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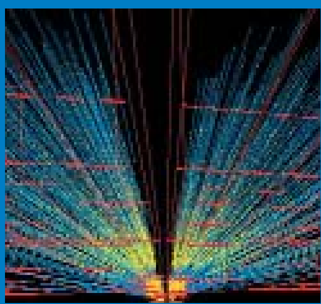
ANALYSIS OF THE EXISTING STATE OF RESEARCH, DEVELOPMENT AND INNOVATION IN THE CZECH REPUBLIC AND A COMPARISON WITH THE SITUATION ABROAD IN 2008



Office of the Government of the Czech Republic,
Research and Development Council

ANALYSIS OF THE EXISTING STATE OF RESEARCH, DEVELOPMENT AND INNOVATION IN THE CZECH REPUBLIC AND A COMPARISON WITH THE SITUATION ABROAD IN 2008

Research and Development Council

Published by: © Office of the Government of the Czech Republic, 2008
Research and Development Council
Nábřeží Edvarda Beneše 4
118 01 Praha

ISBN 978-80-87041-50-5

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Prague, December 2008

Table of Contens

Preface

Motto: *'We will only do what we are number one or number two at in the world.' Jack Welch*

This year, during which the Czech Government approved the reform of the research, development and innovation system and the documents to implement this programme, we again present the professional public with an Analysis of the Existing State of Research, Development and Innovation in the Czech Republic and a Comparison with the Situation Abroad.

This document has been drawn up as a collaborative effort between the Research and Development Council and numerous experts from institutions actively addressing research, development and innovation.

The Analysis is not intended solely as a statistical comparison of State aid channelled into research and development, but should also (by means of evaluations based on the quantifiable effects of the results achieved in comparison with the rest of the world) highlight achievements and draw attention to specific challenges. Accordingly, this publication is a key document forming the basis for the identification of positive and negative trends in development and for the adoption of measures that will help improve the Czech Republic's competitiveness. By detecting potential problems early on, it plays a role in calibrating the relationship between the freedom of science and scientific responsibility for ensuring that the practical application and implementation of fresh observations are beneficial.

In the light of the results stemming from the conclusions of the Analysis and their possible impacts, it has been made clear once again that the lack of resources earmarked for disciplines in this field is not our only challenge. The one percentage point we need to meet the EU target of investing 3% of GDP in research can be bridged by drawing on private resources, primarily in the field of innovation. A more fundamental problem is making sure they are used effectively. Czech research is too watered down and fragmented, it covers a plethora of disciplines that do not always offer prospects, and the returns offered by research results to the Czech economy and society are relatively small.

In this Analysis, not even the most attentive of readers will find all the answers to all the problems, and countless other questions will occur to them. However, if this document becomes a source of information and helpmate for those involved in science or in the application of scientific results, it will contribute to the advancement and effectiveness of research, development and innovation.

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

I. Introduction

This Analysis of the Existing State of Research, Development and Innovation in the Czech Republic and a Comparison with the Situation Abroad in 2008 follows a layout similar to that employed last year. The individual chapters assess R&D inputs (Chapter A), R&D outputs (Chapter B), innovation and competitiveness (Chapter C), the Czech Republic's involvement in the EU's Framework Programmes (Chapter D) and exceptional R&D&I results in 2007 (Chapter E).

In the preparation of the 2008 R&D&I analysis, the authors drew on their own sources of information (Research and Development Information System), Evaluations of Research and Development and R&D Results for the years 2002 to 2006, reports and analyses by the European Commission, and other domestic and foreign sources of information. Numerous indicators are accompanied by the values for the EU-15, the EU-25 and the EU-27, as well as for other scientifically developed countries. Depending on the sources of data used, the figures may not cover identical periods.

As part of the Reform of the R&D&I System in the Czech Republic, approved by the Czech Government under Resolution No 287 of 26 March 2008, there will be a fundamental change in the provision of institutional support for R&D; one of the pillars used to determine the amount of aid will be an assessment of the R&D results achieved by individual research organizations in the preceding five years.

Chapter A – Research and development inputs

Chapter A's analysis of research, development and innovation in 2008 comprises an evaluation of input into research, development and innovation (R&D&I). Compared to last year's analysis, there has been a slight rise in the number of indicators. Most notably, the section assessing human resources in research and development (R&D) has been expanded.

Chapter A – R&D inputs – has two parts: R&D Investment and R&D Human Resources.

Chapter/part	**Title**	**Number of indicators**
A	R&D inputs	42
A.1	Investment in research and development	25
A.2	Human resources in R&D	17

Part A.1 contains 22 graphs making international comparisons of total R&D expenditure, expenditure intensity (i.e. the share in GDP) and expenditure structure based on the sources of funding and the sectors in which resources are spent. The principal source of data is Main Science and Technology Indicators (MSTI 2008/1), published by the OECD, while information about EU countries which are not OECD members comes from Eurostat data sources.

The primary statistics on the Czech Republic's R&D inputs (human and financial resources designated for research and development activities in individual sectors and bodies carrying out R&D in the Czech Republic) are drawn from the Czech Statistical Office's regular annual survey. Slight differences between values released by the CZSO/Eurostat and the data presented in the Analysis may be caused by ongoing efforts to make the GDP estimate more accurate in line with the schedule of short-term information published at the CZSO.

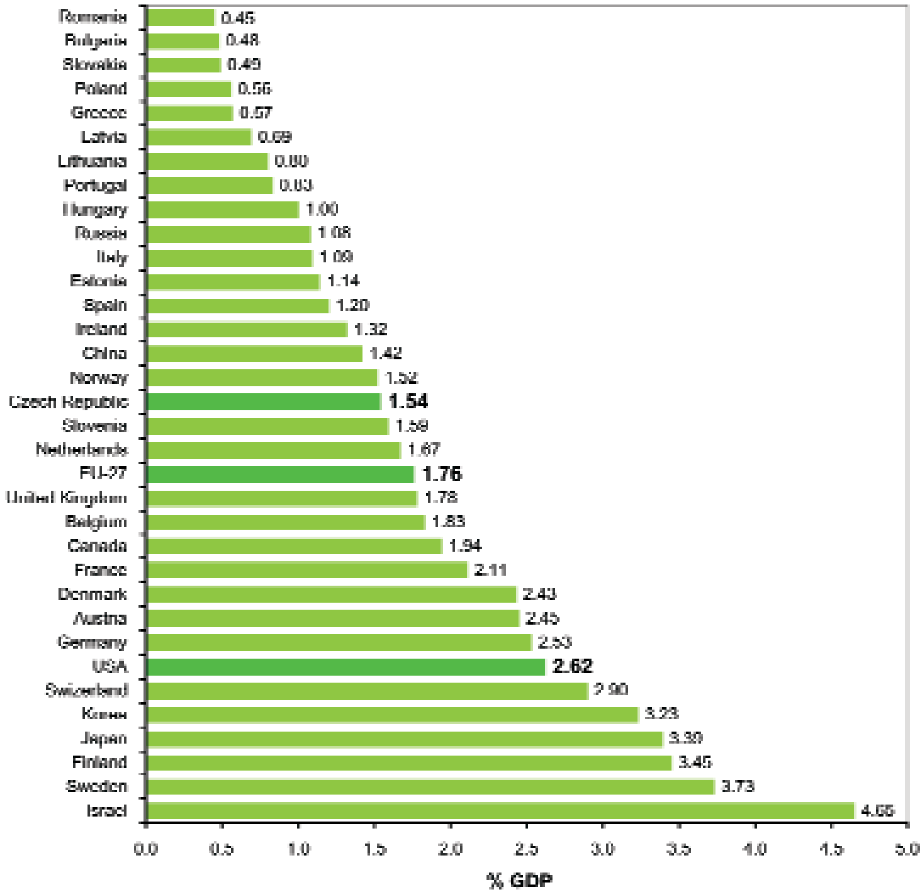
Data from the R&D Information System (R&D IS), operated by the Research and Development Council, are used to assess how State aid for R&D has evolved in the Czech Republic. Developments in general State aid are explored, as are developments in the two basic forms of support – targeted and institutional aid.

As part of the Reform of the R&D&I System in the Czech Republic, approved by the Czech Government under Resolution No 287 of 26 March 2008, there will be a fundamental change in the provision of institutional support for R&D; one of the pillars used to determine the amount of aid will be an assessment of the R&D results achieved by individual research organizations in the preceding five years.

This part of the chapter also spells out trends in support among the largest aid grantors (the administrators of budget headings from which R&D appropriations are granted) and tracks levels of aid poured into R&D in the Czech Republic's individual regions. Two graphs are map developments in the distribution of targeted and institutional aid among the principal disciplines.

Part A.2 contains 16 graphs presenting relevant information about human resources development in the field of R&D; they draw on facts from the OECD's MSTI, Eurostat data, CZSO figures, information from the R&D IS and data from the Institute for Information on Education. The graphs also offer international comparisons of how the numbers of researchers in the public sector, at universities and in the business sector have evolved. In addition, there is an emphasis on students and graduates of science and technology subjects. The final graphs in this part of the chapter shed light on those responsible for carrying out research projects, broken down by sex and age.

A.1 Investment in R&D
A.1.1 Total R&D expenditure



Source: OECD, Main Science and Technology Indicators, 2008/1, EUROSTAT, May 2008, figures for 2006

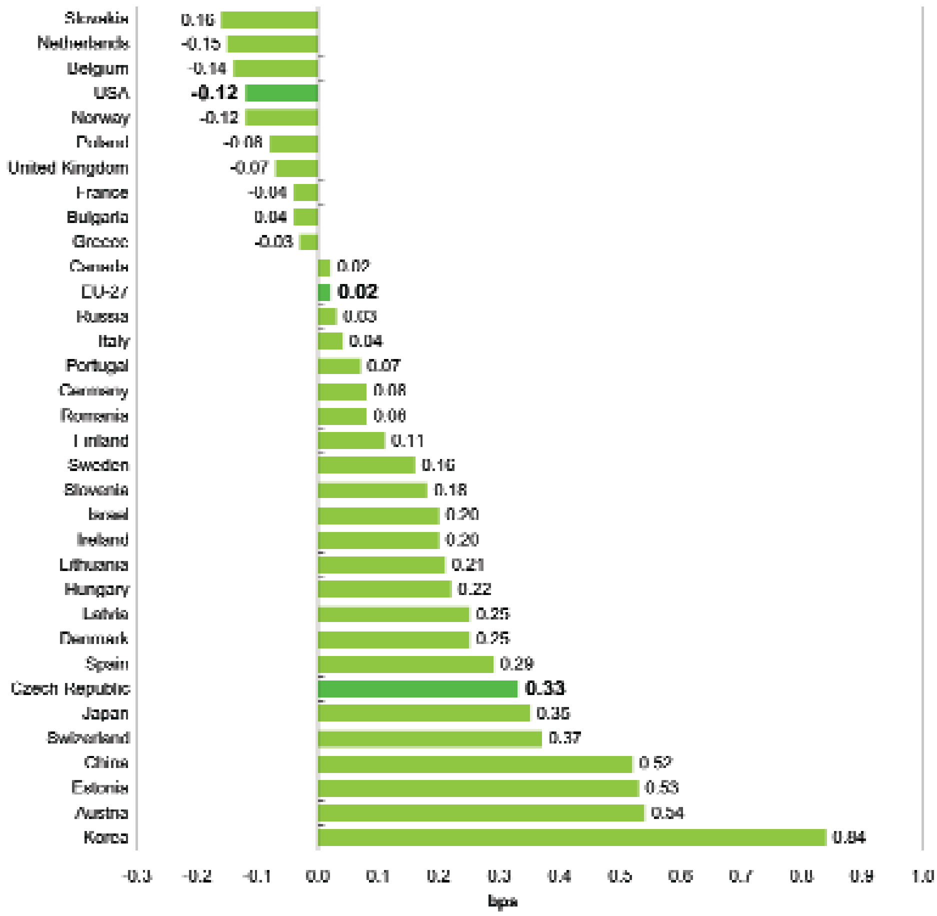
Total R&D expenditure comprises expenditure (both current and capital) intended for internal R&D which is carried out by economic operators in a particular country, no matter how they are financed (public or private, national or foreign sources - this is broken down in more detail in subsequent graphs). In keeping with Eurostat and OECD, the abbreviation GERD (Gross Domestic Expenditure on R&D) is used. GERD is the baseline indicator for R&D statistics and is appropriate for international comparisons.

Besides GERD expressed in figures calculated according to the current rate or translated according to the purchasing power parities of national currencies (PPPs), the ratio of GERD as a percentage of GDP (R&D intensity) is also applied to international comparisons.

The Czech Republic's R&D expenditure in 2006 came to 1.54% of GDP, which is still below the EU-27 average (1.76% of GDP). Of the new Member States, only Slovenia records higher R&D expenditure expressed as a percentage of GDP (1.59% of GDP). The lowest R&D expenditure is reported by Bulgaria and Romania (less than 0.5% of GDP), i.e. the countries acceding to the EU in the last round of enlargement.

The other end of the scale is dominated by the most developed countries of western and northern Europe, Israel (with the highest ratio of 4.65% of GDP), Japan, Korea and the United States. Since the early 1990s, Europe has been headed by Sweden, reporting figures in excess of 3% of GDP (3.73% of GDP in 2006).

A.1.2 Changes in R&D expenditure between 2000 and 2006

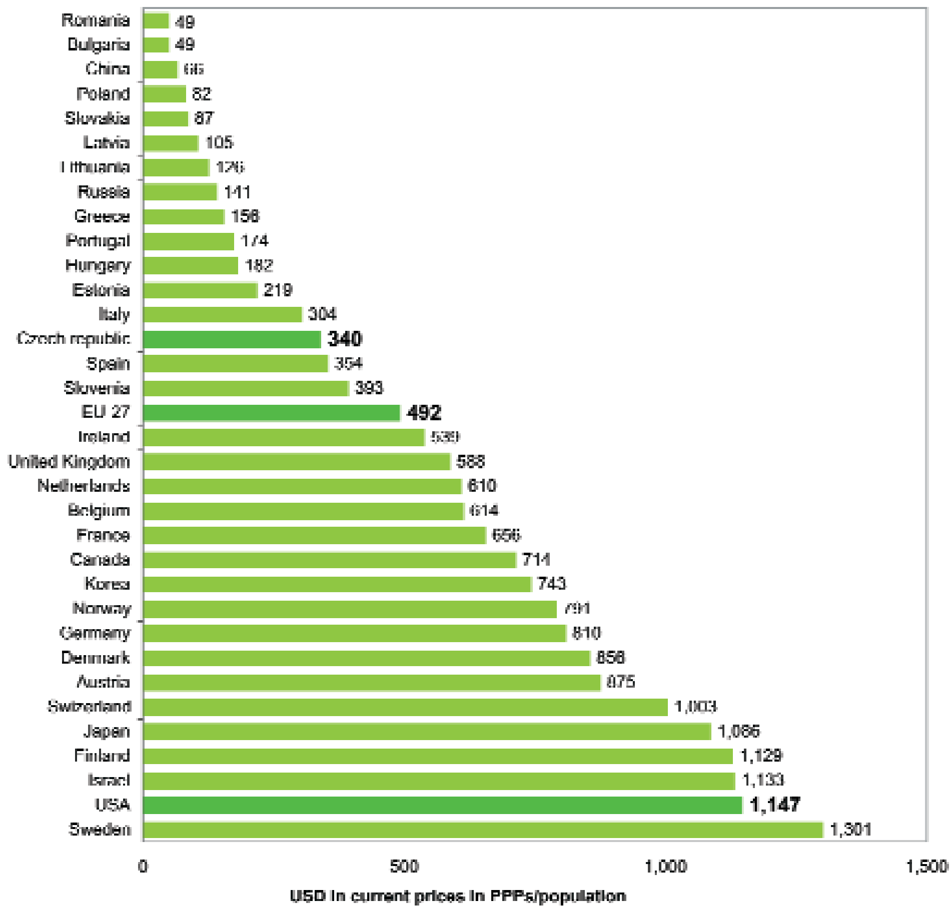


Source:	OECD, Main Science and Technology Indicators, 2008/1, EUROSTAT, May 2008, additional CZSO calculations, figures for 2000–2006
Note:	Switzerland (2000–2004), Italy (2000–2005), Norway (1999–2006), Greece (1999–2006), Denmark (1999–2006), Sweden (1999–2006)

In the Czech Republic, the R&D intensity grew by 0.33 bps from a baseline value of 1.21% of GDP between 2000 and 2006. Significant growth was also recorded in this period by Austria and Estonia (by more than 0.50 bps), and, of the non-European states, in particular by Korea (an increase by 0.84 bps) and China (by 0.52 bps).

In comparisons of R&D performance measured, for example, by number of patents, scientific publications and their citations, the actual expenditure per head of population (or, preferably, per R&D employee) must be taken into consideration. Information on such expenditure is set out in the introduction to Chapter B – R&D outputs.

A.1.3 Total R&D expenditure (GERD) per capita

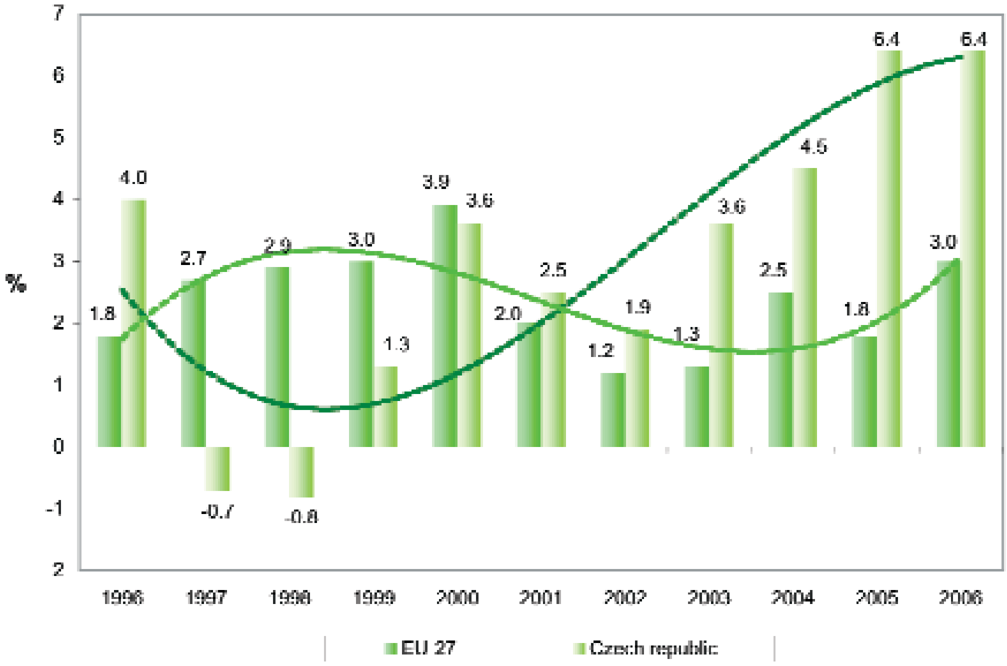


Source:	OECD, Main Science and Technology Indicators, 2008/1, EUROSTAT, May 2008, additional CZSO calculations, figures for 2006
Note:	Switzerland (2004), Italy (2005)

Converting funds granted for R&D into per capita figures shows that the leaders, again, are the Scandinavian and west European states, together with the USA, Israel, Japan and Korea (more than USD 1,000 per capita in PPP).

In the Czech Republic, USD 340 in PPP per capita was invested in R&D; the average in EU Member States was just short of USD 500. Again, those well below the average were the new Member States (Bulgaria and Romania, with less than USD 50 per capita), with those acceding in 2004 not faring much better – the lowest values in this group were recorded by Poland and Slovakia (approximately USD 85).

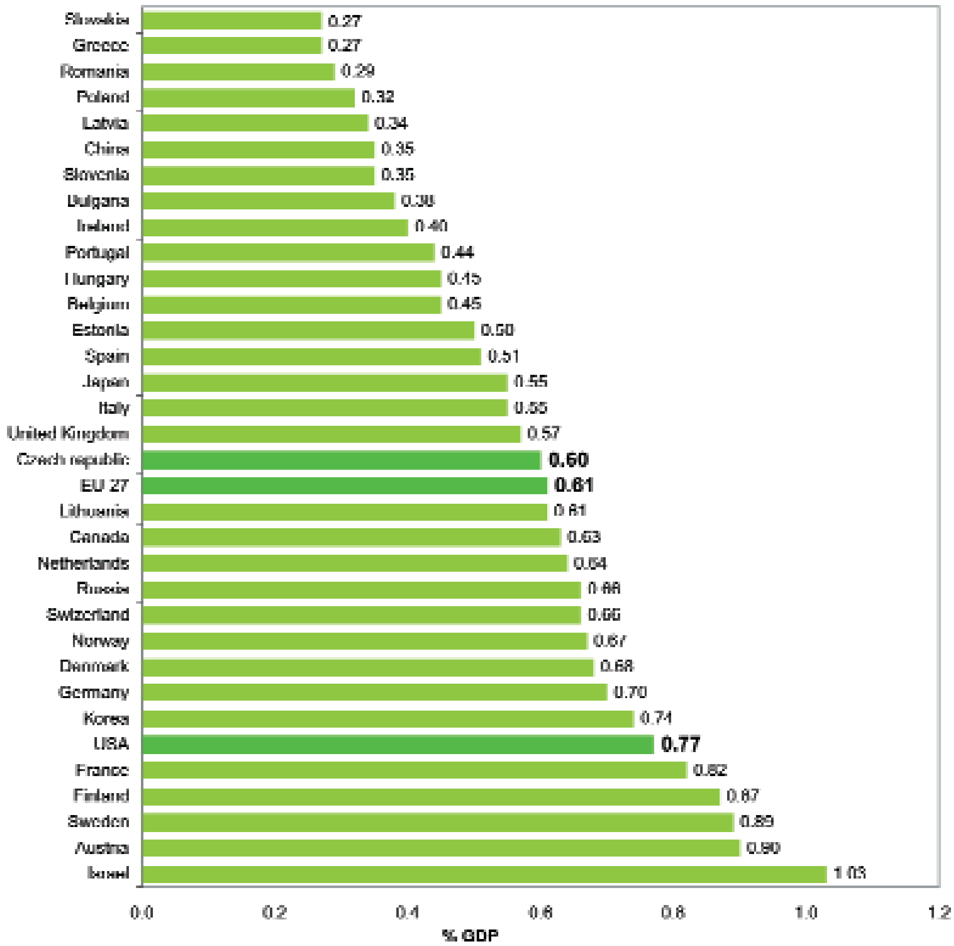
A.1.4 Momentum of real GDP growth in the Czech Republic and in the EU-27



Source: Green Paper on Research, Development and Innovation in the Czech Republic, Technology Centre, AS CR, January 2008

Since 1999, the Czech Republic has kept to a positive growth rate of GDP, which accelerated to as much as 6.4% in 2005 and 2006, as indicated by the bar chart. The trend line (the hatched curve) is rising, and comparisons with the growth dynamism of the European economy thus show that the growth of the Czech Republic is above average; this has positive repercussions on the real convergence of the Czech economy with the EU-27 average.

A.1.5 Public expenditure on R&D



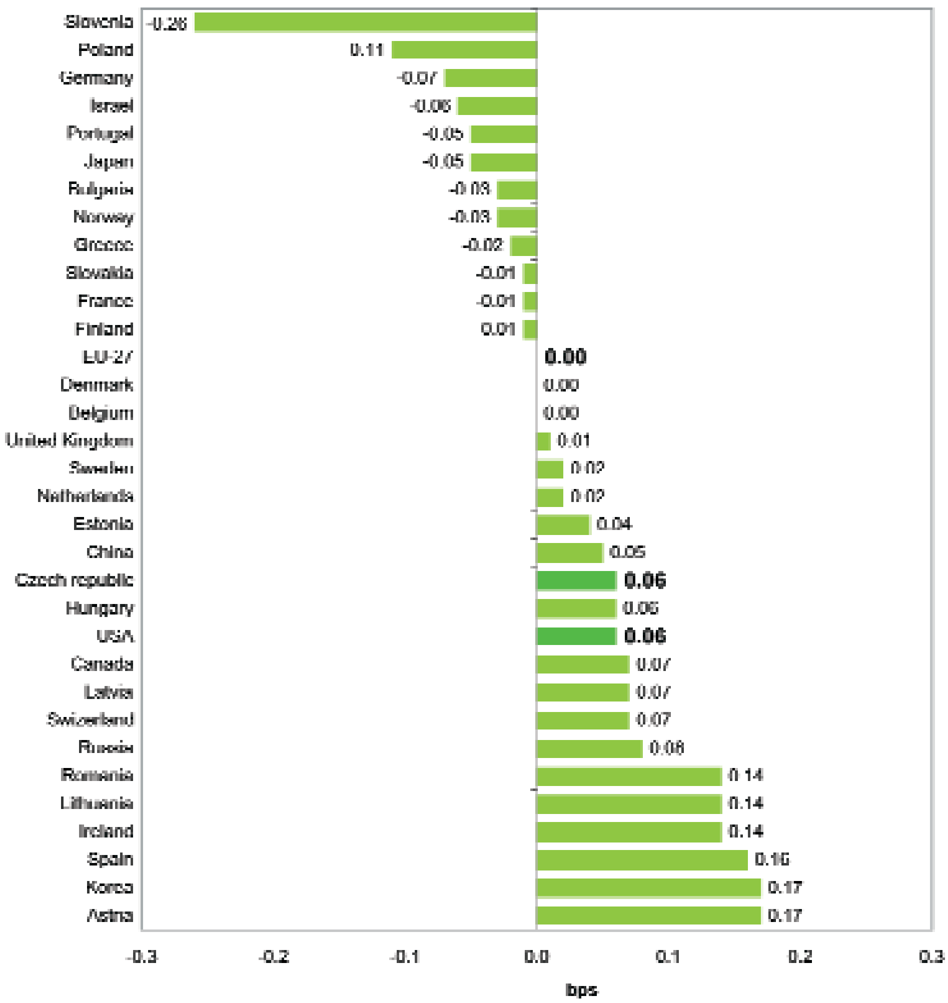
Source: OECD, Main Science and Technology Indicators, 2008/1, EUROSTAT, May 2008, figures for 2006

Note: data for 2003: Israel and the Netherlands
data for 2005: Belgium, Bulgaria, Denmark, Estonia, France, Italy, Lithuania, Latvia, Germany, Norway, Portugal, Russia, Greece, Slovenia, Sweden, Switzerland and the EU-27

R&D expenditure statistics may also be monitored by reference to the origin of financial resources. This section deals with public resources, i.e. funds from the national budget or from the budgets of local and regional government. It is important to note that the actual percentage of public sources from the gross domestic product is an indicator that is hard to interpret. High values are recorded not only by developed states with a strong commitment to R&D, but also by countries where the public sector makes a particularly substantial investment in R&D.

In the Czech Republic, in 2006 0.6% of GDP was invested in R&D from the public purse, i.e. a level just shy of the EU-27 average. Compared to the new EU Member States, only Lithuania invested the same amount as a percentage of GDP; the other EU newcomers invested a lot less (Hungary 0.45% of GDP, Poland 0.32% of GDP). The lowest levels were found in Slovakia and Greece (0.27% of GDP). In Europe, the countries channelling most public finances into R&D, expressed as a share of GDP, were Austria (0.9% of GDP), Sweden (0.89% of GDP - 2005 data) and Finland (0.87% of GDP). Of the non-European states, the highest levels are reported by the United States and Korea (approximately 0.7% of GDP).

A.1.6 Change in the intensity of public expenditure on R&D between 2000 and 2006

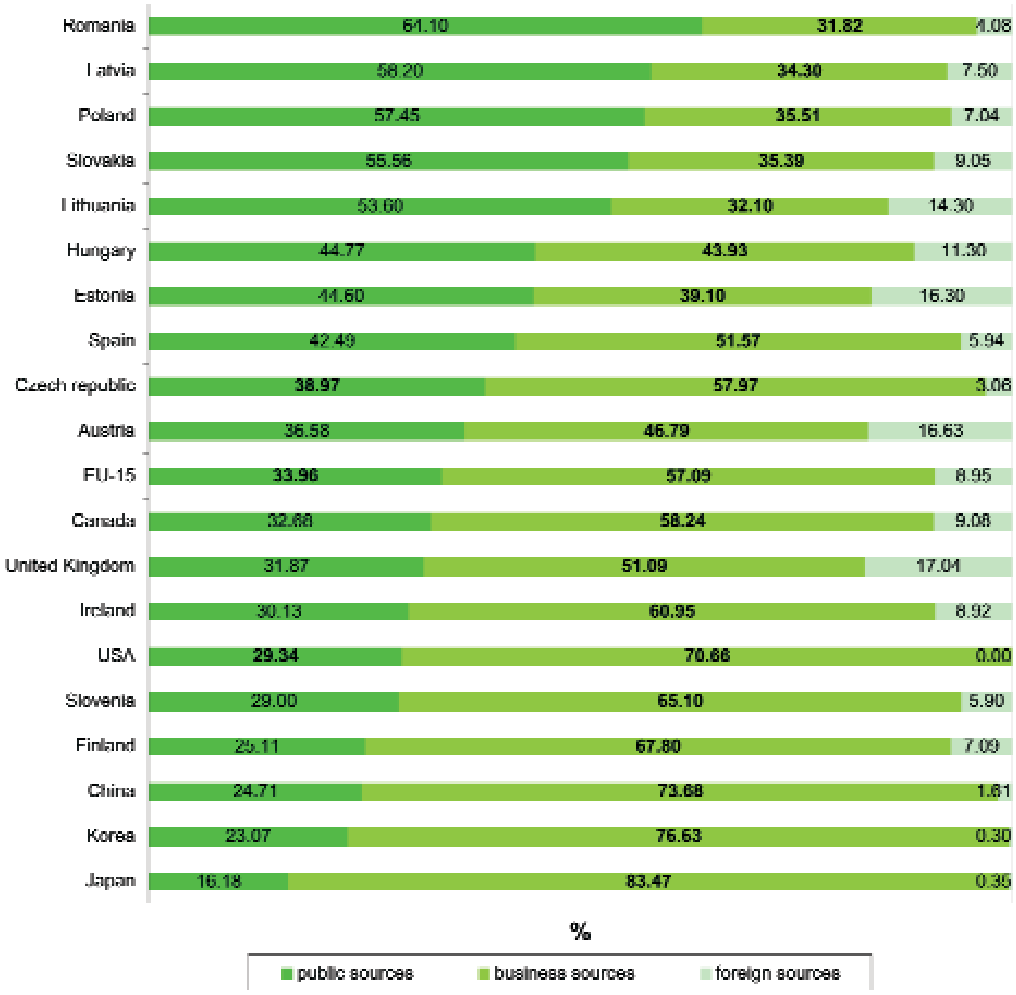


Source: OECD, Main Science and Technology Indicators, 2008/1, EUROSTAT, May 2008, figures for 2000–2006, additional CZSO calculations

Note: data for 1999–2005: Denmark, Norway, Sweden, Greece
data for 2000–2003: Israel and the Netherlands
data for 2000–2005: Belgium, Bulgaria, Estonia, France, Lithuania, Latvia, Germany, Portugal, Russia, Slovenia, Switzerland and the EU-27

Between 2000 and 2006, the most significant decrease in the intensity of public expenditure on R&D was observed in Slovenia (by a full 0.26 bps). There was also a decline in Germany and Israel, although the total volume (in both absolute terms and as a percentage of GDP) in these countries is, respectively, double and triple that of Slovenia. In contrast, the highest relative growth in public expenditure on R&D between 2000 and 2006 was recorded in Austria, Korea and Spain (by between 0.16 bps and 0.17 bps).

A.1.7 Share of public, business and foreign resources in total R&D expenditure



Source: OECD, Main Science and Technology Indicators, 2008/1, EUROSTAT, May 2008, additional CZSO calculations, figures for 2006

Note: Data for 2005: Denmark, France, Germany, Greece, Slovenia and the EU-15

Under the Lisbon Strategy a ratio of 1:3 is regarded as an appropriate share of public expenditure in total R&D spending (i.e. 3% of GDP for overall expenditure, of which 1% of GDP from the public purse). If a state reports that R&D expenditure is equal to 3% of GDP and public resources account for less than a third of that (e.g. Finland - 25%), the business sector can be considered to act as a major player in research. Among states with a large share of public expenditure, we can surmise that the market economy in the field of R&D does not sufficiently motivate the private sector to shoulder a reasonable share of the burden of investing in highly specialized activities that require high qualifications and skills (science, research, higher education, health care, design, marketing, consulting, data processing, telecommunications, etc.).

In the Czech Republic, in 2006 the public sector accounted for 39% of total R&D expenditure. Compared to most other states, notably in western Europe (the EU-15), this is above average (the EU-27 average was 35%). The public sector's share of R&D financing was higher in all former eastern European states. The highest contribution made by the public sector to R&D funding could be found in Romania (64.1%). Very high values (over 50%) were also reported in Latvia, Poland, Slovakia and Lithuania. The only two states which are not new EU Member States but where the public budget accounts for more than one third of R&D expenditure are Spain (42.5%) and Austria (36.6%). On the other hand, in one new EU Member State - Slovenia - R&D expenditure from the public budget is 29%.

Of the non-European states, in relative terms those where public sector investment is lowest are Japan (16.2%), Korea (23.1%) and China (24.7%). All these states report lower values than Finland.

The share of business funding reveals, to a large extent, whether a significant number of large (generally multinational) corporations producing high-tech goods operate in a particular state. Large multinational corporations and their branches in various countries often invest more money in R&D than a small to medium-sized state economy is capable of financing.

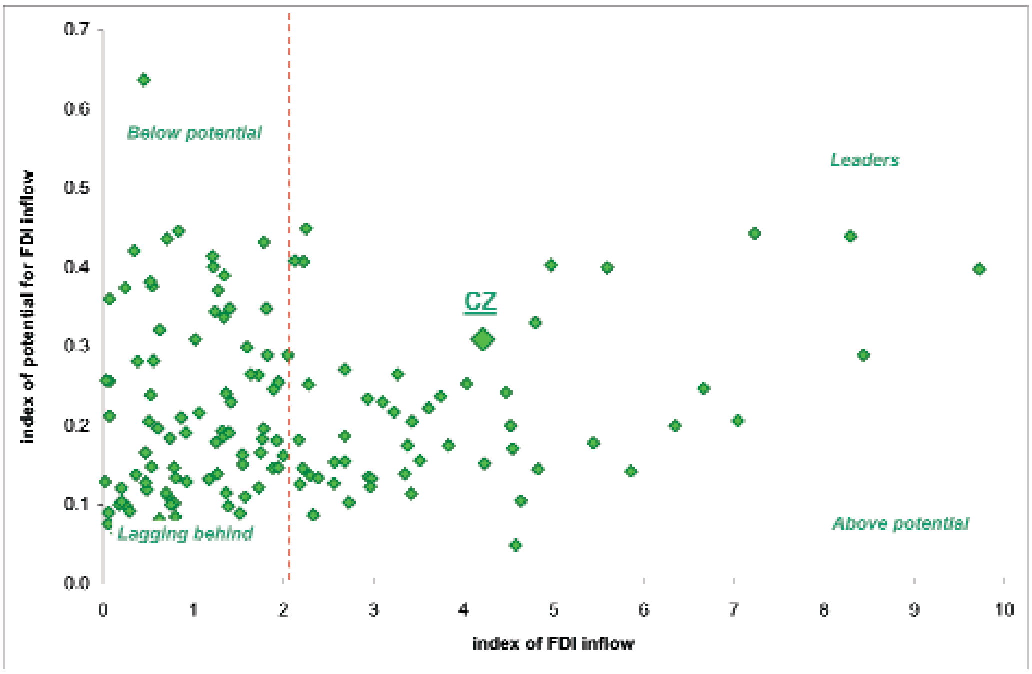
In the Czech Republic, the business sector accounted for 56.9% of R&D expenditure, which ranks it just slightly above the average for the EU-15 and EU-27 (approximately 54%). Compared to other new EU Member States, this was the highest value after Slovenia (59.2%). Relatively speaking, businesses in Romania (30.4%) and Lithuania (26.2%) made the lowest investments in R&D.

The highest share of business resources in research investment existed in the Asian economies - approximately 76% in Korea and Japan, and more than two thirds even in China and Taiwan. In Europe, the business community in Finland (66%) and Ireland (59.3%) made the highest relative investments.

As in previous years, in the Czech Republic 97% of corporate investment in R&D was directed back into the business sector. Between 2000 and 2006, the share of investments geared towards the public sector shrank from 5% to 3%. At the end of this period, only 0.2% of expenditure was ploughed into higher education and 0.05% into the private non-profit segment. According to this quantitative indicator, in the Czech Republic there has not been intensified cooperation between business entities and universities.

Foreign resources invested in R&D in the Czech Republic accounted for only 3.1%, which is the lowest among the European countries. This share has hovered between two and four per cent in the Czech Republic since 2000. Relatively modest volumes of foreign resources channelled into R&D can also be found in Romania, Slovenia and Spain. In Finland, the level of foreign funds in the overall volume was 7.1%, which is below average. The highest rates in Europe were reported in the United Kingdom and Austria (approximately 16%), followed by Estonia and Lithuania (approximately 15%).

A.1.8 Attractiveness and potential of countries for inflows of foreign direct investment (FDI)



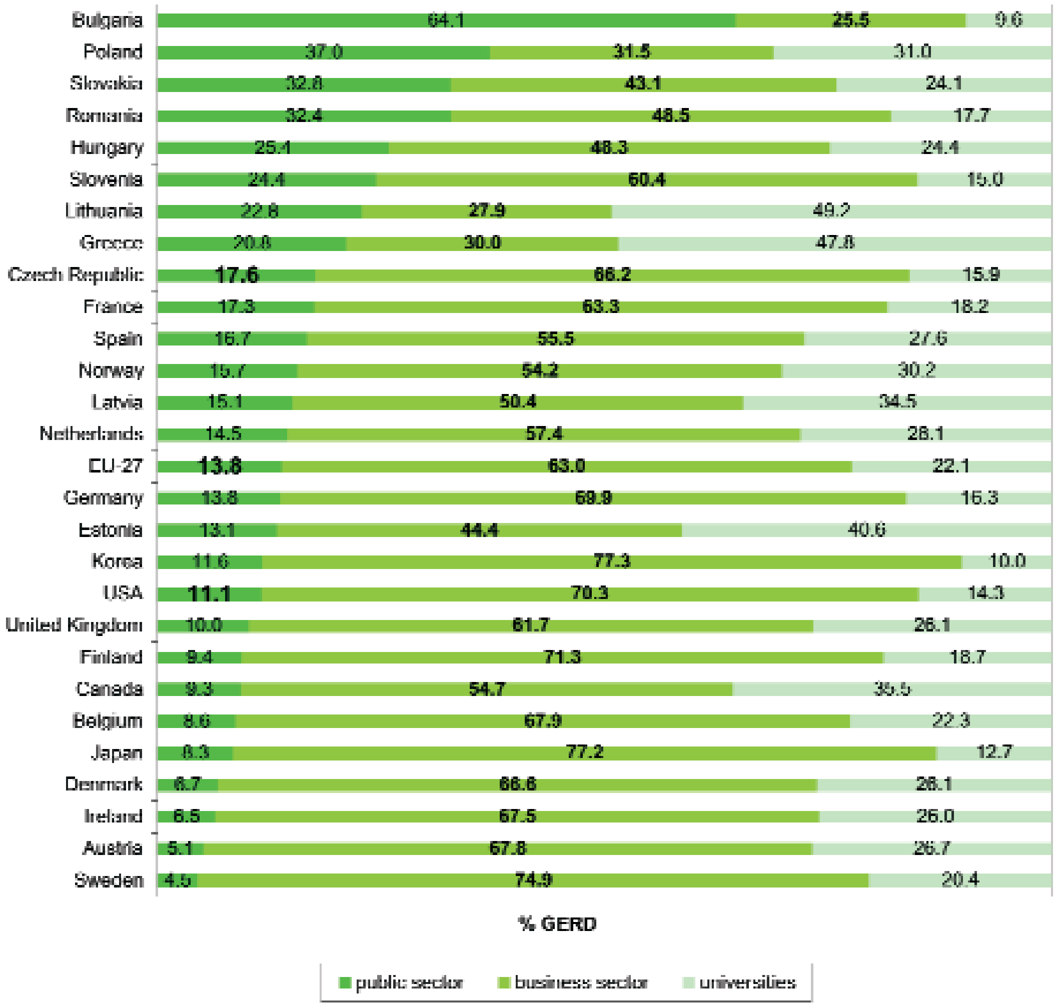
Source: Green Paper on Research, Development and Innovation in the Czech Republic, Technology Centre, AS CR, January 2008

The graph illustrates the positions of 141 countries worldwide in terms of the foreign investments they attract. The Czech Republic's position is indicated with the abbreviation CZ.

From the perspective of attractiveness for the inflow of foreign direct investments, the Czech Republic has long figured among the leading countries. As a result, it reports a high influx of FDI relative to the country's size and economic maturity. In the evaluation of FDI levels and the potential for further FDI inflows, published in the World Investment Report 2007 (UNCTAD), the Czech Republic features among the front-runners as a country attracting above-average levels of FDI with the potential for even more. The other countries of central Europe belong to the same group. In the international FDI Performance Index, the Czech Republic ranks 32nd (8th out of the EU-27); in the FDI Potential Index, the Czech Republic is 39th (19th out of the EU-27).

Factors which have the greatest bearing on investors' decisions to invest in the Czech Republic include the workforce's high level of education and low risk of fluctuation. The relatively low labour costs and sound infrastructure are also viewed in a positive light. Finally, investment decisions are also swayed by similar cultural and historical developments, which give the Czech Republic and the whole of central Europe an edge over the east Asian countries that, despite their low costs, are completely different culturally and historically.

A.1.9 Share of R&D funding channelled into the public and business sectors and into universities



Source: OECD, Main Science and Technology Indicators, 2008/1, EUROSTAT, May 2008

In 2006, R&D resources applied in the public sector as a share of overall R&D expenditure in the Czech Republic amounted to 17.6% of the total volume of resources used. The public sector in this respect primarily comprises individual research institutions in the competence of ministries, along with the centres run by the Academy of Sciences of the Czech Republic (as of 1 January 2007, these are 'public research institutions'). The share taken up by the public sector in the use of R&D funding is higher in all new Member States (ranging from a fifth to a third). A negative extreme can be found in Bulgaria, where the public sector accounts for 64.1% of all funding channelled into R&D. It follows from this high value that research funding by the business sector in Bulgaria is only very peripheral.

The lowest public sector shares in the application of R&D funding are reported in Scandinavia (apart from Norway), Austria, Ireland and Belgium. Of the non-European states, the share is very

low in Japan (8.3%), Canada and the United States (approximately 10%), and Korea (approximately 12%).

Again, it is important to stress that a minimum share of resources applied in the public sector does not necessarily mean the R&D situation is better. In this regard, a country's science policy and a certain inertia on the part of R&D institutions play a large role. France (Centre national de la recherche scientifique) and Germany (the Max Planck Society etc.) serve as a good example; here, public research has long received financial support from the state and researchers are grouped into institutions along the lines of those mentioned above.

Most states report values of between 60% and 70% for R&D funds applied in the business sector as a share of overall R&D expenditure. Higher shares are recorded by two Asian states (Korea and Japan with values of approximately 77%) and two Scandinavian states (Sweden and Finland with 75% and 71% respectively). Lower shares are mainly found among the new Member States, but also among several other European states where a large proportion of research (approximately one third) takes place at universities (the Netherlands, Spain and Norway). As already mentioned above, Bulgaria – with a share of just 25.5% taken up by the business sector – is a negative extreme when it comes to the structure of resources by recipient.

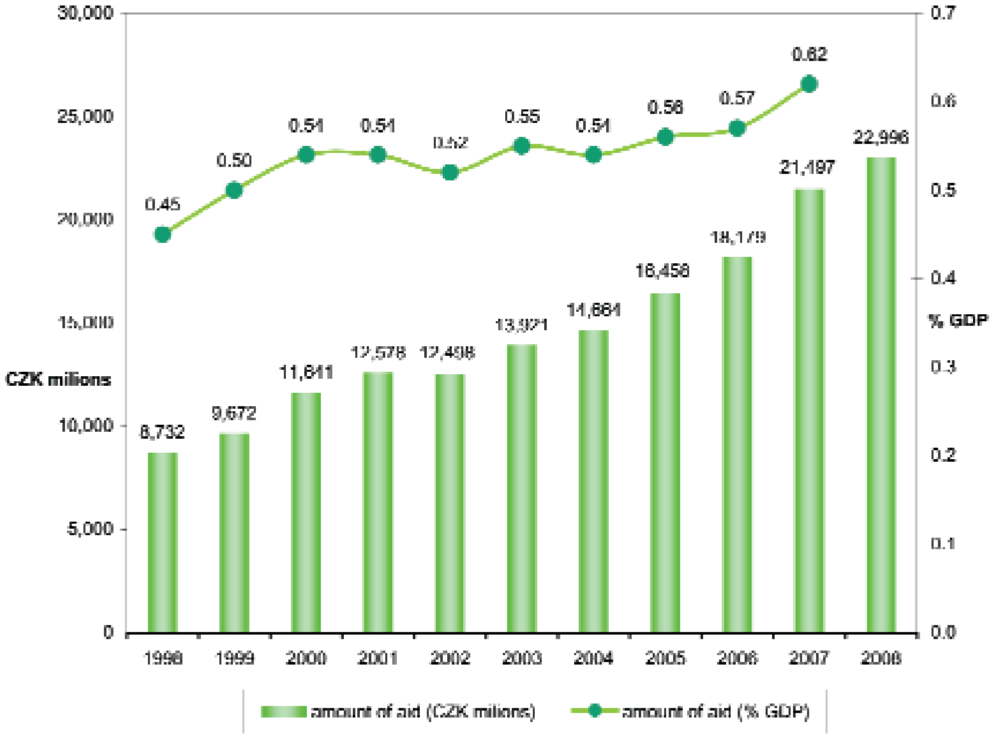
The Czech Republic, reporting a value of 66.2%, is slightly above the European average. In the last three years, there has been a rise in the share of funds channelled into the business sector from approximately 60% (between 2000 and 2003); in absolute terms, there has been constant growth (on average by 13% per year between 2000 and 2006).

In 2006, roughly CZK 33.0 billion was invested in R&D activities in the Czech Republic's business sector. Of this funding, 14% came from the public purse, compared to 20% in Slovakia, 43% in Latvia, 47% in Romania and as much as 52% in Russia. In contrast, the share of public resources in R&D expenditure within the business sector in Finland was a mere 4%, and in Japan just 1%.

Again, it should be borne in mind that in terms of the resources channelled into R&D at universities there is no optimal share for universities, nor can we apply the rule that the more universities contribute to R&D the better. As has been mentioned above, these figures reflect the calibration of the R&D system in a given state or the state's research policy.

Universities in EU Member States took up a share, on average, of 22.1% of R&D resources. This value is more or less constant, especially in the western EU countries. It is clear from the data describing the share assumed by industry (i.e. the private sector) in R&D funding at the universities of a given state that the overwhelming majority of finance at Czech universities comes from public or foreign sources. In the Czech Republic, the private sector contributed a paltry 0.7% to the funding of R&D at universities; this is easily the lowest figure compared to other European states and again confirms the hypothesis that cooperation between the academic sphere and the private sector is at a very low level.

A.1.10 Developments in overall R&D support from the public purse in the Czech Republic



Source: national budget of the Czech Republic, 1998–2008

Note: The information on GDP and R&D expenditure from the national budget is taken from documentation produced by the Ministry of Finance. Expenditure is cited in the current prices of the relevant years. These data on R&D expenditure differ slightly from the Czech Statistical Office's figures used in graph A.1.5 for the Czech Republic.

In the Czech Republic, the amount of State aid, expressed in monetary units, has risen relatively fast throughout the period (apart from 2002). The increase in public expenditure has had a positive impact on the growth of overall R&D expenditure, which in 2001–2005 was fourth highest among EU Member States. The table below sets out the rises in expenditure, in monetary units, expressed as a percentage of expenditure in the preceding year.

Table A.1 Changes in R&D expenditure from public resources compared to the previous year

2001	2002	2003	2004	2005	2006	2007	2008
8.7%	-6.4%	11.4%	5.3%	12.2%	10.5%	18.3%	7.0%

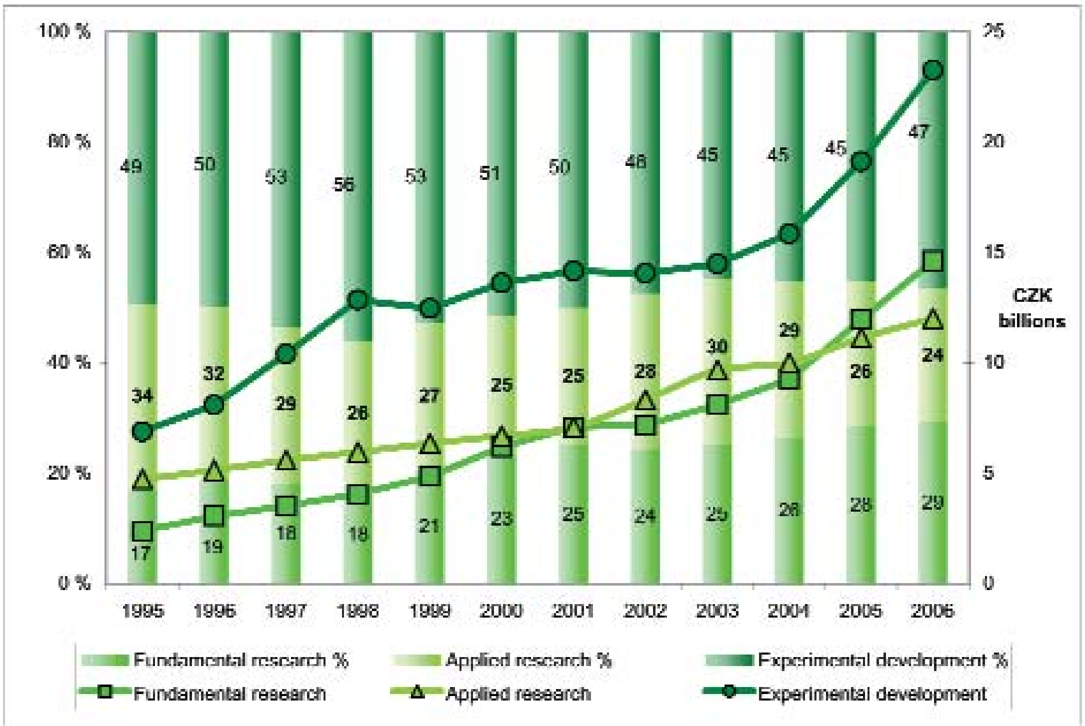
Note: The figures for 2007 and 2008 do not include expenditure covered under foreign programmes.

The major part of funds used as State aid for R&D is provided in the form of either targeted or institutional subsidies. A less proportion of targeted aid is granted through public contracts.

Targeted R&D aid is granted within the scope of calls for research project proposals seeking support under applied research programmes with specifically defined objectives and a specific focus, or under grant projects covering a wide range of disciplines, where fundamental research predominates.

Much of the institutional support available is provided to deal with the research intentions put forward by larger teams of researchers, or even whole organizations. A lesser degree of institutional support is granted to universities for specific research, i.e. research linked to the teaching of students. Draft research intentions are also evaluated, but the decisions on financial assistance are based on factors different from those in public tenders. By virtue of the approved R&D&I system reform in the Czech Republic, in the future institutional support will be distributed with consideration for the capability of a research entity to achieve long-term R&D results comparable on an international scale.

A.1.11 Share of fundamental and applied research and experimental development in overall R&D expenditure



Source: Green Paper on Research, Development and Innovation in the Czech Republic, Technology Centre, AS CR, January 2008

Fundamental research encompasses experimental or theoretical work carried out in a bid to find out more about the basics or essence of the phenomena observed, and to explain their causes and possible impacts when the knowledge acquired is put to use, without considering their specific application.

Applied research covers experimental or theoretical work carried out with a view to gaining new knowledge focusing on future practical application. The results of applied research are directed towards a specific and practical objective.

Experimental development is characterized as the systematic creative application of research observations or other initiatives for the production of new or improved materials, products or equipment, or for the introduction of new or improved technologies, systems and services, including the acquisition and verification of prototypes, pilot production or demonstration equipment.

The main attribute of Czech fundamental research is excellence, whereas applied research is characterized by its close links to the business sector, ensuring that R&D results can be put into use immediately. Permanent contact between research and the application sphere is ensured by the intensive mobility of researchers between enterprises and research organizations; this helps the research sector grasp the needs of businesses and reinforces the transfer of knowledge and new technologies to businesses.

In the Czech Republic, the share of fundamental research in overall R&D expenditure in 2006 was just short of 30% of total expenditure, which is more than the average reported by EU

Member States. In addition, the share of fundamental research in overall R&D expenditure has risen slightly in the last few years.

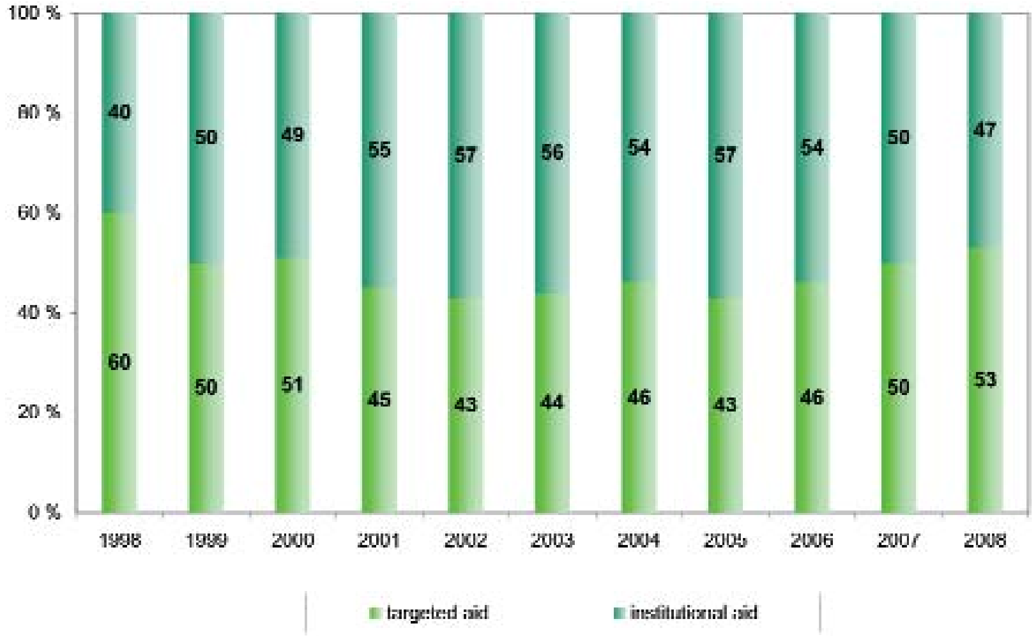
The share of applied research in overall R&D expenditure has been lower than the share of fundamental research in recent years (in the EU-25, the USA and Japan the reverse is the case). The support poured into applied research in the Czech Republic has declined since 2003, and in 2006 only 24% of overall R&D expenditure was devoted to applied research. The low share of applied research is obvious not only in research conducted in the public sector, higher education and further education, but also in research and development within the business sector. Statistics show that, in the last few years, the share of applied research in all sectors of implementation has declined moderately (more detailed information can be found in the analysis of research in individual sectors of implementation).

The share of experimental development in overall R&D expenditure in recent years has risen slightly, and in 2006 expenditure here accounted for close to 47% of overall R&D expenditure (GERD) in the Czech Republic. Experimental development prevails in the business sector in particular.

This research structure, which to a certain extent is an adverse factor, could reflect negatively on the development of the knowledge-based economy. The prevalence of expenditure on fundamental research and the lower share of expenditure on applied research could, for instance, be one of the reasons for poor efficiency in the commercialization of research results (the low patent activity and the scarcity and obsoleteness of applied observations appropriate for practical use). The low share of applied research in the business sector (the prevalence of experimental development) and in the public sector (the predominance of fundamental research) could reflect, inter alia, the lack of interest between the business and public sector in collaborating on avenues of research.

A host of institutions are geared towards both fundamental and applied research, but the results reported are predominantly from fundamental research. In fields drawing on patent protection for the outputs of applied research (e.g. technical sciences, with the exception of information technology), the country is clearly lagging behind the overwhelming majority of EU-27 countries. The presentation of results in the proceedings of regional conferences is hardly a suitable output for applied research.

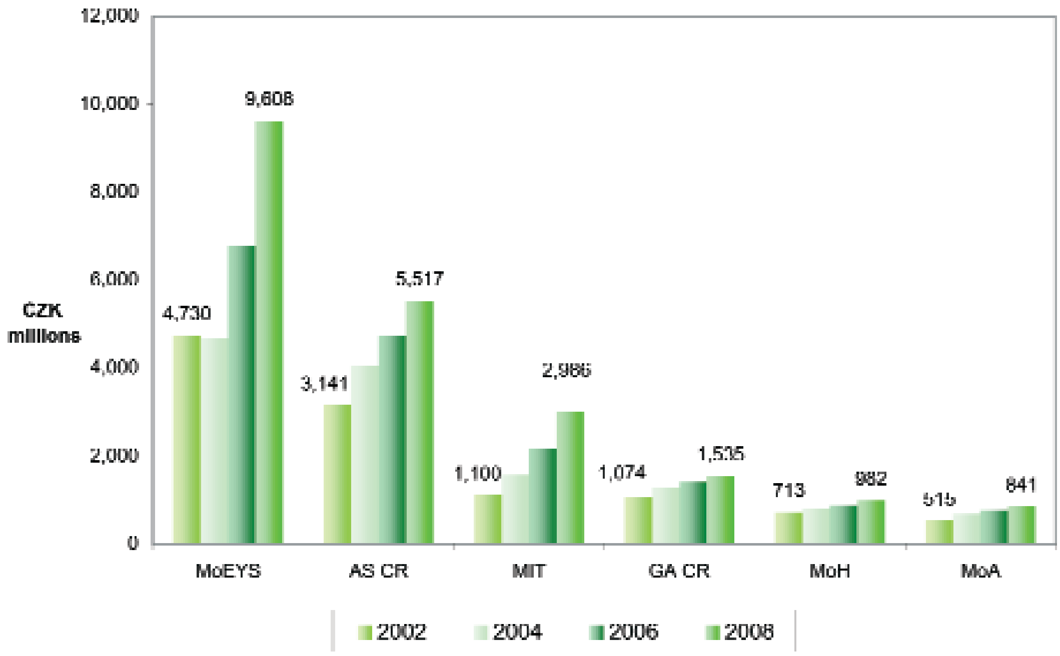
A.1.12 R&D expenditure – targeted and institutional support in the Czech Republic



Source: R&D appropriations in the national budget of the Czech Republic, 2008

In 1998, the share of targeted support in total State aid was relatively sound (60%). Between 1999 and 2002, it dwindled to 43%. In 2002, the Research and Development Council set a target of a steady rise in the share of targeted support at the expense of institutional support. It is feasible that the ratio of 60:40 from 1998 will be restored in 2010. The reform of the R&D&I system and the new concept of specific research are factors that will further this progress.

A.1.13 Developments in R&D support from the public purse among selected providers



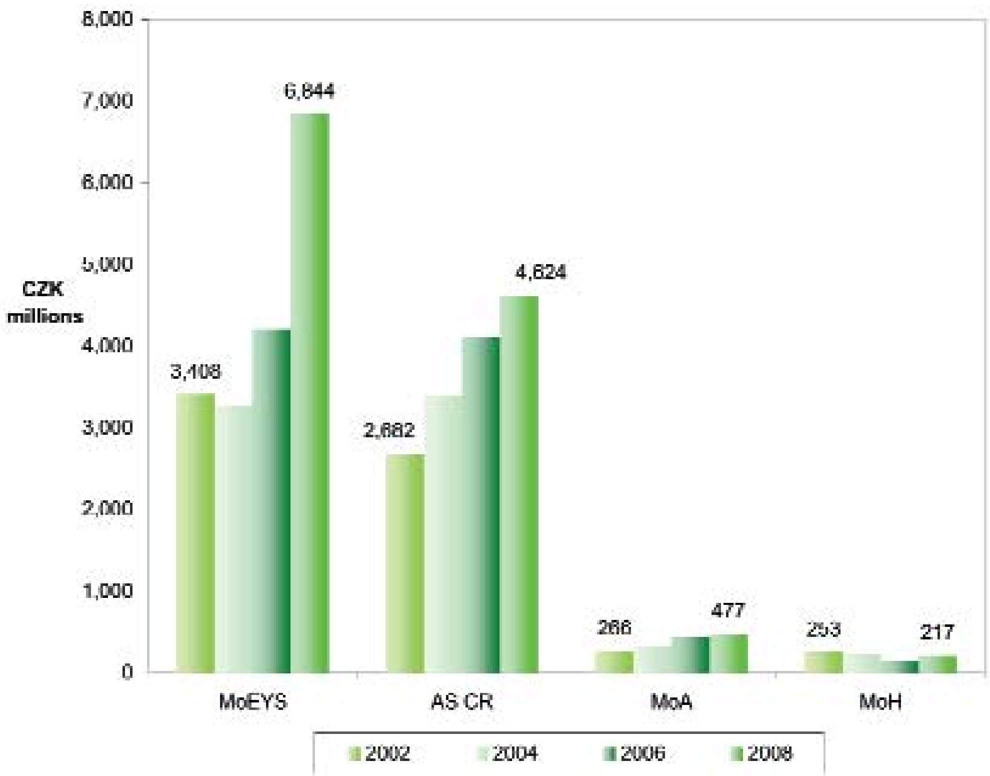
Source: national budget of the Czech Republic, 1998–2008

State aid for R&D in the Czech Republic comes from the budget headings of 21 providers – ministries, central bodies of state and public administration, the Academy of Sciences of the Czech Republic (AS CR), and the Czech Science Foundation (GA CR). The largest providers are the Ministry of Education, Youth and Sports (MoEYS), the AS CR, the Ministry of Industry and Trade (MIT), the GA CR, the Ministry of Health (MoH) and the Ministry of Agriculture (MoA). These six largest providers account for approximately 90% of total R&D State aid earmarked for R&D expenditure in the Czech Republic in the monitored years.

The rise in overall assistance provided by the MoEYS to a level more than double in 2008 what it was in 2002 can be attributed to the increase in resources intended for the co-financing of EU Structural Funds. The volume of these resources is almost CZK 1,378 million.

Total expenditure in the reporting period went up by 84%; of this, R&D support granted by the MIT nearly tripled, and AS CR assistance increased by 75%. Aid from the MoA (67%), GA CR (43%) and MoH (37%) rose at the slowest pace.

A.1.14 Institutional support of R&D among selected providers

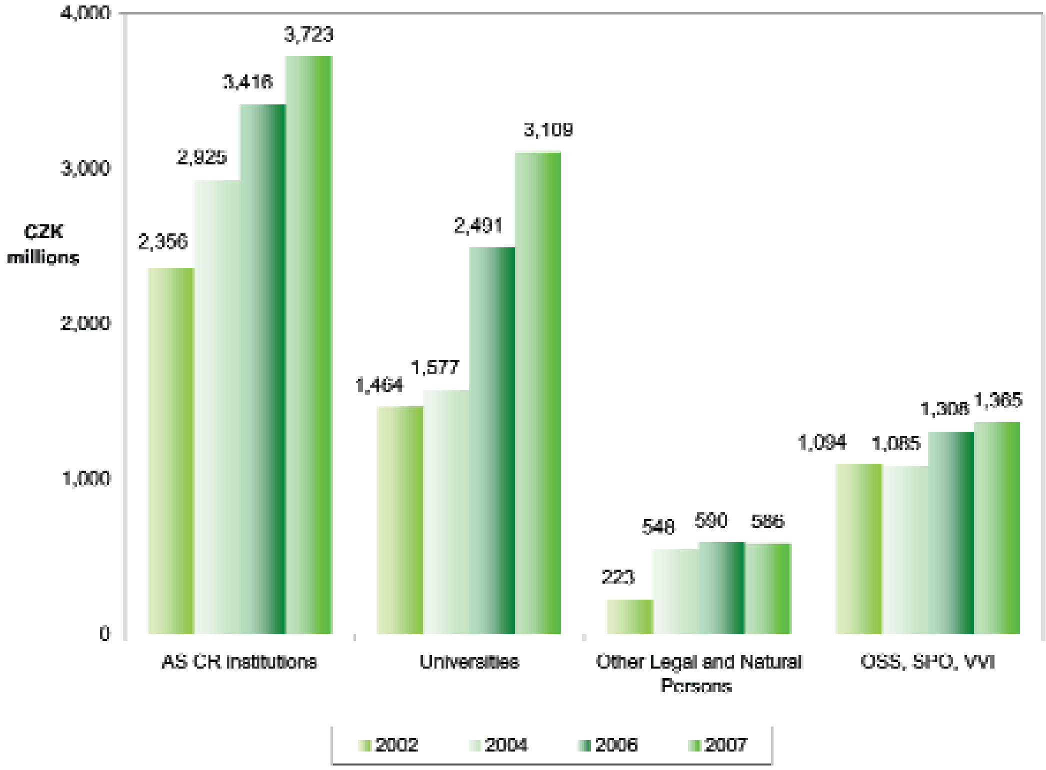


Source: R&D IS, Central Register of Research Intentions (CEZ)

The largest providers of institutional support in the Czech Republic are the MoEYS and AS CR. The MoEYS inter alia finances the research intentions of universities, specific research at universities and the research intentions of selected legal persons who fulfil the conditions laid down in Act No 130/2002 on aid for research and development.

The AS CR funds the research intentions of centres transformed into public research institutions in 2007. In the years analysed, the MoEYS and AS CR distributed more than 80% of total institutional support for R&D in the Czech Republic. The remainder comes from the MoH, the MoA and several other ministries and central bodies of state and public administration.

A.1.15 Use of institutional support for R&D among groups of beneficiaries



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

In the R&D IS, groups of State aid beneficiaries are registered and classified by legal form and founder.

The Institutions of the AS CR include public research institutions set up in accordance with Act No 341/2005 (the founder is the AS CR).

The group of Universities encompasses public universities set up in accordance with Act No 111/1998, state universities set up by the state, and private universities set up by legal or natural persons.

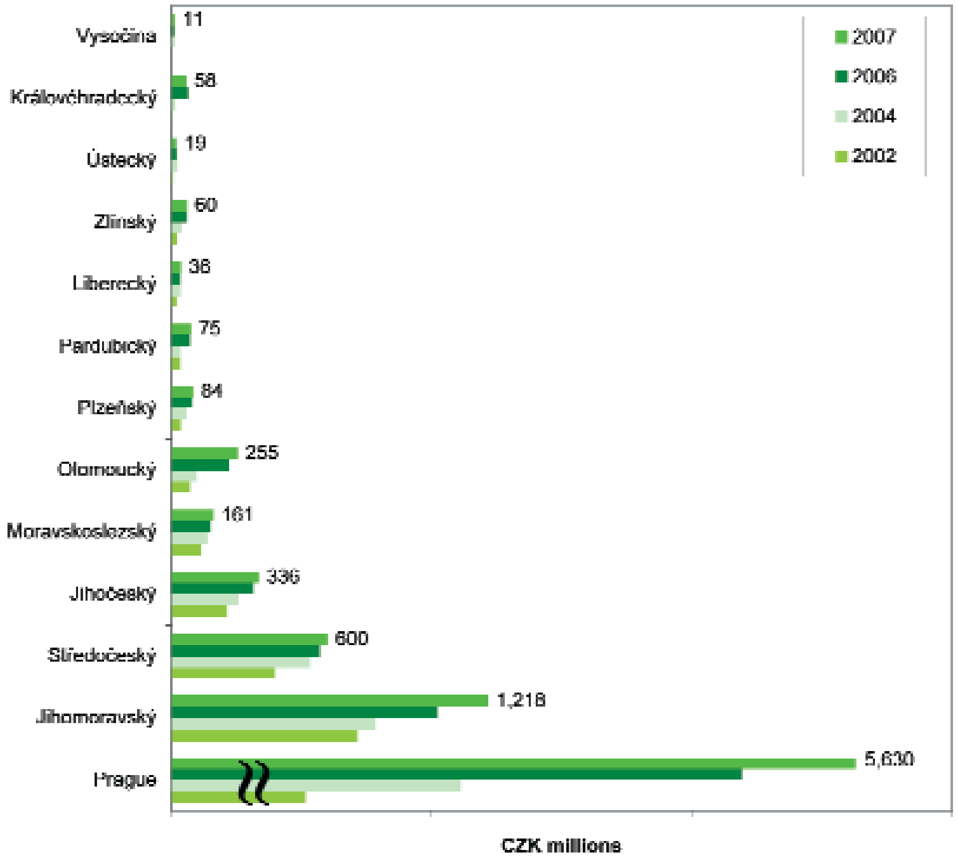
OSS, SPO, VVI[1] – this group comprises state organizations partly funded from the public purse (SPO), organizational units of the state (OSS) and public research institutions (VVI) set up in accordance with Act No 341/2005, apart from AS CR institutions.

The category of Other Legal and Natural Persons comprises individuals and institutions that are not classified under any of the groups above (e.g. public limited companies, limited liability companies, public benefit companies, foundations, civic associations, etc.).

The difference between the amount of institutional support recorded in the R&D IS (CEZ) and the appropriations from the national budget for the AS CR comprises resources for AS CR activities in accordance with Section 3 of Act No 130/2002; in particular, this includes building investments, the cost of operating the AS CR Office and the centrally managed joint activities of all centres (e.g. foreign contact under inter-academic agreements, the provision of shared computer networks, and the public services of the AS CR library).

[1] Where an organization became a public research institution in 2007, it is reported under this group of beneficiaries in the graphs for the whole of the monitored period.

A.1.16 Institutional support of research by regions



Source: R&D IS, Central Register of Research Intentions (CEZ)
Note: CZK 106 million in 2002 and CZK 96 million in 2004 for classified plans of the Ministry of Defence were added to the institutional support of the City of Prague.

In the Czech Republic, institutional support is concentrated in three regions: the City of Prague, Jihomoravský region and Středočeský region, i.e. the two largest centres (Prague, Brno) and their backdrop. These three regions take up a share of institutional support granted to beneficiaries for research intentions amounting to almost 88% of the total amount of aid, resulting in extreme regional disparities. The Karlovarský region, on the other hand, has no institutional support.

Notable differences exist in R&D aid in all EU countries. In the ERGO periodical of the AS CR Technology Centre, regional disparities in EU innovative potential are assessed by reference to data from the statistical yearbook EU Regions 2006. Of the five regions reporting the highest R&D expenditure, three are German; of the five regions with the lowest expenditure, three are Polish.

In the Czech Republic, Středočeský region is among the twenty regions with the highest R&D expenditure (3.49% of GDP in 2004). However, the Czech Republic figures among the five countries with the most sizable disparities in expenditure between regions (the greatest differen-

ce is between the Středočesko (Central Bohemian) region and the Severozápad (Northwest) region. The largest disparity of all is reported by Germany (the Braunschweig region – 8.7% of GDP, versus the Wese-Ems region – 0.65% of GDP).

Table A.2 details the numbers of regions in the EU-27 compared in this analysis (the overall numbers and numbers where the per capita GDP is higher or lower than the EU-27 average).

Table A.2 NUTS2[2] regions with the highest and lowest R&D expenditure

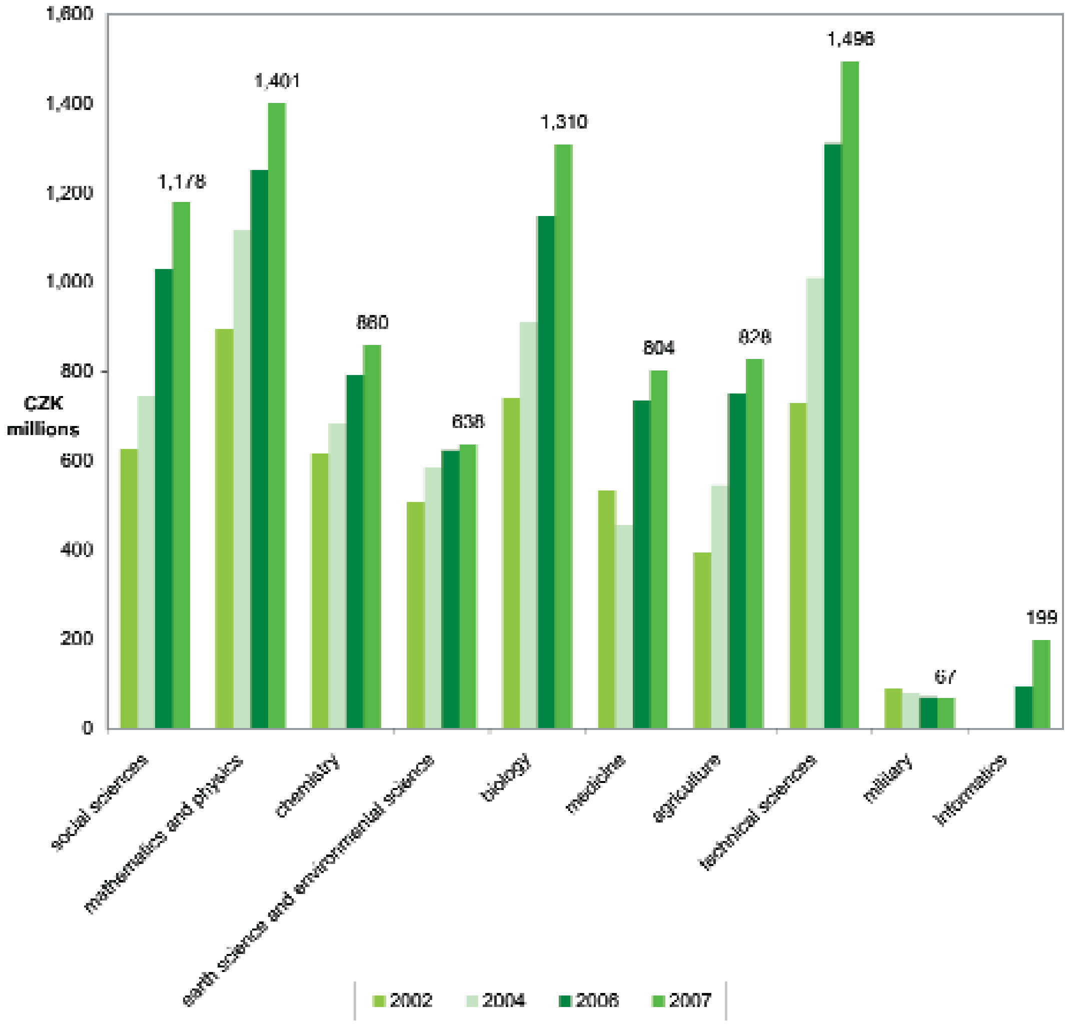
Regions with the highest R&D expenditure	%GDP	Regions with the lowest R&D expenditure	%GDP
Braunschweig (DE)	8.70	Zachodniopomorskie (PL)	0.16
Västverige (SE)	6.03	Aland (FI)	0.16
Stuttgart (DE)	4.66	Opolskie (PL)	0.15
Oberbayern (DE)	4.60	Swietokrzyskie (PL)	0.06
Pohjois-Suomi (FI)	4.60	Severozapaden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

Source: Regionální diference inovačního potenciálu EU [Regional Differences in the EU's Innovative Potential], V. Čadil, ERGO, March 2007, data for 2004.

The mismatch between institutional and targeted aid in the Czech Republic is the result of the uneven distribution of R&D resources and capacities in the Czech Republic. It is established that these mismatches are caused, to some extent, by the different economic and innovation levels in individual regions. Disparities in the levels of economic development between individual regions are typical throughout the EU. In 2004, the average per capita GDP in the EU-27 in purchasing power parity (PPP) was EUR 21,503. In 2004, the City of Prague was twelfth among the EU-27 regions with per capita GDP at 157% of the EU-27 average. The highest level was recorded in Inner London (303% of the EU-27 average) and the lowest was documented in the Romanian region of Vest (39% of the EU-27 average).

[2] NUTS-2 - Nomenclature of Territorial Units for Statistics. Level '2' indicates associated regions; in the Czech Republic these are the highest territorial administrative units.

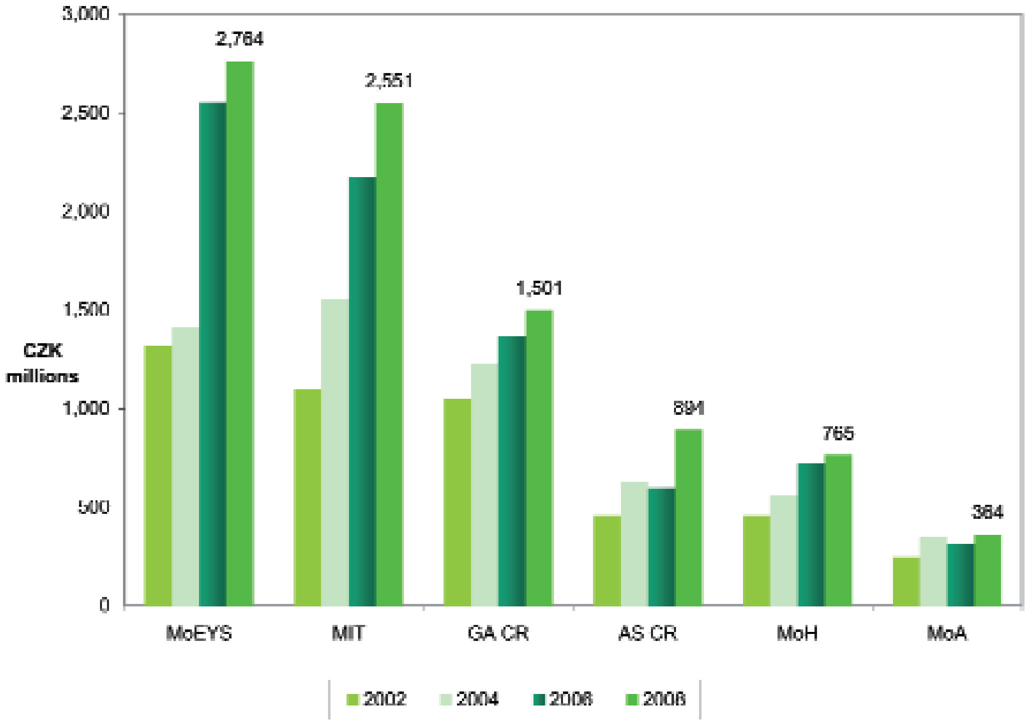
A.1.17 Institutional support for research intentions by discipline



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

Graph A.1.17 indicates expenditure on the institutional support of research intentions among the principal groups of disciplines monitored in the R&D information system. The years evaluated are 2002, 2004, 2006 and 2007. Apart from the military discipline, institutional support of research intentions in 2007 rose among all groups of disciplines compared to the support provided in 2002. The highest growth was in agriculture (by 52.4%), technology and engineering (51.2%) and social sciences, where there was 46.7% growth compared to 2002.

A.1.18 Targeted R&D support among selected providers

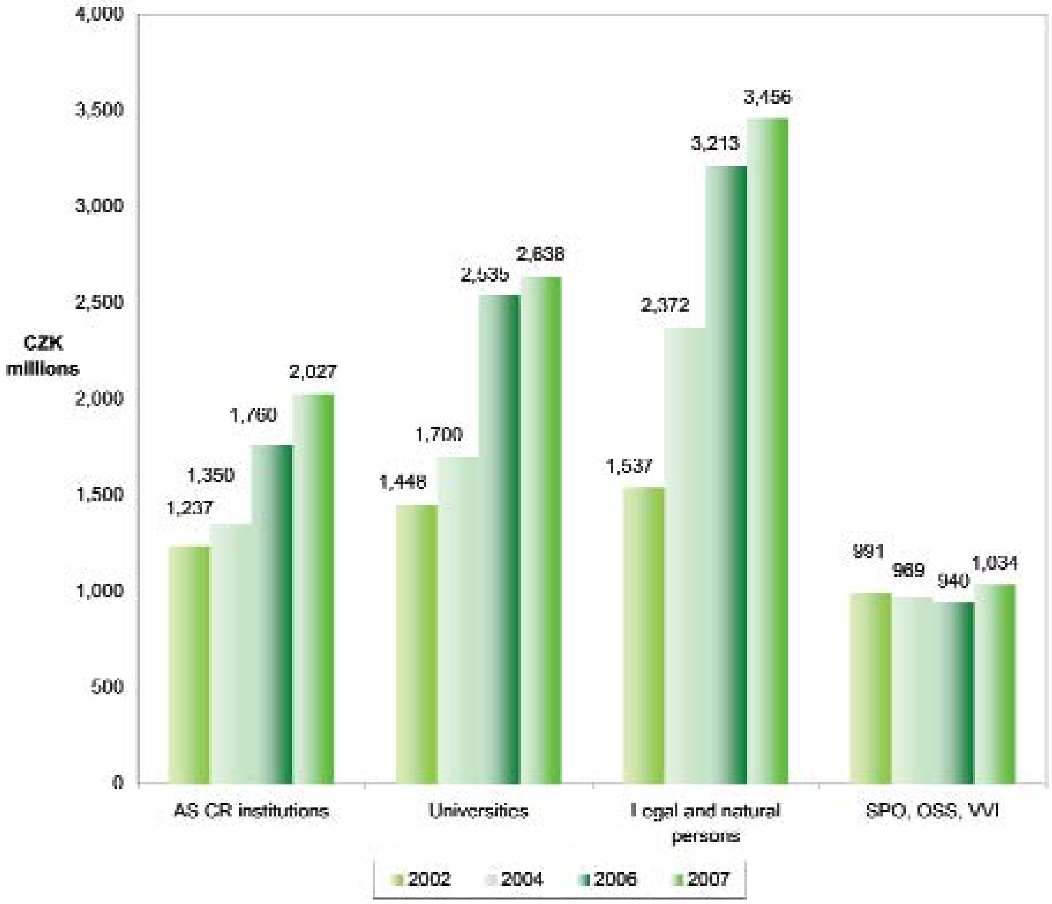


Source: national budget of the Czech Republic, 2002–2008

The MoEYS, MIT and GACR provide more than a billion crowns in targeted aid every year.

The six largest providers of targeted aid (the AS CR, GA CR, MoEYS, MIT, MoH and MoA) disburse approximately 73% of all targeted aid every year. The remaining 27% comes from other ministries and central bodies of state and public administration.

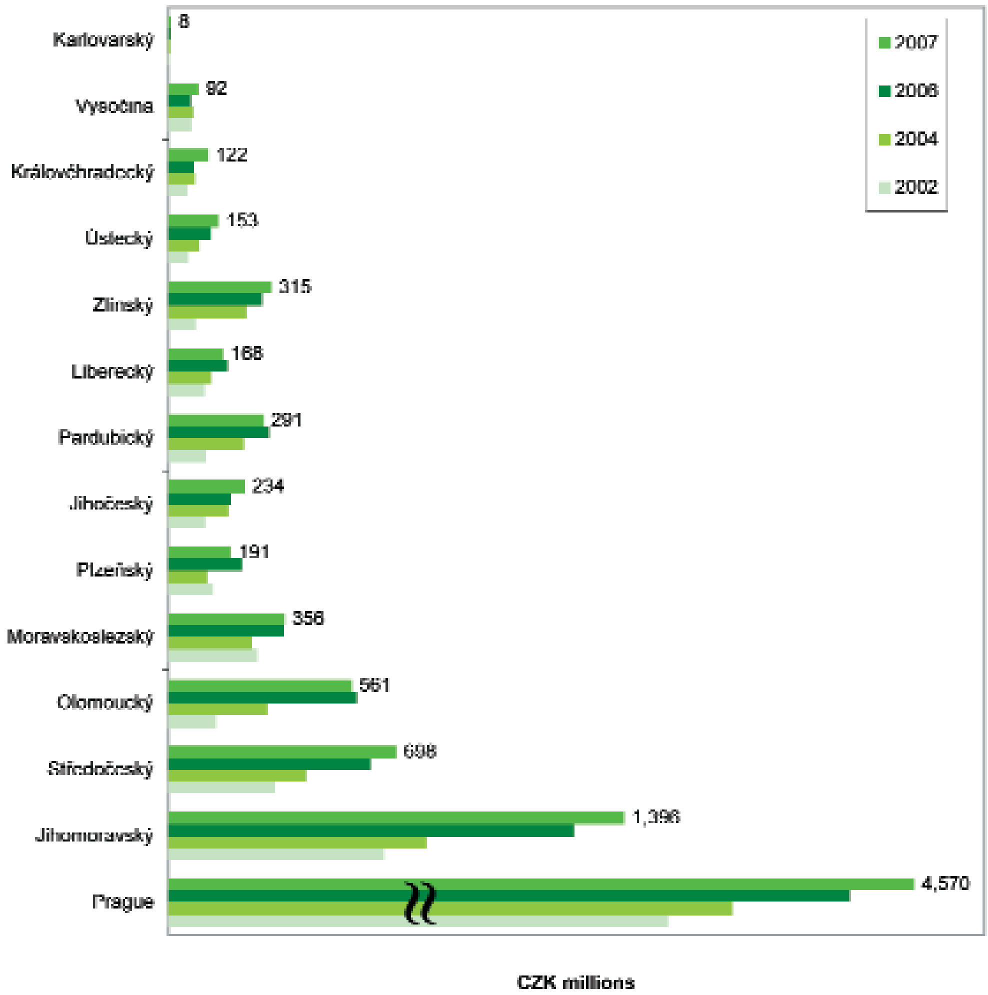
A.1.19 Use of R&D targeted support in individual groups of beneficiaries



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

In the Czech Republic, the highest growth dynamism in the use of targeted resources can be found among 'other legal and natural persons'. The figure has more than doubled over a period of five years, which is quite remarkable. The growth of targeted support for universities (both state and private) is consistent with R&D development at universities and the increasing capacities if universities.

A.1.20 Targeted R&D support by regions



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

Again, there is an extreme concentration of targeted R&D support in the capital. This can be attributed not only to the advantages offered by Prague as an agglomeration, but also, and in particular, it can be put down to the fact that all research institutions and individuals who could draw on these resources are located here. The following table offers a comparison of how the shares of institutional and targeted aid of the City of Prague and the largest provincial users have evolved.

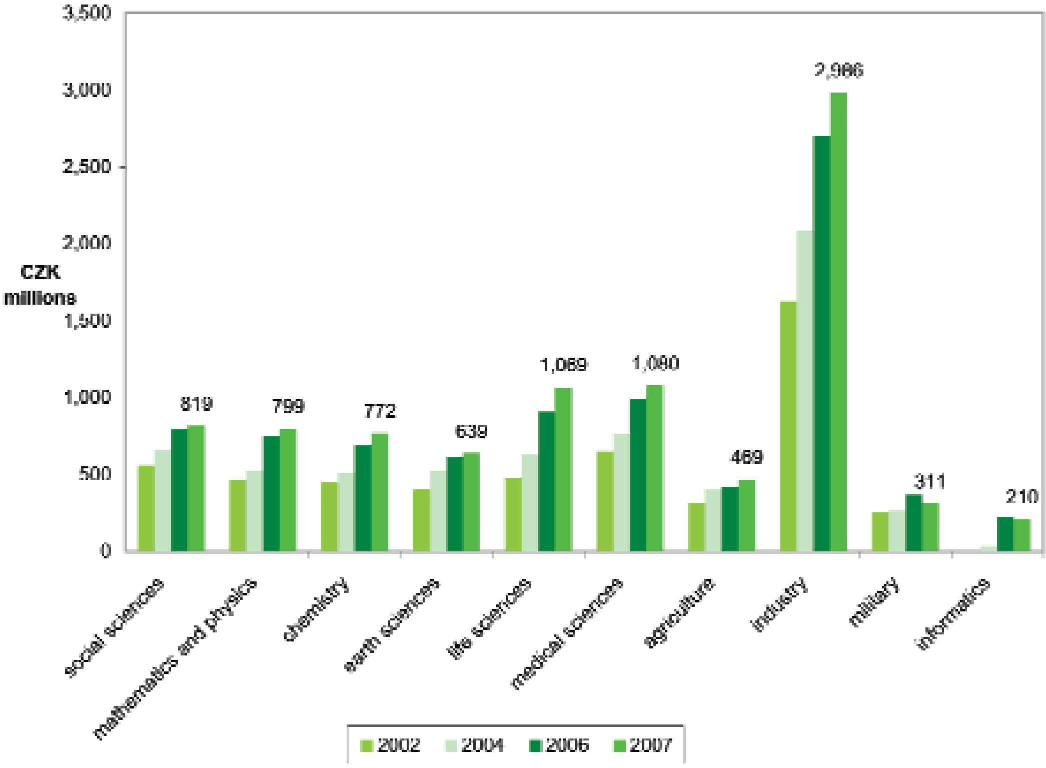
Table A.3 Comparison of developments of shares in overall institutional and overall targeted aid for R&D among regions

Regions	2002	2004	2006	2008
Institutional R&D support (%)				
City of Prague	68.4	67.0	66.5	67.0
City of Prague, Jihomoravský region and Středočeský region	90.0	88.5	86.9	87.8
Targeted R&D support (%)				
City of Prague	58.4	54.0	49.4	49.4
City of Prague, Jihomoravský region and Středočeský region	77.6	73.0	71.5	72.7

Source: R&D IS, Central Project Register (CEP), Central Register of Research Intentions (CEZ)
Note: The aid for the classified research intentions of the Ministry of Defence in individual years is added to the institutional support of the City of Prague.

Shares in the overall targeted R&D support in the City of Prague and in the three regions with the highest uptake of R&D aid are lower than for institutional support. The share of institutional support used in the City of Prague is more or less constant, while targeted support in the capital is dropping in relative terms. Despite this, targeted support is regionally concentrated to a significant degree and is out of step with the need to develop competitiveness and innovation in the regions.

A.1.21 Targeted support for R&D projects by discipline



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

Combined with the absolute rise in the volume of targeted aid, there was a logical increase in the volume of funds in the individual disciplines, but with varying levels of momentum. The most striking relative growth was reported in biology (in 2007 there was 55% more funding than in 2002). In terms of absolute financial volume, the field which saw the biggest rise was technology and engineering, which was already well ahead of the other disciplines in 2002.

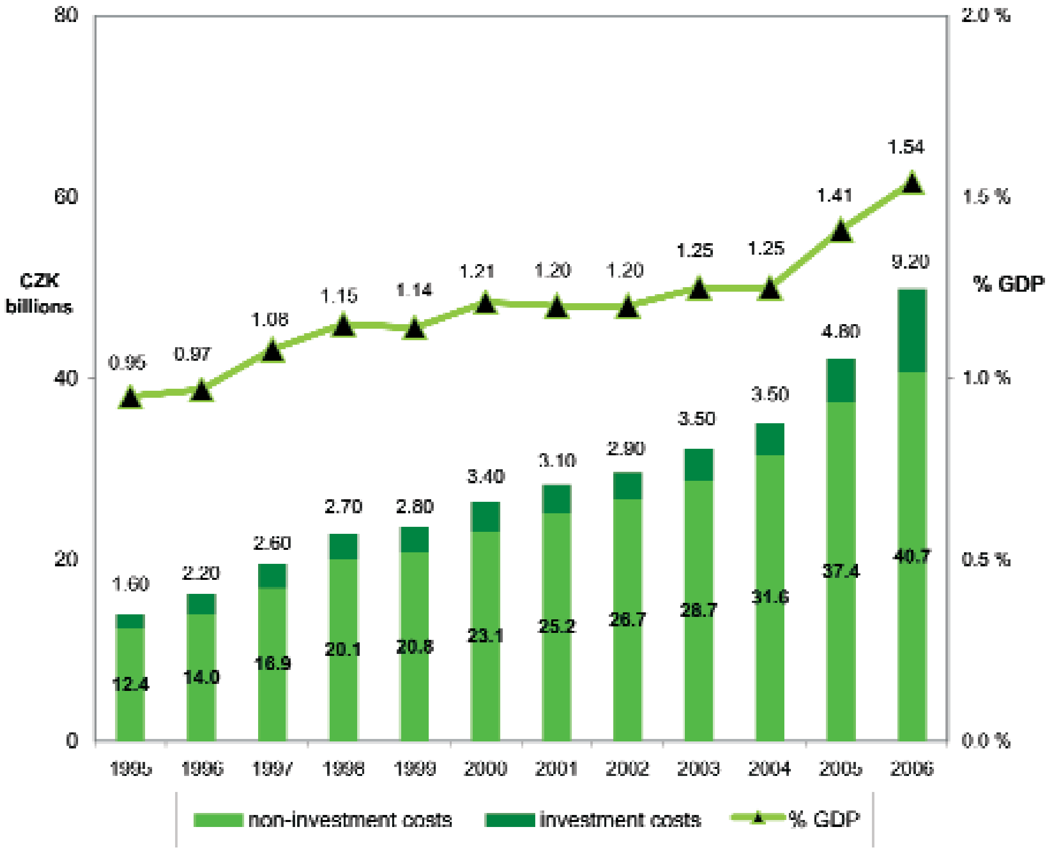
Table A.4 Shares of aid for the individual groups of disciplines

Discipline	Institutional aid(%)	Targeted aid(%)	Total aid(%)
social sciences	13.4	8.9	11.2
mathematics and physics	15.9	8.7	12.3
chemistry	9.8	8.4	9.1
earth science	8.0	6.9	7.5
life sciences	14.9	11.7	13.3
medical science	9.2	11.8	10.5
agriculture	9.4	5.1	7.3
industry	17.0	32.6	24.8
military	0.8	3.4	2.1
informatics	2.3	2.3	2.3

The data are for 2006. In the Czech Republic, the highest share of overall aid (whether institutional support of of research intentions or targeted support of research projects) was in engineering, which attracted almost a quarter of all State aid.

Very low shares (institutional, targeted and overall support) are reported in informatics, which can be explained up to a point by the fact that in the Czech Republic this field, unlike in other countries, is grasped and reported more as engineering. The relatively low support of IT projects is inconsistent with the trend of priorities for this area mentioned in EU documents.

A.1.22 Total R&D expenditure by cost type



Source: CZSO, Annual Statistical Survey on Research and Development (VTR 5-01)

Non-investment costs encompass wages and salaries, including other staff costs (OON) and other non-investment costs.

Investment costs encompass the cost of acquiring land, buildings, structures, machinery, apparatus and equipment, including software.

In 2006, in the structure of overall R&D expenditure in the Czech Republic, non-investment (current) costs took up 81.5% (CZK 40.7 billion) and investment costs 18.5% (CZK 9.2 billion). Just under half (42.3%) of current R&D expenses comprised wages and other staff costs (CZK 17.2 billion).

R&D-related wages and salaries rose by an average of 15% over the last five years. Under investment costs, the largest item was the acquisition of machinery, apparatus and equipment, including software designed for research and development (91.9%).

Table A.5 Non-investment and investment R&D costs in the Czech Republic

	2000			2002			2004			2006		
	MCZK	**%**	**index**	**MCZK**	**%**	**index**	**MCZK**	**%**	**index**	**MCZK**	**%**	**index**
Non-investment	23,066	87.1	100	26,663	90.2	115.6	31,617	90.1	137.1	40,692	81.5	176,4
wages	7,662	28.9	100	9,570	32.4	124.9	12,705	36.2	165.8	17,199	34.5	224,5
other	15,405	58.2	100	17,093	57.8	111.0	18,912	53.9	122.8	23,493	47.1	152,5
Investment	3,421	12.9	100	2,890	9.8	84.5	3,466	9.9	101.3	9,208	18.5	269,2
buildings and structures	402	1.5	100	339	1.1	84.2	545	1.6	135.6	748	1.5	186,3
apparatus and equipment	3,019	11.4	100	2,551	8.6	84.5	2,921	8.3	96.8	8,460	17.0	280,2
Total expenditure	26,487	100	100	29,552	100	111.6	35,083	100	132.5	49,900	100	188,4

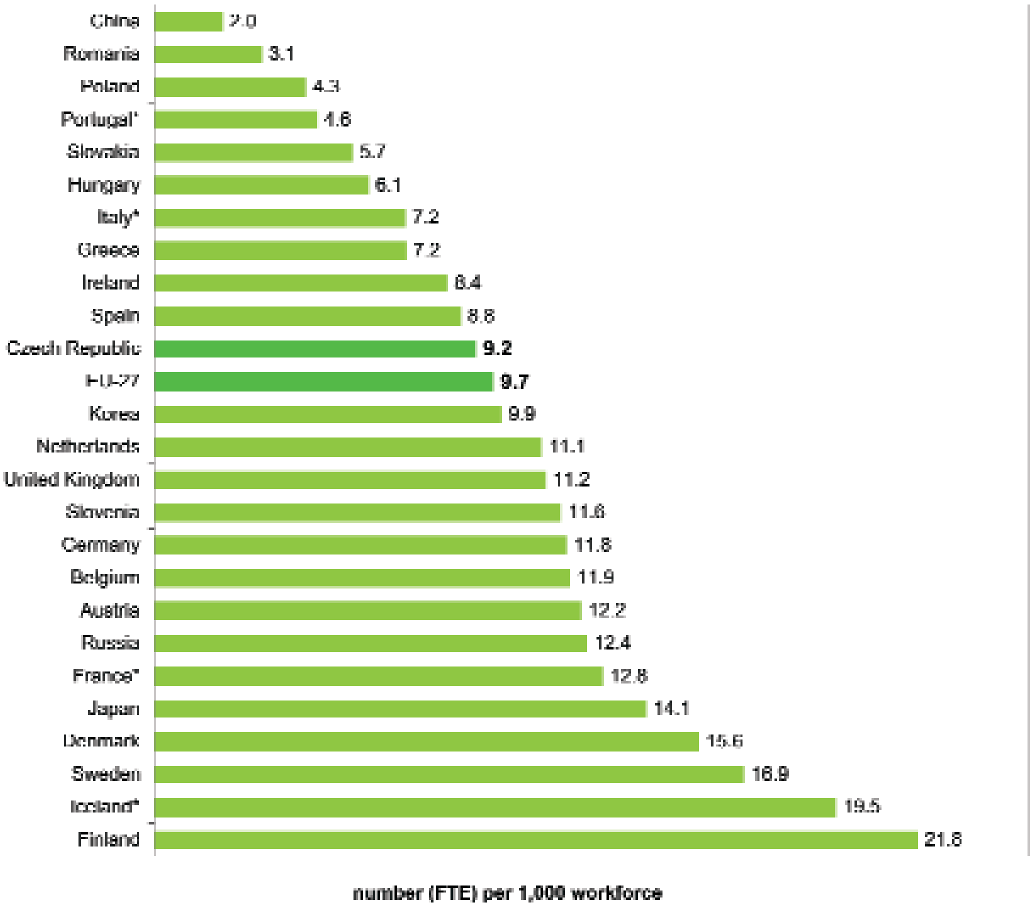
Source: CZSO, Annual Statistical Survey on Research and Development (VTR 5-01)

The share of non-investment costs in overall R&D expenditure in 2000-2005 hovered around 90%. In 2006, there was a relatively marked rise in the share of R&D investment costs, notably in the business sector (investment in machinery, apparatus and equipment).

The share of wage costs in the monitored period rose moderately; from 2003 it exceeded one third of overall internal R&D expenditure.

A.2 Human resources in R&D

A.2.1 Number of R&D personnel



Source: OECD, Main Science and Technology Indicators, 2008/1, EUROSTAT, May 2008, additional CZSO calculations, figures for 2006

Note: with countries marked with an asterisk the data are for 2005
FTE – R&D full-time equivalent

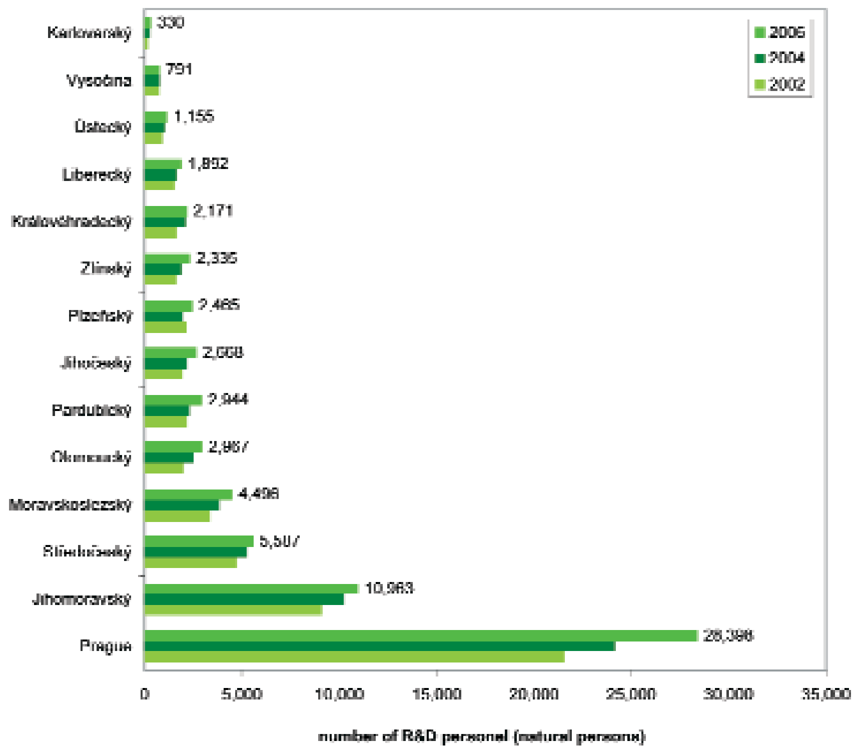
R&D employees are monitored by means of two baseline indicators. The registered number of employees includes all R&D employees irrespective of whether they are full- or part-time workers. The FTE indicator of R&D employees offers the most precise picture regarding the actual time spent on R&D activities among employees in the field of research. One FTE is tantamount to one year's work by an employee devoted 100% to R&D activities. Among employees who are also involved in other activities, only the time they actually spend on R&D is counted. In the Czech Republic, between 2004 and 2005 there was a change in the methodology used for FTE conversions, resulting in a relatively high rise in the indicator values between 2004 and 2006.

According to the OECD definition in the Frascati Manual, R&D personnel are researchers carrying out research directly, technicians, administrative staff and other workers at research cent-

res in individual organizational units. R&D personnel also include employees who procure direct services for research purposes, e.g. R&D managers, administrative officials, and secretaries.

With 9.2 (FTE) persons employed in R&D per 1,000 members of the workforce, in 2006 the Czech Republic was almost level with the EU-27 average (9.7). The values of this indicator in other new Member States, with the exception of Slovenia (11.6), were well below the EU-27 average (Hungary – 6.1, Slovakia – 5.7, Poland – 4.3). In the global comparison, the countries at the bottom of the chart are China (2.0), Mexico (2.1) and Turkey (2.2). The highest values were achieved by the Scandinavian countries (Finland – 21.8, Iceland – 19.5, Denmark – 15.6) and Japan (14.1).

A.2.2 Developments in the number of R&D personnel by regions

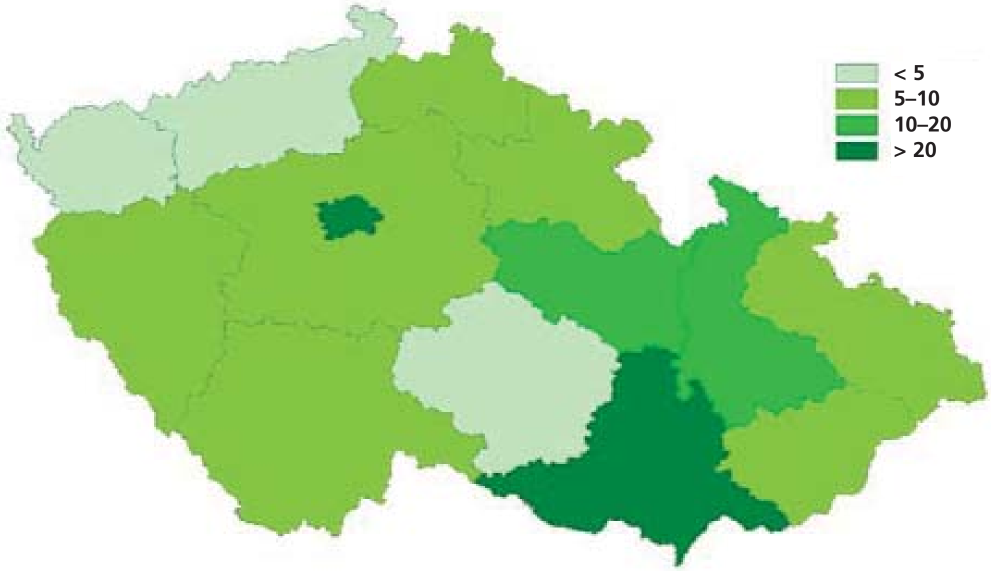


Source: CZSO, Annual Statistical Survey on Research and Development (VTR 5-01)

Most persons employed in R&D (natural persons) are concentrated in Prague and the south Moravian region Jihomoravský region. In 2006, almost 29,000 persons were employed in this field in Prague.

Since 2002, the number of these employees has risen in Prague by close to 7,000. In Jihomoravský region, 11,000 people were working in R&D in 2006; the growth compared to 2002 was almost 2,000 employees. In 2006, a relatively high number of R&D personnel could also be found in the Středočeský region (5,587) and in the Moravskoslezský region (4,496). In other regions, the number of employees in this field ranged between one and three thousand. The exceptions were Vysočina and Karlovarský region, each with fewer than a thousand people working in research.

A.2.3 Share of R&D personnel in regions

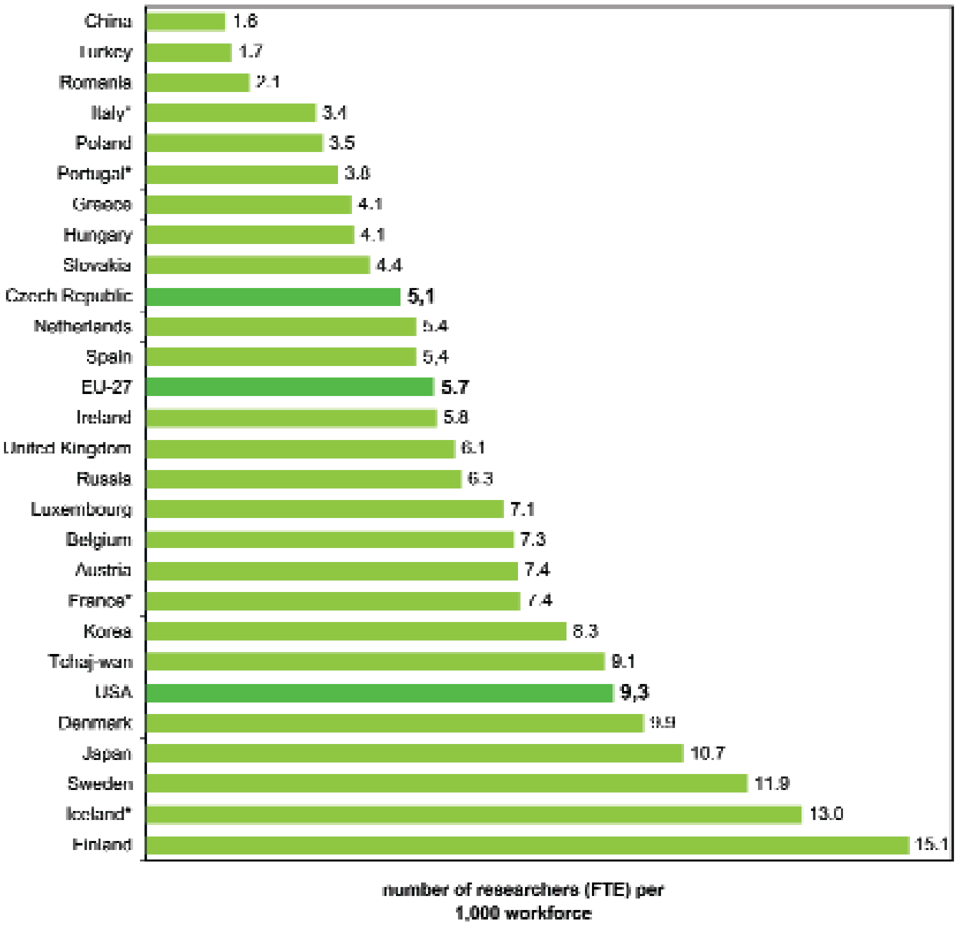


natural persons per 1,000 employees in the region

Source: CZSO, Annual Statistical Survey on Research and Development (VTR 5-01)

It is evident from the cartogram that, as with the number of R&D personnel (natural persons), the number of R&D personnel per 1,000 employees is highest in Prague. In 2006, 45 persons per 1,000 employees were employed in research and development in the capital. Jihomoravský region came second in this category, with 21 R&D personnel per 1,000 employees. The lowest values are reported in regions which have the fewest employees in research and development, i.e. Karlovarský region, Ústecký region and Vysočina. In these places, approximately three persons per thousand employees work in research and development. In all other regions, the number of research and development personnel per thousand employees is between 8 and 12.

A.2.4 Number of researchers



Source: OECD, Main Science and Technology Indicators, 2008/1, EUROSTAT, May 2008, additional CZSO calculations, figures for 2006

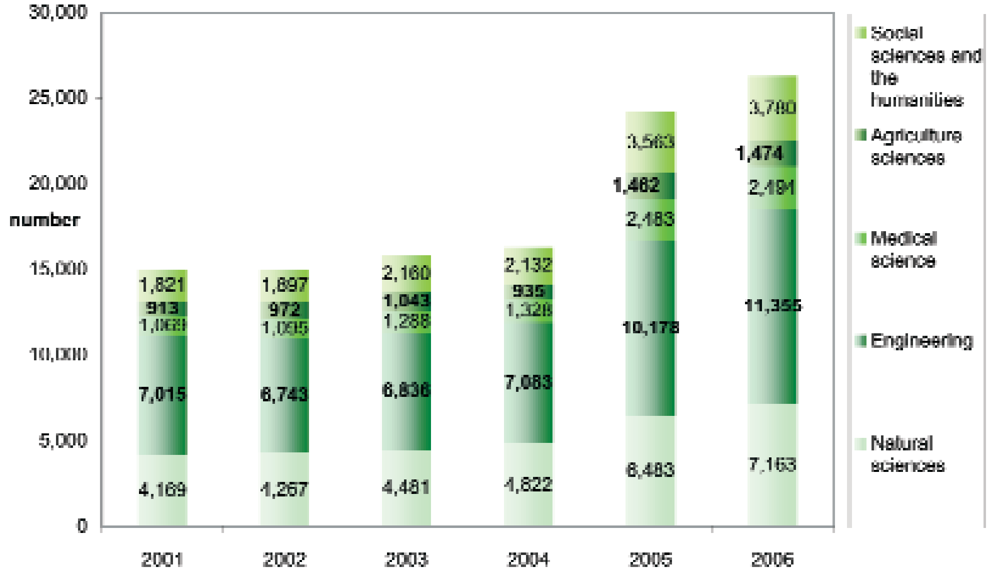
Note: with countries marked with an asterisk the data are for 2005.

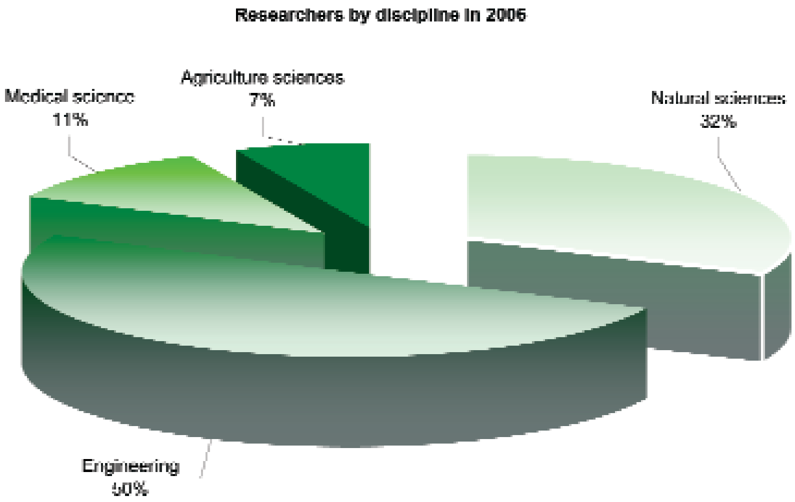
Researchers are persons addressing the concept or creation of new knowledge, products, processes, methods and systems, or managing such projects. Researchers are the most important group of R&D personnel. The most commonly used indicator for international comparisons of the number of human resources in R&D is the number of researchers per 1,000 people in the workforce.

In 2006, the highest number of researchers per 1,000 people in the workforce was reported, as in the case of R&D personnel, in the Scandinavian countries (Finland – 15.1, Iceland – 13.0, Sweden – 11.9). The Czech Republic (5.1) and Slovenia (5.7) achieved values close to the EU-27 average (5.7). The other new Member States were again below the EU-27 average with this indicator (Slovakia – 4.4, Hungary – 4.1, Poland – 3.5).

In the EU-27, researchers accounted for 59% of all R&D personnel. The highest shares of researchers in research personnel were recorded in Korea (84%), Portugal (82%), China (81%) and Poland (81%). In the Czech Republic, 55% of all R&D personnel were researchers.

A.2.5 Researchers by discipline in the Czech Republic

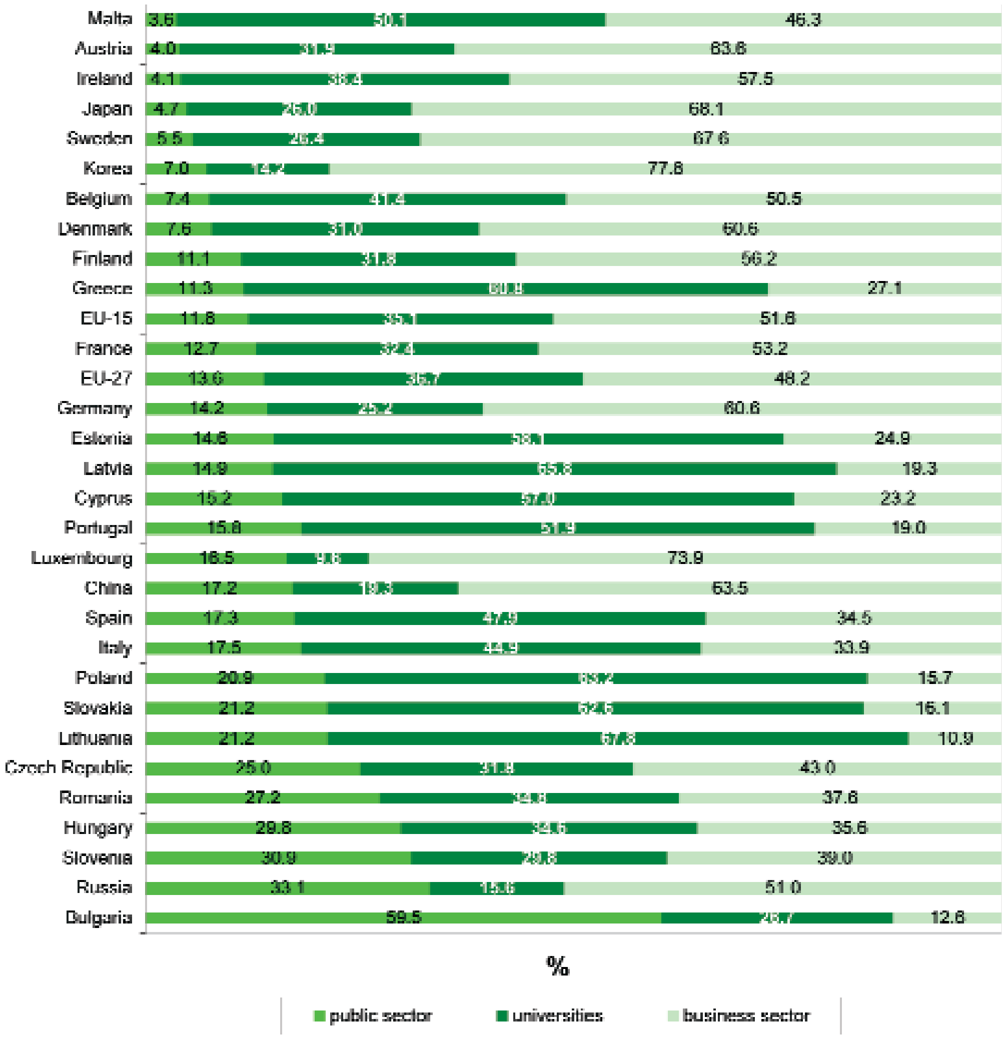




Source: Green Paper on Research, Development and Innovation in the Czech Republic, Technology Centre, AS CR, January 2008

In the Czech Republic, in the long run the highest proportion of researchers has been in engineering (43.2%). The second largest discipline is natural sciences (27.3%), followed by social sciences and the humanities (14.4%), medical science (9.5%) and agricultural sciences (just 5.6%). The highest rise (expressed as a percentage) between 2001 and 2006 was recorded in medical science (by 2.4 bps), followed by social sciences and the humanities (2.2 bps); natural and agricultural sciences dwindled (by 0.5 bps), while the steepest decline was documented in engineering (3.2 bps).

A.2.6 Share of the number of researchers in the public sector, at universities and in the business sector



Source: OECD, Main Science and Technology Indicators, 2008/1, data for 2006
Note: EU-27, France, Italy and Portugal – data for 2005

In 2006, the proportion of the total number of researchers (FTE) in the public sector in Europe was highest in the new Member States (Slovenia – 30.9%, Hungary – 29.7%, the Czech Republic – 24.9%). This is due to the fact that extensive academies of sciences and numerous ministerial research institutions existed in these countries and remain a strong tradition. However, since 2002 this indicator has contracted in these states.

In the EU-27 as a whole, in 2006 13% of all researchers were employed in the public sector. Countries hovering around this average were France (12.6%), Germany (14.2%), Finland (11.1%) and Greece (11.4%). Values markedly lower than the European average were achieved

by Malta, Austria and Ireland, where the share of researchers employed in the public sector was never more than 5%. Of the non-European states, the smallest proportion of researchers in the public sector existed in Japan (5%) and Korea (7%).

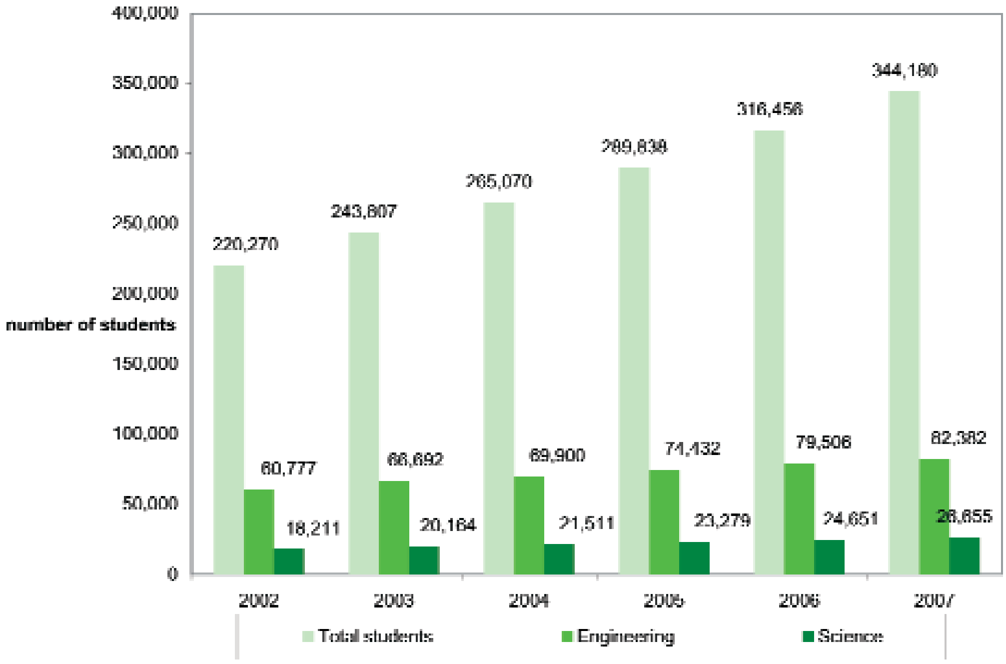
Of the total number of all researchers, the highest proportion of the number of researchers at universities among the monitored countries was reported by Poland and Slovakia. In 2006, a high proportion of researchers in the higher-education sector could also be found in Greece. In 2006, other monitored countries achieved values below the EU average, which stood at approximately 36%. Of all researchers, the lowest proportion of researchers employed in the university sector in 2006 was documented in Germany (25.2%) and Japan (26%). In the Czech Republic, 31.8% of all researchers worked in the higher-education sector in 2006, a moderate increase compared to 2002.

Of the total number of researchers, the highest proportion of the number of researchers operating in the business sector in 2006 could be found in Japan (68.1%). Of the European countries, the highest shares were reported by Luxembourg (73.9%), Sweden (67.6%) and Austria (63.6%). Conversely, the lowest representation of researchers in the business sector existed in the new Member States of Bulgaria (12.6%), Poland (15.7%) and Slovakia (16.1%). The Czech Republic had the highest share of researchers in the business sector of all the new Member States (43.0%). The lower share of researchers in the business sector in former socialist countries is caused by the persistent high proportion of fields of production and services that are not research intensive.

The Commission takes the view that the low share of R&D in the business community compared to the USA and Japan is a major threat to the EU's knowledge economy. A Commission publication[3] of June 2007 states that the more than 85% mismatch between R&D aid intensity in the EU and among its principal competitors is rooted in the difference in R&D financing in the private sector (when the EU is compared with the USA). This can be attributed to the differing structure of businesses and the fact that cutting-edge technology (e.g. in the field of informatics) is less developed in the EU.

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

A.2.7 Number of students registered at universities in the Czech Republic



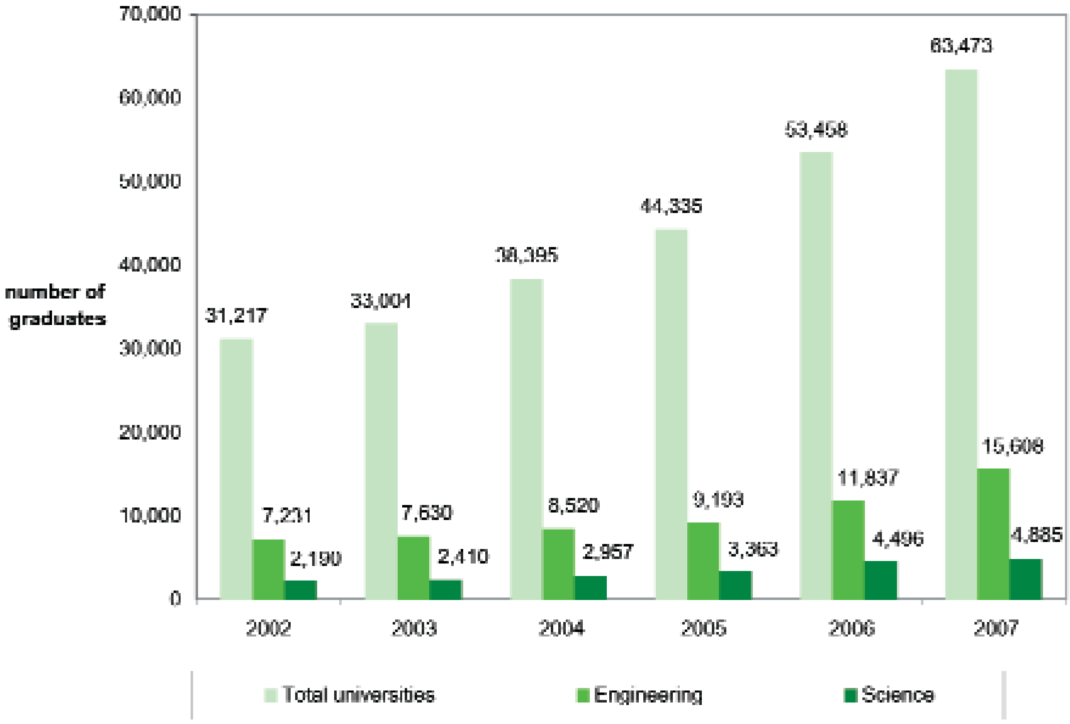
Source: Institute for Information on Education (UIV)
Note: number of students as at 31 December of the calendar year

Higher-education study in the Czech Republic takes place in the context of accredited study programmes. These are bachelor, master and doctoral programmes; students may participate in them as full-time courses, distance learning, or a combination of the two. The study programmes are subject to accreditation granted by the MoEYS.

The total number of students registered in all study programmes (natural sciences, engineering, agricultural and forestry sciences, health, medical science, veterinary science, the humanities and social sciences, economics and jurisprudence, teaching and social welfare, culture and the arts), as reported by the UIV in its statistics, has risen in all the monitored years. In 2007, the total number of registered students climbed to 156.3% of the number of students registered in 2002; there was more dynamic growth among those studying sciences (146.4%) than those studying engineering (135.6%).

The year-on-year increase in the total number of university students in 2006–2007 is not as high as in 2005–2006, and for engineering study programmes is actually appreciably lower (from 6.8% to 3.6%); the rate of increase in the numbers enrolled for sciences went up from 5.9% in 2006 to 8.1% in 2007.

A.2.8 Number of university graduates in the Czech Republic



Source: Institute for Information on Education (UIV)

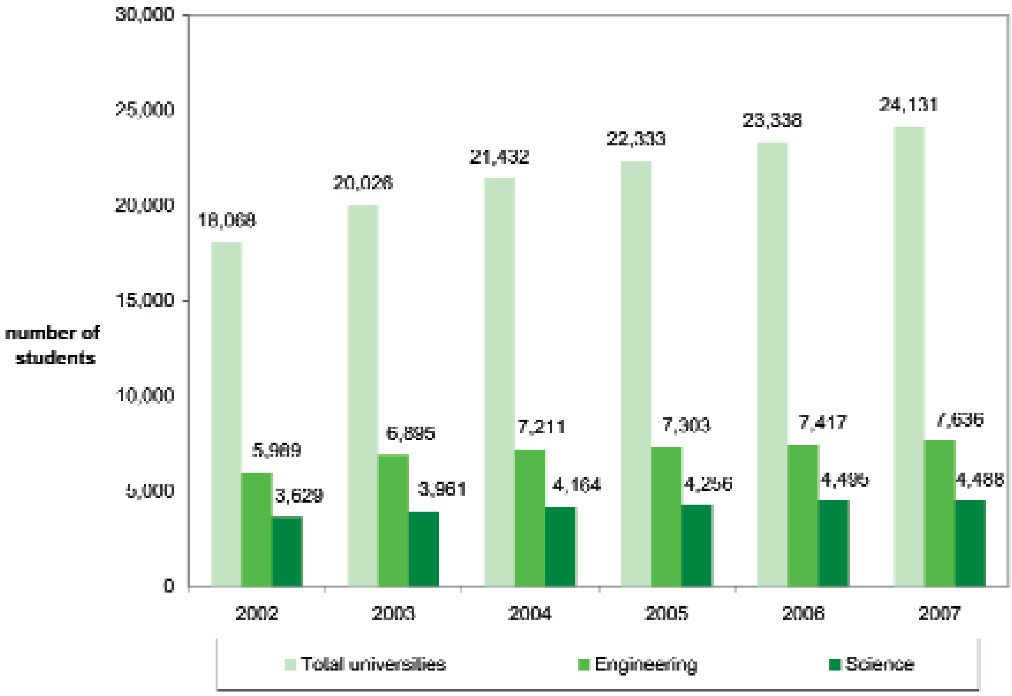
The total number of university graduates in all study programmes in the Czech Republic is steadily rising. Since 2006 there has been growth to 118.7% (108.5% in science programmes and as much as 113.2% in engineering fields).

Even so, we remain a country where only a very low proportion of the population holds a university degree (14% in the 25–34 age category); the gross graduation rate for universities is also one of the lowest among OECD countries.

Promoting interest in science and engineering among young people is a priority of the 'Training for Competitiveness Operational Programme' (under Priority Axis No 2 – Tertiary education, research and development).

Courses in science and engineering need to be aligned with the needs of the individual regions and the Czech business sector, in particular in the field of high-tech and medium high-tech production and KIS (knowledge-intensive services).

A.2.9 Number of students enrolled in doctoral study programmes in the Czech Republic



Source: Institute for Information on Education (UIV)

Doctoral courses aim to guide students towards independent scientific and creative activity in avenues of R&D. Compared to 2006, the number of doctoral students at universities in the Czech Republic has climbed to 103.4%; while the numbers in science programmes have virtually stagnated, engineering subjects have registered growth to 103%.

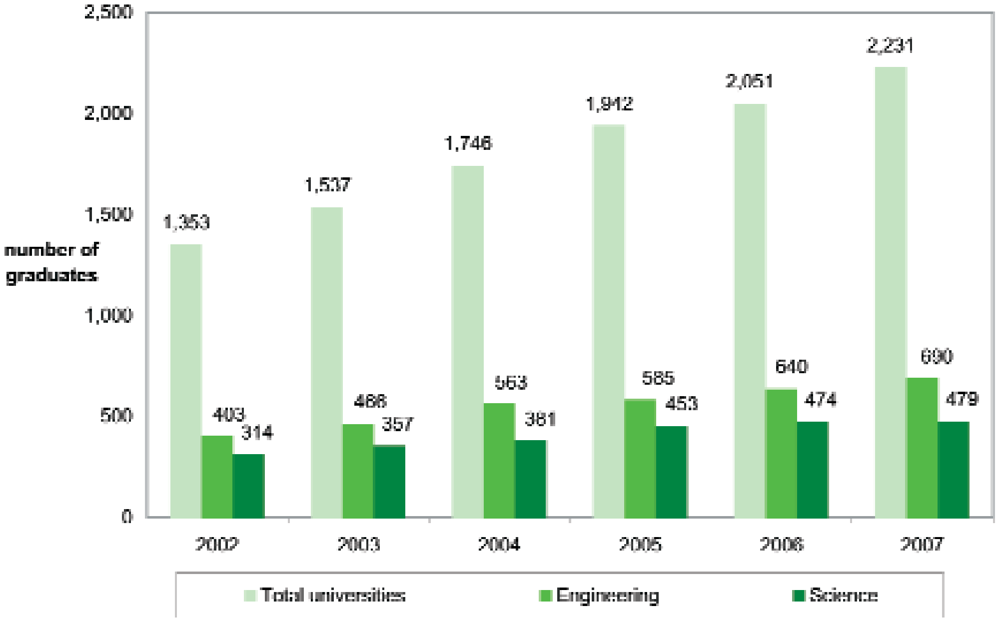
The total number of doctoral students in engineering and science programmes is growing every year. Compared to 2002, there has been an increase in the total number of doctoral students to 133.6% (127.5% in engineering programmes and 123.7% in science programmes).

Low numbers of doctoral students in technical and scientific study programmes and low success rates are reflected in most EU-27 countries. This is borne out in a report by the European University Association – EUA[4] published in the second half 2007. This report is intended for universities, ministries responsible for universities, and other interested parties. The challenges concerning doctoral studies were also discussed by the first global conference on higher education, held on 30 August – 1 September 2007 in Banff, Canada. Three of the nine principles declared[5] are directly linked to doctoral education.

4 Doctoral Programmes in Europe´s Universities. Achievements and Challenges, EUA 2007

5 http://www.cgsnet.org/portals/0/pdf/mtg_BanffPrinciples.pdf

A.2.10 Number of doctoral graduates in the Czech Republic



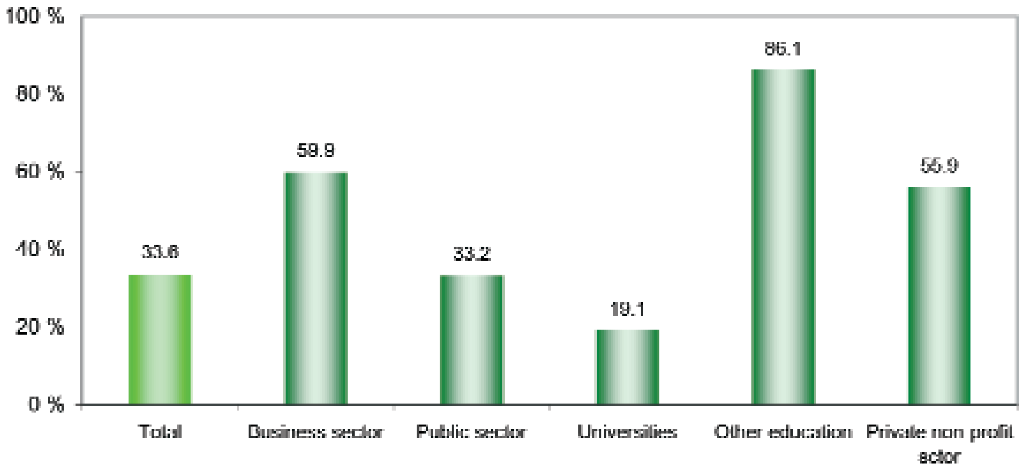
Source: Institute for Information on Education (UIV)

The total number of doctoral graduates at universities is constantly rising in the Czech Republic; over the last year there has been an increase to 108.7% (101.1% in sciences and 107.8% in engineering).

As such, growth here is outpacing the EU-25 on average. However, the Czech Republic (along with most European countries) falls short of the target of one doctoral graduate per 1,000 inhabitants aged 25–34. One of the reasons for this is the high failure rate.

Since 1999, the number of doctoral graduates has risen by approximately 260%. Regrettably, the number of doctoral drop-outs has more or less kept pace (a rise by 218%). More detailed data sets maintained by the Institute for Information on Education indicate that the lowest success rate among doctoral students can be found in sciences and engineering.

A.2.11 Share of doctoral graduates employed as researchers in the Czech Republic



Source: Green Paper on Research, Development and Innovation in the Czech Republic, Technology Centre, AS CR, January 2008

Note: The public sector includes not only public research institutions, but also state administration. Other education includes schools besides universities, e.g. primary schools, secondary schools, and further-education colleges.

Graduates of doctoral studies are qualified for scientific research. However, according to the Green Paper on R&D&I in the Czech Republic[6] only one third of these graduates work in research.

Graph A.2.11 illustrates the share of PhD holders employed as researchers or R&D personnel in all employed doctoral graduates in the relevant sector.

The difference between the tertiary education sector and the rest of the education system in terms of the share of PhD holders employed as researchers or R&D personnel in the total number of PhD holders employed in a given sector can be explained by the fact that in the tertiary education sector PhD holders are employed as teaching staff, whereas in the rest of the education system teaching is mainly carried out by staff who do not hold PhDs.

A detailed analysis of the 'other education' sector, where relatively few PhD holders work (6%), shows that those PhD holders who do work in this sector are mainly engaged in R&D (86.1%).

From the perspective of economic status, most respondents are employees, and the highest proportion of them work as scientists or experts. Almost half of them are teaching staff, mainly as science teachers at universities. From the perspective of employment, most PhD holders work in the public sector – approximately half of them work in the tertiary education sector and a quarter in the public sector, where the leading public research institutions (e.g. AS CR) are represen-

[6] Klusáček, K. et al.: Zelená kniha výzkumu, vývoje a inovací v České republice. (Green Paper on Research, Development and Innovation in the Czech Republic). Technology Centre of the Academy of Sciences of the Czech Republic, March 2008

ted. Approximately a fifth of respondents work in the business (private) sector. The remainder can be split almost equally into the private non-profit sector and other education.

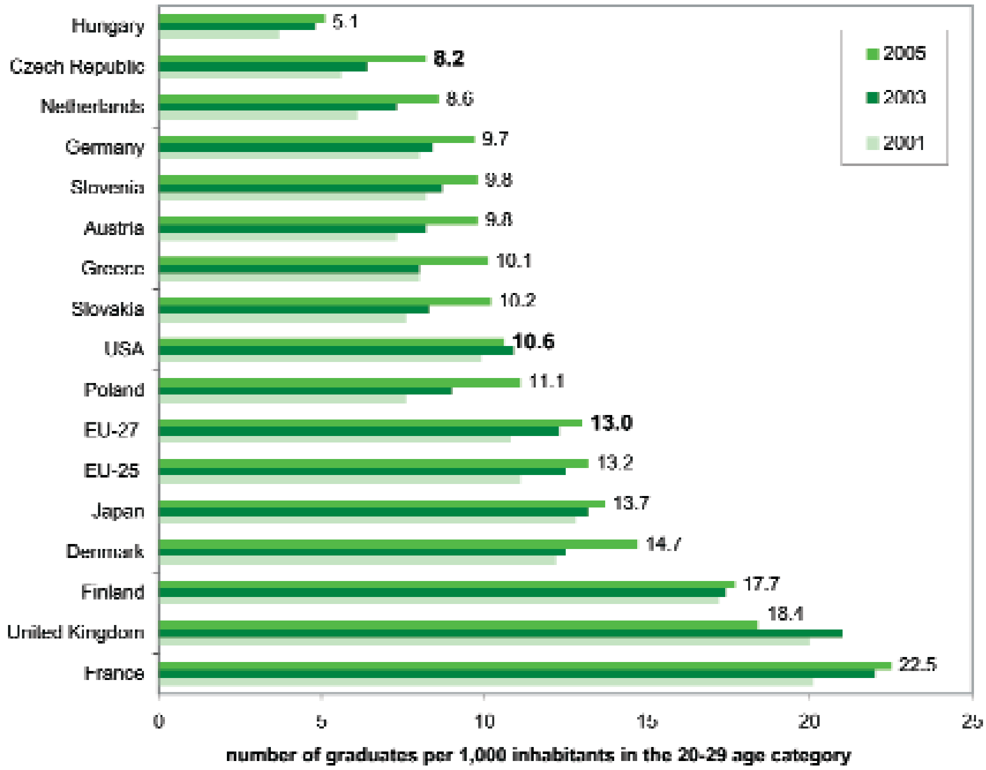
Table A.6 Share of PhD holders in employment sectors in 2006

Sector	Total	Men	Women
Business sector	19%	23%	11%
Public sector	25%	25%	26%
Tertiary education	50%	48%	53%
Other education	3%	2%	6%
Private non-profit sector	3%	2%	3%

The most important motivation when selecting a career in research among doctoral graduates is the creative nature and innovative potential of the work. The high degree of independence also offers relatively strong motivation for doctoral graduates to pursue a research career. Conversely, the pay or working conditions are rarely a determining factor.

Eurostat is currently evaluating an extensive survey (CDH) in 40 countries worldwide relating to the work carried out by doctoral graduates. The national guarantor for the Czech Republic is the Czech Statistical Office; the project is supported by the AS CR, the MoEYS and the Research and Development Council.

A.2.12 Number of science and engineering graduates



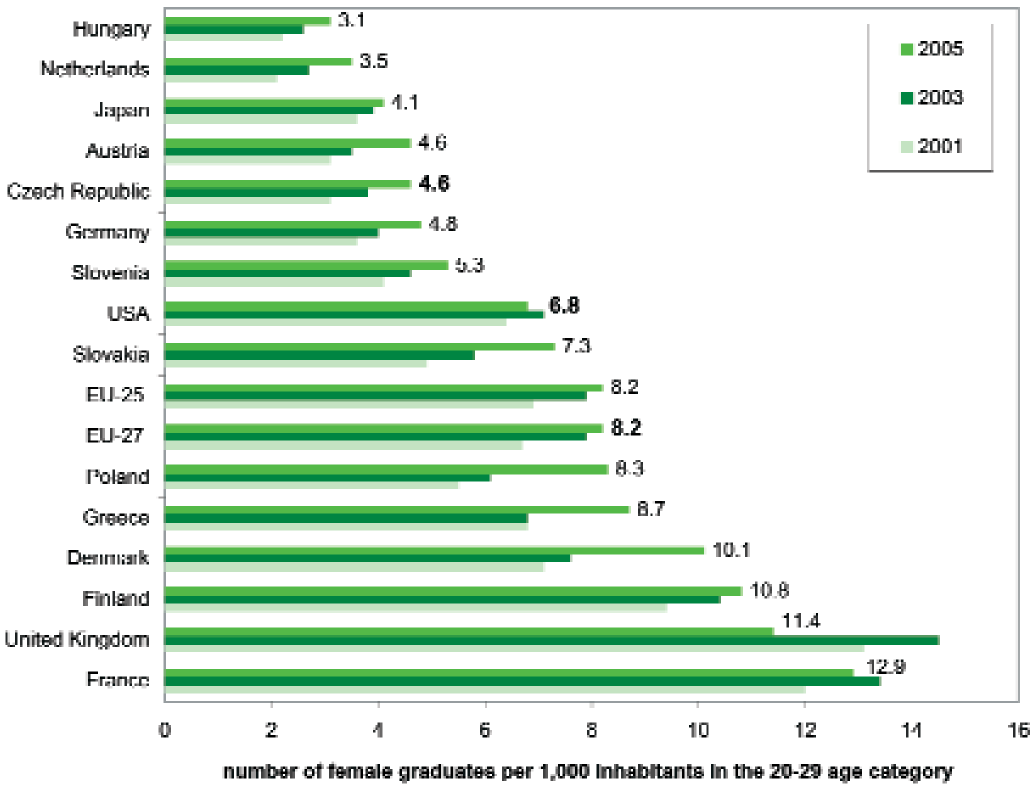
Source: Eurostat, (ISCED 5–6)

The numbers of all science and engineering graduates (men and women) at tertiary level per 1,000 inhabitants in the age category 20–29 are rising in the reporting countries, with the exception of the United Kingdom. The Czech Republic reports the second lowest numbers of science and engineering graduates; the Czech Republic has 8.2 graduates per 1,000 inhabitants in the age category 20–29 (Hungary is lowest with 5.1).

Obviously, the indicator for the Czech Republic is influenced by the still markedly lower share of the Czech population that has attained full higher education.

Of the total population of the Czech Republic, there is a relatively large percentage of engineering graduates. The share of the total number of engineering graduates aged 25–64 in the total number of university graduates in that age group is approximately 35%, which is well above the EU-25 average of 20% engineering graduates. However, the current structure of graduates suggests that this result is influenced by older graduates, as the proportion of fresh graduates in these disciplines is currently lower.

A.2.13 Number of female science and engineering graduates



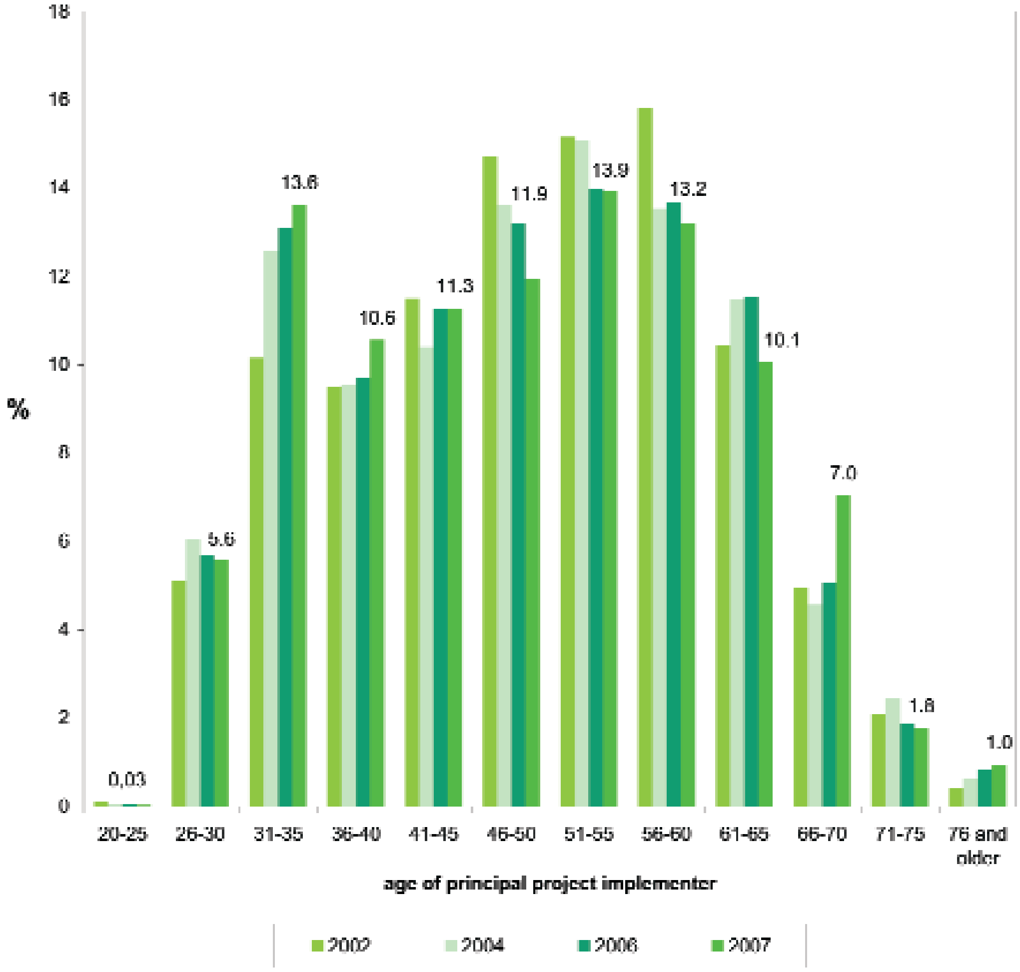
Source: Eurostat, (ISCED 5–6)

In terms of the number of female science and engineering graduates at tertiary level per 1,000 inhabitants in the 20–29 age category, the Czech Republic is 11th or 12th; in terms of the total number of graduates we are 14th (second from last).

In the EU, female students generally show substantially lower interest in science and engineering. According to Eurostat statistics[7] in 2004 female students accounted for 54.8% of all students in tertiary education in the EU, but in terms of science they accounted for 37.5% of all students and in engineering the figure was just 24%.

[7] Science, technology and innovation in Europe. Eurostat 2008

A.2.14 Numbers of R&D projects by age of principal implementers

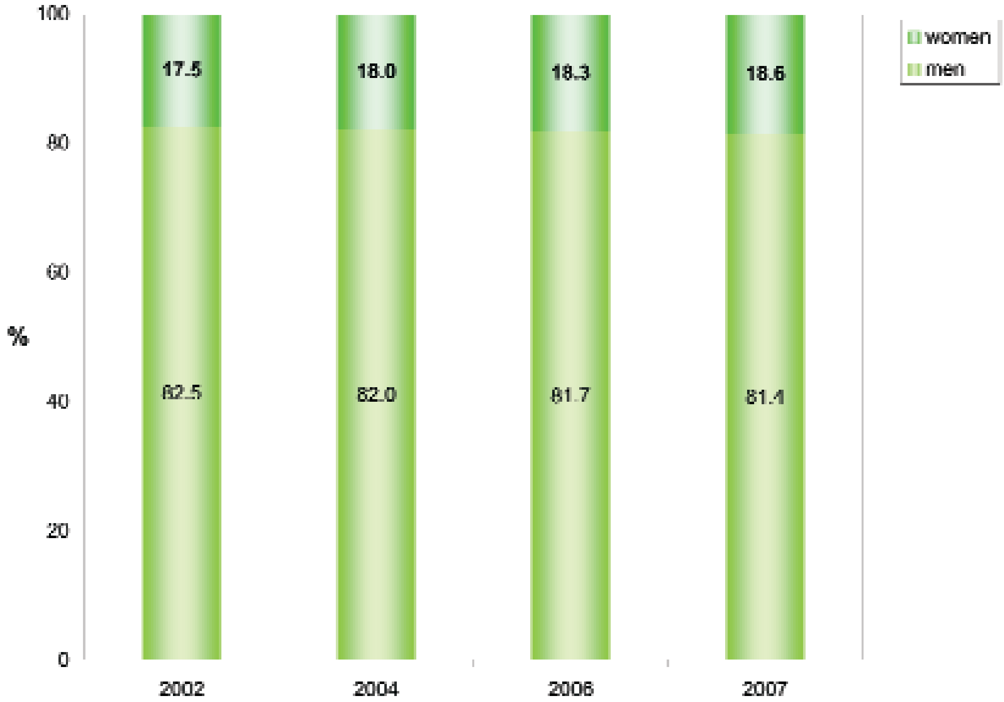


Source: R&D IS, Central Project Register (CEP)

Note: The graph does not include the implementers of projects where the subject is classified under Governmental Order No 267/2002 on the research and development information system, where the result incorporates classified information under specific legislation (e.g. Act No 148/1998, as amended, Act No 412/2005, as amended, Decree No 244/1998, as amended, Decree No 56/1999).

In contrast to past years, no absolute numbers of projects by age category are cited. Instead, we have opted for percentages as these offer a better comparison of generological trends.

A.2.15 Numbers of R&D projects by sex of the principal implementers



Source: R&D IS, Central Project Register (CEP)
Note: The graph does not include the implementers of projects where the subject is classified (see the same note for graph A.2.15)

The overriding majority of principal implementers of projects in the Czech Republic are men; this situation is similar to managerial positions in the R&D sphere and in the private sector. Men account for more than three quarters of all principal implementers. Between 2002 and the present, to all intents and purposes the share of women among the principal implementers has stagnated (there has been growth of a single percentage point). In 2007, just over 81% of men and just under 19% of women were principal project implementers.

Chapter B – Outputs of research and development

This separate chapter on R&D outputs has three parts:
- B.1 Results of R&D financed from public resources
- B.2 Bibliometry
- B.3 Patent applications, patents and licences granted

Compared to last year's analysis, there are rather more graphs and tables. The comments on the individual indicators (parameters) include additional themes shedding more light on the tables and graphs.

Numbers of key indicators in Chapter B

Chapter/part	Title	Number of indicators
B	R&D outputs	41
B.1	Results of R&D financed from public resources	20
B.2	Bibliometry	7
B.3	Patent applications, patents and licences granted	14

Part B.1 contains maintained data from the R&D Results Information Register (RIV), which is part of the R&D Information system (R&D IS) operated by the Research and Development Council. This part sets out the structure of the R&D results achieved among the key groups of State R&D aid beneficiaries. It also describes the methodology and main conclusions of the R&D evaluation conducted in 2007. The R&D evaluation system is being developed further; this issue has been addressed inter alia by the Commission on the Evaluation of R&D Results, an advisory body to the Research and Development Council.

Part B.2 also evaluates publication output - the number of publications and citations thereof in periodicals monitored by Thomson Reuters. A bibliometric evaluation was conducting by drawing on the database National Scientific Indicators 2007.

There has been a gradual, moderate improvement in R&D publication performance in the Czech Republic. However, the Czech Republic still lags far behind the developed countries used in the comparison of this indicator. The root causes of this situation are the substantially lower relative overall expenditure on R&D, the lower number of researchers, and the lesser demands placed by grantors of State aid on the quality R&D results.

Part B.3 encompasses patent applications and patents granted by three patent offices: the Industrial Property Office of the Czech Republic (UPV), the European Patent Office (EPO) and the United States Patent and Trademark Office (USPTO). Data were taken from the most recent yearbooks published by these offices. This part also contains basic information about the number of valid licences for patents and designs granted by entities in the Czech Republic and the amount of fees collected for these licences. These figures are drawn from the CZSO's regular annual statistical survey (LIC 5-01).

The Czech Republic lags far behind the other developed countries in the comparison in terms of patenting activities. One of the root causes in this case is the industrial structure, with a low

share of most advanced technologies and the persistent relatively good competitiveness of Czech industrial undertakings on foreign markets in fields where R&D is not intensive. However, this competitiveness is based on low labour costs and seems set to weaken quickly in the coming years.

Obviously, R&D expenditure in the individual countries compared must be taken into consideration when assessing R&D performance based on the number of publications, citations, patent applications and patents granted. The indicator of R&D expenditure as a percentage of the gross domestic product (GDP) is of scant informative value in performance comparisons given the sizeable gaps in GDP in individual countries. A more appropriate indicator is R&D expenditure per capita or per employee in an assessed country, translated from the national currency into either USD or EUR in accordance with the current exchange rate, or on the basis of purchasing power parity (PPP). However, because the numbers of R&D personnel relative to the population or number of employees differs considerably, the most objective indicator seems to be total R&D expenditure per R&D employee.

A substantial portion of R&D costs comprises the cost of machinery, apparatus, equipment, software, etc., which are generally purchased abroad on the basis of exchange rates. As indicated in Chapter A, the share of wage costs in overall R&D expenditure in the Czech Republic is approximately one third; however, the figures are not converted into purchasing power parity.

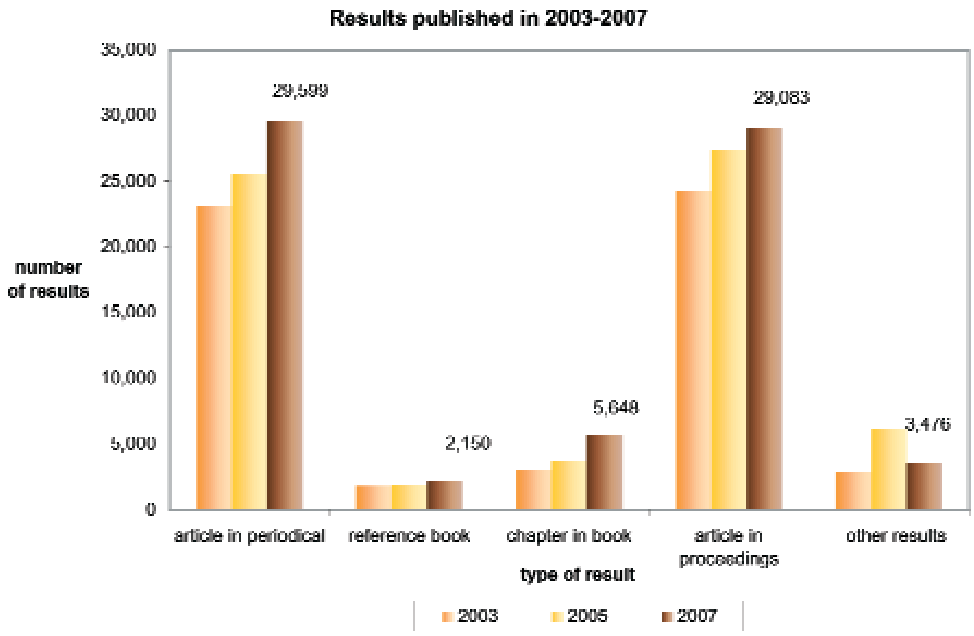
Of the countries monitored, Austria reports high specific R&D expenditure in both cases. Very low specific R&D expenditure can be found in Poland and Slovakia. The Czech Republic, in the conversion to PPP, achieves more than 70% of the average value of specific R&D expenditure in EU-15 countries. Converted by the exchange rate, however, the result is just under 35% of the EU-15 average, which is clearly inadequate.

B. 1 Results of R&D financed from public resources

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

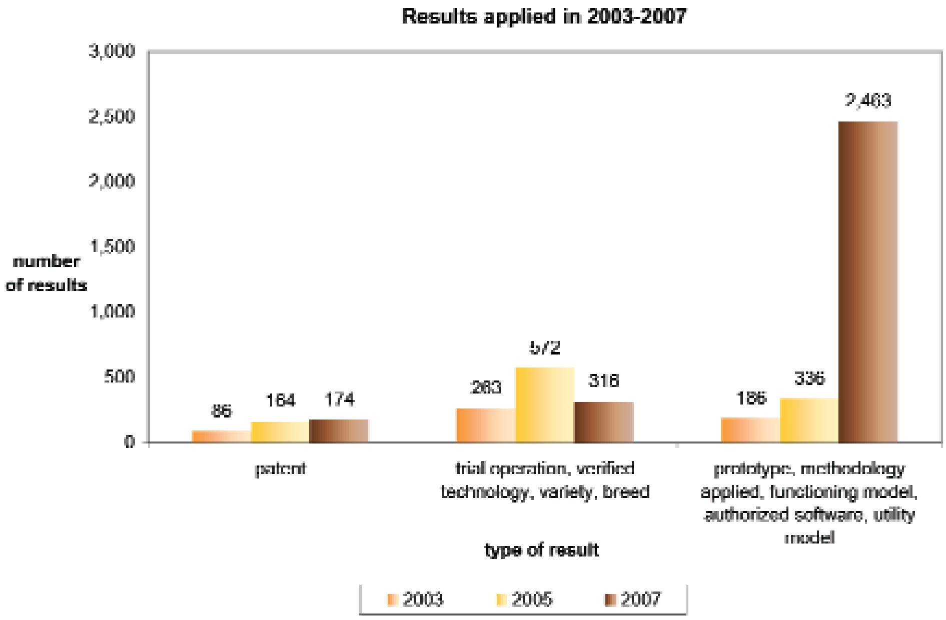
Type of result	Year of application 2003	2005	2007
article in periodical (J)	23,018	25,551	29,599
specialist book (B)	1,786	1,889	2,150
chapter in book (C)	3,068	3,712	5,648
article in proceedings (D)	24,189	27,413	29,083
patent (P)	86	164	174
prototype, methodology applied, functioning model, authorized software, design (S)	186	336	2,463
trial operation, verified technology, variety, breed (Z)	263	572	316
other results (A, E, M, V, W)	2,895	6,165	3,476
TOTAL	**55,491**	**65,802**	**72,909**

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



The numbers of articles in specialist periodicals and chapters in books has grown at a rather faster rate than the numbers of articles in proceedings or specialist books; the number of other results has fallen dramatically. The more significant growth of articles in specialist periodicals is a positive trend because these are valuable results.

In terms of the number of individual types of results for the period monitored, articles in proceedings, along with articles in specialist periodicals, clearly prevail over other types of publication results.



With regard to the results of applied research, there has been a clear steep rise in the set of results defined as methodology applied, prototype, functioning model, authorized software and design. This can be attributed to the higher scores achieved by applied R&D results.

In the group of results defined as trial operation, verified technology, variety and breed, there was a drop in numbers as a result of the clarification of the definition of this type of result.

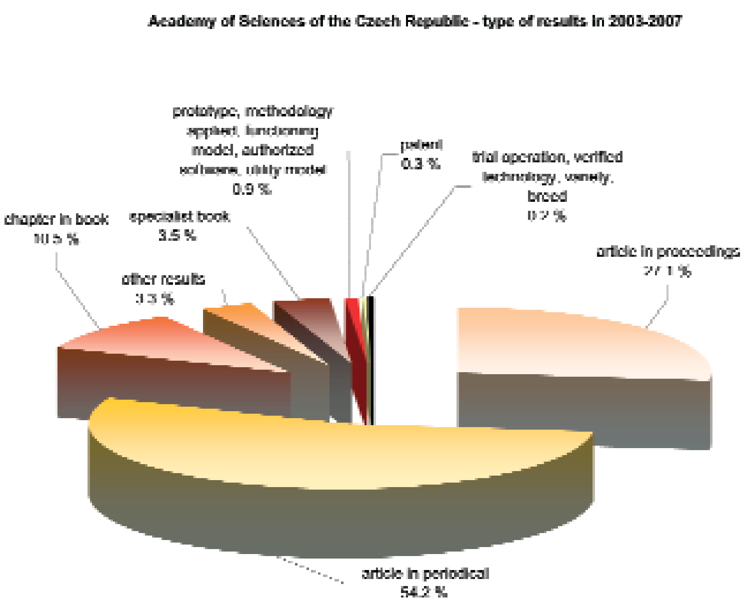
Patent numbers are rising. However, bearing in mind the overall low figures (see also part B.3 – Patent applications, patents and licences granted) the situation in the Czech Republic can hardly be branded as favourable.

B.1.2 Numbers of registered R&D results by group of beneficiaries and type of result, 2003–2007

Type of result	AS CR	Universities	OSS SPO, VVI	Other legal pand natural persons
article in periodical (J)	35,122	78,245	16,282	3,512
specialist book (B)	2,262	6,217	1,348	383
chapter in book (C)	6,789	11,411	2,230	472
article in proceedings (D)	17,530	105,118	9,399	5,007
patent (P)	215	317	85	206
prototype, methodology applied, functioning model,	562	2,065	1,001	1,307
trial operation, verified technology, variety, breed (Z)	113	415	440	1,031
other results (A, E, M, O, V, W)	2,159	13,860	3,319	2,697
TOTAL	**64,752**	**217,648**	**34,104**	**14,615**

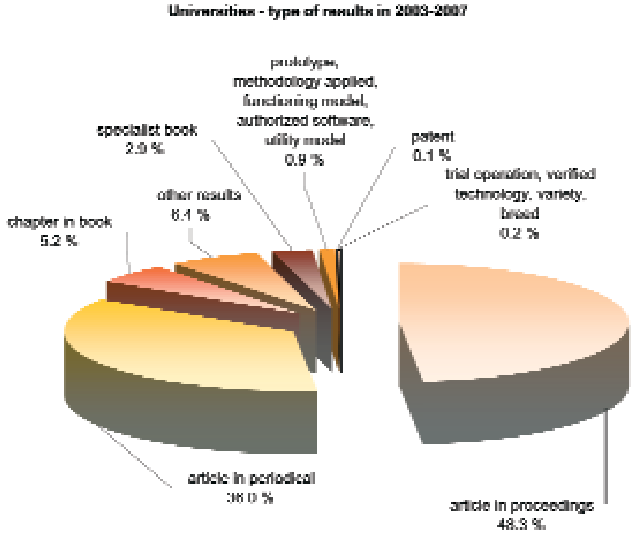
Source: R&D IS, Results Information Register (RIV)

The **Institutions of the AS CR** include public research institutions set up in accordance with Act No 341/2005 (the founder is the AS CR).



Between 2003 and 2007, the AS CR institutions report the highest number of results (approximately 54%) in the category of articles in specialist periodicals. The numbers of results relating to applied research hover around 1.4%.

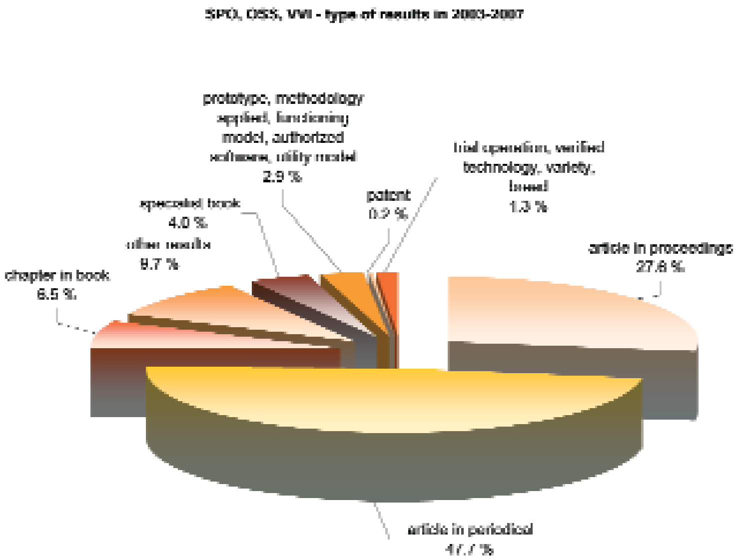
The group of **Universities** set up in accordance with Act No 111/1998 includes public universities, state universities (police and military), and private universities set up by legal or natural persons.



As the table in the introduction to the chapter indicates, universities submitted the highest number of results to the IS – 217,648, i.e. almost 66% of the overall number of registered results. Between 2003 and 2007, the highest proportion (48%) can be found in the category of articles in proceedings, followed by the category of articles in specialist periodicals (a share of approximately 36%).

The numbers of results relating to applied research come to 1.2%.

SPO, OSS, VVI[8] – this group comprises state organizations partly funded from the public purse (SPO), organizational units of the state (OSS) and public research institutions (VVI) set up in accordance with Act No 341/2005, apart from AS CR institutions.

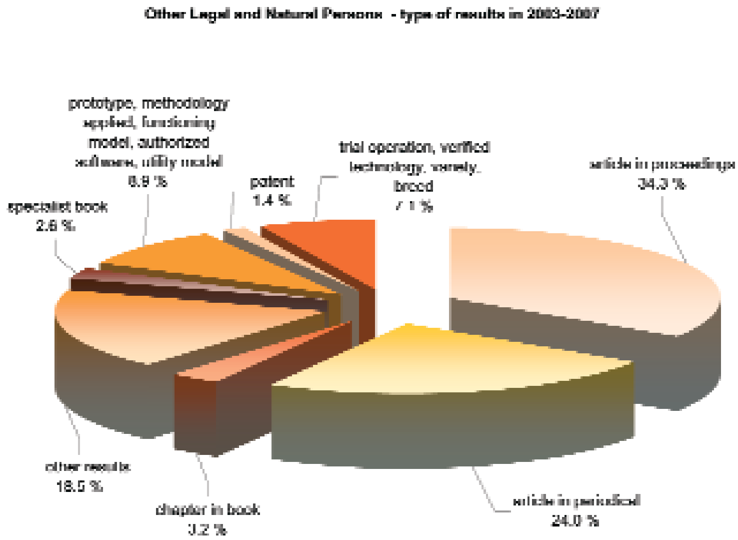


The situation among organizational units of the state (OSS), organizations partly funded from the public purse (SPO) and other public research institutions (VVI) cannot be regarded as satisfactory.

[8] Where an organization became a public research institution in 2007, it is reported under this group of beneficiaries in the graphs for the whole of the monitored period.

The results of applied research account for just 4.4% of the total number of results. Most of these research organizations should be geared largely towards applied R&D because they are predominantly organizations set up by individual ministries to perform the specialized tasks of the relevant ministry with a view to the direct use of observations in the sphere of application.

The category of **Other Legal and Natural Persons** comprises individuals and institutions that are not classified under any of the groups above (e.g. public limited companies, limited liability companies, public benefit companies, foundations, civic associations, etc.).



The situation is different for the group of beneficiaries comprising other legal and natural persons, as their results are represented in most of the monitored groups of results (with articles in proceedings faintly predominant). Significant proportions can be found among 'other results' (18.5%), type-S results (prototype, methodology applied, functioning model, authorized software, design – 8.9%), and type-Z results (trial operation, verified technology, variety, breed – 7.1%). The representation of patents is relatively low, standing at 1.4%.

B.1.3 Evaluation of R&D and results thereof in 2007

The evaluation of R&D and the results thereof in 2007 ('2007 Evaluation') was carried out by the Research and Development Council pursuant to Government Resolution No 644 of 23 June 2004 on a research intentions for an evaluation of research and development and the results thereof. This evaluation is carried out every year and is designed to assess the efficiency of aid beneficiaries and grantors in the use of aid, and how and with what result they capitalize on the State aid granted from the national budget.

The first evaluation was conducted in 2004, when the Methodology for the Evaluation of Research and Development and the Results Thereof in 2004 was first published; this Methodology, in accordance with Government Resolution No 1167 of 19 November 2003, drew on the Analysis of the Existing State of R&D in the Czech Republic and a Comparison with the Situation Abroad in 2003. As the evaluation results are used by the Research and Development Council as one of the basis for preparing draft national budget expenditure on research and development, the Methodology is refined on an ongoing basis, not only by way of adjustments to the scoring (the weights) of individual registered results, but also in terms of the methods of calculations, their definition and the creation and supplementation of related databases of research activities (i.e. R&D projects, research intentions, aid for specific research at universities).

The 2007 Evaluation included research activities completed in 2002–2006, research intentions in progress as of the second year of implementation, specific research at universities in 2006, and results relating to these research activities.

R&D programmes and research intentions focusing on R&D infrastructure and the development of such infrastructure were not included in the 2007 Evaluation.

Table B.1 Summary results of 2007 Evaluation

Total evaluated	**8,575** research activities
Total institutions contributing to the implementation of the research activities evaluated	**1,534** institutions
Total included in 2007 Evaluation	**202,630** results
Value of weights of all results evaluated	**1,235,516**
Total expenditure from national budget to implement the research activities evaluated	CZK **69,182,347,000**

After the definitions of the individual types of results had been clarified so that each proposer could correctly classify the result, and after the Evaluation Methodology had been modified accordingly, the Research and Development Council started excluding registered results found to be classified without justification or incorrectly.

J-type results (i.e. articles in specialist periodicals) were scored differently for articles in journals (according to the Thomson Reuters WoS) and in other specialist periodicals.

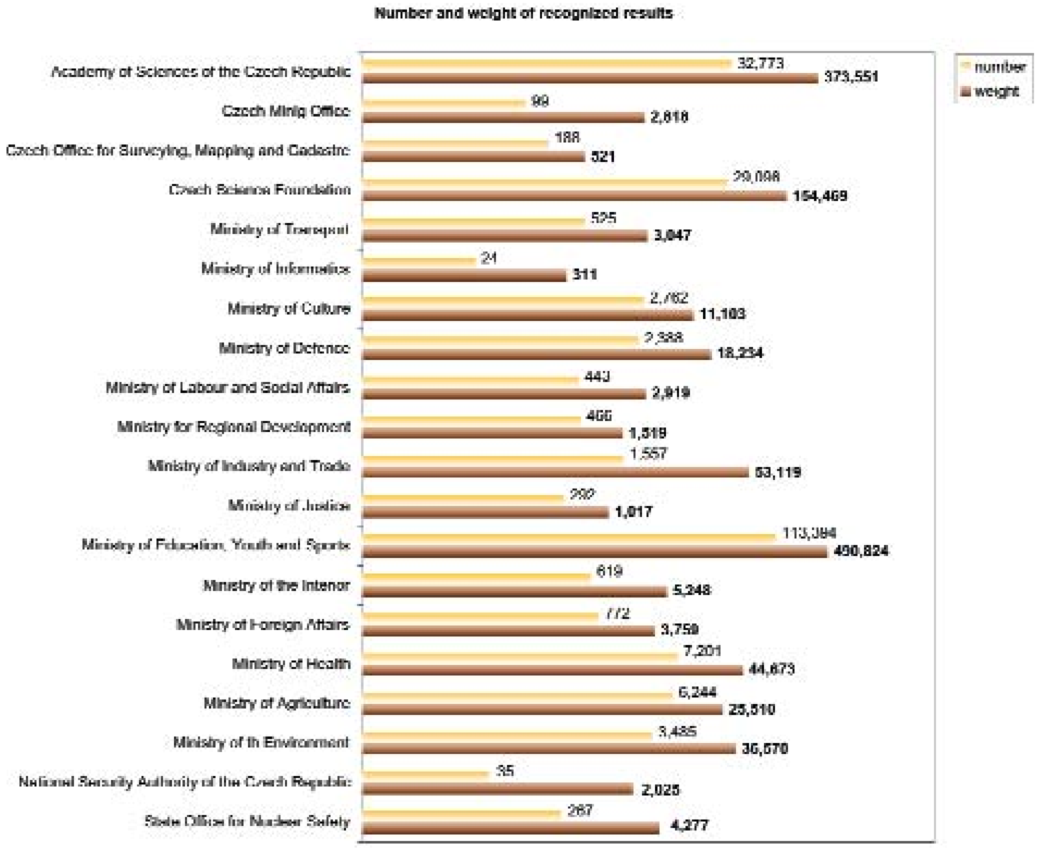
In the 2007 Evaluation, applied results (previously termed 'technologies') are split into two categories. One encompasses trial operations, verified technology and varieties or breeds (the result type 'Z'), while the other covers prototypes, methodology applied, functional models, authorized software, results reflected in legislation or standards, designs and specialized maps with

specialist content (the result type 'S'); each of these two result categories uses different scoring.

With regard to non-journals in which results contained in the RIV have been published, a list of titles not complying with the requirements of scientific peer-reviewed journals was drawn up. The registered results published in these titles were not included in the evaluation.

The efficiency of using State aid from the national budget to address research activities is measured by the ratio of the overall scoring of results (the sum of total weights) to the amount of State aid (in millions of Czech crowns) expended on dealing with the research activities to which these scored results were assigned (reported as the result of dealing with the research activity).

B.1.4 Evaluation of aid grantors



Source: R&D IS, 2007 Evaluation
Note: total expenditure on research activities completed in 2002–2006, on research intentions in progress as of the second year of implementation, and on specific research at universities in 2006

Over the period of evaluation, the most expenditure from the national budget was channelled into research activities supported from the budget heading of the AS CR and the MoEYS. These grantors' expenditure accounts for 60% of all State aid granted.

Average aid from the national budget per research activity hovers around 76% of the overall eligible costs.

In terms of the number of research activities supported, the leader is the GA CR; the average amount of aid per research activity over the full duration of that activity is CZK 1.5 million. In this respect, a host of small-scale research activities benefit from aid.

Table B.2 Expenditure and eligible results of grantors

Grantor	Number of research activities	Expenditure (TCZK)		Total eligible results		
		Total	National budget	Number	Weight	Weight / number
Academy of Sciences of the Czech Republic	904	27,656,450	23,042,834	32,773	373,551	11.4
Czech Mining Office	25	123,034	123,034	99	2,818	28.5
Czech Office for Surveying, Mapping and Cadastre	7	185,134	176,443	188	521	2.8
Czech Science Foundation	3,548	8,317,829	5,582,619	29,098	154,469	5.3
Ministry of Transport	84	654,837	557,186	525	3,047	5.8
Ministry of Informatics	11	86,948	83,526	24	311	12.9
Ministry of Culture	235	781,681	556,967	2,762	11,103	4.0
Ministry of Defence	190	2,265,903	2,021,074	2,388	18,234	7.6
Ministry of Labour and Social Affairs	96	434,522	384,344	443	2,919	6.6
Ministry of Regional Development	68	102,200	101,315	466	1,519	3.3
Ministry of Industry and Trade	591	14,894,142	6,074,796	1,557	53,119	34.1
Ministry of Justice	1	60, 078	60,078	292	1,017	3.5
Ministry of Education, Youth and Sports	973	22,968,524	18,897,792	113,394	490,824	4.3
Ministry of the Interior	44	108,415	108,415	619	5,248	8.5
Ministry of Foreign Affairs	91	113,431	109,047	772	3,759	4.9
Ministry of Health	1,088	4,623,570	4,356,792	7,201	44,673	6.2
Ministry of Agriculture	244	3,440,641	3,227,137	6,244	25,510	4.1
Ministry of the Environment	268	4,332,644	3,355,886	3,485	36,570	10.5
National Security Authority of the Czech Republic	55	90,130	90,130	35	2,025	57.8
State Office for Nuclear Safety	52	363,544	272,932	267	4,277	16.0
TOTAL	**8,575**	**91,603,657**	**69,182,347**	**202,630**	**1,235,516**	

Source: R&D IS, 2007 Evaluation
Note: total expenditure on research activities completed in 2002–2006, on research intentions in progress as of the second year of implementation, and on specific research at universities in 2006

One of the major problems of targeted aid is the focus on a large number of relatively small projects. It is here that another of the reasons why applied research does not deliver specific implementation – the use and application of results – can be seen.

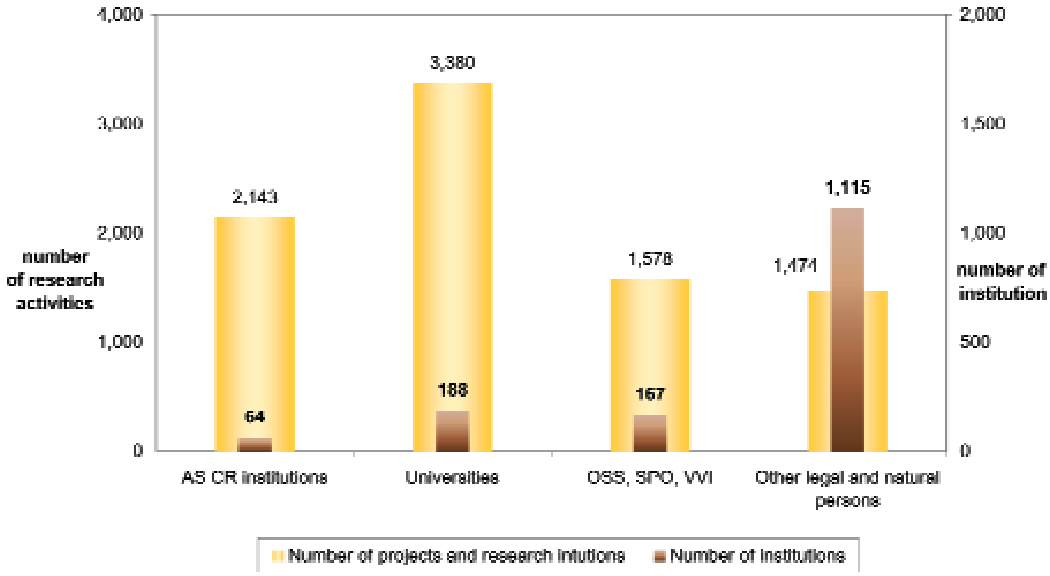
The highest number of results over the period evaluated was achieved by beneficiaries of State aid granted from the MoEYS budget heading. The highest amount of aid to deal with research activities was granted by the AS CR. A comparison of the data in Table B.2 cannot identify any correlation between the amount of aid granted and the number of results achieved and their scores.

The highest subsidy from the national budget was granted to beneficiaries from the AS CR, where an average of CZK 12.2 million was provided per research activity. Among universities, an average of CZK 6 million was granted per research activity.

Beneficiaries of the aid granted by the MoEYS recorded the highest number of results and the highest overall scores, with high efficiency in the use of resources; the exploitation of capacities for research and for education, the pooling of investment resources, etc., unquestionably played a positive role here. The relatively low average score per result achieved (4.1) can be interpreted as the focus of a significant part of research on less prestigious results.

Beneficiaries of the aid granted by the AS CR are largely dedicated to quality results with high scores (especially contributions to journals). The average score of these results is 11.4.

B.1.5 Evaluation of groups of beneficiaries



Source: R&D IS, 2007 Evaluation

Overall, the highest number of supported research activities were handled by beneficiaries at universities. The highest average number of research activities addressed per research institution is reported by the AS CR (33.4 projects), contrasting with other legal and natural persons, who on average dealt with only 1.3 projects.

Table B.3 Expenditure from the national budget, number and weight of eligible results by group of beneficiaries

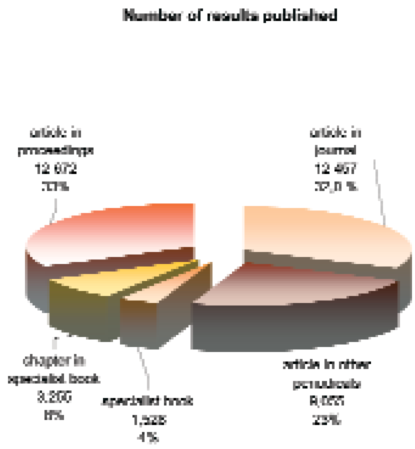
Group of beneficiaries	NB expenditure (CZK millions)	Number of results	Weight of results	Weight / number
AS CR institutions	26,162	39,322	451,345	11.5
OSS, SPO, VVI	12,391	21,460	132,445	6.2
Universities	20,282	135,468	564,612	4.2
Other legal and natural persons	10,347	6,380	87,114	13.6
TOTAL	**69,182**	**202,630**	**1,235,516**	

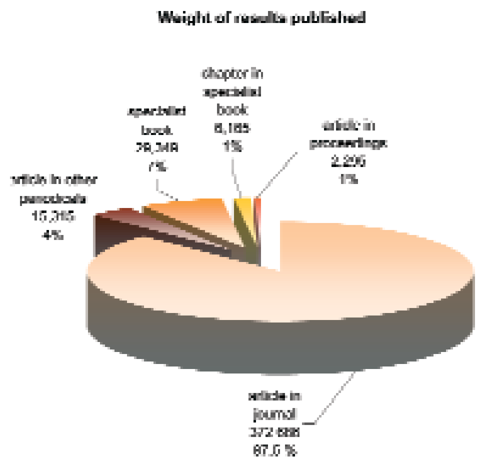
Source: R&D IS, 2007 Evaluation
Note: total expenditure from the national budget on research activities completed in 2002–2006, on research intentions in progress as of the second year of implementation, and on specific research at universities in 2006

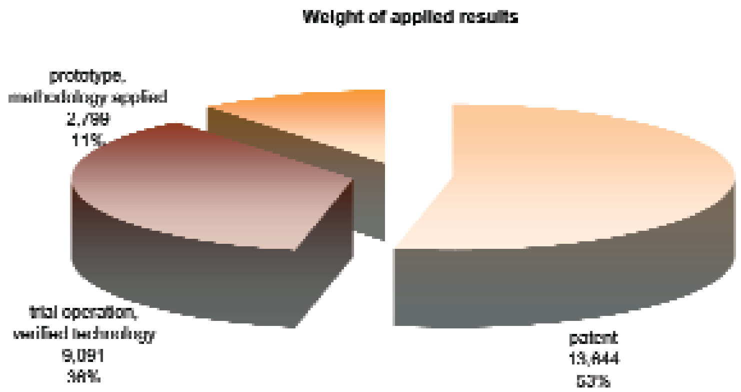
The low number of research activities addressed among these beneficiaries is almost identical to the number of research activities handled by OSS, SPO and VVI. This shows the need for further involvement in R&D by beneficiaries from among other legal and natural persons, because they provide the guarantee of solutions associated with the implementation of R&D results.

The highest average score of 13.6 points of average weight per result is achieved by other legal and natural persons, who account for a significant portion of the results of applied research with a relatively high score (cf. the ratio of the number of applied results among OSS, SPO and VVI to beneficiaries from the ranks of other legal and natural persons).

B.1.6 Evaluation of AS CR institutions by structure of result types





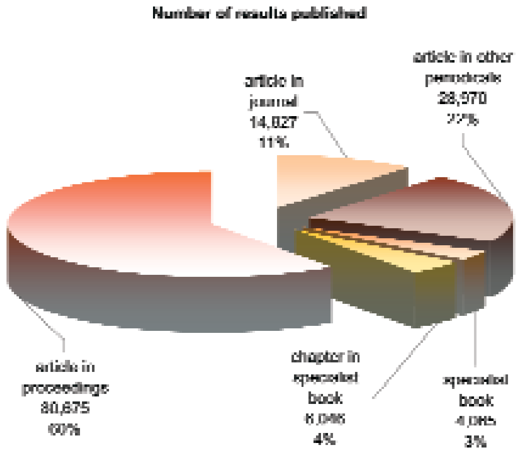


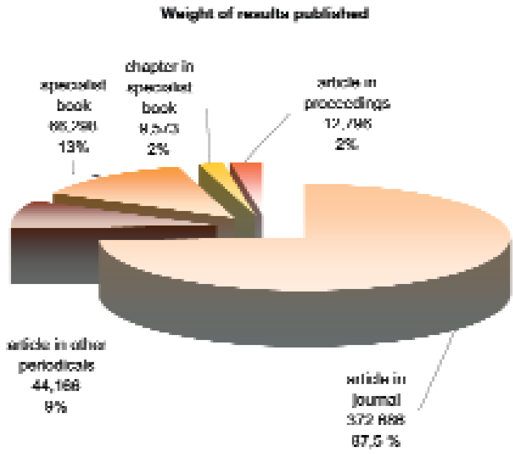
Source: R&D IS, 2007 Evaluation
Note: the results achieved in the handling of research activities completed in 2002–2006, research intentions in progress as of the second year of implementation, and specific research at universities in 2006

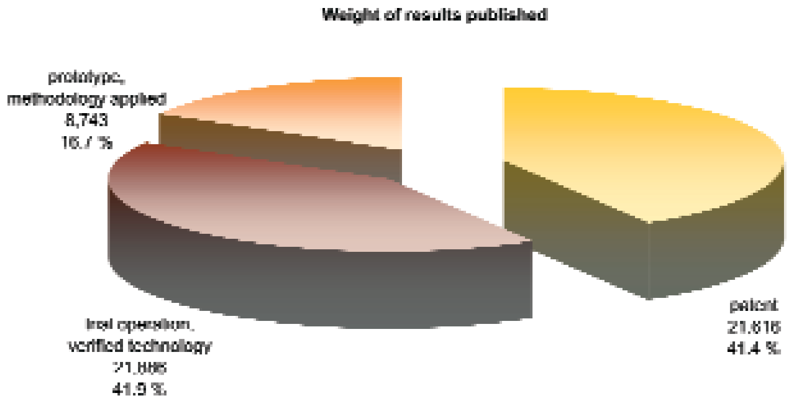
The public research institutions of the AS CR report the most publication results in the form of contributions to proceedings (32.5%), which are closely followed by articles in journals (32.0%). The value of the weight of results published in journals is 87.5%.

In the field of applied R&D and the individual types of results attributed to such R&D, the weight of patents is more than half the weight of the applied results, although overall their number remains low (see also part B.3 – Patent applications, patents and licences granted). An increase in the shares of patents would be advantageous as they pave the way for the possibility of applying the results of certain fundamental research disciplines in practice.

B.1.7 Evaluation of universities by structure of result types





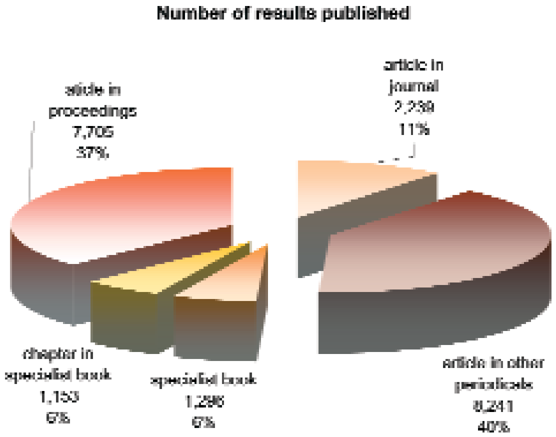


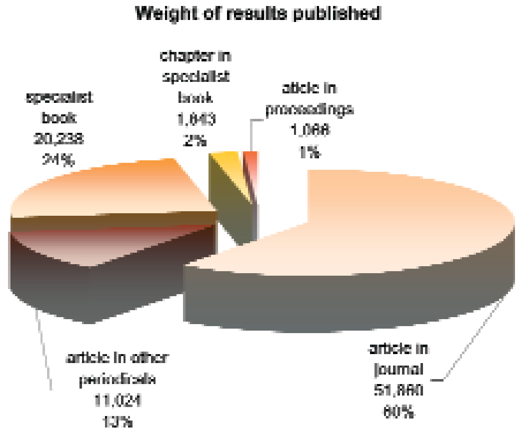
Source: R&D IS, 2007 Evaluation
Note: the results achieved in the handling of research activities completed in 2002–2006, research intentions in progress as of the second year of implementation, and specific research at universities in 2006

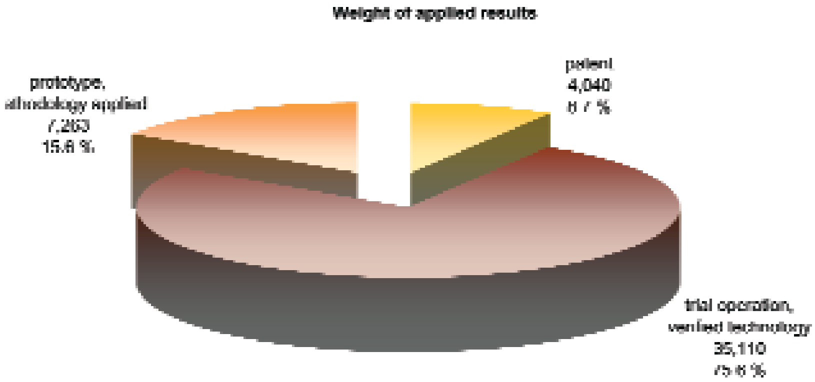
Universities record most publication results in the form of contributions to proceedings (59.9%) because universities are common conference delegates. Their second most publication results, at a third of the contributions to proceedings, comprise articles in non-journals (21.5%); third are articles in journals (11%). Although, by number, the proportion of contributions to proceedings is just shy of 60%, their weight is a mere 2%, unlike articles in journals, which by number account for 11% but have a weight of 87.5% in relation to the percentage of publication results.

In the field of applied research, the predominant result types are trial operation and verified technology (a weight of 41.9%), with the number of patents not fare behind (a weight of 41.4%). The balanced distribution of these application results forms the basis for their sound application and possible financial benefit.

B.1.8 Evaluation of OSS, SPO and VVI by structure of result types





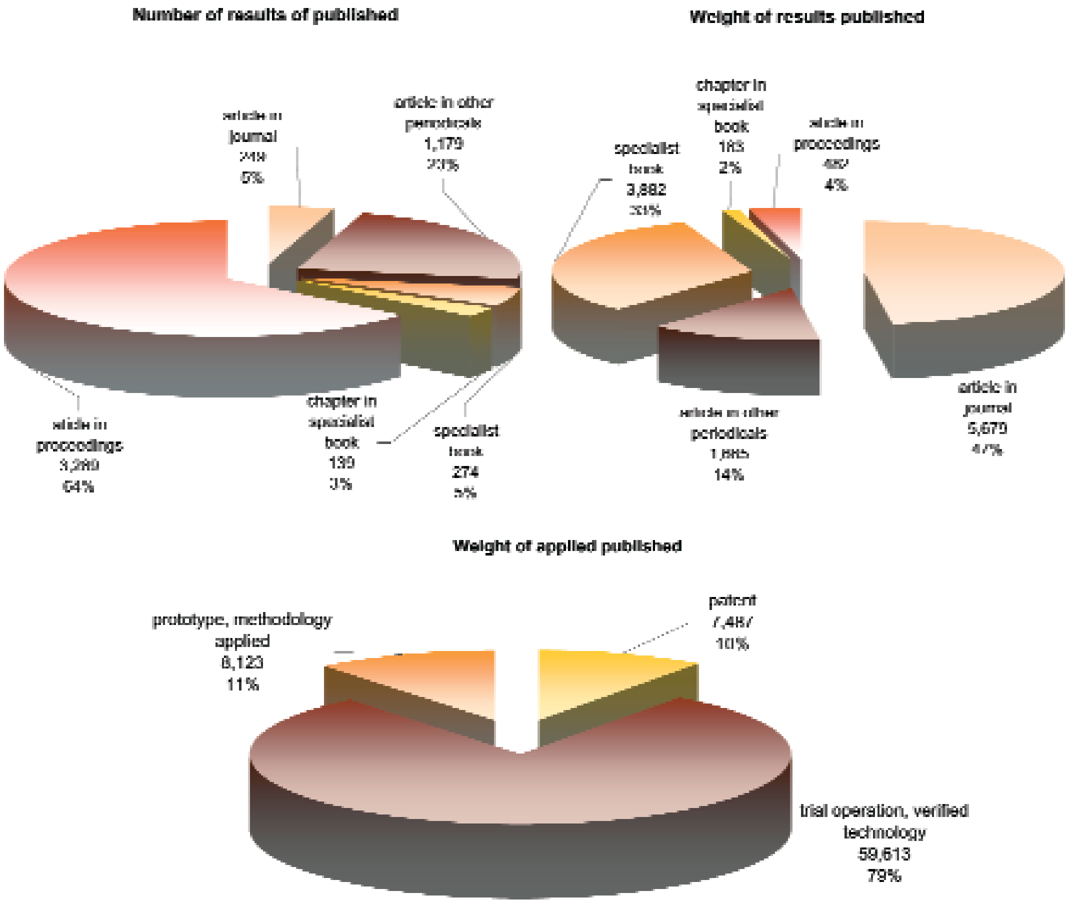


Source: R&D IS, 2007 Evaluation
Note: the results achieved in the handling of research activities completed in 2002–2006, research intentions s in progress as of the second year of implementation, and specific research at univer-sities in 2006

In the group of OSS, SPO and VVI beneficiaries, where aid is largely granted for applied research, publication results in specialist periodicals predominate (39.9%), followed by contributions to conference proceedings (37.3%). The number of published results in journals is third from the perspective of percentages. The weight of results in journals returns a relatively high value (60.3%).

In the field of applied research, the most noteworthy share is taken up by the type result of trial operation and verified technology (a weight of 75.6%). This is followed by the result type of methodology applied and prototypes where, from the perspective of number, methodology applied predominates (a weight of 15.6%). Patents are last (a weight of 8.7%). In terms of the possibility of implementing the individual types of results and acquiring further financial resources, the structure of results is unsatisfactory.

B.1.9 Evaluation of other legal and natural persons by structure of result types

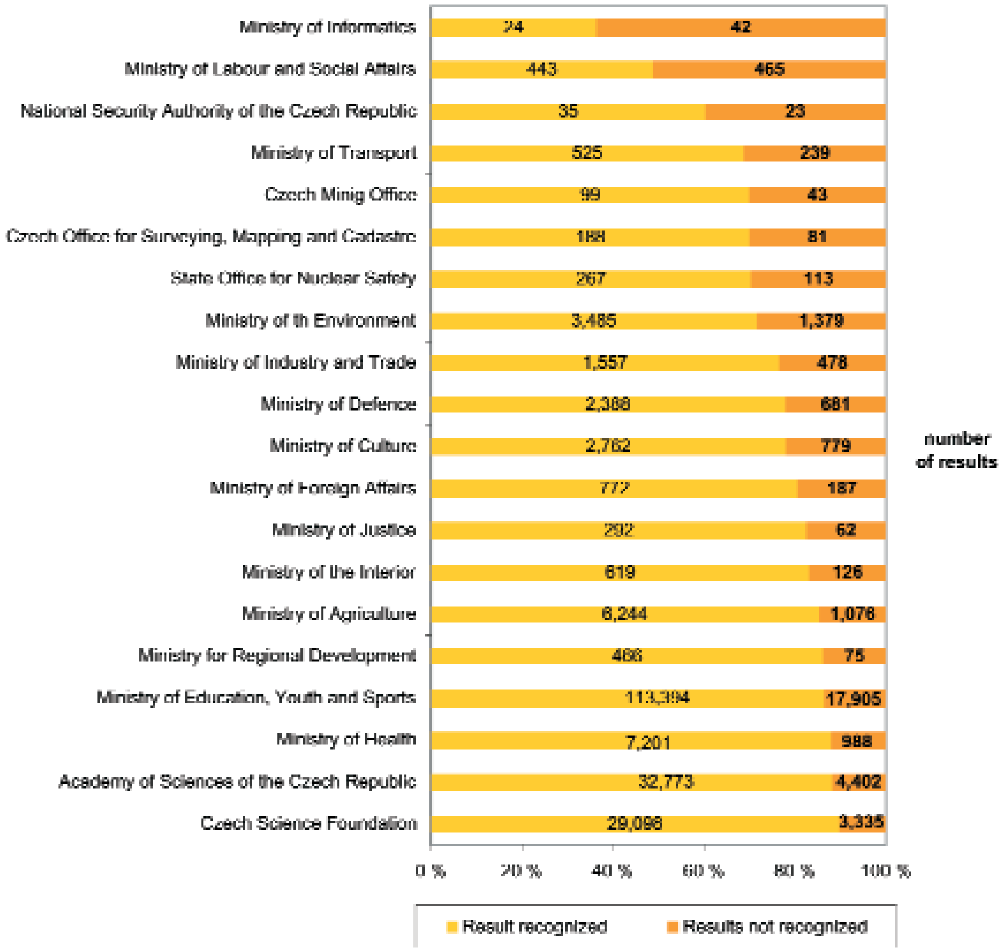


Source: R&D IS, 2007 Evaluation
Note: the results achieved in the handling of research activities completed in 2002–2006, research intentions s in progress as of the second year of implementation, and specific research at universities in 2006

With regard to the group of beneficiaries from the category of other legal and natural persons, in the publication of the results of supported research activities, an absolute majority of publication results comprises contributions to proceedings (64.1%). In non-journals, the share of publication activities is approximately a quarter (23%). The number of publication activities in journals (4.9%) is roughly half that recorded by the group of beneficiaries from the category of universities and OSS, SPO, VVI; their weight is 47.8% of the overall value of results.

In the field of applied research and the results attributed to it, the type result of trial operation and verified technology (a weight of 79.2%) predominates. Other results of the type 'prototype, methodology applied and patents' are represented at the same level.

B.1.10 Share of scored and non-scored results by grantor



Source: R&D IS, 2007 Evaluation

The category of results without scoring includes results designed to mediate the transfer of applied R&D results into practice, or internal implementation or use.

Table B.4 Types of results – non-scored

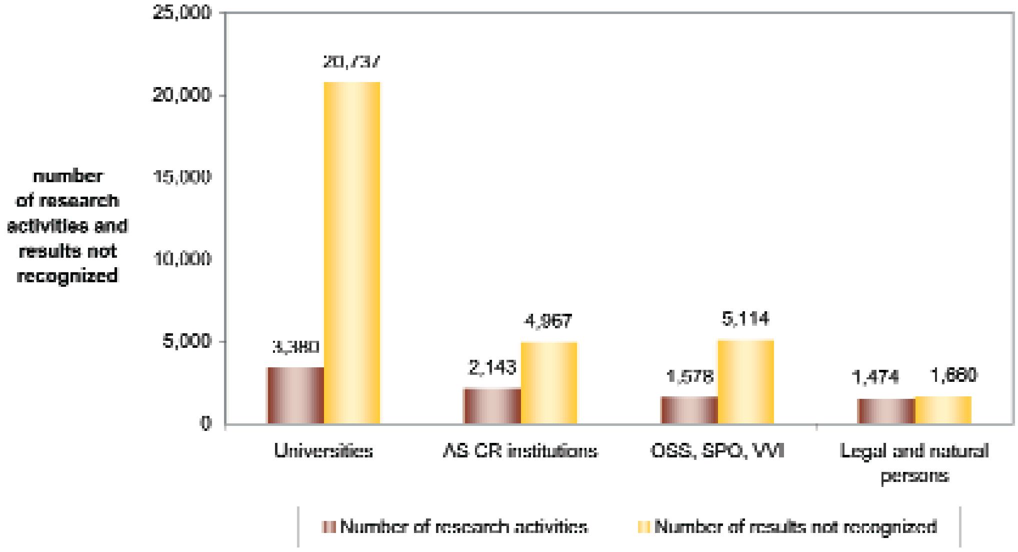
Code	Description
A	Audiovisual output, electronic documents issued solely in a form readable by computer, Internet, web presentation
E	Exhibition organization
M	Conference organization
O	Other results that cannot be classified among the types of results specified here
V	Opposed research report intended for state administration, arising as a result of implementing a project commissioned as a public contract
W	Workshop organization

Other examples of results assigned a zero weight value:

In relation to the type C result, a type B result with the same ISBN code was found, a type J result was published in a periodical in the List of Periodicals Excluded from the Evaluation of Research and Development and the Results Thereof in 2007; in respect of the type B result, type D and C (formerly K) results were found with the same ISBN code. Other results were found where duplicity was detected in the standardization process.

The highest ratio of non-scored to scored results was reported by two grantors – the Ministry of Informatics and the Ministry of Labour and Social Affairs. With these grantors, non-scored results account for more than half of all the results evaluated. This shows that the blanket provision of State aid delivering the expected results and is becoming inefficient.

B.1.11 Non-scored results by group of beneficiaries



Source: R&D IS, 2007 Evaluation

The highest number of non-scored results, i.e. results excluded from evaluation under valid Methodology for the Evaluation of Research and Development and the Results Thereof in the given year, is recorded among universities.

The numbers of non-scored results are clearly relatively high among other groups of beneficiaries too. This situation underscores the fact that too many small-scale research activities are being handled, often with average or below-average results.

B.2 Bibliometry

This part of the chapter follows the lines established in previous years. Baseline bibliometric indicators – numbers of publications and citations thereof in journals, as monitored by Thomson Reuters by drawing on the database of National Scientific Indicators 2007 – are evaluated. It should be pointed out that there are relatively broad fluctuations in quality even in the category of journals. In international comparisons, the publication quality indicator may include whether an article has been published in a foreign periodical or in a specialist periodical of national significance. These two factors are not reflected in the methodology used in this chapter. The following baseline indicators are used:

Relative production of publications - revealing the publication activity of a particular state. The average number of articles in the last five years (a fifth of the absolute number of articles in 2003-2007) per 1,000 inhabitants in the given state or per researcher (the registered number of researchers expressed as natural persons, i.e. the headcount).

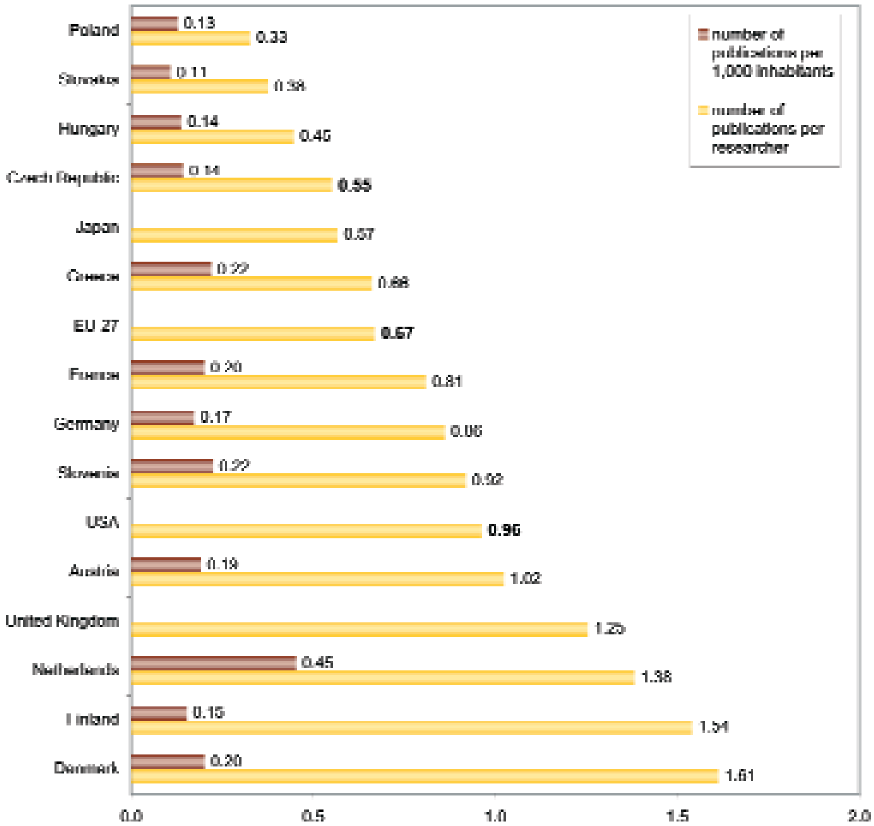
Relative production of citations - revealing the degree to which articles are cited in a particular state. The average number of citations in the last five years (a fifth of the absolute number of citations in 2003–2007) is relativized in view of the population (1,000 inhabitants in the given state) or the number of researchers (the registered number of researchers expressed as natural persons, i.e. the headcount).

Relative citation index (RCI) – comparing the standard of the bibliometric quality of productions of a particular state with the average global standard. The share of a state's citation index (the average number of citations per publication) and the world citation index (the total number of citations in relation to the total number of publications in the world). A state's relative citation index equal to one means that the standard of bibliometric quality is average, above one is above-average, and below one is below-average on a global scale.

Relative citation index of disciplines (RCI VO) – comparing the standard of the bibliometric quality of productions of a particular state in a given discipline with the average global standard of that discipline. The share of a national citation index in a discipline and the average global citation index in the same discipline multiplied by one hundred. The relative citation index of a discipline in a particular state equal to 100 means that this is an average global bibliometric level. On account of the insufficient number of publications in certain fields (all fields of Social Sciences and the Humanities, apart from Economics and Environmental Studies in the group Environmental Science) and hence the statistical irregularity, disciplines excluded from the analysis were selected. The minimum level was set so that the number of articles was at least several dozen. Where there were only a handful of articles, the discipline was excluded.

The data source was the National Science Indicators maintained by the US company Thomson Reuters. This company inter alia evaluates the quality of specialist periodicals around the world. Where a periodical satisfies all the prescribed criteria and is of professional quality, it may be included among journals and the articles published in it are added to the database. At present, there are approximately 10,000 journals; they are classified into 25 groups by specialization and, at the lowest level, into 106 disciplines.

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



Source: Thomson Reuters ISI National Science Indicators, 1981–2007. Eurostat. OECD, Main Science and Technology Indicators 2008/1.

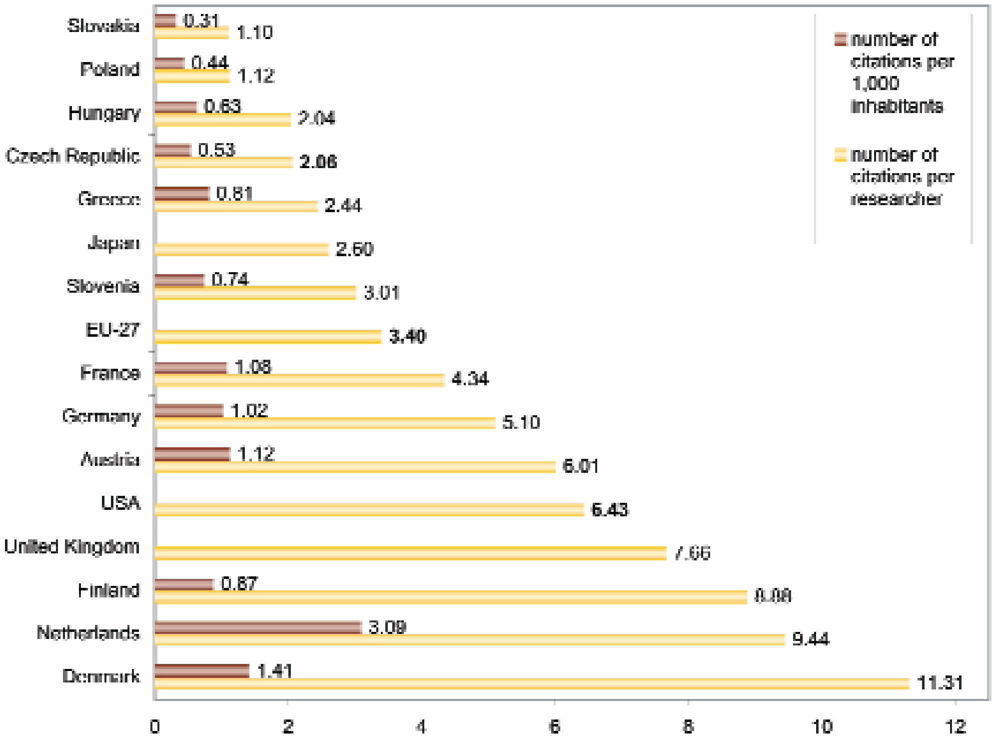
Note: Relative to the average population in 2003–2007, or the latest available data about the number of researchers (all states – 2005 or 2006; Austria – 2004).

In the international comparison of publication activity relative to the population, the Czech Republic is below average. The values of the relative citation index (measured per 1,000 inhabitants) are also below the average for the EU as a whole (0.67 versus 0.55). The highest values are achieved by the Scandinavian states of Denmark and Finland (more than 1.5 articles per 1,000 inhabitants), followed by the Netherlands, the United Kingdom and Austria (more than one article in a journal per 1,000 persons). In the past five years, the Netherlands has reported the highest value per scientist (on average, 100 scientists publish 45 articles in journals every year).

EU Member States acceding in the enlargement of 2004 and 2007 are among the states with the lowest publication activity: Poland, Slovakia, and Hungary (all with a relative citation index below 0.5).

The greater differences in the numbers of articles per 1,000 inhabitants are generally consistent with the differences in the numbers of researchers per 1,000 inhabitants (cf. graph A.2.4). In absolute terms, the international comparison also makes interesting reading. Whereas, in the past five years (2003–2007), an average of 5,650 articles were published in journals in the Czech Republic, 4,500 were published in Hungary – a country with the same number of inhabitants. Austria – similar in population to Bulgaria – printed an average of 8,500 articles in journals per year between 20003 and 2007. In Denmark and Finland, states with smaller populations (approximately five million), over 8,000 articles were published every year.

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



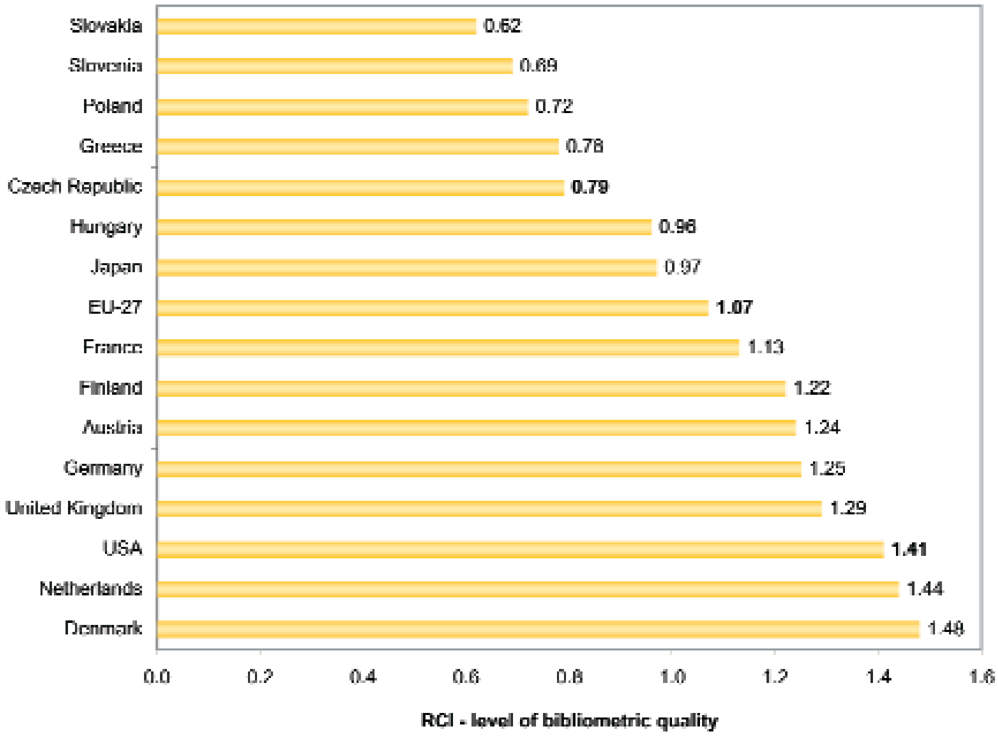
Source: Thomson Reuters ISI National Science Indicators, 1981–2007. Eurostat. OECD, Main Science and Technology Indicators 2008/1.

Note: Relative to the average population in 2003–2007, or the latest available data about the number of researchers (all states – 2005 or 2006; Austria – 2004).

The relative production of citations reports an even greater spread than the relative production of publications. This is logical – not all articles published in journals are necessarily cited in the future; therefore, there is a concentration of citations, which is also reflected in the international comparison of individual countries.

The sequence of states by relative production of citations is very similar to the preceding graph. The highest values are reported by Denmark, the Netherlands, Finland and the United Kingdom. The lowest values are in Slovakia, Poland, Hungary and the Czech Republic. The EU-27's average citation rate is not achieved by any of the new EU Member States (from the enlargement of 2004 and 2007).

B.2.3 Comparison of selected countries by relative citation index



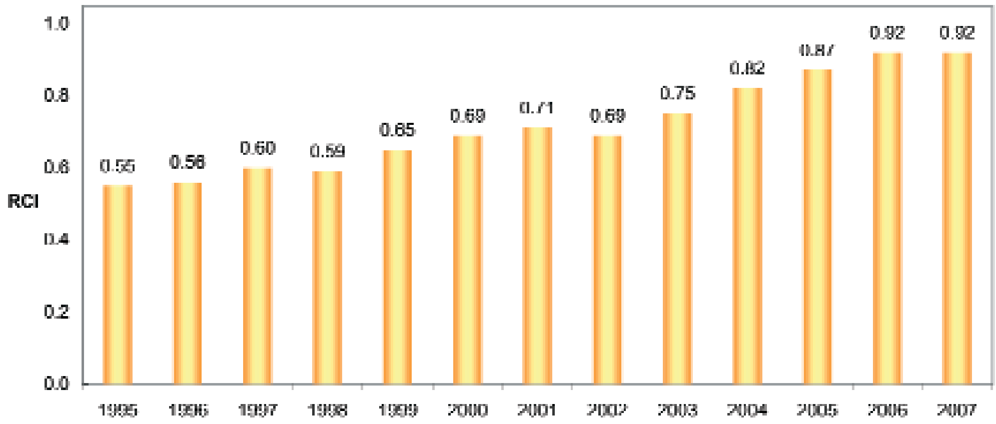
Source: Thomson Reuters ISI National Science Indicators, 1981–2007.
Note: Data for 2003–2007

The relative citation index between other bibliometric indicators offers the most informative values regarding the standard of articles published by a particular state. This is because it assesses the number of publications by number of citations and therefore describes how interested the academic community is in an article.

The average value of the Czech Republic's relative citation index was 0.79 in the past five years, which is well below the EU-27 average. Other new Member States report even lower values; the only exception in this regard is Hungary, whose citation index was a tenth weaker than the EU average (0.96 versus 1.7).

The highest relative interest is in the scientific articles of Danish and Dutch authors (with an RCI of almost 1.5).

B.2.4 Development of the relative citation index



Source: Thomson Reuters ISI National Science Indicators, 1981–2007.

Table B.5 Baseline bibliometric indicators in the Czech Republic and the world

Parametr	2000	2001	2002	2003	2004	2005	2006	2007
P1	4,080	4,385	4,599	4,974	4,974	5,876	5,962	6,454
C1	42,451	41,936	37,155	36,123	30,548	24,702	11,983	2,271
C1/P1	10.4	9.56	8.08	7.26	6.14	4.2	2.01	0.35
P	739,736	757,395	753,850	815,494	790,194	908,340	899,486	924,757
C	11,084,971	10,193,698	8,845,665	7,924,036	5,911,891	4,404,195	1,958,660	351,040
C/P	14.99	13.46	11.73	9.71	7.48	4.85	2.18	0.38
(C1/P1)/C/P)	0.69	0.71	0.69	0.75	0.82	0.87	0.92	0.92

Source: Thomson Reuters ISI National Science Indicators, 1981–2007.
Notes: P1 = number of publications in the Czech Republic; P = number of publications in the world; C1 = number of citations in the Czech Republic; C = number of citations in the world

While developments in the Czech Republic's relative citation index are favourable, it still falls short of the global average. In 2007, it stood at 0.92.

In the table, we can observe the calculation of the Czech Republic's relative citation index from raw data. It is important to note that there is no trend of falling numbers of citations either in the Czech Republic or in the world, but that the more recent the date of publication, the shorter the time in which it has been possible to cite an article. The Czech Republic's relative citation index (the last line in the table) is adjusted for this factor because it is relativized with consideration for the average global values in which this period was the same length (or shortness) in individual years.

In 2007, 6,454 articles by Czech authors were published in journals. This was 0.7% of the total volume of articles in journals in the same year (versus 0.55% in 2000). In 2007 more than three quarters of articles were published in OECD states; 37% of the global volume of articles was published in the EU.

B.2.5 Developments in the relative citation index of disciplines and in the number of publications

The National Science Indicators database makes it possible, among other things, to judge the standard of individual disciplines based on the relative citation index of disciplines (for a definition see the introduction to the Bibliometry chapter).

Of the total number of 106 disciplines, in the last five years (2003–2007) only 40 have reported an above-average value (over 100) in the RCI VO every single year in the Czech Republic. If we sum up the average value of the relative citation index of disciplines over the last five years, 57 disciplines had a value of more than 100, i.e. above average.

Between 2006 and 2007, there were improvements in 68 disciplines. However, not all disciplines are adequately represented in the number of publications or citations in order for the RCI VOs to be statistically comparable, as already mentioned in the introduction to this part of the chapter.

Table B.6 Disciplines evaluated

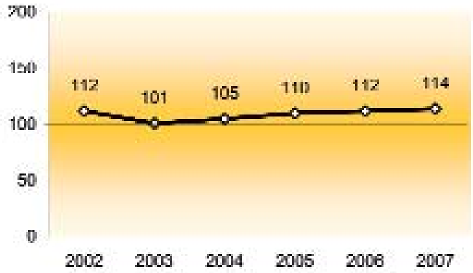
Group of sciences	Number of disciplines evaluated	Number of disciplines where there was an improvement in 2007 compared to 2006	
		in the RCIO value	in the number of publications
Non-life sciences	5	2	2
Chemical sciences	4	3	2
Engineering	3	3	3
Life sciences	4	2	3
Medical science	4	3	4
Social sciences and the humanities	4	2	2
Environmental science	3	3	2
TOTAL	**27**	**18**	**18**

The table shows the numbers of disciplines evaluated in the individual groups and the numbers of disciplines where there was an improvement in the RCIO value and an increase in the number of publications in 2007 compared to 2006. In 18 disciplines, of a total number of 27 disciplines, there was an increase in the RCIO value in 2007 compared to 2006. In 18 disciplines, there was an increase in the number of publications. In all technical disciplines, there was an increase both in the RCIO value and in the number of publications.

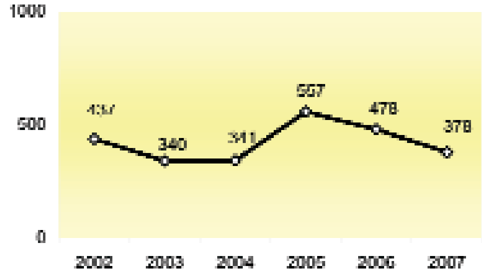
The graphs on the left illustrate the value of the relative citation index of the discipline; the graphs on the right show the absolute number of articles published in the calendar year in journals. In the context of the individual groups of disciplines, the same benchmark is maintained to make orientation in the graphs and lines of indicator values easier. The horizontal line delineates the average RCIO value.

Non-life sciences

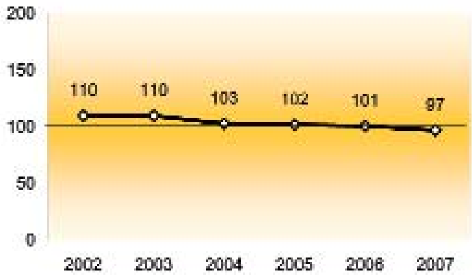
Physics - RCIO



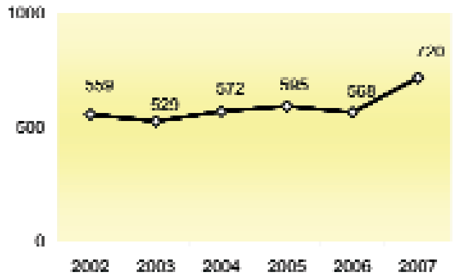
numbers of publications



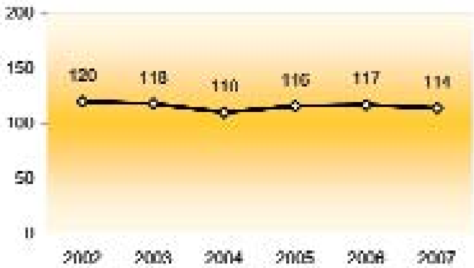
Applied physics, condensed matter, materials sciences - RCIO



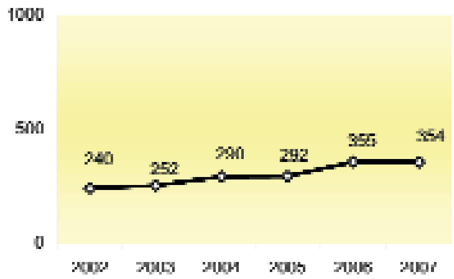
numbers of publications



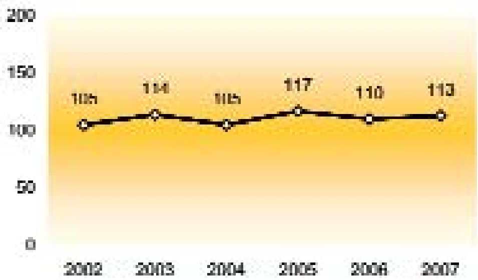
Physical chemistry - RCIO



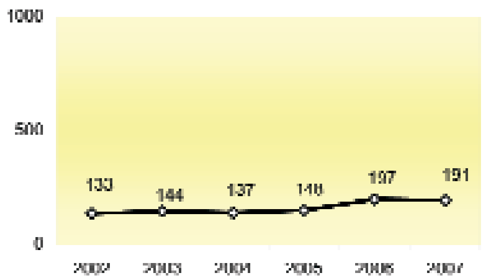
numbers of publications



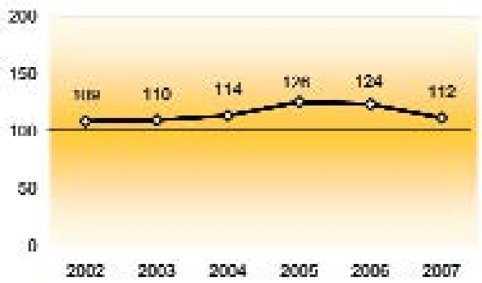
Mathematics - RCIO



numbers of publications



Engineering mathematics - RCIO



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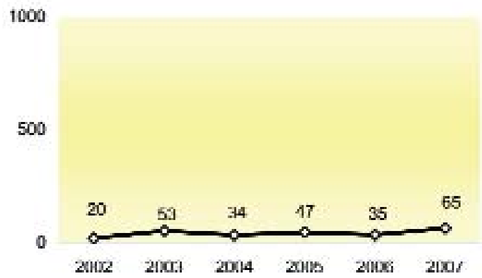
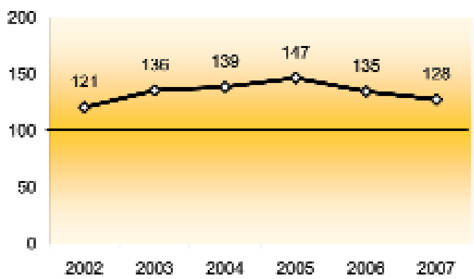


All the disciplines above recorded an above-average RCIO value of at least 100 throughout the period. In the fields of applied physics, condensed matter, and materials sciences, Czech researchers publish more than 500 scientific articles per year.

Chemical sciences

Chemical engineering - RCIO



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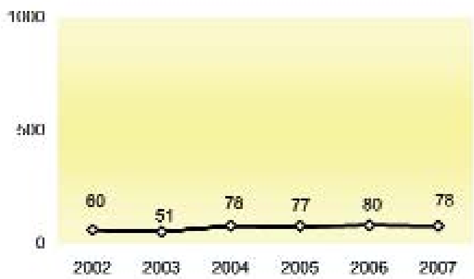
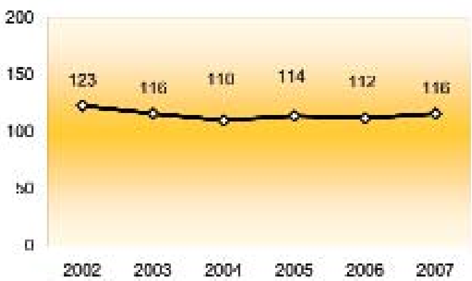


Organic chemistry,
polymer sciences - RCIO



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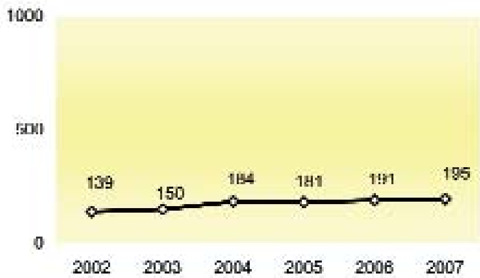
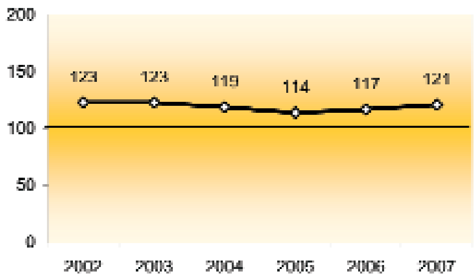


Inorganic and nuclear chemistry - RCIO



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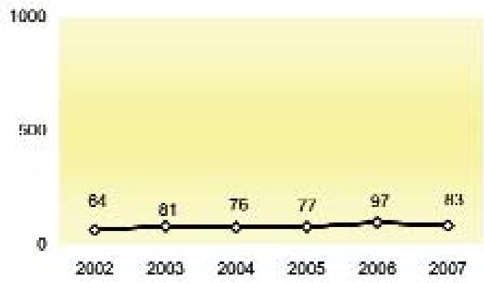
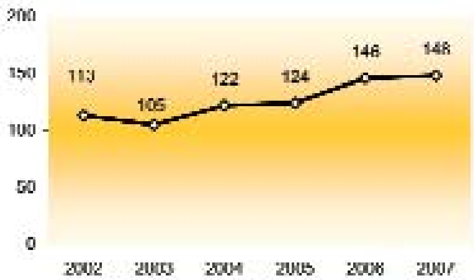


Pharmacology and toxicology - RCIO



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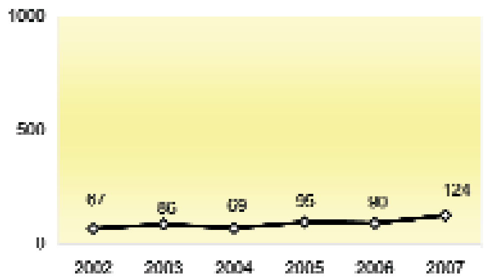
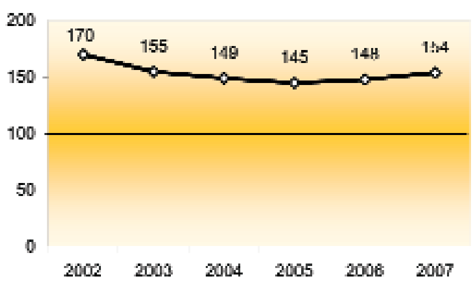


In the chemical sciences all the disciplines have recorded an above-average RCIO value of more than 100 throughout the period. In the fields of organic chemistry and polymer sciences, Czech researchers publish more than 100 scientific articles per year.

Engineering

Spectroscopy, apparatus - RCIO



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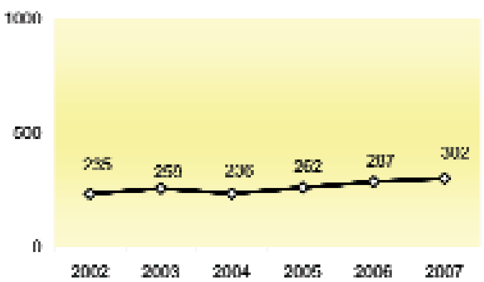
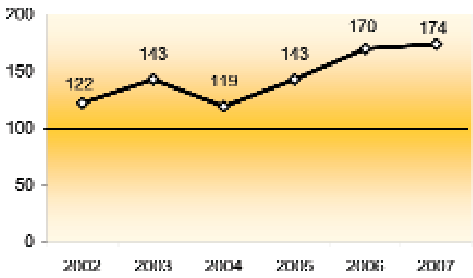


Nuclear engineering - RCIO



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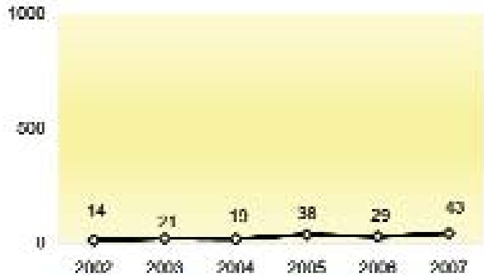
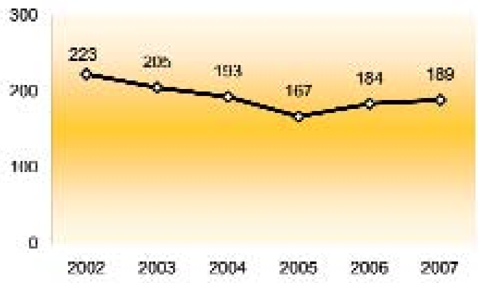


Instruments and measurement - RCIO



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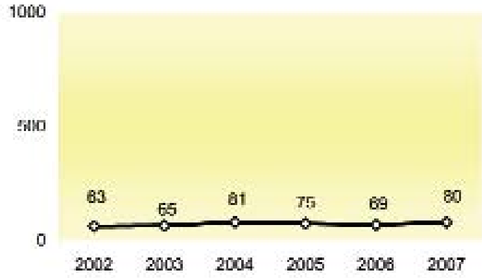
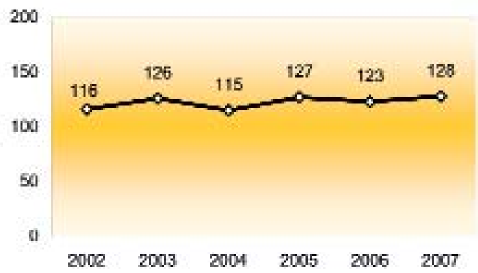


All engineering disciplines reported RCIO values in 2002–2006 that were significantly higher than the global database average. However, apart from the discipline of Spectroscopy, apparatus and analytical apparatus, the annual numbers of publications are lower than 100.

Life sciences

Plant and animal biology - RCIO



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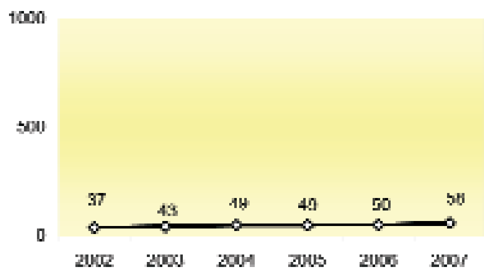
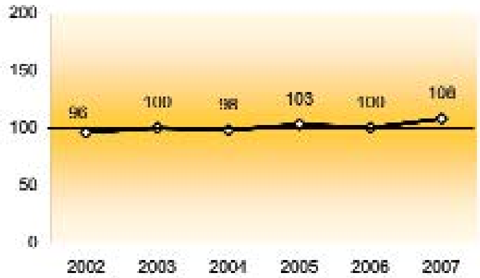
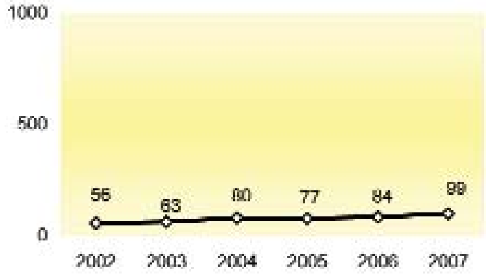


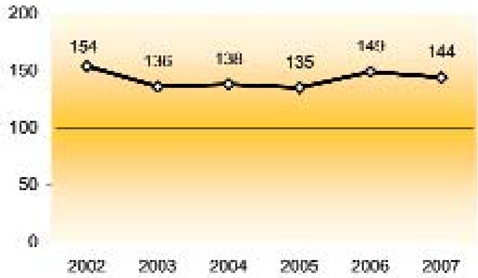
Molecular biology and genetics - RCIO



numbers of publications

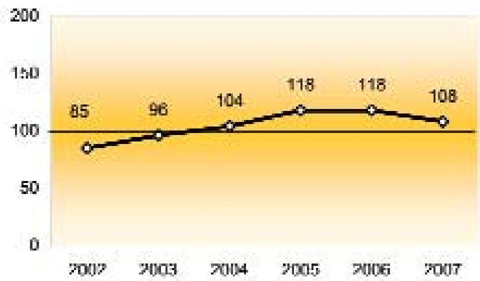


Entomology - RCIO

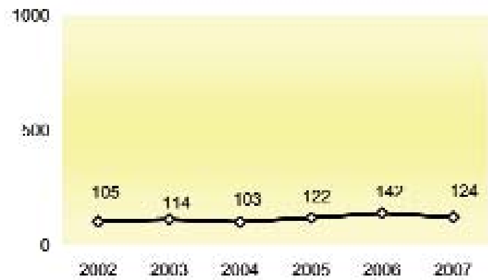


numbers of publications

Veterinary medicine - RCIO



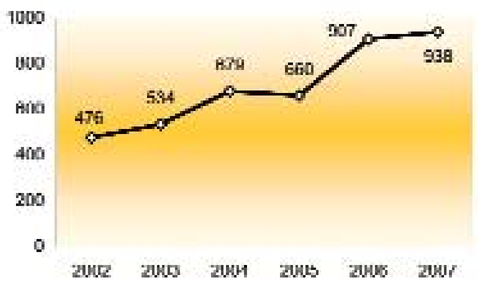
numbers of publications



Of the disciplines above, the best results are achieved by entomology and plant and animal biology; in all the years they report RCIO values much higher than 100, albeit with a relatively small number of publications.

Medical sciences

General and internal medicine - RCIO



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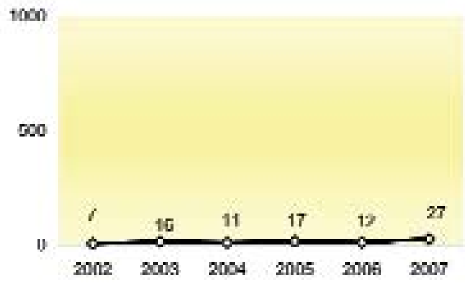
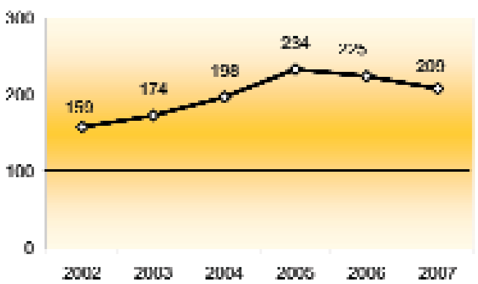
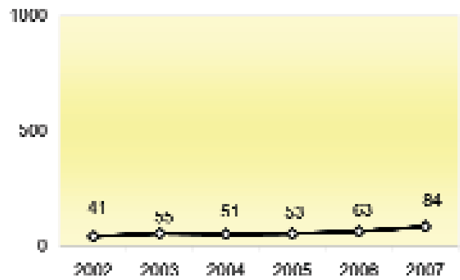


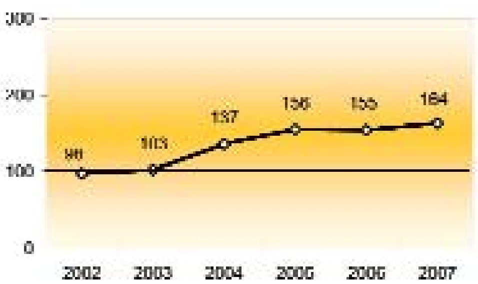
Cardiology, respiratory medicine - RCIO



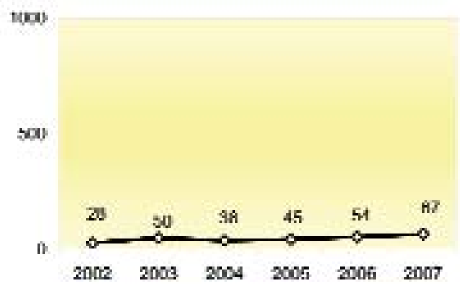
numbers of publications



Cardiology and haematology - RCIO

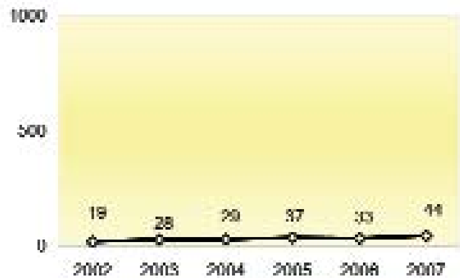


numbers of publications



Oncology - RCIO

numbers of publications



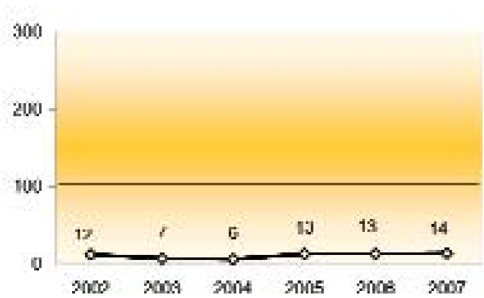
Of the 106 disciplines defined by the sets of publications monitored by Thomson Reuters ISI, Czech researchers report by far the best results in general and internal medicine. Since 2003,

RCIO values in this field have been more than five times the average for this discipline in the global database. In 2007, this discipline reported more than nine times the global database average, but the numbers of publications in this field are low.

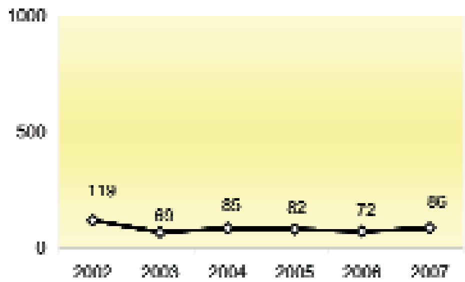
Medical sciences confirm that the evaluation of disciplines by the RCIO of disciplines defined by sets of publications is problematic. In the Thomson Reuters ISI system, cardiology is covered by cardiology and respiratory medicine on the one hand, and cardiology and haematology on the other.

Social sciences and the humanities

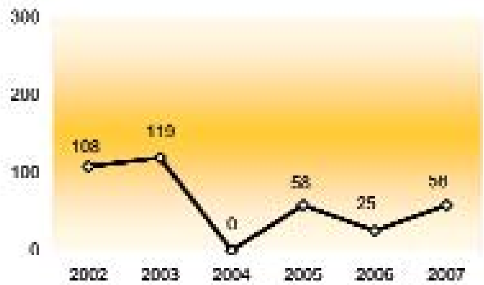
Economics - RCIO



numbers of publications



History - RCIO



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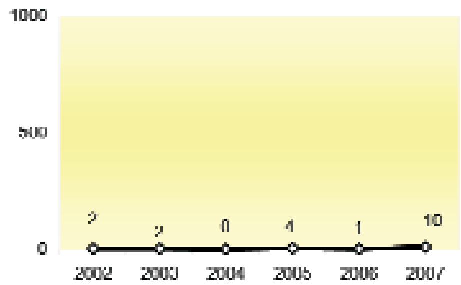
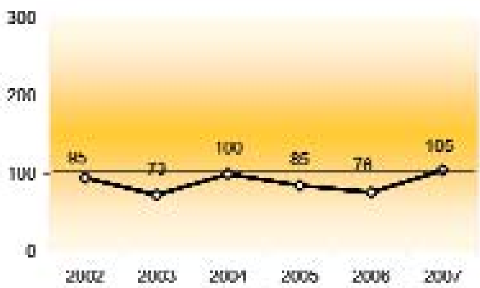


Most disciplines under social sciences and the humanities in the Czech Republic are classified, in the evaluation of disciplines in the system of sets of periodicals evaluated by Thomson Reuters ISI, as disciplines with a significantly below-average RCIO indicator, and it is clear that in this field there is a systemic deficiency that prevents these data from being regarded as a benchmark of discipline quality. The RCIO value for economics in the monitored years hovers at ten per cent of the global database average. Given the wide scope covered by the discipline of economics and the number of workers involved in it in the Czech Republic, not even the number of publications can be regarded as satisfactory.

Disciplines such as teaching, history and law cannot be evaluated in a plausible manner because they report very low numbers of publications in the database used. As such, no RCIO values are cited for teaching and law, where a very low number of papers forms the base and the RCIOs have virtually no informative value.

Environmental sciences

Environmental studies, geography, developing countries - RCIO



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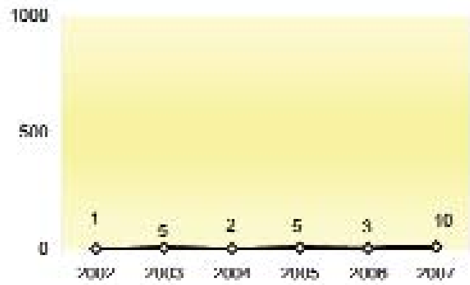
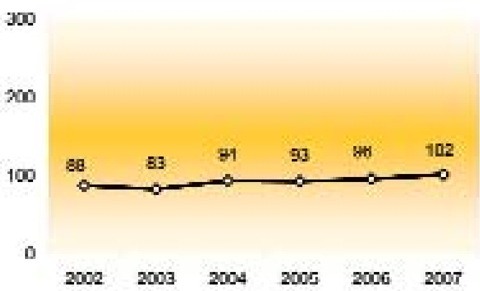
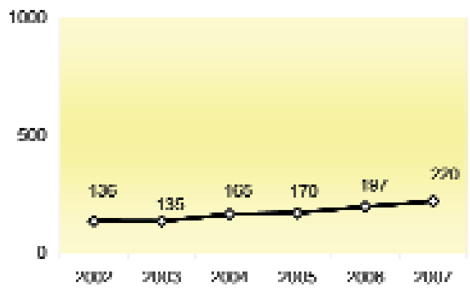


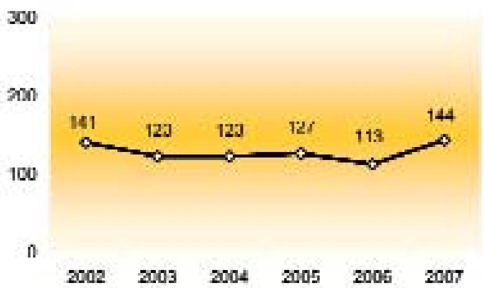
Environment, ecology - RCIO



numbers of publications



Environmental engineering, energy - RCIO



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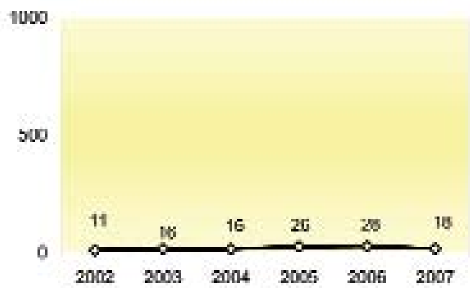


Of the three disciplines under environmental sciences, in relative terms Czech researchers in the field of environmental engineering and energy achieve the best results. Throughout the 2002–2007 period, the RCIO is above the average reported by this discipline in the global database. In the environment and ecology, the RCIO values are slightly below the global database for the whole period.

The discipline of environmental studies, geography and developing countries achieves RCIO values close to the global database average, but with a very low number of publications.

B.3 Patent applications, patents and licences granted

Intellectual property rights have two different areas: copyright, regulated by Act No 121/2000, and industrial property rights, regulated by numerous other laws. Copyright protects not only classic works (e.g. literature, pictures, statues, music, film), radio programmes and computer programs, but also scientific works, which are the unique output of the author's creativity and are expressed in an objectively perceivable form.

The following forms can be used for the protection of industrial property rights:
protection by granted patent (Act No 527/1990), protecting technical and functional aspects of products and processes. An invention is patentable if it satisfies the criteria of industrial use and novelty and is not obvious to a person skilled in the field of technology.
a utility model, providing protection for the method of a technical solution, comparable to a patent but much faster and less costly to arrange; however, there is no possibility of protecting the controlled technical solution (Act No 478/1992).
a design, protecting the appearance of a product under Act No 207/2000.
a trade mark, constituting any sign capable of being represented graphically and consisting of words, letters, numbers, a drawing or the shape of the product or its packaging, or a combination thereof, intended as a means of distinguishing between the goods or services of various enterprises (Act No 441/2003).

Innovative businesses draw on intellectual property protection more frequently than enterprises with lower levels of innovation. Table B.7 sets out the results of the CIS 4 survey, which inter alia evaluated the methods used for the protection of intellectual property rights at EU-27 innovative businesses. The survey covers a three-year period from 2002 to 2004. Of the reporting countries, the protection of intellectual property rights is most commonly applied by innovative businesses in France (just 16.2% of enterprises do not have protection), Germany (34.8% of enterprises have no protection) and Finland (reporting 50% of enterprises without protection). Undertakings in Hungary protect their intellectual property rights the least (77.3% of enterprises do not have protection). There is a remarkably large percentage of undertakings without the protection of intellectual property rights in Denmark (61.9%), which is the same level as among Czech businesses. Typically, classic intellectual property protection in highly dynamic sectors with short innovation cycles (e.g. information technology) is not even possible. To some extent, this explains the position in Finland, but regrettably not the situation in the Czech Republic.

Rights to inventions, which are very often the result of R&D, are typically protected by patent. Patent applications are submitted most commonly by innovative businesses in France (22.2% of enterprises), Germany (20.1% of enterprises) and Finland (18.2% of enterprises). The shares of innovative businesses that protect their intellectual property rights with patents are 3–6% in new EU Member States and Greece.

Patents are the most significant form for the protection of industrial property rights. The protection of industrial property rights links innovations, inventions and other creations to the market and can result in major economic effects (e.g. licence sales).

The numbers of patent applications and numbers of patents granted are generally regarded as one of the indicators of R&D successfulness. Inventions essentially emerge as R&D products. This is not altered by the fact that the granting of a patent tends to be well down the line from the completion of research and development work.

In the Czech Republic and in all new EU Member States, simplified approaches to the indicator of the number of patent applications or patents granted are manifested in discussions relati-

vely often. R&D entities frequently complain about the complicated nature of procedures, the length of time it takes to get a patent, and the high financial cost of obtaining and maintaining a patent. It has been hard to promote the concept that the point is not the numbers of applications or the numbers of patents granted in the strict sense, but the economic benefit from gaining a competitive edge on the market based on the legal protection of an invention by means of a patent or from selling licences.

There are currently two systems for the protection of inventions in Europe: the European patent system and the national patent systems. The first is based on the Convention on the grant of European patents (the Munich Convention). National patent systems are based on the national patent law of individual countries. In both systems, it also possible to draw on the Patent Cooperation Treaty (PCT), where a substantial part of patenting procedure takes place at international level.

Table B.7 Shares of innovative businesses with and without the protection of intellectual property rights (%)

	Patent application	Trade mark registration	Design registration	Copyrighting	No protection
Bulgaria	7.6	18.5	6.8	3.9	63.1
Denmark	19.6	25.0	9.8	9.5	36.1
Czech Republic	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
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 additional calculations by the Research and Development Council

The Convention on the grant of European patents, signed in Munich in October 1973, entered into effect on 7 October 1977. This convention created a uniform patenting system for all states parties, based on which an applicant, with a single patent application and through uniform procedure, can obtain the protection of an invention in all states parties specified in the European patent application. If a European patent is granted, an invention is protected in these countries to the same degree as if a national patent had been granted. The Convention on the grant of European patents established the European Patent Organization (as a legislative body) and the European Patent Office (as an executive body).

The above-mentioned Patent Cooperation Treaty (PCT) was signed in Washington on 19 June 1970. It entered into effect on 28 January 1978. Under the PCT, an international application carries the same effect as a national application in all states parties. The PCT administrator is the World Intellectual Property Organization (WIPO). WIPO presently comprises 184 member states. Of these 139 are PCT member states. Within the scope of the international stage of proceedings, the subject of an international application is subjected to a search of current technologies and, where appropriate, to a prior examination of patentability. These are then used in the national or regional stage of proceedings before national or regional patent offices (e.g. the EPO), where the proceedings for the grant of national or regional patents is completed.

Despite several years of efforts, the Community patent (originally under the 1975 Luxembourg Treaty) has not been introduced alongside the existing systems.

This part of Chapter B follows up on the analyses from 2004–2007. It contains data on the numbers of patent applications in 2003, 2005 and 2007 submitted to the Industrial Property Office of the Czech Republic (UPV), the European Patent Office (EPO) and the United States Patent and Trademark Office (USPTO), and on the numbers of patents granted by these offices. On a number of occasions, the data from 2003 and 2005 have been formulated more precisely. The data were taken from the annual reports of the relevant patent offices for 2007. As the analysis has been expanded, utility model (design) applications to the UPV have been included in this part. Utility models provide protection to technical solutions, which as a general rule are used in lower ranking innovations. The Czech text of this analysis preserves the terminology of Czech patent law, which uses the term 'přihláška vynálezu' ('invention application'), and the terminology of the EPO and the USPTO, which use the term 'patent application' ('přihláška patentu').

The data, in keeping with the R&D evaluation methodology applied by both the OECD and Eurostat, are per million inhabitants of the relevant country. In other countries, sometimes the data are per million employed persons.

Analyses of patent applications and patents granted, and especially their link with R&D support, are difficult. The results are published with a time lag of three or four years. In 2006, Eurostat published the results of a more detailed investigation into patents from 2002. This investigation inter alia addressed the proportions of the principal R&D sectors (business, public and universities) in the twenty countries with the highest numbers of patent applications submitted to the EPO and in the twenty countries with the highest numbers of patents granted by the USPTO.

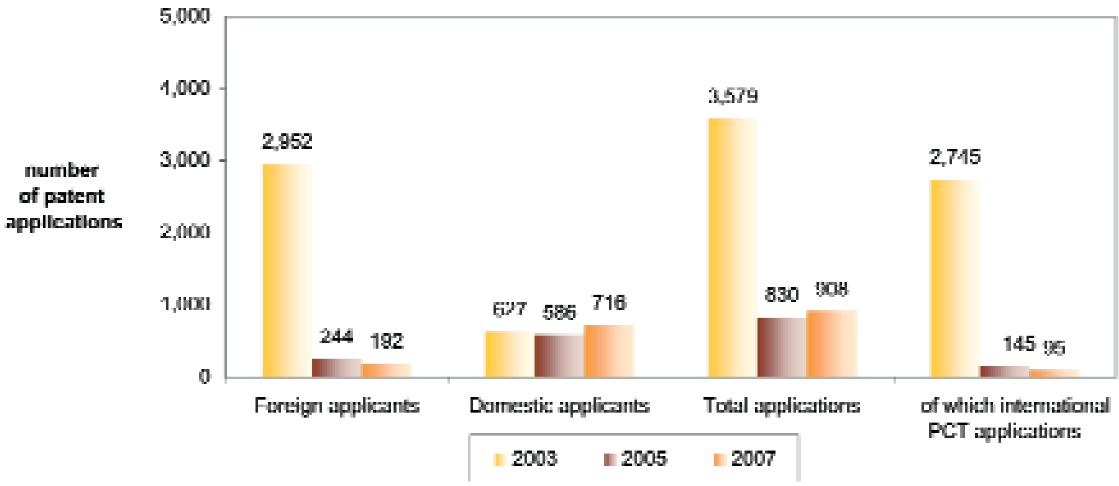
Of the twenty countries with the highest numbers of patent applications submitted to the EPO, the proportion of applications from the business sector is higher than 80% in nine countries, headed by Japan (more than 90%). The second largest patent applicant is the public sector. The public sector recorded its highest proportion in Canada (over 20% of the total number of applications). The proportion of patent applications from universities did not exceed 10% in any of the twenty countries; the highest such figure was reported in Canada (just under 8%).

Of the twenty countries with the highest numbers of patents granted by the USPTO, the proportion of patents granted to the business sector is higher than 80% in thirteen countries, again headed by Japan (more than 95%). The public sector recorded its highest share in Denmark (approximately 55%). The share of universities in the patents granted was markedly lower. Universities recorded their highest share in Belgium (approximately 7%).

After 2002, there was an increase in the numbers of patent applications and patents granted to the public sector and to universities. Even so, the business sector remains the key player in the field of patent applications and patents granted.

The Eurostat document also demonstrates the relatively strong correlation between the number of patent applications submitted to the EPO per million inhabitants and the R&D expenditure per million inhabitants.

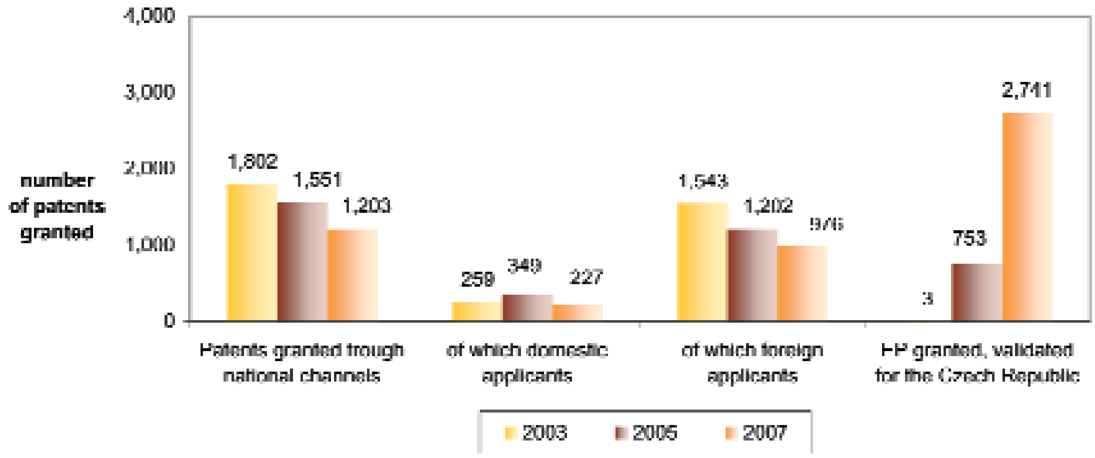
B.3.1. UPV patent applications



Source: Annual Report of the Industrial Property Office (UPV) 2007

In the Czech Republic, there was a moderate rise in 2007 compared to 2005, but compared to 2003 there was a drop in the total number of patent applications; this can be attributed primarily to the fall in the number of applications from foreign applicants. A substantial part of foreign applications – more than half – is submitted via international channels in accordance with the PCT. The numbers of applications from domestic applicants are growing slightly. Foreign patent applicants seeking protection in the Czech Republic prefer to submit European patent applications to the EPO, in which they specify the Czech Republic as a country in which they want to be protected by a European patent.

B.3.2 Patents granted by the UPV



Source: UPV Annual Report 2007

In the Czech Republic, the numbers of patents granted through national channels report a downward trend. Notably, there has been a decline in the proportion of foreign applicants, who give preference to patenting in the Czech Republic via the EPO. The share of foreign applicants in the total number of patents granted through national channels shrank from 86.6% in 2003 to 81.1% in 2007.

However, the number of European patents validated for the Czech Republic is rising at a dynamic pace. The increase in the number of these patents in 2007 was more than three times higher than in 2005. In the table below, the numbers of national patents granted by the UPV and the numbers of European patents validated[9] in the Czech Republic are set out.

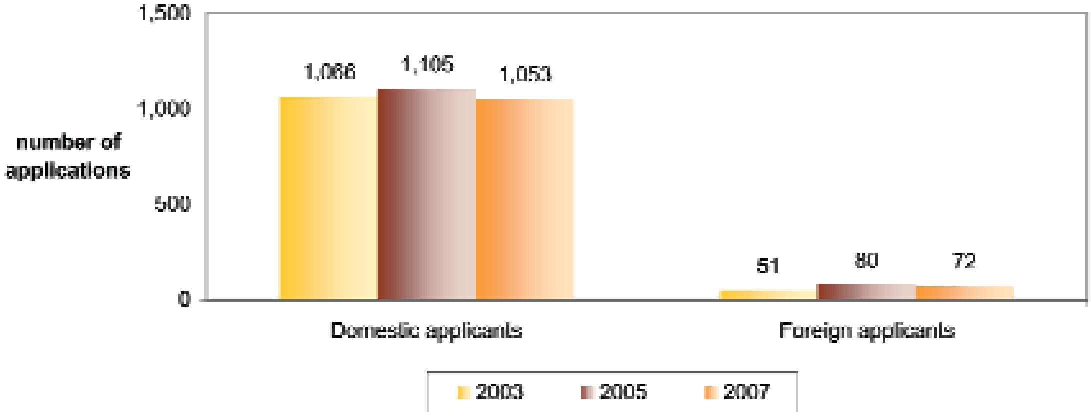
Table B.8 National patents granted and European patents validated with effect in the Czech Republic, by country of origin (countries with the highest numbers of patents)

	2001	2003	2005	2007
Czech Republic	241	259	350	235
Germany	507	542	757	1,352
USA	298	272	212	491
France	94	106	180	344
Switzerland	93	113	106	265

Source: UPV Annual Report 2007

9 Validated patent – a European patent for which a Czech translation has been submitted and for which an administrative fee has been paid.

B.3.3 UPV utility model (design) applications



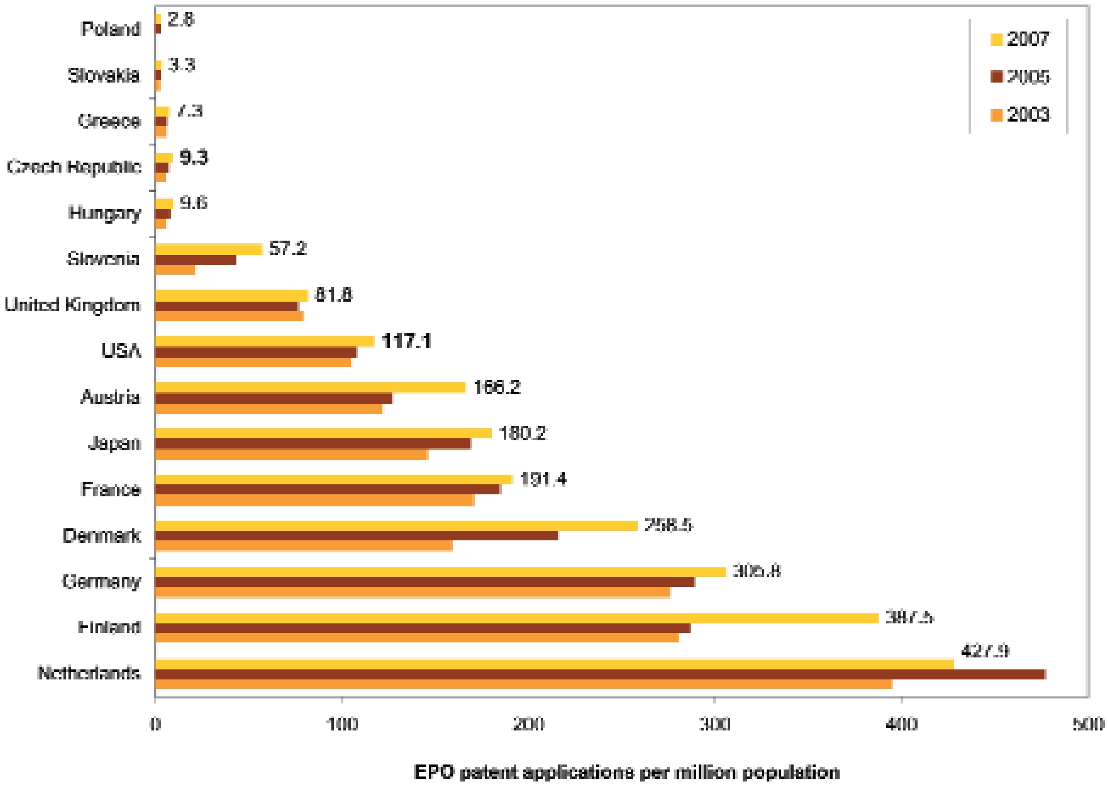
Source: UPV Annual Report 2007

Table B.9 National utility models registered in the Czech Republic

	2003	2005	2007
National applicants	962	1,019	990
Foreign applicants	59	66	69
Total applicants	1,022	1,084	1,059

Source: UPV Annual Report 2007

B.3.4 EPO patent applications



Source: European Patent Office (EPO), Annual Reports 2003, 2005 and 2007

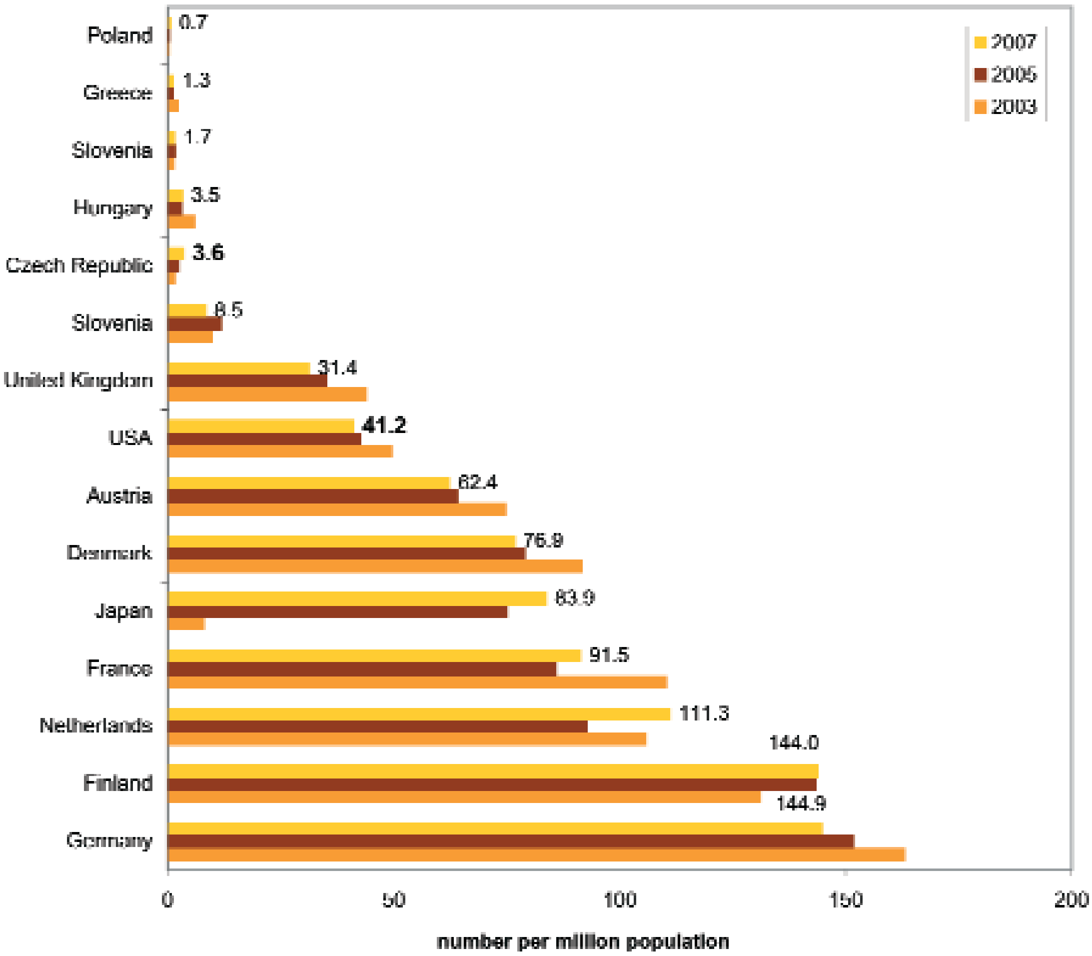
Table B.10 The EPO's largest patent applicants in 2007

Order	Enterprise	Number of patent applications
1.	Philips	3,222
2.	Samsung	2,478
3.	Siemens	1,850

Source: Facts and Figures 2007, EPO

In 2007, the major European multinational industrial corporations registered more patents than all the monitored new EU Member States and Greece together. The EPO publication 'Facts and Figures 2007' sets out the largest applicants from the business community.

B.3.5 Patents granted by the EPO

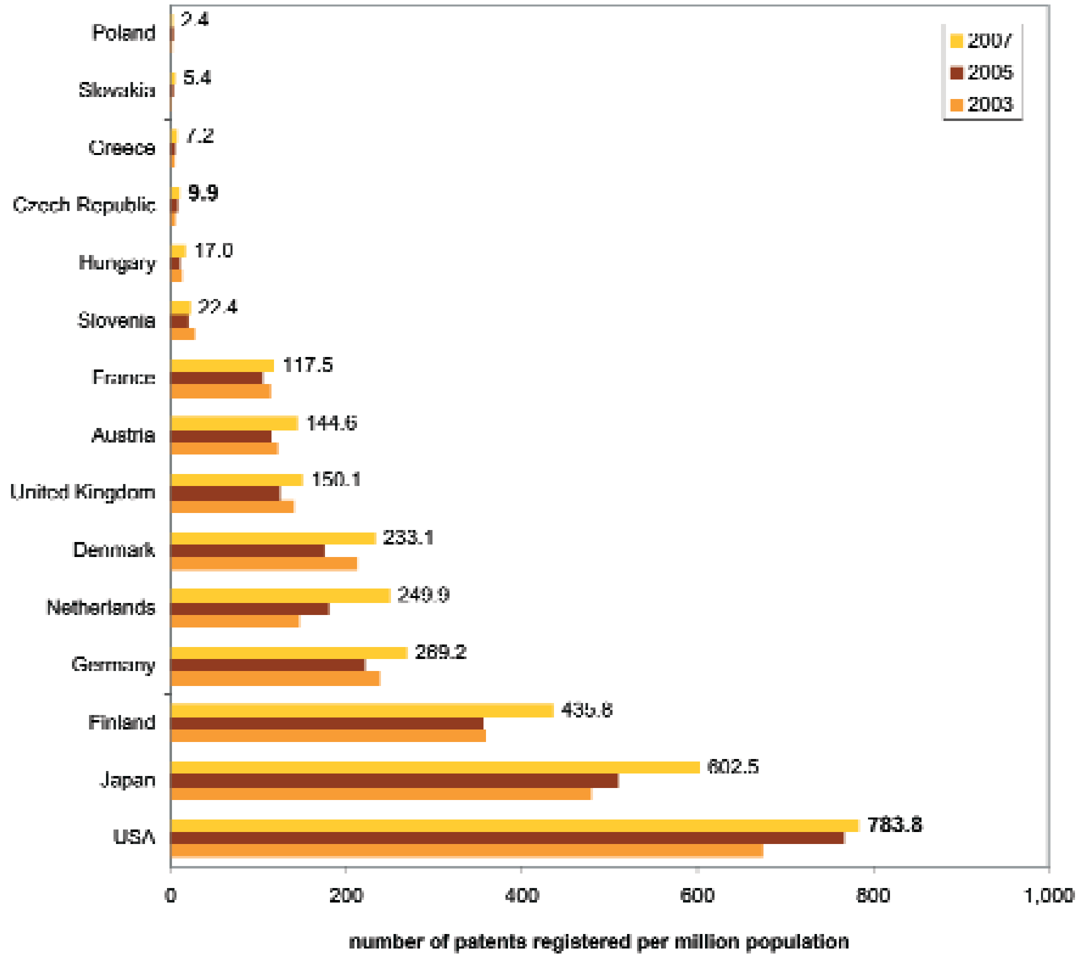


Source: EPO, Annual Reports 2003, 2005 and 2007

Differences in the numbers of patents granted between the EU-15 Member States in the comparison and the new Member States plus Greece are considerably greater than the differences in the number of patent applications. The new Member States lag far behind mainly because of the structure of their industry, which continues to have a place on the international markets due to its lower labour costs.

Another reason is unquestionably the lower R&D performance, notably in industry, if we taken into account that even in the most developed countries worldwide approximately 80% of the total number of patent applications comes from the business community. In these countries, the remaining 20% of patent applications is shared between the public sector and universities.

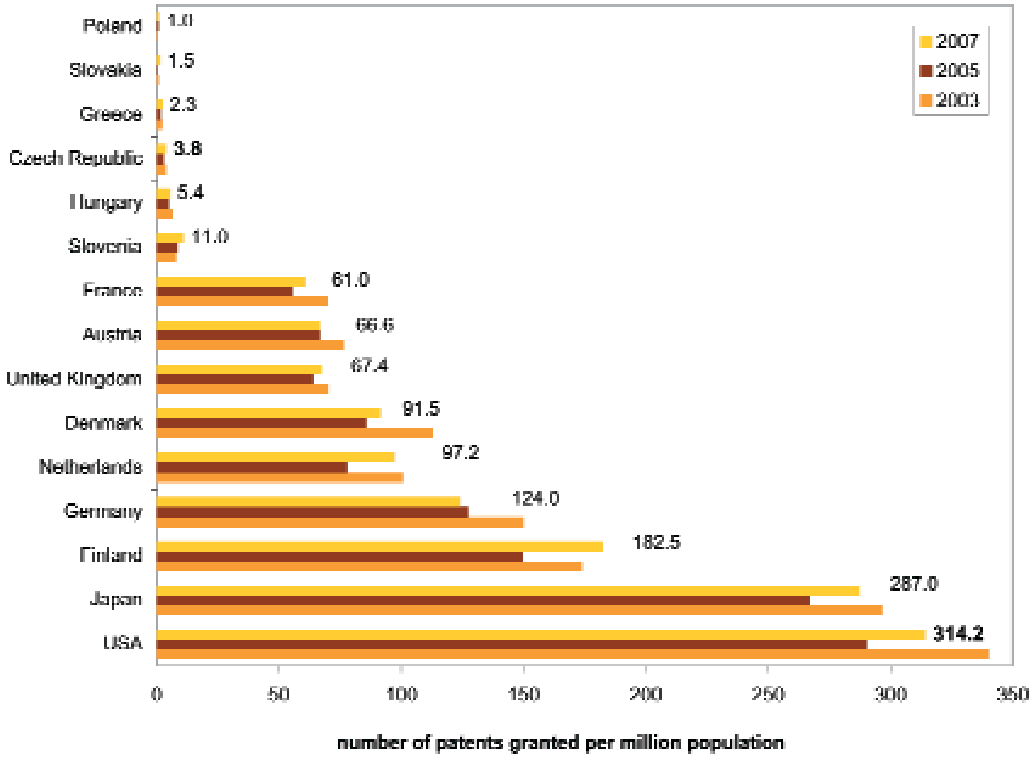
B.3.6 USPTO patent applications



Source: Performance and Accountability Report Fiscal Years 2007

The same comments made on the graphs detailing the number of patent applications and patents granted via the EPO apply to the patent applications submitted to the United States Patent and Trademark Office (USPTO).

B.3.7 Patents granted by the USPTO



Source: Performance and Accountability Report Fiscal Years 2007

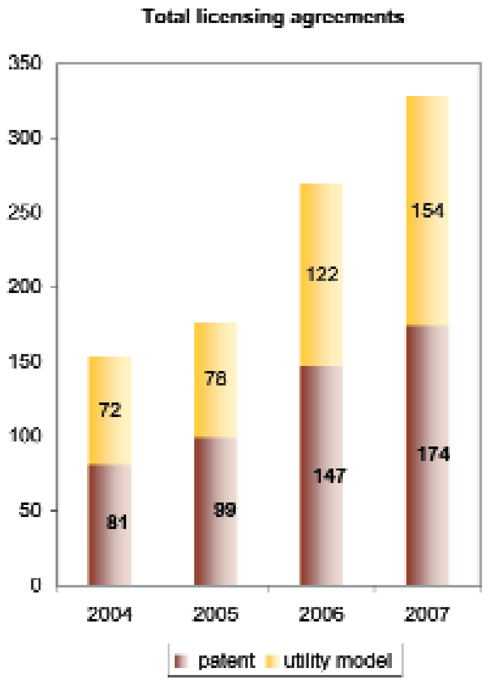
For the sake of comparison, it is possible to cite the numbers of patents granted by the USPTO to some of the smaller reporting countries in 2007: Austria – 553 patents, Denmark – 494 patents, Hungary – 55 patents, the Czech Republic – 39 patents, Poland – 37 patents. The numbers of patents granted to distinguished American universities run counter, to some extent, to the claims of the low proportion of universities in the numbers of patents granted.

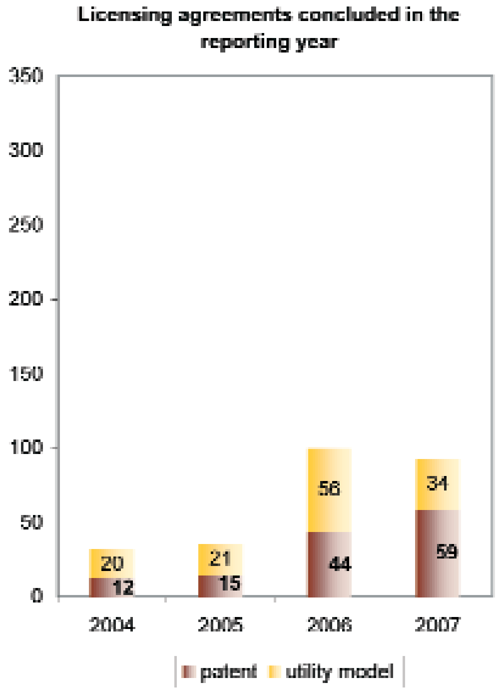
Table B.11 Most successful US universities by number of patents granted by the USPTO

	University	Numbers of patents granted 2003	2006
1.	University of California, Berkeley	424	410
2.	Massachussetts Institute of Technology	132	139
3.	California Institute of Technology	135	115
4.	University of Texas	101	107
5.	Stanford University	75	98

Source: USPTO, Patent Statistics Report for Viewing – 2007

B.3.8 Number of valid licences for patents and utility models granted in the Czech Republic





Source: CZSO, Annual Statistical Survey on Licences (LIC 5-01)

A licensing agreement grants a right, to an agreed scope and for an agreed territory, to acquire (purchase) or provide (sell) patented and unpatented inventions, utility models, designs, topographies of semiconductor products, new plant varieties and animal breeds or trade marks. As such a licence is one way of commercially exploiting industrial rights and intellectual property.

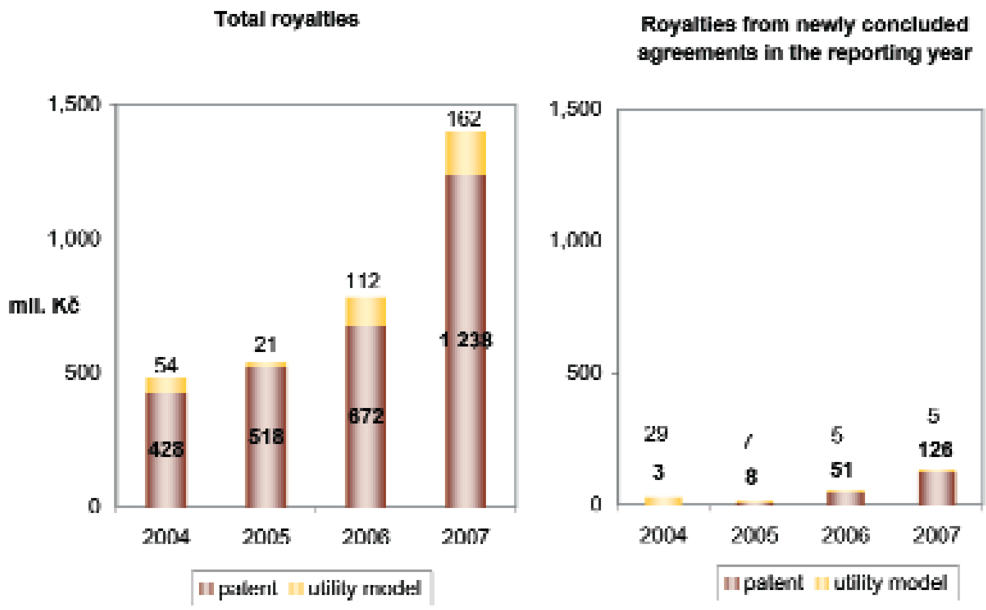
The data contained in this part are limited to licences for patents and utility models provided by entities in the Czech Republic. These figures are drawn from the CZSO's regular annual statistical survey (LIC 5-01).

The number of licences granted to use a patent or utility model owned by an entity in the Czech Republic in a reference year includes all valid licensing agreements concluded between an entity operating in the Czech Republic (a licensor) and a licensee from the Czech Republic or another country. Licensing agreements are generally concluded for a period of longer than one year.

In 2007, only 41 patent licensors and 48 utility model licensors were detected in the Czech Republic. In the same year, 328 valid patent or utility model licensing agreements were ascertained. Of the total number of valid licensing agreements, 93 new agreements were concluded in 2007. Seventy-seven per cent of valid patent or utility model licences (254 licensing agreements) were concluded between two Czech entities; 23% were concluded with foreign partners (licensees).

In 2007, universities contributed just nine licences (3) and public research institutions eighteen licences (6%) to the total number of valid patent and utility model licences.

B.3.9 Value of licence fees for patents and utility models in the Czech Republic



Source: CZSO, Annual Statistical Survey on Licences (LIC 5-01)

In respect of licensing, licence fees and royalties (income) obtained by the licensor from the licensee in the reference year (not from the outset of the licensing agreement) are monitored.

In 2007, the income of entities operating in the Czech Republic from patent or utility model licensing was CZK 1.4 billion (CZK 1.24 billion from patents and CZK 0.16 billion from utility models). In 2007, most of the royalties collected came from the United States of America (CZK 949 million).

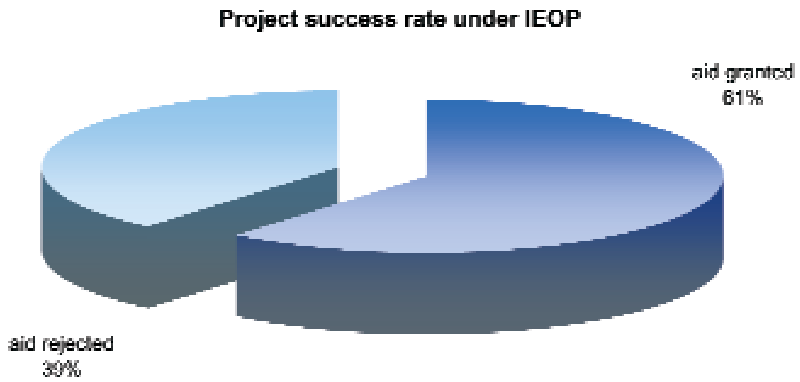
Royalties under newly concluded agreements amounted to CZK 141 million and contributed 9% to total income from valid licensing agreements. There was CZK 1.3 million in royalties collected per new licence.

C.1 Encouraging innovation in the Czech Republic

C.1.1 Support for innovation under programmes run by the Ministry of Industry and Trade in 2004–2006

Since May 2004, the MIT's most important instrument supporting the development of the innovative environment and the growth of innovation activities in the business sector has been the 'Industry and Enterprise Operational Programme' (IEOP), announced for the 2004–2006 period. The source of aid granted under the IEOP was financial resources from the EU Structural Funds, specifically the European Regional Development Fund (75%), and from the national budget (25%).

Under this programme, from the perspective of the overall perception of the innovation process, support was channelled not only into the actual development of innovation infrastructure and the innovation of products, technologies and services, but also into the operations of start-ups and recently formed enterprises, the formation of regional and supra-regional industry associations and the development of consultancy services. The principal means of support was subsidies, soft loans and interest-free loans.

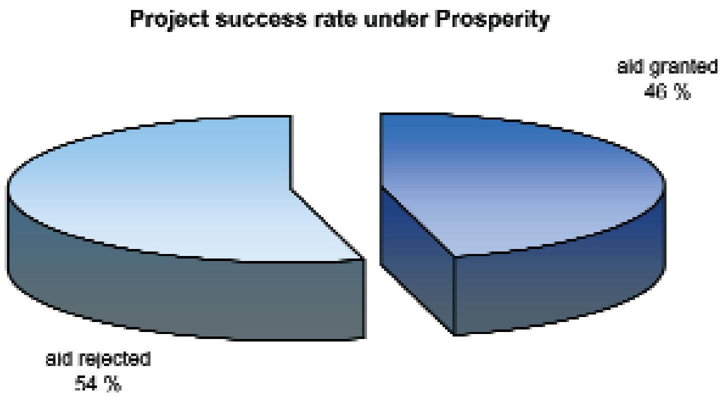


As at 31 December 2007, of the total number of 4,673 applications delivered, decisions to grant subsidies were issued and credit agreements were concluded for the implementation of 2,858 projects with total aid of more than CZK 10 billion. As at the same date, approximately 50% of aid resources had been released. The volume of payments lags behind the volume of resources earmarked for issue under decisions (agreements) because they are made ex-post, i.e. on the successful winding-up of the project or stages thereof.

The following programmes had the closest link to aid for the development of the innovative environment and innovation activities of the business sector under the IEOP:

PROSPERITY

The Prosperity (Prosperita) programme focused on the support of infrastructure development for industrial research, development and innovation.



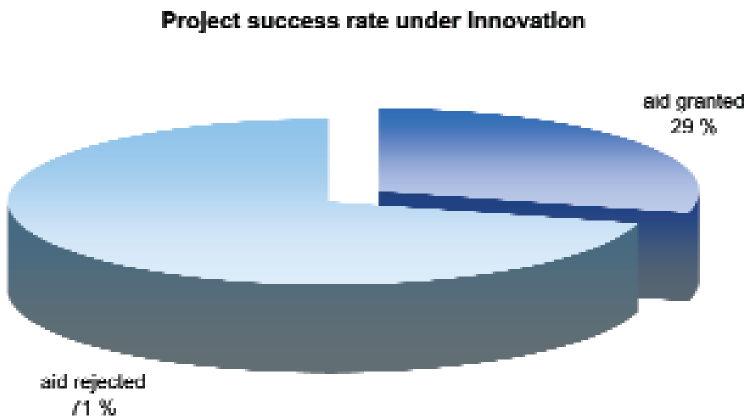
The basic task of this programme was to encourage the formation and functioning of business incubators, science and technology parks and technology transfer centres. From the time the programme was announced until 31 December 2007 (i.e. over the whole programming period), 70 projects were submitted under the Prosperity programme in which the proposers were not only individual enterprises, but also universities and scientific research institutions. Aid of a total value of CZK 1,761 million was granted to 32 projects over the programming period.

In 2007, decisions were issued granting subsidies to three projects which had been approved by the Evaluation Committee in 2006. As with all other IEOP programmes, the only activity in 2007 was the completion of previously approved projects; new projects were not accepted. In 2007, only one project was successfully wound up.

INNOVATION (INNOVATION II)

The Innovation I (Inovace I) and Innovation II (Inovace II) projects in the 2004–2006 programming period focused on promoting the roll-out of innovations of products, technologies and services. The objective was to support the innovation activities of Czech undertakings and improve their competitiveness on the global markets.

Of the 331 applications submitted under this programme, as at 14 March 2008 subsidies had been granted to 97 projects (one additional project was granted both a subsidy and a soft loan) totalling close to CZK 1.5 billion. These figures demonstrate the business community's keen interest in a programme designed to put R&D results into practice.



During 2007, projects approved in previous years were run and wound up. CzechInvest received payment applications after the winding-up of projects or on completion of individual stages of projects. In 2007, 50 payment applications relating to successful projects were received. In 2007, overall 37 projects eligible for subsidies totalling TCZK 531,754 were wound up.

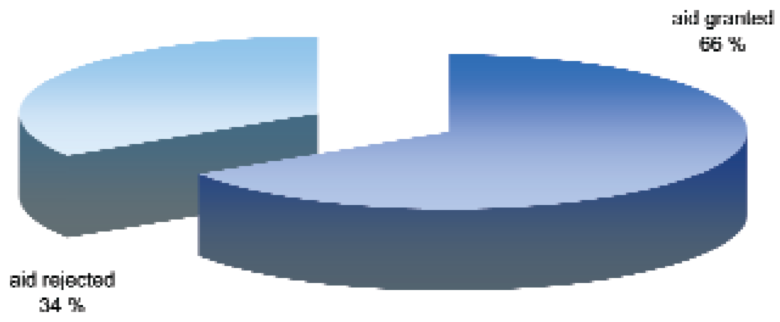
At the end of 2007, roughly TCZK 695,623 had been paid to applicants' accounts; this is significantly higher than in previous years. This increased uptake was principally affected by the fact that it was not until 2007 that most approved projects were wound up or at least one of the project stages was completed, i.e. applications for the reimbursement of eligible costs were made in that year. A similar accumulation of payment applications is expected in 2008 because the deadline for the disbursement of aid for projects under the programme is the end of 2008.

CLUSTERS

The aim of the aid granted under the Clusters (Klastry) programme was to motivate entities in the innovation process to create and develop regional and supra-regional industry associations. This programme was broken down into support for activities connected with the search for potential clusters and support for the creation and development of these industry associations.

The stage entitled 'Search for entities appropriate to form a cluster' was rounded off for some projects in 2006 with the successful formation of a cluster and the submission of a subsidy application in the stage 'Setting-up and developing a cluster'. Clusters have successfully been set up that comprise private, largely production companies forming the core, vocational educational institutions, and research facilities.

Project success rate under Clusters



In the stage 'Search for entities appropriate to form a cluster', 42 projects are being implemented. In 2007, 20 projects were wound up with a total aid uptake of TCZK 13,673.

The objectives of these projects were to map the potential for the establishment and development of a cluster in the given region, to find and put together a suitable membership base, and to identify the common needs and interests of members. Of the 20 projects wound up, 14 ended up with a positive result, i.e. a new cluster was formed.

In the stage 'Setting-up and developing a cluster', 14 projects are being implemented. Of these, four projects were issued with a Decision in 2007 allocating them a total of TCZK 70,760. In 2007, no projects were wound up; in the context of payment application authorization, TCZK 11,346 was paid out in 2007.

C.1.2 Encouraging innovation under programmes run by the Ministry of Industry and Trade in 2007–2013

In the 2007–2013 period, the principal vehicle of direct aid for innovations is the 'Entrepreneurship and Innovation Operational Programme 2007–2013' (EIOP), which reflects the priority areas of the MIT innovation policy and interweaves this policy with the regional dimension of economic-policy measures. The Prosperity programme promotes innovation infrastructure, the Innovation programme promotes the introduction of innovations and increased patenting, and the Cooperation (Spolupráce) programme encourages regional and supra-regional cooperation. The Potential (Potenciál) programme promotes the scientific research infrastructure of enterprises.

PROSPERITY

Compared to the previous programming period, the activities supported under the programme have been expanded primarily to include more intensive support for the process of the creation and development of technology transfer centres. In another new development, business angels[10]. will be promoted. Further, an emphasis will be placed on supporting the infrastructure for newly emerging innovative companies. The programme was notified to the European Commission in 2007, and therefore the first call was made in April 2008. Registration applications are admitted from August 2008 to July 2009. Applicants may submit full applications between September 2008 and the end of 2009. The total allocation for the whole 2007–2013 programming period is EUR 429,361,000; CZK 4 billion has been earmarked for the initial call.

COOPERATION

The Cooperation programme, besides encouraging the creation and development of traditional clusters, also focuses on providing aid for the formation of technology platforms and other cooperation projects. As the programme first had to be notified to the European Commission, it was not launched until spring 2008. Registration applications for the first call, which was limited to technology platforms, were received from July 2008 to October 2008; applicants could submit full applications between October and November 2008. The total allocation for the whole 2007–2013 programming period is EUR 189,634,000; CZK 100 million has been earmarked for the initial call.

INNOVATION

Under the Innovation programme, besides activities supported in the previous programming period, an increased emphasis has been placed on promoting the introduction of organizational and marketing innovations; there is also now support for the protection of industrial property rights (patents, designs, utility models, trade marks). The total allocation for the 2007–2013 programming period is EUR 500,922,000.

The first call under the Innovation – Innovative Project programme was notified on 25 April 2007. The allocation for this call was CZK 1.5 billion. The admission of full applications ended in November 2007. In all, 209 full applications were submitted seeking a total of CZK 3,430 million.

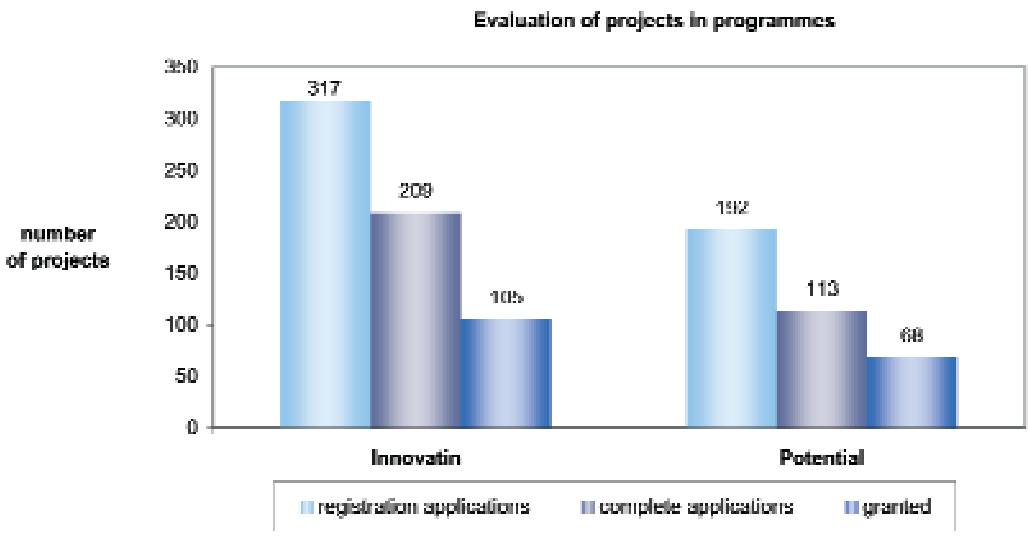
The evaluation of the first call was completed by the evaluation committees on 11 June 2008. There were 16 evaluation committees, members of which comprised MIT representatives, regional representatives, and experts. Based on assessments by independent external evaluators and programme criteria, 105 projects out of 209 full applications were recommended for aid, with the total recommended aid standing at CZK 1,575 million. The allocation planned for the first call was overrun by CZK 75 million; however, the allocation was increased. This action was authorized by the Managing Authority (the permission of the EIOP Monitoring Committee is not necessary). The inc-

[10] A business angel is a natural person who provides capital and experience of corporate management to one or more start-up companies.

reased success rate among businesses (50.2%) compared to the same programme under the IEOP (29%) can be attributed to the applicants' greater experience in the field of innovation and the higher quality of the projects proposed. The average subsidy per project was CZK 15 million.

The second call under the Innovation – Innovative Project programme was notified in May 2008, with an allocation of CZK 2 billion. Registration applications could be submitted between July 2008 and September 2008. Full applications were received from 3 October to the end of 2008. This time, large enterprises were also permitted to submit applications.

The first call under the programme Innovation – Project for the Protection of Industrial Property Rights was notified on 2 January 2008. Registration applications could be submitted from March to December 2008. For technical reasons, the launch of full application admissions was delayed until early September, and accordingly the deadline has been extended to March 2009. The allocation for this call is CZK 60 million. In this case, applicants may be not only small and medium-sized enterprises, but also natural persons, universities and public research institutions. The aid intensity ranges from 45% to 75% of overall assistance, depending on the type of applicant. The number of registration applications submitted outstripped the projected interest in the programme, mainly among business entities. There is particularly keen interest in protection under international patents.



POTENTIAL

The goal of the Potential programme is to promote the introduction and improvement of the research, development and innovation capacity of companies and to increase the number of companies that carry out internal research, development and innovation.

The evaluation of projects in the programme's first call (the admission of registration applications was from 1 June to 31 December 2008) was completed by the evaluation committees on 29 May 2008. Based on assessments by independent external evaluators and programme criteria, 69 projects out of 113 full applications were recommended for aid, with the total recommended aid standing at CZK 1,109 million. Given the terms and conditions of the first call, all projects are implemented by small and medium-sized enterprises.

In view of the fact that one applicant refrained from implementing a project, the amount needed in aid for recommended projects is now CZK 1,106,888,000. The allocation planned for the first call was CZK 900 million, and therefore the resources available had to be increased by transferring funds with the programme budget. The Managing Authority is authorized to take this action (the permission of the EIOP Monitoring Committee is not necessary).

The average subsidy per project was TCZK 16,079 and TCZK 16,278 respectively. Aid was granted to 60% of the full applications submitted. Of the registration applications submitted, only 36% received assistance; however, it is necessary to bear in mind certain specificities – some applicants submitted multiple projects in a bid to circumvent the maximum possible subsidy per project, or failed to fill in the application correctly and instead of correcting it simply submitted a new one, etc.

The second call under the programme was notified in January 2008. Admissions of electronic registration applications for subsidies began in March 2008 via the Internet application eAccount. The admission of registration applications ends in September 2009. The admission of full applications runs from July 2008 to November 2009. The allocation planned for this call is CZK 2,580 million.

C.1.3 Competitiveness and Innovation Framework Programme 2007–2013

In 2007, the implementation of the Community framework programmes 'Competitiveness and Innovation 2007–2013' (CIP) was also launched. The CIP coordinator is the MIT. This programme brings together and follows up on certain programmes from the earlier period (e.g. MAP, LIFE, eContent, MODINIS). The CIP administrator in Brussels is the EACI agency. Uniform implementation should bolster synergy, with the aim to cut costs. The CIP is composed of three sub-programmes. Each sub-programme has its own steering committee, work programme and system for the organization of calls. The common horizontal theme is the promotion of eco-innovations. The total allocation for the 2007–2013 implementation period is EUR 3,621,000.

Framework Programme
Competitiveness and Innovation
2007–2013

- Entrepreneurship and Innovation Programme (EIP) – € 2,170 million, incl. € 430 million for eco-innovations
- ICT Policy Support Programme (ICT PSP) € 730 million
- Intelligent Energy for Europe Programme (IEE) € 730 million

The **Entrepreneurship and Innovation Programme** (60% of the overall budget) is geared towards support for innovative small and medium-sized enterprises. The largest activity under this programme can be found in the new financial instruments provided by the European Investment Fund (EIF) – risk capital for highly innovative businesses, microcredit and guarantees for loans to small and medium-sized enterprises.

Another significant project is geared towards the provision of support services to enterprises. In particular, this entails providing information about financing opportunities and about the CIP in general, assistance during technology transfer, support for the development of innovations and the cross-border activities of small and medium-sized enterprises, and their participation in FP7.

Other programme activities include the production of studies and analyses, the development and coordination of policies for Pro Inno and Europe Innova operations, the organization of a Conference on the Charter for Small Enterprises and other networking actions. Market replication projects will also be supported, especially in the field of eco-innovations and reducing the administrative burden.

The Information and Communication Technology Policy Support Programme promotes the broader use of information and communication technology by citizens, state administration and undertakings within the scope of the i2010 initiative (20% of the overall budget). Specific activities aim to:

a) create a Single European Information Space and internal information market;

b) stimulate innovation by expanding and investing in ICT;

c) foster an open information society with greater efficiency and effective services in the public interest and enhance the quality of life;

The Intelligent Energy for Europe Programme (20% of the overall budget) contains three priorities:

a) to raise energy efficiency and the increase the rational use of energy sources;

b) to increase Member States' investments in new and renewable energy sources and energy diversification;

c) to enhance energy efficiency and apply new and renewable sources in transport.

Specific activities concern, for example, tackling obstacles to the successful demonstration and marketing of new technologies, reducing the financial risk attached to the roll-out of new technologies, training in a bid to change consumer behaviour and exchanging experiences.

The CIP and its instruments are promoted via the Enterprise Europe Network, the member centres of which should provide uniform services throughout Europe. In the Czech Republic, this network is operated by the BISONet consortium managed by the AS CR Technology Centre. Consortium members are the Euro Info Centres and members of the national network of Czech Innovation Relay Centres, associated partners are CzechInvest, the Economic Chamber of the Czech Republic, and the Association of Regional Development Agencies. The activities of the pan-European network were officially launched at a conference in Brussels on 6 February 2008.

The challenge to create this single European network was the first call notified under the programme and was supported by the Entrepreneurship and Innovation sub-programme. The BISONet consortium was also the only Czech consortium supported under the Entrepreneurship and Innovation sub-programme in 2007. In this sub-programme, calls for individual projects are notified separately. Another significant challenge under this sub-programme from the perspective of funding concerns innovation financial instruments.

Under the ICT and Intelligent Energy sub-programme, one or two calls are usually notified every year and cover all areas of the annual work programme. The results of these calls are unfortunately not known yet; as such the participation of Czech entities cannot be evaluated.

C.1.4 Innovative businesses

The OECD 2005 Oslo Manual defines an innovative business as follows: 'An innovative firm is one that has implemented an innovation during the period under review.'

In the Czech Republic, the share of innovative businesses in 2006 was 28.1%; in 2005 the figure was 30.1%. Excluding construction, the share of innovative businesses in 2006 was 35.1%, compared to 38.5% in 2005. Large enterprises (63.4%) are more innovative than medium-sized (42.6%) and small enterprises (23.4%). From the perspective of sectors, enterprises in manufacturing (37.1%) are more innovative than those in the services sector (25.0%). The highest share of innovative businesses was found in the South Moravian regione of Jihomoravský region (31.5%), followed by the City of Prague (30.9%). By type of innovation activity, enterprises innovated processes (21.9%) more than products (18.5%).

Table C.1 Expenditure on innovation in the business sector (CZK millions, current prices)

	2003	2005	2006
Total	46,740	115,316	104,573
Principal sectors			
Extraction of mineral resources	179	353	168
Electricity, gas and water supply	3,281	18,787	1,029
Services (total)	11,954	36,051	40,326
Manufacturing	31,937	60,125	60,349
of which electrical and optical instrument manufacture	7,971	9,581	9,257
machinery and equipment manufacture	2,839	6,476	9,165
manufacture of vehicles	3,843	12,272	13,127

Source: CZSO, TI survey

Note: Absolute figures are hard to compare with previous data for 2003 because, commencing with the TI2005 survey there was a significant expansion in the target group of undertakings (e.g. to include construction, hotel services, retail and others). Therefore, there was a change of definition in accordance with the new version of the Oslo Manual 2005.

Total expenditure on innovations by enterprises dwindled year on year, but this can be attributed to the consolidation of the expansion in the target group of enterprises. There was a dramatic fall in innovation expenditure in electricity, gas and water supply. In contrast, the growth in the services sector is pleasing to see. Innovation expenditure in manufacturing more or less stagnated. In this sector, there was, however, a marked increase in innovation expenditure in machinery and equipment manufacture.

In the Czech Republic, 2,266 enterprises were granted some form of State aid in 2004–2006; of these, more than one third (43%) mustered support from the EU (the Structural Funds or framework programmes). Manufacturing businesses managed to obtain more assistance for innovative activities than enterprises in services. Among the manufacturing undertakings, 45% were supported by the EU, as opposed to 41% of service enterprises. In accordance with the principles for the granting of State aid, support from both domestic and EU sources was principally channelled into small and medium-sized enterprises.

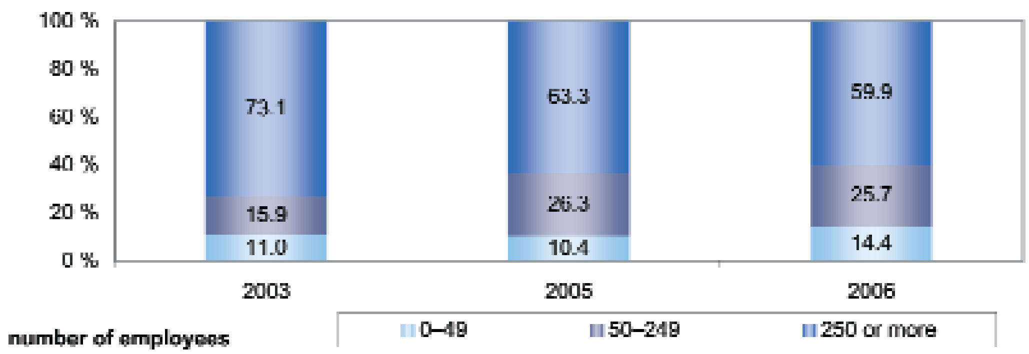
Table C.2 Numbers of business acquiring financial assistance in 2004–2006 (CIS2006) for the implementation of innovations, classified by grantor

Grantor	Czech Govt	local authorities	EU (Structural Funds)	EU (FP5 or FP6)
Czech Republic (total)	**996**	**295**	**644**	**331**
manufacturing	634	166	452	191
services	297	78	162	98
other	65	51	30	42

Source: CZSO, TI survey
Note: other – includes entities classified under the Industrial Classification of Economic Activities (OKEČ): construction (F), extraction of mineral resources (C) and electricity, gas and water supply (E)

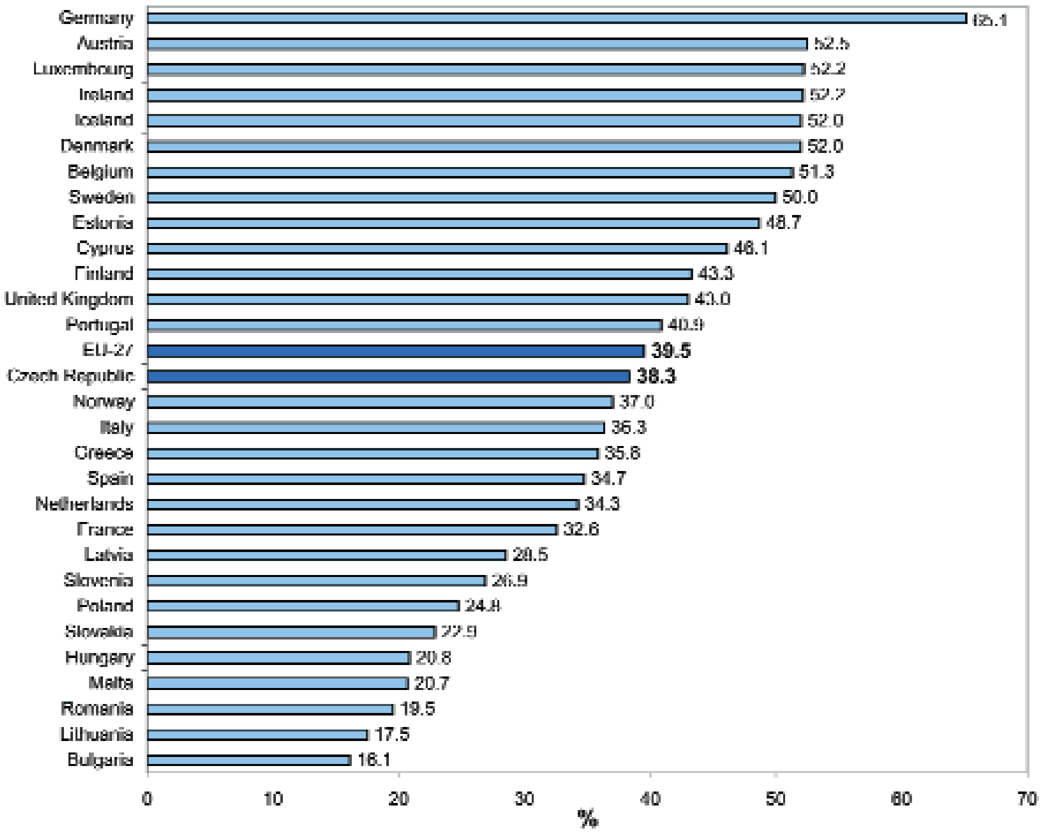
In 2006, there was an increase in spending on innovations among small enterprises, the share of which in overall innovation expenditure (14.4%) went up to the detriment of medium-sized and, in particular, large enterprises. The share of spending by medium-sized enterprises stagnated year on year, following a major rise in 2005 over 2003. The share of large enterprises' innovation expenditure in overall innovation expenditure is following a downward trend.

Share of innovation expenditure at enterprises, by size of enterprise



Source: CZSO, TI survey

C.1.5 Share of innovative businesses in the total number of businesses in 2002–2004



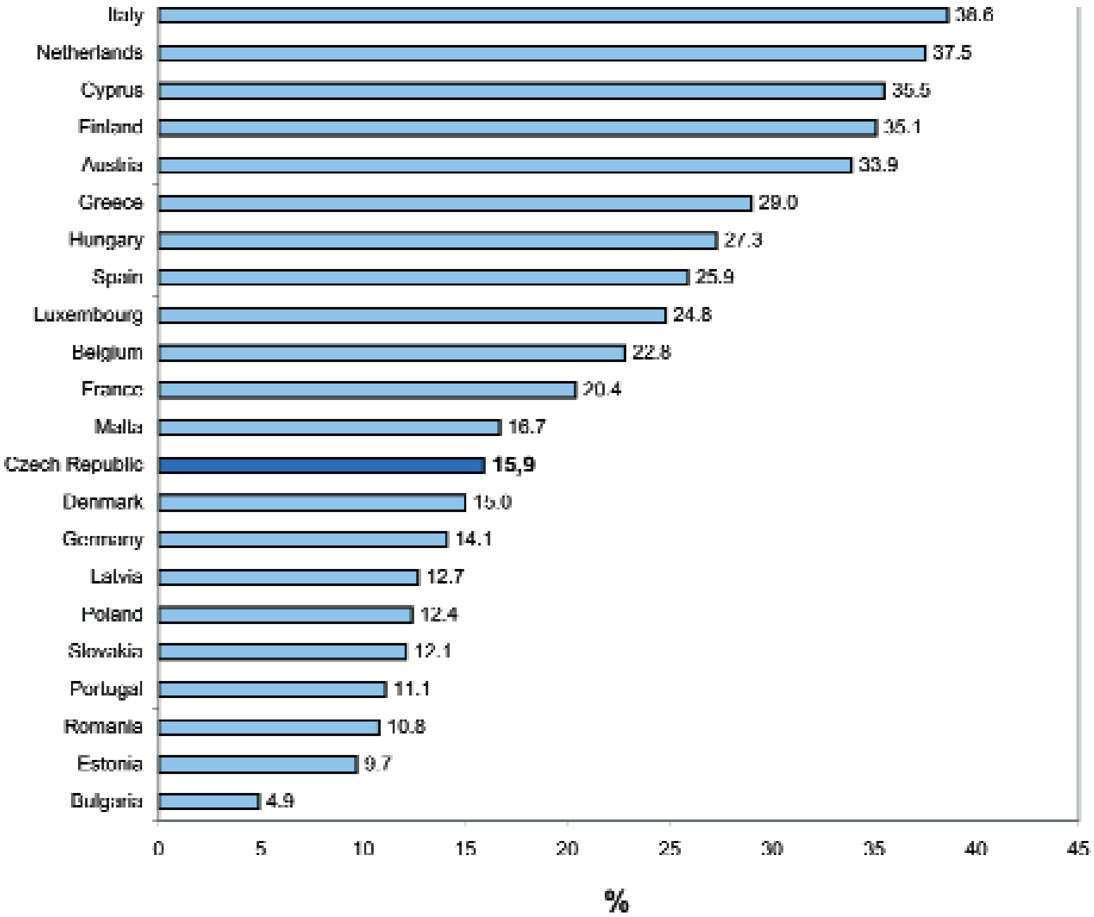
Source: Eurostat, CIS 4 innovation survey
Note: Czech Republic: 2003–2005

In 2002–2004, the highest proportion of innovative businesses in the EU could be found in Germany (65.1%). Only in another six countries is the share of innovative businesses higher than the share of non-innovative businesses. The shares in these cases were just over 50%. The proportion of innovative businesses in the Czech Republic was 38.3%, which is essentially in line with the average for the EU-27 as a whole. In Estonia, the proportion of innovative businesses was 48.7%, which is more, for example, than in Finland and the United Kingdom. The lowest share of innovative businesses was reported by Bulgaria (16.1%), followed by Lithuania (17.5%) and Romania (19.5%).

In manufacturing, the highest share of innovative businesses was recorded by Germany (74.0%), followed by Ireland (61.4%) and Belgium (58.2%). The Czech Republic, with a share of 41.7%, is again close to the EU-27 average. The lowest shares of innovative businesses in manufacturing were reported by Lithuania (17.4%) and Bulgaria (18.2%).

In the services sector, the highest proportion of innovative businesses was again found in Germany (57.8%). Second spot belonged to Luxembourg (53.2%), the economy of which is more geared towards services (especially the bank sector). Only Estonia (50.7%) reported more innovative businesses than non-innovative businesses in this sector. In the Czech Republic, this share was 33.9%. Once again, this corresponds to the EU-27 average. The lowest share of innovative businesses was reported by Bulgaria (12.7%) and Slovenia (16.0%).

C.1.6 Share of innovative business granted State aid in 2002–2004



Source: Eurostat, CIS 4 innovation survey
Note: Czech Republic: 2003–2005

In 2002–2004, innovative businesses in Italy received most assistance from the public purse. Of the total number of innovative businesses, 38.6% received some form of State aid. Innovative businesses in the Netherlands (37.5%) and in Cyprus (35.5%) also received considerable assistance for the innovative activities. The share of innovative businesses in the Czech Republic which received some form of State aid was 15.9%, which is close to the EU-27 average. The lowest assistance for innovation from the public purse was received by enterprises in Bulgaria (4.9%) and in Estonia (9.7%), which is interesting considering their high proportion of innovative businesses.

With regard to the EU funds, most public aid was granted to innovative businesses in Greece (19.7%) followed, by a gap of almost 10%, by Austria (9.3%). The Czech Republic, with a share of 4.5%, is average. Innovative businesses with the least success in gaining resources from EU funds were those in Estonia (1.8%) and Luxembourg (1.8%).

The governments in Cyprus (33.8%) and the Netherlands (32.5%) do most to support their innovative businesses from the national budget. In the Czech Republic, 10.9% of innovative businesses were granted aid from the national budget. The governments of Bulgaria (1.4%) and Romania (3.2%) channel least support into innovative businesses.

Local government in Italy (25.7%) and Austria (20.6%) plays a significant role in promoting innovation. In contrast, regional authorities in Cyprus (0.3%) and Estonia (0.6%) play the smallest role in the support of innovation. This is probably due to the size of the countries and their local government structure.

The most successful innovative businesses at gaining aid under FP5 and FP6 through innovation projects were those in Greece (7.8%) and Finland (4.3%).

C.2 International comparison of innovation performance according to the European Innovation Scoreboard 2007

The Scoreboard is published annually by the European Commission. The Scoreboard and its methodology were prepared on the basis of a requirement of the European Council stemming from its spring summit in Lisbon in 2000. Its mission is to contribute to the open method for the coordination of national policies within the EU. The European Innovation Scoreboard is regarded as an effective tool for the benchmarking of innovation policies.

Table C.3 Indicators

	Innovation drivers (input dimension)	
1.1	New S&E 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 lifelong 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
	Knowledge creation (input dimension)	
2.1	Public R&D expenditures (% of GDP)	Eurostat, OECD
2.2	Business R&D expenditures (% of GDP)	Eurostat, OECD
2.3	Share of medium-high-tech and high-tech R&D (% of manufacturing R&D expenditures)	Eurostat, OECD
2.4	Share of enterprises receiving public funding for innovation (%)	Eurostat (CIS4)
	Innovation and entrepreneurship (input dimension)	
3.1	SMEs innovating in-house (% of SMEs)	Eurostat (CIS4)
3.2	Innovative SMEs cooperating with others (% of SMEs)	Eurostat (CIS4)
3.3	Innovation expenditures (% of total innovation expenditures for all enterprises relative to the total turnover of all enterprises)	Eurostat (CIS4)
3.4	Early-stage venture capital (% of GDP)	Eurostat
3.5	ICT expenditures (% of GDP)	Eurostat, World
3.6	SMEs using organizational innovation (% of SMEs)	Eurostat (CIS4)
	Applications (output dimension)	
4.1	Employment in high-tech services (% of total workforce)	Eurostat
4.2	Exports of high technology as a share of total exports (%)	Eurostat
4.3	Sales of new-to-market products (% of turnover)	Eurostat (CIS4)
4.4	Sales of new-to-firm products (% of turnover)	Eurostat (CIS4)
4.5	Employment in medium-high and high-tech manufacturing (% of total workforce)	Eurostat
	Intellectual property (output dimension)	
5.1	EPO patents per million population	Eurostat
5.2	USPTO patents per million population	Eurostat, OECD
5.3	Triad patents per million population	Eurostat
5.4	Number of new Community trademarks per million population	OHIM, Eurostat
5.5	Number of new Community designs per million population	OHIM, Eurostat

In the table, structured as innovation process inputs and outputs, there is a specification of the five indicator groups, the 25 individual indicators used for the evaluation in 2007, and their sources of data.

The methodology is steadily modified. In 2005, the European Innovation Scoreboard was completely revised in collaboration with JRC 1. The number of indicator groups was increased from four to five for the basic thematic breakdown into innovation process input and output dimensions, and for the purposes of the evaluation 26 indicators were modified and used (in 2004 there were 22 indicators and in 2003 there were 28 indicators). No significant methodological changes were made in 2006. The same structure of indicator groups was kept; 25 indicators were monitored. In 2007, there were no changes to the number and content of monitored indicators or their structure. An evaluation was conducted for individual indicators, including trends; the Summary Innovation Index and its trends were also assessed. The evaluation encompassed 37 countries, i.e. the EU-27 Member States, the USA, Japan, Norway, Switzerland, Iceland, Croatia, Turkey, Israel, Australia and Canada.

The values of most indicators were for 2005 and 2006. For certain countries, not all the indicators were available. The value for the EU is for the EU-27, apart from indicators 1.3, 3.5, 5.2 and 5.3, which are for the EU-25, and indicator 3.4, which is for the EU-15. The averages for indicators based on data from CIS4 surveys in the individual countries are not official Eurostat estimates.

The aim of this evaluation is not to set an order of countries, but to identify the reasons why they are successful or lag behind, and ways to apply best practices while respecting the specific characteristics of the different countries.

According to the EIS 2007 results, the Czech Republic's position remains unsatisfactory in a number of areas. Nevertheless, its overall moderate improvement and certain favourable growth trends should be viewed in a positive light. This is also documented by the Czech Republic's classification among the moderate innovators, a step up from its previous status among the catching-up countries. In the EIS analyses, the Czech Republic is on track to reach the EU average according to the Summary Innovation Index within a decade.

Based on their innovative performance (EIS 2007), the countries fall into the following four groups (in descending order):

Innovation leaders: Sweden, Switzerland, Finland, Israel, Denmark, Japan, Germany, the United Kingdom, the USA.

Innovation followers: Luxembourg, Iceland, Ireland, Austria, the Netherlands, France, Belgium, Canada.

Moderate innovators: Estonia, Australia, Norway, the Czech Republic, Slovenia, Italy, Cyprus, Spain. (The value of the Summary Innovation Index is somewhat lower than the EU average.)

Catching-up countries: Malta, Lithuania, Hungary, Greece, Portugal, Slovakia, Poland, Croatia, Bulgaria, Latvia, Romania. Turkey currently performs below the other countries.

According to the Summary Innovation Index, in the EIS 2007 database the Czech Republic came 21st out of the 37 countries monitored (in 2005, it was 26th out of 33 countries). The Czech Republic is the second best rated country of the new EU-27 Member States (just behind Estonia). However, the innovation developed countries remain a long way in front.

Table C.4 Innovation drivers

	Science and engineering (S&E) graduates	Population with tertiary education	Lifelong learning	Broadband penetration rate	Youth education attainment level
	1)	2)	3)	4)	5)
EU- 27	12.9	23.0	9.6	14.8[11]	77.8
Finland	**17.8**	**35.1**	**23.1**	**24.9**	84.7
Denmark	14.7	**34.7**	**29.2**	**29.6**	77.4
France	**22.5**	25.5	*7.5*	18.0	82.1
Germany	*9.7*	23.8	*7.5*	15.3	71.6
Netherlands	*8.6*	**29.5**	**15.6**	**29.0**	74.6
Austria	*9.8*	*17.6*	**13.1**	15.8	85.8
Greece	*10.1*	21.5	*1.9*	*2.7*	81.0
United Kingdom	**18.4**	**30.7**	**26.6**	**19.2**	78.8
Czech Republic	*8.2*	*13.5*	*5.6*	*8.4*	91.8
Hungary	*5.1*	*17.7*	*3.8*	*7.5*	82.9
Slovakia	*10.2*	*14.5*	*4.0*	*4.3*	91.5
Slovenia	*9.8*	21.4	**15.0**	*11.4*	89.4
USA	10.6	**39.0**	–	**18.0**	–
Japan	13.7	**40.0**	–	**18.9**	–

Bold: more than 20% better than the EU-27 average
Italics: more than 20% worse than the EU-27 average
Normal: in the band of the EU-27 average ± 20%

Key:
1) Share of science and engineering graduates in the total population aged 20–29 (%).
2) Share of the population with tertiary education in the total population aged 25–64 (%).
3) Share of persons who participated in any type of lifelong learning activity during the four weeks prior to the survey in the total population aged 25–64 (%).
4) Share of persons using broadband lines in the total population (%).
5) Share of persons with upper secondary education aged 20–24 (%).

The Czech Republic is below the EU average in all indicators but one. It is furthest below the average in terms of the broadband penetration rate. However, from the perspective of the year-on-year comparison of below-average results in this group of indicators, the situation has improved (the gap between the Czech Republic and the EU average has narrowed). The long-term exception is the indicator of the share of persons with upper secondary education aged 20–24. In this case, the Czech Republic is well above the European average (in fact, it is top).

11 *EU-25

Table C.5 Knowledge creation (input dimension)

	Public R&D expenditures (% of GDP)	Business R&D expenditures (% of GDP)	Share of medium-high-tech and high-tech R&D (%) 1)	Share of enterprises receiving public funding for innovation (%) 2)
EU-27	0.65	1.17	85.20	9.00
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
Netherlands	0.76	*1.03*	87.90	**12.90**
Austria	0.75	**1.60**	82.30	**17.80**
Greece	*0.43*	*0.18*	81.00	10.40
United Kingdom	0.58	1.09	91.70	*3.80*
Czech Republic	*0.50*	*0.92*	85.40	*6.10*
Hungary	*0.50*	*0.41*	90.90	*5.70*
Slovakia	*0.25*	*0.25*	*63.40*	*2.80*
Slovenia	0.35	*0.87*	89.30	*4.10*
USA	0.69	**1.87**	89.90	–
Japan	0.74	**2.40**	86.70	–

Bold: more than 20% better than the EU-27 average
Italics: more than 20% worse than the EU-27 average
Normal: in the band of the EU-27 average ± 20%

Key:
1) % of expenditure on this R&D in manufacturing
2) % of the total number of enterprises – innovative and non-innovative (based on CIS)

In the monitored indicators, the Czech Republic generally trails the European average, but not so much as in the case of human resources as innovation drivers. Medium-high-tech and high-tech R&D expenditure in manufacturing is at roughly the EU-27 average. However, most of this expenditure is in the medium-high-tech sectors (the main driver is the automotive industry) and in multinational corporations (notably Škoda Auto). Business R&D expenditures as a percentage of GDP are at almost 80% of the European average. A positive aspect is that public and, especially, business expenditure has recently been rising at a faster rate than the European average.

Table C.6 Innovation and entrepreneurship (input dimension)

	SMEs innovating in-house 1)	Innovative SMEs cooperating with others 2)	Innovative expenditures 3)	Early-stage venture capital (% of GDP)	ICT expenditures (% of GDP)	SMEs organizational innovation 4)
EU-27	21.6	9.1	2.15	0.053[12]	6.4 *	34.0
Finland	24.7	17.3	2.50	*0.027*	7.0	**47.0**
Denmark	**28.5**	**20.8**	2.40	*0.015*	6.5	**57.1**
France	19.7	11.5	2.23	*0.030*	6.0	35.9
Germany	**32.0**	8.6	2.93	*0.011*	6.2	**53.2**
Netherlands	18.6	**12.3**	*1.25*	*0.012*	7.6	*26.2*
Austria	**32.4**	7.7	–	*0.030*	6.3	**48.1**
Greece	19.7	8.4	**3.08**	*0.002*	*4.9*	39.6
United Kingdom	22.4	**12.6**	1.61	**0.224**	**8.0**	–
Czech Republic	24.0	**12.9**	2.15	*0.000*	*6.6*	35.0
Hungary	**9.3**	*6.6*	*1.16*	*0.005*	**8.1**	*19.1*
Slovakia	11.6	*6.8*	1.90	*0.001*	6.7	*13.4*
Slovenia	16.3	10.5	*1.28*	–	5.4	50.8
USA	–	–	–	*0.035*	6.7	–
Japan	15.3	6.9	–	–	**7.6**	–

Bold: more than 20% better than the EU-27 average
Italics: more than 20% worse than the EU-27 average
Normal: in the band of the EU27 average ± 20%

Key:
1) SMEs – small and medium-sized enterprises, expressed as %
2) Shares of SMEs as a percentage of the relevant category in the total number of SMEs in manufacturing and in services.
3) Total innovation expenditure as a percentage of total turnover for all enterprises in manufacturing and in services.
4) Share of SMEs using organizational innovation in the total number of SMEs (%).

In this set of indicators, the Czech Republic is generally at a level of roughly 80% of the European average. It is essentially relegated to this position by its long-term very weak score in the early-stage venture capital financing, which has been practically zero for several years. Conversely, the Czech Republic is now well above the EU average in terms of the share of small and medium-sized enterprises innovating in cooperation with other organizations. It is also above the EU average in its share of small and medium-sized enterprises innovating in-house. The Czech Republic is slightly above the EU average in its expenditure on information and communication technologies. Business innovation expenditure is around the European average, but from the perspective of structure (based on the results of the CIS4 survey) more is channelled into the

12 **EU-25

purchase of technologies and know-how than into R&D. The Czech Republic has reached the European average in the field of non-technical (organizational) innovation in small and medium-sized enterprises. Compared to the results obtained from the previous CIS3, this indicator and most others in this set (where the source of information is the results of the CIS4 survey), this is a noticeable improvement in the situation.

Table C. 7 Applications (input dimension)

	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 products	Employment in medium-high high and high-tech manufacturing
	1)	2)	3)	4)	5)
EU-27	3.26	16.7	7.3	6.2	6.63
Finland	**4.59**	18.1	**9.7**	5.1	6.81
Denmark	**4.22**	*12.8*	*5.2*	5.8	5.80
France	3.70	17.8	6.2	5.6	6.33
Germany	3.48	13.6	7.5	**10.0**	**10.75**
Netherlands	**4.08**	18.3	*4.0*	*4.3*	*3.25*
Austria	*2.89*	11.3	*5.2*	5.4	6.75
Greece	*1.95*	*5.7*	*4.8*	6.2	*2.23*
United Kingdom	**4.20**	**26.5**	6.4	**7.6**	5.52
Czech Republic	3.00	*12.7*	7.7	**7.8**	**10.33**
Hungary	3.37	**20.2**	*4.2*	*2.5*	**8.41**
Slovakia	*2.53*	*5.4*	**12.8**	6.4	**9.72**
Slovenia	2.87	*4.5*	7.4	6.9	**8.5**
USA	–	**26.1**	–	–	*3.84*
Japan	–	**20.4**	–	–	7.30

Bold: more than 20% better than the EU27 average
Italics: more than 20% worse than the EU27 average
Normal: in the band of the EU27 average ± 20%

Key:
1) Share in total employment in services (%)
2) Share of the value of exports from the relevant category in the total value of exports, in national currency and current prices
3) Share of sales of new products (new to market as a whole) in the aggregate turnover of all enterprises in manufacturing and services.
4) Share of sales of new products (new to firm as a whole) in the aggregate turnover of all enterprises in manu facturing and services.
5) Share in total employment in manufacturing

Note: The numbers of patent applications at the EPO and patents granted at the USPTO differ from the numbers referred to in part B.3 Patent applications, patents and licences granted. In part

B.3, the annual reports of the relevant patent offices were used. The figures in Table 7 are figures adjusted in accordance with European Commission methodology, which corrects data from patent offices' yearbooks from several aspects (foreign-owned enterprises, differences in validation, etc.). With regard to patents granted via the USPTO, part B.3 contains figures for the fiscal year; in Table 7 these are figures for the current calendar year.

The Czech Republic generally enjoys an above-average position only in this indicator group. However, the markedly above-average value of employment in medium-tech and high-tech manufacturing (with a concentration in medium-high-tech sectors, especially the automotive industry and the chemical industry) has a significant influence on this. Sales of new-to-firm products are also clearly above average. Sales of new-to-market products are moderately above the European average. The Czech Republic is below the European average in terms of employment in high-tech services and from the perspective of high-tech exports in total exports; in both indicators there has been a relatively modest deterioration in the country's position.

Table C.8 Intellectual property (output dimension)

	EPO patent applications 1)	USPTO patents granted 2)	Triad patents 3)	New Community trademarks 4)	New Community designs 5)
EU-27	128.0	52.2	20.8	108.2	109.4
Finland	**305.6**	**133.2**	**29.3**	119.0	*97.9*
Denmark	**235.8**	64.0	**25.3**	**191.5**	**240.5**
France	149.1	52.4	**25.1**	*83.9*	*98.6*
Germany	**311.7**	**129.8**	**53.8**	**164.6**	**202.7**
Netherlands	**244.3**	**84.2**	**47.4**	**172.3**	**138.8**
Austria	**195.1**	**63.4**	**30.0**	**221.5**	**208.8**
Greece	*11.2*	*1.4*	*0.3*	*34.4*	*3.1*
United Kingdom	121.4	50.6	*15.8*	**139.0**	*75.0*
Czech Republic	*15.9*	*3.2*	*1.1*	*33.1*	*51.6*
Hungary	*18.9*	*3.5*	*1.8*	*20.5*	*11.3*
Slovakia	*8.1*	*0.4*	*0.0*	*16.7*	*27.3*
Slovenia	*50.4*	*7.0*	*2.7*	*30.5*	*51.5*
USA	167.6	**273.7**	**33.9**	*33.6*	*17.5*
Japan	219.1	**274.4**	**87.0**	*12.9*	*15.2*

Bold: more than 20% better than the EU27 average
Italics: more than 20% worse than the EU27 average
Normal: in the band of the EU27 average ± 20%

Key:

1) Patent applications (number per million population).
2) Patents granted (number per million population).
3) Triad patents – the application for the same patent is submitted to the EPO, the Japanese Patent Office and the patent is granted via the USPTO (number per million population)
4) Number per million population
5) Number per million population

In this group of indicators, the Czech Republic reports its long-term worst results in relative terms, and in the field of patents in particular it is well below the European average. It lags behind furthest in the triad patents (approximately 5% of the EU average). The situation is better in relative terms with regard to new European Community designs and trademarks, but even here the values are not more than 50% of the EU average. There has been a major improvement only in terms of the number of European Community utility models.

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

The Global Competitiveness Report has been drawn up since 1979 for the annual World Economic Forum. The latest edition, published in spring 2008, contains information about 131 countries and thus remains the most extensive publication of its kind. All data are presented solely for the individual countries, and therefore there is no evaluation of the EU-15, EU-25 or EU-27. The partner organization for the Czech Republic is the CMC Graduate School of Business in Čelákovice.

The competitiveness of countries is evaluated primarily based on the Global Competitiveness Index (GCI), which replaced the Growth Competitiveness Index (Growth CI) used in previous years. The GCI consists of a combination of hard data and the results of opinion surveys (the Executive Opinion Survey). Details on the methodology and in-depth data can be found in: M. E. Porter, K. Schwab, X. Sala-i-Martin, The Global Competitiveness Report 2007–2008, World Economic Forum, Geneva, Switzerland 2007.

The GCI has a structure built on 12 pillars: (1) Institutions, (2) Infrastructure, (3) Macroeconomic stability, (4) Health and primary education, (5) Higher education and training, (6) Goods market efficiency, (7) Labour market efficiency, (8) Financial market sophistication, (9) Technological readiness, (10) Market size, (11) Business sophistication and (12) Innovation. The increase in the number of pillars to 12 from the previous year's nine is the result of splitting the 'market efficiency' pillar into three components (goods market, labour market and financial market) and the creation of the 'market size' category as a separate pillar. All the described pillars are interlinked. This means that if only one of them has a high value, this cannot be interpreted as high competitiveness in a particular country.

Pillars 1–4 represent the basic requirements of competitiveness and play a key role in less developed economies (factor-driven economies) based on unskilled labour and natural resources.

Pillars 5–10 represent the efficiency enhancers of competitiveness and have the most noteworthy influence on economies based on production process efficiency and production quality (efficiency-driven economies).

Pillars 11–12 encompass the innovation factors behind competitiveness and are significant for economies based on the application of the most advanced production processes culminating in new products (innovation-driven economies).

In this structure, the Czech Republic is classified in the transition phase between efficiency-driven economies and innovation-driven economies, i.e. between the second and third level of economic development. Of the new EU Member States, Estonia and Hungary, and more recently Slovakia and Croatia, are also in a transition phase. The only new EU Member State in the third group is Slovenia.

In the evaluated set of 131 countries, the United States of America have overtaken Switzerland as the world's most competitive economy. This primacy is the corollary of highly developed and innovative firms operating on highly efficient markets. This combination is bolstered by the well-functioning university system and sound cooperation between the education and business sector in the field of R&D. For most of the reporting countries, there was little change in their order

compared to the previous year. The leading positions continue to be taken up by the Scandinavian countries; other countries in the top ten were Switzerland, Germany, Singapore, Japan, the United Kingdom and the Netherlands.

Table C.9 Global Competitiveness Index (GCI)

	2007–2008	2006–2007	2005–2006
USA	1	6	1
Denmark	3	4	3
Germany	5	8	6
Finland	6	2	2
Japan	8	7	10
United Kingdom	9	10	9
Netherlands	10	9	11
Austria	15	17	15
France	18	18	12
Czech Republic	33	29	29
Slovenia	39	33	30
Slovakia	41	37	36
Hungary	47	41	35
Poland	51	48	43
Greece	65	47	47

The table sets out the order of selected countries in the 2007–2008 period based on the Global Competitiveness Index. Compared to the previous year, the Czech Republic went down four places to 33rd; of the new EU Member States, only Estonia is ahead of us (27th). However, this country, like most other new EU members, also saw its position deteriorate slightly over the year.

Table C.10 Global Competitiveness Index (GCI) – Basic requirements (Pillars 1–4)

	Basic requirements Aggregate of pillars 1-4	Pillar 1 Institutions	Pillar 2 Infrastructure	Pillar 3 Macroeconomic stability	Pillar 4 Health and primary education
USA	23	33	6	75	34
Denmark	1	2	7	10	3
Germany	9	7	1	60	40
Finland	2	1	10	9	1
Japan	22	24	9	97	23
United Kingdom	16	15	13	46	21
Netherlands	7	10	11	20	10
Austria	10	11	14	40	15
France	13	22	2	59	12
Czech Republic	42	69	41	43	29
Slovenia	37	44	37	29	22
Slovakia	50	60	58	62	39
Hungary	55	54	54	107	41
Poland	64	82	80	56	36
Greece	48	49	35	106	42

In 2008, the table shows the order of selected countries in the evaluation of Pillars 1–4 (basic requirements). In this evaluation, the Czech Republic fared worse than in the evaluation of efficiency and innovation factors (see the tables below). The evaluation of the institutional environment (69th). i.e. the standard of the judiciary, the transparency of legislation, the degree of corruption and the level of bureaucracy and regulation, while the evaluation of health and primary education in this summary is relatively high (29th).

Table C.11 Global Competitiveness Index (GCI) – efficiency enhancers (Pillars 5–10)

	Aggregate of pillars 5-10	Pillar 5 Higher education	Pillar 6 Goods market efficiency	Pillar 7 Labour market efficiency	Pillar 8 Financial market sophistication	Pillar 9 Technological readiness	Pillar 10 Market size
USA	1	5	12	1	11	9	1
Denmark	4	3	3	5	6	5	45
Germany	11	20	14	47	14	21	5
Finland	14	1	10	29	17	11	49
Japan	13	22	19	10	36	20	4
United Kingdom	2	15	13	7	2	16	6
Netherlands	9	10	8	32	15	4	19
Austria	21	17	5	42	28	18	35
France	20	18	24	98	24	22	7
Czech Republic	30	28	38	35	53	35	38
Slovenia	38	24	39	51	47	29	72
Slovakia	34	41	35	25	33	36	57
Hungary	40	33	59	58	51	41	41
Poland	43	35	69	49	64	51	22
Greece	57	39	60	120	60	58	39

In the table tracking the order of countries based on an evaluation of efficiency enhancers (Pillars 5–10), the Czech Republic came 30th overall, which is more or less in line with its aggregate GCI standing (33rd). Of the efficiency enhancers, by far the worst factor is financial market sophistication, which indicates the relatively low credibility and transparency of the banking and financial sector. Of the new EU Member States, only Estonia (27th) does better in the evaluation of efficiency enhancers.

Table C.12 Global Competitiveness Index (GCI) – innovation factors (Pillars 11–12)

	Innovation factors **Aggregate of pillars11–12**	**Pillar 11** **Business sophistication**	**Pillar 12** **Innovation**
USA	4	7	1
Denmark	8	6	10
Germany	3	1	7
Finland	6	11	3
Japan	2	3	4
United Kingdom	14	13	14
Netherlands	12	8	13
Austria	11	5	15
France	16	10	17
Czech Republic	28	30	27
Slovenia	30	31	30
Slovakia	52	52	51
Hungary	43	46	37
Poland	61	68	58
Greece	59	62	63

Table C.12 suggests that the Czech Republic achieves its best results in the evaluation of innovation factors (pillars 11–12), where it came 28th out of 131 countries. In this evaluation, it remains the best among the new EU members and is even in front of some 'old' EU Member States (Greece, Spain, Portugal and Italy).

C.4 Use of venture capital to promote innovation

In the comments, early-stage venture capital (the financing of the formation of new businesses and their initial development) expressed as a percentage of GDP and expansion venture capital (development financing) in 2002–2006 are monitored and assessed.

For most new Member States, venture capital data are not available, so EU-25 and EU-27 values are not tracked.

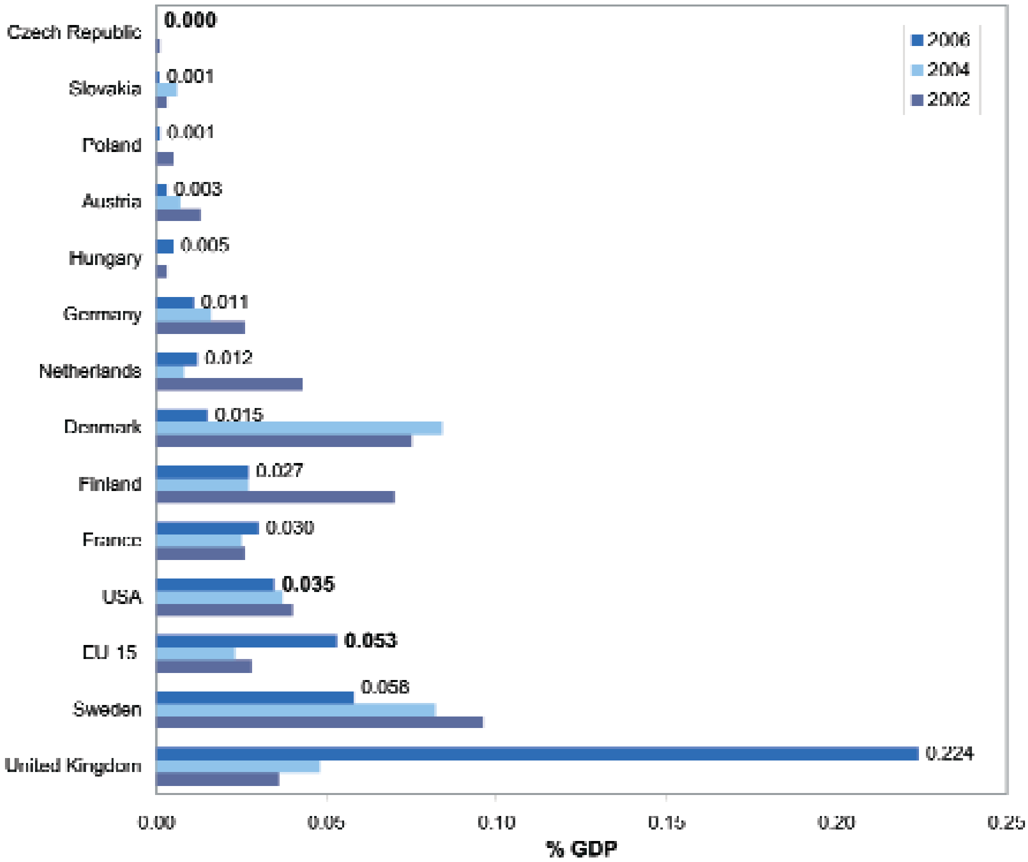
Definitions of venture capital, while varying, commonly identify this capital as a means of financing businesses (companies) which are not publicly transferable on the stock exchange by investing in their formation or increasing their share capital. This financing secures the capital needed to launch the company's operations, to develop and expand the company, and where appropriate to purchase the whole company. Venture capital strictly includes seed and start-up capital for firms, e.g. new technological firms or spin-offs, and capital investment in expansion.

Venture capitalists seek out new companies and new business activities promising major returns on their investment in the future, although such financing comes with risks. These new companies are formed primarily in high-tech industries and in knowledge-intensive sectors of the economy.

Along with financial resources facilitating the implementation of a new idea or new technology and further growth, venture capitalists also bring with them know-how and assistance in the strategic management of the company. Venture capitalists are mainly venture capital funds (with sources in particular from the sphere of the financial economy: pension funds, banks and insurance companies); for smaller-scale investments, business angels are becoming increasingly important.

Despite all the efforts of EU institutions, the early-stage venture capital in EU countries since 2000 (after the dot-come bubble burst) has generally shrunk or stagnated in the last few years, and investments in the development stage of companies are also sluggish. Developments on the venture capital markets in individual years are typified by a certain degree of volatility.

C.4.1 Use of early-stage venture capital

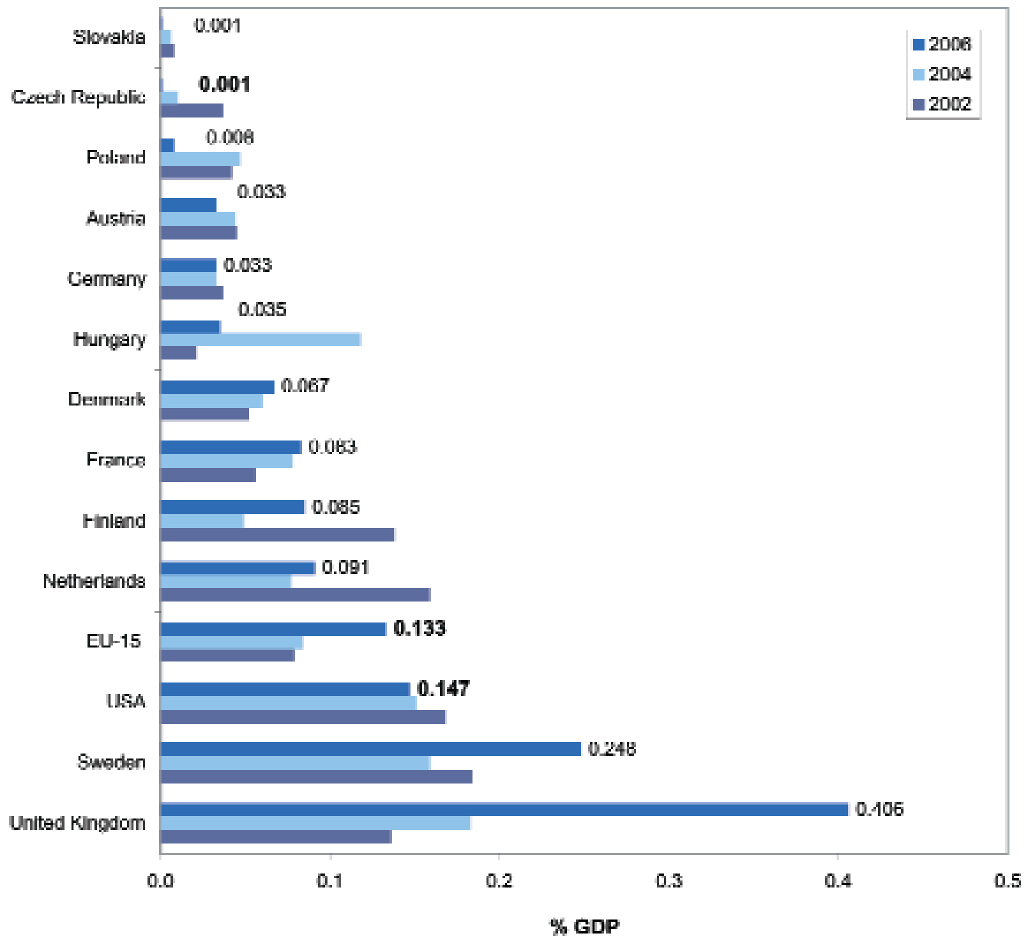


Source: Eurostat; original source EVCA, Price Waterhouse Coopers

Early-stage venture capital (pre-seed, seed and start-up capital) culminated in the USA and Europe with a boom in 2000, but in subsequent years these markets weakened substantially. In 2004 and 2005, the situation on these markets was more stable, and recently there has even been something of a recovery.

Investments in expansion are higher than investments in early-stage business operations. The low level of early-stage venture capital is evidently connected with the New Economy crisis at the turn of the millennium. The representatives of venture capital funds and companies draw attention to the excessively high risk of the initial stages of business and to the generally limited amount of necessary capital.

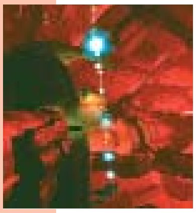
C.4.2 Use of expansion-stage venture capital



Source: Eurostat; original source EVCA, Price Waterhouse Coopers

In 2006, the United Kingdom, followed by Sweden and the USA, documented the highest proportion of venture capital use among the reporting countries. However, surveys indicate that European enterprises still prefer traditional forms of financing (e.g. their own resources) over venture capital financing.

In the Czech Republic, seed and start-up venture capital (for the initial development of new technology companies and spin-offs) is practically non-existent. This is also reflected in the insufficient segment of business angels. There was a dramatic fall in venture capital investment in the Czech Republic after 2000, as well as a decline in business expansion.



Chapter D – The Czech Republic's involvement in EU Framework Programmes

D.1 Evaluation of the Czech Republic's participation in the EU's Sixth Framework Programme for Research and Development

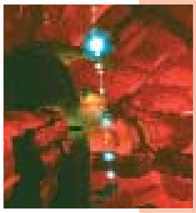
The Sixth Framework Programme (FP6) focuses, like its predecessors, on target-oriented research; its priorities were set on the basis of an extensive debate about the EU's needs. FP6 also set a new general target of contributing to the creation of the European Research Area (ERA). Reaching this target was contingent on the creation of a common R&D policy to help monitor the objectives of the Lisbon Strategy, i.e. to achieve, by 2010, the highest level of competitiveness in the global knowledge society of the 21st century. With this in mind, completely new project types were introduced, i.e. integrated projects and networks of excellence facilitating the more effective involvement of national teams in large research projects and networks necessary to address major problems. FP6 generally sought an increase in the use of European research institute capacity, the greater follow-up of national research, closer cooperation between research financed from the public purse and private industrial research, and the formation of an environment supporting the market application of R&D results.

The Euratom programme aims to achieve these goals especially in the peaceful use of nuclear energy.

The general budget of FP6 and the Euratom programme, following the accession of ten new Member States in 2004, is **EUR 19.1 billion**. The structure of the budget is set out in Table D.1. Each priority has its own detailed work programme, referred to by the European Commission's calls for proposals. FP6 was de facto launched on 17 December 2002, when the first calls – covering almost the whole range of priorities – were issued.

The Commission's contribution to a team involved in the implementation of an FP6 project hinges on the type of activity (30% of the total costs in relation to demonstration actions, a 50% contribution for research activities, or 100% for coordinators or implementers of projects in which the Commission has a common interest).

Project proposals, which are usually submitted by international consortiums, pass through a peer review system in which an international team of experts classifies projects in accordance with set criteria. Depending on their ranking, project proposals also have a chance to gain a Commission contribution. Another factor in the success of a project is how contracting negotiations progress between the consortium and the Commission, entailing the fulfilment of a host of formal requirements, the most important of which is the conclusion of a consortium agreement between the participating teams (concerning the value of knowledge invested by the teams at the beginning of the project, the management of funds during project implementation and, in particular, the handling of the results obtained). During the contracting negotiations, agreement is reached on the amount of the Commission's contribution to the team to cover its implementation costs – these resources are referred to as the contracted amount. Consortiums for the implementation of FP6 projects may be composed, without restriction, of teams from the EU-27 Member States and six associated countries (Iceland, Israel, Liechtenstein, Norway, Switzerland, and Turkey). Where required by a project, a participant from any country may contribute to the work of a team; in this case, the Commission contribution for this participant's involvement is regulated by special rules.



In evaluations of statistical data about the participation of countries in FP6, it is necessary take into account the informative value of indicators provided by the Commission. Most commonly, the aggregate number of teams from a particular country that make up the members of those consortiums that submitted project proposals in a programme are cited. However, a more important characteristic of a country's successfulness is the aggregate number of its participants in successful contracted projects. This chapter sets out the numbers of participants in contracted projects; the international comparison of EU-27 countries is based on the number of participants in contracted projects adjusted for a uniform sized population (one million inhabitants).

Clearly, though, actual participation in a consortium does not reflect the significance of a team's contribution to the preparation of a proposal and the subsequent implementation of a project. The amount of the contracted contribution is indicative of the significance of a team's participation in a successful project. The international comparison can then be based on the aggregate aid received on aggregate by all teams from a particular country in contracted projects. Here too, however, the international comparison needs to express the aggregate contracted aid in comparable units. Two indices are used in the chapter: the aggregate contracted aid per researcher (i.e. the aggregate aid obtained by all participants from a country divided by the number of researchers in that country) and the aggregate contracted aid of a country relative to its gross R&D expenditure.

The statistics are drawn from the E-CORDA database of contracted projects, which the European Commission made accessible to Member States' administrations on 2 June 2008. This database contains information about 10,058 projects where successful contracting negotiations were held between the European Commission and the relevant consortium in the period from 17 December 2002 (when the first FP6 calls for proposals were made) to 31 January 2008. 74,400 teams from across the world contribute to the implementation of these projects. The European Commission will support them with EUR 16.678 billion, which corresponds to approximately 95% of the FP6 budget intended for indirect actions, i.e. for FP6 projects implemented by international consortiums (less expenditure on the activities of the Joint Research Centre, which are the European Commission's 'direct actions' – see the FP6 budget in Table D.1). The European Commission regards the data in the above-mentioned database as a final FP6 statistic.

Source: E-CORDA database of contracted FP6 projects, European Commission, June 2008. Europe in figures, Eurostat figures 2006–7, Eurostat, European Commission, 2007, ISSN 1681-4789, Statistics in focus, 7/2006, EUROSTAT

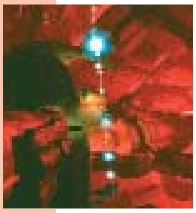
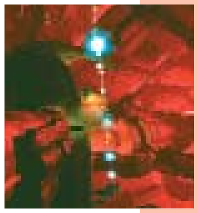
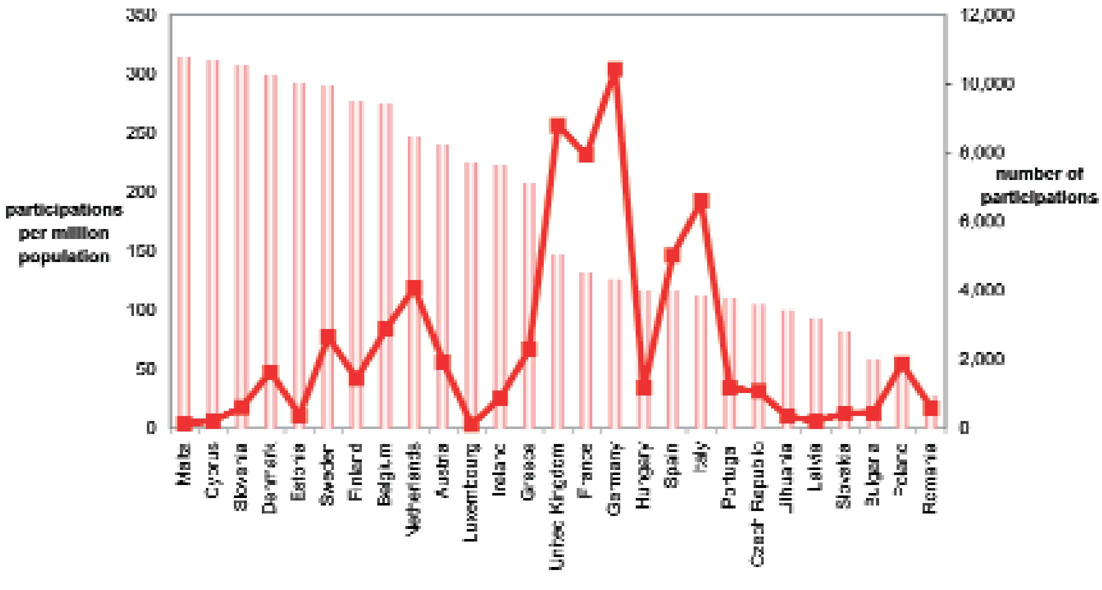


Table D.1. FP6 structure and budget (after the accession of new Member States in 2004)

		mil. €
Sixth Framework Programme for Research and Development		**17,883**
1. Focusing and integrating Community research (SP1)		**14,682**
1.1 Thematic priorities:		12,438
1.1.1	Life sciences, genomics and biotechnology for health	2,514
1.1.2	Information society technologies	3,984
1.1.3	Nanotechnologies and nanosciences, knowledge-based multifunctional materials, and 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 change and ecosystems	2,329
1.1.7	Citizens and governance in a knowledge-based society	247
1.2 Specific activities covering a wider field of research		1,409
1.2.1	Supporting policies and anticipating scientific and technological needs	590
1.2.2	Horizontal research activities involving SMEs	473
1.2.3	Specific measures in support of international cooperation	346
1.3 Non-nuclear activities of the Joint Research Centre		865
2. Structuring the European Research Area		**2,854**
2.1	Research and innovation	319
2.2	Human resources and mobility	1,732
2.3	Research infrastructures	715
2.4	Science and society	88
3. Strengthening the foundations of the European Research Area		**347**
3.1	Support for the coordination of activities	292
3.2	Support for the coherent development of policies	55
Euratom Framework Programme		**1,230**
1. Priorities of research-themed activities		**890**
1.1	Controlled fusion	750
1.2	Management of radioactive waste	90
1.3	Radiation protection	50
2. Other activities in the field of nuclear technologies and safety		**50**
3. Activities of the Joint Research Centre		**290**
Total		**19,113**



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



Source: E-CORDA database, Europe in figures, internal calculation by the AS CR Technology Centre

The curve in Graph D.1.1 shows the absolute numbers of EU-27 team participations in FP6 projects registered as 'successful' by the Commission as at 21 December 2007. As at that date, there are 9,789 projects being implemented by 72,748 teams (some teams are involved in the implementation of multiple projects, hence the 'number of participations', which is higher than the number of different participants). The participants in these projects are seeking contributions totalling EUR 16,678 million from the Commission, equivalent to approximately 95% of the FP6 budget earmarked for the support of international consortiums implementing these projects.

The bar graph D.1.1 illustrates the participation of EU-27 states per unit of population (one million inhabitants). The states in the graph are ranked by this relative indicator.

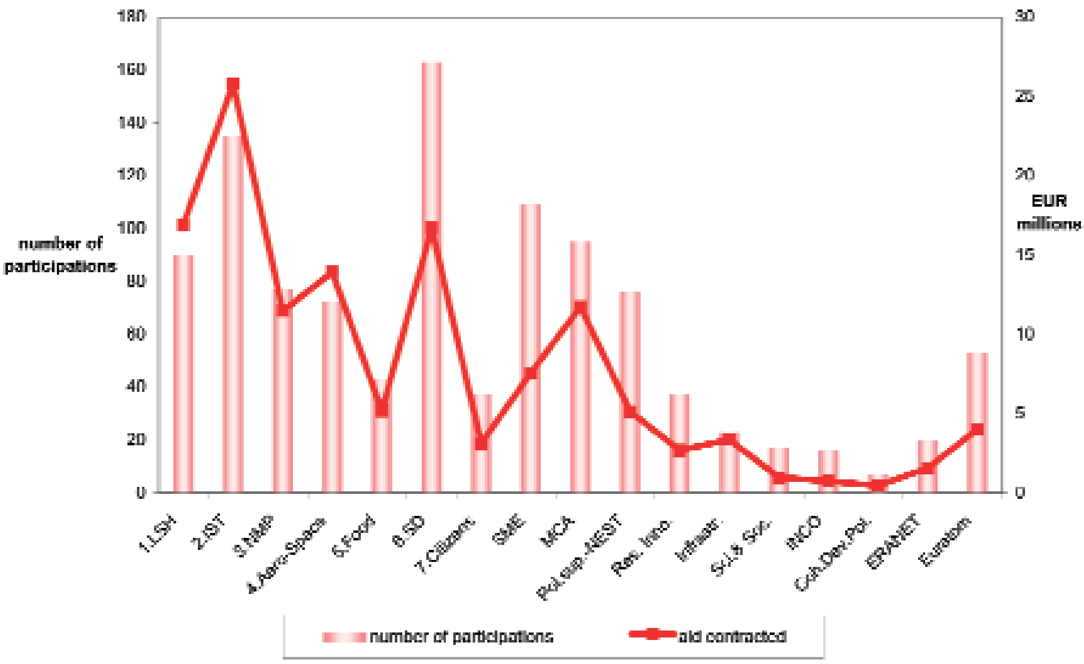
Among these projects, there are 876 where 1,068 teams from the Czech Republic are involved; this is approximately 1.6% of the participation of all EU Member States (i.e. less than the share of the Czech Republic's population in the total EU-27 population. These data place the Czech Republic 21st in the EU-27. If we rank states by absolute numbers of participations in FP6 projects, the Czech Republic comes 16th.

Czech participants enter projects with an overall budget of EUR 189.808 million and seek aid of EUR 130.056 from the Commission.

From the perspective of the total number of participations, the highest level of participation is reported by the Big Four, i.e. Germany (10,438 participations), the United Kingdom, France and Italy, which together account for more than half (51.6%) of the participations of all EU Member States. The lowest level of participation is reported by Cyprus, Latvia, Malta and Luxembourg (93 participations), which together represent 1% of the participations of all EU Member States.

On the other hand, converted to a figure per million inhabitants in the relevant country, the highest participation is reported by Malta (315), Cyprus (312) and Slovenia (308). These small countries (by population) do not typically have their own national grant agencies to cover such a wide range of R&D as in most medium-sized and (especially) large states, and therefore they are not comparable with other larger countries: small states form the group with the lowest absolute participation in FP6 but the highest participation per capita. They are followed by states with highly developed internal research, i.e. Denmark (299), Sweden (291) and Finland (277). In this indicator, the participation of the United Kingdom, Germany, France and Italy is roughly half that in the Nordic countries above. The lowest participation according to this indicator can be found in Bulgaria, Poland and Romania (altogether fewer than 55 participations per million population).

D.1.2 Participation of Czech teams in selected FP6 programmes



Source: E-CORDA, internal calculation by the AS CR Technology Centre

The bars in graph D.1.2 show, progressively, the numbers of participations by Czech teams in projects under these programmes (see also the FP6 structure in Table D.1):

1. LSH: 1. thematic priority, Life sciences, genomics and biotechnology for health,
2. IST: 2. thematic priority, Information society technologies,
3. NMP: 3. thematic priority: Nanotechnologies, nanosciences, new knowledge-based materials and production processes,
4. Aerospace: 4. thematic priority, Aeronautics and space,
5. Food: 5. thematic priority, Food quality and safety,

6. SD: 6. thematic priority incorporating the programme Energy, Global climate change and Transport,

7. Citizens: 7. thematic priority, Citizens and governance in a knowledge-based society,

SME: research activities involving SMEs,

MCA: human resources and mobility (Marie Curie Actions – MCAs),

Pols. sup-NEST: Research for policy support and new and emerging science and technology,

Res. Inno.: research and innovation support programmes,

Infrastr.: programmes promoting transnational use of scientific infrastructures,

Sci&Soc: science and society,

INCO: support of (international) cooperation with third countries (i.e. outside the EU),

Coh DevPol: support for the coherent development of national research and development policies

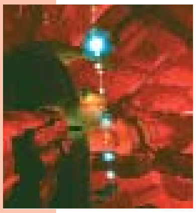
ERANET: support for the coordination of national activities,

EURATOM: separate programme in the field of nuclear energy utilization

Graph D.1.2 shows that the Czech Republic has most participations (163) in the sixth thematic priority, which encompasses three areas. Second is involvement under the IST priority (135 participations), which has the largest budget of all the FP6 priorities. Next is involvement in SME projects (109 participations). The portfolio of the Czech Republic's involvement in FP6 priorities (i.e. the distribution - as a percentage – of the Czech Republic's participation in FP6 priorities) differs from both the cumulative portfolio of new Member States and the cumulative portfolio of old Member States. Both groups report the highest percentage of involvement on the IST priority. At the same time, the Czech Republic has a clearly lower percentage of involvement in the first priority (LSH) than either the new or (especially) old Member States.

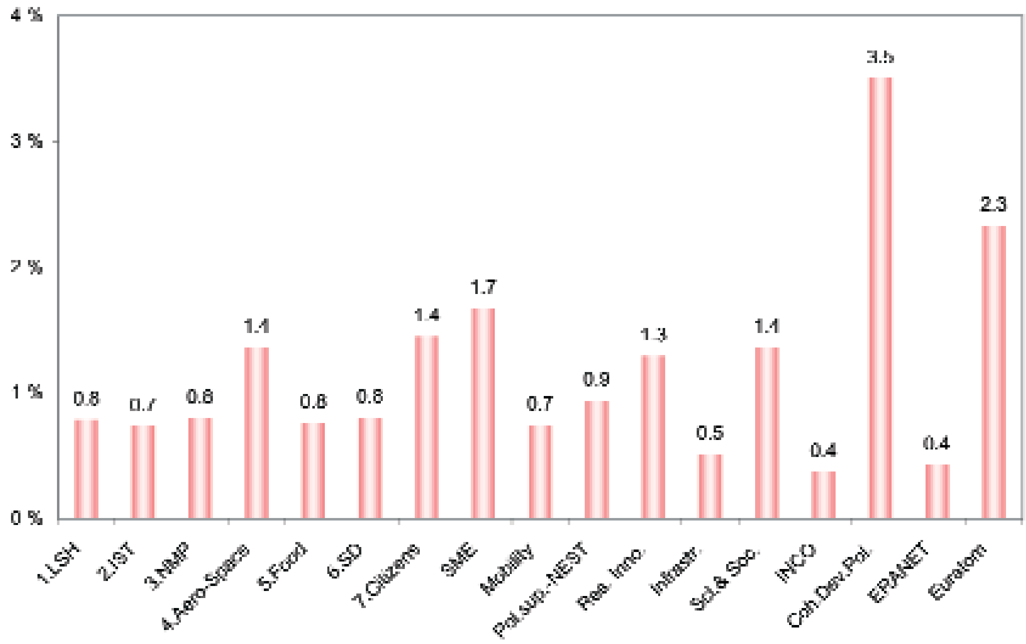
In respect of contracted aid, the highest contributions have been received by Czech teams participating in projects under IST, the second thematic priority EUR 25.787 million), followed by projects under LSH, the first thematic priority (EUR 16.944 million) with SD, the sixth thematic priority, in third (EUR 16.685 million). In Aerospace, the fourth thematic priority, Czech teams' contracted aid is EUR 13.926 million, i.e. approximately 11% of overall contracted resources, which is twice as high as the share received under this priority by old Member States (and four times higher compared to new Member States). The Czech Republic's high success in the fourth thematic priority can be attributed to Czech teams' involvement in aeronautics projects. Czech teams receive lowest aid in the priorities which only have small budgets, i.e. INCO (EU cooperation with third countries), Sci.& Soc. (Science and society), Coh.Develop.Pol. (coherent development of national R&D policies) and ERANET (international interconnection of national providers of resources for R&D).

However, account should be taken of the fact that the amount of aid depends primarily on the size of the budget for the individual programmes. The second thematic priority (IST) has the largest budget and the support for the coherent development of policies has the smallest budget; in this context, the Czech teams acquired the highest and lowest overall aid respectively in these two priorities. The degree of participation is thus important for the share of aid gained by Czech teams from the total amount distributed under the relevant priority. Overall, Czech teams have been assigned 0.86% of the FP6 budget allocated for EU Member States so far. The bar graph in Figure 1 sets out the shares released to EU Member States from budgets and contracted by Czech teams in the individual priorities. The Czech Republic obtained the highest percentage of released budget funds under the programme to support the coherent development of policies (3.5%). Participation in the Euratom programme is very successful; here, the Czech teams gained 2.3% of the budget funds distributed. In research activities involving SMEs, the Czech teams obtained 1.7% of the budget. However, these three priorities only have small budgets. Of the thematic priorities, the Czech Republic is most successful in the field of 'citizens and governance in a know-



ledge-based society', where Czech teams gained 1.45% of the budget resources released. In the priority 'aeronautics and space', the Czech Republic obtained 1.42% of the budget resources distributed, which is the highest proportion gained from the budget of a thematic priority by any new Member State. In contrast, in the priorities with the largest budgets, i.e. IST, LSH, NMP, the Czech teams obtained 0.72%, 0.78% and 0.8% of the budget respectively.

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



Source: E-CORDA, internal calculation by the AS CR Technology Centre

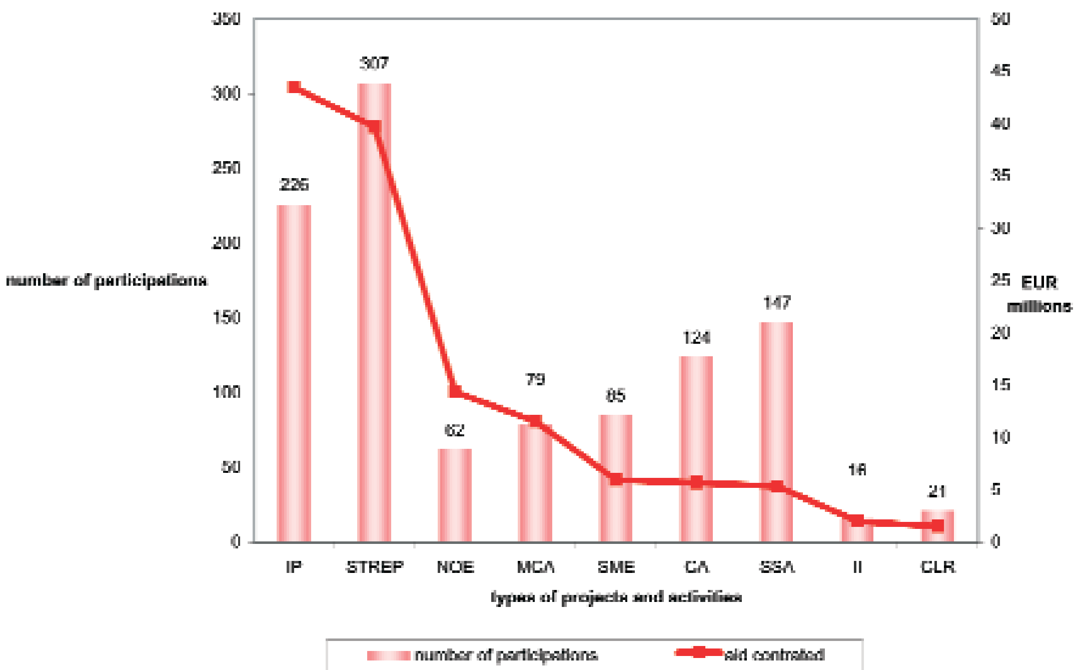
First, account should be taken of the fact that the amount of aid depends primarily on the size of the budget for the individual programmes. The second thematic priority (IST) has the largest budget and the support for the coherent development of policies has the smallest budget; in this context, the Czech teams acquired the highest and lowest overall aid respectively in these two priorities. The degree of participation is thus important for the share of aid gained by Czech teams from the total amount distributed under the relevant priority.

Overall, Czech teams have been assigned 0.86% of the FP6 budget allocated for EU Member States so far. The bar graph D.1.3 sets out the shares released to EU Member States from budgets and contracted by Czech teams in the individual priorities. The Czech Republic obtained the highest percentage of released budget funds under the programme to support the coherent development of policies (3.5%). Participation in the Euratom programme is very successful; here, the

Czech teams gained 2.3% of the budget funds distributed. In research activities involving SMEs, the Czech teams obtained 1.7% of the budget. However, these three priorities only have small budgets.

Of the thematic priorities, the Czech Republic is most successful in the field of 'citizens and governance in a knowledge-based society', where Czech teams gained 1.45% of the budget resources released. In the priority 'aeronautics and space', the Czech Republic obtained 1.37% of the budget resources distributed, which is the highest proportion gained from the budget of a thematic priority by any new Member State. In contrast, in the priorities with the largest budgets, i.e. IST, LSH, NMP, the Czech teams obtained 0.79%, 0.74% and 0.80% of the budget respectively.

D.1.4 Numbers of participations by Czech teams in individual FP6 instruments



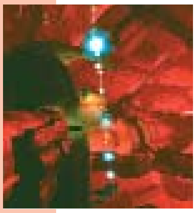
Source: E-CORDA, internal calculation by the AS CR Technology Centre

Bar graph D.1.4 shows the total numbers of participations by Czech teams in the individual FP6 instruments (forms of aid). The hatched curve in the graph indicates the amounts contracted by Czech teams under the individual instruments (project types).

These are the FP6 following instruments (project types), ordered according to the overall aid contracted:

IP: integrated project,

STREP: specific targeted research project,



NOE: network of excellence (featuring data about the aid available to Czech teams after these projects have been wound up),

MCA: Marie Curie Actions to promote researcher mobility,

SSA: specific support actions,

SME: research activities involving SMEs,

CA: coordination actions,

Infrastr: projects to promote infrastructures.

CLR: collective research involving associations of SMEs

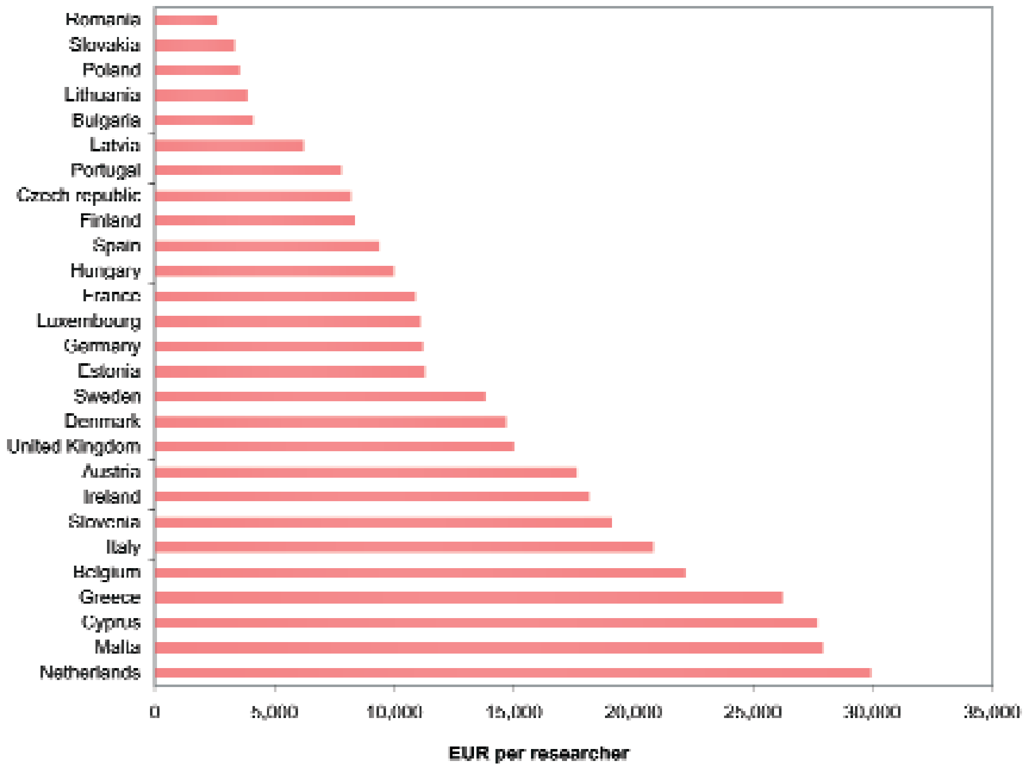
These instruments (forms of aid) are used in all the thematic priorities referred to in the preceding graph D.1.3.

The Czech teams clearly most commonly participate in projects that are research oriented, e.g. STREP projects (307 participations) and IP integrated projects (226 participations). The third highest involvement is in specific support actions (147 participations), although these are not primarily focused on research.

In respect of the contracted amount of aid, Czech teams seek most assistance for integrated projects (EUR 43.484 million), followed by STREP projects (EUR 39.714 million); Czech teams obtain the third highest amount through their involvement in networks of excellence (EUR 14.366 million). While Czech teams obtain close to 75% of their total assigned resources under the principal instruments (IP, NoE, STREP), which is on a par with the old Member States as a whole, for the new Member States the overall figure is just 63%. Therefore, with the exception of the Czech Republic, the new Member States participate in SSA and CA projects much more frequently than the old Member States. However, a more in-depth analysis suggests that Czech participants involved in individual IPs contribute only a low level of capacity and as such apply to the European Commission for aid for their participation in IPs which is clearly lower than participants from other countries, in particular from the old Member States, i.e. the EU-15. Further, the fact that Czech participants obtain the fourth highest amount (EUR 11.537 million) in mobility support projects cannot be disregarded. These projects lead to the initialization of further international cooperation in R&D.

In contrast, one of the lowest aid amounts, also in comparison with other EU-27 countries, was sought by Czech teams from SSA projects (EUR 5.361 million). However, the number of participations in this form of aid reported by Czech teams is relatively high. In projects for small and medium-sized enterprises (SMEs and CLR), aid amounting to EUR 7.476 million was assigned to Czech teams.

D.1.5 Relative aid disbursed from FP6



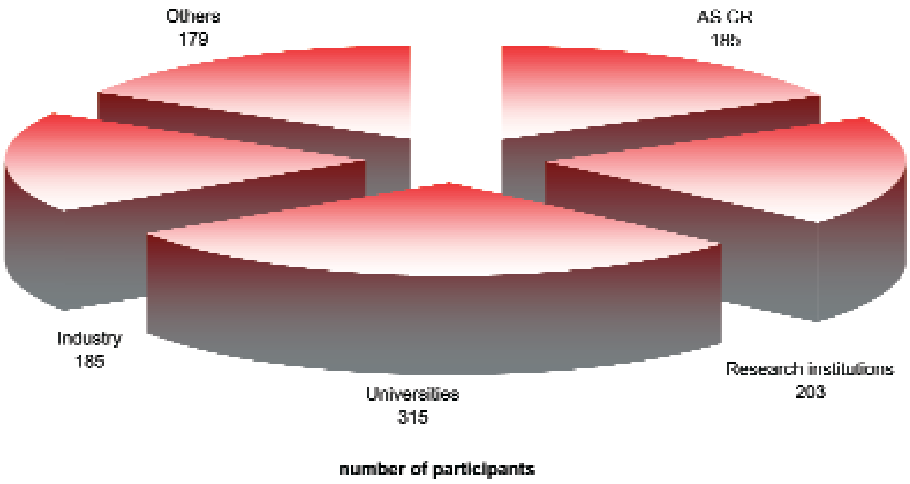
Source: E-CORDA Feb/2008, Statistics in focus 7/2006, internal calculation by the AS CR Technology Centre

The significance of national participation in framework programme projects is expressed more explicitly by the total amount granted to national teams than by the absolute number of their participations. For the purposes of international comparison, this aid needs to be converted into a figure per number of inhabitants (e.g. per one million population) or into the unit capacity of the national R&D system. This second possibility is illustrated by bar graph D.1.5, which compares EU-27 countries in terms of the amounts contracted, converted into capacity per researcher in the relevant national R&D system.

Leaving aside states with a small number of researchers (Malta, Cyprus, Slovenia and Estonia), it is clear from the graph that the old Member States (the EU-15) obtain higher amounts than new Member States in terms of the unit capacity of their research systems. There are numerous reasons for this difference. First of all, account should be taken of what opportunities for project-oriented research are offered to national teams by their own national R&D system (states without their own grant scheme generally obtain higher amounts per researcher than states with their own grant schemes). These opportunities are well developed in the large states (the United Kingdom, Germany, France) and in states which channel a high level of investment into their national R&D systems (Sweden, Finland). The standard of pay in national R&D sectors unquestionably has a considerable impact, as approximately 50% of project budgets comprises wages and salaries. Another factor is the structure of project types in a particular country: predominant participation in support projects (CA – coordination actions, SSA – specific support actions) diminishes the overall amount assigned (see also the preceding graph D.1.4).

The Czech Republic ranks 20th under this indicator (EUR 8,188 per researcher) among EU-27 Member States, and sixth among new Member States. Hungary is in 17th place, obtaining aid of EUR 9,984 per researcher.

D.1.6 Structure of Czech participants contributing to the implementation of FP6 projects



Source: E-CORDA

The structure of Czech participants is broken down into the following categories:

AS CR – a collective reference to all institutions of the Academy of Sciences of the Czech Republic,

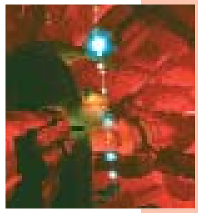
VU – R&D entities (both public and private research organizations),

Universities – universities (public, state and private),

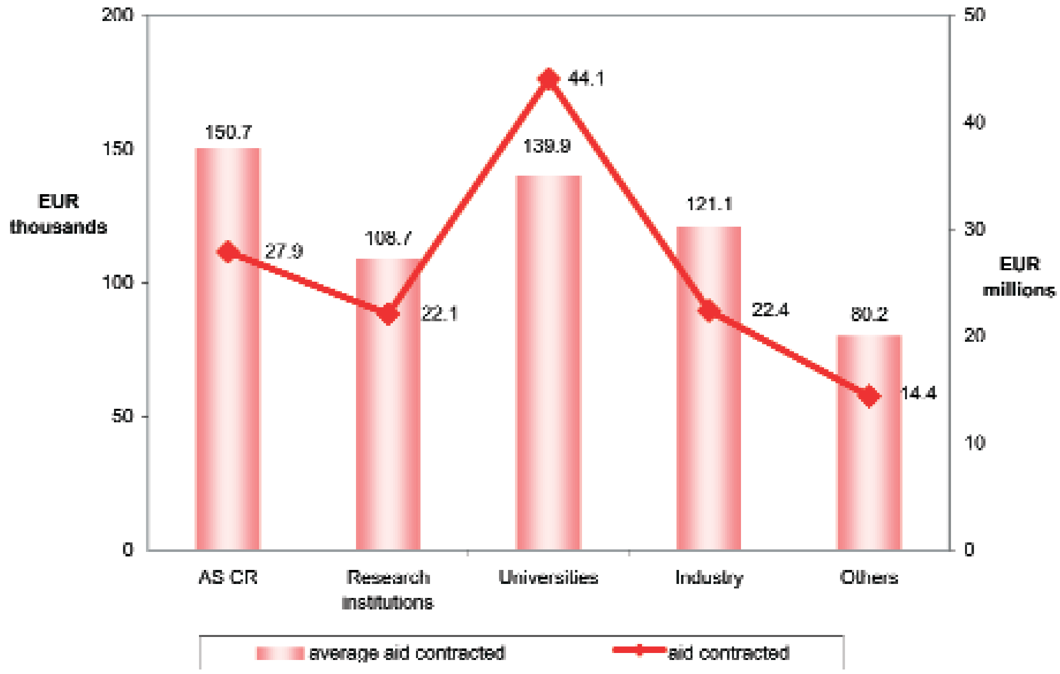
Industry – teams from industrial enterprises,

Other – teams that do not belong to the categories above (e.g. state and regional administration authorities, non-industrial institutions providing services, teaching hospitals, non-university educational establishments, end users of project results, etc.).

Graph D.1.6 shows that the highest number of participants comes from universities. The research sector (i.e. AS CR and research institutions together) is only marginally above the number of university participations. The representation of industrial teams among Czech participants is relatively high, as underlined in particular in a comparison with other new Member States.



D.1.7 Overall and average aid granted in individual R&D sectors

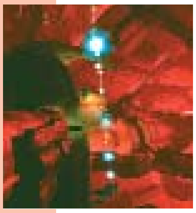


Source: E-CORDA

In the Czech Republic, overall the highest average aid was obtained by university teams. However, the research sector (i.e. AS CR and research institutions together) obtained slightly more aid than universities. However, European statistics suggest that the average assistance granted to universities is appreciably higher than the support for the whole research sector. The lower level of research activities among Czech universities compared to the norm in the EU is also apparent in terms of participation in FP6. However, the share of universities involved in FP6 is higher than their share in aid from national (public and private) sources.

The assistance received by industrial teams for their participation is relatively high, approximately 17% of overall aid for all Czech teams; this easily ranks the Czech Republic first among all the new EU Member States. The ability of institutions to participate in projects with a reasonably large team capacity is of paramount importance in FP6, much of the budget of which has been allocated to the implementation of major projects.

Graph D.1.7 indicates that the average level of aid per participation is highest among participants from the AS CR and lowest in the 'Other' category. In the case of industry, it should be borne in mind that industrial teams obtain, on average, a lower aid rate for their participation than academic or university teams. If, instead of the average aid granted, we consider the 'average budget', then the average budget of a Czech industrial team's participation exceeds the average budget of all participants by approximately 30%. Further characteristics of industrial participation indicate that Czech industry contributes to the implementation of FP6 projects much more intensively than industrial teams from new Member States.



D.2. Evaluation of the Czech Republic's involvement in the EU's Seventh Framework Programme for Research and Development

The **Seventh Framework Programme FP7**) makes a marked change compared to the series of framework programmes to date. For the first time, the lion's share of the framework programme's overall budget will be dedicated to the support of fundamental research. There is also a fundamental change in terms of the actual increase in the budget: FP7 will have an annual budget higher by approximately 40% than the annual FP6 budget. In its principal aims, FP7 follows up on FP6. FP7 is also intended to contribute significantly to the implementation of the Lisbon strategy. Therefore, FP7 takes the full range of project types from FP6 and adds a number of programme initiatives leading to the more efficient use of European research institute capacities. The new framework programme therefore expands projects that strengthen cooperation between regions and between the national R&D systems, and reinforces the existing trends of interlinking private and public sources of funding, thus helping to form an economy based on the production of knowledge.

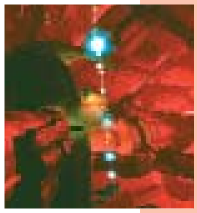
As before, the Euratom programme, focusing on special areas of the peaceful use of nuclear energy, is running concurrently with FP7. The rules for participation in the Euratom programme are the same as the FP7 rules. A completely new development is the Competitiveness Framework Programme, which provides a number of financial instruments for aid to SMEs within the knowledge economy and thematically is geared towards information technology and energy issues.

The FP7 general budget comprises **EUR 50.521 billion** for the new 2007–2013 period. The structure of the budget is set out in Table D.2. FP7 consists of four specific programmes. The Cooperation specific programme supports target-oriented research, i.e. research based on the needs of society. As in the previous framework programmes, each priority has its own detailed work programme, referred to by the European Commission's calls for proposals. FP7 was de facto launched on 21 December 2006, when the first calls – covering almost the whole range of priorities – were issued.

The Commission's contribution to a team involved in the implementation of an FP7 project hinges on the type of activity (30% of the total costs in relation to demonstration actions, a 50%-75% contribution for research activities, or 100% for project coordination or for implementers of coordination and support actions, i.e. projects in which the Commission has a common interest). Project proposals put forward under thematic priorities of the Cooperation specific programme by international consortiums pass through the same evaluation process described for FP6.

The **Ideas** specific programme supports frontier research. In this programme, no basic research themes are set, but research areas and avenues are defined. Project proposals may be submitted by researchers from across the world. Nevertheless, the projects must be implemented at institutes situated in the EU. The Ideas programme is managed by the autonomous European Research Council (ERC). The ERC sets up expert committees which, based on peer reviews, select and recommend submitted proposals for funding. The success of a proposal depends exclusively on its scientific excellence assessed in accordance with two criteria: the professional competence of the promoter and the proposal per se, i.e. how it extends beyond the limits of current knowledge in a particular area.

The **People** specific programme supports the lifelong learning of researchers and is geared to the direct continuation of Marie Curie Actions implemented under previous framework programmes. The range of these actions (actually grants) has been adapted to current and recently anticipated needs.



The **Capacities** specific programme aims to strengthen the research capacities of the European Research Area. It supports the development of research infrastructures, research involving small and medium-sized enterprises, the interconnection of knowledge regions, the development of research potential, 'science in society' activities and international cooperation with third countries.

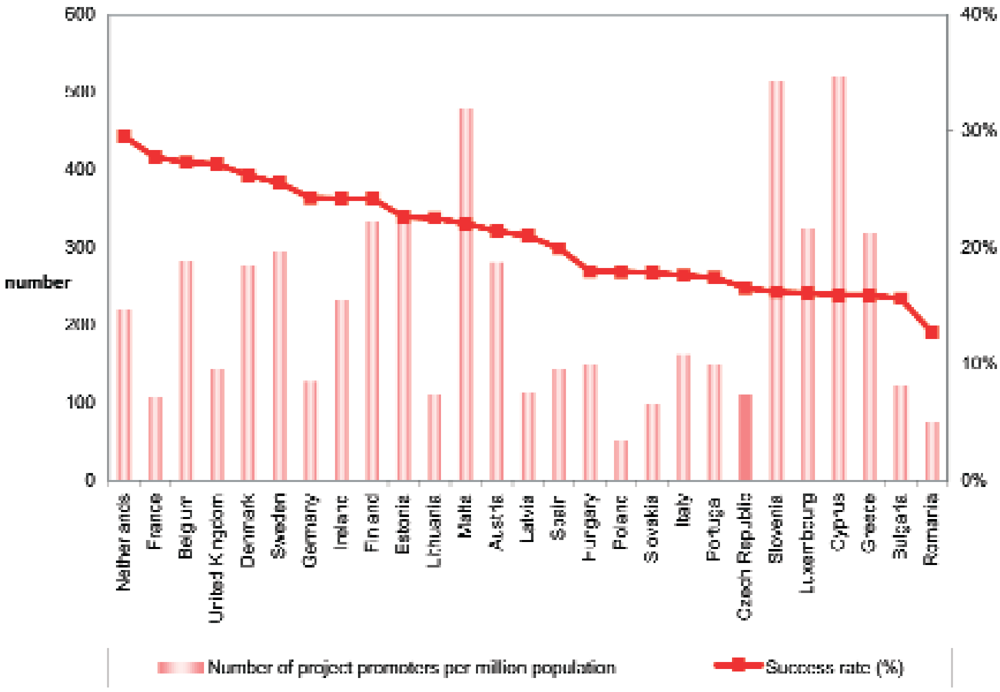
As at 19 May 2008, the E-CORDA database contained data about 22,367 formally correct project proposals registered by the Commission in response to 52 calls covering the whole range of FP7 priorities. In all 106,946 teams (not necessarily unique) from 247 countries worldwide contributed to the preparation of these proposals. Under a number of SP1 priorities and under the whole of the SP2, the calls had two rounds; in the first round, only the suggestions (very short proposals) of projects were sent. The ratio of proposals recommended for funding to the number of proposals sent in the second round is taken as the rate of success by the Commission. Overall, 12,659 proposals were sent in the second round; 87,098 teams from across the world contributed to their preparation. Overall, 19,546 teams from EU-27 countries will contribute to 2,859 proposals that were recommended for financing and progressed to the contracting stage.

Table D.2. FP7 structure and budget

	MEUR
Seventh Framework Programme for Research and Development	**50,521**
1. Specific programme 1 (SP1): Cooperation	**32,413**
Thematic priorities:	12,438
Health	6,100
Food, agriculture and fisheries, biotechnology	1,935
Information and communication technologies	9,050
Nanosciences, nanotechnologies, materials and new production technologies	3,475
Energy	2,350
Environment (including climate change)	1,890
Transport (including aeronautics)	4,160
Socio-economic sciences and the humanities	623
Security	1,400
Space	1,430
2. Specific programme (SP2): Ideas (support of frontier research)	7,510
3. Specific programme (SP3): People (Marie Curie Actions)	4,750
4. Specific programme (SP4): Capacities	4,097
Research infrastructures	1,715
Research for the benefit of SMEs	1,336
Regions of knowledge	126
Coherent development of research policies	70
International cooperation	180
Non-nuclear research of the Joint Research Centre	1,751
Euratom Framework Programme (2007–2011)	2,751

Source: E-CORDA FP7 database of registered projects, May 2008

D.2.1 Successfulness of EU-27 teams in the initial FP7 calls

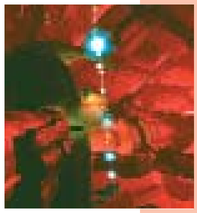


Source: E-CORDA, internal calculation by the AS CR Technology Centre

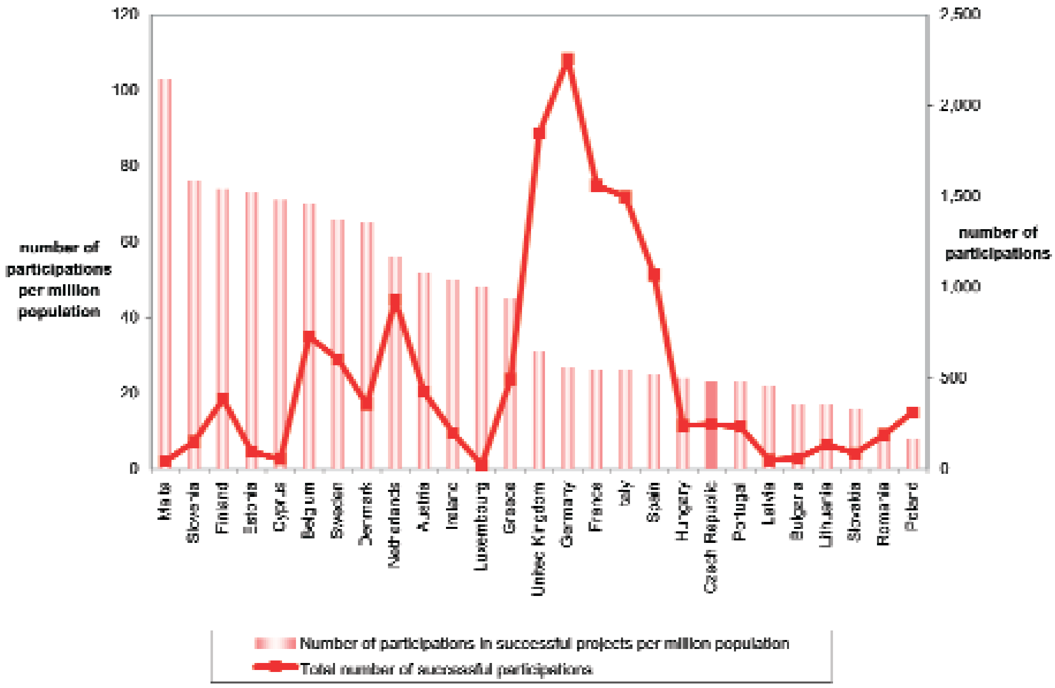
The bar graph D.2.1 shows the total numbers of proposals evaluated per million population. The greatest activity in the preparation of proposals is therefore reported by small countries - Cyprus, Slovenia, Malta, Estonia and Luxembourg. The large countries (Germany, the United Kingdom, France and Italy) prepared less than half the project proposals of small countries per million population. In the Czech Republic, there were 111 projects per million population, which is the fourth lowest number of all EU-27 countries.

The states in graph D.2.1 are ranked by the successfulness of proposals. The successfulness of Czech teams overall was 22.5%, ranking the Czech Republic 11th among EU-27 countries, or second among the new Member States (behind Estonia, which had a success rate of 22.6%). This suggests that Czech teams find consortium partners among the most successful European teams.

It is clear from the graph that medium-sized states, i.e. Austria, Belgium, Bulgaria, Denmark, Greece, Finland, Hungary, the Netherlands, Portugal and Sweden, with which the Czech Republic is usually compared, generally have a higher number of proposals per million population than the Czech Republic. Consequently, the Czech Republic will ultimately be involved in the implementation of fewer projects than most other states in the same size category. The Czech Republic should draw on the experience of Finland, Sweden, Denmark, Belgium and the Netherlands, which submit large numbers of high-quality project proposals per million population. On the other hand, while certain southern countries (Greece, Portugal, Bulgaria) contribute to the preparation of a higher number of project proposals, they are not particularly successful and hence do not receive aid from the Commission.



D.2.2 Participation of teams from EU-27 Member States in successful FP7 projects



Source: E-CORDA, internal calculation by the AS CR Technology Centre

The hatched curve in Graph D.2.2 links up points depicting the absolute numbers of EU-27 team participations in FP7 projects registered as 'successful' by the Commission as at 19 May 2008. As at that date, there are 2,859 projects to be implemented by 19,546 teams (some teams are involved in the implementation of multiple projects, hence the 'number of participations', as used for FP6 statistics). The participants in these projects are seeking contributions totalling EUR 5,748 million from the Commission.

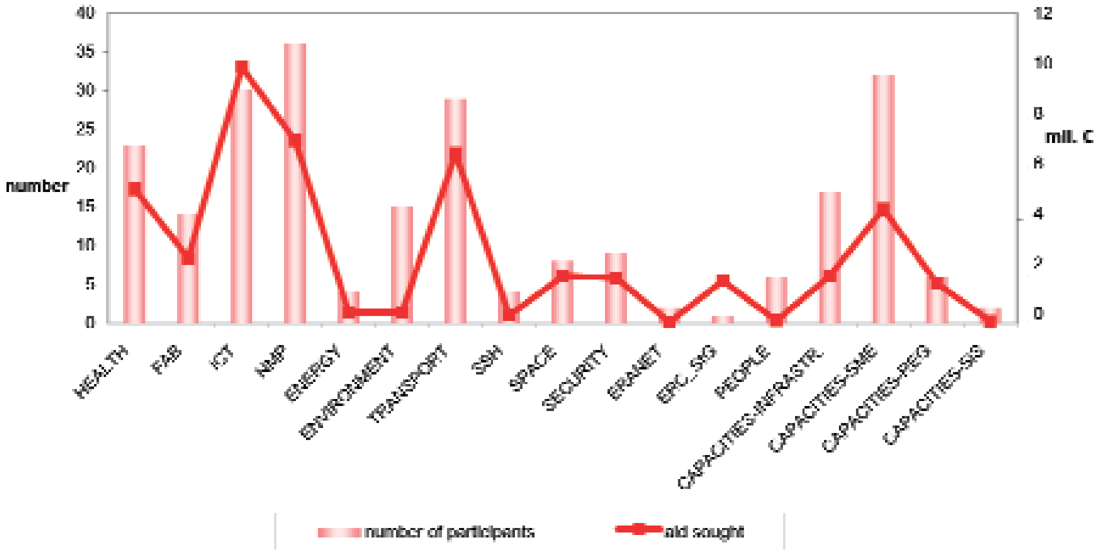
The bar graph D.2.2 illustrates the participation of EU-27 states per unit of population (one million inhabitants). The states in the graph are ranked by this relative indicator.

Among these projects, there are 212 where 259 teams from the Czech Republic will be involved; this is approximately 1.6% of the participation of all EU Member States (i.e. less than the share of the Czech Republic's population in the total EU population). These data place the Czech Republic 21st in the EU-27. If we rank states by absolute numbers of participations in FP6 projects, the Czech Republic comes 16th. In the FP7, the position occupied by the Czech Republic in the previous framework programme is repeated. It should be borne in mind that the last 11 states in the graph (i.e. starting with Italy) generally spend a lower percentage of GDP on R&D than the Czech Republic.

Czech participants enter projects with an overall budget of EUR 65.126 million and seek aid of EUR 47.318 from the Commission.

On the other hand, converted to a figure per million inhabitants in the relevant country, the highest participation is reported by Malta (315 participations per million population), Cyprus (312) and Slovenia (308). They are followed by states with highly developed internal research, i.e. Denmark (299 participations per million population), Sweden (291) and Finland (277). In this indicator, the participation of the United Kingdom, Germany, France and Italy is roughly half that in the Nordic countries above. At the other end of the scale, the lowest participation can be found in countries such as Bulgaria, Poland and Romania (altogether fewer than 55 participations per million population).

D.2.3 Participation of teams in selected FP7 programmes and aid sought



Source: E-CORDA, internal calculation by the AS CR Technology Centre

The participation of teams from the Czech Republic is illustrated by the bars in graph D.2.3: Czech teams are involved in projects that fall within the individual thematic priorities of the Cooperation specific programme and other specific programmes (see also the FP7 structure in Table D.2):

1. Cooperation specific programme

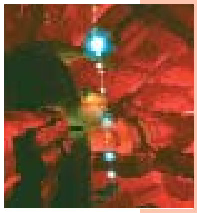
Health – research in the thematic priority of Health,
FAB – food, agriculture and fisheries, biotechnology
ICT – information and communication technologies,
NMP – nanosciences, nanotechnologies, materials and new production technologies,
Energy – research in the thematic priority of Energy,
Environment – research in the thematic priority of the Environment (including climate change)
Transport – research in the thematic priority of Transport (including aeronautics),
SSH – socio-economic sciences and the humanities
Space – research in the thematic priority of Space
Security – research in the thematic priority of Security
ERA-NET – these are projects interconnecting European providers of R&D resources (these projects were notified in individual thematic priorities and belong to the first specific programme)

2. Ideas specific programme

ERC StG – European Research Council, only 'grants for starting researchers'

3. People specific programme

People – human resources and mobility (Marie Curie Actions – MCAs),



4. Capacities specific programme

Capacities-Insfrastr. – research infrastructures

Capacities-SME: – research for the benefit of SMEs,

Capacities-Reg. – regions of knowledge and research potential (support of convergence and outermost regions)

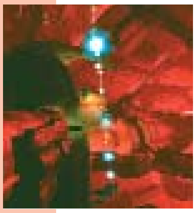
Capacities - SiS – science in society

Capacities-Inco – support of (international) cooperation with third countries (i.e. outside the EU),

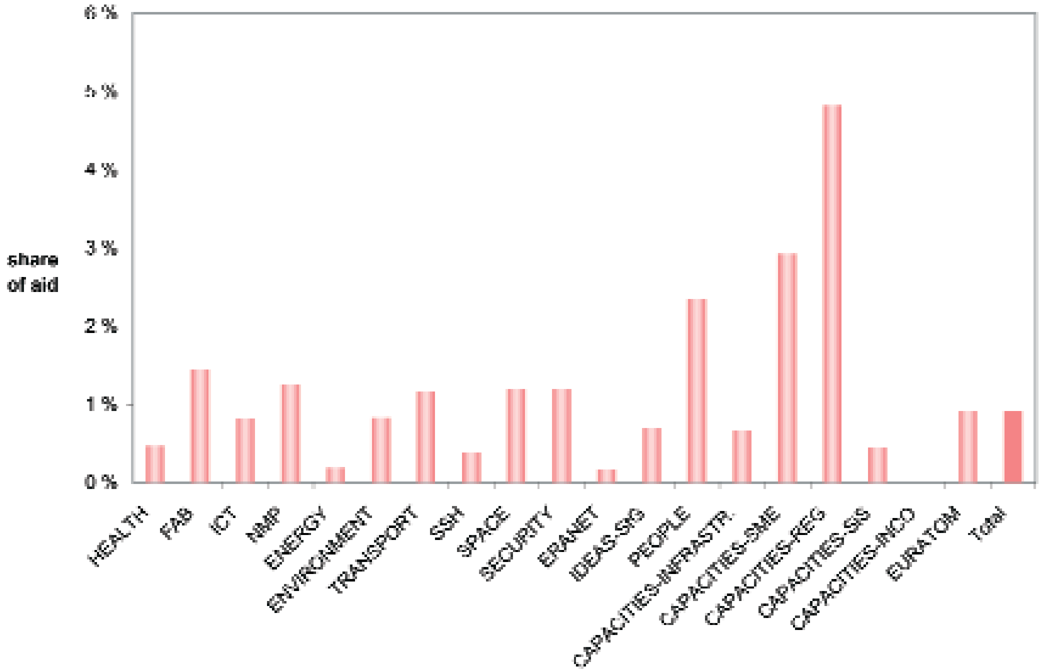
EURATOM: separate programme in the field of nuclear energy utilization

The bar graph D.2.3 shows that the Czech Republic has most participations in the NMP thematic priority, which is a significant difference compared to FP6, under which the highest numbers of participations were in the ICT priority. Here it should be noted that of the two calls advertised in ICT in 2007, the database only states, in relation to ICT, projects from the first call. Of the thematic priorities, next are transport research and health research. However, the bar graph clearly illustrates that the second highest number of participations is in the field of small and medium-sized enterprises. The portfolio of the Czech Republic's involvement in FP7 priorities (i.e. the distribution – as a percentage – of the Czech Republic's participation in FP7 priorities) differs from both the cumulative portfolio of new Member States and the cumulative portfolio of old Member States. Both groups report the highest percentage of involvement on the IST priority. At the same time, the Czech Republic has a clearly lower percentage of involvement in the Health priority than either the new or (especially) old Member States.

In respect of the contribution that Czech teams will be seeking from the Commission, despite the incomplete data it is clear that only some of the projects have passed through contracting procedure, especially in relation to Marie Curie Actions. For the time being, there are indications that the highest contribution will be received by teams in the priorities ICT (approximately EUR 10 million), NMP (EUR 7.1 million) and Transport (EUR 6.6 million). Small and medium-sized enterprises are seeking aid in the region of EUR 4.4 million.



D.2.4 Shares of the individual FP7 programme budgets obtained by Czech teams



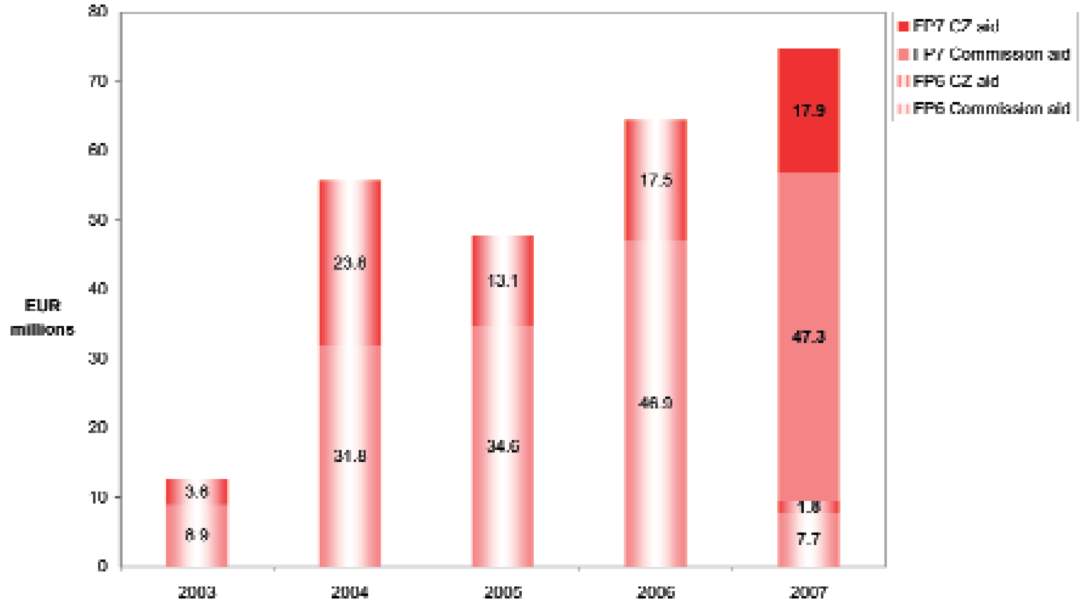
Source: E-CORDA, internal calculation by the AS CR Technology Centre

The amount of aid critically depends on the size of the budget for individual programmes. The second thematic priority (IST) has the largest budget and the support for the coherent development of policies has the smallest budget; in this context, the Czech teams acquired the highest and lowest overall aid respectively in these two priorities. Rather than the absolute magnitude of the aid sought, the degree of participation is important for the share of aid gained by Czech teams from the total amount distributed under the relevant priority. These shares are set out in the bar graph D.2.4.

Overall, Czech teams are seeking 0.91% of the FP7 budget allocated for EU Member States so far. It can be seen that the Czech Republic receives the highest share (4.8% of overall aid for EU teams) in the second specific programme, specifically for the development of 'regions of knowledge and research potential (support of convergence and remote regions); small and medium-sized enterprises also receive a high degree of aid (2.9%). Given the incompleteness of the data on projects under the People specific programme, this 'third most successful Czech programme' cannot be evaluated at this time.

Of the thematic priorities, the Czech Republic is most successful in FAB (1.5%), NMP (1.3%), Security (1.2%) and Space (1.2%). In contrast, in the Health and ICT priorities, which have the largest budgets, the Czech teams obtained 0.51% and 0.82% of the budget respectively.

D.2.5 Growth of overall resources spent on the participation of Czech teams in FP6 and FP7



Source: E-CORDA

The bar graph D.2.5 illustrates the growth of resources spent on the participation of Czech teams in FP6 and FP7. The bar indicates the general budget of all Czech participants in the given year. The lower part of the bar illustrates the cumulative contribution from the Commission for the participation of Czech teams; the upper part expresses the expenditure from Czech sources. In 2007, the bar shows these data separately for FP6 (the lower pair) and FP7 (the upper pair). However, it should be borne in mind that during FP6 the budgets of academic and university teams did not contain information about the salary costs of project implementers; therefore, the data about the overall budgets are not complete. Since the beginning of FP7, where there is a new method to support participation, the budgets are complete, i.e. they include the wages and salaries of researchers.

The graph shows the sustained growth of assistance granted by the Commission to Czech teams. In 2007, this aid was approximately EUR 55 million (i.e. approximately CZK 1.4 billion), which is a sum comparable to the 2007 budget of the Czech Science Foundation. Participation in framework programmes is therefore no longer 'complementary' as its significance now dove-tails with the importance of national targeted financing via the Czech Science Foundation.

Chapter E – Exceptional results in research, development and innovation in 2007

This chapter follows up on a similar chapter in the 2007 R&D&I Analysis and has four parts:

- An awards presented by the Government of the Czech Republic
- Awards presented by ministries, the Academy of Sciences of the Czech Republic and the Czech Science Foundation
- Awards presented by the Association of Innovative Entrepreneurship of the Czech Republic (AIPCR)
- Awards presented in the Czech Head competition

The chairman of the Research and Development Council asked for documentation on the prizes (awards). Information about the prizes awarded in the Czech Head competition was obtained from publicly available documents of Česká hlava, s.r.o., the company that organizes the competition.

Czech Head is a project to promote scientific and technical knowledge. First held in 2002, it comprises a set of interlinked activities to popularize science and enhance the social standing of domestic engineers and scientists as the main drivers of the country's economic prosperity. Every year, the project culminates in the award of national Czech Head prizes for leading figures in science and engineering. The prizes are awarded on the basis of a public competition arranged by Česká hlava s.r.o. and the Czech Head Endowment Fund. The reputation of this project has gradually risen. In 2005, the competition was expanded to include the category 'National Prize of the Government of the Czech Republic', renamed 'Czech Head National Government Prize' in 2007.

The Czech Head National Government Prize is awarded as a financial prize for exceptional results in R&D to the individual who achieved those results. The financial prize, CZK 1 million, is provided out of the national budget, from resources earmarked for R&D. The Government of the Czech Republic decides who to award the prize to on a proposal from the Research and Development Council. In the competition, prizes are awarded in seven other categories. The details are laid down in part E.3 of this chapter.

This chapter provides basic information about the following numbers of awards.

Czech Head National Government Prize	1
Awards presented by ministries and other institutions	
• Ministry of Industry and Trade	2
• Ministry of Education, Youth and Sports	5
• Ministry of Health	1
• Ministry of Agriculture	1
• Academy of Sciences of the Czech Republic	3
• Czech Science Foundation	4
• Czech Mining Office	1
• Association of Innovative Entrepreneurship	3
Other awards presented in the Czech Head competition	7
Total prizes awarded	**28**

E.1 Award presented by the Government of the Czech Republic

Czech Head National Government Prize 2007

Prize awarded to:

Antonín Holý
for the design and synthesis of acyclic nucleosides

Antonín Holý is a world-famous scientist in the field of medicinal chemistry. He discovered biologically active substances for the treatment of serious illnesses that are components of significant antiviral drugs, e.g. to combat AIDS. A significant benefit of Professor Holý's work is his ability to promote the application of the results of his research. Specific products have emerged from the development of highly effective medicinal products, such as Vistide, Hespera, Vistead, etc., in close cooperation with the pharmaceutical corporation Gilead Science in California. Professor Holý has supported the development of this discipline through his work at the Institute of Organic Chemistry and Biochemistry, Academy of Sciences of the Czech Republic.

E.2 Awards presented by ministries and other institutions

E.2.1 Ministry of Industry and Trade

Gold Medal – International Engineering Fair, Brno

Prize awarded to:

Richard Wittek, Jan Kůr, Daniel Smutný, MESING, spol. s r.o.
for a measuring device for the surface flaw detection using dispersed laser light.

A prototype measuring device has been developed that works in an automatic cycle to check for surface flaws in parts manufactured for the automotive industry. Until now, checks for surface faults have usually been conducted visually. However, these checks are very unreliable (entailing a subjective assessment of the surface) and no longer meet today's strict requirements for the inspections of the quality of the surface of precision engineering components. Surface defectometry is a new discipline in the field of metrology. Thanks to its intensive development of the checking method and equipment MESING has gained a head start over the competition in the Czech Republic and abroad. The checking method developed can be applied in devices installed in laboratories or directly on the production line.

Business Project of the Year, award presented by CzechInvest and the Ministry of Industry and Trade

Prize awarded to:

CRYTUR, spol. s r.o.,
Technical University of Liberec, Mechanical Engineering Faculty,
Institute of Physics, AS CR,
Czech Technical University in Prague, Nuclear and Physical Engineering Faculty
for monocrystal manufacture oxidation technology

The introduction of new monocrystal manufacturing technology for use in high-tech applications for powerful lasers and for display systems, such as x-ray cameras, tomography (PET) and electron microscopy. The project encompasses investment in the cultivation, working and characterization of a new class of monocrystals cultivated in oxidation conditions. The technology, developed through internal research and patented, covers the sharply rising exports to developed markets, scales up significantly the range available, and facilitates the manufacture of internally developed devices.

E.2.2 Ministry of Education, Youth and Sports

Prize of the Minister for Education, Youth and Sports

Prize awarded to:

Miroslav Karásek, Institute of Photonics and Electronics, AS CR,
Jan Radil, Josef Vojtěch, CESNET, z.s.p.o.
for the application of optical fibre amplifiers in the Czech research and training network.

The development of a unique software and hardware modular kit for an optical fibre amplifier, using commercial optical components in an innovative configuration and internal software. The qualities and price of the developed optical fibre amplifiers better than commercially available fibre amplifiers. While preserving high operational reliability, they offer significant modularity and easy control via numerous interfaces.

Prize of the Minister for Education, Youth and Sports

Prize awarded to:

Jiří Jarušek, Miroslav Krbec, Institute of Mathematics, AS CR
for the monograph 'Unilateral Contact Problems'

This monograph is dedicated to the theory of contact problems, and provides a modern theoretical basis and overview of modern methods from related disciplines that have impacted the theory of partial differential equations in recent years and that are used very progressively and systematically in the monograph. This is a unique project globally, because it offers not only in-depth results relating to the theory of contact problems, but also constitutes a modern, indispensable theoretical basis for further study. A further author of the monograph is Christof Eck of Universität Bielefeld.

Prize of the Minister for Education, Youth and Sports

Prize awarded to:

Miroslav Verner, Charles University, Prague, Faculty of Arts, Czech Institute of Egyptology

for the discovery of and research into the pyramid complex of the ruler Raneferef in Abusir, Egypt; publications: 'Abusir IX – The Pyramid Complex of Raneferef – The Archaeology' and 'Abusir X – The Pyramid Complex of Raneferef – The Papyrus Archive'

Professor Verner is a leading Egyptologist who has been leading researching in Egypt for over 30 years. He is the main author and editor of an extensive two-volume publication that comprehensively addresses the results of the archaeological research into the pyramid complex of Raneferef. The processing and evaluation of extensive relics of the original central papyrus archive provides a unique insight into the organization and operation of state administration and the economy of the ancient Egyptian state in the second half of the third millennium BC.

Prize of the Minister for Education, Youth and Sports

Prize awarded to:

Miroslav Kasal, Brno University of Technology, Faculty of Electrical Engineering and Communication Technologies

for work on the international AMSAT satellite space project

The development of fundamental equipment of an international telemetric and command station for satellites in high elliptical and low circular orbits. This is the only fully automatic station and also facilitates remote access via the Internet. The PCSAT2 project block worked onboard the International Space Station (ISS).

Medal of the Ministry of Education, Youth and Sports, Level I

Prize awarded to:

Jan Petrášek, Institute of Experimental Botany, AS CR

for the study 'PIN proteins perform a rate-limiting function in cellular auxin efflux'.

First paper on work dedicated to clarifying the biochemical function of PIN proteins in the mechanism of the polar transport of the plant hormone auxin, published in Science (312: 914-918, 2006). This work sheds light on plant biology and, generally, on the transport of substances through cellular membranes. Its significance is borne out by the fact that, based on citations, in July 2007 it was included among the 'New Hot Papers' in the survey ESI Special Topics, Thompson Scientific.

E.2.3 Ministry of Health

Prize of the Minister for Health 2007

Prize awarded to:

Milan Elleder, Charles University, Prague, First Faculty of Medicine
for the development of DNA chip applications for the diagnosis and study of pathogenesis and the treatment of heritable metabolic diseases.

A MetabolonChip has been prepared, facilitating the monitoring of the expression of approximately 2,000 genes involved in the metabolism. A comparison of the gene expression in the studied states returned significant information in the identification of candidate genes and some information about the molecular pathogenesis of the diseases studied. The project proved the clear benefit of chip technology in the study of molecular pathogenesis and the identification of risk and predictive factors for the diagnosis and treatment of other heritable diseases..

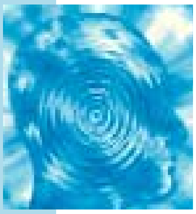
E.2.4 Ministry of Agriculture

Prize of the Minister for Agriculture for the Best R&D Result in 2007

Prize awarded to:

Pavel Trefil, BIOPHARM, Výzkumný ústav biofarmacie a veterinárních léčiv, a.s.
for a method for the creation of transgenic poultry. Patent CZ 289464 and application for a EUROPATENT, European Patent Application No 958098.6

The patent covers a unique method for the creation of transgenic poultry by transferring testicular cells from the testicles of a donor cockerel to the testicles of an acceptor cockerel, where the spermatogonial cells have been removed in advance. The transferred spermatogonial cells are capable of producing sperm in the acceptor cockerel, and therefore the result achieved with the use of spermatogonial cells in the transgenesis of poultry is a key and absolutely original factor in the transfer of genetic information. The author's institute was the first in the world to create a transgenic example (Gallus domesticus) in the manner described in the patent - by transferring spermatogonial cells containing a reporter gene.



E.2.5 Academy of Sciences of the Czech Republic

Prize of the Academy of Sciences of the Czech Republic for Excellent Results of Major Scientific Importance

Prize awarded to:

Marian Karlický, Astronomical Institute, AS CR
for discovering new types of radio and x-ray emissions of solar eruptions and their theoretical explanation

This is a set of 53 reviewed works published in leading international astrophysics journals, and is a summary of the author's exceptional results in solar eruption results obtained at the Astronomical Institute of the Academy of Sciences. The main results shed light on the primary process of solar eruptions. These results can be applied not only in the study of solar flares, but also in the study of eruptions in the atmosphere of stars, processes in the magnetosphere of planets, and laboratory plasma.

Prize of the Academy of Sciences of the Czech Republic for Excellent Results of Major Scientific Importance

Prize awarded to:

collective from the Jaroslav Heyrovský Institute of Physical Chemistry, AS CR, Ladislav Kavan, Martin Kalbáč
for electrochemically active nanomaterials based on titanium dioxide and carbon

New electrode nanomaterials were prepared. The new preparative procedures include photochemical synthesis of double-walled nanotubes, the preparation of nanocrystalline $Li_4Ti_5O_{12}$ a TiO_2(B), mesoporous TiO_2 films, composite nanotube-olivine and polyine-nanodiamond. For the synthesis of polyines, fullerenes, nanotubes and nanotexture carbon films, the mechanism of galvanic carbonization of perhalogenated hydrocarbons was clarified.

Prize of the Academy of Sciences of the Czech Republic for Excellent Results of Major Scientific Importance

Prize awarded to:

collective from the Institute of Ethnology, AS CR, Lubomír Brouček, Lydia Petráňová, Jiří Traxler and Josef Vařeka
for the work 'Folk culture. Ethnographic encyclopaedia of Bohemia, Moravia, and Silesia, I-III' (Lidová kultura. Národopisná encyklopedie Čech, Moravy a Slezska, I-III)

The first synthetic picture of the traditional culture of Bohemia, Moravia, and Silesia, drawn up as an encyclopaedic work. In scope and subject it is one of the most voluminous works of its kind in Europe. The encyclopaedia contains 2,200 entries, 1,200 black-and-white and 240 appendices, maps, graphs and examples of music scores.

E.2.6 Czech Science Foundation

Prize of the President of the Czech Science Foundation

Prize awarded to:

David Vokrouhlický, Charles University, Prague, Faculty of Mathematics and Physics
for Jarkovsky and YORP phenomena in the translational and rotational dynamics of asteroids

This project addressed the effect of solar radiation on long-term changes to the heliocentric system and rotational state of small asteroids and meteoroids. In particular, a component absorbed and subsequently heat radiated through the surface of a body may contribute to a significant change in the heliocentric distance of its orbit, or permanently speed up or slow down its rotational velocity. These phenomena were examined theoretically and were applied in various specific issues of planetary dynamism.

Prize of the President of the Czech Science Foundation

Prize awarded to:

Bořivoj Vojtěšek, Masaryk Memorial Cancer Institute
Miroslav Fojta, Institute of Biophysics, AS CR
for the development of novel therapeutic strategies through sensitizing tumour cells to anti-cancer drugs by targeting p53-kinases and p53 homologues

A contribution to the clarification of the role of the protein p53 and its homologues in the regulation of the cellular cycle and apoptosis, clarification of the role of these proteins in the pathogenesis of cancer. Potential application of results in predicting the patient's response to applied therapy and in searching for new therapeutic possibilities in oncology. A comprehensive and systematic solution to current oncology issues.

Prize of the President of the Czech Science Foundation

Prize awarded to:

Petr Baldrian, Institute of Microbiology, AS CR
Martin Pospíšek, Charles University, Prague, Faculty of Natural Sciences
for the environmental significance of saprophytic fungi, lignocellulose decomposition in forests

It was found that saprophytic fungi from the basidiomycota group play a significant role in the transformation of organic matter in forests, especially lignin and humin. For the decomposition of biopolymers, they use a complex system of extracellular enzymes including ligninolytic oxidase of lacasse and Mn-peroxidase and polysaccharide-splitting enzymes.

Prize of the President of the Czech Science Foundation

Prize awarded to:

Václav Dvořák, Technical University of Liberec
for optimizing and controlling blending processes

The project deals with the issue of optimizing and controlling blending processes in ejectors. This challenging, largely theoretical solution is based on mathematical modelling and simulations. New geometrical layouts facilitating qualitative improvements in the internal systems and efficiency of ejectors are analysed. The knowledge obtained serves as the basis for the design of new-generation ejectors. The timeliness and quality of the solution are evidenced by the implementer's successful publication.

E.2.7 Czech Mining Office

Golden Plaque of the Czech Mining Office

Prize awarded to:

Břetislav Janovský, OZM Research s.r.o., Hrochův Týnec,
OKD, HBZS, a.s., Ostrava
for the software 'Emergency management'

This software makes it possible, after an analysis of the composition of mine air at any point of measurement, to determine the explosiveness of a mix, to determine the formation of CO content in the air over a unit of time, and to determine whether it is possible, in case of explosiveness, to render such a mix inert with a supply of nitrogen. The software makes it possible for the crisis manager to work with a wide range of data transferred from the mine directly to the control centre, and as such to obtain a perfect picture of events at the place of the accident. This unique software solution complies with the specific requirements of mine rescue operations and ensures a higher degree of safety when working in extreme conditions.

E.3 Awards presented by the Association of Innovative Entrepreneurship of the Czech Republic

E.3.1 Innovation of the Year 2007, awarded by the First Vice-Chairwoman of the Research and Development Council

Prize awarded to:

Pavel Pospíšil, LINET, s.r.o., Slaný
for the 'Latera' bed

The Latera bed is an adjustable bed designed for the care of immobile patients in acute or long-term care. The lateral tilt of the bed on both sides reduces the physical demands of routine nursing activities. The i-brake automatic braking system reduces the risk of a fall. This innovative product is a world-class development in health and care technology.

Prize awarded to:

Libor Kotačka, Optaglio, s.r.o., Husinec
for the metal micro dots OVDot^{tm}

OVDot^{tm} metal micro dots (50–800 micrometres) are designed for the highly forensic protection of documents and goods. The surface of each dot is covered by a hologram. The dot can be in any shape (e.g. a hexagon, the outline of a butterfly), an alphanumeric code of several characters may be recorded in each dot. This new product is unique on the market in the protection of documents, goods, persons, etc.

Prize awarded to:

Lubomír Rákos, AMAGRO, s.r.o., Prague
for the humic concentrate Lignohumate B

The humic concentrate Lignohumate B is a mix of salts of humic substances with a high fulvic acid content (at least 50%), suitable for agriculture, horticulture, parks, sports grounds and land reclamation. It is a humic product unique in the world, formed in the process of the controlled synthesis of organic matter.

E.4 Other prizes awarded in 2007 in the Czech Head competition

E.4.1 INVENTION

Škoda Auto a.s. Prize

This prize is awarded for a discovery of exceptional work in the past few years.

Prize awarded to:

Miroslav Bleha, Institute of Macromolecular Chemistry, AS CR
Luboš Novák, MEGA a.s.
for the development of ionex membranes and the use of membrane processes in ecological and production applications.

Both prize-winners have spent many years researching and developing polymer membranes for various practical uses, e.g. in the preparation of drinking water, waste water treatment, and special applications in the pharmaceutical industry. Put simply, polymer membranes can be described as a new type of filter capable of separating individual components of solutions. The developed membranes are applied in the production halls of numerous global vehicle manufacturers. Long-term results confirm that this product, developed in Czech research and made by a Czech company, easily rivals products from the technologically most advanced countries of the USA and Japan.

E.4.2 PATRIA

Unipetrol a.s. Prize

This prize is awarded to a person whose professional and managerial qualities have successfully been applied abroad in recent years.

Prize awarded to:

Jiří Městecký, University of Alabama at Birmingham (USA)
for significant discoveries in mucosal immunity.

Professor Jiří Městecký is part of the world's elite in this discipline. He is the co-discoverer of the structure and function of specialized human antibodies which are used in the protection of mucous membranes (intestine, bronchi) against infection. His team obtained priority observations about the existence of a common mucosal immune system in humans and described mucosal tolerance, which could be used in the treatment of several serious autoimmune diseases such as multiple sclerosis and rheumatoid arthritis. He has also helped unravel the mechanism behind the development of serious kidney disease (IgA nephropathy).

E.4.3 INDUSTRIE

Prize of the Ministry of Industry and Trade

This prize is awarded for the most striking technological or product innovation.

Prize awarded to:

Research Institute of Geodesy, Topography and Cartography, Zdiby
for new web technology for geometric plan processing.

The production of a geometric plan, for many years, mainly entailed the laborious delineation of building corners, the axes of tracks and pathways, masts and land plots. In the era of modern information technology, the Internet and GPS, it was only a matter of time before these resources would penetrate surveying and cartography. A new building or path can be drawn in a geometric plan and then directly in a cadastral map from any place where the Internet is accessible. This faster and more readily available means of producing geometric plans will help not only professionals, but can also be used in schools for teaching purposes.

E.4.4 DOCTORANDUS

Siemens Prize for an Innovative Approach

This prize is awarded for the most pronounced work, expert or scientific activity by a doctoral student.

Prize awarded to:

Aleš Benda, Jaroslav Heyrovský Institute of Physical Chemistry, AS CR
for the development, implementation and application of new fluorescent microscopic techniques

Aleš Benda specializes in the development and application of modern methods in fluorescent microscopy, i.e. a discipline which plays a very important role in scientific knowledge. He has developed a method for the exact measurement of the mobility of molecules in lipid membranes. He was one of the first in the world to introduce into common practice a unique sophisticated method facilitating the simultaneous monitoring of various states of a single type of fluorescent marked molecules and use it to distinguish the movement of a loose, and in a membrane tied, form of a single type of molecule.

E.4.5 GAUDEAMUS

Prize awarded to:

Suzanna Hlinka, Akademie der Musischen Kuenste Bern,
Academy of Performing Arts in Prague, Faculty of Music
for her Master's degree dissertation on 'Mathematics and music in context'

The prize-winner is a top-class pianist who records for Czech and foreign radio stations. In her work she has focused on a highly unusual subject - the relationship between mathematics and music, i.e. disciplines which, on the face of it, are incompatible with each other. However, a link between mathematics and music has often been sought, e.g. the Pythagorean concept of music. Drawing on different works of music, the author proved that principles of mathematical logic can be identified in aesthetic principles based on logical relations. On the other hand, mathematics and its principles cannot fully replace a natural creative approach.

E.4.6 HOPE

Poštovní spořitelna Prize

This prize is awarded for the most pronounced work, expert or scientific activity by a secondary-school student.

Prize awarded to:

Ondřej Mikšík, Kroměříž Grammar School
for the practical use of methods for the digital processing of images.

This student of the grammar school in Kroměříž won the prize for his digital image processing project. Digital image recognition is currently highly topical - especially the analysis or description of objects captured in a digital image. This recognition is used for navigation systems and intelligent cars that draw attention to signs, hazards, etc. Use is also anticipated in banking, where digital images precisely determine account holders etc. The high standard of work is underscored by a quotation from the assessment of the work: '… from the perspective of expertise and practically achievable results, given the of the author (19) this paper is of exceptional standard and on a par with university diploma work or dissertations.'

E.4.7 MEDIA

Prize of the Czech Head Endowment Fund

This prize is awarded to a journalist or other media figure who has made the greatest contribution to the promotion of domestic science and engineering.

Prize awarded to:

Václav Cílek, Institute of Geology, AS CR
for popularizing science.

Václav Cílek is not only a top scientist (he is the director of the Institute of Geology, AS CR, and the author of almost 200 scientific papers), but is also intensively involved in popularizing scientific disciplines, especially climatology and environmental issues. He wrote his first article on climate change 20 years ago, he is the author of several books, he features in many periodicals, such as Respekt, Vesmír and Analogon, and daily newspapers such as Salon deníku Právo, and prepares radio and television programmes. He is a leading figure in Czech science with the ability to embrace the general public through the media and explain highly complex problems to them in a wider context and in a clear and intelligible form.

Basic pasrameters of countries for 2008 R&D&I

	Population (millions)	Gross domestic product (GDP)					Labour productivity		Public spending on tertialy education		Number of researchers (FTE)	Total expenditure on researchs and development (GERD)			
		USD millions in PPPs	per capita in USD in PPPs	real annual growth (%)	per capita in PPPs (EU-27=100)		per employee (EU-27=100)		EUR millions in PPPs	% GDP	thousands	USD millions in PPPs	per capita in USD in PPPs	% GDP	
	2006	**2006**	**2006**	**2006**	**2000**	**2006**	**2000**	**2006**	**2005**	**2005**	**2006**	**2006**	**2006**	**2000**	**2006**
Belgium	10.5	353,479	33,527	2.8	126.2	119.6	137.1	131.3	3,670	1.29	33,924	6,472	614	1.97	1.83
Bulgaria	7.7	83,135	10,798	6.3	27.9	36.7	30.4	34.8	465	0.76	10,336	380	49	0.52	0.48
Czech Republic	**10.3**	**225,958**	**22,009**	**6.4**	**68.6**	**78.1**	**61.9**	**70.4**	**1,569**	**0.89**	**26,267**	**3,489**	**340**	**1.21**	**1.54**
China	1,314.5	6,091,977	4,635	11.1							1,223,756	86,758	66	0.90	1.42
Denmark	5.4	191,393	35,202	3.5	131.9	125.6	110.6	108.3	3,653	2.38	28,653	4,652	856	2.18	2.43
Estonia	1.3	27,160	20,215	11.2	44.7	68.3	46.5	64.2	175	0.92	3,513	294	219	0.61	1.14
Finland	5.3	172,399	32,736	5.0	117.6	116.7	114.9	112.2	2,715	2.01	40,411	5,945	1,129	3.34	3.45
France	63.2	1,962,072	31,048	2.0	115.6	111.7	125.2	124.0	18,858	1.19	204,484	41,436	656	2.15	2.11
Ireland	4.3	173,179	40,716	5.7	131.0	145.2	127.2	134.7	1,483	1.11	12,167	2,290	539	1.12	1.32
Italy	58.9	1,704,426	28,917	1.9	117.2	103.1	126.1	108.8	10,550	0.76	82,489	17,827	304	1.05	1.09
Japan	127.8	4,088,916	32,006	2.2	117.2	114.1			19,769	0.61	709,691	138,782	1,086	3.04	3.39
Lithuania	3.4	56,253	16,574	7.7	39.4	56.1	42.7	57.0	423	1.04	8,036	428	126	0.59	0.80
Latvia	2.3	36,197	15,821	12.2	36.8	53.6	40.1	50.9	226	0.88	4,024	241	105	0.44	0.69
Luxembourg	0.5	36,936	78,138	6.1	244.3	278.8	176.1	183.9			2,346	542	1,147	1.65	1.47
Hungary	10.1	182,834	18,154	3.9	56.2	64.9	64.7	74.5	1,495	1.03	17,547	1,831	182	0.78	1.00
Germany	82.4	2,631,597	31,950	2.9	118.8	114.0	108.1	106.9	24,213	1.14	282,063	66,689	810	2.45	2.53
Netherlands	16.3	597,232	36,548	3.0	134.6	130.4	114.5	113.2	6,582	1.37	45,852	9,959	609	1.82	1.67
Norway	4.7	242,591	52,047	2.2	165.4	186.1	138.8	158.8	4,231	2.27	21,653	3,686	791	1.64	1.52
Poland	38.1	559,532	14,674	6.1	48.4	52.3	50.9	66.2	5,211	1.19	59,573	3,110	82	0.64	0.56
Portugal	10.6	220,723	20,854	1.2	78.2	74.5	68.9	68.5	1,743	0.98	21,126	1,839	174	0.76	0.83
Austria	8.3	295,624	35,695	3.3	131.7	127.0	121.5	119.8	3,524	1.48	30,452	7,249	875	1.91	2.45
Romania	21.6	234,727	10,873	7.9	25.9	38.8	29.2	39.1	1,387	0.81	20,506	1,067	49	0.37	0.45
Russia	142.8	1,868,980	13,092	6.7							464,357	20,155	141	1.05	1.08
Greece	11.1	303,604	27,233	4.2	84.3	97.1	93.8	103.8	3,434	1.44	19,907	1,735	156		0.57
Slovakia	5.4	94,797	17,585	8.3	50.2	63.6	58.0	71.6	591	0.81	11,776	467	87	0.65	0.49
Slovenia	2.0	49,359	24,595	5.7	78.8	87.7	75.1	83.9	496	1.27	5,834	787	393	1.41	1.59
United Kingdom	60.5	1,996,983	32,990	2.8	117.2	117.7	108.9	109.4	18,950	1.21	183,535	35,591	588	1.85	1.78
USA	**299.8**	**13,132,900**	**43,801**	**2.9**	**159.3**	**157.1**	**140.2**	**142.7**	**135,870**	**1.33**	**1,387,882**	**343,748**	**1,146**	**2.74**	**2.62**
Spain	44.1	1,294,828	29,382	3.9	97.6	104.8	103.8	102.9	9,473	0.95	115,798	15,596	354	0.91	1.20
Swesen	9.1	316,657	34,870	4.1	127.1	124.4	113.6	113.8	4,801	1.92	55,729	11,815	1,301	3.57	3.73
Switzerland	7.6	285,280	37,747	3.2	145.6	136.6	110.6	105.8	3,340	1.48	25,400	7,479	1,003	2.53	2.90
EU15	390.5	12,251,133	31,372	2.8	115.2	112.1	113.1	110.4			1,134,306	230,596	591	1.85	1.88
EU27	**493.9**	**13,819,441**	**27,982**	**3.1**	**100.0**	**100.0**	**100.0**	**100.0**	**125,967**	**1.15**	**1,332,397**	**242,816**	**492**	**1.74**	**1.76**
OECD	1,178.1	36,145,441	30,681	2.9							3,891,123	817,769	694	2.23	2.26

Source: OECD, EUROSTAT, additional calculations by CZSO

Abbreviations and acronyms

AS CR	Academy of Sciences of the Czech Republic
AIPCR	Association of Innovative Entrepreneurship of the Czech Republic
CA	coordination actions
CEP	Central R&D Project Register
CEZ	Central register of research intentions
CIS 4	Community Innovation Survey
CBU	Czech Mining Office
Commission	European Commission
CZSO	Czech Statistical Office
CUZK	Czech Office for Surveying, Mapping and Cadastre
EIS 2006	European Innovation Scoreboard 2006
EPO	European Patent Office
ERA	European Research Area
EU	European Union
EU-15	the following EU Member States: Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, the United Kingdom, Greece
EU-25	the EU-15 + the Czech Republic, Estonia, Cyprus, Lithuania, Latvia, Hungary, Malta, Poland, Slovakia and Slovenia
EU-27	all EU Member States (EU-25 + Bulgaria and Romania)
Eurostat	Statistical Office of the European Communities
FDI	foreign direct investments
Frascati	S&T classification (Frascati Manual, OECD 2002)
FP6	Sixth Framework Programme of the European Union
FP7	Seventh Framework Programme of the European Union
GACR	Czech Science Foundation
GCI	Global Competitiveness Index
GERD	Gross Domestic Expenditure on R&D
Growth CI	Growth Competitiveness Index
GDP	gross domestic product
ICT	Information and communication technology
IMD	International Institute for Management Development, Lausanne, Switzerland
IEOP	Industry and Enterprise Operational Programme
ISOP	MIT operating system information system
JRC	Joint Research Centre
MoT	Ministry of Transport
MoD	Ministry of Defence
MoI	Ministry of Informatics
MIT	Ministry of Industry and Trade
MoLSA	Ministry of Labour and Social Affairs
MoJ	Ministry of Justice
MSTI	Main Science and Technology Indicators, OECD
MoEYS	Ministry of Education, Youth and Sports

MoI	Ministry of the Interior
MoH	Ministry of Health
MoA	Ministry of Agriculture
MoFA	Ministry of Foreign Affairs
MoEnv	Ministry of the Environment
NB	national budget of the Czech Republic
NBU	National Security Authority
NSI	National Science Indicators
NUTS-2	Nomenclature of Territorial Units for Statistics
OECD	Organization for Economic Cooperation and Development
OHIM	Office of Harmonization for the Internal Market
OON	other wages
OP	operational programme
OSF	Structural Funds Department, MIT
OSS	organizational unit of the state
PCT	Patent Cooperation Treaty
PPP	purchasing power parity
RCI	relative citation impact of a country / region
RCIO	relative citation impact of a discipline of a country / region
R&D	research and development
R&D&I	research and development and innovation
R&DfI	research and development for innovation
R&DIS	Research and development information system
RIV	Results Information Register
RPC	relative production of citations
RPP	relative production of publications
RVV	Research and Development Council
SME	Small and medium-sized enterprises
SPO	state organizations partly funded from the public purse
SSA	specific support actions
SUJB	State Office for Nuclear Safety
TCAS CR	Technology Centre of the Academy of Sciences of the Czech Republic
UIV	Institute for Information on Education
UNCTAD	World Investment Report 2007
UPV	Industrial Property Office
USPTO	United States Patent and Trademark Office
VES	Register of Public Tenders in Research and Development
VK	training for competitiveness
VS	university (public, private)
VVI	public research institutions set up in accordance with Act No 341/2005
VZ	research intentions
WEF 2006	World Economic Forum 2006
WIPO	World Intellectual Property Organization

GOVERNMENT OF THE CZECH REPUBLIC

RESOLUTION

OF THE GOVERNMENT OF THE CZECH REPUBLIC

No. 1340 of 3 November 2008

on the Analysis of the existing state of research, development and innovation in the Czech Republic and a comparison with the situation abroad in 2008

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 2008 contained in Part III of the document Ref. No. 1602/08

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