ANALYSIS OF THE EXISTING STATE OF RESEARCH, DEVELOPMENT AND INNOVATION IN THE CZECH REPUBLIC AND A COMPARISON WITH THE SITUATION ABROAD IN 2011

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Introduction

***Motto**: "Even in this difficult economic and budget situation the research and development remains a priority for this government."*

The annual Analyses of the Existing State of Research, Development and Innovation in the Czech Republic and a Comparison with the Situation Abroad are being prepared by the Research and Development Council as stipulated in the Act No. 130/2002 Coll., on the Support of Research and Development from Public Funds and on the Amendment to Some Related Acts (the Act on the Support of Research and Development).This year it is already for the tenth time when the public is being presented with a detailed balance of inputs into research and development and their impact on the outputs, especially innovation and competitiveness. As the analysis contains a number of data regarding the Czech Republic and compares them with the situation in other European countries, Japan and USA, it is an important analytical and base data for the creation of conceptual and strategic documents in this field.

The used structure, scope and form of graphic design of the document are similar as last year. This year the explanatory part of the text is improved, as the aim was not just to present the description of the data but also to present an opinion. Extensive tables are included in the appendixes. Unlike the past years this year's analysis has its appendixes extended with a chapter including more detailed information regarding some of the used data sources, statistical surveys and indicators and their definitions, which are necessary for the correct interpretation of the data.

Science and research both have an irreplaceable role in the advanced society. As well as other parts of the social life science and research gradually change and adapt to current challenges and become a subject of targeted reforms. Apart from traditional characteristics such as independence, rationality and objectivity other values are coming into the forefront nowadays due to the changes in the science policy, such as usability, excellence, interdisciplinarity, international cooperation and mobility. These new values contribute to the improvement of our country's competitiveness, which is also one of the main priorities of the government. It is an undisputable advantage that the Czech economy has an industrial tradition and can benefit from its advantageous position in the heart of Europe.

The Czech Government is fully aware of the importance of science and research, as is proved by the fact that the budget proposal approved by the government includes record high expenditures on research and development in the amount of 26.6 billion CZK. With the addition of the EU funding the total amount is 38.7 billion CZK.

I believe that the presented information will be useful for anyone who isn't indifferent to the current state of Czech research, development and innovation and who deals with conceptual questions of its further development.

RNDr. Petr Nečas

Prime Minister
Chairman of the Research and Development Council

Executive Summary

Research and development (R&D) is an important source of new knowledge, which, if transformed correctly into innovations, can contribute to the improvement of quality of life (its health, social, economic and other aspects). The economic importance of the innovation activities grows especially as the sources of the Czech competitive advantage change in connection to the gradual loss of price advantage. Necessary for responsible decision making in R&D policies is good knowledge of the information system and its development trends. The aim of this document is to provide basic information on research, development and innovation (R&D&I) in the Czech Republic and to compare the state and trends in this field with the situation abroad. Because of its size and the complexity of R&D&I its aim is not to analyze in detail individual aspects of the Czech innovation system. Similar to past years it attempts to describe and interpret data gained from official statistics and databases and provide basic information background for creation of strategies, policies and measures at various levels and for preparation of additional surveys, which are necessary for the overall understanding of the character of the Czech innovation system. The following points summarize the main discoveries formulated in this analysis.

Research, development and innovation in enterprises

- R&D in the Czech Republic is performed mainly in the business sector, which has the major part of the total of more than 2.5 thousand research sites.
- The business sector is also the most important regarding the expenditures on R&D and the funding provided for R&D activities. Also more than a half of all employees in R&D work in the business sector.
- A look at the detailed structure of the business sector shows that the leaders in R&D activities are foreign owned companies, which spent almost 60% of the business sector's overall R&D funding and these funds came predominantly from their own sources.
- The R&D in foreign owned companies is much more concentrated than in domestic companies. While the average yearly investments into R&D in foreign owned companies reach almost 42 million CZK, in domestic companies this figure is only ca. 8 million CZK. Regarding the benefit for the Czech economy it is important how these investments are connected to domestic economy, both to domestic companies and research organizations. However the available data provide only limited information on this.
- As for the sector point of view the most important subject regarding R&D activities is traditionally the automotive industry with more than one quarter of the overall business R&D spending. Dynamic growth in R&D spending has been recorded in the IT industry, which is related to the creation of new R&D sites in this sector. The sector orientation of business R&D is reflected in dominant representation of R&D workers in technical sciences.
- A remarkable characteristic of the R&D in the business sector is a long term significant gender imbalance of R&D workers as the women make up only less than 20% of all R&D workers in this sector. For comparison the share of women in the public R&D is 42%.

- The increase of R&D expenditure in the business sector is accompanied by a slight growth of the number of patent applications submitted by the business subjects. However regarding the number of patent applications and granted patents the Czech Republic is still well behind the European average.
- The lower patent activity is partly due to the fact that the enterprises in the Czech Republic still mainly innovate through the transfer and adaptation of existing technology, not through the development of completely new (patentable) technological solutions.

- This is also confirmed by the data, which shows that industry sectors where businesses invest more intensively into R&D (knowledge-intensive industries) are characterized by a higher number of patent applications and higher revenue from innovated products on the market.
- Apart from the manufacturing of automobiles the knowledge-intensive industries (i.e. with an above-average R&D spending) don't significantly contribute to the added value of the Czech economy so far. The dynamics of these sectors is positive however.
- Positive is also the fact that the foreign trade with high-tech products grows faster in the Czech Republic than the total foreign trade, which shows an increasing competitiveness of this production on foreign markets.

Research, development and innovation in the public sector

- The public research with the dominant role of public research institutions created by the Czech Academy of Sciences and public universities is undergoing gradual structural changes, where the share of university research on total public R&D spending has increased from 36% to 48% since 2000.
- These changes in the R&D expenditure structure happen while the amount of research sites in government and university sector and the government R&D spending remain the same. This means that the R&D expenditures are increasing in the university sector, which shows that the universities change their orientation to support the so called second role of the universities.
- This trend in the university sector is also evident from the number of researchers, which has grown by more than a third since 2005. The number of researchers in the government sector stagnates and since 2008 it slightly decreases.
- As for the departmental structure of the public R&D the situation still remains where the technological R&D is performed mainly at universities and the R&D in natural sciences is being performed mostly by research institutions created by the Czech Academy of Sciences.
- The number and quality of results of R&D achieved by the public sector is increasing. The main form of publicizing the results of R&D, which were achieved with the help of public funding, is to publish them in scientific periodicals. The application-oriented result group has also grown significantly over the last years (especially those with high point value in the current Methodology).
- A significant increase in the number of results has been recorded by the universities over the past few years, which is in large part due to the increasing R&D funding and number of researchers in the university sector.
- The departmental structure of the achieved results is also changing, with the most significant increase in the number of results in the social sciences and humanities. However, it is important to add that the various result types are extremely hard to compare, e.g. from the point of view of human resources, financial or time costs etc.
- According to the available data it is possible to expect that the increase in the number of results and the change of their structure has been influenced by the changes in the Methodology of R&D Result Evaluation and by taking this Methodology into account when setting the amount of support for development of research organizations.
- Whether this is a real increase in the productivity of the R&D or adaptation to a new evaluation system remains a question, which can only be answered through and ex-post evaluation of the use of application outputs.

Cooperation in research, development and innovation

- The persisting weakness of the innovation system in the Czech Republic is the low level of cooperation between public research and businesses. It is apparent particularly when looking at the share of business resources in university (1.1%) and government (4.7%) sector R&D expenditures. These values are way below the European average. These results are further supported by innovation surveys, according to which neither the universities nor the public research organizations are key partners for business in their innovation activities.
- Because in the Czech Republic the foreign owned businesses play a significant role in the innovation system, it is a challenge to create tighter and long-term connections between these businesses and the public research.
- The low intensity of cooperation in R&D is also apparent on the international level, where it is possible to observe low interest of research teams (especially from public research) in international cooperation within the 7th Framework Program and other European initiatives.

Human resources potential in research, development and innovation

- Regarding the human resources potential in R&D it is positive that the number of university students and graduates increases steadily.
- Although it can be expected that with the increasing number of students and graduates the share of population with tertiary education will converge to the European average, the quality of education of current students remains a question.
- A question related to the potential for R&D is the change in the structure of studied programs. Statistics show that there is a shift from technology studies and the increase of students in life and medical sciences isn't very significant.
- On the other hand there is an increasing interest in the study of social sciences, economy, law and humanities. These changes in popularity of individual programs are already reflected in the change of the structure of population with tertiary education.

Contents

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 Cadaster
CZ-NACE	Classification of economic activities
EIS	European Innovation Scoreboard
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 Program of the European Union
FP7	Seventh Framework Program of the European Union
GACR	Czech Science Foundation
GBAORD	Government Budget Appropriations or Outlays for R&D by Socio-economic Objectives

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 Program
ISOP	MIT operating system information system
ITER	International Thermonuclear Experimental Reactor
JRC	Joint Research Centre
MoT	Ministry of Transport
MoD	Ministry of Defense
MoI	Ministry of Informatics
MIT	Ministry of Industry and Trade
MoLSA	Ministry of Labor 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 program
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&D IS	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	World Economic Forum
WIPO	World Intellectual Property Organization

A Investments into R&D

R&D is a systematic creative work performed in order to extend current knowledge, including the knowledge of man, culture and society, to gain new knowledge or to use it in practice through methods, which enable confirmation, supplementation or disproving of the gained knowledge.

R&D activities are generally considered to be one of the crucial ones when creating new knowledge, products and innovative technological procedures and can significantly contribute to the economic and technological development of the society. The support of R&D from public resources is subject to national science policies of individual states, which set long-term basic direction of research.

Research at universities and public research institutions should be oriented at the deepening of our knowledge in the dynamically developing so-called borderline scientific disciplines. Correctly allocated resources in public research are the key factor to ensure continuous benefits of new scientific and technological knowledge potentially usable even in the business sector while at the same time developing qualified human resources and strengthening the widely discussed sustainable society development. Therefore it appears as highly desirable that the public resources allocated to the support of R&D at universities and public research institutions should be used most efficiently.

R&D concluded in the business sector is aimed particularly at the applied research and experimental development. The results of these activities are mainly connected to innovations, i.e. the development of new or improvement of current products or services. Regarding the public support of private R&D we differentiate between the direct support from the state budget and indirect support through the possibility to apply R&D relevant tax deductions to the income tax base.

The main aim of this analysis, which is divided into two main chapters, is to present relevant information about the development and structure of expenditures for R&D, which is concluded in the Czech Republic. Further mentioned will be the specifics and main trends of these expenditures in the international context.

Chapter A.1 focuses on the characteristics of basic data and the total amount of R&D expenditure in the Czech Republic and abroad including their structure according to the sources of funding and sectors of their use. These data are supplemented by detailed information about R&D expenditures used in the government, university and business sectors.

The source of the data for this chapter is the Annual Statistical Survey on Research and Development (VTR 5-01), which the CZSO sends to all subjects in the Czech Republic who perform R&D as their primary or secondary economic activity regardless of the number of employees, sector or branch in which they operate.

Detailed information can be found at: http://www.czso.cz/csu/redakce.nsf/i/statistika_vyzkumu_a_vyvoje

Chapter A.2 includes the basic data on the total support of R&D from the state budget in the Czech Republic and abroad and informs about the structure of this support according to its form (institutional and project), main grantors, groups of supported scientific disciplines and beneficiaries.

The source of data for this chapter are information contained in the Annual Statistical Project on Government Budget Appropriations or Outlays on R&D (GBAORD), which is organized within the EU as a compulsory project with the aim to identify the main areas of R&D, where the state support is directed. The GBAORD statistic in the Czech Republic is conducted by the CZSO in cooperation with the RVVI.

Detailed information can be found at:
http://www.czso.cz/csu/redakce.nsf/i/statni_rozpoctove_vydaje_a_dotace_na_vyzkum_a_vyvoj_gbaord

The data for the international comparison come from the OECD publication „Main Science and Technology Indicators (MSTI 2011/1)“. Data on EU states, which are not OECD members, have been calculated by the CZSO from Eurostat data sources. In the table appendix with international comparison are also data available on 31st August 2011 on all states of the EU, OECD, China and Russia. The charts don't include data on Cyprus, Luxembourg and Malta from the EU countries and Iceland, Israel and New Zealand from the OECD countries.

Part of this chapter is also a table appendix including detailed data for years 2005-2010 on R&D expenditures and numbers of research and development workplaces from the VTR 5-01 survey and data on state budget expenditures and grants for R&D. Apart from the aggregate data for the whole Czech Republic the table appendix also contains regionally sorted data.

A.1 Total R&D expenditures

Total R&D expenditures, which are designated GERD (Gross Domestic Expenditure on R&D), include all current and capital expenditures for R&D conducted in the territory of the given state in the monitored year regardless of the source of their funding. The R&D expenditures can be determined by using two base indicators:

- *In current prices: current prices of goods and services in the given year*
- *In constant prices: in order to eliminate inflation. Because there is no special price index for R&D the GDP deflator has been used for the calculation of constant prices.*

A.1.1 Basic indicators

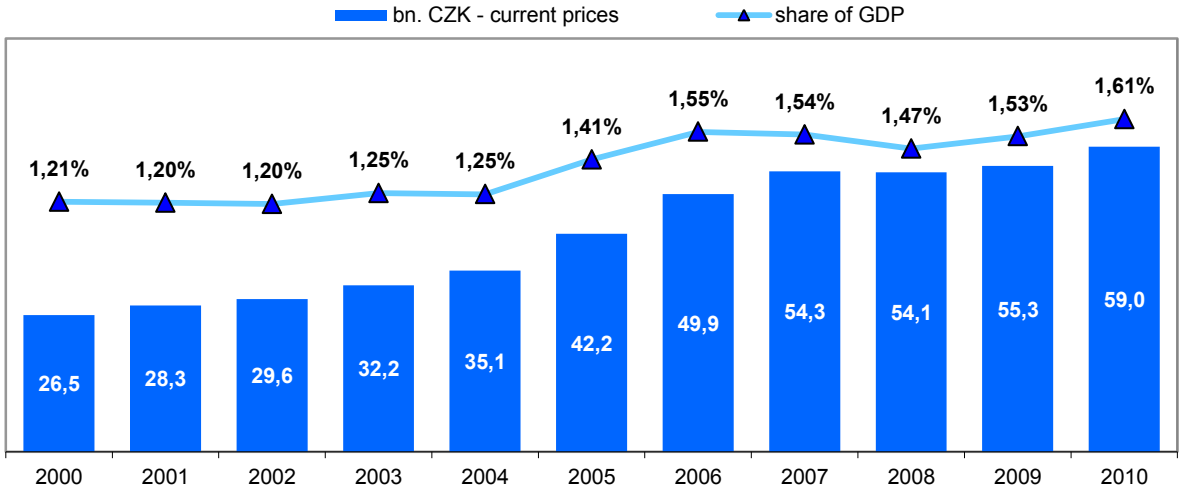
In the Czech Republic R&D is performed at 2 587 workplaces, 82% of which belong to the business sector. R&D expenditures exceeded 100 million CZK at only 112 R&D workplaces. 50 of these workplaces belong to the business sector, 33 to the government and the remaining 29 to the higher education (university) sector.

In the period 1993-2007 continuous increase of total investments into R&D has been recorded in the Czech Republic. During this period the R&D expenditures in current prices increased almost five times – in constant prices this increase was approximately half as big. If in 1993 the R&D expenditures in the Czech Republic were 12 billion CZK, in 2000 it was 27 billion and seven years later even 54 billion CZK.

After the decrease in 2008 caused mainly by the drop of private investments and a slight increase in 2009, which was mainly due to public and foreign investments we have recorded a significant increase of R&D expenditures in 2010. In the background of this 3.7 billion CZK (6.7%) year-on-year increase are R&D investments from private domestic business enterprises, which have increased by 4.2 billion CZK (17%).

In 2010 the total R&D expenditures reached almost 60 billion CZK, which equals to 1.61% share on the GDP. It is the highest figure since 1993. The growth of this basic ratio in the field of R&D expenditures in the last two years has been caused by the year-on-year decrease of the GDP in current prices by almost 2% in 2009 and almost six times faster growth of R&D expenditures than GDP in 2010.

Chart A.1: Total R&D expenditures in the Czech Republic



Source: CZSO 2011 Annual Statistical Survey on Research and Development VTR 5-01

Table A.1 Year-on-year change of total R&D expenditures in the Czech Republic

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Billion CZK (current prices)	2,8	1,8	1,2	2,7	2,8	7,1	7,7	4,4	-0,2	1,2	3,7
% in current prices	*12,0%*	*7,0%*	*4,3%*	*9,1%*	*8,8%*	*20,3%*	*18,3%*	*8,8%*	*-0,3%*	*2,3%*	*6,7%*
% in constant prices of 2000	*10,4%*	*2,0%*	*1,4%*	*8,1%*	*4,1%*	*20,6%*	*17,0%*	*5,2%*	*-2,1%*	*-0,2%*	*7,9%*

Source: CZSO 2011 Annual Statistical Survey on Research and Development VTR 5-01

In 2010 almost half of the total R&D expenditures came from domestic business enterprises. The state budget contributed 40%, foreign businesses 7% and international organizations, especially through EU funds and programs, the remaining 4%. The Czech business sector is the most important sector not only in the case of funding R&D activities, but also regarding the amount of financial resources spent on concluded R&D. In 2010 the business enterprises spent 62% of the total R&D expenditures on conducted R&D, the government sector 20% and the universities the remaining 18%. The information on the structure of R&D expenditure according to the sources of their funding and the sectors of their use are described in detail in the following two chapters.

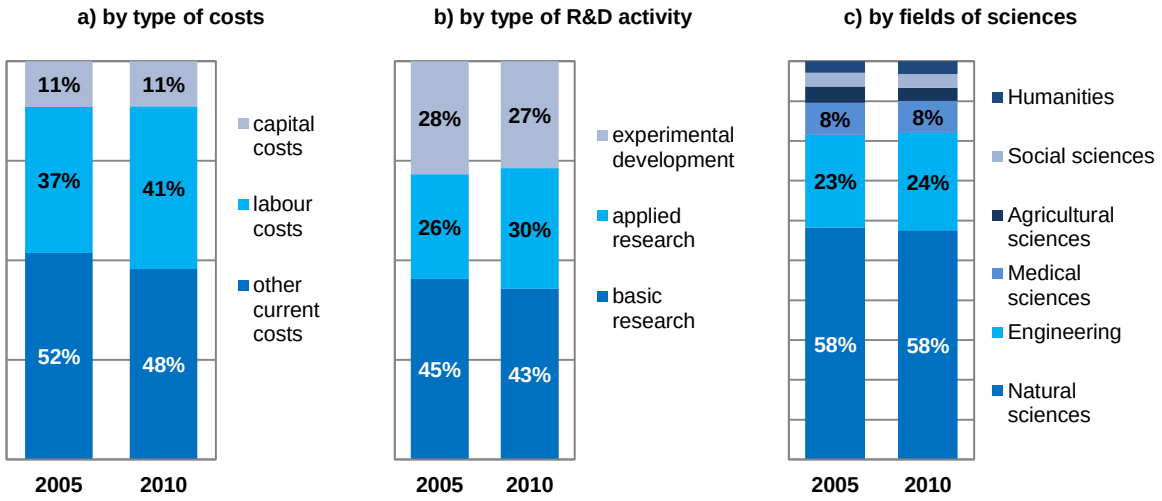
A significant part of the R&D expenditures in the Czech Republic comprises of wages and other current costs, which in 2010 together made up 89%, and the capital costs that captured the remaining 11% of the total R&D expenditures. Wage costs are the fastest growing cost item of R&D. While they made up 29% (7.7 billion CZK) of the total R&D expenditures in 2000, in 2010 their share increased to 41% (24.1 billion CZK).

Most of the financial resources are being spent on experimental development, which is related to the fact, that the business enterprise sector plays the most important role in the Czech R&D. In 2010 25.3 billion CZK (43%) were spent on activities related to experimental development, 17.9 billion CZK (30%) on applied research and the rest 15.9 billion (26%) on basic research, which is mainly carried out by the government sector.

Regarding the major field of sciences, within which the R&D is concluded, in 2010 the most of financial resources was allocated to technical sciences (40 billion CZK, 58%) and natural sciences (14.4 billion CZK, 24%). The R&D in engineering is mainly performed in the business sector and the higher education sector. R&D in natural sciences is performed mostly in the government sector, mainly at the workplaces of the

Academy of Sciences. Since 2005 the expenditures in humanities have relatively grown the most, by more than a half. In the same period the monetary increase has been the largest in technical sciences (9.4 billion CZK) and natural sciences (4.6 billion CZK).

Chart A.2: Structure of total R&D expenditures in the Czech Republic



Source: CZSO 2011 Annual Statistical Survey on Research and Development VTR 5-01

International comparison[1]

In 2009, for the first time since 1995 when the total EU27 data became available, there has been a year-on-year decrease in total R&D investments from 239.7 billion EUR in 2008 to 236.8 billion EUR in 2009. The R&D expenditures decreased in 15 of the 26 countries (data on Greece is not available). The most significant drop measured in absolute values occurred in the UK in two consecutive years. In 2009 the investments there decreased by 2.9 billion EUR and in 2008 by 4.3 billion EUR.

Germany with its total R&D expenditures in the amount of 67.7 billion EUR, France with 42.1 billion EUR and UK with 29.3 billion EUR contributed almost 60% of the total EU expenditures. The Czech Republic with 2.1 billion EUR contributed to the EU27 spending with less than one percent (0.88%) and in the imaginary table of EU countries ranked on the 15th place.

Despite the very low share of the total R&D expenditures in the EU27 it is together with Poland by far the highest value from the new member states. E.g. in comparison to Hungary the Czech R&D spending is twice as high and seven times as high as in Slovakia. However, if we compare ourselves to long-term member states of similar size as e.g. Austria or Belgium, then the expenditures in the Czech Republic are still several times lower.

[1] International comparison should always be concluded in the context of development, size and focus of individual economies. Comparison then should be made with states that have similar population, geographic and economic conditions.

The differences between the states in their expenditures on R&D are influenced apart from size, development and focus of individual economies also by the price levels of individual states. If we compare the absolute amount of R&D expenditures through the purchasing power parity (PPP), which eliminates the differences in price levels of individual countries, then the position of the Czech Republic regarding the total EU27 expenditure would be approximately 50% better and we would overtake Ireland and be on par with Portugal. For better international comparison the following table contains data on R&D expenditures in constant prices of the year 2000 in selected countries of the EU, the OECD, China and Russia.

Table A.2: Total R&D expenditures in selected countries (million USD at PPP, constant prices of 2000; EU27 = 100)

	EU27	US	Jap.	China	Ger.	Russia	Austria	Finland	Poland	CR	Hun.
2000	184 126	268 121	98 896	27 183	52 342	10 495	4 474	4 445	2 605	1 863	977
2009	229 997	324 987.	113 152	125 748	62 373	19 012	7 241	6 104	3 850	3 145	1 694
2000	*100*	*146*	*53,7*	*14,8*	*28,4*	*5,70*	*2,43*	*2,41*	*1,41*	*1,01*	*0,53*
2009	*100*	*140*	*49,2*	*54,7*	*27,1*	*8,27*	*3,15*	*2,65*	*1,67*	*1,37*	*0,74*

United States (US) – 2008

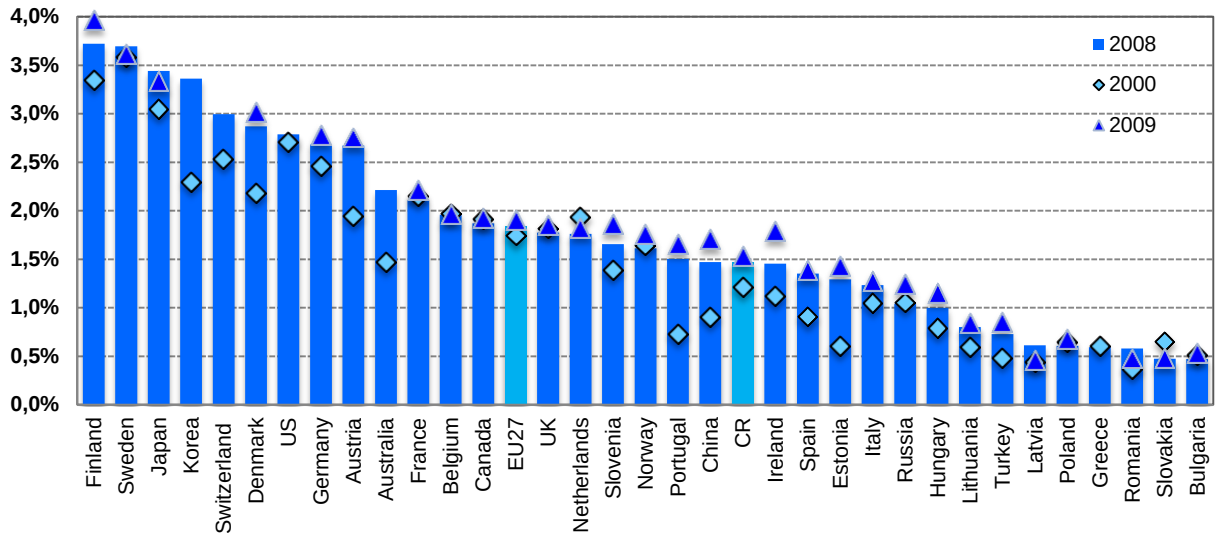
Source: OECD MSTI 2011/1, Eurostat 2011

In 2009 the highest intensity in R&D[2] of EU27 states - more than 3% - has been reached in Scandinavian countries, particularly in Finland where the R&D expenditure share has been almost 4%. In the case of Denmark and Finland the intensity of R&D has grown particularly during the second half of the 90s. Sweden maintains the 3% and higher share since 1993. In the EU, Germany and Austria also maintain high intensity values (above 2.5%). The German share of total R&D expenditures was above 2.5% already through the second half of the 80s and in Austria the intensity has increased over the past 15 years. Apart from Germany and Sweden it was also France and the UK who belonged to the EU states with the highest R&D intensity but the latter two states are slowly losing their position within the EU.

Within the OECD the highest R&D expenditures share of GDP is being achieved by Israel since 2000, in 2009 its expenditures equaled 4.28% GDP. Other OECD states with the R&D expenditures as a share of GDP higher than 3% are Japan, Korea and Switzerland. In the United States the R&D expenditures represent a 2.5 – 2.8% share of GDP since the first half of the 80s. Unlike the other states the expenditures in Israel don't include defense expenditures and in US capital R&D expenditures.

[2] Total R&D expenditures in international comparison are usually measured as a share of GDP. This ratio is called R&D Intensity and belongs to the group of basic structural indicators evaluating the fulfillment of the targets of the Lisbon Strategy in individual EU states. R&D Intensity was included among the indicators for evaluation of the targets of the Europe 2020 strategy.

Chart A.3 Intensity of total R&D expenditures (GERD as % GDP)



Greece – 2007; Denmark, Norway, Greece, Sweden – 1999

Source: OECD MSTI 2011/1, Eurostat 2011

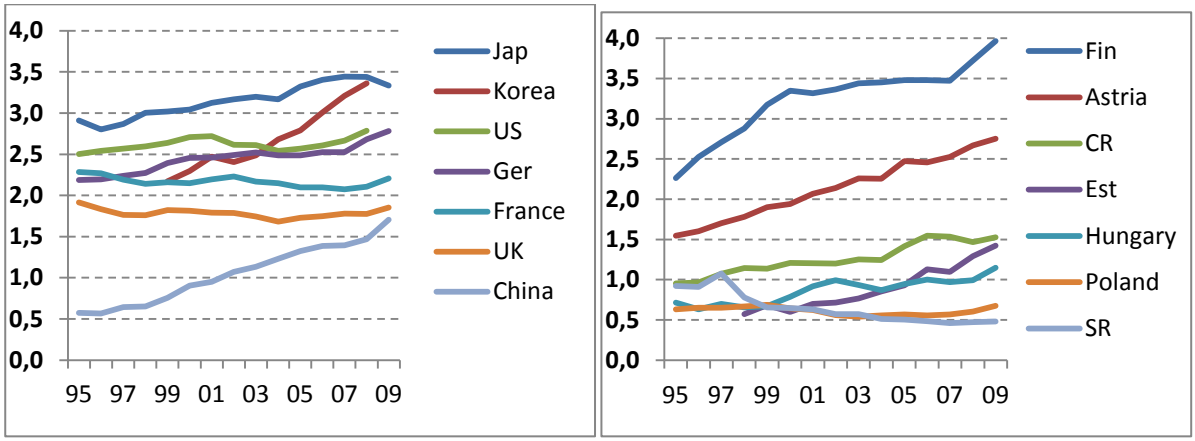
Among countries with a stable growth of R&D intensity in the last 15 years in the EU are apart from the above mentioned northern states and Austria also Ireland, Spain or Portugal. As for the new EU countries a very dynamic and stable growth can be seen in Estonia and partially also in the Czech Republic. Regarding non-EU countries stable growth of investment into R&D can be seen in the Asian countries, particularly in Korea and China, where the R&D intensity grows even in spite of the large year-on-year GDP increases.

On the other hand, France and the UK belong to states where the R&D intensity stagnates and decreases in the long term. Similar statement can be done also to the average of the original 15 EU states, where the R&D intensity in 2007 reached only the level of 1990.[3] As for the new states, stagnation or even decrease of R&D intensity is the case of Poland and Slovakia, where the local statistics show a significant decrease of R&D expenditures since the breakup of Czechoslovakia. Similar fate befell Russia after the dissolution of the Soviet Union where the R&D expenditures in 1990 were approximately a 2% share of the GDP and only 0.7 – 1% of GDP in the period 1992 – 1999.

The change of R&D intensity in time must be interpreted in the context of the total GDP of individual countries and year-on-year increases of GDP. The starting value of this intensity of individual countries in the given period is also important.

[3] The growth of R&D intensity is a long-term target, which is evidenced also by the mentioned development in Finland, Denmark or Austria. It's not only the case of increasing public investment, but mainly private investment, as we will see in the next chapter. Other crucial factors are qualified human resources and related education policy (chapter B.2) and the overall economic and political development of the society (chapter D).

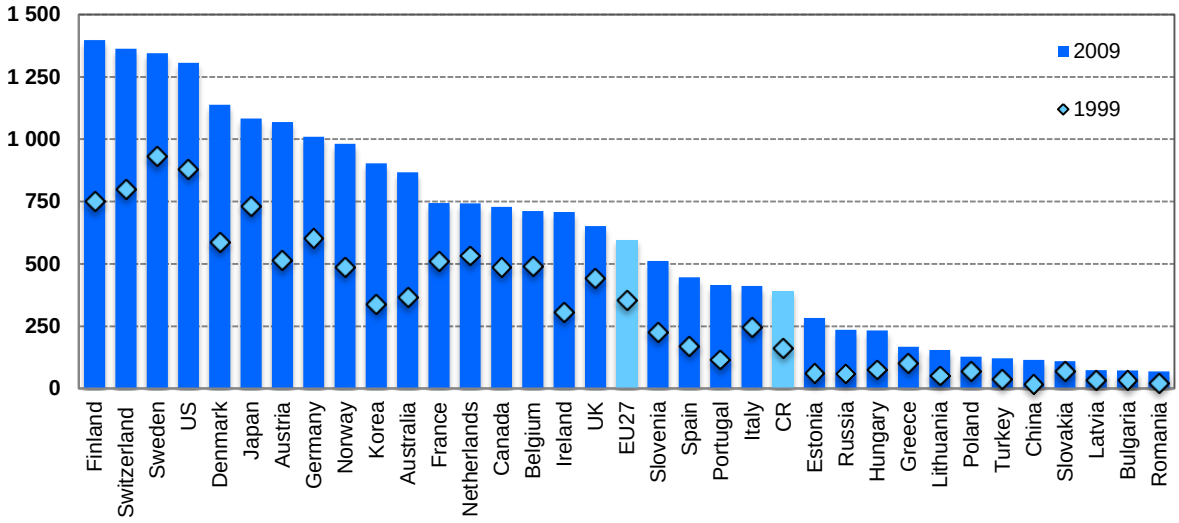
Chart A.4: The development of the intensity of total expenditure on R&D (GERD as % GDP) in selected countries



Source: OECD MSTI 2011/1, Eurostat 2011

Apart from the R&D intensity, which is influenced by different GDP values in individual countries, the international comparison uses total R&D expenditures per capita at PPP. In the evaluation according to this indicator the Scandinavian countries (Finland and Sweden) dominate again together with Switzerland and the US with total R&D expenditures higher than 1300 USD per capita at PPP. The EU27 average in 2009 was 596 USD per capita at PPP, i.e. 1.7 times as much as 10 years ago. The Czech Republic with R&D expenditures of 390 USD per capita at PPP (in 1999 it was 163 USD per capita at PPP) is in the 16th place within the EU, however apart from Slovenia it belongs to the best new EU states. Another interesting fact is that not only China but also Turkey invests more in R&D per capita than some of the EU member states.

Chart A.5: **Total R&D expenditures per capita (USD at PPP, constant prices of 2000)**



Korea, USA and Switzerland year 2008, Greece year 2007

Source: OECD MSTI 2011/1, Eurostat 2011, CZSO calculations

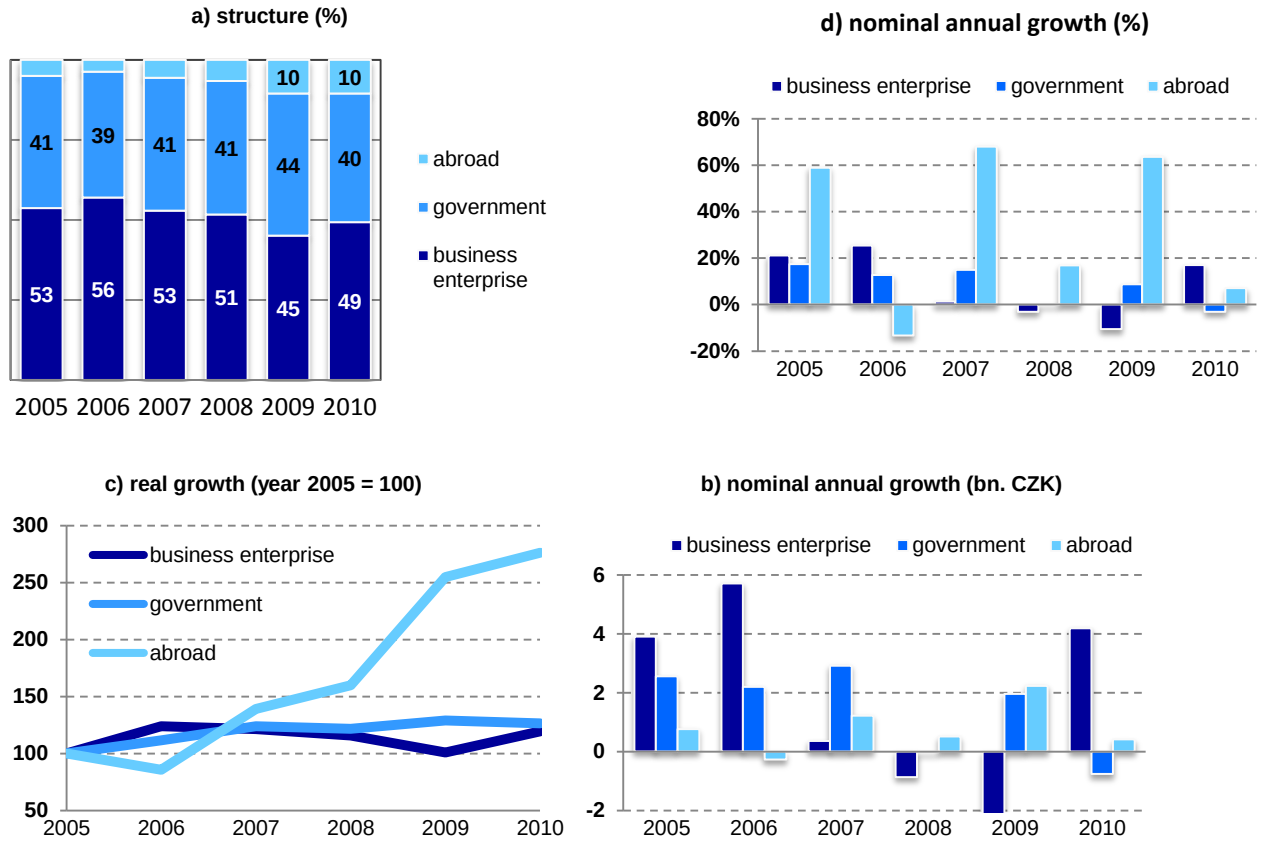
A. 1.2 Total R&D expenditures according to main sources of their funding

Among the basic characteristics monitored in the statistics of total R&D expenditures and expenditures in individual sectors is the origin of financial resources designated for R&D. We differentiate three basic R&D financial resources: business (domestic private), public and foreign (public and private funds from abroad).

Public and domestic business resources have a crucial role in R&D funding and not only in the Czech Republic. Until 2008 their share in R&D funding has always been higher than 90%. In 2009 this share dropped to 88% due to the decrease of funding from domestic business sources and primarily due to the significant increase in foreign investments into R&D in the Czech Republic. If in 2009 the increase in these foreign investments was caused primarily by private sources, in 2010 for the first time a significant increase in public sources has been recorded as well. In the next few years in the Czech Republic we can expect a significant increase in financing R&D from foreign sources, especially from EU structural funds.

Detailed information about funding R&D in the Czech Republic from foreign sources is included in chapter E.1.

Chart A.6: Total R&D expenditures in the Czech Republic according to the sources of their funding



**doesn't include other national resources (income of universities and public research institutions from own sources), which are negligible in the total amount of R&D expenditures (with the exception of funding of university R&D – see chapter A.1.5). In 2010 460 million CZK worth of R&D has been funded from these sources, i.e. the share of the other national sources in total R&D expenditures in the Czech Republic reached 0.8%.*

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

Domestic business enterprises provide from their own sources the largest part of funding for R&D activities on our territory. Until 2008 their share has always been at least 50%. Since 2007 the share of funding from private domestic business sources has decreased to 45% in 2009. In this year the level of public sources came close to the private sources for the first time.

The business enterprises in the Czech Republic invested 110 billion CZK into either their own R&D or R&D in other sectors over the past 4 years, however only 2.5% (2.8 billion CZK) went to co-financing R&D in the universities or government sectors. E.g. in 2010 the business enterprises invested 544 million CZK into R&D performed government sector and 113 million CZK into R&D performed in the higher education sector. Despite the fairly often mentioned framework cooperation between universities and business enterprises, e.g. in education etc., there is still no deeper cooperation in the field of R&D in the Czech Republic.

In the appendix is included a detailed schematic description of the funding of R&D in the Czech Republic in individual sectors in 2010.

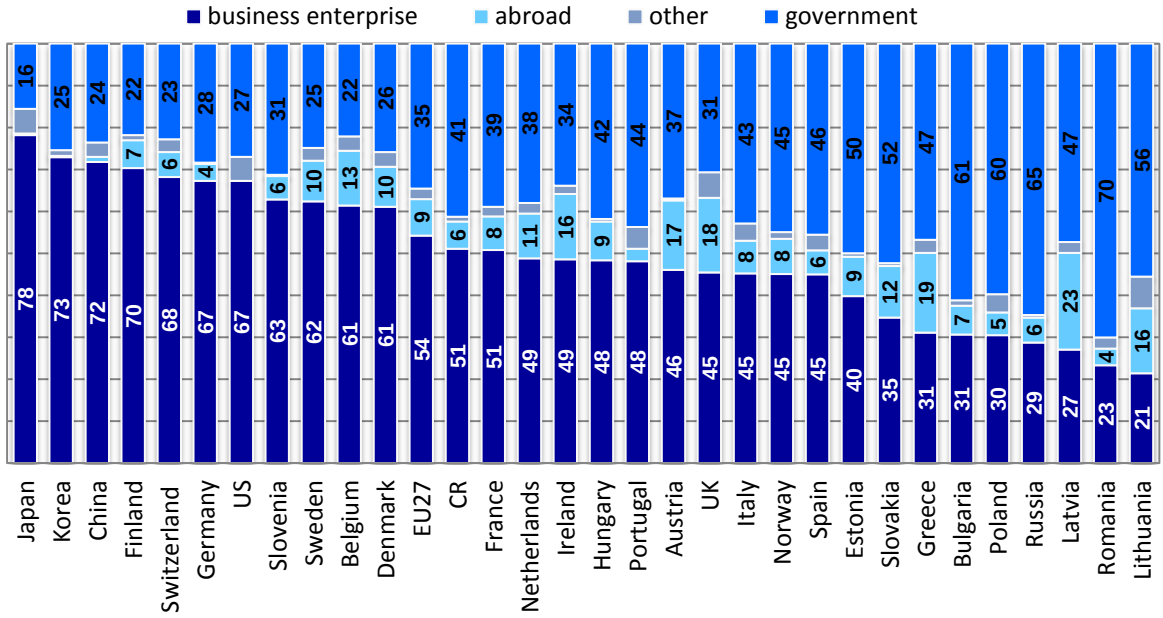
International comparison

The European Commission in 2000 set a goal to reach a R&D expenditures/GDP ratio of 3% by 2010, whereas two thirds of these expenditures should be funded from business (private) sources. The second criterion is currently fulfilled by Finland and Germany and partially by Sweden. However the EU as a whole, including the Czech Republic, doesn't fulfill this target yet. However if we added to the domestic business sources the foreign private sources then the EU made significant steps to this target, although with significant differences between individual states.

The structure of R&D funding with low share of public sources and a major share of private sources is typical especially for Asian countries. In 2008 (more current data are not available on most of the countries) the domestic business enterprise funds contributed at least 70% of the R&D expenditures in Israel, Japan, Korea and China, in the EU in Luxembourg and Finland; more than 2/3 of the R&D funding in Switzerland, Germany and the US. The situation in the Czech Republic is approaching the EU27 average where in 2008 the domestic business sources contributed 54% of the R&D funding.

On the other hand, the large share of public and low share of private sources of R&D funding is typical particularly for the new EU member countries. For example in Poland in 2008 the public sources comprised 60% of the funding and in Romania as much as 70%. In the Czech Republic the share of public sources in total R&D funding is between 35 – 45% since 1998. In 2008 the share of public sources of R&D funding was 6 percentage points higher that the EU27 average.

Chart A.7: Total R&D expenditures according to the sources of their funding in 2008



Belgium, Denmark, Netherlands, Norway and Sweden – 2007, Greece – 2005

Source: OECD MSTI 2011/1, Eurostat 2011

In most of the monitored countries there has been no significant change in the structure of R&D funding over the last 10 years.[4] The exceptions in EU are Portugal, Estonia, Hungary and Slovenia, where the share of domestic business sources increased by more than 10 percentage points (in the case of Portugal even 27 percentage points). On the contrary the share of domestic business sources decreased by more than 10 percentage points in Ireland, Slovakia or Romania. Regarding the non-EU states the most significant change in the funding structure occurred in China where the private sources increased significantly over the last few years.

A.1.3 Total R&D expenditures according to their use – sectors of performance

Apart from classifying the R&D expenditures by the sources of funding belongs to the basic classifications also the R&D expenditures by sector of performing, i.e. where the financial resources designated for R&D are really spent regardless of their source of funding. The sector of R&D performance is a basic category used in the R&D statistic, which gathers all institutional units performing R&D based on their main functions, behavior and targets. The R&D indicators are commonly monitored and published, even on the international level, in four sectors: business, government, higher education and private non-profit (see the methodological appendix for more details).

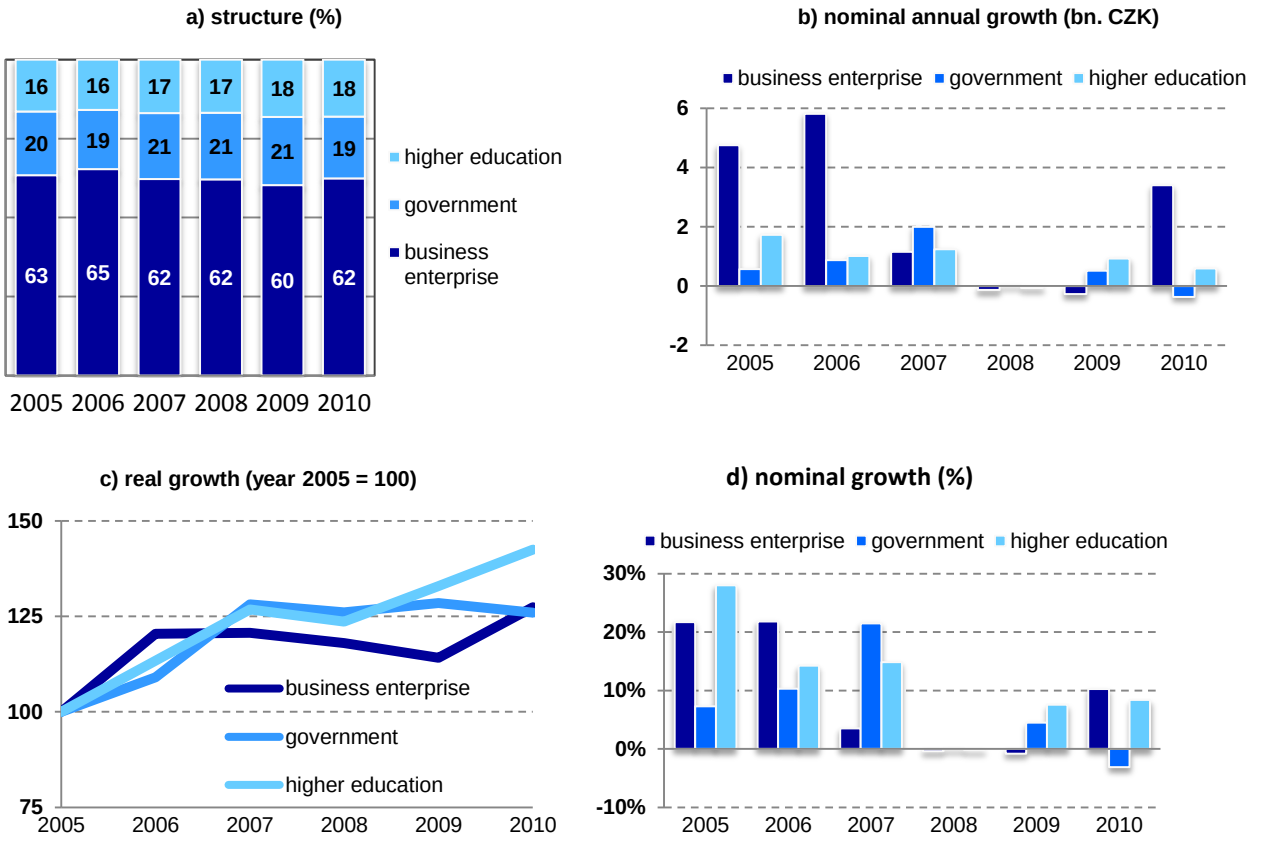
The business enterprise sector in the Czech Republic, unlike most of the post-communist EU states, is a sector with the highest R&D expenditures. Its share in the use of financial resources designated for R&D activities on our territory was at least 60% during the whole monitored period. Since the establishment of the Czech Republic the R&D activities performed in the business enterprise sector (measured by the funds

[4] Also when interpreting the changes in the structure of R&D funding it is necessary to take into account the data on the amount of R&D expenditures funded from individual sources based on the size of the monitored economies or the initial amount of these expenditures in the monitored period. Another aspect is also the analysis of individual sources of R&D funding according to the sector of its use. A detailed interpretation of these facts is beyond the scope of this analysis; however the necessary data are available in the table appendix.

spent on them) play a more important role than those performed in the higher education or government sectors (public R&D).

The government sector, representing mainly by individual public research institutions, represents the second most important R&D sector in the Czech Republic despite the fact that its share from total expenditures significantly decreased since 1993, mainly because of the universities. If in 1993 the government sector's share in public R&D was almost 90%, then in 2005 it was only 55%. In the following years until 2009 we were witnesses of the stabilization of the R&D structure. However, in 2010 the share of the government sector in public R&D further decreased. Detailed information is presented in the following three chapters.

Chart A.8: Total R&D expenditures according to the main sectors of their use*



**Data on the non-profit sector are not shown, because their role within the total R&D expenditures is negligible. 300 million CZK have been spent in this sector in 2010, which is 0.5% of the total R&D expenditures in the Czech Republic.*
Source: CZSO 2011, Annual Statistical Survey on Research and Development VTR 5-01

During the past ten years the annual R&D expenditures grew in average by 6% per year; in the first five years they grew faster in the business enterprise sector and since 2005 in the university and government sectors. However, these are only average increases, which don't show the differences in the pace of the growth in individual years, which are shown in the following chart. Within the expenditures on public R&D it is possible to observe that until 2006 (with the exception of 2003) the expenditures for performed R&D in the higher education sector grew faster than in the government sector. A similar statement can be applied again since 2009 and also in the coming years. A faster growth in the higher education sector than in research organizations can be expected, according to the proposed state budget for R&D.

International Comparison

If we look at the structure of R&D expenditures according to the sectors of performance we will see that there are big differences between individual EU and OECD states. These differences reflect to the large extend the structure of funding presented in the previous chapter. If we concentrate on the share of financial resources spent on R&D performed in the business enterprise sector in the total R&D expenditures, we will see that the Czech Republic is positioned long-term on the average of the EU27 level (63% in 2008).

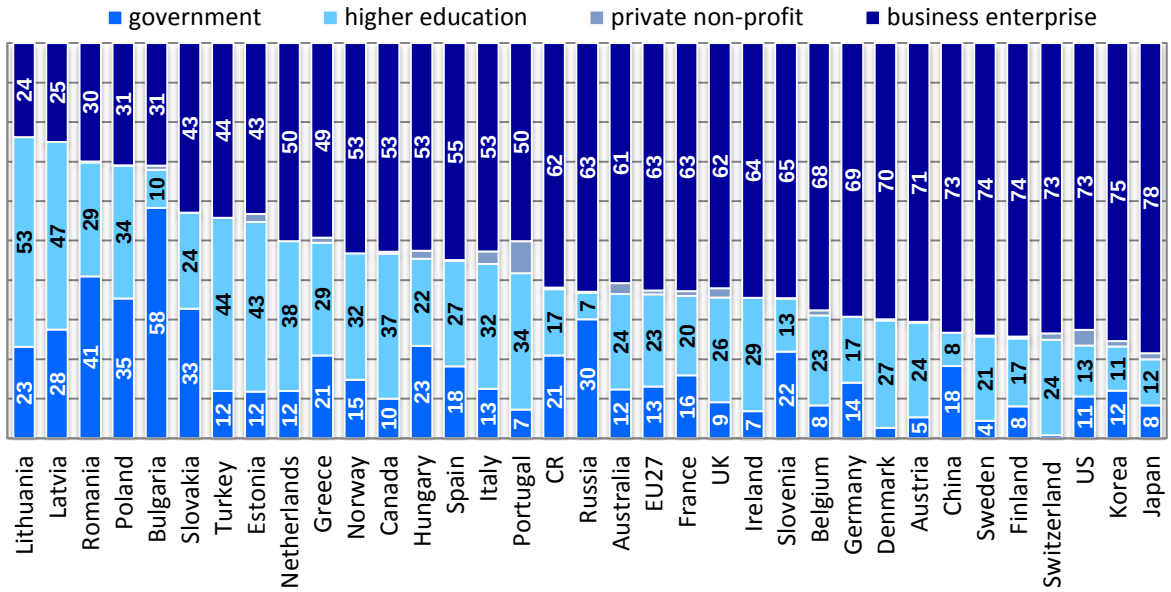
Among states with less than 70% of business enterprise sector share in the use of overall R&D expenditures are mainly Asian OECD countries such as Japan or Korea, Scandinavian states with the exception of Norway, Switzerland, China, United States and Austria. To these states we can add the Benelux states and Germany with a share of more than 2/3.

The public R&D performed in the higher education and government sectors, measured by the share from the total R&D expenditure, plays an important role in all the new EU countries with the exception of Hungary, Czech Republic and Slovenia. Apart from the new EU countries the role of public R&D within the overall R&D expenditures is important in states with relatively low R&D intensity, such as Spain or Portugal and in states with a significant role of the higher education sector (Netherlands).

Within the EU the higher education sector is strongest within the public R&D in Denmark, Sweden, Ireland, Portugal and Austria.[5] On the contrary in most of the new EU countries (apart from Estonia) the government sector plays more important role in the public R&D, mainly due to the strong position of institutions such as the Academy of Sciences (e.g. in Poland or Hungary) and (or) very low R&D expenditures in the higher education sector (Bulgaria, Slovakia). Among states with a balanced share of the university and government sectors are France, the United States and Korea with significant expenditures on defensive R&D and Germany with a strong position of four groups of research institutions (Max Planck, Leibniz, Helmoholtz and Fraunhofer societies).

[5] Regarding the share of university and government sector in the public R&D there is no optimal limit or rule which would set the share of one or the other sector in public R&D. It is more of a reflection of the system of public R&D in the given state or its tradition.

Chart A.9: Total R&D expenditures according to the main sectors of their use in 2008



Greece – 2007
Source: OECD MSTI 2011/1, Eurostat 2011

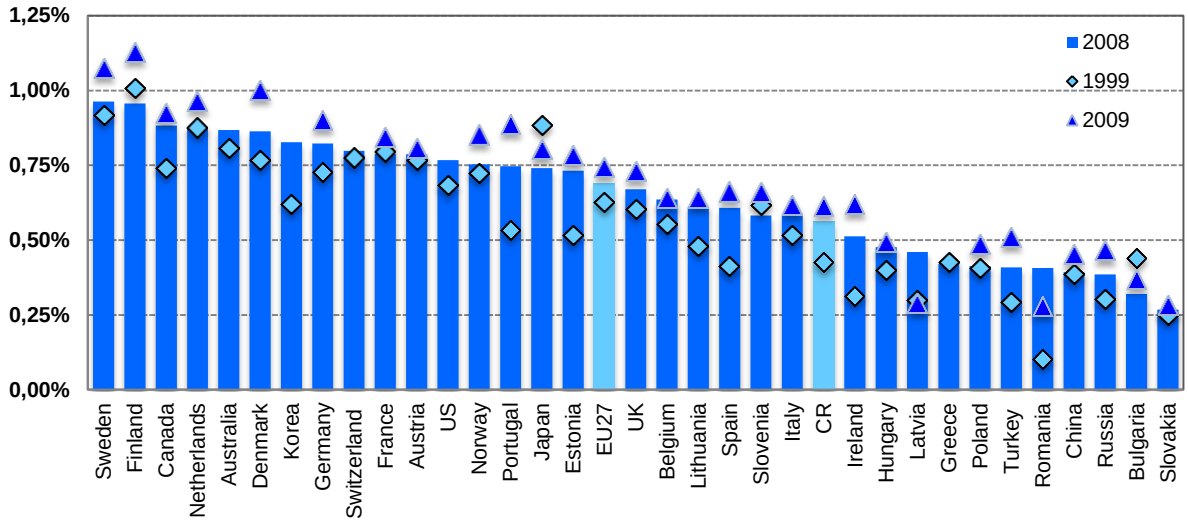
In almost all of the monitored countries including the Czech Republic there was some kind of strengthening of the higher education sector's position in the structure of public R&D. Apart from the above mentioned Denmark the share of higher education sector in public R&D grew most in the new EU countries.

More detailed information on the R&D expenditures in individual sectors of performance is presented in the following chapter. However, due to better interpretation of data on the government and higher education sectors the rest of this subchapter will be dedicated to the data on the public R&D as a whole.

The EU as a whole spends more money on public research (unlike the total R&D spending) than the United States. If in 2008 the EU countries reported R&D expenditures in government and higher education sectors in the amount of 85.8 billion EUR, then in the US it was ¾ of this amount (63.5 billion EUR). Unlike the expenditures on R&D performed in the business enterprise sector, in Poland the public spending was 80% higher than in the Czech Republic. On the other hand in comparison to the original EU states of similar size such as Austria or Belgium the difference is not as large as in the case of the business enterprise sector, which will be described in detail in the chapter A.1.6.

In 2008 the share of expenditures on public R&D of EU countries was 0.7% GDP. The largest share of GDP, ca. 1%, has the public R&D in Sweden and Finland. Such a high share isn't caused by a significant share of the public R&D in the total R&D expenditures, because it is less than 30%, but by generally high expenditures on R&D in these countries. On the other hand a share lower than 0.5% GDP has been reported in the majority of the new EU countries apart from Estonia, Slovenia and the Czech Republic in spite of the relatively strong share of the public R&D in the total R&D expenditures. As for the non-EU countries the public R&D has an important position regarding the GDP in Israel, Canada, Australia and Korea.

Chart A.10: Expenditures on R&D performed in the government and higher education sectors (public R&D as % GDP)



Greece – 2007
Source: OECD MSTI 2011/1, Eurostat 2011

In 2009 there was a year-on-year increase in the public R&D/GDP ratio in almost all of the monitored countries. This was caused by the combination of year-on-year increases in R&D spending in higher education and government sectors and mainly by the year-on-year decrease of the GDP in the monitored countries.

A.1.4. Governmental R&D – expenditures on R&D performed in the government sector

R&D workplaces in the government sector in the Czech Republic mainly consists of individual AS CR[6] institutions and departmental research workplaces[7], which perform R&D as their main economic activity (CZ-NACE 72). Since 1st January 2007 most of these were granted the status of public research institutions (p. r. i.). Among the other workplaces of the government sector that perform R&D as their secondary activity are mainly public libraries, archives, museums and other cultural institutions (CZ-NACE 91) and workplaces active in the field of public administration, economic and social policy (CZ-NACE 841).

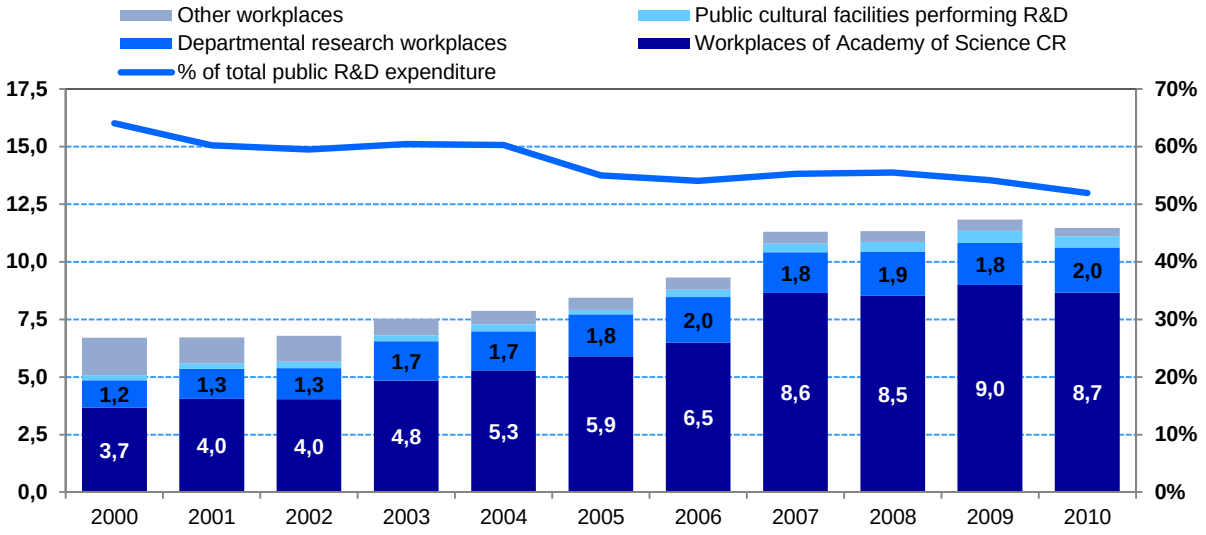
In 2010 the R&D in the Czech Republic has been performed at 196 workplaces of the government sector, only a fifth of them spent more than 100 million CZK on the performed R&D. Those were mostly AS CR workplaces. As for the individual scientific areas, 30% (59) of the government R&D workplaces stated that their major operation belongs to the natural sciences; most of them are AS CR workplaces. The majority of the workplaces (70, i.e. 36%) stated that their major scientific activity belongs to the humanities group. These workplaces are mainly public libraries, archives, museums and other cultural institutions, which perform R&D as their secondary activity. *Detailed information about the number of R&D workplaces in the government sector can be found in the table appendix.*

[6] AS CR institutions (54 institutions in 2010) with the main goal to perform basic research are organized into three scientific areas: Mathematics, Physics and Earth Sciences (18 institutions), Life and Chemical Sciences (18 institutions) and Humanities and Social Sciences (17 institutes) – for more information see the table included in the table appendix.
[7] These are mostly departmental public research institutions, which formerly fell directly under the individual ministries, e.g. Ministry of Agriculture or Transportation. Most of them were granted the status of public research institutions (e.g. Crop Research Institute, Institute of Animal Science etc.).

In 2010 the expenditures on R&D performed in the government sector (GOVERD) in the Czech Republic were 11.5 billion CZK. Since 2000 the expenditures on R&D in this sector almost doubled (in constant prices), however in relation to the GDP or the state budget there hasn't been any significant change – in 2000 as well as in 2010 these expenditures were 0.31% of the GDP and ca. 1% of the state budget.

During the last ten years the importance of governmental research changed significantly, both within the overall R&D as well as within the public R&D. If the government sector contributed by ¼ to the total R&D expenditures performed in the Czech Republic in 2000, then ten years later it was only 1/5. In the same way the share of the government sector on the public R&D decreased from 64% in 2000 to 52% in 2010.

Chart A.11: Expenditure on R&D performed in the Czech government sector (billion CZK)



Source: CZSO 2011, Annual Statistical Survey on Research and Development VTR 5-01

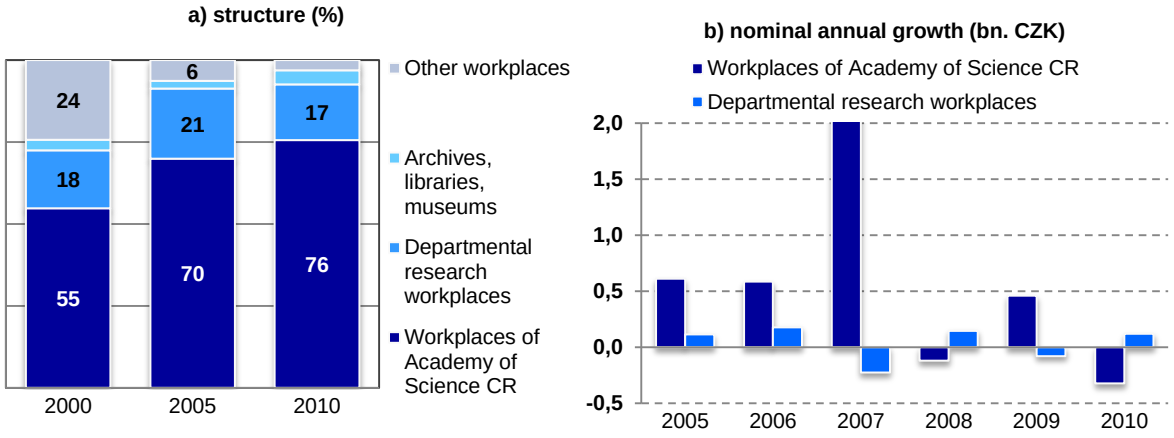
The largest part of R&D expenditures in the government sector is used at the workplaces of individual AS CR institutes in long-term; in 2010 this was 8.7 billion CZK (75.6% of the total R&D expenditures in government sector). It may be the same amount as in 2007, but 4% less than in 2009. The spending at departmental research workplaces in the same year was 2 billion CZK (17%) and 850 million (7.4%) were designated to R&D in other subjects of the government sector, whereas more than half (58%) of this amount has been spent in public cultural facilities.

Between 2005 and 2010 the R&D expenditures in the government sector grew at the phase of 5% on average per year, i.e. significantly slower than e.g. expenditures on R&D performed in the higher education sector (see next chapter) and overall investments in the government sector R&D were 55 billion CZK. This growth was fastest in 2007, when the expenditures on government R&D increased by 17.5% or 2 billion CZK. Since 2007 there has been stagnation or even decrease in the real expenditures on R&D in this sector. Prior to 2005 the R&D expenditures grew fastest in 2000 and 2003. On the contrary, if we discount the beginning of the 90s, when there was a significant drop in government sector R&D expenditure[8], then the R&D expenditures decreased in this sector even in the following years: 1997, 1999, 2001 and 2002.

[8] At the beginning of the 90s there was a significant reduction of the number of employees working at the AS CR and a restriction of the scope of performed R&D activities.

Within the various types of R&D workplaces in the government sector the importance of departmental research organizations and other workplaces (CZ-NACE 841), measured by their share in the total R&D expenditures in the government sector, is gradually decreasing since 1995. In the case of departmental research organizations there is stagnation in R&D expenditures even in absolute values since 2006; both in 2006 and 2010 the R&D expenditures reached 2 billion CZK.

Chart A.12: Expenditures on R&D performed in the Czech government sector sorted by individual workplaces



Source: CZSO 2011, Annual Statistical Survey on Research and Development VTR 5-01

Most of the R&D activities in the government sector belong to the field of basic research. In 2010 the expenditures on basic research in this sector reached 8.5 billion CZK which was 74% of the R&D expenditures in the government sector. Expenditures on applied research were in the amount of 2.6 billion CZK (23%) and the least part of expenditures were aimed at experimental development with 356 million CZK (3%).

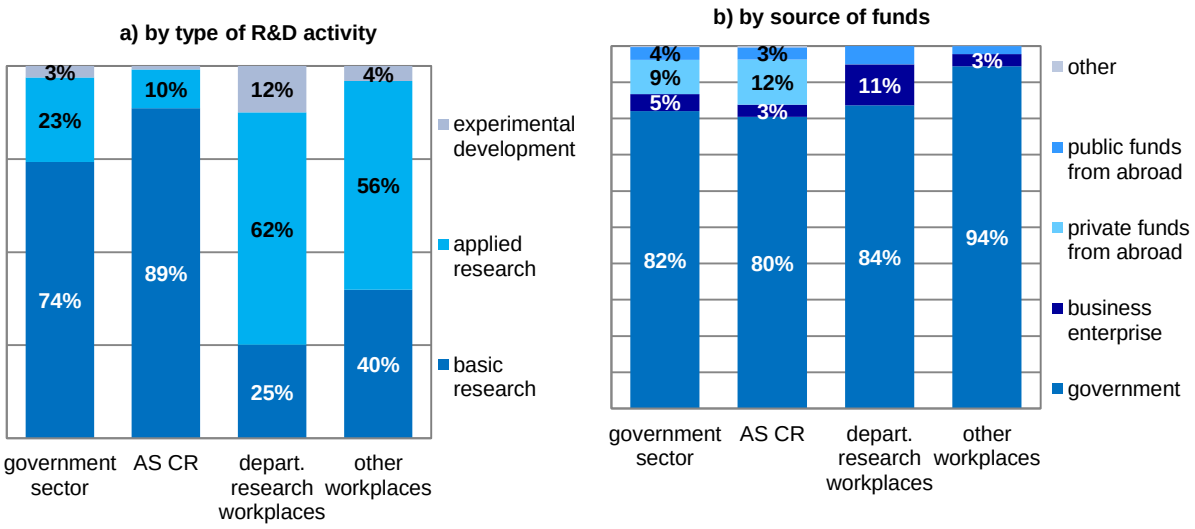
Due to the limited international comparison of the type of R&D activities performed in the government sector (data is available on ca. 20 EU countries from various years) it is possible to state that the role and significance of the public research institutions is quite different in individual countries, not only within the EU but also when analyzing the OECD countries.[9] As was mentioned in chapter A.1.3, in post-communist countries the government sector is dominant by institutions of the type of the AS CR which are oriented mainly on the fundamental research. A completely different situation can be observed in some western European countries, USA, Japan or China where these institutions focus on experimental R&D. These institutions have the goal to support the industrial development through services within the market-oriented R&D.[10]

[9] Because there isn't always a clear border between the fundamental and applied research it is necessary to proceed with great caution when interpreting the gained data sorted by the type of R&D activity. The differentiation of fundamental and applied research is largely dependent on what designation the researchers themselves use and thus this differentiation shouldn't be used in order to make political decisions.

[10] In the Czech Republic this was the function of departmental research organizations. The majority of these institutions after their transformation or privatization now belong to the business sector. These are private and public businesses with major activity in R&D and a significant share in the business R&D, unlike in other states (see chapter A.1.6).

The governmental R&D in the Czech Republic is as expected funded mainly from the public sources; in 2010 82% of the governmental R&D expenditures came from the state budget. Unlike the higher education sector, private foreign sources play an important part in the funding of government R&D. Those are incomes from license payments gained for granting the rights to use inventions protected by patent law (more chapter C.3.3).

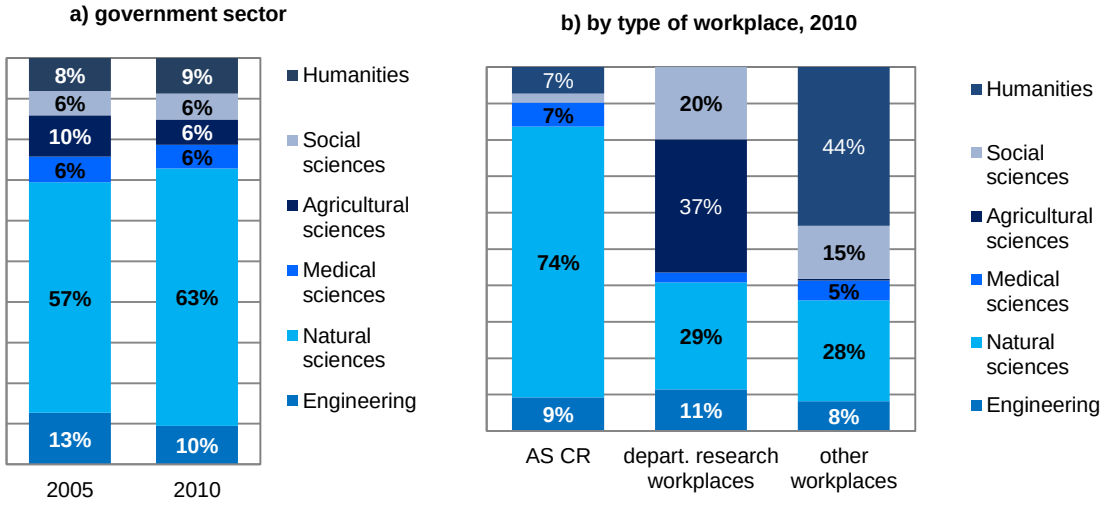
Chart A.13: Expenditures on R&D performed in the Czech government sector sorted by the R&D activity type and sources of their funding, 2010



Source: CZSO 2011, Annual Statistical Survey on Research and Development VTR 5-01

The major part of R&D expenditures in the government sector, unlike in the higher education sector, is targeted to R&D in natural sciences which are significant for AS CR workplaces. In 2010 this was 1.3 billion CZK (63% of the total government R&D spending). Expenditures on R&D in engineering were 1 billion CZK (9.5%) in the same year. The same amount was directed to the humanities. Apart from the AS CR workplaces these are mainly public libraries, archives, museums and other cultural institutions, which perform R&D as their secondary activity in this field. Agricultural sciences are the main activity of applied R&D workplaces established by the Ministry of Agriculture, agricultural R&D is performed only in a limited scope at the AS CR workplaces, in many cases in mutual cooperation of fundamental and applied research institutes. Since 2005 the representation of natural sciences has increased in the government sector at the expense of engineering and agricultural sciences.

Chart A.14: Expenditures on R&D performed in the Czech government sector sorted by the dominating scientific fields



Source: CZSO 2011, Annual Statistical Survey on Research and Development VTR 5-01

The share of natural sciences in the Czech governmental R&D is the highest compared to 20 EU states on which data is available. Unlike the Czech Republic the engineering have also a significant role in the government sector with 26% share. For example in Germany the share of engineering in R&D expenditures in the government sector is 28%, in Finland even 41%.

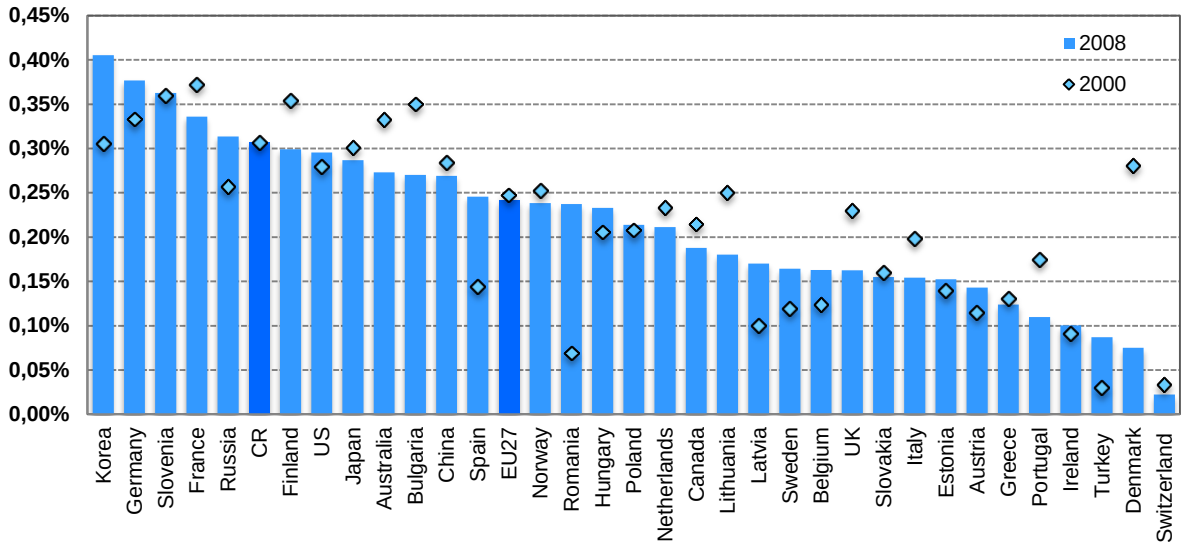
International comparison

The imaginary top ten EU countries with the highest share of the government sector on total R&D expenditures in 2009 evokes only from the new member states. These were primarily Bulgaria with 58% share, Romania (41%), Poland (35%) or Slovakia (33%), i.e. states that also show a very low overall R&D intensity. The Czech Republic is the last among the new member states with a 21% share. Apart from new member states the government sector plays an important role in countries with significant expenditures on defensive R&D and at the same time with strong position of Academy of Sciences or similar institutions (e.g. France, Germany or Italy). On the contrary the government R&D plays a minimal role in Denmark or Switzerland, where the public R&D lies almost entirely within the universities (see chapter A.1.3).

If we express the R&D expenditures in government sector as % of the GDP of individual countries, we'll get a completely different picture about the significance of the government sector in R&D. The Czech Republic is after Germany, Slovenia and France the country with the highest R&D expenditures in relation to GDP in the government sector. The share of the Czech government sector from GDP is ¼ higher than the average of the EU27 which was 0.26% in 2008 as well as in 2000. As will be mentioned in the next chapter, the share of the higher education sector is 1.8 times higher than the share of the government sector. Within the OECD states the highest value of government R&D expenditures in relation to GDP is in Korea.

In absolute values the governmental R&D spending within EU27 in 2007 were the highest in Germany (9.8 billion EUR) and France (6.9 billion EUR). These two countries comprised more than a half (52%) of the total EU expenditures that in 2009 reached 31 billion EUR in current prices. The Czech Republic contributed by 1.4% to this figure.

Chart A.15: Expenditures on R&D performed in the government sector (GOVERD as % GDP)



Greece – 2007; Norway, Austria, Greece, Sweden – 1999
Source: OECD MSTI 2011/1, Eurostat 2011

The following table contains data on the government sector R&D expenditures at PPP in constant prices of the year 2000 (comparison to the EU27 average). This indicator shows a better international comparison and development in time.

Table A.3: Expenditures on R&D performed in the government sector in selected countries (million USD at PPP, constant prices of 2000, EU27 = 100)

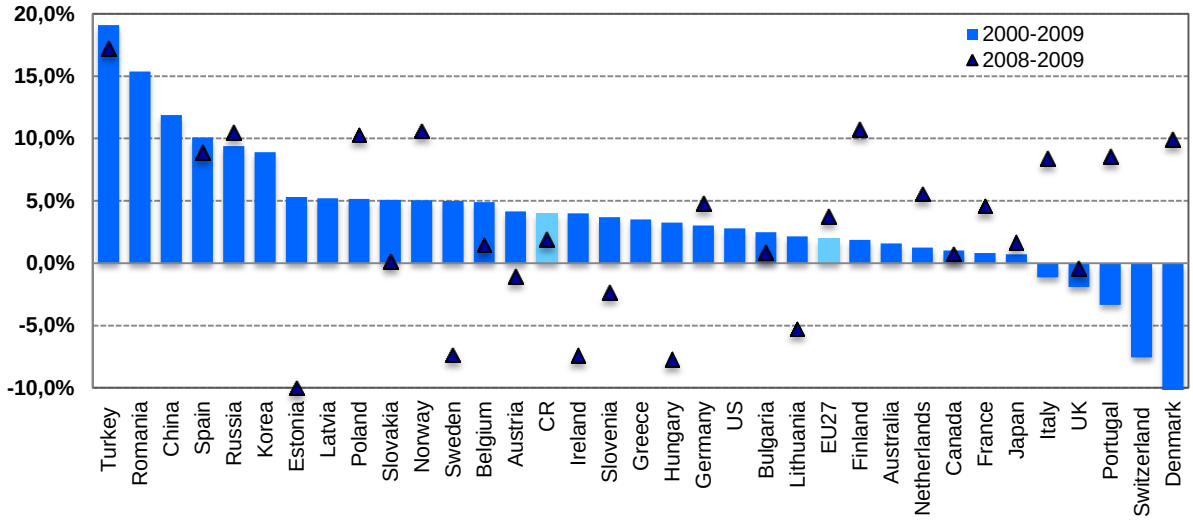
Year	EU27	US	China	Jap.	Ger.	France	Russia	Korea	UK	Poland	CR	Finland	Hun.
2000	26 131	27 685	8 555	9 781	7 107	5 708	2 565	2 471	3 519	840	472	470	255
2009	31 232	34 462	23 522	10 426	9 294	6 139	5 754	4 615	2 961	1 321	672	555	340
2000	*100*	*106*	*32,7*	*37,4*	*27,2*	*21,8*	*9,8*	*9,46*	*13,47*	*3,21*	*1,81*	*1,80*	*0,98*
2009	*100*	*114*	*75,3*	*33,4*	*29,8*	*19,7*	*18,4*	*15,33*	*9,48*	*4,23*	*2,15*	*1,78*	*1,09*

USA and Korea - 2008

Source: OECD MSTI 2011/1, Eurostat 2011

Unlike the R&D expenditures in the higher education sector the real expenditures in the government sector increased half as fast on the average (by 2% a year) in the EU between 2000 and 2009; in Italy, UK, Portugal, Switzerland and Denmark these expenditures decreased. However, these are average increases, which do not show the differences in the phase of the growth in individual year (apart from the specific year 2009 shown in the following chart). *A detailed interpretation of these year-on-year increases is beyond the scope of this analysis; however the necessary data are available in the table appendix.*

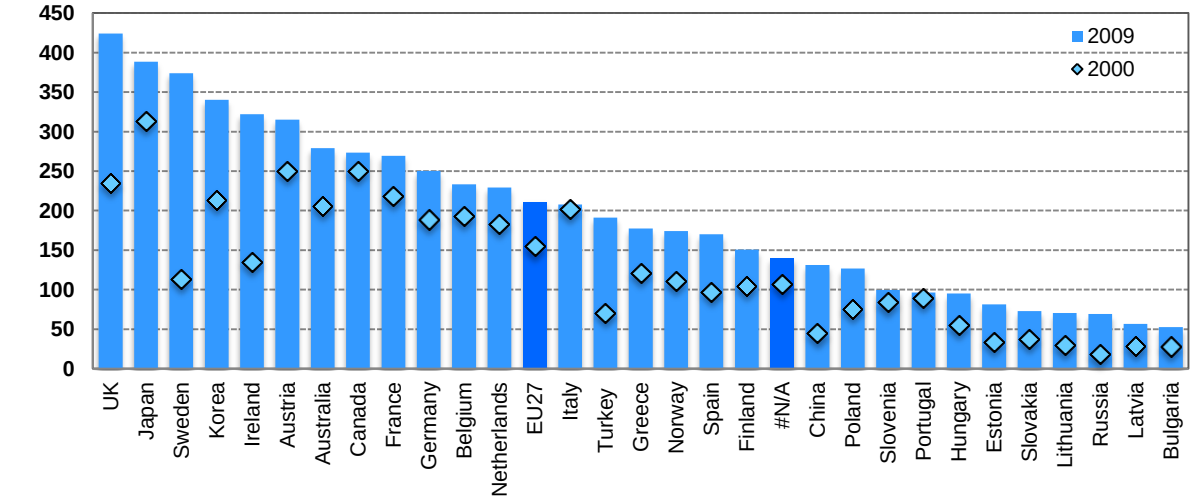
Chart A. 16 Average annual growth of R&D expenditures in the government sector



Australia, Korea, USA and Switzerland 2000-2008; Austria, Norway and Sweden 1999-2009; Greece 1999-2007
Note: The chart doesn't include data on year-on-year change in the following two states, because there has been a significant decrease: Latvia (47%) and Romania (35%), and China where there was a significant year-on-year increase by 29%
Source: OECD MSTI 2011/1, Eurostat 2011

The evaluation of R&D in the government sector uses not only absolute values or R&D expenditure/GDP ratio but also expenditures related to one researcher in this sector (see chapter B.1). In 2009 this indicator reached 211 thousand USD at PPP in the EU. In the Czech Republic the value was 140 thousand USD at PPP, i.e. 2/3 of the EU27 average. The same value applies e.g. on China. In most of the new EU countries the value of this indicator is 100 thousand USD at PPP and lower. The highest values in the EU were recorded in the UK where it exceeded 400 thousand USD at PPP.

Chart A.17: Expenditures on 1 researcher (FTE) in the government sector (thousand USD at PPP)



Australia, France, Canada, Korea and Lithuania – 2008, Greece – 2007, Norway, Austria, Greece and Sweden – 1999
Source: OECD MSTI 2011/1, Eurostat 2011

A. 1.5 University research – expenditures on R&D in the higher education sector

R&D workplaces in the higher education sector in the Czech Republic are formed mostly from individual faculties of the public and private universities (156 faculties at 28 universities in 2010) and since 2005 in accordance with the OECD methodology also 11 faculty hospitals. Apart from the individual workplaces at the public universities and faculty hospitals the R&D is also performed at 26 private colleges and other educational institutions of post-secondary education. However, the significance of private university R&D is negligible – in 2010 it didn't make even 1% of the total R&D expenditures in the higher education sector.

Only 29 of the above mentioned 193 workplaces of the higher education sector had R&D expenditures of more than 100 million CZK. Aside from on faculty hospitals those were faculties of public universities. Only the Charles University (7), the Czech Technical University in Prague (5), the Technical University in Brno (4), the Masaryk University in Brno (2) and the Palacky University in Olomouc (2) had more than one workplace with such high R&D expenditures.

Regarding the scientific disciplines the university R&D workplaces stated that in 2010 most of them had their major activity in the social sciences (48, 25%) and engineering (43, 22%). All workplaces performing R&D in engineering, except one workplace, belonged to the public universities.

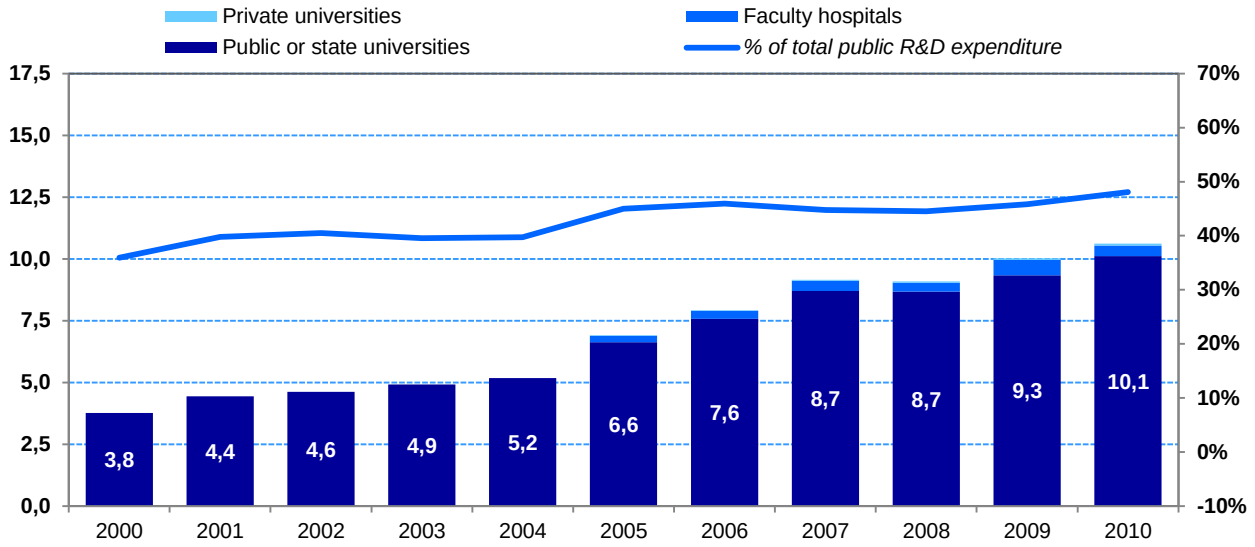
In 2010 the expenditures in the Czech higher education sector were 10.6 billion CZK, i.e. almost 3 times as much as ten years ago. As stated above the majority of university R&D in the Czech Republic is performed at public universities; in 2010 95% of the expenditures went there, 4% to the faculty hospitals and the remaining 1% to the private universities.

The share of the higher education sector in the total R&D expenditures increased from 12% in 2000 to 18% in 2010 and in public research from 36% to 48%.[11] These figures show that unlike the government sector the university R&D/GDP ratio grew significantly in this period from 0.17% in 2000 to 0.29% in 2010.

The higher education sector is the fastest growing sector of the Czech R&D in the last 10 years regarding expenditures. Since 2000 the expenditures on R&D in the higher education sector grew by 8.7% a year, i.e. twice as fast as in the government sector. However, it is necessary to stress that this growth is from a much smaller base.

[11] Similar to other post-communist countries the Czech higher education sector started building its own research capacities only in the second half of the 90s. As the dominant part of the universities' operation was education, their share in R&D expenditures was negligible. E.g. in 1993 with 400 million CZK the universities' made up only 3 % of the total and ca. 10 % of the public R&D.

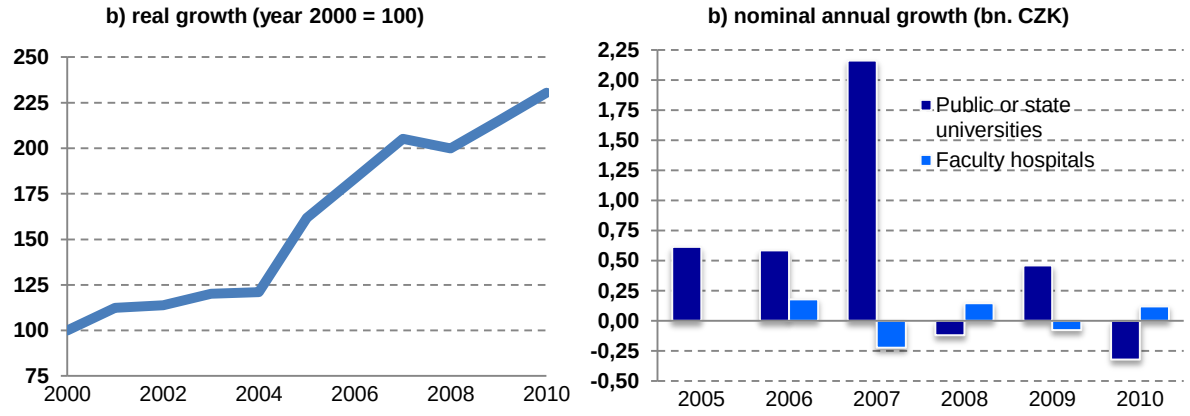
Chart A.18: R&D expenditures in the Czech higher education sector (billion CZK)



Source: CZSO 2011, Annual Statistical Survey on Research and Development VTR 5-01

Since 2005 the expenditure growth in the higher education sector isn't as fast as in the previous period. Between 2005 and 2010 the expenditures grew by 7.3% a year. The fastest growth occurred in 2005-2007 with annual growth by 1/5, i.e. by 1.3 billion CZK. *The year-on-year decrease in 2008 was probably caused by the application of the Act No. 218/2000 on Budgetary Rules and on amendments of some related acts (budgetary rules), as amended, which stated that the unused expenditures will not be transferred into the reserve funds of the state organization units and therefore will not be included in 2008 resources, because as can be seen in the next two years the R&D expenditures in this sector increased again and quite significantly.*

Chart A.19: The growth of R&D expenditures in the Czech higher education sector

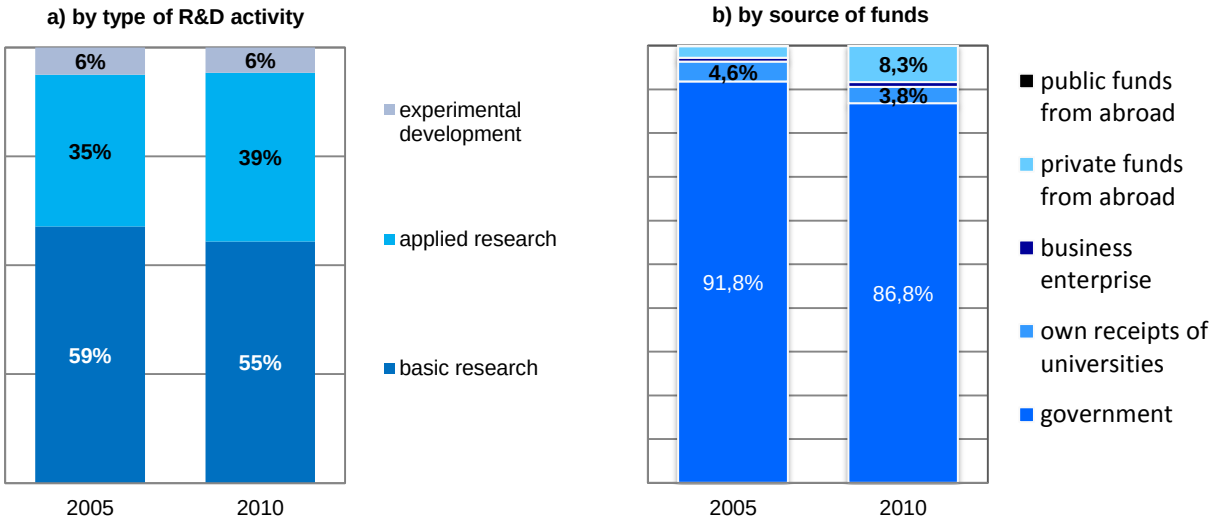


Source: CZSO 2011, Annual Statistical Survey on Research and Development VTR 5-01

Similar to the government sector the higher education sector also allocated most of the resources on basic research (5.9 billion CZK, 55%), 4.1 billion CZK (39%) went into applied research and the remaining 620 million CZK (6%) went into experimental development.

The main source of the university R&D funding in 2010 was the state budget with 87% share (in previous years always more than 90%). Foreign funding made up 4.5% in 2006-2009. In 2010 the funding from abroad almost doubled. In absolute values it was an increase from 426 million CZK in 2009 to 886 million in 2010. Unlike the government sector the foreign funding of higher education sector comes mostly from the EU funds. Share of universities' own income not generated by business activities in the R&D expenditures was 4% in 2010. As was already stated in chapter A.1.2 business sources had only a small share in the R&D funding in the higher education sector. In 2010 the business enterprises spent ca. 100 million CZK on R&D activities performed by universities which equals to 1% of the total university R&D expenditures.[12]

Chart A.20: R&D expenditures in the Czech higher education sector sorted by type of R&D activities and sources of funding

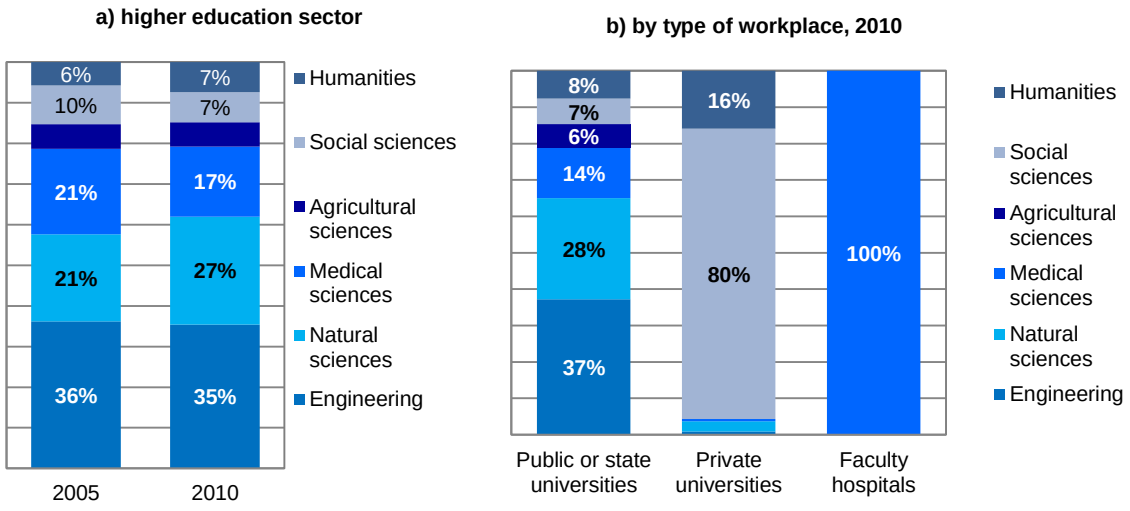


Source: CZSO 2011, Annual Statistical Survey on Research and Development VTR 5-01

As will be mentioned below, the share of technical sciences in total R&D expenditures is crucial in the Czech higher education sector also in the available international comparison.[13] Based on these, albeit partial data, it is possible to presume that the Czech higher education sector could play a significant role in research cooperation projects with business enterprises. However, when taking into account the share of business funding of the university R&D it doesn't seem to be the case. While in the EU in average 7% of the university R&D is being funded by business enterprises (data from 2008), in the Czech Republic this figure is only 1% - the lowest from all the monitored EU and OECD countries. In case of the higher education sector the spread of R&D expenditures between various scientific disciplines is completely different than in the government sector. The higher education sector allocates most of the R&D resources into technical sciences (3.8 billion CZK, 35% in 2010) and apart from natural sciences (2.8 billion, 27%) a large share belongs also to the medical sciences (1.8 billion, 17%).

[12] In 2010 only 16 of the total 193 sites (8%) stated that they received money from businesses to perform R&D to order. Namely those were 22 faculties from 13 public universities, 5 faculty hospitals and only 2 private universities.
[13] As was the case of life sciences in the government sector, the university sector is specific in that it has one of the biggest shares of technical sciences in its total expenditures in comparison with the 20 EU states on which data is available in this regard.

Chart A.21: R&D expenditures in the Czech higher education sector sorted by scientific disciplines

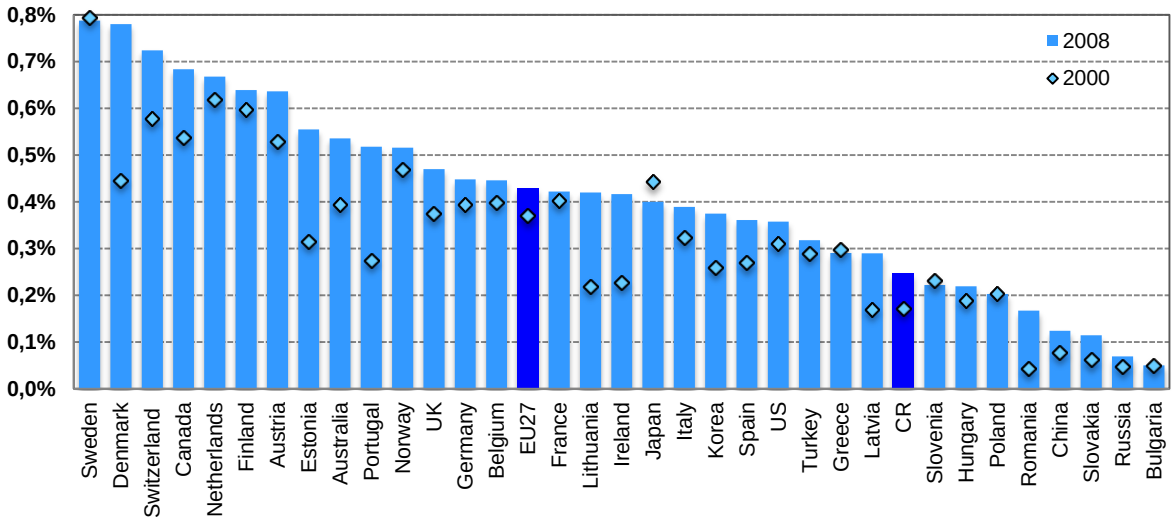


Source: CZSO 2011, Annual Statistical Survey on Research and Development VTR 5-01

International comparison

Unlike the government sector the higher education sector's share on total R&D expenditures shows lower values than the average of EU27. In 2009 this was 6 percentage points less, whereas the EU27 average was 24%. According to this ratio the highest values can be seen in the Baltic countries (Latvia, Lithuania, Estonia), the share of the higher education sector in total R&D expenditures is around 40% there, followed by Netherlands, Greece or Poland. As for the OECD non-EU countries the share of the higher education sector was the highest in Turkey, Canada or Norway (See chapter A.1.3).

Chart A. 22 R&D expenditures in the higher education sector (HERD as % GDP)



Greece – 2007, Norway, Austria, Greece, Sweden – 1999
Source: OECD MSTI 2011/1, Eurostat 2011

Related to GDP the EU countries' expenditures on university R&D were 0.43% in 2008 and 0.46% in 2009. The highest share of GDP of all the EU27 countries (as well as with many other indicators) was recorded in the Scandinavian countries, ranging from 0.75% in Finland to 0.9 % in Denmark and Sweden. The Czech

Republic had the highest share of all new EU countries with the exception of Estonia (0.56% GDP). Despite this fact, the Czech Republic significantly lack behind in this indicator compared to the EU27 average (as well as all the other new EU countries) .

As was stated in chapter A.1.3 of all the EU countries the higher education sector has a completely dominant position in the public R&D in Denmark, of the remaining OECD countries in Switzerland that is in countries with a high overall R&D intensity. It is interesting that in Denmark the expenditures in the government and higher education sector were almost equal ten years ago.

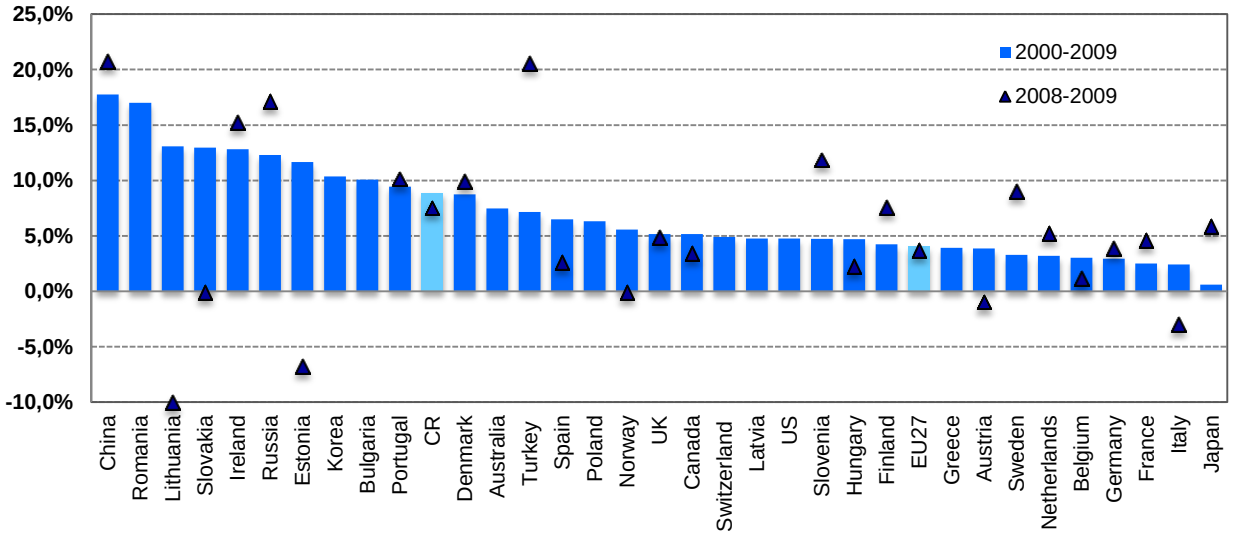
Table A.4.: R&D expenditures in the higher education sector in selected countries (million USD at PPP in constant prices of 2000; EU27 = 100)

Year	EU27	US	Jap	Ger.	China	France	Austria	Den.	Poland	Finland	CR	Hun
2000	39 084	30 693	14 368	8 423	2 329	6 180	1 138	686	821	793	265	235
2009	55 902	41 757	15 174	10 949	10 147	7 718	1 726	1 458	1 427	1 154	569	355
2000	*100*	*79*	*36,8*	*21,6*	*6,0*	*15,8*	*2,9*	*1,80*	*2,10*	*2,00*	*0,70*	*0,60*
2009	*100*	*75*	*27,1*	*19,6*	*18,2*	*13,8*	*3,1*	*2,60*	*2,60*	*2,10*	*1,00*	*0,60*

USA – 2008
Source: OECD MSTI 2011/1, Eurostat 2011

Almost in all of the monitored countries the higher education sector's significance in the public R&D has more or less increased. Apart from Denmark the share of the university R&D grew the most in the new EU countries.

Chart A.23: Average annual growth of the R&D expenditures in the higher education sector

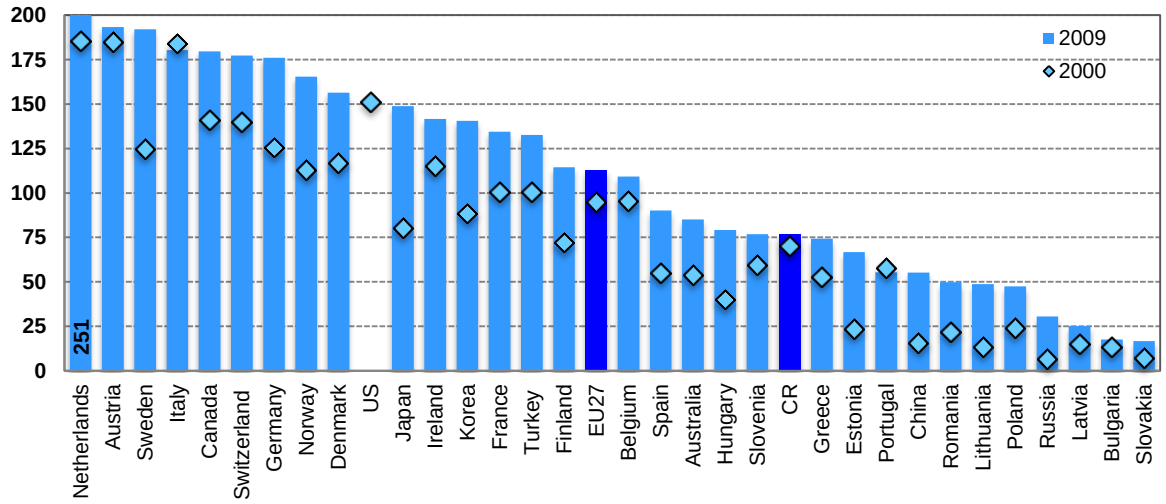


Australia, Korea, USA and Switzerland 2000-2008; Austria, Norway and Sweden 1999-2009; Greece 1999-2007
Note: The chart doesn't include data on year-on-year change in the following two states, because there has been a significant decrease: Latvia (47%) and Romania (35%), and China where there was a significant year-on-year increase by 29%
Source: OECD MSTI 2011/1, Eurostat 2011

In absolute values the individual EU27 countries spent a total of 56 billion EUR in current prices on university R&D, i.e. 25 billion more than in the government sector. Most of this amount has been used by the universities in Germany (21%), France (15%) and the UK (14%). The Czech Republic's share in this figure was 0.7%. Between 2008 and 2009 the expenditures on university R&D increased in almost all EU states.

For better comparison the data in the following table and chart are at PPP in constant prices. This eliminates the differences in price levels in individual countries and possible influence of inflation. Unlike the government sector, the R&D expenditures in the higher education sector grew in all monitored countries of the EU and the OECD in 2000-2009. The average real growth in EU27 was 4% a year, however in the Czech Republic this indicator grew twice as fast. Also in this case this is only the average growth, which doesn't show the differences in the growth rates in individual years. *A detailed interpretation of these year-on-year increases is beyond the scope of this analysis; however the necessary data are available in the table appendix.*

Chart A.24: Expenditures on 1 researcher (FTE) in the higher education sector (thousand USD at PPP)



Australia, France, Lithuania, Canada and Korea 2008; Austria, Norway, Greece and Sweden 1999
Source: OECD MSTI 2011/1, Eurostat 2011

Also in the case of the higher education sector it is possible to use the R&D expenditures per 1 (FTE) researcher for international comparison. In 2009 this ratio reached 113 USD at PPP in the EU countries, which is half of the value in the government sector. The values in the Czech Republic were (like in the government sector) around 2/3 of the EU27 average; however in absolute values this was only 77 thousand USD at PPP. Similar values can be observed in Hungary or Slovenia. Highest values were in Austria and Sweden (over 175 thousand USD at PPP) and Netherlands (over 250 thousand USD at PPP).[14]

A.1.6 Private R&D – R&D expenditures in the private sector

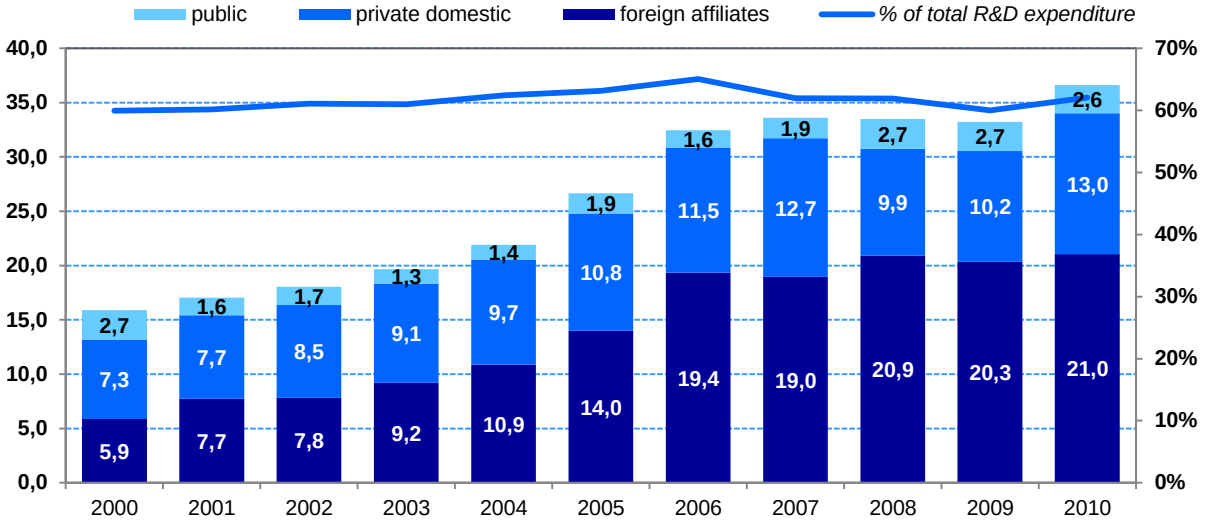
The private sector includes all businesses, organizations and institutions where the main activity is production of market goods or services in order to sell them at an economically significant price.

In 2010 research was conducted in the Czech Republic at 2 130 workplaces of the business enterprise sector. However, only in 508 subjects with yearly R&D expenditures of more than 10 million CZK and 50 with R&D expenditures of more than 100 million CZK. On the other hand ¼ of the business enterprises that perform R&D had R&D expenditures of less than 1 million CZK.

[14] The amount of R&D expenditures per one researcher is also influenced by the fact that R&D is often performed in the same places and by the same people as the pedagogical activity. Therefore the R&D activities can be partially financed from other sources than those meant specifically for R&D and vice versa. Without a more detailed knowledge of how the R&D is organized and funded in the university sectors of individual countries these figures shouldn't be used in order to make political decisions.

The Czech business enterprise sector is the most important R&D sector according to the R&D expenditures in the monitored period. Its share in total R&D expenditures never dropped below 60% since the half of the 90s. Until 2007 the R&D expenditures in this sector increased steadily. After two years of decline, in 2010 the expenditures on R&D increased in business enterprise sector by 3.4 billion CZK (10%). In 2010 the total R&D expenditures in the business enterprise sector reached 36.6 billion CZK, i.e. 20.7 billion more than 10 years ago.

Chart A.25: R&D expenditures in the Czech business enterprise sector (billion CZK)

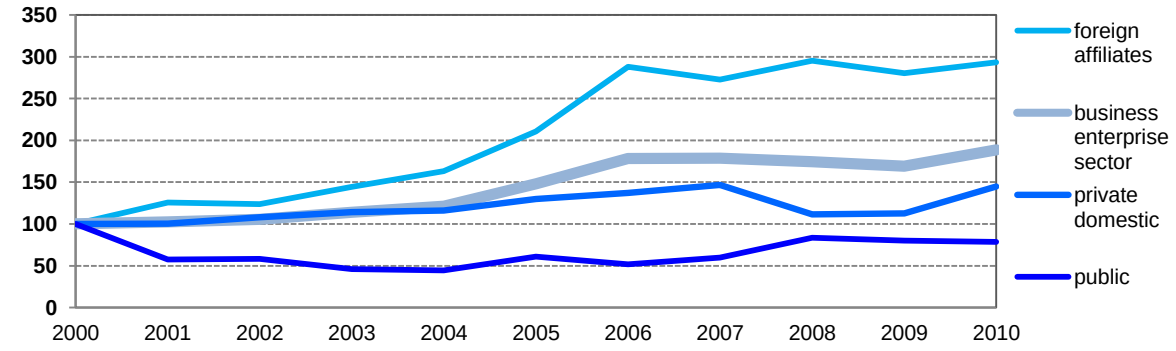


Source: CZSO, Annual Statistical Survey on Research and Development VTR 5-01

In the last ten years the R&D expenditures in the business enterprise sector grew by 8.7% a year. The growth rate was the fastest in 2005 and 2006, each year by ca. 20%, especially in foreign affiliates. On the contrary in 2008 and 2009 there was a decrease in the R&D expenditure as stated above – 2.2% in 2008 and 3.3% in 2009 in the constant prices of 2000.

As for the business ownership since 2003 the largest part of the business R&D expenditures was spent by foreign affiliates. In 2010 these foreign affiliations had a 58% share in the total business R&D expenditures, although they make up less than ¼ of the R&D subjects in this sector. Domestic businesses had a 32% share and public businesses the remaining 8%. Public businesses comprise mainly of former departmental research institutes. However, during the monitored period the structure of the R&D expenditures changed significantly. In 1999 the domestic private businesses had a 50% share in the total business enterprise sector R&D expenditures and the public businesses almost ¼.

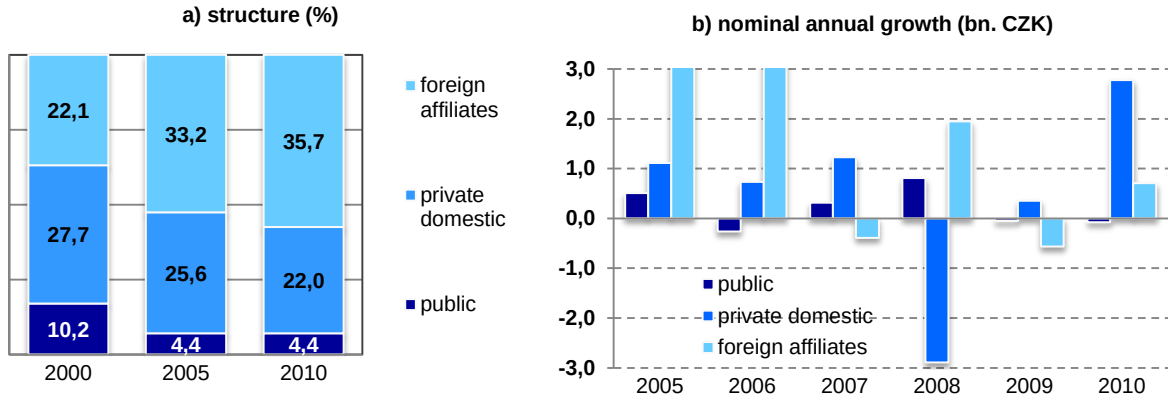
Chart A.26 Real growth of R&D expenditures in the Czech business enterprise sector (year 2000=100)



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

R&D activities in the business enterprise sector are in long-term funded mainly by domestic business sources. Until 2008 their share was more than 80%. However, in 2009 there was a significant increase in funding from the state budget and foreign sources. In case of the foreign sources these were mainly private funds from the same ownership group. In 2009 the public sources had a 15% share and the foreign a 13% share in the business R&D funding. In the next year the share of both decreased but they still had a total of 23% share in the funding, where 4.7 billion CZK came from domestic public sources and a billion less came from foreign sources. Public sources had a share of 3% in the funding of foreign owned businesses' R&D, 23% in domestic businesses' R&D and 42% in public businesses (data from 2010). From the economic activity point of view the most resources of the business enterprise sector R&D (BERD) in 2010 were allocated to manufacturing industry - 23.1 billion CZK (BERD 63.2%). In business enterprises with R&D as their major activity (CZ-NACE 72) was spent 4.8 billion CZK (13%) in the same period . Business enterprises with IT as their major activity (CZ-NACE 62) invested 3.6 billion CZK (10%) in their own R&D.

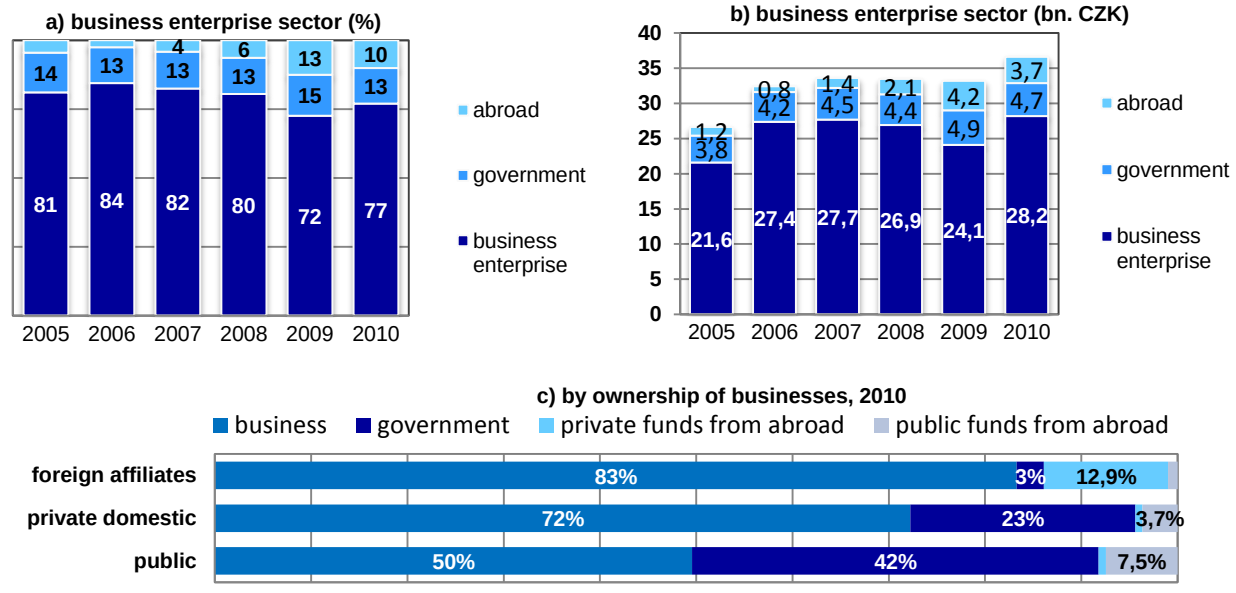
Chart A.27: R&D expenditures in the Czech business enterprise sector by ownership



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

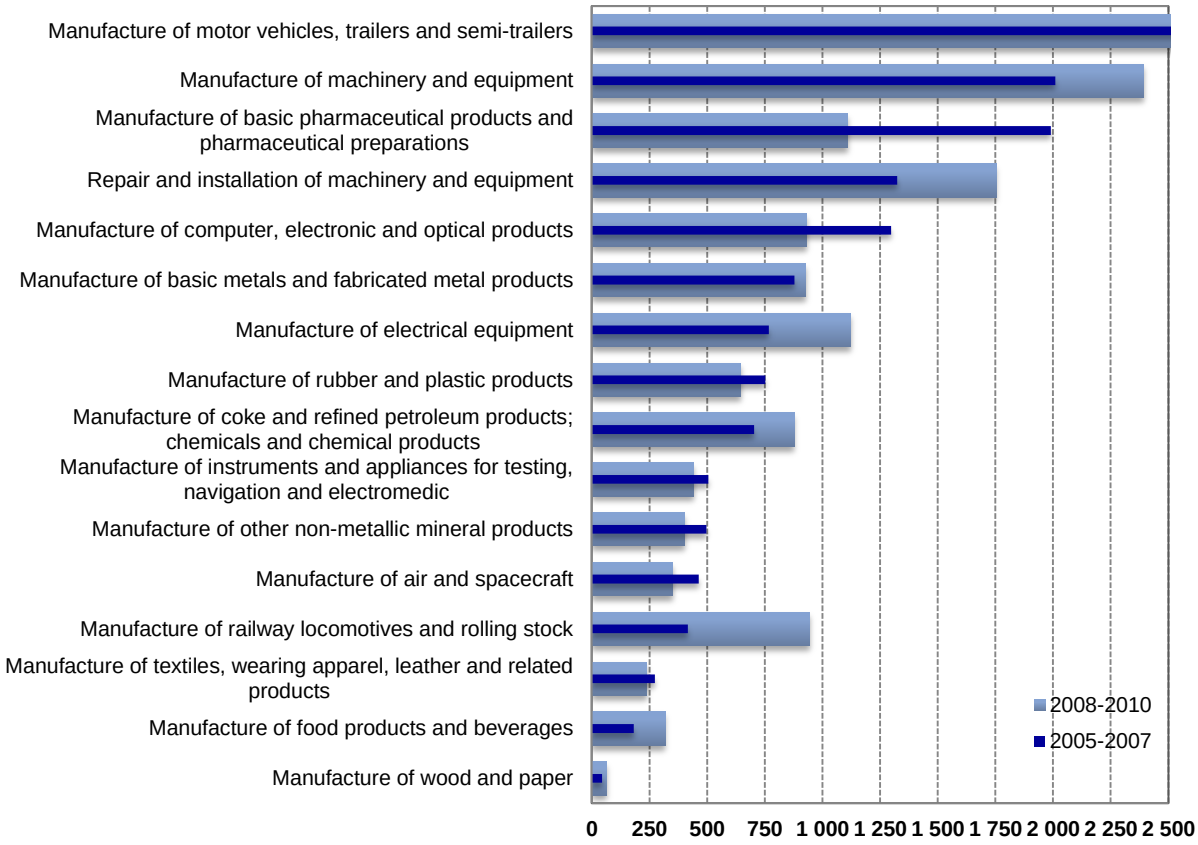
As for the individual manufacturing industry branches the majority of the financial resources have been traditionally invested in the automotive industry. In 2010 the R&D expenditures in this industry branch reached 3.5 billion CZK (almost 39% of the total R&D expenditures in the manufacturing industry). *Detailed information about expenditures in the business R&D is included in the table appendix.*

Chart A.28: R&D expenditures in the Czech business enterprise sector by sources of funding



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

Chart A.29: R&D expenditures in the Czech business enterprise sector in the manufacturing industry by branches (annual average in the monitored period in million CZK)

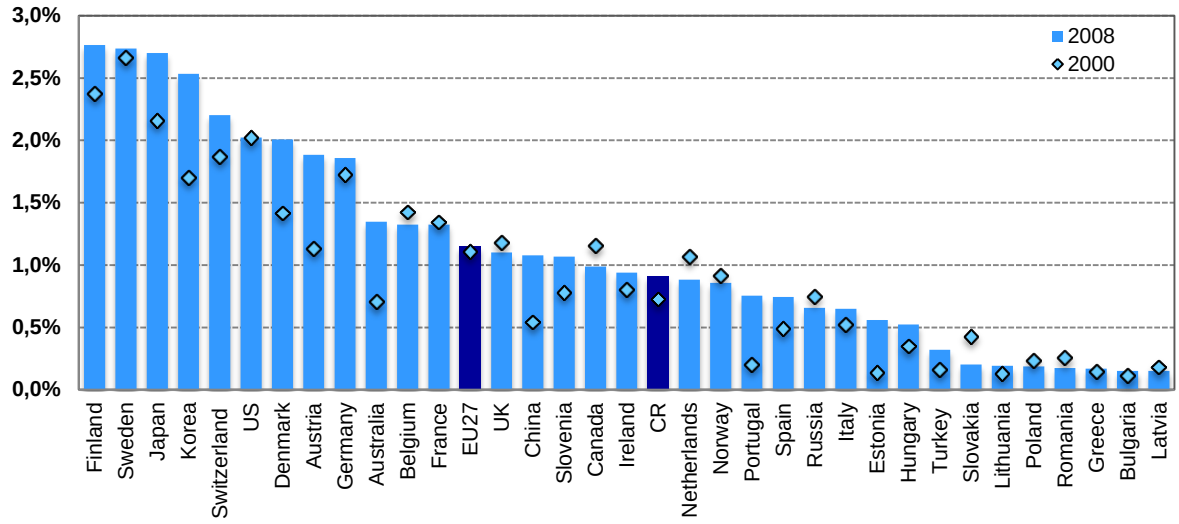


Note: Automotive 8677 million CZK (2008-2010) and 7796 (2005-2007)
Source: CZSO, Annual Statistical Survey on Research and Development VTR 5-01

International comparison

The business enterprise sector has a dominant role in the R&D regarding the share in the total R&D expenditures in Asian OECD countries (Korea, Japan) with more than 75% share, in Scandinavian countries, China, the USA, Switzerland, Austria and Germany with larger than 70% share. Unlike the other new EU countries the business enterprise sector has a dominant role in the R&D in Slovenia and the Czech Republic. In the last five years the Czech Republic with a ca. 62% share is around the average of the EU27 (See chapter A.1.3). In the last two years for which relevant data are available (2008 and 2009) Sweden and Finland had the highest R&D intensity in the business enterprise sector (more than 2.5%), i.e. countries which had the highest overall R&D intensity. Very high R&D expenditures were also achieved in Denmark, Austria and Germany. Since 2000 the EU27 average value is around 1.1%. In the Czech Republic the ratio has grown from 0.7% in 2000 to 0.9 in 2008 which is the same value as in Netherlands or Ireland. With the exception of Slovenia this is the highest value of all the new EU states. As for the OECD countries the highest investments in business R&D have been made in Israel (3.8% GDP); ratio of more than 2.5% GDP has been achieved in Japan and Korea. Switzerland and the USA also achieve relatively high values exceeding 2% GDP. The business R&D intensity, measured by percentage point increase, has increased the most in Austria, Finland, Portugal and Denmark and decreased the most in Slovakia, the UK and the Netherlands.

Chart A.30: R&D expenditures in the business enterprise sector (% GDP)



Greece – 2007, Norway, Austria, Greece, Sweden - 1999
Source: OECD MSTI 2011/1, Eurostat 2011

When measured in absolute values the businesses in the USA invest much more in R&D than the EU countries. In 2008 the US businesses invested 200 billion EUR into their R&D in comparison to 150 billion EUR invested by the EU businesses, i.e. one third more (at PPP even 50% more). The majority of investments in the EU business enterprise sector go into R&D in Germany (46.1%) that is 1.8 times higher than France (25.8 bn EUR) or 2.3 times higher than in third placed UK (20 bn EUR). Czech businesses invested into R&D the largest sum by far of all new EU countries. Our standing in the central European region is therefore very good because businesses in Poland, which has 4 times more inhabitants, invested only 50% of the sum invested by the Czech businesses. Similar situation holds for Hungary and Slovak businesses invested only 10% of this sum (data for 2009 in current prices).

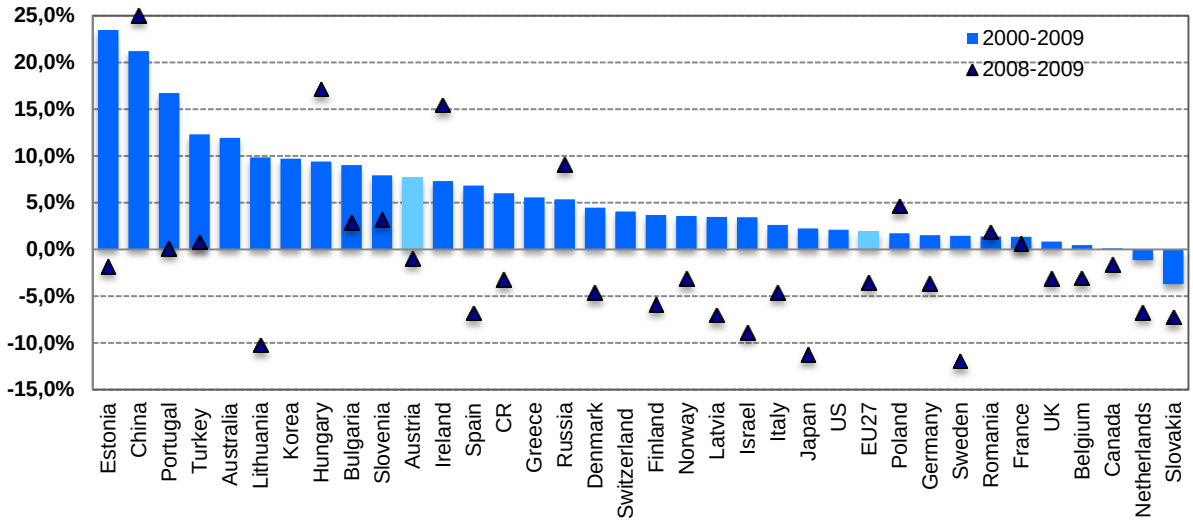
Also in the case of business R&D we'll use the purchase power parity to show better comparison. The highest year-on-year growth between 2000 and 2009 was in Estonia and China with around 20%. Significant growth has been recorded in Portugal, Turkey and Korea. Until 2007 the Czech Republic belonged to the group of EU states with the highest growth rate, however, in the following two years there has been a significant decrease in the R&D expenditures, which started to increase again in 2010. Unlike the higher education sector R&D expenditures in 2009 there was a decrease in business R&D expenditures in most of the EU countries – average decrease in EU27 was 3.5%.

Table A.5 R&D expenditures in the business enterprise sector in selected countries (million USD at PPP in constant prices of 2000; EU27=100)

Year	EU27	US	Jap.	China	Ger.	Korea	France	UK	Austria	Fin.	Den.	CR	Pol.	Hun.
2000	117 202	199 961	70 178	16 299	36 812	13 742	20 601	18 095	2 436	3 152	2 100	1 117	940	433
2009	139 904	235 954	85 726	92 079	42 130	28 845	23 250	19 518	5 109	4 360	3 252	1 887	1 097	969
2000	*100,0*	*170,6*	*59,9*	*13,9*	*31,4*	*11,7*	*17,6*	*15,4*	*2,1*	*2,7*	*1,8*	*1,0*	*0,8*	*0,4*
2009	*100,0*	*168,7*	*61,3*	*65,8*	*30,1*	*20,6*	*16,6*	*14,0*	*3,7*	*3,1*	*2,3*	*1,3*	*0,8*	*0,7*

USA and Korea – 2008
Source: OECD MSTI 2011/1, Eurostat 2011

Chart A.31: Average annual growth of R&D expenditures in the business enterprise sector



Australia, Korea, USA and Switzerland 2000-2008, Austria, Norway, Sweden 1999-2009, Greece 1999-2007
Source: OECD MSTI 2011/1, Eurostat 2011

A.2 Direct support of R&D from the state budget

Data on the direct support of R&D from the state budget come from the grantors of this support. The data are compiled within the R&D&I Information system. These data form the basis of the Annual Statistical Project on Government Budget Appropriations or Outlays on R&D (GBAORD), which is organized within the EU as a compulsory survey according to the Commission Regulation (EC) No. 753/2004 of 22nd April 2004. The aim is to identify the main areas of R&D where the state support is targeted.

A.2.1 Total direct support of R&D from the state budget – basic indicators

Total direct support of R&D from the state budget includes all financial resources granted from state budgets including all resources allocated to R&D in abroad. According to the international methodology R&D support provided through returnable loans, pre-financing of EU programs and support of innovation are not included in the direct support.

Base for the determination of total direct support from the state budget is the state final account's expenditure area for R&D granted by the Ministry of Finance, i.e. these are funds that were actually drawn from the state budget (not just planned) in the given year. See table A.6.

Planned expenditures were much higher than those actually drawn by 31st December of the given year in the last four years. The difference is even bigger when looking at pre-financing of EU R&D programs.

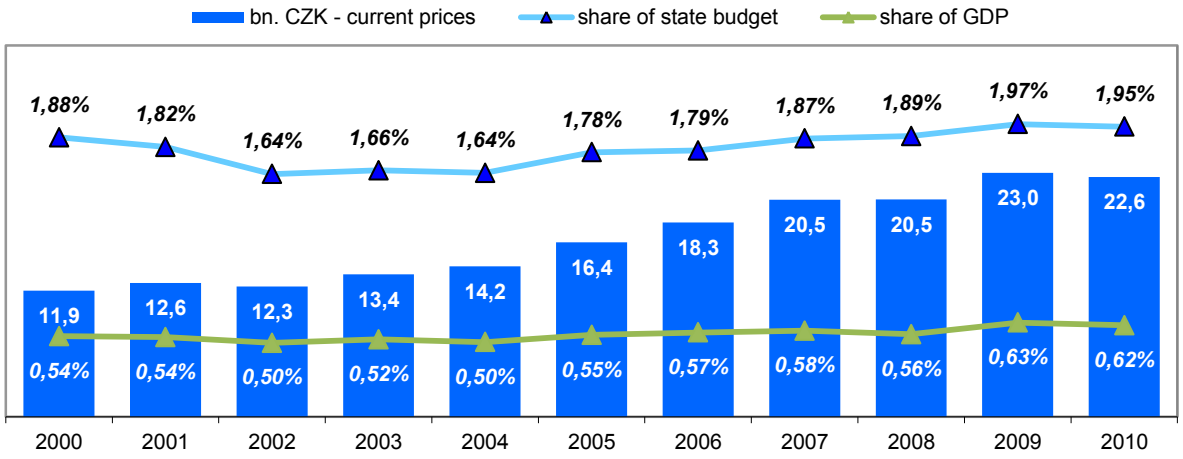
Table A.6: Total R&D expenditures from the Czech state budget (billion CZK)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
planned	11,6	12,6	12,5	13,9	14,7	16,5	18,2	21,5	23,0	24,8	25,4	25,9
planned*	.	.	.	.	.	.	.	25,1	23,1	32,4	29,4	28,9
realized	**11,9**	**12,6**	**12,3**	**13,4**	**14,2**	**16,4**	**18,3**	**20,5**	**20,5**	**23,0**	**22,6**	**.**
realized*	.	.	.	.	.	.	.	20,5	20,5	24,1	24,9	28,9

** including EU programs pre-financing covered by income from the EU*
Source: Ministry of Finance of the Czech Republic; State final account, chapter R&D

In 2010 the R&D expenditures from state budget reached 22.6 billion CZK, i.e. almost twice as much (1.9 times) as ten years ago in current prices (1.6 times in constant prices). In the last ten years a total of 174 billion CZK has been drawn from the state budget across all R&D sectors – 105 billion in the last five years.

Chart A.32: Total R&D expenditures from the Czech state budget



Source: CZSO and Ministry of Finance of the Czech Republic; State final account, chapter R&D

The state budget presents the second most important source of R&D funding (after private business investments). During the whole monitored period its share in total R&D funding was between 39% and 45% with the peak of 45% in 2000, 2001 and 2009. In 2010 this share decreased to 39%.

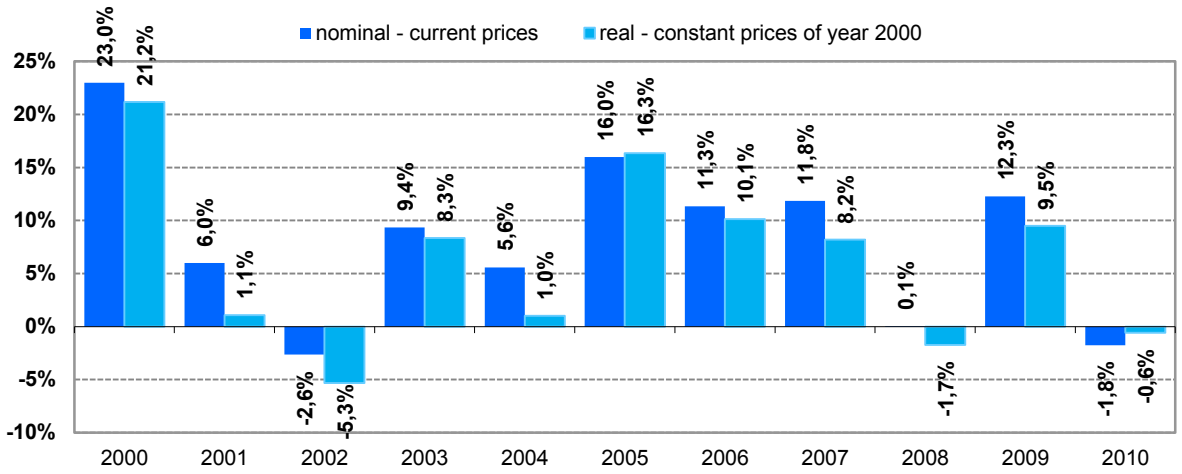
The share of R&D expenditures funded from the state budget in GDP (public funding R&D intensity) was at its peak in 2009 with 0.63% GDP. In that year there was a significant shift of this basic ratio that was caused by the decrease of GDP as well.

Apart from the comparison of R&D expenditures from the state budget as a share in GDP a comparison with total state budget expenditures is being used as well. State budget expenditures and grants for R&D had a share of more than 1.6% of the total state budget expenditures; since 2004 this ratio had steadily increased from 1.64% in 2004 to 1.97% in 2009. As for the public budget, which includes the state budget and regional budgets, the total public R&D expenditures had a 1.36% share in 2010. In 2010 all the above mentioned ratios decreased due to the decrease of public R&D expenditures from the state budget by 1.8% in 2010 compared to 2009, although the planned figure increased by 2.3% in the same period.

Apart from 2002 and 2010 the state budget expenditures on R&D had grown, albeit with a different annual growth rate[15]. If we focus on the development of the state budget expenditures on R&D in constant prices of 2000, then they grew annually by 4.5% between 2000 and 2010 with an 11.5% growth rate between 2004 and 2007 and only 2.3% in the following three years.

[15] The year-on-year decrease in 2008 was probably caused by the application of the Act No. 218/2000 on Budgetary Rules and on amendments of some related acts (budgetary rules), as amended, which stated that the unused expenditures will not be transferred into the reserve funds of the state organization units and therefore will not be included in 2008 resources

Chart A.33 Annual real and nominal growth of state budget R&D expenditures



Source: CZSO and Ministry of Finance of the Czech Republic; State final account, chapter R&D

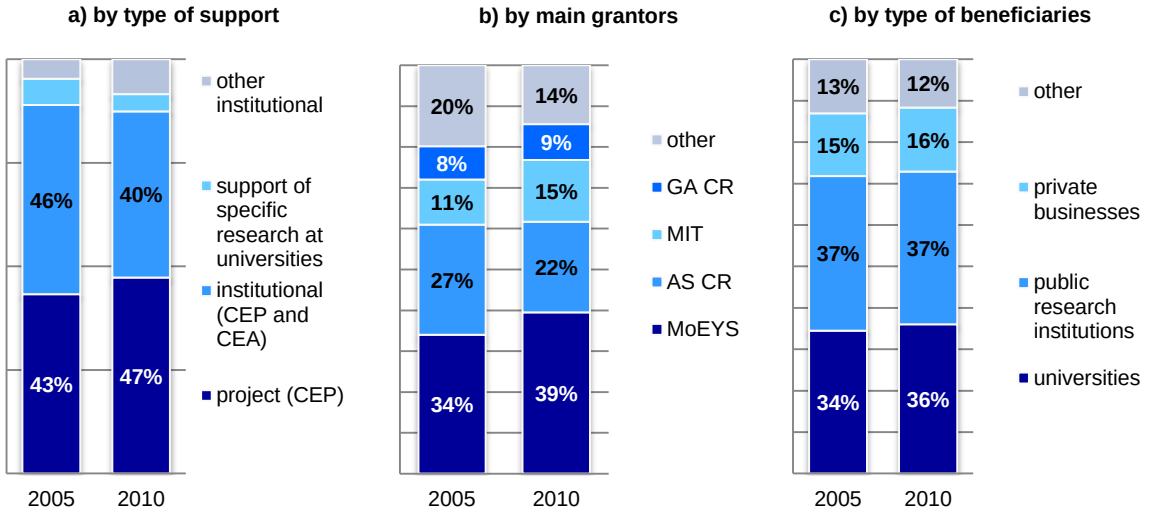
Table A.7: Annual change in the state budget R&D expenditures (billion CZK)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
planned	2,0	0,9	-0,1	1,4	0,7	1,8	1,7	3,3	1,5	1,8	0,6
realized (drawn)	**2,2**	**0,7**	**-0,3**	**1,1**	**0,7**	**2,3**	**1,9**	**2,2**	**0,0**	**2,5**	**-0,4**

Source: CZSO and Ministry of Finance of the Czech Republic; State final account, chapter R&D

In the last five years the share of the project and institutional funding of R&D has been almost equal in the Czech Republic. The biggest part of the financial resources for R&D expenditures from the state budget comes from the Ministry of Education, Youth and Sports (MoEYS) since 1999. In 2010 the share of MoEYS reached 39%, i.e. 10 percentage points more than in 1999. The AS CR with 22% share in 2010 is the second most important grantor of public R&D funding. The Ministry of Industry and Trade and the Czech Grant Agency had a share of 15% and 9% respectively. In 2010 the biggest share of the funding went to public research institutions – a total of 8.3 billion CZK, which is ca. 36.6% of all the state budget expenditures on R&D. Within the public research institutions the most significant are individual AS CR institutes. These have a share of 88% (7.3 billion CZK) in the total amount allocated to public research institutions. In the second place are public and private universities with 35.9% (8.1 billion). The third most important group of beneficiaries are the private businesses which received 3.5billion CZK (16%).

Chart A.34: Structure of the state budget R&D expenditures in the Czech Republic (%)



Source: CZSO according to the data from the State final account and R&D&I IS

International Comparison

Unlike the total R&D expenditures or privately funded R&D the state R&D expenditures in current prices grew annually by 3% in the EU27 and reached 88.6 billion EUR. In 2009 the German state budget provided 20.8 billion EUR (23.5%) and the French 14.9 billion EUR (16.9%). Since 2009 in both countries the budget chapter for R&D has increased by 6% in Germany and 4% in France. On the other hand, in the UK there has been an annual decrease of almost 7% to 11.1 billion EUR (12.5%) in 2009. The Czech Republic with 870 million EUR is at the 15th place within the EU. In the USA the state R&D expenditures at PPP in constant prices of 2000 reached 116 billion USD in 2009, i.e. 1/3 more than in EU27.

Table A.8: State budget R&D expenditures in selected countries (million USD at PPP in constant prices of 2000; EU27=100)

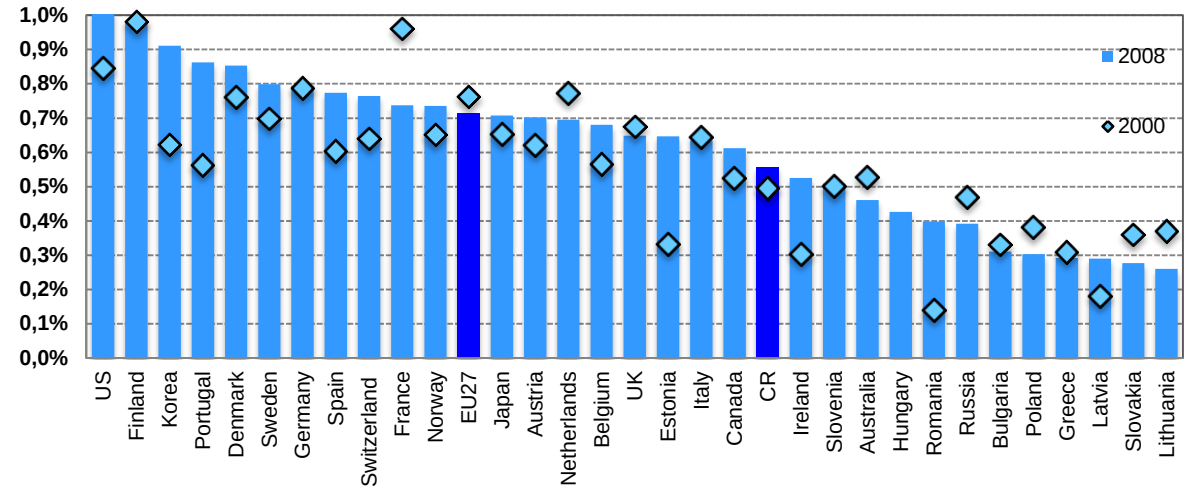
	EU27	US	Jap.	Ger.	Fran.	UK	AUT	Pol.	Fin.	Den.	CR	IRL	SR
2005	82 800	115 964	24 620	16 916	16 168	11 636	1 671	1 365	1 557	1 163	1 018	655	211
2008	86 905	116 685	25 415	18 599	12 935	11 908	1 917	1 683	1 644	1 446	1 204	810	268
2009	90 614	..	25 446	19 516	13 276	12 373	2 053	1 939	1 740	1 596	1 298	819	273
2005	*100*	*140*	*29,7*	*20,4*	*19,5*	*14,1*	*2,02*	*1,65*	*1,88*	*1,40*	*1,23*	*0,79*	*0,25*
2008	*100*	*134*	*29,2*	*21,4*	*14,9*	*13,7*	*2,21*	*1,94*	*1,89*	*1,66*	*1,38*	*0,93*	*0,31*
2009	*100*	*..*	*28,1*	*21,5*	*14,7*	*13,7*	*2,27*	*2,14*	*1,92*	*1,76*	*1,43*	*0,90*	*0,30*

Source: OECD MSTI 2011/1, Eurostat 2011

In 2008 the highest values of state budget R&D expenditures were in Finland (0.98%), Portugal (0.86), Denmark (0.85%) and Sweden (0.80%). The Scandinavian countries had a high share of total R&D expenditures in GDP as well, namely 3%. The Czech Republic was with 0.56% GDP below the EU27 average (0.71%). The lowest values were recorded in Poland (0.3%), Greece (0.29%), Latvia (0.29%), Slovakia (0.28%) and Lithuania (0.26%).

As has been already stated in chapter A.1.2 in 2009 there has been an increase in the share of public funded R&D in GDP in most of the monitored states due to the combination of an increase in budget R&D expenditures and a decrease in GDP. The Baltic states (mainly Latvia and Lithuania) and Romania are an exception as there has been a significant annual decrease in public funding of R&D. Available data for 2009 can be found in the table appendix.

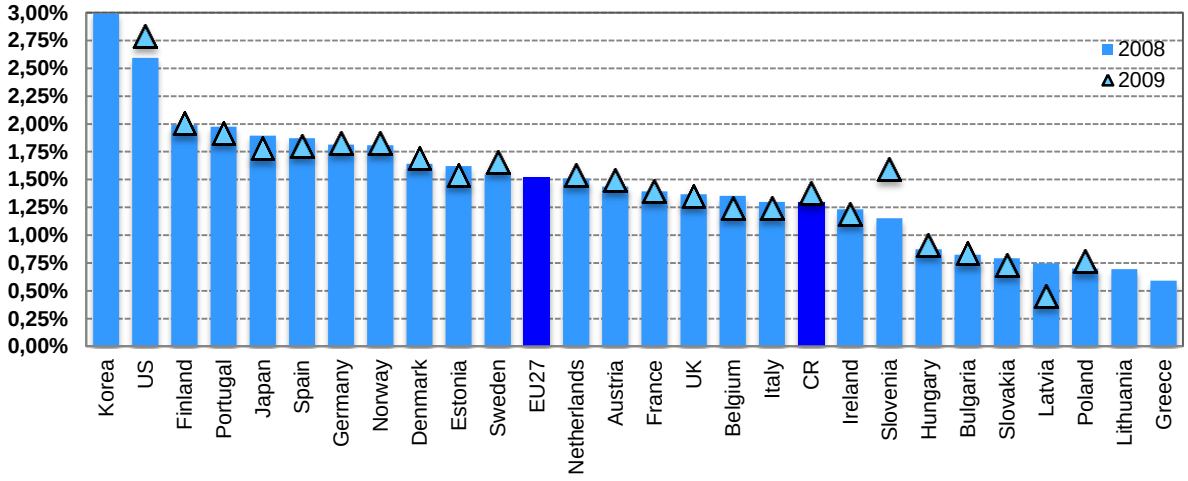
Chart A.35 State budget R&D expenditures and grants (% GDP)



Source: OECD MSTI 2011/1, Eurostat 2011

In the last monitored year (2008) the average value of the state budget R&D expenditure /GDP ratio was 1.52%. Within the EU27 the highest values were in Finland, Portugal, Germany and Spain – between 1.8 and 2%. The highest values of all the monitored countries were achieved in Korea (2.99%) and the USA (2.59%). The Czech Republic was below the EU27 average with 1.29%. However, this value was the second highest among the new EU countries after Slovenia and Estonia. Very low values were in Poland (0.7%) and in Greece (0.63%). Unlike the share of GDP the share of state budget R&D expenditures of total public expenditures didn't change very much in 2009. The exceptions are Slovenia, Sweden, the Czech Republic and the USA, where this value has grown, and Italy, Portugal, Spain, Belgium or Japan where it has decreased.

Chart A.36: State budget R&D expenditures (% of total public expenditures)



Source: OECD MSTI 2011/1, Eurostat 2011

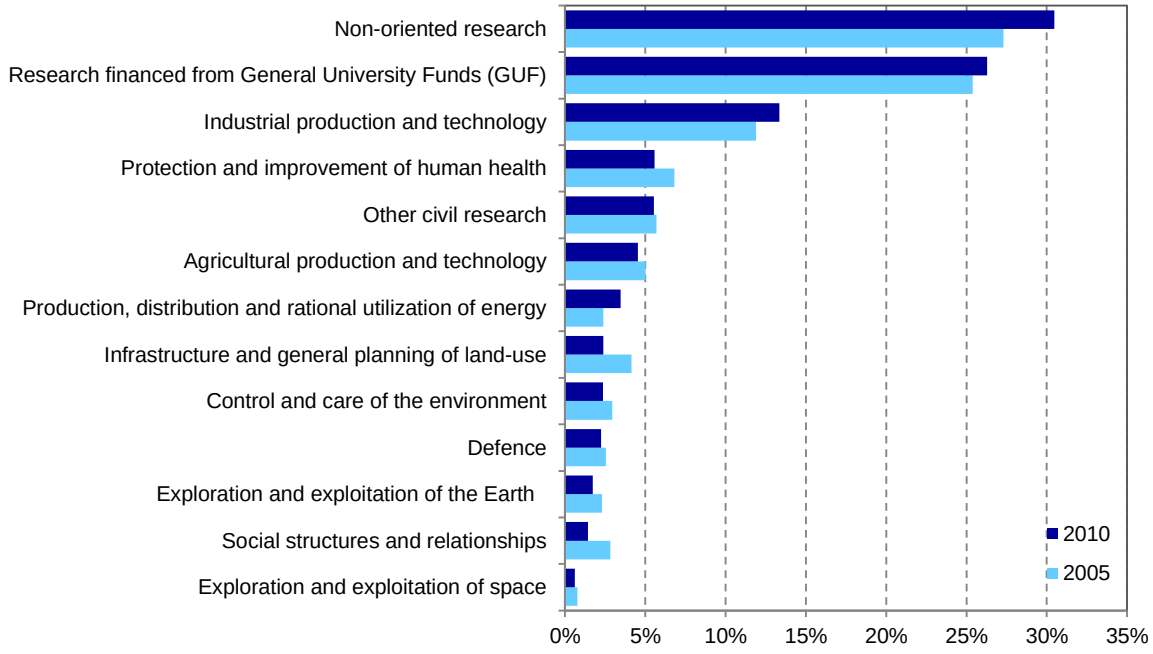
A.2.2 Total direct support of R&D from the state budget by socioeconomic targets

To better sort the state budget R&D support the so called socioeconomic targets have been created in order to identify the key support areas in the EU/OECD countries. The current classification is the NABS1992, which uses 13 main socioeconomic targets. Most of these break into partial sub targets. Classification by various R&D budget items is performed at the level of grantors of public support and their programs.

Since 2002[16] the most of the resources for R&D belong to the "Non-oriented research" target. In 2010 30.5% (6 886.7 million CZK) of the total state budget R&D expenditures (22.6 billion CZK) went into this target. Most of the funding came from the AS CR institutes (65% of the resources within the target), CGA (21.4%) and MoEYS (11.1%). Most beneficiaries are from the public research institutions group (72.4% within the target). The second most important target was the "Research financed from General University Funds"[17] with 26.3% (5.94 billion CZK). According to the OECD methodology this target has only one grantor – MoEYS - and the sole beneficiaries are universities.

The industrial R&D falls under the target "Industrial production and technology", which received 13.4% (3 billion CZK) of the total R&D expenditures. Most of the resources came from the MIT (81.8% of the resources within the target). Private business enterprises were the main beneficiaries with 89.4%.

Chart A.37: Structure of the state budget R&D support by socioeconomic targets (%)



Source: CZSO according to the data from the State final account and R&D&I IS

[16] The GBAORD classification by socioeconomic targets NABS 1992 is being performed in the Czech Republic since 2002

[17] The target Research financed from General University Funds includes all resources coming from the MoEYS R&D chapter into the university budgets. Apart from project, research goals and research institute development the specific research performed at universities belongs here as well.

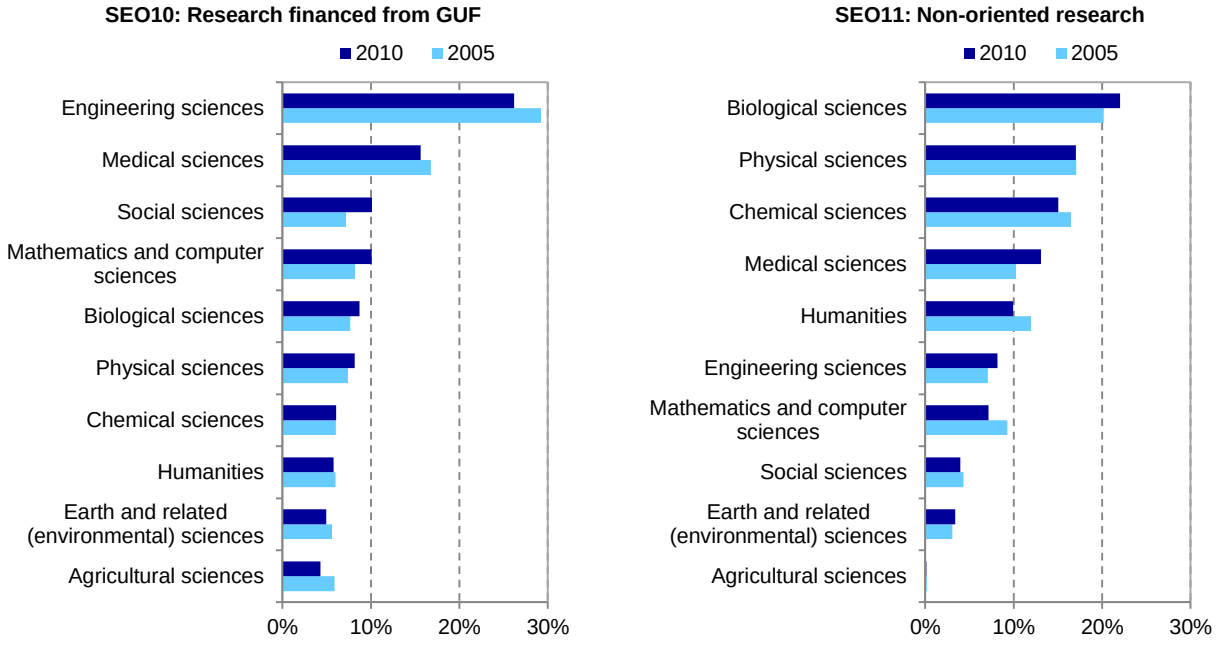
Other socioeconomic targets do not exceed 10% of the total budget expenditures. The highest value of these has the Protection and improvement of human health (5.6%). A special target is the Specific research[18], which includes items that cannot be placed under other targets. This target had a share of 5.5% (1.25 billion CZK). The defense R&D (socioeconomic target Defense) had a 2.2% share of the total state R&D expenditures.

Main targets break into partial sub targets (except for Specific research and Defense). In case of Research financed from General University Funds and Non-oriented research these are further classified by scientific disciplines that are similar for both. The ranking of the disciplines varies for each of the targets and is significantly influenced by support providers.

The Research financed from General University Funds target reflects the volume of support granted by MoEYS to universities. In 2010 the largest part of R&D was performed in the technical sciences (26.2% resources within target), followed by medical sciences (15.6%). The share of social and mathematical sciences was 10.1% for both. The least amount of support was granted to agricultural sciences (4.3%).

In the case of the Non-oriented research target the ranking of individual disciplines is very different. The largest part of this target was in natural sciences (22% resources within target) and physics (17%) and the least part in agricultural sciences (0.1%).[19]

Chart A.38: Structure of state budget R&D support in selected socioeconomic targets (%)



Source: CZSO according to the data from the State final account and R&D&I IS

[18] This includes payments related to international R&D (payments to foreign countries), administrative costs (office operation).

[19] A complete analysis of the budget expenditures and grants sorted by socioeconomic targets can be found at http://czso.cz/csu/redakce.nsf/i/statni_rozpoctove_vydaje_a_dotace_na_vyzkum_a_vyvoj_gbaord.

International comparison

State budget R&D expenditures can be sorted by socioeconomic targets on which they are allocated. The most general classification is expenditures on civilian R&D and military R&D. The highest military R&D ratio is in the USA with 51% in 2009.

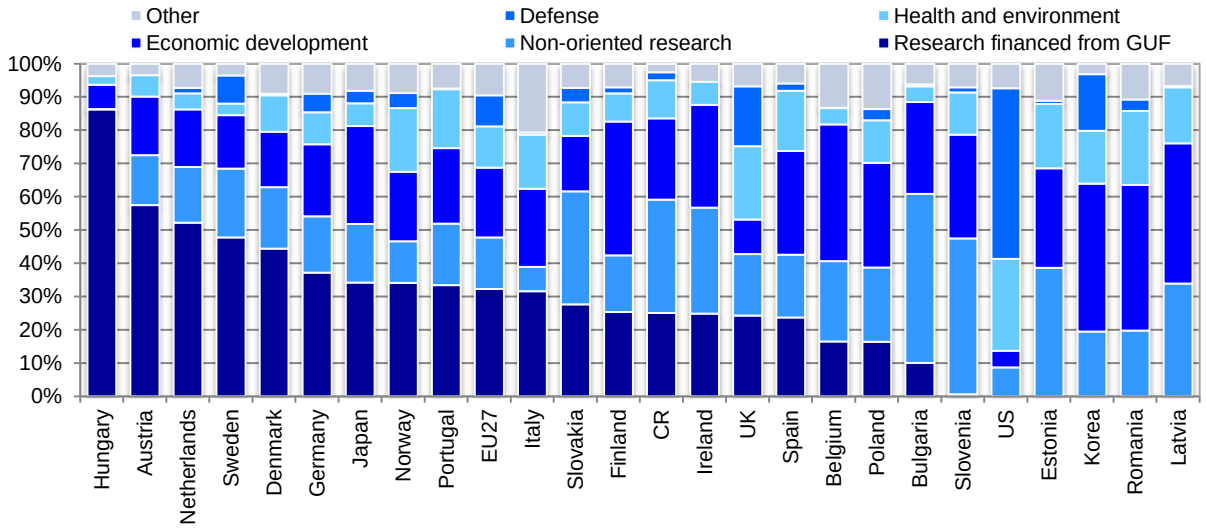
The Research financed from General University Funds target constituted a significant part of the public R&D expenditures in most countries. The highest shares were in Austria (58%) and Netherlands (52%). The Czech Republic was below the EU27 average (32%) with 25%.

The second largest group of targets was the area of economic development with the EU27 average of 21%. The highest values were in Romania (44%), Korea (44%), Latvia (42%) and Belgium (41%). In the Czech Republic the share was 25%.

A significant share of the budget expenditures in many countries went into Non-oriented research with highest values in Bulgaria (51%), Slovenia (47%) and Estonia (39%). In the Czech Republic this target received the highest share of budget R&D expenditures with 34% of the total amount. The EU27 average for this target was 15%.

Apart from expenditure on civilian R&D we also monitor the military R&D. The USA are a clear leader in this field, way behind them in the second place is the UK with 18%.

Chart A.39: State budget R&D support by main socioeconomic targets



Source: OECD MSTI 2011/1, Eurostat 2011

A.2.3 State budget R&D support by type of funding, grantors and beneficiaries

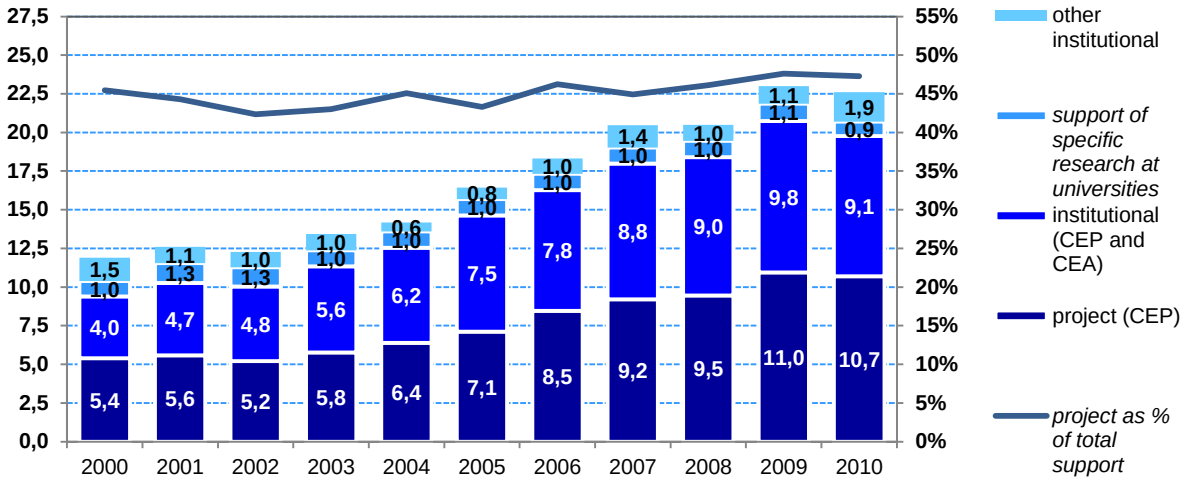
The direct public support of R&D in the Czech Republic is executed in two main forms:

- Project funding awarded based on a public tender for R&D program projects with specific targets, grant projects within a wide spectrum of scientific disciplines where basic research is prevalent, funding for R&D infrastructure development, R&D where the government specifies individual projects and funding of specific university research, i.e. research done by students within accredited master or post-gradual programs.

- Institutional funding, i.e. granting institutional resources to research projects, which are since 2010 gradually replaced by a long-term conceptual development of research organizations based on the evaluation of their results, international participation of the Czech Republic in R&D, co-financing of operational programs in R&D, costs of the system of R&D&I support, especially for organizing public tenders and project evaluations and costs related to the operation of the RVV, CGA, CTA and AS CR.

Since 2000 the share of the project funding in the total state budget R&D expenditures has been higher than 50%, however it never exceeded 55%. Without the support of specific research at public universities the share would be 45% with the highest value of 47.6% in 2009. In absolute values the project funding almost doubled during the period 2000-2010 (by 5.3 billion CZK) and institutional funding increased 2.3 times (by 5.1 billion CZK).

Chart A.40: State budget R&D expenditures by type of support (billion CZK)



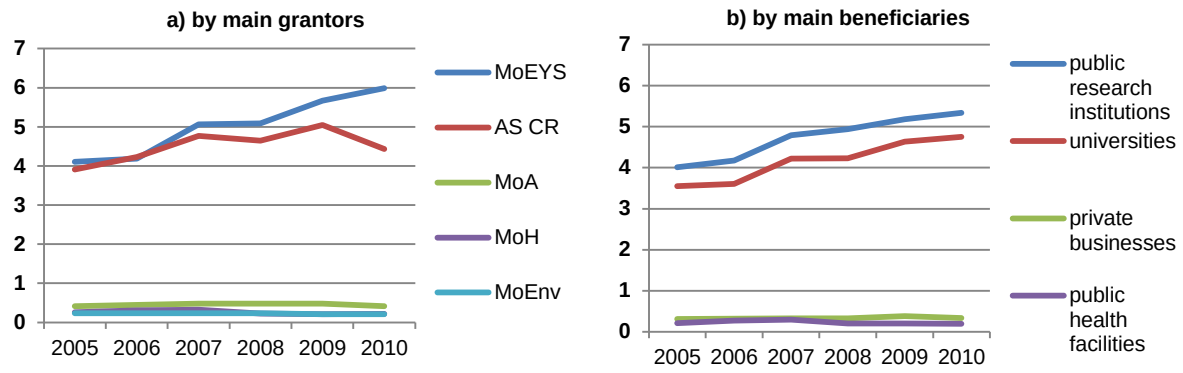
Note: Other institutional support includes funding of international participation of the Czech Republic in R&D, co-financing of operational programs in R&D, costs of the system of R&D&I support, especially for organizing public tenders and project evaluations and costs related to the operation of the RVV, CGA, CTA and AS CR.

Source: CZSO according to the data from the State final account and R&D&I IS

The two major providers of institutional support in the Czech Republic are MoEYS and AS CR. In 2010 these two institutions provided almost 90% of the institutional funding. While MoEYS supports mainly individual public universities, the AS CR supports its own institutes. Apart from these two the individual ministries support their own departmental research organizations. The AS CR had been the major provider up until 1998 when it was superseded by the MoEYS. The MoEYS' share reached 50% (5 991 million CZK) in 2010. The AS CR provided 37.2% (4 437 million CZK). Other significant providers were the MoA with 414 million CZK, MoH with 215 million CZK and MoEnv with 210 million CZK (data for 2010). With the exception of MoEYS all the other mentioned providers reduced their institutional funding in the last three years.

Public research institutions (p. r. i.) form the main group of beneficiaries of the institutional R&D funding. In 2010 they received 5 340 million CZK, i.e. 45% of the total institutional R&D support. 88% of this amount went to the workplaces which were established by the AS CR (in 2005 this was 83%). Public and private universities are the second most important beneficiaries of the institutional R&D funding. In 2010 they received 4 755 million CZK (40%).

Chart A.41: State budget R&D institutional funding* by type of grantors (billion CZK)



* Including the support of specific research at universities, which falls under project funding since 2010. However, to preserve the continuity of the time series we continue to include it into institutional funding.
Source: CZSO according to the data from the State final account and R&D&I IS

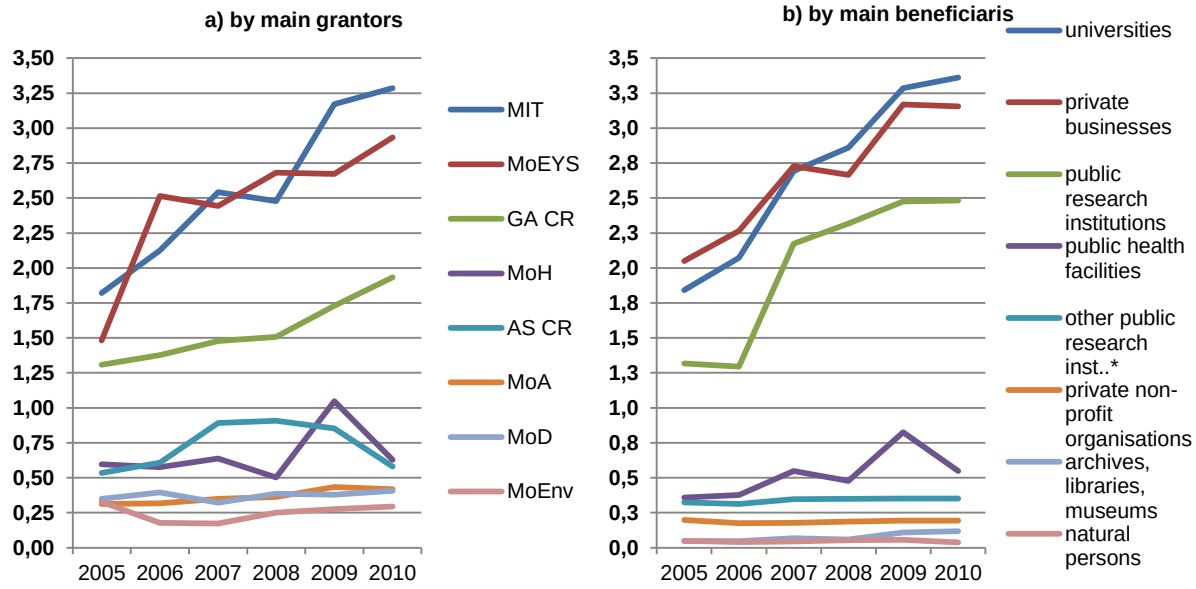
Project support of the R&D in the Czech Republic is financed through 11 budget chapters. Main providers of the project funding are MIT, which supports mainly applied research through programs such as TIP, Continuous prosperity or Tandem or Impulse in the past. Main beneficiaries are private domestic business enterprises. In 2010 the MIT's share in project funding was 31% (3 285 million CZK), MoEYS was the second most important provider with 28% share (2 934 million CZK) that goes mainly to the applied R&D performed at universities. The third major provider is the CGA, which supports grants for fundamental research. It grants funding to the best projects from all disciplines based on tenders in R&D. In 2010 the CGA provided 1 933 million CZK (18%). Apart from the three mentioned providers the funding comes also from MoH (629 million CZK, 6%), MoA (418 million CZK, 3.9%) and MoD (407 million CZK, 3.8%). Aside from MoEYS and MIT the cross-sectional applied research is also supported by the MoC and MoI. Between 2000 and 2002 the main provider of project funding was the AS CR Grant Agency, which since then reduced its operation and since 2009 it has not been providing funding for any new projects.

Since 2005 the project funding increased the most at the MoEYS (2x) and MIT (1.8x), in both cases the absolute increase was by 1.5 billion CZK. The funding provided by CGA increased by 50% (by 0.6 billion CZK).

In 2010 there were ca. 1 500 beneficiaries of this support. Two thirds went to private business enterprises, 85% of the beneficiaries received less than 10 million CZK and only 1.3% (20) of them received more than 100 million CZK. In the last three years approximately one third of the project funding went to basic research, one half to the applied and industrial research and the rest to the experimental development.

Main beneficiaries of the project funding in the recent years were public universities. Their share in project funding increased from 25.9% (1 841 million CZK) in 2005 to 31.4% (3 361 million CZK) in 2010.[20] The private business enterprises are the second largest group with 29.5% share in 2010. In absolute values the private business enterprises received 3 156 million CZK with 84% of that amount going to the domestic business enterprises. [21] In 2005 – 2004 the private business enterprises were the primary beneficiaries of the project funding. In 2010 the share of research institutions on project funding increased to 23.2%; in absolute values this equals 2 482 million CZK with 85.3% (2 118 million CZK) going into institutions established by the AS CR.

Chart A.42: State budget R&D project funding by type of grantors and beneficiaries (billion CZK)



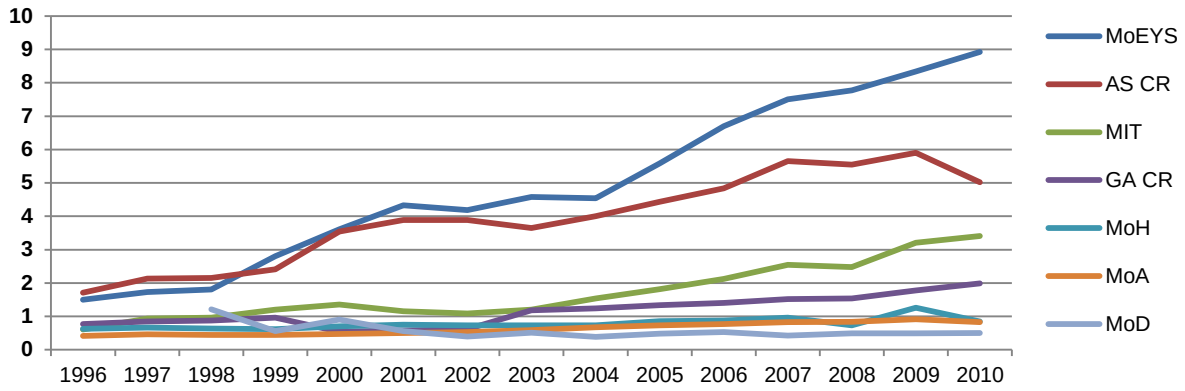
Source: CZSO according to the data from the State final account and R&D&I IS

It shall be pointed out that regardless of whether it is the project or institutional funding, the MoEYS is the primary provider of public R&D funding in the Czech Republic. In 2010 almost 9 billion CZK (39% of the total public R&D funding) came from its budget chapters. In the approved budget for 2010 the amount meant for R&D increased by 2 billion (10.9 billion CZK). Since 2000 the MoEYS R&D budget chapter is the fastest growing one and increased almost 2.5 times. The second most important provider is the AS CR with 5 billion CZK (22%) in 2010. Unlike the MoEYS or MIT the R&D budget chapter of the AS CR has been reduced by almost 886 million CZK in 2010. The third largest provider is the MIT with 3 413 million CZK (15%) in 2010. In 2005 its share was 11%.

[20] Not including the funding of the specific university research

[21] The table appendix contains detailed data on the direct support of R&D from the state budget in private businesses according to CZ-NACE.

Chart A.43: State budget R&D funding by major grantors (billion CZK)



Source: Ministry of Finance, State final account 200 – 2010, chapter R&D, RVVI secretariat, R&D expenditures approved by the government in 1996-1999

Among the main beneficiaries of the R&D support from the state budget are the public universities, public research institutions and private business enterprises. In 2010 the largest part of the funding went to the public research institutions (8 281 million CZK, 36.6%). In 2010 88% of this amount went to the individual institutes of the AS CR. *The most important beneficiary of this support among the AS CR institutes in 2010 was the Institute of Physics ASCR, v. v. i., which received 552 million CZK (9.6%). Other significant beneficiaries were the Institute of Molecular Genetics of the ASCR, v.v.i. (319 million CZK, 5.5%), Biology Centre of the Academy of Sciences of the Czech Republic, v. v. i. (286 million CZK, 5.0%), Institute of Organic Chemistry and Biochemistry AS CR, v.v.i. (278 million CZK, 4.8%) and the Institute of Physiology AS CR, v.v.i. (255 million CZK, 4.4%).*[22]

The second largest beneficiaries are the public and state universities, which in 2010 received 8 116 million CZK (35.9%). *The long-term most important beneficiary within the university R&D funding is the Charles University, which receives almost 30% (2.31 billion CZK in 2010) of these resources. The Czech Technical University in Prague received 1.1 billion CZK (13.1%) in 2010 and the Masaryk University 0.9 billion CZK (10.8%). These three universities received more than half (52.4%) of the total financial resources allocated on public and state university R&D.*

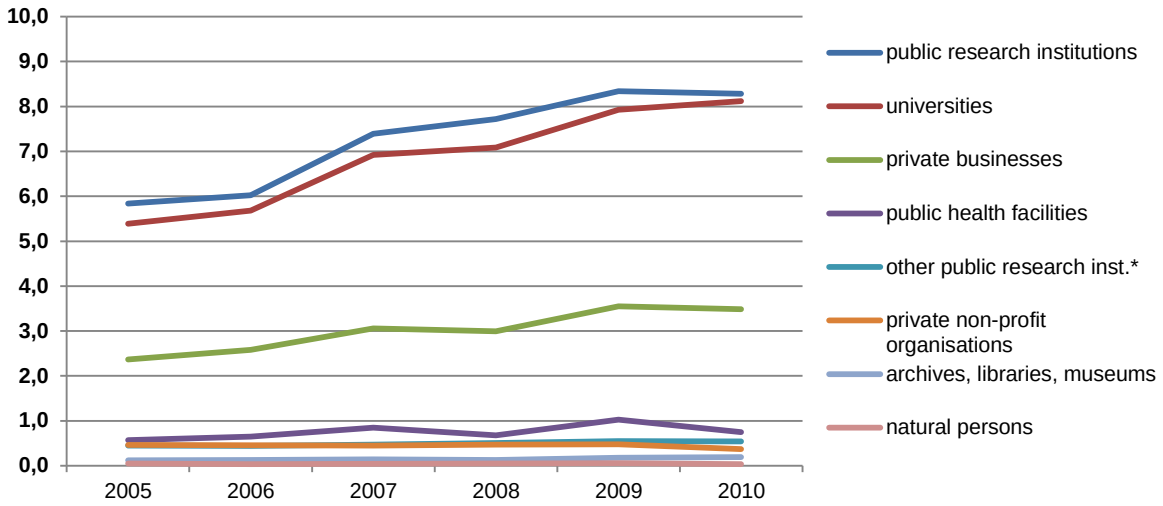
The third largest beneficiaries are the private business enterprises, which in 2010 received a total of 3.5 billion CZK (15.4%). Private businesses also receive the largest part of the project funding and together with the universities they form the fastest growing group with 50% increase in the state budget funding during the last 5 years.

Within the public support of business enterprise sector R&D we can differentiate between the direct and indirect support. Aside from the direct R&D support since 2005 the businesses use also the indirect support by using tax deductible R&D items according to the Act No. 589/1992 Coll., on Income Tax. In the period 2005 – 2009 the indirect support reached 5.1 billion CZK.[23]

[22] Not including the amount which individual institutes received from the AS CR budget chapter meant for its infrastructure

[23] Detailed data in the table appendix

Chart A.44: State budget R&D funding by major beneficiaries (billion CZK)



Source: CZSO according to the data from the State final account and R&D&I IS

A.3 Conclusion

R&D in the Czech Republic is performed at ca. 2 500 workplaces with the majority (82% in 2010) of them belonging to the business enterprise sector. Only 112 of these workplaces had expenditures of more than 100 million CZK. 50 of these belong to the business, 33 to the government and 19 to the higher education sector.

From 1993 to 2007 there has been a continuous growth of total R&D investments. During this period the R&D expenditures in the Czech Republic increased almost fivefold in current prices – half as much in constant prices. If in 1993 the investments amounted to 12 billion CZK then in 2000 this was 27 billion and seven years later 54 billion CZK. After the annual decrease of total R&D expenditures in 2008 caused by the decrease in private domestic investments and a slight increase in 2009 there has been a significant increase in 2010. This increase (by 3.7 billion CZK, 6.7%) was due to an increase of domestic private investments which grew by 4.2 billion CZK (17%). In 2010 the total R&D expenditures reached 60 billion CZK which equals 1.61% GDP and it is the highest figure since 1993.

As for the R&D funding/GDP ratio we are lacking behind most of the EU15 states, however, we belong to the best within the new EU states. In 2009 the highest R&D intensity (more than 3%) of all the EU27 states was achieved in the Scandinavian states, in Finland where the ratio was almost 4%. Values over 2.5% GDP were recorded in Germany and Austria. Within the OECD countries the highest value has been achieved since 2000by Israel, in 2009 this was 4.28% GDP. Other states with values over 3% are Japan, Korea and Switzerland. In the USA the values have been between 2.5 and 2.8% GDP since the half of the 80s.

In 2010 almost half of the total R&D expenditures in the Czech Republic came from domestic businesses. The state budget contributed by 40%, foreign businesses by 7% and international organizations, especially through EU funds and programs, by the remaining 4%. The Czech business enterprise sector is the most important sector not only in the case of funding R&D activities but also regarding the amount of financial resources spent on concluded R&D. In 2010 the businesses spent 62% of the total R&D expenditures on concluded R&D, the government sector 20% and the universities the remaining 18%.

The largest part of R&D expenditures in the government sector is long-term used at the workplaces of individual AS CR institutes; in 2010 this was 8.7 billion CZK (75.6% of the total R&D expenditures in government sector). It may be the same amount as in 2007 but 4% less than in 2009. The spending at departmental research workplaces in the same year was 2 billion CZK (17%) and 850 million (7.4%) were designated to R&D in other subjects of the government sector, whereas more than half (58%) of this amount has been spent in public cultural facilities.

The majority of university R&D in the Czech Republic is performed at public universities; in 2010 95% of the expenditures went there, 4% to the faculty hospitals and the remaining 1% to the private universities. During the last 10 years the share of the higher education sector in the total R&D expenditures increased from 12% in 2000 to 18% in 2010 and in public research from 36% to 48%.

The state budget presents the second most important source of R&D funding (after private business investments). During the whole monitored period its share in total R&D funding was between 37 and 45%. In 2010 this share decreased to 40%. The share of R&D expenditures funded from the state budget in GDP is still higher in the Czech Republic than in the most of the EU15 states. Large share of public sources and a low share of business sources are typical for new EU27 countries.

B Human Resources in R&D

An important part of the economic and technological development, which has a significant influence on an economy's competitiveness, is the creation and transfer of knowledge. New knowledge couldn't be created without sufficient support of human resources. Providing an adequate human resource base for R&D&I activities doesn't depend only on the labor market but also on education trends. Universities have a crucial role in the creation of adequate human resources. One of their main tasks is to prepare a sufficient, high-quality base of research workers, primarily from post-graduate students. However, we cannot neglect the master study programs, which provide highly qualified experts for technical support, management, IT and services and also distribute the results of scientific activities. Also it is hard to imagine full-fledged post-gradual study without quality master programs as well as basic- and high-school education.

The aim of this analysis is to provide information about the number and structure of persons active in R&D, qualified human resources and university students in the Czech Republic and to outline their specifics and main trends in the international context. The contents of the following chapters are summarized in the following lines:

Chapter **B.1 Employees in R&D** contains basic information about the total number of employees in R&D and their structure according to available characteristics and about the structure of the R&D workers and employees in individual sectors (business, government and university). Apart from the data for the Czech Republic there are basic indicators in the international comparison as well.

The source of data for the B1 chapter is the Annual Statistical Survey on Research and Development (VTR 5-01), whose report units are all subjects in the Czech Republic who perform R&D. The aim of this survey is to gain detailed data on human and financial resources allocated to R&D activities. The Survey fully respects OECD and EU principles provided in the Frascati manual and the relevant EU Regulation and therefore the results for the Czech Republic are fully internationally comparable. More information about the VTR 5-01 survey is available in the methodological appendix or at http://czso.cz/csu/redakce.nsf/i/statistika_vyzkumu_a_vyvoje.

Chapter **B.2 University Education** contains information about the number and structure of persons with finished university education and also basic information about the university students (development of their number as well as how they are spread among the various disciplines and programs). Focus is on students of natural sciences and technical sciences in all university study programs and especially in doctoral programs. This chapter is put in the international context as well.

The source of data for this chapter is the Labor Force Sample Survey with basic units being households and individuals. Data are presented as annual averages and if their value is below 3000 persons they are considered as data with low reliability. Data on students and university graduates have been gathered from the data sources of the Institute of Information on Education (IIE), which is directly managed by the MoEYS. The data come from the SIMS database (Union Students Register information). Classification by study programs is based on the program's code, which in some cases doesn't reflect the relevance of individual study programs to the main program groups. Due to the problematic placement of individual students into relevant program groups, qualified estimates are used when sorting by study programs.

Detailed information (data, methodology, definitions) about these statistics can be found at http://www.czso.cz/csu/redakce.nsf/i/lidske_zdroje_pro_vedu_a_technologie.

B.1 Employees in R&D

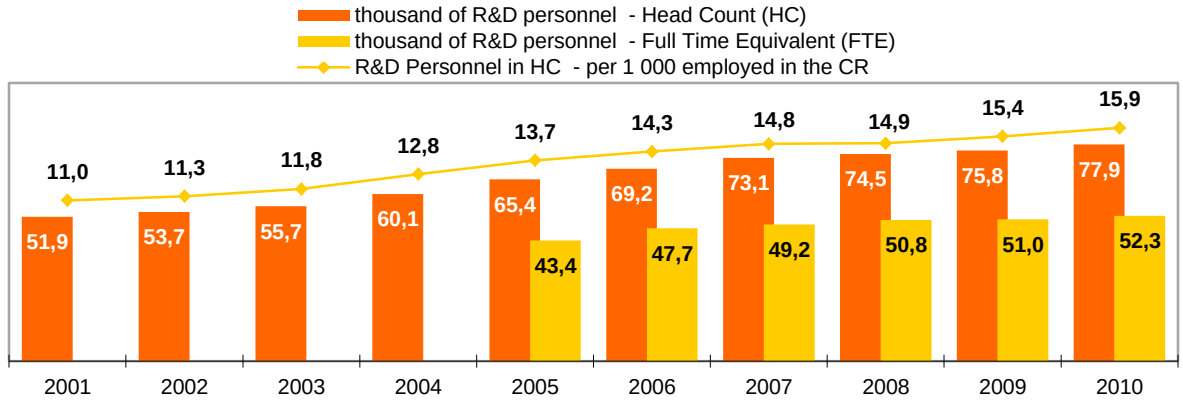
The number of employees in R&D is ascertained by two basic indicators, which are the number of natural persons (HC) and the number of R&D full-time equivalents (FTE) (See chapter F). If not stated otherwise, all data in this chapter are in FTE.

B.1.1 Total number of R&D employees

As stated in chapter A.1.1 in 2010 there were 2 587 research workplaces in the Czech Republic. More than 1 250 of them (49%) employed less than 5 R&D personnel (FTE), 435 workplaces (17%) employed 5-9.9 R&D employees. Only 5% of the workplaces have 50-99 R&D personnel and 4% more than 100 R&D employees.

At the end of 2010 there were 77 093 R&D personnel (HC) in the Czech Republic, regardless of whether part-time or full-time workers. When converted to the full time equivalent (FTE) indicator the number of R&D decreased to 52 290. Since 2001, when the number of R&D workers (HC) was almost 52 thousand, this number increased by 50%. The ratio of number of R&D workers per 1000 workers increased steadily as well – in 2001 there were 11 R&D workers per 1000 workers, in 2010 this number increased to 15.9 workers. Women make up one third of the R&D workers in the case of both indicators.

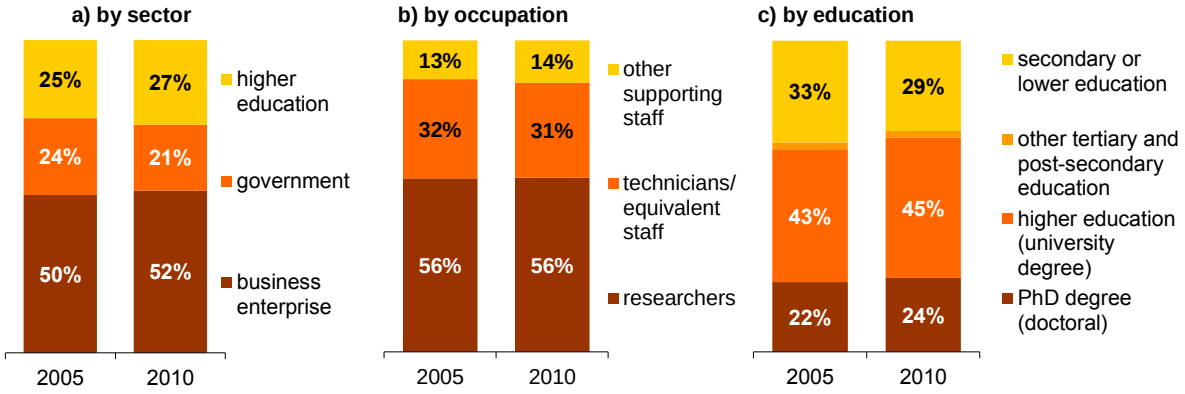
Chart B.1 Employees in R&D



Source: CZSO 2011 Annual Statistical Survey on Research and Development VTR 5-01

In 2010 as well as in the previous years the major part of R&D personnel worked in the business enterprise sector, namely almost 27 000 persons (FTE) which equals to 52% of all R&D employees. 14 000 (27%) of them worked in the higher education sector and 11 000 (21%) of them in the government sector. In comparison to 2005 the number of R&D personnel of business enterprise sector R&D personnel increased from 22 000 to 27 000. The higher education sector recorded a significant increase as well – from 11 000in 2005 to 14 000 in 2010. The government sector more or less stagnated.

Chart B 2: Structure of R&D personnel (FTE)



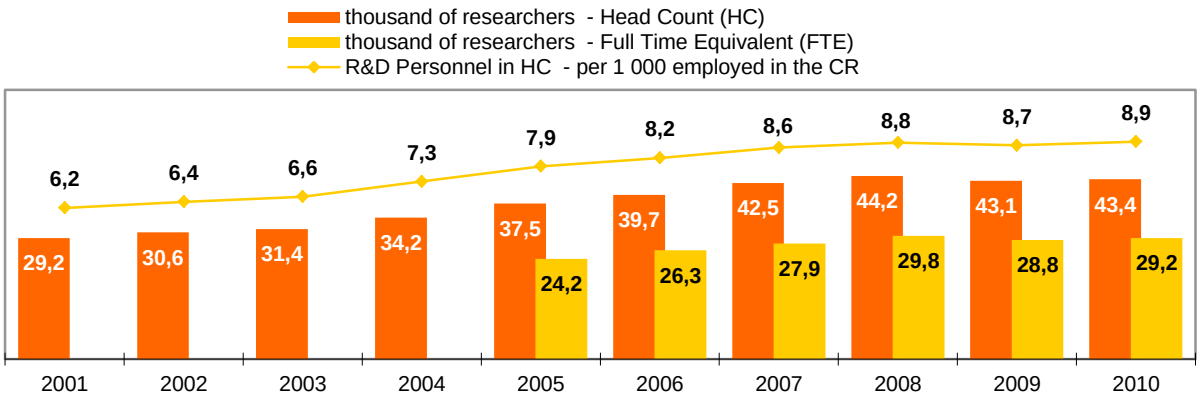
Source: CZSO 2011 Annual Statistical Survey on Research and Development VTR 5-01

As expected, dominant among the R&D personnel are researchers. In 2010 they made up almost 30 000 FTE employees, which equaled to 56%of all R&D employees. Technicians were the second most numerous group with 16 000 (31%) and the remaining 7 000 were other supporting staff.

More than 2/3 of all R&D personnel have university education, in 2010 it was 36 000 persons FTE (69%), in more detail, 24 000 of these with master or bachelor level education and 12 000 with doctoral education. 29 % of the employees had secondary or lower education and 2% had other tertiary and post-secondary education. The education structure changed over the years, in 2005 there were 43% of university educated employees and 33% with secondary or lower education.

As stated above, 56% of all R&D employees (FTE) are researchers. In 2010 there were 43 000 researchers (HC)that equals 29 000 in full time equivalent (FTE). Their number has increased steadily until 2008. Between 2008 and 2009 their number decreased mainly due to the fact that AS CR institutes moved some of the researchers to technical staff because of methodological reasons. The number slightly increased again between 2009 and 2010. In overall, between 2001 and 2009 the average annual rate of growth has been 4.5% (HC).

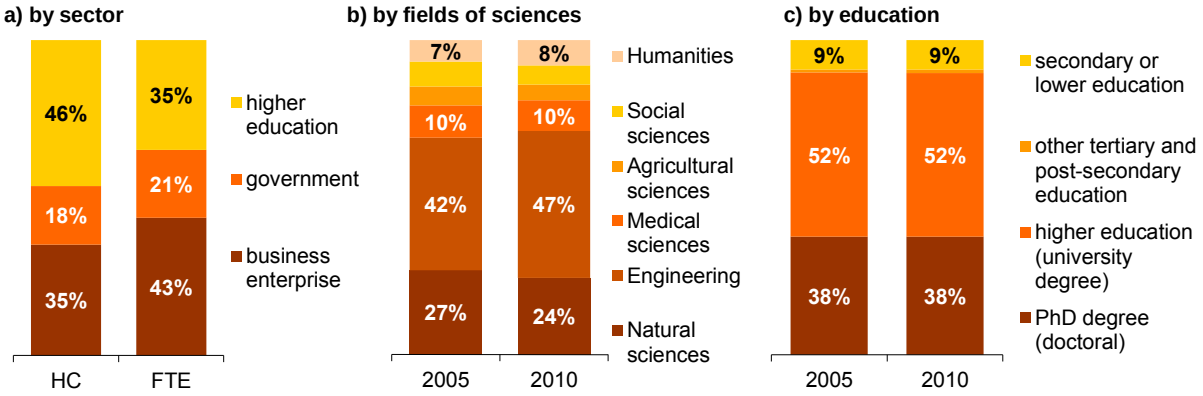
Chart B 3: Researchers



Source: CZSO 2011 Annual Statistical Survey on Research and Development VTR 5-01

The spread of researchers among individual sectors is very different for each indicator. Therefore we will use both the FTE and HC indicators. In the case of the HC indicator the most researchers were in the higher education sector (20 000, 46%), followed by the business enterprise sector (15 000, 35%) and government sector (8 000, 18 %). As for the FTE indicator the leading sector was the business enterprise sector (12 661, 43%) followed by the higher education sector (10 115, 35%) and government sector (6244, 21%). It is clear that the higher education sector uses the most part-time researchers.

Chart B 4: The Structure of researchers



Source: CZSO 2011 Annual Statistical Survey on Research and Development VTR 5-01

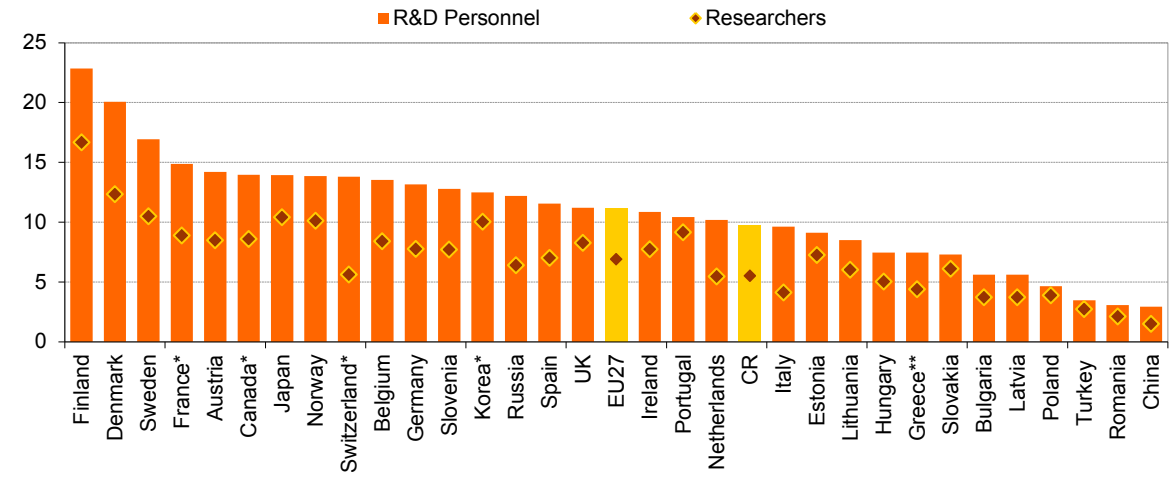
Most of the researchers (70%) are working in engineering and natural sciences, 10 % in the medical sciences, 8% in humanities, 6% in social sciences and only 5% in agriculture sciences.

Researchers have higher overall education than other R&D workers, more than 90% of them have some type of university education, 52% has master or bachelor education, 38% doctoral education ant the remaining 9% secondary or lower education.

International Comparison

In 2009 the Czech Republic was slightly below EU average (11.1) with almost 10 R&D personnel (FTE) per 1000 employees. Similar ratios can be observed in Portugal, Netherlands or Italy. Highest values (over 20) were in Finland and Denmark. Lowest values were in Turkey (3.5), Romania (3.1) and China (2.9). To get an idea about the absolute values of R&D personnel, let's add that China employed 2.3 million R&D personnel in 2009 and the EU27 with population only one third of China's size employed in the same year 2.5 million R&D personnel.

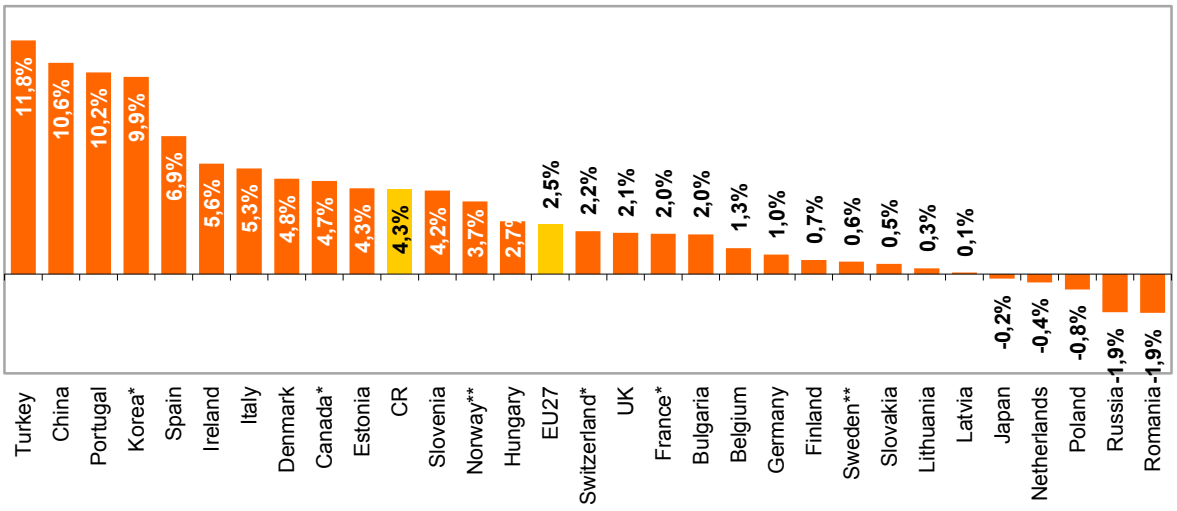
Chart B.5: R&D personnel (FTE), 2009 (per 1000 employees)



Source: OECD MSTI 2011/1, Eurostat 2011

In the case of researchers the Czech Republic was below the EU average as well as in case of R&D personnel. In 2009 there were 5.5 researchers per 1000 employees (FTE) compared to the EU27 average that equaled to 6.9. Similar values as in the Czech Republic could be found in Switzerland, Hungary and Netherlands. Countries with values over 10 were Norway, Japan, Spain, Denmark and Finland, where it reached the value of 17. On the other hand the values in Turkey, Romania and China were below 3.

Chart B.6: Average annual increase of R&D personnel (FTE), 2000-2009 (%)

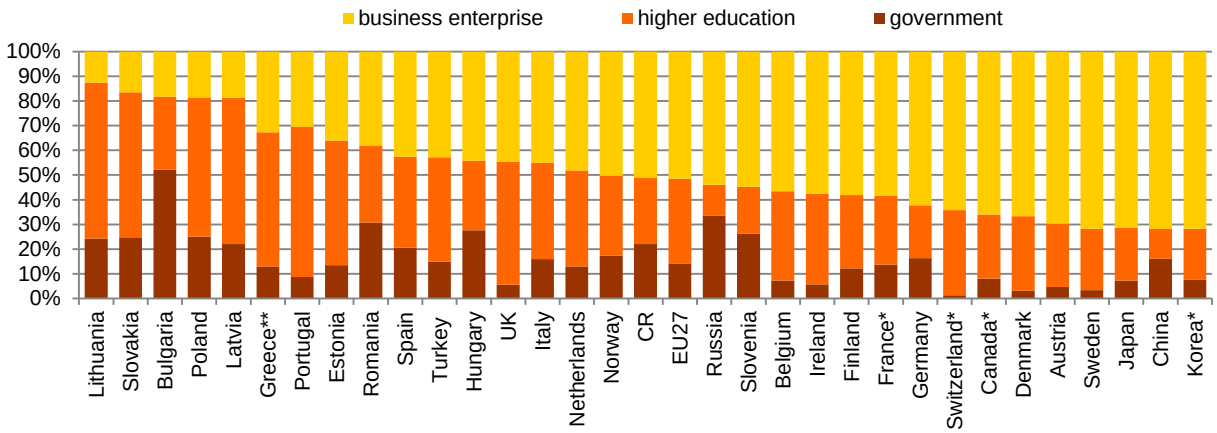


Note: In the Czech Republic the annual increase is calculated from the natural person count (HC) due to the change in FTE methodology, which significantly overrates the annual increase in FTE.
Source: OECD MSTI 2011/1, Eurostat 2011

The most significant increase of R&D personnel has been recorded in China, Portugal and Korea where their number increased about 10% annually on average in the period 2000-2009. The average increase in EU27 was 2.5%. Lithuania (0.3%), Slovakia (0.5%) and Latvia (0.1%) recorded only minimal increases and Japan, Netherlands, Poland, Romania and Russia recorded an average annual decrease.

The public sector in Lithuania, Slovakia, Bulgaria, Poland, Latvia and Greece employs more than 2/3 of R&D personnel. For example, in Bulgaria is 60% of R&D personnel employed in the government sector. The Czech Republic together with Norway and Netherlands belongs to states where the number of R&D personnel in the public and private sectors is more or less equal, which is also the case of the EU27 average. On the other hand, the private sector is dominant in Austria, Sweden, Japan, China and Korea with 70% of all R&D employees.

Chart B.7: R&D personnel by sector, 2009



Source: OECD MSTI 2011/1, Eurostat 2011

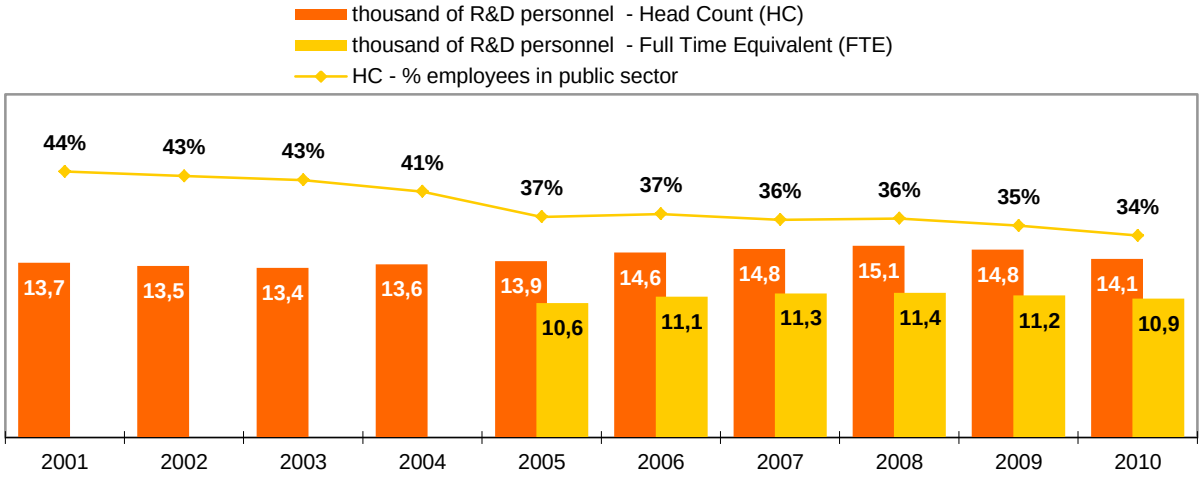
B. 1.2 R&D personnel in the government sector

Between 2001 and 2005 the number of R&D personnel in the government sector was ca. 13 500 persons (HC). Since 2005 there had been a slight increase which stopped in 2008 at 15 100. Since then the number is decreasing. In the last monitored year the number was 14 100 (HC). Within the public sector there has been a steady decrease in the share of government sector employees from 44% in 2001 to 34% in 2010. When converted to FTE the number drops to 11 000. On the contrary the number of R&D personnel in the higher education sector increased both in absolute and relative values (see chapter B.1.3).

The development of the number of R&D personnel copies the development of R&D expenditures in this sector – stagnation since 2007 with a small change in 2009 (see chapter A.1.4).In 2010 there were 6 000 researchers (57% of total sector R&D employees), 2 500 technicians (24%) and 2 000 other workers (18%).

During the whole period more than half of all R&D personnel in the government sector were employed in the AS CR institutes, in 2010 this was already 2/3 (7 200) of all sector R&D employees, 2 400 (22%) employees worked in the departmental research workplaces and 1 300 (11%) in other government sector workplaces.

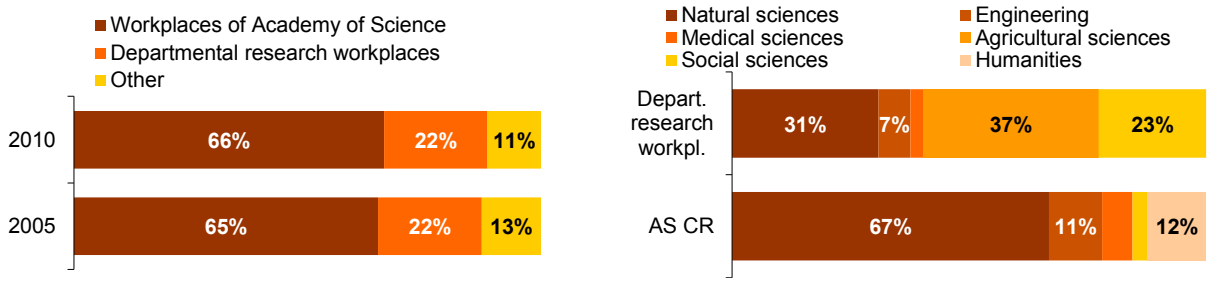
Chart B.8: R&D personnel in the government sector



Source: CZSO 2011 Annual Statistical Survey on Research and Development VTR 5-01

In 2010 most of the government sector R&D personnel worked in natural sciences (55%), 10 % worked in engineering and 13% in humanities. If we focus on individual types of research workplaces, we'll see that they vary greatly in their scientific focus. In the AS CR institutes the natural sciences dominate with 67% employees (4 800), followed by humanities (12%) and engineering (11%). On the other hand, in the departmental research workplaces agricultural sciences are the dominant field of study (37%), followed by natural sciences (31%) and social sciences (23%).

Chart B.9: Structure of R&D personnel in the government sector (FTE) by type of workplace and scientific discipline, 2010



Source: CZSO 2011 Annual Statistical Survey on Research and Development VTR 5-01

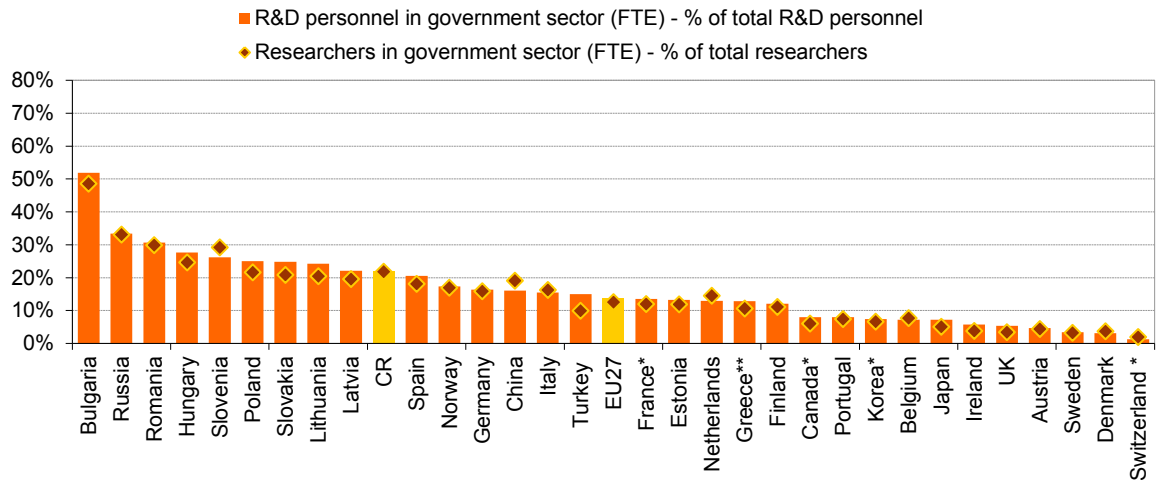
In 2010 70% (7600) of the employees in this sector had some type of university education; 3 500 had doctoral education and 4 100 master education.

International comparison

The highest share of government sector R&D personnel in total R&D personnel among the monitored countries was in Bulgaria with more than 50%. High values were reached in Russia and Romania, but the ratio was just above 30%. It can be stated that the post-communist countries in general have a high share of government sector R&D employees. The EU average is 14%; low values were recorded in Austria (5%), Denmark (4%), Sweden (4%) and Switzerland (1%).

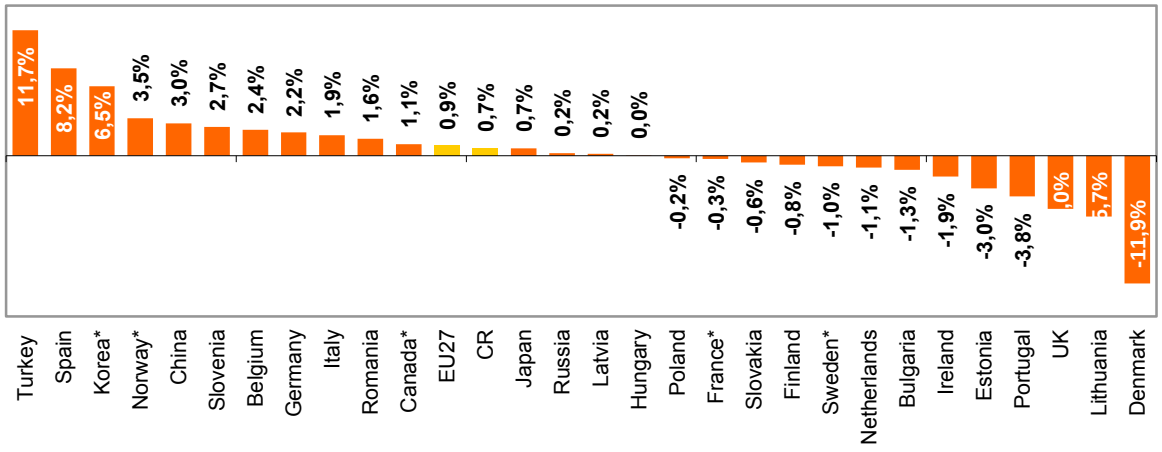
The highest increase between 2000 and 2009 was recorded in Spain (8.2%) and Korea (6.5%). In the Czech Republic the amount of government sector R&D personnel increased on average by 0.7% a year, i.e. slightly slower than in EU27 (0.9%). In many of the EU countries there had been a decrease in this amount; the number of government sector R&D personnel decreased the most in Denmark with an annual average of 11.9%.

Chart B.10: R&D personnel in the government sector (FTE), 2009



Source: OECD MSTI 2011/1, Eurostat 2011

Chart B.11: Average annual increase of R&D personnel in the government sector (FTE), 2000-2009 (%)



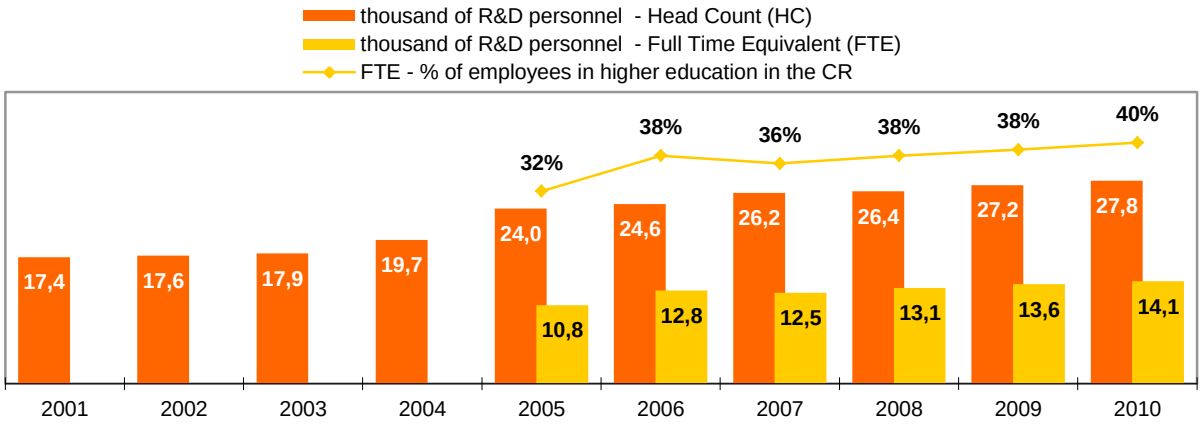
Note: in the Czech Republic the annual increase is calculated from the natural person count (HC) due to the change in FTE methodology, which significantly overrates the annual increase in FTE.
Source: OECD MSTI 2011/1, Eurostat 2011

B. 1.3 R&D personnel in the higher education sector

In 2010 there were almost 28 000 R&D personnel (HC) in the higher education sector, which represents a large increase since 2001 (by more than 10 000 persons). After the conversion to FTE the number drops to a half. In comparison to other sectors the higher education sector has the most part-time workers. These are mostly employees, who also perform pedagogical activities. In 2010 the higher education sector had 14 000 employees (FTE), i.e. 40% of all employees in this sector. As stated above the number of male and female employees is almost equal, as for university R&D personnel the share of women is 39%.

In 2010 the higher education sector R&D personnel comprised of 72% researchers (10 000 FTE), 21 % technicians (21%) and 7% other employees (1 000). Unlike the government sector the employees in university R&D are more evenly spread across all disciplines. Most people are employed in engineering (36%, 5000 FTE), followed by natural sciences and medical sciences (both 17%, 2400), humanities (1 700), social sciences (1 400) and agricultural sciences (900).

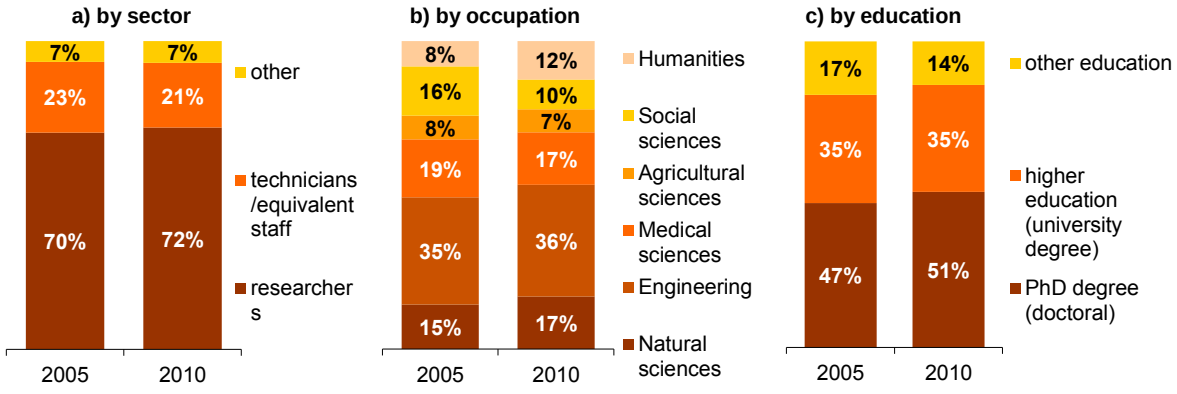
Chart B.12: R&D personnel in the higher education sector



Source: CZSO 2011 Annual Statistical Survey on Research and Development VTR 5-01

In 2010 86% of the R&D personnel in the higher education sector had some form of university education; more than half (51%) had doctoral education and 35% either master or bachelor education.

Chart B 13: Structure of R&D personnel in the higher education sector (FTE)

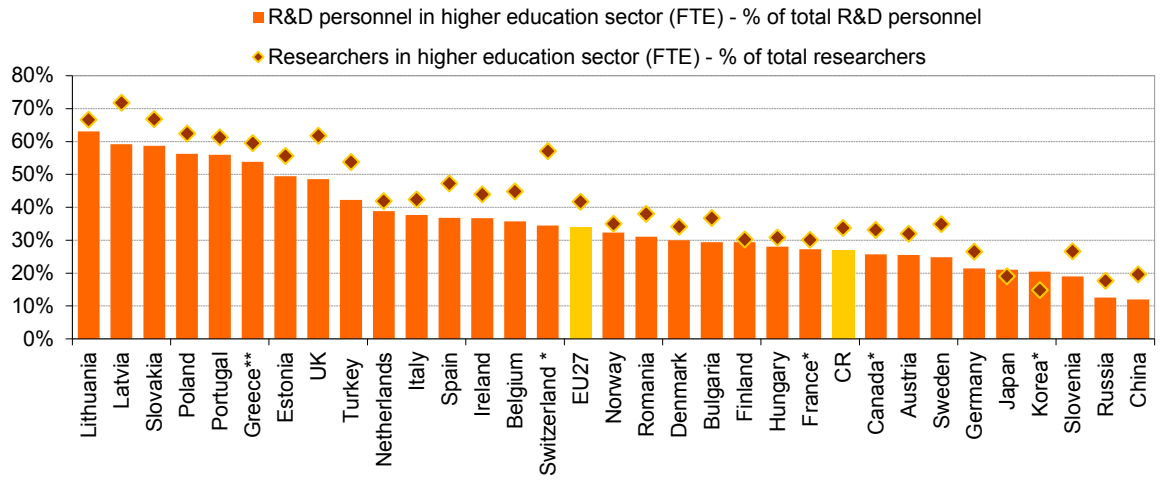


Source: CZSO 2011 Annual Statistical Survey on Research and Development VTR 5-01

International comparison

Slovakia, Latvia and Lithuania had the highest share of higher education sector R&D personnel in all R&D personnel with values around 60%. The EU27 average was 34%, the lowest values were in Slovenia (19%), Russia (13%) and China (12%).

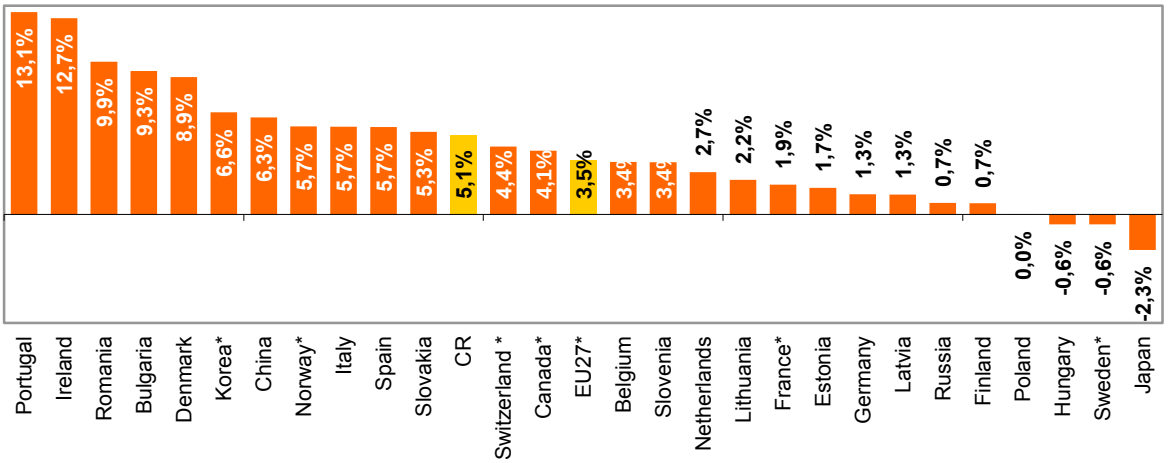
Chart B 14: Structure of R&D personnel in the higher education sector (FTE), 2009



Source: OECD MSTI 2011/1, Eurostat 2011

If we focus on researchers we'll see that in their case the higher education sector has a large share, namely 57%. Similar situation is in most of the monitored countries, i.e. there is larger share of university employees among researchers than among all R&D employees. The EU27 average is 42%, the value in the Czech Republic is 34%. With the exception of Japan, Hungary and Sweden the number of R&D personnel in the higher education sector increased between 2000 and 2009. Highest values were recorded in Portugal (13.1%), Ireland (12.7%) and Romania (9.9%). The EU average increase was 3.5% a year. In Poland the number of R&D personnel in the higher education sector stagnated.

Chart B 15: Average annual increase in the number of R&D personnel in the higher education sector (FTE), 2000-2009(%)



Note: in the Czech Republic the annual increase is calculated from the natural person count (HC) due to the change in FTE methodology, which significantly overrates the annual increase in FTE.
Source: OECD MSTI 2011/1, Eurostat 2011

B. 1.4 R&D personnel in the business enterprise sector

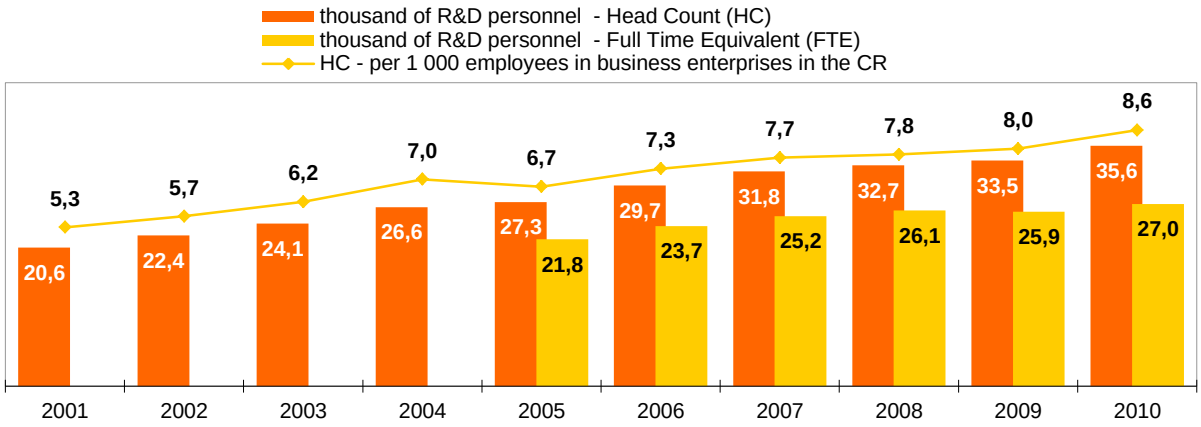
In 2010 there were almost 36 000 natural persons (HC) employed in the business enterprise sector R&D; this number increased by 15 000 since 2001. After conversion to the FTE indicator the number is 27 000 (FTE). In the same year there were 8.6 R&D workers per 1000 employees (HC) in the business enterprise sector; in 2001 this number was only 5.3. Unlike the previous two sectors, the business enterprise sector has only a small share of women (20%) which is a trend that has been observed in the past as well.

The structure of the business enterprise sector R&D personnel is completely different from the previous two sectors; in 2010 there were 47% researchers, 40% technicians and 13% other employees.

Unlike the previous two sectors the business enterprise sector has only 60% R&D personnel with university education and only 7% of employees with doctoral education.

Almost half of the business enterprise sector R&D personnel worked in companies with more than 250 employees (13 000, 47%), 36% were employed in companies with 50 -249 employees and 14% in companies with 10-49 employees. Only 3% worked in the smallest companies with less than 10 employees.

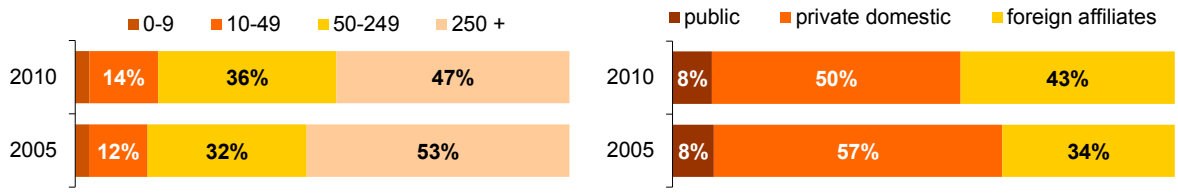
Chart B.16: R&D personnel in the business enterprise sector



Source: CZSO 2011 Annual Statistical Survey on Research and Development VTR 5-01

Most of the business enterprise sector R&D personnel work in domestic private enterprises. In 2010 their number was 13 400 (50%). 11 500 (43%) were employed in foreign owned companies and the remaining 2 000 in domestic public enterprises. In 2005 there were 57 % in domestic private enterprises and 34% in foreign owned companies.

Chart B 17: Structure of R&D personnel in the business enterprise sector (FTE) by company size (number of employees)



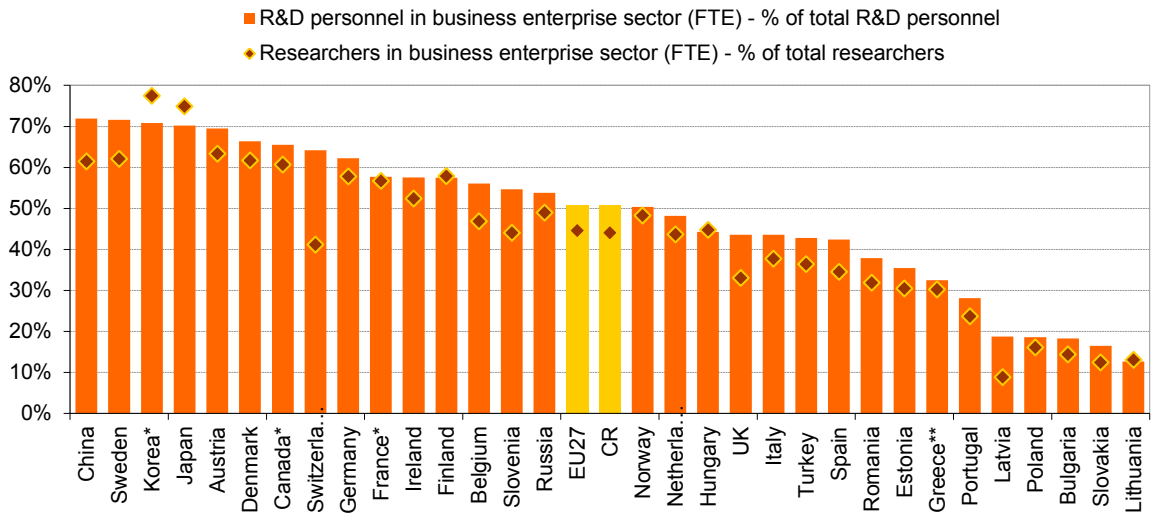
Source: CZSO 2011 Annual Statistical Survey on Research and Development VTR 5-01

As for the economic activities in 2010 the major part of R&D personnel worked in the manufacturing industry (15 000, 42%), primarily in automotive (3 100, 9%) and engineering (2 500, 7%). Almost 12 000 employees worked in the R&D of services.

International comparison

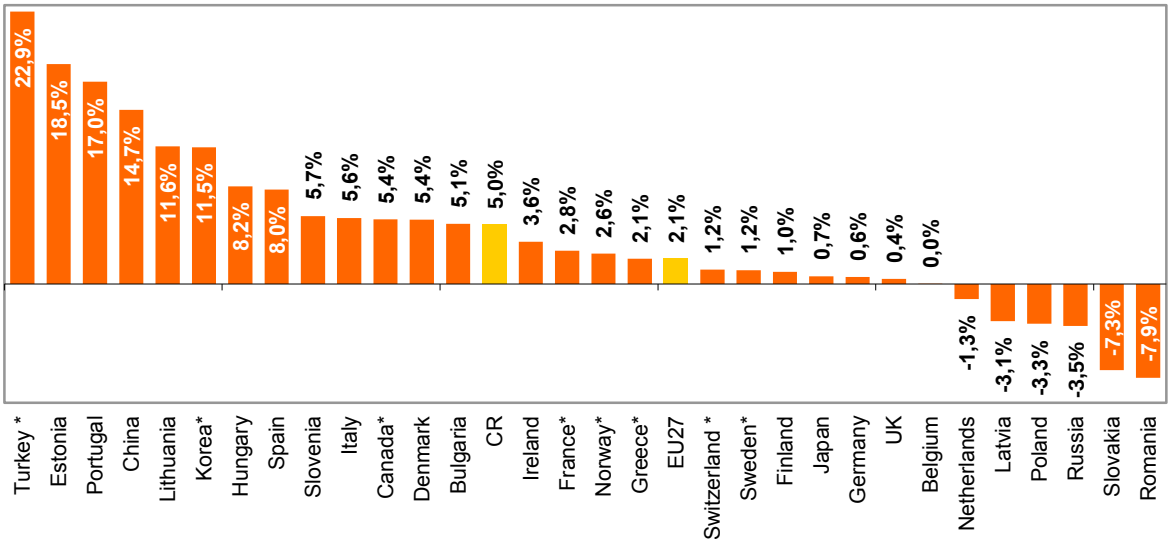
In 2009 the highest share of business enterprise sector R&D personnel in all R&D personnel was recorded in Sweden, China and Korea with values over 70%. The value in the Czech Republic (51%) was almost the same as in Norway or the EU27 average. Very low values of less than 20% have been recorded in Latvia, Slovakia, Poland, Bulgaria and Lithuania.

Chart B.18: R&D personnel in the business enterprise sector (FTE), 2009



Source: OECD MSTI 2011/1, Eurostat 2011

Chart B 19: Average annual increase in the number of R&D personnel in the business enterprise sector (FTE), 2000-2009(%)



Note: in the Czech Republic the annual increase is calculated from the natural person count (HC) due to the change in FTE methodology, which significantly overrates the annual increase in FTE.
Source: OECD MSTI 2011/1, Eurostat 2011

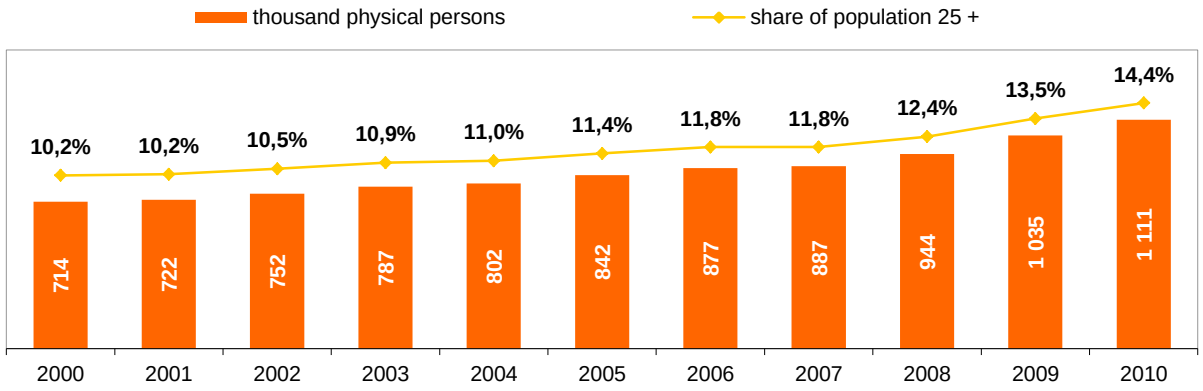
B.2 University education

As mentioned in the chapters above, there are 69 % of university educated persons in the R&D personnel and there are 90 % of such educated people among research employees. All university educated people of course cannot be expected to work currently or in the future in R&D but they are potential sources for this field and they do participate substantially in the creation of the new knowledge and technologies. This chapter contains information about current numbers of people with university level education as well as about students and graduates of tertiary education. It will have look in detail at natural and technical sciences which may be regarded as the key domains for R&D (demonstrated by 75 % of employees of R&D working in these domains in 2010).

B.2.1 Persons with finished university education

The amount of university educated people increases every year. In 2010 there were almost 1 million 111 thousand people with a university degree in a population older than 25 years, that means 14.4 % of population of this age (which was chosen for a probability of a completed education). In the beginning of the monitored period, in the year 2000, approximately 714 thousand persons - 10 % of the population - had a university degree. The overbalance of the male over female among university educated people was more significant in 2005 than today. In 2000 the ratio was 59 % of male to 41 % of female. In 2010 the ratio was more balanced - 54 men and 46 women in 100 university educated people.

Chart B.20: Persons with finished university education aged 25 and above

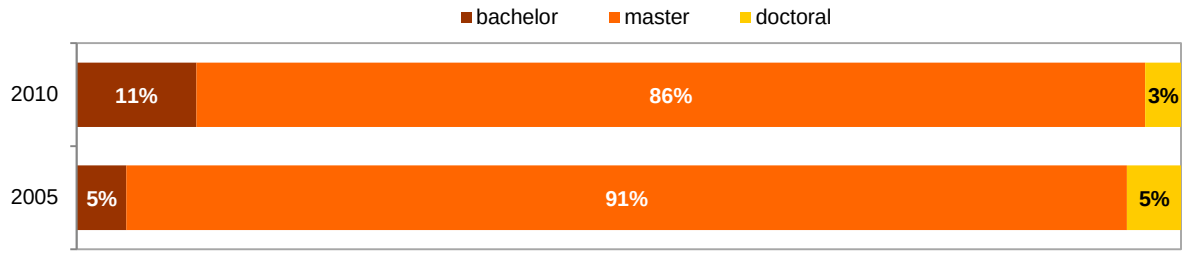


Source: CZSO 2011, Selective survey of the workforce

In a long term there is a majority of people with a master degree in a university educated population. In 2010 there were 86 % of people with a master degree, 11 % of people with a bachelor degree and the rest of 3 % of the university educated population with doctoral education. During years there were changes in the structure of the university educated population - in the favor of the bachelor degree. This drift was caused by the changes of the structure of the offered study programs. Even before 10 years the bachelor study programs were exceptional and the university study was possible mostly in 5-years master programs.

In the university educated population is the majority of people educated in the fields of social science, commerce and law and technical science, technology and civil engineering (both of 25 %), pedagogy education has 17 % of university educated people and 8 % is educated in natural science.

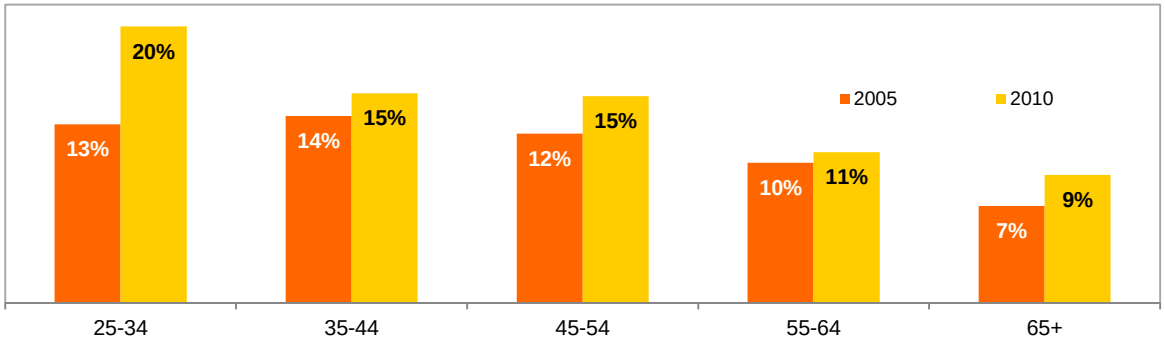
Chart B.21: Persons with university education by type of study program



Source: CZSO 2011, Selective survey of the workforce

In 2010 the highest ratio of the university educated people was in the population of the age 25-34 years where people with such education comprised 20 % and the increase of 7 percent points was recorded in comparison with the year 2005. The increase of the university educated people in the population was noted also in other age groups. In 2010 the university educated people occupied app. 15 % of the persons in the age of 35-54 years and 10 % of the persons in post-productive age.

Chart B.22: Persons with university education by age (% of persons in a given age group)



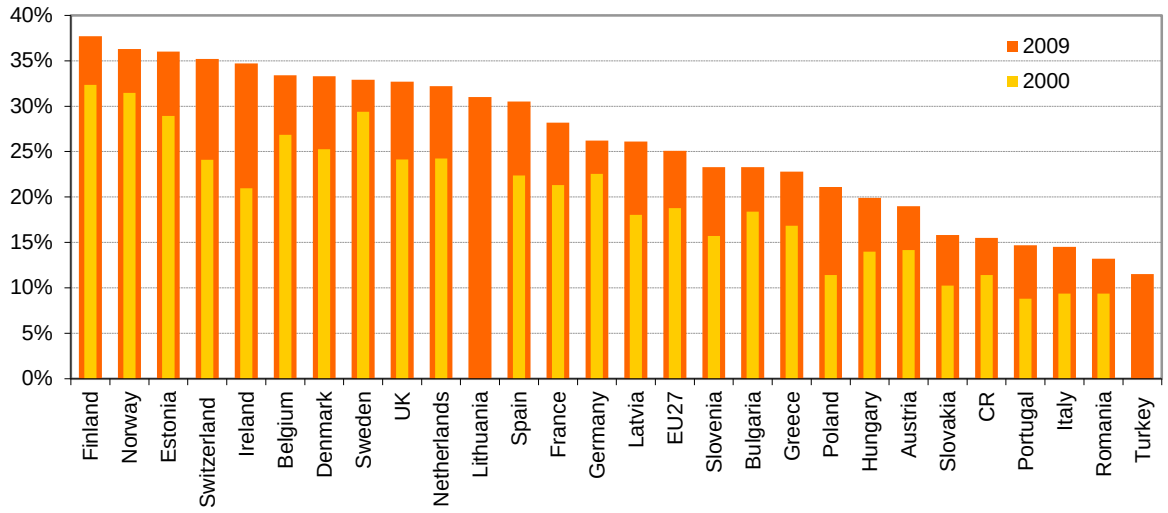
Source: CZSO 2011, Selective survey of the workforce

International comparison

The rate of university educated people in the population of Czech Republic is in the long term deep below the European average. In 2009 there was 15.5 % of the population with obtained university level education. The EU27 average was 25 % in the same year - the highest proportion was reached in Finland, Norway and Estonia where more than 35 % of the population was university educated. Since 2000 the abovementioned ratio has increased in all watched countries. The highest growth was recorded in the case of Ireland where the ratio of university educated persons in the population has increased by almost 14 percentage points.

The Czech Republic is one of the countries with the lowest rate of university educated persons in the population; however the situation is totally different regarding people with at least secondary education. In 2009 91 % of the population had at least secondary education. Same rate was obtained in the Lithuania and in the Slovakia. The EU27 average is 72 % of people with at least secondary education in the population. The lowest ratios of people with at least secondary education have the Spain (52 %), Italy (54 %), Portugal (30 %) and Turkey (28 %) whereas the last three of them have also very low representation of university educated people in their populations (less than 15 %).

Chart B.23: Persons with finished tertiary education aged 25-64 years (% of 25-64 population)



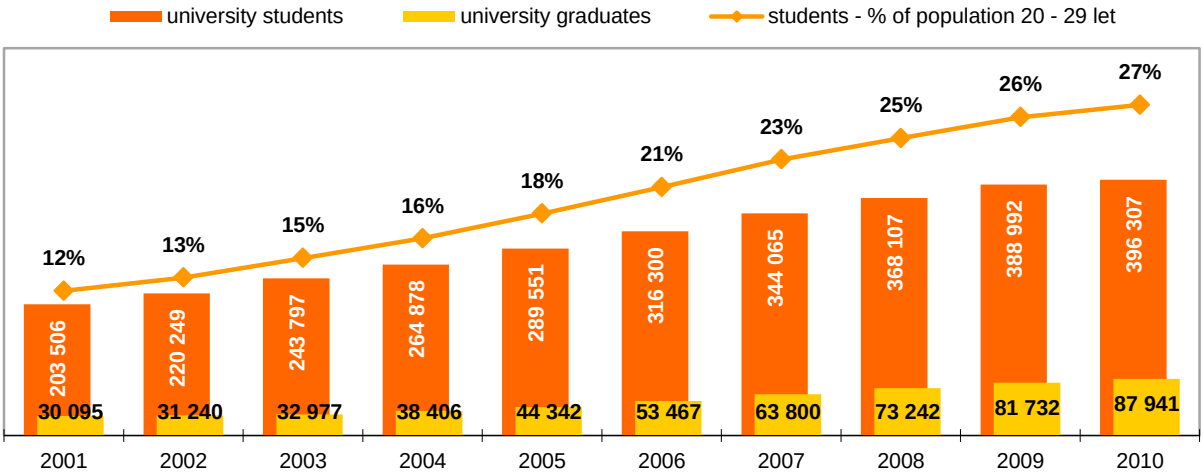
Source: Eurostat 2011,

B.2.2 University students and graduates

In last ten years the number of university students (bachelor, master and doctoral level) in the Czech Republic has been increasing constantly - from 2001 the number of university students almost doubled to almost 400 thousand students in 2010. We can call abrupt not only the increase of absolute value, but also ratio indicator - the representation of university students in the population of 20-29 years old. Whereas there were 12 % of university students in young population in 2001, in 2010 there were more than 27 % of university students in this group. More significant than the number of students was the increase of female students in absolute numbers. There were 98 thousand of them in the beginning of watched period in the year 2001 and more than 221 thousand in 2010 (representing 56 % of all university students). Since 2001, when there were 48 % of female students between university students, their representation among university students has increased considerably.

While the number of university students almost doubled between years 2001-2010, the number of graduates in the same period increased almost three times. In 2001 more than 30 thousand students has graduated university in the Czech Republic, in 2010 there were almost 88 thousand of the graduates. Such a distinct increase of graduates may be partly due to split up of the master level to two levels and a majority of bachelor level graduates continues their studies in the follow-up master level program. Representation of women among the university graduates was more than 50 % for whole watched period (in 2001 women constitute 51 % of all graduates and after 9 years, in 2010, even 60 %). From the fact of higher representation of female graduates than female students may be deducted their higher success at finishing university studies.

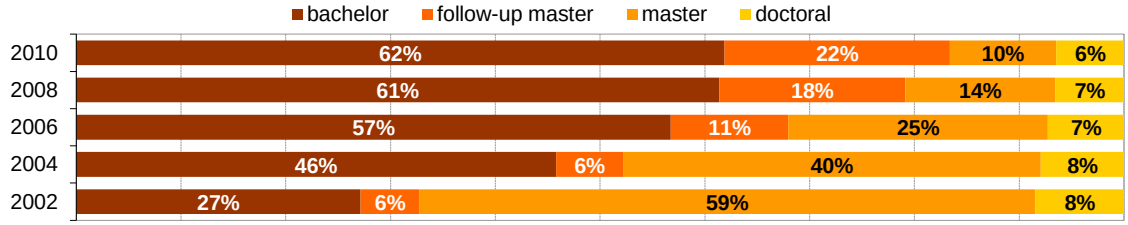
Chart B.24: University students and graduates in the Czech Republic



Source: Institute for Information in Education

The three-stage structure of university level education has been strictly appointed in 2001 when previously characteristic 4-6years university education has been transformed to usually triennial bachelor level study programs and to master level study programs. There are two types of the master level programs – the follow-up master programs, which enable the bachelor level graduates to continue in their education ant so called long master programs, where it was impossible to divide the program in two parts. In 2010 there were 62% bachelor level and 22 follow-up master level students. Only 10% were in the long master programs.

Chart B.25: University students by study program type



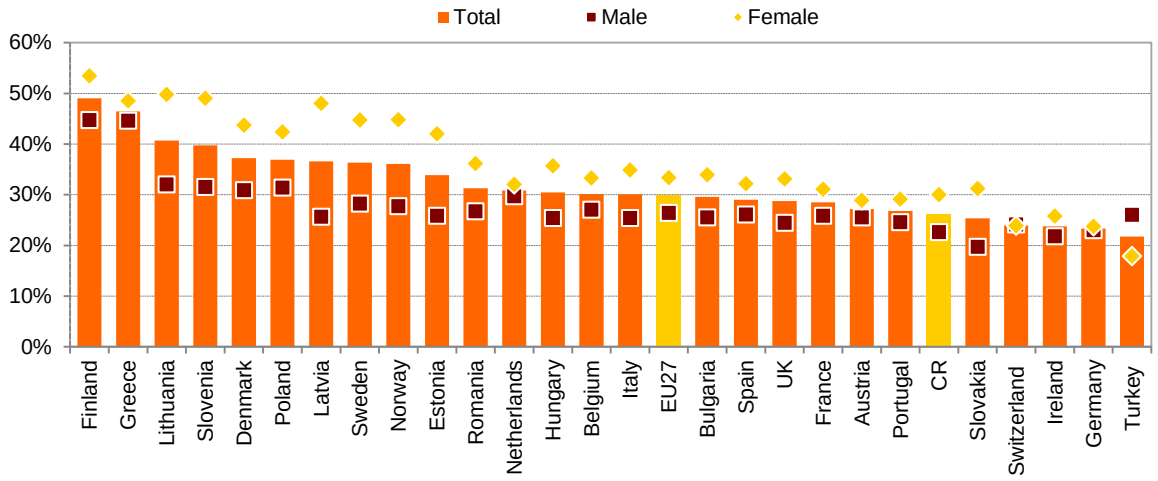
Source: Institute for Information in Education

In the long term most students are interested in social sciences, economy and law; in 2010 there were 137 000 students in these programs, which was 34% of the total number of students. Compared to 2001 there has been a 160% increase in the number of persons studying these programs as well as natural sciences and services. On the contrary the increase in the number of technical science students has been negligible (17%). In 2001 the social sciences had a 26% share in the total number of students, followed by technical sciences with 24%. However, in 2010 the share of technical sciences was only 15% (59 000). At the doctoral level the most popular programs are natural sciences, mathematics and informatics, which were studied by more than 7 000 doctoral students, followed by technical sciences and construction with more than 5 000 students. Social sciences, economy and law were third with 4 500 students.

The countries with the highest share of university educated persons in population in 2008 were Finland (49%), Greece (46%), Lithuania (41%) or Slovenia (40%). The Czech Republic with its 26% was below the EU average of 30%. In the monitored states there are in general more students of tertiary education among

women of 20-29 years than among men of the same age. In Latvia there is a 48% share of students among women and only 26% among men. The only exceptions are Germany and Switzerland where the shares are equal and Turkey, which has 26% students among men and only 18% among women.

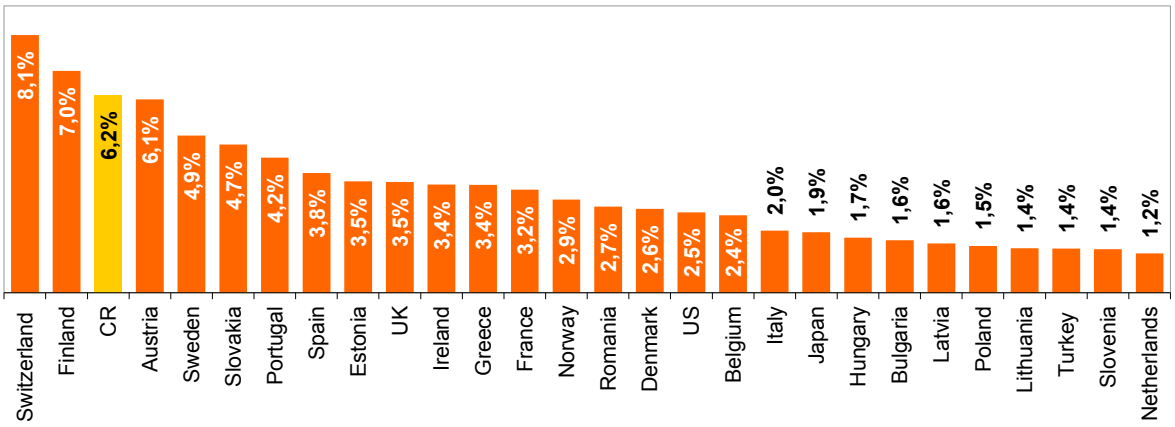
Chart B.26: Tertiary education students, 2008 (% of population 20-29 years)



Source: Eurostat 2011

Students of the doctoral programs made up 6.2% of all tertiary education students in the Czech Republic in 2008. Only Switzerland and Finland have higher values. On the other had low values were recorded in Lithuania, Turkey, Netherlands and Slovenia, where they are below 1.5%.

Chart B.27: Students in doctoral programs, 2008 (% of all tertiary level students)



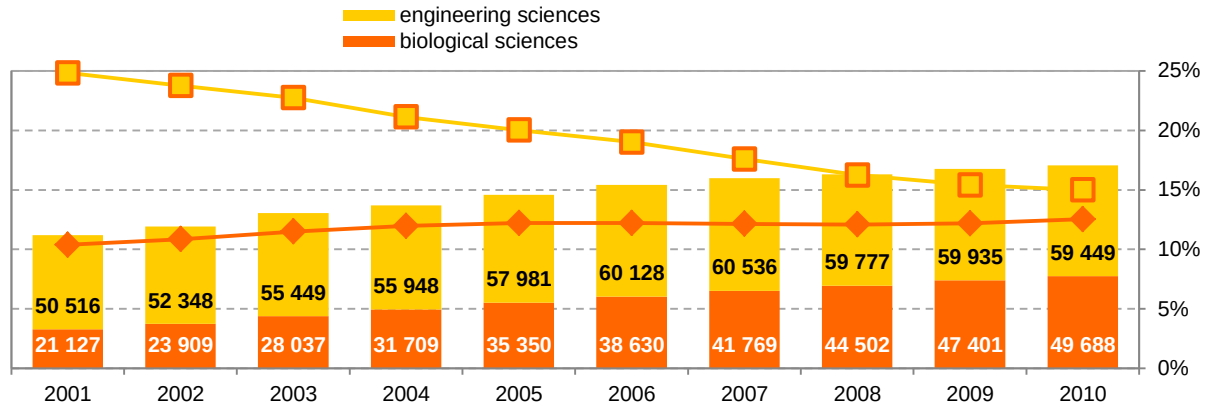
Source: Eurostat 2011

B.2.3 University students and graduates in natural and technical sciences

The narrowest base in human resources measurements comprises of university educated persons in natural and emineering sciences, therefore we shall concentrate on them.

In 2010 there were ca. 109 000 students of natural and engineering sciences. Since 2001, where there were 71 000 we have seen a steady increase in their number. However, the natural sciences have shown a significantly higher growth rate. The number of engineering sciences students more or less stagnated. Since 2001 the number of natural sciences students increased from 21 000 to 50 000 (135%) and the number of engineering sciences students increased from 50 000 to 59 000 (17%) in 2010.

Chart B.28: Students in natural and technical sciences programs



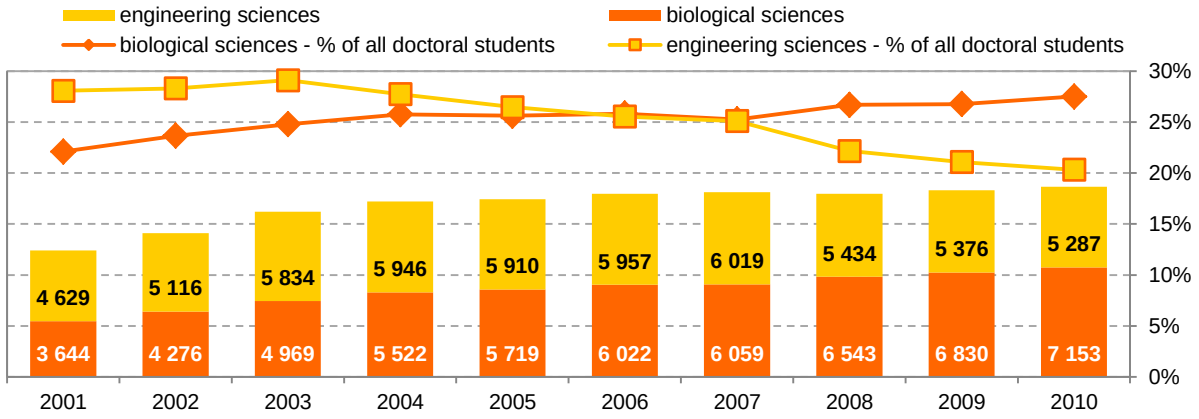
Source: Institute for Information in Education

In 2010 there were 49 000 students in mathematics, informatics and natural sciences programs with the majority of men with 64%. In 2010 there also were 12% of foreign students. Among this group of students the most popular program is informatics with 45% students, 26% studied inorganic sciences and 21 organic sciences. The smallest number of students studies mathematics and statistics - only 9%.

59 000 people studied engineering sciences in 2010, with the majority of them being men (75%); foreign students made up 7%. The most popular program is engineering (55%), followed by architecture and construction (32%) and manufacturing (13%).

In 2010 there were more than 12 000 doctoral students in these programs, which is 48% of all doctoral students. Since 2001 the share of doctoral students in these programs in the number of all doctoral students decreased by 2 percentage points. In natural sciences there were 42% of female doctoral students, in engineering sciences 23%. In the case of natural science doctoral students this ratio is above the average of all study programs.

Chart B.29: Doctoral students in natural and technical sciences programs

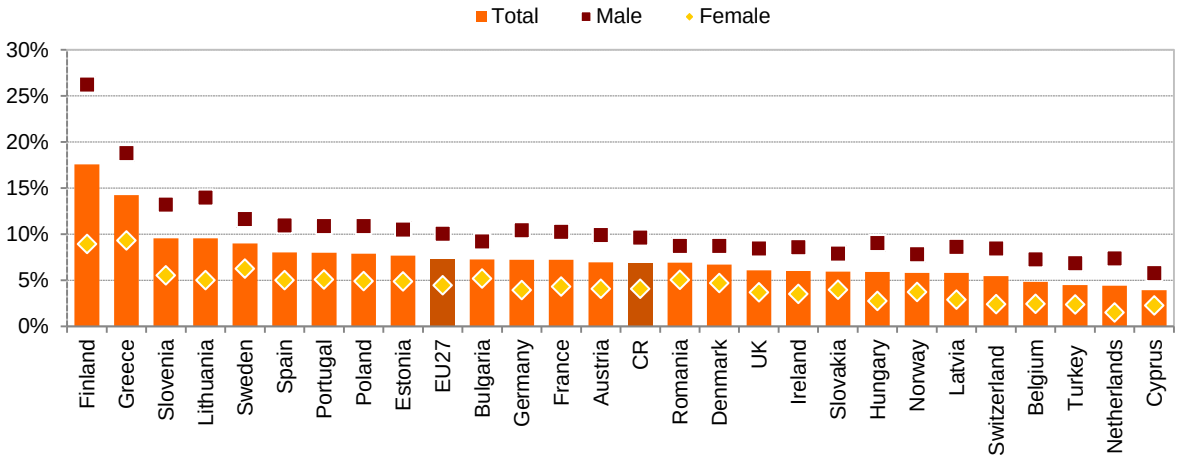


Source: Institute for Information in Education

International comparison

In Finland in 2008 the students in natural and engineering sciences made up 18% of the population aged 20-29, which was the highest value of all monitored states. Relatively high values were recorded in Greece (14%), Lithuania (10%) and Slovenia (10%). As was already stated above, the share of students is higher among women than among men. This is not true in the case of technical sciences. In all the monitored states the share of students was higher among men than among women.The highest gender difference was in Finland where there were 26% of students among men and only 9% among women.

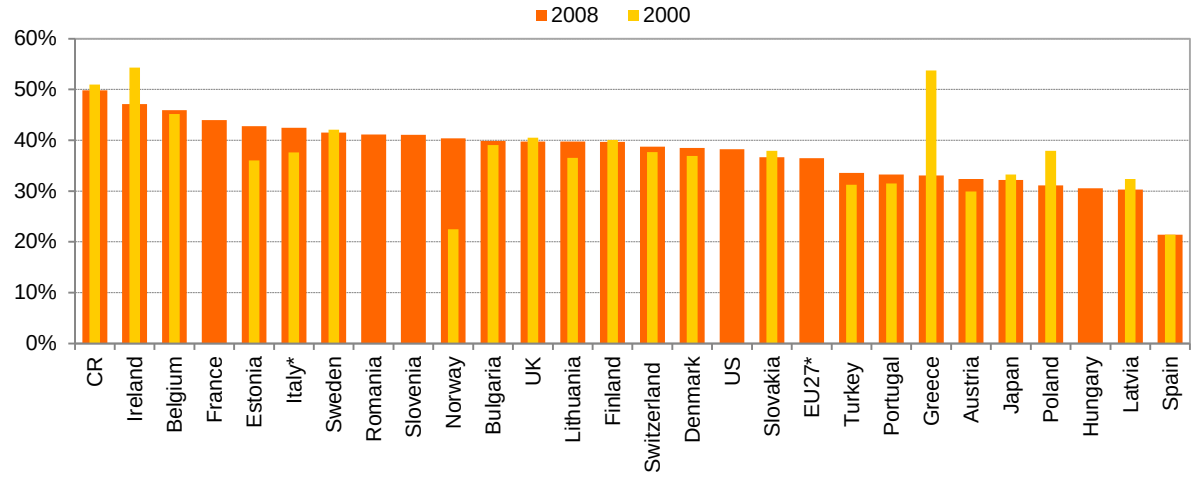
Chart B.30: Students of tertiary level education in technical and natural sciences, 2008 (% population aged 20-29)



Source: Eurostat 2011

In 2008 the share of doctoral students of technical and natural sciences in the total number of doctoral students was the highest in the Czech Republic (50%), Ireland (47%) and Belgium (46%). On the other hand low values were recorded in Hungary (31%), Latvia (30%) and Spain (21%). The EU27 average was 36%. The highest increase in this value compared to 2000 was recorded in Norway, where this share increased from 22% to 40%. On the other hand the highest decrease was recorded in Greece – from 54% in 2000 to 33% in 2008.

Chart B.31: Doctoral students of technical and natural sciences (% of all doctoral students)



Source: Eurostat 2011

B.3 Summary

Researchers are considered to be the most important group of employees in R&D; without them no new knowledge would be created. Their R&D activities must be supported by other employees, be it other experts, technicians, administrative staff or management. The share of researcher varies per individual sectors. The lowest share of researchers is among the business enterprise sector R&D personnel (47%). In government sector this share is 57% and in the case of university research the researchers are a dominant group of employees with 72%.

Although the number of Czech R&D personnel increased steadily through the whole monitored period, in the case of researchers there was a decrease by more than 1 000 RTE employees between 2008 and 2009. The decrease is mainly due to the situation in the business and government sector. The higher education sector is the only sector, where the number of researchers increased between 2008 and 2009 (by 400 people). The number of researcher grew again in 2010 by 400 persons.

Among the R&D personnel there is a large share of university educated persons – only 31% of the employees have a lower education. This is also due to the nature of the activities, which are closely connected to R&D. The highest share of university educated persons is in the higher education sector, which is caused by the main functions of the universities – education and science.

The increasing education level of the population and the flexibility of the workforce have a positive effect on the competitiveness of the Czech economy. Although we have much less of human resources with university education than the other advanced European countries, where the values are commonly between 30 and 40%, the ratio of persons with finished high school education places us very high in the international statistics. The Czech Republic has more than 90% share of high-school educated persons in population of 25-64 years. With the increasing number of university students it can be expected that there will be an increase in the number of persons with tertiary education in the population. However, the question of the quality of the education remains.

Also very important for the development of science is the structure of programs studied by the university students. Technical, natural and medical sciences are considered as the base for creating new knowledge and R&D results. During the years the number of university students has been increasing; however there has also been a change in the structure of programs. Young people are less interested in engineering sciences and the increase in medical and natural science students has been negligible. On the other hand, the students are more interested in social sciences, economy, law and humanities, which also reflects in the structure of population with tertiary education – between 2000 and 2010 the share of persons educated in engineering or natural sciences decreased by 6 percentage points and the number of persons educated in social sciences increased.

C R&D outputs

This chapter includes a summary of results generated within the Czech R&D IS. The source of data is the Information Register of R&D Results (RIV), which gathers information about the outputs of R&D programs and projects funded by public sources. The Register includes mainly data on the output and the project which led to this result, the source of its funding, beneficiary, authors, type of result, its name and description, year and confidentiality level of the data. The R&D IS is operated by the RVVI.[24]

The overviews of R&D outputs are sorted by a number of criteria: disciplines, result types, authors and funding providers. Time series are also presented to indicate the dynamic of R&D in a wider scope. To evaluate the total value and structure of Czech R&D at the international level we will use the Thomson Reuters Web of Science (WoS database *Science Citation Index*, *Social Sciences Citation* Index and *Arts & Humanities Citation Index*), which now include more than 10 000 periodicals. Data for international comparison was gathered through the TR inCites analytical tool. TR Essential Science Indicators (ESI), which defines 22 R&D branches, was used to describe the R&D outputs sorted by departmental structure.

The source of data on patent activity was the Industrial Property Office (UPV), which ensures patent protection in the Czech Republic. The CZSO in cooperation with UPV publishes detailed statistic data in various classifications according to the Patent Manual (OECD, Paris 2009). Data used in international comparisons come from Eurostat and OECD. Detailed information (data, definitions, methodology) are available at http://www.czso.cz/csu/redakce.nsf/i/patentova_statistika.

Information about granted licenses is monitored by the CZSO since 2004 through the annual survey on licenses (LIC 5-01). The aim of this survey is to determine the amount of license agreements on the provision or acquisition of a right to some type of industrial right protection valid in the Czech Republic and the value of received or paid license fees for the provision or acquisition of such right. Detailed information (data, definitions, methodology) are available at http://www.czso.cz/csu/redakce.nsf/i/licence.

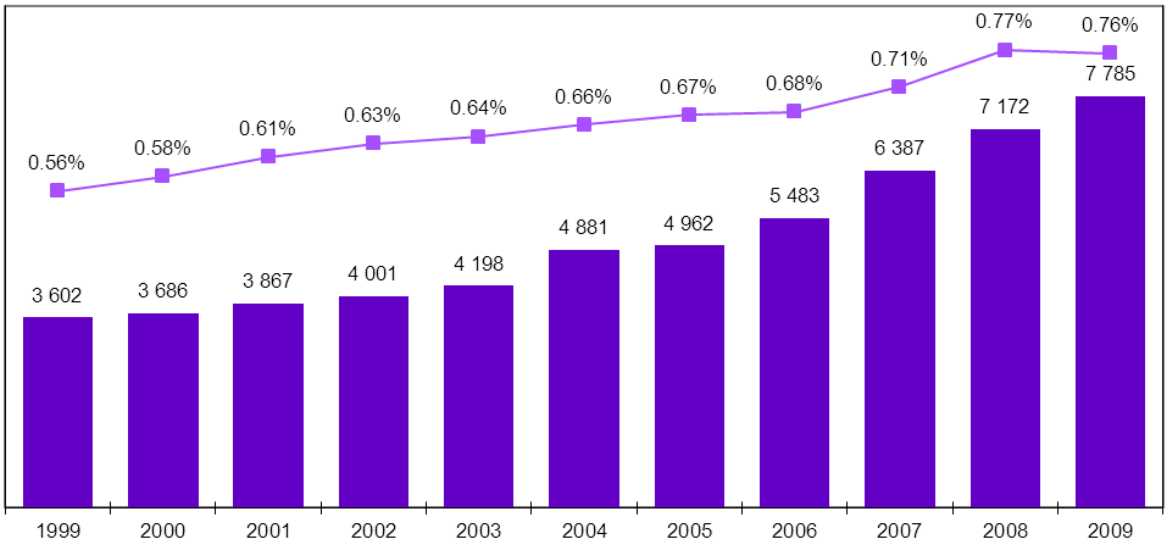
[24] The R&D IS is defined in the Act No. 130/2002 Coll., on the Support of Research and Development from Public Funds and on the Amendment to Some Related Acts (the Act on the Support of Research and Development) and its implementing provision in the form of Government Regulation No. 397/2009 Coll. on an information system for research, experimental development and innovation.

C.1 Bibliometry

C.1.1 Share of the Czech Republic in the international production of publications in R&D

The number of publications registered in the Thomson Reuters[25] by Czech authors increased by 116% during the last ten years (1999-2009). This dynamic increase was also reflected in the increased share of the Czech Republic in the total world production of publications. While in 1999 this share was 0.56%, in 2009 it was 0.76% of the total world production of publications. When compared to the EU15 the increase is even higher - by 0.8 percentage point. This trend shows that the Czech R&D's importance is increasing within the world production of publications.

Chart C.1: Total number of publications by Czech authors in the years 1999-2009 and its share in total world production.



Source: Thomson Reuters Web of Science

Apart from the share of the Czech Republic in the total world production of publications another important indicator of the quality of national research is the importance of the published knowledge in the international context. This is measured by the number of references to this publication, i.e. the utilization rate of this knowledge by other researchers and relevance to the international context.[26] The frequency of citation depends on the departmental citation practices and on the speed of publication of new knowledge. In general the dynamic disciplines have higher citation rate. Citation rate which is independent on discipline type can be calculated by the normalization of the number of citation to the global averages within individual disciplines.[27] The field normalized citation rate of 100% means that it is equal to the global

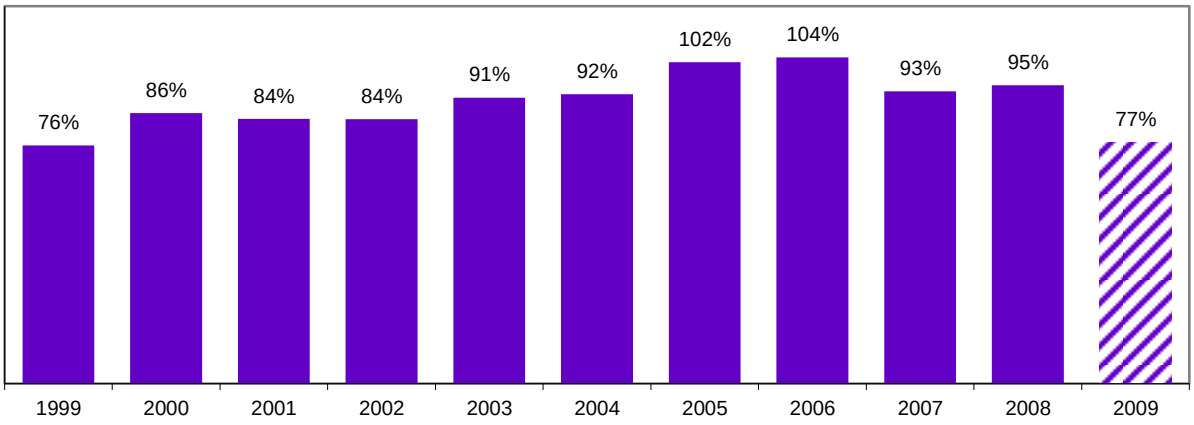
[25] Records in databases WoS *Science Citation Index*, *Social Sciences Citation Index and Arts & Humanities Citation Index* with the suffix CU='CZECH REPUBLIC'. In accordance with the bibliometric part of the „International Audit of Czech R&D and implementation of its results into strategic documents " performed by Technopolis consortium (*Bibliometric Analysis of the Czech Republic Research Output in an International Context -Institutional Analysis*, Annex 8 to the Second Interim Report) only documents of the type 'Article', 'Letter', 'Note' a 'Review' are counted.

[26] E.Garfield, *Citation Indexing. Its theory and application in science, technology, and humanities*, Wiley New York 1979.

[27] Normalization of citation values can be done as a ratio of sums of citations and sums of global averages for given publication group ("crown" indicator used by the Centre for Science and Technology Studies, University Leiden) or the relative number of citations to publications from a specific unit, compared to the world average of citations to

average. Values below 100% indicate below-average importance, values above 100% show above-average relevance of the publication. The chart C.2 shows a time series of item oriented citation score of Czech publications between 1999 and 2009. The time series clearly shows the growth of the Czech R&D excellence. Since 2004 the average normalized citation score exceeded the global average. The 2007 and 2008 values and especially the extremely low value in 2009 are due to the short time period since the publishing of the publications. Although the normalized citation scores are adjusted for field specific citation practices it is necessary to bear in mind that the WoS coverage is not even for all disciplines. While the coverage of natural sciences and biomedicine is 80-100%, coverage of engineering, applied physics and mathematics is estimated at 60-80%. Also less than 1/3 of all publication in social sciences and humanities is recorded in the Social Sciences Citation Index and Arts & Humanities Citation Index databases.

Chart C.2: Item oriented citation score of publications by Czech authors in 1999-2009

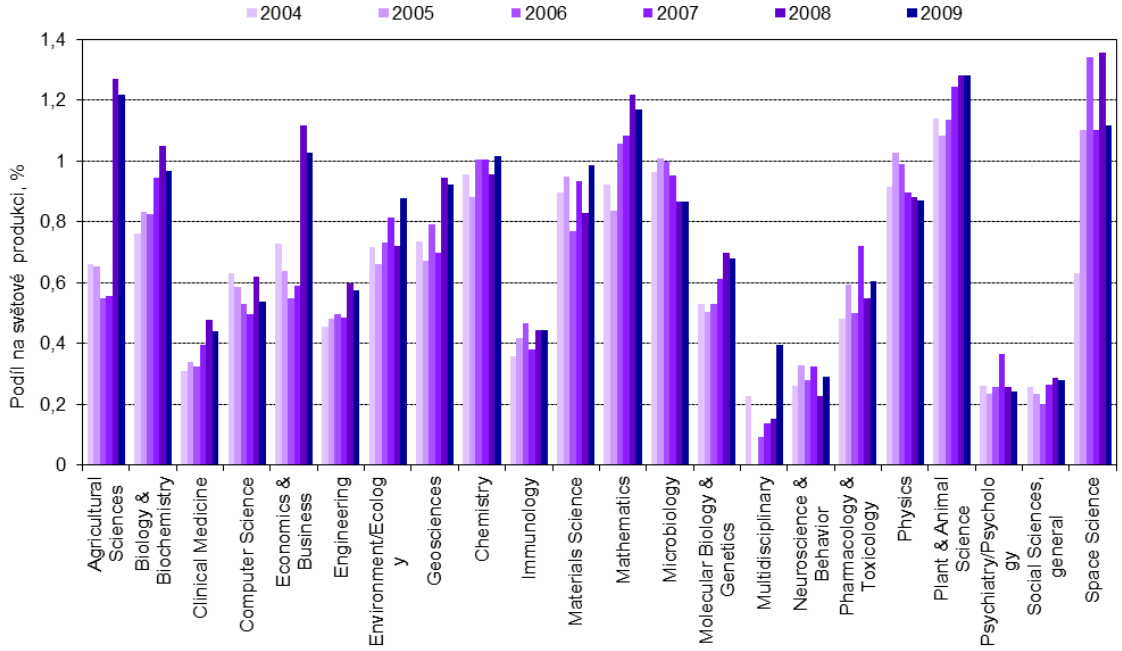


Source: Thomson Reuters Web of Science

As for the subject structure of the publications (according to ESI classification) in most disciplines there was an increase of the Czech share in global production between 2004 and 2009. This share almost doubled in agricultural sciences and economy. Thanks to this increase the agricultural sciences are now together with mathematics, botany and zoology and space sciences in the group of disciplines with the highest national share in global production. On the other hand the stagnation of the Czech share is apparent in IT, social sciences, neurosciences and psychiatry/psychology.

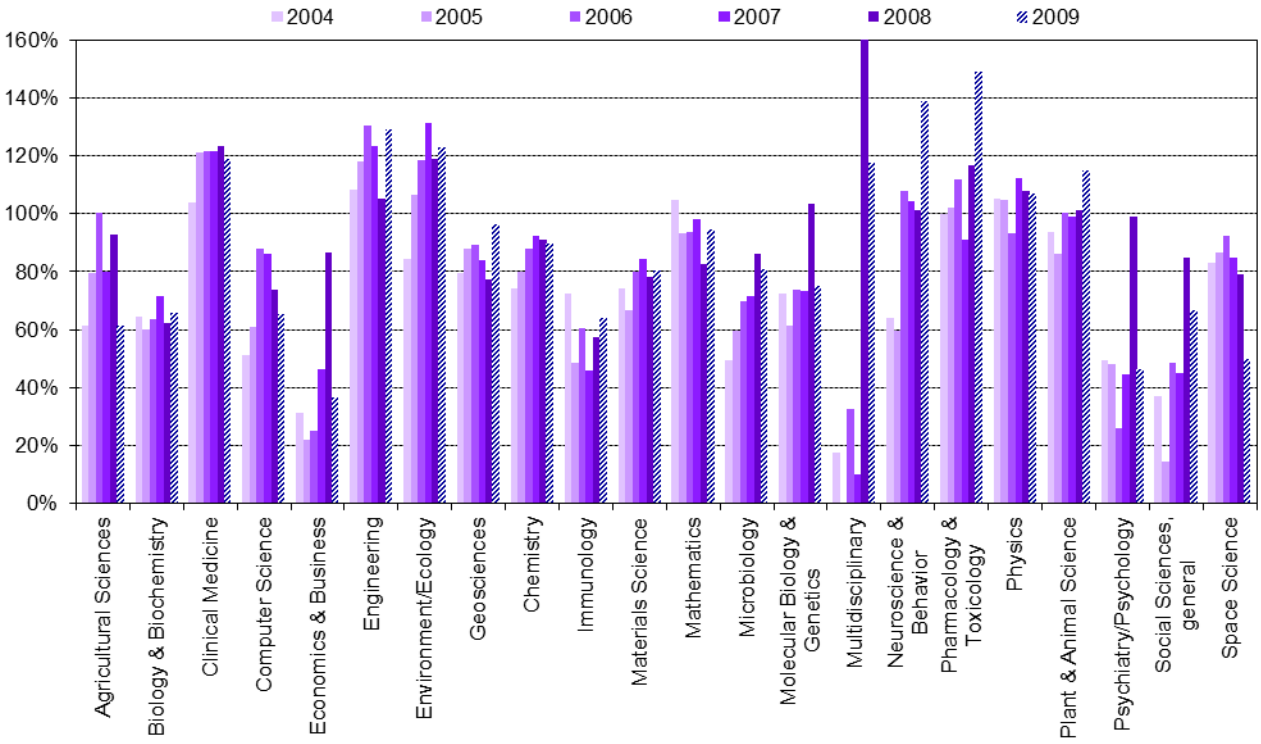
publications of the same document type, age and subject area ("item oriented" indicator used by the Karolinska Institutet, Sweden). For details see http://kib.ki.se/sites/kib.ki.se/files/Bibliometric_indicators_definitions_1.0.pdf.

Chart C.3: Share of Czech publications in global production in the years 2004-2009 by discipline



Source: Thomson Reuters Web of Science

Chart C.4: Item oriented citation score of Czech publications in 2004-2009 by disciplines



Note: the citation score in 2009 is influenced by a significant statistical uncertainty due to a short time period since the publishing
Source: Thomson Reuters Web of Science

When comparing the impact of publications by Czech authors in individual disciplines, measured by the item oriented citation score of Czech publications from years 2004-2009 in 2010, we can observe that in the long term there are above-average citation scores for clinical medicine, technical sciences and environment/ecology. Positive development of the impact of Czech publications can be observed also in economy, social sciences, neurosciences and psychiatry/psychology, which are among the disciplines with fastest growing citation score. In case of economy the fast growth is also caused by a significant increase in the number of publications compared to the world. On the other hand in disciplines such as IT, technical sciences, and Earth sciences there has been a systematic decrease in the citation score since 2006; in the case of IT this decrease is also accompanied by the stagnation of the share of publications in the global amount.

International comparison

In the international comparison of publishing activity relative to population (Chart C.5) the Czech Republic reached values comparable to the EU27 average, Italy and Portugal in 2009. When compared to the new EU countries higher values can be found in Estonia (by 0.1) and Slovenia (with twice as much publications). Highest values per population are in Switzerland, Scandinavian countries and Netherlands. When comparing the publishing activity relative to the number of FTE workers the position of the Czech Republic is similar, albeit slightly above the EU27 average. This data shows that the Czech Republic isn't among the European or global outsiders regarding the number of publication and relative to its R&D sector size achieves similar relative values as e.g. Finland or the UK.

However, when comparing the impact of Czech publication the situation is quite different. There are much bigger differences between the Czech Republic and the original EU member states in the relative number of citations (chart C.6) again relative to population and the number of FTE R&D workers. In number of citations relative to population we are below the EU average by ca. 1/3 and have only half of the value achieved by Germany.

Based on the international comparison of publishing activity it is possible to state that the Czech Republic steadily improves its standing in the context of international R&D. The data in this chapter present only a limited picture of the results generated in the Czech R&D, in which disciplines, by which institutions and whether and how does this structure change in time. These aspects will be covered in the next chapters.

Chart C.5 Publication production of selected countries relative to population and the number of FTE R&D* workers in 2009

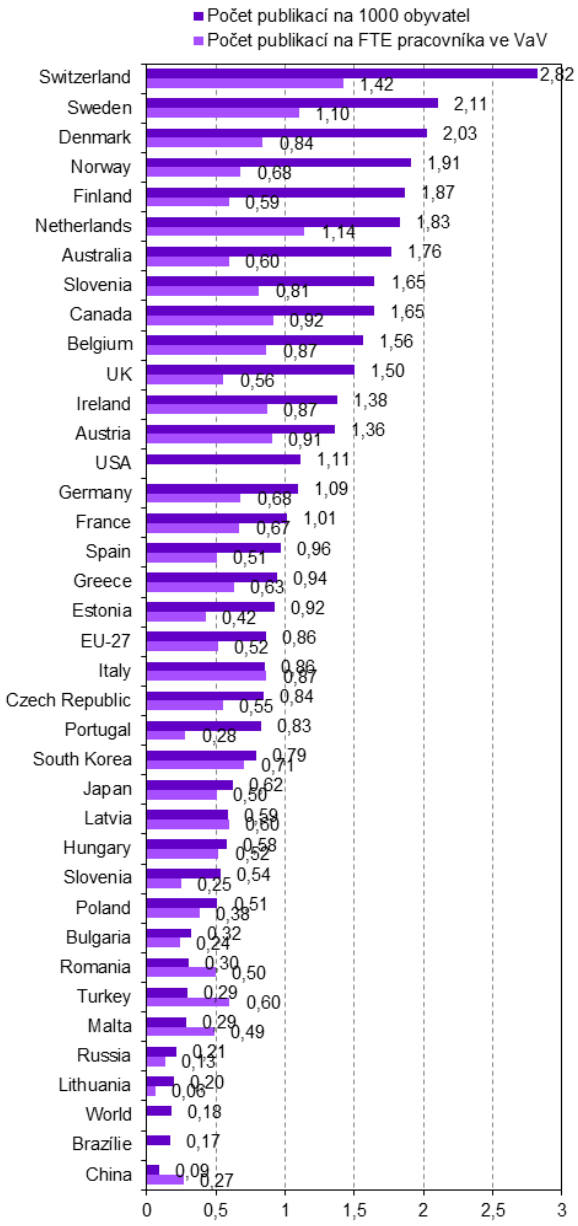
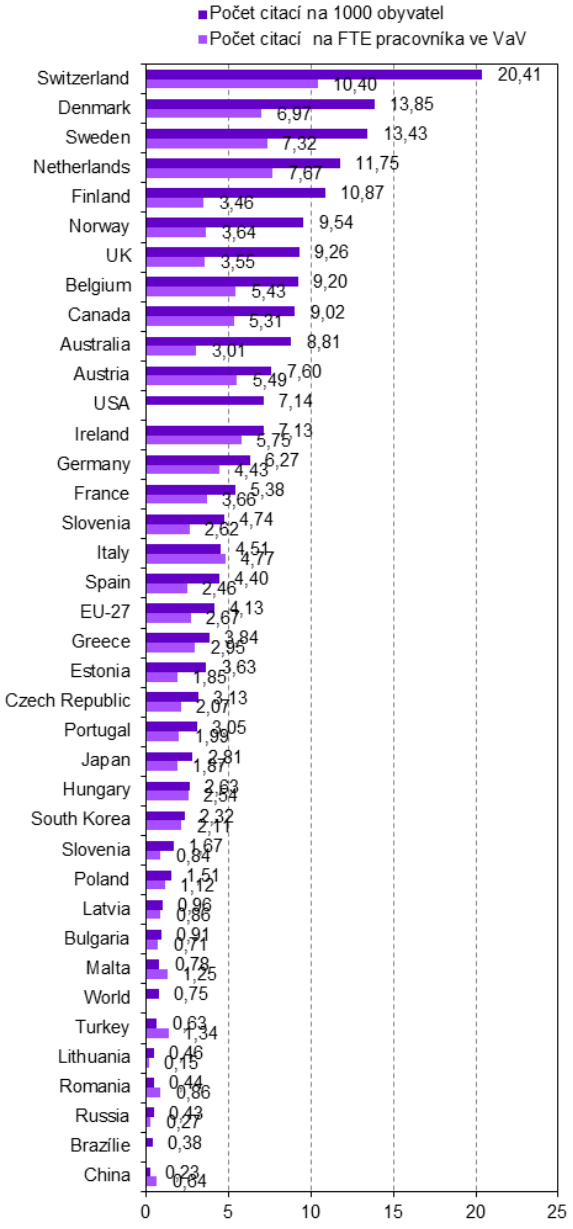


Chart C.6: Comparison of relative citation score of publications from selected countries in 2007



Source: Thomson Reuters InCites
Note: FTE of R&D workers in government and higher education sector

C.1.2 Overview of results recorded in the Information Register of R&D Results

When looking at table C.1, which shows the number of records in RIV since 2005, it is apparent that the main result types are publication outputs. These make up 9/10 of the total number of records with the majority being articles in specialist periodicals (J category). If we compare the number of RIV records and the number of Czech impact publications (TR WoS) it is apparent, that the publishing strategy of authors is shifting towards presentation of result in impact periodicals. Between 2005 and 2009 the share of articles in impact periodicals grew from 30% to 37%. There has also been a significant increase in the book production. The number of specialist books (B category) and chapter in specialist books (C category) increased since 2005 by 76% and 107%. As the B and C categories are important publishing channels in the social sciences, these changes may indicate dynamic development in the social science field.

All result types in the application field have grown significantly with the exception of category Z (Trial operation, verified technology). The number of granted patents tripled since 2005; a dynamic growth, albeit from a lower base, has been observed in all other applied result categories. As expected a huge shift in the number of registered results occurred between 2007 and 2008, when the changes in the methodology of R&D results for allocation of part of research organizations' institutional budgets were announced. [28] How this increase indicates the actual increase in efficiency of applied research and to what degree this is only a calculated reaction of the relevant subjects to the new methodology can be hinted by an ex-post evaluation of the utilization of application outputs (active licenses, know-how sale etc.); however this evaluation is missing.[29]

Table C.1: Number of R&D results by main categories of the RIV database in 2005 – 2010

Result type	2005	2006	2007	2008	2009	2010
Specialist book (B)	977	1 252	1 526	1 654	1 499	1 720
Chapter in specialist book (C)	2 198	3 237	3 546	3 879	4 620	4 560
Article in proceedings (D)	16 603	19 010	21 922	18 523	15 762	14 171
Article in specialist periodical (J)	16 328	18 717	21 335	21 317	20 883	22 366
Total publication outputs (B + C + D + J)	**36 106**	**42 216**	**48 329**	**45 373**	**42 764**	**42 817**
Patents (P)	**49**	**54**	**60**	**87**	**137**	**157**
Trial operation, verified technology, variety, breed, medical treatment	**504**	**277**	**311**	**450**	**587**	**509**
Results with legal protection (utility model, industrial model) (F)	20	30	49	202	342	346
Technically applied results (prototype, functional sample) (G)	297	1 347	2 154	1 232	1 405	1 393
Certified methodologies (N)	30	56	108	497	822	941
Software (R)	18	41	79	700	1 075	1 201
Total applied outputs (F + G + N + R)	**364**	**1 475**	**2 389**	**2 631**	**3 643**	**3 881**
Audiovisual production, electronic documents (A)	1 724	1 811	1 073	815	581	371
Exhibition organization (E)	64	91	98	126	160	158
Results implemented by provider (results implemented in legal standards)) (H)	9	74	24	53	78	114
Conference organization (M)	355	471	566	663	482	440
Other results (O)	2 240	1 224	1 604	1 912	2 518	2 791
Research report containing classified information (V)	0	0	3	7	3	1
Workshop organization (W)	288	357	437	489	374	505
Total other outputs (A + E + H + M + O + V + W)	**4 680**	**4 028**	**3 805**	**4 065**	**4 196**	**4 380**
Total number of RIV records	**41 703**	**48 049**	**54 894**	**52 606**	**51 327**	**51 744**

Note: the result type "Technically applied results (prototype, functional sample)" was classified as category S in the RIV until 2008. In the table and following overviews this category is combined with the current category G. Similar goes for the result type "Trial operation, verified technology, variety, breed, medical treatment" which was classified as category T until 2006 and now is combined with the current category Z.

Source: R&D IS, Results Information Index (RIV) dated 31. 12. 2010

[28] Methodology of R&D evaluation 2009, Office of the Government of the Czech Republic, Ref. No. 08724/09-RVV (Methodology). Institutional support has been allocated for the first time in 2010 but the basic changes in result evaluation were known already since 2006.

[29] This evaluation is partially substituted by the analysis of licenses (see chapter C.2). However, the analysis of licenses doesn't explicitly focus on results supported from public sources.

C.1.3 Disciplinary structure of the results recorded in the RIV database

The R&D IS divides the results into a total of 123 disciplines.[30] For the presentation purposes these are aggregated into ten wider discipline groups according to the 2010 Evaluation Methodology[31]: social sciences, technical sciences, mathematical and information sciences, physics, chemistry, Earth sciences, biology, agricultural sciences, medical sciences and art and humanities.

The most results are generated in the technical sciences and social sciences (see Table C.2), the most dynamic groups are mathematical and information sciences, medical sciences and art and humanities. With the exception of chemistry and agricultural sciences the number of results grew in all groups between 2005 and 2010. When evaluating the trends within disciplines it is necessary to bear in mind that the results are recorded into RIV by the authors themselves with no subsequent check. Results of one author can therefore be recorded in various disciplines according to the nature of the individual results.

Table C.2: Number of records in RIV within the wider discipline groups, 2005-2009

Discipline group	2005	2006	2007	2008	2009	2010	Index 2010/2005
Social sciences	7 227	8 918	11 040	10 370	10 111	9 652	1,34
Technical sciences	9 905	11 461	12 803	12 103	11 545	11 696	1,18
Mathematical and information sciences	2 373	2 855	3 195	3 373	3 311	3 672	1,55
Physics	3 067	3 527	3 729	3 606	3 459	3 566	1,16
Chemistry	3 304	2 933	3 178	3 254	2 914	2 947	0,89
Earth sciences	2 415	2 401	2 666	2 662	2 788	2 731	1,13
Biology	2 889	3 461	3 279	3 306	3 291	3 243	1,12
Agricultural sciences	2 942	3 207	3 558	2 972	2 623	2 846	0,97
Medical sciences	3 447	3 854	5 392	4 962	4 778	5 273	1,53
Art and humanities	4 135	5 432	6 055	5 998	6 508	6 117	1,48
Total	**41 703**	**48 049**	**54 894**	**52 606**	**51 327**	**51 744**	**1,24**

Source: R&D IS, Results Information Index (RIV) dated 31. 12. 2010

As stated before individual disciplines vary in the nature of their main results. The disciplinary structure is combined with result types in chart C.3, more detailed information is in the data appendix. Main results for all disciplines are articles in specialist periodicals (J) and articles in proceedings (D). Their share and dominance varies for individual disciplines:

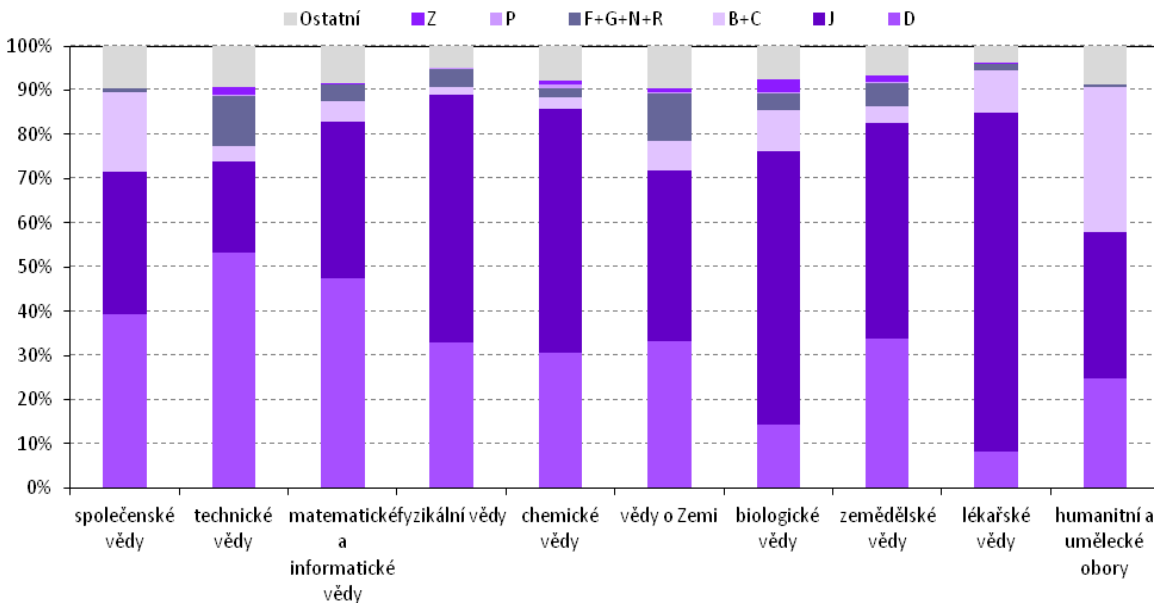
- Publications in specialist periodicals are dominant in medical and biology disciplines.
- These publications are also dominant in physics, chemistry, agricultural sciences and Earth sciences, but publications in proceedings are just slightly less important. Result types F-R have a significant role within Earth sciences.
- Dominant within social, technical, mathematical and information sciences are still articles in proceedings (D), followed by articles in specialist periodicals (J). Specialist books (B+C) are important for social sciences and application results (F+G+N+R) are important within technical sciences. Mathematical and information sciences are the only discipline group where the amount of conference-type results increased since 2005.
- Humanities have the most balanced result types with a slight dominance of specialist books.

[30] See http://www.vyzkum.cz/FrontClanek.aspx?idsekce=959

[31] Methodology of evaluation of results of research organizations and evaluation of results of finished programs (valid for 2010-2011), p.27. Office of the Government of the Czech Republic Ref. No. 05440/10-RVV, http://www.vyzkum.cz/FrontClanek.aspx?idsekce=566918

- The different structure of individual result types shows differences between the individual disciplines and confirms that the possibilities of total and gross comparison are limited without taking into account these differences. It also confirms that the evaluation possibilities of the TR WoS for all disciplines are limited – particularly the humanities' results are directed into different result types and therefore the comparison isn't fully accurate.
- Different structure of individual types of results in individual disciplines also shows the difficulty of creating one single quantitative methodology for all disciplines or a comparison, which would use only some evaluation types. The results of this analysis are in a simplified way in accordance with the results and recommendations of the International Audit of R&D in the Czech Republic.[32]
- Apart from these overall trends and differences between disciplines we consider it important to point out some of the partial results of the analysis. These show how the disciplines can be influenced by the changes in the R&D system. Of course it isn't possible to find a clear causality.

Chart C.7: Structure of R&D results by main discipline groups and result types, average for 2005-2010



Source: R&D IS, Results Information Index (RIV) dated 31. 12. 2010

[32]Results of the International Audit of Czech R&D and implementation of its results into strategic documents. See http://www.msmt.cz/strukturalni-fondy/ipn-pro-oblast-terciarniho-vzdelavani-vyzkumu-a-vyvoje/mezinarodni-audit-vedy-vyzkumu-a-inovaci.

There is for example a remarkable increase in the number of registered results within the Z category in the biology group since 2008 – especially when compared to the stagnation in other disciplines. To determine whether this growth is a result of the shift in orientation towards commercially usable application outputs or whether it is a reaction to the change in R&D evaluation methodology could only be possible through an ex-post evaluation of the commercial effect of these results.

Another example is the production of application result groups F+G+R+N. Since 2006 the production of these results has increased fivefold. The fastest growth has been recorded in the agricultural sciences and mathematical and information sciences. These result types have grown in the technical sciences as well – compared with the decrease of category Z results and even more intensive decrease in the D category.

C.1.4 Institutional structure of results registered in the RIV database

In detailed statistical overview the beneficiaries of public funding are divided into 10 groups according to the CZSO methodology derived from international classification. Because these groups are sometimes very narrow, this chapter will use 4 aggregated groups of institutions according to their function, establishing bodies and funding type.

- Academy of Sciences (AS CR)
- Public universities (PU)
- State organizational units, state allowance organization, public research institutions outside the AS CR (other institutions with public funding) (PFI)[33]
- Other legal and natural persons (LNP)

When interpreting the data it is necessary to bear in mind that in the past years there has been a widespread development of Czech universities accompanied by an increase in the number of R&D workers and students performing research within their education. Also all scientific publications with participation of doctoral students, who conduct research at non-university workplaces, are assigned to the relevant universities. On the other hand the numbers of R&D staff of the AS CR have more or less stagnated over the recent years (see chapter B).

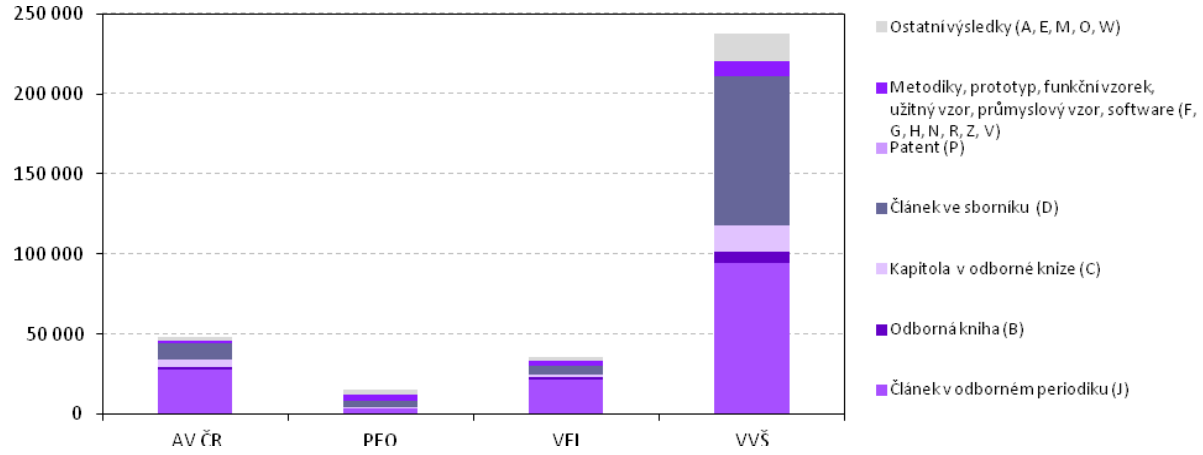
The dominant type of results in all the three research institution groups is publication in specialist periodicals (chart C.8). At AS CR this type makes up ca. 60%, at PU ca. 40%. The latter has the same share of articles in proceedings (40%). As for the LNP it is not surprising that most of the results are application results. This confirms their focus on applied R&D as opposed to the stronger fundamental research focus of the public research organizations.

The PFI also have a larger share of application oriented results, which is probably due to the fact that their R&D is performed according to the concrete tasks by their funding body.

The remaining two groups – PU and AS CR – don't have a significant difference in the share of application results despite the fact that technical, engineering and applied disciplines are usually the domain of universities within the national R&D system. As for the result type structure the PU group is the most heterogeneous, on the other hand the AS CR specializes much more in articles in specialist periodicals.

[33] This group includes mostly departmental research organizations, hospitals and medical facilitites

Chart C.8: Total numbers of results in main categories by institution type, average of 2005-2010

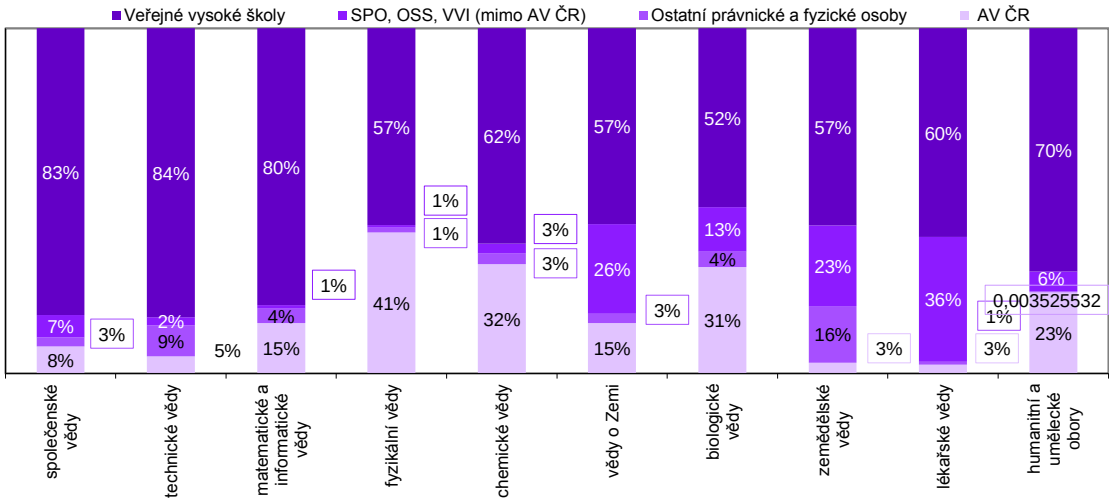


Source: R&D IS, Results Information Index (RIV) dated 31. 12. 2010

The resulting average structure of results for 2005-2010 is of course influenced by different dynamics, which is not only the case of individual result types, but is also true for the various institution groups. In the last six years the publishing activity of PU and PFI increased significantly – particularly in the field of specialist books, where the activity doubled. The increase in specialist articles was ca. 50%. The PU group also recorded an extreme increase in the number of patents and applied outputs. This increase coincides with the changes in the evaluation methodology in 2009. All groups recorded a decrease in the D category, where the criteria were made stricter (only contributions registered as Proceeding papers within the TR WoS are eligible for evaluation).

The structure of R&D results can also be influenced by the structure of disciplines within individual institution groups. The chart C.9 shows the share of author groups in the total number of results in discipline groups. The resulting shares are of course influenced by the different number of employees in individual groups and therefore cannot be compared without taking this into account (See chapter B).

Chart C.9: Share of author groups in the total number of results in discipline groups. Total numbers of results in 2005-2010

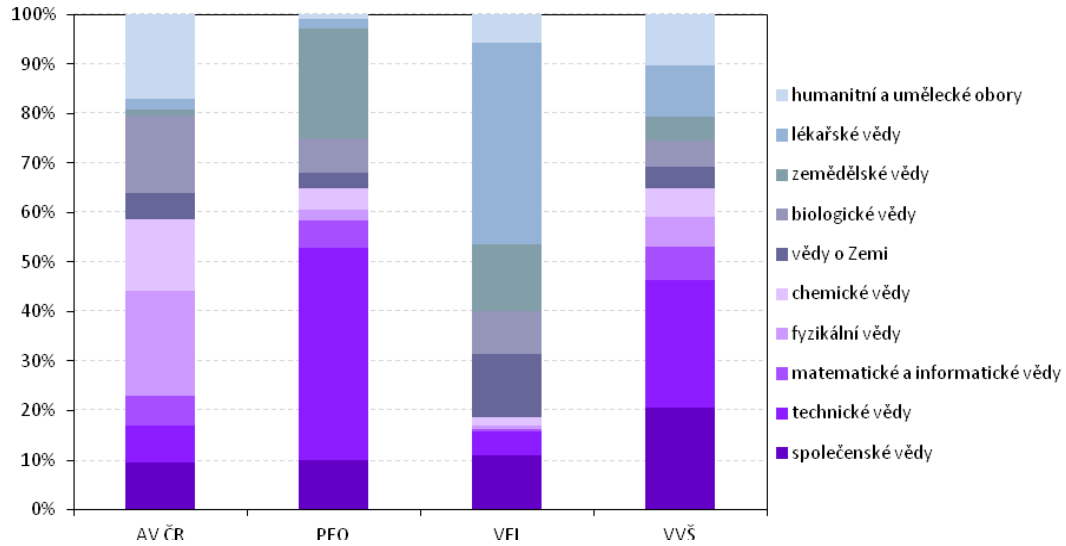


Source: R&D IS, Results Information Index (RIV) dated 31. 12. 2010

Due to the absolutely higher numbers of results in the PU group this group dominates in all the disciplines. However, if we take into account the size of individual institutions, we'll see a significant share of the AS CR particularly in the fields of physics, biology, chemistry and art and humanities. The PFI group dominates in the medical sciences, which is due to the amount of hospitals and medical facilities within this group.

If we relativize these results and look only at the inner structure of results of individual groups (chart C.10) it becomes apparent that in both PU and AS CR the social sciences and art and humanities are the dominant disciplines (27% AS CR, 31% PU). Other important disciplines in the AS CR are physics, chemistry and biology. Technical sciences have a significant role in the PU group.

Chart C.10: Disciplinary structure of results by institution types. Total numbers of results in 2005-2010



Source: R&D IS, Results Information Index (RIV) dated 31. 12. 2010

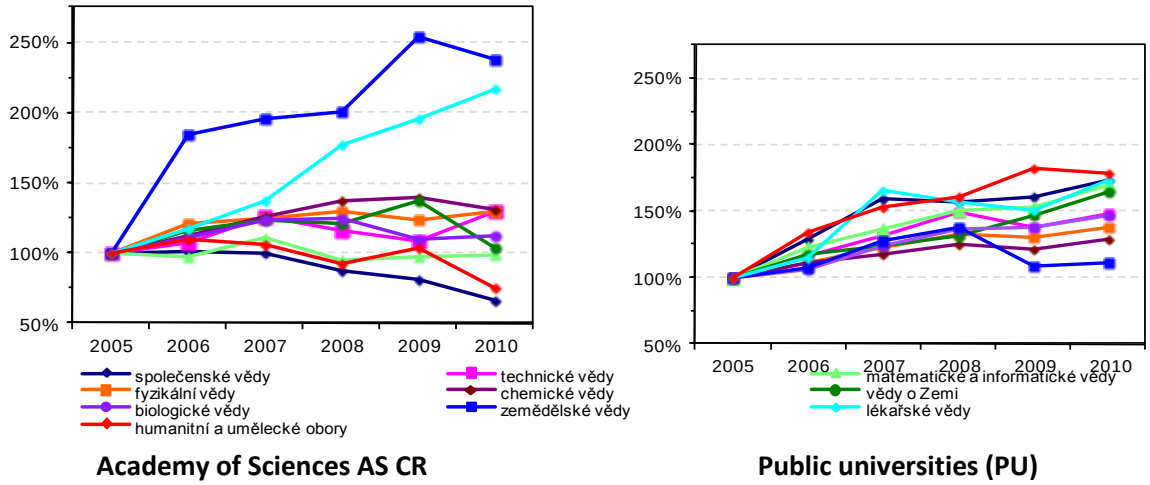
The J category is a useful indicator of change in the structure of research institutions due to its large number of results. The dynamics of these results sorted by disciplines in the two major institution groups is shown in chart C.11.

The AS CR group recorded a significant increase in the number of publication in the medical and agricultural sciences, which indicates an increase of R&D activities in these disciplines. Chemistry and physics also show a systematic growth. On the other hand the decrease in the number of publications in social sciences, art and humanities may signal a decline in these disciplines.

The fastest growth in the PU group was recorded in the social sciences and art and humanities, followed by medical, mathematical and information sciences and Earth sciences.

Mathematical and information sciences are the only discipline where the number of D category results increased, both in the AS CR (139% in 2010) and PU (149% in 2010) groups.

Chart C.11: Results in the J category created by the AS CR (left pane) and PU (right pane), 2005-2010



Source: R&D IS, Results Information Index (RIV) dated 31. 12. 2010

C.2 Patent applications, patents and licenses granted

A patent is a legal instrument provided by the relevant patent office, which grants legal protection to the invention for a maximum of 20 years (if the patent fees are being paid) in the territory for which the patent was granted (for example the UPV grants the so called national route patents, which are valid on the Czech territory). To be granted a patent it is necessary to file an application with the relevant patent office. Patents are granted for inventions which are novel, inventive and capable of industrial application. It is possible to patent not only products and technologies, but also chemically created substances, medicines, industrial production microorganisms as well as microbiological means and products gained through these means. However, it isn't possible to patent scientific theories or inventions, software programs, new species of plants or animals or methods of surgical or therapeutic treatment of human or animal body and diagnostic methods used on human or animal body.

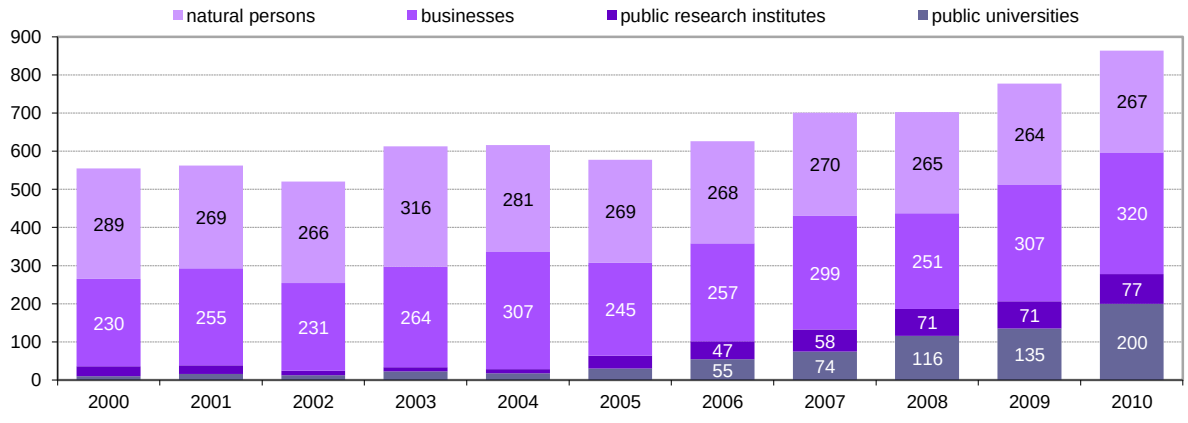
License agreement is defined as granting the right, in the agreed scope and in the agreed territory, to acquire or grant license for some type of the industrial rights protection. The licensor empowers the licensee, in the agreed scope and in the agreed territory, with industrial property rights and the licensee agrees to pay license fees. License fees can be paid in regular installments or as a one-time payment when the agreement is signed. There are also cases when the license is granted freely.

A patent license is a license where the subject is the granting of a right to use an invention protected by a patent either in the country of the licensee or in countries where the licensee intends to export the licensed product.

C. 2.1 Patent applications submitted in the Czech Republic by domestic applicants[34]

In 2010 there were a total of 869 applications filed by domestic applicants with the UPV, i.e. 300 more than in 2000. The increase in the number of application hasn't been continuous over the years and there have been year-on-year decreases as well. Patent applications filed by natural persons stagnated over the monitored period and their number was ca. 270. The number of applications coming from businesses increased despite some fluctuations from 230 in 200 to 320 in 2010. However, the applications submitted by public research institutions and universities showed a steady growth since 2005. This was probably caused by the changes in evaluation methodology for allocation of funds to these institutions. While in 2005 there have been a 34 applications from universities and 30 from public research organizations, in 2010 the public research organizations filed 77 and universities 200 applications with the UPV.

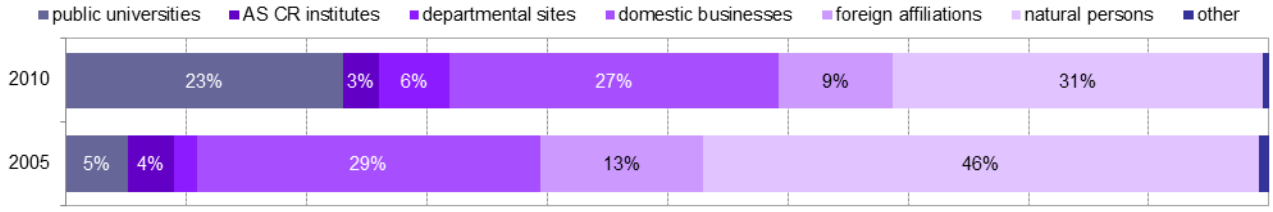
Chart C.12: Patent applications filed by applicants from the Czech Republic by type of applicant



Source: UPV and CZSO calculations

As mentioned above the structure of submitted applications by type of applicant changed significantly. While in 2005 only 5% of applications came from universities, in 2010 their share was 23%. Public research organizations submitted 77 (9%) with 26 of those coming from the AS CR institutes and 51 from departmental research institutions. Three quarters of the 320 applications submitted by businesses in 2010 came from domestic businesses, the remaining part from foreign affiliates.

Chart C.13: Structure of patent applications filed by applicants from the Czech Republic by type of applicant



Source: UPV and CZSO calculations

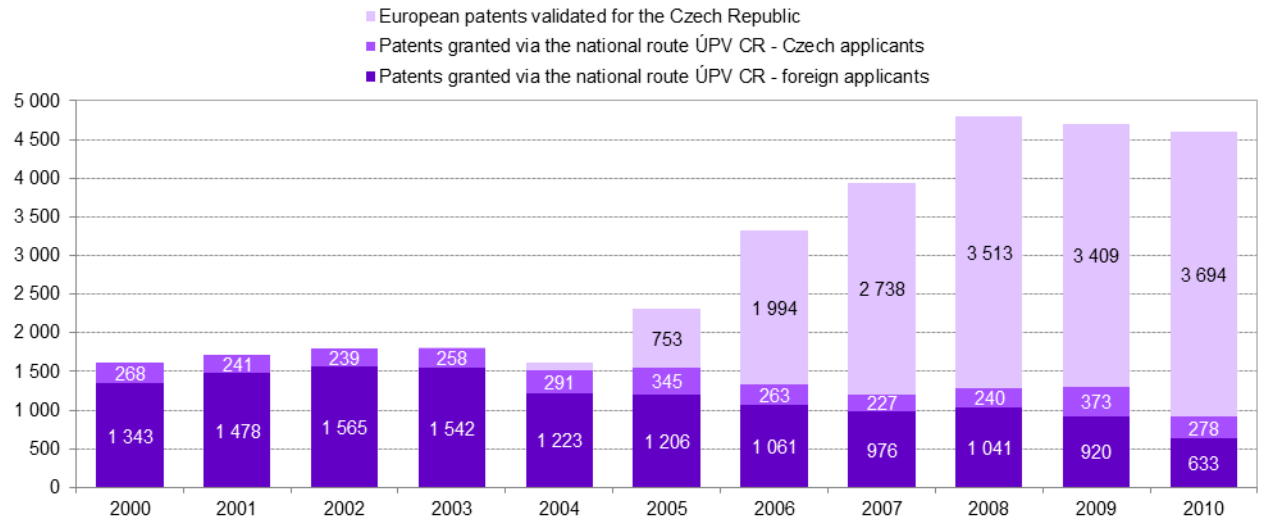
[34] Since 2002 the foreign applicants have an option to file the patent application with the European Patent Office with the option of subsequent validation for the Czech Republic territory through the UPV. This is the reason why the number of application filed by foreign applicants directly in the Czech Republic decreased significantly (from 4 000 in 2001 to 100 in 2010). Therefore the CZSO doesn't monitor data on the number of submitted patent applications by country of the applicant anymore.

Not all applications merit the granting of a patent. Only 45% of applications filed during 1995-2000 were granted a patent by the end of 2010. Universities and public research organizations have the highest success rate with 88% and 82% of successful applications. The success rate for businesses was 60% and for natural persons only 29%. The average period from the filing of an application to the granting of a patent was 3.25 years.

C.2.2 Number of granted patents valid for the Czech Republic

There are two ways a patent valid for the Czech Republic can be granted – by the UPV via the national route or by validating the patent applications for Czech territory (also done by the UPV). The possibility of validation exists since 2002 but came fully into practice after 2004 as is apparent from the following chart. In 2010 the patents validated for the Czech Republic made up 80% of all patents granted in this year. During the monitored period the most patents were granted in 2008 (4 793). Of the 911 patents granted via the national route 633 came from foreign applicants and only 278 were filed by Czech applicants.

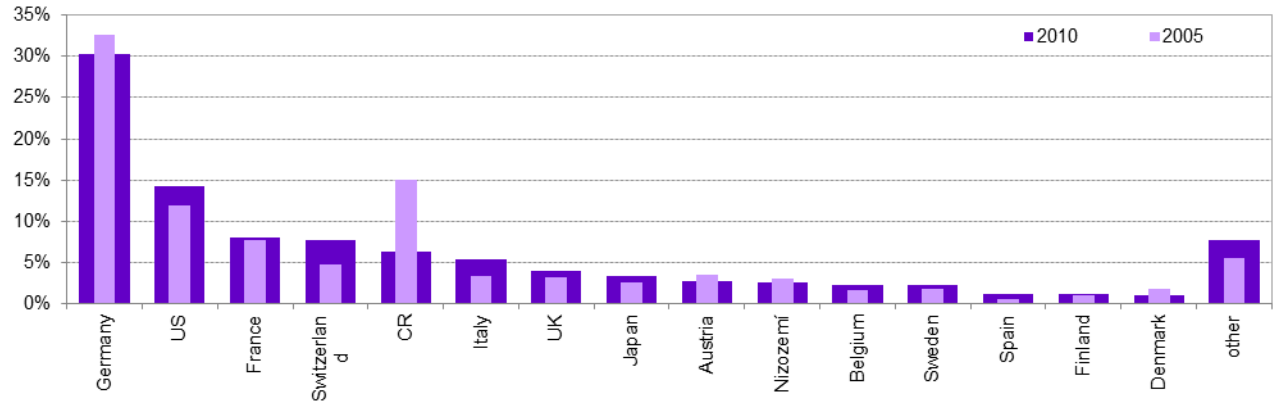
Chart C.14 Patents granted in the Czech Republic by type of their granting



Source: UPV and CZSO calculations

Almost 1/3 of all patents granted or validated in the Czech Republic in 2010 belonged to German applicants (1 392). After all, Germany has a long-term high share in patents granted in the Czech Republic. The second largest share belonged to the United States (14 %, 657); other significant participants were France (370) and Switzerland (354). If in 2005 the domestic applicants had a 15% share in the granted patents, then in 2010 this share decreased to only 6%. The decrease in the number of domestic applicants between 2005 and 2010 was caused to some extent by the already mentioned possibility of validation of European patent applications.

Chart C.15: Structure of patents granted in the Czech Republic by country of the applicant

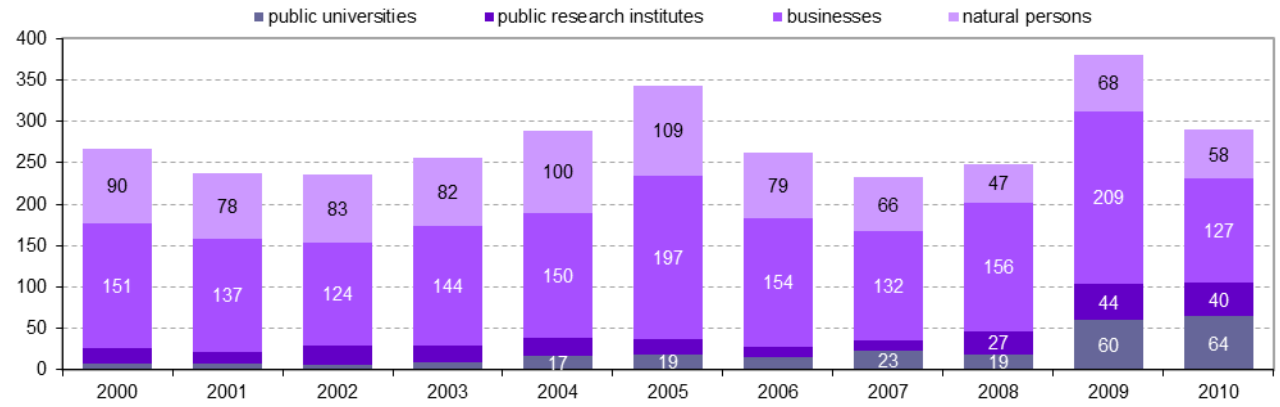


Source: UPV and CZSO calculations

C.2.3 Patents effective in the Czech Republic granted (validated) to domestic applicants

Applicants from the Czech Republic were granted 294 patents by the UPV in 2010. During the last ten years no trend has been observed in the development of their number. We can see a trend starting in the case of patents coming from the universities. Their number has been increasing over the last few years, which is the result of the increasing number of submitted applications since 2005 (see chapter C.3.1). In 2010 most patents were granted to businesses (127) and universities (64), 58 were granted to natural persons and 40 to public research organizations.

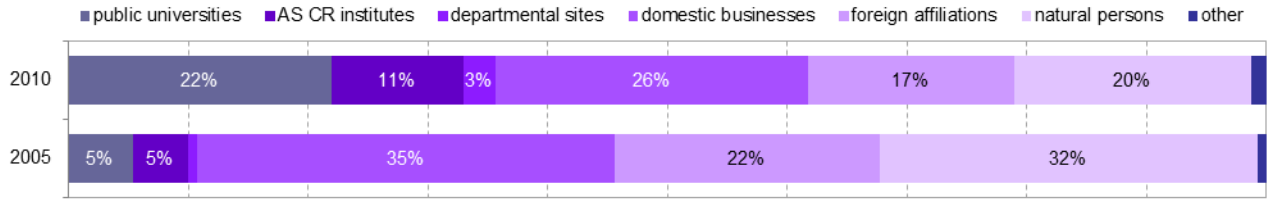
Chart C.16: Patents granted to applicants from the Czech Republic by type of applicant



Source: UPV and CZSO calculations

The structure of patents granted to applicants from the Czech Republic and their development in time are similar to patent applications. The number of patents granted to universities has increased and the share of patents coming from AS CR institutes increased as well. On the other hand domestic businesses, foreign affiliates and natural persons had a smaller share of patents in 2010 than in 2005.

Chart C.17: Structure of patents granted to applicants from the Czech Republic by type of applicant



Source: UPV and CZSO calculations

The basic tool for recording and searching patent documents is the International patent classification with 60 thousand subclasses, which aggregate into 8 main sections. In the years 2005-2010 only 90 of the total of 1775 patents were granted in high-tech branches, mostly micro organic and genetic engineering.

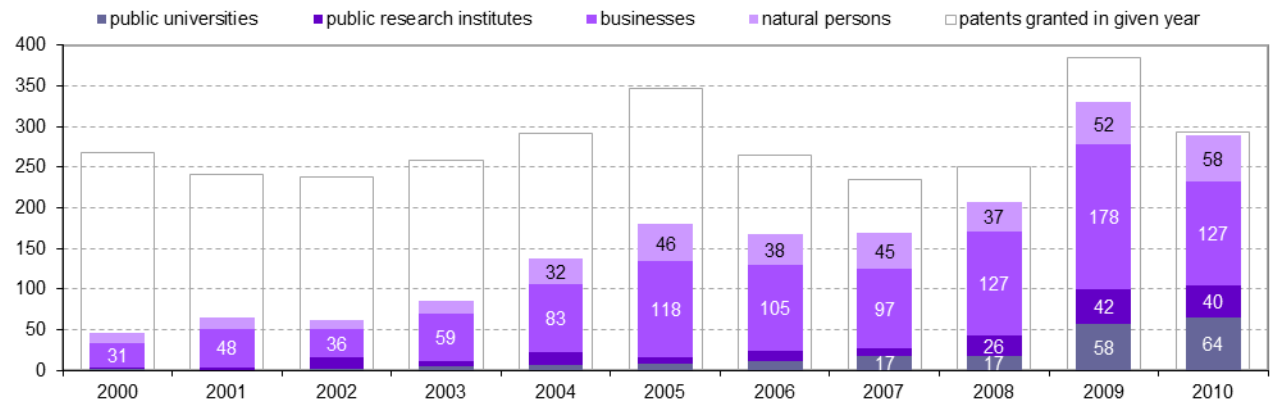
C.2.4 Patent licenses

Before we focus on the licenses themselves, we need to deal with the patents valid in the Czech Republic granted to Czech applicants. That's because the license can be granted only for valid patents and the survey on patents is being sent also to patent holders.

As mentioned above, patent grants legal protection of the invention for 20 years, however only if the fees are paid. Apart from patents granted the number of valid patents is also an important indicator. By 31st December 2010 there were almost 23 400 valid patents, 9 000 of which were granted via the national way, 14 000 were validated. Czech applicants held 1 904 valid patents.

It is logical that all patents granted in 2010 were valid at the end of the year; however the situation is quite different in the case of patents granted in earlier years. As we go further in the past the fewer patents are still valid. If at the end of 2010 86% of the patents granted in 2009 were still valid, then only 17% of those granted in 2000 were still valid.

Chart C.18: Patents valid in the Czech Republic by 31.12.2010 granted to Czech applicants by date of granting

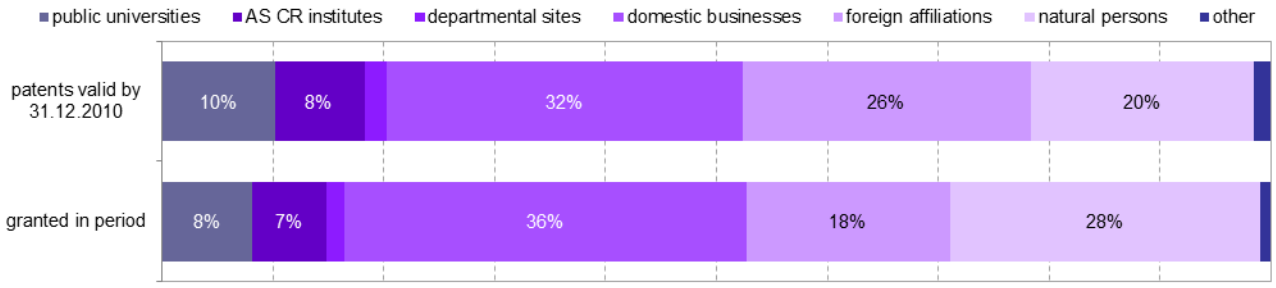


Source: UPV and CZSO calculations

Of the 1904 patents granted by 31.12.2010 more than 1 100 (58%) belonged to businesses, while 613 patents belonged to domestic companies and 494 to foreign affiliates. Most of the public patents belonged to AS CR institutions (154).

If we compare patents valid by 31.12.2010 and patents granted between 2000 and 2010 by applicant type, we can see that while 28% of the patents were granted to natural persons, they had only a 20% share in valid patents. The share of domestic companies also decreased from 36% to 32%. On the other hand the foreign affiliations increased their share from 18% to 26% 2010.

Chart C.19: Patents valid in the Czech Republic by 31.12.2010 granted to Czech applicants by type of applicant

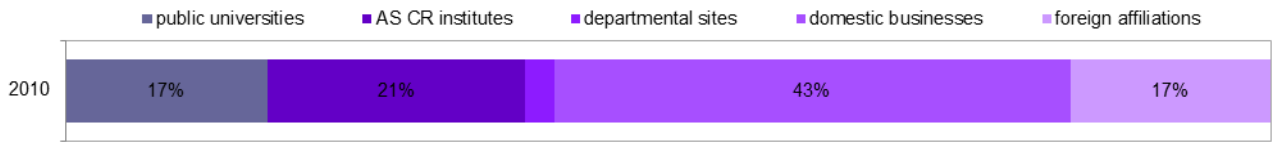


Source: UPV and CZSO calculations

In 2010 license agreements were made to a total of 84 patents of Czech licensors. Most of these agreements were for patents owned by domestic businesses (34, 43% of all licensed patents of Czech applicants in 2010). Licenses were also granted for 14 university patents, 14 patents from foreign affiliations and 20 patents from research institutions. Most of these came from the AS CR institutes (18).

Most of the licensed patents in 2010 came from the Chemistry; metallurgy (22, 28%) field, followed by Industrial machinery; transport (15, 19%), Textile, paper (15%) and Human needs with 10 patents licensed in 2010.

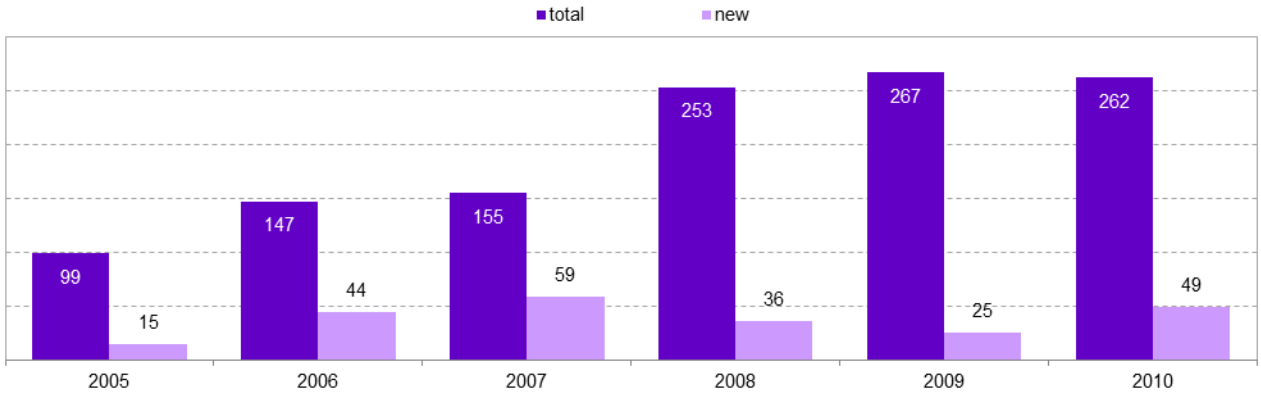
Chart C.20: Licensed patents in 2011 by type of licensor



Source: CZSO survey Lic 5-01 UPV and CZSO calculations

The following text focuses on the number of patent licenses granted by Czech subjects and fees gained from these licenses.

Chart C.21: Patent licenses granted by Czech subjects

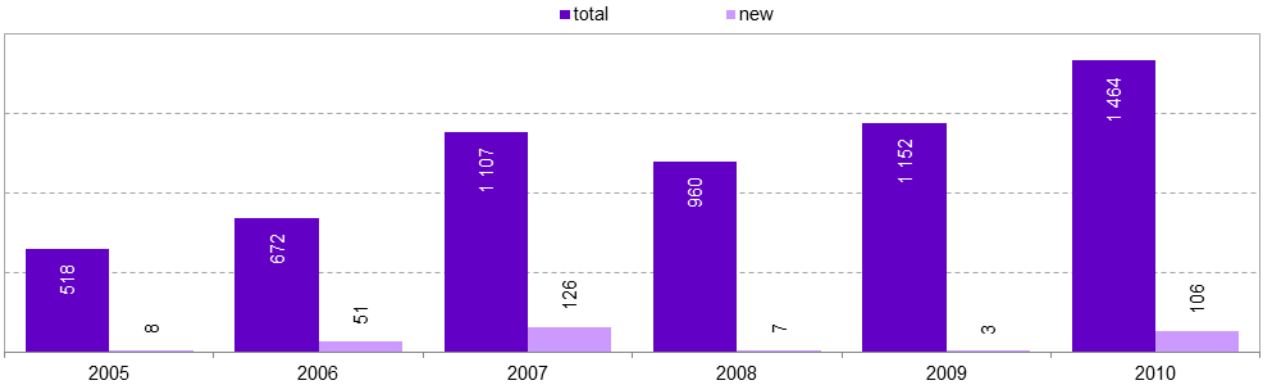


Source: CZSO survey Lic 5-01

In 2010 53 Czech licensors granted 262 licenses, 49 of them being new license agreements. More than 2/3 of the patent licenses come from the business sector; in 2010 this was 176 licenses (67%). The government sector provide 24 licenses (9%) and 17 came from the university sector.

Most of the patent licenses granted by Czech subjects stay in the Czech Republic; in 2010 85% (222) of these licenses were granted to contract partners from the Czech Republic. Partners from the EU27 countries were granted 25 licenses, most of them to German partners (8).

Chart C.22: Income from license fees in the Czech Republic (million CZK)



Source: CZSO survey Lic 5-01

In 2010 Czech subjects received almost 1.5 billion CZK from license fees; 106 million were for new licenses. As stated above, most of the licenses are granted by the business sector, but the beneficiary of most of the license fees is the government sector, namely the AS CR and its institutes. IN 2010 the business sector received only 71 million CZK, which is less than 5% of all license fees in that year. THE AS CR institutes received more than 1.3 billion CZK (92% of all received license fees).

The largest share of the license fees came from the USA (1.3 billion CZK, 91%). Czech contractual partners paid 68 million CZK for 222 licenses.

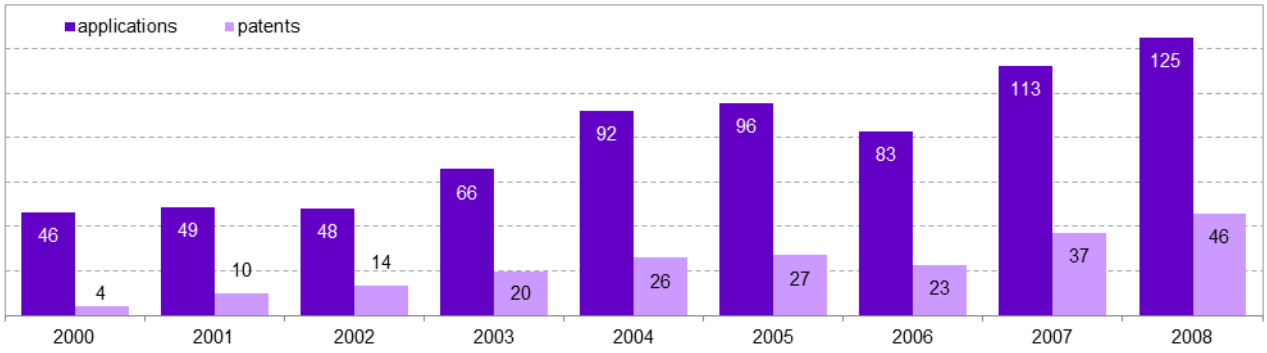
C.2.5 European Patent Office (EPO)

Apart from the information provided by the UPV there is information available on the patent applications granted by the EPO. EPO grants "European patents", which are valid in all its member states in which the holder has validated his rights. European patents grant their holders the same rights as he would gain via the national route.

Czech applicants at EPO

Between 2000 and 2008 Czech subject filed 717 patent applications with the EPO; however this number made up only 0.007% of all applications filed with EPO in this period. E.g. Austrian applicants filed 10 000 applications, the Dutch filed 40 000 and the German applicants almost 199 000 applications. In 2008 Czech subjects filed 125 applications with EPO, which equals 12 per one million inhabitants. This value is still way below the EU27 average (107 applications/million inhabitants); however the number of applications filed by Czech subjects with EPO has been growing over the recent years. Together with the number of applications there has been an increase in the number of patents granted by the EPO as well. While in 2000 Czech applicants were granted only 4 patents, in 2008 it was 46 patents.

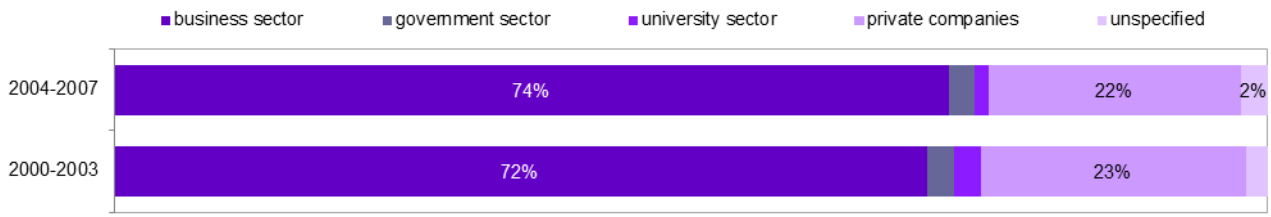
Chart C.23: Patent applications and patents granted by EPO to Czech applicants



Source: OECD

During the whole monitored period most of the applications filed by Czech applicants with EPO came from the business sector - 280 applications between 2004 and 2007. Natural persons filed 84 applications (22%), 9 applications came from the government sector and 5 from the university sector.

Chart C.24: Patent applications filed by Czech applicants with EPO by applicant's sector



Source: Eurostat

International comparison

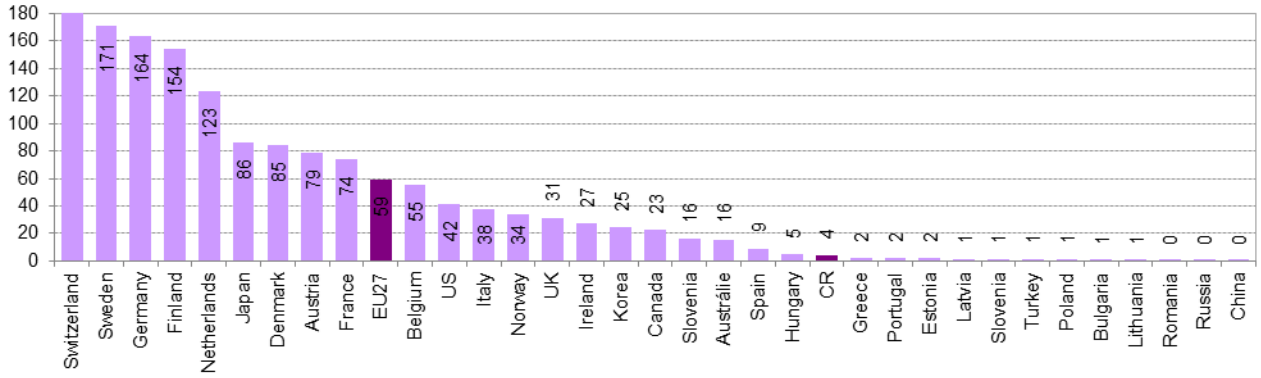
As stated above, Czech applicants filed 125 applications with EPO in 2008, which was less than 0.1% of all applications and equaled 12 applications per million inhabitants. Within EU27 there were 53 000 patent applications, which equals 44% of all applications filed with the EPO (107 applications/million inhabitants).

In 2008 the USA had a 24% share in all applications filed with EPO and Japan almost 17%. As for the European states most of the applications came from Germany (19%), followed by France (7%) and Switzerland (4%).

If we relate the applications to the number of inhabitants, we'll see that Switzerland has the highest value with 600 patents per million inhabitants. High values of more than 250 applications per million inhabitants were recorded in Germany, Finland and Sweden.

As well as in the case of applications the highest number of granted patents goes to European applicants. 49 % of patents granted by the EPO have their origin within the EU27. USA were granted 21% of the patents and Japan 18%. Germany is again dominant within the European states with 23% share.

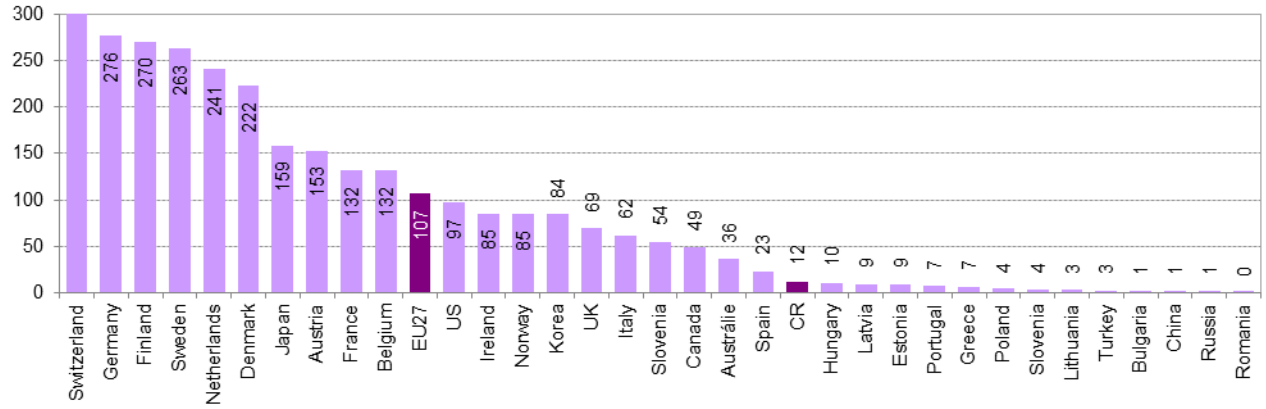
Chart C.25: Patent applications filed with EPO, 2008 (number per million inhabitants)



Source: OECD

Within the EU27 there were 59 patents granted by EPO per million inhabitants, which is more than ten times as much as in the Czech Republic. Similar to patent applications most of the patents were granted to Switzerland (316), Sweden (171), Germany (164) and Finland (154).

Chart C.26: Patents granted by EPO, 2008 (number per million inhabitants)



Source: OECD

C.3 R&D inputs and outputs

The previous chapters A and B assessed the R&D inputs – financial and human resources, while the chapter C evaluated the R&D results or outputs. Of course it remains a question to what degree the level of inputs and outputs are related – whether the financial and human resources are allocated efficiently, how difficult it is to obtain concrete research results etc. The evaluation of the efficiency and benefits of the R&D inputs should be a part of every quality evaluation. All the same it isn't possible to conduct such evaluation by just mechanically comparing inputs and outputs. There are several reasons for this, the most important being these:

- The costliness of individual science disciplines is very hard to compare.
- The unknown (or different) time delay between investment and execution of R&D activities and their results.
- It is difficult to compare individual results even within one category – e.g. publications in impact periodicals differ in their difficulty and amount of time needed for their preparation.

Add to this the fact that for no R&D result there is an assessment of its benefits or impact, whether it concerns income received in the form of patent license fees or the citation score of published results.

On top of that there is a different structure and goals of individual subjects, which perform these activities. If we evaluate public R&D expenditures, there are apparent differences between universities, public research institutions and hospitals. Each of these subjects has a different focus, which reflects in their organizations, status or financial resources. From previous chapters it is also apparent that they their focus differs in disciplines as well.

Due to all these reasons it isn't possible to simply compare and evaluate available statistical data concerning R&D inputs and outputs. Despite that this chapter focuses on the comparison of this data. The aim is to show and compare the main differences in the structure of human and financial resources and to point out problems that may be caused by the comparison of aggregated data on various results, disciplines and institutions.

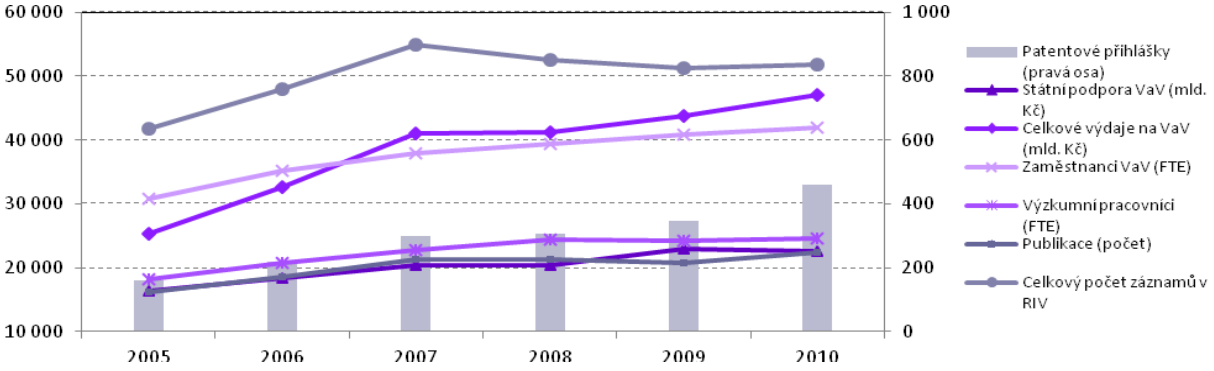
The source of data for this comparison is the data from the previous three chapters. The largest methodological hurdle was the different classification of data on financial and human resources and R&D results by disciplines. Human resources and R&D expenditures are sorted according to the Frascati manual[35] and the R&D results according to R&D IS's own classification.[36] To compare this data the authors of this analysis together with other experts created a convertor, which converted the R&D IS results into the main discipline groups of the Frascati Manual. The data sorted by type of evaluated subject was connected vie the ID codes of individual subjects. The base for this interconnection comprised of all subjects in the CEP, CEZ and CEA databases in the years 2005-2010. These were linked with data from the VTR 5-01 (total R&D expenditures and numbers of employees and researchers), RIV database (number of publications) and the UPC database of granted patents (filed applications by date of filing). Sorting by subject type was done after linking the base subject file with the Registry of Economic Subjects (RES) dated 30th June 2011, from which the data on the activity of economic subjects (CZ-NACE), legal form, ISEKTOR and in case of businesses information about their size were used. A more detailed description is included in the appendix. Due to large differences between individual result types only publication in reviewed periodicals and patent applications were selected.[37]

C.3.1 Total R&D inputs and outputs

Before we compare the data in a more detailed form the chart C.27 shows the development of aggregated indicators – total number of publications, patent applications, R&D expenditures and number of R&D employees. According to the chart it is apparent that the publication results grew together with the public R&D expenditures and the number of R&D employees. The growth of patents and patent application was even faster. The total number of results recorded in the RIV stagnated after the 2005-2007 growth, which may be due to the change in the structure of results – e.g. the decrease in the number of articles in proceedings, which are generally less time consuming than a number of results in the fast growing application focused result group.

A difference in growth rates can be found between results and total expenditures, which grew faster – on the other hand this corresponds with the lower rate of "result publishing" in the business sector, which is the main source of this growth. According to this simple comparison it seems that the R&D "efficiency" didn't change much over the 5 years – the R&D sphere produces more results, however with increased funding. Nevertheless as was already stated, this comparison is too simplified.

Chart C.27: Development of R&D inputs and outputs – selected indicators, 2005-2010



Source: CZSO, R&D IS

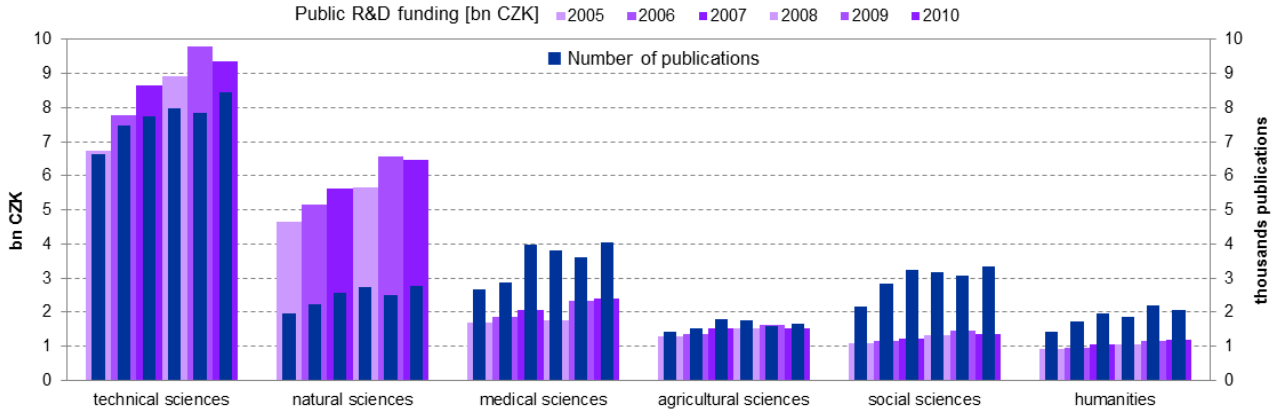
[35] Field of Science and Technology classification (Frascati manual 2002, IECD 2007)
[36] See viz http://www.vyzkum.cz/FrontClanek.aspx?idsekce=959
[37] Due to a significant delay between the filing of an application and the granting of a patent (the delay could be a matter of several years), only patent applications were considered (not the granted patents), although it may cause certain distortion of data.

C.3.2 R&D inputs and outputs by main disciplines

The first part of the detailed comparison is aimed at the main disciplines and their differences – charts C.28 and C.29 provide comparison of the public funding and R&D results; the first chart shows comparison of J category results, the second the total number of records in the RIV database. Apparent from both charts are the different financial demands of R&D in individual disciplines as well as different result focus – technical sciences are significantly behind other disciplines in the comparison of funding and number of publications, however when taking into account all result types, they show above average values.

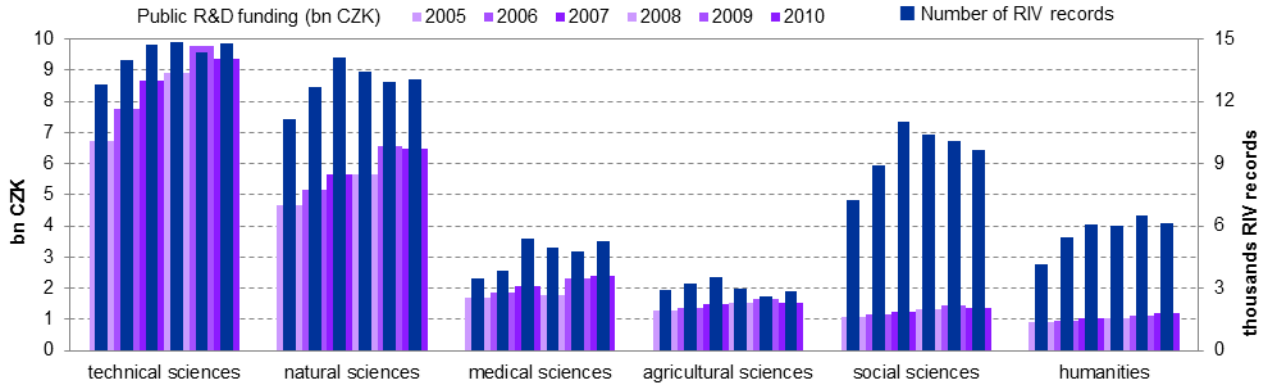
The comparison of trends is interesting as well. The amount of public funding and number of publication grew the same way in all the scientific disciplines with the publications having a ca. one-year delay. On the other hand the total number of records stagnated over the last 2-3 years and in some disciplines even decreased (technical, agricultural and social sciences). This is caused by the different trends in individual result categories, especially after 2007, which can be related to the new Methodology and its evaluation of individual result types. Research organization logically directed their efforts towards the more valued results, such as application-oriented results in the case of technical and agricultural sciences or articles and books in the case of social sciences. However, it is not possible to assess from the statistical data whether the quality of the results improved as well. Moreover there is no comparison standard for this.

Chart C.28: Public funding and number of publications in 2005-2010 by main disciplines



Source: CZSO, R&D IS

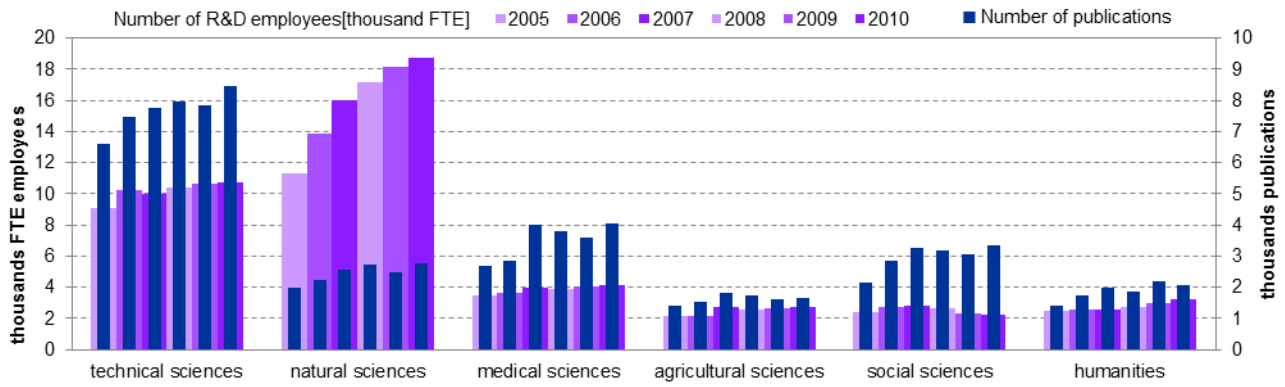
Chart C.29: Public funding and number of records in the RIV database in 2005-2010 by main disciplines



Source: CZSO, R&D IS

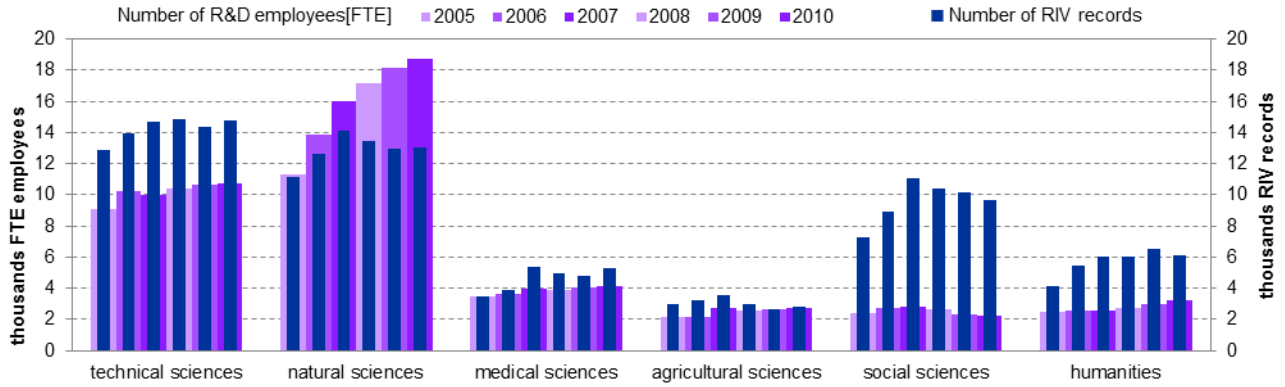
Apart from the financial demands of R&D results it is also possible to compare how demanding these are in terms of human resources. It is possible to expect similar results, as part of the financial resources is related to the human resources. The difference to the comparison with public funding is particularly apparent in technical and natural sciences – while the chart shows that the latter are more financially demanding, the technical sciences are demanding in terms of human resources. This information is interesting especially regarding the studies showing a decrease in the number of students and graduates interested in technical sciences and a career therein. [38]

Chart C.30: Number of R&D personnel (FTE) and number of publications in 2005-2010 by main disciplines



Source: CZSO, R&D IS

Chart C.30: Number of R&D personnel (FTE) and number of records in the RIV database in 2005-2010 by main disciplines



Source: CZSO, R&D IS

C.4 Summary

The results indicate systematic structural changes in the Czech R&D. In the past six years the number of results grew the most in social sciences, art and humanities, Earth sciences and medical sciences. Also remarkable is the high increase in the number of results in the field of intellectual property. During the analyzed period the number of granted patents almost tripled and the total amounts in other categories related to industrial rights, such as utility models and industrial designs increased almost eightfold. To what degree is this trend the result of an actual increase in R&D efficiency and to what degree it is only an adjustment to the new evaluation system remains a question, which cannot be answered solely by quantitative data. This has been already pointed out in the last chapter, which compared the R&D inputs and outputs.

[38] See e.g. TC (2001): Map of research and application potential of the Czech Republic

D Innovation and competitiveness

The previous three chapters of this analysis focused on the evaluation of R&D activities and their results. The importance of R&D is undisputable, however not the importance of the R&D itself, but its connection with other factors, which can be summarized under the title of this chapter – innovation and competitiveness.

According to the World Economic Forum (2010), author of one of the international competitiveness rankings, competitiveness can be defined as a set of institutions, policies and factors, which influence the level of productivity of the given state. States do not participate directly in this competition; they are intermediaries, who influence the success of businesses in the economic competition. With the increasing economic level of countries it becomes more and more difficult for the companies to be successful in the competition only due to the traditional production factors (particularly cost of labor). In these countries there is an apparent shift to the knowledge-intensive production. The role of knowledge and especially the ability to use it commercially as innovations is the key factor to maintain the productive economies of advanced states, to which the Czech Republic belongs. Sufficient innovation productivity enables the businesses in advanced countries to remain competitive in the increasingly interconnected global markets, where they face stiff competition from developing economies.

The companies must therefore compete through unique products and services, specific know-how and innovations. These are defined not only as implementing new products and production methods, but also as changes in work organization and business management or new selling methods. Similarly innovation isn't bound only to the R&D results, but a large part is created as a reaction to the market conditions and demands (so called market-push innovation).

Innovation productivity isn't related only to the abilities of companies, it is also connected to the wider environment of the innovation system. This includes the system of public and private institutions, whose activities ensure individual aspects of the innovation process (i.e. creation, transfer and utilization of new knowledge). An important prerequisite of a well-functioning national innovation system is a balanced development of individual actors and subsystems in all phases, because innovation isn't a domain of one single subject, but it is a result of continuous interaction between individual elements of the national innovation system. Important parts of this system are not only universities and research organization, but also businesses, their suppliers and customers and last but not least the quality of institutions and environment, where the innovation process is performed. All these aspects enter into the evaluation of competitiveness of individual countries, which is the focus of the first part of this chapter.

The second part focuses on analyzing the productivity and structure of the Czech economy with emphasis on technologically demanding fields. Part of this chapter evaluates the Czech international trade with technologically demanding products. Another part focuses on the innovation productivity of the business sector, which shows the readiness and ability of Czech companies to utilize new knowledge in innovations. The focus is mostly on those fields, which are important regarding the Czech economic structure (manufacturing industry). One of the indicators of the economic competitiveness for an open economy such as the Czech Republic is the export success rate.

Public support of innovation as an important factor for increasing productivity is an important tool for improving the country's competitiveness. This is the reason why many countries stimulate innovation by direct and indirect methods. The last part of this chapter focuses on the scope and structure of public support of innovation.

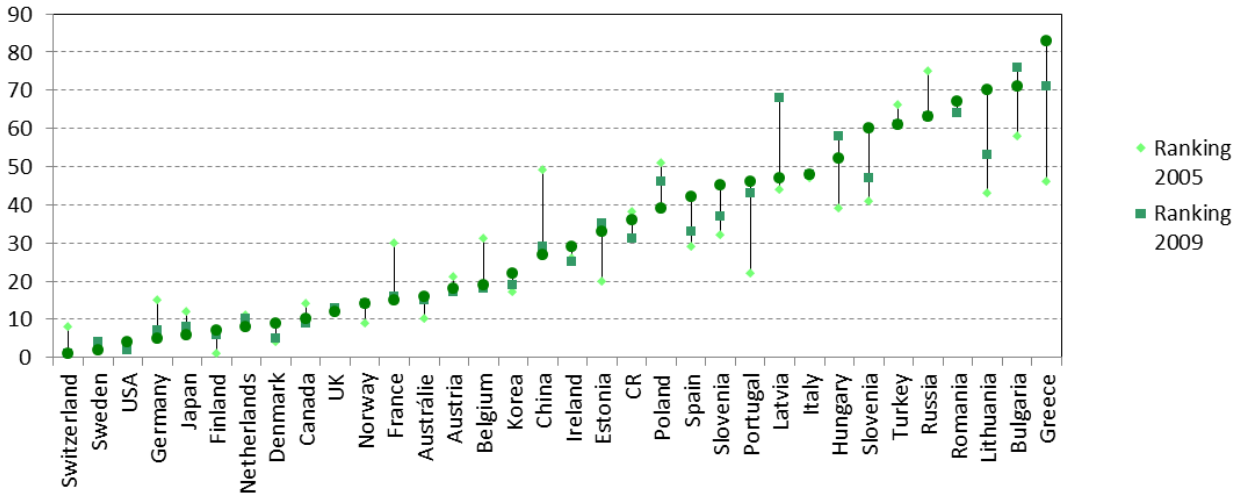
D.1 International evaluation of competitiveness

Measuring competitiveness isn't only a question of national statistics, but it is also the focus of many international organizations. One of the most respected indexes is the Global Competitiveness Index, calculated annually by the WEF; in the EU it is the Summary Innovation Index for the EU and other selected countries, which is published annually within the Innovation Union Scoreboard (formerly European Innovation Scoreboard).

D.1.1 Global Competitiveness Index by the WEF

The Global Competitiveness Index, published annually by the WEF comprises of more than a hundred of quantitative and qualitative indicators divided into 10 basic groups including macro- and microeconomic factors of the competitive advantage (WEF 2010). The number of indicators and evaluated countries changes annually, therefore the data presented in the time series is only limited and provide only framework overview of the Czech position.

Chart D.1: Competitiveness ranking of countries according to WEF 2005, 2009 and 2010



Source: WEF, The Global Competitiveness Report 2010-2011

In 2010 the Czech Republic ranked 36th of 139 monitored countries, which was five places lower than in 2009, however in 2005 Czech Republic was in 38th place. The competitiveness of the Czech Republic is positively influenced by the effective market (35th), advanced market and technology (34th and 32nd), innovation ability (27th) and especially the quality of the university education (24th). AS for the individual indicators the main competitive advantage can be seen in a relatively free competition (12th) and availability of research and educational services (17th). On the other hand the negative factors are the quality of institutional environment, which includes obstacles presented by government regulations (118th) and insufficient transparency of government's policy (102th), clientelism (107th) or public resources fraud (102nd). This results in one of the lowest global values of political trust in the Czech Republic (121st). Lesser values are in only 18 countries, most of the East-European and developing countries.

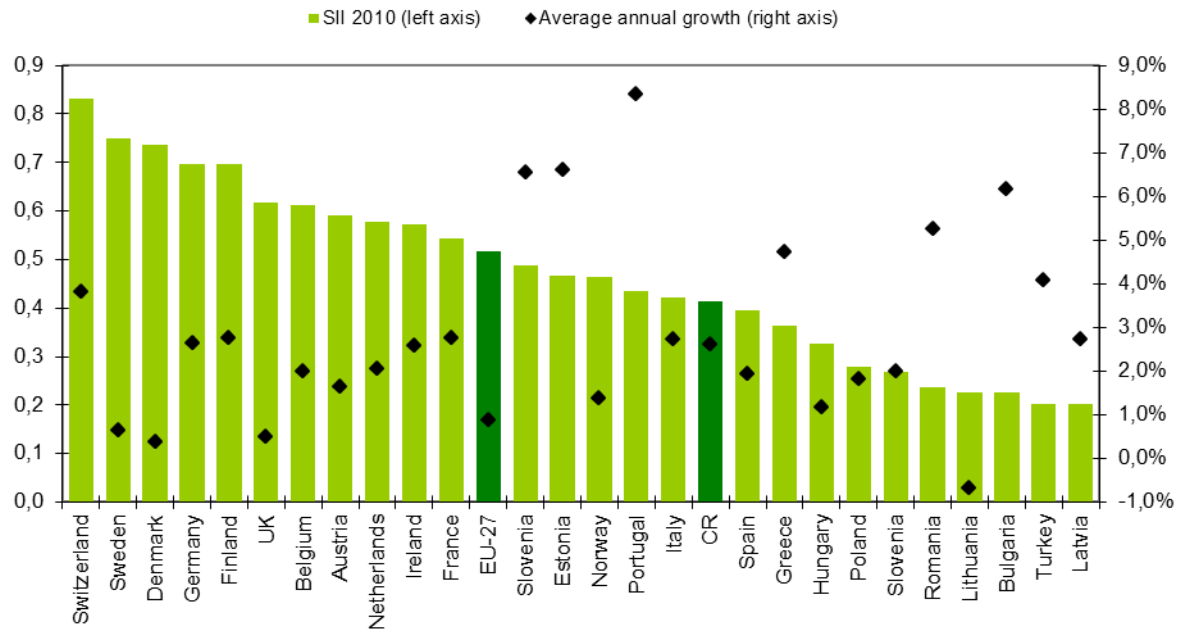
D.1.2 Summary Innovation Index

The main tool for comparing innovation environment and innovation performance of the European countries is the Summary Innovation Index (SII), calculated annually since 2001. Due to the fact that the indicators and methodology changed during the years, it is possible to evaluate the Czech Republic's standing only in comparison to other states; the year-on-year comparison has no value. According to the

new methodology from 2010 the SII has 25 quantitative indicators, only 12 of which remain unchanged from the previous year. The indicators are grouped into eight categories including **innovation inputs** (human, knowledge and financial resources), **firm activities** (firm investments, innovation cooperation, entrepreneurship and industrial property protection) and **innovation outputs** (innovative businesses and economic effects of innovation).

According to the SII 2010 the Czech Republic belongs (as in the last two years) in the group called "moderate innovators" (together with Greece, Hungary and others) with the SII value 0.414, which is below the WU27 average of 0.516. As for the new EU states, Slovenia and Estonia had higher values. Cyprus, Malta and Luxemburg were replaced by Norway, Switzerland and Turkey in chart D.2. According to the dynamics of innovation performance development calculated based on individual indicators, which make up the SII 2010, in the last five years the Czech Republic belonged in the group of above-average countries with 2.57% annual growth rate (annual growth rate average of the EU27 was 0.85%).

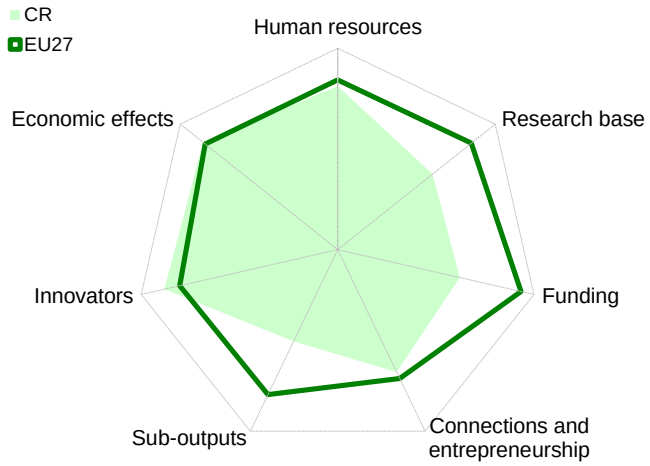
Chart D.2: Innovation performance according to SII 2010



Source: Innovation Union Scoreboard 2010

When looking at the individual aspects of the innovation environment and innovation performance of Czech businesses in detail we'll see that although the Czech subjects don't show many sub-outputs (i.e. primarily the use of intellectual property rights), they are above-average in innovation outputs (economic effects and innovativeness of Czech SME). Although the Czech Republic lacks behind the EU27 average in all innovation inputs, the innovation activities of businesses are comparable with the EU27 average. The nature of implemented innovations is evaluated in detail in chapter D.3. The below-average standing of the Czech research base is influenced by the insufficient participation of foreign doctoral students from non-EU countries and low citation score of Czech scientific publications. In the funding area this is caused by a very low amount of risk capital. The Czech Republic is traditionally behind in the use of industrial rights. The number of international patents, industrial designs and trademarks is also very low. The above-average standing in the Innovators group is caused by a high share of innovative SME. Good results in the economic effects of innovations are caused primarily by the employment in knowledge-intensive fields, sale of innovated products and a high share of export of medium- and high-tech production in the total export.

Chart D.3: Comparison of individual aspects of innovation performance of the Czech Republic and EU27 average according to IUS 2010



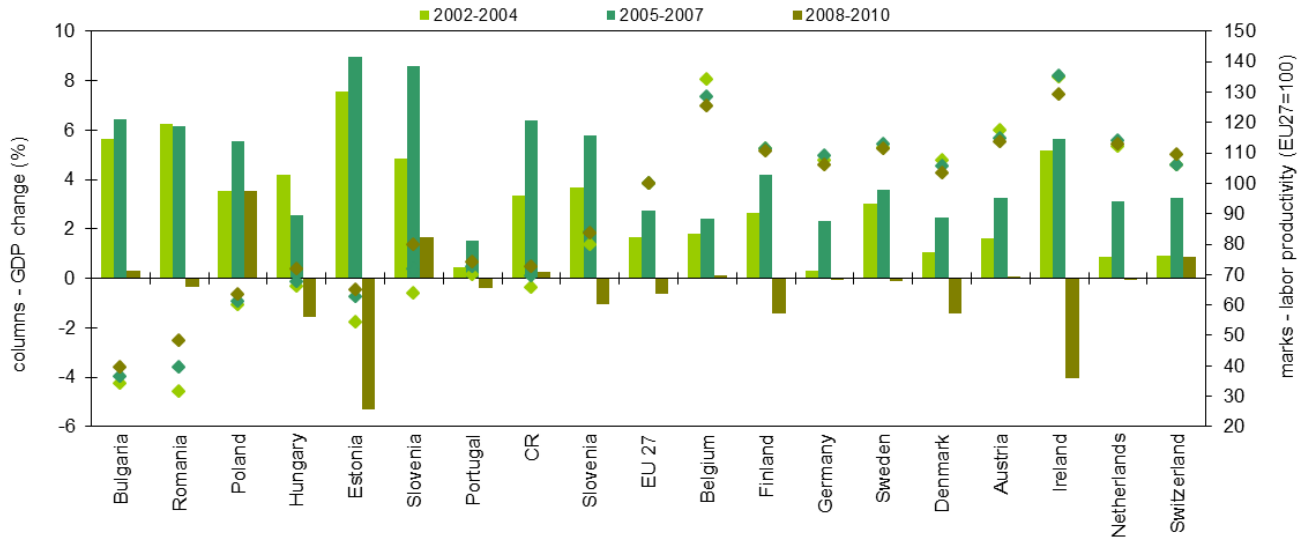
Source: Innovation Union Scoreboard 2010

D.2 Economic indicators

D.2.1 Development of GDP and labor productivity

A simpler indicator reflecting the competitiveness of countries, which is being used in international comparisons, is the GDP, its level and dynamics. According to the GPD dynamics the Czech Republic did well in 1995-2008, its growth during this period was higher than the EU27 average and second only to Slovakia in the Central Europe region. It is apparent that the Czech Republic together with other new EU members approaches the EU27 level of GDP per capita, but also that there still is a huge gap between it and the most advanced states (Finland, Austria, Denmark or Switzerland). The influence of the economic crisis on the GDP growth was apparent in the last monitored period. All monitored economies showed significantly lower GDP growth rates compared to years 2005-2007 and many of them actually decreased (e.g. Estonia, Ireland). In comparison to the others states the Czech Republic went through this period relatively well.

Chart D.4: Growth of GDP (at PPP, %), labor productivity and GDP per capita (EU27 average = 100) in selected European countries in 2002-2010 (in case of labor productivity the last monitored year is 2009)



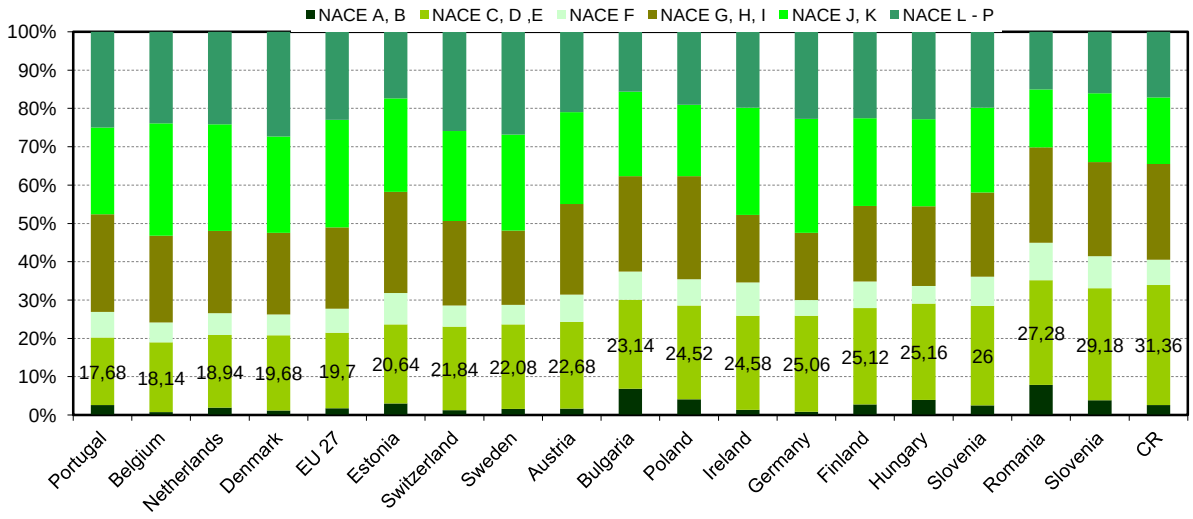
Source: Eurostat

The GDP growth is connected to the growth of labor productivity. This is still lower in the Czech Republic than the EU27 average; however its growth rate exceeded the EU27 average. Despite that the growth didn't reach the levels as in Slovakia, which recorded higher GDP growth rates.

D.2.2 Structure of the Czech economy

The competitiveness of an economy, as well as the GDP, is significantly influenced by the structure of the economy. As for the branch structure the Czech Republic still belongs to the most industrial countries of the EU. According to the NACE classification it had the highest share of the secondary sector without construction (NACE C-E) in GVA. Other states of the former Soviet bloc have also a high share of the secondary sector. Services (NACE G-P) in the Czech Republic are still less developed than in other EU states. The share of public services (NACE L-P) in GVA is significantly lower, which may indicate a lower productivity of labor, most of the GVA services are produced by financial services (NACE J, K) and especially trade services (NACE G, H).

Chart D.5: Economic structure as % GVA in 2005-2009



Source: Eurostat

It is apparent that the share of services in the GVA is the fastest growing. This is caused mainly by the private services segment, which increased its share from 40% in 1995 to 43% in 2010. This is accompanied by a decrease of the share of agriculture from 4.5% in 1995 to 1.7% in 2010. The shares of other sectors have stagnated over the long term. Data from 2008 and 2009 shows that the economic crisis had a particularly negative impact on the industry sector whose share in GVA dropped to the level of 1995. Because the manufacturing industry is the dominant customer of market services it can be expected that the crisis will have a delayed impact on the market services sector. The government savings will also have a negative effect on the public services, which can be seen from the preliminary data for 2010.

Table D.1: Development of the Czech economy by selected branches (current prices; %)

OKEČ		1995	2000	2005	2006	2007	2008	2009	2010*
agriculture	HPH	4.5	3.6	2.6	2.5	2.4	2.3	1.9	1.7
	ZAM	6,7	5,0	4,0	3,9	3,8	3,7	3,7	
industry	HPH	38.5	37.5	38.0	38.2	38.5	38.0	37.3	37.5
	ZAM	30,9	30,5	29,9	30,0	29,6	29,4	28,3	
manufacturing ind.	*HPH*	*23.1*	*25.9*	*25.5*	*25.6*	*25.7*	*24.3*	*22.7*	*23.3*
	ZAM	*27,4*	*27,8*	*27,7*	*27,9*	*27,6*	*27,4*	*26,3*	
services	HPH	*57.0*	*58.9*	*59.5*	*59.3*	*59.1*	*59.7*	*60.8*	*60.8*
	ZAM	52,4	55,6	57,2	57,3	57,7	57,8	58,6	
G – K	*HPH*	*39.9*	*42.1*	*41.8*	*42.0*	*42.3*	*43.0*	*42.8*	*43.0*
	ZAM	*33,4*	*35,6*	*36,7*	*36,8*	*37,3*	*37,5*	*38,0*	
L – P	*HPH*	*17.1*	*16.8*	*17.7*	*17.3*	*16.8*	*16.7*	*18.0*	*17.8*
	ZAM	*19,0*	*20,0*	*20,5*	*20,5*	*20,3*	*20,2*	*20,6*	

Note: Services OKEČ (Branch Classification of Economic Activities) G-K are provided mainly by the private sector, L-P by the public sector, preliminary data
Source: CZSO – National accounts, Employment and unemployment

Completely different trends were observed in the structure according to employments. It is apparent that the manufacturing industry GVA, which had grown during the whole period until 2008, wasn't connected with any significant change in the share of employees. The labor productivity in market services and manufacturing industry increased during the monitored period. In the case of the former it was connected to an increase in employment, in the case of the latter the employment rate remained the same.

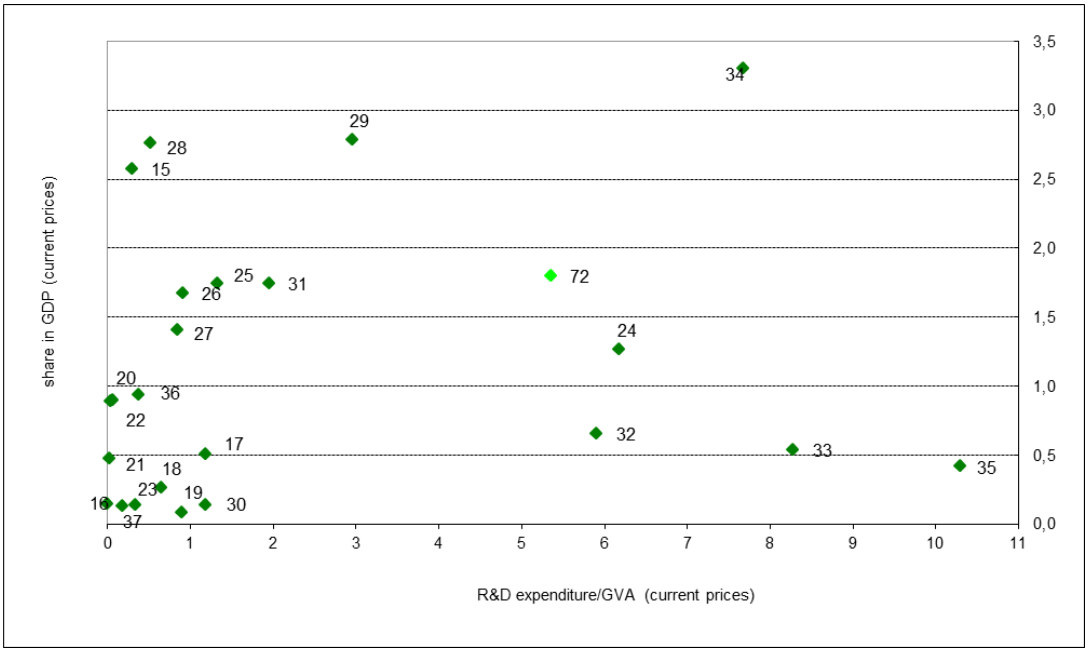
D.2.3 Economy structure by knowledge intensity

Another interesting aspect is the share of knowledge-intensive activities in key branches. Instead of the traditional OECD classification by knowledge intensity, which doesn't take into account the actual nature of industries in individual countries, this chapter evaluates the intensity of businesses in selected branches (measured by R&D expenditure/GVA ratio). The chapter focuses mainly on the manufacturing industry (OKEČ 15-37), which were until know the main drivers of the Czech growth. To this group were added activities in the field of IT (OKEČ 72), which are also a very dynamic branch of the service sector.

Based on these data there are three groups of branches, which are significant for the Czech economy regarding their knowledge intensity or GVA share:

1. Branches with high R&D intensity and high GVA share (OKEČ 34)
2. Branches with low R&D intensity and high GVA share(OKEČ 29; 28; 15)
3. Branches with high R&D intensity and low GVA share (OKEČ 35; 33; 24; 32; 72)

Chart D.6: Knowledge intensity and share in GVA of manufacturing industry branches and selected services, 2005-2009 average; (%)



Source: CZSO

D.3 Innovation performance in business sector

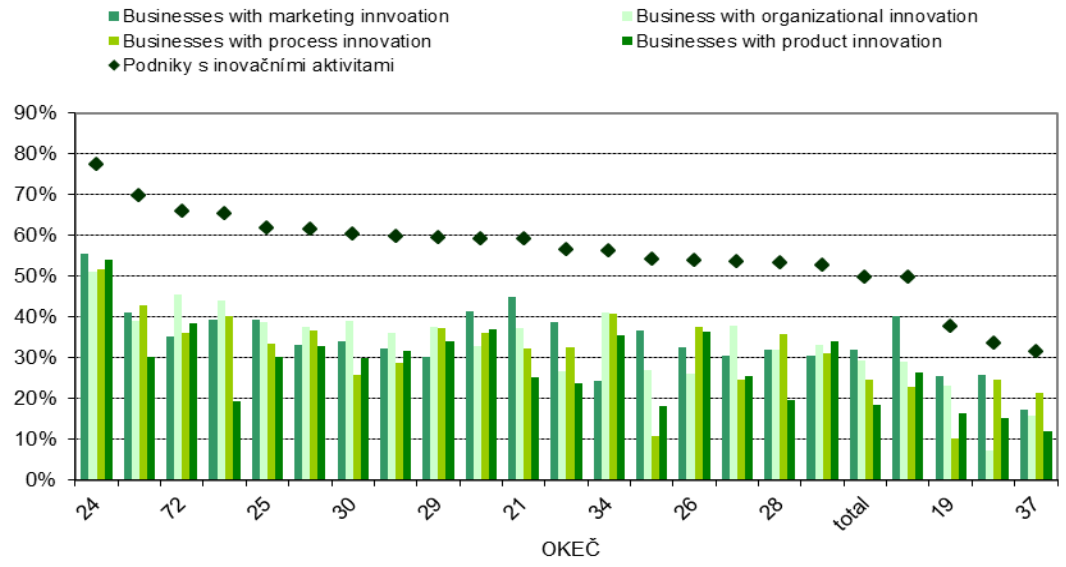
A general comparison of innovation performance by company size and ownership was conducted in the Analysis of the State of R&D from 2010. Analysis of innovation activities is based on available data (Innovation Survey of Businesses 2006-2008[39]); similar survey will be concluded during 2011 and published in February 2012. The focus will be only on innovative businesses. According to the CZSO (or Eurostat methodology) innovative businesses are those, which either implemented one of the four innovation types or performed continuous or interrupted innovation activities during the monitored period.

D.3.1. Innovative businesses and innovation types

The chart D.7 clearly shows that most of the companies in the manufacturing industry perform more innovation activities than the republic average. All the above mentioned branches are also above the average, however no clear relation has been found between the share of innovative businesses and R&D intensity. This is due to the nature of the survey, which doesn't take into account qualitative differences between individual innovations or their quantity. That's why the automotive industry (OKEČ 34), i.e. branch, which has the highest GVA share and R&D intensity, finished in the second half of the monitored sample. According to this survey the most innovative businesses are those in the branch "production of chemical substances, medicines and chemical fibers (OKEČ 24) both from the general and individual innovation point of view.

[39] Due to insufficient number of subjects and therefore the absence of most of the monitored data, these activities were excluded from the comparison: manufacturing of tobacco products (OKEC 16) and production of coke and nuclear fuels; oil refinement (OKEC 23). Names of individual branches with numerical codes are included in the appendix.

Chart D.7: Share of innovative businesses and individual innovation types in the manufacturing industry branches and Czech Republic total, 2006-2008

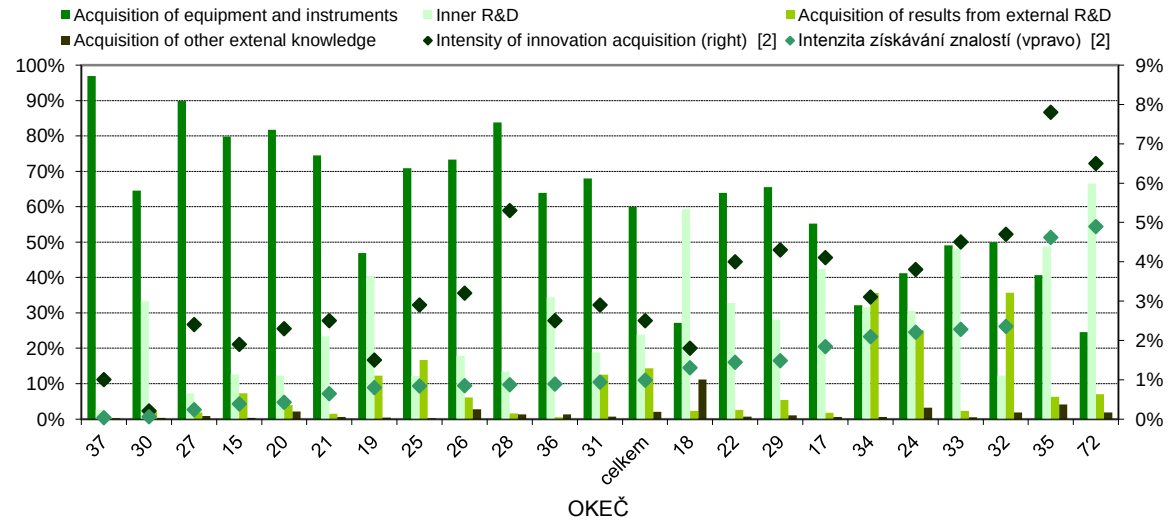


Source: CZSO, TI 2008

D.3.2 Innovation expenditures

A more interesting comparison is provided by the data on innovation expenditures. Chart D.8 shows that with increasing expenditures on machines, equipment and software the expenditures on obtaining knowledge, especially internal R&D, tend to decrease. The innovation intensity indicator includes all innovation expenditure, including the purchase of machines and equipment, as a share of total revenue. According to this indicator the branch with the highest innovation intensity is the production of metal constructions and products (OKEC 28), where the highest share of innovation expenditures is spent on machines and equipment. All of the branches selected in the previous part due to their share in GVA and R&D intensity, except for food industry (OKEČ 15), had above-average innovation intensity. These branches also show the highest intensity of obtaining knowledge.

Chart D.8: Innovation expenditures in innovative businesses from selected branches and innovation intensity in 2008



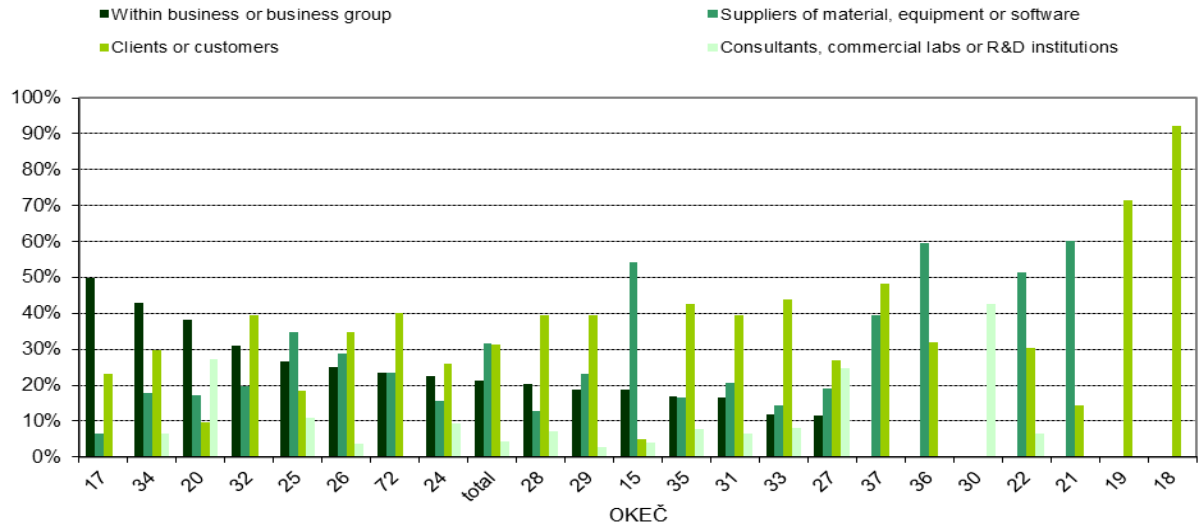
[1] Share of innovation expenditures in total revenue, [2] share of expenditures for internal R&D, obtaining results from external R&D or obtaining other external knowledge on total revenue

Source: CZSO, TI 2008

D.3.3 Innovation cooperation

Innovation often isn't the result of only one subject's activities, but is created in cooperation with other subjects. With the exception of some branches the most significant partners seem to be the businesses' suppliers, clients and customers. In the case of more knowledge-intensive businesses the partner is often a business group or the company itself. Often the main source of innovation for these businesses is the parent company, which may indicate a lesser autonomy of Czech affiliations and their lesser inveteracy in the national economy. The importance of the business group was also apparent when observing branches with a higher GVA share, but lower R&D intensity (OKEČ 28, 29, 15), which can be connected to the high share of foreign-controlled businesses in the Czech Republic. In the case of businesses with lower R&D intensity the important innovation partners are usually equipment suppliers. This corresponds with the previous chart.

Chart D.9: Most significant innovation partner of innovative businesses by type of partner in 2006-2008

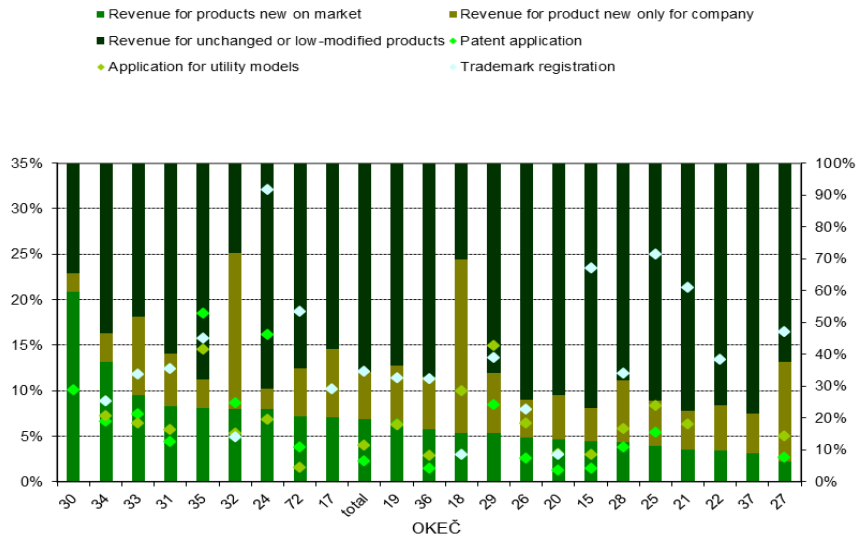


Source: CZSO, TI 2008

D.3.4 Innovation results

Based on the data from the innovation survey it is possible to perform a comparison of innovation effects between individual branches. The chart below shows that the more knowledge-intensive branches more often introduce new products, which are the result of higher R&D investments. The highest share of revenue from brand new products is in the production of office machines and computers (OKEČ 30), where there is a very dynamic development of new technologies. The most frequent form of intellectual property protection is trademark registration. In the case of knowledge-intensive branches, which have a higher share of revenue from new products, there is an apparent higher interest in obtaining patent protection.

Chart D.10: Revenue from innovated products in businesses with product innovation in 2008 and intellectual property rights of innovative businesses in 2006-2008



Source: CZSO, TI 2008

D.4 High-tech foreign trade

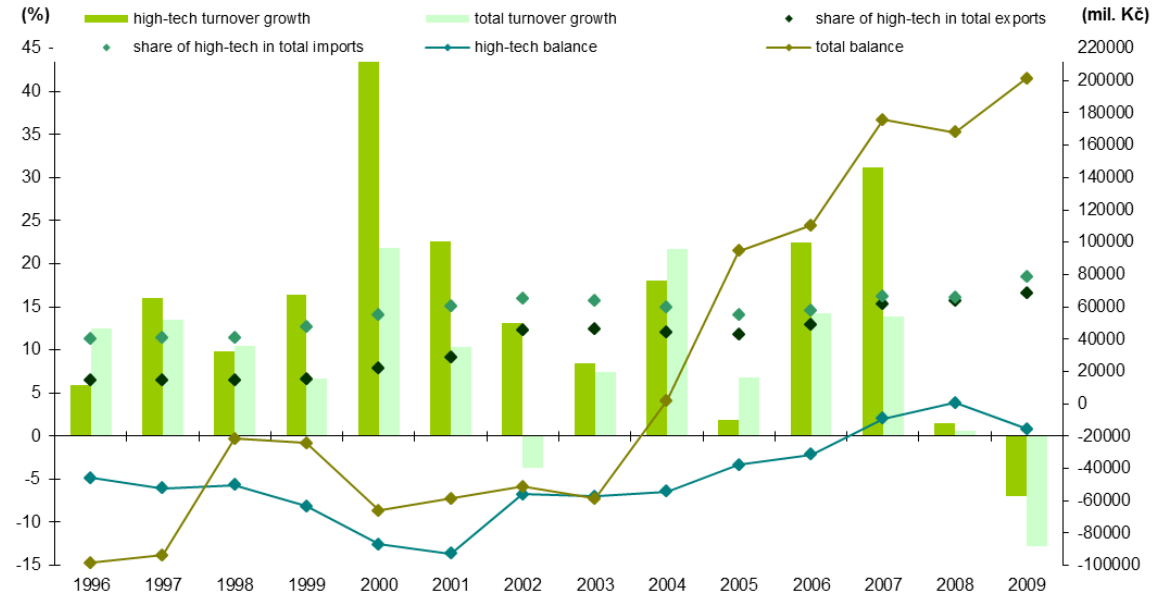
For a small open economy such as the Czech Republic the foreign trade is very important. The foreign trade balance had only a 5.5% share in the Czech GDP, but the total turnover of foreign trade is 1.5 times bigger than the GDP. The ability to succeed on foreign markets is also considered as another indicator of the economy's competitiveness. The most important export items are machines and automobiles.

Since 2004 the Czech Republic has a positive foreign trade balance. Similar development can be observer in the foreign high-tech trade, which also gradually became balanced. However it never reached a significant surplus. With the exception of 2009 the high-tech goods turnover has grown consistently since 1996 and for most of the period grew faster than the total turnover. This reflected in the increasing share of high-tech foreign trade both in the total export (14.4% in 2010) and the total import (17.9% in 2010). Years 2008 and 2009 are influenced by the global economic crisis; however the high-tech foreign trade recorded a lower loss than the overall Czech foreign trade turnover and in 2010 the trend of previous year resumed.

A closer look at the goods structure of the Czech high-tech export (Chart D.12) shows the dominance of IT and electronics including telecommunication. [40] Both categories increased their share in high-tech export to 83%. Similar development can be observed in the structure of high-tech imports. The negative balance of Czech high-tech foreign trade is particularly influenced by the increased imports of IT from China, and electronic and telecommunication equipment (primarily from China and Germany).

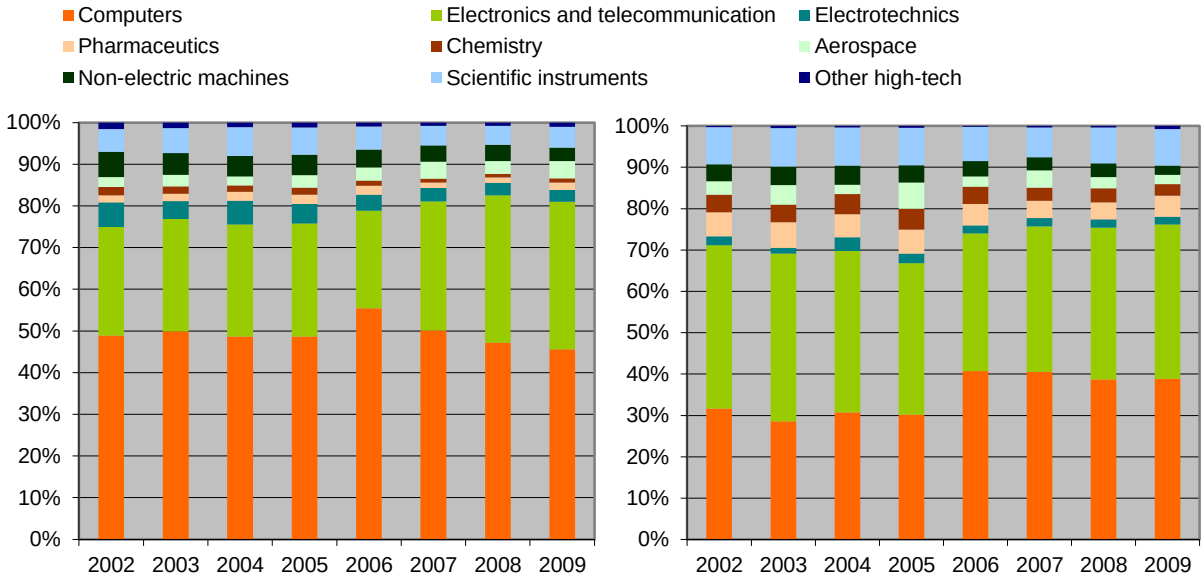
[40] Since 2007 there is an apparent decrease of the share of IT and the increase of electronics and telecommunication. This is due to the change in SITC goods classification, which came into effect in 2007.

Chart D.11: Foreign trade turnover and the share of high-tech foreign trade (%) and Czech foreign trade balance in 1996-2010* (billion CZK)



**data for 2010 is preliminary*
Source: CZSO

Chart D.12: Structure of exported and imported high-tech goods, Czech Republic in 2002-2010*



*Note: since 2007 there is new goods classification, therefore data from previous years aren't comparable; * preliminary data for 2010*
Source: CZSO

D.5 Summary

The international multi-criteria comparison of competitiveness shows that the Czech Republic has a relatively good economic environment, which is its main advantage when compared to other states. Innovation performance and generally the competitiveness of the Czech Republic is hindered by low-quality political environment, ineffective administration of public resources and excessive bureaucracy, as is shown in the WEF international comparison. According to the international comparison of the summary innovation performance the Czech Republic remains below EU27 average, however it has an above-average ability to utilize the economic benefits of innovations. The main shortcomings of the innovation environment are the low availability of innovation funding (especially in the form of risk capital) and low use of industrial right protection. The data in this chapter indicates that the Czech competitiveness is primarily driven by the innovation activities of businesses and hindered by the quality of institutional environment.

The manufacturing industry remains an important sector of the Czech economy and we can expect that this situation won't change anytime soon. Despite that the share of services in the total GVA increases gradually, as is common in the advanced countries. However, the Czech Republic is still way behind the advanced European states in terms of economic advancement and labor productivity. In the recent years it has been apparent that some other new member states show a higher growth rate of labor productivity and economy and the Czech Republic can lose its leading position in this group of states. Nevertheless it is positive that the economic crisis didn't impact the Czech economy as hard as in the case of other European states (e.g. Estonia).

The manufacturing industry is not only important in the economy, but also in the R&D activity of the business sector. Selected branches of the manufacturing industry invest the most resources into R&D. In this regard the most important branches are automotive and production of optical and electrical precise equipment. Knowledge-intensive branches are also progressively represented in the innovation characteristics. Businesses in these branches are more active in gaining knowledge (internal or external) and spent a larger part of their R&D expenditure on their own R&D. Because of this these businesses have also a higher share in the patent applications and higher revenue from innovative products. As a result innovation enables these businesses to succeed on new product markets and increase their competitiveness. Apart from the production of automobiles (OKEČ 34) the knowledge-intensive branches don't have a significant share in GVA. On the other hand there are also branches, which are not so demanding regarding the utilization of knowledge, but allocate a larger part of their resources on acquiring new machines and equipment.

The foreign trade income is an important part of the GDP of the open Czech economy. The positive factor is that the high-tech sector shows a higher growth rate than the total Czech foreign trade and therefore its share in both exports and imports increases continuously. Another trend is the decrease of the until recently significantly negative high-tech foreign trade balance; in 2010 there was a surplus in this trade for the first time. As for the structure of goods the most important item over the long-term have been computers and electronic and telecommunication equipment, which together make up ca. 80% of high-tech exports and imports.

E International research and cooperation

International cooperation in R&D activities continuously gains in significance, which is aided by the deepening integration of the European Research Area –ERA. For a number of years the Czech Republic has drawn funds from framework and operational programs and maintained bilateral and multilateral cooperation with foreign partners. Therefore the activities of the Czech R&D exceed the national borders.

However the importance of the R&D cooperation grows, there are no long-term indicators, which would map this area and therefore it is not possible to use them for a thorough analysis of cross-border activities. The financial indicator show the total amount of funding coming to the Czech Republic and the structure of target subjects. A more detailed overview of the activities and success rate of Czech beneficiaries, including the topical focus of the R&D, can be gained from data on framework programs for R&D (FP). These programs are long-term the largest activity of international R&D cooperation in terms of budget. Apart from that the Czech Republic draws funds from operational programs (OP). The FP are community programs, which are financed directly from the EU budget and managed by the Commission. Unlike the OP, which allocate funding from structural funds, the FP have a lesser degree of national interference. Apart from FP and OP the Czech Republic participates in a number of other international activities, e.g. the EUREKA project or COST program. Apart from that there is funding from the Financial Mechanism EEA and FM Norway.

The structure of this chapter copies the differences between individual international R&D funding tools and describes in separate parts the Czech participation in FP, OP and other sources of R&D support. The amount of funding coming from the FP is higher than form any other source and therefore the major part of this chapter focuses on it. Information about FP comes from the E-CORDA database, which is maintained by the Commission and is not publicly available. The main sources of data on the OP are the summary monitoring reports and data of various ministries; the participation in other international programs was evaluated by the R&D IS. The characteristics of individual programs are preceded by introductory information about the funding of Czech R&D from foreign sources, which uses data from CZSO and Eurostat.

E.1 Foreign sources of R&D funding

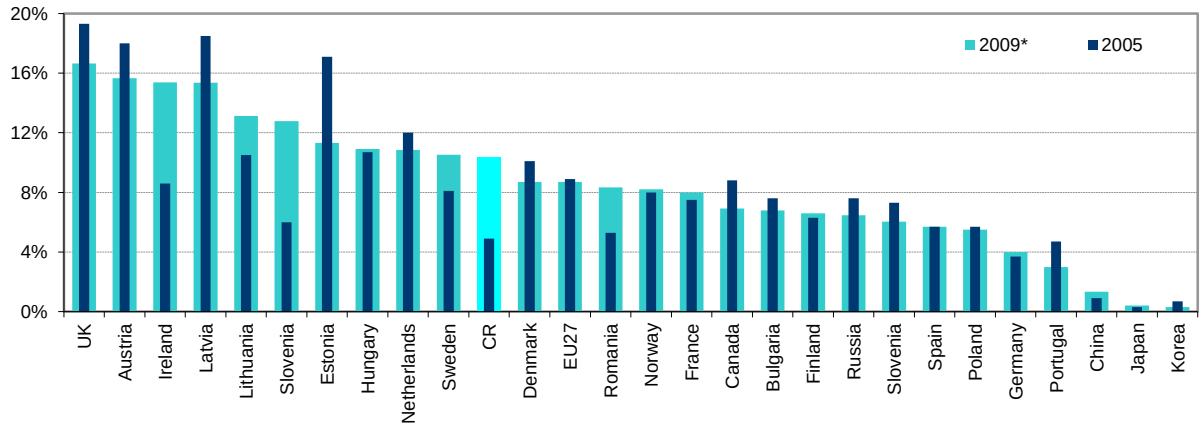
The funding sources are monitored in the surveys as one of the R&D expenditures characteristics. The foreign funding category includes resources from foreign businesses, various forms of payments from the EU and international organizations and foreign governments, universities and NGOs. The share of foreign R&D is increasing, especially in recent years. This is the reason why the Czech Republic moved above the EU27 average in 2005-2009 (chart E.1). The share of foreign funding doubled over this period; however in 2009 its share stopped at 10.4% and stagnated. In absolute values the amount of foreign funding increased, but so did the total R&D expenditures (GERD).

The growth of the volume of foreign R&D funding is accompanied by an increasing number of sites using these sources. This can be seen as positive, because it causes an increase of the base of those, who have sufficient quality or experience to reach foreign funding. The highest increase has been recorded in foreign-owned businesses. The data indicates that an increasing number of activities with high added value are being performed in the Czech Republic. This is confirmed by the data on foreign affiliations, which shows that the highest relative increase in R&D funding is in specialist, scientific and technical activities. The number of beneficiaries among universities is also increasing, while in the AS CR sites the number of beneficiaries stays the same.

The rate in which the domestic sources are complemented from foreign sources differs greatly between individual states and identification of trends is very difficult. The same is true for the presented development (chart E.1). The European countries have a far larger share of foreign R&D funding that the Asian countries, where R&D funding has mostly national character.

A significant factor within the EU is the economy size. Large economies such as Germany or France have a lower ratio of foreign R&D funding and contribute more to the European reallocation mechanism. On the other hand the highest ratios can be seen in smaller economies, usually from the group of new member states (e.g. Slovakia). The share of foreign funding in R&D expenditures is one of the few indicators, which is balanced for the new and older EU members. As for the relative increase in this ratio the highest values can be observed in Slovakia, Czech Republic and Ireland. The cause of increasing foreign funding can be seen in the attractiveness of the Czech Republic for the private investors. The funding from private sources quadrupled between 2006 and 2009; in 2010 their decrease was balanced by the significant increase in public funding, coming mostly from the EU.

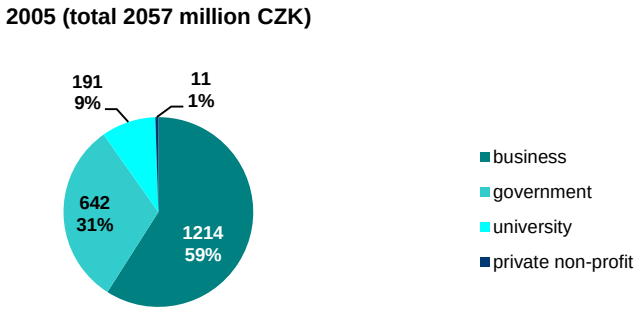
Chart E.1: The share of R&D expenditures from foreign sources in 2000-2009 (% GERD)



*Note: *EU27, France, Bulgaria, Spain, Germany, Portugal, Korea – data for 2008*
Source: CZSO, Annual Statistical Survey on Research and Development VTR 5-01

As for the target subjects the allocation of R&D is more or less similar as in the case of total R&D expenditures regardless of country of origin. The business sector is dominant with 60% of foreign funding (see chart E.2). Although in absolute value the amount of foreign funding in 2010 was three times as large as five years ago, the business sector share remains the same. This however isn't the case of the second largest sector – government sector – which comprises mainly of AS CR institutes. Despite the absolute increase a part of its share has been claimed by universities, whose share increased by 2/3 during the last 5 years (fivefold in absolute value). This trend indicates the increasing internationalization of universities as the public funding of university R&D increased by less than 100% during the same period.

Chart E.2: R&D expenditures from foreign sources by sectors of performance in 2005-2010 (current prices)



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

E.2 Framework programs for R&D support – 7th FP and EURATOM

From the very beginning, which dates to 1984, EU framework programs have been focused mainly on target-oriented research, whose goals are formulated in working programs issued by the European Commission. However the **7th Framework Program for research, technological development and demonstration (FP7)** represents an important change, since for the first time it contains a substantial portion of the overall budget for the support of fundamental research. This part of FP7 is managed by the autonomous European Research Council (ERC). As before, the **7th EURATOM Framework Program,** which is focused on special areas of the peaceful use of atomic energy, runs in parallel with FP7. Although the fiscal periods of the 7th FP and EURATOM are different, the rules for participation in this program are the same as those for FP7.

The budget of FP7 is 50.521 billion EUR for the fiscal period 2007-2010; the EURATOM budget is 2.8 billion EUR for 2007-2011 (for additional period 2012 -2013 there is a proposed budget of 2.5 billion EUR). The unusually large increase in the budget: FP7 will have at its disposal annually a budget which is some 40% higher than for FP6, is unprecedented. The FP7 consists of four specific programs: Cooperation, Ideas, People and Capacity.

The specific program **SP1 "Cooperation"** supports target-oriented research, that is, research based on the needs of society. This program is divided into ten thematic priorities which follow on clearly from the range of themes of the preceding FP6. Just as in previous framework programs each priority has its own detailed work program, referred to in European Commission calls for submission of project proposals.

The specific program **SP2 "Ideas"** supports blue-sky research work. For this program no research targets are set, but the areas and disciplines for research are defined. Project proposals may be submitted by researchers from throughout the world, but projects must be implemented in EU locations or countries associated to the FP7[41]. The ERC sets up commission, which on the basis of peer review select and recommend submitted project proposals for financing. A proposal's worth is decided exclusively by its scientific excellence assessed by two criteria: the professional capability of the proposer and the proposal itself, i.e. the manner in which it exceeds the bounds of current knowledge in the given area.

The specific program **SPS "People"** support lifetime learning for researchers and is a direct continuation of the "Marie Cure Events" which already have an established tradition from earlier framework program. The range of these events is of course adapted to current and newly anticipated needs.

The specific program **SP4 "Capacity"** has as its goal the strengthening of the research capacity within the European research space. It supports the development of research infrastructures, research on behalf of small- and medium-sized enterprises, the linking-up of knowledge regions, the development of research potential, the activities of "science in society" and international cooperation with third countries.

The 7th FP EURATOM includes two research areas - "Fusion energy research" and "Nuclear fission and radiation protection". The program includes activities within R&D, technological development, international cooperation, spreading of technical knowledge and its use in specialist education.

In many cases the European Commission provides only a portion of the costs for a team's involvement in a project. According to Act No. 130/2002 Coll., on the Support of Research and Development from Public Funds and on the Amendment to Some Related Acts (the Act on the Support of Research and Development) universities, public research institutions and a number of other organizations can request that the Ministry of Education, Youth and Sport increases its institutional funding up to the level where, in conjunction with the European Commission contribution it covers 100% of their team participation costs in a FP7 project.

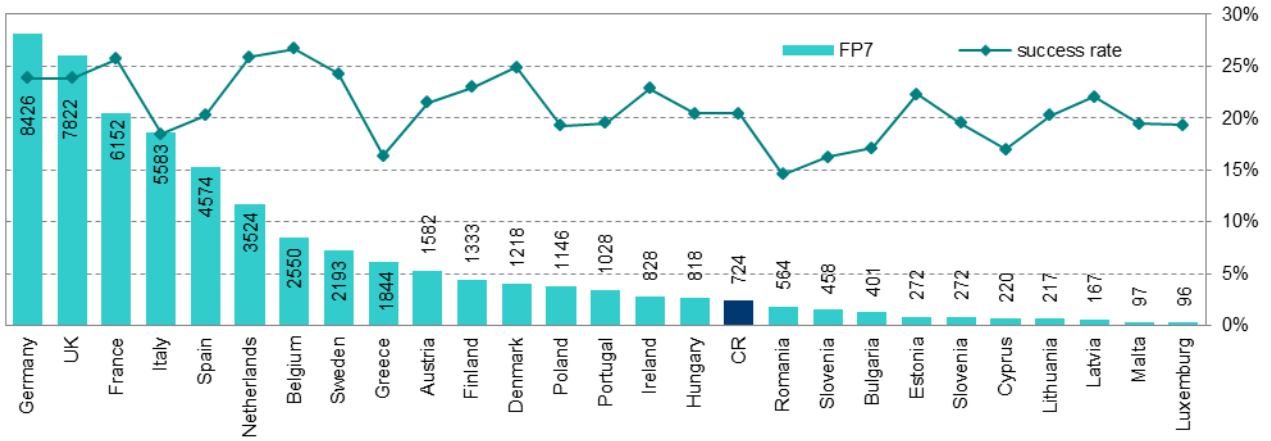
In the following analysis the abbreviation FP7 is used both for FP7 and FP7 EURATOM.

E.2.1 Participation in FP7 projects and their preparation

The FP7 is in its five year and so the cumulative indicators of participation show relatively high values. Chart E.3 shows the number of teams from individual EU countries, which participate in any of the FP7 projects. Teams from the Czech Republic participated in 724 projects. The chart is clearly divided into two halves – older member states recorded more participation, while the second part comprises mainly of new member states. The projects for participation are selected in a process based on the independent review method. The ratio of total submitted projects and executed projects shows the success rate of individual countries. The chart E.3 shows the success rate, i.e. the number of teams, which submitted a proposal and number of those, whose project was selected. Czech teams reached a success ratio of 20.4%, which places them in 14th place. The most successful teams are from Belgium, Netherlands and France. These teams exceeded the 25% success ratio.

[41] Norway, Iceland, Liechtenstein, Israel, Switzerland, Turkey, Croatia, Serbia, Macedonia, Montenegro and Albania, Bosnia and Herzegovina, Faroe Islands

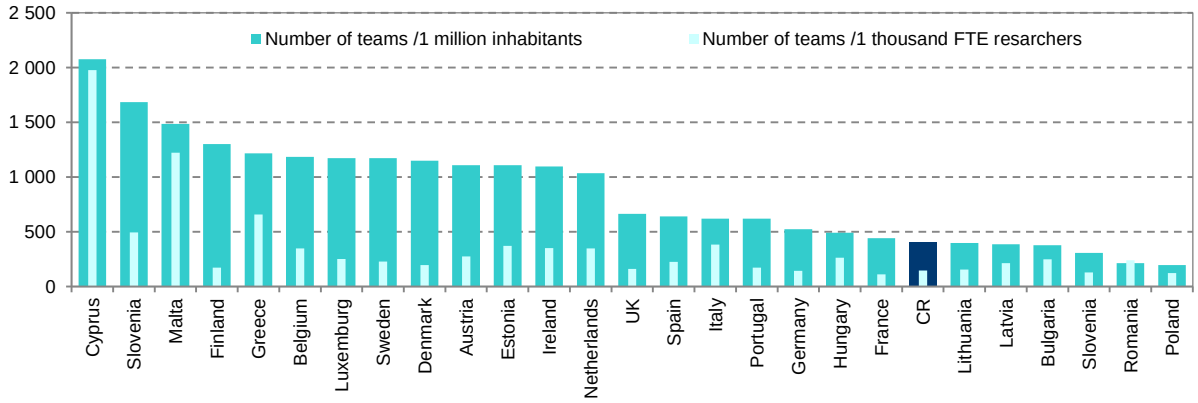
Chart E.3: Number of participating teams and success rates of individual EU countries in FP7



Source: E-CORDA

Individual member states differ in the proposal submission activity. Their reaction to calls within the FP7 depends strongly on the R&D sites capacity, which in turn strongly depends on the population size, availability of financial resources and other R&D characteristics. Chart E.4 compares the number of teams participating in the FP7 per 1 000 FTE researchers in the given country to the number of teams per million inhabitants. It is apparent that the FP7 is more attractive for smaller member states (with the exception of Italy). On the other hand states such as France, Germany or the UK are at the bottom of this ranking. Countries with similar size as the Czech Republic (Greece, Sweden, Belgium, Austria, Portugal, Hungary and Bulgaria) have significantly higher intensity of proposal submission than the Czech Republic. According to the number of teams/1000 researchers (FTE) ratio the Czech Republic is in the 23rd place, only Slovenia and Poland ranked worse among the new member states. According to the number of teams/million inhabitants ratio the Czech Republic showed better values than all the older member states and was 6th among the new member states.

Chart E.4: Relative number of teams from EU member states participating in FP7

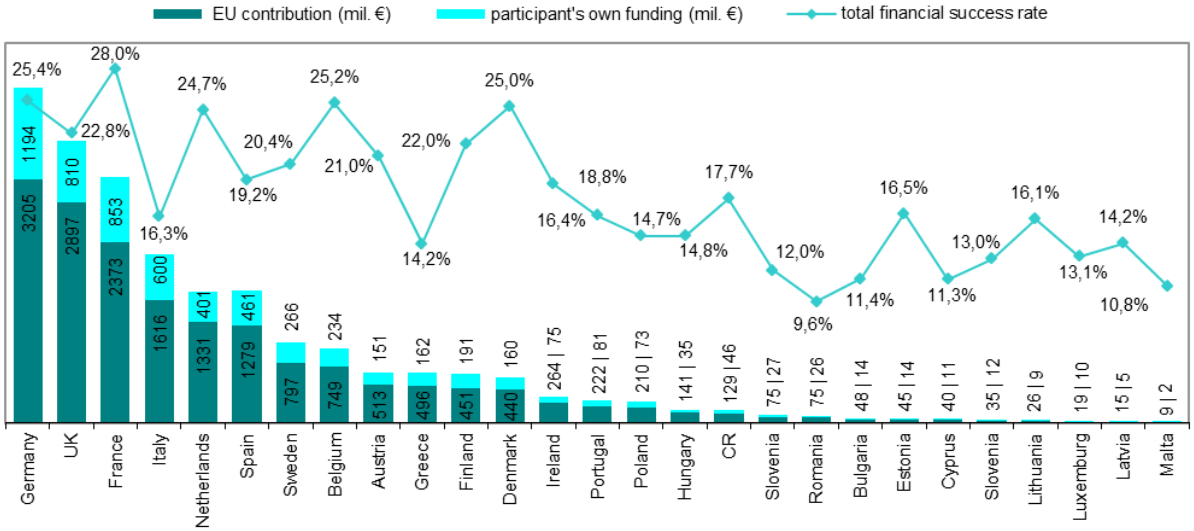


Source: E-CORDA, Eurostat

E.2.2 Financial indicators

The contribution of the team participating in FP7 depends on the activity type and the nature of the applicant. The contribution is between 50% of the total costs in the case of demonstrational activities to 50-75% in the case of research activities to 100% contribution for coordination of research projects or for solvers of coordination and support activities and also for fundamental research projects. Higher contributions go to non-profit public subjects, higher education institutions, non-profit research organizations and SME. Chart E.5 shows the amount of funding the teams from individual countries received for their project's operation complemented by sources provided by the participants themselves. The rankings are again influenced by the size of individual countries. Teams from the Czech Republic received a pledge of funds in the amount of 129 million EUR from the EU and another 46 million EUR were contributed by the participants themselves. The total amount is 175 million EUR, which is comparable to Hungary. Other states with similar size receive multiple times higher funding.

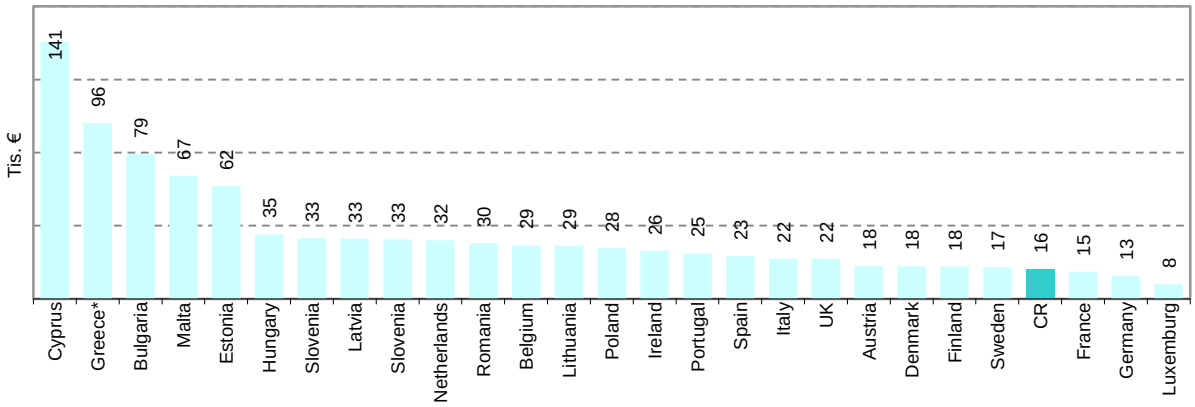
Chart E.5: Financial indicators of the FP7 by EU member states



Source: E-CORDA

As for the financial success rate, i.e. the ratio of requested and received funding, the Czech teams fare much better. Their success rate is higher than in all of the new member states and also higher than in some original member states, such as Italy, Portugal and Greece. Countries, which typically have a strong R&D, such as France, Belgium, Netherlands and others have a much higher success rate. While the Czech value is 17.7%, the best countries have values over 25%.

Chart E.6: Contribution requested by teams from individual countries per 1 million EUR GERD



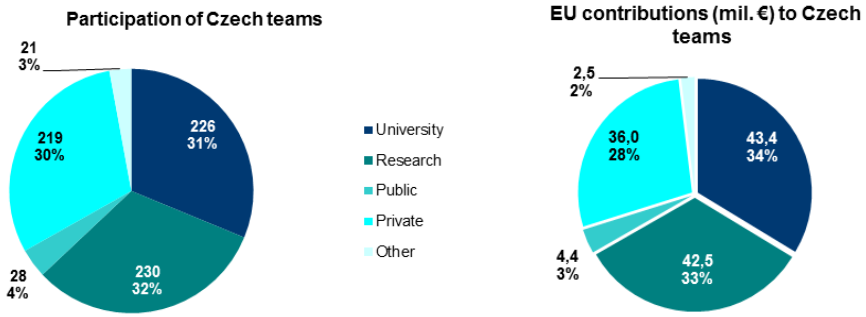
Data not available for 2008-2009, estimate based on 2007 results
Source: E-CORDA, Eurostat

It is necessary to view the financial indicators in relation to the amount of R&D investment in the given country by relating the amount of requested resources to the GERD expenditures. The monitored period includes years 2007-2011, whereas there is only a small part of 2011. Therefore we take into account the sum of GERD in years 2006-2010. Chart E.6 shows the total amount of EU contributions to 7FP projects converted to 1 million EUR GERD. Teams from the Czech Republic demanded in the 2007-2011 period 129 million EUR, GERD in 2006-2009 reached 7.979 billion EUR. The Czech Republic therefore requests ca. 16 000 EUR per 1 million EUR GERD and this value places it in 4 places from the bottom. The chart also shows that the larger states demand less contributions than the smaller ones related to their R&D spending. When comparing countries with similar R&D intensity (Estonia, Slovenia, Netherlands, Portugal, Ireland, Spain) we can see that these countries receive multiple times larger contribution than the Czech Republic.

E.2.3 Structure of 7FP participants

FP7 enables the participation of universities and research organizations, private businesses, government institutions and other subjects. The participation of SME is particularly supported; the long-term target is to reach a 15% share. The participation of the private sector in the FP7 is decreasing compared to previous programs and effort is made to turn this trend around. In the Czech Republic 135 of the 724 participating subjects come from SME, which is ca. 18.6%, in case of the EU contribution the share is 18.5%. The value of both indicators therefore exceeds the quota set by the EU. The Czech Republic always belonged to countries with a high share of the private sector, which continues to be true even today. In comparison to other countries it is in 7th place in the share of private sector and 9th according to the EU contribution. The sector structure of participants is shown in chart E.7, the classification is in accordance with the source data of the Commission. The shares of university and research sector are almost equal in the Czech Republic. A large part of the research sector is made up by the AS CR institutes (57% participants and 65% EU contribution). There is a very low participation of the government sector; its share is low also when compared to other EU states (21st place). This places the Czech Republic among countries with strong R&D systems such as Netherlands, France, UK and Germany.

Chart E.7: Participation of Czech teams and EU contribution by sector

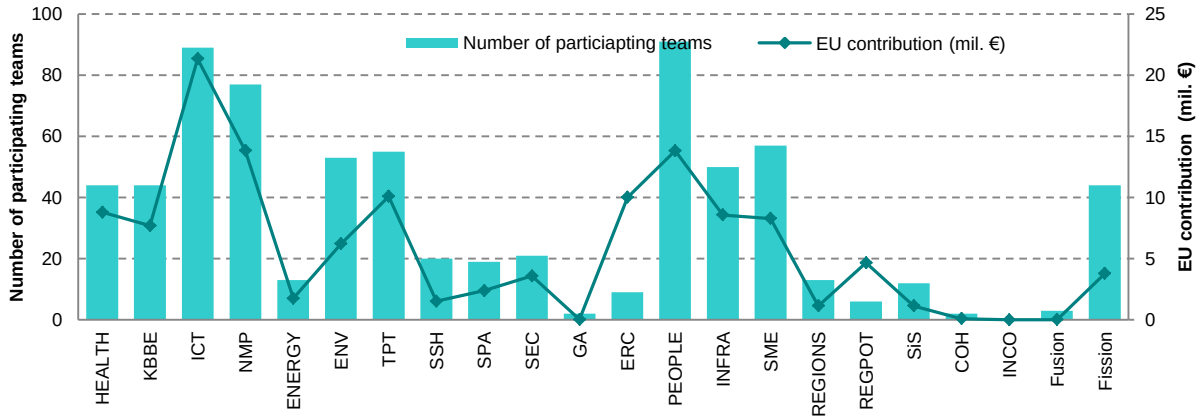


Source: E-CORDA

E.2.4 FP7 priorities

The FP7 is divided into four specific programs and each of these programs includes a number of topical or horizontal priorities. Topical priorities monitor research goals in a given field (e.g. Health), horizontal goals target aspects which go across ERA (blue-sky research, mobility, participation of SME etc.). Chart E.8 shows the number of participating Czech teams in individual priorities and the contribution they received from the EU. The values are influenced by the size of budgets of individual priorities; the largest priorities are ICT and HEALTH. The Ideas program also has a sizeable budget with only one priority (ERC); however compared to other priorities there is a larger contribution per participant. Slightly less sizeable budgets are in priorities Nano science, materials and new technologies (NMP), transport (TPT) or program People (PEOPLE). The most teams from the Czech Republic participate in PEOPLE, ICT, NMP and slightly less in HEALTH. Other priorities with significant Czech participation are Agriculture, food and biotechnology (KBBE), Environment (ENV), Transport (TPT), Infrastructure (INFRA), R&D in SME (SME) and nuclear fission and protection (Fission) of the EURATOM program. On the other hand the Czech teams do not participate in the INCO priority. The Czech teams received the most resources in ICT, NMP and PEOPLE; an above average contribution related to the number of projects was achieved in the research potential priority (REGPOT).

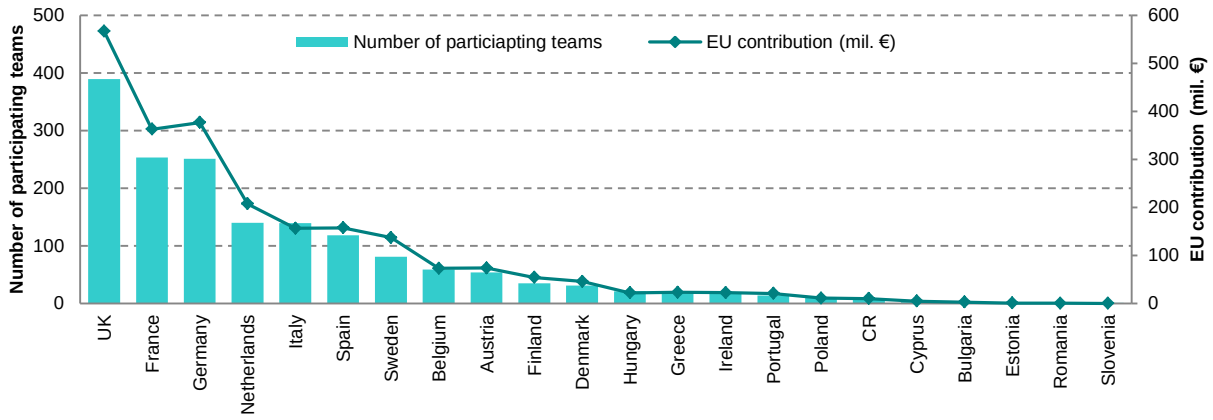
Chart E.8: the participation of Czech teams and EU contribution in individual FP7 priorities



Source: E-CORDA

The highest average contribution per participant is in the Ideas (ERC) program. These are projects that are solved by only one solver. They are aimed at fundamental research and have a goal to surpass the limits of human knowledge. Although they were first implemented in FP7, they are considered as one of the indicators of scientific excellence and prestige. Most represented country is the UK with 25% of the whole EU, followed by France, Germany, Italy, Spain and Netherlands. Czech teams acquired 9 ERC projects with the total contribution of 10 million EUR. In the group of new member states only Hungary has higher participation, however its value is twice as high as the Czech one (21 projects and 22 million EUR).

Chart E.9: Participation of teams from EU member states in ERC grants (specific program Ideas)



Source: E-CORDA

E.3 R&D support from EU structural funds

Structural fund are one of the tools for executing the policy of economic and social cohesion of the EU, which aims to decrease the differences in development of member states and their regions. Basic documents regulating the drawing of financial resources from SF are operational programs (OP). R&D funding is covered by three OP. OP R&D for Innovation (OP VaVpI) is aimed at strengthening of the research, development and innovation potential of the research institutions and universities. OP Education for Competitiveness tries to modernize the education system. OP Enterprise and Innovation is the key tool for developing R&D activities in the business sector. In the years 2007-2013 the Czech Republic may draw a total of 200 billion CZK.

The global aim of the OP VaVpI is to strengthen the research, development and innovation potential of the Czech Republic, contributing to a growth in competitiveness and the creation of highly skilled jobs. The program is administrated by MoEYS and supports modernization of research sites and increase in capacities of tertiary education. From the funding point of view (almost 60 billion CZK) it is the fourth largest OP. Support within this program is provided as a 100% subvention. The OP is divided into 4 main axes. One third of the funding goes to the first axis, which supports the creation of cutting edge R&D institutes with unique infrastructure and a certain critical mass; another third of the funding is allocated to the second axis, which aims to support regional application-oriented sites. The third axis focuses on the development of infrastructure for R&D results commercialization and the fourth axis focuses on improving the quality of tertiary education, modernization of the system and its connection to practice. Financial overview of the OP funding is provided in table E.1. By 3rd June 2011 the managing body received 220 applications in the value of 97.6 billion CZK, which is ca. 160% of the total allocation. So far the support has been granted to 62 projects, which will draw one half of the program's allocation. The largest demand overhang is in the case of regional R&D centers. 32 projects were supported from 103 applications; this covers 72% of the allocation of this axis.

Table E.1: Statistics of drawing from OP VaVpI (3rd June 2011)*

Priority axis	Total allocation	Submitted applications		Projects with issued Decision	
	mil. CZK	mil. CZK	%	mil. CZK	%
1 European centers of excellence	19 762,8	23 945,0	121,2	9 319,2	47,2
2 Regional R&D centers	19 763,1	51 315,9	259,7	14 283,6	72,3
3 Commercialization and popularization of R&D	6 149,7	7 488,7	121,8	800,0	13,0
4 Infrastructure for university education and R&D	11 941,3	14 070,0	117,8	5 609,6	47,0
OP VaVpI Totals	59 706,9	97 603,8	163,5	30 796,6	51,6

** Only axes with a direct connection to R&D are listed (not the Technical help axis). Last row presents total data for the OP*
Source: monthly monitoring report, May 2011, MLD

The global aim of the **Education for Competitiveness OP (OP VK)** is the development of an education-based society with the purpose of strengthening the competitiveness of the Czech Republic by means of the modernization of the systems of elementary, tertiary and further education, linking them into a comprehensive system of lifetime training and improving conditions in research and development. The MoEYS allocates a total of 53 billion CZK within this OP. The co-financing rate is as much as 100%. The resources are divided into 4 priority axes, the second being the most relevant for R&D. This axis focuses on modernization of tertiary education, making the system more attractive for employees and creation of partnerships for execution of common research projects. 2350 individual projects applied for resources in the amount of 18 billion CZK; 559 of them received the Grant Award Decision. From the financial point of view the demand is almost twice as large as the supply, however only one third of the resources have been drawn so far.

Table E.2: Statistics of drawing from OP VK (3rd June 2011)*

Priority axis	Total allocation	Submitted applications		Projects with issued Decision	
	mil. CZK	mil. CZK	%	mil. CZK	%
2 Tertiary education, R&D	18 068,7	43 167,9	238,9	6 287,2	34,8
OP VK Totals	52 754,1	100 307,0	190,1	22 683,7	43,0

** Only axes with a direct connection to R&D are listed. Last row presents total data for the OP*
Source: monthly monitoring report, May 2011, MLD

The partial activities of the OPPI aim to fulfill the global goal of the program, which is to improve the competitiveness of the Czech Republic and to bring the innovation performance of Czech businesses closer to the level of foremost European countries. The program focuses on the development of business environment and stimulation of the transfer of R&D results into the commercial sphere. OPPI falls under the administration of MIT and may draw funds exceeding 88 billion CZK. The R&D is connected to the fourth and fifth axis (table E.3) and partial programs Innovation, Potential, Prosperity and Technological Platforms. Of the three mentioned programs the OPPI is the program with the best drawing of funds. 63% of the total allocations have already been allocated; the development of the fourth axis is the same as the OP average. 1 092 successful projects received 62% of the available funding. The fifth axis is significantly behind, not only in the share of projects with issued Decisions, but also in the number of applications. There are huge regional differences in the drawing of partial programs. The most active regions are Středočeský, Jihomoravský, Moravskoslezský and Zlínský.

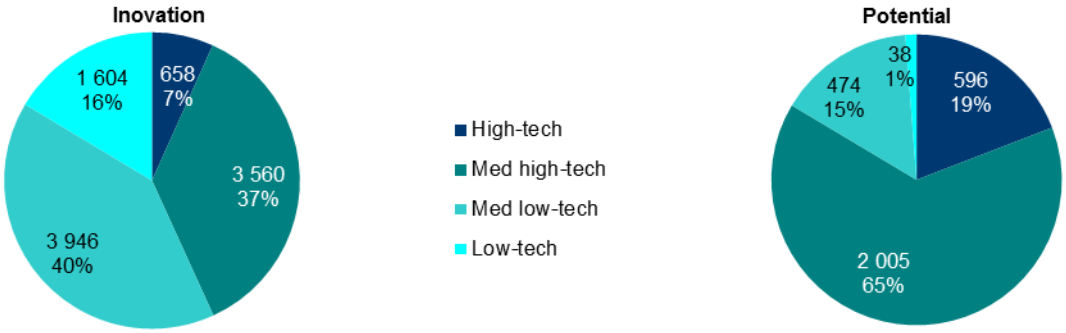
Table E.3: Statistics of drawing from OPPI (3rd June 2011)*

Priority axis	Total allocation	Submitted applications		Projects with issued Decision	
	mil. CZK	mil. CZK	%	mil. CZK	%
4 Innovation	22 646,2	31 853,8	140,7	13 940,3	61,6
5 Enterprise and innovation environment	26 543,4	24 447,6	92,1	12 139,4	45,7
OPPI Totals	88 121,5	110 948,3	125,9	55 273,3	62,7

** Only axes with a direct connection to R&D are listed. Last row presents total data for the OP*
Source: monthly monitoring report, May 2011, MLD

The comparison of two complementary programs Innovation and Potential in terms of technological demands of activities of businesses with supported projects shows fundamental differences (Chart E.10). There are traditionally four groups sorted by the level of sophistication of the performed activities - high-tech, medium high-tech, medium low-tech a low-tech. While the participants of the Innovation program, which aims mostly at incremental improvements in production, are mostly businesses with traditional production, i.e. with lesser share of high-tech activities, the Potential program attracts companies from branches with higher added value and supports internal R&D activities.

Chart E.10: Amount of funding from Innovation and Potential programs – structure of target subjects (20th June 2011)



Source: Czechinvest, OP information system (ISOP)

Because Prague isn't included in Goal I and cannot be supported from the above mentioned OP, two much smaller programs have been created. **OP Prague Competitiveness** is aimed at support of investment projects, among others support of innovation in businesses. This program has total available funding of 2.4 billion CZK, 86% of which has already been allocated. **OP Prague Adaptability** in the first axis provides resources for non-investment projects in the field of knowledge economy development. This represents the largest and also most attractive set of activities within the program. 270 projects have already drawn almost 80% of the available funding, whereas the demand is four times as big as the supply.

E.4 Support of international cooperation

The Czech Republic supports international cooperation through various mechanisms, be it program schematics or various forms of partnership agreements. The funding from state budget is directed to programs COST CZ, EUPRO II, EUREKA CZ, INGO II and KONTAKT II[42]; the amount of the funding for 2011 is 590 million CZK. Within the multilateral international cooperation the Czech Republic participates in the activities of the Research and Technology Organization - RTO, NATO scientific program called Security through Science, European Defense Agency EDA, Central European Initiative CEI, Visegrad Fund and also narrowly specialized organizations such as the European Space Agency or European Southern Observatory ESO. Bilateral cooperation agreements in R&D have been signed with 17 states and enable e.g. the mobility of researchers.

The above mentioned program schematics have different goals in an effort to complexly cover the R&D issue. The acceptable period of project solution is limited to a maximum of 4 years (3 years for INGO program); all programs are also expected to provide measurable and evaluable results in the form of publications, applicable outputs, patents, research reports etc. Projects are evaluated according to their goals, international cooperation, necessity and usability of their results. Applicants for support can be state organizational units and legal or natural persons. The support can reach 100% of eligible costs, however it is limited to 50% in programs EUREKA CZ and KONTAKT II for applied research.

Program **COST CZ**, which is a successor of the proven initiative COST, is aimed at the support of multilateral international cooperation in fundamental research especially when establishing new contacts. Each member state choses its individual form of support of its research organizations' participation and therefore it is impossible to perform international comparison. Disciplinary focus is set in individual calls for proposals.

Program **EUPRO II** is aimed at the support of the participation of Czech institutions in coordination of European research, in FP EU and bilateral activities. EUPRO II helps to provide the scientific community with information about the rules of international programs and to provide sufficient information for successful participation of Czech research sites in the above mentioned activities.

Program **EUREKA CZ** is an intergovernmental initiative independent on EU activities, which is aimed at the support of applied research in industrial companies, research institutes and universities across the technological sectors. EUREKA currently associates 39 countries; the Czech Republic is a member since 1995. EUREKA differentiates three categories of projects: individual, Eurostars and cluster projects. The Eurostars initiative focuses solely on SME, stimulates their research activities and lowers the risk connected with their innovation process.

The aim of the **INGO II** program is to enable the participation of Czech research sites in research programs or managing bodies of cutting-edge non-governmental organizations. Without such a program it would be impossible to e.g. participate in the CERN research projects. The expected results are publications in scientific periodicals with as high citation score as possible.

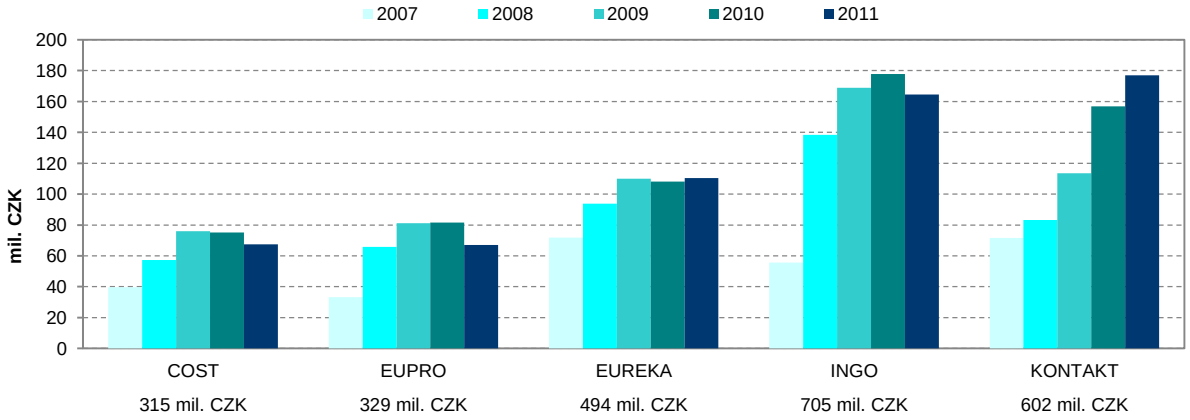
Program **KONTAKT II** supports the bilateral or multilateral international cooperation of R&D institutions. While in the previous years it focused primarily on the cooperation with EU member states (e.g. created prerequisites for participation in FP), now it focuses on strengthening connections to non-member countries. Currently the focus is on cooperation with China, Japan, Korea, Russia and USA.

[42] Starting with public tenders announced in 2011 the MoEYS implements new names for former programs COST, EUPRO, EUREKA, INGO and KONTAKT. This will lead to the overlapping of old and new names, whereas during the transition period both names shall be used.

Although the Czech Republic participates in these programs since the half of the 90s, the following statistics show only data for the last five years. Chart E.11 shows the volume of financial support, which is provided from the state budget to individual programs. Target subjects receive the most funding from INGO and KONTAKT programs, which focus on prestigious, cutting-edge projects and bilateral cooperation. The growing trend in drawing funding from KONTAKT is probably caused by the reorientation on non-European countries with high R&D potential. This growth significantly contrasts with the stagnation or decrease in support directed through other programs.

Because the funds are drawn through multiannual programs, there is certain inertia in annual budgetary expenditures. Current decrease in the interest in INGO (see E.12) will be fully shown in the coming years. The slight increase in allocation in programs COST, EUREKA and INGO isn't a reflection of an increased interest, on the contrary the amount of allocated funding has decreased. Interesting trend can be seen when comparing the allocation and interest measured in the amount of allocated resources in the KONTAKT program. In this case despite a slight decrease the amount of allocated funding exceeds the given available funding. Funding must therefore be supplied from resources meant for subsequent calls. The chart E.12 also shows that the highest supply overhang is in the COST program, which focuses solely on fundamental research. On the other hand EUREKA and KONTAKT, which are oriented on applied research, show more balance.

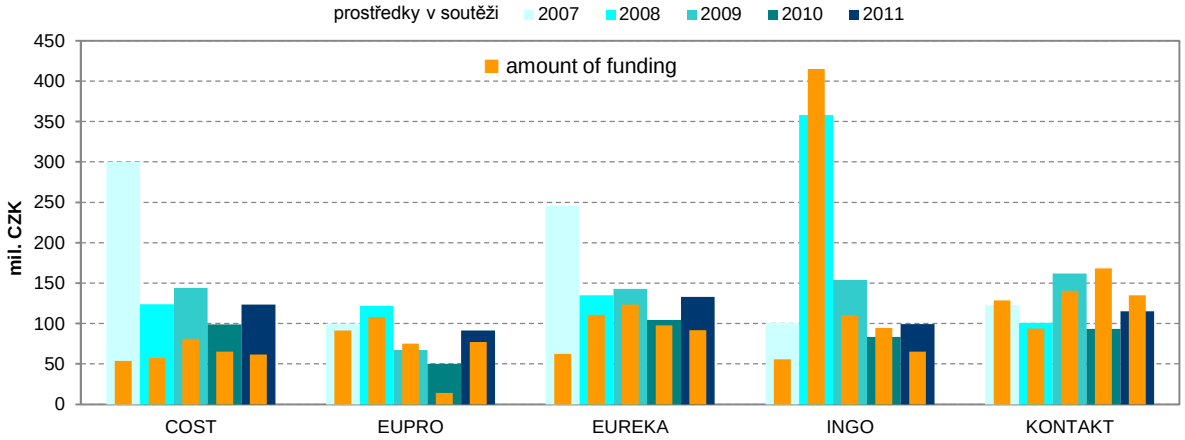
Chart E.11: State budget resources allocated to the support of international cooperation in years 2007 – 2011



Note: the designation of a program always represents the current and previous programs (e.g. COST represents the sum of total support in programs COST and COST CZ)
Source: R&D IS

Relative success rate of individual proposals depends on the evaluation criteria. Lowest success rate was recorded in the KONTAKT program, where only one half of all proposals receive funding. On the other hand EUPRO and EUREKA programs, where there is a lower number of projects (but these projects are larger), have a success rate of almost 80%.

Chart E.12: Comparison of resources, which were the subject of competition, and the amount of granted funding in years 2007 – 2001



Note: Financial resources from the budget chapter of the provider meant for activities transferred from previous years to the competition year
Source: IS R&D

E.5 Conclusion

The described characteristics show that the R&D includes a significant international element. Foreign resources complement national and enable Czech subjects to widen their activities and participate in projects, which would otherwise exceed their budget possibilities. Nevertheless the results of foreign-funded R&D could mean crucial economic and social benefits for the Czech Republic. This is further evidenced by the amount of total foreign funding coming into Czech R&D, which reaches 10% of total gross expenditures for R&D (GERD). Thanks to the increasing foreign funding he Czech Republic has more possibilities, however it should be pointed out that the national sources are still the primary ones and it is mainly their volume which decides the number of projects in the Czech Republic.

Czech participation in FP7 and EURATOM is influenced by national R&D capacities, which should be borne in mind when comparing it to other European countries. Therefore the relativized indicators have a higher representation value, such as the success rate of submitted proposals, which places the Czech Republic at the beginning of the second half of countries. Reserves cannot be seen in the quality of the proposals, but in the overall interest in these programs. The number of participating teams converted to FTE places the Czech Republic among the five worst countries. Another factor is the amount of funding compared to GERD, in which the Czech Republic is way behind the EU average.

A large amount of financial resources from EU structural funds is directed to the Czech Republic through operation programs. Foremost among these are the investment projects directed to the European centers of excellence and application-oriented sites. Investments aiming at improving the R&D environment in the business sector and production innovation are significant as well.

The openness of Czech R&D, particularly the international activities themselves, brings a highly-prized opportunity to cooperate with cutting-edge European and international teams. This opportunity is provided to Czech sciences by international cooperation programs rather than bilateral treaties. Increased interest has been observed in recent years in cooperation with strong countries outside the EU (China, Russia etc.). The overall rate of participation in international R&D subjects isn't only a matter of initiative of domestic teams, but also shows the interest of foreign subjects in Czech researchers and knowledge. Two-way financial and knowledge flows show the quality of the Czech R&D and that it is able to successfully compete for resources in international competitions and offer specific knowledge, which is highly-prized abroad.

F Appendices

F.1 Methodology of surveys and definitions of indicators

This appendix contains detailed information about some of the data sources, surveys, indicators and other definitions, which are necessary for correct data interpretation.

F.1.1 R&D indicators

The CZSO monitors the R&D characteristics through the Annual Statistical Survey on Research and Development (VTR 5-01), which contains questions on **human and financial resources** for R&D activities performed in the Czech Republic in individual sectors of performance of R&D. This survey is conducted since 1995 and fully repsects the methodology of OECD and EU contained in the **Frascati manual** and **Commission Regulation (EC) No. 753/2004**.

Reporting units – the annual R&D report is sent to all natural and legal persons performing R&D in the Czech Republic regardless of the number of the number of employees, major economic activity, legal form or institutional sector. Since 2001 the Annual Statistical Survey on Research and Development (VTR 5-01) is being sent to all **R&D departments** of the monitored subjects, which enables a more precise classification of the data and corresponds with the necessary requirements for regional classification.

The basic **characteristics** in this survey are:

- **Number of persons employed in R&D** sorted by activity, education and gender
- **The amount of R&D expenditures** sorted by sources of funding and functional aspect

Detailed information can be found in the Annual Statistical Survey on Research and Development (VTR 5-01) published on the CZSO website.

The above mentioned characteristics are available in the following **classification**:

- By **sector of performance of R&D** (business, government, university and private non-profit),
- By prevailing group of **scientific disciplines**,
- By **regions** (CZ-NUTS 3) and in the case of the business sector even by **districts** (CZ-NUTS 4),
- In the business sector also by **ownership type**, **size** and **prevailing economic activity,**
- In the university and government sectors also by **site type.**

The above mentioned classifications are also available in combinations.

Important definitions of the R&D survey

R&D is a systematic creative activity performed in order to broaden the current knowledge, including the knowledge of man, culture and society, gaining of new knowledge or its practical use through methods, which enable confirmation, complementation or refutation of gained knowledge. We differentiate three **types** of R&D activities:

- **Fundamental research** – theoretical or experimental activity performed in order to gain new knowledge on the basic principles of phenomena or observed facts, which isn't directly aimed at practical use.
- **Applied research** – theoretical and experimental work aimed at gaining new knowledge or skills for development of new or substantially improved products, methods or services.

- **Experimental development** – includes gaining, connecting, forming or using current scientific or technological, commercial and other relevant knowledge and skills to develop new or substantially improved products, methods or services.

As the line between fundamental and applied research isn't always clear it is necessary to always proceed with caution when interpreting data sorted by R&D activity.

Sector of performance of R&D is the basic category used in the R&D statistics, which groups all institutional units performing R&D based on their main function, behavior and goals. The R&D indicators are standardly monitored and published even at the international level in **four sectors of performance of R&D** (hereinafter only sectors) - business, government, university and private non-profit. These sectors were defined based on the Code-list of institutional sectors and subsectors (ISEKTOR) used in National accounts (ESA system) and definitions provided in the Frascati manual.

- **The business sector** includes all economic subjects with the main activity of production of market goods or services for the public at an economically significant price. Economic subjects belonging to this sector are included in one of these ISEKTORs:
  - Non-financial companies (ISEKTOR 11)
  - Financial institutions (ISEKTOR 12)
  - Employers (ISEKTOR 141)
  - Self-employed persons (ISEKTOR 142)

The CZSO didn't have a complete list of subjects with prevailing activities in the area of services until 2004. Due to this the monitored R&D characteristics in the area of services are undervalued until 2003.

- **The government sector** includes all administrative bodies at all levels (ISEKTOR 13) with the exception of publicly administrated higher education (OKEČ 803)
  The R&D sites in the Czech government sector comprise mainly of individual AS CR sites (54 subjects with 60 sites in 2010) and departmental research sites (24 subjects with 38 sites) with R&D as their main activity (OKEČ 73/CZ-NACE 72). Since 1st January 2007 most of these subjects received a new status of public research organizations. Among the other sites of the government sector which perform R&D as their secondary activity are mainly hospitals, public libraries, archives, museums and other cultural institutions with R&D as their secondary activity (80 subjects with 98 sites in 2010).
- **The university sector** includes all public and private universities and other institutions of higher education (OKEČ 803) and also all research institutes, experimental facilities and clinics operating under direct control or managed or connected to organizations of higher education.
  R&D sites in the university sector in the Czech Republic are made up mostly of individual faculties of the public universities (156 faculties at 28 universities in 2010) and since 2005 in accordance with the OECD methodology also 11 faculty hospitals.
- **The private non-profit sector** includes private institutions, including private persons and households, whose primary objective isn't the generation of profit, but to provide non-commercial services to households. These are for example associations of research organizations, associations, communities, clubs, movements or foundations. Subject belonging to this sector are included in of these ISEKTORs:
  - Households (ISEKTOR 14 except for 141 and 142)
  - Non-profit institutions providing services to households (ISEKTOR 15)

The non-profit private sector is negligible in terms of R&D – 2010 it had only 0.5% share in total R&D expenditures in the Czech Republic

Detailed information about the number of economic subjects and their R&D sites in all mentioned classifications can be found on the CZSO webpages.

Persons employed in R&D according to their **activity**:

- **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.
  These are usually employees in Class 2 and subclass 1237 according to the current classification Employment-extended (KZAM-R).
- **Technicians and equivalent workers** which perform scientific and technical tasks, apply concepts and operation methods, usually under supervision of researchers.
  These are usually employees in Class 31 and 32 according to KZAM-R
- **Other R&D employees**, who participate in or are included in R&D activities (e.g. craftsmen, secretaries etc.). Also included are managers and administrative employees, whose activities are direct services to R&D.

The number of employees in R&D is determined by two baseline indicators, which are the headcount (HC) and the number of persons converted to full-time equivalent of R&D activities (FTE):

- **Evidential number of R&D personnel by 31st December in natural persons (HC–headcount)**. This indicator includes all people employed in research and development regardless of their employment terms. In the university and government sectors there are a large number of persons working in R&D who are employed by more subjects. Therefore this indicator doesn't show the real number of persons working in R&D and the number of employees (HC) is overrated. *Until 2000 this number included services contracts. Since 2001 this indicator is monitored separately and therefore the data isn't fully comparable.*
- **The converted number of employees (Full Time Equivalent – FTE)** indicator of R&D personnel 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 order to make this indicator more precise and to provide better international comparison there has been a change in its calculation in 2005. FTE data since 2005 aren't fully compatible with the data from previous years.*

Apart from the data on number of employees in HC and FTE the CZSO also monitors the data on the number of persons employed in R&D based on **service contracts**. This data converted with the use of the FTE methodology is a part of the converted number of R&D employees.

The number of employed persons is monitored according these characteristics:

- Gender
- Activity (researchers, technicians, other employees)
- Education defined by ISCED 97, divided into tertiary (doctoral – ISCED 6, university master of bachelor – ISCED 5A and college ISCED 5B) and secondary and lower (ISCED 1-4).

The above mentioned classifications are also available in combinations.

R&D expenditures include all expenditures meant for R&D performed within the monitored subject regardless of their funding source. As for the **cost types** the R&D expenditures consist of:

- Current expenditures, which include:
  - Wages of persons employed in R&D, including health and social insurance and bonuses
  - Other non-investment costs, such as stock, supplies and equipment meant for R&D, including costs of services rented or bought for R&D, administrative costs, wages of persons not included in the R&D staff etc.
- Investments, which include:
  - Purchase of long-lived intangible assets (intangible results of R&D activities, software…)
  - Purchase of property and buildings for R&D
  - Purchase of other long-lived tangible assets (technical and other equipment)

The amount of R&D expenditures is **measured**:

- **In current prices** – prices of goods and service in the current year
- **In constant prices**, which eliminate inflation depreciation

The amount of own R&D expenditures of individual monitored subjects is **monitored** according to these characteristics:

- **Sources of R&D funding** – we differentiate between three main sectors of R&D funding:
  - Business sector – **private business sources**, which form the own sources of monitored companies meant for the R&D activities performed by them and business sources of subjects operating in the territory of a given state meant for R&D in other subjects or universities or public research organizations.
  - Government sector without universities – **public resources** (institutional or project) coming from the **state or regional** budgets meant for R&D activities in the Czech Republic.
  - Abroad – **foreign resources** including all R&D resources coming from abroad. In the case of the Czech Republic this includes resource from international organizations including their facilities within the Czech territory and the resources from parent companies directed to their affiliations.

  Apart from the above mentioned sources there are also other national sources, such as incomes of universities or private NGOs not coming from the state budget, business sector or abroad. These sources are negligible – in 2010 they had a 0.8% share in Czech R&D funding.

Functional aspect of resources allocated to own R&D, which includes:

- **Type of R&D costs** (wages, investments and other)
- **Type of R&D activity** (fundamental, applied and experimental R&D)
- **Prevalent group of scientific disciplines**

Detailed information about this statistic is available at: http://www.czso.cz/csu/redakce.nsf/i/statistika_vyzkumu_a_vyvoje

F.1.2 R&D results

The R&D results are evaluated according to the data from the Information Register of R&D Results (RIV). Results are divided into 17 categories, which are specified in detail in table F.2 including conditions, which must be met. The results are further evaluated and categorized according to the definitions in the Methodology of R&D Result Evaluation for years 2010 and 2011, which is presented in table F.1.

Table F.1: Branch classification of results in the RIV

Discipline group	Disciplines according to IS R&D Code book
Social sciences	archeology, anthropology, ethnology; political science, management and administration; documentation, library science; law; economy; sport and free time activities; pedagogics; psychology; sociology, demography; municipal, regional and transport planning; safety and health protection, human-machine, agricultural economy
Technical sciences	Mining industry including coal mining and processing, Agricultural machines and construction, Medical facilities, apparatus and equipment, electronics and optoelectronics Sensors, detecting elements, measurement and regulation, Computer hardware and software, Use of computers, robotics and its application, Non-nuclear power engineering, energy consumption and utilization, Nuclear energy, Metallurgy, metal materials, Ceramics, fire-proof materials and glass, Composite materials, Other materials, Corrosion and material surfaces, Fatigue and fracture mechanics, Structural engineering, Civil engineering, Land transport systems and equipment, Industrial processes and processing, Machinery and tools, Other machinery industry, Reliability and quality management, industrial testing, Propulsion, engines and fuels, Aeronautics, aerodynamics, airplanes, Cosmic technologies, Navigation, connection, detection and countermeasure, Firearms, ammunition, explosives, combat vehicles. Militarism
Mathematics and information sciences	General mathematics, Applied statistics, operational research, Theory and management systems, Information theory, informatics
Physics	Theoretical physics, Elementary particle theory and high energy physics, Nuclear, atomic and molecular physics, accelerators, Optics, masers and lasers, Acoustics and oscillation, Thermodynamics, Liquid mechanics, Plasma physics and discharge through gases, Solid-state physics and magnetism, Astronomy and celestial mechanics, astrophysics, Biophysics
Chemistry	Inorganic chemistry, Analytical chemistry, separation, Organic chemistry, Macromolecular chemistry, Biochemistry, Physical chemistry and theoretical chemistry, Electrochemistry, Nuclear and quantum chemistry, photo chemistry, Industrial chemistry and chemical engineering
Earth sciences	Hydrology and limnology, Geology and mineralogy, Seismology, volcanology and Earth structure Geochemistry, Earth magnetism, geodesy, geography, Atmospheric sciences, meteorology, Pedology, Pollution and air control, Pollution and water control, Contamination and decontamination of soil including pesticides, Nuclear waste, radioactive pollution and control, Solid waste and its control, recycling
Biology	Morphological game parks and cytology, Genetics and molecular biology, Immunology, Physiology, Microbiology, virology, Botany, Zoology, Ecology – communities, Biotechnology and bionics, Protection of landscape
Agricultural sciences	Plant growing, crop rotation, Fertilization, irrigation, soil treatment, Plant cultivation, Diseases, pests, weeds and plant protection, Zootechnics, Nutrition of farm animals, Farm animal breeding and farm animal pedigree breeding, Diseases and animal vermin, veterinary medicine, Forestry, Fishery, Food industry

Medical sciences	Cardiovascular diseases including cardio-surgery, Endocrinology, diabetology, metabolism, nutrition, Pneumology, Oncology and hematology, Other fields of internal medicine,ENT (ie. ear, nose, throat), ophthalmology, dentistry, Pediatrics, Neurology, neuro-surgery, neuro-sciences, Traumatology and orthopedics, Surgery including transplantology, Gynecology and obstetrics, Psychiatry, sexology, Hygiene, Epidemiology, infection diseases and clinical immunology, Dermatology and venereology, Other medical fields, Public health system, social medicine, Pharmacology and apothecary chemistry, Environmental impact on health
Art and humanities	Philosophy and religion, History linguistics, Literature, mass media, audio-visual activities, Art, architecture, cultural heritage

Source: Methodology of R&D Result Evaluation for years 2010 and 2011, Office of the Government of the Czech Republic, Ref.No.: 05440/10-RVV

Table F.2: Result categories in the RIV

Kód	Popis	Poznámka
J	Article in specialist periodical	Specialist periodical is any printed or electronic periodical, which is reviewed and ha an ISSN code.
B	Specialist book	A book is a non-periodical specialist publication of at least 50 pages of own text without graphic appendixes, printed or electronic, published by a specialist publishing house and reviewed by at least one respected reviewer from the same branch. If the book is published in the Czech Republic, it has to be registered in the National Library. A specialist book is NOT a textbook, expert assessment, opinions, reports, non-published diploma, doctoral, habilitation or dissertation theses with an ISBN code, dictionaries, proceedings, methodical manuals, catalogues, norms, travelogues, fiction
C	Chapter in specialist book	Chapter in a book (result B) only in case when the book only has one editor and each chapter is written by a different author
D	Article proceedings	Proceeding is a reviewed non-periodical publication, published on occasion of a conference, seminar or symposium with an ISBN code. Intentionally published compendium of works is not a proceeding.
P	Patent	
Z	Trial operation, verified technology, variety, breed, medical treatment	Trial operation tests the R&D results. Its goal is to test the properties of the R&D result (technology, system etc.) prior to its regular operation at maximum or planned level. A necessary requirement is the novelty and uniqueness of the tested prototype. Verified technology is similar to trial operation with the difference that in this case only the novelty of a technology is tested.
F	Results with legal protection (utility model, industrial model)	Utility models are technical solutions, which are new and exceed the usual specialist skills. Only solutions recorded by the UIP can be considered to be utility models (Act No 478/1992). An industrial design is a result which is protected by Act No. 207/2000, of the Protection of Industrial Designs and the Amendment to Act No. 527/1990 of Coll., on Inventions, Industrial Designs and Rationalization Proposals, as amended
G	Technically applied results (prototype, functional sample)	A more sophisticated industrial product created as one piece to test its properties in practice or a design, development and subsequent production of a unique machine or lab equipment. Only results of applied or experimental R&D can be considered such products.
H	Results implemented by provider	Results reflected in legal acts and norms, results reflected in directives of non-legislative nature within the competencies of the relevant provider, results reflected in the strategic documents of R&D or administrative bodies
N	Certified methodologies	Certified methodologies – methodology used by an administrative body and recommended for practical use. In case of treatment method there is a condition of clinical testing. Landmark procedure – procedure, which is a tested set of activities, documents and technologies within the research of national and cultural identity, which lead to the preservation of national heritage . Specialized maps – map works documented by data gained and interpreted by scientific methods.
R	Software	. Software must be created in connection to the solution of an R&D activity and free to use in accordance with license conditions of the author and § 16 of the Act. This is not the case if the software has been created by the support beneficiary solely for his own needs and it is used solely by him or another person, or software which is used solely for the needs of the provider. Since 1st January 2011 there is a condition to seal an agreement on the utilization of the R&D results between the author and user so that there would be an evidence of an economic benefit of at least 1 million CZK.

V	Research report containing classified information	A result which was applied in accordance with §4 g) Government Regulation No. 267/2002 Coll., before 31.12,2009 and since 1.1.2010 and result in accordance with § 4 g) Government Regulation No. 397/2009 Coll., containing classified information according to a specific provision (e.g. Act No. 148/1998 Coll. as amended and Act No. 412/2005 Coll. as amended).
A	Audiovisual production	These results are not awarded any points. The methodology doesn't set any criteria for their inclusion in RIV.
M	Conference organization	
W	Workshop organization	
E	Exhibition organization	
O	Other results	

F.1.3 Innovation and competitiveness

Aggregated categories used by WEF

The basic indicator groups corresponding with the 12 pillars of competitiveness

I. Institutions
II. Infrastructure
III. Macroeconomic Stability
IV. Health and Primary Education
V. Higher Education and Training
VI. Goods Market Efficiency
VII. Labor Markets Efficiency
VIII. Financial market sophistication
IX. Technological Readiness
X. 10 Market Size
XI. Business Sophistication
XII. Innovation

Innovation survey

To gather the necessary data the harmonized questionnaire of the EU countries from the Community Innovation Survey 2008 was used. The survey was conducted for the period2006-2008 with the referential year 2008. The TI 2008 survey has been sent to 8 638 reference units in the business sector from selected industry and services branches. A detailed structure of the survey files is available at http://www.czso.cz/csu/2010edicniplan.nsf/t/2900313DCE/$File/960510m.pdf. Data presented in this publication was gathered based on 79% return rate of the questionnaires.

According to the new concept of innovation from the revised Oslo manual 2005 there are four types of innovations:

A **product innovation** is the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses. This includes significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics. Product innovations can utilize new knowledge or technologies, or can be based on new uses or combinations of existing knowledge or technologies.

A **process innovation** is the implementation of a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software. Process innovations can be intended to decrease unit costs of production or delivery, to increase quality, or to produce or deliver new or significantly improved products.

A **marketing innovation** is the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing. Marketing innovations are aimed at better addressing customer needs, opening up new markets, or newly positioning a firm's product on the market, with the objective of increasing the firm's sales.

An **organizational innovation** is the implementation of a new organizational method in the firm's business practices, workplace organization or external relations. Organizational innovations can be intended to increase a firm's performance by reducing administrative costs or transaction costs, improving workplace satisfaction (and thus labor productivity), gaining access to non-tradable assets (such as non-codified external knowledge) or reducing costs of supplies.

According to the CZSO (or Eurostat methodology) innovative businesses are those, which either implemented one of the four innovation types or performed continuous or interrupted innovation activities during the monitored period.

Foreign trade with high-tech products

The foreign trade statistic monitors only cross-border flows. The value of goods crossing the Czech border is considered as imports and exports of the Czech economy. The high-tech products are such products, which are manufactured in technologically demanding processes. Their development s also accompanied by high costs of innovation or R&D. For the needs of foreign trade statistics the OECD defined a list of high-tech products in 1997 according to the Standard International Trade Classification Rev. 4, which came into force in 2007. The updated list of high-tech products is divided into 9 main groups:

- Electronics and telecommunication
- Electrical engineering
- Pharmacology
- Chemistry
- Aerospace
- Non-electric machines
- Scientific equipment
- Computers
- Other high-tech

The list of individual items can be found at: http://www.czso.cz/csu/redakce.nsf/i/seznam_jednotlivych_polozek_high_tech_zbozi_dle_sitc_rev_4/$File/01_ht.pdf

The data on exports and imports of high-tech goods, especially the categories Electronics and telecommunication and Computers are among those most influenced by the so called “branding”, i.e. the export is significantly overrated (in CZK).

F.2 Table appendix

Tab. A.1 Total gross domestic expenditure on R&D in the Czech Republic (GERD)

mil. CZK - current prices

	2005	2006	2007	2008	2009	2010
Total	**42 198**	**49 900**	**54 284**	**54 108**	**55 350**	**59 033**
by type of costs						
Current expenditure	**37 369**	**40 692**	**47 100**	**48 154**	**49 762**	**52 345**
labour costs for employees	15 092	16 757	19 768	21 278	22 136	23 264
labour costs for contractors	406	442	519	616	710	852
other current costs (material, equipment, energy)	21 871	23 493	26 813	26 260	26 916	28 228
Capital expenditure	**4 829**	**9 208**	**7 184**	**5 954**	**5 588**	**6 688**
long-term intangible assets	.	.	.	.	.	1 297
land and buildings	.	.	.	.	.	1 717
machines, equipment and devices	.	.	.	.	.	3 675
by source of funds						
Business enterprise (private national)	22 437	28 142	28 500	27 628	24 701	28 891
Government (public national)	17 248	19 445	22 362	22 342	24 301	23 539
Abroad (private and public)	2 057	1 786	2 999	3 507	5 736	6 142
business enterprise (private from abroad)	1 392	1 065	2 074	2 542	4 431	3 926
public (sources from EU, NATO, etc.)	666	721	925	964	1 305	2 216
Other national	456	528	423	631	612	461
by sector of performance						
Business enterprise sector	**26 657**	**32 470**	**33 620**	**33 486**	**33 218**	**36 623**
public enterprises	1 866	1 601	1 913	2 724	2 670	2 594
private national enterprises	10 784	11 518	12 747	9 853	10 207	12 981
foreign affiliates	14 007	19 351	18 960	20 909	20 340	21 049
Government sector	**8 441**	**9 309**	**11 306**	**11 325**	**11 836**	**11 469**
workplaces of Academy of Science	5 901	6 489	8 649	8 530	8 990	8 669
other research (department) workplaces	1 807	1 985	1 761	1 908	1 830	1 950
other government and public organisations	733	835	896	887	1 016	850
Higher education sector	**6 907**	**7 918**	**9 158**	**9 090**	**10 022**	**10 616**
public and state universities	6 617	7 554	8 687	8 664	9 324	10 110
faculty hospitals	267	325	423	362	620	419
private universities	24	40	48	64	78	87
Private non-profit sector	**194**	**204**	**199**	**208**	**274**	**324**
by type of R&D activities						
Basic research	11 952	14 630	16 152	16 288	16 918	15 860
Applied research	11 123	12 011	13 803	14 350	13 310	17 870
Experimental development	19 123	23 259	24 329	23 470	25 122	25 303
by fields of sciences						
Natural sciences	9 845	10 991	13 755	12 788	13 512	14 398
Engineering	24 566	27 240	31 022	31 368	31 276	33 994
Medical sciences	3 374	6 894	4 303	4 343	4 996	4 758
Agricultural sciences	1 757	1 867	1 988	2 014	2 124	1 941
Social sciences	1 457	1 683	1 781	2 033	1 684	2 068
Humanities	1 199	1 225	1 434	1 563	1 758	1 874
by regions						
Praha	15 835	19 186	22 914	22 481	20 906	20 998
Středočeský	8 561	8 525	10 560	9 782	10 051	11 900
Jihočeský	1 610	1 713	1 787	1 967	2 123	2 116
Plzeňský	1 130	1 334	1 394	1 767	1 599	2 295
Karlovarský	76	71	78	98	92	106
Ústecký	589	588	692	808	652	696
Liberecký	1 110	1 483	1 312	1 517	1 329	1 449
Královéhradecký	1 169	985	1 268	1 213	1 651	1 568
Pardubický	1 632	1 932	2 018	2 002	1 939	2 228
Vysočina	707	517	538	698	646	743
Jihomoravský	4 654	5 057	5 726	6 047	8 127	8 411
Olomoucký	1 372	1 328	1 511	1 433	1 620	1 599
Zlínský	1 571	1 646	1 721	1 633	1 583	1 809
Moravskoslezský	2 182	5 535	2 765	2 661	3 030	3 114

Source: the CZSO, Annual statistical R&D surveys (VTR 5-01)

Tab. A.2 Total number of R&D workplaces in the Czech Republic

	2005	2006	2007	2008	2009	2010
Total	**2 017**	**2 142**	**2 204**	**2 233**	**2 345**	**2 587**
by size of expenditure on R&D (mil. CZK)						
less than 1	581	588	534	489	528	619
1-9,10	881	947	1 016	1 052	1 109	1 230
10-49,10	378	417	443	474	486	516
50-99,10	90	95	106	104	114	110
100 and more	87	95	105	114	108	112
by number of R&D personnel (FTE)						
Only contractors in R&D	52	45	42	52	60	79
less than 5	973	1 034	1 052	1 026	1 074	1 259
5 - 9,9	319	363	376	404	418	435
10 - 19,9	227	240	266	261	297	309
20 - 49,9	235	237	248	254	262	270
50 - 99,9	103	117	102	112	116	121
100 and more	108	106	118	124	118	114
by sector of performance						
Business enterprise sector	**1 615**	**1 732**	**1 764**	**1 792**	**1 899**	**2 130**
public enterprises	1 245	1 321	1 329	1 246	1 289	1 557
private national enterprises	304	352	374	477	539	507
foreign affiliates	66	59	61	69	71	66
Government sector	**184**	**191**	**198**	**198**	**198**	**196**
workplaces of Academy of Science	65	59	60	60	60	60
other research (department) workplaces	39	39	39	39	38	38
other government and public organisations	80	93	99	99	100	98
Higher education sector	**157**	**170**	**184**	**183**	**185**	**193**
public and state universities	135	140	145	145	148	156
faculty hospitals	11	11	11	11	11	11
private universities	11	19	28	27	26	26
Private non-profit sector	**61**	**49**	**58**	**60**	**63**	**68**
by type of R&D activities*						
Basic research	529	569	581	604	630	658
Applied research	819	827	996	1 063	988	1 323
Experimental development	1 149	1 255	1 099	1 048	1 275	1 217
by fields of sciences						
Natural sciences	357	318	324	368	425	510
Engineering	1 214	1 341	1 391	1 397	1 445	1 536
Medical sciences	97	132	126	125	130	147
Agricultural sciences	98	112	122	115	118	152
Social sciences	137	129	136	117	110	111
Humanities	114	110	105	111	117	131
by regions						
Praha	591	594	626	614	627	657
Středočeský	162	180	189	187	204	225
Jihočeský	92	88	91	96	100	111
Plzeňský	74	81	84	81	93	100
Karlovarský	16	19	22	21	23	20
Ústecký	71	80	82	82	75	87
Liberecký	73	74	74	81	87	91
Královéhradecký	97	104	111	107	116	139
Pardubický	88	118	111	112	121	134
Vysočina	69	76	66	79	80	89
Jihomoravský	292	315	321	342	365	420
Olomoucký	98	100	107	105	113	122
Zlínský	118	132	131	134	140	164
Moravskoslezský	176	181	189	192	201	228

* one R&D workplace can be active in more than one type of R&D activity

Source: the CZSO, Annual statistical R&D surveys (VTR 5-01)

Tab A.3 Expenditure on R&D performed in the government sector in the Czech Republic (GOVERD)

mil. CZK - current prices

	2005	2006	2007	2008	2009	2010
Total	**8 441**	**9 309**	**11 306**	**11 325**	**11 836**	**11 469**
by type of workplace						
Research workplaces (CZ-NACE 72)	**7 708**	**8 474**	**10 410**	**10 438**	**10 820**	**10 619**
workplaces of Academy of Science CR	5 901	6 489	8 649	8 530	8 990	8 669
other research (department) workplaces	1 807	1 985	1 761	1 908	1 830	1 950
Other workplaces of government sector	**733**	**835**	**896**	**887**	**1 016**	**850**
archives, libraries, museums	199	309	381	426	530	494
other	534	526	515	461	486	356
by type of costs						
Current expenditure	**7 227**	**8 030**	**8 905**	**9 467**	**10 146**	**9 906**
labour costs for employees	3 532	3 801	4 100	4 512	4 678	4 646
labour costs for contractors	105	128	136	146	163	233
other current costs (material, equipment, energy)	3 590	4 101	4 668	4 808	5 305	5 027
Capital	**1 214**	**1 279**	**2 401**	**1 858**	**1 690**	**1 563**
long-term intangible assets	.	.	.	.	.	32
land and buildings	.	.	.	.	.	795
machines, equipment and devices	.	.	.	.	.	736
by source of funds						
Business enterprise (private national)	**778**	**717**	**755**	**666**	**492**	**544**
from which receipts from R&D activities performed on contracts	.	.	.	.	.	*355*
Government (public national)	**6 909**	**7 886**	**9 312**	**9 513**	**10 117**	**9 406**
Abroad (private and public)	**642**	**572**	**1 160**	**947**	**1 088**	**1 498**
business enterprise	417	314	836	628	691	1 076
from which receipts from licensing	.	.	.	.	.	*1 052*
public (sources from EU, NATO, etc.)	225	258	324	319	397	422
Other national	**112**	**134**	**79**	**198**	**139**	**21**
by type of R&D activities						
Basic research	6 443	7 042	8 855	9 065	9 197	8 513
Applied research	1 675	1 889	2 212	2 039	2 444	2 600
Experimental development	323	378	240	221	194	356
by fields of sciences						
Natural sciences	4 789	5 393	7 334	6 999	7 428	7 266
Engineering	1 073	1 135	1 108	1 021	1 237	1 090
Medical sciences	532	511	651	684	770	665
Agricultural sciences	861	877	768	794	775	717
Social sciences	502	656	565	883	598	728
Humanities	684	737	880	944	1 028	1 003
by regions						
Praha	5 431	6 430	8 501	8 371	8 546	8 351
Středočeský	1 120	1 072	982	1 014	1 078	1 044
Jihočeský	451	504	550	596	629	630
Plzeňský	10	15	16	25	31	67
Karlovarský	4	4	3	1	1	1
Ústecký	9	18	14	23	26	11
Liberecký	12	11	8	15	15	19
Královéhradecký	331	88	73	63	126	53
Pardubický	0	38	36	15	29	14
Vysočina	15	13	16	17	11	10
Jihomoravský	979	1 030	1 011	1 058	1 235	1 174
Olomoucký	8	11	17	17	19	10
Zlínský	1	2	5	6	4	3
Moravskoslezský	70	73	74	105	86	80

Source: the CZSO, Annual statistical R&D surveys (VTR 5-01)

Tab A.4 Number of R&D workplaces in the government sector in the Czech Republic

	2005	2006	2007	2008	2009	2010
Total	**184**	**191**	**198**	**198**	**198**	**196**
by size of expenditure on R&D (mil. CZK)						
less than 1	35	37	40	39	43	42
1-9,10	51	59	58	61	54	60
10-49,10	45	40	44	41	40	37
50-99,10	24	24	26	23	23	24
100 and more	29	31	30	34	38	33
by number of R&D personnel (FTE)						
Only contractors in R&D	1	0	2	4	4	7
less than 5	58	69	74	68	70	66
5 - 9,9	11	14	13	15	16	17
10 - 19,9	18	16	17	16	13	16
20 - 49,9	29	27	26	30	27	25
50 - 99,9	27	24	23	22	28	28
100 and more	40	41	43	43	40	37
by type of workplace						
Research workplaces (CZ-NACE 72)	**104**	**98**	**99**	**99**	**98**	**98**
workplaces of Academy of Science CR	65	59	60	60	60	60
other research (department) workplaces	39	39	39	39	38	38
Other workplaces of government sector	**80**	**93**	**99**	**99**	**100**	**98**
archives, libraries, museums	44	58	60	64	65	63
other	36	35	39	35	35	35
by source of funds*						
Business enterprise (private national)	**77**	**79**	**63**	**70**	**75**	**87**
from which receipts from R&D activities performed on contracts	.	.	.	.	.	*68*
Government (public national)	**183**	**186**	**197**	**197**	**196**	**194**
Abroad (private and public)	**60**	**57**	**60**	**65**	**69**	**70**
business enterprise	13	13	9	9	14	17
from which receipts from licensing	.	.	.	.	.	*16*
public (sources from EU, NATO, etc.)	55	53	53	58	66	69
Other national	**16**	**17**	**21**	**12**	**17**	**11**
by type of R&D activities*						
Basic research	119	127	140	134	136	131
Applied research	85	78	76	89	94	106
Experimental development	31	28	24	21	25	21
by fields of sciences						
Natural sciences	60	54	58	63	60	59
Engineering	18	16	21	19	19	18
Medical sciences	11	11	9	8	9	8
Agricultural sciences	26	24	26	24	23	24
Social sciences	24	26	25	22	19	17
Humanities	45	60	59	62	68	70
by regions						
Praha	90	90	95	91	89	89
Středočeský	16	17	16	16	16	17
Jihočeský	15	10	10	10	11	11
Plzeňský	3	4	4	5	5	5
Karlovarský	3	3	4	3	3	2
Ústecký	6	9	9	9	8	7
Liberecký	4	5	5	7	7	7
Královéhradecký	9	8	6	6	9	8
Pardubický	0	5	4	4	5	5
Vysočina	4	4	4	3	3	3
Jihomoravský	25	23	25	28	28	29
Olomoucký	3	4	6	6	6	4
Zlínský	3	4	5	5	4	4
Moravskoslezský	3	5	5	5	4	5

* one R&D workplace can have more than one source of funds and so it can be active in performing more than one type of R&D activity

Source: the CZSO, Annual statistical R&D surveys (VTR 5-01)

Tab. A.5 Expenditure on R&D performed in the higher education sector in the Czech Republic (HERD)

mil. CZK - current prices

	2005	2006	2007	2008	2009	2010
Total	**6 907**	**7 918**	**9 158**	**9 090**	**10 022**	**10 616**
by type of workplace						
Public and state universities	6 617	7 554	8 687	8 664	9 324	10 110
Faculty hospitals	267	325	423	362	620	419
Private universities	24	40	48	64	78	87
by type of costs						
Current expenditure	**6 214**	**7 016**	**8 214**	**8 409**	**9 363**	**9 851**
labour costs for employees	2 830	3 199	4 038	4 188	4 472	4 541
labour costs for contractors	160	183	221	250	287	341
other current costs (material, equipment, energy)	3 224	3 634	3 955	3 971	4 603	4 969
Capital	**694**	**902**	**945**	**681**	**659**	**765**
long-term intangible assets	.	.	.	.	.	67
land and buildings	.	.	.	.	.	210
machines, equipment and devices	.	.	.	.	.	487
by source of funds						
Business enterprise (private national)	**58**	**55**	**67**	**57**	**106**	**113**
from which receipts from R&D activities performed on contracts	.	.	.	.	.	*99*
Government (public national)	**6 341**	**7 166**	**8 387**	**8 256**	**9 076**	**9 216**
Abroad (private and public)	**191**	**354**	**411**	**394**	**426**	**886**
business enterprise	9	21	5	3	1	6
from which receipts from licensing	.	.	.	.	.	*4*
public (sources from EU, NATO, etc.)	182	333	406	391	425	881
Other national	**318**	**344**	**294**	**383**	**415**	**400**
by type of R&D activities						
Basic research	4 068	4 875	5 619	5 208	6 032	5 886
Applied research	2 409	2 547	3 059	3 364	3 624	4 112
Experimental development	431	496	480	519	366	618
by fields of sciences						
Natural sciences	1 476	2 020	1 911	2 357	2 446	2 819
Engineering	2 502	2 653	3 388	3 228	3 474	3 761
Medical sciences	1 453	1 543	1 843	1 573	2 084	1 833
Agricultural sciences	421	458	606	613	717	634
Social sciences	658	796	922	812	713	784
Humanities	398	448	488	506	588	786
by regions						
Praha	3 349	3 739	4 180	4 213	4 639	4 634
Středočeský	.	1	12	17	2	12
Jihočeský	283	285	310	382	383	410
Plzeňský	302	403	435	466	398	448
Karlovarský	.	.	1	1	0	0
Ústecký	48	76	99	108	115	154
Liberecký	147	169	233	181	220	247
Královéhradecký	281	273	377	286	353	332
Pardubický	185	189	190	194	213	235
Vysočina	.	.	.	.	0	2
Jihomoravský	1 398	1 676	1 918	1 888	2 264	2 627
Olomoucký	393	456	559	570	622	712
Zlínský	97	106	139	183	179	141
Moravskoslezský	424	545	706	602	633	661

Source: the CZSO, Annual statistical R&D surveys (VTR 5-01)

Tab A.6 Number of R&D workplaces in the higher education sector in the Czech Republic

	2005	2006	2007	2008	2009	2010
Total	**157**	**170**	**184**	**183**	**185**	**193**
by size of expenditure on R&D (mil. CZK)						
less than 1	17	17	24	17	20	18
1-9,10	42	46	52	51	48	48
10-49,10	63	65	58	67	67	71
50-99,10	16	20	25	24	25	27
100 and more	19	22	25	24	25	29
by number of R&D personnel (FTE)						
Only contractors in R&D	2	3	4	3	4	3
less than 5	24	26	35	35	32	29
5 - 9,9	11	20	16	19	17	19
10 - 19,9	19	12	22	17	20	27
20 - 49,9	39	39	44	39	45	46
50 - 99,9	29	37	28	30	26	28
100 and more	33	33	35	40	41	41
by type of workplace						
Public and state universities	135	140	145	145	148	156
Faculty hospitals	11	11	11	11	11	11
Private universities	11	19	28	27	26	26
by source of funds*						
Business enterprise (private national)	**29**	**31**	**32**	**29**	**33**	**26**
from which receipts from R&D activities performed on contracts	.	.	.	.	.	*16*
Government (public national)	**151**	**160**	**172**	**168**	**174**	**181**
Abroad (private and public)	**64**	**86**	**79**	**79**	**86**	**104**
business enterprise	8	9	6	4	5	9
from which receipts from licensing	.	.	.	.	.	*6*
public (sources from EU, NATO, etc.)	59	80	71	71	82	101
Other national	**73**	**68**	**73**	**84**	**83**	**81**
by type of R&D activities*						
Basic research	124	133	145	140	145	153
Applied research	89	95	110	115	111	129
Experimental development	33	37	33	34	35	43
by fields of sciences						
Natural sciences	13	17	13	24	19	24
Engineering	41	41	45	35	47	43
Medical sciences	26	26	26	26	26	27
Agricultural sciences	10	11	13	11	12	12
Social sciences	45	49	59	61	52	48
Humanities	22	26	28	26	29	39
by regions						
Praha	57	60	66	65	67	66
Středočeský	0	2	4	4	3	3
Jihočeský	8	9	13	13	12	12
Plzeňský	10	11	11	10	12	13
Karlovarský	0	0	1	1	1	0
Ústecký	7	8	8	7	6	6
Liberecký	7	6	5	5	5	7
Královéhradecký	5	6	6	6	6	8
Pardubický	8	8	8	8	9	9
Vysočina	0	0	0	0	1	1
Jihomoravský	24	27	27	28	27	29
Olomoucký	9	9	10	10	10	10
Zlínský	5	6	7	7	7	8
Moravskoslezský	17	18	18	19	19	21

* one R&D workplace can have more than one source of funds and so it can be active in performing more than one type of R&D activity

Source: the CZSO, Annual statistical R&D surveys (VTR 5-01)

Tab. A.7 Expenditure on R&D performed in the business enterprise sector in the Czech Republic (BERD)

mil. CZK - current prices

	2005	2006	2007	2008	2009	2010
Total	**26 657**	**32 470**	**33 620**	**33 486**	**33 218**	**36 623**
by type of workplace						
Public enterprises	1 866	1 601	1 913	2 724	2 670	2 594
Private national enterprises	10 784	11 518	12 747	9 853	10 207	12 981
foreign affiliates	14 007	19 351	18 960	20 909	20 340	21 049
by size of enterprises (number of employees)						
very small (0 - 9)	466	502	650	465	695	799
small (10 - 49)	2 187	2 493	2 677	3 105	3 361	3 326
medium (50 - 249)	6 355	6 635	7 762	8 607	9 004	9 799
large (250 and more)	17 649	22 839	22 531	21 308	20 157	22 699
by type of costs						
Current expenditure	**23 741**	**25 447**	**29 784**	**30 073**	**29 982**	**32 287**
labour costs for employees	8 662	9 696	11 561	12 483	12 877	13 953
labour costs for contractors	132	116	144	197	229	233
other current costs (material, equipment, energy)	14 947	15 635	18 079	17 393	16 876	18 101
Capital	**2 915**	**7 022**	**3 836**	**3 413**	**3 236**	**4 336**
long-term intangible assets	.	.	.	.	.	1 192
land and buildings	.	.	.	.	.	711
machines, equipment and devices	.	.	.	.	.	2 433
by source of funds						
Business enterprise (private national)	21 581	27 357	27 669	26 887	24 079	28 176
Government (public national)	3 840	4 226	4 502	4 411	4 911	4 712
Abroad (private and public)	1 214	844	1 404	2 143	4 181	3 705
business enterprise	965	729	1 233	1 911	3 740	2 828
from which enterprises in the same business group	.	.	*1 167*	*1 772*	*2 518*	*2 620*
public (sources from EU, NATO, etc.)	249	115	170	232	441	877
Other national	21	43	45	45	46	30
by type of R&D activities						
Basic research	1 407	2 692	1 654	1 976	1 632	1 392
Applied research	6 929	7 458	8 365	8 786	7 044	10 935
Experimental development	18 321	22 320	23 601	22 724	24 542	24 297
by fields of sciences						
Natural sciences	3 551	3 557	4 503	3 419	3 600	4 227
Engineering	20 974	23 376	26 496	27 086	26 529	29 089
Medical sciences	1 387	4 837	1 803	2 081	2 137	2 243
Agricultural sciences	471	526	600	594	617	582
Social sciences	170	136	154	207	204	409
Humanities	104	38	64	99	130	74
by regions						
Praha	6 899	8 855	10 069	9 733	7 520	7 812
Středočeský	7 438	7 450	9 565	8 751	8 970	10 843
Jihočeský	867	906	924	984	1 074	1 039
Plzeňský	812	915	942	1 276	1 170	1 780
Karlovarský	72	67	74	96	91	104
Ústecký	532	495	574	677	511	531
Liberecký	949	1 301	1 070	1 319	1 091	1 181
Královéhradecký	557	622	817	865	1 173	1 167
Pardubický	1 445	1 705	1 792	1 792	1 698	1 979
Vysočina	691	504	522	680	634	731
Jihomoravský	2 271	2 346	2 791	3 087	4 610	4 565
Olomoucký	966	853	923	833	966	854
Zlínský	1 473	1 538	1 576	1 443	1 400	1 665
Moravskoslezský	1 683	4 911	1 981	1 950	2 309	2 371

Source: the CZSO, Annual statistical R&D surveys (VTR 5-01)

Tab A.8 Number of R&D workplaces in the business enterprise sector in the Czech Republic

	2005	2006	2007	2008	2009	2010
Total	**1 615**	**1 732**	**1 764**	**1 792**	**1 899**	**2 130**
by size of expenditure on R&D (mil. CZK)						
less than 1	499	511	434	403	435	528
1-9,10	759	819	888	913	978	1 094
10-49,10	269	311	338	364	376	400
50-99,10	49	49	54	56	65	58
100 and more	39	42	50	56	45	50
by number of R&D personnel (FTE)						
Only contractors in R&D	29	30	19	28	34	51
less than 5	858	908	909	889	941	1 128
5 - 9,9	295	326	344	364	375	391
10 - 19,9	187	210	224	227	261	262
20 - 49,9	165	171	178	184	190	198
50 - 99,9	46	55	50	59	61	64
100 and more	35	32	40	41	37	36
by type of workplace						
Public enterprises	66	59	61	69	71	66
Private national enterprises	1 245	1 321	1 329	1 246	1 289	1 557
Foreign affiliates	304	352	374	477	539	507
by size of enterprises (number of employees)						
very small (0 - 9)	366	312	285	238	298	370
small (10 - 49)	373	455	481	515	525	630
medium (50 - 249)	478	542	576	619	670	738
large (250 and more)	398	423	422	420	406	392
by source of funds*						
Business enterprise (private national)	1 453	1 595	1 642	1 678	1 770	1 995
Government (public national)	668	691	796	811	903	1 003
Abroad (private and public)	96	100	117	113	190	236
business enterprise	46	39	51	51	70	81
from which enterprises in the same business group	.	.	*33*	*38*	*54*	*59*
public (sources from EU, NATO, etc.)	61	69	69	63	126	162
Other national	10	17	11	12	18	21
by type of R&D activities*						
Basic research	263	293	283	314	326	354
Applied research	606	622	768	817	746	1 048
Experimental development	1 080	1 183	1 038	990	1 206	1 142
by fields of sciences						
Natural sciences	267	235	240	267	329	411
Engineering	1 145	1 273	1 315	1 331	1 369	1 461
Medical sciences	58	91	87	89	93	110
Agricultural sciences	59	73	79	74	77	111
Social sciences	48	40	31	18	21	25
Humanities	38	20	12	13	10	12
by regions						
Praha	403	411	430	425	439	466
Středočeský	142	159	167	165	184	204
Jihočeský	67	67	66	70	71	81
Plzeňský	59	65	67	65	75	82
Karlovarský	13	16	17	17	19	18
Ústecký	58	63	64	65	60	74
Liberecký	61	62	62	67	73	75
Královéhradecký	81	88	98	94	100	122
Pardubický	79	105	99	100	107	120
Vysočina	64	72	62	75	75	84
Jihomoravský	241	262	262	276	298	349
Olomoucký	83	84	87	85	92	102
Zlínský	110	122	118	121	129	152
Moravskoslezský	154	156	165	167	177	201

* one R&D workplace can have more than one source of funds and so it can be active in performing more than one type of R&D activity

Source: the CZSO, Annual statistical R&D surveys (VTR 5-01)

Tab. A.9 Expenditure on R&D performed in the business enterprise sector in the Czech Republic by economic activity

mil. CZK - current prices

	2005	2006	2007	2008	2009	2010
Total	**26 657**	**32 470**	**33 620**	**33 486**	**33 218**	**36 623**
by prevailing economic activity (CZ-NACE)						
Agriculture, forestry and fishing (section A)	81	97	116	99	101	115
Mining and quarrying (section B)	130	61	65	82	65	51
Manufacturing (section C)	**17 303**	**22 282**	**20 756**	**20 837**	**20 561**	**23 133**
Manufacture of food products and beverages (10-12)	135	199	211	316	302	332
Manufacture of textiles, wearing apparel, leather and related products (13-15)	229	316	274	210	248	252
Manufacture of wood (including furniture) and paper (16-18, 31)	46	44	42	43	54	90
Manufacture of coke and refined petroleum products; chemicals and chemical products (19-20)	661	705	741	744	913	972
Manufacture of basic pharmaceutical products and pharmaceutical preparations (21)	802	4 070	1 098	1 085	1 189	1 054
Manufacture of rubber and plastic products (22)	734	903	619	656	607	674
Manufacture of other non-metallic mineral products (23)	547	499	444	487	326	391
Manufacture of basic metals and fabricated metal products (24-25)	884	882	868	932	814	1 028
Manufacture of computer, electronic and optical products (26)	1 533	1 998	1 875	1 605	1 319	1 191
Manufacture of computers and electronic components (261-262)	117	128	197	286	178	187
Manufacture of electronics and optical instruments (263-264, 267-26	1 080	1 214	1 156	1 001	683	458
Manufacture of instruments and appliances for testing, navigation and electromedic (265-266)	335	656	522	318	457	546
Manufacture of electrical equipment (27)	697	716	887	892	1 070	1 402
Manufacture of machinery and equipment i.e.. (28)	1 690	1 974	2 363	2 398	2 277	2 499
Manufacture of motor vehicles, trailers and semi-trailers (29)	7 462	7 591	8 334	8 504	8 024	9 504
Manufacture of other transport equipment (30)	941	919	888	1 259	1 309	1 475
Manufacture of railway locomotives and rolling stock (302)	350	458	439	919	931	985
Manufacture of air and spacecraft and related machinery (303)	547	437	404	287	324	439
Manufacture of other transport means and equipment (301, 303, 304,	44	24	45	53	54	52
Other manufacturing (32)	118	177	251	275	263	289
Repair and installation of machinery and equipment (33)	822	1 289	1 861	1 431	1 845	1 981
Electricity, gas, steam and air conditioning supply (section D)	195	48	66	57	40	28
Water supply; sewerage, waste management and remediation activities (section E)	50	76	67	75	110	121
Construction (section F)	383	349	340	343	376	405
Wholesale and retail trade; repair of motor vehicles and motorcycles (section G)	287	434	683	853	851	922
Information and communication (section J)	**2 552**	**2 818**	**3 258**	**3 816**	**3 817**	**4 098**
Audiovisual, publishing and information activities (58.1, 60, 63)	382	410	467	451	446	2
Telecommunications (61)	13	356	451	436	405	519
IT activities (58.2, 62,63.1)	2 157	2 052	2 339	2 929	2 966	3 577
Financial and insurance activities (section K)	278	916	1 760	919	489	501
Professional, scientific and technical activities (section M)	**4 868**	**4 836**	**5 929**	**5 818**	**6 134**	**6 596**
Architectural and engineering activities; technical testing and analysis (	822	870	904	1 123	1 254	1 514
Scientific research and development (72)	3 929	3 885	4 847	4 519	4 569	4 785
Other professional, scientific and technical activities (69, 70, 73-75)	117	80	178	176	310	297
Human health and social work activities (section Q)	340	414	451	410	461	464
Arts, entertainment and recreation (section R)	93	38	63	92	123	70
Other activities (section H, I, L, N, O, P, S and T)	96	99	67	84	88	117

Source: the CZSO, Annual statistical R&D surveys (VTR 5-01)

Tab A.10 Number of R&D workplaces in the business enterprise sector in the Czech Republic by economic activity

	2005	2006	2007	2008	2009	2010
Total	**1 615**	**1 732**	**1 764**	**1 792**	**1 899**	**2 130**
by prevailing economic activity (CZ-NACE)						
Agriculture, forestry and fishing (section A)	15	20	21	17	24	39
Mining and quarrying (section B)	8	9	8	10	9	9
Manufacturing (section C)	**855**	**978**	**981**	**1 011**	**1 049**	**1 162**
Manufacture of food products and beverages (10-12)	37	54	51	59	53	53
Manufacture of textiles, wearing apparel, leather and related products (13-15)	38	44	42	42	41	42
Manufacture of wood (including furniture) and paper (16-18, 31)	23	23	21	19	21	29
Manufacture of coke and refined petroleum products; chemicals and chemical products (19-20)	79	91	85	86	90	89
Manufacture of basic pharmaceutical products and pharmaceutical preparations (21)	21	22	20	22	23	26
Manufacture of rubber and plastic products (22)	41	42	42	47	52	57
Manufacture of other non-metallic mineral products (23)	40	48	54	51	46	53
Manufacture of basic metals and fabricated metal products (24-25)	98	114	116	124	136	156
Manufacture of computer, electronic and optical products (26)	72	82	85	87	92	101
Manufacture of computers and electronic components (261-262)	16	22	23	26	28	32
Manufacture of electronics and optical instruments (263-264, 267-26	25	24	26	30	30	28
Manufacture of instruments and appliances for testing, navigation and electromedic (265-266)	31	36	36	31	34	41
Manufacture of electrical equipment (27)	87	92	97	96	110	123
Manufacture of machinery and equipment i.e.. (28)	160	191	186	203	207	240
Manufacture of motor vehicles, trailers and semi-trailers (29)	60	63	65	70	65	61
Manufacture of other transport equipment (30)	30	30	33	31	34	38
Manufacture of railway locomotives and rolling stock (302)	10	10	11	14	15	18
Manufacture of air and spacecraft and related machinery (303)	14	13	14	12	14	13
Manufacture of other transport means and equipment (301, 303, 304,	6	7	8	5	5	7
Other manufacturing (32)	34	38	38	39	35	44
Repair and installation of machinery and equipment (33)	35	44	46	35	44	50
Electricity, gas, steam and air conditioning supply (section D)	4	4	5	9	5	4
Water supply; sewerage, waste management and remediation activities (section E)	16	14	18	16	20	23
Construction (section F)	27	34	37	37	39	41
Wholesale and retail trade; repair of motor vehicles and motorcycles (section G)	75	81	96	107	113	132
Information and communication (section J)	**156**	**172**	**196**	**204**	**210**	**233**
Audiovisual, publishing and information activities (58.1, 60, 63)	9	7	7	4	4	5
Telecommunications (61)	3	6	6	5	5	5
IT activities (58.2, 62,63.1)	144	159	183	195	201	223
Financial and insurance activities (section K)	13	17	17	16	16	15
Professional, scientific and technical activities (section M)	**369**	**331**	**318**	**301**	**339**	**389**
Architectural and engineering activities; technical testing and analysis (	111	115	109	110	139	161
Scientific research and development (72)	209	169	154	139	143	155
Other professional, scientific and technical activities (69, 70, 73-75)	49	47	55	52	57	73
Human health and social work activities (section Q)	20	26	29	30	40	46
Arts, entertainment and recreation (section R)	18	9	6	5	5	6
Other activities (section H, I, L, N, O, P, S and T)	39	37	32	29	30	31

Source: the CZSO, Annual statistical R&D surveys (VTR 5-01)

Cooperation of sectors in R&D in 2010

Cooperation of sectors in R&D can be characterized by financial flows targeted on R&D performed in different sectors.

Sectors in R&D can be specified from two points of view:

a) **R&D performing sectors** – sectors, where R&D activities are carried out (Business enterprise, Government, Higher education and Private non-profit);

b) **R&D financing sectors (sources of R&D funds)** – sectors (sources) financing R&D activities (Business enterprise: own funds, Funds from other enterprises; Government; Abroad: Private and Public funds; Other national funds)

Table and scheme below describe flows of funds among these sectors in R&D in 2010.

Tab. 1: Cooperation among sectors, 2010 (mil. CZK)

	CZK million	R&D performing sector:				
		Business enterprise (BERD)	Government (GOVERD)	Higher education (HERD)	Private non profit	**Total**
R&D financing sector (source of R&D funds):	**Business enterprise**	**28 176**	**544**	**113**	**57**	**28 891**
	Own funds	26 261	.	.	.	26 309
	Funds from other enterprises in the same group	265	.	.	.	266
	Funds from other enterprises	1 651	.	.	.	1 658
	Revenues from sale of R&D services	.	*355*	*99*	.	*454*
	Revenues from R&D related (e.g. patent) licence fees	.	*10*	*0*	.	*10*
	Other revenues from business enterprise sources	.	*180*	*14*	.	*194*
	Government	**4 712**	**9 406**	**9 216**	**204**	**23 539**
	Other national sources*	**30**	**21**	**400**	**11**	**461**
	Abroad	**3 705**	**1 498**	**886**	**52**	**6 142**
	Business enterprise funds	2 828	1 076	6	16	3 926
	Public funds	877	407	854	36	2 174
	Other funds	0	15	26	1	42
	Total	**36 623**	**11 469**	**10 616**	**324**	**59 033**

Tab. 2: Structure of sources of R&D funds by performing sectors, 2010 (%)

		R&D performing sector:				**Share of sources of R&D funds on total R&D expenditures**
		Business enterprise (BERD)	Government (GOVERD)	Higher education (HERD)	Private non profit	
R&D financing sector:	**Business enterprise**	97,5%	1,9%	0,4%	0,2%	**48,9%**
	Government	20,0%	40,0%	39,2%	0,9%	**39,9%**
	Other national sources*	6,6%	4,5%	86,6%	2,3%	**0,8%**
	Abroad	60,3%	24,4%	14,4%	0,9%	**10,4%**
	– Business enterprise funds	*72,0%*	*27,4%*	*0,2%*	*0,4%*	*6,6%*
	– Public funds	*40,3%*	*18,7%*	*39,3%*	*1,6%*	*3,7%*

Tab. 3: Structure of R&D expenditures in performing sectors by their sources of funds, 2010 (%)

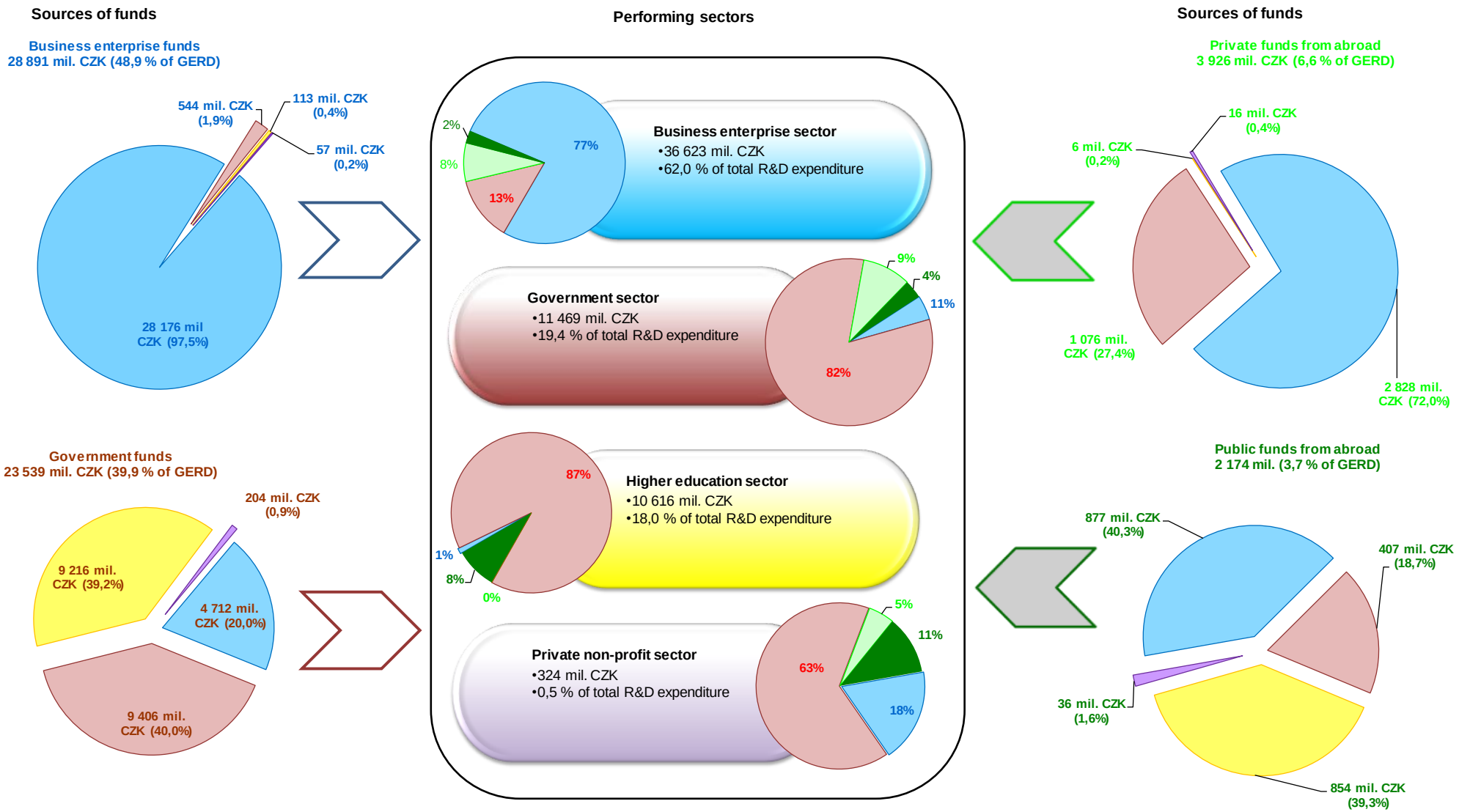
		R&D performing sector:			
		Business enterpr. (BERD)	**Government (GOVERD)**	**Higher education (HERD)**	**Private non profit**
R&D financing sector:	Business enterprise	76,9%	4,7%	1,1%	17,5%
	Government	12,9%	82,0%	86,8%	63,1%
	Other national sources*	0,1%	0,2%	3,8%	3,2%
	Abroad	10,1%	13,1%	8,4%	16,2%
	– Business enterprise funds	*7,7%*	*9,4%*	*0,1%*	*4,9%*
	– Public funds	*2,4%*	*3,6%*	*8,0%*	*11,0%*
Share of performing sectors on total R&D expenditures		**62,0%**	**19,4%**	**18,0%**	**0,5%**

Notes:

- **GERD:** Gross domestic expenditure on R&D
- **BERD:** Business Enterprise expenditure on R&D
- **GOVERD:** Government Expenditure on R&D
- **HERD:** Expenditure on R&D in Higher Education Sector
- **Private funds from abroad** can be characterised as financial funds from private business enterprises from abroad (sources from headquarters or enterprises in the same group, sources from other private business enterprises from abroad received in the form of revenues for R&D services, fees for licences related to R&D or other revenues).
- **Public funds from abroad** contains financial funds from the EU Structural Funds, grants, subventions and public tenders of the European Commission including Framework Programs, public funds from other international organizations and research institutions (as NATO, OECD, UNO, CERN, ILL, ESA) and government funds from abroad.

· field is not filled due to logical reasons

Scheme 1: Cooperation of sectors in R&D, 2010



* This scheme does not depict other national funds whose share in 2010 was 0,8% from total R&D expenditures (461 mil. CZK). Other national funds include own receipts of universities (97,9 % of total other national funds in 2010) and sources from private non-profit organisations (2,1% of total other national funds in 2010).

Explanation of colours:

- Business enterprise
- Government
- Higher education
- Private non- profit
- Private funds from abroad
- Public funds from abroad

Source: the CZSO, Annual statistical R&D surveys (VTR 5-01)

Tab. A.11 Gross domestic expenditure on R&D (GERD): *Main indicators*

	million current EUR				million current PPP US$				million 2000 constant PPP $				*GERD as percentage of GDP*				*GERD per capita (current PPP $)*			
	2000	2007	2008	2009	2000	2007	2008	2009	2000	2007	2008	2009	2000	2007	2008	2009	2000	2007	2008	2009
Austria	4 029	6 868	7 557	7 546	4 474	7 923	8 868	8 931	4 474	6 767	7 311	7 241	1,94	2,52	2,67	2,75	558	954	1 064	1 068
Belgium	4 964	6 357	6 760	6 653	5 571	7 173	7 737	7 685	5 571	6 136	6 401	6 232	1,97	1,90	1,96	1,96	544	675	723	712
Bulgaria	71	140	167	185	258	430	503	554	..	..	..	..	0,51	0,45	0,47	0,53	32	56	66	73
Cyprus	25	70	73	78	32	98	103	113	32	76	75	81	0,24	0,44	0,42	0,46	47	126	131	142
Czech Republic	**744**	**1 955**	**2 169**	**2 094**	**1 863**	**3 896**	**3 954**	**4 095**	**1 863**	**3 221**	**3 152**	**3 145**	**1,21**	**1,54**	**1,47**	**1,53**	**181**	**377**	**379**	**390**
Denmark	3 553	5 871	6 701	6 715	3 119	5 315	6 225	6 284	3 235	4 438	4 881	4 867	2,18	2,58	2,87	3,02	586	973	1 133	1 138
Estonia	37	174	208	197	81	313	378	379	81	257	287	273	0,60	1,10	1,29	1,42	59	233	282	283
Finland	4 423	6 243	6 871	6 786	4 445	6 642	7 473	7 458	4 445	5 774	6 242	6 104	3,35	3,47	3,72	3,96	859	1 256	1 406	1 397
France	30 954	39 303	41 053	42 080	32 957	44 045	46 262	47 953	32 957	36 170	36 828	37 555	2,15	2,07	2,11	2,21	543	691	721	744
Germany	50 619	61 482	66 532	67 655	52 342	74 072	81 849	82 731	52 342	58 925	63 129	62 373	2,45	2,53	2,68	2,78	637	900	997	1 010
Greece	795	1 311	..	..	1 117	1 868	..	..	1 159	1 587	..	..	0,60	0,59	..	..	103	167	..	..
Hungary	405	977	1 059	1 067	977	1 872	2 069	2 334	977	1 521	1 574	1 694	0,79	0,97	1,00	1,15	96	186	206	233
Ireland	1 176	2 434	2 616	2 819	1 222	2 542	2 754	3 165	1 222	2 035	2 220	2 527	1,12	1,29	1,45	1,79	321	582	620	708
Italy	12 460	18 231	19 304	19 276	15 247	22 332	24 510	24 753	15 247	18 597	19 163	18 710	1,05	1,18	1,23	1,27	268	376	410	411
Latvia	38	126	142	85	84	230	249	168	84	206	204	126	0,44	0,59	0,61	0,46	35	101	110	74
Lithuania	73	233	258	222	178	496	523	..	178	420	427	383	0,59	0,81	0,80	0,84	51	147	155	..
Luxembourg	364	592	600	639	386	641	661	709	386	494	479	513	1,65	1,58	1,51	1,68	891	1 346	1 367	1 437
Malta	..	32	33	32	..	56	58	55	..	47	47	44	..	0,58	0,57	0,54	..	137	141	134
Netherlands	7 626	10 342	10 502	10 542	9 062	12 070	12 419	12 274	9 062	9 716	9 640	9 568	1,94	1,81	1,76	1,82	569	737	755	743
Poland	1 197	1 764	2 194	2 096	2 605	3 623	4 160	4 875	2 605	3 027	3 390	3 850	0,64	0,57	0,60	0,68	68	95	109	128
Portugal	927	1 973	2 585	2 791	1 324	2 992	3 985	4 411	1 324	2 286	2 949	3 167	0,73	1,17	1,50	1,66	129	282	375	415
Romania	149	653	809	556	468	1 442	1 878	1 472	468	1 015	1 205	915	0,37	0,52	0,58	0,47	21	67	88	69
Slovakia	143	252	305	303	384	518	593	595	384	415	452	437	0,65	0,46	0,47	0,48	71	96	110	110
Slovenia	297	501	617	657	482	796	978	1 044	482	682	808	833	1,39	1,45	1,65	1,86	242	394	484	511
Spain	5 719	13 342	14 701	14 582	7 789	18 329	20 435	20 496	7 789	13 754	14 799	14 591	0,91	1,27	1,35	1,38	193	408	448	446
Sweden	8 694	11 481	12 314	10 540	8 239	11 961	13 449	12 495	8 500	10 365	11 205	10 380	3,58	3,40	3,70	3,62	930	1 307	1 459	1 344
United Kingdom	29 070	36 529	32 200	29 270	27 855	38 760	40 096	40 280	27 855	32 617	32 494	32 309	1,81	1,78	1,77	1,85	473	636	653	652
EU27	**171 231**	**229 234**	**239 702**	**236 820**	**184 126**	**270 439**	**294 187**	**297 890**	**184 126**	**220 895**	**231 349**	**229 997**	**1,74**	**1,77**	**1,84**	**1,90**	**382**	**545**	**590**	**596**
Australia	..	..	..	..	7 942	..	18 755	..	7 942	..	15 390	..	1,47	..	2,21	..	412	..	867	..
Canada	..	..	..	..	16 690	24 705	24 218	24 551	16 690	20 371	19 564	19 652	1,91	1,96	1,87	1,92	544	750	727	728
Israel	..	..	..	..	6 315	9 088	9 461	8 810	6 315	8 710	8 917	8 228	4,27	4,76	4,68	4,28	1 004	1 266	1 294	1 184
Japan	153 860	110 116	113 986	..	98 896	147 768	148 719	137 909	98 896	124 752	123 149	113 152	3,04	3,44	3,44	3,33	779	1 157	1 166	1 083
Korea	13 271	24 589	21 480	..	18 558	40 743	43 906	..	18 558	35 737	38 273	..	2,30	3,21	3,36	..	395	841	903	..
Norway	2 445	4 665	5 011	4 908	2 178	4 193	4 655	4 734	2 312	3 359	3 563	3 558	1,64	1,62	1,61	1,76	488	891	976	981
Switzerland	6 852	..	10 268	..	5 765	..	10 513	..	5 765	..	7 974	..	2,53	..	3,00	..	800	..	1 363	..
Turkey	1 389	3 403	3 609	3 744	2 823	7 053	7 712	8 681	2 823	5 950	6 012	6 699	0,48	0,72	0,73	0,85	44	100	109	121
United States	290 300	272 298	270 733	..	268 121	373 185	398 194	..	268 121	311 210	324 987	..	2,71	2,67	2,79	..	949	1 236	1 306	..
OECD	**..**	**..**	**..**	**..**	**615 086**	**909 597**	**965 629**	**..**	**615 086**	**757 509**	**783 437**	**..**	**2,20**	**2,27**	**2,33**	**..**	**541**	**752**	**793**	**..**
China	..	35 614	45 151	..	27 183	102 408	120 775	154 147	27 183	86 108	99 412	125 748	0,90	1,40	1,47	1,70	21	78	91	115
Russian Federatio	2 948	10 597	11 836	11 007	10 495	26 647	30 058	33 368	10 495	17 617	17 285	19 012	1,05	1,12	1,04	1,24	71	187	212	235

Exceptions to the reference year 2000: 1999 (Denmark, Greece, Norway and Sweden)

Source: OECD MSTI 2011/1, Eurostat, September 2011 (online database) and CZSO own calculations

Tab. A. 12 Gross domestic expenditure on R&D (GERD) by main source of funds

% GERD

	Industry-financed GERD (business enterprise/private national sources)				Government-financed GERD (public national sources)				GERD financed from abroad (private and public foreign sources)			
	2000	2007	2008	2009	2000	2007	2008	2009	2000	2007	2008	2009
Austria	41,8	48,7	46,1	44,8	38,0	32,3	37,0	39,1	19,9	17,9	16,5	15,7
Belgium	62,4	61,4	..	..	22,9	22,2	..	..	12,2	13,0	..	..
Bulgaria	24,4	34,2	30,6	...	69,2	56,7	61,2	...	5,3	7,6	6,8	..
Cyprus	17,5	16,4	17,8	..	66,5	64,6	64,1	..	9,4	14,5	14,7	..
Czech Republic	**51,2**	**52,5**	**51,1**	**44,6**	**44,5**	**41,2**	**41,3**	**43,9**	**3,1**	**5,5**	**6,5**	**10,4**
Denmark	59,0	61,0	..	60,2	31,2	25,9	..	28,4	5,4	9,5	..	8,7
Estonia	24,2	41,6	39,8	38,5	59,2	45,6	50,0	48,8	12,7	11,7	9,4	11,3
Finland	70,2	68,2	70,3	68,1	26,2	24,1	21,8	24,0	2,7	6,5	6,6	6,6
France	52,5	52,3	50,7	..	38,7	38,1	38,9	..	7,2	7,5	8,0	..
Germany	66,0	68,1	67,3	..	31,4	27,5	28,4	..	2,1	4,0	4,0	..
Greece	24,2	..	..	..	48,9	..	..	..	24,5	..	..	..
Hungary	37,8	43,9	48,3	46,4	49,5	44,4	41,8	42,0	10,6	11,1	9,3	10,9
Ireland	65,8	49,6	48,6	50,4	23,4	32,2	33,9	32,5	8,9	15,9	15,5	15,4
Italy	..	42,0	45,2	..	..	44,3	42,9	..	..	9,5	7,8	..
Latvia	29,4	36,4	27,0	36,9	41,5	49,9	47,3	44,7	29,1	12,7	23,1	15,4
Lithuania	31,6	24,5	21,4	21,0	61,7	47,9	55,6	53,9	6,7	19,6	15,5	13,1
Luxembourg	90,7	76,0	..	..	7,7	18,2	..	..	1,6	5,7	..	..
Malta	..	51,4	56,5	51,4	..	26,4	27,6	31,3	..	22,2	15,8	17,2
Netherlands	48,4	48,8	..	45,1	32,2	38,0	..	40,9	11,0	10,7	..	10,8
Poland	29,5	34,3	30,5	27,1	66,5	58,6	59,8	60,4	1,8	6,7	5,4	5,5
Portugal	27,0	47,0	48,1	..	64,8	44,6	43,7	..	5,2	5,4	3,0	..
Romania	49,0	26,9	23,3	34,8	40,8	67,1	70,1	54,9	4,9	4,5	4,0	8,3
Slovakia	54,4	35,6	34,7	35,1	42,6	53,9	52,3	50,6	2,3	10,2	12,3	12,8
Slovenia	53,3	58,3	62,8	58,0	40,0	35,6	31,3	35,7	6,2	5,8	5,6	6,0
Spain	49,7	45,5	45,0	..	38,6	43,7	45,6	..	4,9	7,0	5,7	..
Sweden	67,1	62,3	..	58,8	26,2	24,9	..	27,4	3,5	9,7	..	10,5
United Kingdom	48,3	46,0	45,4	44,5	30,2	30,9	30,7	32,6	16,0	17,3	17,7	16,6
EU27	**55,3**	**54,6**	**54,2**	**..**	**35,4**	**34,0**	**34,6**	**..**	**7,2**	**9,0**	**8,7**	**..**
Australia	46,3	..	61,4	..	45,5	..	34,9	..	3,5	..	1,7	..
Canada	44,9	49,9	48,4	47,6	29,3	32,1	34,1	33,4	17,4	8,4	7,1	6,9
Israel	70,7	79,6	79,0	..	23,9	13,9	14,3	..	2,6	2,9	3,1	..
Japan	72,4	77,7	78,2	75,3	19,6	15,6	15,6	17,7	0,4	0,3	0,4	0,4
Korea	72,4	73,7	72,9	..	23,9	24,8	25,4	..	0,1	0,2	0,3	..
Norway	49,5	45,0	..	43,6	42,5	44,9	..	46,8	6,3	8,5	..	8,2
Switzerland	69,1	..	68,2	..	23,2	..	22,8	..	4,3	..	6,0	..
Turkey	42,9	48,4	47,3	41,0	50,6	47,1	31,6	34,0	1,2	0,5	1,3	1,1
United States	69,4	66,2	67,3	..	25,8	28,3	27,1	..	..	..	..	..
OECD	**64,4**	**64,2**	**64,4**	**..**	**28,3**	**28,1**	**27,8**	**..**	**..**	**..**	**..**	**..**
China	57,6	70,4	71,7	71,7	33,4	24,6	23,6	23,4	2,7	1,3	1,2	1,3
Russian Federatio	32,9	29,4	28,7	26,6	54,8	62,6	64,7	66,5	12,0	7,2	5,9	6,5

Exceptions to the reference year 2000: 1999 (Denmark, Greece, Norway and Sweden)

Source: OECD MSTI 2011/1, Eurostat, September 2011 (online database) and CZSO own calculations

Tab. A. 13 Government Intramural Expenditure on R&D (GOVERD): *Main indicators*

	million current EUR				million current PPP US$				million 2000 constant PPP $				*GOVERD as % of GDP*				*GOVERD as % of GERD*				*Percentage of GOVERD financed by industry*			
	2000	**2007**	**2008**	**2009**	**2000**	**2007**	**2008**	**2009**	**2000**	**2007**	**2008**	**2009**	***2000***	***2007***	***2008***	***2009***	***2000***	***2007***	***2008***	***2009***	***2000***	***2007***	***2008***	***2009***
Austria	217	367	404	403	239	424	474	477	247	362	391	387	0,11	0,14	0,14	0,15	6,4	5,3	5,3	5,3	3,1	9,3	..	..
Belgium	312	513	561	575	350	579	642	664	350	495	531	539	0,12	0,15	0,16	0,17	6,3	8,1	8,3	8,6	7,2	9,6	..	..
Bulgaria	49	82	97	102	177	251	293	306	..	..	..	..	0,35	0,27	0,27	0,29	68,6	58,5	58,3	55,2	3,4	5,2	3,9	..
Cyprus	11	17	17	17	15	25	25	25	15	19	18	18	0,11	0,11	0,10	0,10	45,8	25,0	23,8	21,7	..	0,0	0,0	..
Czech Republic	**188**	**407**	**454**	**448**	**472**	**811**	**828**	**876**	**472**	**671**	**660**	**672**	**0,31**	**0,32**	**0,31**	**0,33**	**25,3**	**20,8**	**20,9**	**21,4**	**9,6**	**13,7**	**11,3**	**9,8**
Denmark	492	190	175	193	432	172	162	180	432	144	127	140	0,28	0,08	0,07	0,09	14,5	3,2	2,6	2,9	6,7	0,6	..	1,9
Estonia	9	15	24	22	19	27	44	42	19	22	34	30	0,14	0,10	0,15	0,16	23,1	8,7	11,8	11,0	13,1	0,0	1,3	1,9
Finland	468	528	552	617	470	562	600	678	470	489	501	555	0,35	0,29	0,30	0,36	10,6	8,5	8,0	9,1	14,5	13,7	14,2	13,6
France	5 361	6 427	6 544	6 879	5 708	7 202	7 374	7 839	5 708	5 915	5 871	6 139	0,37	0,34	0,34	0,36	17,3	16,4	15,9	16,3	6,7	6,5	6,8	..
Germany	6 873	8 540	9 346	9 840	7 107	10 289	11 498	12 327	7 107	8 185	8 868	9 294	0,33	0,35	0,38	0,41	13,6	13,9	14,0	14,9	2,2	10,8	9,3	..
Greece	173	281	..	..	242	391	..	..	252	332	..	..	0,13	0,12	..	..	21,7	20,9	..	..	1,2	..	..	..
Hungary	106	236	248	214	255	452	484	468	255	367	368	340	0,21	0,23	0,23	0,23	26,1	24,2	23,4	20,1	10,9	12,3	13,3	12,6
Ireland	96	171	180	122	99	179	190	177	99	143	153	141	0,09	0,09	0,10	0,10	8,1	7,0	6,9	5,6	10,7	4,7	1,1	5,0
Italy	2 356	2 644	2 417	2 680	2 883	3 239	3 069	3 442	2 883	2 697	2 399	2 601	0,20	0,17	0,15	0,18	18,9	14,5	12,5	13,9	1,7	4,4	5,3	..
Latvia	8	30	39	21	19	55	69	40	19	49	57	30	0,10	0,14	0,17	0,11	22,7	23,7	27,9	23,9	19,0	20,3	9,9	21,6
Lithuania	31	48	60	52	75	104	118	..	75	88	96	91	0,25	0,17	0,18	0,20	42,4	21,0	22,5	..	14,3	2,5	6,9	6,0
Luxembourg	26	79	99	111	28	85	110	122	28	66	79	89	0,12	0,21	0,25	0,29	7,3	13,3	16,6	17,3	5,8	3,2	..	..
Malta	..	1	2	2	..	2	3	3	..	2	2	2	..	0,02	0,03	0,03	..	3,4	5,3	5,6	..	0,5	7,3	9,4
Netherlands	974	1 259	1 259	1 326	1 091	1 469	1 489	1 565	1 091	1 183	1 156	1 220	0,23	0,22	0,21	0,23	12,0	12,2	12,0	12,7	23,8	17,1	..	32,4
Poland	386	625	775	719	840	1 284	1 470	1 673	840	1 073	1 198	1 321	0,21	0,20	0,21	0,23	32,2	35,4	35,3	34,3	9,5	14,1	6,0	6,3
Portugal	222	184	188	206	317	280	290	325	317	214	215	233	0,17	0,11	0,11	0,12	23,9	9,4	7,3	7,4	3,6	4,4	4,2	..
Romania	28	222	332	194	88	490	769	514	88	344	494	319	0,07	0,18	0,24	0,17	18,8	33,9	41,0	34,9	23,4	11,9	14,4	13,5
Slovakia	35	89	100	103	95	183	195	202	95	147	148	148	0,16	0,16	0,15	0,16	24,7	35,4	32,8	33,9	12,8	13,4	15,7	14,4
Slovenia	77	122	135	136	125	195	214	217	125	167	177	173	0,36	0,35	0,36	0,39	25,9	24,5	21,9	20,8	13,0	13,1	12,7	11,7
Spain	905	2 349	2 672	2 927	1 232	3 227	3 714	4 114	1 232	2 421	2 690	2 929	0,14	0,22	0,25	0,28	15,8	17,6	18,2	20,1	6,1	6,2	5,9	..
Sweden	289	574	547	467	274	598	597	555	283	518	498	461	0,12	0,17	0,16	0,16	3,3	5,0	4,4	4,4	3,8	4,4	..	5,1
United Kingdom	3 672	3 346	2 947	2 679	3 519	3 551	3 670	3 691	3 519	2 988	2 974	2 961	0,23	0,16	0,16	0,17	12,6	9,2	9,2	9,2	10,4	9,2	7,9	8,0
EU27	**23 398**	**29 351**	**30 471**	**31 346**	**26 131**	**35 883**	**38 599**	**40 843**	**26 131**	**29 108**	**30 100**	**31 232**	**0,25**	**0,23**	**0,24**	**0,26**	**14,2**	**13,3**	**13,1**	**13,7**	**6,3**	**8,8**	**8,4**	**..**
Australia	..	..	..	..	1 796	..	2 313	..	1 796	..	1 898	..	0,33	..	0,27	..	22,6	..	12,3	..	5,6	..	9,9	..
Canada	..	..	..	..	1 876	2 414	2 431	2 471	1 876	1 991	1 964	1 978	0,21	0,19	0,19	0,19	11,2	9,8	10,0	10,1	3,1	5,0	4,4	4,9
Israel	..	..	..	..	331	340	367	368	331	326	346	344	0,22	0,18	0,18	0,18	5,2	3,7	3,9	4,2	7,5	8,3	4,7	..
Japan	15 217	8 554	9 494	..	9 781	11 479	12 387	12 708	9 781	9 691	10 257	10 426	0,30	0,27	0,29	0,31	9,9	7,8	8,3	9,2	1,0	0,8	0,7	0,7
Korea	1 767	2 866	2 590	..	2 471	4 749	5 294	..	2 471	4 165	4 615	..	0,31	0,37	0,41	..	13,3	11,7	12,1	..	9,5	4,2	3,5	..
Norway	377	715	729	778	336	653	689	776	356	523	527	583	0,25	0,25	0,24	0,29	15,4	15,6	14,8	16,4	10,3	10,1	10,9	10,3
Switzerland	90	..	76	..	76	..	77	..	76	..	59	..	0,03	..	0,02	..	1,3	..	0,7	..	..	..	..	..
Turkey	86	359	431	471	175	744	922	1 091	175	628	718	842	0,03	0,08	0,09	0,11	6,2	10,6	11,9	12,6	5,4	4,1	6,6	3,4
United States	29 975	29 531	28 709	..	27 685	40 472	42 225	..	27 685	33 751	34 462	..	0,28	0,29	0,30	..	10,3	10,8	10,6	..	0,0	0,0	0,0	..
OECD	**..**	**..**	**..**	**..**	**72 044**	**100 081**	**106 081**	**..**	**72 044**	**82 948**	**85 621**	**..**	**0,26**	**0,25**	**0,26**	**..**	**11,7**	**11,0**	**11,0**	**..**	**3,2**	**4,0**	**3,8**	**..**
China	..	6 850	8 257	..	8 555	19 697	22 087	28 834	8 555	16 562	18 180	23 522	0,28	0,27	0,27	0,32	31,5	19,2	18,3	18,7	9,6	4,9	4,7	4,3
Russian Federatio	721	3 084	3 566	3 331	2 565	7 754	9 056	10 098	2 565	5 127	5 207	5 754	0,26	0,32	0,31	0,38	24,4	29,1	30,1	30,3	10,8	13,3	12,4	11,1

Exceptions to the reference year 2000: 1998 (Austria), 1999 (Greece, Norway and Sweden)

Source: OECD MSTI 2011/1, Eurostat, September 2011 (online database) and CZSO own calculations

Tab. A. 14 Higher Education Expenditure on R&D (HERD): *Main indicators*

	million current EUR				million current PPP US$				million 2000 constant PPP $				*HERD as % of GDP*				*HERD as % of GERD*				*Percentage of HERD financed by industry*			
	2000	2007	2008	2009	2000	2007	2008	2009	2000	2007	2008	2009	2000	2007	2008	2009	2000	2007	2008	2009	2000	2007	2008	2009
Austria	1 003	1 637	1 802	1 799	1 100	1 889	2 114	2 129	1 138	1 613	1 743	1 726	0,53	0,60	0,64	0,66	29,7	23,8	23,8	23,8	1,7	5,7	..	..
Belgium	1 005	1 343	1 540	1 511	1 128	1 516	1 762	1 819	1 128	1 297	1 458	1 475	0,40	0,40	0,45	0,46	20,2	21,1	22,8	23,7	11,8	11,1	..	..
Bulgaria	7	13	16	26	25	42	48	78	..	..	..	..	0,05	0,04	0,05	0,07	9,9	9,7	9,6	14,0	30,8	19,6	17,5	..
Cyprus	6	32	32	33	8	45	47	49	8	34	34	35	0,06	0,20	0,19	0,20	25,0	45,5	45,2	43,5	1,7	2,0	1,7	..
Czech Republic	**106**	**330**	**364**	**379**	**265**	**657**	**664**	**741**	**265**	**543**	**530**	**569**	**0,17**	**0,26**	**0,25**	**0,28**	**14,2**	**16,9**	**16,8**	**18,1**	**1,1**	**0,7**	**0,6**	**1,1**
Denmark	770	1 551	1 822	2 012	686	1 404	1 692	1 883	686	1 172	1 327	1 458	0,45	0,68	0,78	0,90	19,4	26,4	27,2	30,0	2,0	2,1	..	4,4
Estonia	19	73	89	83	43	131	162	160	43	107	123	115	0,32	0,46	0,55	0,60	52,4	41,8	42,9	42,2	7,4	5,6	4,4	4,3
Finland	789	1 165	1 181	1 283	793	1 239	1 284	1 410	793	1 077	1 073	1 154	0,60	0,65	0,64	0,75	17,8	18,7	17,2	18,9	5,6	7,0	7,2	6,4
France	5 804	7 663	8 228	8 648	6 180	8 587	9 272	9 855	6 180	7 052	7 381	7 718	0,40	0,40	0,42	0,45	18,8	19,5	20,0	20,6	2,7	1,6	2,2	..
Germany	8 146	9 908	11 112	11 700	8 423	11 937	13 671	14 522	8 423	9 496	10 544	10 949	0,39	0,41	0,45	0,49	16,1	16,1	16,7	17,6	11,6	15,5	15,1	..
Greece	394	661	..	..	553	920	..	..	574	782	..	..	0,30	0,29	..	..	49,5	49,2	..	..	5,0	..	..	..
Hungary	97	228	233	223	235	437	456	489	235	355	347	355	0,19	0,23	0,22	0,24	24,0	23,3	22,0	20,9	5,5	13,7	14,7	15,5
Ireland	238	660	750	829	247	689	789	918	247	552	636	733	0,23	0,35	0,42	0,52	20,2	27,1	28,7	29,0	5,3	2,3	3,0	3,5
Italy	3 865	5 495	6 098	6 049	4 729	6 731	7 742	7 767	4 729	5 605	6 053	5 871	0,32	0,36	0,39	0,40	31,0	30,1	31,6	31,4	..	1,3	1,1	1,0
Latvia	14	54	67	33	32	101	118	66	32	91	97	49	0,17	0,26	0,29	0,18	38,6	44,1	47,5	39,1	27,1	3,1	8,1	3,0
Lithuania	27	118	137	117	66	251	275	..	66	213	224	200	0,22	0,41	0,42	0,44	37,3	50,6	52,5	..	14,0	3,3	2,5	2,4
Luxembourg	1	18	19	58	0	20	22	63	0	16	16	46	0,00	0,05	0,05	0,15	0,0	3,2	3,3	8,9	..	1,1	..	..
Malta	..	10	10	10	..	17	17	17	..	15	14	14	..	0,18	0,17	0,17	..	31,0	29,8	31,5	..	0,0	0,4	0,2
Netherlands	2 120	3 588	3 980	4 169	2 893	4 188	4 707	4 931	2 893	3 371	3 653	3 844	0,62	0,63	0,67	0,73	31,9	34,7	37,9	40,2	5,8	7,5	..	8,2
Poland	377	598	738	777	821	1 228	1 399	1 807	821	1 026	1 141	1 427	0,20	0,19	0,20	0,25	31,5	33,9	33,6	37,1	7,8	11,3	3,8	3,3
Portugal	348	587	891	987	497	890	1 374	1 560	497	680	1 017	1 120	0,27	0,35	0,52	0,59	37,5	29,8	34,5	35,4	1,0	1,4	0,9	..
Romania	17	157	234	138	55	348	542	364	55	245	348	226	0,04	0,13	0,17	0,12	11,8	24,1	28,9	24,7	6,5	5,6	2,5	3,8
Slovakia	14	63	74	76	37	130	144	149	37	104	110	109	0,06	0,11	0,11	0,12	9,5	25,0	24,3	25,0	0,3	6,8	2,5	2,1
Slovenia	49	78	83	96	80	124	131	152	80	106	109	121	0,23	0,23	0,22	0,27	16,6	15,6	13,4	14,6	7,6	10,6	10,1	9,2
Spain	1 694	3 519	3 932	4 058	2 307	4 834	5 466	5 705	2 307	3 627	3 959	4 061	0,27	0,33	0,36	0,39	29,6	26,4	26,7	27,8	6,9	9,0	8,8	..
Sweden	1 928	2 544	2 624	2 627	1 827	2 651	2 866	3 134	1 885	2 297	2 388	2 604	0,79	0,75	0,79	0,91	22,2	22,2	21,3	25,1	3,8	4,9	..	4,5
United Kingdom	5 985	9 527	8 532	7 756	5 735	10 109	10 624	11 257	5 735	8 507	8 610	9 029	0,37	0,46	0,47	0,52	20,6	26,1	26,5	27,9	7,1	4,5	4,6	3,9
EU27	**35 124**	**51 624**	**55 284**	**56 163**	**39 084**	**61 022**	**68 555**	**72 314**	**39 084**	**49 942**	**53 901**	**55 902**	**0,37**	**0,40**	**0,43**	**0,46**	**21,2**	**22,6**	**23,3**	**24,3**	**6,4**	**6,9**	**6,7**	**..**
Australia	..	..	..	..	2 127	..	4 541	..	2 127	..	3 727	..	0,39	..	0,54	..	26,8	..	24,2	..	4,9	..	5,9	..
Canada	..	..	..	..	4 703	8 412	8 856	9 240	4 703	6 936	7 154	7 396	0,54	0,67	0,68	0,72	28,2	34,0	36,6	37,6	9,5	8,5	8,2	8,2
Israel	..	..	..	..	960	1 068	1 151	1 115	960	1 023	1 085	1 041	0,65	0,56	0,57	0,54	15,2	11,7	12,2	12,7	3,7	7,3	7,3	..
Japan	22 354	13 868	13 264	..	14 368	18 609	17 306	18 494	14 368	15 711	14 331	15 174	0,44	0,43	0,40	0,45	14,5	12,6	11,6	13,4	2,5	3,0	3,0	2,5
Korea	1 497	2 619	2 394	..	2 093	4 340	4 893	..	2 093	3 807	4 265	..	0,26	0,34	0,37	..	11,3	10,7	11,1	..	15,9	14,2	12,0	..
Norway	700	1 462	1 579	1 548	624	1 337	1 491	1 517	662	1 071	1 142	1 140	0,47	0,52	0,52	0,56	28,6	31,9	32,0	32,0	5,1	4,0	..	3,8
Switzerland	1 566	..	2 482	..	1 318	..	2 541	..	1 318	..	1 927	..	0,58	..	0,72	..	22,9	..	24,2	..	5,1	..	6,9	..
Turkey	839	1 640	1 582	1 776	1 704	3 398	3 380	4 117	1 704	2 867	2 635	3 177	0,29	0,35	0,32	0,40	60,4	48,2	43,8	47,4	19,4	23,3	17,4	16,0
United States	33 232	35 769	34 786	..	30 693	49 021	51 163	..	30 693	40 880	41 757	..	0,31	0,35	0,36	..	11,4	13,1	12,8	..	7,1	5,6	5,7	..
OECD	**..**	**..**	**..**	**..**	**98 779**	**155 187**	**165 029**	**..**	**98 779**	**128 758**	**132 869**	**..**	**0,35**	**0,39**	**0,40**	**..**	**16,1**	**17,1**	**17,1**	**..**	**6,5**	**6,6**	**6,4**	**..**
China	..	3 021	3 816	..	2 329	8 686	10 208	12 438	2 329	7 303	8 403	10 147	0,08	0,12	0,12	0,14	8,6	8,5	8,5	8,1	32,4	35,1	34,6	36,7
Russian Federatio	134	670	793	785	477	1 686	2 013	2 379	477	1 114	1 158	1 356	0,05	0,07	0,07	0,09	4,5	6,3	6,7	7,1	27,3	31,0	28,6	22,4

Exceptions to the reference year 2000: 1998 (Austria), 1999 (Greece, Norway and Sweden)

Source: OECD MSTI 2011/1, Eurostat, September 2011 (online database) and CZSO own calculations

Tab. A 15 Business Enterprise Intramural Expenditure on R&D (BERD): *Main indicators*

	million current EUR				million current PPP US$				million 2000 constant PPP $				*BERD as % of GDP*				*BERD as % of GERD*				*Percentage of BERD financed by government*			
	2000	**2007**	**2008**	**2009**	**2000**	**2007**	**2008**	**2009**	**2000**	**2007**	**2008**	**2009**	***2000***	***2007***	***2008***	***2009***	***2000***	***2007***	***2008***	***2009***	***2000***	***2007***	***2008***	***2009***
Austria	2 146	4 846	5 332	5 324	2 355	5 590	6 257	6 302	2 436	4 775	5 159	5 109	1,13	1,78	1,88	1,94	63,6	70,6	70,6	70,6	5,5	10,3	..	..
Belgium	3 589	4 420	4 570	4 477	4 027	4 988	5 230	5 171	4 027	4 267	4 327	4 194	1,42	1,32	1,32	1,32	72,3	69,5	67,6	67,3	5,8	5,7	..	..
Bulgaria	15	43	52	55	55	134	156	166	..	..	..	..	0,11	0,14	0,15	0,16	21,4	31,2	31,0	30,0	4,9	2,7	9,9	..
Cyprus	5	16	17	17	7	22	25	25	7	17	18	18	0,05	0,10	0,10	0,10	20,8	22,7	23,8	21,7	10,3	24,2	17,1	..
Czech Republic	**446**	**1 211**	**1 342**	**1 257**	**1 117**	**2 413**	**2 447**	**2 457**	**1 117**	**1 995**	**1 951**	**1 887**	**0,73**	**0,95**	**0,91**	**0,92**	**60,0**	**61,9**	**61,9**	**60,0**	**14,7**	**13,4**	**13,2**	**14,8**
Denmark	2 596	4 102	4 684	4 487	2 025	3 714	4 351	4 199	2 100	3 101	3 412	3 252	1,41	1,80	2,01	2,02	64,9	69,9	69,9	66,8	4,1	2,4	2,4	2,0
Estonia	8	82	90	88	18	148	163	170	18	121	124	122	0,14	0,52	0,56	0,64	22,5	47,2	43,2	44,7	9,0	9,3	7,1	11,0
Finland	3 136	4 513	5 102	4 847	3 152	4 802	5 549	5 327	3 152	4 174	4 635	4 360	2,37	2,51	2,76	2,83	70,9	72,3	74,3	71,4	3,5	3,5	2,5	2,5
France	19 348	24 753	25 768	26 052	20 601	27 739	29 038	29 688	20 601	22 779	23 116	23 250	1,34	1,31	1,32	1,37	62,5	63,0	62,8	61,9	9,9	9,8	11,4	..
Germany	35 600	43 034	46 073	46 115	36 812	51 846	56 681	55 881	36 812	41 245	43 716	42 130	1,73	1,77	1,86	1,88	70,3	70,0	69,2	67,5	6,9	4,5	4,5	..
Greece	202	353	..	..	294	534	..	..	294	454	..	..	0,15	0,17	..	..	28,5	28,6	..	..	4,2	4,7	..	..
Hungary	180	492	557	611	433	942	1 088	1 336	433	766	828	969	0,35	0,49	0,52	0,66	44,3	50,3	52,6	57,2	6,1	9,6	8,6	15,5
Ireland	842	1 603	1 687	1 868	875	1 674	1 775	2 069	875	1 341	1 431	1 652	0,80	0,85	0,94	1,17	71,6	65,9	64,5	65,4	3,3	5,5	5,5	4,2
Italy	6 239	9 455	10 173	9 924	7 634	11 581	12 917	12 744	7 634	9 644	10 099	9 633	0,52	0,61	0,65	0,65	50,1	51,9	52,7	51,5	11,0	6,6	5,9	..
Latvia	15	41	35	31	34	74	61	62	34	66	50	47	0,18	0,19	0,15	0,17	40,9	32,2	24,6	37,0	5,9	3,0	3,2	3,7
Lithuania	16	66	61	53	39	141	124	..	39	119	101	91	0,13	0,23	0,19	0,20	22,0	28,4	23,8	..	0,8	2,5	2,8	3,6
Luxembourg	337	495	482	471	358	536	534	523	358	413	387	379	1,53	1,32	1,22	1,24	92,7	83,5	80,8	73,8	1,6	4,0	..	..
Malta	..	21	22	20	..	37	37	35	..	31	31	28	..	0,38	0,37	0,34	..	65,5	64,9	63,0	..	1,1	0,3	0,4
Netherlands	4 458	5 495	5 263	5 047	4 994	6 413	6 224	5 778	4 994	5 162	4 831	4 505	1,07	0,96	0,88	0,86	55,1	53,1	50,1	47,1	5,2	2,3	..	3,7
Poland	432	535	679	597	940	1 100	1 287	1 389	940	919	1 049	1 097	0,23	0,17	0,19	0,19	36,1	30,4	30,9	28,5	32,0	11,7	..	12,3
Portugal	258	1 011	1 295	1 303	368	1 533	1 996	2 060	368	1 171	1 478	1 479	0,20	0,60	0,75	0,77	27,8	51,2	50,1	46,7	4,2	3,5	3,3	..
Romania	103	272	242	223	325	600	563	591	325	422	361	368	0,25	0,22	0,17	0,19	69,4	41,6	30,0	40,2	34,0	42,5	39,1	20,7
Slovakia	94	100	131	124	253	205	254	244	253	164	194	180	0,43	0,18	0,20	0,20	65,8	39,6	42,9	41,0	20,6	10,3	13,0	7,1
Slovenia	167	299	398	424	271	476	631	674	271	408	522	538	0,78	0,87	1,07	1,20	56,3	59,8	64,6	64,6	7,0	8,0	5,7	11,8
Spain	3 069	7 454	8 074	7 568	4 180	10 240	11 222	10 637	4 180	7 684	8 127	7 573	0,49	0,71	0,74	0,72	53,7	55,9	54,9	51,9	7,2	16,3	17,9	..
Sweden	6 466	8 343	9 119	7 429	6 128	8 692	9 959	8 796	6 323	7 533	8 298	7 307	2,66	2,47	2,74	2,55	74,4	72,7	74,1	70,4	7,8	4,7	..	5,9
United Kingdom	18 884	22 842	19 962	18 145	18 095	24 237	24 857	24 333	18 095	20 396	20 144	19 518	1,18	1,11	1,10	1,12	65,0	62,5	62,0	60,4	8,8	6,8	6,6	7,9
EU27	**111 350**	**145 912**	**151 592**	**146 937**	**117 202**	**170 421**	**184 091**	**180 913**	**117 202**	**139 283**	**145 035**	**139 904**	**1,11**	**1,12**	**1,15**	**1,16**	**63,7**	**63,0**	**62,6**	**60,7**	**8,0**	**7,0**	**7,3**	**..**
Australia	..	..	..	..	3 799	10 448	11 398	..	3 799	8 676	9 353	..	0,70	1,26	1,35	..	47,8	..	60,8	..	3,8	2,9	2,2	..
Canada	..	..	..	..	10 064	13 744	12 793	12 697	10 064	11 333	10 335	10 164	1,15	1,09	0,99	1,00	60,3	55,6	52,8	51,7	2,3	2,0	2,4	2,4
Israel	..	..	..	..	4 850	7 409	7 654	7 036	4 850	7 101	7 214	6 571	3,28	3,88	3,78	3,42	76,8	81,5	80,9	79,9	9,6	4,3	4,2	..
Japan	109 181	85 770	89 436	..	70 178	115 097	116 688	104 482	70 178	97 170	96 625	85 726	2,16	2,68	2,70	2,53	71,0	77,9	78,5	75,8	1,7	1,1	0,9	1,2
Korea	9 827	18 747	16 188	..	13 742	31 063	33 091	..	13 742	27 247	28 845	..	1,70	2,45	2,53	..	74,0	76,2	75,4	..	7,0	6,2	5,9	..
Norway	1 368	2 488	2 703	2 582	1 219	2 203	2 475	2 442	1 294	1 765	1 895	1 835	0,92	0,85	0,86	0,91	56,0	52,5	53,2	51,6	9,7	7,6	8,9	9,6
Switzerland	5 065	..	7 547	..	4 261	..	7 726	..	4 261	..	5 860	..	1,87	..	2,20	..	73,9	..	73,5	..	2,3	..	1,7	..
Turkey	465	1 404	1 596	1 498	944	2 911	3 411	3 473	944	2 455	2 659	2 680	0,16	0,30	0,32	0,34	33,4	41,3	44,2	40,0	4,3	9,7	9,5	15,2
United States	216 502	196 474	196 563	..	199 961	269 267	289 105	..	199 961	224 550	235 954	..	2,02	1,92	2,02	..	74,6	72,2	72,6	..	8,6	9,9	8,9	..
OECD	**..**	**..**	**..**	**..**	**427 349**	**632 351**	**671 598**	**..**	**427 349**	**527 437**	**546 244**	**..**	**1,53**	**1,58**	**1,62**	**..**	**69,5**	**69,5**	**69,6**	**..**	**7,0**	**6,8**	**6,5**	**..**
China	..	25 744	33 077	..	16 299	74 025	88 480	112 875	16 299	62 243	72 829	92 079	0,54	1,01	1,08	1,25	60,0	72,3	73,3	73,2	6,8	4,8	4,3	4,3
Russian Federatio	2 087	6 807	7 446	6 866	7 429	17 119	18 911	20 814	7 429	11 317	10 875	11 860	0,74	0,72	0,65	0,78	70,8	64,2	62,9	62,4	45,5	55,3	56,0	57,4

Exceptions to the reference year 2000: 1998 (Austria), 1999 (Denmark, Norway and Sweden)

Source: OECD MSTI 2011/1, Eurostat, September 2011 (online database) and CZSO own calculations

Tab. A. 16 Government budget appropriations or outlays for R&D(GBAORD): ***Main indicators***

	million current EUR				million current PPP US$				million 2000 constant PPP $				*GBAORD as % of GDP*				*GBAORD as % of total government expend.*				*GBAORD per capita (current PPP $)*			
	2000	2007	2008	2009	2000	2007	2008	2009	2000	2007	2008	2009	*2000*	*2007*	*2008*	*2009*	*2000*	*2007*	*2008*	*2009*	*2000*	*2007*	*2008*	*2009*
Austria	..	1 770	1 987	2 150	1 430	2 042	2 331	2 544	..	1 742	1 917	2 053	0,62	0,65	0,70	0,78	1,19	1,34	1,44	1,50	178	246	280	304
Belgium	..	2 025	2 344	2 289	1 597	2 285	2 684	2 644	..	1 941	2 222	2 160	0,56	0,60	0,68	0,68	1,15	1,25	1,35	1,24	156	215	251	245
Bulgaria	..	80	109	118	228	246	327	355	..	195	248	257	0,33	0,26	0,31	0,34	1,09	0,65	0,82	0,84	29	32	43	47
Cyprus	..	67	72	84	53	94	103	123	..	72	75	88	0,31	0,42	0,42	0,50	1,08	1,02	1,01	1,09	73	120	131	154
Czech Republic	**..**	**737**	**821**	**870**	**853**	**1 469**	**1 497**	**1 702**	**..**	**1 217**	**1 204**	**1 298**	**0,50**	**0,58**	**0,56**	**0,63**	**1,32**	**1,36**	**1,29**	**1,38**	**84**	**142**	**144**	**162**
Denmark	..	1 801	1 991	2 200	1 171	1 630	1 849	2 058	..	1 359	1 446	1 596	0,76	0,79	0,85	0,99	1,42	1,56	1,64	1,69	219	299	337	373
Estonia	..	78	104	96	45	140	189	185	..	115	145	134	0,33	0,49	0,65	0,70	0,92	1,42	1,62	1,54	33	104	141	138
Finland	..	1 740	1 814	1 928	1 302	1 851	1 973	2 119	..	1 612	1 644	1 740	0,98	0,97	0,98	1,13	2,03	2,05	1,99	2,00	252	350	371	397
France	..	14 108	14 351	14 928	14 738	15 811	16 172	17 011	..	12 907	12 935	13 276	0,96	0,74	0,74	0,78	1,86	1,42	1,39	1,40	243	248	252	264
Germany	..	18 701	19 692	20 833	16 806	22 531	24 225	25 858	..	17 951	18 599	19 516	0,79	0,77	0,79	0,87	1,75	1,77	1,81	1,83	204	274	295	316
Greece	..	673	..	..	620	919	985	..	..	806	..	..	0,31	0,29	0,29	..	0,66	0,63	0,59	..	57	82	88	..
Hungary	..	391	453	427	..	748	886	933	..	235	253	251	..	0,39	0,43	0,46	..	0,78	0,87	0,91	..	74	88	93
Ireland	..	934	946	929	331	975	996	1 029	..	776	810	819	0,30	0,49	0,53	0,58	0,97	1,34	1,23	1,19	87	223	224	230
Italy	..	9 939	9 942	9 778	9 369	12 174	12 623	12 557	..	10 094	9 805	9 441	0,64	0,64	0,63	0,64	1,39	1,34	1,30	1,24	165	205	211	209
Latvia	..	63	67	38	49	117	118	73	..	105	97	55	0,18	0,30	0,29	0,20	0,69	0,84	0,75	0,45	21	51	52	32
Lithuania	..	96	85	70	165	202	170	..	..	171	139	118	0,37	0,33	0,26	..	1,40	0,95	0,70	..	48	60	50	..
Luxembourg	..	138	177	195	30	149	195	217	..	116	143	156	0,13	0,37	0,45	0,51	0,34	1,02	1,21	1,22	9	44	58	65
Malta	..	8	9	10	..	..	..	..	..	32	36	37	..	..	..	..	..	..	..	..	..	..	..	..
Netherlands	..	3 943	4 146	5 070	3 614	4 602	4 903	5 339	..	3 706	3 831	4 680	0,77	0,69	0,70	0,79	1,75	1,52	1,51	1,54	227	281	298	323
Poland	..	980	1 099	1 052	1 539	2 013	2 084	2 446	..	1 708	1 683	1 939	0,38	0,32	0,30	0,34	..	0,75	0,70	0,76	40	53	55	64
Portugal	..	1 272	1 483	1 552	1 019	1 929	2 285	2 452	..	1 472	1 687	1 760	0,56	0,75	0,86	0,92	1,37	1,72	1,98	1,92	100	182	215	231
Romania	..	462	557	360	178	1 021	1 291	954	..	717	832	599	0,14	0,37	0,40	0,31	..	..	..	..	8	48	60	45
Slovakia	..	116	179	190	213	239	348	374	..	190	268	273	0,36	0,21	0,28	0,30	0,69	0,62	0,79	0,73	39	44	64	69
Slovenia	..	180	190	277	174	287	301	440	..	245	249	350	0,50	0,52	0,51	0,78	1,07	1,23	1,15	1,60	87	142	149	216
Spain	..	7 987	8 414	8 700	5 174	10 972	11 696	12 229	..	8 254	8 434	8 753	0,60	0,76	0,77	0,83	1,54	1,94	1,87	1,80	128	245	257	266
Sweden	..	2 671	2 662	2 662	1 731	2 782	2 907	3 162	..	2 410	2 426	2 641	0,70	0,79	0,80	0,91	1,27	1,55	1,55	1,66	195	304	315	340
United Kingdom	..	13 431	11 770	11 050	10 358	14 251	14 656	15 146	..	11 915	11 908	12 373	0,67	0,65	0,65	0,70	1,73	1,49	1,37	1,35	176	234	239	245
EU27	**..**	**84 390**	**86 166**	**88 551**	**72 875**	**94 904**	**100 481**	**..**	**..**	**84 860**	**86 905**	**90 614**	**0,76**	**0,70**	**0,71**	**..**	**1,69**	**1,54**	**1,52**	**..**	**193**	**241**	**254**	**..**
Australia	..	..	..	..	2 851	3 820	3 901	4 694	..	..	..	..	0,53	0,46	0,46	0,54	..	..	..	..	148	180	180	212
Canada	..	..	..	..	4 574	7 551	7 933	..	..	0	0	0	0,52	0,60	0,61	..	1,27	..	..	..	149	229	238	..
Israel	..	..	..	..	1 294	1 140	1 261	1 277	..	..	..	..	0,88	0,60	0,62	0,62	1,81	1,33	1,41	1,40	206	159	173	172
Japan	..	21 775	23 423	27 343	21 223	29 221	30 560	31 073	..	24 629	25 415	25 446	0,65	0,68	0,71	0,75	1,69	1,88	1,89	1,78	167	229	240	244
Korea	..	6 394	5 819	5 996	5 025	10 595	11 895	13 210	..	9 239	10 363	..	0,62	0,83	0,91	1,00	2,77	2,91	2,99	3,02	107	219	245	271
Norway	..	2 168	2 250	2 313	1 057	1 981	2 125	2 282	..	1 577	1 638	1 719	0,65	0,76	0,74	0,85	1,54	1,86	1,81	1,83	235	421	446	473
Switzerland	..	..	2 621	..	1 458	..	2 683	..	..	..	2 023	..	0,64	..	0,76	..	..	..	2,37	..	202	..	348	..
Turkey	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
United States	..	103 532	98 172	118 523	83 613	141 890	144 391	165 317	..	117 876	116 685	..	0,84	1,01	1,01	1,18	2,49	2,76	2,59	2,79	296	470	474	538
OECD	**..**	**..**	**..**	**..**	**198 554**	**299 111**	**311 329**	**..**	**..**	**..**	**..**	**..**	**0,71**	**0,75**	**0,75**	**..**	**..**	**..**	**..**	**..**	**175**	**247**	**256**	**..**
China	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Russian Federatio	..	3 790	4 223	4 792	4 681	9 529	11 304	15 045	..	6 314	6 146	8 263	0,47	0,40	0,39	0,56	..	1,13	1,14	..	32	67	80	106

Exceptions to the reference year 2000: 2002 (the Czech Republic), 2004 (Bulgaria, Cyprus, Latvia and Lithuania)

Source: OECD MSTI 2011/1, Eurostat, September 2011 (online database) and CZSO own calculations

Tab. B.1 R&D personnel in the Czech Republic

	2005	2006	2007	2008	2009	2010
Headcount (HC)	65 379	69 162	73 081	74 508	75 788	77 903
Full-time equivalent (FTE)	**43 370**	**47 729**	**49 192**	**50 808**	**50 961**	**52 290**
By sex (FTE):						
Males	29 235	32 673	33 542	35 101	35 138	36 352
Females	14 135	15 056	15 650	15 707	15 822	15 939
By occupation (FTE):						
Researchers	24 169	26 267	27 878	29 785	28 759	29 228
Technicians	13 773	15 840	15 430	15 133	16 005	15 971
Other R&D personnel	5 429	5 622	5 883	5 890	6 197	7 092
By sector of performance (FTE):						
Business enterprise sector	21 782	23 713	25 217	26 069	25 884	26 998
public enterprises	1 788	1 488	1 550	2 295	2 079	2 115
private national enterprises	12 502	12 993	13 117	10 993	11 140	13 364
foreign affiliates	7 492	9 232	10 550	12 781	12 665	11 519
Government sector	10 584	11 086	11 341	11 386	11 180	10 926
w orkplaces of Academy of Science	6 893	7 188	7 395	7 496	7 396	7 261
other research (department) w orkplaces	2 354	2 411	2 355	2 328	2 308	2 415
other government and public organisations	1 337	1 487	1 591	1 562	1 477	1 250
Higher education sector	10 776	12 776	12 465	13 147	13 648	14 056
public and state universities	10 295	12 411	11 946	12 654	12 960	13 446
university hospitals	431	281	357	335	499	430
private universities	49	84	162	158	189	180
Private non-profit sector	229	154	168	206	249	310
By qualification (FTE):						
R&D personnel w ith tertiary education	29 169	32 980	34 043	36 012	36 260	37 128
PhD holders (ISCED 6)	9 708	10 692	11 187	11 999	12 290	12 442
University degrees holders (ISCED 5A)	18 525	21 229	21 746	22 892	22 856	23 533
Others (ISCED 5B)	936	1 059	1 110	1 121	1 114	1 153
R&D personnel w ith secondary or low er educatic	14 201	14 746	15 148	14 797	14 701	15 162
By major field of science (FTE):						
Natural sciences	11 163	12 102	11 448	12 004	11 925	12 754
Engineering	20 570	23 092	25 113	26 271	26 300	26 379
Medical sciences	3 800	4 008	4 126	4 072	4 293	4 456
Agricultural sciences	2 505	2 631	2 849	2 758	2 765	2 848
Social sciences	2 787	3 219	3 023	2 904	2 604	2 558
Humanities	2 546	2 678	2 632	2 800	3 074	3 295
By region (FTE):						
Praha	17 584	19 889	21 176	20 943	19 747	19 963
Středočeský	4 513	4 924	5 056	5 176	5 230	5 325
Jihočeský	1 644	1 815	1 813	1 898	2 050	2 121
Plzeňský	1 432	1 799	1 953	1 793	1 951	1 933
Karlovarský	70	94	70	136	107	94
Ústecký	697	793	842	798	736	769
Liberecký	1 295	1 857	1 432	1 423	1 270	1 338
Královéhradecký	1 365	1 198	1 453	1 447	1 750	1 807
Pardubický	1 936	2 145	2 193	2 218	2 092	2 160
Vysočina	699	605	605	683	648	692
Jihomoravský	6 036	6 200	6 205	7 501	8 387	8 732
Olomoucký	2 058	2 049	2 011	2 025	1 996	2 110
Zlínský	1 665	1 775	1 625	1 837	1 807	1 785
Moravskoslezský	2 376	2 585	2 759	2 931	3 191	3 459

Source: the CZSO, Annual statistical R&D surveys (VTR 5-01)

Tab. B.2 R&D personnel in the Czech Republic working in the Business enterprise sector

	2005	2006	2007	2008	2009	2010
Headcount (HC)	27 278	29 740	31 847	32 745	33 480	35 629
Full-time equivalent (FTE)	**21 782**	**23 713**	**25 217**	**26 069**	**25 884**	**26 998**
By sex (FTE):						
Males	16 927	18 738	19 775	20 733	20 617	21 722
Females	4 855	4 975	5 442	5 336	5 266	5 276
By occupation (FTE):						
Researchers	10 143	11 053	12 230	13 253	12 657	12 661
Technicians	8 717	9 671	9 807	9 541	9 838	10 299
Other R&D personnel	2 922	2 989	3 180	3 275	3 388	4 038
by size of R&D workplaces defined by their annual expenditure (mil. CZK) on R&D (FTE):						
less than 1	508	552	457	473	503	514
1-9,10	4 688	4 970	5 116	4 979	5 607	6 025
10-49,10	6 790	7 237	7 230	7 998	8 377	8 645
50-99,10	2 905	2 995	3 247	3 185	3 501	3 279
100 and more	6 890	7 960	9 166	9 434	7 895	8 536
by Sub-sectors (type/ownerships of R&D firms):						
public enterprises	1 788	1 488	1 550	2 295	2 079	2 115
private national enterprises	12 502	12 993	13 117	10 993	11 140	13 364
foreign affiliates	7 492	9 232	10 550	12 781	12 665	11 519
By qualification (FTE):						
R&D personnel with tertiary education	12 816	14 407	15 431	16 266	16 177	16 871
PhD holders (ISCED 6)	1 462	1 404	1 595	1 596	1 715	1 790
University degrees holders (ISCED 5A)	10 814	12 361	13 122	13 887	13 699	14 284
Others (ISCED 5B)	540	642	714	782	764	797
R&D personnel with secondary or lower educatic	8 966	9 306	9 786	9 804	9 706	10 127
By major field of science (FTE):						
Natural sciences	4 082	3 913	3 811	3 394	3 451	4 271
Engineering	15 487	17 429	19 038	20 322	20 073	20 190
Medical sciences	1 055	1 231	1 141	1 127	1 118	1 344
Agricultural sciences	728	898	918	964	927	892
Social sciences	206	193	235	167	228	220
Humanities	224	49	75	95	87	82
By region (FTE):						
Praha	5 845	7 010	7 627	7 475	6 050	6 304
Středočeský	3 434	3 780	3 879	3 972	4 107	4 260
Jihočeský	693	796	808	847	899	970
Plzeňský	717	689	777	771	1 047	1 138
Karlovarský	63	86	67	133	102	91
Ústecký	544	562	622	563	498	548
Liberecký	856	1 021	890	1 008	953	989
Královéhradecký	809	860	1 130	1 130	1 397	1 454
Pardubický	1 704	1 851	1 899	1 927	1 783	1 886
Vysočina	675	583	582	668	630	672
Jihomoravský	2 694	2 611	2 701	3 080	3 848	4 068
Olomoucký	1 129	1 127	1 163	1 152	1 144	1 090
Zlínský	1 248	1 294	1 508	1 642	1 607	1 586
Moravskoslezský	1 370	1 443	1 564	1 701	1 819	1 944

Source: the CZSO, Annual statistical R&D surveys (VTR 5-01)

Tab. B.3 R&D personnel in the business enterprise sector by size and industry

Full-time equivalent (FTE)

	2005	2006	2007	2008	2009	2010
Total	**21 782**	**23 713**	**25 217**	**26 069**	**25 884**	**26 998**
By size class of enterprises (number of employees)						
0-9	604	591	636	471	764	757
10-49	2 581	2 937	3 082	3 319	3 664	3 764
50-249	7 008	7 402	7 914	8 827	9 189	9 745
250 +	11 589	12 784	13 585	13 452	12 266	12 732
By prevailing economic activity (CZ-NACE):						
Agriculture, forestry and fishing (section A)	123	156	143	157	152	151
Mining and quarrying (section B)	42	29	17	25	22	23
Manufacturing (section C), total	11 892	13 492	13 970	14 517	14 110	14 861
Manufacture of food products and beverages (10-12)	145	198	220	290	259	215
Manufacture of textiles, w earing apparel (13-15)	361	381	360	282	285	264
Manufacture of w ood (including furniture) and paper (16-18, 31)	85	72	53	42	67	94
Manufacture of coke and petroleum products; chemicals (19-20)	733	805	795	710	835	798
Manufacture of basic pharmaceutical products (21)	399	427	499	532	560	563
Manufacture of rubber and plastic products (22)	491	497	490	594	594	606
Manufacture of other non-metallic mineral products (23)	371	414	395	317	304	350
Manufacture of basic metals and fabricated metal products (24-25)	860	800	806	769	810	1 018
Manufacture of computer, electronic and optical products (26)	1 162	1 691	1 741	1 712	1 536	1 427
Manufacture of computers and electronic components (261-262)	140	172	227	318	260	215
Manufacture of electronics and optical instruments (263-264, 267-268)	697	1 084	1 076	1 012	788	633
Manufacture of instruments and appliances for testing (265-266)	325	436	438	382	487	578
Manufacture of electrical equipment (27)	905	982	1 003	1 069	1 168	1 338
Manufacture of machinery and equipment i.e.. (28)	1 884	2 047	1 976	2 356	2 156	2 526
Manufacture of motor vehicles, trailers and semi-trailers (29)	2 794	3 083	3 360	3 722	3 253	3 075
Manufacture of other transport equipment (30)	711	613	594	619	577	658
Manufacture of railw ay locomotives and rolling stock (302)	224	145	229	309	260	298
Manufacture of air and spacecraft and related machinery (303)	447	437	321	271	266	309
Manufacture of other transport means and equipment (301, 303, 304, 3	40	31	43	39	50	51
Other manufacturing (32)	197	271	291	327	336	392
Repair and installation of machinery and equipment (33)	794	1 209	1 386	1 176	1 372	1 538
Electricity, gas, steam and air conditioning supply (section D)	11	10	12	19	11	14
Water supply; w aste management and remediation activities (section E)	73	63	54	53	106	99
Construction (section F)	383	359	365	364	373	332
Wholesale and retail trade; repair of vehicles (section G)	289	367	483	596	560	679
Information and communication (section J),total	2 847	2 834	2 971	3 452	3 466	3 633
Audiovisual, publishing and information activities (58.1, 60, 63)	81	105	83	111	112	4
Telecommunications (61)	7	121	120	145	173	172
IT activities (58.2, 62,63.1)	2 759	2 608	2 768	3 196	3 181	3 458
Financial and insurance activities (section K)	108	292	799	489	203	157
Professional, scientific and technical activities (section M),total	5 188	5 413	5 690	5 771	6 291	6 486
Architectural and engineering activities; technical testing and analysis (71	1 019	1 101	1 157	1 266	1 514	1 616
Scientific research and development (72)	4 041	4 161	4 287	4 292	4 471	4 562
Other professional, scientific and technical activities (69, 70, 73-75)	129	151	246	213	306	308
Human health and social w ork activities (section Q)	490	543	540	439	423	393
Arts, entertainment and recreation (section R)	205	42	70	80	78	76
Other activities (section H, I, L, N, O, P, S and T)	130	114	103	106	90	95

Source: the CZSO, Annual statistical R&D surveys (VTR 5-01)

Tab. B.4 R&D personnel in the Czech Republic working in the Government sector

	2005	2006	2007	2008	2009	2010
Headcount (HC)	13 880	14 560	14 836	15 091	14 776	14 058
Full-time equivalent (FTE)	**10 584**	**11 086**	**11 341**	**11 386**	**11 180**	**10 926**
By sex (FTE):						
Males	5 718	6 003	5 985	6 088	5 984	5 909
Females	4 866	5 083	5 356	5 298	5 197	5 018
By occupation (FTE):						
Researchers	6 323	6 800	6 915	7 084	6 270	6 244
Technicians	2 488	2 552	2 624	2 522	3 006	2 666
Other R&D personnel	1 773	1 734	1 802	1 780	1 905	2 016
by type of R&D workplace (FTE):						
Research workplaces (CZ-NACE 72)	9 247	9 599	9 750	9 823	9 704	9 677
workplaces of Academy of Science CR	6 893	7 188	7 395	7 496	7 396	7 261
other research (department) workplaces	2 354	2 411	2 355	2 328	2 308	2 415
Other workplaces of government sector	1 337	1 487	1 591	1 562	1 477	1 250
Archives, libraries, museums and other cultura	479	705	905	870	832	708
other	858	781	686	692	645	542
By qualification (FTE):						
R&D personnel with tertiary education	7 064	7 496	7 807	8 111	7 979	7 754
PhD holders (ISCED 6)	3 126	3 274	3 485	3 668	3 590	3 456
University degrees holders (ISCED 5A)	3 757	4 091	4 175	4 294	4 238	4 148
Others (ISCED 5B)	181	131	146	149	152	150
R&D personnel with secondary or lower educatic	3 520	3 590	3 535	3 275	3 201	3 172
By major field of science (FTE):						
Natural sciences	5 478	5 616	5 955	6 192	6 201	6 003
Engineering	1 320	1 327	1 291	1 269	1 227	1 059
Medical sciences	712	733	694	734	735	680
Agricultural sciences	951	964	952	853	757	899
Social sciences	762	884	852	771	726	839
Humanities	1 360	1 561	1 598	1 566	1 534	1 446
By region (FTE):						
Praha	7 113	7 582	7 830	7 759	7 666	7 656
Středočeský	1 077	1 135	1 128	1 141	1 112	1 049
Jihočeský	514	566	603	587	596	585
Plzeňský	53	59	78	93	95	95
Karlovarský	7	8	2	2	2	3
Ústecký	13	26	26	56	54	28
Liberecký	9	24	10	30	29	30
Královéhradecký	349	107	60	68	111	52
Pardubický		53	56	54	60	18
Vysočina	24	22	24	14	17	17
Jihomoravský	1 272	1 339	1 358	1 416	1 297	1 215
Olomoucký	5	14	17	17	16	20
Zlínský	2	3	6	6	7	6
Moravskoslezský	145	146	145	145	118	153

Source: the CZSO, Annual statistical R&D surveys (VTR 5-01)

Tab. B.6 R&D personnel in the Czech Republic working in the Higher Education sector

	2005	2006	2007	2008	2009	2010
Headcount (HC)	23 998	24 634	26 162	26 376	27 215	27 844
Full-time equivalent (FTE)	**10 776**	**12 776**	**12 465**	**13 147**	**13 648**	**14 056**
By sex (FTE):						
Males	6 495	7 841	7 686	8 162	8 395	8 557
Females	4 281	4 935	4 779	4 985	5 253	5 499
By occupation (FTE):						
Researchers	7 575	8 352	8 664	9 358	9 664	10 115
Technicians	2 477	3 535	2 962	2 971	3 105	2 947
Other R&D personnel	723	888	840	818	878	994
by type of R&D workplace (FTE):						
Public and state universities	10 295	12 411	11 946	12 654	12 960	13 446
University hospitals	431	281	357	335	499	430
Private universities	49	84	162	158	189	180
By qualification (FTE):						
R&D personnel with tertiary education	9 096	10 943	10 660	11 462	11 895	12 248
PhD holders (ISCED 6)	5 088	5 970	6 081	6 700	6 944	7 145
University degrees holders (ISCED 5A)	3 802	4 693	4 334	4 582	4 764	4 911
Others (ISCED 5B)	206	280	245	180	187	192
R&D personnel with secondary or lower educatic	1 680	1 833	1 806	1 685	1 753	1 807
By major field of science (FTE):						
Natural sciences	1 564	2 548	1 669	2 398	2 221	2 406
Engineering	3 747	4 269	4 757	4 644	4 970	5 091
Medical sciences	2 031	2 041	2 287	2 201	2 435	2 407
Agricultural sciences	824	760	969	930	1 069	1 045
Social sciences	1 730	2 093	1 827	1 862	1 517	1 364
Humanities	880	1 064	957	1 112	1 436	1 743
By region (FTE):						
Praha	4 453	5 189	5 588	5 560	5 874	5 832
Středočeský		3	47	62	9	17
Jihočeský	422	429	397	457	510	515
Plzeňský	641	1 051	1 096	926	810	701
Karlovarský			1	1	2	0
Ústecký	140	204	191	179	183	193
Liberecký	429	811	531	383	280	317
Královéhradecký	206	231	262	250	242	276
Pardubický	229	240	238	237	249	256
Vysočina					1	3
Jihomoravský	2 065	2 247	2 141	2 978	3 222	3 412
Olomoucký	920	900	817	843	820	981
Zlínský	415	478	109	187	193	193
Moravskoslezský	856	992	1 048	1 084	1 254	1 361

Source: the CZSO, Annual statistical R&D surveys (VTR 5-01)

Tab. B.6 R&D personnel: *Main indicators*

Full-time Equivalent on R&D activities (FTE)

	Total				per thousand total employment		by main sectors of their employment (performance):					
							Business Enterprise sector		Government sector		Higher Education sector	
	2000	2007	2008	2009	2000	2009	2000	2009	2000	2009	2000	2009
Austria	38 893	53 252	58 077	58 002	8,5	**14,2**	20 385	40 288	2 104	2 710	8 670	14 827
Belgium	53 391	57 963	60 129	60 005	13,0	13,5	33 493	33 629	3 493	4 328	15 884	21 453
Bulgaria	15 259	16 940	17 219	18 230	5,5	5,6	2 137	3 335	10 662	9 467	2 414	5 367
Cyprus	680	1 244	1 201	1 205	2,3	3,2	144	320	348	280	137	485
Czech Republic	**24 198**	**49 192**	**50 808**	**50 961**	**4,9**	**9,7**	**11 527**	**25 884**	**7 148**	**11 180**	**5 331**	**13 648**
Denmark	37 693	46 897	58 589	57 507	13,7	20,1	23 725	38 153	5 658	1 805	8 015	17 241
Estonia	3 710	5 002	5 086	5 430	6,5	9,1	417	1 924	948	718	2 305	2 688
Finland	52 604	56 243	56 698	56 069	22,9	22,8	29 384	32 237	7 314	6 787	15 459	16 490
France	327 466	379 006	384 513	..	13,5	14,9	177 688	221 877	53 388	52 055	90 051	104 961
Germany	484 734	506 450	522 688	529 526	12,4	13,1	312 490	329 593	71 454	86 633	100 790	113 300
Greece	30 226	35 629	..	..	6,2	7,4	9 764	11 562	4 431	4 584	17 294	19 172
Hungary	23 534	25 954	27 403	29 795	5,5	7,5	6 471	13 189	8 204	8 234	8 859	8 372
Ireland	12 762	18 212	20 363	20 786	7,5	10,9	8 724	11 959	1 436	1 203	2 602	7 624
Italy	150 066	208 376	239 016	239 246	6,5	9,6	63 998	104 241	31 231	37 036	54 837	90 092
Malta	475	866	948	895	3,2	5,5	75	534	135	73	265	288
Latvia	5 449	6 378	6 533	5 485	5,8	5,6	1 366	1 028	1 192	1 211	2 890	3 246
Lithuania	11 791	12 656	12 632	12 094	8,4	8,5	569	1 527	4 974	2 939	6 248	7 628
Luxembourg	3 663	4 605	4 652	4 689	13,9	13,3	3 337	3 318	303	948	23	423
Netherlands	91 313	93 788	93 432	87 874	11,3	10,2	47 509	42 336	12 627	11 416	30 078	34 122
Poland	78 925	75 309	74 596	73 581	5,4	4,7	18 586	13 693	18 823	18 429	41 499	41 440
Portugal	21 888	35 334	47 882	52 313	4,4	10,4	3 567	14 698	5 936	4 185	9 680	29 291
Romania	33 892	28 977	30 390	28 398	3,1	3,1	22 541	10 758	7 571	8 708	3 780	8 824
Slovakia	15 221	15 421	15 576	15 952	7,5	7,3	5 172	2 625	4 189	3 957	5 860	9 360
Slovenia	8 568	10 369	11 594	12 410	9,5	12,8	4 110	6 785	2 565	3 252	1 746	2 354
Spain	120 618	201 108	215 676	220 777	7,3	11,5	47 055	93 699	22 400	45 353	49 470	81 203
Sweden	72 190	74 437	77 549	75 847	15,9	16,9	44 171	54 285	3 195	2 605	19 175	18 857
United Kingdom	288 599	343 855	342 086	347 486	9,7	11,2	145 499	151 494	29 686	18 797	..	168 936
EU27	**2 000 349**	**2 363 362**	**2 472 130**	**2 495 687**	**9,4**	**11,1**	**1 049 343**	**1 268 255**	**317 630**	**345 638**	**610 046**	**847 543**
Australia	95 621	..	136 696	..	10,6	12,5	28 391	53 556	18 151	17 042	46 287	61 310
Canada	168 118	245 183	242 686	..	11,2	14,0	104 708	158 926	17 410	19 420	45 150	62 340
Israel	..	..	..	..	..	..	41 144	52 800	..	..	9 405	9 152
Japan	896 847	912 202	882 739	878 418	13,7	13,9	581 721	616 965	59 254	63 045	227 882	184 951
Korea	138 077	269 409	294 440	..	6,5	12,5	87 113	208 428	13 182	21 768	36 209	60 372
Norway	27 068	33 635	35 485	36 091	11,0	13,8	13 308	18 166	4 779	6 270	7 313	11 655
Switzerland	52 285	..	62 066	..	12,8	13,8	36 190	39 832	895	809	15 200	21 425
Turkey	27 003	63 377	67 244	73 521	1,4	3,5	6 032	31 476	4 069	11 007	..	31 037
United States	..	..	..	..	..	..	..	..	..	..	..	..
OECD	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**
China	922 131	1 736 155	1 965 357	2 291 252	1,3	2,9	480 791	1 647 454	282 094	368 607	159 246	275 191
Russian Federation	1 007 257	912 291	869 772	845 942	15,5	12,2	628 858	454 972	276 373	282 207	99 552	106 443

Exceptions to the reference year 2000: 1999 (Israel); 2001 (Greece, Norway and Sweden); 2002 (Austria and Malta)

Source: OECD MSTI 2011/1, Eurostat, September 2011 (online database) and CZSO own calculations

Tab. B.7 Researchers: *Main indicators*

Full-time Equivalent on R&D activities (FTE)

	Total				per thousand total employment		by main sectors of their employment (performance):					
							Business Enterprise sector		Government sector		Higher Education sector	
	2000	2007	2008	2009	2000	2009	2000	2009	2000	2009	2000	2009
Austria	24 124	31 676	34 546	34 501	5,1	**8,5**	11 716	21 847	954	1 513	5 955	11 014
Belgium	30 540	36 318	37 287	37 214	7,4	8,4	16 684	17 431	1 809	2 848	11 778	16 637
Bulgaria	9 479	11 203	11 384	11 968	3,4	3,7	1 139	1 718	6 417	5 805	1 886	4 390
Cyprus	303	799	806	820	1,0	2,2	77	210	81	105	128	445
Czech Republic	**13 852**	**27 878**	**29 785**	**28 759**	**2,8**	**5,5**	**5 533**	**12 657**	**4 424**	**6 270**	**3 768**	**9 664**
Denmark	19 453	30 174	35 702	35 306	6,9	12,3	9 081	21 754	3 569	1 302	5 866	12 031
Estonia	2 666	3 690	3 979	4 314	4,7	7,2	274	1 313	559	513	1 806	2 397
Finland	34 847	39 000	40 879	40 849	15,2	16,6	19 035	23 633	4 487	4 505	10 999	12 304
France	172 070	221 851	229 130	..	7,1	8,9	81 012	129 824	26 132	27 372	61 583	68 897
Germany	257 874	290 853	302 467	311 519	6,6	7,7	153 120	179 778	37 667	49 241	67 087	82 500
Greece	14 371	20 817	..	..	..	4,4	3 234	6 286	2 000	2 201	10 471	12 382
Hungary	14 406	17 391	18 504	20 064	3,4	5,0	3 901	8 972	4 653	4 928	5 852	6 164
Ireland	8 516	12 669	14 546	14 765	5,0	7,7	5 631	7 732	737	550	2 148	6 483
Italy	66 110	93 000	96 677	101 821	2,9	4,1	26 099	38 358	14 315	16 547	25 696	43 067
Malta	272	496	546	485	1,8	3,0	47	240	22	38	203	207
Latvia	3 814	4 223	4 370	3 621	4,0	3,7	995	317	662	708	2 156	2 596
Lithuania	7 777	8 489	8 458	8 490	5,5	6,0	288	1 107	2 557	1 733	4 932	5 650
Luxembourg	1 646	2 201	2 288	2 401	6,2	6,8	1 399	1 371	225	659	22	371
Netherlands	42 194	51 057	50 727	46 958	5,2	5,4	20 022	20 477	5 952	6 820	15 586	19 661
Poland	55 174	61 395	61 831	61 105	3,8	3,9	9 821	9 818	11 100	13 193	34 246	38 080
Portugal	16 738	28 176	40 408	45 909	3,3	9,1	2 358	10 841	3 546	3 364	8 592	28 086
Romania	20 476	18 808	19 394	19 271	1,9	2,1	12 690	6 127	5 244	5 744	2 542	7 310
Slovakia	9 955	12 354	12 587	13 290	4,9	6,1	2 420	1 646	2 526	2 763	5 009	8 873
Slovenia	4 336	6 250	7 032	7 446	4,8	7,7	1 380	3 278	1 495	2 171	1 340	1 978
Spain	76 670	122 624	130 986	133 803	4,7	7,0	20 869	46 153	12 708	24 165	42 064	63 175
Sweden	45 995	45 610	48 220	46 892	9,5	10,5	22 822	29 101	2 423	1 483	14 623	16 308
United Kingdom	170 554	252 651	251 932	256 124	5,8	8,3	85 737	84 554	15 004	8 701	49 023	158 004
EU27	**1 117 809**	**1 451 847**	**1 516 298**	**1 544 660**	**5,2**	**6,9**	**522 000**	**688 392**	**169 291**	**193 271**	**412 625**	**642 487**
Australia	66 001	..	91 617	..	7,3	8,4	16 221	26 941	8 724	8 285	39 507	53 340
Canada	107 967	149 308	148 983	..	7,2	8,6	66 867	90 303	7 500	8 890	33 300	49 300
Israel	..	..	..	..	..	..	26 900	..	..	..	..	..
Japan	647 572	684 311	656 676	655 530	9,9	10,4	421 363	490 494	31 228	32 715	179 116	124 224
Korea	108 370	221 928	236 137	..	5,1	10,0	71 894	182 901	11 564	15 552	23 674	34 773
Norway	20 048	24 351	25 578	26 273	7,9	10,1	9 737	12 661	3 037	4 450	5 521	9 162
Switzerland	26 105	..	25 142	..	6,4	5,6	16 275	10 332	405	488	9 425	14 322
Turkey	23 083	49 668	52 811	57 759	1,2	2,7	3 702	21 019	2 479	5 703	16 902	31 037
United States	1 293 582	1 412 639	..	..	9,3	9,5	1 041 300	1 130 500	47 522	47 822	186 049	..
OECD	**3 438 525**	**4 199 512**	**..**	**..**	**6,7**	**7,6**	**2 196 368**	**2 675 791**	**275 935**	**303 350**	**878 788**	**1 171 274**
China	695 062	1 423 381	1 592 420	1 152 311	1,0	1,5	353 843	707 771	193 353	219 483	147 866	225 057
Russian Federation	506 420	469 076	451 213	442 263	7,8	6,4	289 868	216 400	142 191		72 264	77 955

Exceptions to the reference year 2000: 2001 (Denmark, Greece, Israel, Norway and Sweden); 2002 (Austria and Malta)

Source: OECD MSTI 2011/1, Eurostat, September 2011 (online database) and CZSO own calculations

Tab. C.1 Patent aplications to the European Patent Office (EPO)

	Total number			per million inhabitants			Biotechnology patent applications		ICT patent applications		Nanotechnology patent applications		Patent applications on renewable energy	
	2000	2007	2008	2000	2007	2008	2000	2008	2000	2008	2000	2008	2000	2008
Austria	922	1 417	1 297	115,1	170,7	155,5	55	70	120	211	4	13	4	24
Belgium	1 032	1 495	1 439	100,7	140,7	134,4	184	137	254	281	10	13	9	14
Bulgaria	9	12	10	1,1	1,6	1,3	..	..	2	1	..	..	..	..
Czech Republic	**46**	**112**	**132**	**4,5**	**10,8**	**12,7**	**3**	**6**	**1**	**16**	**..**	**2**	**..**	**2**
Cyprus	27	58	38	39,1	74,5	48,0	..	2	8	17	1	1	..	2
Denmark	841	1 129	1 258	157,5	206,8	229,0	157	193	177	214	11	5	14	90
Estonia	2	18	13	1,5	13,7	9,7	2	5	1	5	..	1	..	2
Finland	1 640	1 744	1 548	316,8	329,8	291,4	41	42	955	779	1	7	1	7
France	7 206	8 400	8 646	118,7	131,7	134,8	414	428	2 308	2 845	31	77	18	67
Germany	21 104	23 574	23 164	256,8	286,6	282,1	938	784	5 440	4 831	97	138	111	376
Greece	45	82	84	4,1	7,3	7,5	3	5	7	10	..	1	2	4
Hungary	82	102	108	8,0	10,1	10,8	17	6	5	15	..	4	..	3
Ireland	284	407	439	74,5	93,3	98,7	28	39	116	161	1	7	1	14
Italy	3 420	4 332	3 900	60,1	73,0	65,2	109	100	557	476	9	11	1	56
Latvia	1	19	20	0,4	8,1	9,0	..	1	..	5	..	..	..	..
Lithuania	..	11	11	..	3,2	3,1	..	2	..	4	..	1	..	..
Luxembourg	175	289	294	49,8	85,2	87,3	4	3	17	50	..	1	1	1
Malta	13	22	32	34,2	53,9	76,8	..	1	1	6	..	..	..	..
Netherlands	3 651	4 722	4 034	229,3	288,3	245,4	251	271	1 638	1 415	25	50	15	46
Poland	25	104	170	0,7	2,7	4,4	..	11	1	24	..	1	..	1
Portugal	34	84	76	3,3	7,9	7,1	8	11	4	9	1	..	1	..
Romania	5	8	7	0,2	0,4	0,3	..	..	..	2	..	..	..	2
Slovakia	13	24	23	2,3	4,5	4,2	1	..	1	4	..	..	..	1
Slovenia	35	100	112	17,7	49,6	55,4	1	4	7	14	..	2	..	1
Spain	607	1 186	1 133	15,1	26,4	24,8	36	87	84	194	..	6	10	71
Sweden	2 575	3 096	2 912	290,2	338,5	315,8	134	104	1 094	1 323	8	18	8	25
United Kingdom	4 582	4 514	4 312	77,8	74,0	70,2	517	291	1 495	1 340	40	33	23	54
EU27	**48 375**	**57 061**	**55 208**	**100,3**	**115,0**	**110,7**	**2 901**	**2 601**	**14 291**	**14 252**	**237**	**390**	**219**	**861**
Australia	928	864	808	48,2	40,7	37,4	132	123	390	214	6	7	6	19
Canada	1 626	1 854	1 725	53,0	56,3	51,8	256	151	677	890	6	12	3	14
Israel	643	1 020	1 031	102,3	142,1	141,1	87	115	302	322	6	11	3	15
Japan	19 320	21 159	20 885	152,2	165,6	163,8	752	735	9 351	8 714	181	211	130	211
Korea	1 130	5 116	4 253	24,0	105,6	87,5	81	100	604	2 490	24	55	1	41
Norway	369	391	413	82,1	83,1	86,6	27	22	93	99	3	1	3	18
Switzerland	3 573	5 020	4 735	495,6	658,9	614,0	208	333	807	900	20	18	24	47
Turkey	23	180	199	0,4	2,6	2,8	..	1	2	47	..	..	..	0
United States	32 375	32 848	30 305	114,6	108,8	99,4	4 128	2 289	14 129	10 391	305	310	72	378
OECD	**108 491**	**125 641**	**119 680**	**95,5**	**103,9**	**98,3**	**8 604**	**6 507**	**40 677**	**38 315**	**786**	**1 014**	**460**	**1 603**
China	220	1 663	1 820	0,2	1,3	1,4	17	70	66	1 014	1	3	2	8
Russian Federation	104	145	130	0,7	1,0	0,9	13	8	26	20	4	2	..	6

Source: OECD, Eurostat and CZSO own calculations

Tab. C.2 Patents granted by the Inited States Patent and Trademark Office (USPTO)

	Total number				per million inhabitants				Biotechnology patent applications		ICT patent applications		Nanotechnology patent applications	
	2000	2007	2008	2009	2000	2007	2008	2009	2000	2009	2000	2009	2000	2009
Austria	344	277	261	299	42,9	33,4	31,3	35,8	24	23	40	86	2	1
Belgium	520	409	369	473	50,7	38,5	34,4	43,8	46	83	118	143	1	7
Bulgaria	1	7	26	7	0,2	0,8	3,3	0,9	1	1	0	3	..	..
Czech Republic	**16**	**22**	**19**	**24**	**1,6**	**2,1**	**1,8**	**2,3**	**2**	**1**	**1**	**6**	**..**	**..**
Cyprus	5	9	7	14	7,2	11,6	8,9	17,6	..	..	1	4	..	..
Denmark	407	334	350	337	76,3	61,1	63,8	61,0	102	74	48	95	..	..
Estonia	3	7	2	1	2,2	5,2	1,5	0,7	..	1	..	..	..	..
Finland	697	1 080	970	1 029	134,6	204,3	182,6	192,7	20	28	334	752	1	3
France	3 589	2 839	2 833	2 949	59,1	44,5	44,2	45,7	206	173	972	1 406	25	26
Germany	9 633	8 525	8 416	8 462	117,2	103,6	102,5	103,4	301	354	2 137	3 418	26	66
Greece	12	8	15	14	1,1	0,8	1,3	1,2	1	2	2	3	..	..
Hungary	29	23	34	21	2,8	2,3	3,3	2,0	3	1	1	5	..	1
Ireland	124	130	146	166	32,6	29,9	32,7	37,0	5	14	27	89	1	2
Italy	1 462	1 059	1 104	1 088	25,7	17,8	18,5	18,1	41	52	328	307	..	7
Latvia	1	2	1	1	0,4	0,9	0,4	0,4	..	..	..	..	..	..
Lithuania	..	0	3	..	..	0,1	0,9	..	..	..	..	..	..	..
Luxembourg	64	39	44	56	18,2	11,4	12,9	16,7	2	4	5	16	..	..
Malta	4	2	..	6	10,5	4,9	..	14,5	..	..	..	..	..	..
Netherlands	925	1 945	1 964	2 134	58,1	118,8	119,4	129,1	137	111	244	1 388	0	84
Poland	8	17	34	22	0,2	0,5	0,9	0,6	..	1	2	11	..	..
Portugal	16	12	10	19	1,6	1,1	0,9	1,8	..	2	1	1	..	..
Romania	2	4	3	2	0,1	0,2	0,1	0,1	..	..	..	1	..	..
Slovakia	7	6	3	8	1,3	1,1	0,6	1,5	3	4	3	3	0	..
Slovenia	12	7	11	17	5,9	3,2	5,2	8,3	1	2	..	4	..	..
Spain	198	169	193	233	4,9	3,8	4,2	5,1	16	34	28	64	1	1
Sweden	1 656	1 248	1 247	1 193	186,7	136,4	135,3	128,3	71	49	597	612	4	9
United Kingdom	2 647	2 064	1 889	1 896	45,0	33,8	30,8	30,7	255	183	657	874	12	28
EU27	**22 381**	**20 243**	**19 951**	**20 471**	**46,4**	**40,8**	**40,0**	**40,9**	**1 234**	**1 195**	**5 546**	**9 291**	**73**	**234**
Australia	630	1 108	1 120	1 045	32,7	52,2	51,7	47,3	47	101	122	642	6	18
Canada	3 185	2 766	2 712	2 855	103,8	84,0	81,4	84,6	244	207	963	1 321	12	18
Israel	624	760	797	979	99,1	105,9	109,1	131,5	51	89	262	557	4	11
Japan	31 433	33 867	33 966	35 883	247,6	265,1	266,4	281,8	503	611	17 573	24 064	364	581
Korea	3 350	6 372	7 631	8 922	71,3	131,5	157,0	183,0	25	104	2 487	7 015	12	161
Norway	240	181	204	203	53,4	38,4	42,8	42,1	12	16	54	77	3	2
Switzerland	1 507	1 383	1 479	1 583	209,1	181,5	191,9	202,9	79	129	248	527	3	3
Turkey	4	12	7	9	0,1	0,2	0,1	0,1	..	..	1	2	..	..
United States	87 883	80 701	79 122	84 009	311,2	267,2	259,6	273,2	4 606	4 898	33 626	46 397	510	1 029
OECD	**151 382**	**147 530**	**147 095**	**156 099**	**133,2**	**122,0**	**120,8**	**127,4**	**6 809**	**7 377**	**60 906**	**89 924**	**987**	**2 057**
China	112	529	779	1 029	0,1	0,4	0,6	0,8	5	37	12	509	..	21
Russian Federation	68	71	71	79	0,5	0,5	0,5	0,6	2	8	15	36	..	..

Source: OECD, Eurostat and CZSO own calculations

Tab. X Main macroeconomic and structural indicators

	GDP million current EUR			GDP million current PPP US$			GDP million 2000 constant PPP US$			*Population (thousands)*			*Employment (thousands)*			*General government expend. (million current PPP US$)*		
	2000	**2008**	**2009**	**2000**	**2008**	**2009**	**2000**	**2008**	**2009**	***2000***	***2008***	***2009***	***2000***	***2008***	***2009***	***2000***	***2008***	***2009***
Belgium	252 216	345 006	339 162	283 040	394 900	391 768	283 040	326 692	317 708	10 246	10 708	10 790	4 109	4 454	4 438	139 090	198 221	212 411
Bulgaria	14 035	35 431	34 933	50 793	105 547	104 403	50 793	79 862	75 458	8 191	7 640	7 607	2 795	3 361	3 254	20 978	39 686	42 492
Czech Republic	**61 495**	**147 879**	**137 162**	**154 009**	**269 556**	**268 241**	**154 009**	**214 923**	**206 006**	**10 273**	**10 430**	**10 507**	**4 940**	**5 288**	**5 232**	**64 400**	**115 621**	**123 204**
Denmark	173 598	233 482	222 410	153 854	216 902	208 115	..	170 065	161 205	5 338	5 492	5 522	2 760	2 957	2 866	82 574	112 572	121 574
Estonia	6 160	16 107	13 861	13 531	29 235	26 648	13 531	22 243	19 151	1 372	1 341	1 340	573	657	596	4 888	11 656	12 035
Finland	132 195	185 651	173 267	132 770	200 821	188 127	132 770	167 742	153 980	5 176	5 313	5 339	2 293	2 525	2 454	64 113	99 102	105 826
France	1 439 603	1 933 195	1 889 231	1 534 667	2 195 744	2 173 317	1 534 667	1 747 981	1 702 034	60 725	64 141	64 494	24 332	25 841	25 614	792 426	1 159 399	1 216 768
Ireland	105 854	179 990	160 596	109 163	189 464	176 806	109 163	152 738	141 160	3 804	4 443	4 468	1 697	2 099	1 915	34 132	80 755	86 456
Italy	1 191 057	1 567 761	1 519 702	1 457 396	1 990 548	1 951 474	1 457 396	1 556 312	1 475 113	56 942	59 832	60 193	22 930	25 260	24 839	673 027	972 429	1 013 105
Cyprus	10 079	17 287	16 946	13 474	24 530	24 583	13 474	17 788	17 606	690	789	797	296	383	381	4 931	10 229	11 259
Lithuania	12 377	32 288	26 508	30 106	65 358	.	30 106	53 418	45 543	3 512	3 366	3 350	1 404	1 520	1 416	11 772	24 444	..
Latvia	8 496	23 037	18 539	19 051	40 748	36 453	19 051	33 375	27 383	2 382	2 271	2 261	944	1 125	983	7 106	15 810	16 112
Luxembourg	22 001	39 644	38 073	23 406	43 803	42 204	23 406	31 704	30 550	3 512	3 366	3 350	264	349	352	8 798	16 149	17 807
Hungary	4 221	5 918	5 869	123 900	207 790	203 254	123 900	158 087	147 507	10 211	10 038	10 023	4 250	4 116	3 999	57 939	101 447	102 570
Malta	51 411	106 373	92 942	..	..	..	7 134	8 308	8 131	380	410	414	143	160	162	..	..	..
Germany	2 047 500	2 473 800	2 374 500	2 132 701	3 052 457	2 975 329	2 132 701	2 354 289	2 243 175	82 188	82 120	81 875	39 144	40 276	40 271	962 068	1 335 567	1 413 390
Netherlands	417 960	596 226	571 979	468 195	705 069	674 517	468 195	547 262	525 836	15 922	16 440	16 527	8 115	8 734	8 634	206 801	324 623	346 368
Poland	185 714	363 154	310 418	404 251	688 458	722 191	404 251	561 128	570 387	38 256	38 116	38 153	14 700	15 747	15 815	..	297 369	320 631
Portugal	127 008	171 983	168 587	181 495	265 100	266 492	181 495	196 216	191 324	10 226	10 622	10 632	5 030	5 163	5 021	74 648	115 682	127 951
Austria	207 529	283 085	274 321	230 489	332 203	324 676	230 489	273 872	263 224	8 012	8 337	8 363	3 788	4 117	4 080	120 143	162 065	169 873
Romania	40 651	139 765	117 457	127 997	324 237	310 925	127 997	208 106	193 344	22 138	21 361	21 275	10 772	9 366	9 240	0	0	0
Greece	137 930	236 917	235 017	200 993	337 975	330 697	..	..	..	10 917	11 237	11 283	4 255	4 792	4 758	93 840	166 378	175 863
Slovakia	22 047	64 572	63 051	59 300	125 638	123 909	59 300	95 611	91 038	5 400	5 405	5 417	2 025	2 241	2 184	30 919	43 927	51 431
Slovenia	21 533	37 280	35 311	34 752	59 124	56 218	34 752	48 867	44 895	1 989	2 022	2 042	905	989	970	16 239	26 093	27 559
United Kingdom	1 602 240	1 815 417	1 565 750	1 535 235	2 260 520	2 172 533	1 535 235	1 831 924	1 742 622	58 886	61 398	61 792	29 606	31 525	31 030	599 294	1 071 920	1 119 703
Spain	630 263	1 088 124	1 053 914	858 436	1 512 485	1 481 413	858 436	1 095 374	1 054 598	40 264	45 593	45 929	16 412	20 502	19 116	335 797	624 438	678 427
Sweden	268 253	333 256	290 908	247 959	363 958	345 581	..	303 247	287 075	8 872	9 220	9 299	4 301	4 574	4 481	136 600	188 081	190 608
EU27	***9 207 503***	***12 479 024***	***11 770 040***	***9 549 798***	***14 061 950***	***13 703 048***	***9 549 798***	***11 066 232***	***10 594 775***	***377 955***	***395 385***	***397 004***	***169 037***	***183 169***	***179 869***	***4 316 509***	***6 595 054***	***6 961 149***
Australia	..	..	..	540 441	847 234	876 530	540 441	695 232	..	19 270	21 642	22 101	9 018	10 918	10 998	..	..	..
Israel	..	..	..	147 772	202 302	205 807	147 772	190 673	192 201	6 289	7 309	7 440	2 520	3 048	3 056	71 668	89 621	91 102
Japan	5 056 700	3 308 479	3 613 140	3 250 282	4 322 893	4 135 203	3 250 282	3 579 616	3 392 860	126 926	127 510	127 328	65 255	64 167	63 041	1 253 079	1 612 783	1 746 614
Canada	..	..	..	874 082	1 295 869	1 275 639	874 082	1 046 863	1 021 089	30 686	33 327	33 740	15 051	17 369	17 094	359 318	..	..
Korea	..	..	..	808 400	1 306 387	1 321 033	808 400	1 138 766	..	47 008	48 607	48 747	21 136	23 577	23 506	181 350	397 787	437 822
Norway	182 579	305 323	267 066	162 241	289 108	269 104	..	221 290	202 258	4 491	4 769	4 827	2 320	2 618	2 606	68 628	117 448	124 657
United States	10 774 686	9 716 821	9 993 548	9 898 800	14 296 900	14 043 900	9 898 800	11 668 453	..	282 418	304 831	307 483	139 175	147 643	142 183	3 353 547	5 567 081	5 924 126
Switzerland	270 918	343 346	354 735	227 936	350 978	349 632	227 936	266 211	..	7 209	7 711	7 801	4 080	4 500	4 528	..	113 110	117 976
Turkey	289 933	498 602	440 367	589 237	1 063 519	1 022 490	589 237	829 087	789 076	64 259	71 079	71 897	19 443	21 194	21 275	..	..	..
OECD	**..**	**..**	**..**	***27 915 328***	***41 427 739***	***40 519 285***	***27 915 328***	***33 611 264***	**..**	***1 136 418***	***1 217 458***	***1 224 873***	***514 034***	***559 568***	***548 684***	**..**	**..**	**..**
China	..	..	..	3 011 064	8 216 782	9 046 410	3 011 064	6 763 368	7 379 719	1 267 430	1 328 020	1 334 740	720 850	774 800	779 950	..	..	..
Russian Federatior	..	..	..	998 613	2 888 780	2 685 512	998 613	1 661 175	1 530 154	146 890	142 009	141 904	65 070	70 965	69 430	..	989 071	..

Source: OECD, Eurostat and CZSO own calculations

G Exceptional results in research, development and innovation in 2010

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

G.1.1 Czech Head National Government Prize

Professor Jan Svoboda is one of the world renowned leading experts in retrovirology. In the early 60s he published works on the biology of the Rous sarcoma virus (directly transmittable chicken tumor provoked by a specific oncogenic retrovirus), which is the pillar of our knowledge on retroviruses. These publications are a citation classic and Svoboda's contribution to this field of study was even recognized by the winners of the Nobel Prize awarded for discovering oncogenes – Harold Elliot Varmus and John Michael Bishop.

Jan Svoboda stressed some of the unique Rous sarcoma's properties, which enabled the transition from classical virology to work with defined retroviruses and later to molecular approaches. Jan Svoboda specializes in molecular biology and genetics, retroviruses and oncogenes. He received a number of domestic and international awards for his contributions, among others the Prix Lasassagne award – Paris 1981, American Cancer Society International Cancer Research Fellowship – 1991. During his career he worked and held lectures in a number of countries, for example at the Imperial Cancer Research Fund Laboratories in London, Pasteur institute in Paris or at the University of Missouri-Columbia and UCLA in Los Angeles, USA. He is also the founding member of the European Tumour Virus Group (London 1962). With the exception of an involuntary break in the 70s, when he was a target of political persecution and was relieved of the position of Department Head, he participated in almost all of the 16 meetings of this association.

Professor Jan Svoboda published over 200 scientific works, two of which were selected as the so-called citation classics. He implemented and used the cell genetics procedures in the Czech Republic (e.g. cell hybridization) and later methods of molecular biology, including the cloning of the firs unique gene in Czechoslovakia.

G.2 Awards presented by funding providers

G.2.1 Ministry of Education, Youth and Sport Prize for extraordinary results in research, experimental development and innovation

- **Prof. MUDr. Karel Smetana, DrSc.** (Charles University, Institute of Anatomy, 1st Faculty of Medicine)

Prof. MUDr. Karel Smetana, DrSc. from the 1st Faculty of Medicine received the award for his research in the field of medicine. He was awarded for his achievements in the research of application of fibroplasts in tumorous environments aimed at normalization of growth of epithelium cells. The resulting materials have been patented and have an enormous therapeutic potential for cancer treatment.

- **Doc. Mgr. Jaromír Fiurášek, Ph.D**. (Faculty of Science, Palacký University Olomouc)

Doc. Mgr. Jaromír Fiurášek, Ph.D. from the Faculty of Science of Palacký University in Olomouc was awarded in the field of quantum information. Mr. Fiurásek's research in quantum physics, optics and optoelectronics resulted in the design and implementation of methods of suppressing noise in quantum communication and determining of the optimal schemes for copying of quantum information.

- **Prof. Mgr. Erazim Kohák, PhD.** (Department of Philosophy of the Academy of Sciences of the Czech Republic)

Prof. Mgr. Erazim Kohák, PhD. (Yale ´58) from the Department of Philosophy of the Academy of Sciences of the Czech Republic received the award for outstanding achievements in his research into the defining characteristics of the Czech cultural identity and the general ideas of humanity in Czech thinking, presented in his monograph "Heart and Horizon: Cultural Identity and Global Humanity in Czech Philosophy", later published in Czech in 2009 as an extended version under the title "The Home and the Far-Away: Cultural Identity and the Idea of Humanity in Czech Thinking".

G.2.2 Ministry of Health, Ministry of Health Prize for medicinal R&D

- **Prof. MUDr. Evžen Růžička, DrSc., FCMA** (Neurological clinic of the 1st Faculty of Medicine, Charles University)

For extraordinary results achieved in a project, aim of which was to perfect the implantation procedure of deep brain stimulation, to develop its new indications and contribute to the knowledge of its effects.

- **Doc. MUDr. Pavel Kršek, Ph.D.** (Clinic of Pediatric Neurology, 2nd Faculty of Medicine, Charles University)

For extraordinary results achieved in a project, aim of which was to optimize the diagnostics of complicated candidates of surgical treatment of epilepsy and improve their post-operation prognoses.

- **Professor MUDr. Martin Haluzík, DrSc.** (3rd Medical Department, 1st Faculty of Medicine, Charles University)

For extraordinary results achieved in a project, in which he and his team investigated the effects of the hormone that is related to obesity and inefficiency of insulin in female diabetes patients.

G.2.3 Ministry of Agriculture, Ministry of Agriculture Prize for the best young researchers and best applied research and development result

- **MVDr. Edita Jeklová, Ph.D.** (Veterinary Research Institute)

Winner of the Minister of Agriculture Prize for Young Researchers for her scientific work Characterisation of immunosuppression in rabbits after infection with myxoma virus published in the Veterinary Microbiology periodical. Myxoma virus (MXV) causes the systemic disease myxomatosis in the European rabbit. This work describes the dynamics of the changes in hematological profile, changes in lymphocyte subset distribution and nonspecific proliferation activity of lymphocytes from different lymphoid compartments in individual periods after experimental infection. The results have shown the lowered immunity of the infected rabbits.

- **Doc. Ing. Ivana Knížková, CSc.** (Institute of animal science)

Winner of the Minister of Agriculture Prize for best applied research and development result named "Technology of evaporative cooling with the use of control units". The technology of evaporative cooling of cattle with the use of control units is a operationally-and investment- demanding equipment with an efficient elimination of the animals' heat stress. It minimizes the contamination of floors, water usage and amount of sewage.

G.2.4 Czech Science Foundation, Prize of the Chairman of the Czech Science Foundation

- **Prof. Ing. Pavel Ripka, CSc (**Czech Technical University in Prague, Faculty of Electrical Engineering)
  For developing a new coil-less fluxgate sensor (fluxgate effect in thin layers). Basic principles of its operation were described and tested.

- **doc. Mgr. Radim Filip, Ph.D.** (Faculty of Science, Palacký University Olomouc)

For extraordinary results achieved in the project „Electro-optical control of quantum noise". Main result is the set of new methods of electro-optical control of quantum noise, especially amplifiers and convertors.

- **RNDr. Bořivoj Vojtěšek, DrSc. (Masaryk Memorial Cancer Institute)**

For extraordinary results in the solution of the research project "The role of E3-ligases and inhibitors of heat shock proteins in molecular and cellular consequences of regulation of p53 protein".

- **RNDr. Michael Komárek, Ph.D.** (Prague University of Agriculture, Faculty of Agrobiology, Food and Natural Resources)

For extraordinary results in the solution of the research project "Chemically enhanced phytoextraction from vineyard and hop field soils". The results criticize the efficiency of chemically enhanced phytoextraction of metals from contaminated soils and prove its uselessness in practice.

G.2.5 Academy of Sciences of the Czech Republic , Academy of Sciences of the Czech Republic Prize for outstanding results of major scientific significance

- **prof. Ing. Michal Handl, DrSc., Ing. Jiří Filip, Ph.D., Ing. Jiří Grim, CSc., RNDr. Vojtěch Havlíček, Ph.D.** a **Ing. Martin Hatka** (collective of authors from the Institute of Information Theory and Automation of the ASCR)

For the result "Mathematic modeling of visual materials properties". The team developed mathematical models, which needed a difficult 16dimensional reflectance function.

- **prof. RNDr. Blanka Říhová, DrSc., RNDr. Miroslav Flieger, CSc.** (Microbiology Institute AS CR), **prof. RNDr. Viktor Brabec, DrSc.** (Institute of Biophysics, AS CR) **doc. Ing. Emil Pollert, DrSc.** (Institute of Physics, AS CR), **prof. Ing. Karel Ulbrich, DrSc.** (Institute of Macromolecular Chemistry AS CR), **RNDr. Jarmila Králová, Ph.D.** (Institute of Molecular Genetics AS CR), **RNDr. Ladislav Kohout, DrSc.** (Institute of Organic Chemistry and Biochemistry AS CR), **prof. MUDr. Pavel Martásek, DrSc.** (1. Faculty of Medicine, Charles University), **prof. RNDr. Martin Kotora, Ph.D.** (Charles University in Prague, Faculty of Science), **prof. RNDr. Pavel Anzenbacher, DrSc.** (The Faculty of Medicine, Palacký University Olomouc) and **Prof. RNDr. Vladimír Král, DrSc.** (The Institute of Chemical Technology)

For the result „Nanoparticle and supramolecular systems for targeted drug transport". New systems for targeted drug transport and magnetic hybrid particles designated for diagnostics. New systems for targeted drug transport and magnetic hybrid particles designated for diagnostics were developed. The effects of selected complexes of platinum and ruthenium were explained.

G.3 Awards presented by other organizations

G.3.1 Association of Innovative Entrepreneurship of the Czech Republic, Innovation of the Year Award

- **David Proška** (VÚK Panenské Břežany, a.s.)

For extraordinary result "Wire CuCrTi". Semi-products from CuCrTi designated for production of solar thermal panels with defined properties.

- **Irena Vernerová** (Wienerberger bricks)

For extraordinary result „POROTHERM 44 EKO + Profi DRYFIX". Brick block for external masonry of high energy-conserving buildings – low-energy and passive houses.

G.3.2 INVENTION Award by Kapsch Company

- **prof. Ing. Vladimír Mařík, DrSc.** (Czech Technical University in Prague, Faculty of Electrical Engineering)
- **prof. dr. Ing. Michal Pěchouček, M.Sc. (**Czech Technical University in Prague, Faculty of Electrical Engineering)

Both researchers were awarded for their research into multi-agent technologies; a self-assessment system with artificial intelligence elements, and their use in industrial practice.

The results of their research are successfully applied in the U.S. Air Force and Navy as well as the National Aeronautics and Space Administration (NASA). Their software is also used as a base for the development of new air control processes in the Czech Republic.

G.3.3 INDUSTRIE Award of the Ministry of Industry and Trade

- **LASAK s.r.o.** – Ing. Jakub Strnad, director and factor

For a unique bioactive surface finish of dental implants and an advanced implant design which enable safer and faster healing of the implant in the bone tissues. The dental implants with the BIO-surface speed up the formation of a functional bone-implant interface, thus improving the implant's secondary stability in the early healing phase. The outstanding performance of BIO-surface implants has been documented for even the most demanding indications. This technology has been applied to over 13 000 patients and already has one-third share of the market at the expense of foreign companies. This bioactive surface is used in more than twenty countries, e. g. in Germany, Sweden, which is a really good representation of Czech science abroad.

G.3.4 DOCTORANDUS Award of the VZP ČR

- **Mgr. Jaromír Chalupský** (Institute of Physics AS CR and Czech Technical University in Prague, Faculty of Nuclear Sciences and Physical Engineering)

For his research on the effects of extremely intense X-rays and laser beams that are capable of developing forms of mass that exist, for example, on Jupiter or other more distant space objects, i.e. brown and white dwarfs, or create nanostructures of defined shapes and parameters on surfaces of materials, which are difficult to work with. This was enabled by the methods developed by Jaromír Chalupský, which accurately characterize focusable roentgen laser beams. These activities also hold significant promise for the projected large laser facility ELI Beamlines Facility (ELI - Extreme Light Infrastructure).

G.3.5 PATRIA Award of Veolia Voda ČR

- **prof. RNDr. František Tureček, PhD.** (University of Washington in Seattle, USA)

Tureček's main focus is mass spectrometry and its application in chemistry, biology and medicine. His lab has manufactured some unique instruments, such as the tandem mass spectrometer or instruments for preparative separations of drugs and biomolecules and for preparation of biologically active surfaces via the method of landing ions from the gas phase. This research is characterized by close connection of experimental and quantum-chemical computing methods to characterize complex molecules and to predict their properties and reactivity. His breakthrough works on highly reactive molecules in the atmosphere and products of radiation damage of DNA and proteins are highly prized and belong to the golden fund of the international chemistry. In his lab a new universal biochemistry method for analysis of proteins in cells had been developed, which was a sign of revolution in biology and protein chemistry and the published works became citation classics. His research is funded by the US government and global pharmaceutical companies. František Tureček used to make fun of spectrometry, but it should be pointed out that he published well over three hundred articles, which were used in almost 8 000 citations; His h-index is 40. He was also a co-

author of an important article on quantitative proteomics (Nature Biotechnology, 1999, 10, 994-999), which to this day has 2 300 citations.

During his scientific career he received a number of awards, e.g. AS CR Award in 1979, AS CR Award for Young Scientists three years later, Honorary Plaque AS CR (1983), Hopkins Faculty Award (2006), Honorary Medal of the Organic Chemistry and Biochemistry AS CR etc. The American Biographical Institute lists him among 500 most famous scientists. F. Tureček has also been very active in scientific administration; for a couple of years he worked as an elected secretary of the American Society for Mass Spectrometry (2005-2007), was a member of it nomination committee (2002-2003) and still is the editor of the exclusive Advances in Physical Chemistry and the scientific periodical Journal of Mass Spectrometry.

František Tureček belongs to the best living Czech physical chemists and also to the most successful Czech scientists in terms of publication success.

G.3.6 Gaudeamus Award presented by Poštovní spořitelna

- **PhDr. Markéta Růčková** (Charles University, Faculty of Philosophy)

The committee awarded her for her work "Students of the Unity of Brethren at the beginning of the 17th century or priests-to-be from the archive of Matouš Konečný". It is a scientific elaboration on the accidental find of letters of Matouš Konečný – bishop of the Unity of Brethren (1572-1622). The letters have been found in Mladá Boleslav in the course of reconstruction works in the former cloister Na Karmeli in 2006.

G.3.7 Award of the Engineering Academy of the Czech Republic

For outstanding technical work

- **prof. Dr. Ing. Jiří Marek et al** (TOSHULIN)

For the extraordinary result "vertical turning center POWERTURN 1600 II". This instrument is the result of an innovation process based on own industrial R&D performed at the TOSHULIN Company. The novelty can be seen in the construction of the frame and concrete bed. Excellent precision and performance results of this center have been proven in the aerospace industry in the production of jet engines.

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