23. SCIENCE, RESEARCH, AND INNOVATION

*Science, research, and innovation statistics provides basic data on key activities in the areas of **science, technologies, and innovations** in the Czech Republic from the point of view of inputs, i.e. financial and qualified human resources as well as their results such as innovations, granted patents or external trade with high-tech production.*

***Science** refers to a consistent system of verifiable observations and findings on a given set of phenomena as well as of methods used to obtain, process, to explain in theory, and apply these observations and findings.*

***Research and development** comprise creative and systematic work undertaken in order to increase the stock of knowledge – including knowledge of humankind, culture and society – and to devise new applications of available knowledge.*

***Technologies** take three fundamental forms: **tangible**: knowledge embodied in physical objects (machinery, equipment, instruments, etc.); **intangible**: knowledge accumulated in people (human capital), information embodied in electronic media and documents (software, plans, projects, results of observations, mathematical calculations, maps, etc.), and **institutional**: arrangement of activities and relations (organizational structure, management system, standards, regulations, etc.). Thus, while science is concerned about how and why certain things happen, technology is focusing on the means by which they are implemented.*

*An **innovation** is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations.*

Data provided in this chapter were obtained mainly from regular statistical surveys of the CZSO, primarily from the survey on research and development, survey on innovation activities of enterprises, survey on licences, and from other data sources of the CZSO. In some cases, data from other national data sources were obtained (e.g. the Industrial Property Office of the CR, the Office of the Government of the CR, or the Ministry of Education, Youth, and Sports).

Notes on Tables

*Tables **23**-1 and **23**-2 **Persons with tertiary education***

***Tertiary level of education** is defined according to the International Standard Classification of Education (ISCED 2011) and comprises the following levels of the classification: 5 (short-cycle tertiary education), 6 (bachelor's or equivalent), 7 (master's or equivalent), and 8 (doctoral or equivalent). Education on the tertiary level in the Czech Republic takes place in the last two grades of conservatoires (i.e. in the 7th and 8th grades of an 8-year conservatoire and in the 5th and 6th grades of a 6-year conservatoire), at higher professional schools, and at universities (of university and non-university type; i.e. in bachelor, follow-up master, master, and doctoral study programmes).*

***Fields of education** dealt with in these tables are defined based on the ISCED 97 classification (broad and narrow fields of education and their codes) and include the following categories:*

- *Education (ISCED code 1);*
- *Humanities and arts (ISCED code 2);*
- *Social sciences and law (ISCED code 3 excluding codes 314 and 34);*
- *Economics, Business and administration (ISCED codes 314 and 34);*
- *Natural sciences, mathematics and statistics (ISCED codes 42, 44, and 46);*
- *Computing (ISCED code 48);*
- *Engineering, manufacturing and construction (ISCED code 5);*
- *Agriculture (ISCED code 6);*
- *Health (ISCED code 72);*
- *Social services (ISCED code 76);*
- *Services (ISCED code 8).*

*Data come from the Labour Force Sample Survey (LFSS) of the CZSO (the tables present average annual data for given years). More detailed information on the LFSS can be found in the Chapter **10** Labour Market, Part B.*

*Tables **23**-3 and **23**-4 **Science and engineering professionals***

***Science and engineering professionals** are a narrow group of experts. Within their work activities, they conduct research, improve or develop concepts, theories and operational methods, or apply scientific knowledge relating to fields such as physics, astronomy, meteorology, chemistry, geophysics, geology, biology, ecology, pharmacology, medicine, mathematics, statistics, architecture, engineering, design, and technology.*

Science and engineering professionals are defined since 2011 based upon the Classification of Occupations (CZ-ISCO) containing the following minor groups of occupations of the CZ-ISCO sub-major group 21, which are sources of their main income:

211 Physical and earth science professionals (Natural science professionals);

212 Mathematicians, actuaries and statisticians;

213 Life science professionals;

214 Engineering professionals (excluding electrotechnology);

215 Electrotechnology engineers;

216 Architects, planners, surveyors and designers.

*Due to the sample size, in the case of the number of persons working in CZ-ISCO 211 and 212 occupations (Table **23**-3) these persons were merged into one category of natural science professionals, mathematicians and statisticians.*

*Data on the **numbers** of science and engineering professionals (Table **23**-3) come from the Labour Force Sample Survey (LFSS) of the CZSO. The table presents average annual data for given years. More detailed information on the LFSS can be found in the Chapter **10** Labour Market, Part B.*

*Data on **wages** of science and engineering professionals (Table **23**-4) come from the structural employee wage statistics, which is generated by merging of databases of the sample survey of the **Information System on Average Earnings** of the Ministry of Labour and Social Affairs, which covers the **wage sphere**, and from the database of the administrative data source of the **Salary Information System** of the Ministry of Finance, which exhaustively covers the **salary sphere**. More detailed information on the structural employee wage statistics can be found in the Chapter **10** Labour Market, Part A, namely in notes to Tables **10**-4 and **10**-5.*

*Tables **23**-5 to **23**-7* ***Science and engineering fields of education at universities***

***Education at universities** presented in the tables belongs to the tertiary level of education and includes a **bachelor, follow-up master, master**, and **doctoral** study programme. The follow-up master and master study programmes are given in tables together as **master study programmes**.*

*The system of universities consists of **public** universities (of university and non-university type), **private** universities, and **state** universities (now there are two state universities, one founded by the Ministry of Defence and one founded by the Ministry of the Interior). However, data on students and graduates of state universities are governed by a different methodology and therefore cannot be summarised with data on students and graduates of public and private universities. Data in the tables provide information only as for public and private universities.*

Fields of education given in these tables are defined based on the International Standard Classification of Education, ISCED-F 2013.

***Science fields of education** correspond to the broad field of Natural sciences, mathematics and statistics (code 05) and include:*

- *Biological and related sciences (code 051);*
- *Environment (code 052);*
- *Physical sciences (code 053);*
- *Mathematics and statistics (code 054);*
- *Natural sciences, mathematics and statistics not further defined (code 050);*
- *Inter-disciplinary programmes and qualifications involving natural sciences, mathematics and statistics (code 058);*
- *Natural sciences, mathematics and statistics not elsewhere classified (code 059).*

***Engineering fields of education** correspond to the broad field with code 07 and include:*

- *Engineering and engineering trades (code 071);*
- *Manufacturing and processing (code 072);*
- *Architecture and construction (code 073);*
- *Engineering, manufacturing and construction not further defined (code 070);*
- *Inter-disciplinary programmes and qualifications involving engineering, manufacturing and construction (code 078);*
- *Engineering, manufacturing and construction not elsewhere classified (code 079).*

*Since a field of education with the same code may have various contents at different universities and thus it is problematic to classify students to relevant groups of fields of education according to the ISCED-F 2013, **expert estimates** are given for the breakdown by field of education (made by experts of the Ministry of Education, Youth, and Sports).*

Numbers of students and graduates in tables are given as headcount, i.e. each student is included in particular piece of data only once, including students, who study in more study programmes or more fields of education at the same time. The total numbers of students and graduates thus do not have to be equal to the sums of students and graduates of respective types of study programmes and groups of fields of education.

The data were obtained from data sources of the Ministry of Education, Youth, and Sports, namely from the Union Information from Students' Registers (the "SIMS"*). The source database of SIMS is continually*

completed and updated, including retrospective corrections. Data published in this Yearbook correspond to the state of processing as at 20 January 2017. Data on students of universities are related always to 31 December of the relevant year; data on graduates are related to the entire school year.

*Tables **23**-8 to **23**-12 **Research and development (R&D)***

***Research and experimental development (**hereinafter referred to as R&D) comprise creative and systematic work undertaken in order to increase the stock of knowledge – including knowledge of humankind, culture and society – and to devise new applications of available knowledge (OECD 2015, Frascati Manual). R&D is always aimed at new findings, based on original concepts (and their interpretation) or hypotheses. It is largely uncertain about its final outcome (or at least about the quantity of time and resources needed to achieve it), it is planned for and budgeted (even when carried out by individuals) and it is aimed at producing results that could be either freely **transferred** or traded in a marketplace.*

*The term R&D covers three types of activity: basic research, applied research, and experimental development. **Basic research** is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without any particular application or use in view. **Applied research** is original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards **a** specific, practical aim or objective. **Experimental development** is systematic work, drawing on knowledge gained from research and practical experience and producing additional knowledge, which is directed to producing new products or processes or to improving existing products or processes.*

***Characteristics of research and development** are surveyed by the Annual report (questionnaire) on research and development, which includes questions on human and financial resources earmarked for R&D activities realized on the territory of the Czech Republic in respective sectors of R&D performance. The statistical survey fully complies with methodological principles of the EU and the OECD mentioned in the Frascati Manual and Commission Implementing Regulation (EU) No 995/2012.*

***Reporting units** in the R&D survey are all legal and natural persons performing R&D on the territory of the Czech Republic as their principal (CZ-NACE 72 – Scientific research and development) or secondary economic activity, irrespective of the number of personnel, sector or CZ-NACE activity.*

***Sector of research and development performance** is a basic category used in R&D statistics, which groups all institutional units performing R&D based on their main functions, behaviour, and objectives. R&D indicators are usually measured and published, also at an international level, in four sectors of R&D performance (hereinafter referred to as sectors): business enterprise, government, higher education, and private non-profit sector. These sectors were defined based on the Nomenclature of Institutional Sectors and Subsectors used in the national accounts (the ESA 2010 system) and definitions given in the Frascati Manual:*

- ***business enterprise sector** (S.11: Non-financial corporations; S.12: Financial corporations; S.141: Employers, and S.142: Own-account workers), which comprises all companies, organizations, and institutions, principal activity of which is market production of goods or services for sale to the general public at an economically significant price;*

  The business enterprise sector focuses mainly on applied research and experimental development. Results of these activities are related especially to innovations, i.e. development of new or improved current products or provided services. Entities and R&D workplaces in the business enterprise sector are broken down by type of workplace based on the ownership, namely to public enterprises (corporations), private national enterprises (corporations), and foreign-controlled enterprises (corporations).
- ***government sector** (S.13: General government) comprises bodies of central and local government, except for publicly managed higher education institutions (CZ-NACE 85.4). This sector includes in the Czech Republic especially workplaces of the Czech Academy of Sciences and other places of research under the competence of ministries. (On 1 January 2007 the statute of most of these entities changed to public research institutions.) Among the other entities of the government sector, which perform R&D as their secondary activity are libraries, archives, museums and other cultural establishments;*
- ***higher education sector** comprises all public and private universities and other institutions of post-secondary education with R&D activities (CZ-NACE 85.4: Higher education) and also all research institutes, experimental facilities and clinics, work of which is directly controlled or managed by higher education institutions or that are associated with them (university hospitals). This sector is not a separate institutional sector but it has been separately identified by the OECD for its important role in R&D;*
- ***private non-profit sector** (S.15: Non-profit institutions serving households) comprises private institutions, including private persons and households, whose primary aim is not generation of profit but providing of non-market services to households. They include, e.g., associations of research organizations, associations, unions, movements, federations or foundations. The private non-profit sector is insignificant as for R&D performance.*

*Research and development activities are measured, especially in the government and higher education sectors, in six **broad fields of fields of science** defined according to the Fields of Research and Development Classification (FORD classification):*

- *Natural sciences (Mathematics, Computer and information sciences; Physical sciences; Chemical sciences; Earth and related environmental sciences; Biological sciences; Other natural sciences);*
- *Engineering and technology (Civil engineering; Electrical engineering, electronic engineering, information engineering; Mechanical engineering; Chemical engineering; Materials engineering; Medical engineering; Environmental engineering; Environmental biotechnology; Industrial biotechnology; Nano-technology; Other engineering and technologies);*
- *Medical and health sciences (Basic medicine; Clinical medicine; Health sciences; Medical biotechnology; Other medical science);*
- *Agricultural and veterinary sciences (Agriculture, forestry, and fisheries; Animal and dairy science; Veterinary science; Agricultural biotechnology; Other agricultural sciences);*
- *Social sciences (Psychology and cognitive sciences; Economics and business; Education; Sociology; Law; Political science; Social and economic geography; Media and communications; Other social sciences);*
- *Humanities and the arts (History and archaeology; Languages and literature; Philosophy, ethics and religion; Arts (arts, history of arts, performing arts, music); Other humanities).*

*Surveyed data on the R&D by six broad fields of fields of science are based on the prevailing field of science of the surveyed R&D workplaces (Table **23**-12).*

*Table **23**-9 **R&D personnel***

*Persons employed in research and development (hereinafter referred to as **R&D personnel**) include all persons engaged directly in R&D, whether employed by the statistical unit or external contributors fully integrated into the statistical unit's R&D activities, as well as those providing direct services for the R&D activities (such as R&D managers, administrators, technicians and clerical staff). The R&D personnel category comprises all persons aged 15+ years paid in employment. The formal job attachment refers to, first of all, an employment contract, then a contract for work, and contract on works.*

*R&D personnel are classified according to their R&D function (**occupation**) as:*

- ***researchers**, who are professionals engaged in the conception or creation of new knowledge. They conduct research and improve or develop concepts, theories, models, techniques instrumentation, software or operational methods. Managers and administrators engaged in the planning and management of the scientific and technical aspects of a researcher's work are also classified as "researchers".*
- *technicians and equivalent staff (hereinafter referred to as **technicians**) who are persons whose main tasks require technical knowledge and experience in one or more fields of engineering, the physical and life sciences, or the social sciences, humanities and the arts. They participate in R&D by performing scientific and technical tasks involving the application of concepts, operational methods and the use of research equipment, normally under the supervision of researchers;*
- ***other supporting staff** who are skilled and unskilled craftsmen, and administrative, secretarial, and clerical staff participating in R&D projects or directly associated with such projects.*

*The number of R&D personnel is collected by two main **measurement units:***

- ***headcount (HC)** of R&D personnel refers to the registered number of persons fully or partially engaged in research and development activities, employed in the reporting units in main or secondary employment as at the end of the reference year. Primarily in the higher education and partially also in the government sector, a huge amount of R&D personnel, especially researchers, have an employment contract in more entities. Therefore, in these sectors, the indicator is overestimated and does not provide the real number of persons working in R&D;*
- ***full-time equivalent (FTE)** of R&D personnel is defined as the ratio of working hours actually spent on R&D during a specific reference period (usually a calendar year) divided by the total number of hours conventionally worked in the same period by an individual or by a group. One FTE equals one-year (full-time) work of a member of personnel who is 100% engaged in R&D activities. The FTE indicator also includes the number of persons working for the reporting unit under various contracts for work converted according to the methodology valid for the FTE.*

*Table **23**-10 **R&D expenditure***

***Research and development expenditure** includes all current (labour and other current costs) and capital (investment) expenditure spent during the reference year on R&D performed within a reporting unit (intramural R&D) on the territory of a given country regardless the source of the funds or the way of financing.*

Surveyed (intramural) R&D expenditure does not include extramural expenditure on R&D performed outside a reporting unit, sector, or country. The intramural R&D expenditure thus excludes expenditure spent on purchase of external R&D from entities performing R&D, sources transferred to other experts within a common R&D project, and subsidies or contributions (financial transfers) provided to third persons for R&D performed at their place.

The main aggregate statistics used to describe a country's R&D activities is gross domestic expenditure on R&D (GERD), which covers all expenditure for R&D performed in the national territory during a specific reference period. GERD includes domestically performed R&D that is financed from abroad (i.e. from the "rest of the world") but excludes funding for R&D performed abroad.

The amount of R&D expenditure made in individual sectors of performance is measured by the following ***main sources of funding*** *of R&D activities:*

- *funds from the* ***business enterprise sector*** *comprising mainly of own (internal) sources of surveyed enterprises earmarked for R&D performed within these enterprises and sources of parent companies financing R&D in their foreign affiliations in the Czech Republic. At the government and higher education sectors, financing from business enterprise sources includes mainly income from sale of R&D services (orders for R&D) and income from royalties and licence fees for intangible results of R&D;*
- *funds from the* ***government sector – national*** *that come from the state budget or budgets of regions earmarked for R&D performed on the territory of the Czech Republic;*
- *funds from the* ***European Commission and other international organisations****, which include especially revenue from the European Structural Funds. They include also other sources from the EU budget and sources from international organizations outside the EU (CERN, ILL, NATO, UNO, WHO, Norway grants and EEA grants, etc.).*

Besides the aforementioned main sources, also ***other national*** *sources contribute to R&D financing, which comprise mainly own sources of universities and private non-profit institutions originating neither from the state budget, the business enterprise sector, nor from abroad. These sources are insignificant in the CR within the total R&D expenditure.*

Tables ***23****-13 to* ***23****-15* ***Direct government support of research and development***

The tables contain data on direct government support of R&D (Government Budget Allocations for R&D) previously called GBAORD (Government Budget Appropriations or Outlays for R&D). Data for the Czech Republic are available since 2000. Starting with 2010, in relation to the Statistical Business Register, they were extended by further breakdowns such as economic activity (CZ-NACE), size groups, regions (CZ-NUTS), etc.

Statistics of direct government support of R&D is made with annual periodicity based on the Commission Implementing Regulation (EU) No 995/2012 and the methodology provided in the Frascati Manual (OECD, 2002). A list of socio-economic objectives is provided in the NABS classification (Nomenclature for the Analysis and Comparison of Scientific Programmes and Budgets, 1992 revision, Eurostat 1994).

In the Czech Republic, statistics of direct government support of R&D is compiled based on administrative data taken over from the Research and Development and Innovation Information System of the Czech Republic. Data are partially obtained also directly from individual providers of public support of R&D. Statistics of direct government support of R&D takes into account terminology and specification of expenditure pursuant to the Act No 130/2002 on the Support of Research, Experimental Development, and Innovations from Public Funds (as amended).

Direct government support of R&D includes in the case of the Czech Republic all financial sources provided from the state budget to support R&D, including sources flowing to the R&D abroad. According to the valid international methodology, the government support of R&D excludes support of R&D via loans to be repaid, pre-financing of programmes of the EU covered by income from the European Union, and support of innovations.

All data on the total direct government support of R&D from the state budget for the area of research, development, and innovations result from data provided in the State Final Account of the Czech Republic for the area of R&D. It applies to expenditure, which was really drawn for R&D from the state budget in the given year (not to amounts approved in the Act on the State Budget of the CR for the given year).

Table ***23****-16* ***Direct and indirect government support of research and development in private enterprises***

Indirect government support of research and development is applied deduction of expenditure on realization of R&D projects from income taxes of legal and natural persons.

Data on indirect government support of R&D (Government Tax Relief for R&D Expenditure) have been surveyed by statisticians since 2007. Tax returns are the administrative data source. Only legal persons (enterprises) in institutional sectors S.11 and S.12 are surveyed. Information on natural persons (entrepreneurs) is not available.

Indirect government support of R&D is calculated based on the following formula:

Indirect government support of R&D = applied deduction of expenditure on R&D from the tax base x tax rate.

Deductions cannot be applied on services and intangible results of research and development. A complete list of properties/eligible costs can be found in the instruction of the Ministry of Finance (D-288/2005).

Tables ***23****-17* ***Innovating enterprises***

Data on innovations contained in the chapter are obtained based on a statistical survey on innovations in enterprises, which is carried out to map innovation potential of enterprises doing their business in the Czech

Republic. The survey is organized within the EU based on the aforementioned Commission Implementing Regulation (EU) No 995/2012. The statistical survey population includes reporting units of the business enterprise sector with 10+ employees in selected key activities according to the Industrial Classification of Economic Activities "OKEČ" *(the national version of the NACE Rev. 1.1) and starting from 2008 the CZ-NACE Rev. 2.*

The following are subjects of the statistical survey: technical innovation activities (a product innovation a process innovation) and non-technical innovation activities (a marketing innovation, an organisational innovation).

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. Unlike process innovations, product innovations are sold directly to customers.*

A ***process innovation*** *is the implementation of a new or significantly improved production or delivery method or providing of services including delivery, storage, and auxiliary enterprise activities such as maintenance, purchase, accounting or information system. This includes only significant changes in techniques, equipment and/or software aimed at enhancement of quality, efficiency or flexibility of production or reduction of threat (burden) to the environment or security risks.*

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 addressing customer needs better, opening up new markets, or newly positioning an enterprise's product on the market, with the objective of increasing the enterprise's sales. The distinguishing feature of a marketing innovation compared to other changes in an enterprise's marketing instruments is the implementation of a marketing method not previously used by the enterprise.*

An ***organisational innovation*** *is the implementation of a new organizational method in the enterprise's business practices, human resources or external relations. It is a key change in an organizational structure or management methods that have not been used before in the enterprise to improve knowledge sharing, quality or procedures for the conduct of work.*

Innovating enterprises *are enterprises, which during the reporting period implemented at least one of the aforementioned innovations.*

Tables ***23****-18* ***Expenditure on product and process innovations in enterprises and sales of enterprises with product innovation***

Total innovation costs related to product and process innovations in the surveyed period include: ***in-house research and development, purchase of external research and development, acquisition of machinery, equipment, and software*** *(progressive machines, computer hardware specially purchased to implement new or significantly improved products and/or processes),* ***acquisition of other external knowledge*** *(purchase of patent rights and non-patent inventions, licences, know-how, trademarks, software, and other forms of knowledge from other entities in order to use them for company innovations) and since 2012* ***expenditure on other innovation activities*** *(design, training, introduction of innovations to the market, and other activities related to innovations made).*

Total sales of enterprises with product innovation *are sales of innovating enterprises, which introduced product innovation in the surveyed period. They are broken down to* ***sales for innovated products*** *(new on the market, new for the enterprise) and* ***sales for unchanged or slightly modified products*** *(products or services, at which the element of "novelty" is missing and they are not considered to be innovated).*

Table ***23****-19* ***Patents granted in the Czech Republic***

A ***patent*** *is a public deed issued by the relevant patent office, which provides legal protection to an invention for the period of up to 20 years (provided that maintenance fees are paid), namely on the territory for which it was issued by the office. Patent protection on the territory of the Czech Republic is ensured by the Industrial Property Office of the CR (hereinafter referred to as IPO CR).*

Patents are granted for ***inventions****, which are novelties; they are a result of activity of inventors and are industrially applicable. The following can be patented: not only products and technologies, but also chemically produced substances, drugs, industrial production microorganisms, as well as microbiological ways and products obtained by those ways. What cannot be patented, on the contrary, are discoveries or scientific theories, programmes for computers, new cultivars of plants and breeds of animals or ways of surgical or therapeutic treatment of human or animal bodies, and diagnostic methods used at human or animal bodies.*

Patent statistics *brings information about results and successfulness of research, development, and innovation activity in selected areas of technology. Data in this chapter were processed by the CZSO based on data sources of the IPO CR. Patent data are broken down according to the Patent Statistics Manual of the OECD (OECD, Paris 2009). Based on the International Patent Classification (IPC) it is possible to classify granted patents to selected technological areas.*

*Patent data by **way of patent granting** are broken down to national granted patents by the IPO CR or European patents validated in the Czech Republic by the IPO CR. The second possibility is used mainly by foreign applicants.*

*Patent data broken down by **applicant's country of origin** are classified using the so-called fractional method (e.g., if two applicants from different countries file together a patent application, a half of the patent is assigned to each country).*

*Data on the number of patents belonging to domestic entities are further available in the breakdown by institutional sector (the business enterprise, government, and higher education sectors) defined in accordance with the methodology of sector of research and development performance (see definitions in the Notes on Tables **23**-8 to **23**-12 Research and development (R&D)). Private persons are a separate category.*

*Table **23**-20 **Patent licences***

*A **licence** is one of the possibilities to use industrial rights and intellectual property on a commercial basis. A **licence agreement** refers to granting of the right, in an agreed scope and on an agreed territory, for acquisition or provision of patented or non-patented inventions. The licensor entitles the licence acquirer to exercise industrial property rights in an agreed scope and on an agreed territory and the licence acquirer undertakes to provide some payments (licence fees) or other asset.*

*The basic division of licences is according to whether the subject of a licence is **provided** (an active licence) or **acquired** (a passive licence).*

*By subject of a licence there are **patent licences**, the subject of which is to provide the right to use a valid patent either in the country of the acquirer (purchaser) or in countries, to which the acquirer of the licence intends to export the licence product, **utility model licences**, the subject of which is an industrial design or a utility model, **know-how licences**, the subject of which is to provide unprotected production and technical knowledge or experience.*

*The Czech Statistical Office has been surveying data on licences valid on the territory of the Czech Republic in the area of industrial property protection since the year 2005 by the Annual questionnaire on licences. It is an exhaustive survey. From the point of view of dissemination of results of research and development and their capitalization, the most important subjects of licence agreements are provided **patent licences**, on which the CZSO primarily focuses in its survey. Since 2008, all legal persons with a valid patent for the territory of the Czech Republic as at 31 December of the reference year have been **reporting units** in the survey on provided patent licences.*

Data on the number of patent licensors and the value of received royalties and licence fees are always the totals of processed data from collected questionnaires (reports).

*Data on provided patent licences are available in the breakdown by institutional sector (business enterprise, government, and higher education) defined in accordance with the methodology of sectors of research and development performance (see definitions in the Notes on Tables **23**-8 to **23**-12 Research and development (R&D)).*

*Table **23**-21 **External trade in high-tech goods***

***High-tech goods** are goods produced mainly in technology intensive operations. At the same time, development of such products is accompanied by high costs either for innovation and/or for research and development. For the needs of external trade statistics, high-tech goods are defined by the Standard International Trade Classification (SITC).*

In 2010, Eurostat elaborated an updated list of high-tech goods based on the new SITC Rev. 4 classification, which became effective in 2007. According to the SITC Rev. 4, high-tech goods are divided to nine basic aggregations as follows:

- *Electronics-telecommunications,*
- *Electrical machinery,*
- *Pharmacy,*
- *Chemistry,*
- *Aerospace,*
- *Non-electrical machinery,*
- *Scientific instruments,*
- *Computers-office machines,*
- *Armament.*

*Data come from data outputs of external trade statistics (External Trade Statistics Database of the CZSO). More detailed information can be found also in the methodological notes to the Chapter **11** External Trade.*

*Table **23**-22 **Technology balance of payments***

Technology balance of payments monitors sale and purchase of intangible technologies of a given country

in relation to other economies. Data on receipts (or payments) received within external trade with technology express technological level of an economy, i.e. they inform about the scope of external trade with industrial property and knowledge related to advanced technologies.

Basic methodology and concept of ***technology balance of payments statistics****, which comprises external trade with technology, is based on the Technology Balance of Payments Manual (TBP Manual, OECD, 1990).*

Data on exports and imports of technology *come from a direct survey of the CZSO on exports and imports of services. Individual TBP items (receipt/payment items) are defined based on the EBOPS 2010 (the Extended Balance of Payments Services Classification) as follows:*

Computer services *(codes: 261, 262, and 263) – for more see Chapter* ***22*** *Information society.*

Architectural, engineering and other technical services *(code 280) including especially:*

- *architectural services, which include transactions related to the design of buildings;*
- *engineering services, which include the design, development and utilization of machines, materials, instruments, structures, processes and systems. Services of this type involve the provision of designs, plans and studies related to engineering projects;*
- *scientific and other technical services, which include surveying; cartography; product testing and certification; and technical inspection services.*

Research and development *(code 279) including especially:*

- *the provision of research and development services that are made-to-order (customized) and development of non-customized research and development, excluding sales of proprietary rights, and sales related to licences to reproduce or use;*
- *sale of proprietary rights arising from research and development;*
- *exchange and transfer of R&D funds are funds with or without a compensatory return flow of R&D.*

Royalties and licence fees *(code 266; hereinafter referred to as only "licence fees") include charges for the use of proprietary rights, such as patents, trademarks, copyrights, industrial processes and designs, trade secrets, and franchises, where rights arise from research and development.*

Tables ***23****-23 and* ***22****-24* ***Basic indicators of enterprises in high-tech sector***

The group of industries with high technology intensity (hereinafter referred to as ***high-tech sector****) comprises economic activities using for their production advanced technologies in a large extent and the development of their outputs is accompanied by high costs either for innovations and/or for research and development. These economic activities at the same time generate a higher value added.*

The high-tech sector consists of group of activities belonging to high-tech manufacturing and high-tech services. A list of relevant activities was updated by Eurostat in 2010 by means of the Statistical Classification of Economic Activities (NACE Rev. 2), which is valid since 2008. Those businesses are classified to the high--tech sector the prevailing activity of which belongs to the following divisions and groups of the CZ-NACE:

High-tech manufacturing industries *(Table* ***23****-23):*

Manufacture of pharmaceuticals:

division 21 – Manufacture of basic pharmaceutical products and pharmaceutical preparations

Manufacture of computers and electronic components:

group 26.1 – Manufacture of electronic components and boards

group 26.2 – Manufacture of computers and peripheral equipment

Manufacture of consumer electronics and optical instruments:

group 26.3 – Manufacture of communication equipment

group 26.4 – Manufacture of consumer electronics

group 26.7 – Manufacture of optical instruments and photographic equipment

group 26.8 – Manufacture of magnetic and optical media

Manufacture of scientific electronic equipment:

group 26.5 – Manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks

group 26.6 – Manufacture of irradiation, electromedical and electrotherapeutic equipment

Manufacture of aircraft and related machinery:

group 30.3 – Manufacture of air and spacecraft and related machinery

High-tech service industries *(Table* ***23****-24):*

Audio-visual activities:

division 59 – Motion picture, video and television programme production, sound recording and music publishing activities

division 60 – Programming and broadcasting activities

Telecommunications:

division 61 – Telecommunications

IT activities:

division 62 – Computer programming, consultancy and related activities

Information service activities:

division 63 – Information service activities

Research and development:

division 72 – Scientific research and development

*Indicators in these tables, besides R&D expenditure (source: R&D annual survey), were obtained from an annual structural survey of businesses from selected production industries (**SBS – Structural Business Statistics**) providing a more detailed range of final data, which are, however, available with a greater time delay. More detailed information about the data from the annual SBS of selected production industries, including definitions of individual indicators, can be found in the Chapter **15** Industry and in the Chapter **18** Trade, Hotels and Restaurants.*

* * *

Further data can be found on the website of the Czech Statistical Office at:

– www.czso.cz/csu/czso/science_and_research_veda