R&D personnel

Statistics Explained

Data extracted in January 2026
Planned article update: January 2027

Highlights

The number of full-time equivalent researchers in the EU increased by more than 47.3% between 2014 and 2024, from 1.50 to 2.21 million.

More than half (57.0%) of full-time equivalent researchers in the EU worked in business enterprises, 31.6% in higher education and 10.1% in the government sector in 2024.

This article analyses preliminary data for 2024 on research and development (R&D) personnel, researchers , human resources in science and technology (HRST) and doctorate/PhD students in the European Union (EU) . Statistics on science and technology personnel are key indicators for measuring the knowledge-based economy and its developments, for example, providing information on the supply of and demand for, highly qualified science and technology specialists.

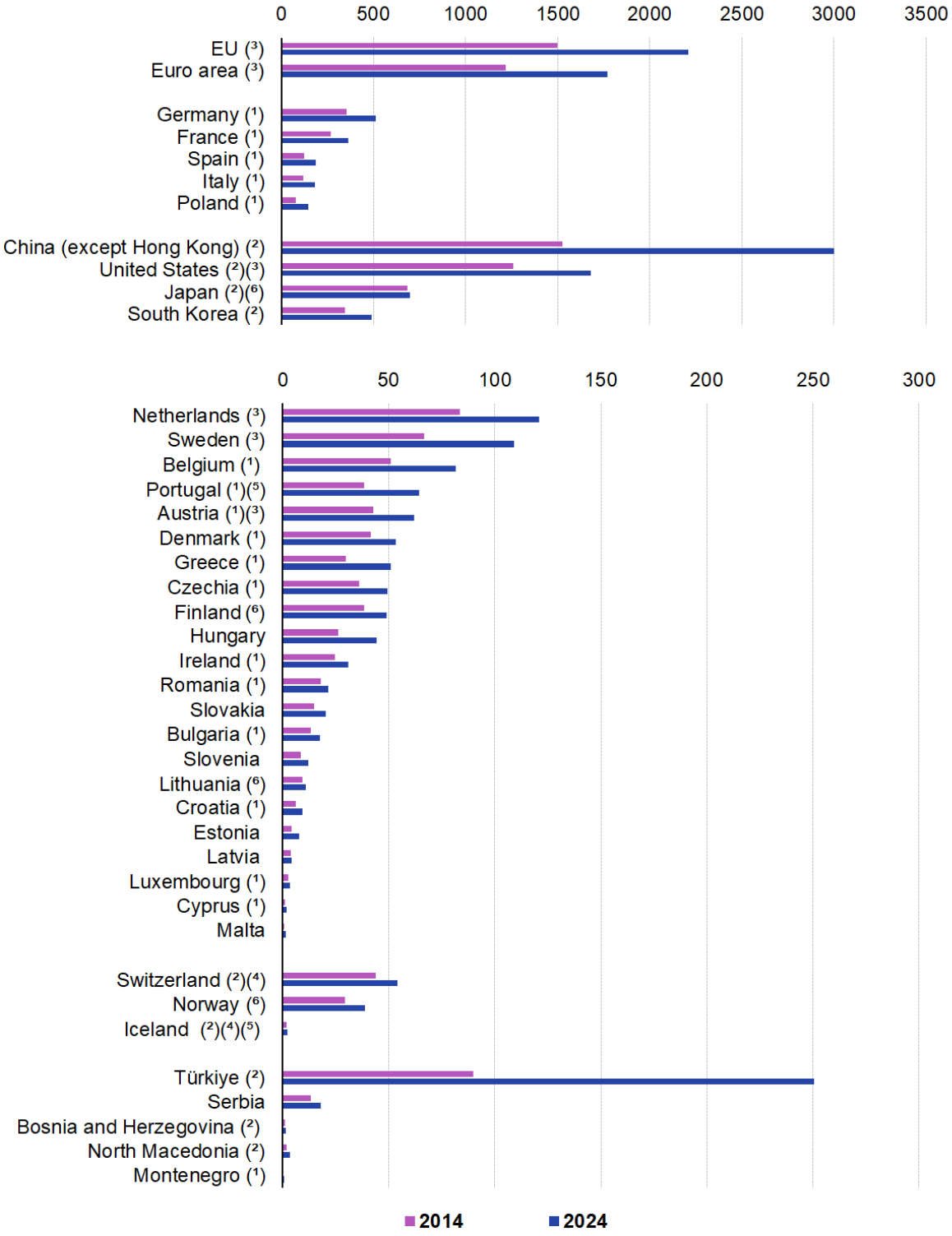
Researchers

The number of researchers in the EU has increased in recent years: there were 2.15 million researchers (in full-time equivalents (FTE)) employed in the EU in 2024 (see Figure 1), which marked an increase of 679 000 when compared with 2014. The number of researchers (FTE) increased strongly in Poland (+82.7%) and Cyprus (+81.2%). Moreover, it increased by more than 60% in Greece (70.1%), Hungary (68.7%), Portugal (68.2%), Sweden (63.9%) and in Belgium (60.7%) between 2014 and 2024. At the opposite end of the range, with small growth rates were Latvia (15.8%) and Lithuania (17.7%).

Among the non-EU member countries shown in Figure 1, the number of researchers in China (excluding Hong Kong) reached 3.01 million in 2023. There was a rapid growth noted in China, where the number of researchers more than doubled compared with 2013. South Korea also recorded a rapid increase in the number of researchers (up overall by 52.3%) between 2013 and 2023. In the United States the growth rate was 38.3% (between 2013 and 2022). The number of researchers rose by 5.9% in Japan between 2013 and 2023. Among the candidate countries, the number of researchers in Türkiye more than doubled during the period 2013-2023.

Number of researchers, 2014 and 2024

(thousand full-time equivalents)



Note: The figure is split into two parts with different y-axes.

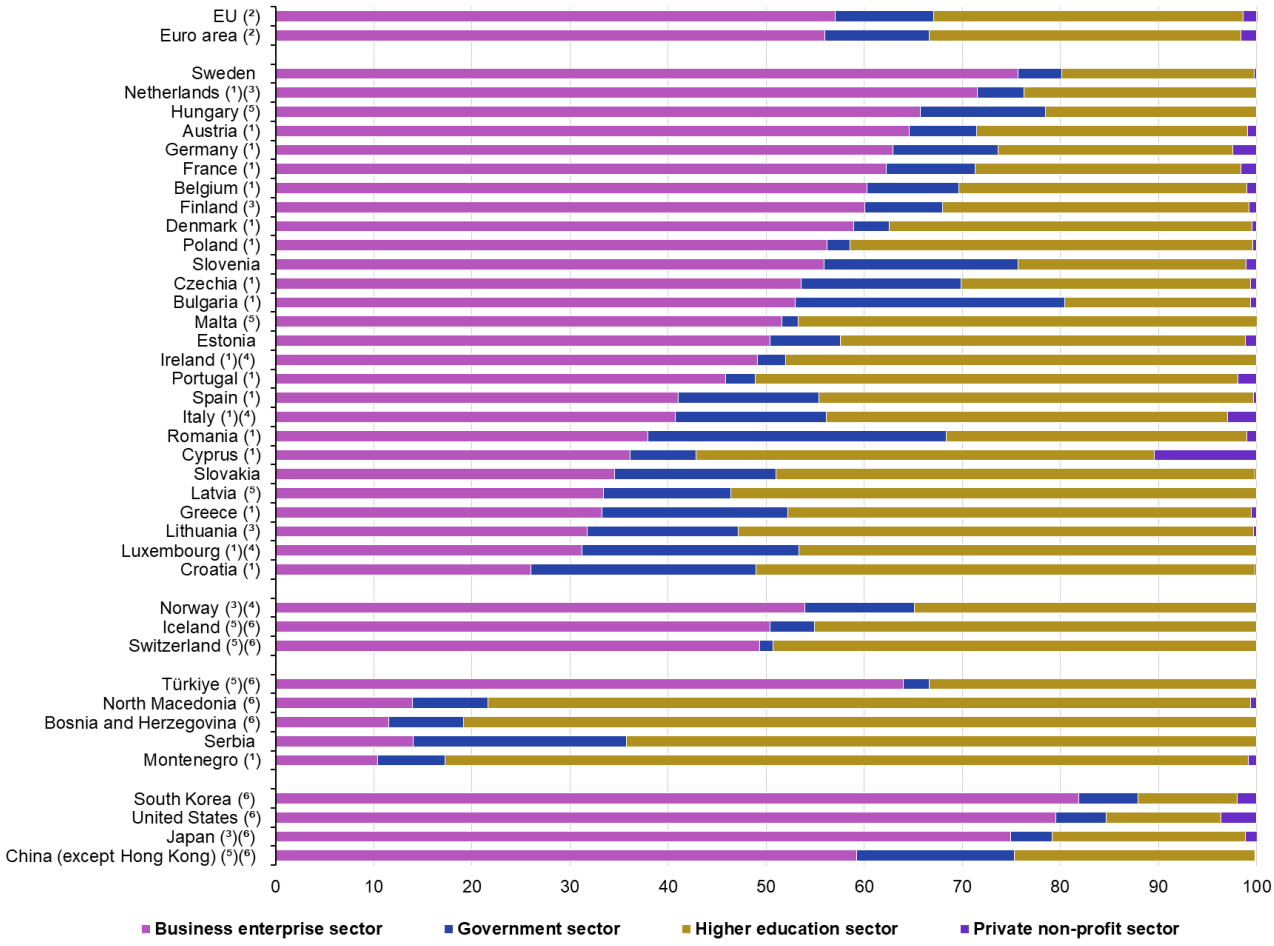
(1) 2024 provisional
(2) 2024 data not available, closest reference year used instead
(3) estimates
(4) 2014 data not available, closest reference year used instead
(5) break in time series
(6) definition differs

Source: Eurostat (online data code: rd_p_persocc) and OECD database

Figure 1: Number of FTE researchers, 2014 and 2024 Source: Eurostat (rd_p_persocc) and OECD database

An analysis of R&D personnel by sector in 2024 (see Figure 2) shows that in the EU there was a high concentration of researchers in the business enterprise sector (57.0%) and the higher education sector (31.6%), while 10.1% of the total number of researchers were working in the government sector . The relative importance of the different sectors varied considerably across the EU countries, with the business sector accounting for three-fifths or more of all researchers in Sweden, the Netherlands, Hungary, Austria, Germany, France, Belgium and Finland. By contrast, the countries with the highest share of researchers working in the government sector were Romania (30.4%), Bulgaria (27.5%), Croatia (23%) and Luxembourg (22.1%). A majority of researchers working in Latvia (53.6%), Lithuania (52.5%) and Croatia (50.8%) were employed within the higher education sector. This sector also accounted for a high share (although less than 50%) of all researchers in Portugal, Slovakia, Ireland, Greece, Malta, Cyprus, Luxembourg, Spain and Estonia. In terms of its number of researchers, the private non-profit sector was the smallest in all EU countries, its highest share (10.4% of all researchers) was recorded in Cyprus, while the next highest shares were in Italy (2.9%) and Germany (2.4%). In the remaining 21 countries for which the data for this sector are available, it ranged between 0.0% and 1.9%.

Researchers by sector, 2024
(% of total number of researchers, based on full-time equivalents, ordered by % in the business enterprise sector)



(¹) provisional
(²) all sectors estimated
(³) at least for one sector definition differs
(⁴) at least for one sector estimated
(⁵) PNP sector not available
(⁶) 2024 data not available, closest reference year used instead

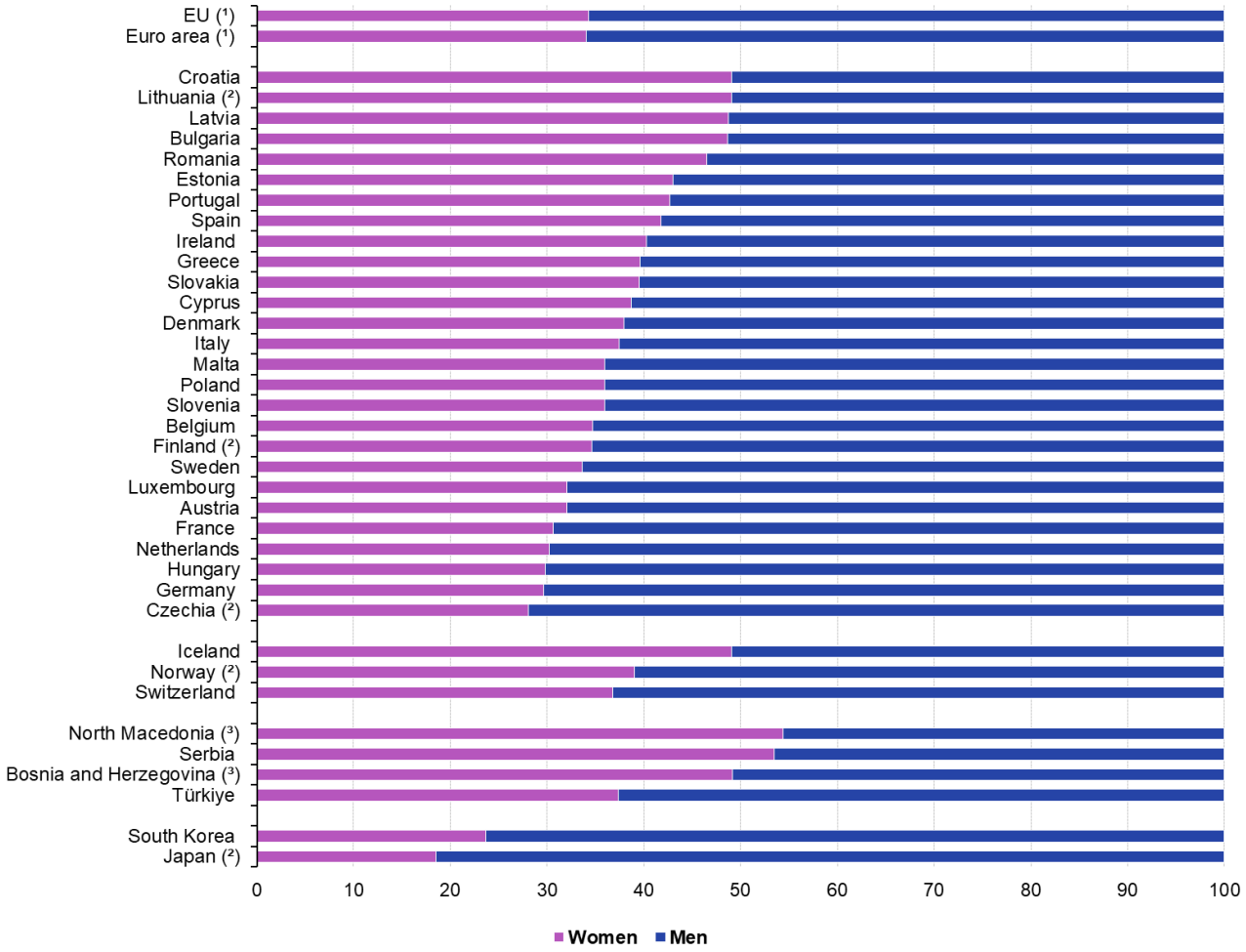
eurostat

Figure 2: Researchers by sector, 2024 Source: Eurostat (rd_p_persocc) and OECD database

An analysis by sex shows that men accounted for approximately two-thirds (65.7%) of the EU's researchers in 2023

(expressed in head count). The share of women in the total number of researchers was close to parity in Croatia, Lithuania, Latvia, Bulgaria and Romania, all above 45% (see Figure 3). The gender gap was the largest in Czechia, Hungary and Germany where women made up less than 30% of all researchers.

Researchers by sex, 2023
(% of total number of researchers, based on head count, ordered by % of women)



(¹) estimated
(²) definition differs
(³) 2023 data not available, closest reference year used instead

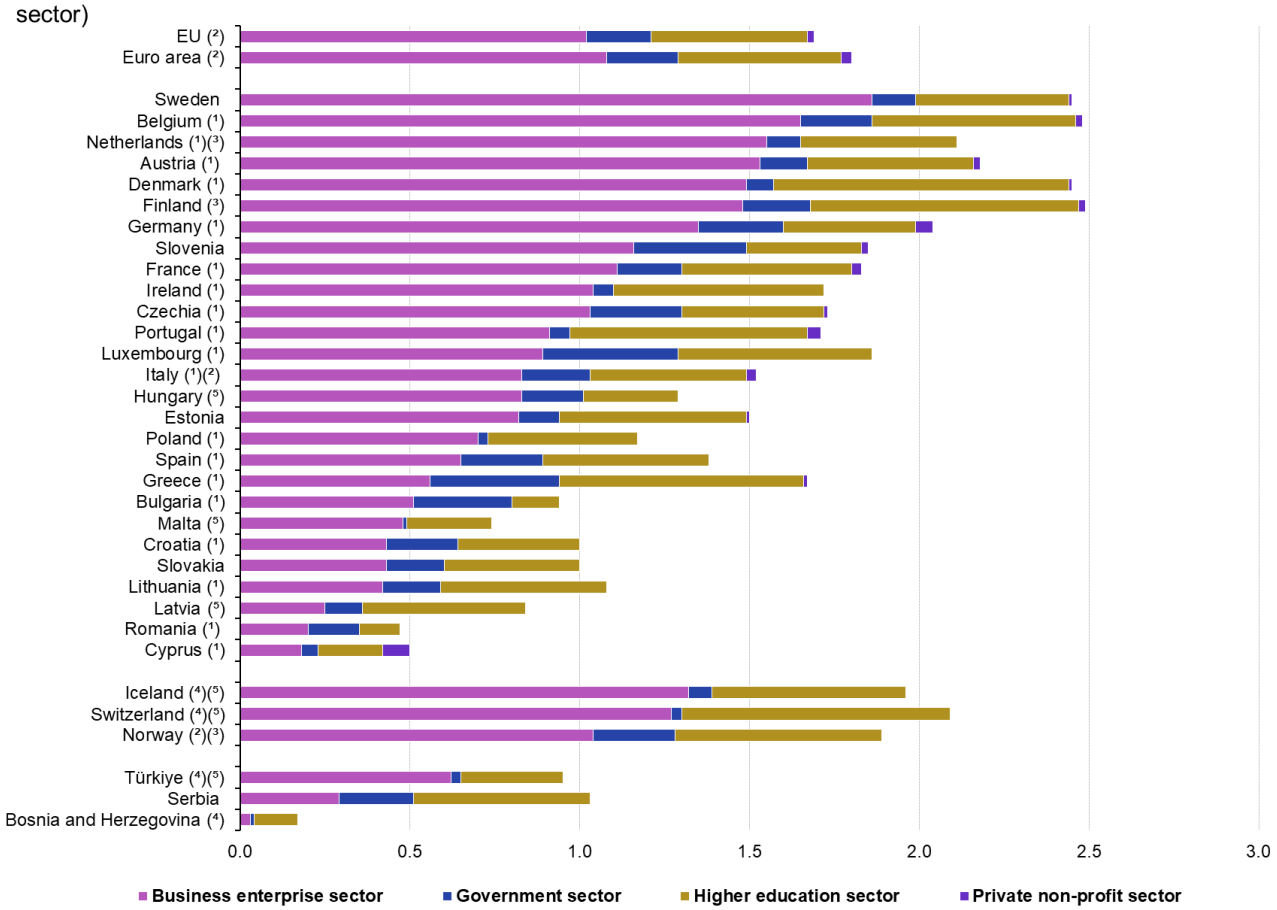
Source: Eurostat (online data code: rd_p_persocc) and OECD database

Figure 3: Researchers by sex, 2023 Source: Eurostat (rd_p_persocc) and OECD database

R&D personnel

R&D personnel in all sectors together accounted for more than 2.0% of the total employment in Sweden, Belgium, Denmark, Finland, Austria, Netherlands, and Germany compared with an EU average of 1.7%. (Note: these figures are based on information in full-time equivalents.) Aside from the above countries mentioned, the share of R&D personnel in the total employment ranged from 0.5% in Romania and Cyprus to 1.9% in Slovenia (see Figure 4).

R&D personnel by sector, 2024
(% of total employment, based on full-time equivalents, ordered by % in the business enterprise sector)



(¹) provisional
(²) estimated
(³) at least for one sector, definition differs
(⁴) 2024 data not available, closest reference year used instead
(⁵) PNP sector not available

Source: Eurostat (online data code: rd_p_perslf)

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Figure 4: R&D personnel by sector, 2024 Source: Eurostat (rd_p_perslf)

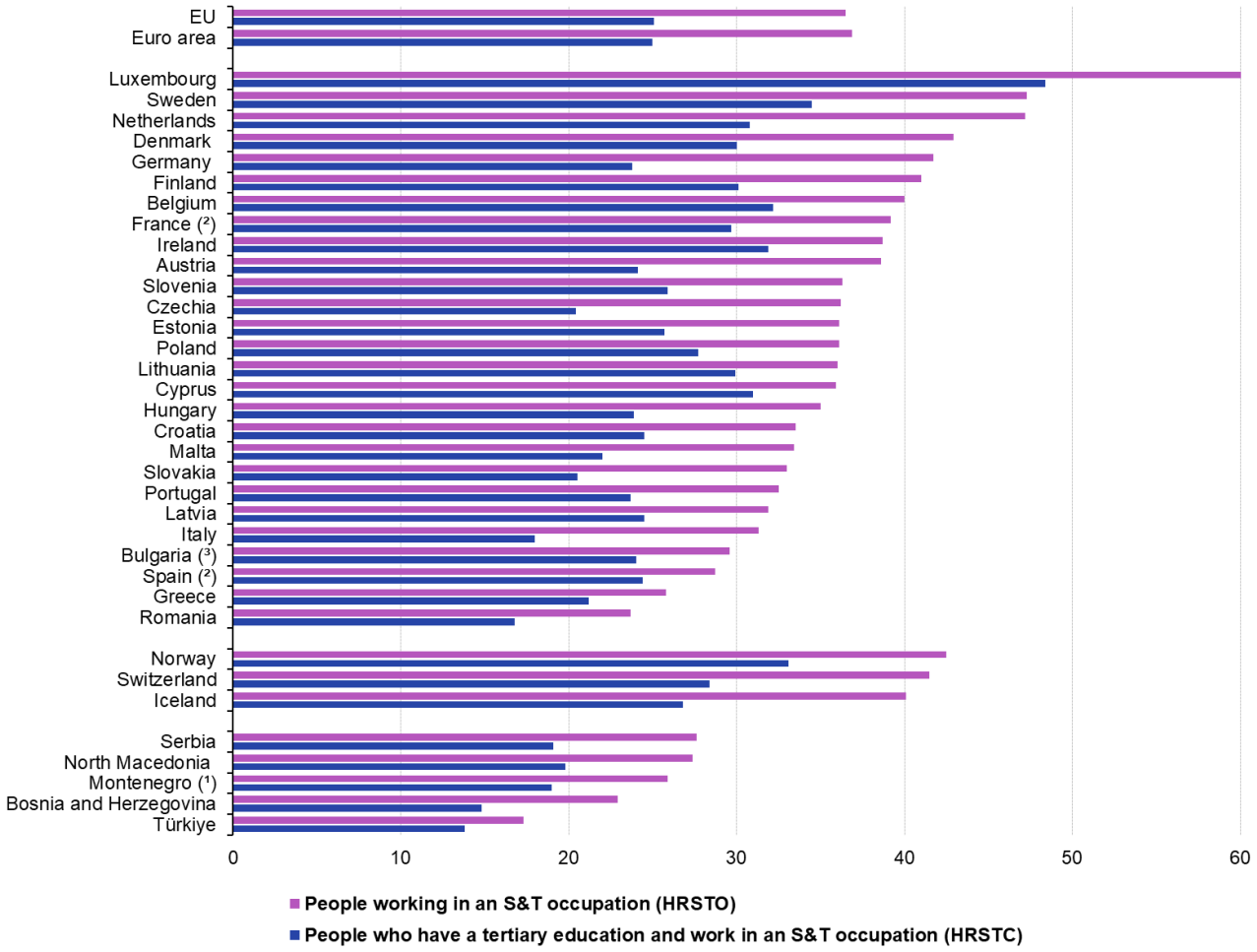
Human resources in science and technology

Human resources in science and technology (HRST) provide information concerning the demand for and the supply of people with high qualifications in science and technology. Around 80.1 million people in the EU were employed in science and technology (S&T) occupations in 2024, this made up one-third (36.5%) of the total labour force aged 15-74 years (see Figure 5). Persons in S&T occupations accounted for well over half of the total labour force in Luxembourg (60.2%) in 2024 and for more than two fifths in Sweden (47.3%), the Netherlands (47.2%), Denmark (42.9%), Germany (41.7%), Finland (41.0%) and Belgium (40.0%). By contrast, the lowest shares of people working in science and technology occupations were recorded in Romania (23.7%), Greece (25.8%), Spain (28.7%) and Bulgaria (29.6%).

The concept of human resources in science and technology in the Canberra manual is based on a broad understanding of science. HRST by education covers all fields of study, in other words anybody who successfully completed a tertiary level education . The HRST 'core' (HRSTC) — which is made up of people who possess a tertiary level education and who are employed in science and technology occupations — amounted to 55.2 million persons in 2024 across the whole EU and accounted for one-quarter (25.1%) of the total labour force. Concerning the HRST 'core', Romania (16.8%), Italy (18.0%), Czechia (20.4%) and Slovakia (20.5%) were the EU countries reporting the lowest figures of their labour force in that category in 2024. At the other end of the scale, HRSTC

accounted for more than one-quarter of the labour force in Luxembourg (48.4%), Sweden (34.5%), Belgium (32.2%), Ireland (31.9%), Cyprus (31.0%), the Netherlands (30.8), Finland (30.1%), Denmark (30.0%), Lithuania (29.9%), France (29.7%), Poland (27.7%), Slovenia (25.9%) and Estonia (25.7%) (see Figure 5).

Human resources in science and technology, 2024
(% of active population aged 15-74 years, ordered y % of HRSTO)



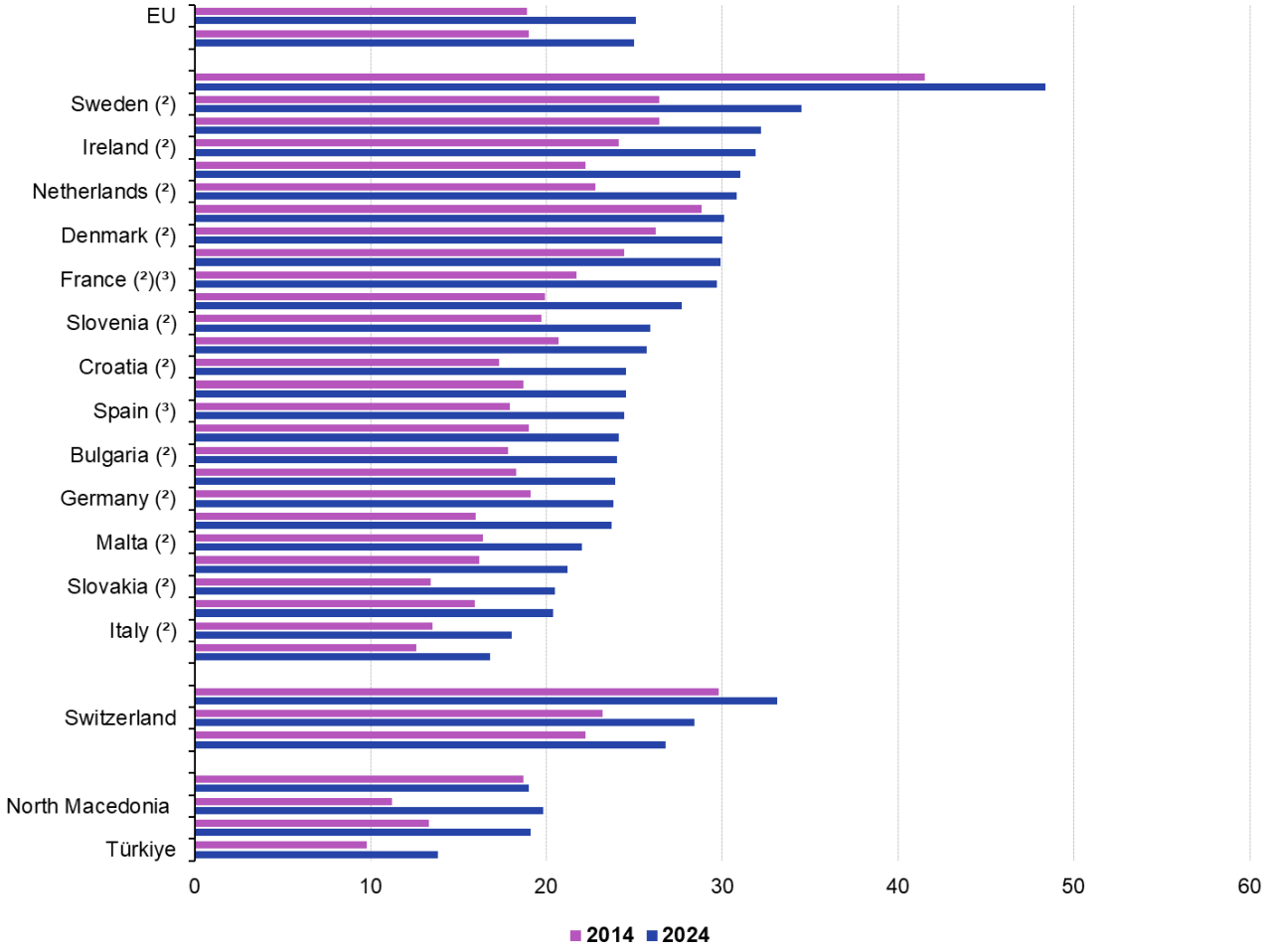
Note: general break in series occuring in all the countries due to revision of ISCED classfication in 2014.
(¹) 2024 data not available, closest reference year used instead
(²) definition differs
(³) break in time series
Source: Eurostat (online data code: hrst_st_ncat)

eurostat

Figure 5: Human resources in science and technology, 2024 Source: Eurostat (hrst_st_ncat)

Between 2014 and 2024 there was a considerable increase in the relative importance of people classified as HRST 'core' within the EU's labour force, as their share rose by 6.2 percentage points (pp) (see Figure 6) from 18.9% to 25.1% in 2024. In fact, this share increased in all EU countries. The largest increases in the relative importance of the HRST core workforce were recorded in Cyprus (8.8 pp), Sweden (8.1 pp), the Netherlands and France (both with 8.0 pp), Poland and Ireland (both with 7.8 pp)Portugal (7.7 pp), Croatia (7.2 pp), Slovakia (7.1 pp) and Luxembourg (6.9 pp).

People with tertiary education and employed in science and technology, 2014 and 2024
(% of active population aged 15-74 years)



Note: general break in series occuring in all the countries due to revision of ISCED classfication in 2011
(¹) 2024 data not available, closest reference year used instead
(²) break in time series
(³) definition differs

eurostat

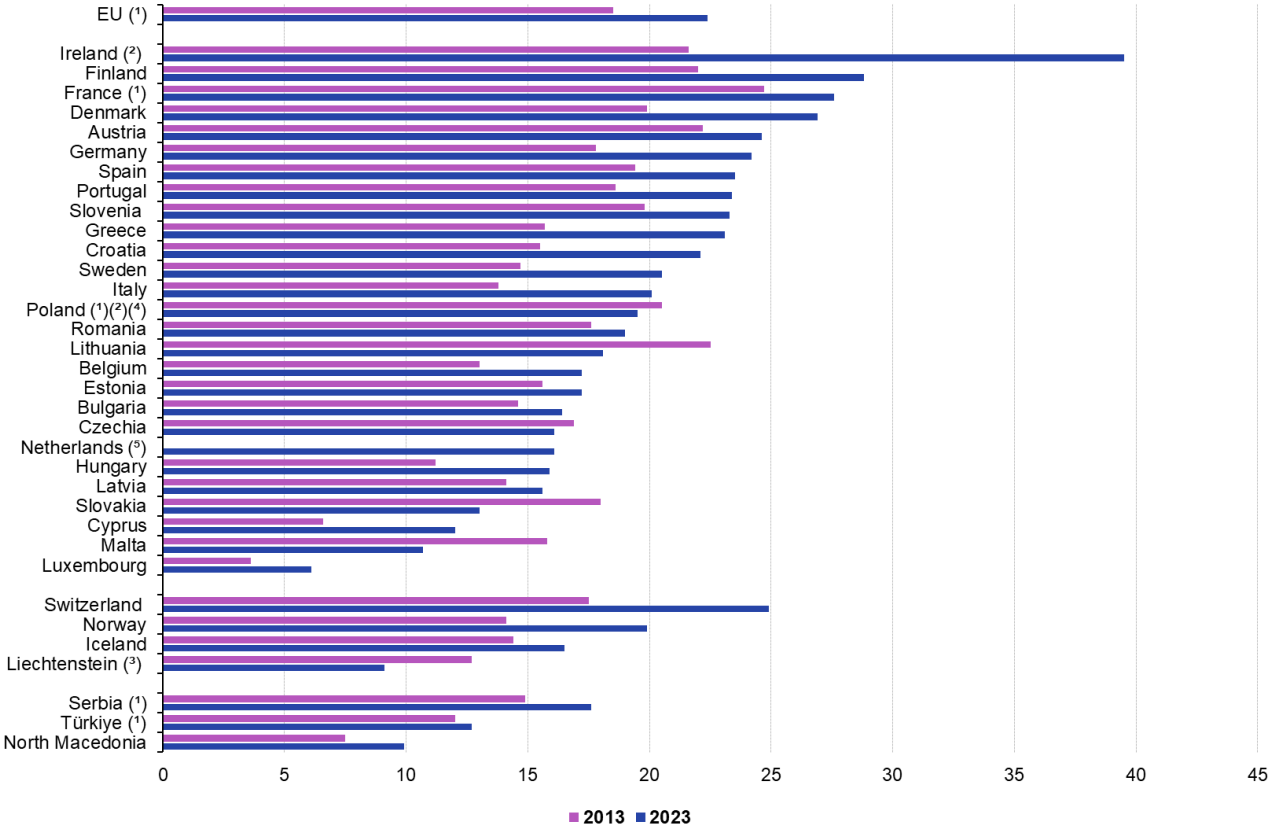
Figure 6: People who have a tertiary education and work in a science and technology occupation, 2014 and 2024 Source: Eurostat (hrst_st_ncat)

Science and technology graduates

Moving away from the broad definitions of HRST, Figures 7 and 8 look at the international standard classification of education (ISCED) levels 5-8 (tertiary education) in the field of science and technology covering natural sciences, mathematics and statistics; information and communication technologies; engineering, manufacturing and construction. Within the EU (2023 data), there were 22.4 graduates of these science and technology fields of education per 1 000 persons aged 20 to 29 years. Among the EU countries (2023 data), relatively high ratios — above 20.0 graduates per 1 000 persons aged 20 to 29 years — were recorded in Ireland, Finland, France, Denmark, Austria, Germany, Spain, Portugal, Slovenia, Greece, Croatia, Sweden and Italy. In Ireland this ratio peaked at 39.5 graduates per 1 000 persons aged 20 to 29 years. This indicator should be interpreted cautiously because graduates are typically counted where they complete their studies, including non-resident or internationally mobile graduates who may return to their home country, after their graduation. Countries that host many international students may therefore record higher values, whereas countries whose residents earn degrees abroad may record lower values. This may explain the particularly low values inin some of the smallest EU countries, namely Luxembourg (6.1 graduates from science and technology fields of education per 1 000 persons aged 20 to

29), Malta (10.7) and Cyprus (12.0).

Science and technology graduates, 2013 and 2023
(tertiary graduates levels 5-8, in science and technology* per 1 000 persons aged 20-29 years)



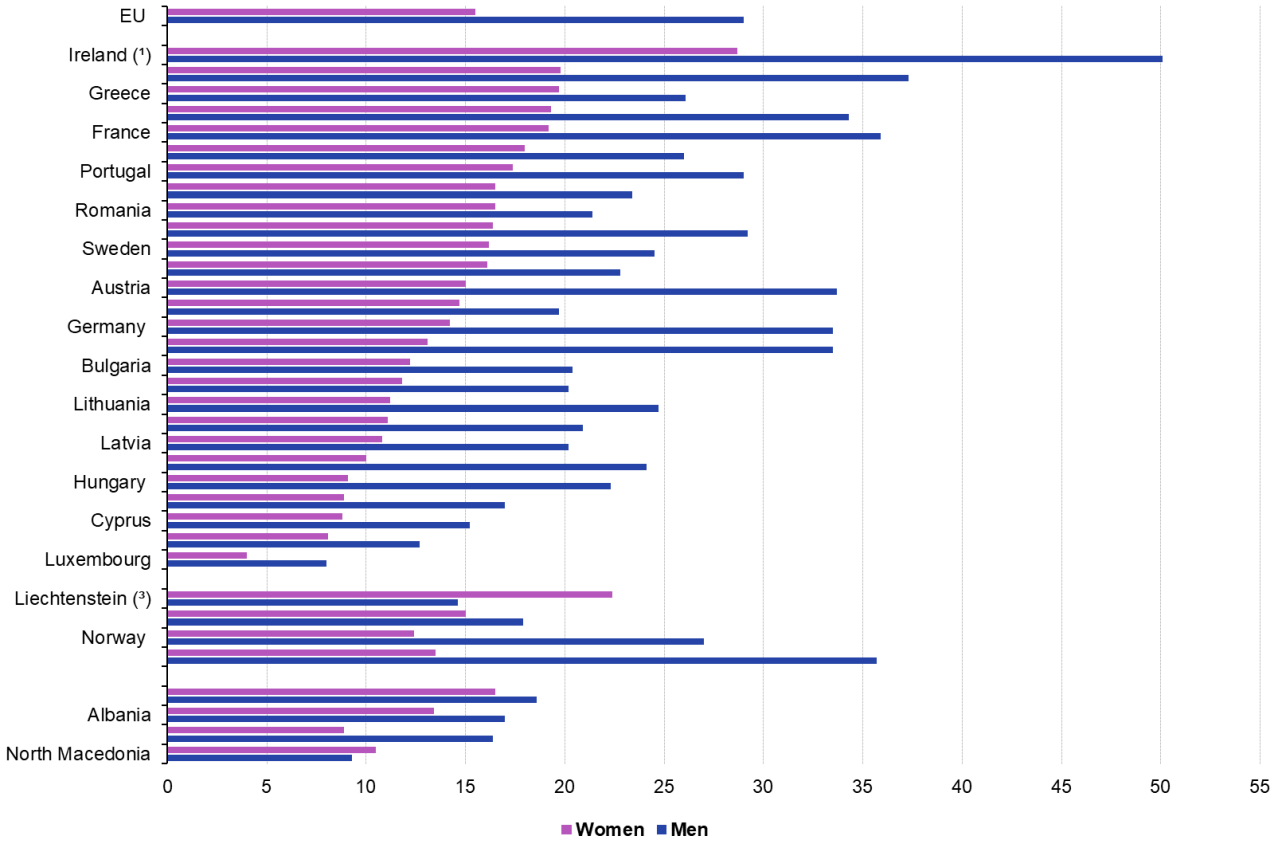
* Science and technology: natural sciences, mathematics and statistics; information and communication technologies; engineering, manufacturing and construction.
(¹) 2013 data not available, closest reference year used instead
(²) definition differs
(³) 2023 data not available, closest reference year used instead
(⁴) estimated
(⁵) data not available
Source: Eurostat (online data code: educ_uoe_grad04)

eurostat

Figure 7: Science and technology graduates, 2013 and 2023 Source: Eurostat (educ_uoe_grad04)

An analysis by sex of graduates in natural sciences, mathematics and statistics; information and communication technologies; engineering, manufacturing and construction shows that men (aged 20-29 years) are more likely to graduate in these fields than women. In 2023, the EU registered 29.0 male tertiary graduates in science and technology per 1 000 men aged 20-29 years and 15.5 female tertiary graduates per 1 000 women of the same age, a difference of 13.5 per 1 000. A gender gap was observed in all EU countries in 2023, ranging from 4.0 per 1 000 in Luxembourg, 4.6 per 1 000 in Malta and 4.9 per 1 000 in Romania to 21.4 per 1 000 in Ireland.

Science and technology graduates by sex, 2023
(tertiary graduates levels 5-8, in science and technology* per 1 000 persons aged 20-29 years)



Note: ranked on the ratio of female graduates per 1 000 persons aged 20-29 years.
* Science and technology: natural sciences, mathematics and statistics; information and communication technologies; engineering, manufacturing and construction.
(1) definition differs
(2) estimated
(3) 2023 data not available, closest referece year used instead

eurostat

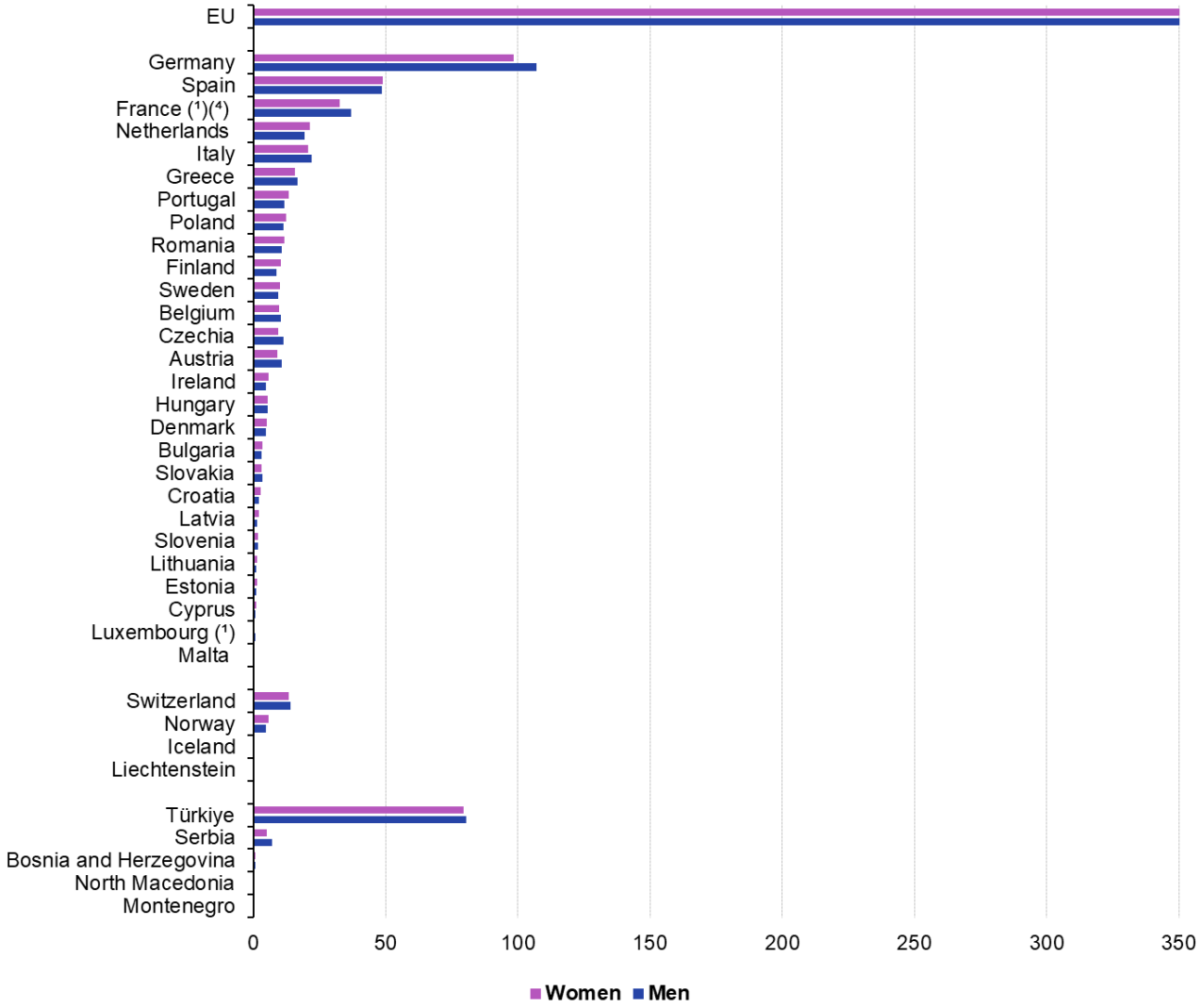
Figure 8: Science and technology graduates by sex, 2023 Source: Eurostat (educ_uoe_grad04)

Doctoral students

A similar but more specific measure of a country's potential research capability is provided by the number of doctoral (PhD) students (see Figure 9). In 2023, there were an estimated 721 000 doctoral students in the EU. Women accounted for slightly less than half (an estimated 49.4%) of doctoral students in the EU in 2023.

The gender split of doctoral students across the EU countries was typically quite balanced: women accounted for more than half of all the doctoral students in 16 out of the 27 EU countries in 2023, their share peaking at 61.0% in Latvia, 56.9% in Cyprus and at 56.5% in Lithuania. Among the 11 EU countries where a higher number of male than female PhD
students was observed, the share of men peaked at 57.0% in Luxembourg, 55.3% in Czechia and at 54.0% in Austria.

Number of PhD students by sex, 2023
(thousands)



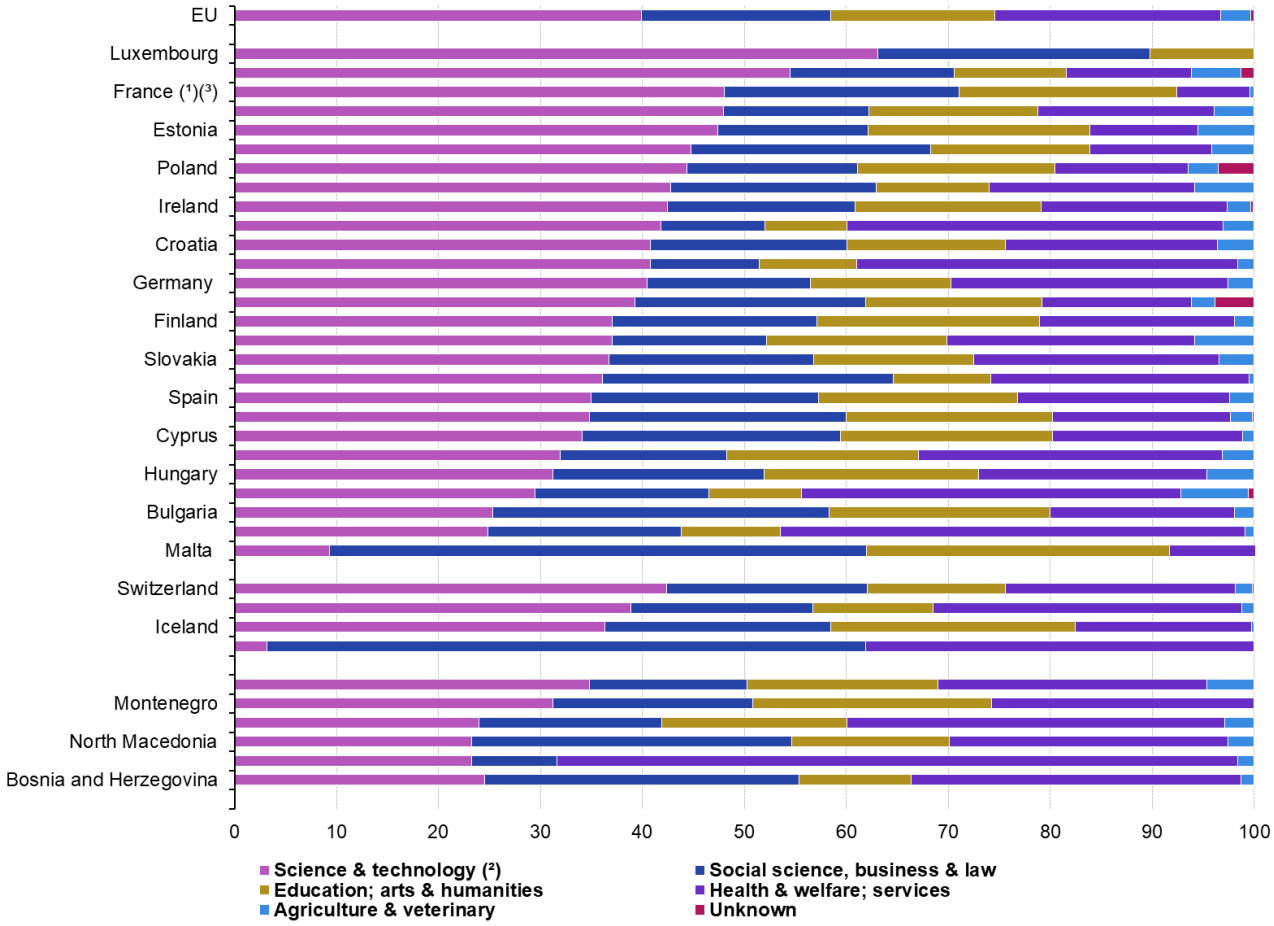
Note: ranked on the total number of PhD students (men and women combined).
(¹) definition differs
(²) 2023 data not available, closest referebce year used instead
(³) estimates
(⁴) break in time series
Source: Eurostat (online data code: educ_uoe_enrt01)

Figure 9: Number of PhD students by sex, 2023 Source: Eurostat (educ_uoe_enrt01)

In relative terms, the broad group covering science and technology accounted for 39.9% of the doctoral students in the EU in 2023 (Figure 10).

Among the EU countries, natural sciences, mathematics and statistics; information and communication technologies; engineering, manufacturing and construction fields of education accounted for more than half of all doctoral students only in Luxembourg (63.1%) and Italy (54.5%). These fields were also very popular among students in France, Czechia, Estonia, Lithuania, Poland, Belgium, Ireland, Denmark, Croatia, Sweden and Germany where the shares ranged between 48.0% and 40.5%. The lowest proportion of PhD students in S&T fields of education was recorded in Malta (9.3%), Latvia (24.8%) and Bulgaria (25.3%). Among the remaining doctoral fields in the EU, the largest shares were health, welfare and services (22.2%), social science, business and law (18.5%) education, arts and humanities (16.0%), and agriculture and veterinary (2.9%).

PhD students by field of education, 2023
(% of total PhD students, ordered by % in sciences & technologies)



Note: Generic programmes and qualifications have been omitted because it is 0 for all countries.
(1) definition differs
(2) Science and technology: natural sciences, mathematics and statistics; information and communication technologies; engineering, manufacturing and construction.
(3) break in time series
(4) 2023 data not available, closest reference year used instead
Source: Eurostat (online data code: educ_uoe_enrt03)

Figure 10: PhD students by field of education, 2023 Source: Eurostat (educ_uoe_enrt03)

Source data for tables and graphs

- R & D personnel: tables and figures

Data sources

R&D personnel

Statistics on R&D personnel are compiled using guidelines laid out in the 7thedition of the Frascati manual , published in 2015 by the OECD ; the manual was updated with improved guidelines reflecting changes in the way that R & D is funded and carried out — see the Frascati manual 2015 .

R&D personnel include all persons employed directly within R&D, as well as persons supplying direct services (such as managers, administrative staff and clerical staff). For statistical purposes, indicators on R&D personnel are compiled as both head counts (HC) and as full-time equivalents (FTEs).

Researchers are a subcategory of R&D personnel and 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 (Frascati manual 2015, pp 162, paragraph 5.35).

Human resources in science and technology (HRST)

Statistics on human resources in science and technology (HRST) are compiled using guidelines laid out in the Canberra manual, prepared in cooperation between the OECD, European Commission , UNESCO and the International Labour Organisation (ILO) and published in 1995. HRST data can be analysed by sex, age, region, sector of activity, occupation, educational attainment and fields of education (although not all combinations are possible). Data relating to stocks of HRST provide information on the number of HRST at a particular point in time, these stock data relate to the employment status as well as the occupational and educational profiles of individuals.

HRST based on education (HRSTE) are persons having successfully completed tertiary education, defined as levels 5, 6, 7 or 8 of the 2011 version of the international standard classification of education (ISCED) . Previously it was defined as levels 5 (a or b) or 6 of the 1997 version of ISCED.

HRST based on occupation (HRSTO) are persons who are employed in science and technology occupations as 'professionals' or 'technicians and associate professionals' within the International Standard Classification of Occupations (ISCO) .

Persons who fulfil both the education and the occupation criteria are classified as the HRST 'core' (HRSTC).

Information on HRST flows from education are obtained from a UNESCO/OECD/Eurostat questionnaire on education and can be used to provide a measure of the current and future supply of HRST from the education system, in terms of actual inflows (graduates from the reference period) and potential inflows (students participating in higher education during the reference period).

Science, technology and innovation

Since the beginning of 2021, the collection of R&D statistics is based on Commission Implementing Regulation (EU) No 1197/2020 of 30 July 2020. Statistics on science, technology and innovation were collected based on Commission Implementing Regulation (EU) No 995/2012 concerning the production and development of Community statistics on science and technology until the end of 2020.

Science and technology graduates are defined as the number of new graduates from all public and private institutions completing science and technology related graduate and postgraduate studies in the reference year. To facilitate comparisons, the number of graduates may be expressed relative to the total number of persons aged 20-29 years and 25-29 years.

Doctoral students

Indicators based on the number of doctoral (PhD) students give an idea of the extent to which countries will have researchers at the highest level of education in the future. The data relate to the number of students in the reference year, they do not refer to the number of new graduates or to the total number (stock) of graduates in the labour market that year. The number of doctoral students is measured as students enrolled in ISCED 2011 level 8: this level concerns tertiary programmes which lead to the award of an advanced research qualification. Programmes at this ISCED level are devoted to advanced study and original research and are typically offered only by research-oriented tertiary educational institutions such as universities. Doctoral programmes exist in both academic and professional fields.

Context

The European Research Area (ERA) is composed of all research and development activities, programmes and policies in Europe which involve a transnational perspective and researchers' mobility.

The recent document Political Guidelines for the next European Commission 2024-2029 , put investment in R&D 'at the centre of our economy. We will increase our **research spending** to focus more on strategic priorities [...]. Europe must also be at the cutting edge between emerging science, tech and industry, the nexus that will make this tech revolution faster and more transformative.'

These Political Guidelines reconfirm the May 2021 Communication Global Approach to Research and Innovation adopted by the European Commission (Communication on a Global Approach to Research and Innovation — Europe's strategy for international cooperation in a changing world (COM(2021) 252 final)) and the Communication on 'A new ERA for Research and Innovation' (COM/2020/628 final).

These programmatic documents underline the EU's desire to play a leading role in supporting international research and researchers' mobility, while delivering innovative solutions that support green and digital solutions in line with the sustainable development goals. It engages the EU to promote resilience, prosperity, competitiveness, economic and social well-being.

These documents reiterate the European Commission adopted Communication of May 2008 to launch an initiative titled, *Better careers and more mobility: a European partnership for researchers* (COM(2008) 317 final). The goal of this initiative was to improve the mobility of researchers and to enhance the diffusion of knowledge throughout Europe, by balancing demand and supply for researchers at a European level, helping create centres of excellence and improving the skills of researchers in Europe.

With this in mind, the EU and its Member States set-up a pan-European initiative — EURAXESS: researchers in motion — which is designed to deliver information and support researcher mobility and career development, while enhancing scientific collaboration between Europe and the world. The same gateway is also used to promote the European Commission's initiative titled *Science4Refugees* , which is designed to help refugee researchers find jobs and to support refugee scientists in finding European researchers with whom they may discuss problems, find solutions and study together.

In December 2008, the Competitiveness Council adopted a definition for a 2020 vision for the ERA . According to the opening statement of this vision, all players should benefit from: the 'fifth freedom', introducing the free circulation of researchers, knowledge and technology across the ERA; attractive conditions for carrying out research and investing in R & D intensive sectors; Europe-wide scientific competition, together with the appropriate level of cooperation and coordination. This vision is part of the wider goals contained within the Europe 2020 strategy for smart, sustainable and inclusive growth.

In 2018 the Commission proposed an ambitious € 100 billion research and innovation programme - Horizon Europe - to succeed Horizon 2020. Horizon Europe was subsequently adopted and launched for 2021–2027 with a budget of around € 95.5 billion in current prices (including NextGenerationEU funding).

The Marie Sklodowska-Curie actions , aim to support the career development and training of researchers — with a focus on innovation skills — in all scientific disciplines through worldwide and cross-sector mobility.

Explore further

Other articles

- Human resources in science and technology
- R&D expenditure

Database

- Science and technology (scitech) , see:

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Statistics on research and development (rd)
R & D personnel at national and regional level (rd_p)
Human Resources in Science & Technology (hrst)
Stocks of HRST at national and regional levels (hrst_st)
Flows of HRST at national level (hrst_fl)

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Total researchers by sectors of performance - head count (tsc00003)
Total researchers by sectors of performance - full time equivalent (tsc00004)
Research and development personnel, by sectors of performance (tsc00002)
Share of women researchers, all sectors (tsc00006)
Share of women researchers, by sectors of performance (tsc00005)

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Doctorate students in science and technology fields (tsc00028)

- Education and training (t_edec)

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Science and technology graduates by sex (tps00188)

Thematic section

- Science, technology and innovation
- Education and training

Publications

- Key figures on Europe – 2025 edition
- Key figures on European business: 2024 edition
- Eurostat regional yearbook — 2025 edition
- Science, technology and innovation in Europe (Pocketbook — 2013 edition)
- Science, technology and innovation in Europe (Pocketbook — 2012 edition)
- Science, technology and innovation in Europe (Pocketbook — 2011 edition)
- Science, technology and innovation in Europe (Pocketbook — 2010 edition)
- Science, technology and innovation in Europe (Statistical book — 2010 edition)

Methodology

- Statistics on research and development (rd) (ESMS metadata file — rd_esms)
- Human resources in science & technology (hrst) (ESMS metadata file — hrst_esms)
- Education administrative data from 2013 onwards (ISCED 2011) (ESMS metadata file — educ_uoe_enr_esms)

External links

- European Commission — Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs Internal Market, Industry, Entrepreneurship and SMEs
- European Commission — Directorate-General for Research and Innovation — Science with and for society
- European Commission — EURAXESS — EURAXESS - researchers in motion
- European Commission — EU budget: Commission proposes most ambitious Research and Innovation programme yet
- European Commission — - European Commission
- European Commission — Joint Research Centre (JRC) — The EU Industrial R & D Investment Scoreboard
- Research and Development Statistics | OECD

Legislation

- Commission Implementing Regulation (EU) No 1197/2020 of 30 July 2020.
- Regulation (EU) No 2152/2019 of the European Parliament and of the Council of 27 November 2019 on European business statistics, repealing 10 legal acts in the field of business statistics (Text with EEA relevance)
- Regulation (EU) No 995/2012 of 26 October 2012 implementing Decision 1608/2003/EC