ANALYSIS OF THE EXISTING STATE OF RESEARCH, DEVELOPMENT AND INNOVATION IN THE CZECH REPUBLIC AND A COMPARISON WITH THE SITUATION ABROAD IN 2007

Research and Development Council

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Prague, December 2007

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Preface

Motto: *"Science makes knowledge from money and innovation makes money from knowledge"*

In 2007, the broad public is once again provided with the below Analysis of the existing state of research, development and innovation in the Czech Republic and a comparison with abroad made by the Research and Development Council in collaboration with a number of institutions dealing with research, development and innovation.

The Analysis represents a document addressing in detail the issue of measurement of inputs into research and development, as well as outputs mainly for innovation and competitiveness, whether concerning human resources, funds or attained results. It presents a series of figures for the Czech Republic and compares them with the existing level in other European countries, the United States, and Japan. Therefore, the Analysis constitutes an important analytical and underlying DOCUMENT for producing concept and strategic materials in this field.

The Analysis neither is nor was meant to be only a list of successes and positives of research, development and innovation carried out, but a complex and comprehensive material drawing attention to failures and negative trends, too, leading as a consequence to reduction in efficiency of economy being in a modern society to a large extent dependant on the knowledge attained by research and development.

This year's Analysis newly includes, among other things, the summary of results of the Evaluation of research and development and its results made for the years 2001–2005. These evaluations made on annual basis aim at expressing the effectiveness of both providers and beneficiaries of the R&D public support and show that not always the research and development efforts are orientated towards attainment of high-quality results. Without having top results applicable in practice, we cannot expect any advancement of competitiveness of the Czech economy from follow-up activities and innovation either.

I believe that this Analysis will become a useful resource for everyone interested in a detailed and concrete information on the state of the Czech research, development and innovation, as well as a valuable guide for everyone dealing with concept issues of research and development.

Ing. Mirek Topolánek
The Prime Minister of the Czech Republic and
Chairman of the Research and Development Council

Introduction

The present Analysis of the existing state of research, development and innovation in the Czech Republic and a comparison with the situation abroad in 2007 is arranged similarly to the last year's version. Research and development (R&D) inputs and outputs are measured within separate chapters A and B, respectively. The scope of this year's Analysis is enlarged in parts dealing with innovation and evaluation of the Czech participation in the 6th Framework Programme. The selection of monitored countries was broadened compared to the previous analysis to include Romania and Bulgaria. For certain indicators, EU-15, EU-25 and EU-27 figures are given, too. Sometimes, however, data do not cover same periods depending on data sources used to obtain them. Basic parameters of monitored countries and the list of abbreviations are given in Annex.

Chapter A – R&D Inputs

This 2007 Research, Development and Innovation (R&D&I) Analysis measures inputs within one chapter. The number of indicators slightly increased compared to the last year's analysis. In particular, the part dealing with evaluation of human resources in research and development has broadened its scope. The group of countries for whom the international comparison is made was enlarged to include Bulgaria and Romania.

Chapter A – R&D Inputs is divided into two parts: Investment into R&D and Human resources in R&D.

Number of indicators in Chapter A

Chapter, Part	Name	Number of indicators
A	R&D inputs	50
A.1	Investment into R&D	36
A.2	Human resources in R&D	14

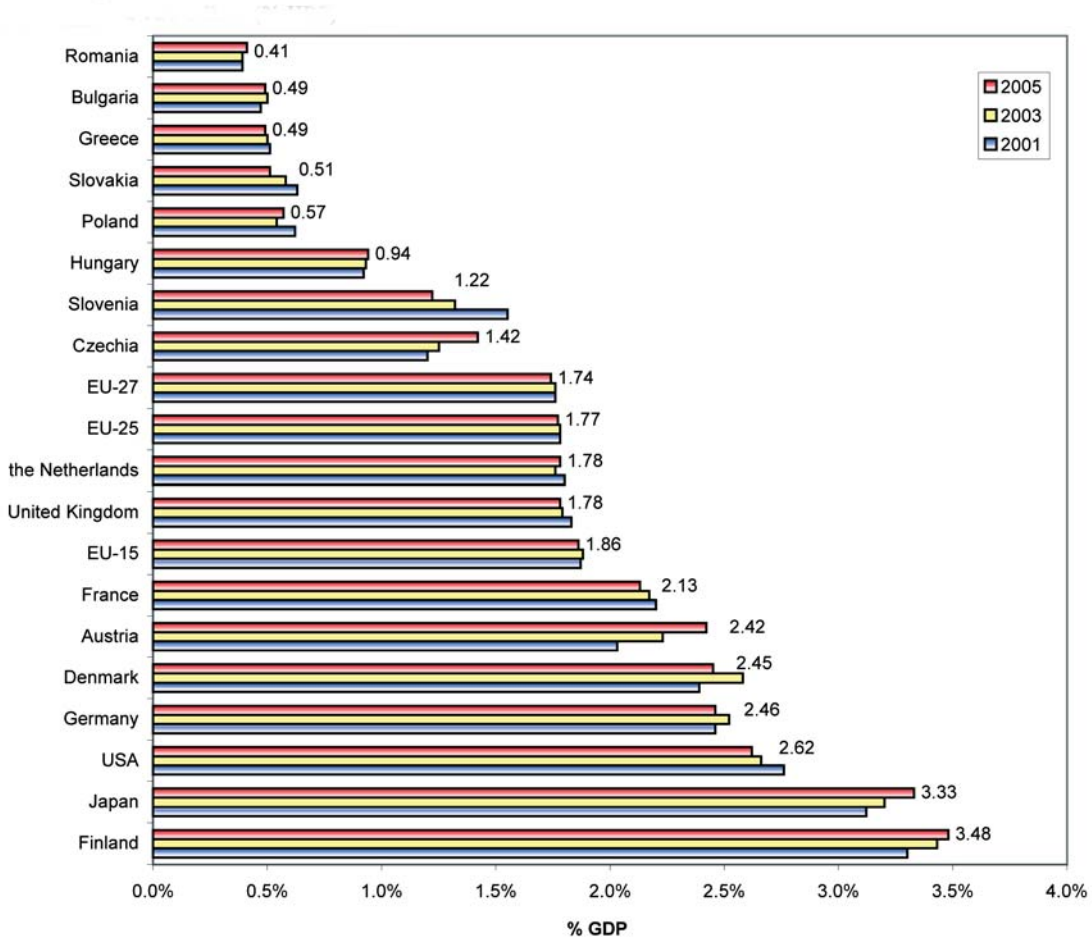
Part A.1 contains 24 graphs showing total R&D expenditure, structure of funding sources and how these funds were spent in an international comparison. OECD data from the Main Science and Technology Indicators (MSTI) are used.

Furthermore, this part provides an evaluation of trends in public R&D support in Czechia using data from the R&D Information System (R&D IS) being operated by the Research and Development Council. It shows trends in overall support from public funds, trends in two basic forms of support – targeted and institutional, as well as trends in support by the leading support providers (administrators of budget chapters under which R&D is funded), and trends in R&D support by individual regions of Czechia. Two graphs illustrate trends in targeted and institutional support broken down by main scientific disciplines.

Part A.2 contains 13 graphs. Graphs show trends in the number of R&D employees, research workers, in an international comparison and within the individual Czech regions. Other graphs illustrate international comparisons of trends in the number of R&D employees in public sector, at universities and in business sector, as well as trends in the number of students in Science&Technology study programmes at universities and students and graduates in doctor's degree study programmes. The last graph of this part shows how the age structure of principal investigators of research projects has changed. Data for this part were taken from OECD, MSTI database, R&D IS and the Ministry of Educatin, Youth and Sport.

A.1 Investment into research and development

A.1.1 Total expenditure on research and development: an international comparison



Source: OECD, Main Science and Technology Indicators, 2007/1

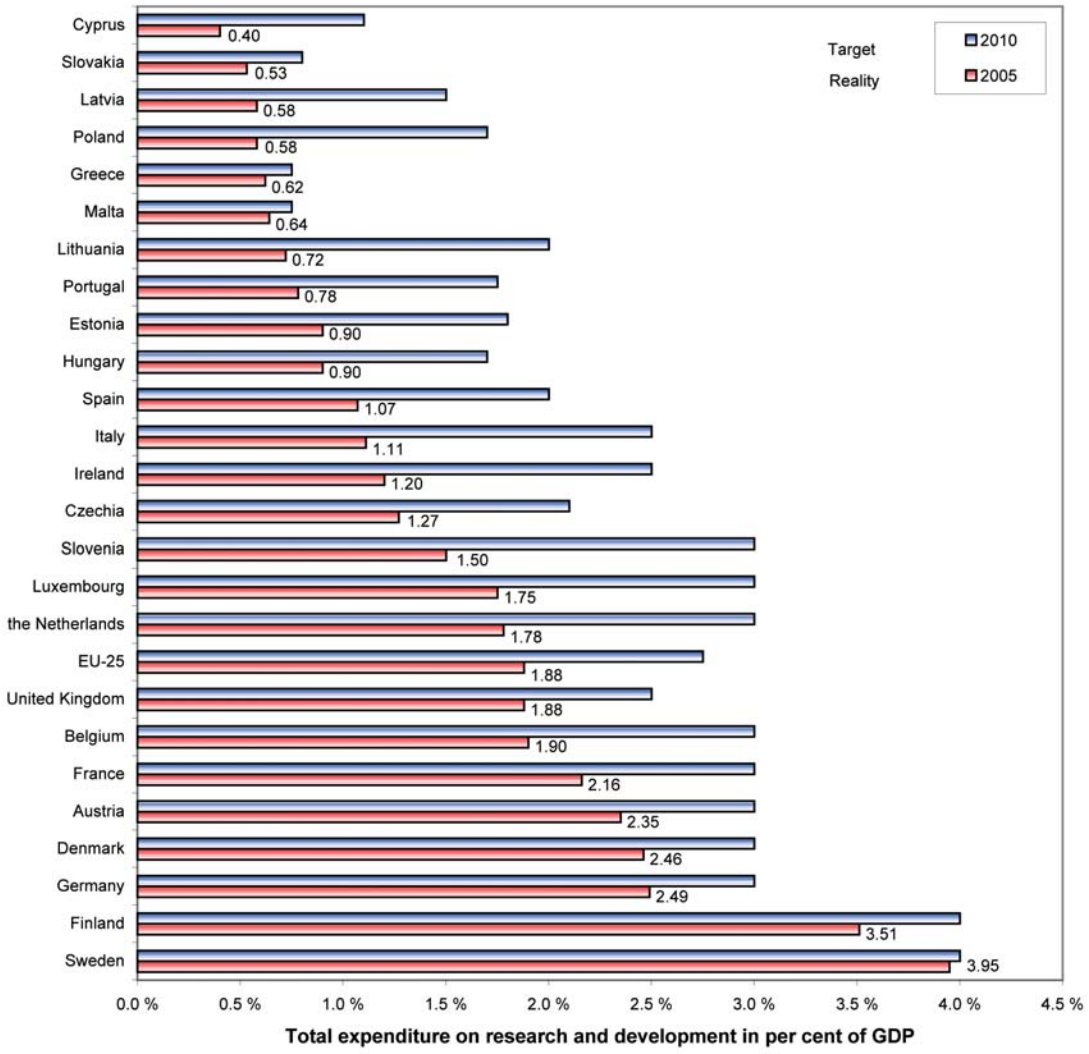
Total R&D expenditure (GERD – gross expenditure on R&D) is the most famous and most frequently used indicator for an international comparison of research and development. It represents the sum of R&D expenditures from public, private (business or non-business), and foreign sources.

The level of total R&D expenditure stagnates, or even declines (Slovenia, USA, etc.) in most of the monitored countries. Czechia, together with Finland and Japan, belongs among countries where expenditure grew in the years 2001, 2003, and 2005. Despite their constant growth, the expenditure on R&D in Czechia still lags behind the EU-27 average (Czechia in 2005 – 1.42 % of GDP, EU-27 – 1.74 % of GDP).

So the highly ambitious target set by the Lisbon Strategy of rising R&D expenditures up to 3.0 per cent of GDP by 2010, of this two thirds from private sources and one third from public sources, evidently won't be fulfilled as confirmed by the following graph.

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

A.1.2 Total expenditure on research and development in EU Member States (GERD): the Lisbon Strategy



Source: Annex to EC COM (2006) 816 of 12. 12. 2006 – Communication from the Commission to 2007 Spring European Council implementing the renewed Lisbon Strategy for growth and jobs – "A year of delivery"

Note: Different target years – Poland (2008), Ireland (2013), United Kingdom (2014).

The target value of EU-25 expenditure in 2010 was calculated by EC on a basis of data given in national documents on the renewed Lisbon Strategy from 2005.

In 2005, the ´ Lisbon target´ level of total R&D expenditure was exceeded by Sweden and Finland. In their national documents on implementation of the renewed Lisbon Strategy from 2005, Germany, Denmark, Austria, France, Belgium, the Netherlands, Luxembourg and Slovenia set the expenditure to the amount of 3 per cent of GDP.

As can be derived from the development so far, only for Germany, Denmark, and Austria this target is feasible. Other countries will not probably accomplish the expendi-

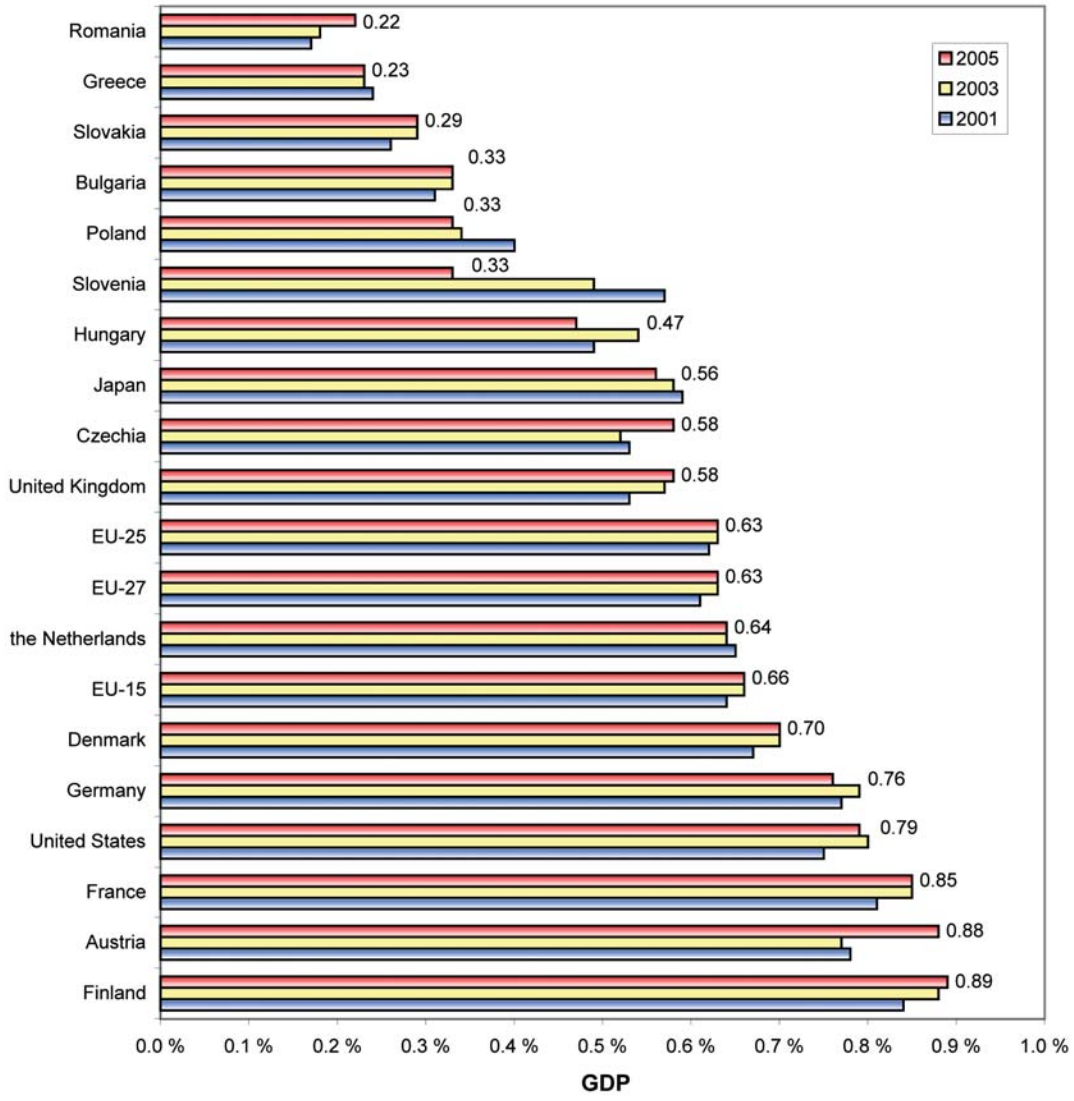
ture target of 3 per cent of GDP. Reasons are the same for most of the EU-27 Member States – a strong pressure to decrease state budget deficits and indebtedness of states. The amount of expenditure expressed as a percentage of GDP is a relative indicator. The actual amount depends on the level of GDP.

EU bodies have expressed their dissatisfaction with the stagnation of R&D expenditure and lagging behind the main competitors such as the United States, Japan, and South Korea (EC in its document "Key figures of science, technology and innovation – 2007").

In its Report No. 6/2007 of 12th January 2007, Eurostat includes, among other things, also the average annual increments for the total R&D expenditure over the period 2001 to 2005 in the EU-27 Member States and in selected countries. Among the EU-27 Member States, highest annual increments were reached in Latvia (17.6 %) and Estonia (17.6 %). Czechia ended up in a very flattering fourth place within EU-27 with annual increments of 8.3 per cent. The average annual increments for EU-27 Member States are 1.5 per cent.

When making comparisons of the R&D performance measured, for example, by the number of patents or scientific publications and their citation frequency, it is necessary to take account of real expenditures per one inhabitant, or more suitably, one R&D employee. Details on these expenditures are found in the introduction to Chapter B: R&D Outputs.

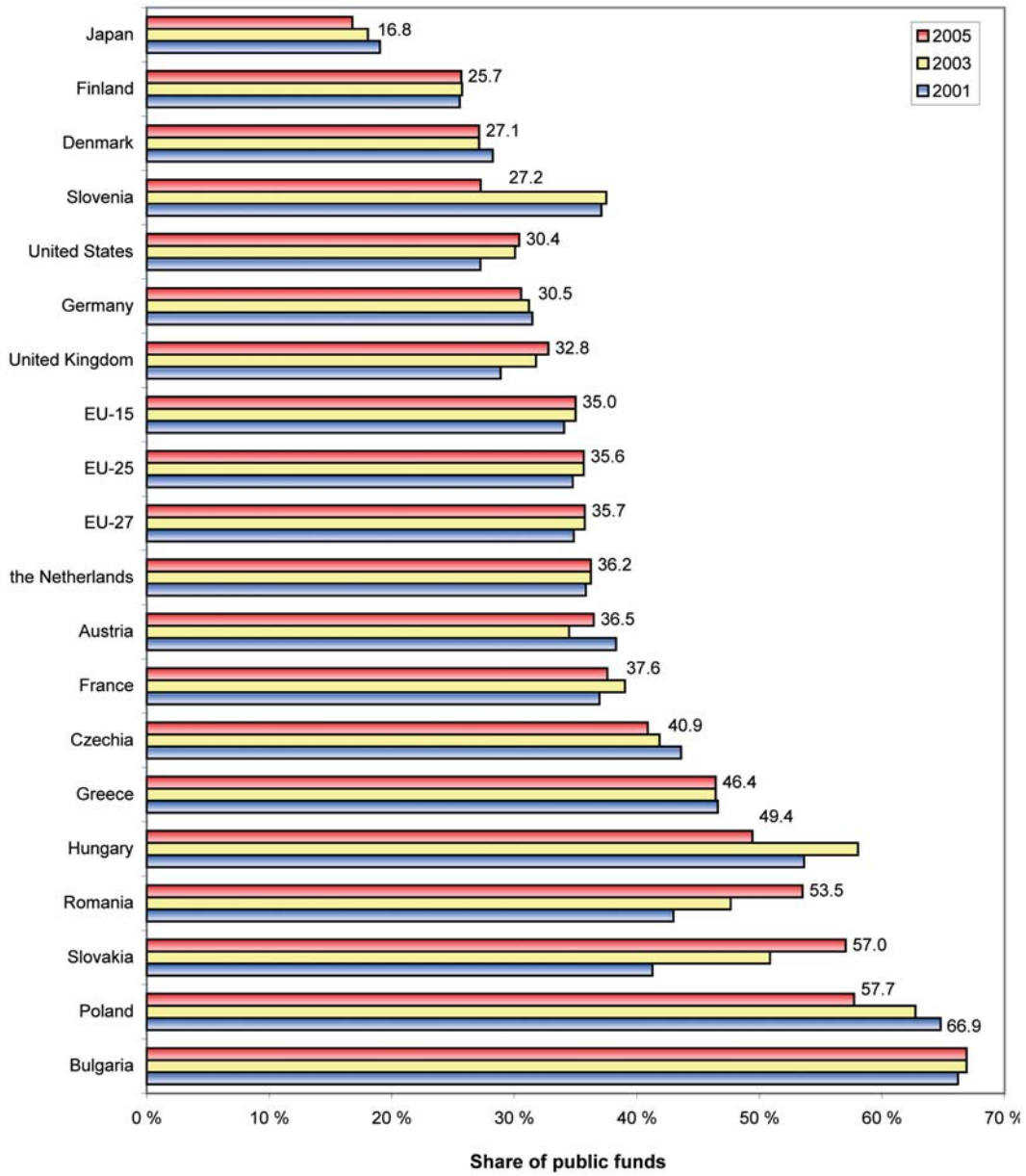
A.1.3 Public R&D expenditure



Source: OECD, Main Science and Technology Indicators, 2007/1

Year 2005 saw a very significant growth in public expenditure in Finland, Austria, but also in Czechia and Romania, compared to 2003. The public expenditure declined e.g. in Japan, Poland, and Slovenia.

A.1.4 Share of public funds in total R&D expenditure



Source: OECD, Main Science and Technology Indicators, 2007/1

In the countries professing liberal economy in a developed market environment, one third is considered to be a suitable share for public funds in total R&D expenditures. This value was applied also as the Lisbon Strategy target – 3 per cent of GDP in total, of this 1 per cent from public funds and 2 per cent from business sources.

High shares of public R&D expenditure, more than 40 per cent, are reported by new EU Member States – Romania, Slovakia, Hungary, Poland, and Bulgaria. This has been evi-

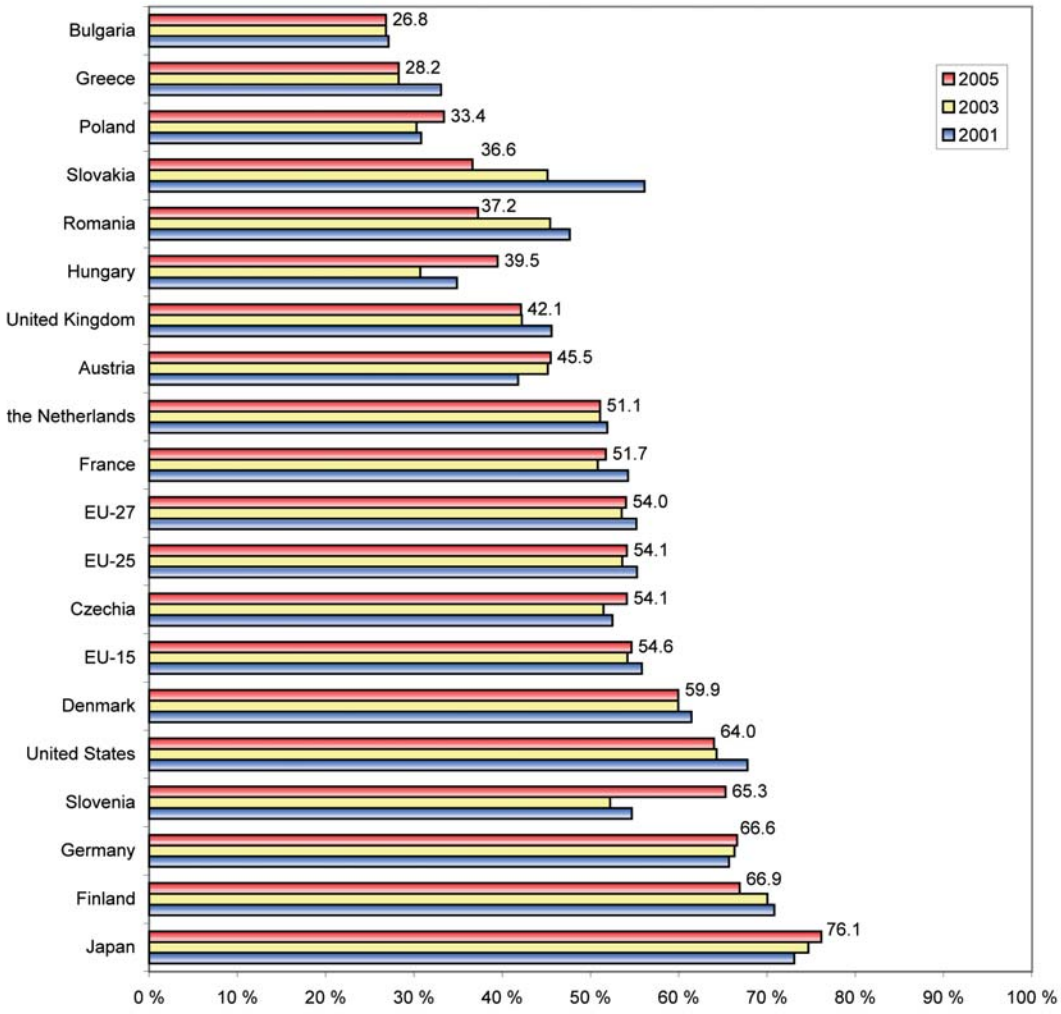
dently caused by low R&D expenditure of business sphere as a result of concentration on lower and medium technologies, unfinished restructuring of industry and efforts to move the existing research base on to "better times".

With its share 40.9 per cent in 2005, Czechia belongs into a large group of countries, whose share of public funds in total R&D expenditure ranges between 30 and 45 per cent.

A very low and continuously declining share of public expenditure is reported by Japan – 16.8 per cent in 2005. This low share of public R&D expenditure in Japan can be explained by the existence of numerous large industrial companies providing extensive support to research and development, including basic research. In most EU countries, basic research is conducted in public sector and universities, and is supported predominantly by public funds.

The position of Czechia in this indicator can be assessed as good.

A.1.5 Share of private funds in total R&D expenditure



Source: OECD, Main Science and Technology Indicators, 2007/1

The share of foreign funds in total R&D expenditure does not exceed 10 per cent in most monitored countries (see following Graph A.1.6). Therefore for most of them, the share of private funds is basically what is left to 100 per cent after adding the share of public funds. Least shares of private funds in 2005 are reported by new EU Member States; the largest by Finland (66.9 %) and outside EU by Japan (76.1 %).

In its document titled "Key figures of science, technology and innovation – 2007", the European Commission warns that particularly the level of R&D expenditure in business sector is alarmingly low. European companies have spent substantially fewer funds on research and development compared to the United States or Japan. The European Commission sees the different structure of industry as the main reason. In Europe, the share of high tech industries is still lower than in the United States. And high R&D expenditure is reported by those companies who produce advanced technologies.

Again, these indicators are relative. Many large European companies put more money in research and development than some EU-27 Member States.

In the 1Q, the European Commission published a report on R&D spending of industry [2]. This report contains a list of one thousand EU companies and one thousand non-EU companies with the highest R&D investment in 2005.

Table A.1 EU industrial companies with highest R&D spending in 2005

Company (registered office)	Scope of activities	R&D expenditure (EUR mil)	R&D expenditure (% of turnover)
(1) Daimler Chrysler (Germany)	Cars, accessories	5,649.0	3.8
(2) Siemens (Germany)	Electrotechnics, electronics	5,155.4	6.8
(3) Glaxe Smith Kline (UK)	Pharmaceutics	4,584.1	14.5
(4) Volkswagen (Germany)	Cars, accessories	4,075.0	4.3
(5) Sanofi Avents (France)	Pharmaceutics	4,044.0	14.8

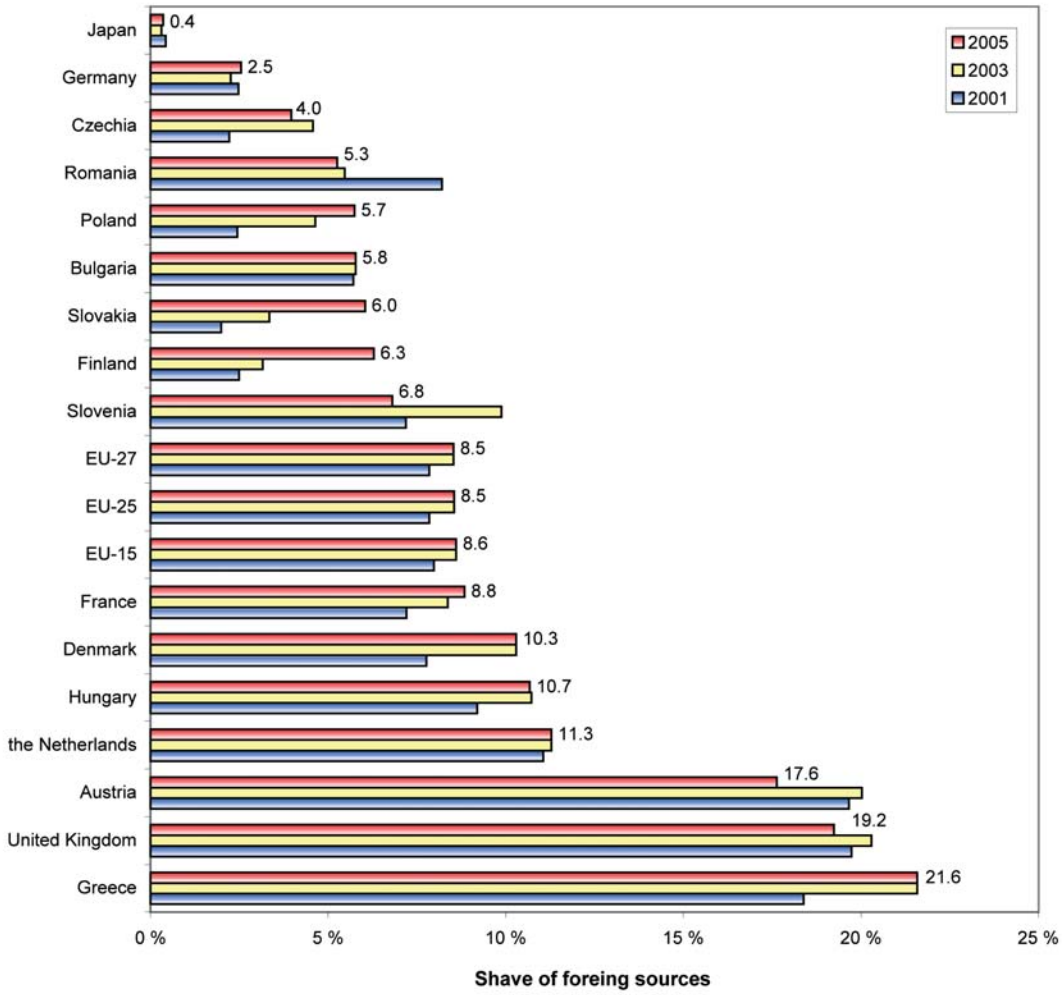
Source: Analysis of the 2006 EU Industrial R&D Investment Scoreboard, Technical Report EU 22694.

Five out of ten EU companies with the highest R&D spending produce cars and car accessories; two produce telecommunication equipment; two are pharmaceutical companies; and one deals with electrotechnics and electronics. Highest levels of R&D expenditure as a percentage of turnover are attained by pharmaceutical and software companies. Even the Dutch company STMicroelectronics ranking 21st on the list spent more funds on research and development in 2005 than the whole business sector in Czechia (STMicroelectronics – EUR 1,317.6 mil; Czechia – EUR 1,200 mil). This fact raises an important question whether the research programmes of medium-sized countries are not too wide thematically to attain results providing considerable benefits for economy and society.

In October 2007, the European Commission published its annual report titled The 2007 EU Industrial R&D Investment Scoreboard. According to this report, 2006 saw a slight increase in business sector funds spent on R&D compared to 2005 – 10 per cent world wide and 7.4 per cent in EU residing companies. The report also contains lists of top 1000 companies with highest spendings, both EU and non-EU. Four Czech companies are among the top thousand EU residing companies: Komerční banka on 340th place (2006 R&D spendings of EUR 28.12 mil), ČEZ on 569th place (EUR 12.24 mil), Aero Vodochody on 854th place (EUR 5.20 mil), and Třinecké železárny on 891st place (EUR 4,57 mil). Some companies are evidently absent from the list, namely Škoda Auto, a.s., Mladá Boleslav and Zentiva for Czechia, and others. Reasons for their unlisting are not known.

[2] Analysis of the 2006 EU Industrial R&D Investment Scoreboard, Technical Report EU 22694.

A.1.6 Share of foreign funds in total R&D expenditure

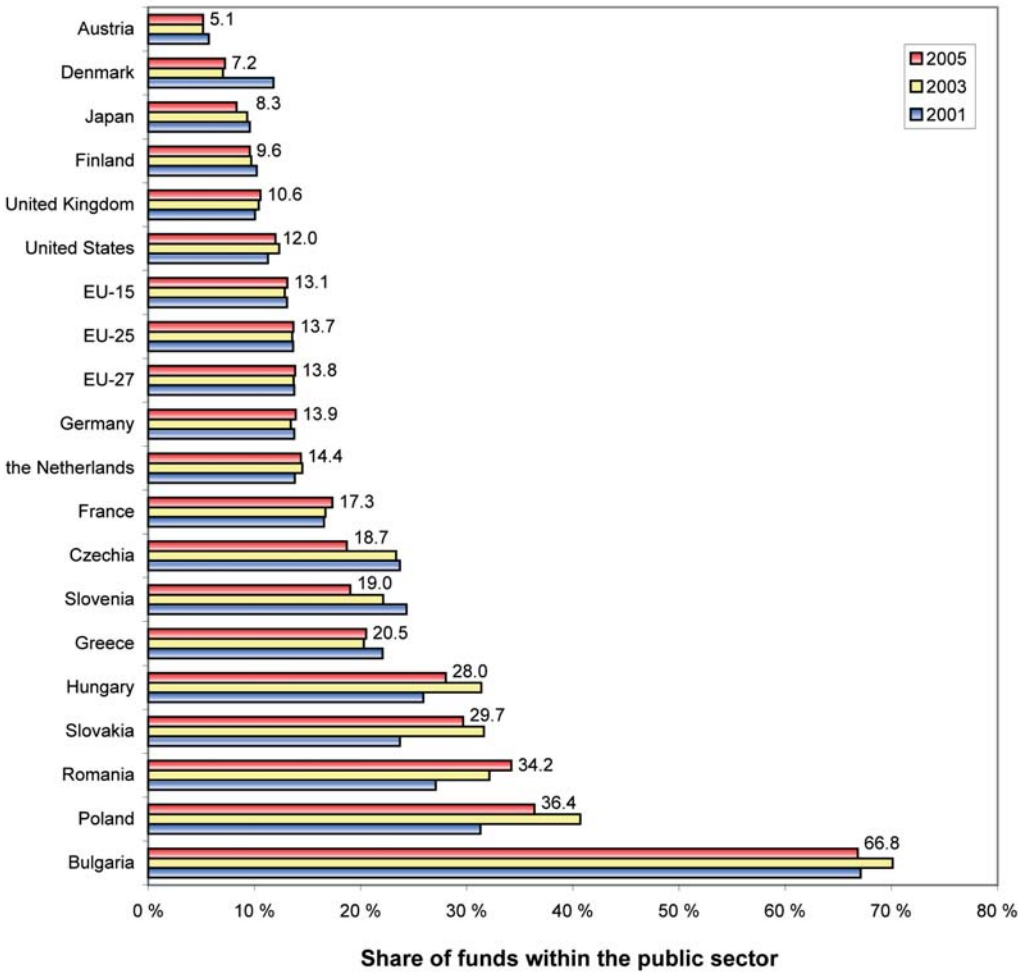


Source: OECD, Main Science and Technology Indicators, 2007/1

The share of foreign funds in total R&D expenditure of individual countries is one of main indicators of internationalisation in research and development. These foreign sources take various forms ranging from spending made by branches of foreign firms in a local country to research purchased by foreign firms from domestic R&D organisations. They may also take a form of expenditure of branches of large research organisations (institutions) established in other countries, for all sorts of reasons.

In this indicator, there is no substantial difference between new EU Member States and EU-15 countries. Of the monitored countries, highest shares of foreign funds were reported in 2005 from Greece, the United Kingdom, and Austria. In Czechia, the share of foreign funds was 4 per cent in 2005; this is by 4.5 percentage points lower then the EU-27 average. Japan reports the lowest share (0.4 per cent in 2005). This may be caused by persistent problems encountered while establishing a branch office in Japan and a relatively low involvement of Japan in international co-operation in research and development.

A.1.7 Share of R&D funds spent within the public sector in total R&D expenditure

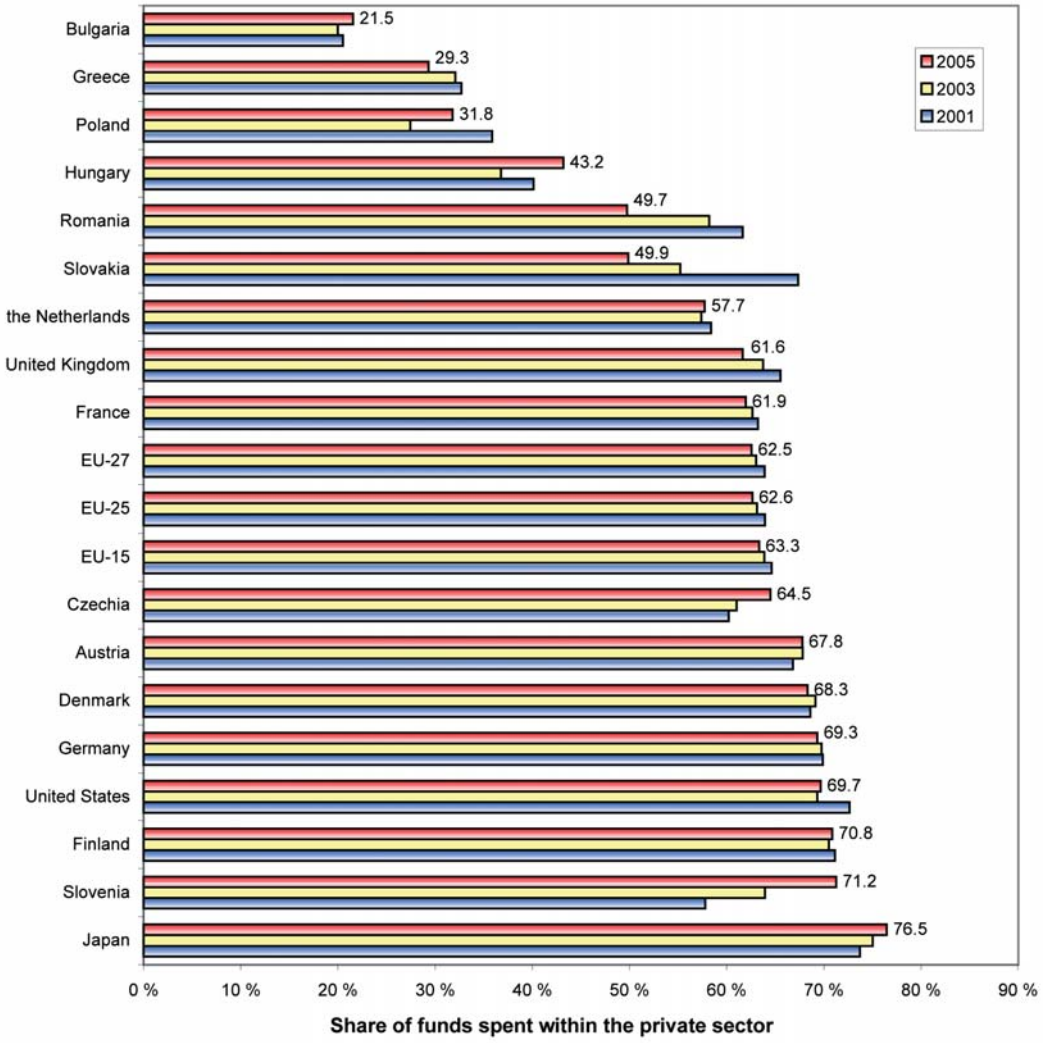


Source: OECD, Main Science and Technology Indicators, 2007/1

The public R&D sector in Czechia is made up of research workplaces established by administrators of budget chapters from which research and development is financed, the so called departmental research institutions, and institutions of the Academy of Sciences of the Czech Republic. A high use of R&D funds within public sector is reported by new Member States, namely Bulgaria, Poland, and Romania, i.e. countries with low share of industries producing top technologies, with limited research capacities at a corporate level.

Czechia has the lowest share among the monitored new EU-27 Member States (18.7 % in 2005). The level of share, of course, depends on the system of research and development in individual countries, on the structure of R&D workplaces and institutions, and their development. Germany and France spent more funds within the public sector than is the EU-15 average. In these two countries, there exist large associations of public research organisations - especially CNRS (Centre National de la Recherche Scientifique) in France and Max Planck Society, Fraunhofer Society, and Helmholtz Association in Germany. In the group of monitored advanced countries, Austria, Finland, Denmark, and Japan report low shares of funds spent within the public sector.

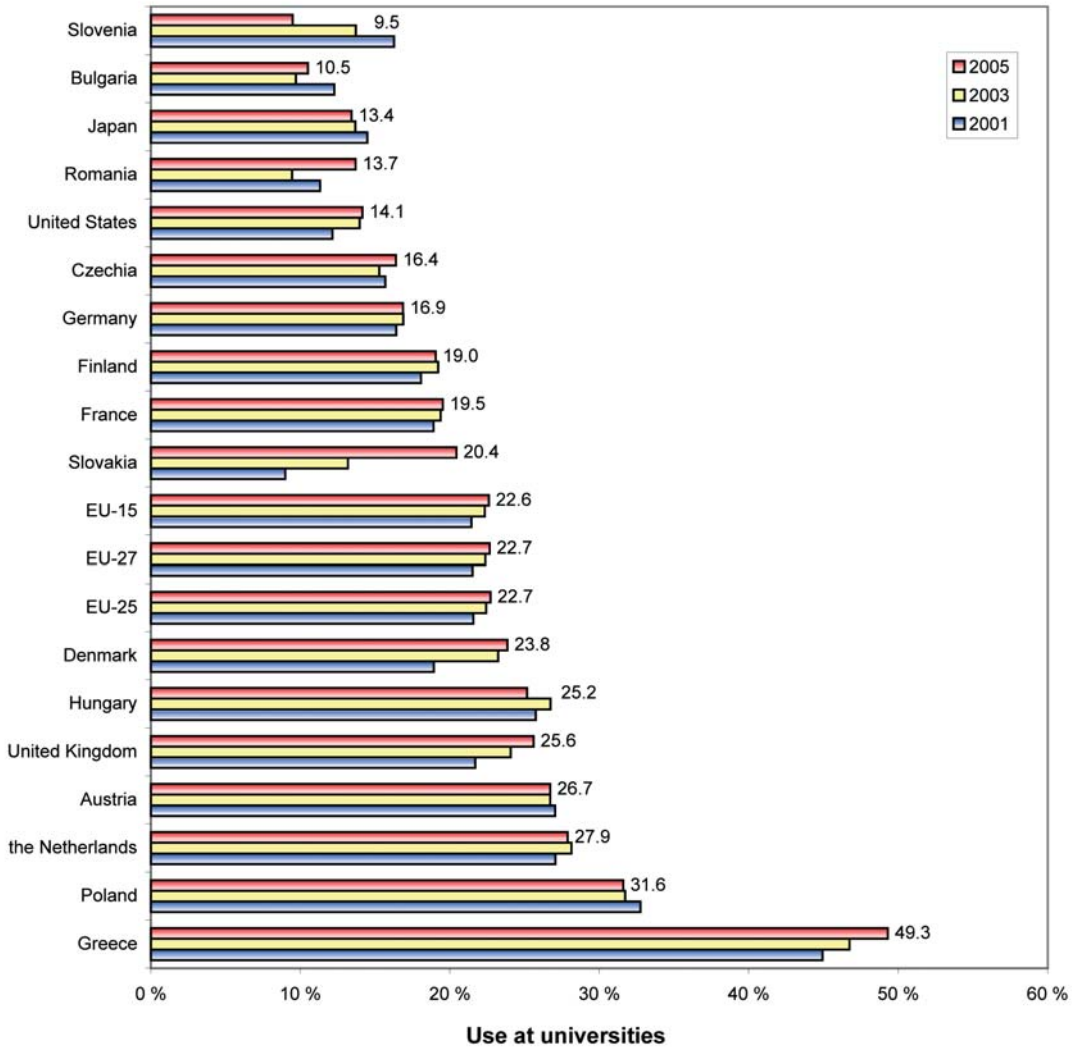
A.1.8 Share of R&D funds spent within the private sector in total R&D expenditure



Source: OECD, Main Science and Technology Indicators, 2007/1

The Graph A.1.8 shows the shares of R&D expenditure spent within the private sector. Most of the monitored countries report 60–70 per cent use of funds within the private sector. Very low shares of use within the private sector have Bulgaria, Poland, and Greece. Reasons are similar to those for the indicator of private R&D expenditure share (see Graph A.1.5) – a low share of high-tech companies and uncompleted restructuring of industry.

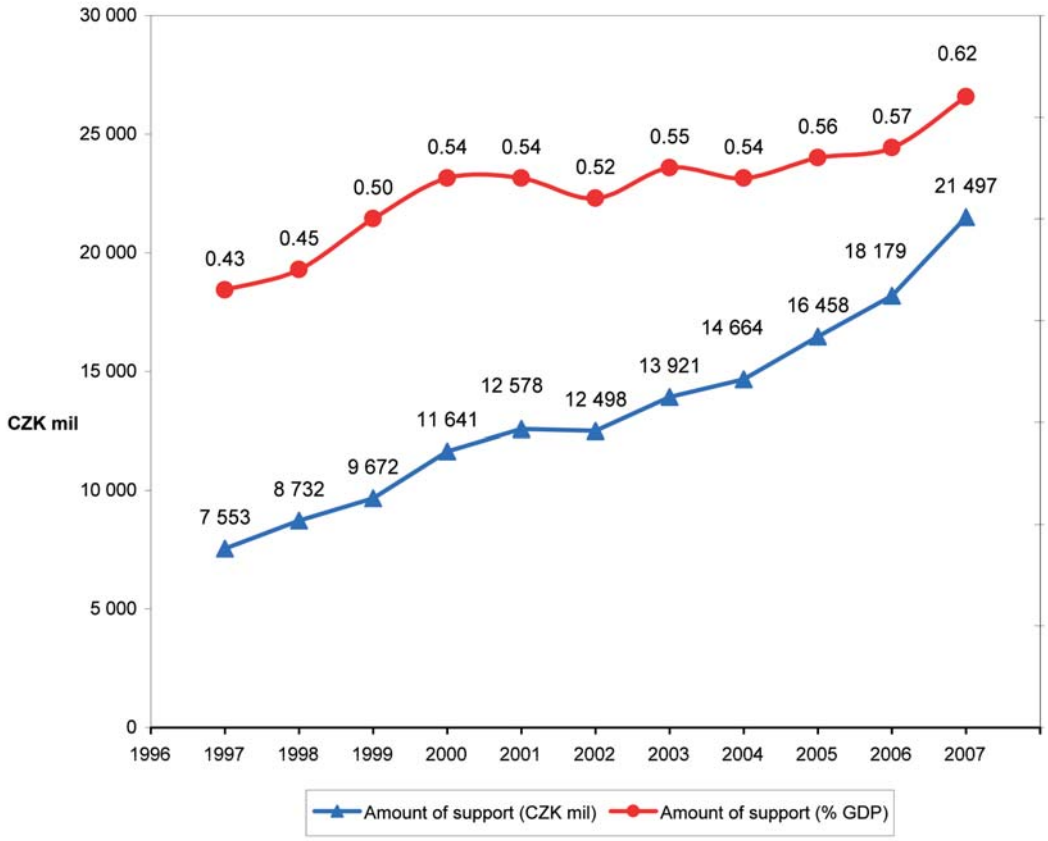
A.1.9 Share of R&D funds spent at universities in total R&D expenditure



Source: OECD, Main Science and Technology Indicators, 2007/1

The Graph A.1.9 shows the shares of R&D expenditure spent at institutions of universities. The figure depends on the system of research and development in individual countries, and its structure and development similarly as in the case of use of funds within the public sector. We can't speak about any optimal share of funds spent within the public sector and at universities. But on the other hand this figure shows how universities participate in research, development and innovation efforts.

A.1.10 Overall R&D support from public funds in Czechia

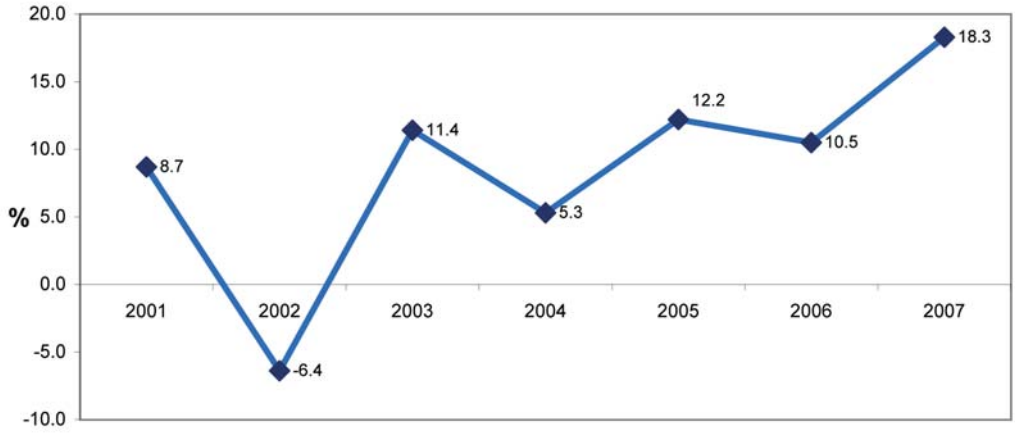


Source: State budget of the Czech Republic, years 1997–2007

Note: Details of GDP and state budget's R&D expenditure are based on data published by the Ministry of Finance. The expenditure given above is in current prices of respective years. These data on R&D expenditure slightly differ from data promulgated by the Czech Statistical Office that are used in Graph A.1.3.

The public support in amounts of money grew relatively quickly during the whole period, with the exception of 2002. The growth in public spending favourably influences the growth of overall R&D expenditure being the fourth highest within EU-27 in the period 2001–2005. The graph A.1.11 shows expenditure increments in amounts of money expressed as a percentage of expenditure of the preceding year.

A.1.11 Changes in public R&D expenditure in Czechia



Source: State budget of the Czech Republic, years 2000–2007

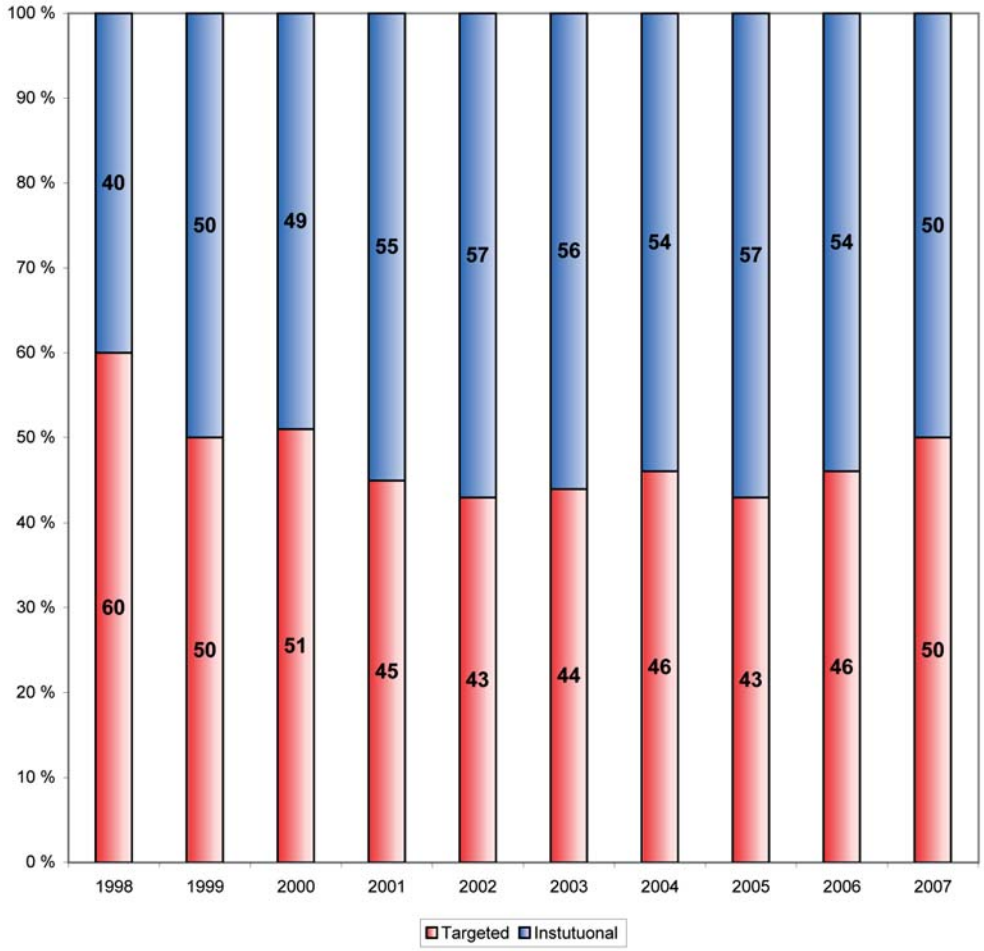
Graph A.1.11 displays public R&D expenditure increments as a percentage of expenditure of the preceding year.

For the most part, the public (state) support to research and development is awarded by form of either targeted or institutional financial allocations. The scope of public (state) contracts in research and development is very small.

The targeted support to research and development is awarded on the basis of public tenders for submitting research project proposals applying for support within research programmes with specifically defined objectives and plan, or within the framework of so called grant projects in a wide spectre of disciplines.

The prevalent part of institutional support is awarded to larger teams of research workers or whole organisations, as the case may be, on the basis of research plans. A smaller part goes to universities for specific research, i.e. research connected with students learning. Every draft research plan must go through an evaluation process, too, but funding decisions have different specifics than those of tenders for research project proposals. For the future, the amount of institutional support should depend on research and development results being accomplished over the long term.

A.1.12 R&D expenditure – shares of targeted and institutional support in the overall public R&D expenditure in Czechia

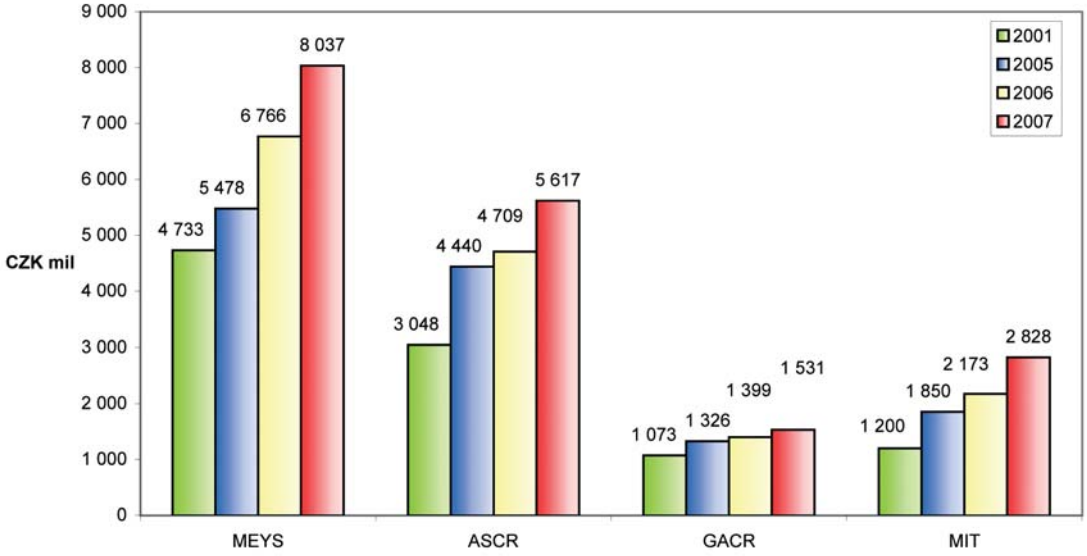


Source: State budget of the Czech Republic, years 1998–2007

Graph A.1.12 shows the trend in shares of both targeted and institutional support. In 1998, the share of targeted support in the overall public support was relatively favourable (60 %). Over the next few years, it fell down to 43 per cent in 2002. That year the Research and Development Council set the target of goal increase in the share of targeted support on the account of the institutional one. However, the fulfilment of this target has not yet been successful with the share of targeted support oscillating between 43 and 50 per cent by 2007.

With the prepared reform of R&D system, the institutional funding of research and development will essentially change. It is assumed that dependence of the amount of support given to R&D organisations on results achieved in the previous period will substantially increase.

A.1.13 Overall R&D support from public funds by selected providers in Czechia



Source: State budget of the Czech Republic, years 2001–2007

In Czechia, the public support to research and development is provided through 21 providers from their respective budget chapters – ministries, central bodies of state and public administration, the Academy of Sciences of the Czech Republic (ASCR) and the Grant Agency of the Czech Republic (GACR). The Ministry of Education, Youth and Sport (MEYS), ASCR, the Ministry of Industry and Trade (MIT) and GACR are among the largest providers. The amount of support awarded by these granting bodies in years 2001, 2005, 2006, and 2007 is illustrated in Graph A.1.13. The participation of four largest providers in the overall public R&D support has been around 80 per cent of R&D expenditure in Czechia in the monitored years.

Table A.2 Trend in the participation of the largest providers in the overall public R&D support

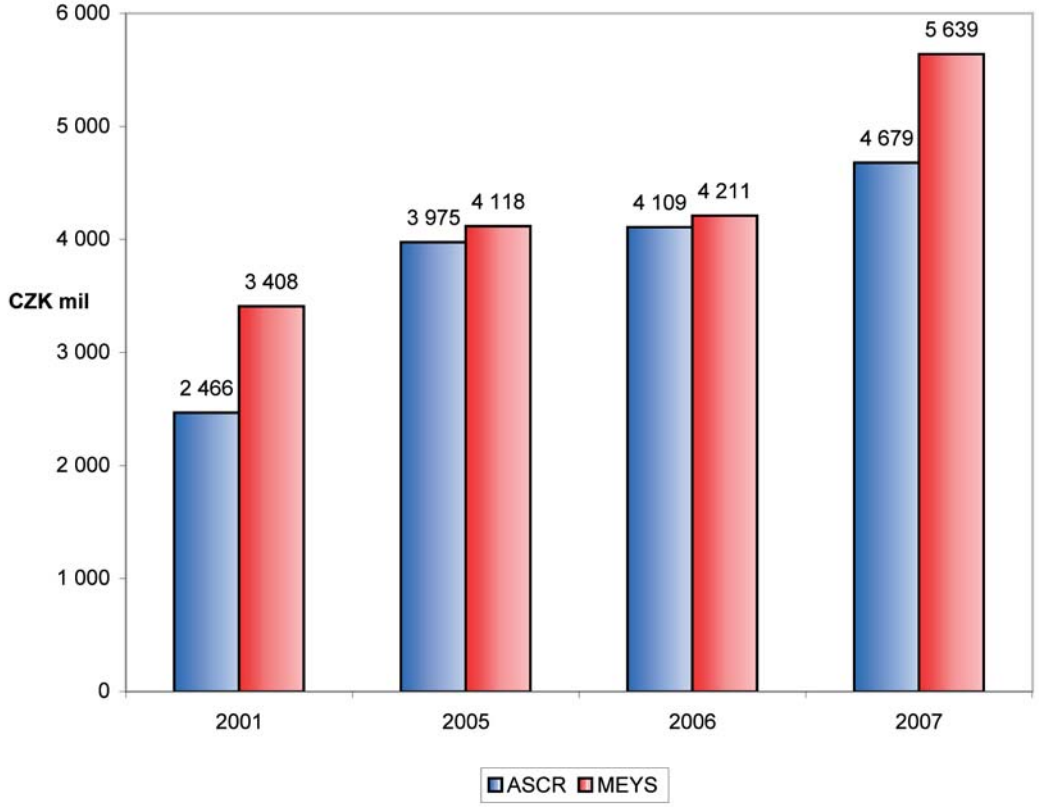
	2001	2005	2006	2007
Public support in total (CZK mil)	12 578	16 458	18 179	21 497
Participation of ASCR	24.2 %	27.0 %	25.9 %	26.1 %
Participation of GACR	8.5 %	8.1 %	7.7 %	7.1 %
Participation of MIT	9.5 %	11.2 %	12.0 %	13.2 %
Participation of MEYS	37.6 %	33.3 %	37.2 %	37.4 %
Participation of four largest providers	79.8 %	79.6 %	82.8 %	83.8 %

The R&D support awarded by the Ministry of Industry and Trade (MIT) nearly doubled. The support provided by the Grant Agency of CR saw the least growth.

Table A.3 Growth in the overall R&D support at the largest providers in 2007 compared to 2001

	ASCR	GACR	MIT	EYS
Growth by	84.3 %	42.7 %	135.7 %	69.8 %

A.1.14 The institutional support awarded to research by selected providers in Czechia



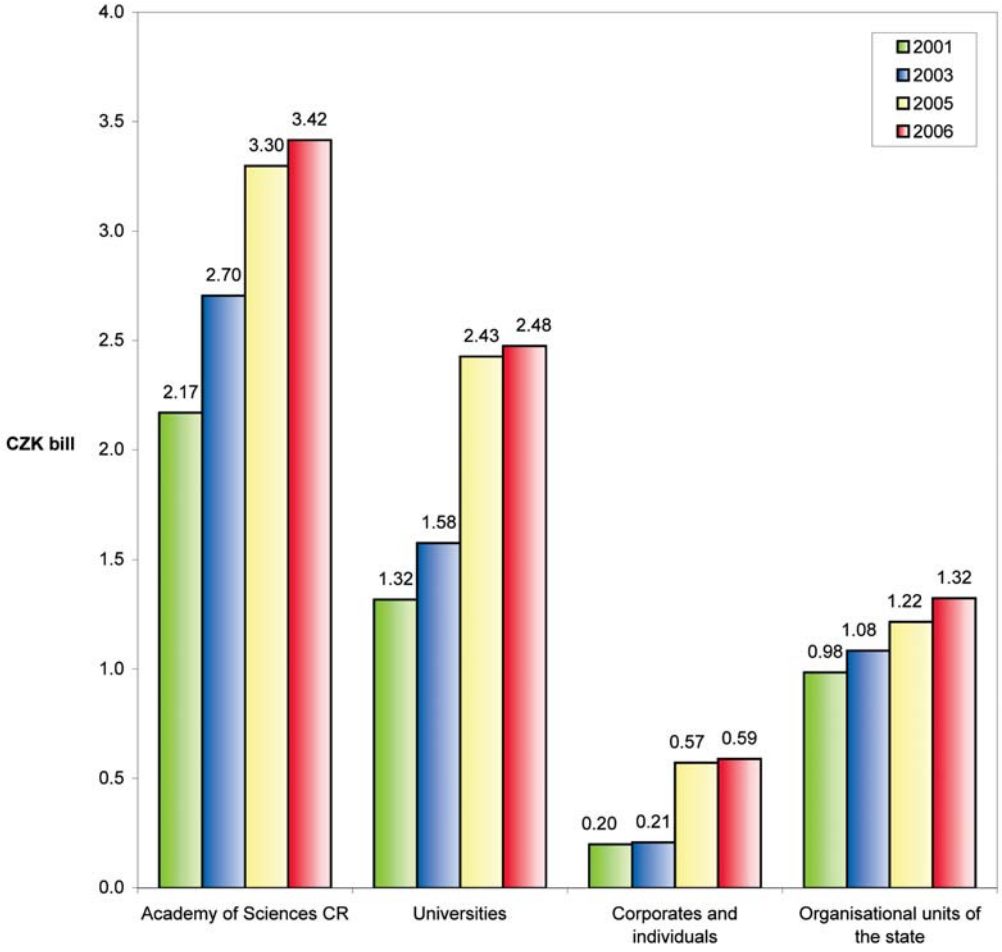
Source: State budget of the Czech Republic, years 2001–2007

MEYS and ASCR are the largest providers of institutional support. MEYS funds research plans of universities, their specific research, as well as research plans of selected corporations that meet the conditions laid down in Act No. 130/2002 Coll. on the Research and Development Support. ASCR funds research plans of its workplaces being transformed to public research institutions since 2007. In the monitored years, MEYS and ASCR have been distributing more than 80 per cent of the overall institutional R&D support in Czechia. The Ministry of Health, the Ministry of Agriculture and certain other ministries and central bodies of state and public administration have provided the remaining part.

Table A.4 Trend in the participation of the largest providers in the overall institutional R&D support

	2001	2005	2006	2007
Institutional support in total (CZK mil)	6 918	9 381	9 635	11 943
Participation of ASCR	35.6 %	42.3 %	42.6 %	39.2 %
Participation of MEYS	49.2 %	43.9 %	43.7 %	47.2 %
Participation of two largest providers	84.8 %	86.2 %	86.3 %	86.4 %

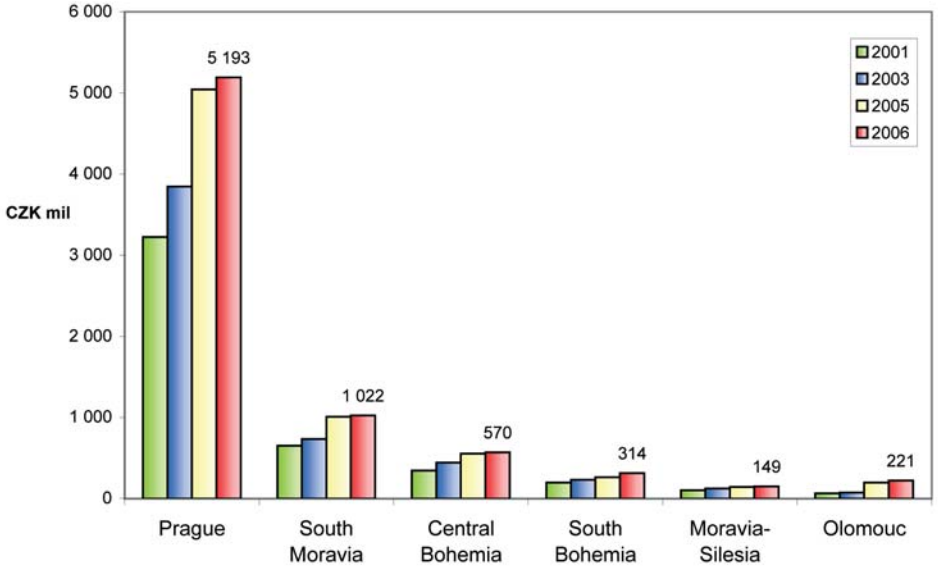
A.1.15 The institutional R&D support spent by individual sectors in Czechia

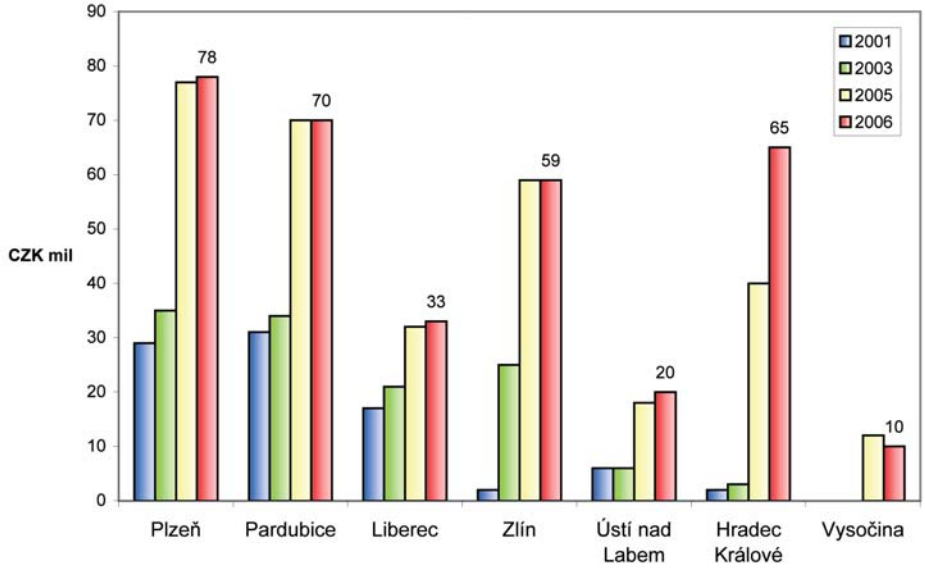


Source: R&D IS, Central Register of Research Plans (CEZ)

The difference between the amount of institutional support registered in R&D IS (Central Register of Research Plans – CEZ) and funds allocated from the state budgets for ASCR makes up the means to ensure the ASCR´s activity according to Section 3 of Act No. 130/2002 Coll. This includes mainly building investments, the expanditure of ASCR Office, and centrally-ensured joint activities of all workplaces (foreign contacts under inter-academic agreements, provision of joint computer networks, public services of ASCR Library, etc.).

A.1.16 Institutional support to research by individual regions in Czechia





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

Note: In 2001 and 2003, CZK 107 mil and 103 mil respectively for secret plans of the Ministry of Defence were added to the institutional support of the Capital of Prague.

Graph A.1.16 depicts the trend in institutional support for research plans in individual Czech regions. Considering large differences in amounts of institutional support, the graph is divided into two parts with different scales for the amount of support. The institutional support concentrates into three regions: the Capital of Prague, South Moravian Region, and Central Bohemian Region. Karlovy Vary Region has no institutional support.

The table A.5 shows the trend in the share of institutional support for research plans in the Capital of Prague and for all three largest beneficiaries in Czechia.

Table A.5 Shares of Prague and the three largest beneficiaries in the overall institutional support

	2001	2003	2005	2006
The capital of Prague	69.1 %	69.0 %	67.1 %	66.5 %
The capital of Prague, South Moravian Region, and Central Bohemian Region	90.4 %	90.1 %	87.9 %	86.9 %

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

The share of institutional support given to research plans slightly declines for both Prague, and three selected regions in the monitored period, but still remains very high; 66.5 and 86.9 per cent for Prague and three selected regions respectively in 2006.

Great differences in R&D support exist in all EU countries. The magazine ERGO of the Technology Centre of ASCR has measured the regional differences in EU innovation potential [3] using data found in the Statistical Yearbook of EU Regions 2006. Besides other indicators, the article gives regional R&D expenditure in per cent of GDP of respective regions. Three regions among those five with the highest R&D expenditure are from Germany; and three regions among those five with the lowest R&D expenditure are from Poland. Central Bohemian Region belongs among twenty regions with the highest R&D expenditure (3.49 per cent of GDP in 2004). But Czechia is among five countries with the largest differences in expenditures between regions (the largest difference is between Central Bohemian Region and Northwest Region). Germany reports the largest difference (Braunschweig Region – 8.7 per cent of GDP and Wese-Ems Region – 0.65 per cent of GDP).

The graph A.1.17 shows the number of regions of EU-27 countries that are compared within this analysis (overall number and number with GDP per head higher or lower than is the EU-27 average).

Table A.6 NUTS-2 regions with the highest and lowest R&D expenditure in 2004

Regions with the highest R&D expenditure	% of GDP	Regions with the lowest R&D expenditure	% of GDP
Braunschweig (DE)	8.70	Zachodniopomorskie (PL)	0.16
Västverige (SE)	6.03	Aland (FI)	0.16
Stuttgart (DE)	4.66	Opolskie (PL)	0.15
Oberbayern (DE)	4.60	Swietokrzyskie (PL)	0.06
Pohjois-Suomi (FI)	4.60	Severozapaden (BG)	0.01

Source: Regional differences in EU innovation potential, V. Čadil, ERGO, March 2007.

[3] Regional differences in EU innovation potential, V. Čadil, ERGO, March 2007.

The unevenness of both institutional and targeted support in Czechia results from the uneven geographical distribution of R&D sources and capacities on the Czech territory (see Graphs A.1.16, A.1.20, and A.2.2). It is beyond dispute that this unevenness is to a certain extent also the reason for unequal economic and innovation level of individual regions.

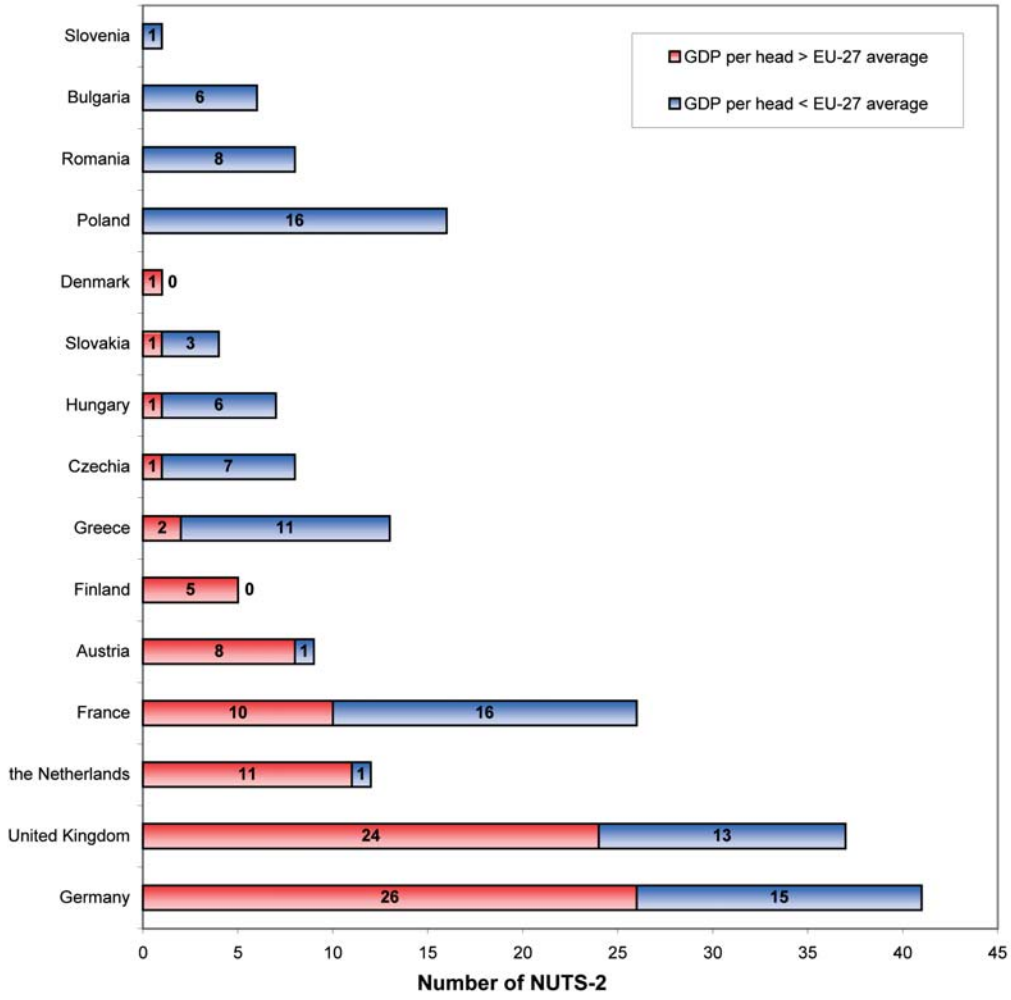
Differences in economic level of individual regions are typical of the whole EU. The Eurostat document [4] evaluates the development of economic level of regions at NUTS-2 level [5] in 2000–2004.

In 2004, the average GDP per head in EU-27 converted at the purchasing power standard amounted to **EUR 21,503**. In that year, the Capital of Prague was on the 12th place among the EU-27 regions with GDP per head of 157 per cent of the EU-27 average. The highest level was achieved by Inner London Region (303 per cent of the EU-27 average) and the lowest level by the Romanian region Vest (39 per cent of the EU-27 average).

[4] Eurostat News Release No. 23/2007 of February 19, 2007

[5] NUTS-2 – Nomenclature of Territorial Units for Statistics. Level 2 identifies aggregate regions, i.e. higher territorially self-governing units in Czechia.

A.1.17 Economic level of NUTS-2 regions of EU-27 in 2004



Source: Eurostat News Release No. 23/2007 of February 19, 2007

Out of the monitored countries, only Finland and Denmark report no region, whose level is lower than the EU-27 average (EUR 21,503); with Denmark being classified as a single NUTS-2 region. Bulgaria, Poland, Romania and Slovenia (1 region) have no above-level regions.

Table A.7 Economic level of selected NUTS-2 regions of Czechia in 2004

Region (NUTS-2)	Covers regions as follows:	GDP per head (as % of the EU-27 average)
Prague	The Capital of Prague	157.1
Central Bohemia	Central Bohemian Region	69.9
Southwest	South Bohemian and Plzeň Regions	69.6
Northwest	Karlovy Vary and Ústí nad Labem Regions	60.7
Northeast	Liberec, Hradec Králové, and Pardubice Regions	63.7
Central Moravia	Olomouc and Zlín Regions	59.8
Moravia-Silesia	Moravian-Silesian Region	61.1

Source: Eurostat News Release No. 23/2007 of February 19, 2007
Note: NUTS-2 – Nomenclature of Territorial Units for Statistics. Level 2 identifies aggregate regions, i.e. higher territorially self-governing units in Czechia.

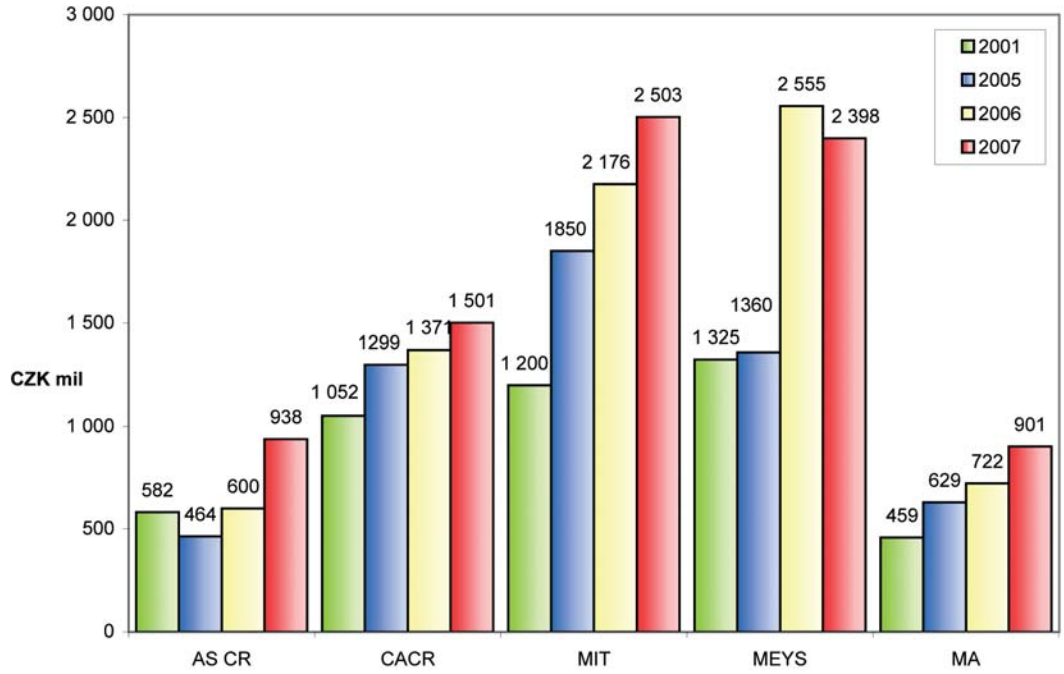
In all Czech regions, with the exception of Prague (and also Southeast – covering South Moravian and Vysočina Regions – not included in this list), the gross domestic product per head is between 60 and 70 per cent of the EU-27 average. EU exerts maximum efforts to smooth down differences in the level of individual regions. The implementation of the EU cohesion policy in 2007–2013 will use structural funds for strengthening research and development in regions with lower level of GDP per head.

The European Commission has emphasised this, among other things, in the Communication on utilisation of research and innovation for strengthening competitiveness released in September 2007 [6]. In its Communication, EC recommends to strengthen synergies between the research policy, regional policy, and research and innovation programmes at both EU level and level of individual Member States.

In Czechia, research and development will be supported through operational programmes Enterprise & Innovation (OPEI), Research and Development for Innovation (OPR&DfI), and Education for Competitiveness (OPEC).

[6] COM (2007) 496/F of 7. 9. 2007

A.1.18 Targeted R&D support by selected providers in Czechia



Source: State budgets of the Czech Republic, years 2001–2007

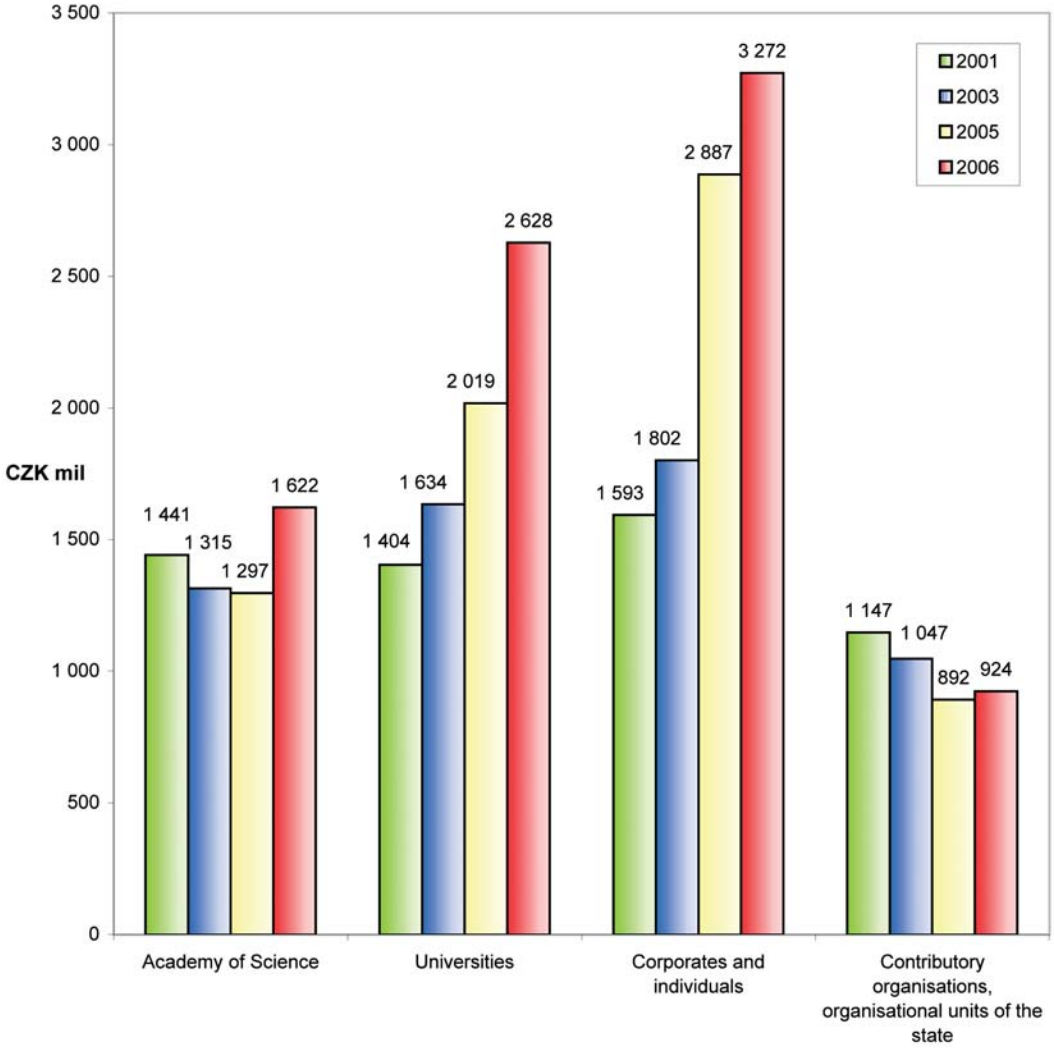
More than one billion Czech crowns of targeted support annually is provided by GACR, MIT, and MEYS. ASCR gives targeted support to grant projects through the Grant Agency of ASCR. Other funds serve to finance programmes being provided by ASCR; the support beneficiary can be even an institution not founded by ASCR.

Table A.8 Shares of the largest providers in the overall targeted R&D support in Czechia

	2001	2005	2006	2007
Targeted support in total (CZK mil)	5 707	7 094	8 616	9 554
Shares of GACR+MIT+MEYS	62.7 %	63.5 %	70.8 %	67.0 %
Shares of ASCR+GACR+MIT+MEYS+MA	80.9 %	79.0 %	86.2 %	86.2 %

Five leading providers of targeted support (ASCR, GACR, MIT, MEYS, and MA) distribute around 80 per cent of the overall targeted support annually. Remaining nearly 20 per cent is provided by other ministries and central bodies of state and public administration.

A.1.19 Targeted R&D support spent in individual sectors in Czechia

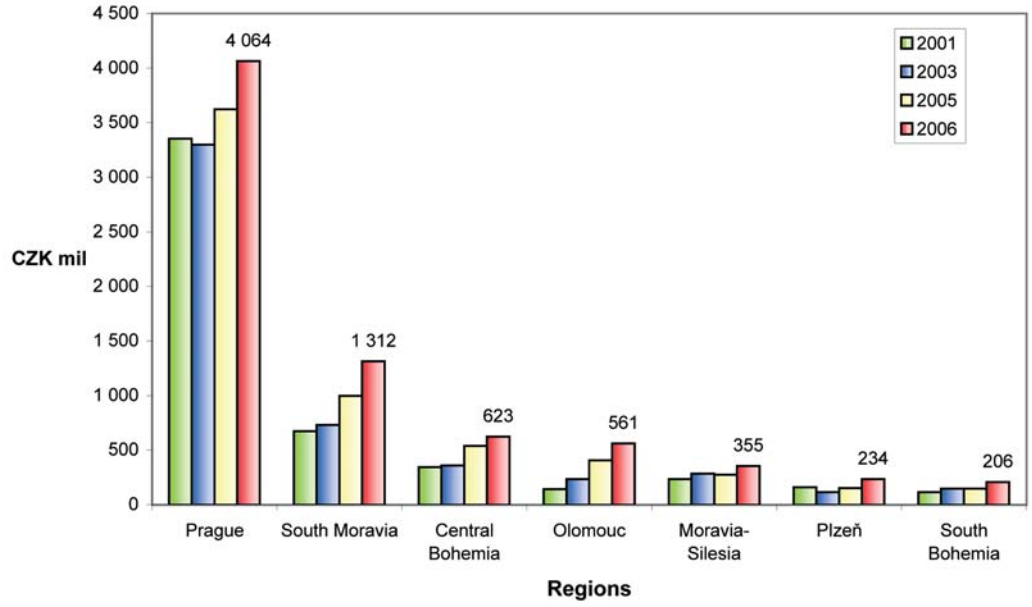


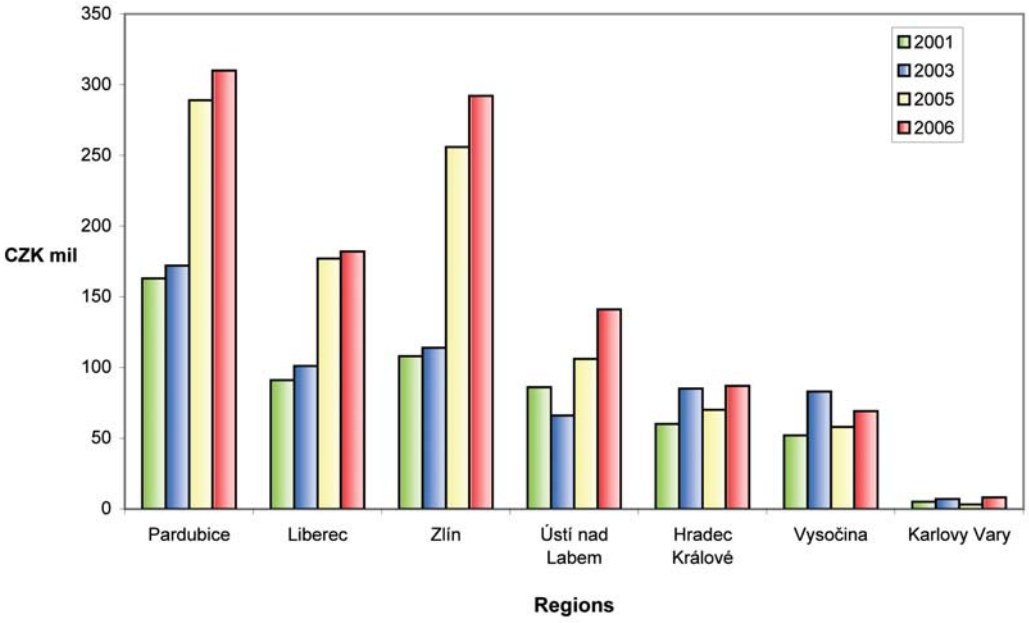
Source: R&D IS, Central Register of R&D Projects (CEP)

A dynamic growth is experienced by use of targeted funds at universities (public, state, and private) and with corporates and individuals. In the group of corporates and individuals, the use of targeted funds in 2006 increased to more than double compared to 2001.

Data take into account only the primary beneficiary, not the final one. For example, in some cases the universities are primary beneficiaries – e.g. some research centres – and then they transfer certain portion of funds to other project participants, such as corporates.

A.1.20 Targeted R&D support by Czech regions





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

Shares of targeted support in the overall targeted support in Czechia directed to individual regions have declined over the monitored period, both for Prague and the three selected regions; markedly for Prague – it fell by more than half in 2006. A relatively quick growth of support is experienced in Olomouc, Pardubice, and Zlín Regions, mostly through increased research efforts of territorially competent public universities.

The table A.9 makes it possible to compare trends in institutional and targeted support shares of the Capital of Prague and largest regional spenders.

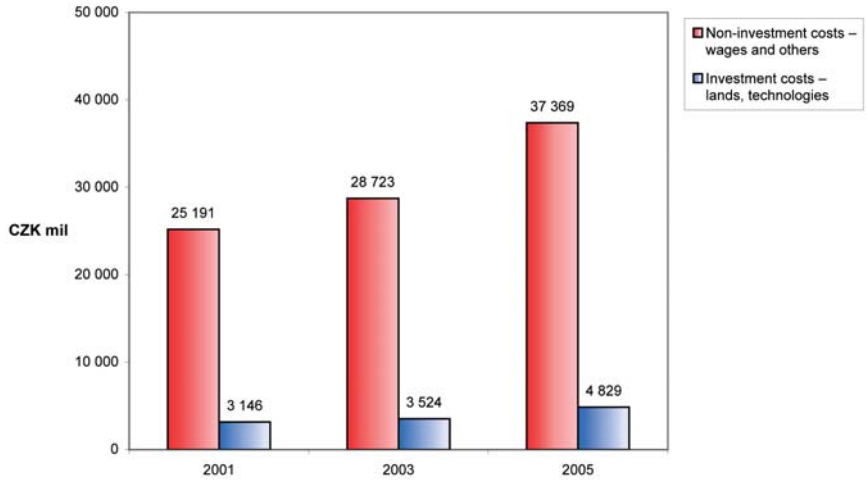
Table A.9 Comparison of trends in shares of overall institutional and overall targeted R&D support in Czech regions

Regions	2001	2003	2005	2006
	Institutional R&D support in %			
The Capital of Prague	69.1	69.0	67.1	66.5
The Capital of Prague, South Moravian and Central Bohemian Regions	90.4	90.1	87.9	86.9
	Targeted R&D support in %			
The Capital of Prague	60.1	56.1	51.1	48.1
The Capital of Prague, South Moravian and Central Bohemian Regions	78.2	75.7	72.7	71.0

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

Shares of the overall targeted R&D support in Prague and in the three regions with the largest use of R&D support are less than in case of institutional support. In the period from 2001 to 2006, shares of institutional and targeted support spent in the capital of Prague decreased by 2.6 and 12.0 percentage points, respectively. Shares of institutional and targeted support for the three monitored regions decreased by 3.5 and 7.2 percentage points, respectively. Nevertheless, even the targeted R&D support is spent very unevenly within the regions and does not correspond with the needs for competitiveness and innovation development there.

A.1.21 Classification of internal R&D expenditure



Source: CSO, R&D indicators 2001, 2003, and 2005

Non-investment costs include wage costs, incl. other personal costs (OPC), and other non-investment costs.

Investment costs include costs of lands, buildings, constructions, machines, apparatuses and equipment, incl. software.

The share of non-investment costs in overall internal R&D expenditure ranged around 88 per cent in the above mentioned years.

Table A.10 Growth in non-investment and investment R&D expenditure in Czechia

Costs in %	2001	2003	2005
Non-investment	100	114.0	148.3
investment	100	112.0	153.5

Source: CSO, R&D indicators 2001, 2003, and 2005

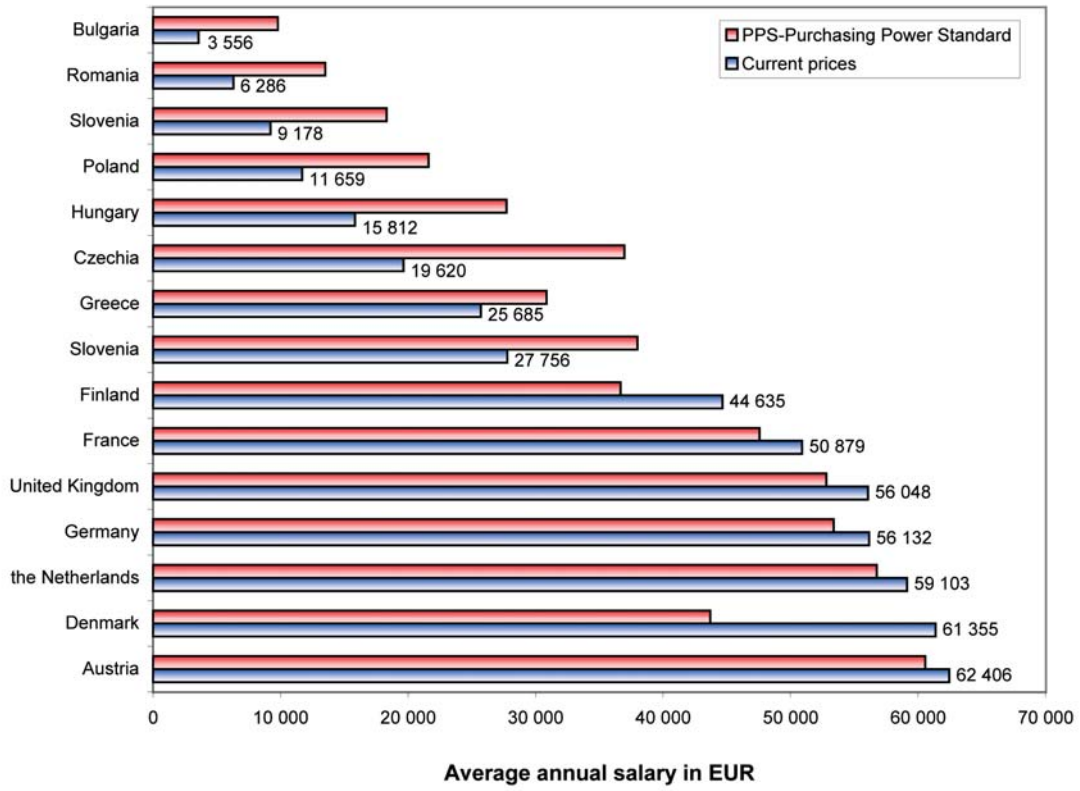
Table A.11 Share of wage costs in overall internal R&D expenditure in Czechia

Costs	2001	2003	2005
Share of wage costs in overall internal R&D expenditures	30.1 %	34.2 %	36.7 %

Source: CSO, R&D indicators 2001, 2003, and 2005

The share of wage costs has moderately grown over the monitored years and exceeded one third of the overall internal R&D expenditure in 2003.

A.1.22 Average annual salaries of research workers in selected EU countries in 2006



Source: Study on the Remuneration of Researches in the Public and Private Commercial Sectors, EC, Research Directorate, April 2007.

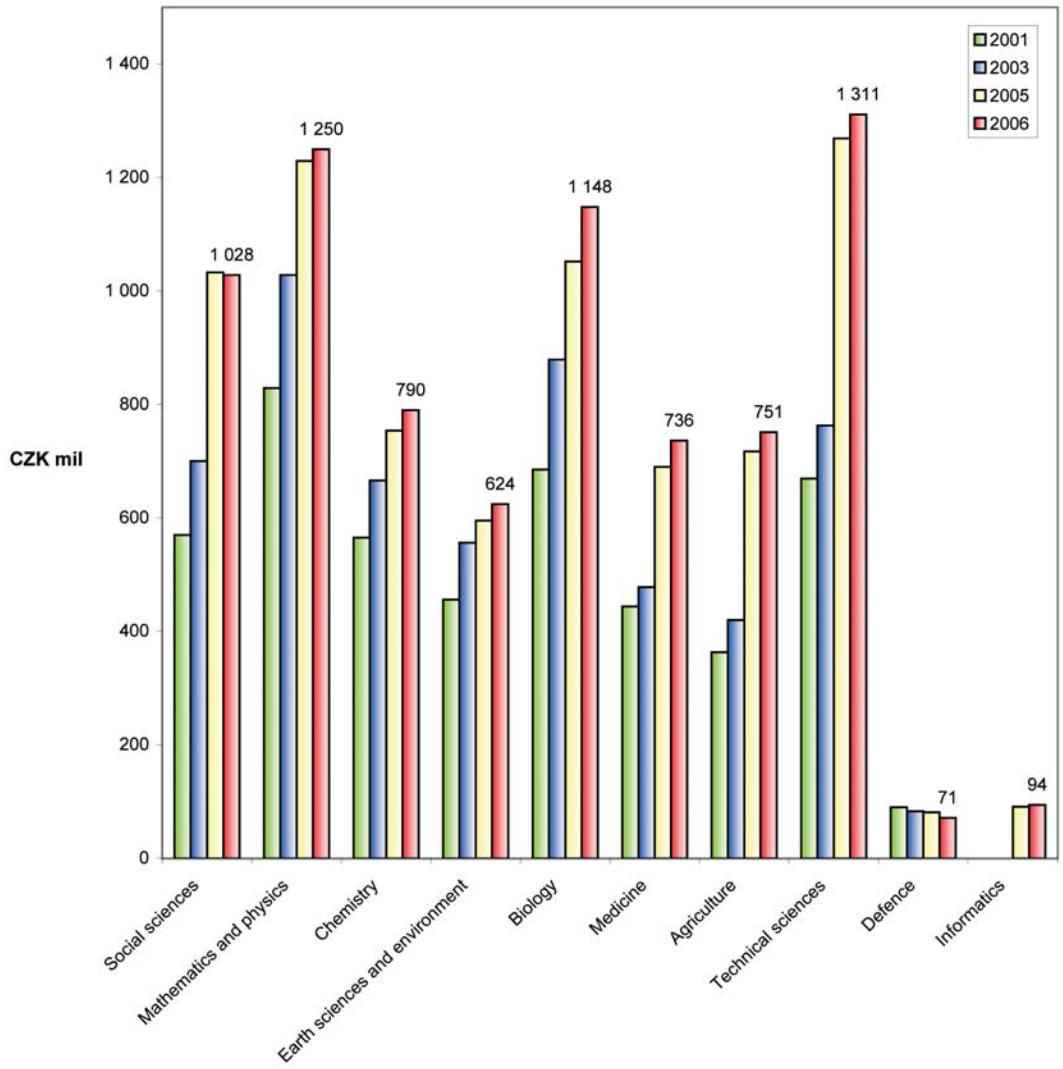
Salaries of research workers in Czechia are still markedly lower than in EU-15 Member States, while when using the conversion at the purchasing power standard (PPS) the situation of researchers in Czechia is very good. This conclusion was confirmed also by a study made by the European Commission in April 2007 [7].

Out of the monitored countries of EU-27, largest salaries are reported by research workers in Austria when compared both in current prices and converted at the purchasing power standard (PPS). In the last several years, Austria has gone through extensive changes in the system of R&D support, which have contributed to enhanced performance of research and development. As already mentioned, Austria is one of the few countries that will succeed in fulfilment of the Lisbon Strategy objective – R&D expenditure of 3 per cent of GDP by 2010. Salaries of Czech research workers in current prices are less than one third of salaries in Austria (31.4 %); if compared at PPS more than half (61 %).

According to EC, high differences in salaries prevent the accomplishment of a high level of mobility of research workers.

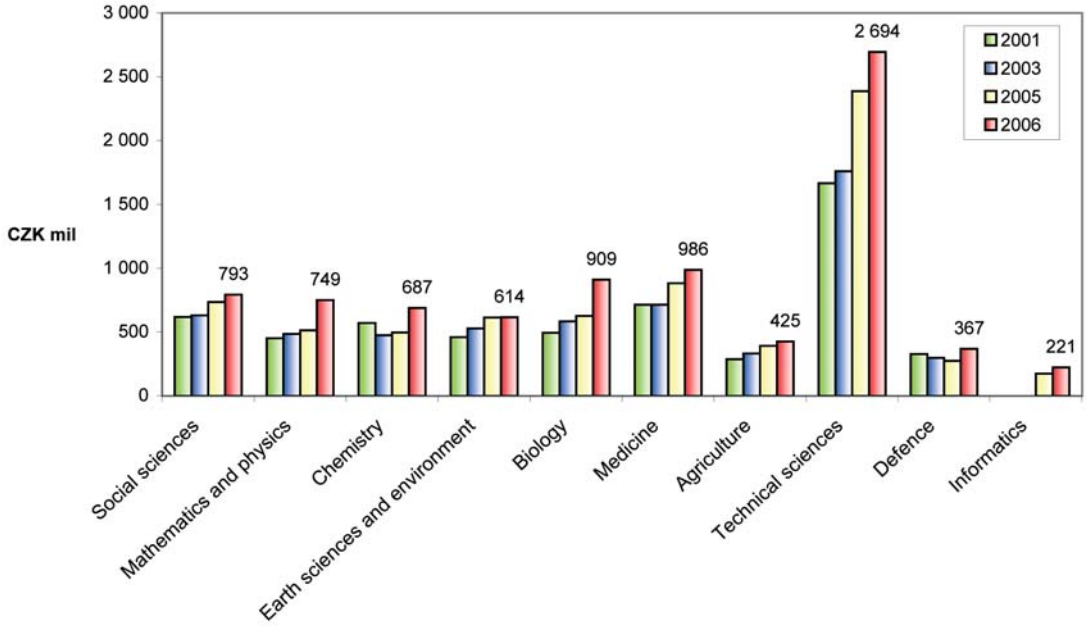
[7] Study on the Remuneration of Researches in the Public and Private Commercial Sectors, EC, Research Directorate, April 2007.

A.1.23 Amount of institutional support for research plans by disciplines in Czechia



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

A.1.24 Amount of support for R&D projects by disciplines in Czechia



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

Graphs A.1.23 and A.1.24 show data for institutional support for research plans and targeted support for R&D projects in the main groups of scientific disciplines monitored within the R&D Information System. Evaluation is done for years 2001, 2003, 2005, and 2006. In 2006, the institutional support for research plans grew in all disciplines, except of defence, compared to 2005. The targeted support for scientific disciplines slightly grew in all groups. Biology saw the highest growth by 45 per cent against 2005.

The table A.12 gives percentages of support in individual scientific disciplines in 2006 for the institutional support for research plans, targeted support, and the support in total.

Table A.12 Shares of support given to individual disciplines in 2006 in Czechia

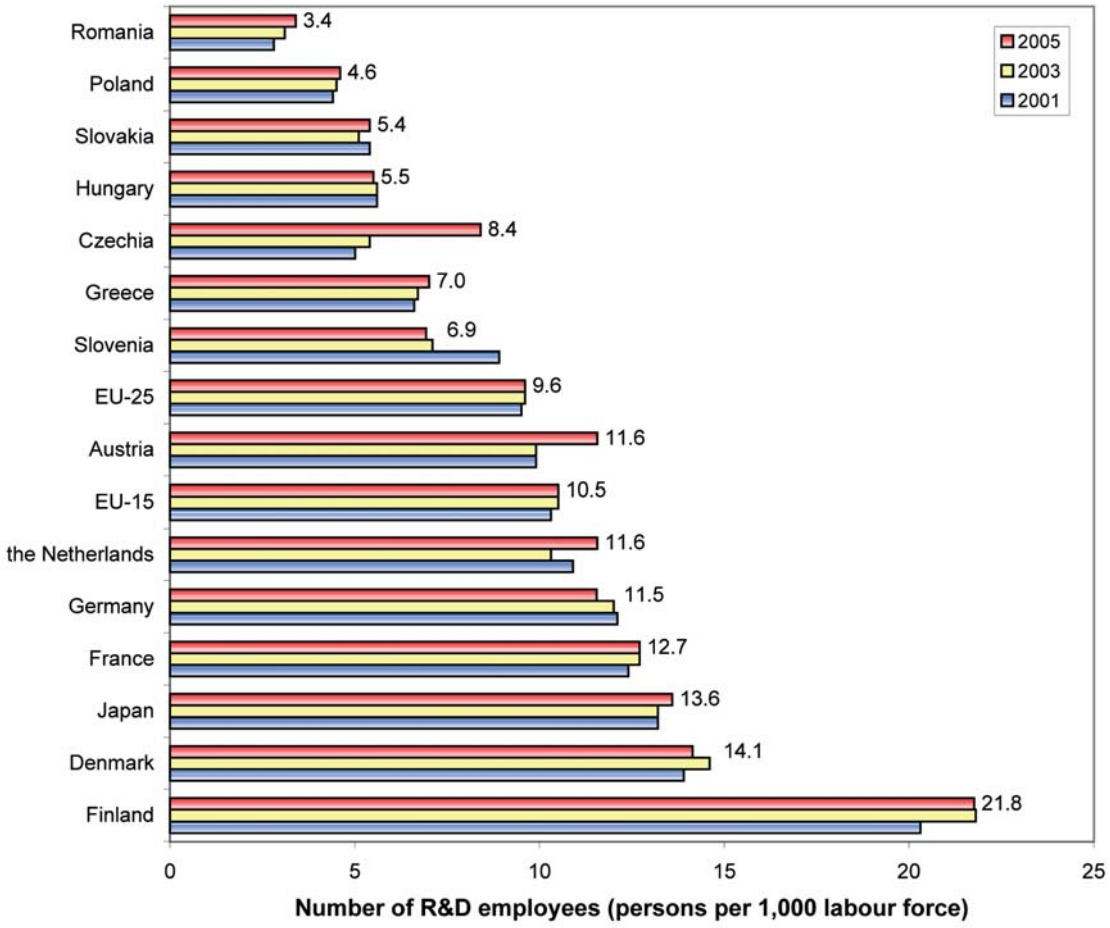
Discipline	Institutional support (%)	Targeted support (%)	Support in total (%)
Social sciences	13.2	9.4	11.2
Mathematics and physics	16.0	8.9	12.3
Chemistry	10.1	8.1	9.1
Earth sciences and environment	8.0	7.3	7.6
Biology	14.7	10.8	12.7
Medicine	9.4	11.6	10.6
Agriculture	9.6	5.0	7.2
Technical sciences	16.8	31.9	24.6
Defence	0.9	4.3	2.7
Informatics	1.2	2.6	1.9

Technical sciences have the highest share both in the institutional support for research plans and targeted support for research projects. Nearly one quarter of public support in total goes to technical sciences.

Very low shares – institutional, targeted, and total – are reported by informatics, which is partly caused by the fact that this area is understood in Czechia (unlike other countries) more like technical science. Anyway, a relatively low support for projects focused on informatics is in contradiction with EU priorities.

A.2 Human resources in research and development

A.2.1. Number of R&D employees (FTE)



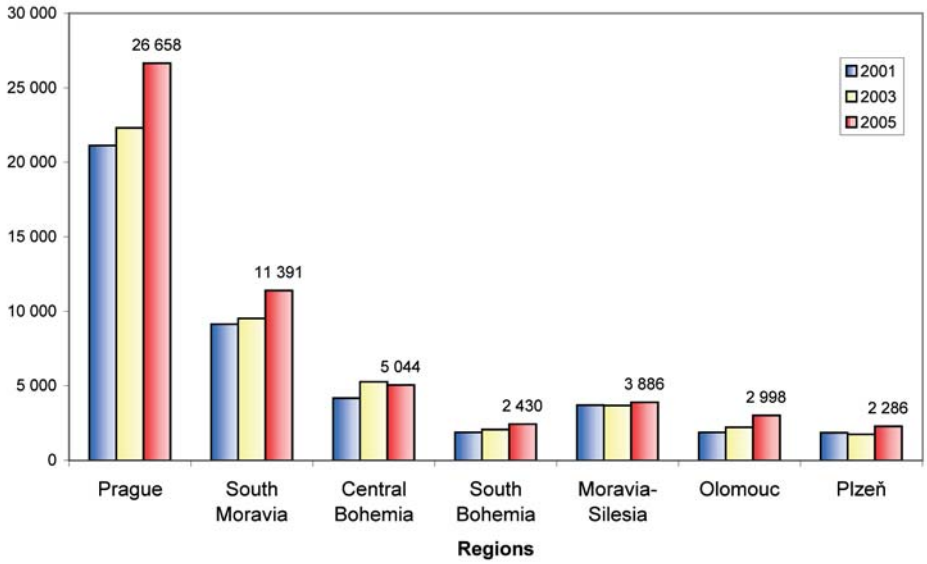
Source: OECD, Main Science and Technology Indicators, 2007/1

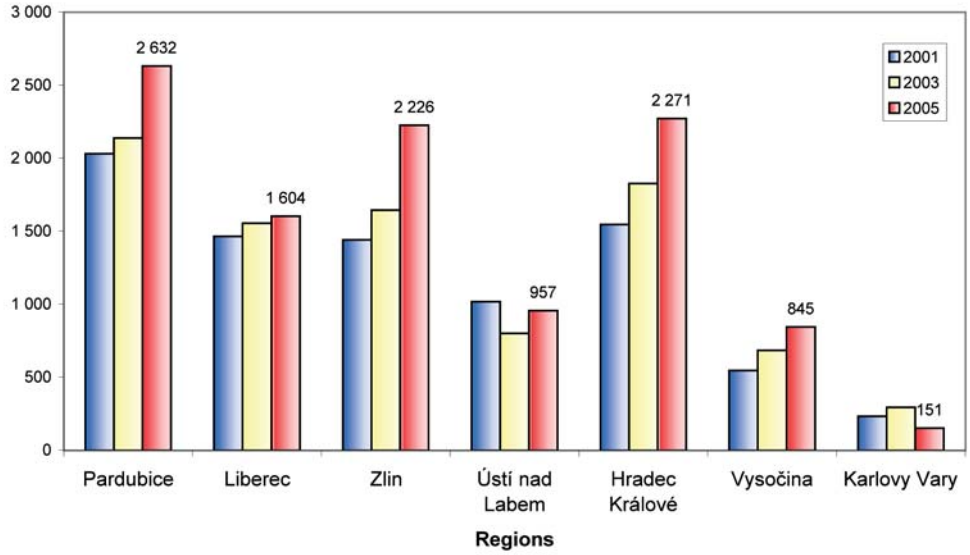
R&D employees are research workers conducting research and development directly, and auxiliary, technical, administrative and other employees at R&D workplaces. Among the R&D employees there belong also employees procuring direct services to research and development activities such as R&D managers, office staff, etc.

The number of R&D employees in new Members States, with the exception of Slovenia and Czechia, is a substantially lower than in EU-15 countries. Slovenia and Greece are in a transition zone between new Member States and EU-15 countries.

In the monitored countries, the number of R&D employees stagnates, even declines in Denmark and Germany. Marked growth in R&D employees in Czechia in 2005 is influenced by change in the methodology of FTE conversion.

A.2.2 Trend in the number of R&D employees by Czech regions – individuals





Source: CSO, R&D indicators 2001, 2003, and 2005

Similarly as the institutional support for research plans - Graph A.1.16 and the targeted support for R&D projects – Graph A.1.20, also R&D employees are concentrated in the same three regions, the Capital of Prague, and Central Bohemian and South Moravian Regions.

Large regional differences in the number of R&D employees exist in EU countries, too. The above-cited work of the Technology Centre of ASCR [8] gives the R&D employment figures as a percentage of total employment for five NUTS-2 regions with the highest and lowest employment in research and development.

[8] Regional differences in EU innovation potential, V. Čadil, ERGO, March 2007.

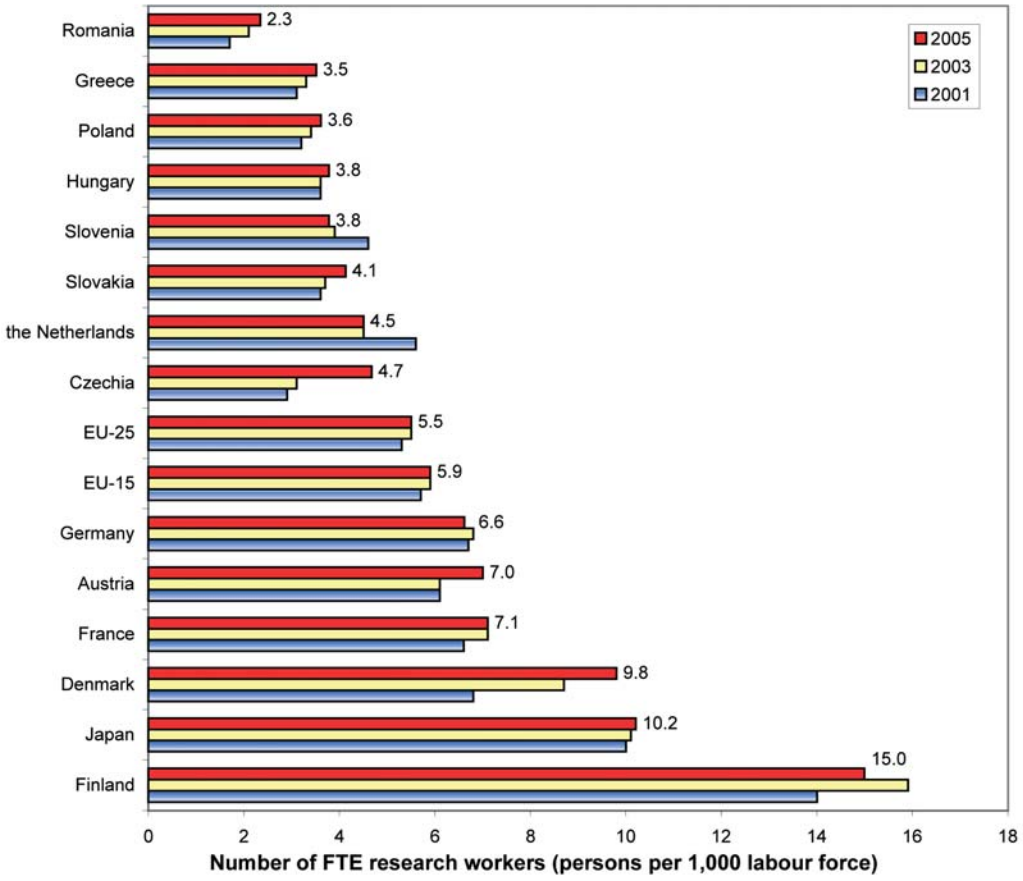
Table A.13 NUTS-2 Regions with the highest and lowest R&D employment (% of total employment)

Regions with the highest R&D employment		Regions with the lowest R&D employment	
Braunschweig (DE)	4.50	Yugoiztochen (BG)	0.18
Viena (AT)	4.14	Nord-Est (RO)	0.18
Pohjois-Suomi (FI)	3.79	Sud-Est (RO)	0.17
Prague (CZ)	3.69	Severozapaden (BG)	0.06
Oberbayern (DE)	3.69	Ciuad Autónoma de Melillla (ES)	0.00

Source: Regional differences in EU innovation potential, V. Čadil, ERGO, March 2007.

Prague with its 3.5 per cent share in total employment is on the fourth place among 268 NUTS-2 regions in EU-27.

A.2.3 Number of research workers (FTE)



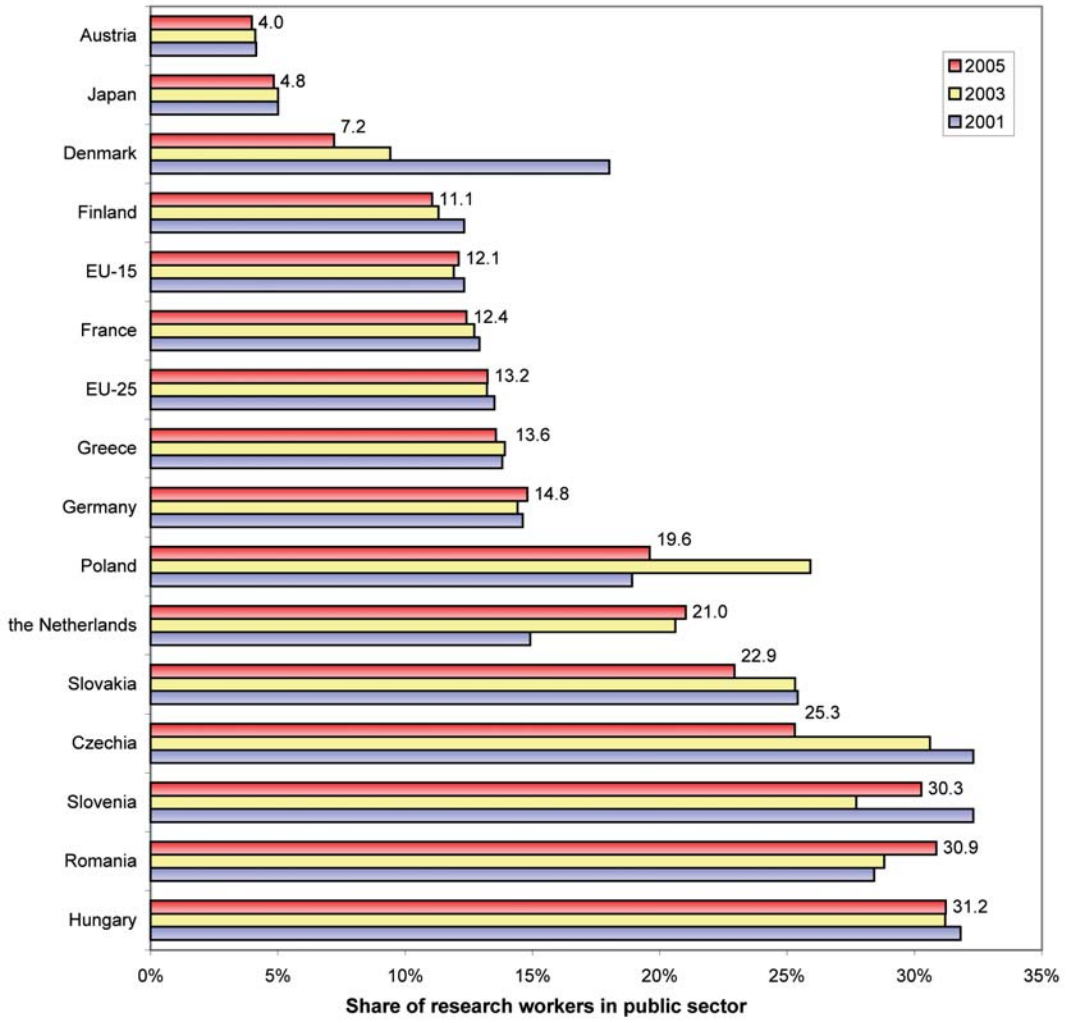
Source: OECD, Main Science and Technology Indicators, 2007/1

The number of research workers per 1,000 labour force is the most commonly used indicator for international comparisons of human resources in research and development. The category of research workers covers workers dealing with concept or creation of new knowledge, products, processes, methods and systems, or those who manage such projects. They are the most important component of R&D employees.

The graph has a similar character as the graph for the number of R&D employees (A.2.1). Finland again reports extremely high values. New Members States have their number of research workers at the level of 0.5 to 0.6 of the EU-15 average.

The relative number of R&D employees is higher in Czechia than in Poland, Slovakia or Hungary (see Graph A.2.1), but it has less research workers than these countries. The share of research workers in the number of R&D employees in Czechia (0.57) is nearly equal to the EU-27 average. It can be concluded that limited R&D expenditure in Poland, Slovakia, and Hungary led to a reduction in the number of auxiliary, technical and administrative staff in R&D organisations.

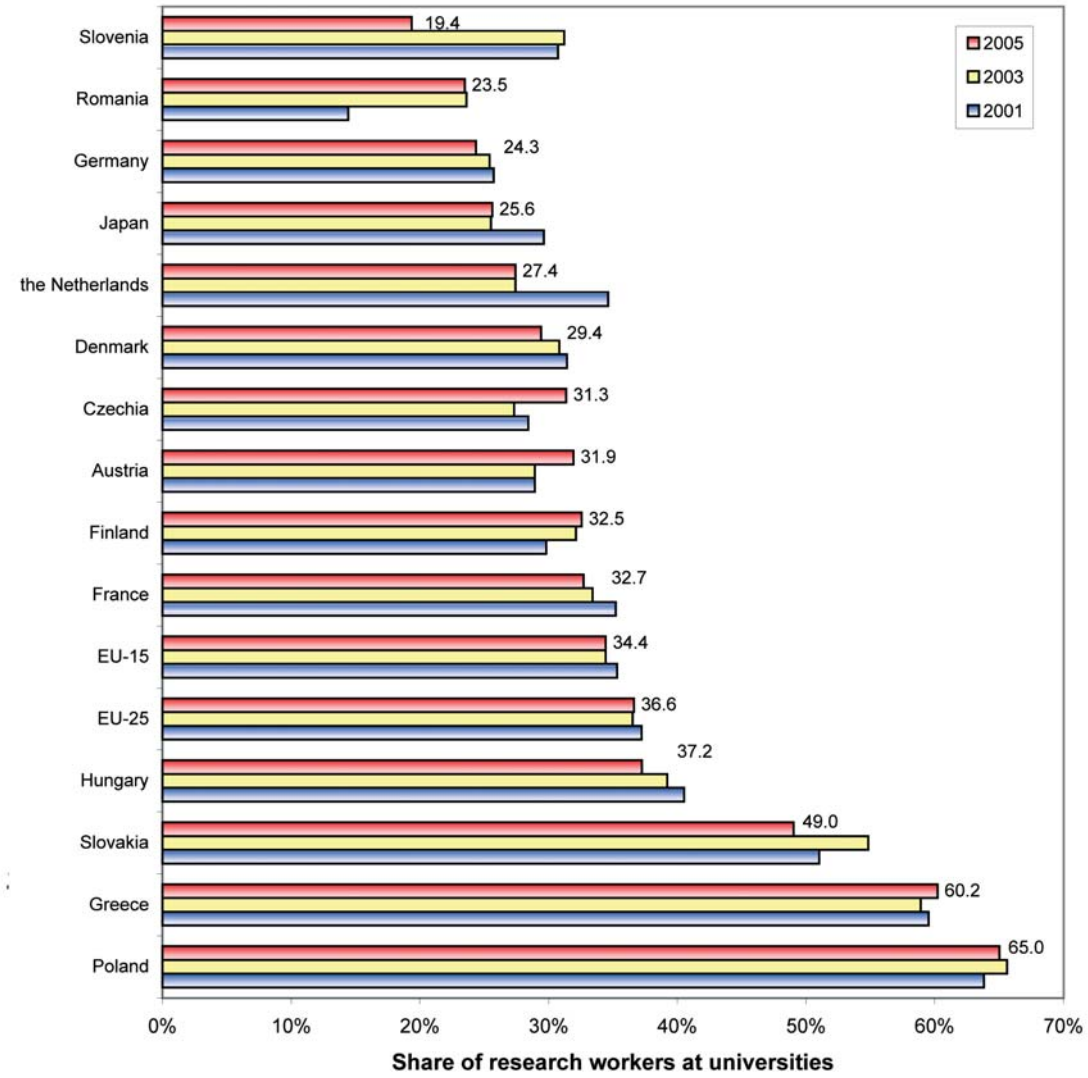
A.2.4 Share of research workers in public sector in the overall number of research workers



Source: OECD, Main Science and Technology Indicators, 2007/1

New Member States have significantly higher shares of research workers in public sector than is the EU-15 average. In 2005, Czechia reported the fourth highest share of these research workers (25.3 %). The structure of R&D systems in individual countries depends on their particular previous development. In countries like Hungary or Poland, there existed large academies of sciences and numerous departmental research institutes. Most of the monitored new EU Members States report lower shares of research workers at universities and, with the exception of Czechia, also in business sector. The low number of research workers in business sector results from still high share of production industries and research-nonintensive services.

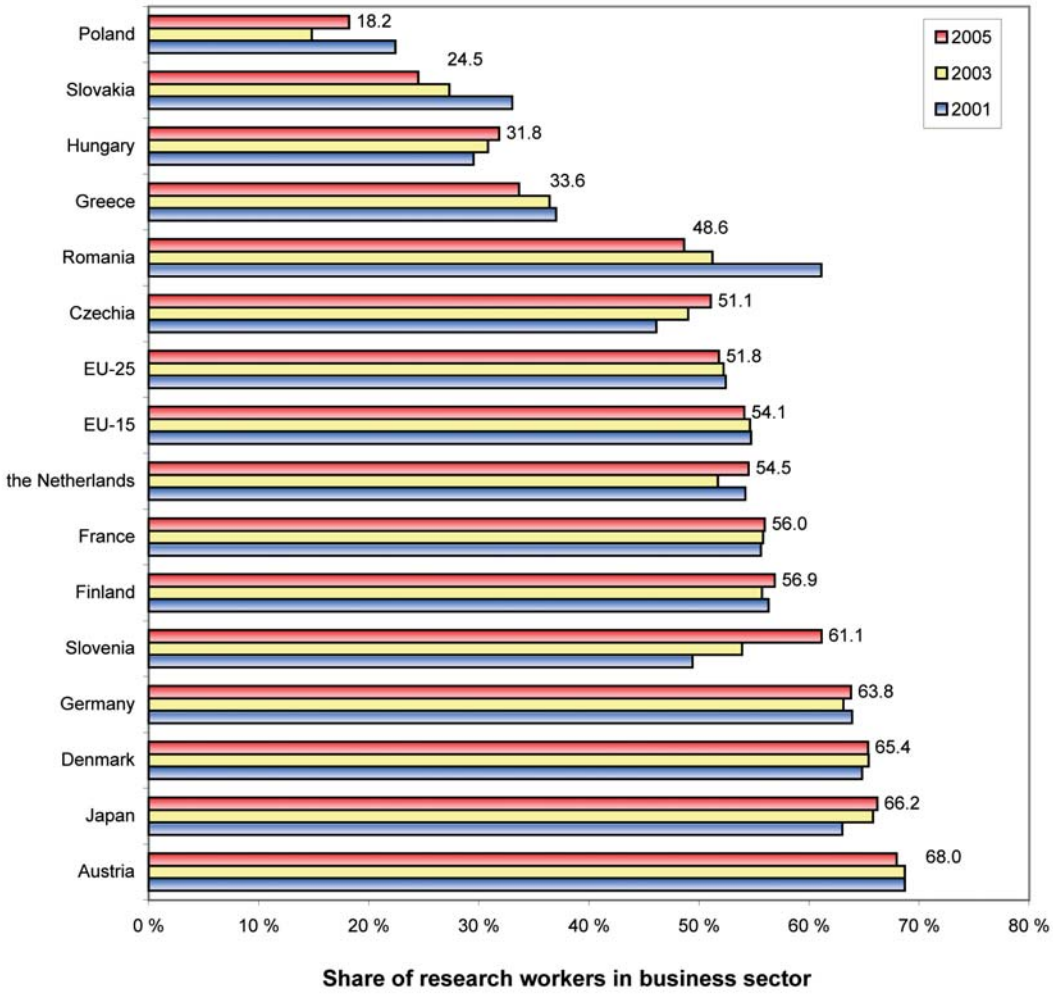
A.2.5 Share of research workers at universities in the overall number of research workers



Source: OECD, Main Science and Technology Indicators, 2007/1

In most of the monitored EU countries the shares of research workers at universities decline. Exceptions are Finland, Austria, Czechia, and Greece.

A.2.6 Share of research workers in business sector in the overall number of research workers



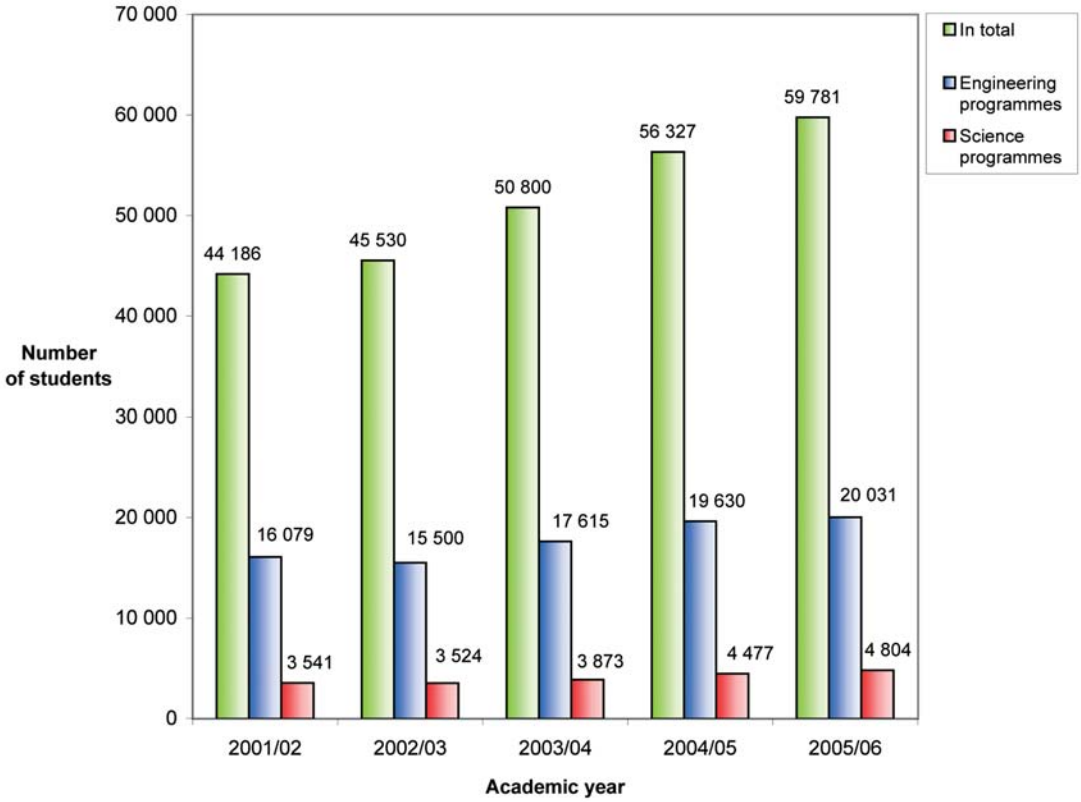
Source: OECD, Main Science and Technology Indicators, 2007/1

The graph corresponds to a certain extent with the graph illustrating the trend in share of R&D funds spent within the business sector (Graph A.1.8). In most of the monitored EU countries the shares of research workers in business sector stagnate, even decline. Exceptions are Czechia, Hungary, Japan, and Slovenia experiencing growth in their number.

The European Commission regards the low share of research and development in business sphere compared to the United States to be a major threat to the knowledge-based economy of EU. In EC publication from July 2007 [9], it is said that more than 85 per cent of the gap between the intensity of R&D support in EU and its main rivals is caused by the difference in R&D funding in private sphere (when comparing EU with the United States). This results mainly from the structure of enterprises and not so big sector of high technologies (e.g. in informatics) in the European Union.

[9] Key figures of science, technology and innovation, EC, June 2007.

A.2.7 Number of university students in Science&Engineering study programmes in Czechia

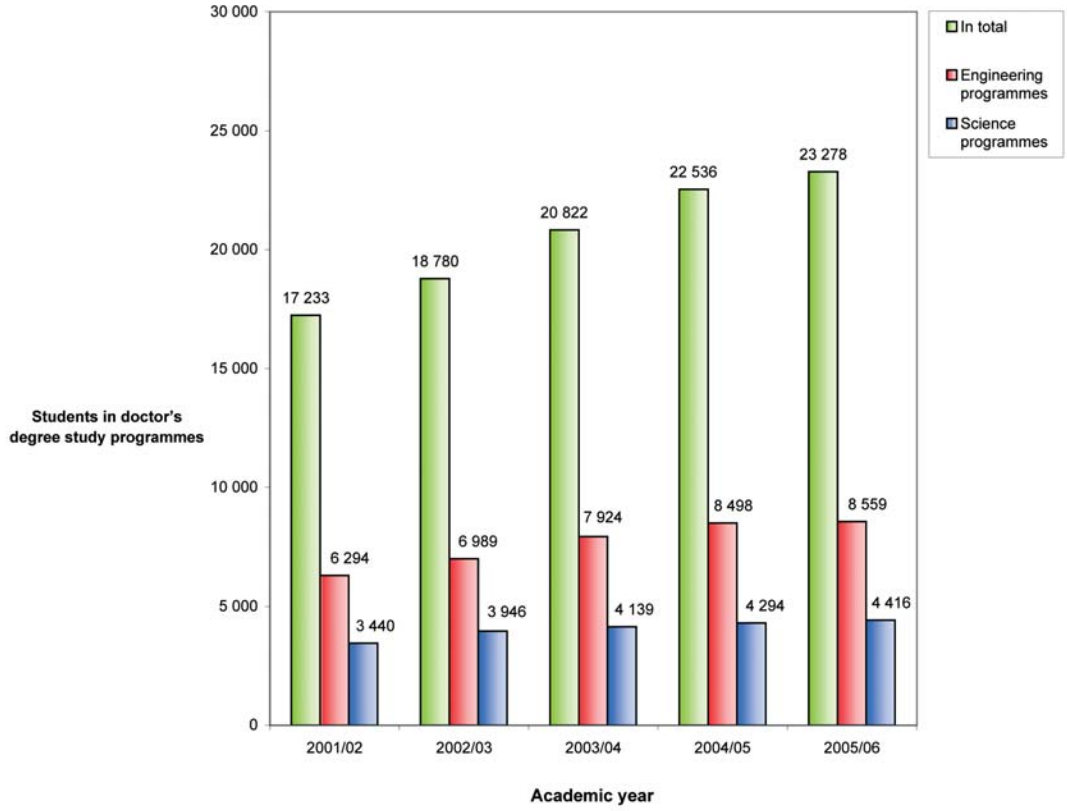


Source: MEYS, Student information management system (SIMS)

Note: The number of enrolled students includes students enrolled for the first time in bachelor and master's degree programme, and in consecutive master and doctor's degrees study programme at public universities in Czechia, in all forms of study, in groups by Science and Engineering disciplines according to STUDPROG system for academic years 2001/02 – 2005/06. The output is provided from the MEYS database "Student information management system" – (SIMS), students enrolled in the period from 1st November of previous year to 31 October of the year of output on the first universities in Czechia (i.e. there is no study with earlier date of enrolment). In case of a registered move to the actual study, the date of enrolment into the first study in the entire line of moves is decisive. Each study of each student, who meets the conditions, is included (one student may enrol for more studies), if it is in progress as of 31 October of the year in question (was not terminated before 31 October of the year in question). Studies are included irrespective of the way of funding. The output covers students on short-term study stays, too.

Total number of enrolled students grew in all monitored years. In the academic year 2005/2006, it increased to 135 percent of the 2001/2002 figure. The number of students in Engineering programmes increased to 124 per cent.

A.2.8 Number of university students in doctor's degree study programmes in Czechia

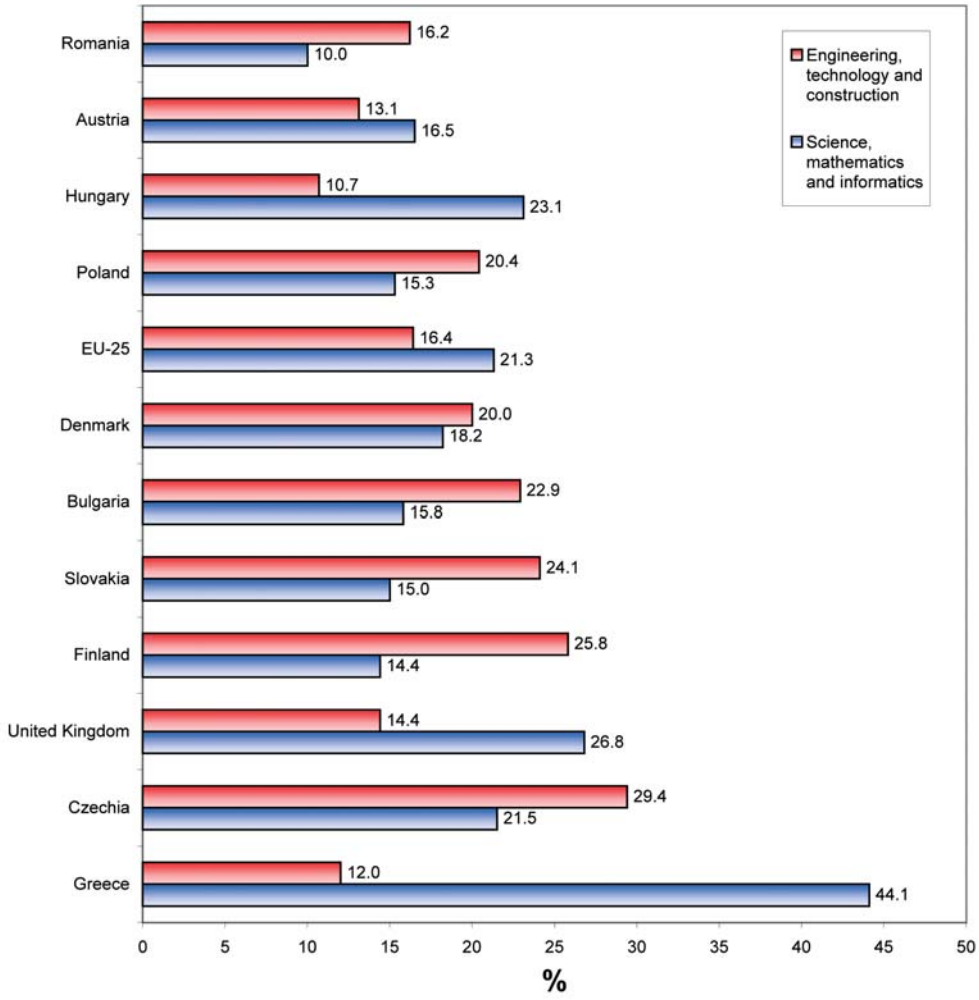


Source: MEYS, Student information management system (SIMS)

Note: The number of students in doctor's degree study programmes at public universities concerns all forms of study. The groups of Engineering and Science study programmes are given for academic years 2001/02 – 2005/06 according to STUDPROG system. The output is provided from SIMS database for academic years 2001/02 – 2005/06. Only active (not interrupted) studies are included. Studies are included irrespective of the way of funding. The output covers students on short-term study stays, too.

The overall number of students in doctor's degree study programmes, as well as their number in Engineering and Science study programmes grew in the period from 2001/02 to 2004/05. In the academic year 2005/2006, both the total number of students in doctor's degree study programmes and number of students in Engineering and Science study programmes increased compared to 2001/2002 figures: 135 per cent in total number, 136 per cent in Engineering, and 128 per cent in Science. The growth in the number of students of the doctor's degree engineering programmes is gratifying.

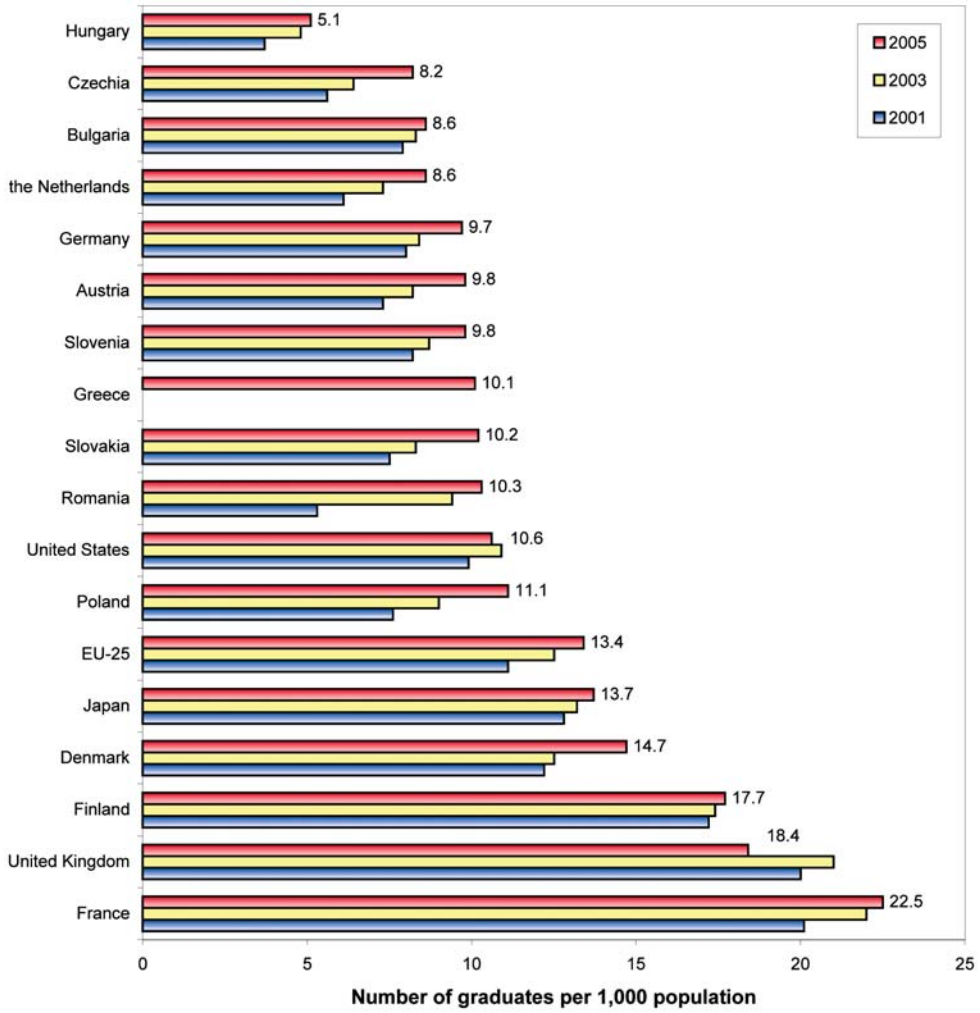
A.2.9 Share of students in the doctor's degree Science&Engineering study programmes in the overall number of students in the doctor's degree study programmes in 2004 in selected EU countries



Source: Europa in Zahlen – Eurostat-Jahrbuch 2006–2007

The Eurostat Yearbook 2006–2007 shows the number of students in the doctor's degree Science&Engineering study programmes. Czechia comes out from this comparison in a relatively very positive light. Shares of students in these two groups of doctor's study programmes belong among the highest of the monitored countries. In absolute figures (the number of students), however, the comparison would turn out worse. Seven monitored countries report higher shares of students in the doctor's degree engineering study programmes than are the shares of students in doctor's degree science study programmes. In four countries (Austria, Hungary, the United Kingdom, and Greece) and in EU-25 it is the other way round.

A.2.10 Number of Science&Engineering graduates in the tertiary level of education per 1,000 population aged 20–29

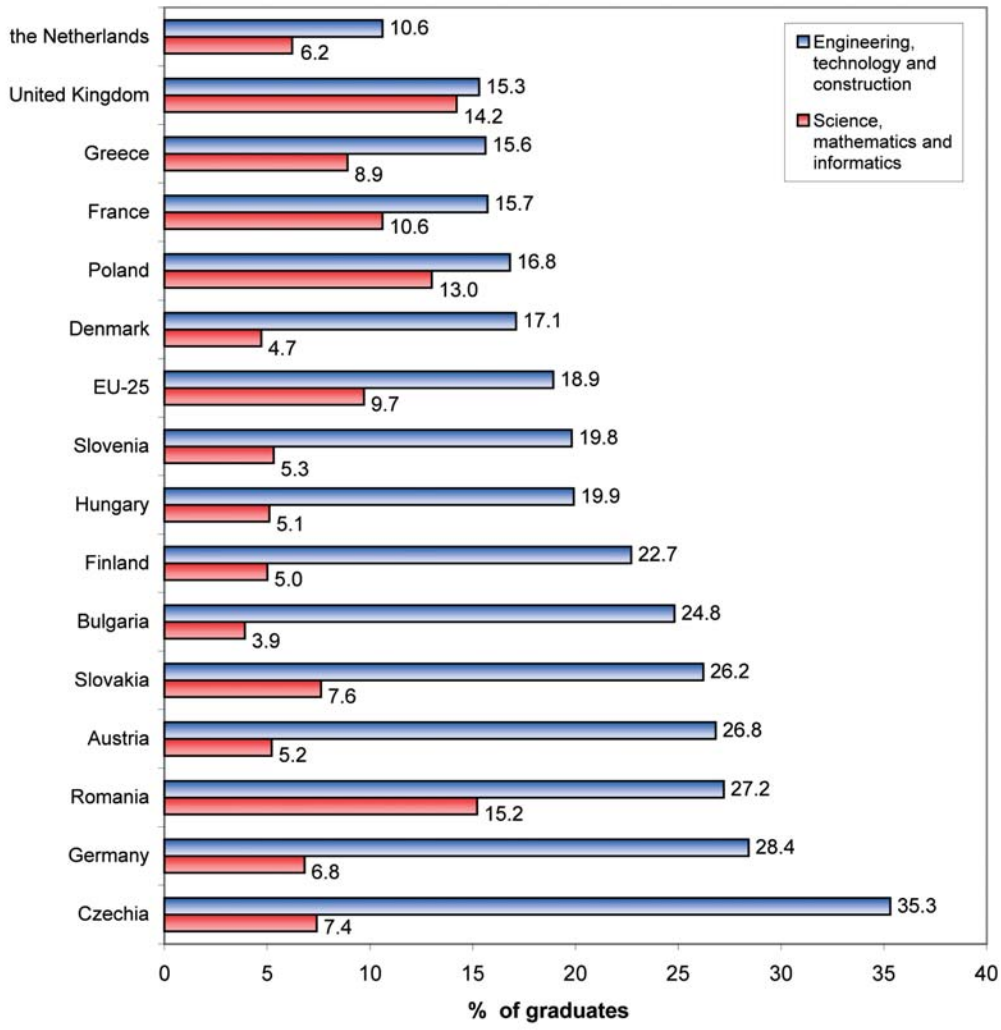


Source: Eurostat August 2007

Note: Data for Greece for years 2001 and 2003 are not available.

In all monitored countries (with the exception of the United Kingdom and the United States) the number of graduates grows. Czechia reports the second lowest number of Science&Engineering graduates; Czechia – 8.2 graduates per 1,000 population aged 20–29, Hungary 5.1. The figures for Czechia are evidently influenced by still markedly lower proportion of Czech population that has completed tertiary education. When the indicator´ share of Science&Engineering graduates in the overall number of universities graduates´ is used, the situation is different. At the same time, it is necessary to say that the number of students in these programmes is above average, but the number of graduates is very low. It can be concluded that simple increase in the number of accepted students is not the way home. It is important that highly gifted secondary school graduates are gained for engineering and science studies.

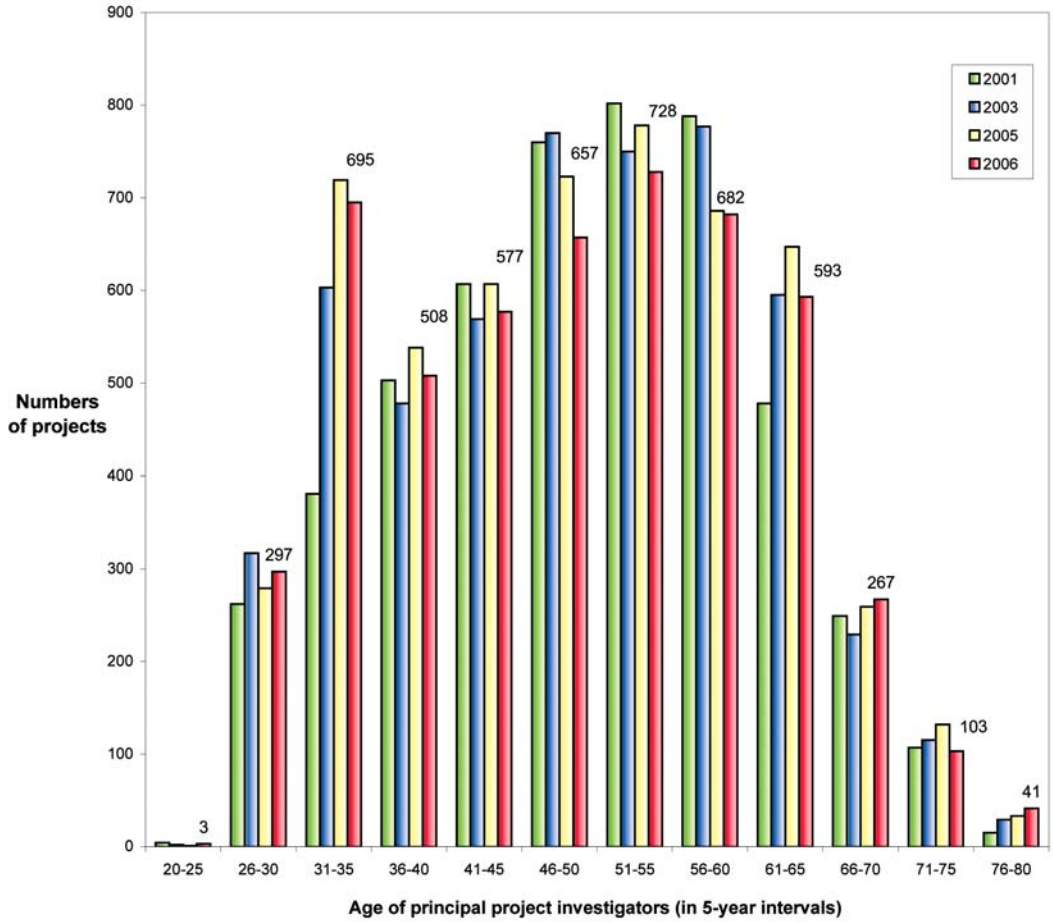
A.2.11 Share of the Science&Engineering graduates in the tertiary level of education aged 25–64 in the overall number of graduates in this age group – year 2005



Source: Eurostat, Statistics in Focus, 18/2006

Czechia has the highest share of Engineering graduates (35.3 %) and is slightly below the EU-25 average in the number of Science graduates (Czechia 7.4 %, EU-25 average 9.7 %). As for the Science graduates, highest shares are reported from Romania (15.2 %), United Kingdom (14.2 %), and Poland (13.0 %).

A.2.12 Number of R&D projects according to the age of principal investigators in Czechia



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

Note: The graph does not show investigators of classified R&D projects.

The age structure of principal investigators of R&D projects in 2006 saw no substantial changes compared to 2005. Declines in most age categories were caused by decline in the overall number of R&D projects. The table A.14 shows the trend in shares of the two main age groups.

Table A.14 Share of the two age groups in the function of a principal project investigator in the overall number of R&D projects in Czechia

	2001	2003	2005	2006
Overall number of R&D projects	5 047	5 252	5 412	5 160
Share of R&D projects with the principal investigator aged 20–40 yrs (%)	22.8	26.7	28.4	29.1
Share of R&D projects with the principal investigator aged 41–65 yrs (%)	68.1	65.9	63.6	62.7

Graph A.2.13 shows that increase in the group of principal investigators aged 31–35 years results from the existence of programmes for promoting young researches announced by ASCR, GACR, and MEYS in the monitored period.

The share of R&D projects with the principal investigator aged 20–40 years increased by 6.3 percentage points in the period 2001–2006.

The share of R&D projects with the principal investigator aged 41–65 decreased by 5.4 percentage points, but still remains too high (62.7 % in 2006).

Chapter B – R&D Outputs

Analogous to the previous 2006 R&D&I Analysis, this separate chapter on R&D outputs has three parts as follows

- B.1 Results of research and development supported from public funds
- B.2 Bibliometry
- B.3 Patent applications and granted patents and licences

The number of graphs and tables is somewhat higher when compared with the previous Analysis. Commentaries to individual indicators (parameters) include additional explaining tables or graphs. In parts where international comparisons are made (bibliometry, patents), Bulgaria and Romania are newly added.

Number of main indicators (parameters) in Chapter B

Part	Name	Number of tables and graphs
B	R&D outputs	33
B.1	Results of research and development supported from public funds	13
B.2	Bibliometry	6 (of this 1 set of graphs for selected disciplines)
B.3	Patent applications and granted patents and licences	14

Part B.1 contains actual data from the Information Register of R&D results (RIV). This register forms an integral part of the R&D Information System (R&D IS) operated by the Research and Development Council (RDC). This part describes the structure of R&D results attained in main groups of public R&D support beneficiaries and the methodology used and principal conclusions derived from evaluation of research and development and its results in 2006. The system of evaluation of research and development and its results is under continuous development. Suggestions are prepared by the Commission for Evaluation of R&D Results at the Research and Development Council.

Part B.2 measures the evaluation of published outputs – number of publications and their citations in periodicals monitored by Thomson Scientific. The bibliometric analysis was made using the National Scientific Indicators 2006 database. There has been a slight improvement in the publishing performance of Czech research and development, but the gap behind advanced countries included in the comparison is still wide. The main reason for lagging behind is a substantially lower relative overall R&D expenditure and lower number of research workers, but there are also additional reasons (e.g. low demand of public support providers for quality of R&D results).

Similarly as in the previous 2006 R&D&I Analysis, Part B.3 presents invention (patent) applications and patents granted by following three patent offices: the Industrial Property Office of the Czech Republic (IPO), the European Patent Office (EPO), and the United States Patent and Trademark Office (USPTO). Data were taken from the actual yearbooks

of these patent offices like in the previous Analysis. This part contains basic facts on the trend in sale and purchase of licences (number of licences and licence fees), too. Czechia´ s lagging behind the evaluated advanced countries in patent activities is marked. This is mainly caused by the structure of industry with a low share of the most advanced technologies and persistent, relatively good competitive strength of Czech industrial enterprises in foreign markets in the R&D-nonintensive branches. This competitive strength is, however, based on low labour cost and this advantage will evidently be diminished in the future.

When measuring the performance of research and development by number of publications, citations, patent applications and granted patents, it is also necessary to take into account the R&D expenditure in countries being compared. The indicator of R&D expenditure as a percentage of GDP has no sufficient predicative ability for making performance comparisons owing to substantial differences in GDPs of particular countries. More suitable indicator is the R&D expenditure per head or employee of a monitored country, either converted from national currency into USD or EUR at a relevant exchange rate or at the purchasing power standard (PPS). Since there are great differences in the relative number of R&D employees in relation to inhabitants or employees, the most objective indicator seems to be the overall R&D expenditure per one R&D employee.

The table B.1 shows the total R&D expenditure (GERD) per one R&D employee in USD thousand at the purchasing power standard (PPS) of national currencies and in EUR thousand at the purchasing power standard (PPS). They are largely data for 2003. The table shows relative expenditure compared with the EU-15 average, too.

Table B.1 Specific overall R&D expenditure per one R&D employee

	GERD per R&D employee			
	USD thousand / R&D employee (PPS–2003)	EU-15=100 %	EUR thousand / R&D employee (b.c. – 2003)	EU-15=100 %
EU-15	107.5	100.0	98.3	100.0
Austria	141.5	131.6	128.5	130.7
Czechia	78.1	72.7	35.2	35.8
Germany	121.6	113.1	102.8	104.6
Denmark	102.3	95.2	116.5	118.5
Finland	89.9	83.6	96.2	97.9
France	110.5	102.8	99.9	101.6
Greece	43.7	40.7	29.9	30.4
Hungary	61.9	57.6	29.7	30.2
The Netherlands	105.5	98.1	101.6	103.4
Poland	32.1	30.0	13.5	13.7
Slovenia	87.8	81.7	48.2	49.0
Slovakia	30.9	28.7	12.7	12.9
Japan	128.0	119.1	135.7	138.1

Source: OECD, Main Science and Technology Indicators (MSTI 2006/2); conversion of relative values to one R&D employee is made by the Secretariat of the Research and Development Council.

Note: For some countries, no comparable data were available (the United Kingdom, the United States).

The R&D expenditure consists mainly of cost of machines, apparatuses, equipment, software, etc., which are mostly purchased abroad at market exchange rates. As mentioned in Chapter A of the Analysis, the share of wage costs in the overall R&D expenditure is one third in Czechia, but data are not converted at the purchasing power standard.

Austria reports high specific R&D expenditure in case of both conversions. On the other hand, Poland and Slovakia have very low specific R&D expenditure. Upon conversion at PPS, Czechia attains more than 70 per cent of the average value of specific R&D expenditure of EU-15. Upon conversion by exchange rate, this level is only 36 per cent of the EU-15 average.

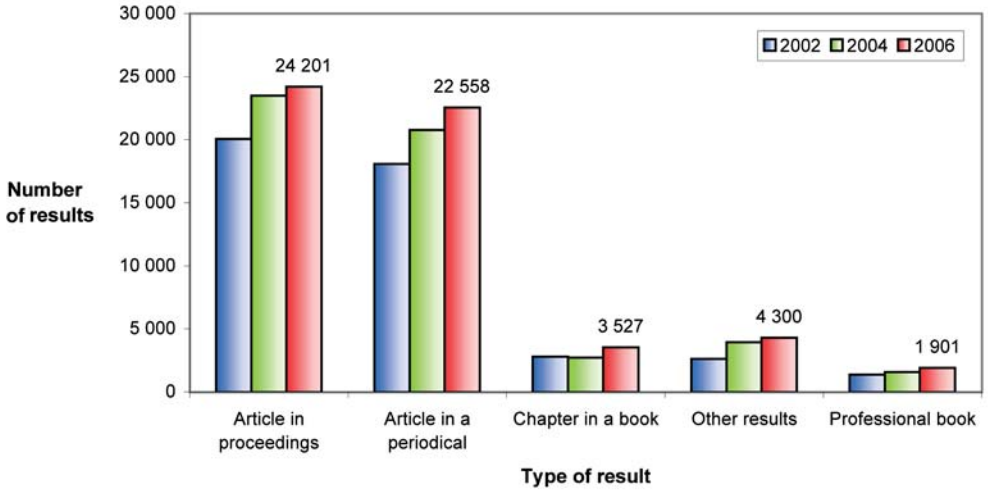
B.1 Results of research and development supported from public funds

B.1.1 The number of registered R&D results by type of result and year of application

Type of result	Year of application		
	2002	2004	2006
Article in proceedings	20 050	23 499	24 201
Article in a periodical	18 082	20 766	22 558
Chapter in a book	2 794	2 715	3 527
Other results	2 609	3 935	4 300
Professional book	1 382	1 583	1 901
Prototype, applied methodology, functional sample, authorized software, utility design	38	88	1 032
Pilot plant, verified technology, variety, breed	229	385	274
Patent	56	155	157

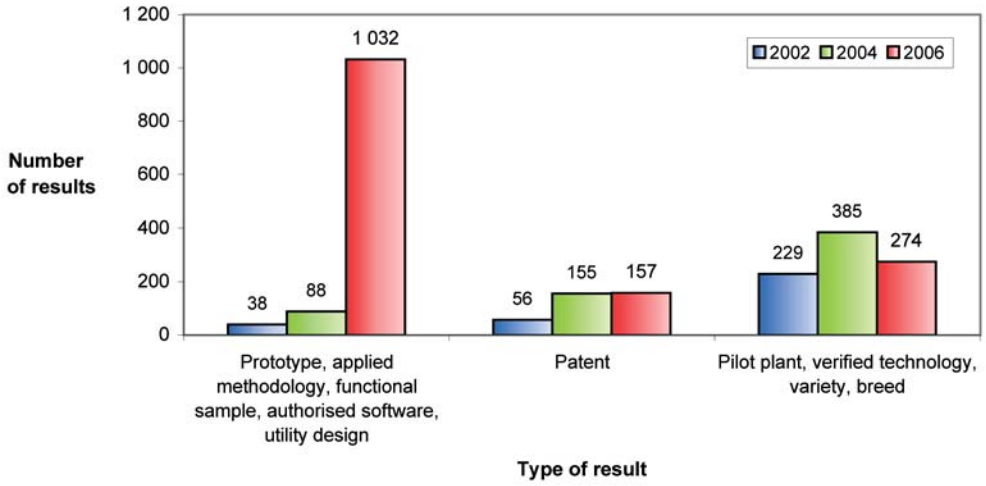
Source: R&D IS, Information Register of R&D results (RIV)

Published results



The change in the amount of individual types of results in individual years (i.e. articles in professional periodicals, articles in proceedings, professional books or their chapters) is not very marked. More remarkable growth can be observed in the categories of article in a professional periodical and article in proceedings.

Results of applied research



As far as the number of individual types of result is concerned in the period in question, the prevalence of articles in professional periodicals and articles in proceedings over other types of publications is clearly apparent.

In addition, a slight trend of increase in the number of results is evident also with other types covering mostly the results of applied research (see below).

In the applied research results, there is a steep growth in the category Prototype, applied methodology, functional sample, authorized software, and utility design. But this is given by an increased emphasize being put on the appreciation of results of applied research and development.

It is also apparent that the so much hoped-for increase in the number of patents, one of the most valuable applied results, has not been confirmed. The same stagnation or even declining trend can be seen also with other types of applied results (pilot plant, verified technology, variety, and breed).

In general, the situation in Czechia cannot be described as positive.

B.1.2 The number of registered R&D results in the period 2002–2006 by category of recipient and type of result

	Academy of Sciences CR	Universities	Departmental institutes	Other corporates and individuals
Article in proceedings	15 565	86 541	7 537	3 492
Article in a periodical	30 314	57 206	12 504	2 584
Chapter in a book	5 265	7 682	1 525	230
Professional book	1 973	4 472	1 200	348
Prototype, applied methodology, functional sample, authorized software, utility design	200	553	310	319
Patent	140	218	73	152
Pilot plant, verified technology, variety, breed	131	306	329	900
Other results	1 809	12 470	2 911	1 979

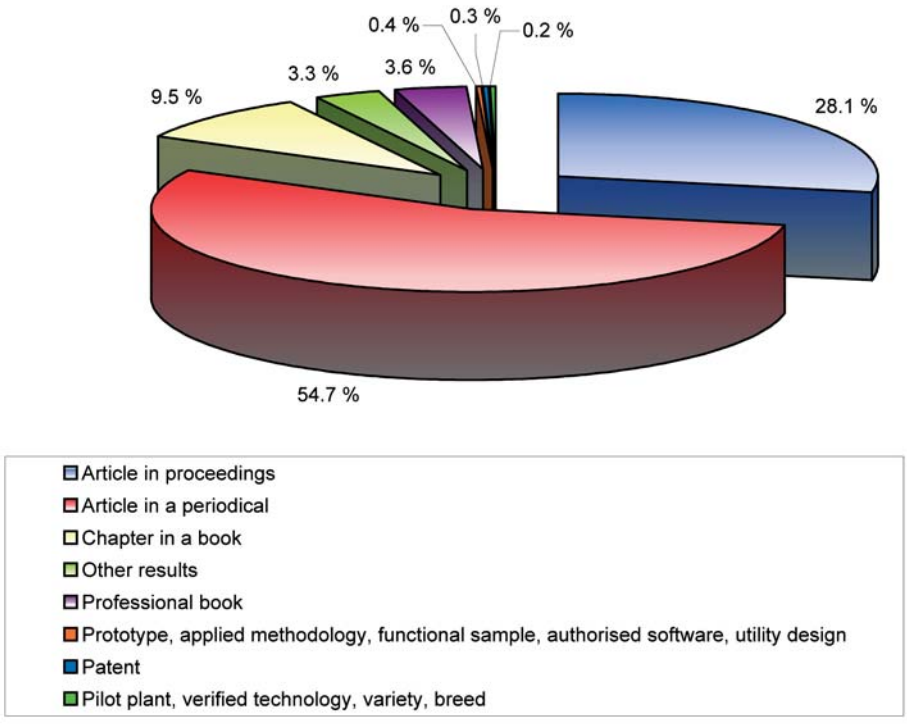
Source: R&D IS, Information Register of R&D results (RIV)

Institutes of the Academy of Sciences of CR have most of their results in the period 2002–2006 (ca 50 per cent) in the category Article in a professional periodical, similarly as departmental institutes. On the contrary, institutions of higher education have most results (50 per cent) in the category Article in proceedings, then follows Article in a professional periodical with ca 30 per cent share.

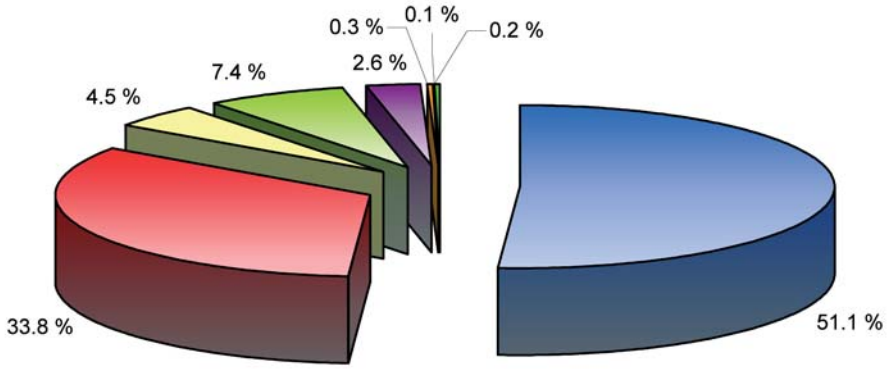
Results concerning the applied research in the Institutes of the Academy of Sciences of CR and universities comply with their focus. The situation at departmental institutes (a minimum increase of 1.2 per cent compared to 2004 noticeable only in category Pilot plant, verified technology, variety, and breed) cannot be viewed as satisfactory, because many of these institutes should be focused on applied research and development.

Quite a different situation is in ´ Other corporates and individuals´ group. They have their results represented very evenly in most of the monitored result groups, with a moderate predominance of Article in proceedings. The figure for Pilot plant, verified technology, variety, and breed is very significant (9 %), as well as the category Patent with a 1.3 per cent share making it a relatively important.

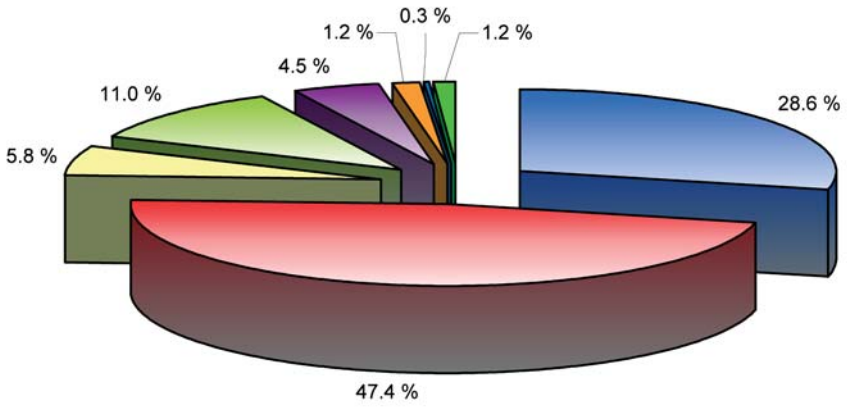
Academy of Sciences - types of results



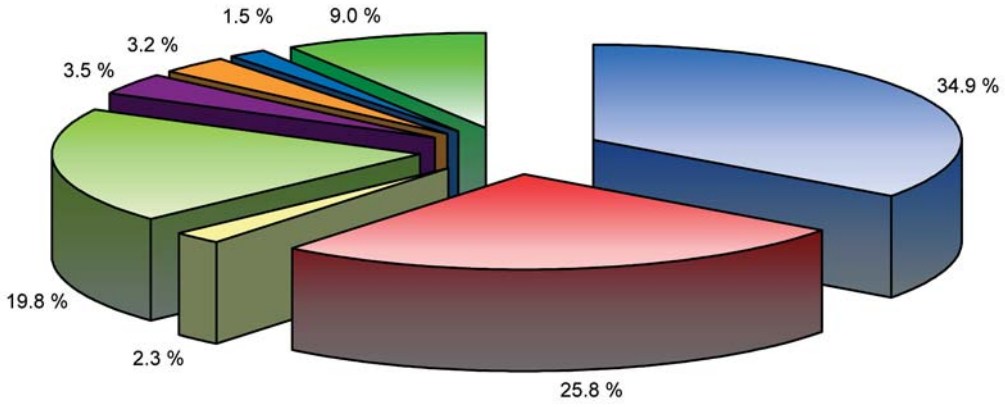
Universities- types of results



Departmental institutes - types of results



Other corporates and individuals - types of results



B.1.3 Evaluation of selected providers in the period 2001–2005

The evaluation of research and development and its results (hereinafter referred to as the "evaluation") is conducted by the Research and Development Council under the Government Resolution No. 644 of June 23, 2004 on the proposal for evaluation of research and development and its results. The evaluation is made every year and measures how effectively beneficiaries and providers of support behave when using it or respectively, how the support provided through state budget is used and what are the results.

The first evaluation was made in 2004, when the "Methodology for evaluation of research and development and its results" was published. Considering that results of evaluation are used by the Research and Development Council as one of sources when compiling proposals for the state budget R&D expenditure, the evaluation goes through a continuous refinement process not only in terms of point evaluation of individual attained results, but also ways and methods for selection of research activities (i.e. R&D projects, research plans, specific research support at university) for evaluation and their results.

Table B.2 Evaluation of selected providers

SB Index	Provider	Actual expenditure in CZK mil		Recognised results in total	
		Total	State budget	Number	Weight
8.59	Ministry of Industry and Trade	15 990	6 169	1 277	52 965
9.09	Ministry of Agriculture	2 356	2 118	5 128	19 262
10.01	Ministry of Health	3 845	3 570	7 083	35 740
13.79	Academy of Sciences of CR	20 571	16 308	26 362	224 970
29.93	Grant Agency of CR	9 329	5 877	30 332	175 909
36.23	Ministry of Education, Youth and Sport	15 343	11 934	97 455	432 408

Source: Evaluation of research and development and its results in 2006

Evaluations always involve research activities, which ended in the previous five-year period or respectively, amount of support provided from the state budget for their solution and results related to these research activities. So, it is not decisive in what period the result was accomplished, but in what period the particular research activity, to which the accomplished result is assigned, ended.

The effectiveness of use of state budget funds for undertaking research activities is measured by the "SB (State Budget) Index", which is a proportion between the overall point evaluation of results (sum of overall weights) and the amount of public support (in CZK mil) spent on those research activities, to which these point evaluated results were assigned (reported as a result of undertaking particular research activity). The average (comparative) value of SB Index is determined from the amount of support for all research activities included in evaluation (for all providers and beneficiaries) and from the sum of point

evaluations of all results reported to them – in the evaluation for 2006 this SB Index value was 19.15. This value illustrates how many results converted according to the point evaluation were created with the public support of CZK 1 mil.

This figure is very important, because it is evident from the table that SB Index does not include all expenditure for research in question. The influence of denominator then distorts the SB Index values. E.g. GACR, where most personal costs, costs of infrastructure and current overhead, are covered from other sources (in case of ASCR from research plans, and in case of IHE from other sources of state budget), attains twice as better value of SB Index than ASCR.

For comparing individual beneficiaries (and providers) of support, their SB Index values were figured out based on the support provided to these beneficiaries (and by these providers) and the point evaluation of results related to research activities undertaken (or provided) by them. According to their SB Index values, beneficiaries and providers were then placed into groups marked as higher-than-average (SB Index value higher than 130 per cent of the average SB Index), average (SB Index value between 70 and 130 per cent of the average SB Index), poorer-than-average (SB Index value between 0 and 70 per cent of the average SB Index), and markedly poorer-than-average (SB Index was equal to null).

For the Evaluation of R&D results in 2007, following changes have been made:

- the evaluation includes R&D projects terminated in the previous five-year period and research plans ended in the same period; in addition, in at least one year of the monitored period 2002–2006 the research plan must be in the state of active solution, i.e. B = running (běžící in Czech).
- the evaluation includes also results attained with using the institutional support for specific research at institutions of higher education, in the same way as the funds provided for this type of support are included,
- the evaluation does not include R&D programmes and research plans aimed at R&D infrastructure and its development,
- RDC has the option not to include results into the evaluation, if any unauthorized or incorrectly classified result is discovered,
- individual types of results were precisely defined so that every submitter of result is able to classify the attained result to a correct type,
- J – type results (article in a professional periodical) are evaluated differently for articles in "impacted" journals and in other professional periodicals,
- the applied results (formerly marked as "technologies") were divided into two categories – Pilot plant, verified technology, variety, breed (Z – type result) and Prototype, applied methodology, functional sample, authorized SW, result projected into legal regulation or norm, utility and industrial design, and specialized maps with technical content (S – type of result), and each type of result has a different point evaluation.
- from non-impacted journals contained in RIV, a list of titles was selected that do not meet the condition of a scientific reviewed journal. Results published in these journals will not be included in the evaluation.

B.2 Bibliometry

This part of the chapter is methodologically processed in the same manner as in 2006 R&D&I Analysis. Compared are the main bibliometric indicators of Czechia and other countries, Bulgaria and Romania have broadened the group of measured countries. Following indicators are measured:

- Relative production of publications (RPP) for a set of countries being compared
- Relative production of citations (RPC) for a set of countries being compared
- Relative citation impact (RCI) for a set of countries being compared
- Trend of the relative citation impact (RCI) of Czechia in 2002–2006
- Trend of the relative citation impact (RCI) and number of publications in Czechia in selected scientific disciplines in 2002–2006

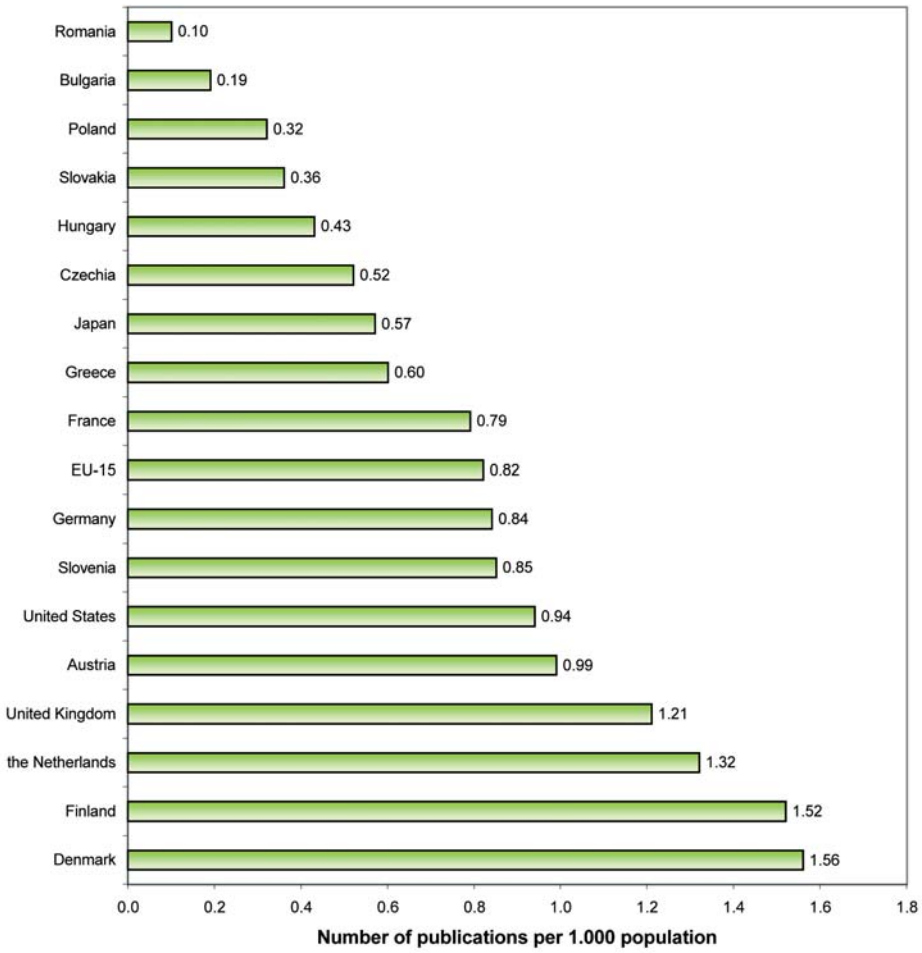
Graphs were produced using the National Scientific Indicators 2006 database of Thomson Scientific. The licence to use the database was purchased by the Research and Development Council.

In some cases data differ from figures contained in the previous 2006 R&D&I Analysis. The reasons for differences are always explained.

The publication performance of Czechia keeps getting better moderately. In 2002–2006, 37 scientific disciplines from 106 in total have a higher relative citation impact than is the world database average in each of the monitored years.

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

B.2.1 Comparison of selected countries and Czechia by relative production of publications



Source: Thomson ISI® National Science Indicators (NSI),1981–2006

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

The indicator of production of professional scientific publications makes it possible 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 scientific publication. These are particularly those parts of research being classified in the Frascati Manual (Evaluation of scientific and technological activities, OECD, Paris 2002) as basic research and a portion of the applied research.

The indicator of a simple production of publications discriminates against smaller countries having less scope of research than the bigger ones. Therefore it is more just to use for comparison of countries the indicator of a *relative production of publications* implementing the correction to the size of a particular country by conversion to 1,000 population of

that country. The production of publications is a quantitative indicator that speaks nothing about their quality.

Of the monitored countries (without France), all EU-15 countries and Slovenia are above the EU-15 average (0.82). All new EU Member States, with the exception of Slovenia, are below this average, as well as Japan and Greece. More than one publication per 1,000 population per year is reported by Denmark (1.55 publication per 1,000 population per year), Finland, the Netherlands, and the United Kingdom.

The ftable B.3 compares the trend in relative production of publications (RPP) of Czechia and EU-15 in 2003–2006. The gap between Czechia and the EU-15 average remains basically unchanged and correlates with the trend in R&D support.

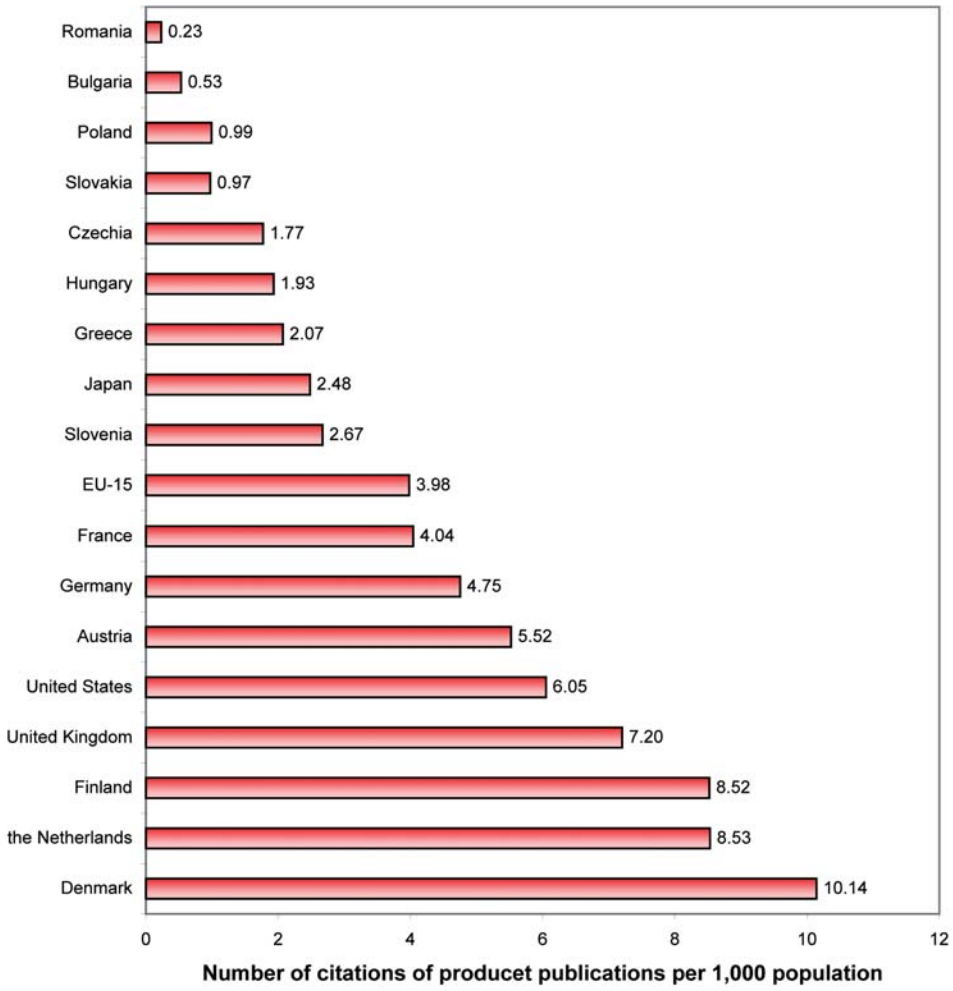
Table B.3 Relative production of publications (RPP)

	2003	2004	2005	2006
Czechia	0.42	0.45	0.49	0.52
EU-15	0.74	0.77	0.81	0.82

It is necessary to say that comparisons based on the conversion to 1,000 population are not an absolutely objective method in case of existence of more significant differences in the number of research workers or respectively, R&D expenditure. Comparing the performance of research and development, it is necessary to take into account specific R&D expenditure per R&D employees of a particular country (see introduction to Chapter B). There is no doubt that less research workers with less money will produce less scientific publications and other outputs.

Table 1 in the introduction to Chapter B shows that the overall R&D expenditure per one R&D employee in Czechia is 78.1 per cent of the EU-15 average when converted at the purchasing power standard (PPS) and only 35.8 per cent when converted by exchange rates. So if we speak at all about any lagging behind of new EU Member States, than this lagging behind is markedly lower than would follow from Table 3.

B.2.2 Comparison of selected countries and Czechia by relative production of citations



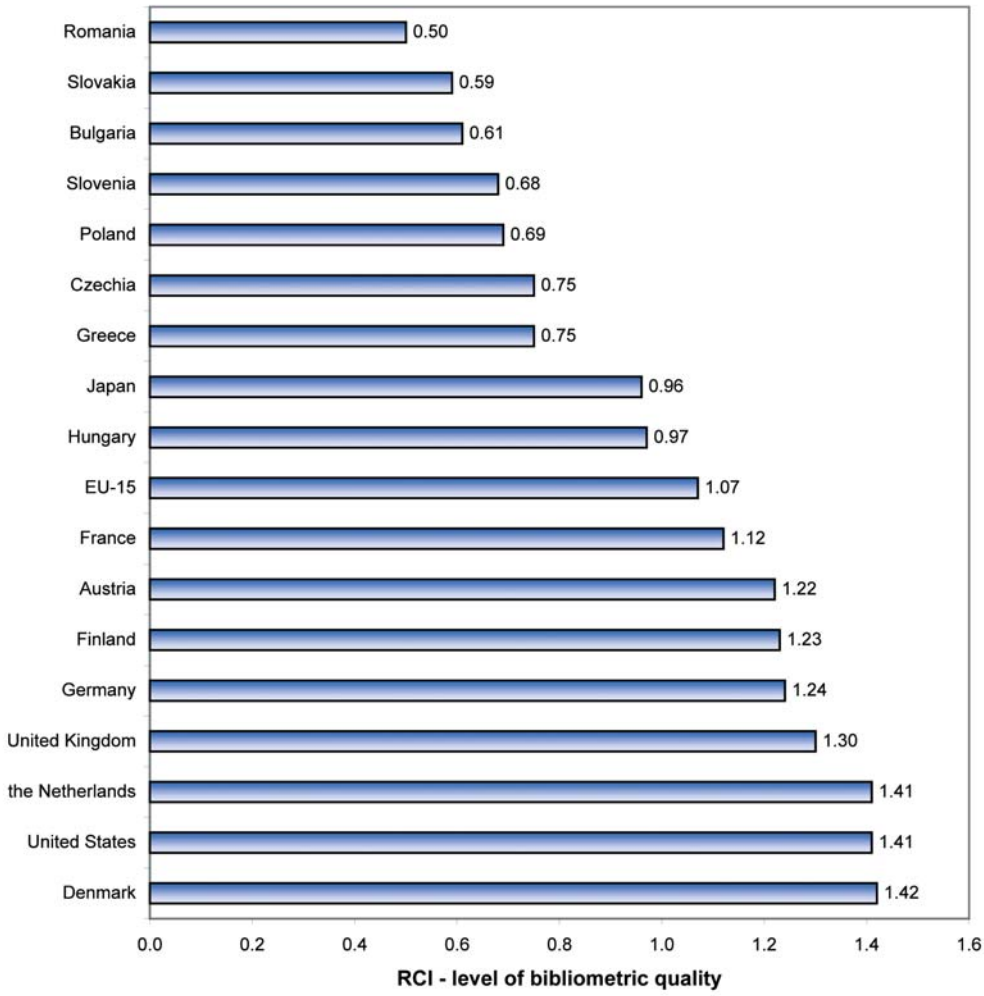
Source: Thomson ISI® National Science Indicators (NSI),1981–2006

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

For evaluation of a publication's quality the number of its citations is used that with certain limitations (e.g. it is not possible to compare the number of citations of publications in different disciplines against each other) speaks about the interest of a scientific community in the work in question. Similarly as with the production of publications, the indicator of the total production of citations would be discriminating against small countries and therefore the indicator of a *relative production of citations* is use.

Likewise for the relative production of publications, all new EU Member States, as well as Greece and Japan, are markedly below the EU-15 average in this indicator. Poland, Bulgaria and Romania close the table of 15 selected EU countries made in descending order as classified by value of RPC indicator.

B.2.3 Comparison of selected countries and Czechia by relative citation index



Source: Thomson ISI® National Science Indicators (NSI),1981–2006

Definition: RCI stands as abbreviation for a relative citation impact of a particular country (region) defined as the citation impact of a particular 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 one publication pro duced by research of a particular country (region) in 2002–2006 irrespective of disciplines. RCI indicator compares the level of bibliometric quality of publications of a particular country (region) with the average level of bibliometric quality of publications of the Thomson ISI® world database for 2002–2006.The value of RCI = 1 means that the 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 an above average level, while RCI < 1 indicates a level lower than the average.

As mentioned before, the evaluation of a relative production of both publications and citations (i.e. as converted to the number of inhabitants) is misleading in cases where there

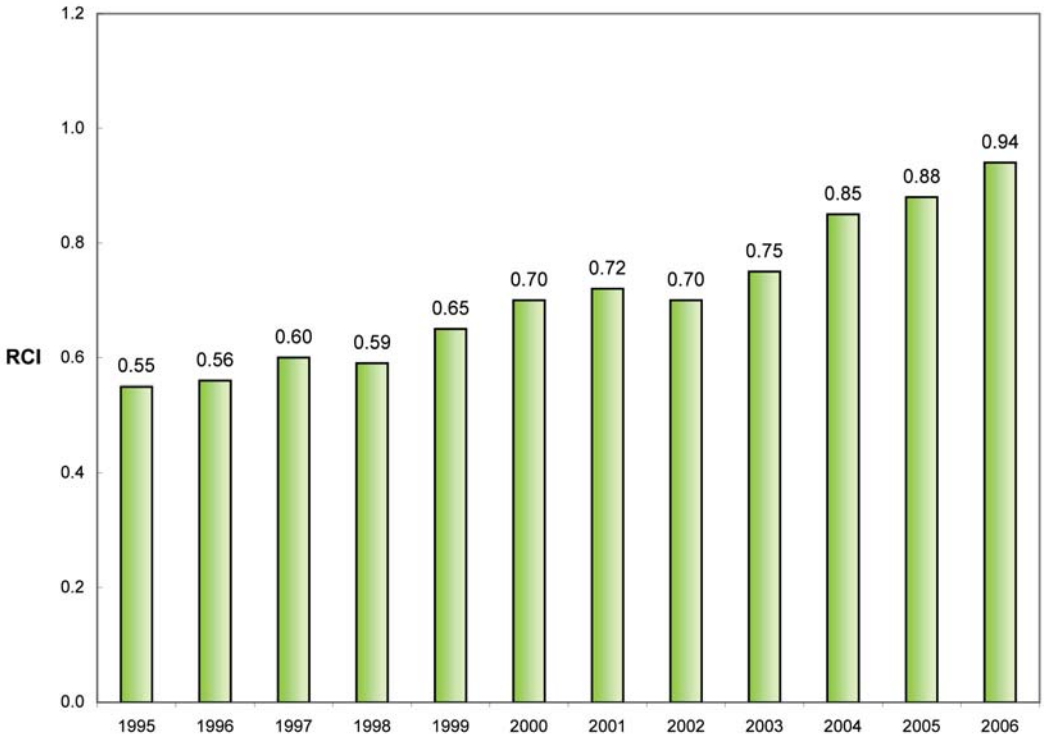
are large differences in the relative number of research workers or relative amount of R&D expenditure in the countries under comparison. A little more objective is the comparison by a relative citation impact. The definition is given under Graph B.2.3.

Usually, all scientific production of a particular country is compared against the world database. Often, even individual scientific disciplines are compared (see Graphs B.2.5). Five- year periods or individual years may be compared. Graph B.2.3 gives figures for the period 2002–2006.

The results of monitored countries are similar to those attained for indicators of relative production of publications and relative production of citations (Graphs B.2.1 and B.2.2). 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. On the other hand, other monitored EU-15 Members States and the United States report higher figures.

A leading position among the monitored countries is occupied by Denmark (RCI = 1.42), followed by the United States and the Netherlands. Denmark, the country with a traditionally high level of publication activity, is thus demonstrating its prominent position also in this indicator. Czechia has overtaken Slovenia in this indicator and takes 12th place in the pack of evaluated countries.

B.2.4 Trend of the relative citation index of Czechia



Source: Thomson ISI® National Science Indicators (NSI),1981–2006

Definition: The annual bibliometric quality of publications is expressed by RCI indicator (for definition of RCI indicator, see the definition for Graph B.2.3) for publications and their citations produced by research of Czechia for each given year.

In 1995, the value of RCI indicator for Czechia was a little more than half the value of the world database standard (0.55). Since then, the RCI figure for Czechia has been experiencing a steady growth (with the exception of years 1998 and 2002) and for 2006 it is equal to 0.94 of the world database average.

A conclusion can be drawn that the ever increasing bibliometric quality of publications reflects the structural changes made mostly in basic research in the course of transformation of the Czech research and development at the beginning of the 1990´ s. This favourable trend has been apparently caused by growth in the R&D support, increased emphasis laid upon the evaluation of research and its results at all levels of control, more effective publication policy, and strengthening of international collaboration. In many disciplines, the young new generation of scientific workers is establishing itself. But for the overall evaluation, the sector evaluations are even more important. Significant is the excellence in several key disciplines, namely in connection with innovation activities. Therefore, the analysis by disciplines is made.

B.2.5 Trend of the relative citation index of scientific disciplines and the number of publications in Czechia

The National Science Indicators database of Thomson ISI® makes it possible, among other things, to measure the level of individual scientific disciplines by the so-called relative citation impact of a discipline (RCIO). It is possible to compare countries against each other or disciplines of selected countries against the citation impact of a discipline in the world database. Definition of the indicator is as follows.

Definition: RCIO stands as abbreviation for the relative citation impact of a discipline of a country being defined as the citation impact of a discipline of a particular country (region) divided by the citation impact of the same discipline of the Thomson ISI® world database (citati on register). It refers to publications and their citations produced by research of a particular discipline over a particular period in Czechia. 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 over a particular period of time. 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 indicates an above average level, while RCIO < 100 indicates a level lower than the average.

The database, which was available for making 2006 R&D&I Analysis, gives figures for 106 scientific disciplines. Each discipline has its scientific periodicals assigned, in which Thomson ISI® monitors published scientific articles and their citations.

At present, nearly nine thousand scientific periodicals are monitored, of them nearly six thousand in the field of natural, technical and medical sciences. Also social, human and art sciences have an adequate coverage. A certain disadvantage is that the mentioned scientific disciplines partly overlap even if they are clearly defined by a set of monitored journals. Therefore, RCIO indicator cannot be considered an absolutely objective indicator of the level of a particular discipline. But the mutual comparison of levels of individual countries and their comparison with the average level of the world database is relatively objective.

From among 106 scientific disciplines monitored in 2002–2006, Czechia reports 37 disciplines the relative citation impact (RCIO) of which exceeded 100 in all monitored years, so it was higher than the citation impact of the respective discipline in the world database. On the other hand, there are 36 scientific disciplines with RCIO lower than the citation impact of the respective discipline in the world database in each of the monitored years. For the remaining 33 disciplines, their relative citation impacts exceeded the citation impact of the world database in at least one of the monitored years.

Below mentioned are RCIO figures for the best scientific disciplines in the field of lifeless sciences, life sciences, technical sciences, chemistry and medical sciences. This part of chapter contains also RCIO figures for selected disciplines of social and human sciences and environmental sciences. For each discipline, there is also the number of publications of Czech authors in journals specific to a particular discipline.

RCIO data in 2002–2005 more or less differ from figures contained in the previous 2006 R&D&I Analysis for most of the groups of scientific disciplines. For the groups of disciplines of lifeless sciences, chemical sciences, life sciences, social and human sciences, and environmental sciences, differences are caused by better precision of the Thomson ISI® source database NSI, namely in the number of citations. For the groups of disciplines of

technical sciences and medical sciences, there occurred a methodological mistake during RCIO ascertainment, and this mistake has been corrected in the actual 2007 R&D&I Analysis. The evaluation of scientific disciplines appears more favourable in these groups compared to the last year's Analysis.

The table B.4 contains the number of measured scientific disciplines in each respective group, as well as the number of disciplines, for which RCIO value improved and the number of publications increased in 2006 compared to 2005.

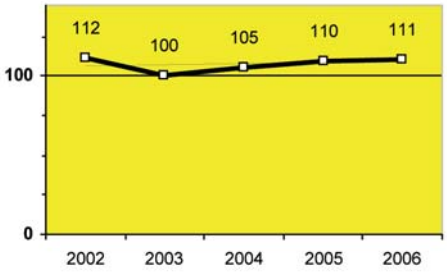
Table B.4 Measured scientific disciplines

Group of sciences	Number of measured scientific disciplines	Number of disciplines, for which there is an improvement in 2006 compared to 2005	
		in RCIO value	in the number of publications
Inanimate nature	5	3	2
Chemical sciences	4	2	3
Technical sciences	3	3	1
Animated nature	4	2	2
Medical sciences	4	1	3
Social and human sciences	4	2	1
Environmental sciences	3	1	2
IN TOTAL	**27**	**14**	**14**

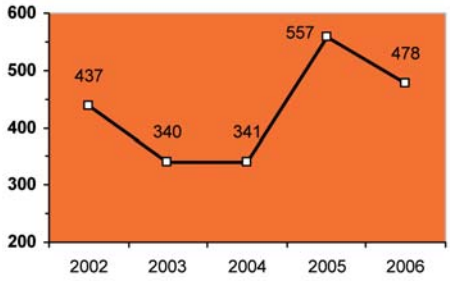
Out of 27 scientific disciplines, 14 saw an increase in RCIO value in 2006 against 2005 and 14 disciplines saw an increase in the number of publications, too.

Inanimate nature

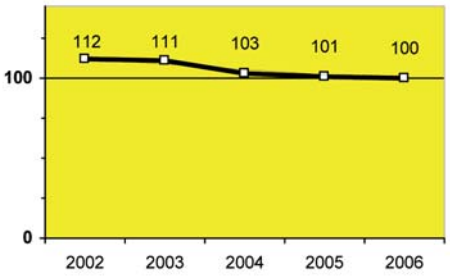
Physics – RCIO



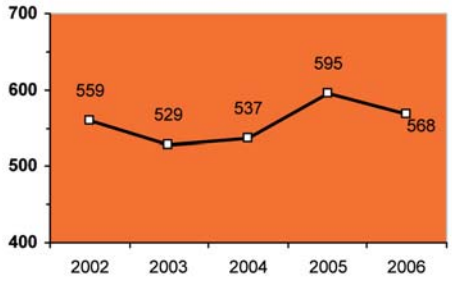
Number of publications



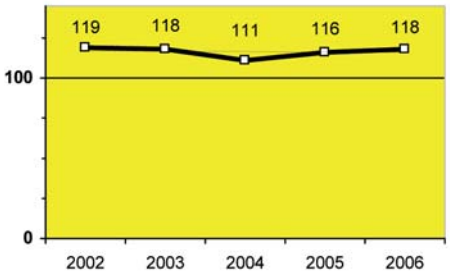
Applied physics, condensed matter physics, material sciences – RCIO



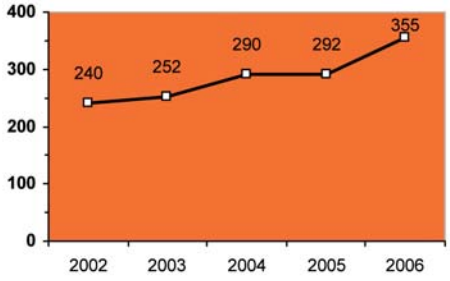
Number of publications



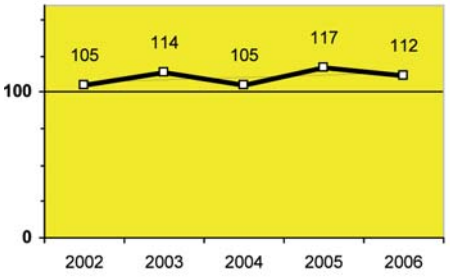
Physical chemistry – RCIO



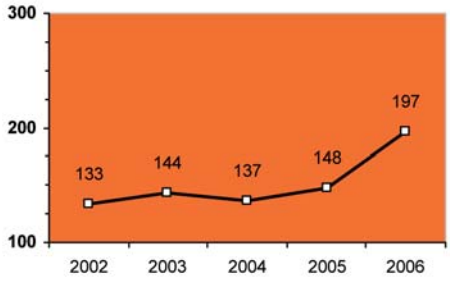
Number of publications



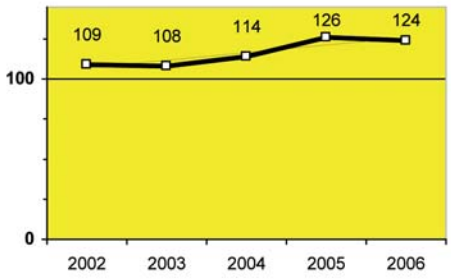
Mathematics – RCIO



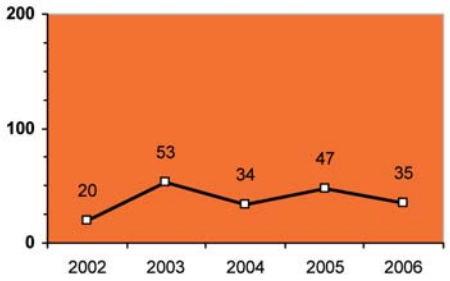
Number of publications



Engineering mathematics – RCIO



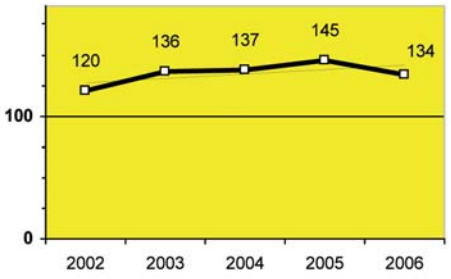
Number of publications



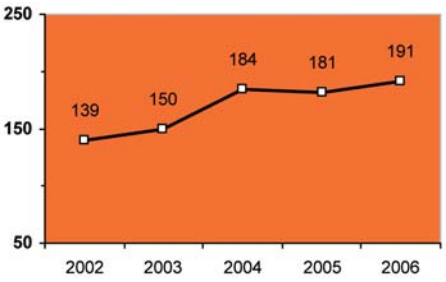
In all of the above scientific disciplines, RCIO values have been exceeding 100 over the whole monitored period. In the applied physics, condensed matter physics, and material sciences, the Czech research workers publish more than 500 scientific articles specific to this discipline every year.

Chemical sciences

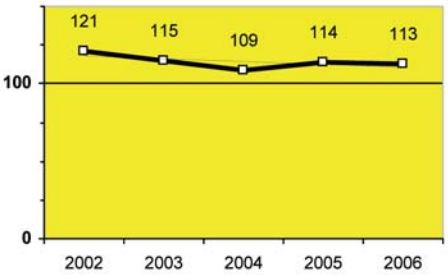
Chemical engineering – RCIO



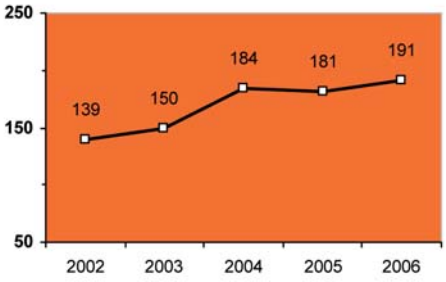
Number of publications



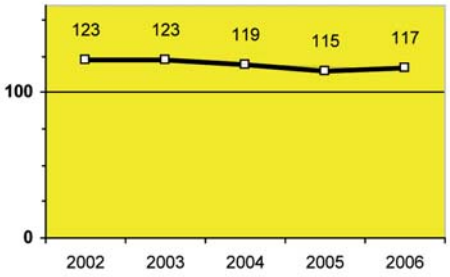
Organic chemistry, polymer sciences – RCIO



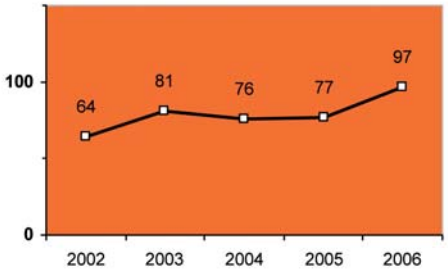
Number of publications



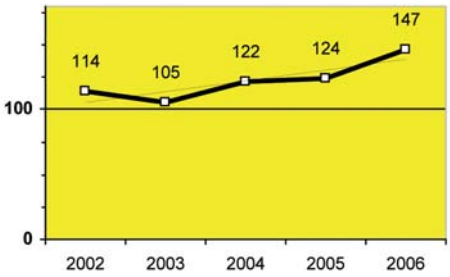
Inorganic and nuclear chemistry – RCIO



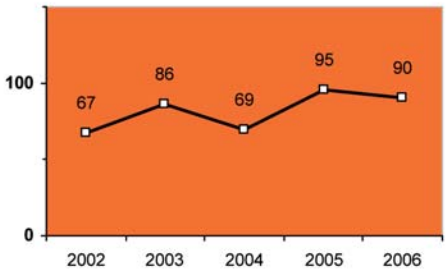
Number of publications



Pharmacology and toxicology – RCIO



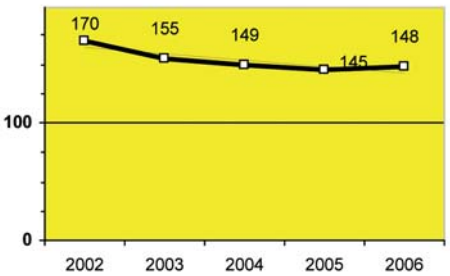
Number of publications



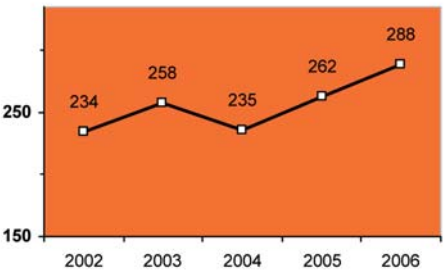
In chemical sciences, the situation is similar to that in lifeless sciences as far as RCIO values are concerned.

Technical sciences

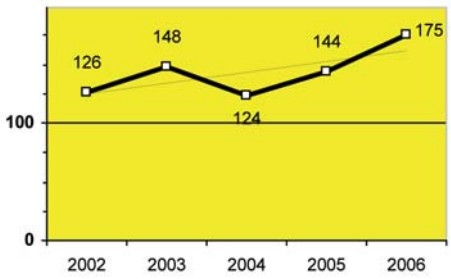
Spectroscopy, instruments, analytical instruments – RCIO



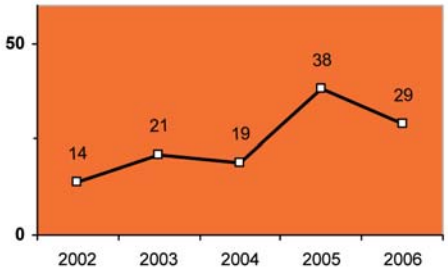
Number of publications



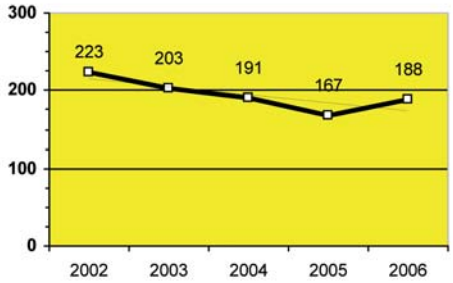
Nuclear engineering – RCIO



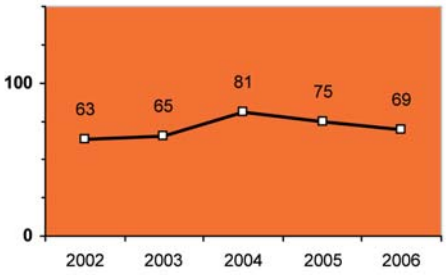
Number of publications



Instruments and measurement – RCIO



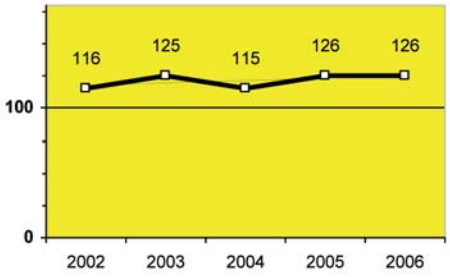
Number of publications



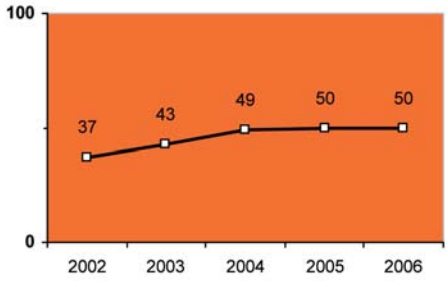
As mentioned above, the last year's methodological mistake concerning RCIO values in the group of technical sciences was corrected. All disciplines of technical sciences have been attaining substantially higher RCIO values in 2002–2006 than is the world database average. But with the exception of Spectroscopy, instruments, analytical instruments, the other two disciplines have the number of publications less than one hundred.

Animated nature

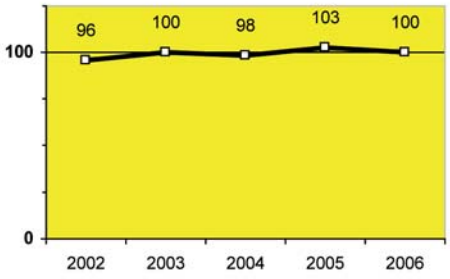
Botany and zoology – RCIO



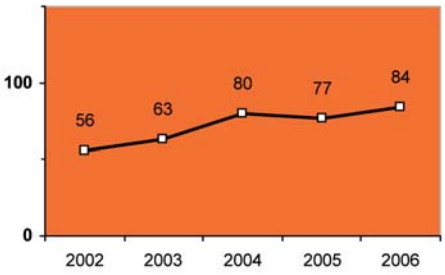
Number of publications



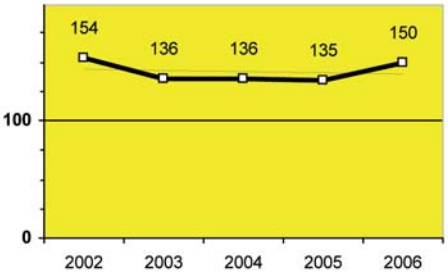
Molecular biology and genetics – RCIO



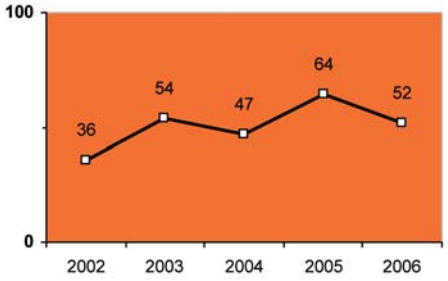
Number of publications



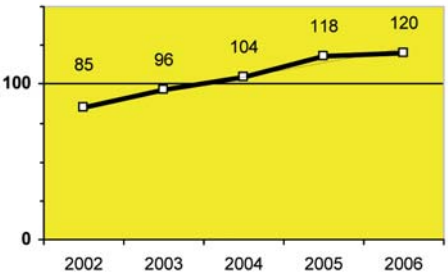
Entomology – RCIO



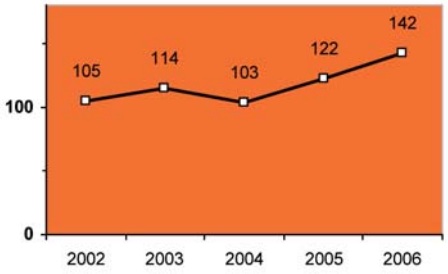
Number of publications



Veterinary medicine – RCIO



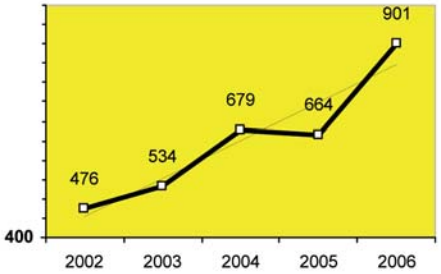
Number of publications



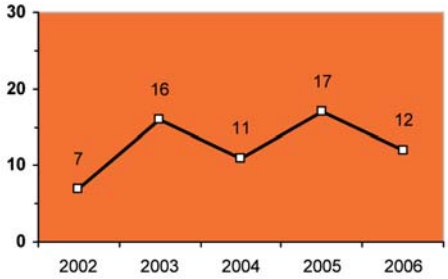
Best disciplines are entomology and botany with zoology reporting RCIO values > 100 in all years.

Medical sciences

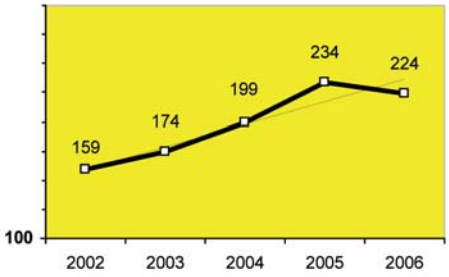
General and internal medicine – RCIO



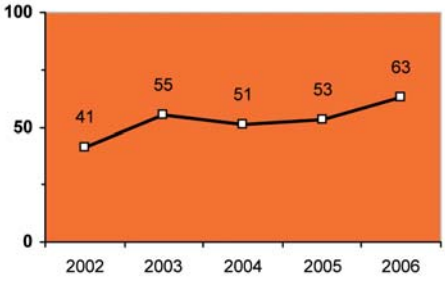
Number of publications



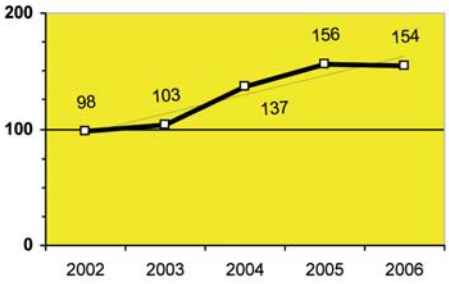
Cardiology, respiration medicine – RCIO



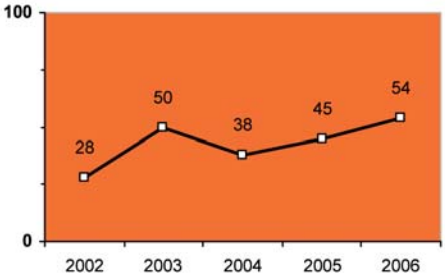
Number of publications



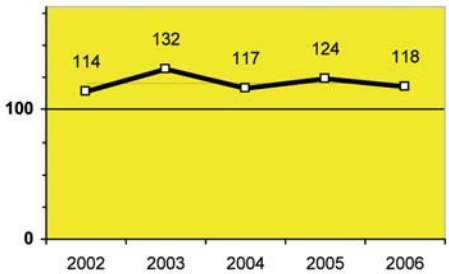
Cardiology and haematology – RCIO



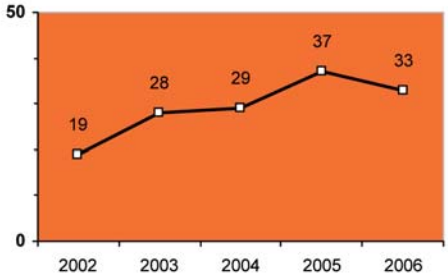
Number of publications



Oncology – RCIO



Number of publications



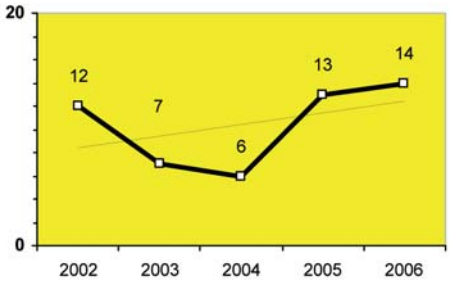
The methodological mistake, which occurred in the previous 2006 R&D&I Analysis, has been eliminated also in medical sciences. From among 106 disciplines defined by sets of

publications monitored by Thomson ISI®, Czech research workers report best results by far in the general and internal medicine. Since 2003, the RCIO values of this discipline have been more than five times the average of this discipline in the world database. In 2006, this discipline was more than ninefold the average of the world database. But the number of publications is low; only seventeen publications in 2005.

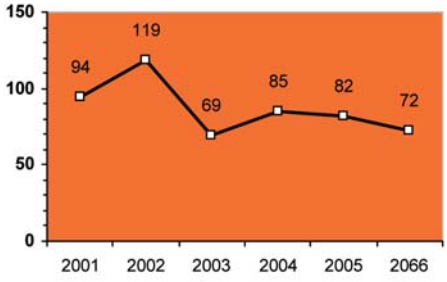
Medical sciences themselves confirm that the evaluation of disciplines according to RCIO disciplines defined by sets of journals is somehow questionable. In the Thomson ISI® system, cardiology is included partly in the discipline Cardiology and respiration medicine, and partly in Cardiology and haematology.

Social and Human Sciences

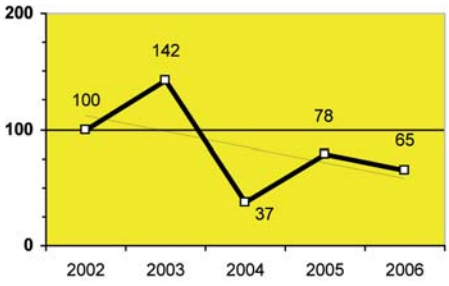
Economics – RCIO



Number of publications



Pedagogics – RCIO



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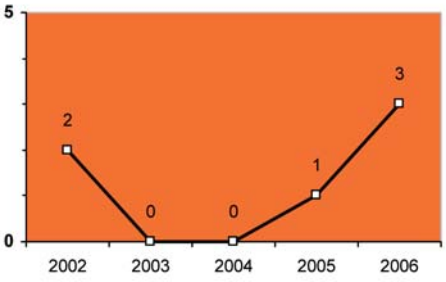
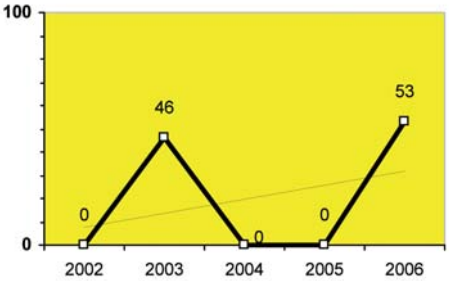


Law – RCIO



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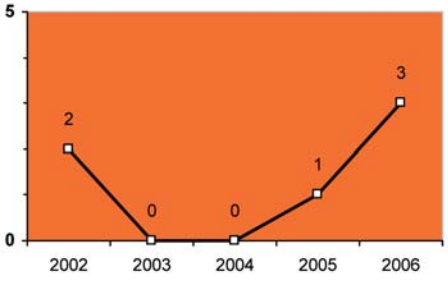
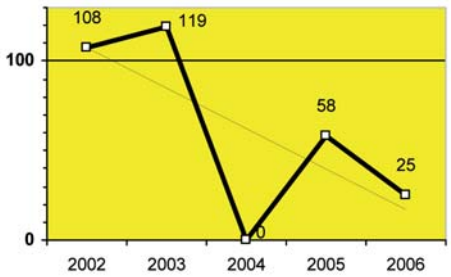


History – RCIO



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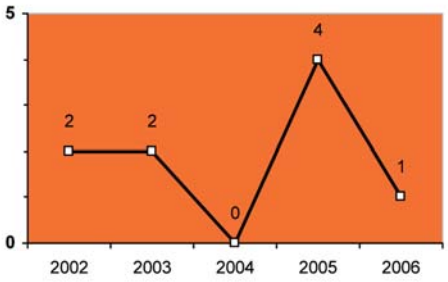
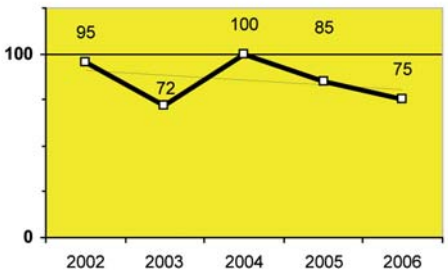


Most disciplines of social and human sciences in Czechia belong among disciplines that are notably below average when measured by RCIO indicator in the Thomson ISI® system of sets of journals. RCIO value for economics moved around 10 per cent of the world database average over the monitored years. Neither the number of publications can be marked as satisfactory when taking into account the scope of economics as a discipline and number of workers concerned with it in Czechia.

The evaluation of disciplines such as pedagogics, history and law cannot be made in a reliable manner, because these disciplines report a very low number of publications in the database being used.

Environmental Sciences

Environmental studies, geography, development countries – RCIO



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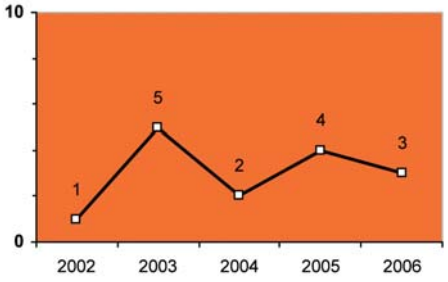
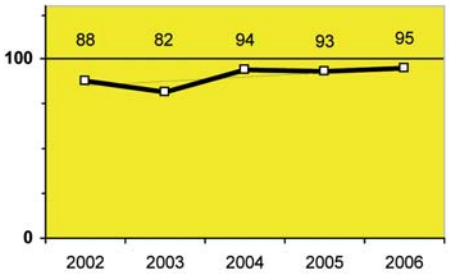


Environment, ecology – RCIO



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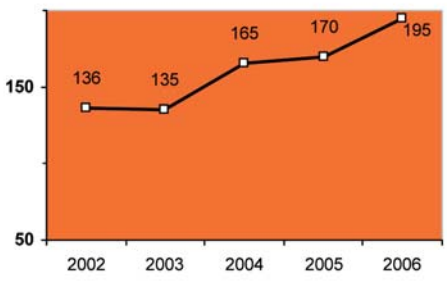
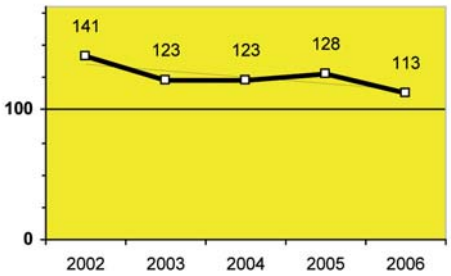
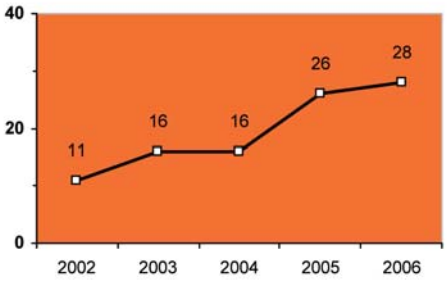


Environmental engineering,
power engineering – RCIO



Number of publications



As far as the above three disciplines of environmental sciences are concerned, Czech research workers attain best results in environmental and power engineering. RCIO figures exceeded the discipline's average in the world database in the whole period 2002–2006. RCIO values for environment and ecology were slightly below the world database average over the whole period.

The number of publications is relatively high. The discipline Environmental studies, geography, and development countries reaches RCIO values close to the world database average, but with a very low number of publications.

B.3 Invention applications, granted patents and licences

Intellectual property rights have two different areas: copyrights and industrial property rights. Copyright protects works (e.g. literature, paintings, sculptures, music, films, etc.), radio shows, computer programmes. Industrial property rights can be protected through:

• patents that protect technical and functional aspects of products and procedures. The invention is patentable, if it meets criteria of industrial utilisation and newness and is not obvious in light of the prior art.

• utility designs that guarantee a protection comparable with patent protection, but in a substantially shorter time and at lower costs,

• industrial design that protects the appearance of a product, its design,

• trademark that protects the brand or combination of brands serving for distinguishing goods and services of one producer (provider) from goods and services of the other.

Innovative enterprises protect their intellectual property more often than enterprises with only a small scope of innovation. Table B.4 contains results for CIS4 survey measuring, among other things, also methods of the intellectual property rights protection in EU-27 innovative enterprises. The survey covers the three-year period 2002–2004. In the monitored countries, the protection of intellectual property rights is most often applied by innovative enterprises in France (only 16.2 per cent of enterprises do not apply the protection), Germany (34.8 per cent without protection), and Finland (50 per cent without protection). The least protection is applied to intellectual property rights in Hungary (77.3 per cent without protection). Surprising is a high share of enterprises without the intellectual property rights protection in Denmark (61.9 %), which is similar to Czech enterprises. It is typical that in branches with a high dynamics and short innovation cycle (e.g. information technologies), the classical protection of intellectual property is not possible. This explains to a certain extent the position of Finland, but unfortunately not the position of Czechia.

Rights to inventions being very often the outcome of research and development efforts are generally protected by patent applications. Patent applications are most frequently used by innovative enterprises in France (22.2 per cent of enterprises), Germany (20.1 per cent), and Finland (18.2 per cent). Shares of innovative enterprises protecting their intellectual property rights by a patent range from 3 to 6 per cent in the group of new EU Member States and Greece.

Patents are the most important form of protection of the intellectual property. The protection of intellectual property rights provides a connecting link between innovation, inventions and other production, and the market.

The number of invention (patent) applications and the number of granted patents respectively are generally considered to be one of indicators of the R&D success rate. Inventions basically arise as products of research and development. It does not matter that many times there can be a great time lag between the termination of research and development works and the grant of a patent

In Czechia, and in all new EU Members States, discussions relatively often reveal oversimplifying approaches to the indicator of the number of applications or granted patents. Often R&D entities complain of very complicated patent granting procedures and high financial demands of patent acquisition and maintenance. It is difficult to enforce the con-

cept that not the number of applications or granted patents as such, but the economic benefit from obtaining a competitive advantage on the market through legal protection of an invention by patent or sale of licence is what counts.

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 Convention on the Grant of European Patents (the "Munich Convention"). National patent systems are based upon a national patent law of respective countries. In both systems it is possible to use the Patent Co-operation Treaty (PCT), with essential part of the patent granting procedure taking place at international level.

Table B.5 Shares of innovative enterprises with protection and without protection of intellectual property rights (%)

	Patent application	Trademark registration	Industrial design registration	Copyright application	Without protection
Bulgaria	7.6	18.5	6.8	3.9	63.1
Denmark	19.6	25.0	9.8	9.5	36.1
Czechia	5.1	7.9	20.8	4.3	61.9
France	22.2	33.5	18.4	9.7	16.2
Finland	18.2	19.9	9.6	2.3	50.0
Hungary	6.5	4.8	9.5	1.9	77.3
Germany	20.1	19.1	18.0	8.0	34.8
The Netherlands	14.4	17.3	5.7	5.1	57.5
Poland	4.9	18.8	9.8	6.7	59.8
Romania	6.9	7.4	17.1	3.4	65.2
Greece	3.0	5.5	24.8	9.0	57.7
Slovakia	3.7	7.1	18.4	6.0	64.8

Source: Eurostat, Statistics in Focus 91/2007, and own calculations of the Research and Development Council

The Convention on the Grant of European Patents or the European Patent Convention was signed in October 1973 in Munich and took effect on October 7, 1977. It established a single system of 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 designated in the European patent application [1]. Once a European patent is granted, the invention is protected in these countries in the same way as by national patents. The Convention on the Grant of European Patents set up the European Patent Organisation (as its legislative body) and the European Patent Office (as its executive body) [2].

The already mentioned Patent Co-operation 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 184 member states [3]. One hundred and thirty-seven of them are PCT member states. Within the so-called international phase of the procedure, the object of international application is sub-

[1] Typically, it takes a little longer than four years to grant a patent. For other information on the European patent granting procedure see www.epo.org.

[2] See the European Patent Office (EPO) website http://www.european-patent-office.org.

[3] See the list of members on http://www.wipo.org/members/members/index.html.

jected to search on the state of the art 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 grant of national or regional patents is finished [4].

Despite many years of efforts, the Community patent has not yet been implemented beside the existing systems (as originally laid down in the Luxembourg Treaty of 1975).

This part of Chapter B follows up with 2004, 2005 and 2006 Analyses. It contains data on the number of patents being applied (invention applications) in 2001, 2003 and 2005 at the Industrial Property Office of the Czech Republic (IPO), the European Patent Office (EPO), and the U.S. Patent and Trademark Office (USPTO), and on the number of patents being granted by these offices. In many cases, data from 2001 and 2003 were put more precisely. Data were taken from annual reports of respective patent offices for 2006. In the view of the extended scope of the presented analysis, this part includes also applications of utility designs at IPO. The utility design provides protection to technical solutions that are generally applied to innovations of lower levels. The Czech patent law terminology is maintained that uses the term "invention application", as well as the EPO and USPTO terminology that uses the term "patent application".

In compliance with both the OECD and Eurostat methodology for R&D evaluation, data are converted to one million inhabitants of a respective country. Sometimes, the conversion to one million of employed persons is used abroad, too.

To make an analysis of patent applications and granted patents, and mainly of their connections with the R&D support, is very demanding. Results are published after three or four-year delay. In 2006, Eurostat published results of a detailed survey concerning patents for 2002 [5]. The survey, among other things, dealt with the shares of main R&D sectors (private, public, and higher education) in twenty countries with the highest number of patent applications filed at the European Patent Office (EPO) and in twenty countries with the highest number of patents granted by U.S. Patent and Trademark Office (USPTO)

From among the twenty countries with the highest number of patent applications at EPO, nine countries have the share of applications from business sector higher than 80 per cent; the highest is in Japan (more than 90 per cent). The second largest patent applicant is the public (government) sector. The highest share was attained by the public sector in Canada (over 20 per cent from the overall number of applications). In none of these 20 countries the share of patent applications from higher education institutions exceeded 10 per cent; the highest was in Canada, less than 8 per cent.

From among the twenty countries with the highest number of granted patent by USPTO, thirteen countries have the share of patents granted to business sector higher than 80 per cent; the highest is again in Japan (more than 95 per cent). The highest share of public sector was attained by Denmark (ca 55 per cent). The share of higher education in granted patents was markedly lower. Most successful was the higher education sector in Belgium (ca 7 per cent).

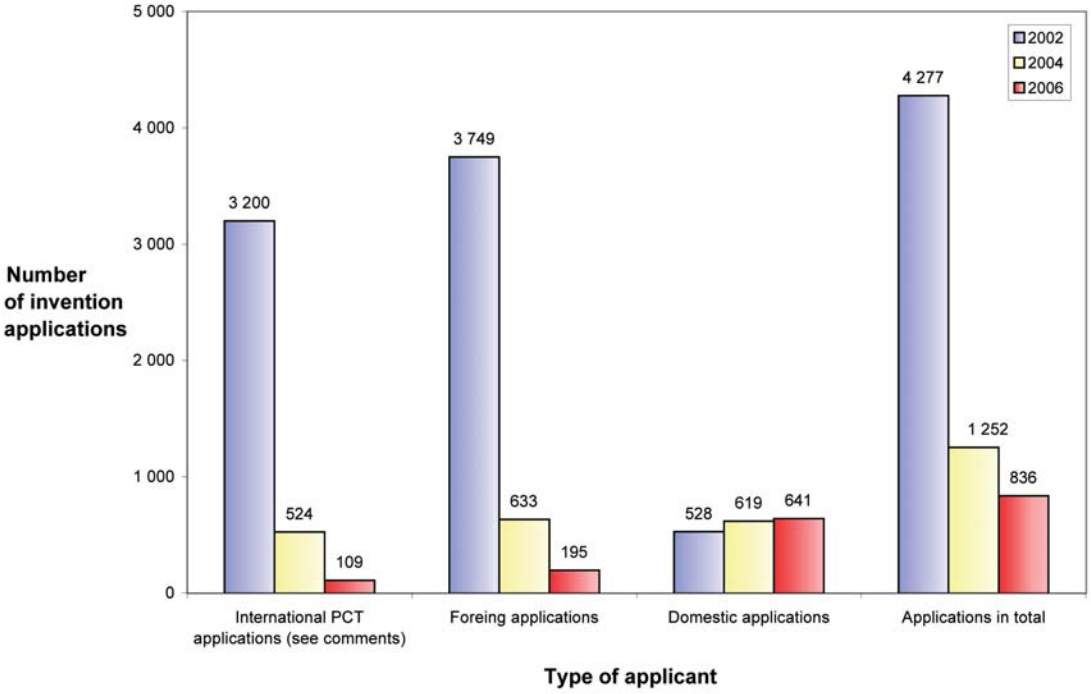
After 2002, the number of patent applications and patents granted to public sector and sector of higher education has increased. Despite this growth, the business sector remains the leader in patent applications and granted patents.

The Eurostat document also proves a relatively strong correlation between the number of patent applications at EPO per million of inhabitants and the R&D expenditure again per million of inhabitants.

[4] For additional information on PCT system see the notes on methodology in the Eurostat reference data bank NewCronos, Theme 9, Domain: patents.

[5] Eurostat, Statistics in Focus, 16/2006

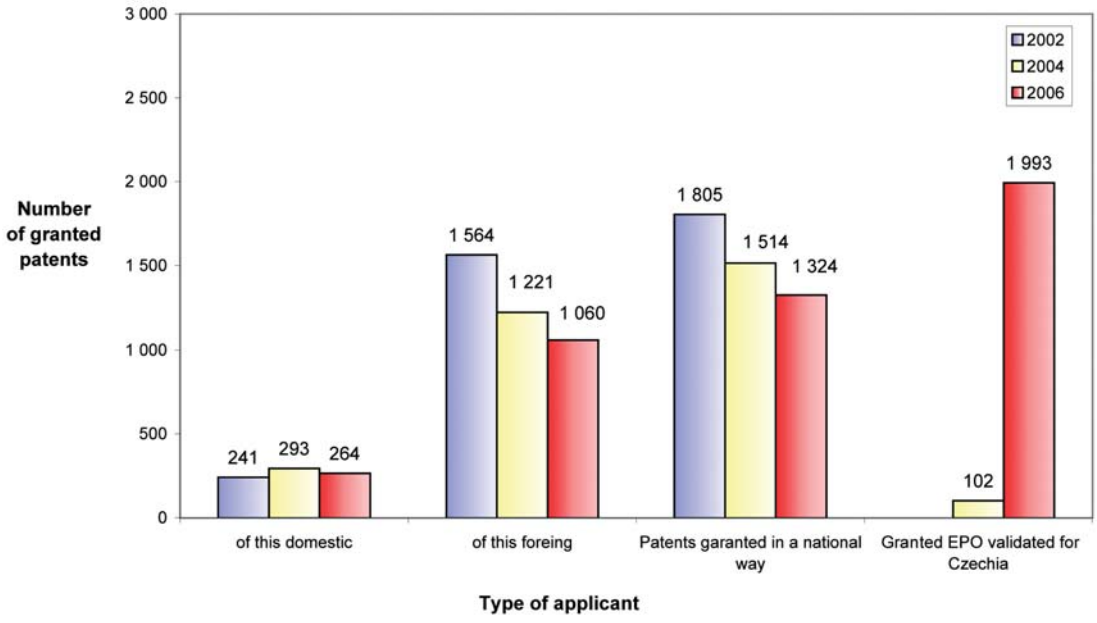
B.3.1. Invention applications filed in Czechia



Source: IPO Annual Report 2006

Year 2006 saw the continuation of decline in the overall number of invention applications, which was caused especially by reduction in the applications of foreign applicants. A substantial part of foreign applications – more than half – is filed as international applications under the Patent Co-operation Treaty (PCT). The number of applications of domestic applicants is slightly growing. Applicants, who seek protection for their inventions in Czechia, prefer to file an European Patent Application at EPO with designing Czechia as a country, where they wish to obtain protection conferred by the European patent.

B.3.2 Patents granted in Czechia



Source: IPO Annual Report 2006

The number of patents granted in a national way has been declining; mainly the share of foreign applicants who prefer to apply for the patent in Czechia through the European Patent Office (EPO). The share of foreign applicants in the overall number of patents granted in a national way fell from 88.8 per cent in 2002 to 80.1 per cent in 2006.

However, the number of European patents validated [6] for Czechia experiences a dynamic growth. The increase in the number of these patents was 45 per cent higher in 2006 than in 2005. The table below shows the number of national patents granted by IPO and European patents validated in Czechia.

Table B.6 Granted national patents and validated European patents with effects in Czechia by country of origin – (countries with the highest number of patents)

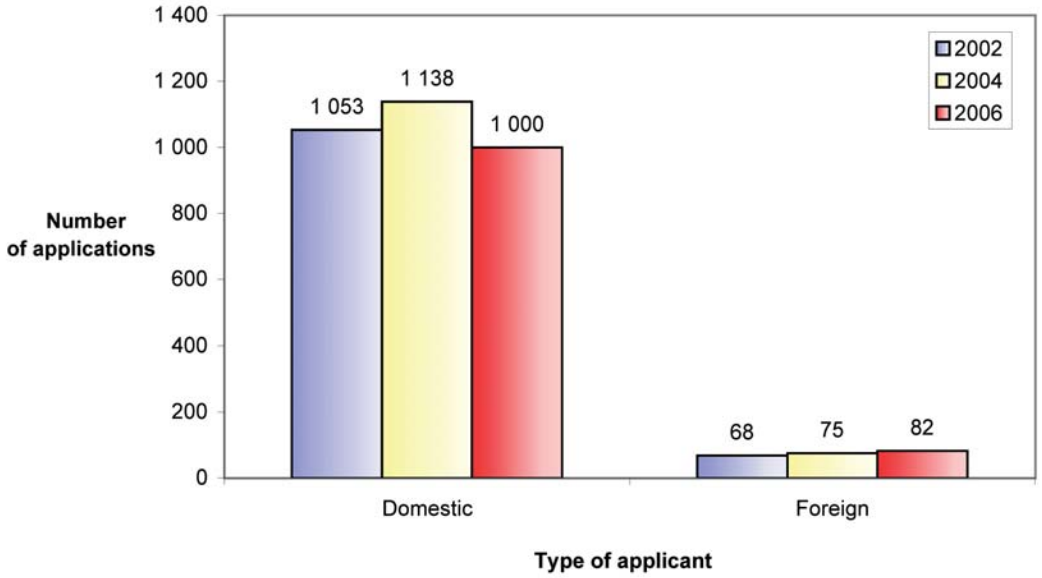
	2001	2003	2005	2006
Czechia	241	259	350	266
Germany	507	542	757	1 171
United States	298	272	212	362
France	94	106	180	303
Switzerland	93	113	106	231

Source: IPO Annual Report 2006

[6] Validated patent – European patent, for which translation into Czech was submitted and administrative charges paid.

B.3.3 Applications of utility designs in Czechia

The industrial rights in Czechia are relatively frequently protected by applications of utility designs. As already mentioned in the introduction to this part, the registered utility design provides a relatively efficient protection of industrial rights in shorter time and with lower costs than patent.



Source: IPO Annual Report 2006

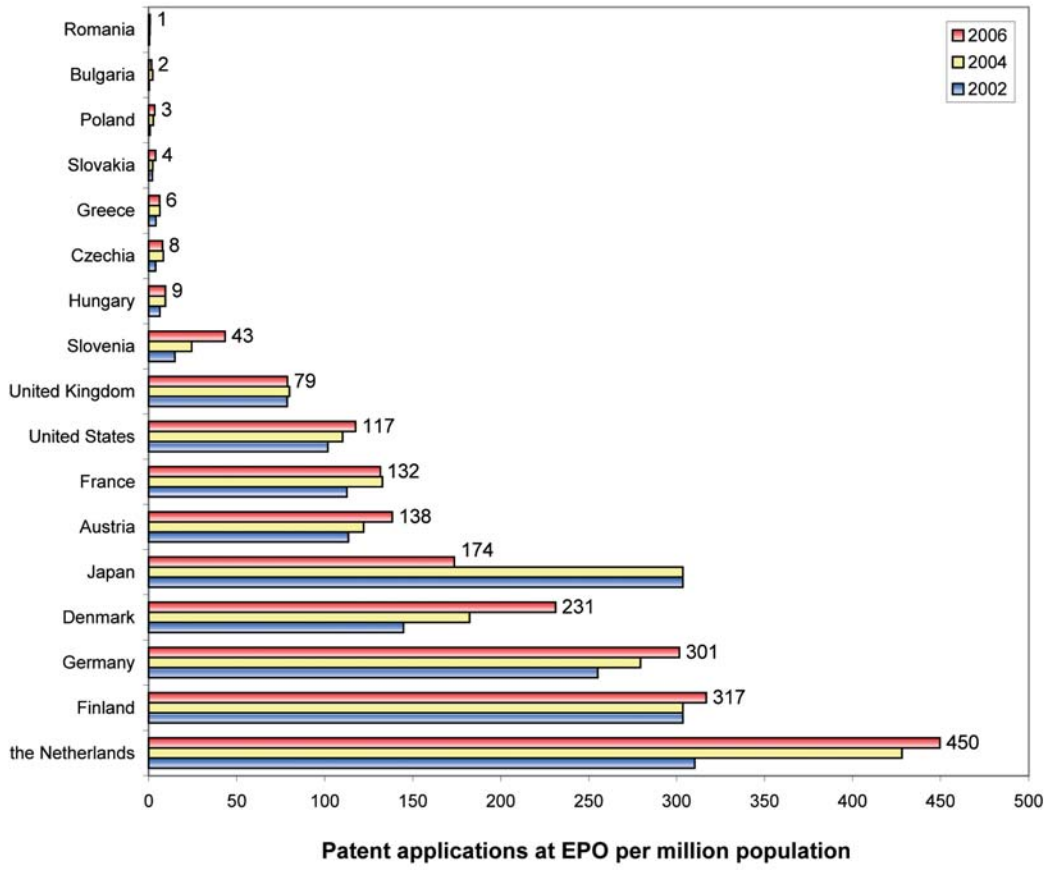
IPO Yearbook 2006 states that activities of Czech applicants reported a certain growth in 2006, but still without any explicit progress, which would acknowledge the scientific and technical maturity of the Czech society.

Table B.7 Registered national utility designs in Czechia

	2002	2004	2006
Domestic applicants	967	1 042	938
Foreign applicants	76	62	83
Applications in total	1 043	1 104	1 021

Source: IPO Annual Report 2006

B.3.4 Patent applications at EPO

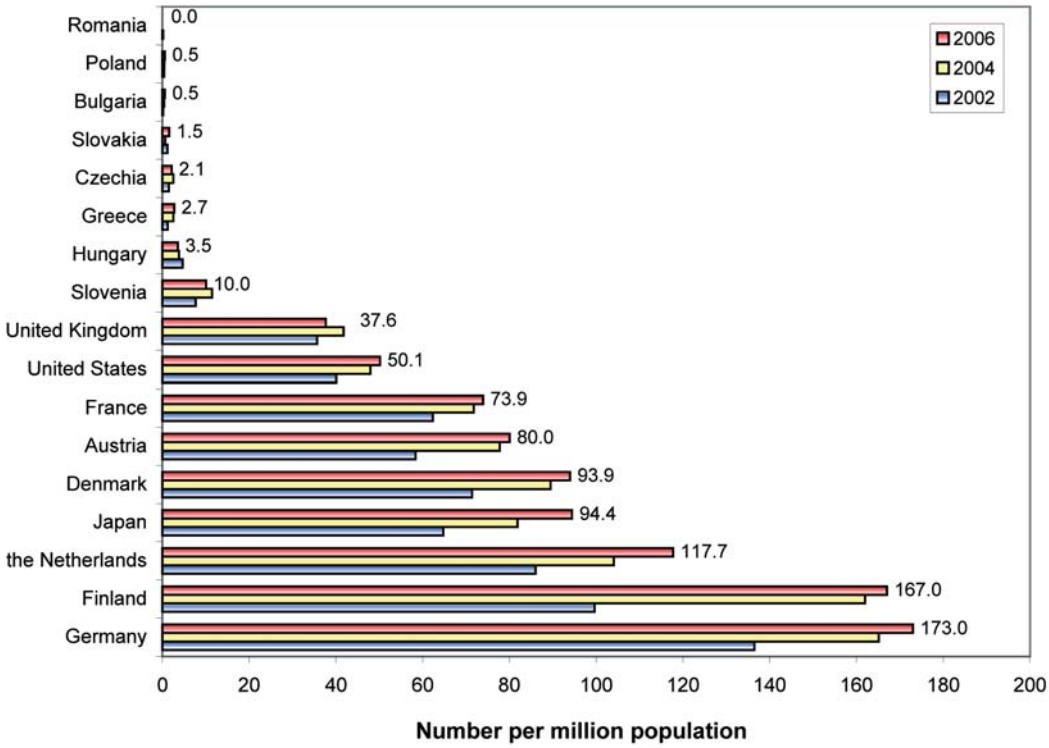


Source: EPO, Annual Report 2002, 2004 and 2006

Like in 2005 and 2006 Analyses, the number of patent applications of the new EU Member States and Greece are more than one order lower than patent applications from the monitored EU-15 states. The only exception is Slovenia with 43 applications filed in 2006. Applications of the Netherlands, Germany and Denmark experienced a relatively fast growth in the period 2002–2006.

When evaluating this markedly different number of patent applications and granted patents of EPO and USPTO, it is necessary to take into account also the unmatched amount of total R&D expenditure, preferably R&D expenditure per one R&D employee. This expenditure is given in the table in the introductory commentary to this chapter. The same applies to the number of granted patents at EPO and applications and granted patents by USPTO.

B.3.5 Patents granted by EPO



Source: EPO, Annual Report 2002, 2004, and 2006

Differences between the compared EU-15 Member States and new Member States and Greece in the number of granted patents are even more marked than differences in the number of patent applications. The reason for this considerable lagging behind of new Member States is mainly the structure of their industry that still asserts itself in international markets due to lower labour costs. Another reason is undoubtedly a lower performance of research and development, mainly the industrial one, if we consider that even in the most advanced countries of our world aboat 80 per cent of all patent applications come from the business sector. As already mentioned, the remaining 20 per cent of patent applications are divided between the public sector and universities.

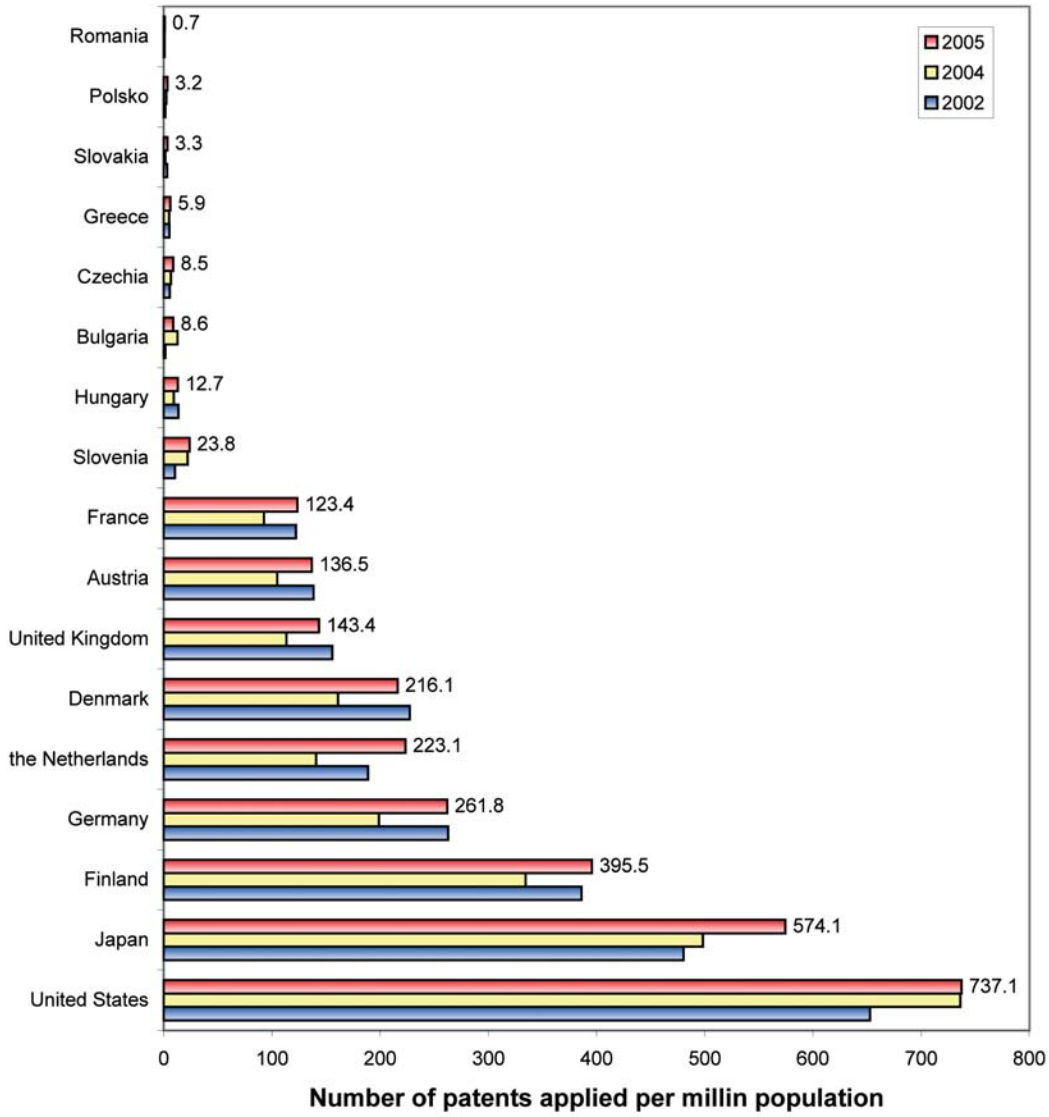
In 2006, major European industrial companies applied for more patents than all the monitored new EU Member States and Greece together. EPO publication Facts and Figures 2006 shows the largest applicants from the business sphere.

Table B.8 The largest patent applicants at EPO in 2006

Ranking	Company	Number of patent applications
1.	Philips	4 425
2.	Samsung	2 355
3.	Siemens	2 319
9.	Nokia	882
10.	General Electric	768

Source: Facts and Figures 2006, EPO

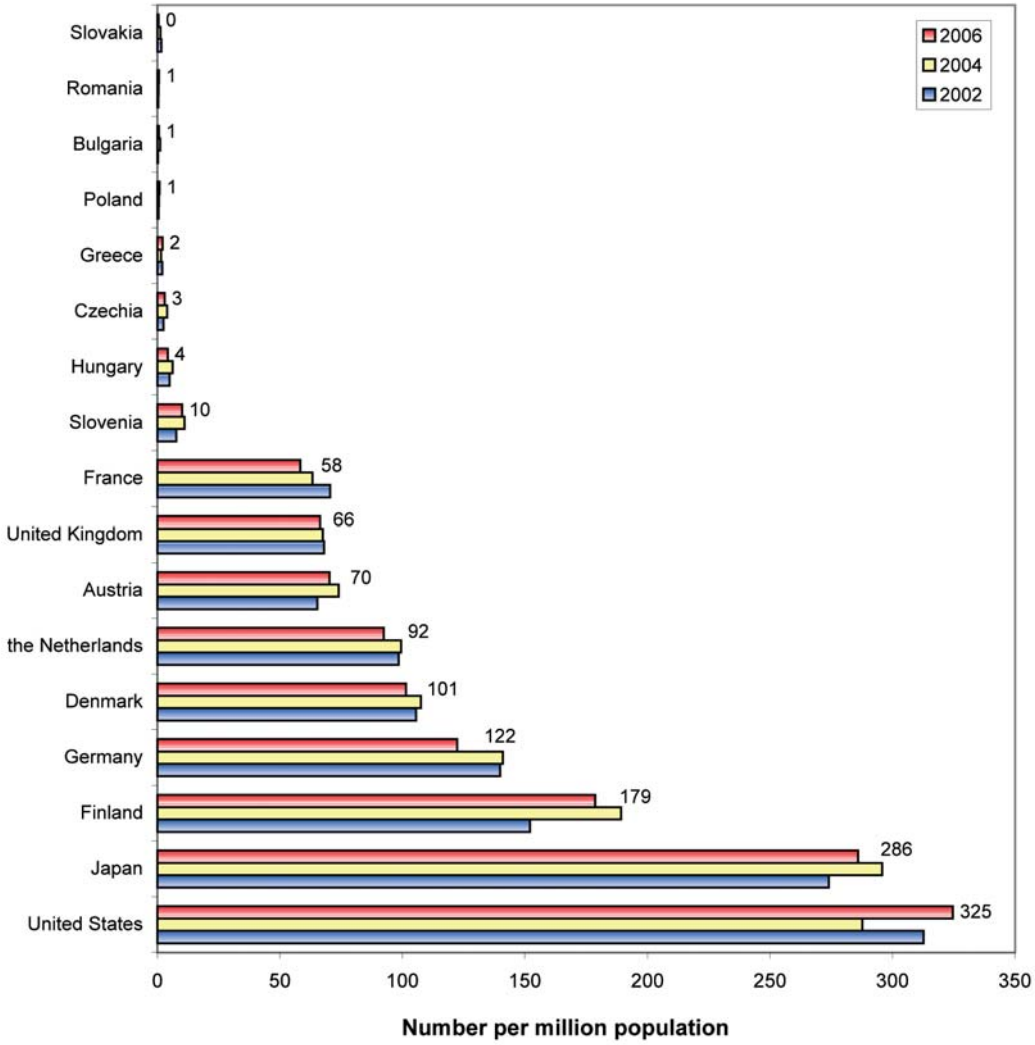
B.3.6 Patent applications filed with USPTO



Source: Performance and Accountability Report Fiscal Years 2006

Note: Details about the number of patents applied at USPTO in 2006 will be available in December 2007

B.3.7 Patents granted by USPTO



Source: Performance and Accountability Report Fiscal Years 2006

Commentaries to graphs referring to the number of applications filed and patents granted by EPO apply similarly to patent applications and patents granted by USPTO. The number of patents obtained by America's leading universities corrects to a certain extent the statements about low share of higher education institutions in the number of granted patents.

Table B.9 Most successful US universities by the number of patents obtained at USPTO

	University	Number of obtained patents 2003	2005
1.	University of California, Berkeley	424	390
2.	Massachussetts Institute of Technology	132	136
3.	California Institute of Technology	135	101
4.	University of Texas	101	90
5.	Stanford University	75	90
10.	Columbia University	52	57
20.	University of North Carolina	24	20

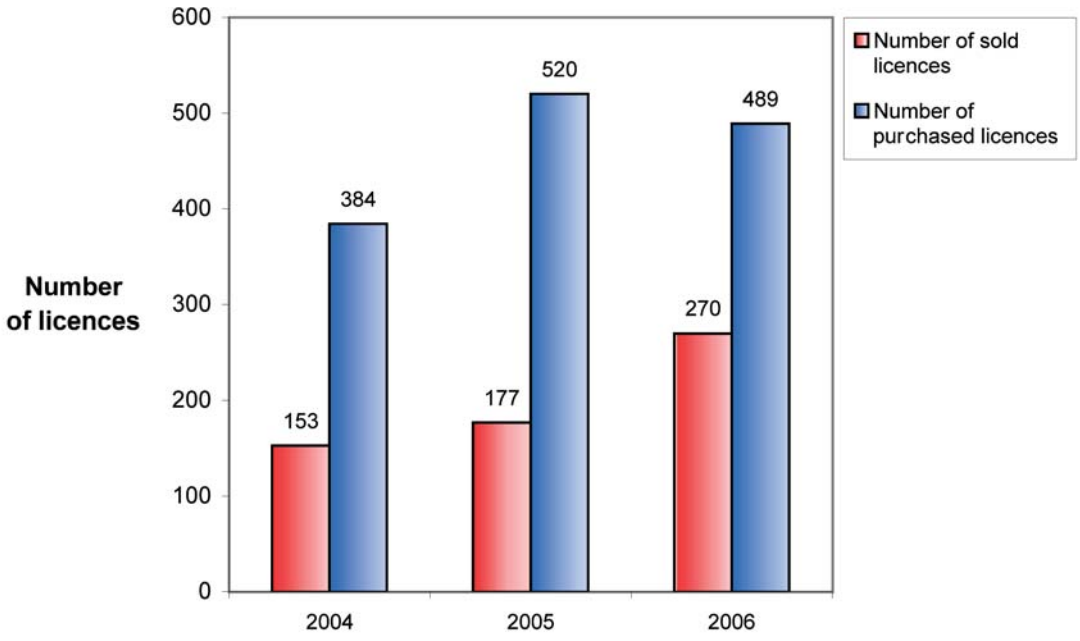
Source: USPTO, Patent Statistics Report for Viewing – 2006

For comparison's sake, it is possible to give the number of patents obtained at USPTO by some of the smaller countries under evaluation in 2006: Austria 575 patents, Denmark 547 patents, Hungary 41 patents, Czechia 28 patents, and Poland 26 patents.

B.3.8 Number of sold and purchased licences in Czechia

A licence is one of several options how to make commercial use of industrial rights and intellectual property. Since 2003, the licence data have been ascertained by a separate annual statistical survey that is exhausting. Reporting units are all entities, for whom either sale or purchase of a licence for some type of industrial property protection was ascertained.

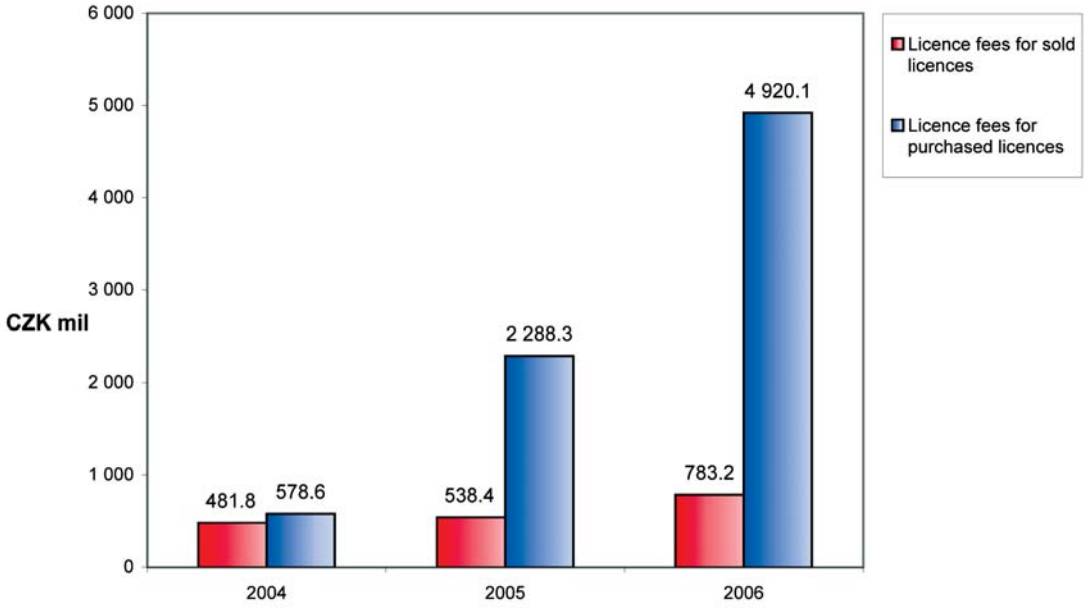
The licence agreement grants the right in agreed scope and on agreed territory for acquisition (purchase) or provision (sale) of both patented and non-patented inventions, utility designs, industrial designs, topographies of semiconductor products, new plant varieties and animal breeds, or trademarks. The provider authorizes the acquirer to exercise industrial property rights in agreed scope and on agreed territory and the acquirer commits itself to provide certain consideration or property value. The licence agreement takes effect towards third parties through entry into IPO register.



Source: CSO, Statistical Yearbook of the Czech Republic 2006

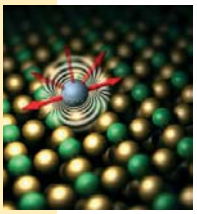
The number of purchased licences exceeds the number of licences sold. The higher number of licence purchases corresponds with a relatively small number of Czech patents.

B.3.9 Licence fees for sold and purchased patent and utility design licences in Czechia



Source: CSO, Statistical Yearbook of the Czech Republic 2006

Licence fees for purchased licences grow significantly faster (in 2006, more than eightfold increase against 2004) than fees for licences sold – growth by ca 35 per cent.



C.1 Innovation support from programmes of the Ministry of Industry and Trade

C.1.1 Innovation support in 2004–2006

Since May 2004, the most important tool of the Ministry of Industry and Trade (MoIT) to support the development of innovation environment and growth of innovation activity of the entrepreneurial sector has been the Operational Programme Industry and Enterprise (OPIE) announced for the period 2004–2006. The source of support granted within OPIE are the EU structural funds - namely the European Regional Development Fund, with a possibility to draw up to 75 per cent, and the state budget funds (25 %). The above proportionality applies only in case when support of 100 per cent of the project funding was agreed to the applicant. This proportionality will differ in practice depending on the character of an institution, because by far not all of them may claim 100 per cent support. If we understand the innovation process in all its complexity, besides the innovation infrastructure development itself, and product, technology and service innovations, also the activity of new entrepreneurs and firms with shorter history is supported within this programme, as well as establishment of branch groupings at regional and supra-regional levels, and development of consulting services. The main instruments of support are grants and preferential (soft) or interest-free loans.

As of August 22, 2007, the grant award decision was issued or loan contract concluded for implementation of 2,872 projects (out of 4,673 delivered applications), with a total amount of support exceeding CZK 10 billion. As of the same date, the support was paid up in the amount exceeding CZK 4 billion for implementation of 556 projects. The reason why the amount of realized payments lags behind the decided/contracted amount is that money is disbursed ex post, i.e. after successful completion of a project or its partial phase.

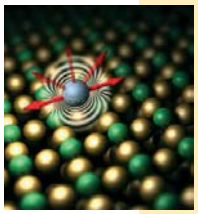
Following programmes of support within OPIE have closest links to support of development of innovation environment and innovation activities of the entrepreneurial sector:

PROSPERITY

The PROSPERITY programme supports the development of infrastructure for industrial research, development, and innovation. The programme pays a special attention to the establishment and development of business incubators, science and technology parks, and technology transfer centres. From the day of its announcement to August 22, 2007, 62 projects were submitted within the PROSPERITY programme not only by individual enterprises, but also universities and research institutions. Over the whole programming period, the support in a total amount of CZK 1.7 billion was awarded to 32 projects.

Twenty-one projects were supported in a total amount of CZK 994 mil in 2006. Three projects obtained the funding decision only in 2007, in an aggregate value of CZK 391 mil.

In 2006, the largest number of projects was submitted in South Moravian Region. The most important projects – as far as the amount of grant is concerned – were implemented in



Pardubice Region – two projects of TechnoPark Pardubice k.s., each of them being granted a support of nearly CZK 150 mil.

INNOVATION (INNOVATION II)

The INNOVATION programme is focused on promoting the implementation of product, technology and service innovation. Its objective is to support development of innovation activity of Czech firms and enhance their competitiveness in world markets. Within the INNOVATION programme, grants were awarded to 61 projects (1 project obtained both the grant and preferential loan) out of 218 submitted applications (19 applicants withdrew later) in a total amount of nearly CZK 1 billion. The above-described data demonstrate the great interest of entrepreneurial public in this programme aimed at putting the results of research and development into practice.

The follow-up INNOVATION II programme was announced in February 2006 and 113 entrepreneurs submitted their applications (14 of them withdrew later). Within the INNOVATION II programme, the support for implementation of 39 projects was awarded in a total amount of nearly CZK 500 million.

In aggregate, 101 projects were supported in INNOVATION I + II programmes (out of 331 submitted projects) with overall amount of grants or loans reaching nearly CZK 1.5 billion. In term of the support amount, the project of the company Biopreparáty, s r.o. from Central Bohemian Region was the most successful in 2006.

CLUSTERS

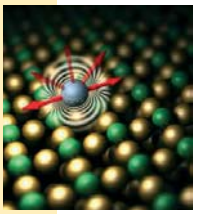
The aim of the support provided under the CLUSTERS programme was to stimulate the innovation process entities to establish and develop branch groupings at both regional and supra-regional levels. This programme was divided into providing support to activities connected with searching for potential clusters and providing support to establishment and development of these branch groupings.

Successful establishment of a cluster and filing of a grant application within the next phase of the cluster's establishment and development concluded the phase of searching for suitable cluster entities for some projects in 2006. It was managed to group together private, mostly production firms forming the cluster's core, educational institutions of a professional focus, and research capacities not only of these institutions, but outside higher education, too.

The year 2006 saw a marked growth in the interest of applicants for support under this programme compared to the previous year. During the implementation of CLUSTERS programme, granting decisions were issued to 42 projects of searching in a total amount of CZK 32,6 million.

Also the interest of applicants for support in the phase of establishment and development of the CLUSTERS programme increased in 2006. Fourteen granting decisions in the amount of CZK 246.9 million were issued during the programme implementation.

Projects from various industries such as machine building, wood processing, clothing, brewing, pharmacy, package materials, construction materials, nanotechnologies etc. were supported.



C.1.2 Innovation support in 2007–2013

In 2007–2013, the main tool for direct innovation support will become the Operational Programme Enterprise and Innovations for 2007–2013 (OPPI) reflecting the priority areas of the innovation policy of MIT, while connecting this policy with regional dimensions of economic and political measures. The PROSPERITY programme will promote the innovation infrastructure, the INNOVATION programme will be focused on innovation implementation and enhanced patent activity, and the CO-OPERATION programme on promoting regional and supra-regional co-operation.

The supported activities under the PROSPERITY programme will be broadened mainly by more intensive support given to the process of establishment and development of technology transfer centres. The emphasise will be henceforth put on promoting the infrastructure for newly established innovation spin-offs. Besides activities being promoted in the previous period, the programme INNOVATION will accent the support given to the introduction of organisational and marketing innovation, as well as costs of industrial property rights protection (patents, industrial designs, trademarks, etc.).

In addition to the support provided to the establishment and development of traditional clusters, the CO-OPERATION programme will be aimed at promoting the establishment of poles of excellence, technology platforms, and other projects of co-operation.

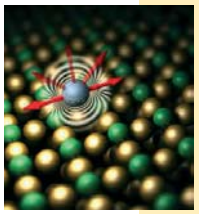
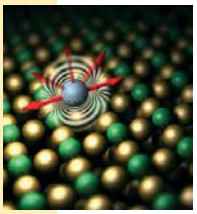


Table C.1 Overview of applications according to OPIE programmes 2004–2006

Programme	Allocation 2004-2006 (CZK mil)	Delivered applications		OSF Approved [1]		Decided	
		Number of projekts	Amount (CZK mil)	Number of projekts	Amount (CZK mil)	Number of projekts	Amount (CZK mil)
1.1 PROSPERITY	1 559	62	3 919	32	1 745	32	1 761
1.2 REAL ESTATES	2 133	184	5 235	110	1 950	109	1 936
1.3 TRAINING CENTRES	357	95	523	77	356	77	356
1.4 CLUSTERS – ESTABLISHMENT	0	17	344	14	246	14	245
1.4 CLUSTERS – SEARCHING	252	60	46	42	32	42	32
1.4 INTERNATIONAL TRADE	112	1	112	1	112	1	112
1.4 REGISTRY OF ADVISORS	123	1	123	1	123	1	123
2.1 MARKETING	280	613	357	546	324	546	323
2.1 DEVELOPMENT	1 086	496	3 124	109	726	109	727
2.1 DEVELOPMENT II	0	220	776	110	377	110	377
2.1 CREDIT	924	1	925	1	925	1	924
2.1 START	235	1	235	1	235	1	235
2.2 INNOVATION GRANTS	1 486	199	3 619	61	975	61	965
2.2 INNOVATION GRANTS II	0	99	1 137	39	499	39	499
2.2 INNOVATION COMBINED (GRANT & LOAN)	2	6	60	1	5	1	5
2.3 RENEWABLE SOURCES OF ENERGY	719	153	2 554	69	751	69	752
2.3 ENERGY SAVINGS	113	47	196	35	116	35	111
3.1 TECHNICAL ASSISTANCE	185	4	185	4	185	4	185
3.2 TECHNICAL ASSISTANCE Others	176	4	176	4	176	4	176
I N T O T A L	**9 747**	**2 263**	**23 652**	**1 257**	**9 864**	**1 256**	**9 849**

Source: Information System for Operational Programme Industry and Enterprise (ISOP), MIT

[1] OSF – Office for Structural Funds at MIT



C.2. International comparison of innovation efficiency according to the European Innovation Scoreboard 2006 (EIS 2006)

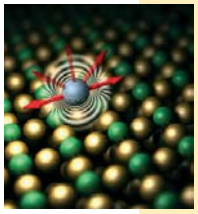
This scoreboard is published annually by the European Commission upon request of the European Council announced on the Lisbon spring meeting in 2000. The scoreboard and its methodology were prepared in order to contribute to the so-called open method of co-ordination of national policies within EU. The European Innovation Scoreboard is an effective tool for benchmarking innovation policies.

The table C.2 shows five groups of indicators and 25 individual indicators used for evaluation in 2006, together with their primary data sources.

Table C.2 Evaluation indicators

	INPUT – Innovation drivers	
1.1	Science & Engineering graduates (per 1,000 population aged 20–29)	Eurostat
1.2	Population with tertiary education (per 100 population aged 25–64)	Eurostat, OECD
1.3	Broadband penetration rate (number of broadband lines per 100 population)	Eurostat
1.4	Participation in life-long learning (per 100 population aged 25–64)	Eurostat
1.5	Youth education attainment level (% of population aged 20–24 having completed at least upper secondary education)	Eurostat
	INPUT – Knowledge creation	
2.1	Public R&D expenditure (% of GDP)	Eurostat, OECD
2.2	Business R&D expenditure (% of GDP)	Eurostat, OECD
2.3	Share of medium-high-tech and high-tech R&D (% of manufacturing R&D expenditure)	Eurostat, OECD
2.4	Share of enterprises receiving public funding for innovation (%)	Eurostat (CIS)
	INPUT – Innovation & Entrepreneurship	
3.1	SMEs innovating in-house (% of all SMEs)	Eurostat (CIS)
3.2	Innovative SMEs co-operating with others (% of all SMEs)	Eurostat (CIS)
3.3	Innovation expenditure (% of total turnover)	Eurostat (CIS)
3.4	Early-stage venture capital (% of GDP)	Eurostat
3.5	ICT expenditure (% of GDP)	Eurostat
3.6	SMEs using non-technological change (% of all SMEs)	Eurostat (CIS)
	OUTPUT – Application	
4.1	Employment in high-tech services (% of total labour force)	Eurostat
4.2	Exports of high-technology products as a share of total exports (%, monetary data)	Eurostat
4.3	Sales of new-to-market products (% of total turnover)	Eurostat (CIS)
4.4	Sales of new-to-firm not new-to-market products (% of total turnover)	Eurostat (CIS)
4.5	Employment in medium-high and high-tech manufacturing (% of total labour force)	Eurostat
	OUTPUT – Intellectual property	
5.1	EPO patents (per million population)	Eurostat
5.2	USPTO patents (per million population)	Eurostat
5.3	Triadic patent families (per million population)	Eurostat, OECD
5.4	New Community trademarks (per million population)	OHIM
5.5	New Community designs (per million population)	OHIM

Values for most of the indicators are given for years 2004 and 2005. Several countries had not all indicators available.



The objective is not to arrive at a rank of countries, but search for reasons behind success and failure, and new ways how to apply best practice while respecting specifics of individual countries.

The methodology faces an ongoing adaptation process. In 2005, the European Innovation Scoreboard was totally rewritten in collaboration with JRC 1. The number of indicator groups increased from 4 to 5, with basic thematic classification into innovation process inputs and outputs. Twenty-six indicators were modified and used for evaluation purposes (22 indicators in 2004 and 28 indicators in 2003). The year 2006 saw no marked changes in methodology. The same classification of indicator groups was maintained and 25 indicators monitored. The evaluation was made for individual indicators and their trends; the summary innovation index and its trends were also measured.

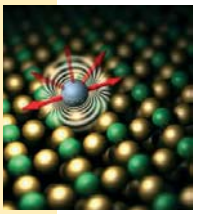


Table C.3 Innovation drivers

	Science & Engineering (S&E) graduates a)	Population with tertiary education b)	Life-long learning c)	Broadband penetration rate d)	Youth with secondary education e)
EU 15	13.6	24.0	12.1	12.0	74.1
EU 25	12.7	22.8	11.0	10.6	75.9
Finland	**17.4**	**34.6**	**24.8**	**18.7**	84.8
Denmark	13.8	**33.5**	**27.6**	**22.0**	76.0
France	22.0	24.9	*7.6*	13.9	82.8
Germany	*9.0*	24.6	*8.2*	10.2	71.0
The Netherlands	*7.9*	**30.1**	**16.6**	**22.4**	74.6
Austria	*8.7*	*17.8*	13.8	11.6	85.9
Greece	–	20.5	*3.9*	*0.2*	81.9
United Kingdom	**18.1**	**29.6**	**29.1**	13.5	77.1
Czechia	*7.4*	*13.1*	*5.9*	*4.3*	**90.3**
Hungary	*5.1*	*17.1*	*4.2*	*4.5*	83.3
Slovakia	*9.2*	*14.0*	*5.0*	*1.5*	91.5
Slovenia	*9.3*	20.2	**17.8**	*7.8*	**90.6**
United States	*10.2*	**38.4**	–	**14.9**	–
Japan	13.4	**37.4**	–	**16.3**	–

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 %

a) Share of Science & Engineering graduates in overall population aged 20–29 (in %).

b) Share of population with tertiary education in overall population aged 25–64 (in %).

c) Share of persons taking part in any life-long learning activity in the last four weeks preceding the survey in overall population aged 25–64 (in %).

d) Share of persons using broadband lines in overall population (%).

e) Share of persons with secondary education in overall population aged 20–24 (%).

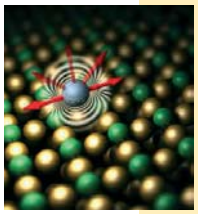


Table C.4 INPUT – Knowledge creation

	Public R&D expenditure (% of GDP)	Business R&D expenditure (% of GDP)	Share of medium-high-tech and high-tech R&D (%) a)	Share of enterprises receiving public funding for innovation (%) b)
EU 15	0.66	1.24	89.20	–
EU 25	0.65	1.20	–	–
Finland	**0.99**	**2.46**	86.40	15.20
Denmark	0.76	1.67	84.70	7.80
France	0.79	1.32	86.80	6.60
Germany	0.76	**1.76**	92.30	9.20
The Netherlands	0.76	*1.03*	87,90	12.90
Austria	0.70	**1.51**	83.00	17.80
Greece	*0.41*	*0.20*	–	8.90
United Kingdom	0.57	1.15	91.70	3.80
Czechia	*0.50*	*0.92*	85.40	6.10
Hungary	0.50	*0.41*	87.80	5.70
Slovakia	*0.25*	*0.25*	*63.40*	2.80
Slovenia	0.48	*0.97*	85.00	4.10
United States	0.69	**1.87**	89.90	–
Japan	0.74	**2.39**	86.70	–

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 %

a) % of manufacturing R&D expenditure.

b) % of all enterprises – both innovating and non-innovating (based on CIS).

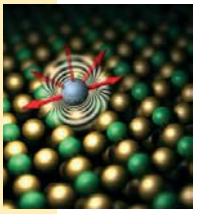


Table C.5 INPUT – Innovation & Entrepreneurship

	SMEs innovating in-house	Innovative SMEs co-operating with others	Innovation expenditure	Earlystage venture capital (% of GDP)	ICT expenditure (% of GDP)	SMEs with organisational innovation
	a)	b)	c)			d)
EU 15				0.023	6.4	
EU 25					6.4	
Finland	37.6	17.3	2.50	**0.036**	7.0	47.0
Denmark	16.1	20.8	2.40	**0.068**	6.5	57.1
France	29.2	11.5	2.23	0.026	6.0	35.9
Germany	46.2	8.6	2.93	*0.015*	6.2	53.2
The Netherlands	34.2	12.3	1.25	*0.005*	7.6	38.0
Austria	44.7	13.2	–	*0.013*	6.4	26.2
Greece	17.5	6.3	2.08	*0.008*	*5.1*	*59.0*
United Kingdom	22.4	12.6	1.61	**0.048**	**8.0**	–
Czechia	25.2	12.9	2.15	*0.000*	*6.6*	35.0
Hungary	17.0	6.6	1.16	*0.002*	**8.1**	*19.1*
Slovakia	13.1	6.8	1.90	*0.004*	6.7	13.4
Slovenia	16.3	10.5	1.28	–	5.4	50.8
United States	–	–	–	**0.072**	6.7	–
Japan	15.3	6.9	–	–	**7.8**	–

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 %

a) SMEs – small and medium-sized enterprises.

b) Shares of SMEs of a respective category in the overall number of SMEs in manufacturing and services (in %).

c) Innovation expenditure in % of all turnovers in manufacturing and services.

d) Share of SMEs with organisational innovation in the overall number of SMEs (%).

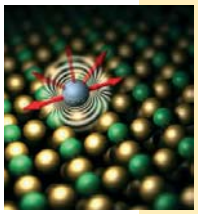


Table C.6 OUTPUT – Application

	Employment in high-tech services	Exports of high-technology products as a share of total exports	Sales of new-to-market products	Sales of new-to-firm not new-to-market products	Employment in medium-high and high-tech manufacturing
	a)	b)	c)	d)	e)
EU 15	3.49	17.7			6.71
EU 25	3.35	18.4			6.60
Finland	**4.51**	17.8	9.7	5.1	6.76
Denmark	**4.69**	13.3	5.2	5.8	6.29
France	3.92	20.1	6.2	5.6	6.34
Germany	3.36	15.4	7.5	10.0	**10.43**
The Netherlands	4.05	19.1	4.0	4.3	*3.30*
Austria	*2.71*	14.7	5.2	5.4	6.45
Greece	*1.75*	*7.4*	2.9	8.9	*1.99*
United Kingdom	**4.28**	**22.8**	6.4	7.6	5.61
Czechia	3.10	*13.7*	7.7	7.8	**9.42**
Hungary	3.02	**21.7**	4.2	2.5	**8.19**
Slovakia	*2.74*	*4.6*	12.8	6.4	**9.37**
Slovenia	2.94	*5.2*	7.4	6.9	**9.37**
United States	–	**26.8**	–	–	*3.84*
Japan	–	**22.4**	–	–	7.30

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 %

a) Share in overall employment in services (%).

b) Export of appropriate category as a share of total exports in national currency and current prices (%).

c) Share of "new to market" product sales in the overall manufacturing and services turnover (%).

d) Share of "new to firm" product sales in the overall manufacturing and services turnover (%).

e) Share in overall employment in manufacturing (%).

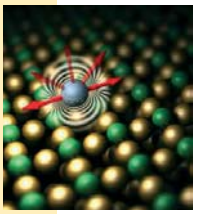


Table C.7 OUTPUT – Intellectual property

	EPO patents	USPTO patents	Triadic patent families	New Community trademarks	New Community designs
	a)	b)	c)	d)	e)
EU 15	161.4	60.2	38.9	115.7	127.6
EU 25	136.7	50.9	32.7	100.7	110.9
Finland	**305.6**	**104.6**	**101.7**	106.8	*95.5*
Denmark	**235.8**	72.9	*32.4*	**159.8**	**243.2**
France	153.7	56.8	36.5	*76.0*	*88.1*
Germany	**311.7**	**123.0**	**85.2**	**140.5**	**186.5**
The Netherlands	**244.3**	**78.3**	**59.6**	**141.0**	132.8
Austria	**195.1**	**74.7**	33.7	**187.0**	**195.8**
Greece	*8.1*	*1.9*	*0.6*	*24.9*	*1.1*
United Kingdom	*121.4*	*44.6*	33.0	125.2	*76.1*
Czechia	*15.9*	*4.3*	*1.5*	*25.7*	*40.9*
Hungary	*18.9*	*5.3*	*1.9*	*18.8*	*15.2*
Slovakia	*8.1*	*3.3*	*0.3*	*10.8*	*17.3*
Slovenia	*50.4*	*15.4*	*2.8*	*21.7*	*33.9*
United States	142.6	**277.1**	47.9	33.8	17.5
Japan	174.2	**304.6**	102.1	11.7	13.2

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 %

a) Patent applications (number per million population).

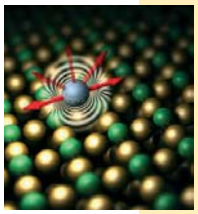
b) Patents granted (number per million population).

c) Triadic patent families – patent applications with EPO and Japan Patent Office, and patents granted by USPTO (number per million population).

d) Number per million population.

e) Number per million population.

Note: The number of patent applications at EPO and patents granted by USPTO differs from figures given in Part B.3 Patent applications, granted patents and licences. Part B.3 used data from annual reports of the respective patent offices. Figures in Table C.7 are data adapted according to the European Commission methodology, which corrects data from yearbooks of patent offices from certain aspects (enterprises in foreign ownership, differences in validation, etc.). As for patents granted by USPTO, figures in Part B.3 are given for a fiscal year, in Table C.7 for a normal calendar year.



C.3 Competitiveness according to the Global Competitiveness Report for the World Economic Forum

The Report has been compiled for the World Economic Forum annual meetings since 1979. The recent version of the Global Competitiveness Report 2006–2007 published in summer 2007 contains information from 125 countries and so it is the most extensive world publication of its kind. For the Czech Republic, the partner organisation is CMC Graduate School of Business in Čelákovice. In the light of advancing economic globalisation and thus aroused need for more complex analyses, the competitiveness evaluation is based mainly on the *Global Competitiveness Index (GCI)*. For maintaining continuity and to have a possibility to make comparisons, the ranking of countries according to the *Growth Competitiveness Index (Growth CI)*, which has been used in recent years, is given at the end of the report.

The Global Competitiveness Index (GCI) is built upon 9 "pillars": (1) Institution, (2) Infrastructure, (3) Macro-economy, (4) Health and Primary Education, (5) Higher education, (6) Market efficiency, (7) Technological readiness, (8) Business sophistication, and (9) Innovation. Individual pillars and data for their determination are mutually dependent, and isolated high value of individual figure does not indicate high competitiveness of that evaluated country.

GCI is created by combination of hard statistical data and survey "soft" data (Executive Opinion Survey).

Details on methodology and detailed data can be found in the publication A. Polez-Carlos (Editor), K. Schwab, M.E. Porter: The Global Competitiveness Report 2006–2007, World Economic Forum, 2006.

Switzerland is a country with the most competitive global economy. In this position Switzerland superseded the United States that fell to the sixth place as a result of not very stable macroeconomic environment. The superiority of Switzerland is a consequence of several factors, mainly the high innovation capacity and high culture of entrepreneurial environment. An important component of the innovation capacity is a first rate research infrastructure co-operating well with the industry. Corporate R&D expenditure is high and labour market flexible. Most of the monitored countries saw no marked changes when compared with the last evaluation; Scandinavian countries traditionally occupy high-ranking positions. Czechia has maintained its 29th place, it is second among the new EU Member States after Estonia (25th place) and ahead of Slovenia (33rd place). Poland's decline has continued (48th place).

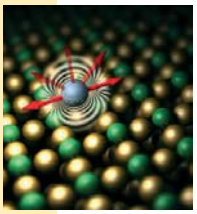


Table C.8 Global Competitiveness Index (GCI)

	2006–2007	2005–2006
Switzerland	1	4
Finland	2	2
Sweden	3	7
Denmark	4	3
United States	6	1
Japan	7	10
Germany	8	6
The Netherlands	9	11
United Kingdom	10	9
Austria	17	15
France	18	12
Ireland	21	21
Estonia	25	26
Czechia	29	29
Slovenia	33	30
Portugal	34	31
Slovakia	37	36
Hungary	41	35
Greece	47	47
Poland	48	43

More detailed information can be derived from data on values for individual pillars, which form the grounds for determination of GCI. The relative importance of pillars for the competitiveness growth depends on the degree of economic development of a particular country. The table shows rankings in the monitored set of 125 countries for selected countries in the period 2006–2007.

Pillars 1–4 create basic conditions for competitiveness and play main role in less developed economies (factor-driven economies), which are mostly based on unskilled labour and natural resources.

Pillars 5–7 are basis of efficiency factors and influence significantly the competitiveness of economies based mostly on production efficiency and quality (efficiency-driven economies).

Pillars 8 and 9 specify innovation factors and are crucial for the growth of economies based on utilization of principal innovation leading to new and unique products (innovation-driven economies).

In this classification, Czechia has been ranked in the transition phase between the second and third group; of the new EU Members States, also Estonia and Hungary are in this group; Slovenia was newly classified in the third group.

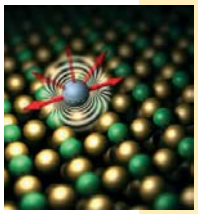


Table C.9 Global Competitiveness Index (GCI) – basic conditions for competitiveness (pillars 1–4)

	Basic conditions Summary of 1–4 pillars	1st pillar Institution	2nd pillar Infrastructure	3rd pillar Makro-ekonomy	4th pillar Health and primary education
Switzerland	5	5	2	18	29
Finland	3	1	10	12	7
United States	27	27	12	69	40
Germany	9	7	1	63	71
The Netherlands	8	9	8	22	13
Austria	18	13	17	36	49
Czechia	42	60	33	42	58
Slovakia	47	53	47	68	74
Hungary	52	46	48	98	66
Poland	57	73	57	70	26

In the evaluation by pillars establishing basic conditions for competitiveness (pillars 1 to 4), Czechia attains worse results than by pillars leading to efficiency and innovation factors (see attached tables). Very low is the evaluation of institutions (1st pillar – 60th place) and mainly the evaluation of health and primary education (4th pillar – 58th place).

Low evaluation of the institutional environment (covering, among others, justice, rate of corruption, transparency of legislation, allocation of public funds to health care, education, research and development) is not surprising; low evaluation of health and primary education is caused above all by low net primary education enrolment rate.

In this indicator, Czechia is only on 84th place behind many countries that are regarded as developing [2].

[2] This is evidently a question of methodology. In Czechia, a relatively high number of children, who attain the age of six as December 31 of a current year, do not start their school attendance.

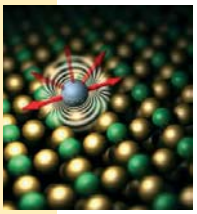


Table C.10 Global Competitiveness Index (GCI) – efficiency factors of competitiveness (pillars 5–7)

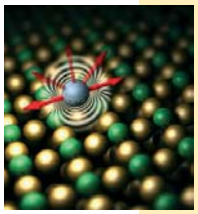
	Efficiency factors Summary of pillars 5–7	5th pillar Higher education	6th pillar Market efficiency	7th pillar Technological readiness
Switzerland	5	6	5	5
Finland	4	1	17	12
United States	1	5	2	8
Germany	17	18	20	20
The Netherlands	9	8	12	11
Austria	20	19	26	21
Czechia	27	27	41	26
Slovakia	34	38	34	30
Hungary	32	30	37	36
Poland	48	33	64	51

In the table of efficiency factors of competitiveness, Czechia is on 27th place on aggregate, which approximately corresponds to its overall ranking by GCI (29th place). The only weakness is the evaluation of market efficiency, where despite the export openness and EU membership, a certain role is played also by small domestic market.

Table C.11 Global Competitiveness Index (GCI) – innovation factors of competitiveness (pillars 8–9)

	Innovation factors Summary of pillars 8–9	8th pillar Business sophistication	9th pillar Innovation
Switzerland	2	3	3
Finland	6	11	4
United States	4	8	2
Germany	3	1	5
The Netherlands	11	7	11
Austria	12	4	17
Czechia	27	29	28
Slovakia	43	45	42
Hungary	39	49	31
Poland	51	63	44

According to innovation factors of competitiveness, Czechia is the best of the new EU Member States and even better than some EU-15 countries (Greece, Portugal, Italy, and Spain).



C.4 Use of venture capital to support innovation

Commentaries monitor and evaluate two indicators as follows:

- Venture capital investment into early stages of business (funding of establishment of new enterprises and their initial development) in 2000 to 2006 (% of GDP)
- Venture capital investment into enterprise expansion (development funding) in 2000 to 2006

  For most of the new Member States, data on venture capital investment are not available, and so the figures for EU-25 and EU-27 are not monitored.

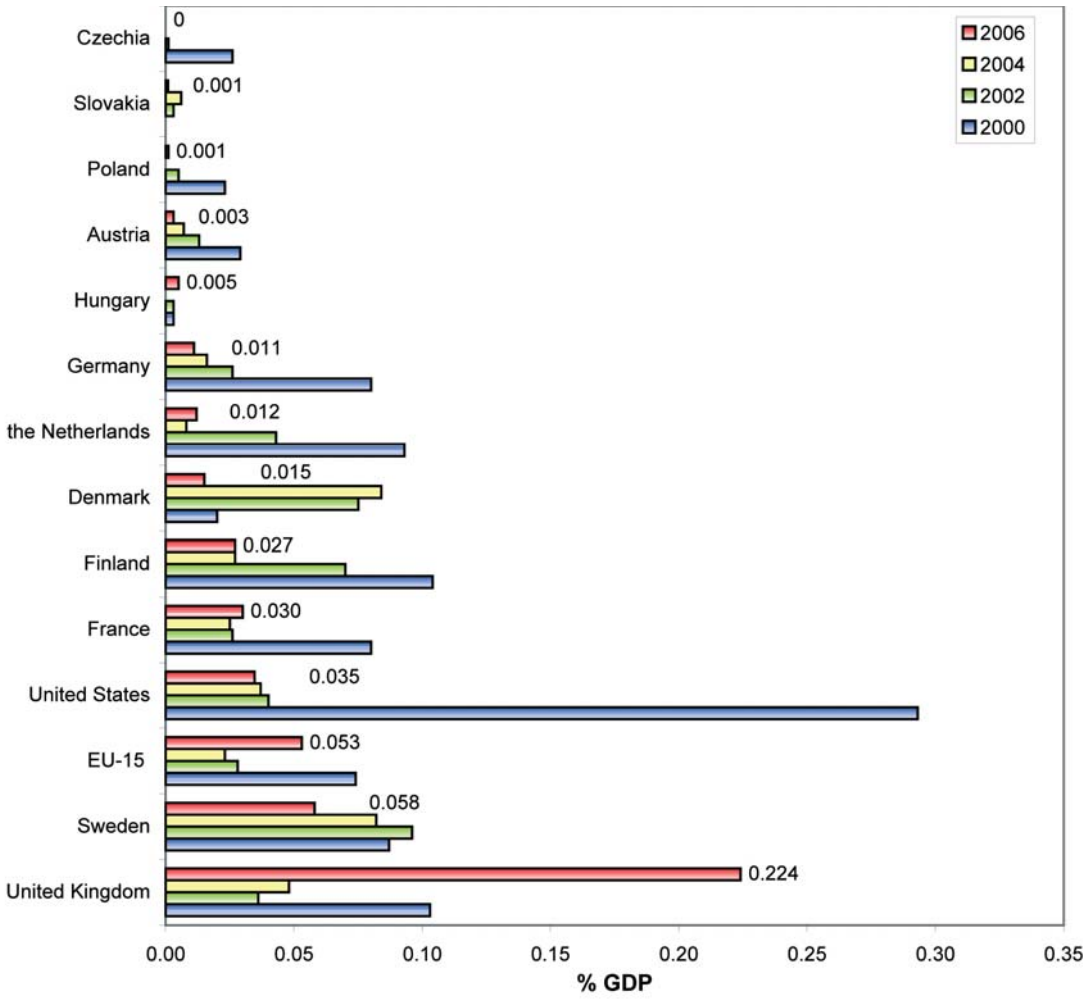
Various **definitions of venture capital** usually agree on its common definition to be a tool for funding enterprises (companies) not publicly traded on stock markets by form of an investment into creation or increase in their basic capital. This funding provides capital necessary for starting up the company's activity, its development, expansion or buyout of the whole company. Venture capital as strictly defined includes investment of initial capital into seed and start-up phases of firms such as new technology firms or spin-offs (seed and start up) and capital investment into the company's expansion phase (expansion).

Venture capital investors search for new companies and new business activities promising a considerable increase in the value of invested means in the future, even if their funding is risky. These new companies are established mostly in high-tech industries and knowledge-intensive sectors of economy.

Together with funds making it possible to realise a new idea or technology and further growth, the venture capital investor brings also know-how and management support. Venture capital investors are mostly venture capital funds; for smaller investment the so-called business angels are growing in importance.

Despite maximum efforts by EU bodies, venture capital investment into early stage companies mostly went down in EU countries after 2000 (following the bursting of the technology bubble), or has stagnated recently, as well as investment into expansion. A certain volatility is characteristic of development on venture capital markets in individual years.

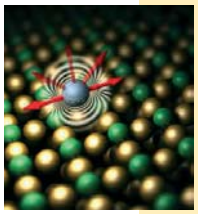
C.4.1 Venture capital investment – early stage funding



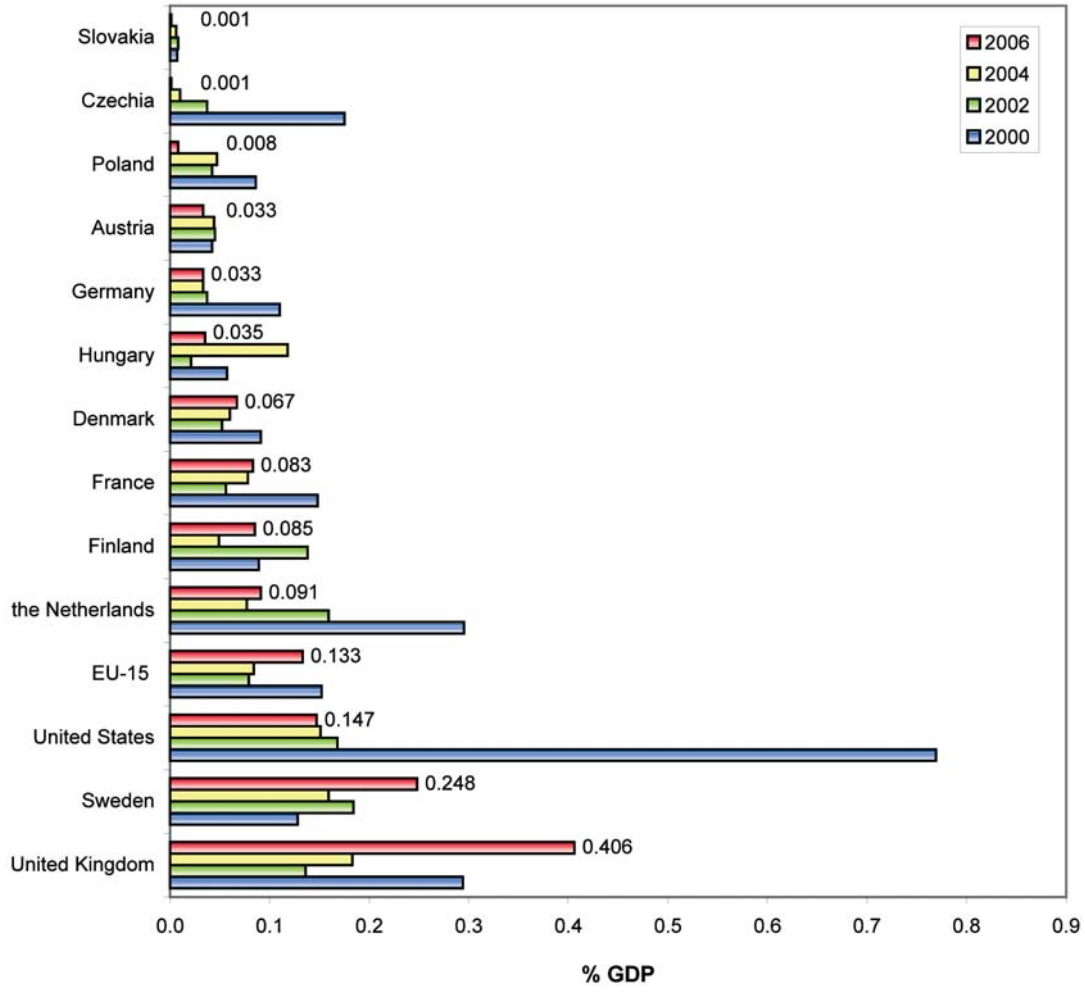
Source: Eurostat; original EVCA source, Price Waterhouse Coopers

Investments of venture capital into early stage funding (pre-seed, seed, and start-up capital) had their boom in the United States and Europe in 2000; these markets have weakened substantially in the following years. In 2004 and 2005, the situation became more stable; we can even speak about a certain recent revival in some countries.

Investment into expansion efforts of companies is higher than investment into their early stages of business. Low venture capital investment into early stages is evidently connected with the so-called "crisis of new economy" at the turn of the millennium. Representatives of funds and venture capital firms point out that early stages of business are too risky and amounts of necessary capital mostly limited.



C.4.2 Venture capital investment – period of expansion



Source: Eurostat; original EVCA source, Price Waterhouse Coopers

In 2006, the United Kingdom reported the highest share of use of venture capital of all the monitored countries, followed by Sweden and the United States. According to surveys, European entrepreneurs still prefer traditional forms of funding (e.g. use of own sources) over the venture capital funding option.

Venture capital investment into seed and start-up funding of companies (initial development of new technology firms and spin-offs) is virtually non-existent in Czechia. This concerns also the unsatisfactory segment of business angels. Venture capital investment has experienced a significant decline after 2000 in Czechia also in the expansion funding.

Chapter D – Evaluation of the Czech participation in the 6th EU Framework Programme

6th Framework Programme (FP6) is aimed, like the previous framework programmes, at targeted research and its priorities have been 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, FP6 has introduced 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, FP6 strives for better utilization of capacities of European research workplaces, better relationship of national researches, closer co-operation between research funded from public sources and private industrial research, and creation of an environment supporting commercial application of research and development results.

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

The total budget of FP6 and EURATOM programme after accession of ten new Member States in 2004 amounts to EUR 19.1 billion. Its structure is given in Table D.1. Each priority has its own detailed work programme, which the European Commission (EC) calls for submission of draft projects refer to. The Sixth Framework Programme was actually launched on December 17, 2002 when the first calls were delivered covering nearly the whole spectrum of its priorities.

The amount of EC contribution to a team participating in solution of FP6 projects depends on the type of its activity (and ranges from 30 per cent of overall cost for demonstration activities to 50 per cent for research activities up to 100 per cent for project co-ordinators or investigators of projects, in which EC has a special interest).

Draft projects being 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. Draft projects have a chance to win the EC contribution in the ranking resulting from the above evaluation. The success of any project is to a great extent supported also by contracting negotiations held between the investigating consortium and EC, which contemplates the fulfilment of a whole range of formal requirements; the most important is 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 management of funds in the course of the project, and particularly on disposing the attained results). Contracting negotiations result in agreement on the amount of EC contribution for participating teams to cover their project costs – these funds are marked as contracted amount. Consortia for solution of FP6 projects can be formed without any limitations from teams of EU-27 states, eight associated countries (Iceland,

Israel, Liechtenstein, Norway, Switzerland, and Turkey) and if required by the project solution, a team from any country may participate (with the amount of EC contribution for its participation being regulated by special rules).

When evaluating the statistics on participation of countries in FP6, it is necessary to bear in mind the factual reporting value of indicators provided by EC. The most common figure is the aggregate number of teams of a particular country that became members of consortia, which submitted draft projects within a certain programme. More important characteristic of a particular country's success is, however, the aggregate number of its participants in successful contracted projects. And this chapter mentions just the number of participants in contracted projects. The international comparison of EU-27 countries is then based upon the "number of participants in contracted projects converted to a unit population (one million population)".

It is, however, obvious that participation in the consortium itself in no way reflects the importance of the team's contributions to the draft project preparation or subsequent 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 this 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 the aggregate contracted support of a particular country per its gross R&D expenditure. Data are taken from E-CORDA database of contracted projects made available by EC to administrations of individual member states in July 2007. This database contains data on projects being successfully contracted between EC and consortia in the period from December 17, 2002 (when first calls to submit projects into FP6 were delivered) to May 31, 2007. The European Commission will support the solution of these projects by the amount of EUR 15.8 billion which corresponds approximately to 90 per cent of the FP6 budget intended for the so-called "undirect actions" (after exclusion of cost of activities of the Joint Research Centre being marked as "direct actions" by the European Commission - see the FP6 budget in the table D.1).

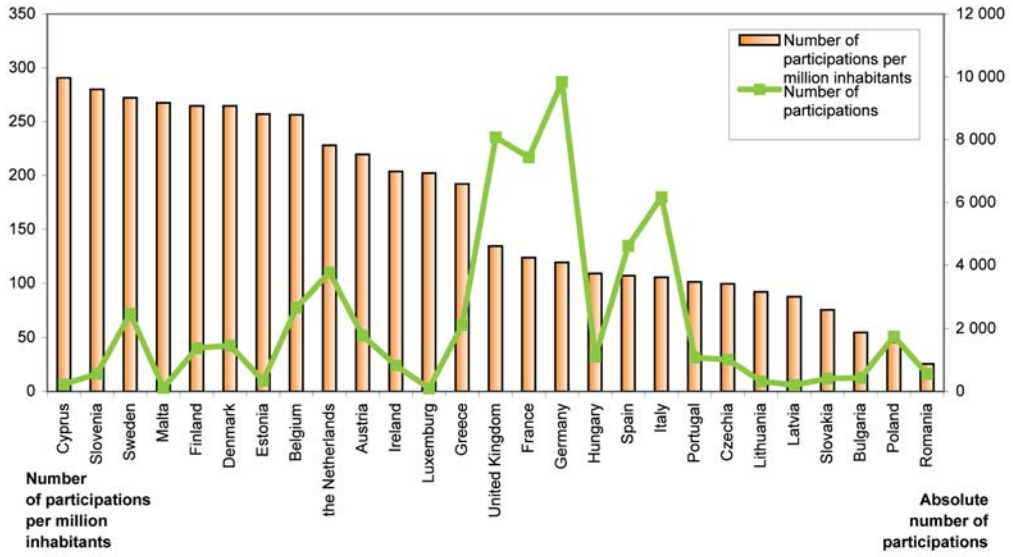
Source: EU Database E-CORDA of contracted projects of the FP6, EC, July 2007.
Europe in figures, Eurostat figures 2006-7, Eurostat, European Commission, 2007, ISSN 1681-4789
Statistics in focus, 7/2006, EUROSTAT

Table D.1 Structure and budget of FP6 (after accession of new Member States in 2004)

6th EU Framework Programme for Research and Development		€ mil
		17 883
1. Concentrating and Integrating Community Research (SP1)		**14 682**
1.1 Thematic Priorities:		12 438
1.1.1	Animated nature, 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 co-operation	346
1.3 Other than nuclear activities of the 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		92
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 Radioactive waste management	*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**

D.1 Evaluation of the Czech participation in EU FP6

D.1.1. Participation of teams from EU-27 Member States in FP6 as a whole



Source: E-CORDA database; Europe in figures; own calculations of TC AS (Technology Centre of Academy of Sciences of the Czech Republic)

The connecting line in Graph D.1.1 shows the absolute number of participations of EU-27 teams in FP6 projects being registered as "successful" (by the European Commission) as of May 31, 2007. There are 8,861 projects in total as of this date, in the solution of which 69,162 teams will participate (some teams participate in more than one project and therefore we speak about the "number of participations" which is higher than the number of participants). Participants in these projects ask the European Commission for support of EUR 15.811 billion corresponding approximately to 90 per cent of the overall budget of FP6 allocated to support international consortia undertaking these projects.

The column graph shows the participations of EU-27 states as converted to a unit population (per one million inhabitants). States in the graph are ranked according to the level of this relative indicator.

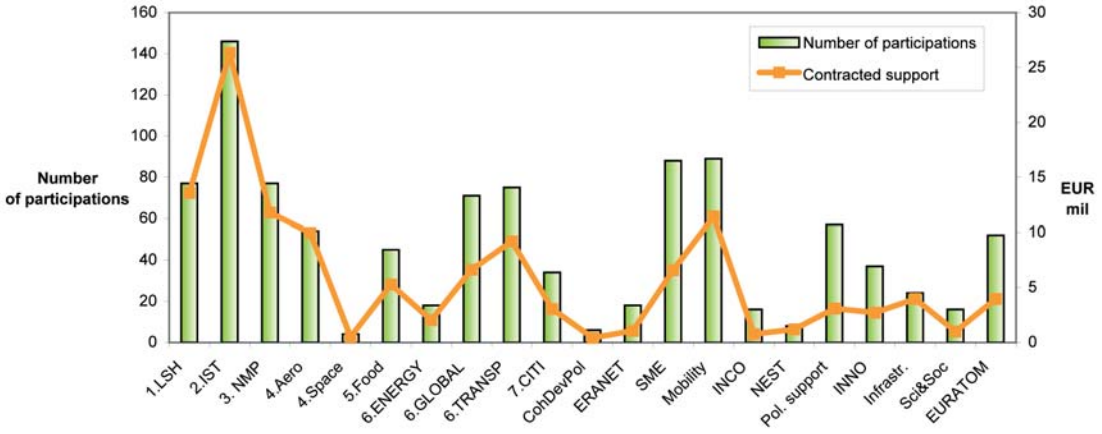
There are 830 projects among those mentioned, in the solution of which 1,012 teams from Czechia will participate. These data classify Czechia on the 21st place among EU-27 states. If we rank the states according to the absolute number of participations in FP6 projects, Czechia takes 16th place.

Czech participants go into these projects with the overall budget of EUR 185.199 million and ask the European Commission for support of EUR 124.480 million.

In terms of total number of participations, the highest figure is reported by teams from Germany (9,833 participations), followed by the United Kingdom, France, and Italy. Least participations are reported by Cyprus, Latvia, Malta, and Luxembourg (93 participations).

On the other hand, if converted to 1 million population of a particular country, the highest participation is reported by Cyprus (over 290 participations per million population), followed by Slovenia and Sweden (both countries show over 270 participations per million population). The lowest participations are then reported by Bulgaria, Poland, and Romania (mostly less than 55 participations per million population).

D.1.2 The participation of Czech teams in selected FP6 programmes and contracted support for these participations



Source: E-CORDA, own calculations of TC AS

Columns of Graph D.1.2 show the number of participations of Czech teams in projects falling under following programmes (see also the structure of FP6 in the table); the graph curve then shows the amount of contracted support in selected FP6 programmes:

1. LSH: 1st thematic priority – animated nature, genomics and biotechnology for health,
2. IST: 2nd thematic priority – information society technologies,
3. NMP: 3rd thematic priority – nanotechnologies and nanosciences, new intelligent materials and production processes,
4. Aero: 4th thematic priority – aeronautical research,
4. Space: 4th thematic priority – space research,
5. Food: 5th thematic priority – healthy and safe foodstuffs,
6. ENERGY: 6th thematic priority – energy,
6. GLOBAL: 6th thematic priority – global climate changes,
6. TRANSP: 6th thematic priority – transport,
7. CITI: 7th thematic priority – citizens and governance in a knowledge-based society,

Coh DevPol: coherent development of policies,
ERANET: co-ordination of national research activities,
SME: involvement of small and medium-sized enterprises,
Mobility: human resources and mobility (the so called Marie Curie action),
INCO: international co-operation with third countries (outside EU),
NEST: new and emerging science and technology,
Pol. support: research-encouraging policies,
INNO: programmes promoting research and innovation,
Infrastr: programmes promoting transnational utilisation of scientific infrastructures,

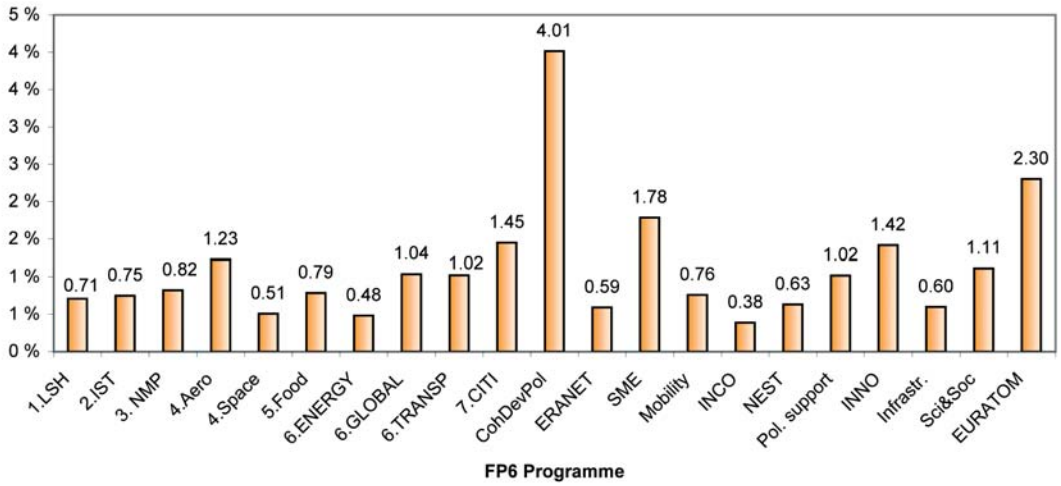
Sci&Soc: science and society,
EURATOM: separate programme in the area of nuclear energy use.

Graph D.1.2 shows that Czechia has most participations (146) in the 2nd thematic priority. But if we consider the three thematic fields of the 6th thematic priority together, then Czechia would have most participations in this very priority (164 participations in total; global climate changes 71, energy 18, and transport 75 participations). The next place is then taken by participation in programmes aimed at mobility of researchers (89 participations) and projects realizing research for the benefit of small and medium-sized enterprises (88 participations). In the first and third thematic priority, which both draw a considerable part of the FP6 budget, Czechia has 77 participations in each.

In terms of contracted support, the highest contribution has been obtained by Czech teams participating in projects of the 2nd thematic priority (EUR 26,32 mil), in those three areas of the 6th thematic priority (EUR 17,86), and then follows the 1st thematic priority with EUR 13,56 mil. The lowest support is obtained by Czech teams in space research (EUR 0.51 mil) and INCO programme – EU co-operation with third countries (EUR 0,76 mil).

It is also necessary to take into account that the amount of support depends primarily on the size of budgets for particular programmes. The highest budget belongs to the 2nd thematic priority IST and the lowest at all is allocated to support coherent development of policies; and in correspondence with this Czech teams have obtained the highest and lowest support respectively in these two priorities. An important measure of participation in these two priorities is then the share of support obtained by Czech teams from the overall amount distributed within the given priority. Generally, Czech teams contracted 0.79 per cent of the so far released budget of FP6.

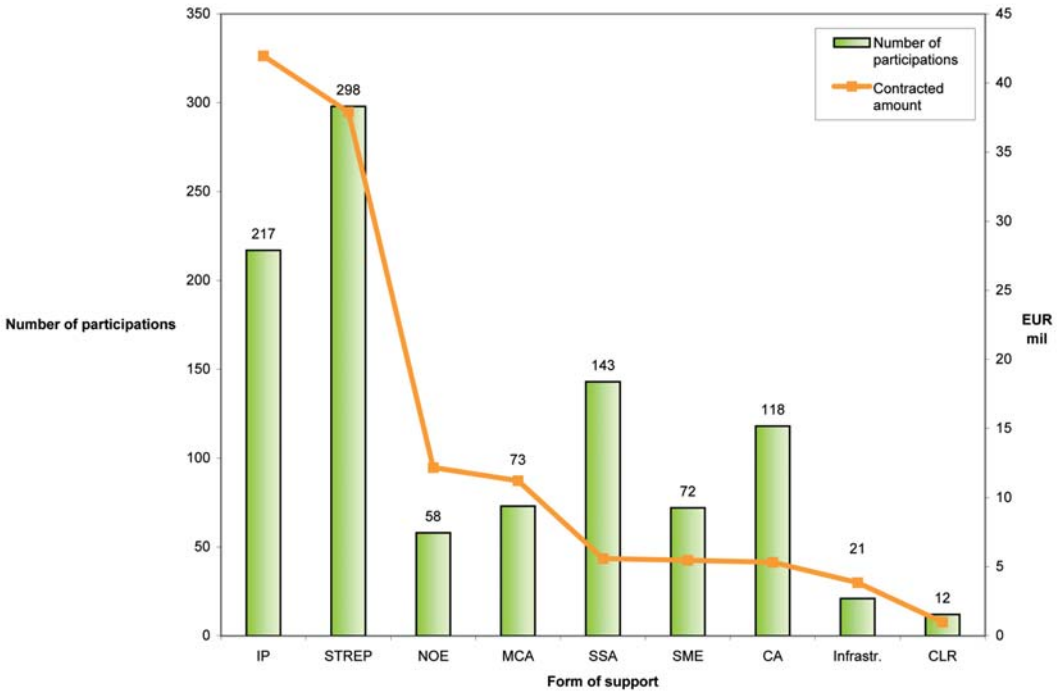
D.1.3 Shares of budgets of individual FP6 programmes obtained by Czech teams



The column graph depicts the shares being contracted by Czech teams out of budgets released for individual programmes. Czechia has obtained the highest percentage of the released budget in the programme promoting coherent development of policies (4.01 %). Highly successful in this regard is then the Czech participation in EURATOM programme, in which Czech teams have got 2.3 per cent of distributed budget; in research promoting small and medium-sized enterprises this figure is 1.78 per cent. But these three priorities have only small budget at their disposal.

As far as thematic priorities are concerned, Czechia is most successful in "citizens and governance in a knowledge-based society", in which Czech teams have taken 1.45 per cent of the budget that was distributed. In the priority "aeronautical research" Czechia have obtained 1.23 per cent of the distributed budget (by far the highest share taken by a new Member State ever). If we consider together all three areas of the 6th Priority, the Czech teams have obtained 0.91 per cent of the budget available. On the other hand, in priorities having the largest budgets at their disposal (i.e. IST, LSK, and NMP), Czech teams have obtained 0.75, 0.71, and 0.82 per cent respectively.

D.1.4 Number of participations of Czech teams in individual FP6 instruments (forms of support) and allocation of contracted support to these instruments



Source: E-CORDA, own calculations of TC AS

The column Graph D.1.4 shows the overall number of participations of Czech teams in individual FP6 instruments (forms of support). The graph's curve indicates amounts contracted by Czech teams in individual instruments (types of projects).

The FP6 instruments (types of projects) are as follows (ranked according to the overall contracted support):

IP: integrated project
STREP: specific targeted research projects
NoE: networks of excellence (data on support of Czech teams will be available only after termination of these projects)
MCA: Marie Curie action promoting mobility of researchers
SSA: specific support actions
SME: projects promoting small and medium-sized enterprises
CA: co-ordination actions
Infrastr: projects promoting infrastructure usage
CLR: "collective research" for associations and groupings representing SMEs.

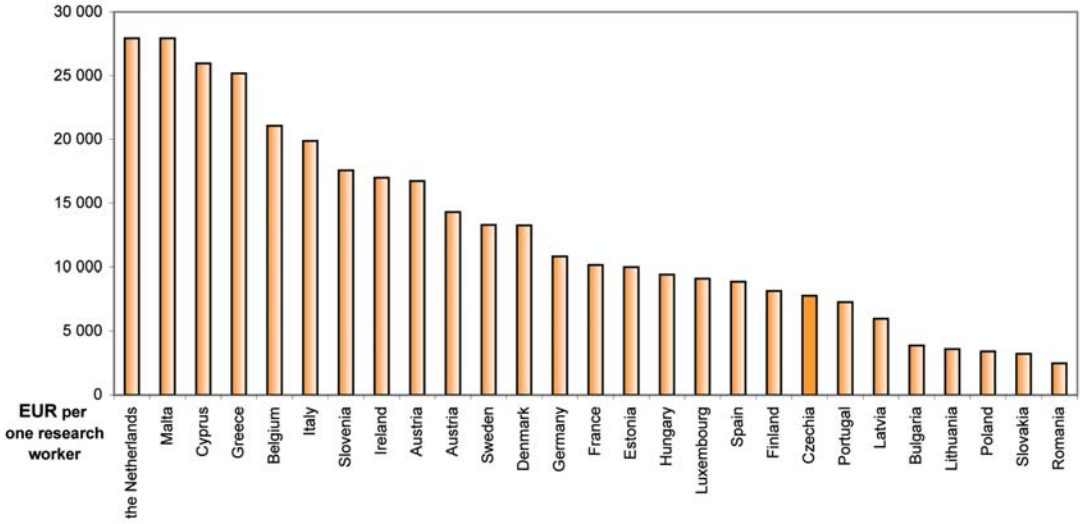
These instruments (forms of support) are used in all thematic priorities mentioned on the previous Graph D.1.3.

It is evident that most often Czech teams take part in research-oriented projects such as STREP projects (298 participations) and integrated IP projects (217 participations). The third highest participation is in ´ specific support actions´ (143 participations) that, however are not primarily focused on research.

As far as the contracted amount of support is concerned, the Czech teams demand the highest level of support for integrated projects (EUR 41.9 mil), STREP projects (EUR 37.9 mil), and finally, the third highest amount was obtained by involvement in the networks of excellence (EUR 12.2 mil). While Czech teams obtain 72 per cent of the total contracted funds in "main instruments" (IP, NoE, STREP), this percentage is substantially lower with other new Member States. New Member States most often take part in SSA and CA projects. The deeper analysis, however, shows that Czech participants are only concerned in IP projects with a very small capacity and so their support requested from the European Commission for their participation in IPs is markedly lower than that of participants from other, mainly "old Members States"; i.e. EU-15. It cannot be ignored that Czech teams get their fourth highest amount (EUR 11.2 mil) through involvement in projects promoting the mobility of researchers. These projects lead to initialization of further international co-operation in research and development.

On the other hand, one of the smallest supports even when compared to other EU-27 countries has been demanded by Czech teams in SSA projects (EUR 5.6 mil). At the same time, Czech teams report a relatively high number of participations in this particular form of support. In projects for small and medium-sized enterprises (SME and CLR), Czech teams have contracted the support of EUR 6.6 mil.

D.1.5 Relative contracted supports from FP6 per 1 research worker in EU-27 Member States



Source: E-CORDA, Statistics in focus 7/2006, own calculations TC AS

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 the number of their participations. For the purposes of international comparison it is, however, necessary to convert this support either to the number of inhabitants (e.g. 1 million population) or to a unit capacity of the national R&D system. This latter possibility is illustrated by the column Graph D.1.5 giving the comparison of EU-27 countries by contracted amounts converted to the capacity of 1 research workers of the national R&D system of a particular country.

If we leave aside countries with small number of researchers (MT and CY), then the graph shows that old Member States (EU-15) contract higher amounts per unit capacity of their research systems than the new ones. This difference has several reasons. In the first place, it is necessary to take into account what opportunities of a project-oriented research are offered to national teams by their own national R&D systems (states without own grant system often contract higher amounts per one research worker than states having their own grant systems). These opportunities are richly developed mainly in large states (the United Kingdom, Germany, and France) or states with high investments into their own national R&D systems (Sweden, Finland).

The salary level in national R&D sectors is another key issue, since wage costs constitute around 50 per cent of project budgets. It also depends on the structure of project types in a particular state: the prevailing participation in supporting projects (CA-coordination actions, SSA – specific support actions) reduces the overall contracted amount (see also the previous Graph D.1.4).

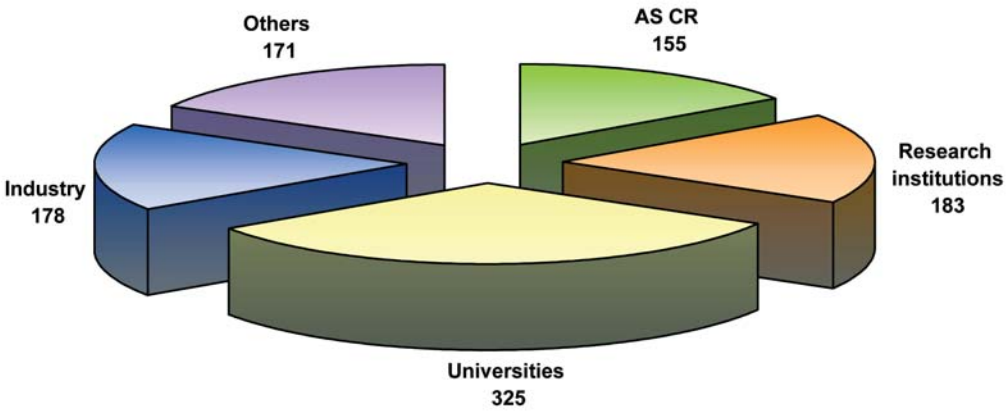
According to this indicator, Czechia takes the 20th place (EUR 7,780 per research worker) among EU-27 countries and 6th place respectively among the new Member States. Hungary on the 16th place contracts support in the amount of EUR 9,436 per one research worker.

D.2 Participation of individual Czech R&D sectors in FP6

D.2.1 The structure of Czech participants in FP6 projects

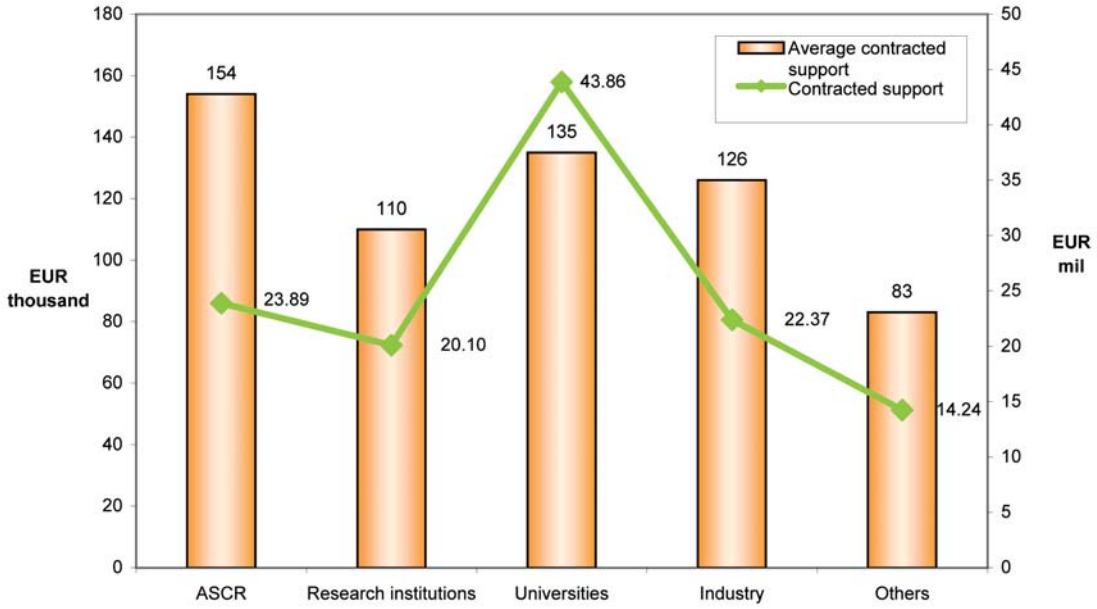
The structure of Czech participants is classified in following categories:
ASCR marks all institutes of the Academy of Sciences of the Czech Republic in aggregate,
Research institutions marks entities in research and development founded by the state,
IHE marks universities,
Industry marks teams from industrial companies,
Others marks teams which do not fall into any of the above categories (e.g. bodies of state and regional administration, non-industrial service institutions, faculty hospitals, educational institutions outside the university sector, end users of project results, etc.).

The attached graph shows that the highest number of participants comes from the higher education institutions. The research sector in aggregate (i.e. ASCR + research institutions) only slightly exceeds the number of IHE participations. The representation of industrial teams among the Czech participants is relatively high which is excellent mainly when compared to other new Member States.



Source: E-CORDA

D.2.2 Contracted support for individual R&D sectors in Czechia



Source: E-CORDA

It is evident from Graph D.2.2 that teams from higher education institutions have contracted the highest support in total. The research sector (i.e. categories ASCR + research institutions in aggregate) has only obtained a slightly higher support than institutions of higher education. But European statistics show that the support obtained by universities markedly exceeds the support given to the whole research sector. So even the participation in FP6 reveals that Czech institutions of higher education have less research activities than is usual within EU. But the share of higher education institutions in FP6 efforts is higher than their share in support from national (public and private) sources.

The support obtained by industrial teams for their participation is relatively high, ca 18 per cent of the overall support given to all Czech teams, which ranks Czechia definitely first among all new EU Member States.

The ability of institutions to take part in projects with an adequately large team capacity has an essential meaning in FP6, the large part of whose budget has been allocated to the solution of large projects. Graph D.2.2 also shows that the average level of support per one participation is highest for the participants from ASCR and lowest in the category of "Others". In case of industry it is necessary to consider carefully that industrial teams receive *a lower percentage of support* on average for their participation than academic or university teams. If we consider "an average budget", instead of an average contracted support, than the average budget of participation of Czech industrial team exceeds the average budget of all participants by ca 30 per cent. Also other characteristics of the ´ industry´ participation suggest that the Czech industry is, obviously, involved in the solution of FP6 projects more intensively than industrial teams of other new Member States.

Chapter E – Remarkable achievements in research, development and innovation in 2006

This chapter follows in the steps of a similar chapter contained in 2006 R&D&I Analysis, but has a somewhat different outline. It is made up of five parts:

- Awards granted by the Government of the Czech Republic
- Awards granted by the European Union
- Awards granted by ministries, the Academy of Sciences of CR and the Grant Agency of CR
- Awards granted in the competition Czech Head (Česká hlava)
- Prize of the Association of Innovative Entrepreneurship of CR (AIECR)

Data on granted awards (honours) were requested by the Chairman of Research and Development Council; data on Czech Head prizes were taken from public documents of the competition organiser Česká hlava, s.r.o; and data on DESCARTES Prize awarded to the Czech scientist were supplied by the Charles University in Prague.

The project Czech Head intended to support scientific and technical intelligence was announced in March 2002. It consists of a set of mutually interconnected activities the aim of which is to popularise science and increase social respect for Czech scientists and engineers as our future economic prosperity makers. Each year the project culminates in a ceremonial honouring the best Czech "Heads" of science and technology. Awards are granted on the basis of a public contest announced by the already mentioned company Česká hlava s.r.o. and the Czech Head Foundation. The project's reputation has been steadily growing. In 2005, the category National Prize of the Government of CR Czech Head was added.

The National Prize of the Government of CR is awarded as a financial bonus for remarkable achievements in the field of research and development to an individual who attained this achievement. The financial bonus in the amount of CZK 1 million is provided from the state budget funds allocated to research and development. The decision to award the prize falls under the competence of the Government of the Czech Republic, who do so upon the proposal of the Research and Development Council. Awards in seven other categories are granted within this competition. Details are given in Part E.4 of this chapter.

This chapter provides basic facts on the following number of awards:

The National Prize of the Government of the Czech Republic	1
EU DESCARTES Prize	1
Awards granted by ministries and other institutions	
• Ministry of Industry and Trade	2
• Ministry of Education, Youth and Sport	4
• Ministry of Health	1
• Ministry of Agriculture	2
• Academy of Sciences of CR	3
• Grant Agency of CR	3
• Association of Innovative Entrepreneurship	2
• Awards granted within the Czech Head contest	5
Awards granted IN TOTAL	**24**

E.1 Awards granted by the Government of the Czech Republic

Name of achievement in R&D&I:

Lifelong work of world-wide importance in the field of theory of integral and differential equations

Brief characteristics of achievement in R&D:

Professor J. Kurzweil is the maker of one of the most acclaimed contributions of the Czech mathematics to its world colleague – the sum definition of non-absolutely convergent integral being introduced for the first time in professor Kurzweil´ s work in 1957. By his integral, professor Kurzweil helped to solve the question what is going on with physical systems under quick strokes having different directions. This helps in practice with complicated constructions and machines.

Author of achievement in R&D:

Prof. RNDr. Jaroslav Kurzweil, DrSc., Dr.h.c

Granted award:

The National Prize of the Czech Republic

Who granted the award:

The Government of the Czech Republic

E.2 Awards granted by the European Union

Name of achievement in R&D&I:

Important discoveries in the field of sources of cosmic gamma rays arising in supernova explosions in the sky

Brief characteristics of achievement in R&D&I:

Important discoveries in the field of sources of cosmic gamma rays arising in supernova explosions in the sky. A substantial contribution to cosmology and theory of evolution of the cosmos. A world-wide important contribution to the very fundamentals of theoretical physics with direct applications to the theory of the cosmos evolution creating conditions for new substantial development of scientific knowledge.

Author of achievement in R&D&I:

Prof. RNDr. Ladislav Rob and his colleagues from the Institute for Particle and Nuclear Physics of the Faculty of Mathematics and Physics of the Charles University in Prague

Granted award:

Descartes Prize

Who granted the award:

The European Union

E.3 Awards granted by ministries and other institutions

E.3.1 The Ministry of Industry and Trade

Name of achievement in R&D&I:

FF-P2/140 Project – Innovation of the spherical-roller bearing production programme in ZKL Brno, a.s.

Brief characteristics of achievement in R&D&I:

In 2003–2006, 60 new types of spherical-roller bearings were developed in both radial and axial designs, as well as suitable for vibration environment. By innovation of radial and axial spherical-roller bearings of higher technical parameters the income from added value has increased and business contracts have grown in number thus helping Czech products from ZKL Brno to gain new territories.

Author of achievement in R&D or implementor of innovation:

Ing. Miroslav Dvořák, Ing. Vladimír Zikmund, Ing. Leoš Šilhan, ZKL Brno, a.s.

Granted award:

Golden medal from MSV in Brno for spherical-roller bearing for vibration environment from ZKL. Brno, a.s.

Who granted the award:

The Evaluation Committee for Golden Medals in Brno in 2006

Name of achievement in R&D&I:

Introduction of a serial production of jet spinning machine J 10

Brief characteristics of achievement in R&D&I:

Introduction of a serial production of jet spinning machine J10. The machine development was realised by the company Rieter in collaboration with European development teams. Jet spinning has a potential to compete with existing ways of spinning in both productivity and quality and usable properties of the produced yarn. The textile machine has a complexly conceived electronic control system being unique on the world market.

Author of achievement in R&D&I:

Ing. Jiří Sloupecký, Petr Kopecký, Rieter CZ a.s., Ústí nad Orlicí workplace

Granted award:

Entrepreneurial Project of the Year 2006 Award – Project with the largest innovative potential

Who granted the award:

The Investment and Business Development Agency CzechInvest and Association for Foreign Investments – AFI, under the sponsorship of MIT

E.3.2 The Ministry of Education, Youth and Sport

Name of achievement in R&D&I:

Results in paediatric haematology and oncology

Brief characteristics of achievement in R&D&I:

Scientific and research activity in the field of children's haematooncology, haematology, bone marrow transplantation, and clinical immunology. Prof. Starý is one of the authors of a new treatment protocol for the therapy of paediatric acute lymphoblastic leukaemia used in many countries all over the world. His contribution to the progress in treatment of defects of haematogenesis in children is of a worldwide importance.

Author of achievement in R&D&I:

Prof. Jan Starý, DrSc., 2nd Faculty of Medicine of the Charles University, Prague

Granted award:

Prize of the Minister of Education, Youth and Sport for Research

Who granted the award:

The Minister of Education, Youth and Sport

Name of achievement in R&D&I:

Research findings for methods for controlling hygienic limits of contaminants in foodstuffs

Brief characteristics of achievement in R&D&I:

Introduction of new progressive multiresidual methods necessary for quick and effective control of hygienic limits of contaminants in foodstuffs. Scientific contribution in the field of quality and safety of foodstuffs. The attained results of the scientific team of professor Hajšlová led to integration of the Czech research into a number of prestigious European research projects focused on this particular issue.

Author of achievement in R&D:

Prof. Ing. Jana Hajšlová, CSc., Institute of Chemical Technology, Prague

Granted award:

Prize of the Minister of Education, Youth and Sport for Research

Who granted the award:

The Minister of Education, Youth and Sport

Name of achievement in R&D&I:
Achievements in molecular biology research

Brief characteristics of achievement in R&D&I:
Set of publications titled "Study of physiological and pathological processes at the molecular level". The contribution of Professor Elleder consists not only in his scientific work in biomedicine, and molecular and cellular pathology, but also in his activity as organiser of scientific work. As a principal investigator of the research project "Study of physiological and pathological processes at the molecular level" he built up a scientific team that published several original studies in professional, mainly foreign, journals and monographs under his leadership.

Author of achievement in R&D&I:
Prof. MUDr. Milan Elleder, DrSc., 1st Faculty of Medicine of the Charles University, Prague

Granted award:
Medal of the 1st Degree on the occasion of the presentation of Awards of the Ministry of Education, Youth, and Sport for Research

Who granted the award:
The Minister of Education, Youth and Sport

Name of achievement in R&D&I:
Realisation of exhibition project "Golden times of media"

Brief characteristics of achievement in R&D&I:
Compilation of the primary source material for commentary on the position of media in society and development of Czech mass media in the European context from their beginnings up to present days. This is the first achievement of its kind in the Czech environment that is based on so far not processed archive materials and popularises results of an original scientific work. The contribution and importance of this project lies not only in the presentation of the topic itself, but also in the connection of the academic sphere with culture. The topic of media has got into the context of large topics dealt with by the National Museum that hosted the exhibition.

Author of achievement in R&D&I:
Doc. PhDr. Barbara Köpplová, CSc., Doc. PhDr. Jan Jirák, Faculty of Social Sciences of the Charles University, Prague

Granted award:
Medal of the 1st Degree on the occasion of the presentation of Awards of the Ministry of Education, Youth, and Sport for Research

Who granted the award:
The Minister of Education, Youth and Sport

E.3.3 The Ministry of Health

Name of achievement in R&D&I:

Varicocela in children and adolescents – indication for timely surgery and the importance of preservation of lymphatic vessels in varicocelectomy

Brief characteristics of achievement in R&D&I:

A microsurgical technique saving lymphatic vessels of the testicle has been worked out. Better fertility parameters after timely surgery has been proved compared to conservative treatment and therefore it is advisable to indicate the patient for surgery in his child or adolescent age.

Author of achievement in R&D&I:

Doc. MUDr. Radim Kočvara, CSc., Clinic of Urology, General Faculty Hospital in Prague MUDr. Jiří Doležal, Department of Urology, České Budějovice Hospital

Granted award:

Prize of the Minister of Health for 2006

Who granted the award:

The Minister of Health

E.3.4 The Ministry of Agriculture

Name of achievement in R&D&I:
Coreus marginatus (Heteroptera: Coreidae) as a natural enemy of Rumex obtusifolius (Polygonaceae)

Brief characteristics of achievement in R&D&I:
Possibility of potential use of a squash bug (Coreus marginatus) to regulate biologically the spread of the invasive Rumex obtusifolius. Squash bug (Coreus Marginalis) feeds on the seeds of Rumex obtusifolius and is able to damage them very dramatically. This squash bug has a negative impact on the seed quality and potential to be used as a biological control of the spread of invasive Rumex on agriculturally managed lands.

Author of achievement in R&D&I:
Mgr. Martina Hrušková, Research Institute of Crop Production, Prague[1]

Granted award:
Prize of the Minister of Agriculture for Young Scientific Workers for 2006

Who granted the award:
The Minister of Agriculture

Name of achievement in R&D&I:
Variety of perennial wheat Rheia registered in 2002

Brief characteristics of achievement in R&D&I:
Cultivation of new wheat variety Rheia. Rheia wheat is a high-yielding variety responding effectively to various cultivation interventions and showing resistance against major diseases and high resistance to cold. It copes well with conditions of late sowing. It belongs among 5 most widely spread varieties of perennial wheat in the Czech Republic.

Author of achievement in R&D&I:
Ing. Václav Šíp, CSc., Research Institute of Crop Production, Prague

Granted award:
Prize of the Minister of Agriculture for the best applied achievement of research and development in 2006

Who granted the award:
The Minister of Agriculture

[1] Since January 1, 2007, the institution has been transformed to a public research institution according to Act No. 341/2005 Coll., as well as the institutes of the Academy of Sciences of CR.

E.3.5 The Academy of Sciences of CR

Name of achievement in R&D&I:
From Yisuv to Israel. Formation of Israeli power elite 1919–1949

Brief characteristics of achievement in R&D:
Monograph deals with the beginnings of the Israeli statehood during the British mandate over Palestine. It focuses on the ideology of the main social and political directions for the Jewish community (Yisuv) and their relationship to the Jewish cultural and religious heritage. The contribution of the work consists particularly in application of critical historiography and processing of sources in original languages. It brings many new and original information and facts and its potential takes it far beyond the European continental environment. Adapted segments of this monograph were published in foreign prestigious reviewed periodicals.

Author of achievement in R&D&I:
PhDr. Jan Zouplna, Ph.D., Oriental Institute of ASCR, Prague

Granted award:
ASCR Prize to young scientists for outstanding scientific achievements

Who granted the award:
The President of the Academy of Sciences of CR

Name of achievement in R&D&I:
Object recognition using fusion of image from various sources

Brief characteristics of achievement in R&D&I:
A comprehensive methodology of the so called Image Fusion has been developed making it possible from various images of the same object to increase severalfold their information value and recognition success. The proposed achievement belongs into the artificial intelligence branch, the automatic object recognition on real images using a computer. Original theoretical results have been attained; then shaped after implementation and testing into a user's software (IMARE and IMRES toolboxes for Matlab).

Authors of achievement in R&D&I:
Prof. Ing. Jan Flusser, DrSc., Ing. Filip Šroubek, Ph.D., Ing. Tomáš Suk, CSc., Institute of Information Theory and Automation of ASCR, Prague

Granted award:
ASCR Prize for Outstanding Scientific Results of Major Significance

Who granted the award:
The President of the Academy of Sciences of CR

Name of achievement in R&D&I:

Functional genomics, genotypization and molecular diagnostics of flagellates of the order Kinetoplastida, human pathogenic parasites

Brief characteristics of achievement in R&D&I:

Flagellates of the order Kinetoplastida are agents of serious human and livestock diseases with tragic consequences. This research using molecular biological methods has made it possible to acquire underlying knowledge about the functional genomics, molecular markers, and means of quick and specific diagnostics of representatives of genuses Trypanosoma and Leishmania. Proteins have been determined, which are vital to survival of the parasite Trypanosoma brucei (that causes sleeping sickness), and a highly sensitive type-specific PCR test has been developed substantially improving the quality of diagnostics of the fatal disease called European leishmaniasis. The knowledge gained through this research will help to improve the diagnostics and control of agents of serious human and animal diseases.

Authors of achievement in R&D&I:

Prof. RNDr. Julius Lukeš, CSc., RNDr. Milan Jirků, Silvie Foldynová-Trantírková, Ph.D., Mgr. Eva Vondrušková-Horáková, Ph.D., Mgr. Eva Zemanová-Chocholová, Ph.D., RNDr. Alena Zíková, Ph.D., Biology Centre of ASCR, České Budějovice

Granted award:

ASCR Prize for Outstanding Scientific Results of Major Significance

Who granted the award:

The President of the Academy of Sciences of CR

E.3.6 The Grant Agency of CR

Name of achievement in R&D&I:
Function, structure and dynamics of nuclear ribosome factory

Brief characteristics of achievement in R&D&I:
Organisation of ribosomal gene transcription and ribosomal RNA maturation; association of chromosomes carrying ribosomal genes in nucleolar organisers. Broadening our knowledge of structural-functional organisation of the nucleus. Success in proving that most chromosomes carrying nonactive nucleolar organisers participate, too, in nucleolus formation (substantially more complicated nucleolus structure).

Author of achievement in R&D&I:
Prof. RNDr. Ivan Raška, DrSc., 1st Faculty of Medicine of the Charles University, Prague

Granted award:
Prize of the President of the Grant Agency of CR

Who granted the award:
The President of the Grant Agency of CR

Name of achievement in R&D&I:
Digital image fusion in case of non-linear display models

Brief characteristics of achievement in R&D&I:
The system for automatic fusion of digital images from real, nonideal sensors embracing new algorithms and fusion methods making it possible to obtain an image in raster that is finer than that of input channels. The achievement represents original contributions to the theory (algorithms and methods of fusion). For practical application, algorithms are processed as Matlab Toolbox. Important applications in astronomy; great number of publications and vast publicity abroad.

Authors of achievement in R&D&I:
Prof. Ing. Jan Flusser, DrSc., Institute of Information Theory and Automation of ASCR, Prague , Ing. Stanislava Šemberová, CSc., Astronomical Institute of ASCR, Prague

Granted award:
Prize of the President of the Grant Agency of CR

Who granted the award:
The President of the Grant Agency of CR

Name of achievement in R&D&I:

Beta-diversity in rainforest butterflies (Lepidoptera) along an elevational gradient in relation to vegetation composition, influences of environment, and geological history.

Brief characteristics of achievement in R&D&I:

The study of beta diversity within a lowland tropical rainforest in a world-wide unique set of samples from >100 communities of herbivorous insects from a contiguous area of tropical forest in New Guinea. The project has contributed to building up a permanent research base in Papua-New Guinea and establishing important long-term co-operation with top workplaces of tropical ecology in the United States, United Kingdom, and Australia.

Author of achievement in R&D&I:

Prof. RNDr. Vojtěch Novotný, CSc., Biology Centre of ASCR, České Budějovice

Granted award:

Prize of the President of the Grant Agency of CR

Who granted the award:

The President of the Grant Agency of CR

E.3.7 Awards granted by the Association of Innovative Entrepreneurship of CR

Name of achievement in R&D&I:
Water micro turbine SETUR

Brief characteristics of achievement in R&D&I:
The water micro turbine SETUR is suitable for a closed circle of generation and consumption of electrical energy. It is designed for gradients of 3–15 metres and flow rates of 3–15 litres per second. It works on a principle of generating a solid of revolution in delivery confusor; it has neither shovels nor similar whirling blades. This is an absolutely exceptional level of application of knowledge of generating liquid turbine protected by 35 patents worldwide, with a high potential to be used in power engineering and other industries.

Author of achievement in R&D&I:
Jiří Spousta, MECHANIKA Králův Dvůr s.r.o, Králův Dvůr

Granted award:
Innovation of the Year 2006 Award

Who granted the award:
The Minister of Education, Youth and Sport

Name of achievement in R&D&I:
Cobalt radiotherapeutic irradiator TERABALT

Brief characteristics of achievement in R&D or innovation:
Cobalt radiotherapeutic irradiator TERABALT – digital cobalt gamma radiotherapeutic irradiator for both radical and palliative oncological treatment of tumour diseases. Basic characteristic of this device is a full transition to digital control system with support of latest computerised technologies. This is an innovated product of a new generation using new designs and production of electronic control modules; application of safety rules for work with high-active sources of ionising radiation; development of a reliable SW.

Author of achievement in R&D&I:
Ing. Karel Kloc, CSc., UJP Praha a.s., Praha

Granted award:
Innovation of the Year 2006

Who granted the award:
The Minister of Education, Youth and Sport

E.4 Other awards granted in the Czech Head contest in 2006

The National prize of the Government of the Czech Republic is mentioned on the first place in Part E.1.

Following prizes have been awarded within the contest:

E.4.1 INVENTIVENESS, Škoda Auto a. s. Prize

This prize is awarded for a discovery or remarkable achievement made in recent years.

The Prize went to:
Prof. RNDr. Oldřich Jirsák, CSc.,
Pro-Rector for Research, Technical University of Liberec
for development of Nanospider device

Nanospider is a device that instead of the so far mostly laboratory production of nanofibres makes possible their industrial production offering material suitable for biomedicine and other technical disciplines. Nanospider is many times more efficient than other devices of similar type, with a surprisingly simple design proving the author's high invention.

E.4.2 PATRIA, Unipetrol a. s. Prize

This prize is awarded to a person whose professional or managerial qualities have won him/her recognition in abroad in recent years.

The Prize went to:
Prof. RNDr. Jiří Čížek, DrSc., F.R.C.C.
Faculty of Mathematics, University of Waterloo, Waterloo, Ontario, Canada
for a new method of fixed clusters

Prof. RNDr. Jiří Čížek, DrSc., F.R.S.C. was nominated for the Nobel Prize in 1998. Prof. Jiří Čížek has suggested a new procedure for the solution in a quantum mechanical method called the fixed cluster method. This has appeared to be one of key procedures for further development of quantum chemistry. This work has been included in the group of 66 most significant works in quantum chemistry of the 20th century. Prof. Jiří Čížek went into exile in 1968 and since then he has worked at University of Waterloo in Canada. In 1988, he was elected a fellow of the Academy of Sciences, Royal Society of Canada.

E.4.3 INDUSTRIE, Prize of the Ministry of Industry and Trade

This prize is awarded for the most significant product or technology innovation.

The Prize went to:

LINET spol. s. r. o., Želevčice Slaný

for manufacturing of a versatile hospital bed with Mobi-Lift system

The versatile Image hospital bed has been developed especially for wards with long-lying patients, where the main problems are their positioning, rehabilitation, and rising from the bed. The bed is electrically positioned and solves the patient's mobilisation in an absolutely new way, which helps to shorten the hospital stay. The bed is successfully exported abroad.

E.4.4 DOCTORANDUS, Siemens Prize

This prize is awarded for the most significant achievement or professional or scientific activity to a student in the doctor's degree study programme.

The Prize went to:

Ing. Štěpán Obdržálek, Ph.D.
Department of Cybernetics, Faculty of Electrotechnics, Czech Technical University, Prague

Ing. Štěpán Obdržálek deals with the problem of computer recognition of objects from images. An important contribution of Ing. Štěpán Obdržálek is the proposal and realisation of a procedure enabling real-time object recognition from a large set using the so-called decision-measurement tree. This procedure can be considered absolutely pioneering. Results of Ing. Obdržálek´ s work have played a key role in the cooperation of the Department of Cybernetics, FoE, CTU with top firms such as Toyota in the field of object recognition in the SafeCar project or American firm Evolution Robotics. Last year, the invention was patented in Japan and its U.S. patent application is under preparation.

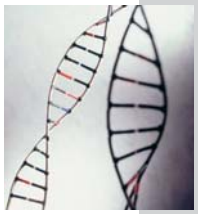
E.4.5 MEDIA, Prize of the Czech Head Foundation

This prize goes to a journalist or media worker who through his/her work contributed most to the promotion of home science and technology.

The Prize went to:

Mgr. Vladimír Kořen
Czech Television, Prague

Vladimír Kořen obtained MEDIA Prize for the Czech Heads series being broadcast on the first channel CT1 of Czech TV for the second consecutive year. This series is highly appreciated by professional public and attains high viewing rates of nearly one million.



Annex

Basic parameters of countries for 2007 R&D&I Analysis

	Number of inhabitants (million)	GDP(USD per head)	State budget revenue from taxes(% GDP)	Labour productivity		Gross expenditure on R&D per head in 2004 (EUR per head)	Global Summary Innovation Index (GSII) according to the European Commission	Ranking in the competitiveness chart according to WEF		Ranking in the competitiveness chart according to IMD	
				per employee(%) EU-25=100 % 2005	per hour worked (%) EU-15=100 % 2004			2004	2005	2006	2007
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Czechia	10.2	19 662	38.4	68.4	49.9	107.7	0.35	29	29	28	32
Denmark	5.4	34 208	48.8	106.1	102.5	907.7	0.59	-	-	5	5
Finland	5.2	31 383	44.2	106.7	95.3	1 006.5	0.76	2	2	10	17
France	60.9	30 401	43.4	119.2	117.7	595.1	0.56	12	18	30	28
Hungary	10.1	16 477	38.1	69.1	-	71.3	0.33	35	41	35	35
Germany	82.5	29 853	34.7	102.0	105.8	667.6	0.63	6	8	25	16
The Netherlands	16.3	35 435	37.5	108.2	116.5	536.4	0.58	11	9	15	8
Poland	38.2	13 433	34.4	62.2	47.6	29.8	0.18	43	48	50	52
Austria	8.2	34 043	42.6	-	96.4	653.3	0,51	15	17	13	11
Greece	11.1	29 212	35.0	-	71.0	87.6	0.28	47	47	36	36
Slovakia	5.4	15 575	30.3	62.2	52.8	32.3	0.26	36	37	33	34
Slovenia	2.1	22 698	39.7	75.8	66.0	190.1	0.36	30	33	39	40
United Kingdom	59.9	33 637	36.0	106.7	97.6	513.5	0.57	9	10	20	20
United States	296.4	41 657	25.5	136.1	115.4	861.4	0.67	1	6	1	1
Japan	127.7	-	26.4	92.6	79.1	938.3	0.70	10	7	16	24
EU-25	463.6	-	-	100.0	100.0	424.8	0.50	-	-	-	-
EU-27	492.9	-	-	-	-	-	-	-	-	-	-

Source:

(1) OECD Factbook 2007, Economic, Environmental and Social Statistics; 2005 figures

(2) OECD Factbook 2007, Economic, Environmental and Social Statistics; 2005 figures, USD per head converted at the purchasing parity standard (PPS)

(3) OECD Factbook 2007, Economic, Environmental and Social Statistics; 2004 figures, state budget revenue from taxes in % of GDP, rate of redistribution in economics

(4) Eurostat; Key figures on Europe, Statistical pocketbook 2006; 2005 labour productivity per employee in %, EU-25=100 %

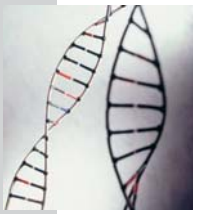
(5) Eurostat; Key figures on Europe, Statistical pocketbook 2006; 2004 labour productivity per hour worked in %, EU-15=100 %

(6) OECD, MSTI 2006/1; gross expenditure on R&D (GERD) per head in 2004, current prices. For Japan, 2003 figures are given.

(7) European Commission; European Innovation Scoreboard 2006

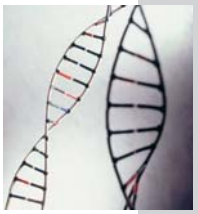
(8), (9) World Economic Forum; Global Competitiveness Report 2006–2007

(10), (11) IMD Switzerland; World Competitiveness Yearbook 2007

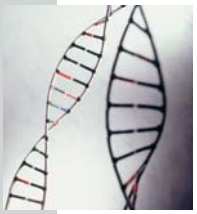


List of abbreviations used

ASCR	Academy of Sciences of the Czech Republic
FP6	6th EU Framework Programme
AIPCR	Association of Innovative Entrepreneurship of the Czech Republic
CA	Co-ordination actions
CEP	Central Register of R&D projects
CEZ	Central Register of research plans
CIS 4	Community Innovation Survey 4
CMA	Czech Mining Authority
CSO	Czech Statistical Office
COSMC	Czech Office for Surveying, Mapping and Cadastre
EIS 2006	European Innovation Scoreboard 2006
EC	European Commission
EPO	European Patent Office
ERA	European Research Area
EU	European Union
EU-15	EU states – Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, United Kingdom, Greece
EU-25	EU-15 + Czechia, Estonia, Cyprus, Lithuania, Latvia, Hungary, Malta, Poland, Slovakia, and Slovenia
EU-27	all EU Members States (EU-25 + Bulgaria and Romania)
Eurostat	Statistical Office of the European Communities
Frascati	OECD Manual for statistical measurement of scientific and technical activities
GACR	Grant Agency of the Czech Republic
GCI	Global Competitiveness Index
GERD	Gross expenditure on R&D
Growth CI	Growth Competitiveness Index
GDP	Gross Domestic Product
ICT	Information & Communication Technologies
IMD	International Institute for Management Development, Lausanne, Switzerland
R&D IS	R&D Information System
ISOP	Information System for Operational Programmes
JRC	Joint Research Centre
MT	Ministry of Transport
MD	Ministry of Defence
MI	Ministry of Informatics
MIT	Ministry of Industry and Trade
MLSA	Ministry of Labour and Social Affairs
MJ	Ministry of Justice
SME	Small and Medium Sized Enterprise
MSTI	Main Science and Technology Indicators, OECD
MEYS	Ministry of Education, Youth and Sport
MI	Ministry of Interior
MH	Ministry of Health
MA	Ministry of Agriculture
MFA	Ministry of Foreign Affairs
ME	Ministry of Environment
NSA	National Security Authority
NSI	National Science Indicators
NUTS-2	Nomenclature of Territorial Units for Statistics, Level 2
OECD	Organisation for Economic Co-operation and Development
OPC	Other Personal Costs
OP	Operational Programme
OPIE	Operational Programme Industry and Enterprise



OSF	Office of Structural Funds of MoIT
PCT	Patent Co-operation Treaty
PPS	Purchasing Parity Standard
RCI	Relative citation impact of a particular country / region
RCIO	Relative citation impact of a discipline of a country / region
RIV	Information Register of R&D results
RPC	Relative production of citations
RPP	Relative production of publications
RDC	Research and Development Council
SB	State budget of the Czech Republic
SSA	Specific support actions
SONS	State Office for Nuclear Safety
TC AS	Technology Centre of Academy of Sciences of the Czech Republic
IPO	Industrial Property Office
USPTO	United States Patent and Trademark Office
R&D	Research and development
R&D&I	Research, development and innovation
R&DfI	Research and development for innovation
VES	Register of public R&D tenders
EfC	Education for Competitiveness
IHE	Institution of higher education (state, public, private, partnership)
RP	Research plan
WEF 2006	World Economic Forum 2006
WIPO	World Intellectual Property Organisation



GOVERNMENT OF THE CZECH REPUBLIC

RESOLUTION

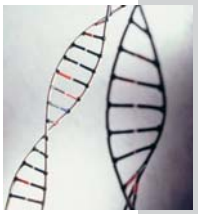
OF THE GOVERNMENT OF THE CZECH REPUBLIC
No. 1284 of 14 November 2007

on the Analysis of the existing state of research, development and innovation in the Czech Republic and a comparison with the situation abroad in 2007

T h e G o v e r n m e n t

approves the Analysis of the existing state of research, development and innovation in the Czech Republic and a comparison with the situation abroad in 2007 contained in Part III of the document Ref. No. 1623/07

The Prime Minister
Ing. Mirek T o p o l á n e k, m. p.



Comments