this specific situation, it is possible to consider especially introduction of following IIR&D:

- Certain tax relieves for enterprises investing in R&D (tax relief as a deduction of chargeable R&D cost from more than 100 %, tax credit note). The entrepreneurial subjects show their utmost interest in these instruments and they can be expected to be also the most efficient.
- Special attention would be dedicated to small and medium-sized enterprises, particularly spin-offs or start-ups. These are very rare in the Czech Republic; due to the insufficient private capital (especially with the founding persons) their access to resources is very complicated. At the same time they are natural partners of academic institutions at implementation of R&D results. It is possible to imagine their preferential treatment (against other enterprises), or a special programme for them may be established.
- High support on the part of entrepreneurs was given to instruments supporting by means of tax relieves the cooperation between the industry and academic sphere. This very instrument could help bridge the yawning gap between these two communities and contribute to introduction of high value-added manufacturing.

It can be assumed with a high probability that actions having positive general impact on entrepreneurship (i.e. simplification of tax system, reduction in the corporate income tax) would not stimulate sophisticated manufacturing applying R&D results. By contrast, the indirect instruments for R&D support lead to targeted increase of interest in research, development and innovation and may lay foundations for stable and healthy growth of enterprises.

The Government took cognizance of this study in its Resolution No. 20 of January 5, 2005.

Act on public research institutions

From the long-term view the present form of a contributory research organisation is not suitable for organisations engaged in research and development. Therefore a new legal form – public research institution with full rights of a legal personality, including own assets with conditions set for disposing these assets - was prepared and approved, while maintaining the plurality of legal forms of research institutions.

The transformation of contributory organisations of research and development to public research institutions (PRIs) is to proceed according to similar principles as with the public higher education institutions. PRI is a satisfactory organisational form especially for transformation of those departmental research organisations being state contributory organisations at present. The contributory organisation was drafted as a universal form for state, later statutory founders, for any area (education, culture, health care, social affairs, etc.). Therefore this form cannot be regulated in more details by amendments of current legal regulations and so it is limited in many rights and duties. On the contrary, the public research institution will apply a targeted form enabling more detailed legal regulation for the specific area of research and development.

The aim of the approved regulation is not to transfer all departmental research institutions to the legal form of a public research institution. Contributory organisations with small portion of activity in research and development and certain contributory organisations conducting research ordered mostly as public tenders (results are intended only for the needs of a provider) were not included in the draft act.

Research institutions having at present the form of an organisational body of the Czech Republic cannot be transferred to a public research institution according to the approved act because they do not have legal personality. Legal status of these research institutions can be changed on the assumption that the research institution as an organisational body of the state will be dissolved and the founder will establish another entity with legal personality. The act enables to establish this new legal entity as a public research institution.

The specialities of transformation of institutes of the Academy of Sciences of CR are solved in the approved amendment to Act No. 283/1992 Coll. on the Academy of Sciences of the Czech Republic, as amended by Act No. 220/2000 Coll.; at the same time, the legal status of the Academy of Sciences of the Czech Republic and its institutes is regularized as well. In general, all conditions set for public research institutions will apply to the transformation of the Academy's institutes.

In connection with introduction of a new organisational and legal form into the law of the Czech Republic it is necessary to amend certain related legal regulations. Considering the scope of these amendments, the Government imposes to include them into a separate act.

Act on public research institutions took effect on September 13, 2005 by publication in the Collection of Laws of the Czech Republic (Section 122) under the number 341/2005 Coll.

Bill for act on human embryonic stem cells research

The aim of the act is to guarantee, with respect to the duties of the state, the respect for human dignity and protection of human life already before birth and legally treat the issues of the human embryonic stem cells research. The act prohibits the creation of embryos for research purposes, research on embryos, as well as research on human embryonic stem cells without a clear proof that these embryonic stem cells were extracted from the so called surplus embryos.

The act regulates basic areas related to research on human embryonic stem cells. The act regulates condition for this type of research, conditions for import of the existing human embryonic stem cells and extraction of the human embryonic stem cells from the so called surplus embryos for research purposes. The act lays down not only rights and duties of persons, but also competences of administrative bodies in handling the human embryonic stem cells and their lines (including professional examination of the application for authorization to conduct research and monitoring activity) to ensure adequate protection of embryo and prevent any possible misuse of the process and results of this research. The act lays down offences and administrative torts relating to the object of regulation with possibilities of recourses against prohibited practices within the penal law.

The necessity of legislative treatment of the area of research on human embryonic stem cells is given particularly by absence of any legal rule regulating this part of research in the Czech Republic and demand for implementation of NR&DP for 2004-2008 (specifically the paragraph 122). Since this is a legislative treatment in the area of research as such (not only in medicine, biology, genetics, etc) the responsibility for preparation of the bill for act lays with the Ministry of Education, Youth and Sport (MŠMT) according to Act No. 130/2002 Coll. on research and development support. The factual intention of the act was adopted in the Government's Resolution No. 1102 of 10 November 2004.

The necessity of legal regulation results from the object of this regulation, because the act will solve rights and duties of legal and natural persons in areas that are sensitive both from human and legal views, and the behaviour of competent state bodies will be regulated as well.

The essential reason for adoption of the act is that there are commitments of the Czech Republic arising from international law, which are not being adequately fulfilled at present.

In particular, there is the Convention on human rights and biomedicine (No. 96/2001 Coll. of international treaties), with its Article 18 regulating the area of research on embryosin vitro (it prohibits the creation of embryos for research purposes and allows the research on embryosin vitro only if adequate protection of embryos is ensured).

Among other relevant provisions giving reasons for adoption of this legal regulation there are the provisions of the Charter of Fundamental Rights and Freedoms (hereinafter referred to as the "Charter"), which may be affected, both positively and negatively, by conducting the research. This is e.g. Article 6(1) of Charter saying that human life deserves to be protected already before birth; Article 15(2) guaranteeing the freedom of scientific research; or Article 31 containing the right of every man and woman to health protection.

The resulting shape of factual intention of this act is a moderated regulation admitting the research on human embryonic stem cells. It does not envisage the creation of embryos for research purposes, but only using of embryos created for the purpose of medically assisted reproduction, the reason for creation of which has already passed away. So the purpose of the legal regulation is not to relieve conditions for this already existing type of research, but prevent possible misuse of its results by establishment of a legal framework.

The government bill was passed into second hearing in the Parliament and the Chairman of the Parliament ordered it to be discussed in the Social Policy and Health Committee.

Operational Programme Human Resources Development (OP HRD)
Measure 3.2: Promotion of tertiary education, research and development

OP HRD is one of the programmes of the European Social Fund (ESF). Its basic aim is the labour market based on qualified and flexible labour force. Within the framework of the Human Resources Development Programme in research and development, the projects are promoted of creation and implementation of programmes for further education and qualification raising of staff members of scientific and research institutions in the area of material and financial management, innovative entrepreneurship and entrepreneurship in research, dissemination of research and development results into practice, technology transfer and acquisition of knowledge about intellectual property protection Particularly last two themes are suitable also for final grades of universities with technical, economic and natural science study programmes.

MŠMT is the intermediary subject. At present, 53 projects are being implemented that were selected upon the first call. In the second quarter of 2005, the second call to submit projects was announced.

Research Ethics Framework

In conformity with the trend of the European Commission at creation of the European Research Area (ERA) the demands are growing on research efficiency, research evaluation, decision making on granting public support to research and other fields related to research and its administration. At the same time heavy demands are put not only on skills of research workers and professional approach of research institutions, but also on the ethics of research and research-related areas. Ethical issues of research are solved at the national level. The European Commissioner for Science and Research Janez Potočnik admits the ethic plurality within the European Research Area; drawing up and observance of ethical rules of research and development is the matter of each member country.

NR&DP for 2004–2008 states the improvement in ethical level in research and development, with recommendation for organisations and institutions, which have neither published their codes of ethics nor established ethical commissions so far, to do so. At the same time, NR&DP promised to promote exchange of experiences and knowledge about creation and application of codes of ethics. Also the NR&DP-based concepts often attend to the area of ethics. Therefore a working group was established at MŠMT with the aim to prepare a material concerning the research ethics framework, which would summarize the principal aspects of general ethics in research, and offer them to research institutions through interested state administration bodies as a basis for elaboration or update of their own codes of research ethics. The working group consisted of experts from medical faculties of the Charles University and their hospitals, institutes of the Academy of Sciences of the Czech Republic, departmental research institutes, Institute for the Care of Mother and Child, Technology Centre of AV ČR, Bioethics Commission of the Research and Development Council, University Centre for Bioethics of the Faculty of Medicine of Masarykova University in Brno, and Ministry of Health and its Central Ethical Commission.

The document has drawn upon many national and international sources. It deals only with general aspects of research ethics and certain other areas related to prepared legal rules. Its aim is to set a common framework for elaboration or update of ethical standards at the level of a research institution. To elaborate one complex code of ethics, which would be applicable to all institutions regardless of their professional contents, is practically impossible. In addition, there is a direct link between the general ethical aspects in research and development and special ethical standards applicable only to one particular area (medical research, animal research, defence research, etc.) Therefore the presented material speaks only about common ethical issues, and only generally, to leave a broad space for each research institution to make provision in its code of ethics for its own ethical aspects.

In connection with the actual preparation of the act on human embryonic stem cells research, but also with its possible further utilisation (e.g. in sociology), the material contains also the part on informed consent.

The state administration of research is affected by this ethical framework only very marginally, because the state administration employees are governed especially by the Code of ethics of public administration employees, which was approved by the Government's Resolution No. 270 of 21 March 2001.

Since April 28, 2005 the draft Research Ethics Framework has been subjected to public discussion on the MŠMT (the submitter) web site. Its announcement was advised to representatives of research organisations (Academy of Sciences of the Czech Republic, Council of Universities, Czech Rectors Conference, and University Trade Union). Leading personalities from research took part in the public discussion as well. Their comments were taken into account in the final version of the material.

The Government took full cognizance of this material by its Resolution No. 1005 of 17 August 2005 as of a document, with the assistance of which research organisations are to elaborate their own codes of research ethics.

Departmental concepts for R&D development

NR&DP imposed upon individual departments ministries etc. to produce departmental concepts of R&D development and submit them to MŠMT. The preparation was coordinated by discussing the standard outline of this document. The overwhelming majority of departments funding the research and development activities has sent the development concepts, with the exception of the Ministry of Finance, which does not play the role of a provider, but is an important body in providing particularly an indirect support to research and development and orientation of public support to fulfilment of the Lisbon strategy, i.e. also the R&D support.

Departmental concepts are placed on the MŠMT web site.

Regional concepts of research and development

The regional research and development is assisted by the Bohemian Regional Innovation Strategy (BRIS) for Prague and Pilsen Regions aimed at establishment of favourable conditions for entrepreneurship development and design of a system of services and instruments promoting innovation in the region. Its applicability in other regions is assumed. By this project the Czech Republic joins the network of IREs (Innovating Regions in Europe).

The project of Czechinvest Agency "Clusters" with participation of all regions of CR is co-funded from structural funds and is putting together academic and business subjects with the aim to increase their competitiveness.

Activities are expected to be tailored as a result of the applied Methodology for evaluation of research and development and its results produced according to point II.3 of the Government Resolution No. 644 of 26 June 2004 to evaluation of research and development.

Long-term main research directions

The preparation of the "Long-term main research directions" (hereinafter referred to as "LMRDs") results from Act No. HYPERLINK „/RedirectorSekce.aspx?idsekce=858"130/2002 Coll. on research and development support from public funds and on amendment to certain related acts (Act on research and development support). LMRDs are understood as basic inputs into the National Research and Development Policy, or for preparation of proposals for its amendments. The aim of LMRDs is to define priorities of perspective research directions from the view of their benefits being the most important for economy, its competitiveness and sustainable development of society. This is another attempt in the Czech research and development to propose to the government such themes, which may play a dominant role. Individual LMRDs were worked up by the Technical Commission of the Research and Development Council as the advisory body of the Government. The first set of proposals was finished in mid-2003 and was given to the scientific public for opinions.

The presented set of LMRDs was created according to a common outline and contains seven thematic directions in total: Sustainable Development, Molecular Biology, Energy Resources, Material Research, Competitive Engineering, Information Society and Security Research. LMRDs lay out the most important issues of research, development and related innovation. At the same time, there is no exhaustive list of directions, which will gain the support exclusively; funded will be also other research activities (research plans, grant projects, research for the needs of state administration, etc.) including departmental research, but with LMRDs always standing as a priority.

The Government approved LMRDs by its Resolution No. 661 of 1 June 2005.

Evaluation of research and development and its results

Also the administrative bodies having competencies in research and development must contribute to solving persisting problems of Czech research and development, especially by taking more unified approach to assessment of results at both project and programme levels, on the basis of the generally accepted criteria.

By its Resolution No. 644 of 23 June 2004 the Government approved the document "Evaluation of research and development and its results", on the base of which a detailed "Methodology for evaluation of research and development and its results" was produced by cooperation of RDC and MŠMT. In compliance with this methodology, records created from data outputs of the R&D IS are used for evaluation of research workplaces.

The summary evaluation of results of R&D programmes finished in 2000 – 2003 was approved by the Government in its Resolution No. 432 of 13 April 2005.

H. Evaluation of participation of the Czech Republic in the 6th EU Framework Programme for Research and Development

(This is only a preliminary evaluation presenting the state as of May 31, 2005)

6th Framework Programme (6FP) is aimed, like the previous framework programmes, at targeted research and its priorities are set on the grounds of an extensive discussion on the EU needs. But the Sixth Framework Programme has a new common objective – to contribute to the creation of the European Research Area – ERA. This objective requires developing a common policy of research and development supporting the attainment of the Lisbon strategy targets; to reach the highest degree of competitiveness in the global knowledge-based society of the 21st century by 2010. Therefore, 6FP introduces absolutely new types of projects - integrated projects and networks of excellence making possible the more effective connection of national teams into large research projects and networks being necessary for solution of essential problems. In general, 6FP strives for better utilization of capacities of the European research workplaces, better relationship of national researches and closer cooperation between research funded from public sources and private industrial research and creation of an environment supporting market application of research and development results.

EURATOM programme wishes to attain the above targets particularly in the field of peaceful use of nuclear energy.

The summary budget of 6FP and EURATOM programme after accession of ten new member states in 2004 amounts to EUR 19.1 billion. Its structure is given in Table A. Each priority has its own detailed working programme, which the European Commission (EC) calls for submission of draft projects refer to. Sixth Framework Programme was really launched on December 17, 2002 when first calls were delivered covering nearly the whole spectrum of its priorities.

The amount of the EC contribution to a team participating in the solution of any 6FP project depends on the type of its activity (and moves from 30 % of the overall cost with demonstration activities, 50 % with research activities and up to 100 % for project coordinators or investigators of projects, in which EC has a special interest).

The draft projects submitted mostly by international consortia go through a process of professional evaluation (peer review system), in the course of which an international team of experts classifies the project according to predetermined criteria. The draft projects have a chance to win the EC contribution in the ranking set by the above evaluation. The success of any project is to a great extent supported also by contracting negotiations between the investigating consortium and EC requiring the fulfilment of a whole range of formal requirements; the most important being the conclusion of a consortial contract between the participating teams (on the value of knowledge brought by each team at the beginning of a project, on the funds management in the course of the project solution and particularly on handling with the acquired results). During contracting negotiations the amount of EC contribution is agreed for the participating team to cover its costs at project solution – these funds are marked as the contract amount. Consortia for solution of 6FP projects can be formed without any limitations from teams of the EU-25 states, eight associated countries (Bulgaria, Romania, Turkey, Island, Israel, Lichtenstein, Norway, and Switzerland) and if required by the project solution, a team from any country may participate (with the amount of EC contribution for its participation regulated by special rules).

When evaluating the statistics on the participation of countries in 6FP, it is necessary to bear in mind the factual reporting value of indicators provided by EC. Most often the aggregate number of teams of a particular country that became members of consortia submitting draft projects within a certain programme is mentioned. But more important characteristics of success of a particular country is the aggregate number of its participants in successful contracted projects. This chapter mentions the numbers of participants in contracted projects. The international comparison of EU-

25 countries is then based upon the “number of participants in contracted projects converted to a unit population (1 million inhabitants)”.

It is, however, obvious that the participation in the consortium itself does not reflect the importance of the team’s contribution to the draft project preparation or project solution. The significance of the team’s participation in successful project is then evidenced by the amount of contracted contribution. So the international comparison can be based upon the aggregate support received together by all teams of a particular country in contracted projects. And even here the international comparison needs to express the aggregate contracted support in comparable units. Two indices are used in the chapter: the aggregate contracted support per one research worker (i.e. the aggregate support received by all participants of a particular country divided by the number of research workers of this particular country) and aggregate contracted support of a particular country per its gross expenditure for research and development. Data are taken from the database of contracted projects made available by EC to the national delegates of the Programme Committee of the Specific Programme 1 (see Table A) in July 2005. The overall released financial contributions of EC set forth in the database correspond approximately to one third of the overall budget of 6FP, and therefore the mentioned statistical indices can be considered as characterising the first third of 6FP.

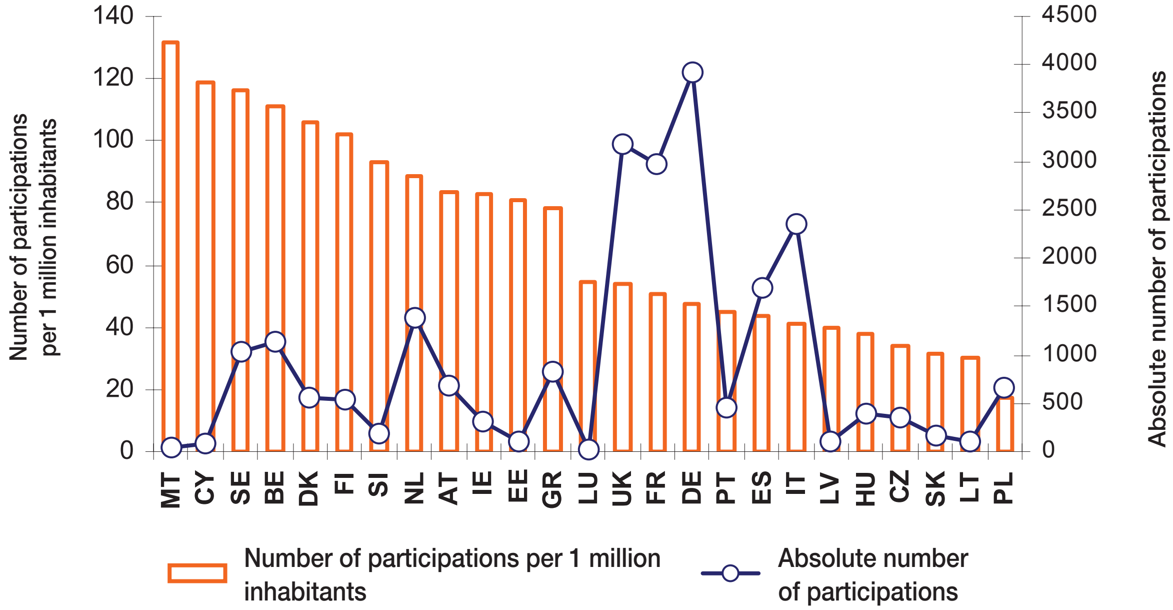
Sources: Database of contracted projects of 6FP, European Commission, Programme Committee SP1, July 2005.

Science and technology in Europe, Statistical pocketbook, Data 1993-2003, Eurostat, European Commission, 2005.

Table A. Structure and budget of 6FP (after accession of new member states in 2004)

	EUR mil
6th EU Framework Programme for Research and Development	**17 883**
1. Concentrating and Integrating Community Research	14 682
1.1 Thematic priorities:	12 438
1.1.1 Life sciences, genomics and biotechnology for health	2 514
1.1.1.1 Advanced genomics and its application for health	*1 209*
1.1.1.2 Combating major diseases	*1 305*
1.1.2 Information society technologies	3 984
1.1.3 Nanotechnologies and nanosciences, intelligent multifunctional materials, new production processes and devices	1 429
1.1.4 Aeronautics and space	1 182
1.1.5 Food quality and safety	753
1.1.6 Sustainable development, global changes and ecosystems	2 329
1.1.6.1 Sustainable energy systems	*890*
1.1.6.2 Sustainable surface transport	*670*
1.1.6.3 Global changes and ecosystems	*769*
1.1.7 Citizens and governance in a knowledge-based society	247
1.2 Cross-cutting research activities	1 409
1.2.1 Encouraging of policies and scientific and technological needs forecasting	590
1.2.2 Specific research activities supporting SMEs	473
1.2.3 Specific measures supporting international cooperation	346
1.3 Other than nuclear activities of Joint Research Centre	865
2. Structuring the ERA	***2 854***
2.1 Research and innovation	319
2.2 Human resources and mobility	1 732
2.3 Research and infrastructures	715
2.4 Science and society	88
3. Strengthening the Foundations of ERA	***347***
3.1 Co-ordination of research activities	292
3.2 Encouragement of coherent development of policies	55
Euratom Framework Programme	**1 230**
1. Priorities of research thematic activities	**890**
1.1 Controlled thermonuclear fusion	750
1.2 Management of radioactive waste	90
1.3 Radiation protection	50
2. Other activities in the field of nuclear technologies and safety	**50**
3. Joint Research Centre activities	**290**
In total	**19 113**

H.1 Participation of teams from EU-25 member states in 6FP as a whole (numbers of participations; numbers of participation/mil. inhabitants)

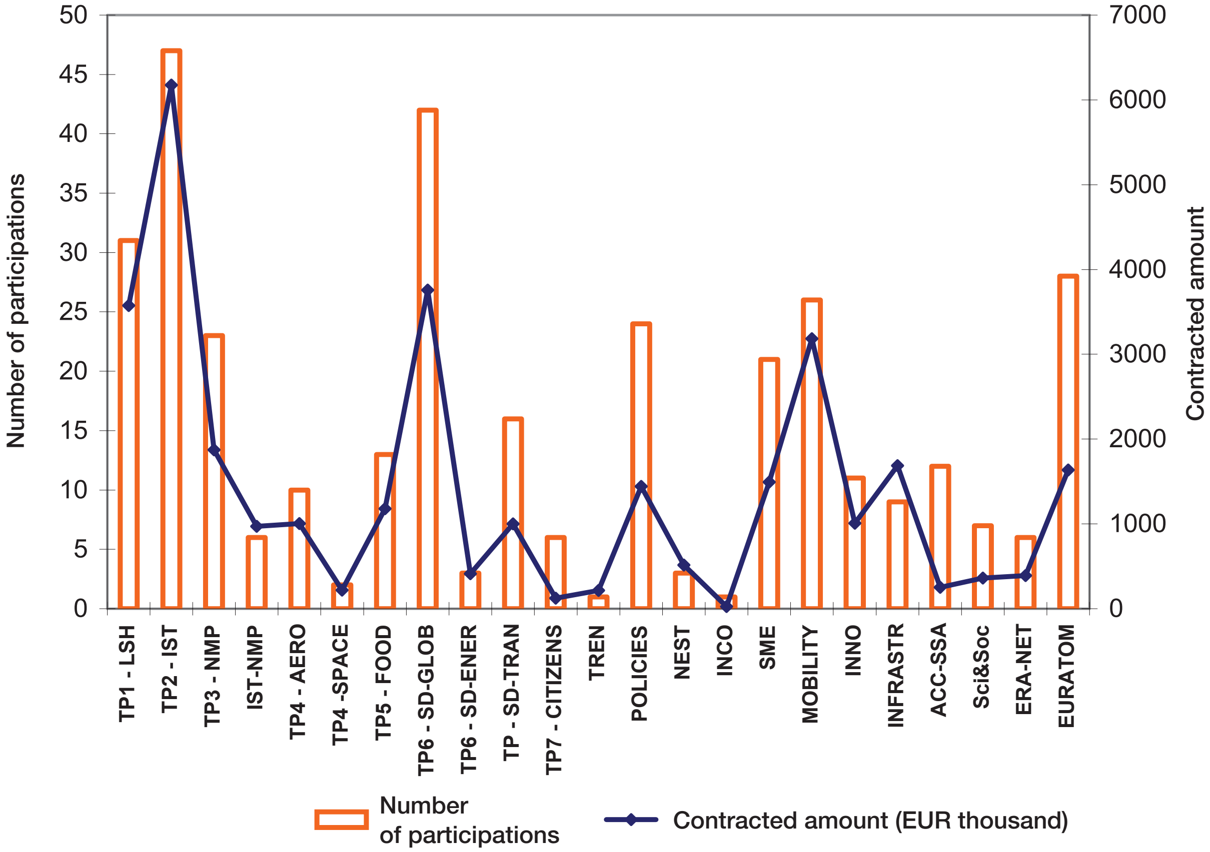


AT - Austria,BE - Belgium, CY - Cyprus, CZ - Czech Republic, DE - Germany, DK - Denmark, EE - Estonia, GR - Grece, ES - Spain, FI - Finland, FR - France, HU - Hungary, IE - Ireland, IT - Italy, LT - Lithaunia, LU - Luxembourg, LV - Latvia, MT - Malta, NL - Netherlands, PL - Poland, PT - Portugal, SE- Sweden, SI - Slovenia, SK - Slovakia, UK - United Kingdom

Commentary:

1. The curve in Graph H.1 depicts the absolute numbers of participations of EU-25 teams in 6FP projects being registered by the European Commission as "successful" as of May 31, 2005. There are in total 3,175 projects as of this date, on the solution of which 26,173 teams will participate. The participants in these projects ask the European Commission for support in the amount of EUR 6.5 billion corresponding approximately to one third of the overall budget of 6FP. Data in this report predicate more or less of the course of the first third of 6FP.
2. The column graph shows the participations of EU-25 states as converted to a unit population (per 1 million inhabitants). The states in the graph are ranked according to the level of this relative indicator.
3. There are 290 projects among those mentioned, on the solution of which 348 teams from the Czech Republic will participate. These data classify the Czech Republic on 22nd place among the EU-25 states. If we rank the states according to the level of absolute numbers of participations in 6FP projects, the Czech Republic takes 16th place.
4. Czech participants ask the European Commission for support in the amount of EUR 32.5 million (ca CZK 1 billion). This amount does not cover the demands of Czech teams engaged in projects of "networks of excellence", because the support allocated here is distributed according to the factual share of teams in the network activities.
5. In terms of total number of participations, the highest participation is reported by teams from Germany (nearly 4 thousand participations), followed by the United Kingdom and Italy. Least participations are reported by Malta, Cyprus, Luxembourg, Lithuania and Latvia.
6. When converted to 1 million inhabitants of a particular country, the highest participation is reported by Malta (over 130 participations/mil. inhabitants), then Cyprus and Sweden (both countries over 110 participations/mil. inhabitants). Lowest participations are reported by Slovakia, Lithuania, Latvia and Poland (less then 20 participations/mil. inhabitants).

H.2 Participation of Czech teams in selected programmes of 6FP and contracted support to these participations (numbers of participations; EUR thousand)



Commentary:

1. The graph columns show successive numbers of participations of Czech teams in projects falling under these programmes (see also the structure of 6FP in Table A):

1 TP – LSH:	1st Thematic Priority, Life sciences, genomics and biotechnology for health,
2 TP – IST:	2nd Thematic Priority, Information society technologies,
3 TP – NMP:	3rd Thematic Priority: Nanotechnologies and nanosciences, intelligent multifunctional materials, new production processes and devices,
IST – NMP:	joint programmes of 2nd and 3rd Thematic Priorities,
4 TP – AERO:	4th Thematic Priority, Aeronautical research,
4 TP- SPACE:	4th Thematic Priority, Space research,
5 TP – FOOD:	5th Thematic Priority, Food quality and safety,
6 TP- GLOBAL:	6th Thematic Priority, Global changes,
6 TP – TRANSPORT:	6th Thematic Priority, Transport,
6 TP – ENERGY:	6th Thematic Priority, Energy,
7 TP – CITIZENS:	Citizens and governance in a knowledge-based society,

TREN:	Transport programmes announced by DG TREN (Transport and Energy),
POLICIES:	Research encouraging policies,
NEST:	New and emerging science and technology,
INCO:	Programmes promoting cooperation EU with third countries,
SME:	Programmes promoting involvement of small and medium-sized enterprises,
MOBILITY:	Programmes promoting mobility of researchers (the so called Marie Curie action),
INNO:	Programmes promoting research and innovation,
INFRASTR:	Programmes promoting transnational utilization of scientific infrastructures,
ACC-SSA:	supporting activities for involvement of new associated candidate states (the present "new member states" had been included among them until May 1, 2004)
Sci&Soc:	Science and society,
ERA – NET:	Programmes for coordination of national research activities,
EURATOM:	Separate programme in the area of nuclear energy use.

2. Graph H.2 shows that the Czech Republic has most participations in the research of information society technologies (44 participations), global changes (27 participations), life sciences (25 participations) and the EURATOM programme (12 participations). Least participations it has in the programme of EU cooperation with third countries and in the transport area (one participation each) and then in Space research (2 participations).
3. On the contrary in terms of contracted support, the highest support is received by teams participating in projects concerning information technologies (EUR 6,176 thousand), then global changes (EUR 3,759 thousand) and life sciences (EUR 3,576 thousand). The lowest support will be received by Czech teams in the programme INCO – Cooperation of EU with third countries (EUR 24 thousand) and Citizens and governance in a knowledge-based society (EUR 122.5 thousand).
4. It is, however, necessary to take into account that the amount of support depends primarily on the size of budgets of individual programmes. This was highest for IST programme. In general, Czech teams contract 0.6% of the so far released budget of 6FP. The curve on Figure 1 depicts shares contracted by Czech teams from budgets released for individual programmes. The most successful from this view is the Czech participation in programmes for transport announced by Directorate General TREN (Transport and energy) of the European Commission (over 7 % of volume of funds for these programmes), then in programmes promoting participation of candidate countries (3.6 %) and also in the EURATOM programme (1.6 %). Contracted support for other programmes moves around 1 % of budgets of respective programmes and areas of 6FP.

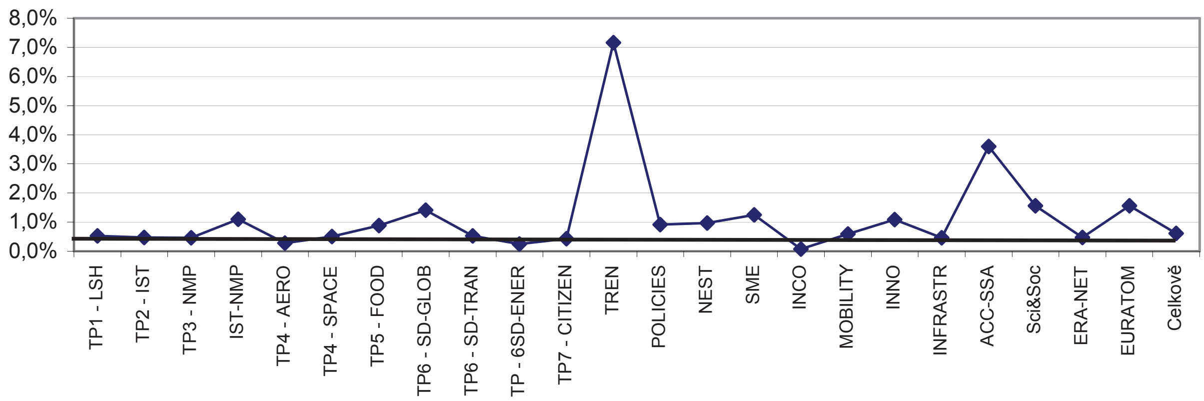
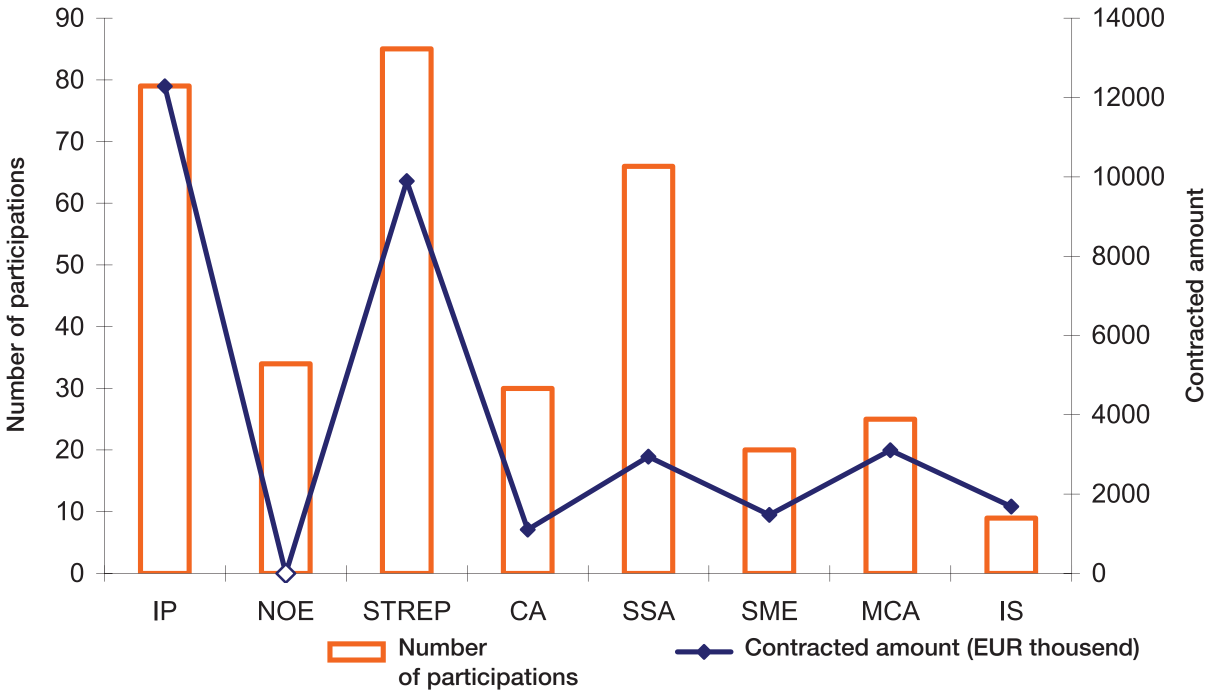


Figure 1: Budget shares for individual programmes of 6FP acquired by Czech teams

H.3 Numbers of participations of Czech teams in individual 6FP instruments (forms of support) and distribution of support demanded by Czech teams from the European Commission towards these instruments (numbers, EUR thousand)



Commentary:

1. The column graph H.3 shows the overall numbers of participations of Czech teams in individual 6FP instruments (forms of support). The graph curve indicates amounts contracted by Czech teams in individual instruments (forms of support).
2. The 6FP instruments (forms of support) are as follows:

   IP: integrated project,

   NoE: networks of excellence (data on support of Czech teams will be available only after termination of these projects)

   STREP: specific targeted research projects,

   CA: coordination actions,

   SSA: specific support actions

   SME: projects promoting small and medium-sized enterprises,

   MCA: Marie Curie action promoting mobility of researchers,

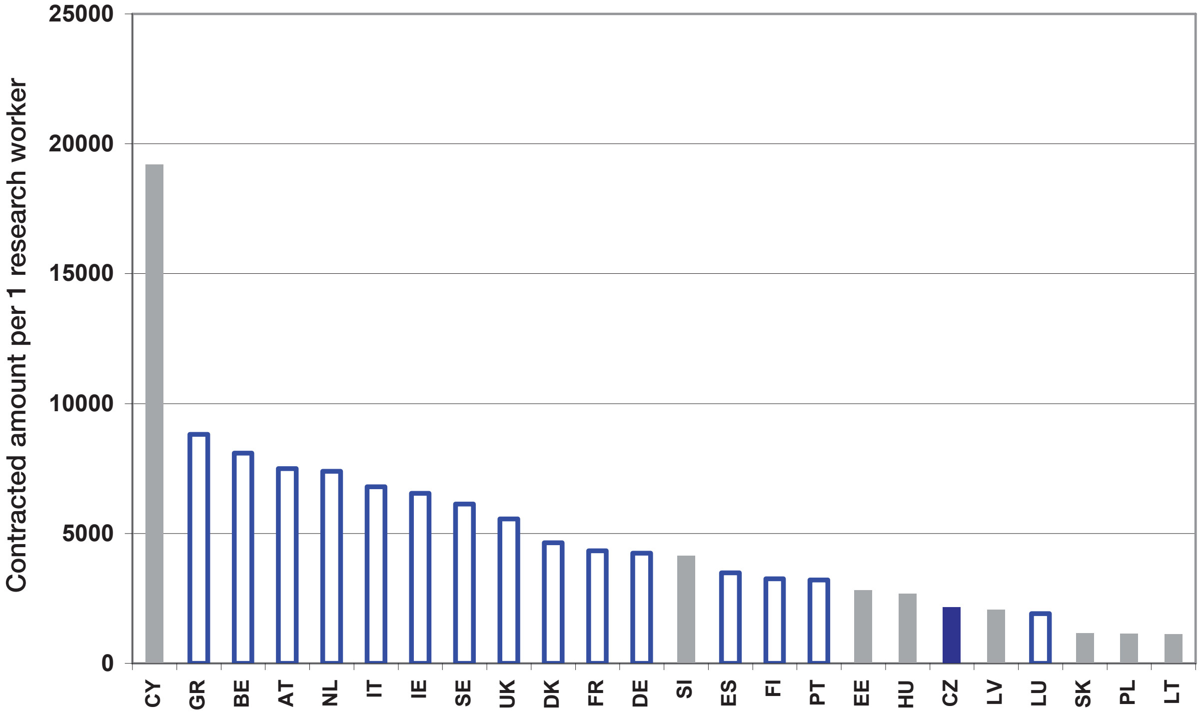
   IS: projects promoting infrastructure usage.

   These instruments (forms of support) are used in all thematic priorities mentioned on the previous graph H.2.
3. It is evident that most often the Czech teams take part in projects being supported by form of STREP (specific targeted research project) (85 participations) and then by form of IP (integrated project) (79 participations). The deeper analysis shows that Czech participants are concerned in IP only with a very small capacity, because the support demanded by the Czech teams from

the European Commission for their participation in IP is markedly lower than with participants from other EU-25 countries. The third highest participation is with SSA (specific support actions) (66 participations).

4. As far as the contracted amount of support is concerned, the Czech teams demand the highest support in integrated projects (EUR 12,280 thousand), then in STREP (specific targeted research projects) (EUR 9,896 thousand). It cannot be ignored that the Czech teams got the third highest amount through their involvement in projects promoting the mobility of researchers Projects in mobility often lead to initialisation of other research activities.
5. On the other hand, one of the smallest supports, even when compared with other EU-25 countries, was demanded by the Czech teams with SMA (specific support actions) (EUR 2,948 thousand). At the same time, the Czech teams report a relatively high number of participations in this form of support.

H.4 Relative contracted supports from 6FP per 1 research worker in EU-25 Member States (EUR per person)

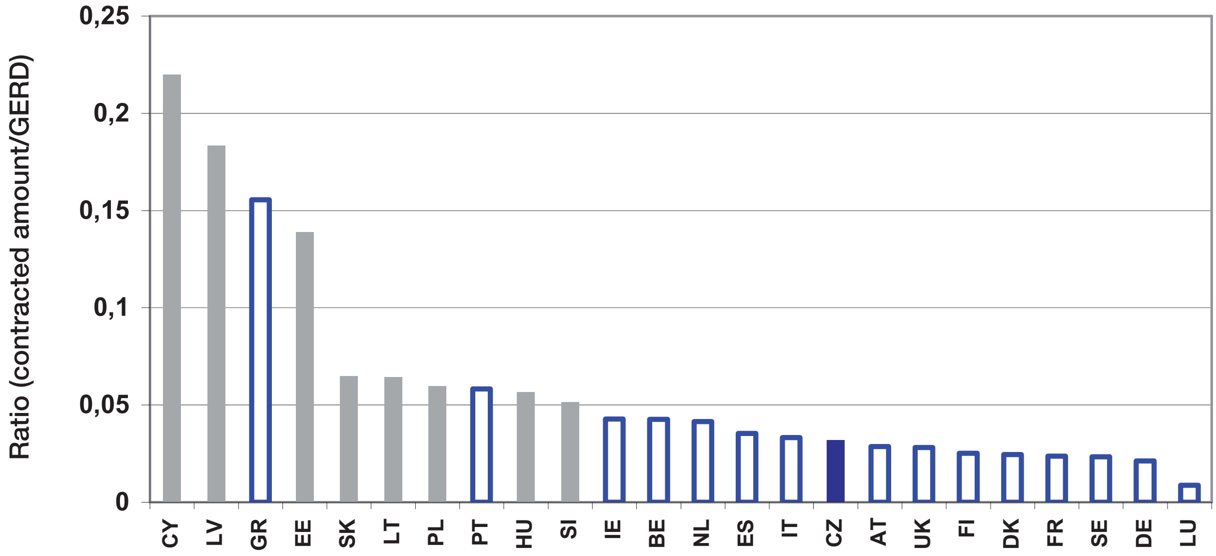


For abbreviations see H.1

Commentary:

1. The importance of national participation in projects of the framework programme is expressed more clearly by the overall amount contracted by national teams than only by data on numbers of their participation. For the purposes of international comparison it is, however, necessary to convert this support either to the number of inhabitants (e.g. 1 million inhabitants) or to a unit capacity of the national R&D system. This latter possibility is illustrated by the column graph H.4 giving the comparison of EU-25 countries by contracted amounts converted to the capacity of 1,000 research workers of the national R&D system. Malta is not included in the graph; data are not yet available.
2. From the graph it can be seen that Cyprus by its amount (EUR 19,211/research worker) is totally beside the set of EU-25 countries. Greece on 2nd place contracts support that is markedly lower (EUR 8,817/research worker). At the same time it is clear that the old member states (EU-15) contract higher amounts per a unit capacity of their research systems than the new member states. This difference has several reasons. On the first place it is necessary to take into account what opportunities of project-oriented research are offered to national teams by their own national R&D systems. These opportunities are richly developed especially in large states (United Kingdom, Germany, and Italy) or states with high investments into their national R&D systems (Sweden, Finland). Also the salary level in national R&D sectors is decisive, since around 50 % of project budgets are represented by wage costs. It also depends on the structure of types of projects of a particular state: prevailing participation in supporting projects (CA – coordination actions, SSA – specific support actions) reduces the overall contracted amount (see also the previous Graph H.3).
3. In this indicator the Czech Republic takes 19th place (EUR 2,171/research worker) among the EU-25 countries; or 5th place respectively among the new member states. Hungary on 18th place contracts support in the amount of EUR 2,688 /research worker.

H.5 Relative contracted supports from 6 FP per unit of R&D expenditure in EU-25 Member States (EUR/EUR)



For abbreviations see H.1

Note: GERD – Gross Expenditure for Research and Development; total R&D expenditures

Commentary:

1. The potential of national R&D systems is strongly dependent on total domestic R&D expenditures (for which we use the English abbreviation GERD – Gross Expenditure for Research and Development).
2. In the column graph H.5, the EU-25 states are ranked according to their ratio "(overall amount contracted in 6FP)/(GERD)".
3. In the new member states this ratio is markedly higher than in EU-15. In the left half of the graph, i.e. among the first 12 states (ranked according to this statistics) there is 8 (out of nine – data for Malta were not available) of new member states. Far highest value of this ratio reports Cyprus receiving from the European Commission the support in the amount of EUR 0.22 for participation of its teams in 6FP projects per EUR 1 invested into its R&D system. On the contrary, the lowest ratio is reported by Germany ("EUR 0.02 contracted in 6FP per EUR 1 invested into R&D") and Luxembourg ("EUR 0.008 contracted in 6FP per EUR 1 invested into R&D").
4. The Czech Republic reports the lowest ratio of all new member states and so it ranks by this value among the advanced EU-15 countries ("EUR 0.03 contracted in 6FP per EUR 1 invested into R&D").
5. It is, however, necessary to interpret the graph data with regard to other important factors. In first 9 states with the highest ratio "EUR contracted/EUR invested") GERD do not reach even 1 % of their gross domestic product. And on the contrary, there are states in the second half of the graph whose GERD moves around 2 % of GDP (Belgium, the Netherlands, Austria, United Kingdom, France, Denmark), or even exceeds this value significantly (Sweden, Finland). The exceptions from this characteristic are Italy, Spain and the Czech Republic.
6. Data indicate that funds for the European research are more easily accessible to states having low intensity of investments into own R&D (low ratio GERD/GDP). It is, however, necessary to state in relation to previous graphs that the value of the fraction "overall amount contracted in 6FP/GERD" ranks the Czech Republic among the most advanced countries not only due to the high value of denominator (i.e. GERD), but also due to the low value of numerator, low overall contracted amount demanded so far from the European Commission by the Czech teams.

I. Remarkable achievements in research and development

In the 2004 R&D Analysis this chapter was missing. In 2002 and 2003, the chapter on remarkable achievements in research and development was included, but failed to collect materials on really outstanding and representative results of research and development. Despite this, the tendency remains to maintain this chapter for presentation reasons also in following years. And so, after a one-year pause, this chapter is again part of the presented R&D analysis.

The methodology for collecting materials on remarkable achievements in research and development was adjusted within the project of the 2005 R&D Analysis. In June 2005, Vice-Premier and Chairman of the Research and Development Council M. Jahn asked in writing the leading representatives of ministries and other central bodies of the state administration, from the budgetary chapters of which the research and development is supported, to send information on the honoured achievements in the field of research and development A table was attached to this letter for characterization of these honoured achievements in research and development. The deadline for sending materials was set to August 31, 2005.

The required deadline was met by the Ministry of Education, Youth and Sport, Academy of Sciences of the Czech Republic, Grant Agency of the Czech Republic, Ministry of Culture, Ministry of Health, Ministry of Agriculture and Czech Mining Office with the below mentioned results. The Ministry of Informatics, Ministry of Defence, Ministry of Transport, Ministry for Regional Development, Ministry of Justice, Ministry of Foreign Affairs, Ministry of Labour and Social Affairs, Ministry of Interior, Ministry of Environment, Security Information Service, Czech Office for Surveying, Mapping and Cadastre and State Office for Nuclear Safety informed that they had not granted any award for results achieved in 2004 within their provided support The Ministry of Industry and Trade called the attention to two achievements of industrial research and development to which particularly significant national awards were granted.

Eighteen achievements in total have been included in this chapter; of them 8 achievements in natural sciences, 7 in technical sciences and 3 in social sciences.

I. 1 Ministry of Education, Youth and Sport

Title of achievement in R&D:
Historical Town's Atlas of the Czech Republic
Brief characteristic of achievement in R&D:
This Atlas enhances the comparative study of urban history, thus making a valuable contribution to a more complex view of the urbanization process changes in Europe; it was made according to the unitied atlas concept for all participating states.
Author(s) of achievement in R&D (name, surname, title, institution):
Doc. PhDr. Eva Semotanová, DrSc., Doc. PhDr. Josef Žemlička, DrSc.- Institute of History of AV ČR
Granted award (name):
Award of the Minister of Education, Youth and Sport for research
Who granted the award:
Minister of Education, Youth and Sport
Brief reasoning behind the proposal – contribution to the world's science development, potential or actual benefits to economy and society of the Czech Republic:
The Atlas makes possible to compare the development of the European urban settlement with similar atlases of Great Britain, Germany, Scandinavian countries, the Netherlands, Austria, France, Italy, Ireland, Switzerland, Poland and Romania. It is a remarkable editorial achievement since a great number of old maps and plans that this volume contains had not been published before.

Title of achievement in R&D:
Mathematical and Computational Methods for Compressible Flow
Brief characteristic of achievement in R&D:
Achievements aimed at mathematical and numerical methods for compressible flow modelling are used with success for solving the problems of environmental protection, space research, for studying the air flow in human larynx, etc.
Author(s) of achievement in R&D (name, surname, title, institution):
Prof. RNDr. Miroslav Feistauer, DrSc. – Faculty of Mathematics and Physics of Charles University (MFF UK), Doc. RNDr. Jiří Felcman, CSc.- MFF UK, Mgr. Ivan Straškraba, CSc. – Mathematical Institute of AV ČR
Granted award (name):
Award of the Minister of Education, Youth and Sport for research
Who granted the award:
Minister of Education, Youth and Sport
Brief reasoning behind the proposal – contribution to the world's science development, potential or actual benefits to economy and society of the Czech Republic:
The book was ordered by Oxford University Press as a result of the worldwide response. It was published in the so called Blue Series "Numerical Mathematics and Scientific Computing", besides the books of world's leading experts dealing with the actual mathematical themes lying on the line dividing the computer sciences and numerical analysis.

Title of achievement in R&D:

Proposal of roentgen spectrometer launched onboard the American MTI satellite

Brief characteristic of achievement in R&D:

Czech solar broad-band hard X-ray spectrometer was launched on March 12, 2000 onboard the MTI satellite. It has been working with success on the orbit for the period of three years.

Author(s) of achievement in R&D (name, surname, title, institution):

RNDr. František Fárník, CSc., RNDr. Martin Karlický, DrSc. – Astronomical Institute of AV ČR

Granted award (name):

Award of the Minister of Education, Youth and Sport for research

Who granted the award:

Minister of Education, Youth and Sport

Brief reasoning behind the proposal – contribution to the world's science development, potential or actual benefits to economy and society of the Czech Republic:

By publishing data in the experiment the Czech Republic has demonstrated the high level of technical skills of Czech scientists and engineers, and due to the faultless operation also the compatibility of the Czech product with American technology.

I. 2 Academy of Sciences of the Czech Republic

Title of achievement in R&D:
Ferromagnetism and new spintronic phenomena in semiconductors
Brief characteristic of achievement in R&D:
The theoretical prediction of the spin Hall effect (SHE) being subsequently confirmed experimentally. By this effect, the carriers with the same spin are turned to one sample edge.
Author(s) of achievement in R&D (name, surname, title, institution):
Dr. Tomáš Jungwirth, Institute of Physics of AV ČR
Granted award (name):
Award of the Academy of the Sciences of CR for outstanding scientific results of major significance
Who granted the award:
Academy Council of AV ČR
Brief reasoning behind the proposal – contribution to the world's science development, potential or actual benefits to economy and society of the Czech Republic:
The discovery of a new physical effect making possible to control the spin polarized currents in semiconductors without the external magnetic field brings vital progress in microelectronics and development of a new generation of computer technologies.

Title of achievement in R&D:
Significance of membrane microdomains and their novel protein components in immunoreceptor signalling
Brief characteristic of achievement in R&D:
Novel transmembrane proteins were discovered, their properties and functional meaning described and certain aspects of mechanisms of the parasite infection theileriosis explained.
Author(s) of achievement in R&D (name, surname, title, institution):
Prof. RNDr. Václav Hořejší, CSc. – the team leader, RNDr. Ladislav Anděra, CSc., RNDr. Pavla Angelisová, CSc., Mgr. Tomáš Brdička, Mgr. Naděžda Brdičková, Mgr. Jan Černý, PhD, Mgr. Karel Drbal, PhD, PhMr. RNDr. Ivan Hilgert, DrSc., MUDr. Ondrej Horváth, RNDr. Vladimír Kořínek, CSc, Mgr. Ing. Jiří Špička – all workers of the Institute of Molecular Genetics of AV ČR.
Granted award (name):
Award of the Academy of the Sciences of CR for outstanding scientific results of major significance
Who granted the award:
Academy Council of AV ČR
Brief reasoning behind the proposal – contribution to the world's science development, potential or actual benefits to economy and society of the Czech Republic:
World priority results in the field of membrane microdomains contribute significantly to understanding of basic signalling mechanisms of immunoreceptors. Published in prominent international periodicals having an average impact factor of nearly 15.

Title of achievement in R&D:
Permanent exposition "The Story of Prague Castle"
Brief characteristic of achievement in R&D:
Detailed evaluation of historical uniques complemented by presentation of principal results of the previous research – in many cases for the first time or in new connections.
Author(s) of achievement in R&D (name, surname, title, institution):
PhDr. Klára Benešovská, CSc.- Institute of Art History of AV ČR, PhDr. Jan Frolík, CSc.- Institute of Archaeology of AV ČR, Mgr. Jana Maříková-Kubková - Institute of Archaeology of AV ČR, PhDr. Ivan Muchka - Institute of Art History of AV ČR
Granted award (name):
Award of the Academy of the Sciences of CR for outstanding scientific results of major significance
Who granted the award:
Academy Council of AV ČR
Brief reasoning behind the proposal – contribution to the world's science development, potential or actual benefits to economy and society of the Czech Republic:
Modern concept of evaluation of the history of Prague Castle as the first class National Cultural Treasure No. 1 is strictly based upon the actual state of scientific knowledge of the problem and makes possible to pass on the scientific research results to the broadest public, both national and international .

I. 3 Grant Agency of the Czech Republic

Title of achievement in R&D: **Meiotic and mitotic division: the roles of cytoplasm and nucleus**
Brief characteristic of achievement in R&D: Analysis of differences between the meiotic and mitotic cell cycles, demonstration of the specific role of cellular organelles in transition from meiosis to mitosis
Author(s) of achievement in R&D (name, surname, title, institution): Ing. Josef Fulka, DrSc.- Research Institute of Animal Production
Granted award (name): Award of the Chairman of the Grant Agency of CR for 2005
Who granted the award: Chairman of the Grant Agency of CR
Brief reasoning behind the proposal – contribution to the world's science development, potential or actual benefits to economy and society of the Czech Republic: Vital importance to livestock reproduction, preservation of endangered species, treatment of infertility in assisted reproduction and cell therapy particularly on the basis of embryonic stem cells.

Title of achievement in R&D: **High quality monocrystals of intermetallic compounds of pure f- and d-metals**
Brief characteristic of achievement in R&D: Improvement of the technology for preparation of monocrystals of binary and tertiary compounds, including development of instrumentation.
Author(s) of achievement in R&D (name, surname, title, institution): RNDr. Pavel Svoboda, CSc. – Faculty of Mathematics and Physics of Charles University
Granted award (name): Award of the Chairman of the Grant Agency of CR for 2005
Who granted the award: Chairman of the Grant Agency of CR
Brief reasoning behind the proposal – contribution to the world's science development, potential or actual benefits to economy and society of the Czech Republic: A set of knowledge acquired on properties of intermetallic compounds of metals being frequently used in industry for their specific magnetic properties. A unique device came into existence making possible the preparation of intermetallic monocrystals.

Title of achievement in R&D: **Platinum complexes modified by oligonucleotids for selective modulation of gene expression; relation to "incongruous" strategy in development of new pharmaceuticals**
Brief characteristic of achievement in R&D: Original utilization of inhibition of specific gene transcription in anticancer therapy
Author(s) of achievement in R&D (name, surname, title, institution): Prof. RNDr. Viktor Brabec, DrSc. – Institute of Biophysics of AV ČR
Granted award (name): Award of the Chairman of the Grant Agency of CR for 2005
Who granted the award: Chairman of the Grant Agency of CR
Brief reasoning behind the proposal – contribution to the world's science development, potential or actual benefits to economy and society of the Czech Republic: Explanation of mechanisms of anticancer effect of platinum and ruthenium complexes consisting particularly in modification of the desoxyribonucleic acid. Novel platinum-based medicine proposed, now passing the second phase of clinical trials.

I. 4 Ministry of Agriculture

Title of achievement in R&D: **Impact of the ESR gene on litter size and production traits in Czech Large White Pigs**
Brief characteristic of achievement in R&D: The contradictory effect of the ESR gene polymorphism on fertility was discovered in the Czech population of Large White Pigs in comparison with studies of foreign authors.
Author(s) of achievement in R&D (name, surname, title, institution): Ing. Eliška Žáková, Ph.D.- Research Institute of Animal Production
Granted award (name): Award of the Minister of Agriculture for young researchers for 2005
Who granted the award: Minister of Agriculture
Brief reasoning behind the proposal – contribution to the world's science development, potential or actual benefits to economy and society of the Czech Republic: The discovery of a contradictory ESR effect with pigs in the Czech Republic will prevent pig breeders from incorrect selection for ESR genotype according to the foreign literature results. Thus the pig fertility can be positively influenced.

I. 5 Ministry of Culture

Title of achievement in R&D: **Studies in technology in Czech lands 1945 – 1992**
Brief characteristic of achievement in R&D: Three volume monograph never before produced in such a scope and ca 60 other editorial titles
Author(s) of achievement in R&D (name, surname, title, institution): RNDr. Jaroslav Folta, CSc. – National Technical Museum
Granted award (name): Award of the Ministry of Culture of CR for research and development
Who granted the award: Minister of Culture of the Czech Republic
Brief reasoning behind the proposal – contribution to the world's science development, potential or actual benefits to economy and society of the Czech Republic: Exceptionally synthetic work of founding significance, capturing changes and development in all fields of technology in Czechoslovakia, bringing stimuli and becoming starting point to further research

I. 6 Czech Mining Office

Title of achievement in R&D: **Personal underground lamp fitting for mine rescuers in extreme conditions**
Brief characteristic of achievement in R&D (maximally 150 character) : The rescue lamp fitting T 1004.02 as implementation of R&D results meets the requirements for IM1 (EExial) category in SNM2 and SNM3 environments
Author(s) of achievement in R&D (name, surname, title, institution): Ing. Bohumír Janošík, František David-KV-Důlní svítidla, s.r.o., Karlovy Vary
Granted award (name): Rescuer's Cross of Merit
Who granted the award: Czech Mining Office
Brief reasoning behind the proposal – contribution to the world's science development, potential or actual benefits to economy and society of the Czech Republic (maximally 220 characters): **Rescue personal lamp fitting T 1004.02 stands unique in the world; it satisfies the mine-specific requirements of rescuers and guarantees higher safety when operated under extreme conditions.**

I. 7 Ministry of Industry and Trade

The Ministry of Industry and Trade has presented two achievements of industrial research and development, not awarded by the Ministry, but being granted prominent and respected external awards. Both achievements evidentially enhance the Czech industry competitiveness.

Title of achievement in R&D: **Air-jet weaving machine CAMEL-FF-P/007**
Brief characteristic of achievement in R&D: Weaving machine of a wholly new concept. It uses mechatronic elements, composition materials and resonance principle. The result is an enhanced performance, reduced energy consumption and noisiness, and higher machine utilization and woven fabric quality. Technology solutions are protected with three significant patents.
Author(s) of achievement in R&D (name, surname, title, institution): Doc. Ing. Josef Dvořák, CSc., Ing. Petr Karel, Ing. Jiří Mlynář, Ing. Zdeněk Volanský - Research Institute of Textile Machines Liberec,Co.
Granted award (name): “Česká hlava (Czech Intellect)” award for 2004, Award of the Engineering Academy of CR for 2004, International Award of Nisa Euroregion for 2004
Who granted the award: Česká hlava, Engineering Academy of CR, Nisa Euroregion
Brief reasoning behind the proposal – contribution to the world’s science development, potential or actual benefits to economy and society of the Czech Republic: The machine is unrivalled in the world; with its original utilization of resonance principle in the machine construction. Strengthening of export capacity (12 machines already sold to Latvia).

Title of achievement in R&D: **Multifunctional machining centre of SPM 320-FD-K3/017 series**
Brief characteristic of achievement in R&D: A machine tool was developed able to offer to its customer top engineering and technology in the area of chip machining, turning, threading, drilling and milling. All this in one machine.
Author(s) of achievement in R&D (name, surname, title, institution): Ing. František Pivec - Kovosvit MAS, a.s., Sezimovo Ústí
Granted award (name): Excellent product for the year 2005
Who granted the award: Design Centre of the Czech Republic, Brno
Brief reasoning behind the proposal – contribution to the world’s science development, potential or actual benefits to economy and society of the Czech Republic: Successful mastering of development task advancing Kovosvit MAS, a.s. into the prestigious group of leading manufacturers and suppliers of machining centres.

I. 8 Ministry of Health

Title of achievement in R&D:

Pharmacologic treatment of endocrine and metabolic abnormalities of PCOS-polycystic ovary syndrome

Brief characteristic of achievement in R&D:

Optimal intervention suitable for long-lasting treatment of patients with polycystic ovary syndrome, influencing the endocrine and metabolic abnormalities.

Author(s) of achievement in R&D (name, surname, title, institution):

Doc. MUDr. David Cibula, CSc. - Department of Gynaecology and Obstetrics of the First Faculty of Medicine, Charles University, Prof. MUDr. Jan Škrha, DrSc. – 3rd Internal Clinic of the First Faculty of Medicine, Charles University, Prof. MUDr. Jaroslav Živný, DrSc. – Department of Gynaecology and Obstetrics of the First Faculty of Medicine, Charles University

Granted award (name):

Award of the Minister of Health for 2004

Who granted the award:

Minister of Health

Brief reasoning behind the proposal – contribution to the world's science development, potential or actual benefits to economy and society of the Czech Republic:

Contribution to the world's science development – finding of a simple parameter for orientation evaluation of the insulin sensitivity with non-overweight PCOS patients.

Title of achievement in R&D:

Heart rate turbulence – patophysiological mechanisms and methodological aspects of its detection

Brief characteristic of achievement in R&D:

The heart rate turbulence is caused by ectopic myocard contractions – vegetative system dystony. New holter mortality predicator was defined.

Author(s) of achievement in R&D (name, surname, title, institution):

MUDr. Dan Wichterle, MUDr. Jan Šimek – Universal Faculty Hospital in Prague

Granted award (name):

Award of the Minister of Health for 2004

Who granted the award:

Minister of Health

Brief reasoning behind the proposal – contribution to the world's science development, potential or actual benefits to economy and society of the Czech Republic:

Contribution to the world's science development – impact on planning of future studies aimed at prevention of sudden coronary death by means of cardioverter-defibrilator implantation.

Title of achievement in R&D: **Maturation of mitochondrial energy metabolism in perinatal period**
Brief characteristic of achievement in R&D: New understanding of mitochondrial energy metabolism malfunction, COX and PDHG biogenesis with newborns, patients with anorexia nervosa and overweight patients
Author(s) of achievement in R&D (name, surname, title, institution): Prof. MUDr. Jiří Zeman, DrSc., RNDr. Hana Hansíková, CSc. - First Faculty of Medicine, Charles University, MUDr. Zdeněk Drahota, DrSc. – Institute of Physiology of AV ČR, Prague
Granted award (name): Award of the Minister of Health for 2004
Who granted the award: Minister of Health
Brief reasoning behind the proposal – contribution to the world's science development, potential or actual benefits to economy and society of the Czech Republic: Contribution to the world's science development – solution of the mitochondrial energy system evolution and analysis of functional impact of its malfunction will help to further enhance the care for very low birthweight children

Title of achievement in R&D: **Genetics and metabolic consequences of inborn malfunction of mitochondrial ATPase.**
Brief characteristic of achievement in R&D: Understanding of pathogenesis of inborn malfunction of mitochondrial ATPase
Author(s) of achievement in R&D (name, surname, title, institution): MUDr. Josef Houštěk, DrSc., MUDr. Mgr. Pavel Ješina – Institute of Physiology of AV ČR, Prague, Doc. MUDr. Hana Houšťková, CSc. – First Faculty of Medicine, Charles University
Granted award (name): Award of the Minister of Health for 2004
Who granted the award: Minister of Health
Brief reasoning behind the proposal – contribution to the world's science development, potential or actual benefits to economy and society of the Czech Republic: Contribution to the world's science development – ATPase malfunction may be caused not only by the materially inherited mitochondrial DNA mutations, but also by mutations of nucleated genes.

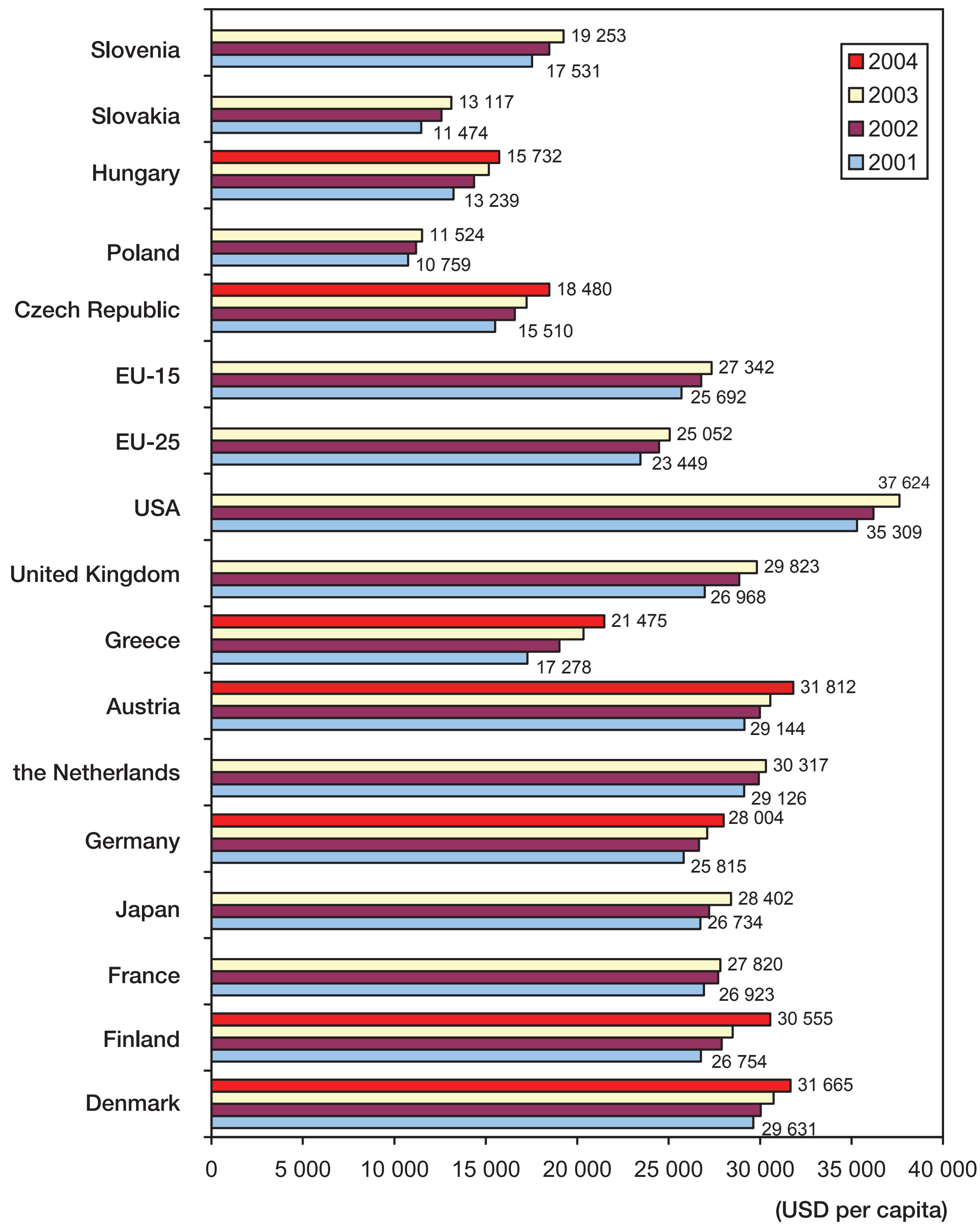
P.I Indicators of economic performance

In the 2003 and 2004 R&D Analyses the economic performance indicators with accompanying commentaries were part of the introductory Chapter A on basic R&D indicators. With such arrangement the chapter was too large making the orientation of readers to a certain extent difficult. These figures are presented separately also in similar international documents like, inter alia, the structural indicators for the spring European Council meeting. In no case the separate presentation of the economic performance indicators can be construed as a negation of mutual connections between the level of research and development and amount of gross domestic product per individual of a country. More to the contrary, the recent OECD and EU publications on research and development often contain graphs depicting the dependence, or close correlation respectively, between the amount of total R&D expenditures (in % of GDP) and relative gross domestic product (GDP per head).

The Annex P.I contains 8 graphs with commentaries for indicators of relative gross domestic product, labour productivity, export of high-tech products, employment in medium-high to high-tech manufacturing and services and results of the technology balance of payments. For some indicators the selected countries were compared against the EU-15 or EU-25 averages.

Annex P.I is based upon data of OECD publication titled Main Science and Technology Indicators 2005/1 and data of the Czech Bureau of Statistics (CBS).

P.I.1 GDP per capita (USD per capita; current prices, PPP)



Source: OECD, Main Science and Technology Indicators, May 2005, CBS and own recounting of CBS

Commentary:

1. The share of gross domestic product (GDP) per capita is generally considered to be the basic indicator of economic level or development of a particular country. The GDP increment is a carefully monitored parameter of economic policies of all countries and integration groupings.
2. GDP per capita values are given in current prices in USD per capita and as converted using the Purchasing Power Parity (PPP). The conversion of national currencies to USD at official rates is not absolutely correct and realistic. The PPP conversion allows for expressing the different level of prices (life cost) in each country. In stable economies the changes in the purchasing power parity of national currencies are very small.

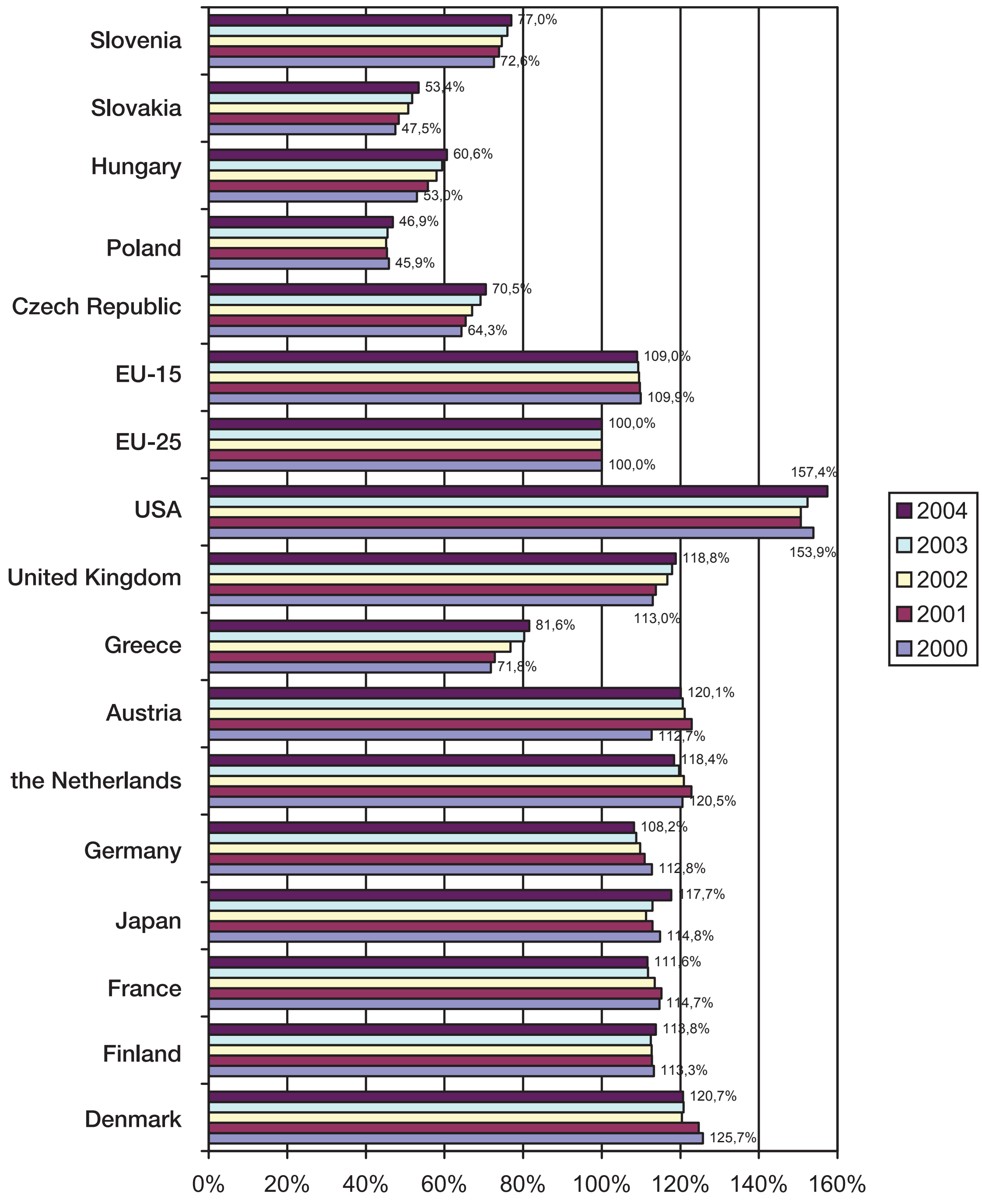
	2001	2002	2003	2004
Rate of exchange (CZK/USD)	38.04	32.74	28.21	25.70
PPP (CZK/USD) according to OECD[1]	14.60	14.27	14.51	14.58

Source: OECD, Main Science and Technology Indicators, May 2005

3. The highest value of GDP per capita of the monitored countries is reported by USA – more than USD 37 000 per capita in 2003; among the European countries by Austria – USD 31 800 per capita in 2004 and Denmark – USD 31 700 per capita in 2004. The level of USD 30 000 per capita was also exceeded by Finland (USD 30 600 per capita in 2004) and the Netherlands (USD 30 300 per capita in 2003).
4. Out of the monitored new EU Member States, the highest GDP value is reported by Slovenia (USD 19 253 per capita in 2003) lagging slightly behind Greece (USD 21 475 per capita) that is the country with the lowest GDP per capita among the EU-15 countries. Then follows the Czech Republic (USD 18 480 per capita in 2004) and Hungary (USD 15 732 per capita in 2004).
5. The following Graph P.I.2 compares the development of the GDP per capita value in proportion to the average GDP per capita values for EU-25.

1 Purchasing Power Parities for OECD Countries 1980-2004;OECD, 9 – Jul- 2004

P.I.2 Proportional GDP per capita value in PPP (EU-25 = 100 %)



Source: Eurostat, June 2005

Commentary:

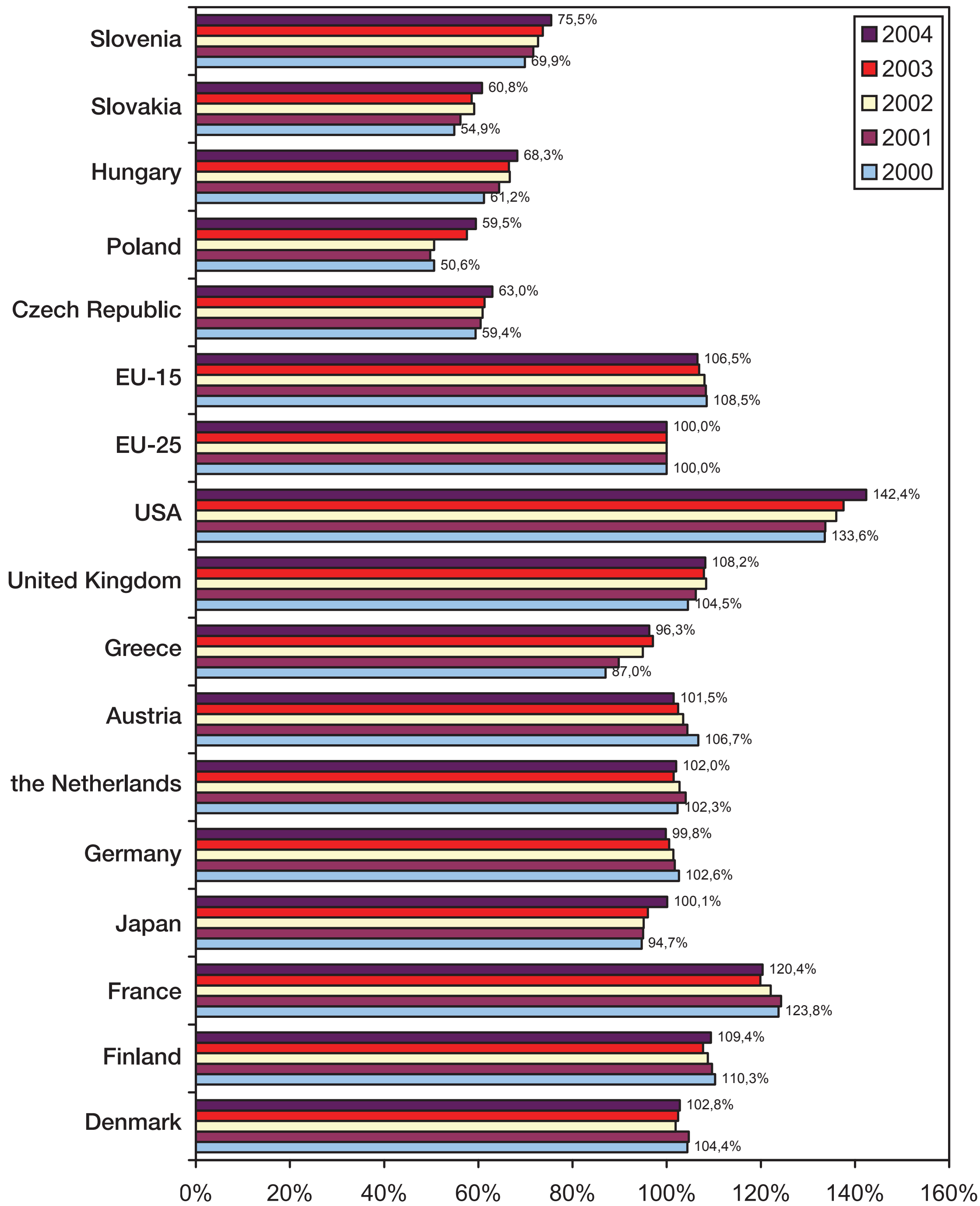
1. The graph depicts the values of gross domestic products in PPP (Purchasing Power Parity) per individual of a monitored country in % of the value of the same indicator for 25 EU Member States (EU-25). The values are presented for the years 2000 to 2004. The graph contains also values for the average of 15 "old" Member States (EU-15). New member states report substantially lower figures of GDP per capita than the majority of EU-15 countries. The value of this indicator for EU-15 is even at relative low population in newly acceded states by nearly 10 % higher than the value of this indicator for EU-25.
2. In 2003, higher than average values of GDP per capita for EU-15 are reported by Denmark (120.7 %), Austria (120.1 %), United Kingdom (118.8 %), the Netherlands (118.4 %), followed by Finland and France. Throughout the whole monitored period the value of GDP per capita in USA exceeds the EU-25 value by more than 50 %.
3. The economic growth slowdown in Germany caused that GDP per capita fell in 2004 to 108.2 % of the value for EU-25. Lower than average values of GDP per capita are reported by all new EU Member States and Greece. In this indicator Greece slightly outperforms Slovenia (Greece 81.6 % and Slovenia 77.0 % in 2004). Out of the new EU Member States from the Central Europe the level of 70 % of the EU-15 average is exceeded only by the Czech Republic (70.5 % in 2004). The values for other monitored countries of this area move in the range between 40 and 60 %.
4. It is worth noted that with the exception of Poland in other newly acceded countries the GDP per capita experiences a relatively dynamic growth, while in EU-15 countries, with the exception of United Kingdom and Greece, it stagnates or declines.
5. Many indicators in Chapter A of the Analysis, e.g. R&D expenditures, are expressed as % of GDP. The same level of R&D expenditures in % of GDP at large differences in the amount of GDP may mean also large differences in the actual level of R&D expenditures and differences in indicators based on the amount of expenditures (numbers of R&D workers, etc.). This fact must be taken into account when interpreting the indicators based upon the GDP level.
6. In Eurostat and OECD documents the level of GDP per capita is often compared with the level of this indicator for USA. The comparisons for 2000 and 2003 are made in following table.

	Czech Republic	Denmark	Finland	EU-15	EU-25	France	Japan	Hungary	Germany	The Netherlands	Poland	Austria	Greece	Slovakia	Slovenia	UK	USA
GDP per head 2000 (% of GDP per head - USA)	42	82	74	71	65	74	75	35	73	79	30	83	47	31	48	74	100
GDP per head 2003 (% of GDP per head - USA)	49	84	81	72	67	74	75	42	74	81	31	84	57	35	51	79	100

Source: OECD, Main Science and Technology Indicators, May 2005 and own recounting of CBS

Among the new member states only Slovenia (51 %) exceeded half of the USA level in 2004. In 2003, the Czech Republic with its GDP per capita attained 49 % of the USA level. The level of the best EU-15 countries (Denmark, Austria, the Netherlands, and United Kingdom) moves around 80 % of the USA value.

P.I.3 Overall productivity of labour (GDP per number of workers as share of the overall EU-25 productivity = 100 %)



Source: OECD, Eurostat, June 2005

Commentary:

1. The productivity of labour expressed as amount of GDP per 1 worker or hour of work is another frequently used indicator of economic performance. Again GDP is given in PPP. It is expressed either by annual increments in per cents or as a percentage of a particular country's productivity to the productivity of a compared country or integration grouping. The Graph P.I.3 depicts the productivities of monitored countries as a percentage to the overall productivity of EU-25. Values for compilation of Graph P.I.3 were taken from Eurostat figures from June 2005.
2. Among the monitored EU-25 member states the highest productivity of labour in 2004 was attained by France (120.4 % of EU-25 productivity). The labour productivity in USA was by more than 20 % higher (142.4 % of EU-25 productivity) than the productivity in France in 2004. With the exception of Finland and United Kingdom, where the labour productivity approached 110 % of the EU-25 productivity in 2004, the labour productivity in other monitored countries moves around 100 % of the EU-25 productivity. The productivity in Greece is getting close to this level.
3. The highest productivity of labour of the new EU Member States is reported by Slovenia (75.5 % of EU-25 productivity in 2004), followed by Hungary (68.3 %) and the Czech Republic (60.3 %).
4. In EU-15 countries, with the exception of United Kingdom and Greece, the productivity of labour stagnates or slightly goes down in comparison with the EU-25 productivity. In new member states it rises, with fastest growth being experienced in Hungary and Slovakia.
5. The table below depicts the labour productivities in monitored years 2000 and 2003 as a percentage of the productivity level in EU-15. The productivity of labour is now measured by the indicator of GDP (PPP) per 1 hour of work.

Relative productivity in 2000 and 2003 – GDP per 1 hour of work (in % of the EU-15 productivity)

	2000 (%)	2003 (%)
EU-15	100	100
Slovakia	44.6	50.8
Poland	37.5	42.7
Czech Republic	42.8	47.2
USA	107.6	112.7
United Kingdom	84.6	88.8
Greece	61.1	68.0
Austria	96.3	92.7
The Netherlands	112.6	116.9
Germany	102.9	102.8
Japan	76.6	78.5
France	114.5	115.2
Finland	93.3	92.6
Denmark	100.8	99.4

Source: Eurostat, Structural indicators, April 2005

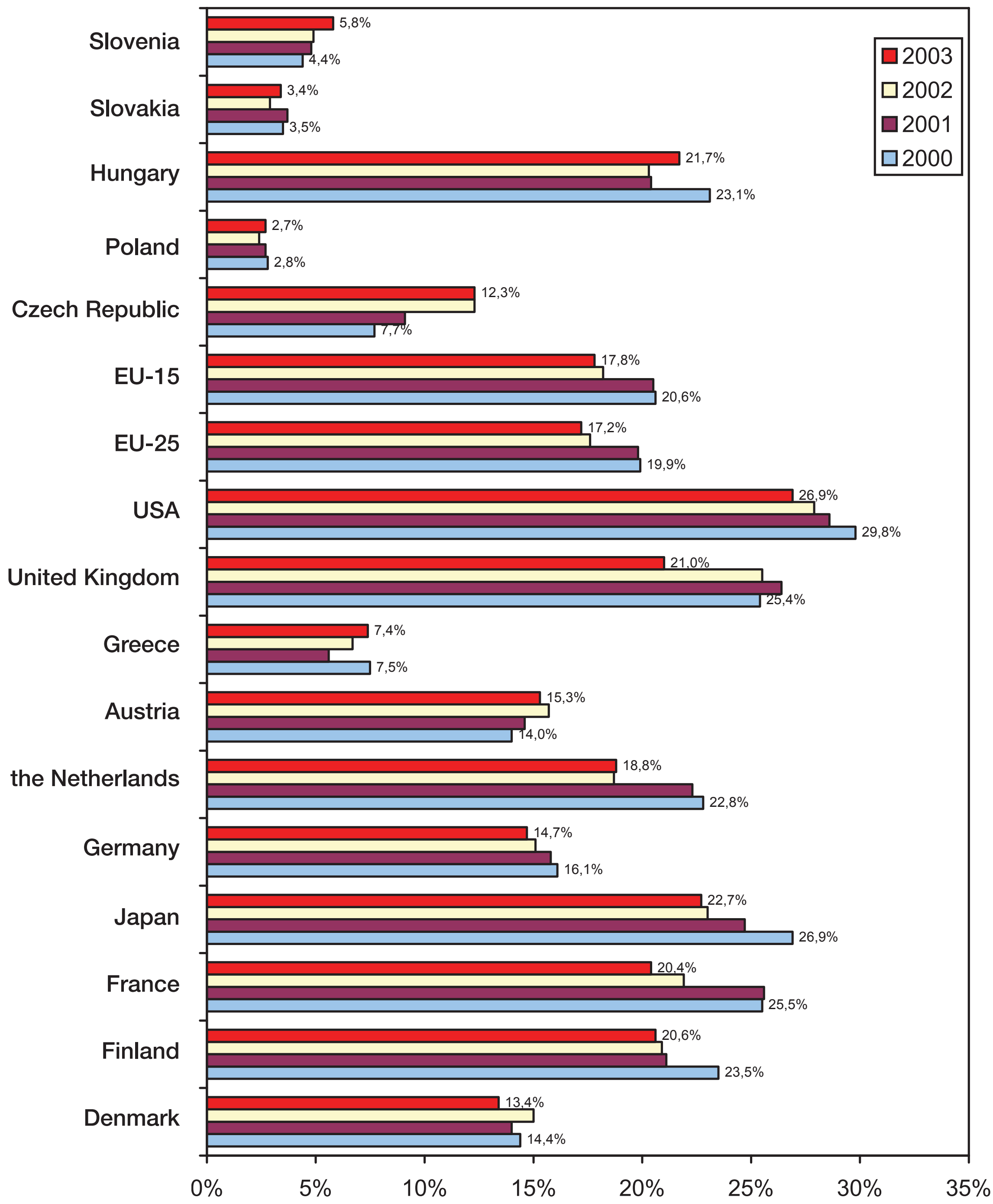
Values for 2003 are only preliminary. Data for Slovenia and Hungary are not yet available.

6. It results from the comparison of values in the table and values in Graph P.I.4 that the difference between USA and EU-15 countries in the labour productivity per 1 hour of work is substantially lower than the difference in the productivity per 1 worker. The reason is that in most countries

of EU-15 the working hours are substantially shorter than in the United States. There is also a higher share of part-time employments in EU-15 countries than in the United States. And so in the EU-15 countries gross domestic products are created with a substantially smaller time usage than in USA.

7. In 2003, the productivity of labour per hour of work was highest in the Netherlands (116.9 % of EU-15 productivity), followed by France (115.2 %) and USA (112.7 %).
8. The lagging of new member states (the table depicts only Slovenia, Poland and the Czech Republic) behind the EU-15 average is higher than with productivity per one worker. The productivity of labour measured as GDP per 1 worker moves around 60 % of the EU-15 productivity in new member states (see Graph P.I.4), while the productivity measured as GDP per 1 hour of work moves at the level of 50 % of the EU-15 productivity. The reason is again – like with comparison between EU-15 and USA – the working hours being significantly longer in new EU Member States than in EU-15 countries.

P.I.4 Percentage of the high-tech products export of the total export (in per cent)



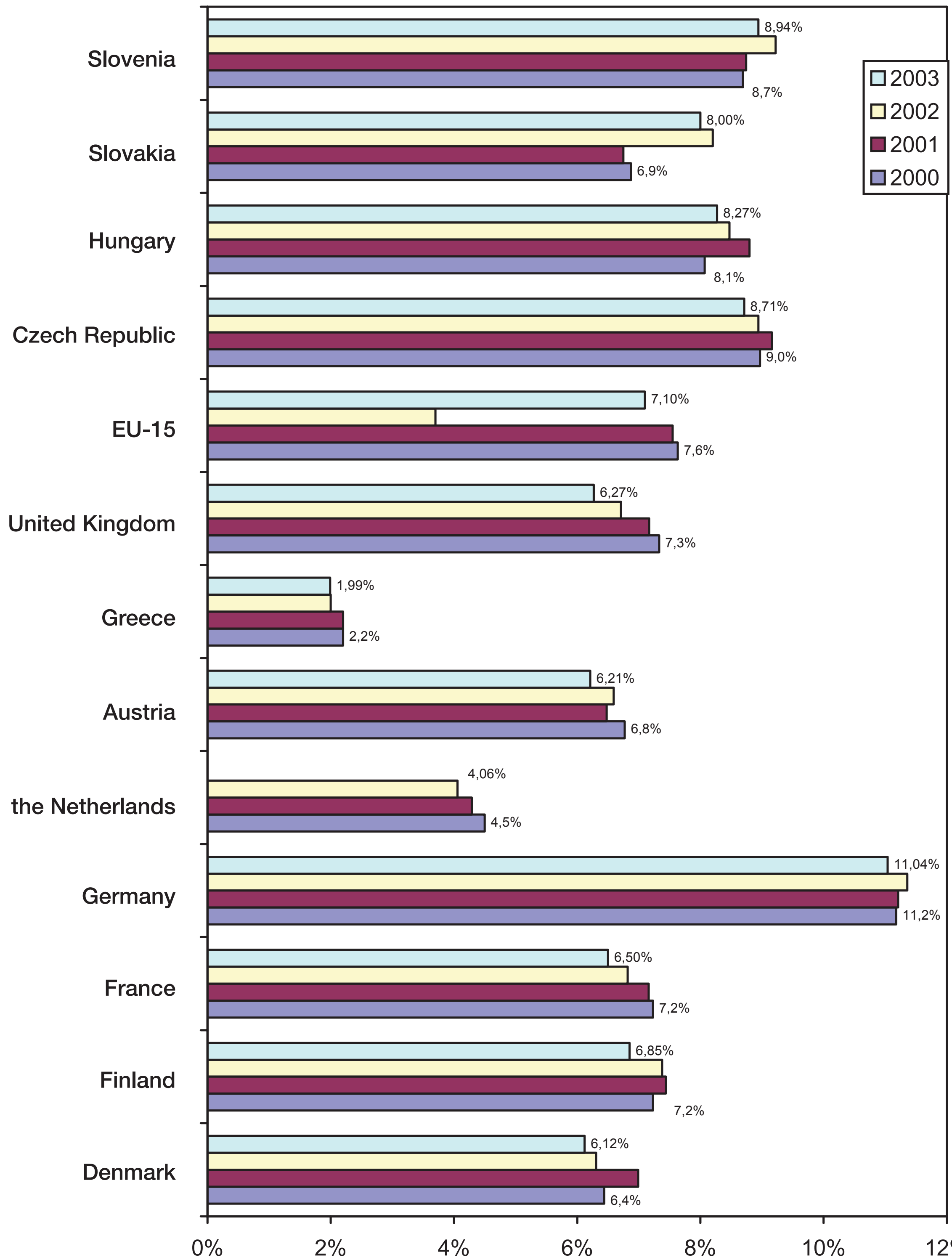
Source: Eurostat, June 2005
Note: Change in the methodology against the last analysis

Commentary:

1. According to the UN international classification of economic activities ISIC[2] Rev. 3 the activities (hereinafter referred to as industries) producing high-tech products include the aircraft industry (ISIC and OKEČ 353), electronic industry (manufacture of radio, television and communication equipment and apparatuses – ISIC and OKEČ 32), manufacture of office technology and computers (ISIC and OKEČ 30), pharmaceutical industry (ISIC 2423, OKEČ 244) and manufacture of instruments and apparatuses (medical, precision, optical and time-measuring – ISIC and OKEČ 33).
2. The percentage of export of high-tech industries in the monitored countries of EU-15, USA and Japan more or less declined in the monitored period. A certain exception is Austria, where the percentage of these exports had been growing until 2002 and declined only in 2003 to 15.3 %.
3. The percentage higher than 20 % among the monitored EU-25 countries was reported in 2003 only by Hungary (21.7 %), United Kingdom (21.0 %), Finland (20.6 %) and France (20.4 %).
4. In the Czech Republic, the dynamic growth of 2000-2002 in the percentage of export of high-tech products had stopped and in 2003 it remained at the level of 2002 (12.3 %). But it still lags behind the figures for both EU-25 and EU-15. The preliminary data show that the percentage of high-tech products export will grow in 2004.
5. In other monitored new EU-25 Member States (Slovenia, Slovakia and Hungary) the percentages stagnate on very low values.

2 ISIC – International Standard Industrial Classification. The Czech Republic uses for classification of all types of economic activities the Industrial Classification of Economic Activities (Odvětvová klasifikace ekonomických činností - OKEČ) that is compatible both with ISIC and the European standard NACE (Nomenclature générale des activités économiques dans les Communautés européennes) binding for all EU Member States.

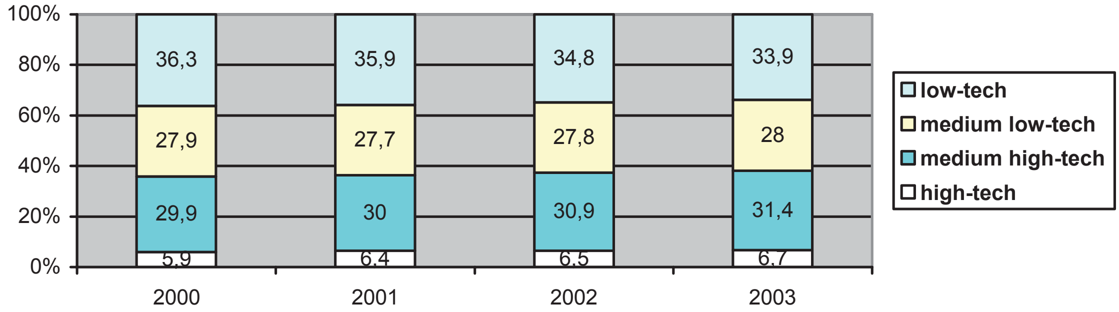
P.I.5 Employment in manufacturing industries with medium-high to high technology (in per cent of overall employment)



Source: Eurostat, June 2005

Commentary:

1. This indicator is based upon a legitimate belief that research and development must lead to introduction of new competitive technologies and products showing itself in the growth of employment in the manufacturing industries with medium high to high technology.
2. The shares of employment in medium-high and high-tech manufacturing industries[3] in the Czech Republic (8.71 % in 2003) and new EU Member States are higher than is the EU-15 average (7.10 % in 2003) and, with the exception of Germany (11.04 % in 2003), higher than in other monitored countries of EU-15. Data for Poland are not available. Neither the United States are presented in the graph; they use a different classification of manufacturing sectors.
3. The Czech Bureau of Statistics monitors the structure of employees of manufacturing industries by technology groups according to their demands on research and development[4]. The table below shows the trend of this structure between 1995 and 2002 in per cents of the overall employment within the Czech manufacturing industries.
4. The structure of employees of manufacturing industries by technology groups between 2000 and 2003 (%)



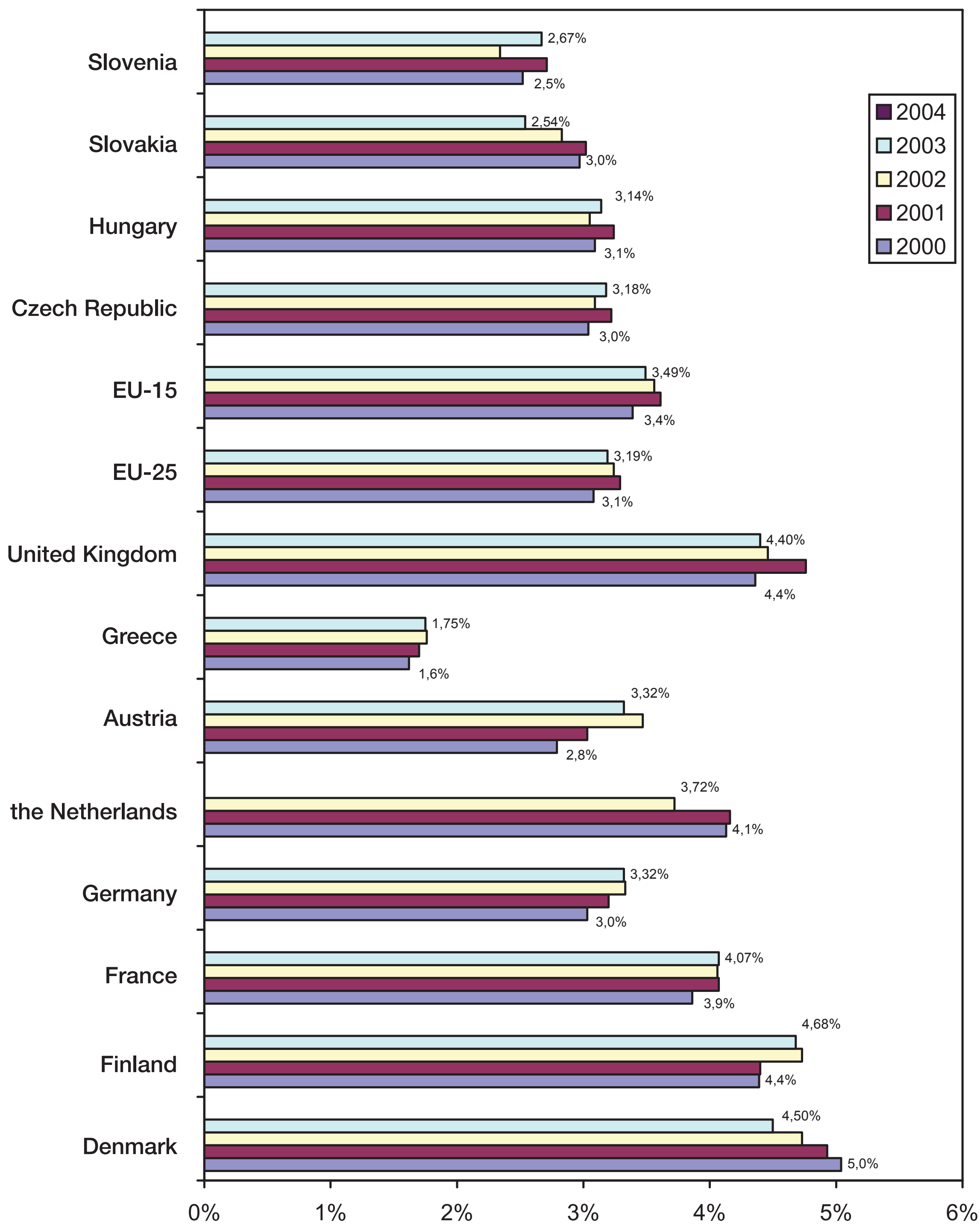
Source: CBS, structural surveys P 4-01 and P 5-01 (high-tech + medium high-tech = manufacturing industries with medium high and high technology)

The share of employees in medium high to high-tech industries grew from 35.8 % in 2000 to 38.1 % in 2003. The employment growth in these industries took place basically to the detriment of employment in the low-tech industries.

3 It covers following groups of economic activity branches according to ISIC, or OKEČ respectively: Manufacture of chemicals, preparations, medicaments and chemical fibres – 24; Manufacture and repairs of machinery and equipment not elsewhere classified – 29; Manufacture of office, accounting and computing machinery – 30; Manufacture of electrical machinery and apparatus not elsewhere classified – 31; Manufacture of radio, television and communication equipment and apparatus – 32; Manufacture of medical, precision and optical instruments, watches and clocks – 33; Manufacture of motor vehicles (with the exception of motorcycles), trailers and semi-trailers – 34; and Manufacture of other transport equipment – 35.

4 High technology research and development-intensive industries or group of manufacturing industries with high technology demands (hereinafter referred to as high-tech): OKEČ 244, 30, 32, 33, and 353. Advanced technology research and development-intensive industries or group of manufacturing industries with medium-high technology demands (hereinafter referred to as medium high-tech): OKEČ 24 excl. 244, 29, 31, 34, 352, 354, and 355. Medium-low technology industries with lower research and development demands or group of manufacturing industries with medium-low technology demands (hereinafter referred to as medium low-tech): OKEČ 23, 25 to 28, and 351. Low technology industries with lower research and development demands or group of manufacturing industries with low technology demands (hereinafter referred to as low-tech): OKEČ 15 to 22, 36 and 37. For names of individual OKEČ see: http//www.czso.cz/csu/redakce.nsf/i/odvetvova_klasifikace_ekonomickych_cinnosti_(okec)

P.I.6 Employment in high-tech services (in per cent of overall employment)

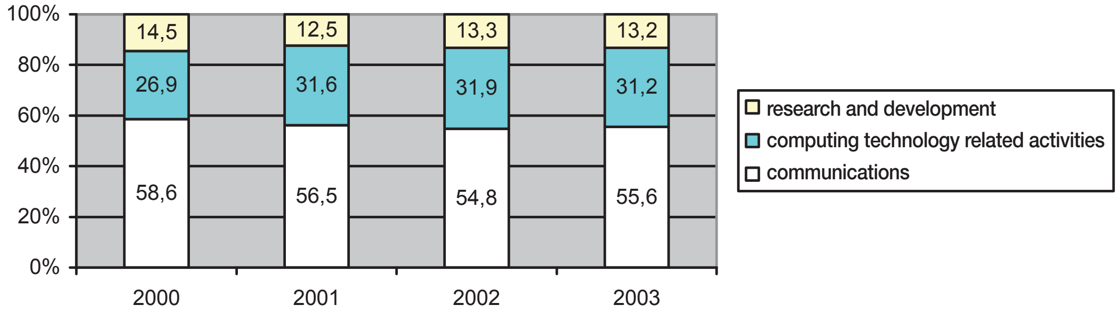


Source: Eurostat, June 2005

Commentary:

1. The importance of services is rising; particularly in the OECD countries. The 2004 Eurostat Yearbook says that in 2003 the services for enterprises, financial services and other services created 50 % of all added value in EU-25. The development of services has been supported also by the fact that many manufacturing enterprises are getting rid of certain activities and purchase them as services (outsourcing).
2. The high-tech services include services in the area of post and telecommunications (ISIC and OKEČ 64), information technologies, including software development (ISIC and OKEČ 72) and R&D services (ISIC and OKEČ 74); i.e. in branches using in a large scope telecommunication technologies, computing technology, scientific and other complex apparatuses, etc.
3. In 2003, the percentage of employment in this sector of services higher than 4 % was reported by Finland (4.68 %), Denmark (4.5 %) and the United Kingdom (4.4 %). Lower than 3 % employment showed Slovenia (2.67 %), Slovakia (2.54 %) and Greece (1.75 %). The levels of employment in high-tech services in the Czech Republic (3.18 %) and Hungary (3.14 %) are close to the EU-25 figure (3.19 %).
4. The Czech Bureau of Statistics monitors the structure of employment in three main branches of high-tech services: communications, computing technology related activities, research and development. The table below shows the trend of this structure between 2000 and 2003 in per cents of the overall employment within the services in the Czech Republic.

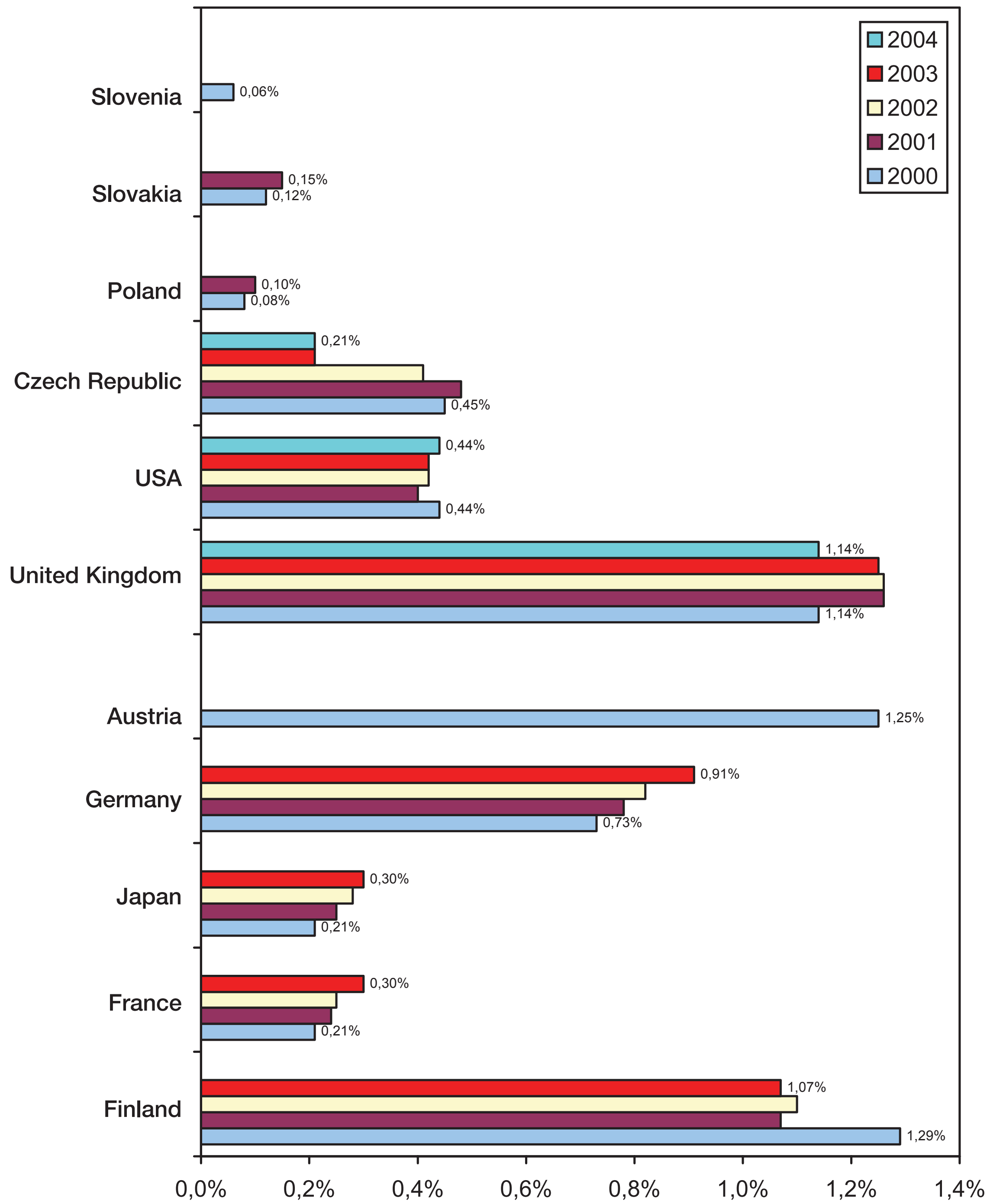
The structure of employment in the main branches of high-tech services in the Czech Republic between 2000 and 2003 (%)



Source: CBS, Selection survey of labour forces (communications + computing technology related activities + research and development = high-tech services, see the Graph P.I.6)

The share of workers in the computing technology areas in the overall number of workers in high-tech services is rising (from 26.9 % in 2000 to 31.2 % in 2003). The decline in the share of employees in research and development from 14.5 % in 2000 to 13.2 % in 2003 is everything else but gratifying. The share of employees in communications decreases more slowly.

P.I.7 Technology balance of payments (income/GDP in per cent)



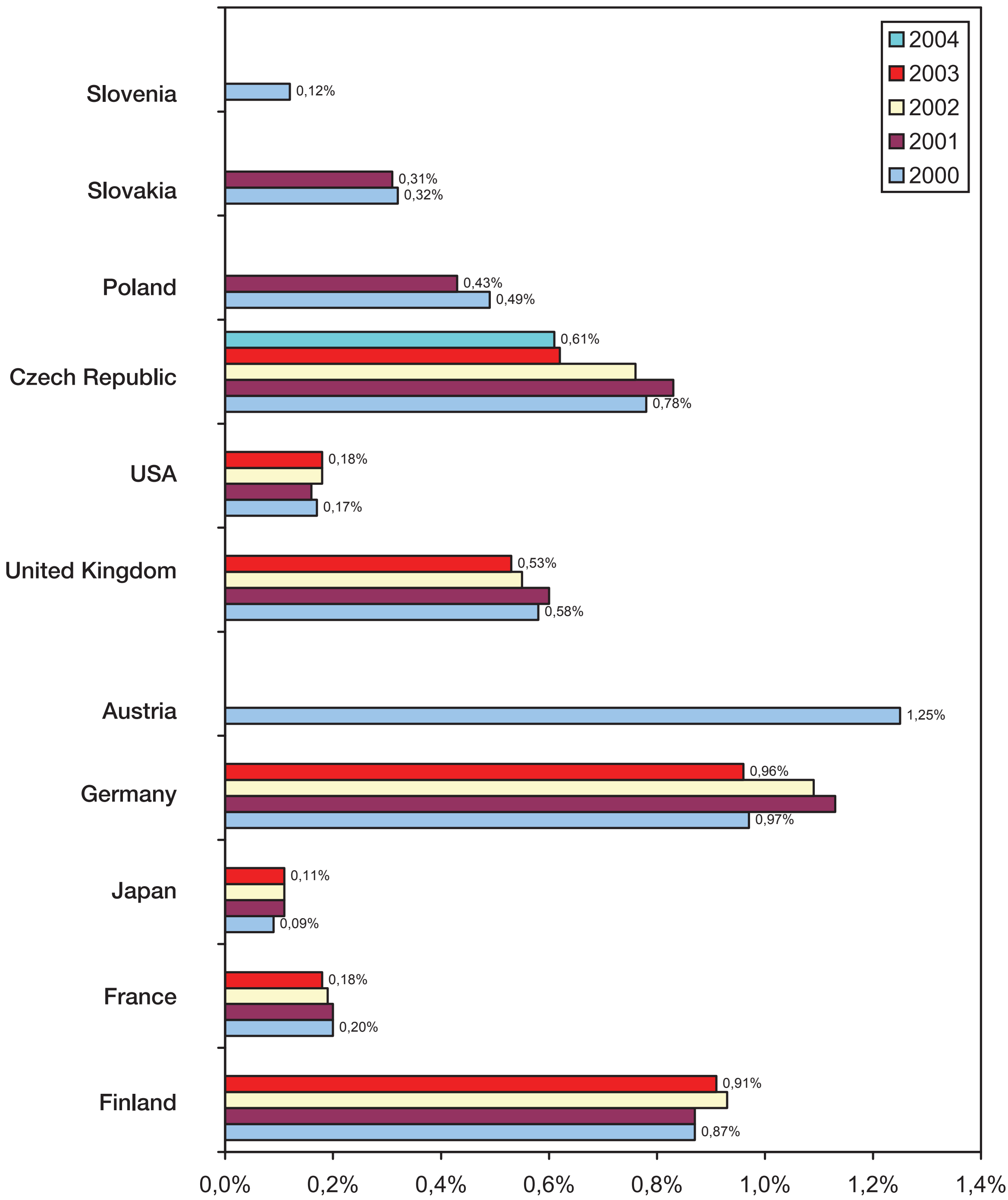
Source: OECD Main Science and Technology Indicators, May 2005 and CBS 2005
Data for Hungary are not available.

Commentary:

1. This indicator is a standard indicator of evaluation of national R&D policies, as well as of national innovation policies implying the technology level of economy, or more exactly the scope of foreign trade in industrial property and knowledge related to advanced technologies. The methodology and concept of this statistics is based upon the OECD Manual (Manual for the Measurement and Interpretation of Technology Balance of Payments Data – TBP Manual, OECD, 1990). The trade in technologies - the technology balance of payments - includes telecommunication and radio communication services, services of computing technology, technical services (project, design, testing and certification – not internal), author's fees and licence fees, research and development, purchase and sale of ownership rights and non-financial assets, etc[5].
2. Higher income of the technology balance of payments testifies to the higher level of respective services, their high quality, favourable prices and adequate marketing. The source of a high level of services included in the technology balance of payments is either a successful domestic research and development or sufficient and well-advised purchase of foreign equipment and know-how.
3. The highest income is reported by Austria (1.27 % GDP in 2000), United Kingdom (1.14 % GDP in 2004) and Finland (1.07 % GDP in 2003). Dynamic growth in income is reported by Germany, from 0.73 % of GDP in 2000 to 0.91 % in 2003; also the income of France and Japan is growing.
4. The income of the Czech Republic in the technology balance of payments fell from a good level 0.48 % of GDP in 2002 to 0.21 % in 2004.

5 In the Czech Republic the branches classified in the technology balance of payments are laid down in the Czech National Bank Ordinance No. 514/2002.

P.I.8 Technology balance of payments (expenditure/GDP in per cent)



Source: OECD Main Science and Technology Indicators, May 2005 and CBS 2005
Data for Hungary are not available

Commentary:

1. Text under point 1 of the Commentary on the previous graph of income of the technology balance of payments applies to the expenditure graph as well.
2. The highest payments among the monitored countries are reported by Austria (1.25 % in 2000), Germany (0.96 % in 2003) and Finland (0.91 %). Purchases in the Czech Republic in branches classified within the technology balance of payments attain the level of purchases in Germany.
3. The level of payments for purchasing technology services in the Czech Republic has declined in the same way as income, from the maximum 0.83 % of GDP in 2002 to 0.61 % of GDP in 2004. The level of payments in other monitored countries is lower than the level of payments in the Czech Republic.

RESOLUTION

of the Government of the Czech Republic
No: 1588 of 23 November 2005

to the Analysis of the existing state of research and development in the Czech Republic and a comparison with the situation abroad – 2005

The G o v e r n m e n t

I. takes cognizance of the Analysis of the existing state of research and development in the Czech Republic and a comparison with the situation abroad – 2005

Comment: