

8. SCIENCE, RESEARCH, AND INNOVATION

Notes on Tables 8-1 to 8-4 and 8-6

Data on the number of workers in research and development (R&D) were obtained from results of a regular annual statistical survey on research and development covering all economic entities, which carry out R&D activities (systematic and creative work executed in order to acquire new knowledge or to apply it) as their principal or secondary activities irrespective of the number of their employees.

- The **registered number of workers as at 31 December (headcount)** refers to the number of persons, fully or partially active in research and development activities, employed under a contract of employment by the end of the year in the entities monitored. First of all, in the higher education sector and partly also in the general government one, there are large numbers of persons working in R&D, particularly researchers, who are employed, often part time, in more than one entity. Therefore, this indicator does not reflect the actual number of persons employed in R&D in the Czech Republic and the given number of R&D workers is thus overvalued.
- **Researchers** are engaged in or manage projects that encompass a concept or creation of new knowledge, products, processes, methods, and systems. They are mostly science and professional intellectual workers and managers of research and development bodies and institutions.
- Technicians and equivalent staff (technicians and associate professionals; hereinafter only as **technicians**) carry out scientific and technical tasks within R&D activities, apply concepts and operating methods, usually under the supervision of researchers.
- **Other supporting staff** contribute to or are assigned to research and development activities (e.g. craftsmen, secretaries, and clerks). This group also encompasses managers and administrative support workers whose activities provide direct services to R&D.
- The **business enterprise sector** includes 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 **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 individual **research workplaces of the Czech Academy of Sciences** and other public research institutions, places of research under the competence of ministries, which perform R&D as their principal activity. Other types of R&D workplaces in the government sector performing R&D most frequently as their secondary activity are **cultural establishments** (e.g. public libraries, archives, museums), **public health establishments** (except for teaching hospitals) with prevailing income coming from health insurance and **other workplaces**.
- The **higher education sector** comprises all public and private universities and all research institutes, experimental facilities, and clinics working under direct control of or managed by universities. R&D workplaces in the higher education sector in the Czech Republic comprise mainly **individual faculties of 28 public and state universities** and, since 2005, in accordance with the OECD methodology, also **10 teaching hospitals**.

Detailed data and methodological information can be found at:
https://www.czso.cz/csu/czso/statistika_vyzkumu_a_vyvoje (Czech only)

Notes on Table 8-5

Patent statistics brings information about results and successfulness of research, development, and innovation activities in selected areas of technology. Data in the Chapter were processed by the CZSO based on data sources of the Industrial Property Office of the Czech Republic (IPO CR), which ensures patent protection for the territory of the Czech Republic. Patents are granted for inventions, which are novelties, they are a result of activity of inventors, and are industrially applicable. The table contains only data about patent activity of entities operating on the territory of the Czech Republic. Since the reference year 1995, the CZSO has been processing and publishing detailed statistical data on patent activity of domestic entities by means of data on applications for patents submitted to the IPO CR, patents granted in the given year, and on valid patents for the territory of the Czech Republic as at 31 December. Data on patents are classified (broken down) using the so-called fractional method.

- The **inventor** of an invention is a person, who created the invention by his or her own creative work. An inventor or co-inventor can only be a natural person. This person has the right to inventorship, which is a personal right non-transferable to a third person. The inventor, as a person, is given in the patent pending and patent documents and information on the inventor is recorded in a patent register.
- A **patent** is a public deed issued by the competent patent office, which provides legal protection of the invention for the period of up to 20 years, on condition that maintenance fees are paid, on the territory, for which it has been issued by the competent office, e.g. the IPO grants so-called national way patents effective on the territory of the Czech Republic. A patent is applied for by filling a **patent application** at the competent patent office. Patents are granted for inventions, which are new, are results of inventive activities, and can be utilised in industry.
- The **technical solution of a utility model**, which is its essence and is protected by the utility model after the certificate of the utility model registration has been issued, yet may not reach the level of an invention. It is, however, required this solution goes beyond the framework of mere professional skills, is not just a modification of the product resemblance, and has to be applicable on industrial scale. Manufacturing and production processes cannot be protected by the utility model.

Detailed information can be found at: https://www.czso.cz/csu/czso/patentova_statistika (Czech only)

Notes on Tables 8-7 to 8-10

Data on **students of and graduates from science and engineering fields of education** were obtained from data sources of the Ministry of Education, Youth, and Sports, namely from the Union Information from Students' Registers (the "SIMS" database). Data are continually added to the source SIMS database and the database is continually updated, including retrospective corrections. Data published in this Yearbook correspond to the state of processing as at 20 January 2020. Data on university students are always as at 31 December of the relevant year; data on graduates are for the whole school year.

Studies of science and engineering fields of education are defined based on the International Standard Classification of Education: Fields of Education and Training 2013 (ISCED-F 2013), broad fields 05 and 07, which comprise fields of education defined in detail as follows:

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).

Engineering fields of education correspond to the broad field of Engineering, manufacturing and construction (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).

Numbers of students and graduates are given as headcount, i.e. each student is included in a particular piece of data only once, including students who study in more study programmes concurrently. 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.

Notes on Tables 8-11 to 8-13

Science and engineering professionals are a narrow group of experts who within their work activities conduct research, improve or develop concepts, theories and operational methods, and 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 on the Classification of Occupations (CZ-ISCO) containing all groups of occupations of the CZ-ISCO sub-major group 21, which are sources of their main income.

Data on the numbers of science and engineering professionals come from the Labour Force Sample Survey (LFSS). In order to ensure higher reliability and to eliminate considerable year-on-year fluctuations of values for this group of employees, data in the table are provided as three-year moving averages (i.e., for example, the value for 2018 is calculated as an average of values for the years 2017, 2018, and 2019).

Data on wages of science and engineering professionals 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 administrative data source of the Salary Information System of the Ministry of Finance, which exhaustively covers the salary sphere.

More statistical data and methodological information on human resources in the fields of science and technology are available at:

<https://www.czso.cz/csu/czso/lidske-zdroje-ve-vede-a-technologiiich> (Czech only)