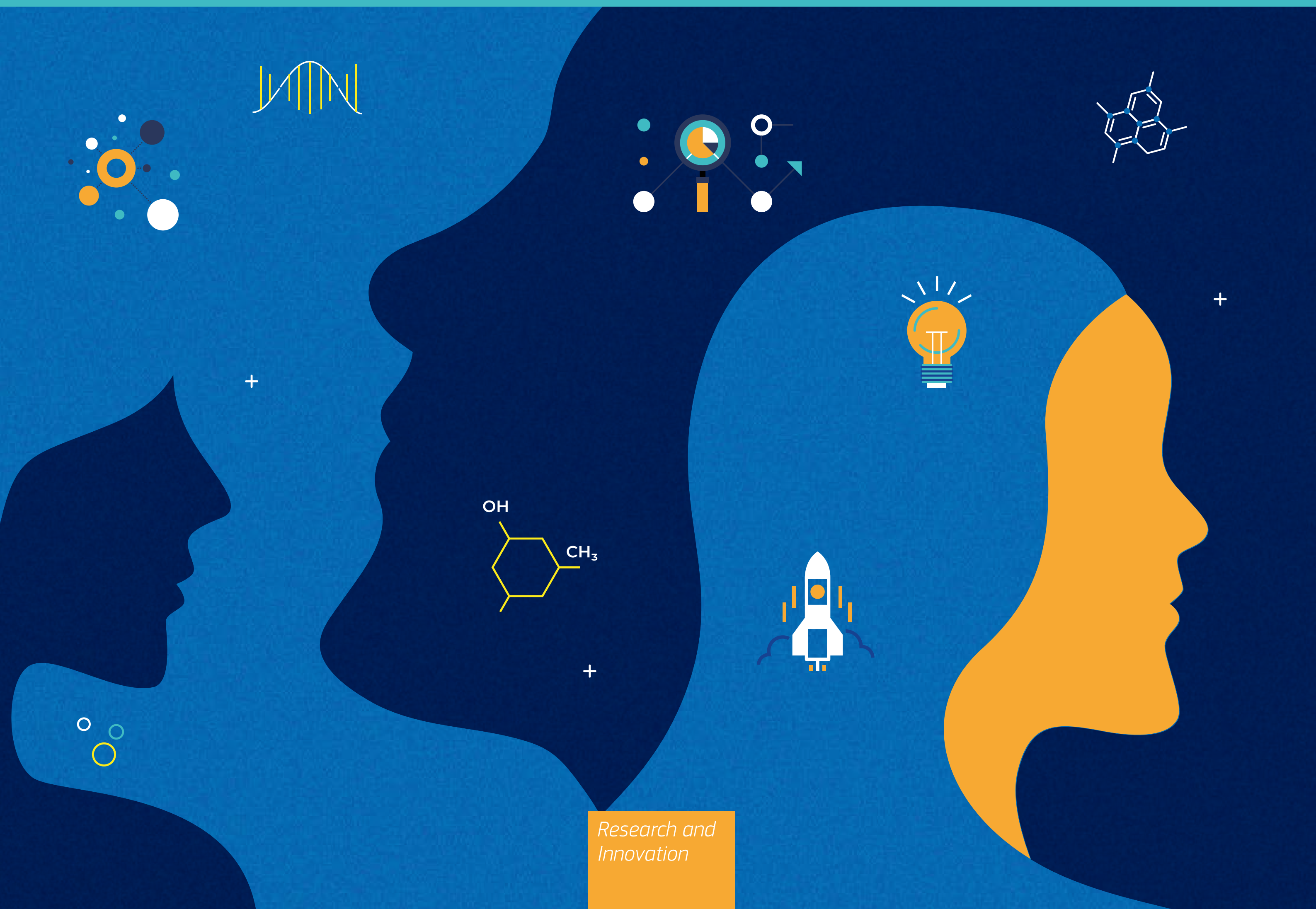
European Commission

SHE FIGURES 2021

Gender in Research and Innovation
Statistics and Indicators



Research and Innovation

She Figures 2021

European Commission
Directorate-General for Research and Innovation
Directorate D — People
Unit D.4 — Democracy and European Values

Contact Mina Stareva, Head of Sector D4.001 – Gender
Athanasia Moungou, Unit D4.001
Email RTD-GENDERINRESEARCH@ec.europa.eu
RTD-PUBLICATIONS@ec.europa.eu

European Commission
B-1049 Brussels

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EUROPEAN COMMISSION

She Figures 2021

Gender in Research and Innovation Statistics and Indicators

2021

Directorate-General for Research and Innovation
Horizon 2020 Science with and for Society

FOREWORD

Since the previous edition of the She Figures report three years ago, we have faced unprecedented challenges: the COVID-19 crisis has aggravated the social and economic challenges that the European Union is facing and has disproportionately affected women, including in R&I. However, we have an opportunity to shape the recovery to make it greener, fit for a digital world, and more inclusive. Women's full participation in R&I is thus crucial for Europe's recovery. There is no sustainable recovery if it is not gender-sensitive.

The adoption of a new Gender Equality strategy in 2019 paved the way for several necessary research and innovation policy actions. First, the renewed priority on gender equality and inclusiveness of the European Research Area (ERA). Second, strengthened provisions for gender equality in the new Framework Programme for R&I, Horizon Europe and third, the launch of a brand new funding scheme to support women-led start-ups.

The European Commission has a longstanding commitment to promote gender equality in R&I. We aim to create a fair higher education system where women and men researchers benefit from equal opportunities and equal treatment, allowing them to thrive in their careers. More than ever, we need to encourage institutional change through instruments such as gender equality plans in research and innovation organisations to achieve long-lasting positive effects, in line with a solid and united ERA.

Since its first publication in 2003, 'She Figures' provides comparable, pan-European data on gender equality in R&I. A novelty of the 2021 report is a more robust policy-oriented context across the chapters and the addition of thematic policy briefs, presenting best practices and policy recommendations in areas where we lack comparable data. Such areas include the impact of COVID-19 on women researchers and scientific productivity, what intersectionality in R&I entails, and the promotion of a gender perspective in innovation.

She Figures 2021 data show some positive trends, with almost gender parity at PhD graduate level and a slight increase in the proportion of women holding the highest academic positions (26.2%) compared to the last edition (24.1%). However, when looking at the representation of women doctoral graduates in specific fields of study, such as Information and Communication Technologies (ICT) and Engineering, Manufacturing and Construction, these numbers remain as low as 22.4% and 30%, respectively. The lack of women in these fields translates into biased R&I output, loss of talent and growth opportunities.

My vision for developing a renewed innovation policy in Europe is to create an innovation ecosystem with the firepower to make Europe an innovation leader, building on the excellence and inclusiveness of a revitalised European Research Area and in synergy with the European Education Area. Together with the EU Member States and the private, we need to support education and training communities, develop talent and skills and nurture the female innovators and entrepreneurs of the future.

Statistics and data help us take action for systemic change. This is why I expect research funders, policymakers, university deans, researchers, innovators, educators and students to make good use of our She Figures 2021 report.

Now is the time for all of us to act as ambassadors of change!

Mariya GABRIEL
European Commissioner for Innovation, Research, Culture, Education and Youth

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She Figures 2021 is the result of the co-ordinated effort and work of many engaged colleagues and committed professionals. I would like to thank the following actors for their contributions and work for the study:

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Irene Norstedt

Irene NORSTEDT
Director
People Directorate
DG Research and Innovation

EXECUTIVE SUMMARY

Equality between women and men is one of the EU's founding values, enshrined in the European Treaties. The EU is committed to advancing gender equality in all areas and has taken active steps to do so within the Research and Innovation (R&I) sector.

Since 2012, 'gender equality and gender mainstreaming in research' has been one of the priorities in achieving the European Research Area (ERA). The creation of the ERA represents the European Commission's ambition for a single market for research, innovation and technology across the EU. Proposed actions within the ERA priority 4 on gender equality centre on three main areas: (i) promoting gender equality in careers, (ii) ensuring gender balance in decision-making and (iii) integrating the gender dimension in R&I content and programmes (European Commission, 2012). The 2020 ERA Communication renewed its commitments to gender equality and gender mainstreaming. The Communication proposes to strengthen gender equality in R&I, through the development of inclusive gender equality plans with Member States and stakeholders and building on the strengthened provisions for gender equality introduced in Horizon Europe. As of 2022, participation in the new Framework Programme will require having a gender equality plan for public bodies, research organisations and higher education establishments (European Commission, 2020a).

The She Figures publications, first released in 2003 and updated every three years, presents data on gender equality objectives in the field of R&I policy. In the context of the above renewed and strengthened policy commitments, She Figures 2021 provides data and analysis for approximately 88 indicators in order to monitor the state of gender equality in R&I across Europe. The results are provided in six chapters and the key findings are summarised below.

Chapter 2
The pool of graduate talent

Increasing the participation of women at all levels in R&I is of strategic importance, as it underpins the ERA's Priority 4 on gender equality and gender mainstreaming in research (European Commission, 2012). Chapter 2 focusses on women's representation among the pool of graduate talent. The data shows that the EU has almost achieved gender parity among Doctoral graduates. In 2018, women represented 48.1% of Doctoral graduates at European level and the proportion of Doctoral graduates was gender-balanced (i.e. women accounted for between 40% and 60%) in the majority of EU-27 Member States and Associated Countries. Gender parity in the pool of Doctoral graduates is crucial for supporting a gender-balanced research workforce. Despite this progress, however, important gender gaps persist in certain broad fields of study. At both European and country level, women Doctoral graduates were over-represented in the field of Education and under-represented in the fields of Information and Communication Technologies (ICT) and Engineering, Manufacturing & Construction. Since the last She Figures edition, there was little progress towards increasing women's representation among Doctoral graduates in Science, Technology, Engineering, and Mathematics (STEM).

Chapter 3
Participation in science and technology occupations

In addition to fields of study, women have been historically under-represented in scientific and technical fields and remain under-represented in technological professions in the labour market. Chapter 3 examines women's and men's participation in science and technology occupations as well as the extent to which available human resources in Science and Technology are fully utilised.

While, in 2019, the share of tertiary educated population is gender-balanced in the EU (53.7%), women were less represented among employed scientists and engineers (41.3%). One area of the labour market in which women are significantly under-represented is entrepreneurship activities in technology-oriented fields. More specifically, a new indicator shows that women represented less than a quarter of self-employed professionals in Science and Engineering (S&E) and ICT. In its Gender Equality Strategy 2020-2025, the Commission underlines that empowering women in the labour market also means enabling them to thrive as entrepreneurs, especially in traditionally male-dominated fields (European Commission, 2020b). As the EU economy transitions towards increased digitalisation, greater efforts are needed to encourage women's participation in the digital economy such as the European Commission's Women in Digital Policy (European Commission, 2020d) or the Digital Education Action Plan (European Commission, 2020c).

Chapter 4
Labour market participation as researchers

Over the last decade, the EU has seen positive developments to achieve gender balance in the overall pool of Doctoral graduates. Despite this progress, in 2018, women represented around one-third (32.8%) of the total population of researchers at European level. Chapter 4 examines women's participation as researchers and assesses women and men's patterns of employment across key sectors of the economy. At both European and country level, women researchers accounted for a lower proportion of the economically active population compared to men researchers. Data also show that horizontal segregation persists in research careers across the main economic sectors (higher education, government and business), with a higher percentage of women researchers being employed in the higher education sector (55.9%). In comparison, men researchers are more likely to be employed in the business enterprise sector (53.3%). Horizontal gender segregation also persists across the different fields of Research and Development (R&D). At country level, men were more likely than women to work as researchers in Natural Sciences and Engineering & Technology in most countries for all economic sectors considered.

Chapter 5
Working conditions of researchers

While the EU has taken action in the last decade to address precarious work, this continues to be an issue which has been exacerbated by the COVID-19 pandemic. One way to improve working conditions for women and men researchers and promote gender equality in research careers is through structural reform and institutional change. Therefore, Chapter 5 examines the relative working conditions of women and men researchers. At European level, in 2019, the proportion of women researchers working part-time in the higher education sector was higher than that of men researchers by 3.9 percentage points. Also at European level, 9% of women researchers and 7.7% of men researchers in the higher education sector worked within precarious contracts. The 2020 ERA Communication has committed to improve career development conditions to attract and retain the best researchers through specific actions (European Commission, 2020a). Resulting measures to reduce the precariousness of researchers in the EU need to take a gender-sensitive approach to address the gendered patterns of precariousness and part-time work. Reflecting concerns raised in the 2020 ERA Communication about precarious employment for new entrants, 2019 European level data shows that both women and men researchers were most likely to be employed under precarious contracts at the earliest career stage. In line with the European Commission's approach to foster institutional change through Gender Equality Plans, in 2020, the websites of the majority of research organisations from which data were gathered, mentioned measures and actions to strengthen gender equality, including promoting equal working conditions.

Chapter 6
Career advancement and participation in decision-making

Since 2012, an increasing number of institutions or research organisations have adopted a variety of measures to make improvements to women's participation in decision-making. These include implicit bias training for recruitment and promotion committees, full-fledged Gender Equality Plans (see Chapter 5) as well as the Human Resources Strategy for Researchers (HRS4R). Despite efforts, the under-representation of women in senior academic and decision-making positions in the EU continues to be a significant issue, thus hindering the growth of the European Research Area (ERA) (European Commission, 2020g). Chapter 6 compares women's and men's representation in different grades of an academic career and examines women's representation in decision-making positions. European level data shows that in 2018, women represented more than 40% of academic staff. However, there were considerable differences by grade. While women represented nearly half of grade C and D staff (46.6% of grade C staff and 47.1% of grade D staff) and more than 40% of grade B staff (40.3%), they only occupied around a quarter of grade A staff positions (26.2%) – equivalent to full professorship. It was also found that, in each and every field of Research and Development, women represented no more than around one-third of grade A staff at European level in 2018. While several EU policies such as the new Gender Equality Strategy 2020-2025 (European Commission, 2020b) have emphasised the importance of increasing women's representation in leadership positions, the proportion of women as heads of institutions in the higher education sector in 2019 stood at only 23.6%. Also at European level in 2019, just over 3 in 10 board members were women (31.1%) and under one-quarter of board leaders (24.5%) were women.

Chapter 7
Research and innovation output

Chapter 7 analyses the gender differences in the number of active authors publishing research, frequency of publication, citation impact of women and men's publications, representation within authorship teams, patent output and representation in academic-corporate collaboration teams. Funding success rate differences between women and men is also considered, as is the integration of a gender dimension in research content.

Data from Chapter 7 shows that among the pool of authors actively publishing, the number of men authors exceeded the number of women authors at all seniority levels between 2015-2019 at both European and country level. When data are disaggregated by R&D field, gender gaps in active authorship are particularly prominent in the fields of Natural Sciences and Engineering & Technology.

Men accounted for a greater share of research team members than women between 2015-2019 at both European and country level. In addition, between 2015-2019, women were more likely to be under-represented among active authors who led research. Women were also significantly under-represented among inventors at the European level, between 2015-2018, holding just one inventorship for every 10 inventorships held by men. Such gender differences in R&I outputs may contribute to a vicious cycle whereby women who have fewer patents or publications to their names have less competitive funding applications, which could in turn decrease the count of patent applications and publication submissions to journals by women.

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ABBREVIATIONS

Abbreviation	Definition
API	Application Programming Interface
BES	Business Enterprise Sector
CES	Conference of European Statisticians
DI	Dissimilarity Index
EIC	European Innovation Council
EPO	European Patent Office
ERA	European Research Area
FTE	Full-Time Equivalent
FWCI	Field-Weighted Citation Impact
GCI	Glass Ceiling Index
GOV	Government Sector
HC	Head Count
HEI	Higher Education Institutions
HES	Higher Education Sector
HRSTC	Human resources in S&T - Core
ICT	Information and Communication Technologies
ILO	International Labour Organization
IPC	Internal Patent Classification
KIA	Knowledge-Intensive Activities
KIABI	Knowledge-Intensive Activities – Business Industries
LFS	EU Labour Force Survey
MORE	Mobility and Career Paths of Researchers in Europe
PATSTAT	Worldwide Patent Statistical Database
PNP	Private Non-Profit
PPP	Purchasing Power Parities
PPS	Purchasing Power Standards
PRO	Public Research Organisations
R&I	Research & Innovation
S&E	Science and Engineering
SWG GRI	Standing Working Group on Gender in Research and Innovation
UIS	UNESCO Institute of Statistics
UNECE	United Nations Economics Commission for Europe
WiS	Women in Science

CHAPTER 1

INTRODUCTION

The She Figures publication, first released in 2003 and updated every three years, presents data on many of the European Commission's gender equality objectives in the field of research and innovation (R&I) policy. Equality between women and men is one of the EU's founding values, recognised as early as 1957 in the Treaty of Rome's Article 119, on equal pay for equal work (European Economic Community, 1957). The right to equal treatment is a general principle of the Treaties[1], while values of equality and non-discrimination are strengthened in various strategies and legislation including, for example, the Work-Life Balance Directive (European Parliament and the Council, 2019), the Equal Treatment Directive 2006/54/EC (European Parliament and the Council, 2006), the European Commission's Strategic Engagement for Gender Equality 2016-2019 (European Commission, 2015) and its successor, the Gender Equality Strategy 2020-2025 (European Commission, 2020b).

Despite EU legal and policy commitments, a range of gender inequalities persist, not least in R&I. These include segregation of women and men PhD graduates across different fields of study, the under-representation of women in Science and Technology occupations (including entrepreneurship and innovation), gender differences in researchers' working conditions, gender inequalities in career advancement and decision-making, and more. Nonetheless, She Figures 2021 finds improvements in women's representation as researchers across the Higher Education, Government and Business Enterprise Sector. Moreover, while previous She Figures editions found a gender gap in international mobility of researchers during their PhD, there was no prominent gender difference observed in 2019. At EU level, there has been some progress in the area of decision-making and leadership, particularly in women's representation at the highest level of academic staff i.e. grade A (from 24% to 26%) and as heads of institutions in the Higher Education Sector (HES) (from 21% to 24%).

At EU level, various policies and programmes aim to tackle these issues and promote gender equality in R&I. Since 2012, gender equality and gender mainstreaming in research has been one of the priorities for the achievement of the European Research Area (ERA). Through the ERA, the European Commission strives to achieve a single market for research innovation and technology across the EU. This will be achieved through (i) promoting gender equality in careers, (ii) ensuring gender balance in decision-making and (iii) integrating the gender dimension in R&I content and programmes. More recently, the 2020 ERA Communication renewed its commitment to gender equality and gender mainstreaming in research through deepening existing priorities and initiatives (European Commission, 2020a). Further, the Horizon Europe programme has strengthened to support gender equality in R&I through (European Parliament and the Council, 2021):

- Integration of the gender dimension in R&I content as a default requirement across the whole programme,
- A new eligibility criterion for Horizon Europe funding where public bodies, research organisations and higher education establishments will be required to have a Gender Equality Plan (GEP) as of calls with deadlines in 2022,
- Funding for actions supporting the development and application of inclusive and sustainable GEPs across EU Member States and Associated Countries, and implementation of the ERA policy agenda,
- Measures and activities for promoting gender equality under the European Innovation Council (EIC), and
- Strong encouragement of gender balance among research teams, which will be taken into account for equally ranked proposals.

She Figures 2021 edition

In light of the new policy commitments for gender equality in R&I, the She Figures publication presents data on many of the European Commission's gender equality objectives in the field of R&I policy. It provides a range of indicators on the state of gender equality in R&I at pan-European level. Most of the indicators included in She Figures 2021 update the indicators included in previous editions on the following themes: the presence of women among higher education graduates by subject area, particularly at Doctoral level, horizontal segregation by gender across different occupations in Science & Technology; gender (im)balance amongst researchers across different sectors of economy; relative working conditions of women and men researchers, with consideration of measures for institutional change; vertical segregation by gender in academia, i.e. the (under)representation of women in the highest grades/positions of research and as heads of academic institutions; women and men's relative R&I outputs, including their success in gaining funding and; the gender dimension in research content.

New indicators are provided to consider new and emerging policy priorities in the area of R&I. More specifically, a new indicator included in the 2021 edition measures the gender gap in entrepreneurship activities in technology-oriented occupations. Another new indicator provides further insight into the precarious position of women and men researchers, disaggregating further the data by family status and career stage. Within the policy context

1 The legal basis for the EU action in the area of gender equality is based on the following provisions: Articles 2 and 3 of the Treaty on the European Union, Article 8 and 10 of the Treaty on the Functioning of the European Union and the Charter of Fundamental Rights of the European Union.

of a new eligibility criterion for GEPs under Horizon Europe, a new indicator uses web-scraping techniques to measure the proportion of proportion of research organisations' websites that mention actions or measures towards gender equality. Four new indicators related to R&I output measure the extent of gender balance in the pool of active authors and in academic-cooperate collaboration teams, as well as the integration of gender dimension in Horizon 2020 projects and intersectional aspects of Horizon 2020 projects.

Data sources and coverage

Most of the data for She Figures are extracted from Eurostat statistics on education, research and development (R&D), professional earnings and human resources in science and technology. Where not available from Eurostat, data on education, research, and the labour market for countries outside the EU were compiled from websites including those of the International Labour Organization (ILO), the Organisation for Economic Co-operation and Develop (OECD) and the UNESCO Institute of Statistics (UIS). The following data sources were also used: specific national data collected by Statistical Correspondents using the Women in Science (WiS) questionnaire; MORE4 Survey dataset – for data on researchers' working conditions and mobility; Patent Office (EPO) Worldwide Patent Statistical Database (PATSTAT) – for data on patent applications (linking to inventorships indicator); The Scopus database, produced by Elsevier – for data on scientific publications.

Unless specified, the data collection for She Figures 2021 extended to 44 countries, namely the 27 European Member States (EU-27), the UK and the 16 countries associated to Horizon 2020 (Iceland, Norway, Albania, Bosnia and Herzegovina, North Macedonia, Montenegro, Serbia, Turkey, Israel, Moldova, Switzerland, Faroe Islands, Ukraine, Tunisia, Georgia, Armenia). Data were also compiled for the G20 region (Argentina, Australia, Brazil, Canada, China except Hong Kong[2], Hong Kong, India, Japan, Mexico, Russia, South Africa, South Korea and United States), to the extent that they are readily available in public data sources and in the patent and bibliometric databases.

Structure of She Figures 2021

Similar to previous editions, the structure of She Figures 2021 follows the chronological journey of researchers from graduating higher education at the Doctoral level to achieving the top decision-making and leadership positions in academia:

- **Chapter 2** examines women's representation among the pool of graduate talent considering women's overall representation among Doctoral graduates, the gender gap among Doctoral graduates in higher education by field of study, and women's and men's propensity to graduate from Bachelor level studies and continue their education at Master and Doctoral level study.
- **Chapter 3** considers women's and men's participation in science and technology occupations by analysing their participation as scientists and engineers, the gender gap in participation in knowledge-intensive activities and unemployment among the tertiary educated labour force, and women's and men's participation in the main economic sectors of higher education, government, and business enterprise.
- **Chapter 4** examines women's participation as researchers, assessing the overall gender gap in women's and men's participation, as well as the distribution and growth of women and men researchers across the main economic sectors of higher education, government, and business enterprise. It also explores gender differences by age group, the Dissimilarity Index, and the extent of gender segregation across fields of R&D.
- **Chapter 5** considers the relative working conditions of women and men researchers in terms of employment in part-time and precarious working contracts, international mobility, and R&D expenditure per researcher.
- **Chapter 6** compares women's and men's representation in the different grades of an academic career, particularly in the highest position at which research is typically conducted i.e. grade A. It examines the pattern of women's and men's representation in a typical academic career, the gender gap in career progression and senior positions in academia (with grade A positions being the equivalent for full-professorship positions), including by age group, the Glass Ceiling Index (GCI), and women's participation in leadership positions in academia (as heads of higher education institutions and as broad members).
- **Chapter 7** examines women's and men's contribution to R&I output in terms of the gender gap in average number of publications and in inventorships, women's representation in authorship teams, and women's and men's contribution as authors who lead research. The chapter also examines differences in funding success rates for women and men and the integration of gender analysis in research content.

2 Official UNESCO statistics for China do not include Hong Kong, which is why the data are presented separately for China except Hong Kong and Hong Kong.

The 2021 She Figures edition will be accompanied by seven policy briefs on emerging and ongoing policy priorities in the area of gender equality in R&I to further contextualise data trends observed. The policy briefs cover topics related to women's presence, participation and progression in science, institutional culture and institutional change, gender imbalance in Europe's research leadership, gender dimension in research and innovation content and training, holistic view of STEM education at undergraduate level, promoting a gender perspective in innovation, and intersectionality. Moreover, the updated 'She Figures Handbook' will provide the latest methodological guidance on data collection and calculation of indicators.

Definitions

Gender refers to 'social attributes and opportunities associated with being female and male and to the relationships between women and men and girls and boys, as well as to the relations between women and those between men' (EIGE, 2021a).

Sex refers to the 'biological attributes that distinguish male, female and intersex' (European Commission, 2020h).

Gender identity refers to 'each person's deeply felt internal and individual experience of gender, which may or may not correspond to the sex assigned at birth, including the personal sense of the body (which may involve, if freely chosen, modification of bodily appearance or function by medical, surgical or other means) and other expressions of gender, including dress, speech and mannerisms' (EIGE, 2021a).

While the data collection for She Figures only considers sex-disaggregated data for men and women, it will be important to also consider non-binary gender for data collection in future publications, where possible. Non-binary is an umbrella term for gender identities that fall outside the gender binary of man or woman. This includes individuals whose gender identity is neither exclusively man nor woman, a combination of man and woman or between or beyond genders. The United Nations Economics Commission for Europe (UNECE) provides an in-depth review on measuring gender identity conducted by the Bureau of the Conference of European Statisticians (CES) in February 2019. Published in April 2019, the review provides insights into different approaches for statistical measurement of gender identity undertaken to date and examines the issues and challenges that will be important to consider for future She Figures data collection (UNECE, 2019).

Horizontal segregation relates to the concentration of women and men in different sectors (sectoral segregation) and occupations (occupational segregation) (EIGE, 2021a). It can occur within education (e.g. over-/under-representation of one sex in particular subjects) and employment (e.g. over-/under-representation of one sex in particular professions, industries, etc.). Unlike vertical segregation, these occupations and sectors are not ordered by a particular criterion. However, the issue of horizontal segregation may in turn lead to greater vertical segregation. For example, the under-valuing of competencies associated with 'women's work' may limit women's prospects for career advancement.

Vertical segregation refers to the concentration of either women or men in 'top' posts, such as decision-making positions or other positions of responsibility. Such roles are often associated with 'desirable' features, including greater pay, prestige and social security. In the context of R&I, the over-representation of men amongst heads of universities is an example of such segregation.

The following terms used for data analysis in the following chapters are defined as:

- **Gender parity** refers to a 50:50 balance in the number or proportion of women and men (with the exception for Chapter 7, see chapter for detail).
- **Gender balance** refers to a presence of women and men that ranges between 40% and 60% of the total population.
- **Under-representation and over-representation** refers to where the representation of women or men is below 40% or above 60%, respectively.

CHAPTER 2
THE POOL OF GRADUATE TALENT

KEY TAKEAWAYS

At European level, the number of women Doctoral graduates has continued to grow gradually over recent years. However, horizontal gender segregation persists in certain fields of education, with women Doctoral graduates in the EU still over-represented in the field of Education and under-represented in the broad fields of ICT and Engineering, Manufacturing & Construction, and several narrow fields of Science, Technology, Engineering and Mathematics (STEM).

- **The proportion of women among Doctoral graduates in the EU almost reached gender parity in 2018** (Figure 2.1). This is important for supporting a gender-balanced research workforce, in line with the ERA commitment to gender balance in research. The proportion of women among Doctoral graduates was gender-balanced (i.e. ranged between 40% and 60%) in the majority of the EU-27 Member States and Associated Countries. At European level, the number of women Doctoral graduates grew at an average annual rate of 0.4% (Figure 2.2).

- Data suggest **positive changes in the gender balance of Doctoral graduates at country level**. In two-thirds of the EU-27 Member States and Associated Countries, the proportion of women among Doctoral graduates increased between 2010 and 2018 (Table 2.1).

- Despite progress towards achieving close to gender parity in the overall pool of Doctoral graduates, **important gender gaps persist in specific broad fields of study** (Table 2.2). At both European and country level, **women graduates were over-represented in the field of Education and under-represented in the broad fields of ICT and Engineering, Manufacturing & Construction.**

- Reflecting the concerns raised in the Gender Equality Strategy 2020-2025 in relation to women's under-representation among STEM graduates, data from 2018 show that **women continue to be under-represented among Doctoral graduates in the majority of narrow STEM fields** (Table 2.4).

- More specifically, **at European level, women are under-represented among Doctoral graduates in Physical Sciences** (38.4%), **Mathematics & Statistics** (32.5%), ICT (20.8%), **Engineering & Engineering trades** (27%), **Manufacturing & Processing** (40.9%), and **Architecture & Construction** (37.2%).

- Between 2015 and 2018, there was **little progress towards increasing women's representation among Doctoral graduates in these narrow fields of STEM** (Table 2.4).

- **Taking all fields of study together, women are less likely than men to begin Doctoral studies** (Table 2.7). This trend is also observed for the majority of the EU-27 Member States and Associated Countries for the fields of Education, Arts & Humanities, Social Sciences, Journalism & Information, Business, Administration & Law, Natural Sciences, Mathematics & Statistics, and Health & Welfare.

2.1 Introduction

This chapter focuses on women's representation among the pool of graduate talent. Increasing the participation of women at all levels of R&I is one of the objectives underpinning ERA Priority 4 on gender equality and gender mainstreaming (European Commission, 2012), with a supporting ERA monitoring indicator on the share of women among PhD graduates. In support of this ERA priority, the development of national action plans provided an opportunity for Member States and Associated Countries to better define gender equality objectives and measures and acted as a catalyst for action at national level, with some countries establishing national-level objectives for gender equality in R&I for the first time. The European Commission's Gender Equality Strategy 2020-2025 reaffirmed the importance of achieving equal participation across different sectors of the economy, including among graduates (European Commission, 2020b).

Educational pathways and their determining impact on women's and men's career choices and labour market outcomes have been an important focus in research and policy. In this respect, recent studies highlight that despite increases in women's representation in higher education, horizontal gender segregation in subject choices continues to persist and partly explains gender inequalities in the labour market (Barone and Assirelli, 2019; Declercq and Varga, 2019). This chapter explores the impact of issues highlighting the extent to which women in higher education and women Doctoral graduates tend to be over-represented in the fields of Education, and under-represented in the fields of Information and Communication Technologies (ICT) and Engineering.

Section 2.2 analyses the representation of women among Doctoral graduates, including the scale of progress made, challenges remaining, and the extent to which this varies in different countries. Since the 2012 ERA Communication, subsequent She Figures editions have shown evidence of overall improvement in women's representation among Doctoral graduates in the EU. Challenges remain, however, with the 2020 ERA Communication highlighting that progress towards gender equality in R&I remains slow, with women continuing to be significantly under-represented among researchers and in decision-making positions in higher education in the EU (European Commission, 2020a).

Section 2.3 analyses the gender balance among Doctoral graduates, in total and by field. The importance of addressing gender segregation in subject choices in the EU is highlighted in the European Commission's (2020b) Gender Equality Strategy 2020-2025 goal of achieving equal participation across sectors of the economy, as women continue to be under-represented in higher-paying professions despite comprising more than half of university graduates.

Section 2.4 explores the representation of women among Doctoral graduates in STEM fields. Recognising the negative effects of gender segregation on subject choices in the context of rapid transformation and digitalisation of the economy, the Gender Equality Strategy 2020-2025 makes several commitments towards closing the gender gap in ICT studies and among STEM graduates (European Commission, 2020b). These commitments include an updated Digital Education Action Plan (European Commission, 2020c), the implementation of the Women in Digital Declaration (European Commission, 2020d), and the Communication on the European Education Area (European Commission, 2020e). Addressing the gender gap in subject areas such as ICT is particularly important in the context of the COVID-19 pandemic, which has accelerated the need for digital skills and negatively impacted Gross Domestic Product (GDP) (European Commission, 2020f).

Section 2.5 explores data that illustrate the varied propensity of women and men to graduate from Bachelor to higher-level studies. Within the context of persisting horizontal gender segregation in subject choices in higher education, this section presents indicators focusing on women and men who graduate from Doctoral education (International Standard Classification of Education (ISCED) level 8). It compares the number of women and men Doctoral graduates by field of study, showing the fields in which women continue to be under-represented or over-represented. This section also provides a view of women and men at different stages of the education system by examining their propensity to graduate from their choices of study at Bachelor, Master, and Doctoral level, and to move from Master to Doctoral-level studies in narrow STEM fields.

2.2 Women's overall representation among Doctoral graduates

The last decade has seen significant developments in the EU in closing the gender gap in women's overall representation among Doctoral graduates. The following indicators shed light on the level of progress in increasing women's representation in the top levels of education by considering their success in graduating from Doctoral degrees in recent years.

Since 2010, the proportion of women among Doctoral graduates has increased, moving the pool of Doctoral graduates closer to gender parity.

The proportion of women among Doctoral graduates in the EU has almost reached gender parity. The 2018 data show that women represented 48.1% of Doctoral graduates at European (EU-27) level, compared to 47.5% in 2010, indicating that gender parity among women and men graduates has almost been reached (when no differentiation is made by field of study) and there has been gradual progress towards gender parity over time (Figure 2.1 and Table 2.1).

Among the EU-27 Member States and Associated Countries, the proportion of women among Doctoral graduates ranged between 40% to 60% in almost all countries, except Albania (62.3%), Georgia (60.8%) and Luxembourg (35.6%) (Figure 2.1). Among the EU-27, the highest proportion of women Doctoral graduates was observed in Lithuania (57.9%) and Poland (56.3%), with the lowest in Luxembourg (35.6%) and Czechia (43.7%).

In around two-thirds of the EU-27 Member States and Associated Countries, the proportion of women among Doctoral graduates increased between 2010 and 2018 (Table 2.1), suggesting that positive changes are underway at country level in terms of achieving gender balance at higher levels of education. This may include measures to reduce discrimination against women in higher education institutions (see examples in Box 1). It may also include measures to incorporate a gender perspective into teaching (see examples in Box 2), which is important in supporting women students. As teaching and learning cultures may be influenced by gender stereotypes, particularly in historically male-dominated areas, this may constitute a barrier to women's progression in academia (Thege, Schmeck and van Elsacker, 2020). Measures to support work-life balance and caring responsibilities for women students are also essential in helping to support women's ongoing participation in higher education (see Chapter 3).

BOX 1 Addressing discrimination against women students in Higher Education Institutions

Sweden's Discrimination Act makes it mandatory to continuously undertake active measures to prevent discrimination. At Lund University, for example, this is done through an annual Equality Report, which is monitored by the Swedish Equality Ombudsman. This process identifies risks of discrimination and factors contributing to discrimination, as well as how to address issues and document their follow-up. Before they can be appointed, lecturers are required to complete at least five weeks of training in higher education teaching and learning (including aspects of equality and bias) or gain the equivalent knowledge by other means[1].

In **France**, the Ministry of Education, Higher Education and Research published a circular in 2015 on the issue of preventing and addressing sexual harassment in higher education institutions and research institutions. In addition, the 2019 Law on the Transformation of Public Service requires universities to have a GEP explicitly addressing discrimination, gender-based violence, harassment and sexist behaviour[2]. A number of measures have also been implemented at institution level. In University Paris Diderot, a three-hour compulsory seminar was introduced in 2011 for new undergraduate students to raise awareness of gender inequality. It forms part of a wider package of measures within the university to foster a culture of gender equality. In Sciences Po Paris, a protocol, monitoring unit and training activities were put in place in 2014 to address sexual harassment. These were adopted as part of the EU-funded EGERA (Effective Gender Equality in Research and the Academia) project[3].

In **Ireland**, a Framework for Consent in Higher Education Institutions was produced in 2019[4]. In 2020, all Irish higher education institutions were requested to develop action plans to address sexual violence and harassment and to report their progress in implementing the 2019 Framework. To further support the development of national policy on sexual harassment and violence in higher education institutions, the Higher Education Authority will conduct a survey in 2021 to gather information on staff and student experiences of sexual harassment and violence in Irish higher education institutions[5].

BOX 2 Integrating a gender perspective into teaching

In Germany, the Women's and Gender Research Network (NRW) developed proposals (in both German and English) to integrate gender studies in a subject-specific way within degree courses for 55 subjects, including areas within the fields of Humanities, Social Sciences, Mathematics, Natural Sciences, Medicine, Engineering, Sport, Arts and Agricultural Studies. This work was part of the research project 'Gender in Bachelor and Master courses – integrate women's and gender studies into the curriculum', supported by the Ministry of Culture and Science of the German State of North Rhine-Westphalia[6].

The EU-funded Baltic Gender Project, which involved partners from eight scientific institutions in **Germany, Estonia, Lithuania**, **Sweden** and **Finland**, aimed to develop approaches for gender-sensitive teaching in the area of Marine Sciences & Technology, with wider applications for gender-sensitive STEM teaching and gender-sensitive marine research. Within its approach to gender-sensitive teaching, it focuses on the inclusion of gender in curricula and gender-sensitive teaching set-ups[7].

1 LERU (2018). Implicit bias in academia: A challenge to the meritocratic principle and to women's careers - and what to do about it, https://www.leru.org/publications/implicit-bias-in-academia-a-challenge-to-the-meritocratic-principle-and-to-womens-careers-and-what-to-do-about-it

2 See: LOI n° 2019-828 du 6 août 2019 de transformation de la fonction publique (1) - Légifrance (legifrance.gouv.fr)

3 EIGE (n.d.). 'Gender Equality in Academia and Research, Legislative and policy backgrounds, https://eige.europa.eu/gender-mainstreaming/toolkits/gear/legislative-policy-backgrounds

4 Government of Ireland (2019). Safe, Respectful, Supportive and Positive. Ending Sexual Violence and Harassment in Irish Higher Education Institutions, https://assets.gov.ie/24925/57c394e5439149d087ab589d0ff39c92.pdf

5 Higher Education Authority (2021). 'Minister Harris launches national staff and student surveys on sexual violence and sexual harassment in Higher Education Institutions', https://hea.ie/2021/04/12/minister-harris-launches-national-staff-and-student-surveys-on-sexual-violence-and-sexual-harassment-in-higher-education-institutions/

6 NRW (n.d.). 'Gender Curricula', http://www.gender-curricula.com/gender-curricula

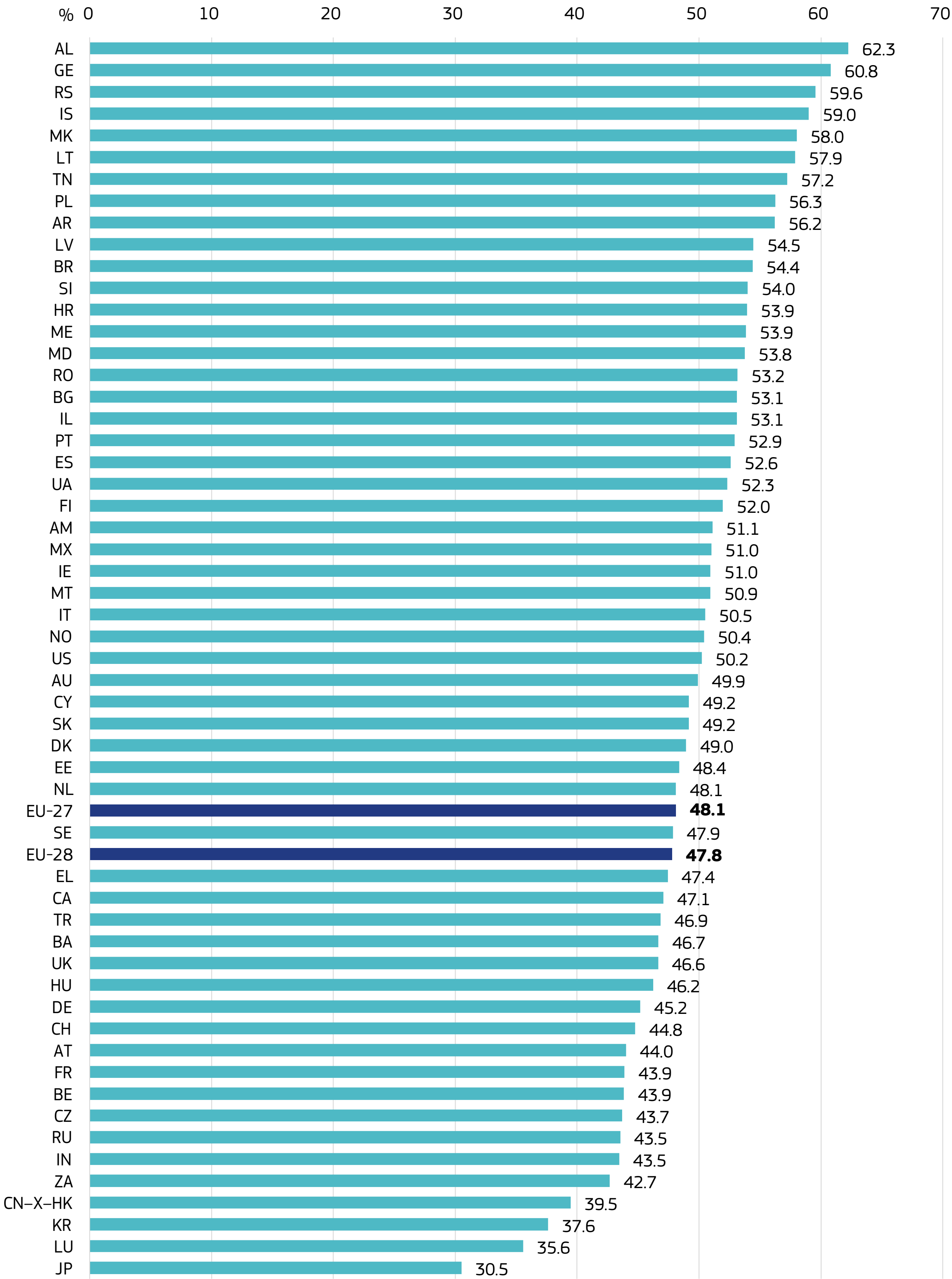
7 Thege et al., (2020). Gender-Sensitive Teaching, https://oceanrep.geomar.de/50001/1/BG_D4.2_Gender-Sensitive%20Teaching.pdf

Between 2010 and 2018, the largest increase was in Armenia and Iceland, where the share of women Doctoral graduates increased by 15.1 and 14.6 percentage points (p.p.), respectively, to exceed gender parity at 51.1% and 59.0%, respectively. Of the EU-27, the largest increases were observed in Malta and Cyprus, where the share of women Doctoral graduates increased by 25.9 and 12.5 p.p., reaching gender parity at 50.9% in Malta and close to gender parity at 49.2% in Cyprus. Box 1 and Box 2 indicate some relevant developments at country level which may have contributed to the recent increases in women's representation among Doctoral graduates. Careful attention must be paid to countries with low absolute numbers of graduates such as Malta, Montenegro and Albania, where small changes in numbers can translate to large changes in percentage terms.

Between 2010 and 2018, the proportion of Doctoral graduates remained gender-balanced in the EU, even for countries where the overall proportion of women Doctoral graduates decreased. Eight Member States saw a decrease (EE, IT, LV, LU, HU, PT, FI and SE), although women represented at least 45% or more Doctoral graduates in 2018, with the exception of Luxembourg, where the proportion of women decreased by 5.8 p.p. to 35.6%.

Across the G-20 region, the proportion of women among Doctoral graduates had a higher average rate of increase (2.3 p.p.) than in the EU between 2010 and 2018. However, even compared to large increases observed in the EU-27 Member States and Associated Countries, the largest increase in the proportion of women Doctoral graduates in the G-20 was observed in mainland China (except Hong Kong), at 6 p.p.

Figure 2.1 Proportion (%) of women among doctoral graduates, 2018



Notes: Exceptions to the reference year: GE: 2019, IL, AU, BR, CA, JP, MX, ZA, KR, US: 2017, AR: 2016, RU: 2012; Data not available: FO; Definition differs: IE, FR.

Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02), UNESCO Institute for Statistics (Tertiary graduates by level of education).

Table 2.1 Proportion (%) of women among doctoral graduates, 2010 and 2018

Country	2010	2018
EU-27	**47.48**	**48.10**
EU-28	**47.27**	**47.78**
BE	42.54	43.85
BG	47.82	53.11
CZ	39.03	43.71
DK	45.59	48.95
DE	44.29	45.18
EE	52.57	48.36
IE	47.79	50.95
EL	41.89	47.43
ES	48.15	52.60
FR	43.13	43.89
HR	51.07	53.94
IT	53.18	50.51
CY	36.67	49.17
LV	59.85	54.47
LT	57.88	57.88
LU	41.38	35.56
HU	46.67	46.23
MT	25 (3/12)	50.94
NL	42.05	48.11
AT	42.59	44.01
PL	49.29	56.25
PT	56.08	52.91
RO	47.73	53.17
SI	54.01	54.01
SK	48.89	49.15
FI	53.49	51.96
SE	48.26	47.85
UK	45.22	46.64
IS	44.44	59.02
NO	44.76	50.40
CH	43.27	44.78
ME	67.86 (19/28)	53.85 (14/26)
MK	50.96	58.02
AL	50 (14/28)	62.25
RS	49.73	59.56
TR	44.60	46.85
BA	35.67	46.67
GE	65.14	60.82
AM	35.99	51.10
MD	55.15	53.75
TN	52.66	57.23
IL	50.72	53.09
UA	54.25	52.33
AR	55.07	56.22
AU	49.33	49.91
BR	51.97	54.39
CA	44.17	47.07
CN_X_HK	37.38	39.46
IN	37.50	43.45
JP	28.41	30.50
MX	45.28	51.03
RU	41.20	43.53
ZA	42.21	42.68
KR	31.97	37.62
US	53.44	50.22

Notes: Exceptions to the reference period: EU-27, EU-28, CN_X_HK, IN: 2013-2018, IT, LU, AL, TN, UA: 2011-2018, ME: 2016-2018, GE: 2010-2019, IL, AU, BR, CA, JP, MX, KR, US: 2010-2017, AR: 2010-2016, RU: 2010-2012, ZA: 2012-2017; Data not available: FO; Definition differs: IE & FR (2018); Includes data from another category: AT & SK (2010).

Other: For proportions based on fewer than 30 graduates, the numerator and denominator are displayed in brackets.

Source: Eurostat – Education Statistics (online data codes: educ_grad5 and educ_uoe_grad02), UNESCO Institute for Statistics (Tertiary graduates by level of education).

The number of women Doctoral graduates has grown gradually and at a faster rate than the number of men Doctoral graduates.

Since 2012, the ERA has prioritised actions for gender equality and gender mainstreaming in research, including calls for national action plans to achieve gender equality in research (Council of the EU, 2015). The following indicator demonstrates the level of progress over time in increasing women's presence among those taking Doctoral degrees by calculating the compound annual growth rate (CAGR) of women and men Doctoral graduates between 2010 and 2018.

Between 2010 to 2018, data on the CAGR for women and men suggested that the EU had gradually progressed towards increasing women's representation among Doctoral graduates. At European level, the number of women graduates grew at an annual average rate of 0.4%, while the number of men graduates decreased at an annual average rate of 0.1% (Figure 2.2).

Following trends at European level, the number of women Doctoral graduates grew at a faster rate than the number of men graduates in 13 Member States (MT, CY, BG, ES, DK, BE, NL, IE, PL, CZ, AT, FR, DE). In Czechia and Poland, the number of women Doctoral graduates increased at a rate of 2.4% and 2.9%, respectively, while the number of men Doctoral graduates decreased at a rate of 0.03% and 0.6%, respectively. Overall, the data suggested that ERA countries have been progressing towards improving gender balance in research since the 2012 ERA priority for gender equality.

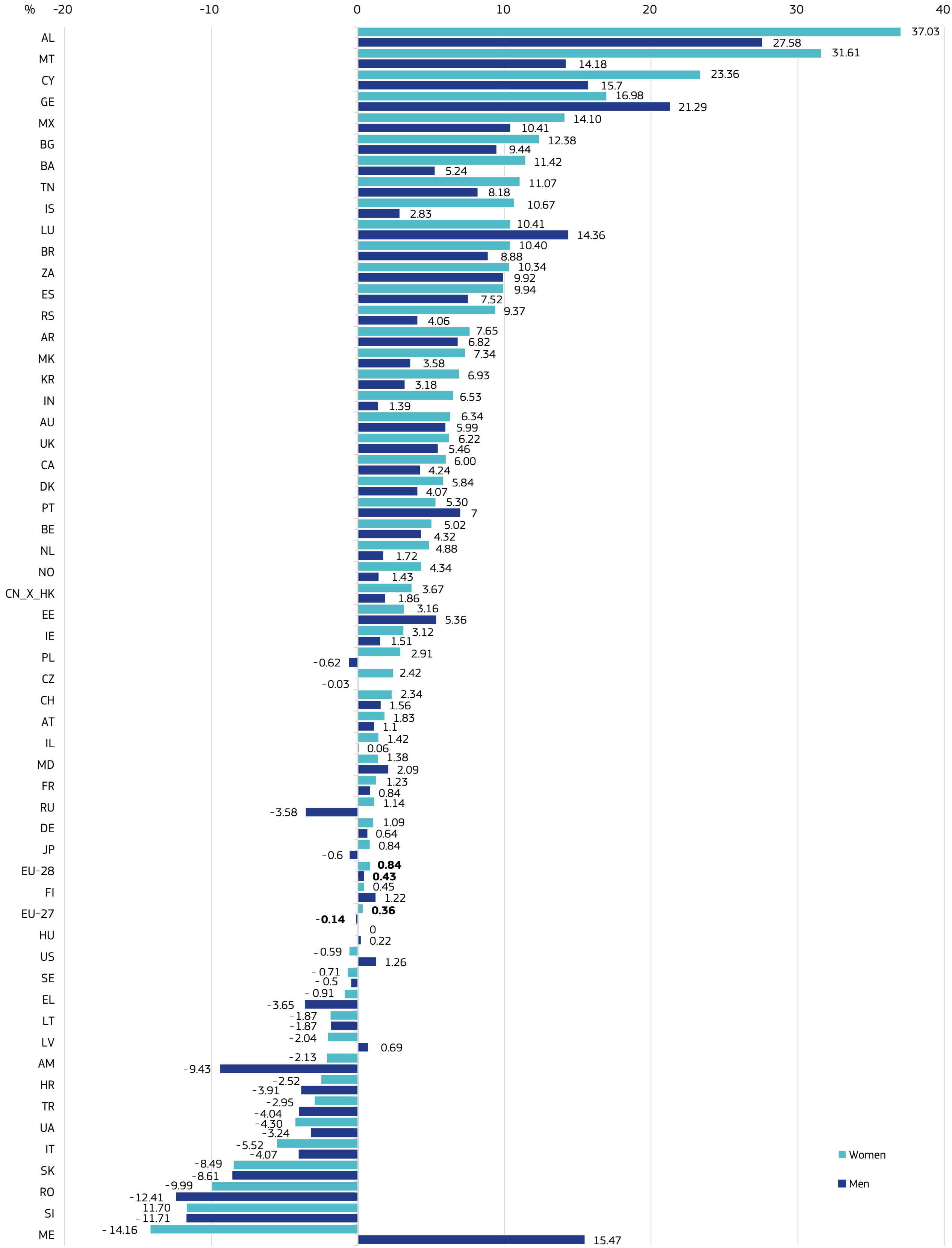
In contrast to the overall trend of an increase in women students and a decrease in men students, the number of men Doctoral graduates grew at a faster rate than the number of women Doctoral graduates in five Member States (LU, HU, FI, EE, PT). The largest difference (4 p.p.) was observed in Luxembourg, which corresponds to the data shown in Table 2.1, indicating that the proportion of women Doctoral graduates in Luxembourg decreased between 2010 and 2018.

In Latvia and Montenegro, the CAGR indicated that the number of women Doctoral graduates decreased, while the number of men Doctoral graduates increased between 2010 and 2018. In Latvia, for example, the number of women graduates decreased at a rate of 2% annually, while the number of men Doctoral graduates increased at a rate of 0.7% annually. However, the decrease in the CAGR for women Doctoral graduates in Latvia does not signify a setback in terms of gender balance, as the proportion of women among Doctoral graduates remained at 54.5% in 2018 (Figure 2.1).

Among the remaining Member States where the CAGR was negative for both women and men Doctoral graduates, two countries (IT, SE) showed a lower rate of decrease for men than for women. However, despite the lower rate of decrease for men, the proportion of women among Doctoral graduates remained at a high level in Italy (50.5%) and in Sweden (47.9%) (Figure 2.1).

Among the EU-27 Member States and Associated Countries, the highest CAGR for both women and men was observed in Albania, where the number of female Doctoral graduates grew by 37% per year on average and the number of male Doctoral graduates grew by 27.6% per year on average, albeit based on small values in one of the reference years. Across all countries, the largest difference between the CAGR for women and men Doctoral graduates was observed in Malta (31.6% for women and 14.2% for men). Similarly, the largest difference between the CAGR for women and men Doctoral graduates was observed in Montenegro (-14.2% for women and 15.5% for men). Again, however, the large differences observed in Malta and Montenegro are likely due to the low absolute values, which can translate to large changes in percentage terms.

Figure 2.2 Compound annual growth rate of Doctoral graduates, by sex, 2010-2018



Notes: Exceptions to the reference period: EU-27, EU-28, CN_X_HK, IN: 2013-2018, IT, LU, AL, TN, UA: 2011-2018, ME: 2016-2018, IL, AU, BR, CA, JP, MX, KR, US: 2010-2017, AR: 2010-2016, RU: 2010-2012, ZA: 2012-2017; Data not available: FO; Definition differs: IE & FR (2018); Includes data from another category: AT & SK (2010).

Source: Eurostat – Education Statistics (online data codes: educ_grad5 and educ_uoe_grad02), UNESCO Institute for Statistics (Tertiary graduates by level of education).

2.3 The gender gap among Doctoral graduates across broad fields of study

While the pool of Doctoral graduates is closer to gender parity when no differentiation is made by field of study, evidence from previous editions of She Figures suggests that gender differences tend to be persistent across fields of study. It is generally accepted that such differences in women and men's educational pathways may have some impact on the occupations they pursue at a later stage. Similar concerns were raised in the recent Gender Equality Strategy 2020-2025 (European Commission, 2020b), which emphasised that gender segregation in subject choices can contribute to women's under-representation in higher-paid sectors and over-representation in lower-paid sectors. The following indicators therefore enable more in-depth analysis of the extent of gender difference in educational pathways at Doctoral level.

Women continued to be under-represented among Doctoral graduates in the fields of ICT and Engineering, Manufacturing & Construction and over-represented in the field of Education.

The data show that despite progress towards achieving close to gender parity in the overall pool of Doctoral graduates in the EU, important gender gaps persist in specific broad fields of study (Table 2.2). In 2018, women continued to be over-represented in the field of Education (67%) and under-represented in the fields of ICT (22.4%) and Engineering, Manufacturing & Construction (29.4%) at European level. Women's under-representation in the ICT field in particular has been a longstanding issue for the EU, with the recent Gender Equality Strategy (European Commission, 2020b) committing to closing the gender gap in ICT studies through an updated Digital Education Action Plan (European Commission, 2020c), the implementation of the 'Women in Digital' Declaration (European Commission, 2020d), and the Communication on Achieving the European Education Area 2020-2025 (European Commission, 2020e).

Women represented more than 60% of Doctoral graduates in Education in all Member States except France (56.5%) and Croatia (53.1%). In all EU-27 Member States and Associated Countries, women were also over-represented in Health & Welfare studies, with the greatest proportion of women Doctoral graduates observed in Israel (80.0%), Iceland (76.5%) and Slovenia (74.4%). Women were significantly under-represented in the field of ICT in most Member States and Associated Countries, with less than 20% of women Doctoral graduates observed in 12 countries (CZ, DE, EE, LT, LU, HU, NL, AT, PL, SI, SK, CH). Similarly, women were under-represented in the field of Engineering, Manufacturing & Construction, with the proportion of women Doctoral graduates falling between the range of 20% and 40% in the majority of the EU-27 Member States and Associated Countries.

Box 3 and Box 4 present measures and actions undertaken to improve women's representation in ICT and Engineering, such as encouraging more girls to study in these fields and raising the visibility of women working in STEM.

BOX 3 Encouraging girls to study ICT and Engineering

In **Poland**, the Perspektywy Education Foundation (*Fundacja Edukacyjna 'Perspektywy'*), is a national non-profit organisation that supports education, including promoting the participation of women in STEM education. This includes the initiatives 'Girls as Engineers!' and 'Girls Go Science!', organised in association with the Conference of Rectors of Polish Technical Universities (KRPUT), which aim to introduce and promote STEM education among girls. Since their introduction in 2003, more than 150,000 girls have participated in these programmes[8].

In **Italy**, the University of Modena and Reggio Emilia, the European Women Management Development Association, and the University of Bologna organise the 'Digital Girls' (*Ragazze Digitali*) Summer Camp. The Summer Camp has been running since 2018 and is open to girls in their second, third and fourth years of high school, free of charge[9].

8 *Perspektywy* Education Foundation, 'Girls as Engineers! & Girls go Science! Campaigns', http://www.dziewczynynapolitechniki.pl/

9 *Ragazze Digitali*, https://www.ragazzedigitali.it/

BOX 4 Raising the visibility of women role models in STEM

In **Czechia**, the Ministry of Education, Youth and Sports, in cooperation with the National Contact Centre - Gender and the Institute of Sociology of the Academy of Sciences of the Czech Republic organises the annual *Milada Paulová* Award for women scientists. The award has been in place since 2009 and aims to show appreciation of prominent Czech women researchers and inspire other women[10].

In **Poland**, the annual *Perspektywy* Women in Tech Summit aims to promote female role models. This is an NGO initiative, supported by the government through the Ministry of Science and Higher Education as part of the 2019-2022 'Dialog' programme. In 2019, more than 6,300 participants from 52 countries joined the Summit, with grants available for students to attend free of charge[11].

In **Belgium**, the Women Award in Technology and Science (WATS) aims to support women in R&I.

The **international** L'Oréal-UNESCO For Women in Science International Awards are presented to five women annually from each of the following regions: Africa and the Arab States, Asia and the Pacific, Europe, Latin America and the Caribbean, North America. More than 100 laureates have received this award to date. The L'Oréal-UNESCO For Women in Science programme also selects [15] 'rising talents' among women scientists in the earlier stages of their careers, each of whom receives an endowment of EUR 15,000 and leadership training[12].

In addition to addressing the gender gap in specific sectors such as ICT, the recent Gender Equality Strategy 2020-2025 (European Commission, 2020b) and 2019 Report on Equality between Women and Men (European Commission, 2019a) emphasise the importance of actions to address stereotypes about women's and men's skills. The under-valuation of women's work partly contributes to lower pay in sectors such as Education and Health & Welfare, in which women tend to be over-represented. Efforts to reduce gender differences in educational pathways must include of actions to overcome gender-based stereotypes in fields in which women tend to be over-represented or under-represented. Box 5 provides examples of measures and actions undertaken to combat stereotypes in certain fields of study, while Box 6 describes 'Girls' Day' (and 'Boys' Day') initiatives, which are open days at relevant organisations, research institutions and higher education institutions to encourage girls to study STEM subjects (and, for 'Boys' Day', to encourage boys to study subjects in which men are under-represented).

10 Centre for Gender & Science 'Milada Paulová Award', https://genderaveda.cz/en/milada-paulova-award/#:~:text=The%20Milada%20Paulova%20Award%20is,society%20or%20private%20research%20sectors

11 *Perspektywy* Women in Tech Summit, https://womenintechsummit.pl/

12 *Fondation l'Oreal*, 'For Women in Science', https://www.forwomeninscience.com/

BOX 5 Getting girls and women interested in STEM careers

At **European level**, the EU Code Week initiative aims to introduce people of all ages (particularly school children) to programming in order to help to 'demystify' technology skills and show how technology can be applied in creative ways to solve problems. Schools across the EU are invited to participate as an opportunity for students to 'explore digital creativity and coding'. Code week was launched in 2013 and has grown significantly over time. In 2015, there were 570,000 participants from 46 countries, increasing to 4.2 million participants from more than 80 countries in 2019. Of these, 49% of participants were women or girls.[13]

In **Germany**, the National Pact for STEM has been in place since 2008. This is a joint initiative of the German Federal Ministry of Education and Research and partners from industry and science. The initiative aims to encourage more young women into STEM careers. It is primarily a networking initiative, linking more than 250 partners. It also provides an online platform to disseminate information, an annual conference, a podcast series with interviews with women role models in STEM, and career guidance materials for female students and their teachers.[14]

In **Ireland**, Science Foundation Ireland's gender strategy includes a pillar on gender in STEM education. Practical actions include supporting projects to increase the numbers of women pursuing STEM subjects, publishing evaluations of public engagement projects that address gender parity in STEM, ensuring that activities and online content represent gender parity and challenge unconscious bias, and developing a toolkit on unconscious bias for education and public engagement initiatives.[15] Ireland also provides networking opportunities for women in STEM through the Stemettes organisation, which is active in both the UK and Ireland.[16]

13 CodeWeek, https://codeweek.eu/

14 EIGE, (n.d.) 'Gender Equality in Academia and Research. Legislative and policy backgrounds'. Available at: https://eige.europa.eu/gender-mainstreaming/toolkits/gear/legislative-policy-backgrounds

15 Science Foundation Ireland, Gender Strategy 2016-2020. https://www.sfi.ie/resources/SFI-Gender-Strategy-2016-2020.pdf

16 Stemettes, https://stemettes.org/

BOX 6 Tackling gender stereotypes in girls' and boys' education and career interests

Girls' Day initiatives, or similar events, are held in more than 30 countries. Among the EU-27 Member States and Associated Countries, this includes **Belgium, Estonia, France, Germany, Greece, Italy, Luxembourg, the Netherlands, Norway, Austria, Poland, Switzerland, Serbia, Slovenia, Spain, Czechia** and **Hungary**.

In **Germany**, the 'Girls Day' initiative has been in place since 2001, where girls in grades 5 to 10 are invited to visit companies, universities and research institutions. Since then, it has reached around 1.5 million girls, with 100,000 girls and 10,000 organisations participating each year. Since 2010, the corresponding 'Boys' Day' initiative provides boys with opportunities to learn about careers in which men are currently under-represented. Survey results with participating girls in 2018 found that 70% had learned about professions they cared about, with 41% stating that they would like to do an internship or apprenticeship in the company they had visited. Of the boys who met health professionals, 67% found the experience interesting and 31% stated that they were now considering a career in this sector[17].

In **Belgium**, 'Girls Day, Boys Day' has run in schools since 2012. It aims to raise awareness and tackle gender stereotypes in careers among young people by showing examples of women working in stereotypically masculine sectors and men working in stereotypically feminine sectors. The ultimate aim of the initiative is to encourage students to make academic and career choices based on interests and skills rather than stereotypes[18].

In the **Netherlands**, Girls Day is run by the Dutch National Expert Organisation on Girls/ Women and Science/ Technology (VHTO). More than 300 organisations take part in the initiative each year, including technology companies, research institutes and higher education institutions, reaching more than 9,500 girls aged 10-15[19]. Activities include tours, workshops, quizzes and meetings with women STEM professionals to try and foster an interest in STEM subjects among girls[20].

Gender differences persisted at Doctoral level in the distribution of women and men by broad field of study.

When 2018 data are broken down by women's and men's distribution across broad fields of study (Table 2.3), the results indicate that, at European level, the most popular broad field of study for women Doctoral graduates was Health & Welfare (26.1%), while the most popular broad field of study for men Doctoral graduates was Natural Sciences, Mathematics & Statistics (27.4%).

Among the EU-27 Member States and Associated Countries, Natural Sciences, Mathematics & Statistics, Engineering, Manufacturing & Construction, and Health & Welfare were the most common choices of study among Doctoral graduates. In all countries except Cyprus, Austria, Poland and Romania, at least one of these three fields was the most popular among women and men Doctoral graduates.

Similar to the findings in Table 2.2, the distribution data show a notable difference between women and men graduates in the field of Education (Table 2.3). For example, while Education was the second least popular choice for men in 10 of the EU-27 Member States and Associated Countries (CZ, DK, EE, IT, MT, PL, RO, SK, MK, RS), it was the second least popular choice for women in only two of those countries (DK, PL).

Further examination of EU-27 Member States and Associated Countries' data points to additional gender differences in choice of study at Doctoral level. For women Doctoral graduates, Natural Sciences, Mathematics & Statistics was the most popular choice in 16 countries (CZ, EE, ES, FR, IT, LV, LT, LU, PL, PT, SK, UK, CH, RS, TR, IL) and Health & Welfare was the most popular choice in 16 others (BE, DK, DE, IE, EL, HR, HU, MT, NL, RO, SI, FI, SE, IS, NO, MK)[21]. For men

17 Girls' Day, https://www.girls-day.de/

18 GENDERACTION (2018). Report on national roadmaps and mechanisms in ERA Priority 4, https://genderaction.eu/wp-content/uploads/2021/02/GENDERACTION_D05_Report-on-national-roadmaps-and-mechanisms-in-ERA-priority-4.pdf

19 EIGE (n.d.). 'Gender Equality in Academia and Research', https://eige.europa.eu/gender-mainstreaming/toolkits/gear

20 VHTO, 'Girlsday', https://www.vhto.nl/english/activities-and-projects/girlsday/

21 The doctoral degree in medicine is not equivalent to doctoral degrees in other subjects in some countries, for example Germany. The significance of a doctoral degree may also vary by field. These factors may help to explain the distribution of fields among doctoral students.

Doctoral graduates, Natural Sciences, Mathematics & Statistics was the most popular choice in 19 countries (BE, BG, CZ, DK, EL, HR, IT, CY, LV, LT, AT, PT, RO, SI, SK, FI, SE, RS, TR), with Engineering, Manufacturing & Construction the most popular choice in 12 (DE, EE, IE, ES, FR, LU, HU, UK, IS, NO, CH, IL). The data shown in Table 2.2 and Table 2.3 indicate that important gender differences persist at Doctoral level when a differentiation is made by broad field of study.

Across all countries including the G-20, very few women and men graduated from the broad field of Services (which includes personal services, hygiene & occupation, health services, security, and transport services). This was the field with the smallest number of women graduates in most countries (except BG, CZ, PL, PT, SI, SK, NO, RS, TR, BR, KR), as well as the lowest proportion of men graduates in several countries (except BG, CZ, EL, FR, HR, HU, PL, PT, RO, SI, SK, MK, RS, TR, BR, KR).

Table 2.2 Proportion (%) of women among doctoral graduates, by broad field of study, 2018

Country	Education	Arts and humanities	Social sciences, journalism and information	Business, administration and law	Natural sciences, mathematics and statistics	Information and Communication Technologies	Engineering, manufacturing and construction	Agriculture, forestry, fisheries and veterinary	Health and welfare	Services
EU-27	**66.64**	**55.46**	**55.96**	**44.76**	**44.93**	**22.37**	**29.43**	**56.81**	**60.26**	**41.98**
EU-28	**66.66**	**54.21**	**55.03**	**44.92**	**45.56**	**22.75**	**28.52**	**57.08**	**59.87**	**41.98**
BE	77.78	46.13	62.83	42.68	40.15	37.5 (6/16)	24.67	57.58	54.95	55.56 (5/9)
BG	65.00	60.11	60.17	50.59	64.91	33.33 (9/27)	27.45	32.35	56.72	21.82
CZ	67.47	55.52	53.41	43.11	46.70	4.05	28.86	50.00	61.36	29.59
DK	-	51.15	57.53	-	40.19	-	30.31	54.97	63.32	-
DE	64.41	55.80	54.49	38.83	40.95	16.15	20.16	64.92	58.55	50.33
EE	77.78 (7/9)	57.89	73.33 (11/15)	47.37 (9/19)	50.00	13.79 (4/29)	45.10	57.14 (4/7)	50 (7/14)	-
IE	62.30	56.69	60.22	40.54	50.28	34.43	27.03	56.41	62.05	60 (3/5)
EL	63.10	54.00	49.55	43.75	48.54	30.43	35.90	46.81	50.47	43.33
ES	64.76	53.45	55.23	46.21	51.94	25.91	37.73	45.49	64.18	44.23
FR	56.52	57.80	49.12	47.71	39.25	25.39	31.04	63.87	55.98	35.65
HR	53.12	57.61	64.79	51.72 (15/29)	59.26	20 (3/15)	31.31	41.38 (12/29)	66.05	10 (1/10)
IT	75.68	58.58	60.58	51.41	47.77	28.72	35.27	56.28	65.88	-
CY	62.5 (15/24)	60 (6/10)	57.14 (12/21)	80 (8/10)	50 (6/12)	0 (0/8)	22.73 (5/22)	66.67 (2/3)	50 (5/10)	-
LV	87.5 (7/8)	66.67 (4/6)	69.23 (9/13)	46.15 (6/13)	57.58	25 (1/4)	34.78 (8/23)	57.14 (4/7)	56.25 (9/16)	-
LT	84.62 (11/13)	59.46	63.89	86.11	59.04	16.67 (1/6)	25.00	76 (19/25)	61.22	-
LU	33.33 (1/3)	70 (7/10)	68.42 (13/19)	53.33 (8/15)	34.78	8.33 (2/24)	5.56 (1/18)	-	-	-
HU	84.44	52.02	51.82	46.81	46.67	10.64	29.91	42.31	57.34	21.43 (6/28)
MT	100 (3/3)	28.57 (2/7)	60 (3/5)	0 (0/3)	62.5 (5/8)	0 (0/2)	0 (0/2)	-	60.87 (14/23)	-
NL	68.33	48.76	62.00	43.25	37.50	13.73	25.36	48.73	59.34	-
AT	65.62	52.80	54.18	48.43	38.89	19.61	26.27	60.00	53.70	38.89 (7/18)
PL	84.48	54.68	59.18	47.46	59.13	10.17	43.45	65.70	72.22	51.80
PT	65.64	59.13	58.02	27.96	62.09	26.32	36.78	62.50	69.53	57.39
RO	77.42	60.19	57.99	62.61	58.71	42.62	35.28	55.00	56.41	26.58
SI	80.95 (17/21)	62.22	62.5 (10/16)	50.00	41.54	17.86 (5/28)	44.55	0 (0/1)	74.36	55.56 (5/9)
SK	67.19	49.16	56.00	45.88	58.87	11.76	25.73	52.17	63.05	49.12
FI	80.26	64.71	66.67	49.54	46.94	26.21	31.49	56.36	65.04	38.1 (8/21)
SE	79.49	55.25	58.30	48.28	39.61	25.73	31.72	48.57	61.16	42.86 (3/7)
UK	66.73	50.77	51.93	45.60	47.50	24.01	25.33	59.34	58.12	-
IS	75 (3/4)	50 (3/6)	80 (8/10)	100 (2/2)	29.41 (5/17)	0 (0/2)	66.67 (2/3)	-	76.47 (13/17)	-
NO	81.63	55.08	57.99	43.55	40.88	20.83 (5/24)	25.32	45.45 (10/22)	61.95	61.11 (11/18)
CH	66.04	52.98	55.89	44.04	42.17	15.25	27.02	79.44	52.44	-
MK	86.67 (13/15)	66.67	47.50	52.38 (11/21)	72.73 (8/11)	60 (6/10)	37.5 (6/16)	50 (2/4)	63.38	10 (1/10)
RS	75 (15/20)	64.00	60.47	48.33	67.70	34.78 (8/23)	50.50	56.52	64.84	44.83 (13/29)
TR	49.73	44.11	45.78	41.00	54.80	48.72	35.19	42.86	71.71	43.06
IL	77.57	58.53	56.00	49.28	52.48	26.32	36.61	46.43 (13/28)	80.00	-
AR	76.62	60.38	55.98	44.19	64.49	10.71 (3/28)	40.51	60.61	56.52	-
AU	66.34	55.82	64.72	50.06	46.67	26.78	28.68	50.77	62.13	40 (4/10)
BR	68.53	51.77	56.42	43.33	50.30	19.51	44.74	52.29	66.90	57.13
CA	70.82	47.87	63.51	51.59	46.10	24.18	23.92	43.79	64.18	-
IN	44.23	43.69	42.04	43.81	38.65	41.81	27.19	33.56	30.75	84.97
JP	47.27	53.77	41.71	33.77	20.62	:	15.49	35.09	31.95	77.08
MX	59.94	47.69	56.49	42.64	47.93	20.47	38.71	39.29	59.83	60 (15/25)
ZA	52.48	34.43	58.88	35.78	44.81	31.37	21.27	50.41	57.31	0 (0/1)
KR	73.56	58.16	49.06	27.75	35.58	15.07	14.38	30.14	53.65	40.40
US	68.54	49.57	62.01	46.34	42.34	22.46	24.26	44.87	73.37	56.90

Notes: Exceptions to the reference year (for all fields): IL, AU, BR, CA, JP, MX, KR, US: 2017, IN: 2016, AR, ZA: 2015; Data not available for: ME, AL, BA, GE, AM, FO, MD, TN, UA; Definition differs: IE & FR (for all fields); Includes data from another category: JP (for all fields).

Other: ':' indicates that data are not available; '-' indicates that the total number of graduates was zero; For proportions based on fewer than 30 graduates, the numerator and denominator are displayed in brackets.

Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02) and OECD (Graduates by field).

Table 2.3 Distribution (%) of doctoral graduates across broad fields of study, by sex, 2018

Country	Education		Arts and humanities		Social sciences, journalism and information		Business, administration and law		Natural sciences, mathematics and statistics	
	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
EU-27	**3.78**	**1.75**	**13.07**	**9.73**	**10.45**	**7.62**	**7.46**	**8.54**	**24.11**	**27.39**
EU-28	**4.11**	**1.88**	**13.66**	**10.56**	**10.44**	**7.80**	**7.26**	**8.14**	**25.43**	**27.80**
BE	2.62	0.59	10.25	9.43	14.30	6.66	7.63	8.08	20.13	23.64
BG	12.55	7.66	14.76	11.09	19.59	14.69	11.86	13.13	15.31	9.38
CZ	5.32	1.99	14.81	9.22	8.93	6.05	9.21	9.44	24.88	22.05
DK	0.00	0.00	8.68	7.95	12.29	8.70	0.00	0.00	12.59	17.96
DE	2.42	1.10	9.26	6.05	7.24	4.99	7.58	9.84	26.32	31.28
EE	5.93	1.59	18.64	12.70	9.32	3.17	7.63	7.94	26.27	24.60
IE	5.11	3.22	11.96	9.51	14.65	10.07	6.05	9.23	24.06	24.76
EL	7.17	3.79	10.96	8.42	7.44	6.84	4.74	5.49	13.53	12.94
ES	6.90	4.17	13.88	13.43	12.14	10.93	5.57	7.20	30.31	31.14
FR	1.51	0.91	16.91	9.66	11.57	9.37	7.97	6.83	30.77	37.25
HR	4.87	5.03	15.19	13.09	13.18	8.39	4.30	4.70	18.34	14.77
IT	0.72	0.23	13.89	10.01	8.06	5.34	9.80	9.44	23.00	25.63
CY	25.42	14.75	10.17	6.56	20.34	14.75	13.56	3.28	10.17	9.84
LV	10.45	1.79	5.97	3.57	13.43	7.14	8.96	12.50	28.36	25.00
LT	5.45	1.36	10.89	10.20	11.39	8.84	15.35	3.40	24.26	23.13
LU	2.08	2.30	14.58	3.45	27.08	6.90	16.67	8.05	33.33	34.48
HU	7.13	1.19	16.89	14.16	13.32	11.26	4.13	4.27	22.33	23.21
MT	11.11 (3/27)	0 (0/26)	7.41 (2/27)	19.23 (5/26)	11.11 (3/27)	7.69 | (2/26)	0 (0/27)	11.54 (3/26)	18.52 (5/27)	11.54 (3/26)
NL	1.78	0.77	7.70	7.50	11.35	6.45	8.22	10.00	13.04	20.15
AT	3.53	1.45	22.92	16.07	13.60	9.09	14.27	11.92	16.46	20.36
PL	2.38	0.56	21.29	22.69	10.50	9.31	7.73	11.00	21.73	19.31
PT	10.68	6.28	12.43	9.65	14.18	11.53	4.92	14.25	20.35	13.96
RO	2.45	0.81	26.22	19.70	10.00	8.23	14.18	9.62	9.29	7.42
SI	6.83	1.89	22.49	16.04	4.02	2.83	10.44	12.26	10.84	17.92
SK	6.21	2.93	12.72	12.71	10.12	7.68	12.86	14.66	22.54	15.22
FI	6.30	1.67	12.49	7.37	14.24	7.70	5.57	6.14	14.24	17.41
SE	4.03	0.96	6.51	4.84	9.82	6.45	2.73	2.69	15.88	22.21
UK	5.30	2.31	15.78	13.37	10.40	8.41	6.52	6.80	30.21	29.18
IS	8.33	4 (1/25)	8.33	12 (3/25)	22.22	8 (2/25)	5.56	0 (0/25)	13.89	48 (12/25)
NO	5.29	1.21	8.60	7.12	12.96	9.54	3.57	4.70	22.22	32.66
CH	1.88	0.78	8.11	5.84	10.95	7.01	7.73	7.97	29.36	32.67
MK	9.22	1.96	21.28	14.71	13.48	20.59	7.80	9.80	5.67	2.94
RS	2.65	1.30	19.75	16.36	4.59	4.42	5.11	8.05	26.98	18.96
TR	10.60	9.44	14.18	15.83	8.21	8.57	12.66	16.06	19.77	14.37
IL	9.66	3.16	14.78	11.86	13.04	11.59	3.96	4.61	39.35	40.32
AR	4.23	1.78	11.26	10.18	21.16	22.92	6.81	11.86	41.82	31.72
AU	7.31	3.69	11.75	9.27	15.15	8.23	8.50	8.45	21.42	24.39
BR	9.60	5.26	10.92	12.14	7.78	7.16	4.12	6.42	14.05	16.56
CA	7.21	2.63	9.41	9.03	24.14	12.24	4.84	3.99	25.75	26.53
IN	4.92	3.93	18.46	15.07	13.78	12.03	10.87	8.83	27.93	28.07
JP	4.58	2.14	14.93	5.38	4.05	2.37	4.76	3.92	9.91	16.01
MX	44.98	31.32	2.82	3.22	10.17	8.16	20.96	29.39	9.77	11.06
ZA	14.22	10.16	7.51	11.28	16.01	8.82	13.51	19.11	24.69	23.98
KR	11.88	2.58	16.01	6.94	6.31	3.95	8.58	13.47	12.53	13.68
US	22.83	10.57	10.39	10.67	17.03	10.53	5.14	6.01	19.86	27.29

Country	Information and Communication Technologies		Engineering, manufacturing and construction		Agriculture, forestry, fisheries and veterinary		Health and welfare		Services	
	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
EU-27	**1.68**	**5.41**	**9.03**	**20.07**	**3.51**	**2.47**	**26.06**	**15.93**	**0.85**	**1.08**
EU-28	**1.78**	**5.52**	**8.79**	**20.15**	**3.09**	**2.12**	**24.78**	**15.19**	**0.66**	**0.84**
BE	0.45	0.59	12.72	30.60	2.84	1.65	28.67	18.51	0.37	0.24
BG	1.24	2.81	5.79	17.34	1.52	3.59	15.72	13.59	1.66	6.72
CZ	0.28	5.24	16.14	30.90	4.84	3.76	12.82	6.27	2.75	5.09
DK	0.00	0.00	16.00	35.27	9.17	7.20	41.27	22.92	0.00	0.00
DE	1.12	4.80	5.79	18.89	4.24	1.89	35.43	20.67	0.60	0.49
EE	3.39	19.84	19.49	22.22	3.39	2.38	5.93	5.56	0.00	0.00
IE	2.82	5.59	6.72	18.88	2.96	2.38	25.27	16.08	0.40	0.28
EL	1.89	3.91	13.26	21.37	2.98	3.05	36.27	32.11	1.76	2.08
ES	2.40	7.62	5.29	9.69	1.48	1.96	21.79	13.50	0.26	0.36
FR	2.99	6.87	10.21	17.73	1.64	0.73	15.77	9.70	0.68	0.96
HR	0.86	4.03	8.88	22.82	3.44	5.70	30.66	18.46	0.29	3.02
IT	1.38	3.49	16.12	30.14	5.50	4.35	21.54	11.37	0.00	0.00
CY	0.00	13.11	8.47	27.87	3.39	1.64	8.47	8.20	0.00	0.00
LV	1.49	5.36	11.94	26.79	5.97	5.36	13.43	12.50	0.00	0.00
LT	0.50	3.40	7.92	32.65	9.41	4.08	14.85	12.93	0.00	0.00
LU	4.17	25.29	2.08	19.54	0.00	0.00	0.00	0.00	0.00	0.00
HU	0.94	7.17	6.57	13.99	4.13	5.12	23.45	15.87	1.13	3.75
MT	0 (0/27)	7.69 (2/26)	0 (0/27)	7.69 (2/26)	0 (0/27)	0 (0/26)	51.85 (14/27)	34.62 (9/26)	0 (0/27)	0 (0/26)
NL	0.61	3.55	6.17	16.85	6.65	6.49	44.48	28.25	0.00	0.00
AT	1.68	5.40	11.25	24.84	3.53	1.84	12.17	8.30	0.59	0.72
PL	0.29	3.31	10.65	17.81	5.49	3.69	16.43	8.13	3.50	4.19
PT	1.67	5.25	13.34	25.77	2.09	1.41	14.85	7.31	5.50	4.59
RO	2.65	4.06	11.73	24.45	5.61	5.21	15.71	13.79	2.14	6.72
SI	2.01	10.85	18.07	26.42	0.00	0.47	23.29	9.43	2.01	1.89
SK	0.58	4.19	8.96	25.00	3.47	3.07	18.50	10.47	4.05	4.05
FI	3.92	11.94	11.76	27.68	3.20	2.68	27.45	15.96	0.83	1.45
SE	2.86	7.58	14.96	29.55	1.11	1.07	41.90	24.42	0.20	0.24
UK	2.13	5.88	7.93	20.42	1.57	0.94	20.16	12.70	0.00	0.00
IS	0.00	8 (2/25)	5.56	4 (1/25)	0.00	0.00	36.11	16 (4/25)	0.00	0.00
NO	0.66	2.55	5.16	15.46	1.32	1.61	38.76	24.19	1.46	0.94
CH	0.97	4.36	9.34	20.47	4.56	0.96	27.11	19.95	0.00	0.00
MK	4.26	3.92	4.26	9.80	1.42	1.96	31.91	25.49	0.71	8.82
RS	1.41	3.90	17.99	25.97	4.59	5.19	14.64	11.69	2.29	4.16
TR	0.55	0.51	14.56	23.63	4.02	4.72	13.65	4.75	1.80	2.10
IL	2.91	9.22	7.80	15.28	1.51	1.98	6.98	1.98	0.00	0.00
AR	0.22	2.47	4.59	9.29	4.30	3.85	5.60	5.93	0.00	0.00
AU	2.04	5.55	9.76	24.17	4.29	4.15	19.71	11.97	0.09	0.13
BR	0.68	3.35	11.73	17.28	10.48	11.41	22.94	13.54	7.70	6.89
CA	1.77	4.94	10.90	30.57	3.44	3.89	12.54	6.18	0.00	0.00
IN	2.18	1.92	8.01	13.58	8.19	10.27	4.32	6.16	1.34	0.15
JP	:	:	11.85	27.10	7.34	5.69	41.73	37.27	0.85	0.11
MX	0.55	2.22	5.70	9.41	1.85	2.98	2.88	2.02	0.32	0.22
ZA	1.43	2.47	4.20	12.27	5.46	4.23	12.97	7.62	0	0.07
KR	1.32	4.48	9.34	33.52	1.93	2.70	26.78	13.95	5.31	4.73
US	1.23	4.29	7.34	23.12	1.30	1.61	13.66	5.00	1.21	0.93

Notes: Exceptions to the reference year (Women and Men): IL, AU, BR, CA, JP, MX, KR, US: 2017; IN: 2016; AR, ZA: 2015; Data not available for: ME, AL, BA, AM, FO, GE, MD, TN, UA; Definition differs: IE & FR (for all fields). Includes data from another category: JP (for all fields).

Other: Graduates with unknown fields of study are not included in the data; ':' indicates that data are not available; For proportions based on fewer than 30 graduates the numerators and denominators are displayed in brackets;

Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02) and OECD (Graduates by field).

2.4 The gender gap among Doctoral graduates in the 'narrow' fields of STEM

The differences between women's and men's education pathways may have an impact on the careers they pursue at a later stage. The Gender Equality Strategy 2020-2025 emphasises the importance of tackling the gender gap in the proportion of STEM graduates within the context of an EU economy that is rapidly transforming towards digitalisation (European Commission, 2020b). To further assess the variation in women's and men's representation in STEM education, the following indicators show women's representation among Doctoral graduates in narrow fields of STEM. In order to assess progress over time in increasing women's presence among Doctoral graduates in STEM fields, the CAGR of women and men Doctoral graduates is also presented by narrow fields of STEM.

Women remained under-represented in most STEM fields, with little or no progress since 2015.

Data from 2018 show that, at European level, women continue to be under-represented among Doctoral graduates in the narrow STEM fields of Physical Sciences (38.4%), Mathematics & Statistics (32.5%), ICT (20.8%), Engineering & Engineering Trades (27%), and Architecture & Construction (37.2%). Between 2015 and 2018, there was little progress towards women's representation among Doctoral graduates in these narrow fields of STEM at European level, with most values within 1 p.p. of their previous proportion (Table 2.4). In contrast, women represented more than half of Doctoral graduates in the fields of Biological & Related Sciences, and Environment in 2018 (EU average of 59.7% and 56% in the respective fields).

Some improvements in women's representation in narrow fields of STEM are evident at country level. In Bulgaria, Ireland, Hungary, Poland and Serbia, for example, women represented more than 40% of Doctoral graduates in Physical Sciences, reflecting an increase of more than 5 p.p. compared to 2015. In Slovenia and Israel, women represented more than 30% of Doctoral graduates in the field of Engineering & Engineering Trades, reflecting an increase of more than 5 p.p. compared to 2015.

In the field of Mathematics & Statistics, notable exceptions include Portugal and Turkey, where the proportion of Doctoral graduates in this field was gender-balanced (48.7% and 52%, respectively, reflecting increases of around 2 p.p.). Similarly, the proportion of women in ICT was gender-balanced in Romania and Turkey (52.8% and 48.7%, respectively, reflecting increases of around 18 and 9 p.p. compared to 2015). The proportion of women in the field of Architecture & Construction was gender-balanced in Serbia (55.6%), following an increase of more than 10 p.p. compared to 2015.

Box 7 provides some measures and actions to increase women's representation among Doctoral graduates in specific fields of STEM, including funding instruments that specifically target women STEM Doctoral students and gender-sensitive supervision of women STEM Doctoral candidates.

BOX 7 Measures to support women STEM Doctoral students

National and regional L'Oréal-UNESCO For Women in Science grants are awarded to women scientists in the early stages of their careers across **more than 110 countries globally**. Each year, 250 young women scientists receive grants to enable them to pursue research projects[22].

In **Sweden**, as part of the FESTA project at Uppsala University, a Gender Sensitive PhD Supervisory Toolkit was developed and became part of the Equal Opportunities Plan 2015-2017 for the Faculty of Science and Technology. The Toolkit aims to contribute to high-quality supervision by providing tools and approaches to increase awareness and help to address gender issues that may arise[23]. An evaluation of the FESTA project stated that, for the PhD supervision tool task, for example, 'the intended outcomes have been reached and a long-term impact is expected'[24].

22 Fondation l'Oreal, 'For Women in Science', https://www.forwomeninscience.com/

23 Female Empowerment in Science and Technology Academia, https://www.festa-europa.eu/

24 Gherardi, S. (2017). Festa Project Final Evaluation Report, Report III- 08 February 2017, https://cordis.europa.eu/docs/results/287/287526/final1-gherardi-final-evaluation-report.pdf

Compared to the European level value, a higher proportion of women Doctoral graduates was observed in the field of Mathematics & Statistics in several G-20 countries (AU, IN, KR) between 2015 and 2018. A higher proportion of women Doctoral graduates was also evident in the field of ICT in several G-20 countries (AU, IN, US) between 2015 and 2018.

The average annual growth rate of the number of women and men Doctoral graduates varied significantly at country level across the narrow fields of STEM.

In assessing the representation of women among Doctoral graduates in specific narrow fields of STEM, it is useful to consider the changing trends of women's and men's participation over time.

As shown in Table 2.5, for 18 of 25 of the EU-27 Member States and Associated Countries for which data were available, the CAGR for women was higher in Physical Sciences than for men. This includes eight Member States and Associated Countries where the number of women Doctoral graduates in Physical Sciences increased on average per year, while the number of men decreased (DE, EE, EL, HU, PL, CH, RS, IL), three countries where the number of women and men Doctoral graduates in Physical Sciences increased, but the number of women increased more (AT, UK, TR), and a further seven in which the numbers of both women and men Doctoral graduates decreased, but the number of men Doctoral graduates decreased at a faster rate (BG, CZ, IE, FR, LT, RO, SE).

Similarly, in the field of Mathematics & Statistics, of the 14 EU-27 Member States and Associated Countries for which data were available for both women and men, the CAGR was higher for women in 11 countries. This includes six countries where the CAGR was positive for both women and men, but the number of women Doctoral graduates grew at a faster rate than men (BE, ES, FR, PT, UK, CH), two countries where the number of women increased per year on average while the number of men decreased per year on average (DE, TR), and a further three countries where the numbers of women and men Doctoral graduates decreased per year on average, but women decreased at a lower rate than men (AT, PL, RO).

In the field of ICT, the CAGR for women was higher than that for men in most EU-27 Member States and Associated Countries for which data were available (10 out of 15). Of these, trends were mixed, with a lower rate of decrease in the number of women graduates in ICT than the rate of decrease for men graduates in five countries (DE, IE, PT, RO, RS). In two countries, the number of women remained stable on average per year, while the number of men decreased (FI, SE). In a further three countries, the numbers of women and men Doctoral graduates in ICT increased, but the number of women increased more (UK, TR, IL). Similarly, the CAGR for women Doctoral graduates in the field of Engineering & Engineering Trades was greater than the CAGR for men Doctoral graduates in 15 of the 27 EU-27 Member States and Associated Countries for which data were available, indicating higher growth or a smaller decrease in the number of women compared to men Doctoral graduates for this field.

Table 2.4 Proportion (%) of women among doctoral graduates, by narrow field of study in Natural Sciences, ICT and Engineering, 2015 and 2018

Country	Natural sciences, mathematics and statistics (EF05)							
	Biological and related sciences (EF051)		Environment (EF052)		Physical sciences (EF053)		Mathematics and statistics (EF054)	
	2015	2018	2015	2018	2015	2018	2015	2018
EU-27	**57.92**	**59.7**	**60.35**	**56.03**	**37.94**	**38.39**	**32.53**	**32.49**
EU-28	**59**	**59.83**	**60.35**	**56.03**	**37.48**	**37.96**	**31.36**	**32.2**
BE	47.62	50	50 (3/6)	100 (6/6)	30.04	29.25	25	39.2
BG	65.06	75.41	66.67 (6/9)	80 (4/5)	55.32	60.71	21.43 (3/14)	47.62 (10/21)
CZ	60.44	60.25	55.17 (16/29)	38.46	35.88	36.44	33.33	33.33
DK	-	-	-	-	-	-	-	-
DE	59.86	58.7	-	-	30.8	31.58	25.31	29.41
EE	66.67 (18/27)	58.06	50 (2/4)	60 (3/5)	25.93 (7/27)	41.67 (10/24)	50 (3/6)	0 (0/2)
IE	54.93	56.28	57.69 (15/26)	51.85 (14/27)	37.2	44.64	25 (6/24)	19.23 (5/26)
EL	66.13	63.41	40 (2/5)	50 (2/4)	44.53	49.19	22.22 (6/27)	31.43
ES	59.11	60.84	-	-	50.64	48.15	36.16	38.6
FR	56.28	57.74	-	-	35.22	35.65	27.78	28.81
HR	70.42	75.68	100 (1/1)	-	61.9	50	40 (4/10)	54.55 (6/11)
IT	:	:	:	:	43.66	:	38.46	:
CY	50 (4/8)	75 (3/4)	-	0 (0/3)	60 (3/5)	50 (1/2)	100 (1/1)	66.67 (2/3)
LV	57.89 (11/19)	60 (6/10)	50 (3/6)	50 (2/4)	34.62 (9/26)	55.56 (10/18)	100 (3/3)	100 (1/1)
LT	70.37 (19/27)	60	45.45 (5/11)	85.71 (12/14)	44.9	46.88	20 (1/5)	57.14 (4/7)
LU	72.73 (8/11)	44.44 (8/18)	-	-	36.36 (4/11)	33.33 (7/21)	0 (0/2)	14.29 (1/7)
HU	60.76	57.5	50	55.81	32.73	40.18	42.86 (9/21)	20 (4/20)
MT	50 (2/4)	100 (3/3)	-	-	100 (2/2)	50 (2/4)	-	0 (0/1)
AT	49.59	50.94	40 (2/5)	37.5 (9/24)	31.58	33.47	24.68	26.98
PL	70.4	72	61.54	62.5	46.68	56.52	26.58	29.03
PT	65.66	68.31	62.5 (5/8)	61.11 (11/18)	68.84	56.94	47.06	48.65
RO	68.09	75 (21/28)	70 (14/20)	33.33 (2/6)	56.76	58.1	36.36	43.75 (7/16)
SI	71.79	60 (15/25)	58.82 (10/17)	75 (3/4)	41.67 (5/12)	50 (4/8)	63.64 (7/11)	50 (3/6)
SK	74.42	77.24	58.54	44.83 (13/29)	52.17	41.49	50 (13/26)	41.18 (7/17)
FI	59.29	54.63	75.86 (22/29)	62.5	44.17	43.44	11.9	16.13
SE	51.22	48	61.04	66.04	34.82	35.51	26.8	22.5
UK	60.71	60.08	-	-	35.57	36.49	28.67	31.34
IS	44.44 (4/9)	40 (2/5)	66.67 (2/3)	66.67 (2/3)	25 (2/8)	11.11 (1/9)	60 (3/5)	-
NO	48.72	58.82	100 (1/1)	25 (1/4)	45.28	32.79	26.67 (4/15)	30.77 (4/13)
CH	55.11	52.1	46.43	47.34	31.16	32.84	26.15	33.33
MK	-	100 (3/3)	-	0 (0/1)	0 (0/5)	100 (4/4)	50 (1/2)	33.33 (1/3)
RS	85.71 (12/14)	67.05	100 (3/3)	76.19 (16/21)	56.12	69.23	64.71 (11/17)	57.69 (15/26)
TR	62.24	60.34	50 (2/4)	45.45 (5/11)	47.49	49.78	49.78	52
IL	59.35	62.57	50	43.75	31.44	39.34	14.71	34.29
AU	55.01	54.08	46.88	48.48	40.04	38.54	39.82	33.63
IN	43.98	:	40.57	:	33.49	:	36.32	:
MX	-	53.46	-	-	33.71	44.8	27.27	29.69
KR	37.5	39.78	28.38	46.67 (7/15)	24.54	28.57	36	33.06
US	53.21	52.37	47.81	55.77	34.32	32.42	27.95	27.12

Country	Information and Communication Technologies (EF06)		Engineering, manufacturing and construction (EF07)					
	Information and Communication Technologies (EF061)		Engineering and engineering trades (EF071)		Manufacturing and processing (EF072)		Architecture and construction (EF073)	
	2015	2018	2015	2018	2015	2018	2015	2018
EU-27	**21.26**	**20.8**	**27.93**	**27.01**	**40.55**	**40.92**	**38.75**	**37.24**
EU-28	**22.57**	**21.88**	**26.63**	**25.28**	**37.17**	**35.31**	**37.72**	**37.2**
BE	0 (0/2)	37.5 (6/16)	20.35	27.85	33.33 (2/6)	50 (5/10)	28 (7/25)	26.47
BG	38.89	33.33 (9/27)	23.49	19.83	54.55	57.14 (12/21)	44.44	43.75 (7/16)
CZ	10.81	3.51	21.45	22.83	62.5	55.26	37.59	28.72
DK	-	-	29.92	30.31	-	-	-	-
DE	12.77	14.58	18.01	17.92	28.26	31.36	33.28	37.02
EE	31.25 (5/16)	13.79 (4/29)	40 (10/25)	42.86	-	-	30.77 (4/13)	55.56 (5/9)
IE	27.91	34.43	21.53	22.45	47.83 (11/23)	70.59 (12/17)	45.16	23.81 (5/21)
EL	20.37	31.11	28.74	33.67	50 (4/8)	40 (8/20)	57.75	45.95
ES	24.1	-	-	-	-	-	35.71	39.11
FR	25.96	25.39	30.58	30.16	57.39	59.38	44.93	36.68
HR	18.18 (2/11)	20 (3/15)	27.91	16.67	51.85 (14/27)	75 (6/8)	0 (0/19)	68.42 (13/19)
IT	23.88	:	22.74	:	28.99	:	51.19	:
CY	50 (1/2)	0 (0/8)	25 (4/16)	14.29 (2/14)	-	-	50 (1/2)	37.5 (3/8)
LV	33.33 (3/9)	25 (1/4)	36.36	33.33 (6/18)	62.5 (5/8)	66.67 (2/3)	38.46 (5/13)	0 (0/2)
LT	62.5 (5/8)	16.67 (1/6)	35.82	20.51	-	14.29 (2/14)	44.44 (8/18)	54.55 (6/11)
LU	7.14 (2/28)	8.33 (2/24)	-	-	-	-	-	-
HU	18.18	10.64	20.27	20.69	60.87 (14/23)	60 (12/20)	31.03 (9/29)	28.21
MT	-	0 (0/2)	20 (1/5)	0 (0/1)	-	0 (0/1)	0 (0/1)	-
AT	23.81 (5/21)	0 (0/14)	25.07	27.3	50 (5/10)	22.22 (2/9)	28.28	23.96
PL	17.07	10.17	35.35	38.84	71.7	70.27	48.15	47.31
PT	23.86	26.32	29.74	34.46	35.71	47.22	42.34	39.25
RO	33.01	52.78	37.05	33.33	44.55	39.47	43.75	45.28
SI	20.45	17.86 (5/28)	31.63	40.43	83.33 (5/6)	-	55.17 (16/29)	42.86 (3/7)
SK	12	12.12	24.06	17.88	37.04	34.78 (8/23)	29.41	35.9
FI	21.71	26.21	31.17	27.81	55.56 (15/27)	56.67	37.93 (11/29)	43.33
SE	25.14	25.73	27.93	31.3	29.73	30.91	30.28	34.58
UK	20.23	24.01	21.96	21.43	23.29	25.9	40.19	37.11
IS	0 (0/1)	0 (0/2)	20 (1/5)	-	0 (0/1)	100 (1/1)	-	100 (1/1)
NO	17.39 (4/23)	20.83 (5/24)	20.2	20.47	-	-	34.78 (8/23)	45.45 (10/22)
CH	15.57	15.25	23.84	22.12	45.33	43.66	30.56	33.11
MK	-	60 (6/10)	40.54	28.57 (4/14)	55.56 (5/9)	100 (2/2)	0 (0/6)	-
RS	31.25	34.78 (8/23)	43.98	45.26	58.82 (10/17)	68.97 (20/29)	44.07	55.56
TR	40 (2/5)	48.72	27.57	22.64	49.07	65.9	54.36	50.2
IL	22.97	26.32	26.21	35.84	-	-	0 (0/2)	50 (5/10)
AU	26.91	26.78	26.09	26.48	26.81	37.65	29.65	30.39
IN	56.76	:	25.09	:	20.97	:	33.33	:
MX	21.88	20.47	33.68	31.76	60	54.55	57.53	48.75
KR	13.33	14.93	11.31	11.15	56.06	58.72	16.6	19.06
US	22.46	22.4	21.98	22.3	27.15	27.32	31.1	33.36

Notes: Exceptions to the reference period: EU-27, EU-28 and BG in Environment (EF052): 2017-2018; IL, AU, MX, KR and US: 2015-2017; IT: 2014 (instead of 2015, data in more recent years are not available). Data not available for NL, ME, AL, BA, GE, AM, FO, MD, TN and UA. Definition differs: EU-27 and EU-28 (all fields), IE & FR (for 2018 data for all fields).

Other: Graduates with unknown fields of study are not included in the data; ':' indicates that data are not available; '-' indicates that the number of graduates was zero; For proportions based on fewer than 30 graduates the numerators and denominators are displayed in brackets;

Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02) and OECD (Graduates by field)

Table 2.5 Compound annual growth rate (CAGR, %) and trend of doctoral graduates (number), by sex and narrow field of study in Natural Sciences, ICT and Engineering, 2015-2018

Country	Natural sciences, mathematics and statistics (EF05)																Information and Communication Technologies (EF06)			
	Biological and related sciences (EF051)				Environment (EF052)				Physical sciences (EF053)				Mathematics and statistics (EF054)				Information and Communication Technologies (EF061)			
	Women	Trend	Men	Trend	Women	Trend	Men	Trend	Women	Trend	Men	Trend	Women	Trend	Men	Trend	Women	Trend	Men	Trend
EU-27	**-11.71**		**-17.96**		**-5.8**		**12.5**		**-1.93**		**-3.77**		**1.11**		**1.31**		**-7.26**		**-4.68**	
EU-28	**-6.16**		**-9.36**		**-5.8**		**12.5**		**-0.15**		**-2.15**		**5.93**		**1.94**		**-3.54**		**0.39**	
BE	-4.56		-7.55		:		:		-26.79		-25.86		82.97		46.85		:		71	
BG	-5.2		-19.73		:		:		-0.65		-7.72		:		:		-13.69		-6.47	
CZ	9.39		9.68		-2.13		22.67		-2.92		-3.71		-16.08		-16.08		:		18.56	
DK	:		:		:		:		:		:		:		:		:		:	
DE	-4.97		-3.43		:		:		0.33		-0.89		5.68		-1.35		-4.04		-8.81	
EE	0		:		:		:		12.62		-11.21		:		:		:		31.48	
IE	9.71		7.72		-2.27		:		-6.41		-15.57		:		5.27		-4.35		-13.59	
EL	-14.09		-10.61		:		:		2.29		-3.91		:		4.55		:		-10.33	
ES	10.75		8.12		:		:		2.27		5.73		10.49		6.72		0		0	
FR	-20.05		-21.62		:		:		-1.98		-2.59		5.86		4.08		-3.77		-2.8	
HR	-17.57		-24.61		:		:		-16.75		-2.13		:		:		:		10.06	
CY	:		:		:		:		:		:		:		:		:		:	
LV	:		:		:		:		:		-22.22		:		:		:		:	
LT	-1.79		:		:		:		-11.99		-14.29		:		:		:		:	
LU	:		:		:		:		:		:		:		:		:		-5.42	
HU	-1.41		3.13		16.96		8.2		7.72		-3.26		:		10.06		:		-2.27	
MT	:		:		:		:		:		:		:		:		:		:	
AT	9.91		7.38		:		71		6.18		3.38		-3.64		-7.44		:		-4.35	
PL	-2.73		-5.22		-5.9		-7.17		3.16		-9.58		-5.01		-8.8		:		-7.97	
PT	4.67		0.58		30.06		:		-4.79		12.97		4		1.82		-1.61		-5.8	
RO	-13.1		-22.43		:		:		-16.56		-18.07		-39.75		-45.63		-17.63		-37.31	
SI	-35.54		-23.11		-33.06		-47.72		-7.17		:		-24.61		-9.14		-17.79		-13.06	
SK	-0.35		-5.33		-18.48		-2		-13.38		0		-18.64		:		:		-12.97	
FI	-4.15		2.13		-3.13		:		-9.71		-8.81		:		-11.1		4.81		-3.48	
SE	-10.61		-6.69		-9.36		-15.66		-5.47		-6.42		-11.54		-4.42		0		-1.03	
UK	4.36		5.26		:		:		5.34		3.94		7.83		3.42		12.15		4.23	
IS	:		:		:		:		:		:		:		:		:		:	
NO	1.72		-11.21		:		:		-5.9		12.24		:		-6.47		:		0	
CH	1.59		5.77		7.17		5.87		2.34		-0.27		18.1		5.27		-1.79		-0.98	
MK	:		:		:		:		:		:		:		:		:		:	
RS	70.04		143.85		74.72		:		4.63		-13.32		10.89		:		-7.17		-11.99	
TR	15.01		18.13		:		:		8.36		5.1		0.87		-2.07		111.79		88.21	
IL	-5.05		-11.27		-23.62		-13.4		7.37		-9.71		:		-10.94		21.27		10.82	
AU	0.81		2.71		15.47		11.8		7.62		11.04		-8.11		5.02		3.35		3.7	
MX	0		0		:		:		29.54		2.55		25.83		18.59		36.28		42.13	
KR	9.39		4.25		-42.26		-61.15		12.63		1.57		-4.55		1.86		67.33		56.65	
US	-0.61		1.09		9.92		-6.31		-1.08		3.24		1.77		3.93		-0.34		-0.2	

Notes: Exceptions to the reference period: EU-27, EU-28: 2017-2018 (for all fields); BG: 2017-2018 for EF052; FR: 2015-2017 for EF072 HR: 2015-2017 for EF052; CY: 2016-2018 for EF052; LT: 2017-2018 for EF072; MT: 2016-2018 for EF054 and EF061, 2015-2017 for EF073; SI: 2015-2016 for EF072; IS: 2015-2017 for EF054 and EF071, 2016-2018 for EF073; MK: 2016-2018 for EF051, EF052, 2015-2017 for EF073; IL: 2015-2017 for EF051, EF052, EF053, EF054, EF061, EF071, EF073; MX: 2015-2017 for EF053, EF054, EF061, EF071, EF072, EF073, AU, KR, US: 2015-2017 for all fields. Data not available for IT, NL, ME, AL, BA, GE, AM, FO, MD, TN, UA. Definition differs for: EU-27 and EU-28 (all fields), IE (all fields for 2018), FR (all fields for 2018 except Manufacturing and processing)

Other: ':' indicates where values are missing or excluded due to small size (all values for that country less than 15). Bars in the 'Trend 'column represent the actual numbers of graduates each year. This differs from the CAGR, which shows the average annual rate of change over the whole period; In the 'Trend' columns, the scale is not the same across countries.

Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02) and OECD (Graduates by field).

2.5 Women and men's propensity to graduate from Bachelor-level studies and move to higher-level studies

In order to assess gender differences in educational pathways, the indicators presented below show progress in increasing women's representation at earlier levels of tertiary education and their propensity to transition from Master to Doctoral level, by broad and narrow fields of study.

Women were still more likely than men to graduate from Bachelor studies.

Table 2.6 compares the number of Bachelor graduates and the number of Bachelor entrants in the same year, by sex. A value of 1 indicates that, for each student entering Bachelor studies in that year, one student graduated. A value of less than 1 indicates fewer graduates than entrants, while a value of more than 1 indicates more graduates than entrants. Although intended as a proxy for graduation rate, the ratio is imperfect in that it compares two different cohorts of students and is therefore affected by changes in the size of the student population over time.

For every EU-27 Member State and Associated Country, except Switzerland, the number of Bachelor graduates compared to the number of Bachelor entrants by total field of study is higher for women than men (Table 2.6). For women, this value ranged from 0.6 (LU) to 1.4 (HU), while for men the ratio ranged from 0.4 (LV) to 1 (IE), indicating that women were more likely than men to graduate from Bachelor-level at country level in 2018.

A similar trend is observed when data are disaggregated by broad field of study. For Arts & Humanities, Social Sciences, Journalism & Information, and Business, Administration & Law, fewer than five countries had higher ratios of Bachelor graduates to entrants for men compared to women. The largest variance in ratios for women and men were observed in the field of Education, where six countries (EE, IT, CY, HU, MT, IS) had differences of more than 0.7 (including a very large difference of 13.5 in favour of men in Malta, although this is based on a small total number of students).

There was a lower ratio of women Doctoral entrants compared to Master's graduates, suggesting that women may have been less likely to continue on to Doctoral level than men.

To explore women's and men's propensity to transition to higher levels of study, Table 2.7 shows the ratio of the number of people who started Doctoral-level studies to the number of people who graduated from Master-level studies in 2018. This indicator is a proxy for the proportion of people who continue from Master-level to Doctoral-level studies.

At country level, only a fairly small proportion of both women and men continued on to Doctoral-level studies from Master-level studies in the EU-27 Member States and Associated Countries (between 0 and 0.2 for women and 0 and 0.3 for men). A number of contextual factors may influence how many PhD students begin studies in a given country in a given year, including the attractiveness of education systems in each country and the level of international mobility of students.

However, across all countries and fields, the ratio for women was either equal to or less than the ratio for men, indicating that, overall, women were less likely to begin Doctoral studies compared to men. When data are disaggregated by broad field of study, a similar trend is observed in the fields of Education (with the exception of IE, HU, AT, IS and CH), Arts & Humanities (except EE and LU), Social Sciences, Journalism & Information (except IE, NL, NO and IL), Business, Administration & Law (except IE), Natural Sciences, Mathematics & Statistics (except CY) and Health & Welfare (except CY, RO, IS, TR and IL).

In more than half of the EU-27 Member States and Associated Countries (19 in total: BG, CZ, EE, IE, ES, FR, HR, CY, LV, LT, LU, HU, SK, FI, SE, UK, NO, TR, IL), women and men were most likely to progress from Master-level studies to Doctoral-level studies in the field of Natural Sciences, Mathematics & Statistics. The data from these countries therefore indicate that, across all broad fields, Natural Sciences, Mathematics & Statistics was the more popular choice among women studying at Doctoral level. However, when the ratios for women are compared to the ratios for men, the data show that women were still less likely than men to continue to study at Doctoral level in Natural Sciences, Mathematics & Statistics for each of these countries, with the exception of Cyprus, Greece, Belgium and Malta.

Table 2.8 shows the same ratio, disaggregated by narrow fields of STEM. The data show that the ratio of Doctoral entrants to Master's graduates for women was either equal to or greater than the ratio for men in almost half of the EU-27 Member States and Associated Countries in the narrow fields of ICT (CZ, DE, ES, FR, HR, IE, LV, LT, LU, AT, PL, SK, NO, CH, TR, IL) and Engineering & Engineering Trades (BG, CZ, DK, FR, HR, LV, AT, PT, SI, SK, FI, SE, UK, CH, MK, RS, IL). The data therefore suggest that countries have made progress in improving the proportion of women continuing from Master's level to Doctoral level in the fields in which women tend to be most under-represented. In all other narrow fields, however, the ratio was lower for women than for men in most countries, particularly in Biological & Related Sciences (higher only in CY and MK), Environment (higher only in AT and SI) and Physical Sciences (higher only in CY, LV, LT, AT and SI).

At country level, there have been some measures to encourage women to undertake studies at Master's and Doctoral level in certain fields of STEM, as shown in Box 8.

BOX 8 Support measures to promote women's representation at Master's and Doctoral level in certain fields of study

In **Israel**, the Ministry of Science and Technology promotes scholarships for women in Science and Technology and for women in Engineering Master's Programmes, with specific funding to facilitate women's research careers in the STEM fields[25]. The scholarship for women in Science and Technology is offered to women PhD students who study in the field of Exact Sciences or Engineering to encourage more women to study in this field. The scholarship for women in Engineering Master's Programmes is specifically for female students about to complete their final year of an undergraduate degree in Engineering, Physics, Mathematics or Computer Sciences and aims to increase the number of female students who pursue graduate degrees in Engineering and Exact Sciences, so as to expand the pool of female candidates for PhDs, and eventually for tenure-track positions.

In **Switzerland**, the Swiss National Science Foundation (SNSF) is currently planning a PhD-funding instrument for women in STEM. This will add to their existing measures for promoting gender equality, including the PRIMA scheme, which was introduced in 2017 to support excellent women researchers[26].

In contrast, the ratio for women is only higher or equal to that for men in a small number of countries in the fields of Biological & Related Sciences (CY, MK), Environment (AT, SI, RS), and Physical Sciences (CY, LV, LT, AT, SI). Women also tended to have a lower ratio than men in the fields of Natural Sciences, Mathematics & Statistics, Manufacturing & Processing, and Architecture & Construction, although there were exceptions (e.g. ES (Mathematics & Statistics), HR (Manufacturing & Processing) and IE (Architecture & Construction).

25 GENDERACTION policy brief on 'disruptive measures for gender equality in R&I', https://genderaction.eu/policy-advice/gender-equality-in-era

26 Multi-Year Programme Swiss National Science Foundation: Promotion of Education, Research and Innovation for 2021-2024 (four-year white paper) – Measures on Gender Equality and Equity, https://www.sbfi.admin.ch/sbfi/de/home/bfi-politik/bfi-2021-2024/transversale-themen/chancengerechtigkeit-bfi

Table 2.6 Ratio of bachelor graduates to bachelor entrants, by sex and broad field of study, 2018

Country	Total		Education		Arts and humanities		Social sciences, journalism and information		Business, administration and law		Natural sciences, mathematics and statistics	
	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
EU-27	**0.85**	**0.68**	**1.16**	**0.89**	**0.65**	**0.58**	**0.8**	**0.7**	**0.88**	**0.75**	**0.57**	**0.46**
EU-28	**0.84**	**0.84**	**0.84**	**0.84**	**0.84**	**0.84**	**0.84**	**0.84**	**0.84**	**0.84**	**0.84**	**0.84**
BE	0.81	0.63	0.97	0.58	0.68	0.59	0.65	0.55	0.72	0.6	0.61	0.54
BG	0.84	0.62	0.62	0.57	0.59	0.44	1.35	1.19	1.36	1.18	0.73	0.54
CZ	0.75	0.61	0.89	0.86	0.71	0.62	0.86	0.75	0.83	0.68	0.63	0.55
DK	0.88	0.83	0.94	0.68	0.92	0.86	0.89	0.89	0.92	0.84	0.71	0.79
DE	0.75	0.7	0.85	0.69	0.75	0.69	0.75	0.67	0.81	0.78	0.5	0.52
EE	0.98	0.69	1.17	0.3 (7/23)	0.87	0.63	1.27	0.71	0.9	0.66	0.68	0.62
IE	1.09	1.04	1.04	0.85	0.75	0.73	1.06	1.15	1.56	1.34	0.84	0.88
EL	0.67	0.5	0.8	0.59	0.64	0.45	0.74	0.57	0.71	0.46	0.63	0.49
ES	0.87	0.75	1.36	1.16	0.72	0.72	0.67	0.69	0.78	0.75	0.71	0.68
FR	0.6	0.5	0.96	0.93	0.44	0.34	0.5	0.41	0.7	0.63	0.42	0.28
HR	0.7	0.54	0.91	0.79	0.62	0.56	0.71	0.47	0.79	0.64	0.75	0.59
IT	0.88	0.72	1.6	3.68	0.73	0.68	0.87	0.75	0.93	0.81	0.47	0.5
CY	0.66	0.43	0.75	1.47 (22/15)	0.57	0.46	0.74	0.56	0.7	0.32	0.58	0.45
LV	0.68	0.42	0.79	0.44	0.64	0.47	0.7	0.46	0.68	0.48	0.52	0.41
LT	1.01	0.68	1.72	1.57	0.81	0.61	0.98	0.75	1.06	0.63	0.85	0.66
LU	0.56	0.5	0.74	0.97	0.42	0.26	0.8	0.74	0.7	0.79	0.33	0.35
HU	1.36	1.01	1.91	3.5	1.02	0.89	1.19	0.96	1.82	1.4	0.99	1.05
MT	0.92	0.74	2.54	16 (32/2)	0.84	0.93	1.15	1	0.78	0.75	1.24	0.71
NL	0.83	0.71	1.13	0.82	0.83	0.93	0.79	0.77	0.76	0.7	0.6	0.66
AT	0.67	0.63	0.63	0.57	0.56	0.51	0.61	0.44	0.93	0.91	0.43	0.55
PL	1.34	0.79	4	4.12	0.64	0.43	0.9	0.57	1.51	0.98	0.65	0.44
PT	0.88	0.77	0.81	0.51	0.73	0.72	0.87	0.73	0.7	0.64	0.8	0.65
RO	0.68	0.55	0.71	0.64	0.6	0.49	0.63	0.43	0.7	0.51	0.74	0.55
SI	0.72	0.55	0.76	0.67	0.67	0.52	0.72	0.57	0.79	0.56	0.76	0.53
SK	0.82	0.62	0.85	0.59	0.72	0.64	0.84	0.64	0.8	0.64	0.77	0.77
FI	1.13	0.87	1.12	1	1.08	1.02	1.22	1.28	1.09	0.8	0.73	0.78
SE	0.72	0.55	0.88	1.09	0.27	0.24	0.65	0.58	0.62	0.54	0.44	0.34
UK	0.8	0.75	0.79	0.79	0.84	0.82	0.76	0.74	0.78	0.72	0.74	0.76
IS	1.09	0.83	1.41	0.69	0.81	0.98	1.21	0.94	0.99	0.85	0.45	0.6
NO	0.93	0.72	2.06	2.08	0.43	0.45	0.52	0.46	0.95	0.65	0.48	0.4
CH	0.94	0.95	1.13	1.28	0.85	0.85	0.83	0.96	0.9	0.93	0.58	0.72
MK	0.57	0.43	0.41	0.2	0.75	0.63	0.55	0.3	0.79	0.52	0.85	0.59
RS	0.65	0.53	0.76	0.52	0.63	0.46	0.56	0.53	0.85	0.76	0.53	0.35
TR	0.73	0.64	0.99	0.82	0.62	0.47	0.62	0.53	0.73	0.7	0.64	0.62
IL	0.81	0.74	0.89	0.86	0.66	0.57	0.78	0.74	1.02	1.1	0.43	0.31
AU	0.77	0.7	0.89	0.81	0.66	0.62	0.65	0.62	0.98	0.85	0.72	0.64
JP	0.94	0.91	0.97	0.95	0.96	0.86	0.99	0.88	0.91	0.91	0.97	1.02
MX	0.64	0.57	0.91	1.05	0.61	0.54	0.67	0.55	0.57	0.53	0.49	0.45
RU	1.07	0.89	0.42	0.32	0.71	0.58	1.49	1.26	1.32	1.23	0.86	0.7
KR	1	0.99	1.02	1.02	1.06	0.99	1	1.09	1.1	1.25	0.94	0.9

Country	Engineering, manufacturing and construction		Agriculture, forestry, fisheries and veterinary		Health and welfare		Services	
	Women	Men	Women	Men	Women	Men	Women	Men
EU-27	**0.78**	**0.69**	**0.77**	**0.71**	**1.03**	**1.1**	**0.83**	**-**
EU-28	**0.84**	**0.84**	**0.84**	**0.84**	**0.84**	**0.84**	**0.84**	**0.84**
BE	0.62	0.62	0.59	0.68	0.86	0.68	0.74	0.5
BG	0.75	0.51	0.87	0.44	0.86	0.84	0.69	0.64
CZ	0.65	0.6	0.54	0.43	0.71	0.62	0.77	0.58
DK	0.74	0.78	1.07	0.94	0.91	0.93	1.11	1.16
DE	0.7	0.74	0.84	0.87	0.76	0.72	0.77	0.75
EE	0.83	0.73	1.17 (28/24)	0.77	1.19	1.01	1.22	0.96
IE	0.91	0.97	0.99	1.32	1.22	1.44	1.1	1.06
EL	0.52	0.49	0.38	0.45	0.79	0.7	0.59	0.66
ES	0.91	0.77	0.99	0.78	0.92	0.89	0.9	0.9
FR	0.59	0.62	1.15	1.04	0.9	0.92	0.7	0.51
HR	0.58	0.48	0.55	0.46	0.72	0.63	0.72	0.58
IT	0.81	0.63	0.71	0.66	1.37	1.58	0.85	0.68
CY	0.88	0.87	2 (16/8)	1.1 (11/10)	0.55	0.35	0.43	0.45
LV	0.56	0.37	1.02	1.3	0.82	0.54	0.72	0.4
LT	1.06	0.77	1.04	1.18	0.98	0.99	1.26	0.7
LU	0.17 (4/23)	0.46	-	-	0	0 (0/21)	-	-
HU	1.2	1.01	1.49	1.26	1.05	0.77	0.85	0.88
MT	1.06	0.77	0.55 (6/11)	0.88 (7/8)	0.96	0.85	0.23	0.16
NL	0.66	0.64	0.8	0.7	0.86	0.84	0.83	0.78
AT	0.6	0.65	0.7	1.01	0.95	0.77	0.73	0.64
PL	0.96	0.65	0.91	0.94	1.3	1.11	0.94	0.83
PT	1.52	0.96	1.5	1.08	1.16	1.14	0.76	0.71
RO	0.69	0.56	0.75	0.74	0.72	0.67	0.74	0.64
SI	0.67	0.55	0.72	0.37	0.7	0.69	0.64	0.69
SK	0.71	0.58	0.9	0.81	0.91	0.9	0.78	0.57
FI	0.98	0.85	1.09	0.79	1.28	1.01	0.97	0.98
SE	0.87	0.66	0.41	0.18	1.1	0.95	0.77	0.61
UK	0.73	0.74	0.88	0.92	0.9	0.95	-	-
IS	0.69	0.83	0.89	0.71 (20/28)	1.5	1.11	1.23	0.4
NO	1.23	1.08	0.77	0.62	1.17	1.13	0.54	0.48
CH	0.8	0.96	1.09	1.08	1.05	0.96	1.04	1.6
MK	0.54	0.52	0.74	0.47	0.31	0.25	0.52	0.36
RS	0.56	0.57	0.51	0.4	0.77	0.68	0.6	0.54
TR	0.75	0.62	0.85	0.77	0.81	0.91	0.68	0.73
IL	0.7	0.81	1.34	1.38	1.06	1.17	-	-
AU	0.61	0.67	0.64	0.67	0.75	0.71	0.48	0.6
JP	0.94	1.02	0.98	0.97	0.83	0.82	0.97	0.83
MX	0.48	0.47	0.49	0.53	0.65	0.62	1.48	0.8
RU	0.84	0.75	0.73	0.63	1.19	0.98	2.24	1.18
KR	0.85	0.98	0.9	0.95	1.07	0.9	0.91	0.85

Notes: Reference year differs: EU-27, EU-28: 2016, IL, AU, JP, MX, RU, KR: 2017. Data not available for: ME, AL, BA, GE, AM, FO, MD, TN, UA; Break in time series: FR (bachelor entrants for total and all fields), DK (bachelor entrants in Engineering and Services). Definition differs for: IE & FR (bachelor graduates for total and all fields), UK (bachelor entrants for total and all fields), ME (bachelor graduates for all fields except Total); Data estimated for: BG & PL (bachelor entrants for all fields). Data included in another category: JP (bachelor graduates and entrants in all fields except ICT); Includes data from another category: JP (bachelor graduates and entrants in ICT).

Other: The indicator compares two different groups of people, i.e. the same reference year's entrants and graduates; ":" indicates that data are not available; "-" indicates that the denominator is zero; for ratios whose denominator is smaller than 30, the numerators and denominators are displayed in brackets.

Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02; educ_uoe_ent02); OECD (Graduates by field; New entrants by field).

Table 2.7 Ratio of doctoral entrants to master graduates, by sex and broad field of study, 2018

Country	Total		Education		Arts and humanities		Social sciences, journalism and information		Business, administration and law		Natural sciences, mathematics and statistics	
	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
BE	0.03	0.04	0	0	0	0	0	0	0	0	0	0
BG	0.07	0.11	0.05	0.13	0.22	0.3	0.12	0.24	0.03	0.05	0.31	0.45
CZ	0.1	0.17	0.03	0.06	0.18	0.34	0.06	0.11	0.04	0.1	0.42	0.6
DK	0.08	0.11	0	0	0.08	0.1	0.04	0.08	0	0	0.14	0.21
DE	0.17	0.22	0.08	0.18	0.11	0.15	0.15	0.19	0.08	0.14	0.38	0.47
EE	0.08	0.13	0.03	0.03	0.16	0.15	0.07	0.09	0.02	0.05	0.34	0.5
IE	0.08	0.1	0.03	0.02	0.16	0.2	0.15	0.14	0.03	0.02	0.29	0.32
EL	0.12	0.19	0.09	0.14	0.2	0.43	0.06	0.1	0.03	0.05	0.15	0.15
ES	0.13	0.19	0.03	0.05	0.38	0.52	0.25	0.44	0.05	0.08	0.64	0.67
FR	0.05	0.07	0.01	0.02	0.15	0.26	0.06	0.11	0.02	0.02	0.18	0.26
HR	0.2	0.28	0.11	0.35	0.29	0.53	0.21	0.49	0.04	0.05	0.93	1.22
IT	0.05	0.08	0	0.02	0.05	0.08	0.03	0.05	0.03	0.03	0.16	0.26
CY	0.04	0.07	0.02	0.04	0.04	0.11	0.1	0.19	0.02	0.02	0.31	0.28
LV	0.1	0.18	0.06	0.08 (1/13)	0.13	0.25	0.16	0.38	0.06	0.13	0.5	0.8
LT	0.07	0.11	0.05	0.07	0.11	0.27	0.07	0.13	0.03	0.04	0.34	0.44
LU	0.14	0.21	0.13	0.14 (1/7)	0.19	0.07	0.56 (14/25)	0.79 (11/14)	0.02	0.03	1.07	2.18 (48/22)
HU	0.09	0.15	0.04	0.03	0.17	0.33	0.13	0.28	0.03	0.05	0.39	0.61
MT	0	0	0	0 (0/14)	0	0	0	0 (0/27)	0	0	0	0
NL	0.06	0.08	0.01	0.01	0.02	0.03	0.03	0.02	0.01	0.01	0.08	0.13
AT	0.12	0.15	0.04	0.02	0.21	0.25	0.11	0.16	0.08	0.09	0.25	0.31
PL	0.04	0.08	0.01	0.03	0.12	0.3	0.04	0.1	0.02	0.04	0.18	0.38
PT	0.18	0.25	0.16	0.26	0.43	0.68	0.23	0.54	0.08	0.19	0.37	0.56
RO	0.08	0.12	0.02	0.07	0.2	0.29	0.08	0.22	0.03	0.04	0.12	0.21
SI	0.12	0.21	0.04	0.09	0.31	0.46	0.05	0.15	0.06	0.11	0.28	0.35
SK	0.07	0.11	0.02	0.04	0.14	0.26	0.04	0.09	0.04	0.08	0.21	0.33
FI	0.08	0.11	0.05	0.1	0.09	0.17	0.08	0.18	0.04	0.05	0.13	0.25
SE	0.09	0.14	0.01	0.02	0.12	0.13	0.06	0.1	0.02	0.02	0.34	0.58
UK	0.11	0.18	0.04	0.05	0.17	0.26	0.09	0.13	0.03	0.04	0.34	0.59
IS	0.11	0.17	0.07	0.06	0.13	0.39	0.16	0.18	0.01	0.01	0.38	0.64
NO	0.12	0.14	0.06	0.09	0.21	0.23	0.09	0.07	0.03	0.03	0.34	0.52
CH	0.2	0.22	0.03	0.01	0.17	0.21	0.15	0.27	0.07	0.07	0.61	0.67
MK	0.14	0.23	0.12	1.58 (19/12)	0.29	0.36	0.94	2.67 (40/15)	0.03	0.05	0.17	0.23
RS	0.18	0.23	0.09	0.14	0.28	0.38	0.2	0.38	0.09	0.11	0.34	0.5
TR	0.2	0.2	0.27	0.32	0.46	0.48	0.2	0.28	0.09	0.1	0.53	0.61
IL	0.08	0.12	0.02	0.03	0.15	0.19	0.1	0.09	0.01	0.02	0.56	0.67
AU	0.12	0.15	0.06	0.09	0.24	0.37	0.24	0.26	0.02	0.03	1	1.2
JP	0.14	0.16	0.1	0.1	0.17	0.23	0.13	0.15	0.05	0.08	0.13	0.18
MX	0.09	0.12	0.09	0.13	0.28	0.37	0.1	0.2	0.05	0.07	0.47	0.6
KR	0.25	0.38	0.13	0.13	0.29	0.27	0.2	0.34	0.18	0.23	0.5	0.95

Country	Information and Communication Technologies		Engineering, manufacturing and construction		Agriculture, forestry, fisheries and veterinary		Health and welfare		Services	
	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
BE	0	0	0	0	0	0	0	0	0	0
BG	0.04	0.12	0.09	0.11	0.08	0.12	0.09	0.13	0.02	0.04
CZ	0.11	0.11	0.16	0.19	0.13	0.19	0.1	0.2	0.05	0.11
DK	0	0	0.21	0.22	0.35	0.78	0.25	0.33	0	0
DE	0.25	0.15	0.15	0.17	0.41	0.22	0.31	0.49	0.39	0.19
EE	0.14	0.14	0.07	0.11	0.13	0.39 (11/28)	0.1	0.11	0.02	0.05
IE	0.06	0.06	0.22	0.24	0.2	0.3	0.07	0.18	0.02	0
EL	0.16	0.24	0.26	0.31	0.21	0.23	0.31	0.56	0.12	0.24
ES	0.27	0.25	0.15	0.21	0.21	0.32	0.12	0.17	0.05	0.07
FR	0.08	0.07	0.06	0.05	0.06	0.11	0.04	0.04	0.04	0.05
HR	0.08	0.03	0.27	0.25	0.17	0.33	0.35	0.65	0.05	0.07
IT	0.2	0.25	0.09	0.09	0.13	0.12	0.05	0.05	0	0
CY	0.13	0.16	0.1	0.25	-	-	0.1	0.06	0.05 (1/19)	0 (0/5)
LV	0.27	0.24	0.2	0.23	0.25	0.43 (6/14)	0.04	0.06	0.05	0.08
LT	0.11	0.07	0.11	0.12	0.1	0.06	0.03	0.06	0 (0/20)	0
LU	1 (12/12)	0.47	0.13 (1/16)	0.61	0 (0/4)	-	0 (0/12)	0 (0/5)	0 (0/8)	0 (0/7)
HU	0.16	0.18	0.05	0.07	0.09	0.14	0.13	0.16	0.18	0.35
MT	0 (0/24)	0	0.03	0	-	-	0	0	0 (0/1)	0 (0/1)
NL	0.03	0.07	0.1	0.13	0.21	0.27	0.11	0.15	0	0
AT	0.15	0.16	0.19	0.17	0.37	0.39	0.12	0.14	0.09	0.05
PL	0.03	0.04	0.04	0.05	0.08	0.1	0.04	0.09	0.01	0.02
PT	0.38	0.53	0.14	0.14	0.12	0.19	0.12	0.14	0.27	0.29
RO	0.08	0.1	0.12	0.17	0.16	0.12	0.08	0.06	0.05	0.06
SI	0.2	0.25	0.2	0.24	0.04	0	0.19	0.35	0.14	0.08
SK	0.12	0.08	0.1	0.1	0.09	0.12	0.07	0.13	0.07	0.09
FI	0.06	0.09	0.12	0.08	0.08	0.1	0.13	0.2	0.02	0.04
SE	0.29	0.41	0.1	0.09	0.27	0.29	0.15	0.3	0.05	0.08
UK	0.2	0.22	0.18	0.24	0.25	0.26	0.16	0.28	-	-
IS	0 (0/14)	0.07 (2/28)	0.26	0.27	0 (0/1)	-	0.17	0.15	0.5 (1/2)	-
NO	0.08	0.05	0.08	0.1	0.18	0.14	0.22	0.45	0.03	0.04
CH	0.82	0.44	0.33	0.2	0.73	0.14	0.52	0.74	0	0
MK	3.8 (38/10)	10 (60/6)	0.05	0.05	0.86 (6/7)	0.77 (10/13)	0.12	0.32	0.16	0.21
RS	0.13	0.19	0.19	0.2	0.37	0.37	0.17	0.25	0.03	0.08
TR	0.2	0.15	0.42	0.43	0.27	0.2	0.12	0.08	0.06	0.03
IL	0.41	0.23	0.26	0.22	0.22	0.26	0.04	0.03	-	-
AU	0.08	0.09	0.23	0.23	0.58	0.96	0.14	0.21	0.03	0.05
JP	:	:	0.1	0.08	0.11	0.16	0.16	0.33	0.11	0.37
MX	0.02	0.02	0.2	0.21	0.23	0.25	0.03	0.03	0.03	0.04
KR	0.3	0.37	0.38	0.49	0.48	0.68	0.31	0.4	0.38	0.49

Notes: Reference year differs: IL, AU, JP, MX, KR: 2017; Definition differs: BE, DE, IE, FR, IT (all fields), ME (all fields but total); Break in time series: FR (all fields), MK (Information and Communication Technologies); Estimated: PL; Includes data from another category: JP (for all fields except totals and Information and Communication Technologies); Data included in another category: JP (for Information and Communication Technologies), RS (for women and men in all fields); Data not available for: EU-27, EU-28, ME, AL, BA, GE, AM, FO, MD, TN, UA.

Other: The indicator compares two different groups of people, i.e. the same reference year's entrants and graduates; ":" indicates that data are not available; "-" indicates that the denominator is zero; for ratios whose denominator is smaller than 30, the numerators and denominators are displayed in brackets.

Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02; educ_uoe_ent02); OECD (Graduates by field; New entrants by field).

Table 2.8 Ratio of doctoral entrants to master graduates, by sex and narrow field of study in Natural Sciences, ICT and Engineering, 2018

Country	Biological and related sciences (EF051)		Environment (EF052)		Physical sciences (EF053)		Mathematics and statistics (EF054)	
	Women	Men	Women	Men	Women	Men	Women	Men
BE	0	0	0	0	0	0	0	0
BG	0.35	0.57	0.15	0.16	0.3	0.43	0.5 (11/22)	0.83 (15/18)
CZ	0.46	0.95	0.49	1.1	0.45	0.57	0.18	0.24
DK	0	0	0 (0/14)	0 (0/13)	0	0	0	0
DE	0.49	0.59	-	-	0.42	0.58	0.13	0.2
EE	0.56	1.15 (15/13)	0.1	0.16	0.42	0.61	0.17 (1/6)	0.17 (1/6)
IE	0.36	0.37	0.06	0.17	0.71	0.84	0.04	0.08
EL	0.35	0.48	0.41 (7/17)	0.47 (7/15)	0.23	0.26	0.06	0.14
ES	0.74	0.82	0.55	0.68	0.59	0.67	0.47	0.4
FR	0.1	0.12	0	0	0.41	0.52	0.13	0.21
HR	1.27	2.62	0.14 (4/28)	0.22 (2/9)	0.98	1.25	0.35	0.49
IT	:	:	:	:	0.11	0.11	0.07	0.19
CY	0.14	0 (0/13)	3 (6/2)	4 (4/1)	0.63 (5/8)	0.5 (1/2)	0.18 (2/11)	0 (0/2)
LV	0.52	1.14 (8/7)	0.32 (6/19)	1 (5/5)	0.63	0.62 (13/21)	0.33 (2/6)	1 (2/2)
LT	0.35	0.44	0.56 (9/16)	4.5 (9/2)	0.58	0.48	0.04	0.15
LU	1.09 (12/11)	2 (4/2)	-	-	-	4 (16/4)	0 (0/4)	0.8 (4/5)
HU	0.39	0.6	0.42	0.89	0.45	0.58	0.18	0.7
MT	0 (0/21)	0 (0/5)	-	-	0 (0/7)	0 (0/13)	0 (0/1)	0 (0/2)
AT	0.26	0.35	0.03	0.02	0.4	0.37	0.38	0.39
PL	0.21	0.5	0.03	0.06	0.26	0.5	0.03	0.21
PT	0.35	0.48	0.47	0.58	0.44	0.59	0.22	0.75
RO	0.12	0.21	0.02	0.07	0.15	0.32	0.11	0.11
SI	0.33	0.42	0.13	0.09 (1/11)	0.08	0.06	0.25 (7/28)	0.22
SK	0.23	0.3	0.17	0.35	0.19	0.35	0.17	0.28
FI	0.11	0.24	0.1	0.24	0.2	0.27	0.05	0.19
SE	0.24	0.3	0.14	0.21	0.7	1.14	0.52	0.47
UK	0.28	0.4	-	-	0.66	1.01	0.21	0.45
IS	1.33 (8/6)	2.5 (5/2)	0.07 (2/29)	0.3 (6/20)	0.65 (11/17)	1 (14/14)	0 (0/3)	0.33 (2/6)
NO	0.14	0.3	0.12	0.14 (4/29)	0.15	0.16	0.13	0.24
CH	0.72	0.79	0.68	0.88	0.56	0.71	0.18	0.29
MK	0.67 (4/6)	0.4 (2/5)	-	-	0.1 (3/29)	0.18 (3/17)	0.11 (2/19)	0.25 (1/4)
RS	0.36	0.44	0.04	0.04	0.5	0.84	0.29	0.5
TR	0.61	0.78	0.37	0.43 (10/23)	0.51	0.54	0.35	0.51
IL	0.64	0.76	0.57	0.61	0.57	0.77	0.1	0.37
AU	1.9	2.07	0.26	0.39	1.86	1.91	0.4	0.56
MX	0.53	0.71	-	-	0.41	0.53	0.25	0.46
KR	0.65	0.98	0.53 (9/17)	1.05 (20/19)	0.42	0.98	0.14	0.71

Country	Information and Communication Technologies (EF061)		Engineering and engineering trades (EF071)		Manufacturing and processing (EF072)		Architecture and construction (EF073)	
	Women	Men	Women	Men	Women	Men	Women	Men
BE	0	0	0	0	0	0	0	0
BG	0.04	0.12	0.14	0.12	0.07	0.16	0.07	0.12
CZ	0.18	0.13	0.27	0.24	0.18	0.42	0.08	0.09
DK	0	0	0.42	0.36	0	0	0	0
DE	0.48	0.24	0.21	0.21	0.3	0.43	0.09	0.15
EE	0.14	0.14	0.17	0.17	0	0	0.01	0.02
IE	0.06	0.06	0.33	0.35	0.1	0.07	0.11	0.08
EL	0.18	0.25	0.35	0.38	0.23	0.35	0.19	0.19
ES	0.27	0.25	0.23	0.25	0.23	0.29	0.08	0.12
FR	0.08	0.07	0.06	0.04	0	0	0.06	0.06
HR	0.11	0.04	0.37	0.31	0.24	0.12	0.17	0.15
IT	0.72	0.69	0.17	0.1	:	-	0.04	0.03
CY	0.13	0.16	0.2	0.41	-	-	0.05	0.1
LV	0.27	0.24	0.35	0.25	0.18 (5/28)	0.63 (5/8)	0.09	0.12
LT	0.11	0.07	0.09	0.1	0.18	0.87 (13/15)	0.13	0.1
LU	1 (6/6)	0.47	0 (0/4)	0 (0/9)	0 (0/3)	0 (0/6)	0 (0/1)	0.08 (1/13)
HU	0.16	0.18	0.04	0.06	0.1	0.18	0.04	0.05
MT	0 (0/12)	0	0 (0/15)	0 (0/28)	-	-	0.04 (1/24)	0
AT	0.07	0.05	0.41	0.27	0.03	0	0.15	0.13
PL	0.05	0.05	0.05	0.06	0.03	0.03	0.03	0.03
PT	0.38	0.53	0.14	0.12	0.15	0.24	0.16	0.2
RO	0.07	0.09	0.15	0.16	0.08	0.25	0.1	0.18
SI	0.2 (5/25)	0.25	0.34	0.24	0 (0/18)	0 (0/28)	0.08	0.11
SK	0.1	0.07	0.14	0.1	0.13	0.12	0.06	0.1
FI	0.06	0.09	0.12	0.08	0.24 (4/17)	0.65 (13/20)	0.09	0.05
SE	0.29	0.41	0.11	0.08	0.85	1.15	0.04	0.07
UK	0.2	0.22	0.42	0.38	0.24	0.34	0.08	0.09
IS	0 (0/7)	0.07 (1/14)	0.06 (1/17)	0.1	0.71 (5/7)	0 (0/1)	0.33 (1/3)	0.4 (2/5)
NO	0.08	0.05	0.12	0.14	0 (0/28)	0 (0/11)	0.03	0.02
CH	0.82	0.44	0.57	0.23	0.59	0.72	0.14	0.12
MK	3.8 (19/5)	10 (30/3)	0.07	0.03	0.46 (6/13)	1 (7/7)	0	0
RS	0.13	0.19	0.27	0.24	0.37	0.31	0.06	0.11
TR	0.2	0.15	0.4	0.46	0.5	0.63	0.41	0.3
IL	0.41	0.23	0.29	0.23	-	-	0.07	0.09
AU	0.08	0.09	0.35	0.28	0.39	0.35	0.18	0.28
MX	0.02	0.02	0.3	0.29	0.1	0.06	0.09	0.12
KR	0.27	0.39	0.37	0.45	0.33	0.38	0.34	0.39

Notes: Reference year differs: IL, AU, MX, KR: 2017, IT:2014; Definition differs: BE, DE, IE, FR, NL, ME; Break in time series: FR; Estimated: PL; Data not available for: EU-27, EU-28, NL, ME, AL, BA, GE, AM, FO, MD, TN, UA.

Other: The indicator compares two different groups of people, i.e. the same reference year's entrants and graduates; BE: the source reported zero number of doctoral entrants for all narrow fields; ":" indicates that data are not available; "-" indicates that the denominator is zero; for ratios whose denominator is smaller than 30, the numerators and denominators are displayed in brackets.

Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02; educ_uoe_ent02); OECD (Graduates by field; New entrants by field).

2.6 Annex indicators

Annex 2.1 Number of doctoral (ISCED level 8) graduates, by sex, 2013-2018

Country	2013		2014		2015		2016		2017		2018	
	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
EU-27	**49 135**	**54 357**	**49 417**	**53 789**	**50 326**	**55 270**	**50 321**	**53 436**	**52 104**	**56 792**	**50 022**	**53 979**
EU-28	**61 168**	**68 220**	**61 174**	**67 052**	**62 833**	**69 399**	**62 968**	**68 155**	**65 291**	**71 748**	**63 766**	**69 704**
BE	1 054	1 410	1 137	1 444	1 214	1 586	1 353	1 537	1 284	1 634	1 338	1 713
BG	616	586	719	644	719	723	773	691	760	663	725	640
CZ	1 040	1 393	1 062	1 422	1 070	1 370	1 015	1 364	985	1 450	1 053	1 356
DK	852	1 036	1 002	1 124	1 054	1 122	1 065	1 133	1 081	1 151	1 025	1 069
DE	12 256	15 451	12 798	15 349	13 052	16 166	13 248	16 055	12 713	15 691	12 577	15 261
EE	139	94	113	100	107	101	130	109	146	107	118	126
IE	747	785	862	876	683	746	807	761	741	704	747	719
EL	691	836	784	817	849	945	986	1 017	843	1 034	739	819
ES	5 237	5 267	5 361	5 528	5 667	5 649	7 463	7 231	10 104	9 945	9 093	8 193
FR	6 088	7 802	6 003	7 362	6 054	7 720	5 797	7 219	6 145	7 438	6 026	7 703
HR	454	376	450	405	497	381	355	291	397	319	349	298
IT	5 557	5 130	5 588	5 090	5 409	5 076	5 077	4 726	4 832	4 567	4 028	3 946
CY	26	26	33	27	42	35	61	38	46	46	59	61
LV	181	134	159	105	141	114	114	83	93	58	67	56
LT	260	181	243	168	248	169	187	137	190	139	202	147
LU	25	39	31	51	48	59	43	64	71	81	48	87
HU	495	574	553	601	559	647	589	666	551	626	595	692
MT	12	12	6	16	16	14	15	22	28	26	27	26
NL	1 997	2 324	2 142	2 386	2 290	2 373	:	:	2 274	2 473	2 300	2 481
AT	974	1 254	924	1 283	954	1 236	947	1 292	1 191	1 438	1 223	1 557
PL	2 051	1 668	1 798	1 578	2 078	1 709	2 030	1 734	1 767	1 429	2 057	1 600
PT	1 355	1 108	1 347	1 156	1 259	1 092	1 289	1 055	1 167	968	1 199	1 067
RO	2 808	2 562	1 932	1 845	2 082	1 910	1 238	1 022	1 027	861	980	863
SI	626	540	562	441	568	432	2 308	1 455	246	268	249	212
SK	1 091	1 028	1 082	1 100	953	961	928	843	820	840	692	716
FI	961	938	1 061	952	1 052	948	1 036	973	982	871	969	896
SE	1 542	1 803	1 665	1 919	1 661	1 986	1 598	1 935	1 621	1 965	1 537	1 675
UK	12 033	13 863	11 757	13 263	12 507	14 129	12 647	14 719	13 187	14 956	13 744	15 725
IS	26	29	53	35	35	32	46	26	43	21	36	25
NO	741	808	712	730	731	676	686	682	739	750	756	744
CH	1 589	2 042	1 664	2 183	1 727	2 127	1 743	2 192	1 859	2 291	1 864	2 299
ME	:	:	:	:	:	:	19	9	8	10	14	12
MK	119	100	106	100	143	103	111	86	123	86	141	102
AL	114	95	27	30	314	206	364	291	550	340	127	77
RS	358	392	356	385	574	515	585	481	883	656	567	385
TR	3 938	4 796	2 155	2 361	2 394	2 798	2 803	3 249	2 960	3 085	3 435	3 897
BA	88	122	31	50	116	185	128	157	99	142	133	152
GE	218	188	265	185	216	133	210	159	260	209	249	178
AM	106	271	74	173	116	210	125	212	151	197	186	178
MD	295	193	232	176	256	193	254	191	253	192	251	216
TN	337	284	468	357	824	501	700	755	:	:	1 053	787
IL	804	737	769	777	804	813	768	802	859	759	:	:
UA	5 059	3 864	5 127	3 954	4 789	3 481	4 651	3 557	4 172	3 245	3 556	3 239
AR	1 173	915	1 173	915	1 394	1 012	1 301	1 013	:	:	:	:
AU	4 045	4 056	4 205	4 195	4 282	4 345	4 501	4 588	4 613	4 629	:	:
BR	:	:	9 104	7 641	10 141	8 484	11 190	9 415	11 754	9 855	:	:
CA	3 186	3 873	3 250	3 940	3 416	4 130	3 613	4 155	3 767	4 236	:	:
CN_X_HK	19 719	33 036	20 466	33 752	21 145	33 746	23 182	31 969	22 189	34 275	23 612	36 221
IN	9 113	15 187	9 878	14 440	8 949	13 579	9 729	15 366	12 513	16 265	12 505	16 274
JP	4 953	11 518	4 948	11 091	4 747	10 967	4 904	10 900	4 781	10 893	:	:
MX	2 409	2 604	2 758	3 024	2 930	3 120	4 670	4 598	4 751	4 559	:	:
RU	:	:	:	:	:	:	:	:	:	:	:	:
ZA	896	1 164	939	1 331	1 118	1 418	1 187	1 628	1 312	1 762	:	:
KR	4 274	8 351	4 533	8 398	4 719	8 358	5 014	8 868	5 385	8 931	:	:
US	32 131	32 920	33 593	33 856	34 415	34 508	34 724	34 801	35 675	35 367	:	:

Notes: Data not available for: FO; Definition differs: EU-27 & EU-28 (2015, 2016), IE & FR (2018), IT (2017); Data included elsewhere under another category: RU (2013-2017).

Other: ':' indicates that data are not available.

Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02), UNESCO Institute for Statistics (Tertiary graduates by level of education).

Annex 2.2 Number of doctoral (ISCED level 8) graduatesby sex and broad field of study, 2018

Country	Education		Arts and humanities		Social sciences, journalism and information		Business, administration and law		Natural sciences, mathematics and statistics	
	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
EU-27	**1 874**	**938**	**6 483**	**5 207**	**5 181**	**4 079**	**3 701**	**4 568**	**11 954**	**14 653**
EU-28	**2 601**	**1 301**	**8 651**	**7 308**	**6 609**	**5 400**	**4 597**	**5 637**	**16 104**	**19 240**
BE	35	10	137	160	191	113	102	137	269	401
BG	91	49	107	71	142	94	86	84	111	60
CZ	56	27	156	125	94	82	97	128	262	299
DK	0	0	89	85	126	93	0	0	129	192
DE	304	168	1 165	923	911	761	953	1 501	3 310	4 774
EE	7	2	22	16	11	4	9	10	31	31
IE	38	23	89	68	109	72	45	66	179	177
EL	53	31	81	69	55	56	35	45	100	106
ES	612	333	1 232	1 073	1 077	873	494	575	2 689	2 488
FR	91	70	1 019	744	697	722	480	526	1 854	2 869
HR	17	15	53	39	46	25	15	14	64	44
IT	28	9	543	384	315	205	383	362	899	983
CY	15	9	6	4	12	9	8	2	6	6
LV	7	1	4	2	9	4	6	7	19	14
LT	11	2	22	15	23	13	31	5	49	34
LU	1	2	7	3	13	6	8	7	16	30
HU	38	7	90	83	71	66	22	25	119	136
MT	3	0	2	5	3	2	0	3	5	3
NL	41	19	177	186	261	160	189	248	300	500
AT	42	22	273	244	162	138	170	181	196	309
PL	49	9	438	363	216	149	159	176	447	309
PT	128	67	149	103	170	123	59	152	244	149
RO	24	7	257	170	98	71	139	83	91	64
SI	17	4	56	34	10	6	26	26	27	38
SK	43	21	88	91	70	55	89	105	156	109
FI	61	15	121	66	138	69	54	55	138	156
SE	62	16	100	81	151	108	42	45	244	372
UK	728	363	2 168	2 102	1 428	1 322	896	1 069	4 150	4 587
IS	3	1	3	3	8	2	2		5	12
NO	40	9	65	53	98	71	27	35	168	243
CH	35	18	151	134	204	161	144	183	547	750
ME	0	0	0	0	0	0	0	0	0	0
MK	13	2	30	15	19	21	11	10	8	3
RS	15	5	112	63	26	17	29	31	153	73
TR	364	368	487	617	282	334	435	626	679	560
IL	83	24	127	90	112	88	34	35	338	306
AR	59	18	157	103	295	232	95	120	583	321
AU	337	171	542	429	699	381	392	391	988	1 129
BR	1 128	518	1 284	1 196	914	706	484	633	1 652	1 632
CA	267	110	348	379	893	513	179	167	952	1 112
IN	479	604	1 796	2 315	1 341	1 849	1 058	1 357	2 717	4 313
JP	199	222	649	558	176	246	207	406	431	1 659
MX	2 137	1 428	134	147	483	372	996	1 340	464	504
ZA	159	144	84	160	179	125	151	271	276	340
KR	640	230	862	620	340	353	462	1 203	675	1 222
US	8 145	3 738	3 707	3 772	6 076	3 723	1 834	2 124	7 085	9 650

Country	Information and Communication Technologies		Engineering, manufacturing and construction		Agriculture, forestry, fisheries and veterinary		Health and welfare		Services	
	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
EU-27	**834**	**2 895**	**4 476**	**10 736**	**1 739**	**1 322**	**12 923**	**8 522**	**419**	**579**
EU-28	**1 125**	**3 819**	**5 564**	**13 946**	**1 955**	**1 470**	**15 692**	**10 517**	**419**	**579**
BE	6	10	170	519	38	28	383	314	5	4
BG	9	18	42	111	11	23	114	87	12	43
CZ	3	71	170	419	51	51	135	85	29	69
DK	0	0	164	377	94	77	423	245	0	0
DE	141	732	728	2 883	533	288	4 456	3 155	76	75
EE	4	25	23	28	4	3	7	7	0	0
IE	21	40	50	135	22	17	188	115	3	2
EL	14	32	98	175	22	25	268	263	13	17
ES	213	609	469	774	131	157	1 933	1 079	23	29
FR	180	529	615	1 366	99	56	950	747	41	74
HR	3	12	31	68	12	17	107	55	1	9
IT	54	134	630	1 156	215	167	842	436	0	0
CY	0	8	5	17	2	1	5	5	0	0
LV	1	3	8	15	4	3	9	7	0	0
LT	1	5	16	48	19	6	30	19	0	0
LU	2	22	1	17	0	0	0		0	0
HU	5	42	35	82	22	30	125	93	6	22
MT	0	2	0	2	0	0	14	9	0	0
NL	14	88	142	418	153	161	1 023	701	0	0
AT	20	82	134	377	42	28	145	126	7	11
PL	6	53	219	285	113	59	338	130	72	67
PT	20	56	160	275	25	15	178	78	66	49
RO	26	35	115	211	55	45	154	119	21	58
SI	5	23	45	56	0	1	58	20	5	4
SK	4	30	62	179	24	22	128	75	28	29
FI	38	107	114	248	31	24	266	143	8	13
SE	44	127	230	495	17	18	644	409	3	4
UK	292	924	1 089	3 210	216	148	2 770	1 996	0	0
IS	0	2	2	1	0	0	13	4	0	0
NO	5	19	39	115	10	12	293	180	11	7
CH	18	100	174	470	85	22	505	458	0	0
ME	0	0	0	0	0	0	0	0	0	0
MK	6	4	6	10	2	2	45	26	1	9
RS	8	15	102	100	26	20	83	45	13	16
TR	19	20	500	921	138	184	469	185	62	82
IL	25	70	67	116	13	15	60	15	0	0
AR	3	25	64	94	60	39	78	60	0	0
AU	94	257	450	1 119	198	192	909	554	4	6
BR	80	330	1 379	1 703	1 232	1 124	2 696	1 334	905	679
CA	66	207	403	1 282	127	163	464	259	0	0
IN	212	295	779	2 086	797	1 578	420	946	130	23
JP	:	:	515	2 809	319	590	1 814	3 863	37	11
MX	26	101	271	429	88	136	137	92	15	10
ZA	16	35	47	174	61	60	145	108	0	1
KR	71	400	503	2 994	104	241	1 442	1 246	286	422
US	439	1 516	2 619	8 177	464	570	4 873	1 769	433	328

Notes: Exceptions to the reference year: IL, AU, BR, CA, JP, MX KR, US: 2017 (for all fields), IN: 2016 (for all fields), AR, ZA: 2015 (for all fields); Data not available for: AL, BA, GE, AM, FO, MD, TN, UA; Definition differs: IE, FR, ME (for all fields); Includes data from another category: JP (for all fields).

Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02) and OECD (Graduates by field).

Annex 2.3 Number of doctoral (ISCED level 8) graduates by sex and narrow field of study in Natural science and Engineering (fields EF4, EF5 and EF6), 2018

Country	Biological and related sciences (EF051)		Environment (EF052)		Physical sciences (EF053)		Mathematics and statistics (EF054)	
	Women	Men	Women	Men	Women	Men	Women	Men
EU-27	**4 561**	**3 079**	**195**	**153**	**4 832**	**7 757**	**820**	**1 704**
EU-28	**7 116**	**4 776**	**195**	**153**	**6 175**	**10 093**	**1 072**	**2 257**
BE	113	113	6		31	75	49	76
BG	46	15	4	1	51	33	10	11
CZ	144	95	15	24	86	150	13	26
DK	0	0	0	0	0	0	0	0
DE	1 586	1 116	0	0	1 430	3 098	190	456
EE	18	13	3	2	10	14		2
IE	103	80	14	13	50	62	5	21
EL	26	15	2	2	61	63	11	24
ES	1 243	800	0	0	1 183	1 274	259	412
FR	552	404	0	0	1 130	2 040	172	425
HR	28	9	0	0	30	30	6	5
IT	:	:	:	:	551	711	105	168
CY	3	1	0	3	1	1	2	1
LV	6	4	2	2	10	8	1	0
LT	18	12	12	2	15	17	4	3
LU	8	10	0	0	7	14	1	6
HU	46	34	24	19	45	67	4	16
MT	3	0	0	0	2	2	0	1
AT	81	78	9	15	79	158	17	46
PL	162	63	20	12	247	190	18	44
PT	125	58	11	7	82	62	18	19
RO	21	7	2	4	61	44	7	9
SI	15	10	3	1	4	4	3	3
SK	95	28	13	16	39	55	7	10
FI	59	49	20	12	53	69	5	26
SE	60	65	35	18	125	227	18	62
UK	2 555	1 697	0	0	1 343	2 337	252	553
IS	2	3	2	1	1	8	0	0
NO	20	14	1	3	20	41	4	9
CH	260	239	80	89	179	366	28	56
MK	3	0	0	1	4	0	1	2
RS	59	29	16	5	63	28	15	11
TR	321	211	5	6	229	231	117	108
IL	229	137	14	18	83	128	12	23
AU	497	422	80	85	249	397	38	75
BR	977	662	:	:	376	554	60	169
CA	635	605	:	:	277	570	49	164
IN	936	1 192	170	249	704	1 398	227	398
MX	247	215	0	0	198	244	19	45
KR	438	663	7	8	170	425	41	83
US	4 256	3 871	290	230	1 956	4 077	522	1 403

Country	Information and Communication Technologies (EF061)		Engineering and engineering trades (EF071)		Manufacturing and processing (EF072)		Architecture and construction (EF073)	
	Women	Men	Women	Men	Women	Men	Women	Men
EU-27	**498**	**1 896**	**1 780**	**4 811**	**268**	**387**	**823**	**1 387**
EU-28	**790**	**2 820**	**2 406**	**7 110**	**369**	**676**	**1 154**	**1 948**
BE	6	10	105	272	5	5	18	50
BG	9	18	23	93	12	9	7	9
CZ	2	55	71	240	21	17	27	67
DK	0	0	164	377	0	0	0	0
DE	114	668	243	1 113	69	151	204	347
EE	4	25	18	24	0	0	5	4
IE	21	40	33	114	12	5	5	16
EL	14	31	66	130	8	12	17	20
ES	0	0	0	0	0	0	201	313
FR	180	529	333	771	0	0	106	183
HR	3	12	12	60	6	2	13	6
IT	32	102	118	401	238	583	365	348
CY	0	8	2	12	0	0	3	5
LV	1	3	6	12	2	1	0	2
LT	1	5	8	31	2	12	6	5
LU	2	22	0	0	0	0	0	0
HU	5	42	12	46	12	8	11	28
MT	0	2	0	1	0	1	0	0
AT	0	14	104	277	2	7	23	73
PL	6	53	127	200	26	11	44	49
PT	20	56	92	175	17	19	42	65
RO	19	17	72	144	15	23	24	29
SI	5	23	19	28	0	0	3	4
SK	4	29	27	124	8	15	14	25
FI	38	107	84	218	17	13	13	17
SE	44	127	159	349	34	76	37	70
UK	292	924	627	2 299	101	289	331	561
IS	0	2	0	0	1	0	1	0
NO	5	19	26	101	0	0	10	12
CH	18	100	94	331	31	40	49	99
MK	6	4	4	10	2	0	0	0
RS	8	15	62	75	20	9	20	16
TR	19	20	192	656	114	59	124	123
IL	25	70	62	111	0	0	5	5
AU	94	257	241	669	61	101	148	339
BR	56	168	598	1 015	363	190	100	66
CA	68	215	201	843	24	28	61	187
IN	189	144	588	1 756	26	98	73	146
MX	26	101	148	318	84	70	39	41
KR	56	319	204	1 626	101	71	109	463
US	436	1 510	1 829	6 374	339	902	451	901

Notes: Exceptions to the reference year: CA: 2013; IT, BR: 2014; IN: 2015; IL, AU, MX, KR, US: 2017. Definition differs: EU-27, EU-28, IE, FR (for all fields). Data included in another category: BR, CA (for EF052); Data included from another category: BR, CA (EF053, EF071, EF072). Data not available for: NL, ME, AL, BA, GE, AM, FO, MD, TN, UA

Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02) and OECD (Graduates by field).

Annex 2.4 Ratio of doctoral graduates to doctoral entrants, by sex and broad field of study, 2018

Country	Total		Education		Arts and humanities		Social sciences, journalism and information		Business, administration and law		Natural sciences, mathematics and statistics	
	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
BE	2.06	2.3	-	-	-	-	-	-	-	-	-	-
BG	0.71	0.68	0.83	1.36	0.66	0.66	0.78	0.61	0.55	0.68	0.91	0.81
CZ	0.55	0.6	0.54	0.6	0.56	0.51	0.54	0.54	0.57	0.56	0.6	0.81
DK	0.89	0.91	-	-	0.58	0.88	1.13	0.78	-	-	0.8	0.95
DE	0.67	0.69	0.25	0.21	0.43	0.62	0.54	0.69	0.56	0.5	0.72	0.82
EE	0.69	0.74	0.7 (7/10)	2 (2/1)	0.56	0.73 (16/22)	0.79 (11/14)	0.57 (4/7)	0.75 (9/12)	0.77 (10/13)	0.74	0.67
IE	0.71	0.78	0.57	1.05 (23/22)	0.56	0.58	0.66	0.92	0.52	1.08	0.96	0.9
EL	0.5	0.52	0.46	0.76	0.43	0.38	0.41	0.45	0.35	0.38	0.52	0.55
ES	0.86	0.76	0.84	0.63	0.74	0.73	0.64	0.61	0.64	0.56	1.43	1.22
FR	0.73	0.8	0.56	0.66	0.62	0.58	0.66	0.73	0.47	0.57	0.88	0.91
HR	0.18	0.18	0.13	0.14	0.2	0.18	0.24	0.17	0.14	0.21	0.14	0.14
IT	0.8	0.75	1 (28/28)	0.82 (9/11)	0.78	0.79	0.92	0.63	0.72	0.69	0.78	0.77
CY	0.46	0.6	0.54 (15/28)	1 (9/9)	0.67 (6/9)	0.57 (4/7)	0.6 (12/20)	0.69 (9/13)	0.47 (8/17)	0.11 (2/19)	0.33	1.2 (6/10)
LV	0.24	0.23	0.54 (7/13)	1 (1/1)	0.13	0.13 (2/16)	0.2	0.16 (4/25)	0.11	0.13	0.43	0.5
LT	0.67	0.55	0.79 (11/14)	0.5 (2/4)	0.59	0.5	0.55	0.59 (13/22)	0.97	0.2 (5/25)	0.66	0.53
LU	0.92	1.16	0.25 (1/4)	2 (2/1)	1.17 (7/6)	1.5 (3/2)	0.93 (13/14)	0.55 (6/11)	1.6 (8/5)	1.17 (7/6)	1	1.25
HU	0.54	0.55	0.55	0.29 (7/24)	0.43	0.37	0.35	0.35	0.31	0.29	0.62	0.52
MT	27 (27/1)	-	-	-	-	-	-	-	-	-	-	-
NL	1.5	1.56	1.95 (41/21)	4.75 (19/4)	2.64	3.1	1.61	2.39	2.95	3.44	1.72	1.52
AT	0.69	0.81	0.47	1.22 (22/18)	0.92	1.27	0.89	1.16	0.49	0.54	0.84	0.97
PL	0.47	0.4	0.3	0.16	0.43	0.39	0.39	0.34	0.29	0.34	0.57	0.5
PT	0.46	0.41	0.5	0.47	0.38	0.27	0.38	0.34	0.27	0.44	0.68	0.42
RO	0.39	0.37	0.45	0.27 (7/26)	0.51	0.42	0.38	0.42	0.51	0.52	0.46	0.44
SI	0.58	0.54	0.57	0.36 (4/11)	0.62	0.65	0.5 (10/20)	0.3 (6/20)	0.52	0.55	0.42	0.75
SK	0.79	0.77	0.93	1.05 (21/20)	0.65	0.73	1.01	0.89	0.75	0.78	1	0.81
FI	1.08	1.11	0.77	0.52 (15/29)	0.72	0.61	1.16	0.69	0.68	0.73	1.64	1.19
SE	0.99	1.08	1.29	0.73 (16/22)	1.3	1.69	1.3	0.97	0.78	1	1.01	1.13
UK	0.8	0.86	0.67	0.69	0.78	0.92	0.85	0.93	0.74	0.8	0.82	0.84
IS	0.37	0.35	0.25 (3/12)	0.5 (1/2)	0.33 (3/9)	0.21 (3/14)	0.5 (8/16)	0.33 (2/6)	1 (2/2)	0 (0/2)	0.24	0.44
NO	0.69	0.77	0.54	0.28	0.44	0.45	0.64	0.78	0.63	0.83	0.87	0.84
CH	0.73	0.78	0.56	0.9 (18/20)	0.58	0.63	0.78	0.83	0.65	0.6	0.87	0.84
MK	0.73	0.49	1.86 (13/7)	0.11 (2/19)	0.97	0.94 (15/16)	0.42	0.53	0.79 (11/14)	0.59 (10/17)	0.89 (8/18)	0.5 (3/12)
RS	0.44	0.37	0.21	0.19 (5/26)	0.44	0.44	0.22	0.15	0.28	0.4	0.73	0.6
TR	0.45	0.43	0.64	0.71	0.43	0.44	0.43	0.39	0.45	0.42	0.53	0.48
IL	0.75	0.74	0.99	1.09 (24/22)	0.8	0.64	0.52	0.8	0.64	0.69	0.82	0.72
AU	0.82	0.78	0.83	0.84	0.81	0.76	0.98	0.89	0.92	0.8	0.78	0.82
JP	1.03	1.05	0.84	0.9	0.94	1.03	1.14	1.13	1.21	0.85	1.56	1.29
MX	0.85	0.78	1.02	1.01	0.41	0.43	0.73	0.67	0.85	0.8	0.68	0.6
KR	0.51	0.59	0.47	0.53	0.47	0.48	0.32	0.46	0.43	0.57	0.59	0.63

Country	Information and Communication Technologies		Engineering, manufacturing and construction		Agriculture, forestry, fisheries and veterinary		Health and welfare		Services	
	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
BE	-	-	-	-	-	-	-	-	-	-
BG	0.82 (9/22)	0.33	0.48	0.53	0.52 (11/21)	0.88 (23/26)	0.77	0.76	0.75 (12/16)	0.98
CZ	0.1	0.53	0.54	0.6	0.46	0.62	0.52	0.49	0.56	0.56
DK	-	-	0.79	0.9	1.16	1.26	0.95	0.91	-	-
DE	0.28	0.61	0.46	0.53	0.67	0.96	1.27	1.13	0.15	0.38
EE	0.33 (4/24)	1.14	1.53	0.74	0.57 (4/7)	0.27 (3/11)	0.35 (7/20)	0.78 (7/9)	0 (0/1)	0 (0/2)
IE	0.7	0.51	0.58	0.68	1.05 (22/21)	0.94 (17/18)	0.85	0.85	1.5 (3/2)	-
EL	0.33	0.27	0.46	0.47	0.52	0.66	0.6	0.75	0.62 (13/21)	0.71 (17/24)
ES	1.85	1.53	0.52	0.39	0.47	0.59	0.8	0.73	0.15	0.14
FR	0.91	0.83	0.84	0.89	0.73	0.41	0.86	0.91	0.66	0.86
HR	0.33 (3/18)	1 (12/24)	0.15	0.17	0.19	0.25	0.22	0.2	0.04 (1/26)	0.24
IT	1.17	0.68	0.73	0.73	0.85	0.89	0.85	0.76	-	-
CY	0 (0/8)	0.8 (8/20)	0.42 (5/24)	0.57	2 (2/1)	0.25 (1/4)	0.26 (5/19)	1.25 (5/4)	0 (0/1)	-
LV	0.08 (1/26)	0.12	0.28	0.21	0.31 (4/13)	0.5 (3/6)	0.31 (9/29)	0.5 (7/14)	0 (0/6)	0 (0/6)
LT	0.25 (1/8)	0.63 (5/16)	0.43	0.59	1.19 (19/16)	1 (6/6)	0.68	0.7 (19/27)	-	-
LU	0.33 (2/12)	1.57 (22/28)	1 (1/1)	1 (17/18)	-	-	-	-	-	-
HU	0.36 (5/28)	0.51	0.69	0.67	0.54	0.68	0.56	0.58	0.21 (6/29)	0.31
MT	-	-	0 (0/2)	-	-	-	-	-	-	-
NL	1.4 (14/10)	1.44	1.1	1.2	1.84	2.37	2.63	3.14	-	-
AT	0.69	0.57	0.66	0.81	0.58	0.65	0.66	0.72	0.64 (7/11)	1.38 (11/8)
PL	0.27	0.4	0.47	0.37	0.72	0.56	0.55	0.41	1.07	0.75
PT	0.51	0.54	0.47	0.48	0.56	0.41	0.44	0.49	0.75	0.35
RO	0.47	0.29	0.28	0.27	0.36	0.38	0.27	0.39	0.66	0.65
SI	1 (5/10)	0.88	0.92	0.47	0 (0/6)	-	0.54	0.33	0.5 (5/10)	1 (4/4)
SK	0.36 (4/20)	0.59	0.73	0.87	0.83 (24/29)	1 (22/22)	0.67	0.65	0.85	0.47
FI	1.9	1.29	1.36	1.55	1.55 (31/20)	2.18 (24/11)	1.09	1.4	1.6 (8/5)	1.3 (13/10)
SE	0.8	0.89	1.02	1.19	0.41	0.86 (18/21)	0.93	0.99	0.75 (3/4)	0.57 (4/7)
UK	0.67	0.78	0.74	0.85	0.82	0.93	0.85	0.97	-	-
IS	-	2 (2/2)	0.22 (2/16)	0.08 (1/19)	-	-	0.48 (13/27)	0.67 (4/6)	0 (0/1)	-
NO	0.5 (5/20)	0.83	0.53	0.72	0.5 (10/20)	1.33 (12/9)	0.79	0.94	2.2 (11/5)	0.78 (7/9)
CH	0.37	0.6	0.75	0.87	0.79	0.92 (22/24)	0.7	0.76	-	-
MK	0.32	0.13	0.5 (6/24)	1 (10/20)	0.33 (2/6)	0.2 (2/10)	1	0.57	0.2 (1/5)	0.6 (9/15)
RS	0.35	0.28	0.55	0.43	0.52	0.29	0.31	0.28	1.08 (13/12)	0.53
TR	0.68	0.36	0.39	0.38	0.42	0.4	0.37	0.31	0.52	0.46
IL	0.96	1.4	0.89	0.6	0.87 (13/15)	0.88 (15/17)	0.53	0.6 (15/25)	-	-
AU	0.68	0.68	0.72	0.73	1.02	1.12	0.75	0.74	0.44 (4/9)	0.35 (6/17)
JP	:	:	1.35	1.31	1.43	1.25	0.9	0.91	1	0.58 (11/19)
MX	2.17 (26/24)	2.46	0.82	0.61	0.7	0.94	0.74	0.77	1.88 (15/8)	0.43 (10/23)
KR	0.52	0.53	0.48	0.62	0.48	0.58	0.62	0.69	0.6	0.58

Notes: Reference year differs: IL, AU, JP, MX, KR: 2017; Definition differs: BE, DE, IE, FR, IT (all fields); Break in time series: FR; Estimated: PL; Includes data from another category: JP (for all fields except totals and Information and Communication Technologies); Data included in another category: JP (for Information and Communication Technologies), RS (for women and men in all fields).; Data not available for: EU-27, EU-28 ME, AL, BA, GE, AM, FO, MD, TN, UA.

Other: ":" indicates that data are not available; "-" indicates that the denominator is zero; for ratios whose denominator is smaller than 30, the numerators and denominators are displayed in brackets.

Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02; educ_uoe_ent02); OECD (Graduates by field; New entrants by field).

CHAPTER 3
PARTICIPATION IN SCIENCE AND TECHNOLOGY OCCUPATIONS

KEY TAKEAWAYS

Although the share of tertiary-educated people is gender-balanced in the EU, women are less likely to be employed as scientists and engineers. Similarly, women are under-represented among self-employed professionals in Science and Engineering (S&E) and ICT occupations. Despite the gender-balanced pool of graduate talent described in Chapter 2, women were less represented as researchers across various sectors of the economy.

- In 2019, **women represented the majority of the population that is tertiary-educated and employed as professionals or technicians in the fields of science and technology** (HRSTC) at European level (53.7%). However, women were less represented among the population of employed scientists and engineers at the European level (41.3%) (Figure 3.1). Given the strategic importance of technology (tech) industry to the EU economy, these data indicate that greater effort is needed to increase women's participation in this field.

- Despite priorities to foster growth in science and technology, European-level data indicate that **the proportion of women and men in the labour force employed as scientists and engineers has changed little since 2017** (Figure 3.3). In the majority of countries, a greater proportion of men are employed as scientists and engineers compared to women.

- In 2019, **35.3% of women and men were employed in knowledge-intensive activities (KIA) at European level** (Figure 3.4). To meet the high-level skills and advanced knowledge requirements of the changing labour market, more women and men in the labour force need to be trained or encouraged to work in KIA.

- Despite women's over-representation in KIA overall compared to men, **women were less represented in KIA in business industries compared to men at European level** (Figure 3.5).

- In 2018, **women formed less than one-quarter of the self-employed population of professionals in science and engineering and ICT at European level** (Figure 3.6). These results complement the results of the Women in Digital (WiD) Scoreboard 2020 (European Commission, 2020j), which show that women in the EU are less likely to work in specialist fields of STEM and ICT.

- **At European level, gender differences persist in the unemployment rates of tertiary-educated women and men** (3.5% unemployed women compared to 2.6% men) (Figure 3.7). It is important, therefore, to ensure that women's and men's educational attainments are fully utilised.

- Across sectors, **women were less represented as researchers among R&D personnel compared to men, at European level** (60.4% of women versus 65.7% of men) (Figure 3.8). Horizontal segregation in R&D professions must be addressed if the EU is to support inclusiveness among researchers in the ERA.

3.1 Introduction

Chapter 3 examines women's and men's participation in science and technology occupations, as well as the extent to which available human resources in science and technology are fully utilised. It looks at the differences in women's and men's participation across sectors of the economy and economic activities. Historically, women have been under-represented in scientific and technical fields and remain under-represented in the labour market.

The under-representation of women in science and technology is particularly concerning, with the Staff Working Document for the new ERA observing that technology-induced structural changes in the labour market can contribute to growing social and geographical inequalities (European Commission, 2020g). In addressing the potential skills gap in a transforming EU economy, fostering greater investment in science and technology must be a core part of the European vision for growth. The EU's main funding instruments for R&I, Horizon 2020 (2014-2020) and Horizon Europe (2021-2027), recognise and seek to foster the economic benefits that science and technology can deliver (DG Research and Innovation, 2014; DG Research and Innovation, 2019). Despite efforts to increase participation in science and technology occupations, the WiD Scoreboard 2020 shows that women in the EU are less likely to work in specialist fields of STEM and ICT (European Commission, 2020j). This chapter presents indicators to measure the extent of women's under-representation in the fields of science and engineering, and analyses the gender gaps in the labour market.

Section 3.2 analyses women's participation as scientists and engineers, among the tertiary educated, and employed as professionals or technicians, where 'professionals' and 'technicians' are those, whose occupations require professional or technical knowledge and experience[1]. Equal representation in science and engineering careers is important for several reasons. Beyond the EU's commitment to gender equality in all domains, the strategic importance of the tech industry to the EU economy means that gender diversity within this industry is important for ensuring women's full participation in society (European Commission, 2020b). This section considers the extent to which the available human resources in science and technology are fully utilised to support the European vision of growth in science and technology.

Section 3.3 analyses the gender gap in KIA across sectors and specifically in business industries. Changes in the labour market and societal transitions in the EU (namely the green and digital transitions) require a skilled workforce. The Staff Working Document on the ERA (European Commission, 2020g) cautions that Europe is transforming to a knowledge-driven economy at a slow pace, which may have negative implications for its long-term competitiveness. KIA indicators thus further examine the extent to which the available human capital in the EU is utilised. An activity is classified as 'knowledge-intensive' if tertiary-educated people employed in this activity represent more than 33% of total employment in the activity. This section first examines women's overall representation in KIA and then specifically in business industries.

Section 3.4 explores the gender gap in self-employment activities in technology-oriented occupations. The European Commission's WiD policy aims to foster women's labour market participation in technology-oriented occupations and in knowledge-intensive sectors, including ICT (European Commission, 2020d). The Gender Equality Strategy 2020-2025 acknowledges that empowering women in the labour market means enabling them to access opportunities to thrive as entrepreneurs, especially in traditionally male-dominated sectors (European Commission, 2020b). Taking these priorities into account, a new indicator in She Figures 2021 sheds light on women's share of self-employment specifically within the science and engineering and ICT occupations.

Section 3.5 explores the gender gap in unemployment among the tertiary-educated labour force in order to further consider the potential differences between women and men with the same level of educational attainment.

Section 3.6 analyses women's and men's participation in the higher education, government, and business enterprise sectors. A key objective of the 2020 ERA Communication is to deepen the ERA by promoting inclusiveness and helping researchers to obtain the skills needed for excellent science (European Commission, 2020a). This section first examines potential gender differences in employment of researchers among R&D professionals as one measure of the extent of inclusiveness in research.

1 As defined by ISCO-08 classifications, where 'professionals' corresponds to the ISCO-08 major group 2 and 'technicians' corresponds to ISCO-08 major group 3.

Increasing R&D investment to foster job creation and competitiveness in the labour market has been a key EU goal in recent decades. Since 2010, however, R&D expenditure in the EU has increased, but remains lower than the 3% target set in 2010, and is especially low in private investment (i.e. the business enterprise sector) (European Commission, 2020g). Given the strategic importance of increasing jobs in R&D, this section examines the level of women's and men's participation in R&D occupations across three sectors of the economy: the higher education sector (HES), the government sector (GOV), and the business enterprise sector (BES).

Limitations of headcount employment:

When reading She Figures, it is important to bear in mind that some data presented here are measured in headcount and therefore fail to take into account part-time employment among researchers. Headcount data mask variation in working hours, both within the population of women researchers, and also when comparing women and men in research. It is therefore essential to temper the positive image of women's progression in employment in science and technology by keeping in mind their greater likelihood of holding part-time jobs.

3.2 Women's participation as scientists and engineers and among tertiary educated and employed professionals or technicians

There has been gradual progress towards increasing women's overall participation in employment and in science and engineering occupations. Data from the latest She Figures showed that despite progress towards gender equality in employment, women held a lower share of total employment (46.1%) at EU-28 level (She Figures, 2018). While women represented the majority of the tertiary-educated population employed as professionals or technicians in 2017 (53.1%), they represented only 40.8% of people employed as scientists and engineers in the EU-28 (She Figures, 2018). The following indicators shed light on the progress made towards increasing women's participation in these fields.

The proportion of the tertiary-educated population employed as professionals or technicians was gender balanced. However, women were still less represented within the population of employed scientists and engineers.

In 2019, women continued to represent a lower proportion of total employment compared to men, at EU-27 level (46.2%) (Figure 3.1). Similar to the EU-28 trends in 2017, women formed the majority of the tertiary-educated population employed as professionals or technicians (HRSTC) at European level (53.7%). However, the data show that women were less represented among the population of employed scientists and engineers at this level (41.3%). The EU-28 value shows a slight increase in the proportion of women employed as scientists and engineers, from 40.8% in 2017 to 41.1% in 2019.

Between 2015 and 2019, the number of women grew, on average, at a faster annual rate than the number of men in all employment categories (Figure 3.1). This suggests that some positive changes are underway in the EU towards increasing women's representation and utilising the full educational attainments of the EU labour force. Demonstrating further progress towards the European vision for growth in science and technology, the data show growth in the numbers of women and men scientists and engineers, with an average rate of 4.1% per year for women and 3.2% per year for men, at European level between 2015-2019. Box 9 shows examples of measures to help women access IT and tech careers and support women working within this sector.

BOX 9 Supporting women into IT and tech careers

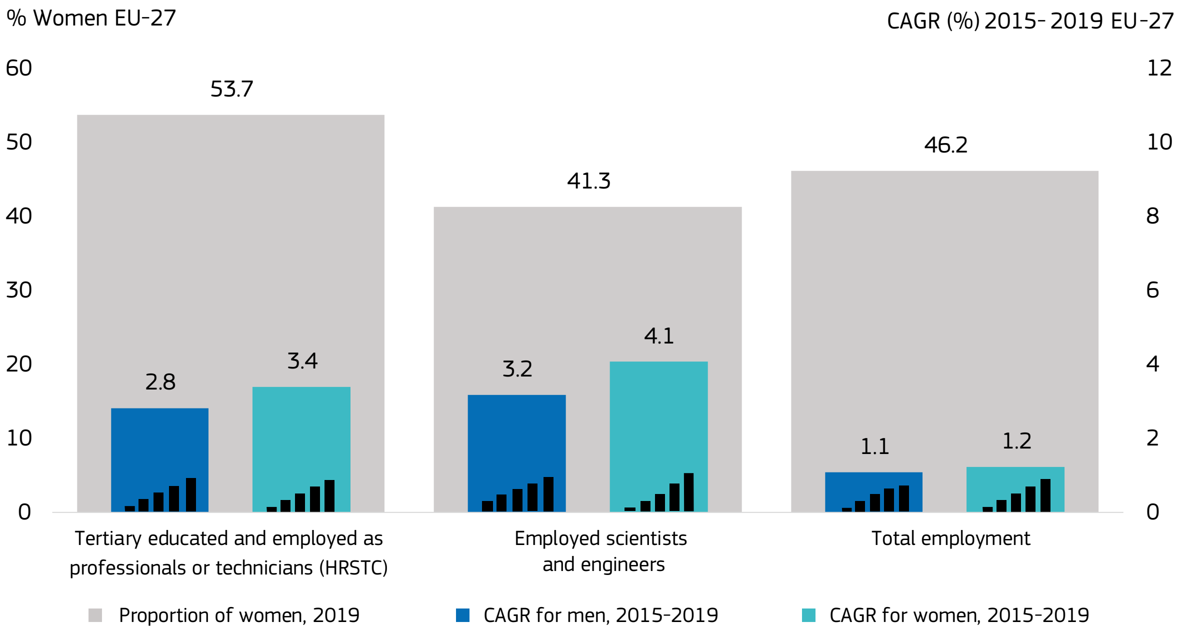
In **Slovakia**, the 'You in IT' (*Aj Ty v IT*) non-profit organisation was established in 2012 in response to low numbers of women among IT students and professionals. It aimed to achieve an IT workforce comprised of at least 40% women. To support this goal, the organisation offers training courses for women, including the Women's Tester Academy and Women's Data Academy. This has led to new employment opportunities for some participants. For example, of the first cohort of 12 women to participate in the Women's Tester Academy, 9 went on to become IT professionals[2].

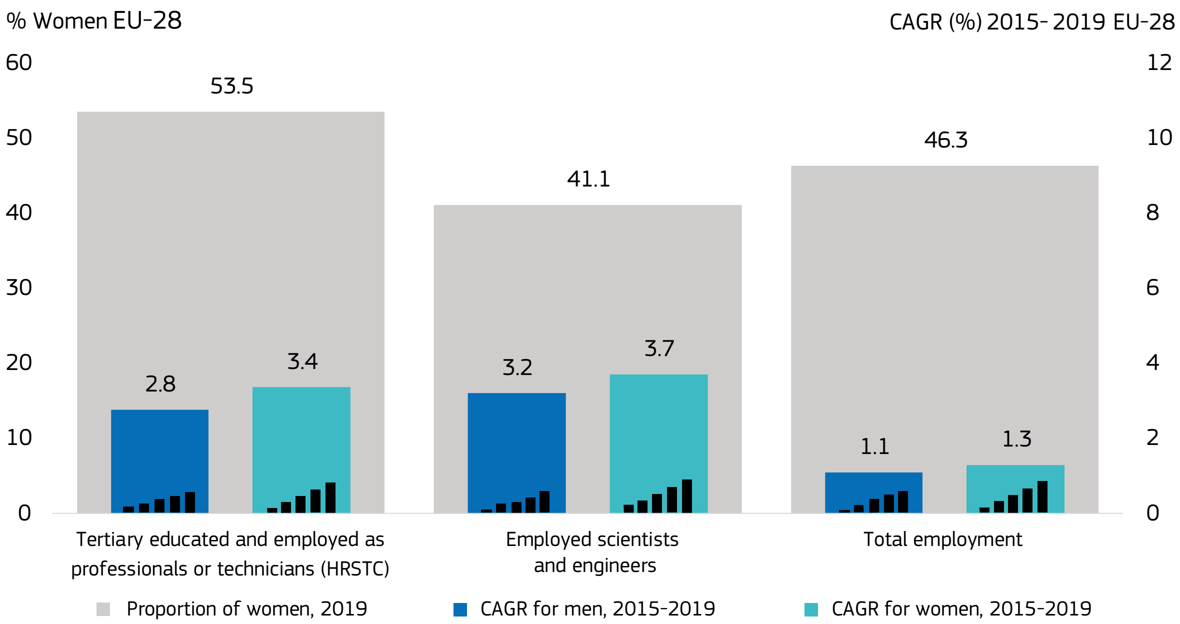
In the **UK**, the coding school '23 Code Street' delivers training for women and non-binary people to support their students into tech careers or upskill them within their existing roles, with the ultimate aim of increasing diversity in the tech industry[3].

In **Czechia**, the non-profit organisation Czechitas aims to increase digital proficiency among women and girls and increase the representation of women in the tech industry. Since 2014, it has provided more than 600 training courses to some 18,000 participants. Courses include the Digital Academy, which was established in 2016 and provides three months' training in practical IT skills to support women into STEM careers. Of the 146 course graduates from the first cohort, two-thirds found new employment after completing the course[4].

2 Aj Ty v IT, https://ajtyvit.sk/
3 23 Code Street, https://www.23codestreet.com/
4 Czechitas, https://www.czechitas.cz/en/

Figure 3.1 Proportion (%) of women in the EU-27 and EU-28 among total employment, the population of tertiary-educated professionals or technicians (HRSTC), and the population of scientists and engineers (S&E) and compound annual growth rate (CAGR) and trends in the number of women and men in the EU-27 and EU-28 in the same populations, 2015-2019





Notes: Proportions show percentages, whereas compound annual growth rate (CAGR) shows average percentage growth per year; The 'trends' represent the actual changes in the number of women and men each year (headcount in thousands). This differs from CAGR, which shows the average yearly change over the whole period. Other: Age: 25-64

Source: Eurostat – Labour Force Survey (online data code: lfsa_egan) & Human Resources in science and technology (online data code: hrst_st_ncat).

There was little difference between the proportion of tertiary-educated women and men working as professionals or technicians at European level, although the situation varied considerably at country level.

Figure 3.2 shows the percentage of tertiary-educated women and men employed as professionals or technicians in science and technology occupations (HRSTC) in 2019. Considering the priorities for growth in Horizon Europe (DG Research and Innovation, 2019) and the 2030 Strategy for a sustainable Europe (European Commission, 2019b), the following indicator explores the extent to which the available human resources in science and technology are fully utilised.

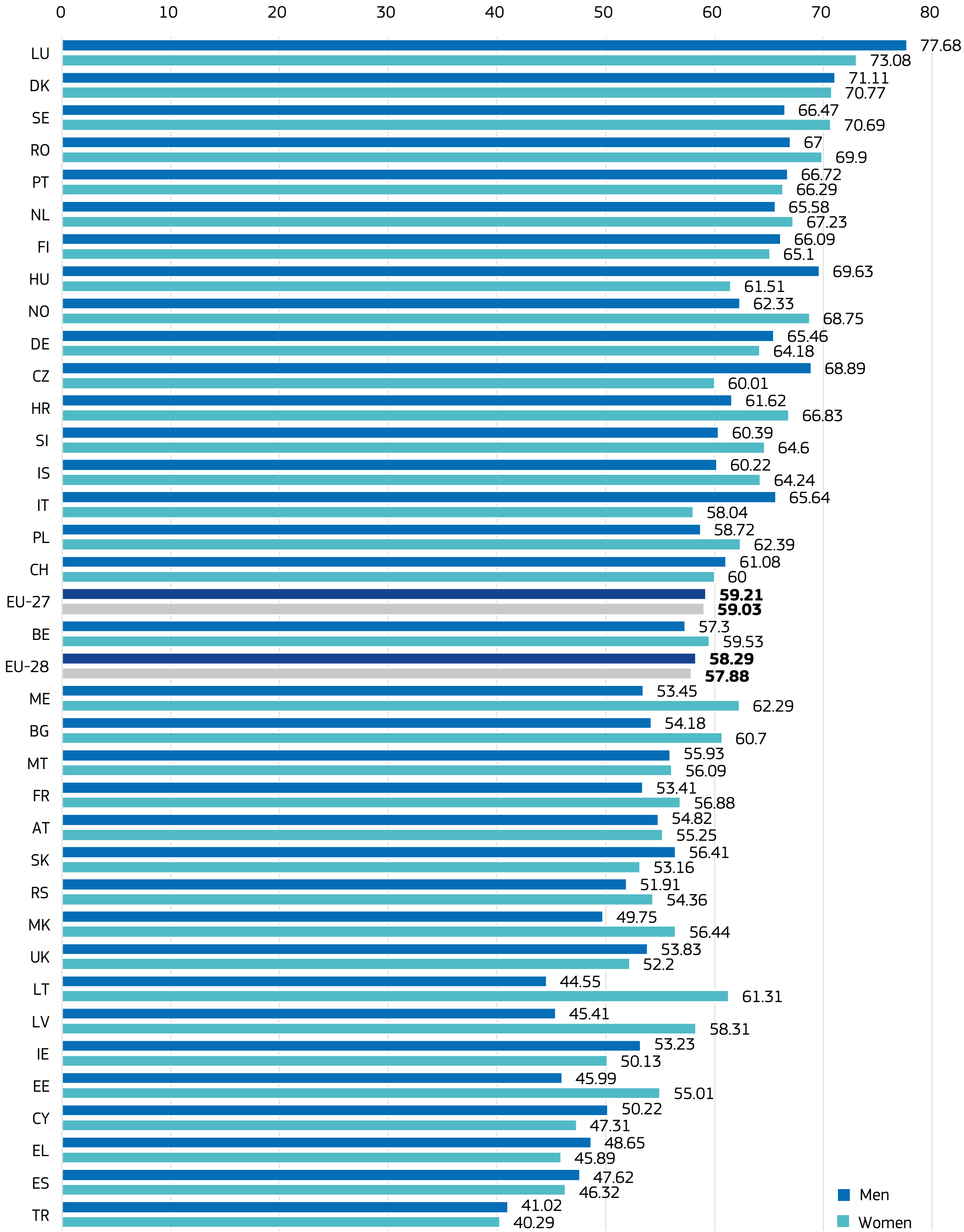
The data show little difference between the employment outlooks of tertiary-educated women and men at European level (Figure 3.2). Around 59% of tertiary-educated women and 59.2% of tertiary-educated men were employed as professionals or technicians. In order to meet the goals for growth in science and technology within Horizon Europe and the Europe 2030 Strategy for a sustainable Europe (European Commission, 2019b), there might be a need for greater utilisation of the available human resources employed as professionals or technicians.

The situation at country level varies considerably. Overall, in 16 EU-27 Member States and Associated Countries, the proportion of tertiary-educated men working as professionals or technicians exceeded the corresponding proportion for women (LU, DK, PT, FI, DE, HU, CZ, CH, IT, SK, UK, IE, CY, ES, EL, TR). In comparison, in 19 EU-27 Member States and Associated Countries, the proportion of tertiary-educated women working as professionals or technicians exceeded the corresponding proportion for men (SE, RO, NO, NL, HR, SI, IS, PL, ME, LT, BG, BE, LV, FR, MK, MT, AT, EE, RS).

There is a considerable gender gap in Latvia and Lithuania, where the difference in the proportion of tertiary-educated men employed as professionals and technicians compared to the corresponding proportion for women is larger than 10 p.p. Similarly, in six other EU-27 Member States and Associated Countries, the proportion of tertiary-educated men exceeded the proportion for women by 5 p.p. (BG, EE, HR, ME, MK, NO). On the other hand, opposite trends were observed in three EU-27 Member States and Associated Countries (CZ, HU, IT), with the proportion of tertiary-educated women employed as professionals and technicians exceeding the corresponding proportion for men by 5 p.p.

Across all countries, the highest percentage of the tertiary-educated population working as professionals and technicians was observed in Luxembourg, with 77.7% of men and 73.1% of women employed. Meanwhile, the smallest percentage was observed in Turkey, with 40.3% of women and 41.1% of men employed.

Figure 3.2 Proportion (%) of tertiary educated and employed as professionals and technicians (HRSTC) among tertiary educated (HRSTE), by sex, 2019



Notes: Data not available for: AL, BA, GE, AM, FO, MD, TN, IL, UA

Source: Eurostat – Human resources in science and technology (online data code: hrst_st_ncat)

In the majority of countries, a greater proportion of men were employed as scientists and engineers compared to women within the total labour force.

The gender gap in science and engineering occupations remains prominent at both European and country level. At European level, the difference between the proportion of women and men in the science and engineering labour force was 1.3 p.p. (3.1% women and 4.4% men).

Despite priorities to foster growth in science and technology, the data indicate little change since 2017 in the proportion of women and men in the labour force employed as scientists and engineers. Data from 2017 showed that 3.1% of women in the labour force were employed as scientists and engineers compared to 4.5% of men, in the EU-28 (She Figures, 2018). Data from 2019 indicate that 3.3% of women were employed as scientists and engineers compared to 4.8% of men, in the EU-28 (Figure 3.3). While the proportion of women employed as scientists and engineers increased slightly at EU-28 level, a similar gender gap persists.

At country level, only four EU-27 Member States and Associated Countries (DK, LT, LV, NO) had a higher proportion of women scientists and engineers in the labour force compared to men. The largest difference between the proportion of women and men scientists and engineers in the labour force was observed in Luxembourg (7.7% male, 3.0% female) and Finland (8.4% male, 3.8% female). On the other hand, the largest difference between the proportion of women and men scientists and engineers in the labour force was observed in Norway (7.1% female and 5.8% male) and Denmark (6.2% female and 5.7% male). Norway had the highest proportion of women scientists and engineers among the total labour force.

Several EU-27 Member States and Associated Countries had a higher proportion of women and men scientists and engineers in the labour force compared to the EU-27 level (AT, BE, DK, EE, IE, FI, NL, NO, SI, SE, UK, CH, IS).

BOX 10 Promoting gender equality in recruitment and promotion processes

In the **UK** and **Ireland**, under the Athena Swan Charter, several higher education institutions have amended their recruitment processes to encourage higher numbers of female applicants. For example, at Imperial College London, the Departments of Materials and Biotechnology have worked to ensure that their job advertisements are gender neutral. In the Department of Materials, aspects such as opportunities for collaboration and a supportive environment were highlighted, while the Department of Biotechnology advertised within the department to enable academics to propose individuals from within their networks. The Department of Materials found that while the proportion of female applicants continued to be low, one-third of recent appointments were female, and the Department of Biotechnology found a significant increase in the number of women at interview stage (from 25% to 46%) and those who accept offers (from 27% to 67%)[5].

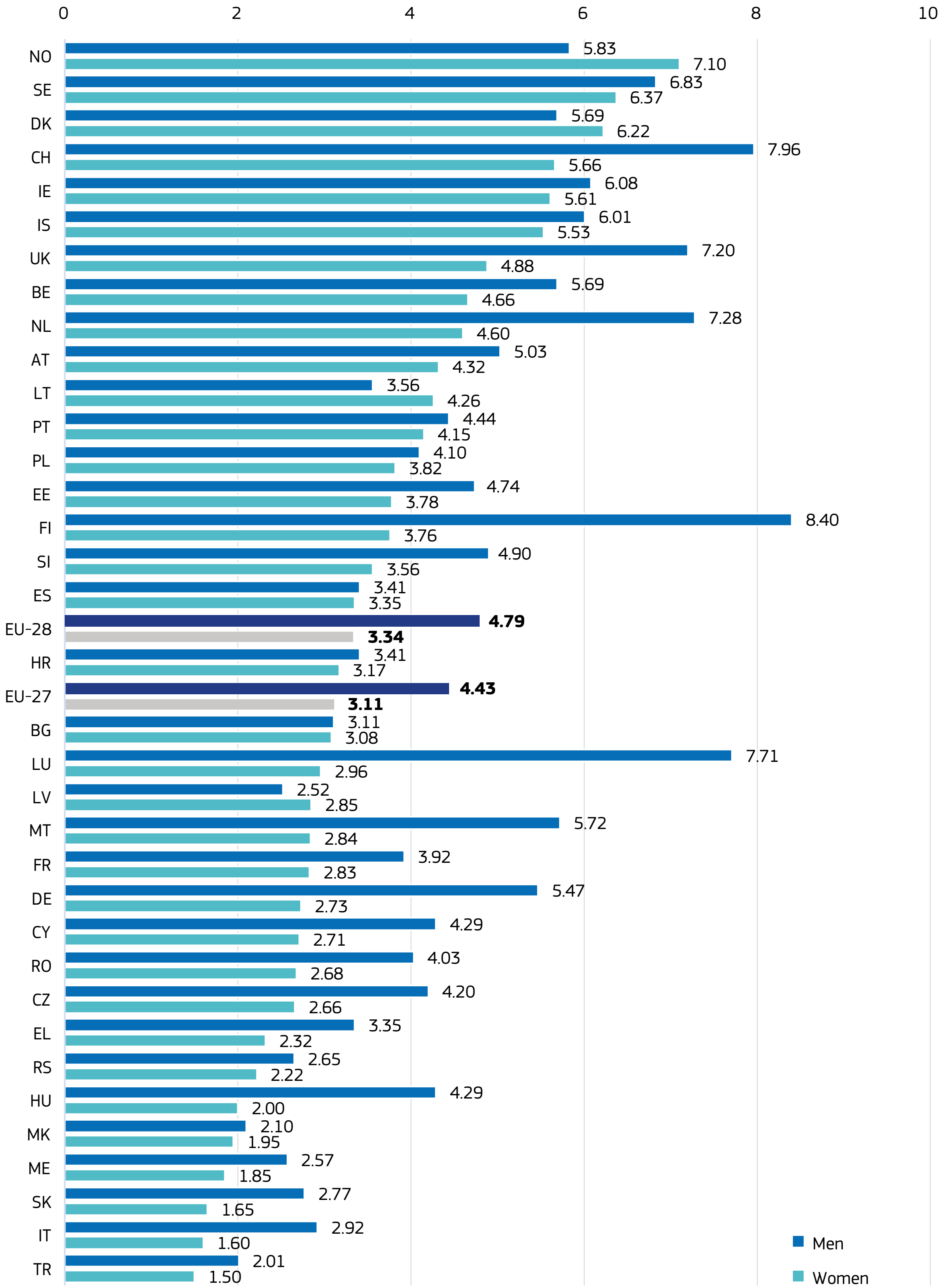
Since 2016, four of **Ireland's** seven[6] universities have implemented measures so that the proportion of women and men to be promoted or recruited is based on the proportion of each gender at the grade immediately below. This is done through the use of quotas, cascade quotas or cascade monitoring tools. The remaining three universities are reviewing their processes, or already monitor gender equality during promotion processes in other ways[7].

5 AdvanceHE Athena Swan Charter, https://www.advance-he.ac.uk/equality-charters/athena-swan-charter#what-is

6 As of 2021, Ireland has eight universities. The Gender Action Plan was produced when there were seven.

7 Accelerating Gender Equality in Irish Higher Education Institutions – Gender Action Plan 2018-2020, https://hea.ie/assets/uploads/2018/11/Gender-Equality-Taskforce-Action-Plan-2018-2020.pdf

Figure 3.3 Proportion (%) of scientists and engineers among total labour force, by sex, 2019



Notes: Data not available for: AL, BA, GE, AM, FO, MD, TN, IL, UA.

Source: Eurostat – Human resources in science and technology (online data code: hrst_st_ncat) and Eurostat – Labour Force Survey – Active population by sex, age and citizenship (online data code: lfsa_agan)

3.3 The gender gap in KIA in business industries

The fast-changing labour market and societal transitions in the EU - for example, the green and digital transitions - require a skilled workforce. Digital skills are particularly important: in a 2020 Communication on the Sustainable Growth Strategy for 2021, the Commission stated its aim to reach 70% of EU citizens with digital skills by 2025 (European Commission, 2020i). Within this context, the Staff Working Document for the 2020 ERA cautions that changes in the labour market can contribute to growing social and geographical inequalities (European Commission, 2020g). The Staff Working Document also notes that Europe is transforming to a knowledge-driven economy at a slow pace, which may have negative implications for Europe's long-term competitiveness. This section examines the extent to which women's and men's full educational attainments are utilised across activities that tend to be knowledge-intensive. As KIA cover all sectors of the economy and women may be over-represented in sectors such as education and health, this section provides a second indicator focusing on business industries (KIABI).

Women were more likely than men to work in KIA.

Overall, of the total number of women and men employed in all sectors of the economy at European level, 35.3% were employed in KIA in 2019 (Figure 3.4). Similarly, 36.6% of employed individuals in the EU-28 worked in KIA in 2019. In comparison, 36.1% of the EU-28 workforce was employed in KIA in 2017 (She Figures, 2018). The data thus indicate a slight increase in the proportion of the workforce employed in KIA.

At both European and country level, the proportion of women employed in KIA was higher than the corresponding proportion of men, when considering all sectors of the economy. In 2019, there was a considerable difference at European level of 15.6 p.p (43.7% for women and 28.1% for men), indicating that women were more likely than men to work in KIA.

Among the EU-27 Member States and Associated Countries, the difference in proportions between women and men varied from 2.2 p.p. in Luxemburg to 24.4 p.p. in Latvia. Other EU-27 Member States and Associated Countries with large differences in the proportions of women and men working in KIA included Iceland (22.5 p.p.), Estonia (21.2 p.p.), Montenegro (21.2 p.p.), Slovakia (20.9 p.p.), Lithuania (20.6 p.p.) and Slovenia (20.6 p.p.).

The comparative over-representation of women in KIA can, in part, be attributed to the traditionally higher representation of women in economic sectors such as education and health (see Chapter 2).

Knowledge-Intensive Activities (KIA) **and Knowledge-Intensive Activities – Business Industries** (KIABI):

- An activity is classified as 'knowledge-intensive' if tertiary-educated people employed in this activity represent more than 33% of total employment in the activity. The definition is based on the average number of employed persons aged 25–64 at the aggregated EU-27 level.
- Two aggregates of KIA are presented in this section: total KIA and KIA – business industries (KIABI).

Despite women's over-representation in KIA overall, women were less represented in KIABI.

Examining the employment of women and men in business industries, as a subset of KIA, is critical for understanding the EU's use of available human capital in a priority area of the economy. Public support for R&D in the business sector tripled in the EU from 0.04% of GDP in 2007 to 0.11% of GDP in 2017 (European Commission, 2020g). Given the increasing prioritisation of the business sector, examining potential gender differences in employment in KIABI can provide insights into potential barriers to recruitment and advancement of highly qualified women in this sector of the labour market.

At European level, in 2019, employed women were less represented in KIABI compared to men, meaning that women may face greater barriers in the labour market as public support increases towards the business sector. Consequently, in order to meet the requirements of the changing labour market, more women and men in the labour force might need to be trained or encouraged to work in this sector. Examples of measures to support gender balance in the private sector are presented in Box 11.

BOX 11 Improving gender balance in the private sector

In **Israel,** funding was introduced in 2016 under the Academia-Industry Scholarship for the Advancement of Women in Science and Technology to support young women researchers to participate in joint research with industry. The funding aimed to help these researchers to develop connections and gain experience to support their careers, and to aid these women in reaching management positions in industry[8].

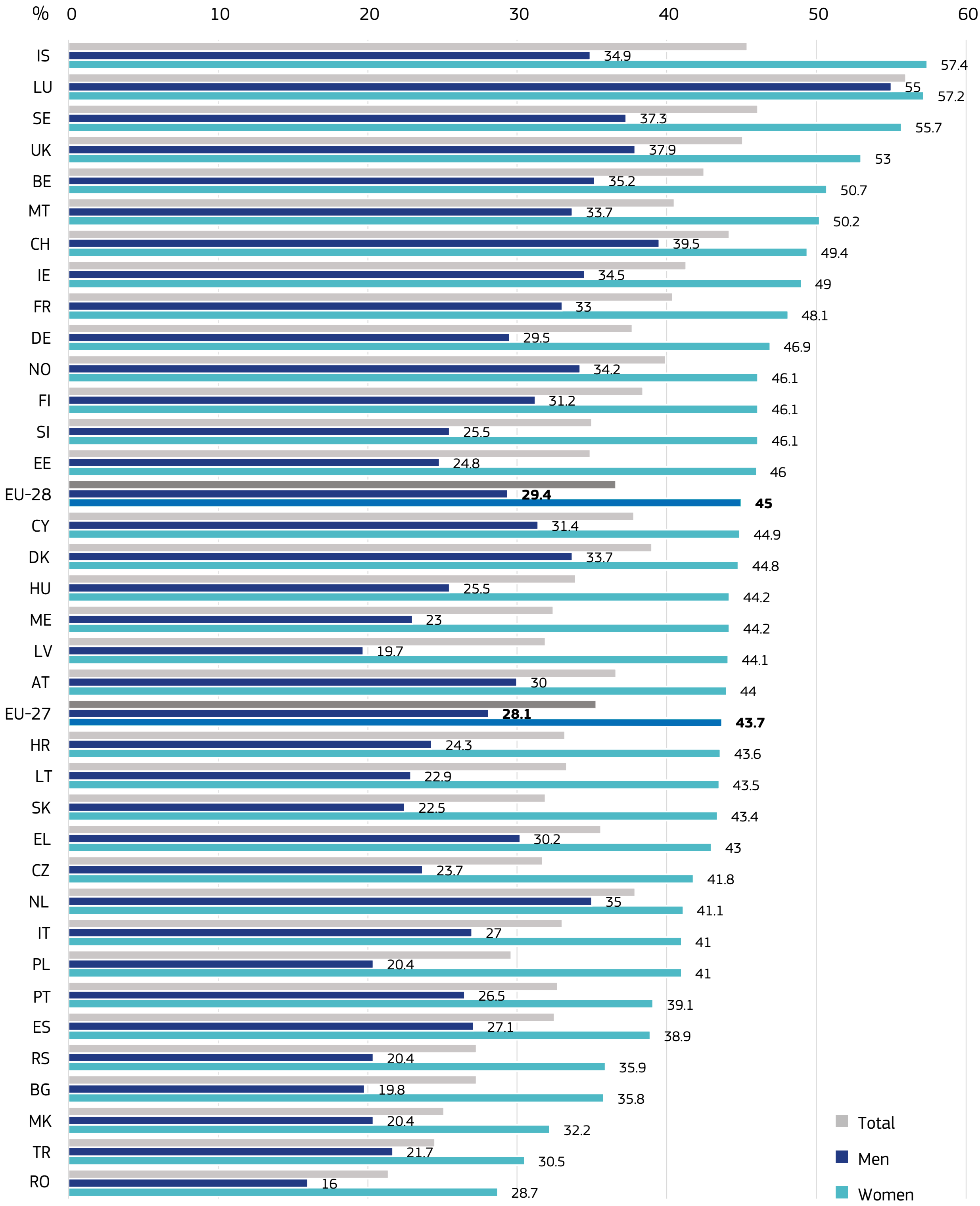
In **Austria**, the Research Promotion Agency (FFG, the national funding organisation for business-oriented research and development) supports R&D companies and non-university research organisations to implement equal opportunities measures through their FEMtech Career projects. Companies can apply to receive funding of up to EUR 50,000 over a period of 6-24 months for relevant projects. This includes training to increase gender knowledge within companies, human resources management (e.g. recruitment, branding), measures to increase work-life balance, measures to support the development of employees (e.g. mentoring), and support to improve internal and external communications[9].

At country level, the representation of women and men in KIABI varies. In approximately half of the 35 EU-27 Member States and Associated Countries examined, women were more likely than men to be working in KIABI. The largest differences between the proportions of women and men employed in KIABI were in Montenegro, Cyprus and Bulgaria (at 4.6, 4.4 and 3.7 p.p., respectively). The opposite trend in favour of men was most evident in Switzerland, Norway and the Netherlands (with differences of 7.4, 6.3 and 6.3 p.p., respectively).

8 GENDERACTION (2018). D 3.1 Report on national roadmaps and mechanisms. in ERA Priority 4, https://genderaction.eu/wp-content/uploads/2021/02/GENDERACTION_D05_Report-on-national-roadmaps-and-mechanisms-in-ERA-priority-4.pdf

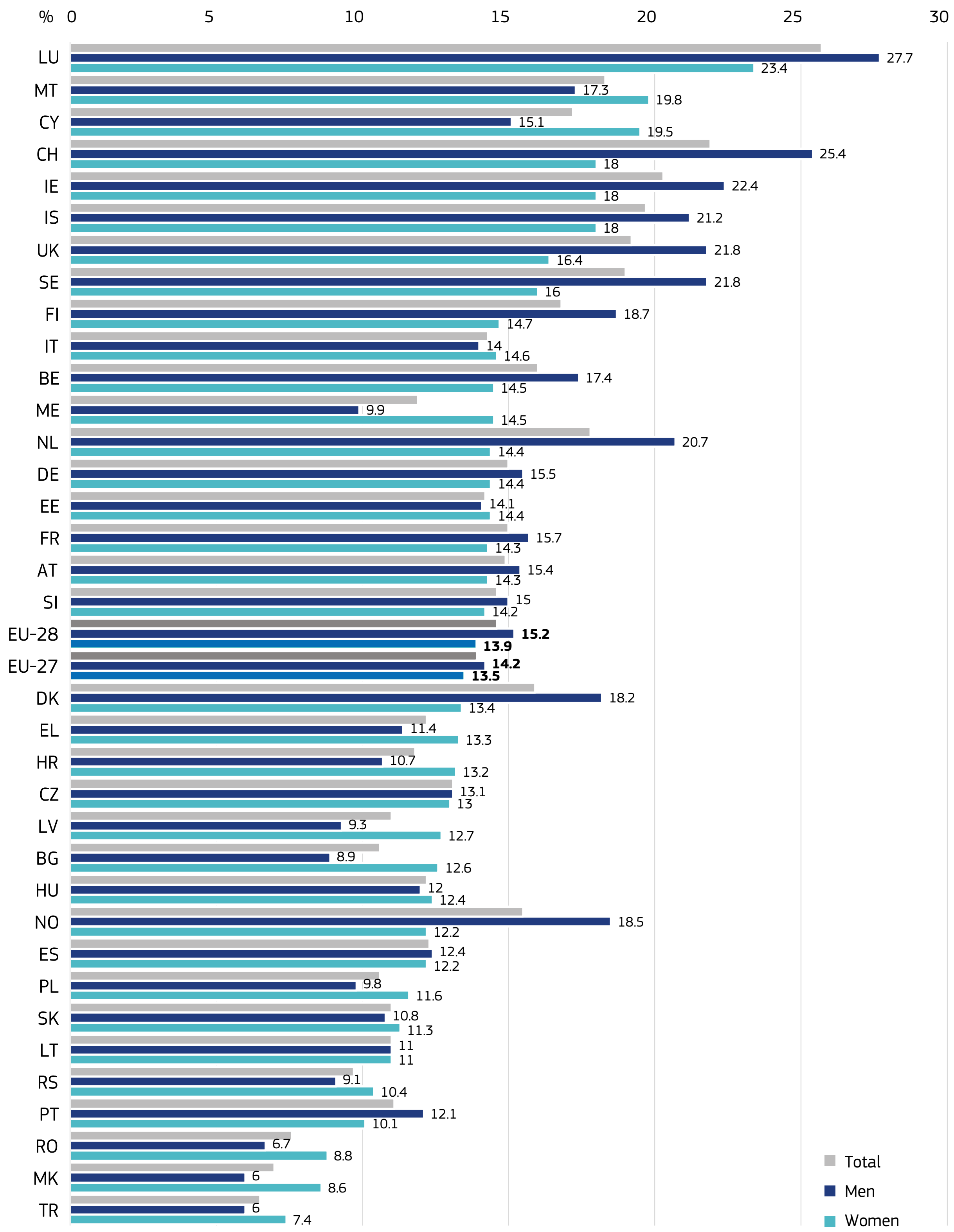
9 FFG, 'Exploiting Talent: Equal Opportunities - FEMtech Career', https://www.ffg.at/femtech-karriere

Figure 3.4 Proportion (%) of employed population in KIA among total employment, by sex, 2019



Notes: Data not available for: AL, BA, GE, AM, FO, MD, TN, IL, UA.
Source: Eurostat – Human resources in science and technology (online data code: htec_kia_emp2)

Figure 3.5 Proportion (%) of employed in KIABI among total employment, by sex, 2019



Notes: Data not available for: AL, BA, GE, AM, FO, MD, TN, IL, UA.

Source: Eurostat – Human resources in science and technology (online data code: htec_kia_emp2)

3.4 The gender gap in self-employment activities in technology-oriented occupations

One of the main reasons for the fast-changing labour market in the EU is digitalisation of the economy and the labour market, and thus the skills required. EU countries have committed to boosting women's participation in the fields of STEM and ICT as part of the WiD policy (European Commission, 2020d). Women in the labour market are significantly under-represented in entrepreneurship, more specifically in technology-oriented fields. A new indicator sheds light on women's share of self-employment in the traditionally male-dominated occupations of scientists and engineers and ICT.

Women represented less than one-quarter of self-employed professionals in science and engineering and ICT.

The results show a significant gender gap at European level, with less than one-quarter of women self-employed[10] as ICT professionals, scientists and engineers in 2018 (Figure 3.6). A similar trend can be seen among EU-27 Member States and Associated Countries, where the proportion of self-employed women fell below 40% in all countries except Croatia (43.9%). In the UK, Slovakia, Poland, Czechia and Hungary, less than one-fifth of women were self-employed as ICT professionals and scientists and engineers.

These results are not surprising in light of the finding that women are considerably under-represented as Doctoral graduates in the fields of ICT and Engineering, Manufacturing & Construction (see Chapter 2). In addition, the results of the WiD Scoreboard 2020 showed that women are still less likely to have specialist digital skills and work in this field compared to men (European Commission, 2020j). The gender gap is further exacerbated by the fact that women are less likely to be self-employed than men and that the self-employment rate for women in the EU remained almost constant between 2002 and 2018 (OECD, 2019).

In addition to gender differences in participation in entrepreneurship activities - with women less represented than men - gender differences exist in the motivation for self-employment. Although a range of motivations were given by both women and men, women were more likely to be motivated by flexible working hours (OECD, 2019). In order to encourage women's entrepreneurial activity in traditionally male-dominated sectors, holistic measures are needed to support women entrepreneurs.

10 This is defined in accordance with the EU Labour Force Survey (EU-LFS) and refers to women who work in their own business or professional practice for the purpose of earning a profit. This includes women who employ others, as well as those who do not.

BOX 12 Supporting women entrepreneurs through mentoring and training

The **international** EMPOWA alliance ran from 2017-2019 as part of the FEMINA project, a consortium of EU stakeholders from both research and business, that aims to further the participation of women in Horizon 2020 in response to the under-representation of women in Horizon 2020 and the low participation of women in the business sector. EMPOWA identified innovative women-led small and medium-sized enterprises (SMEs) and consulted with women entrepreneurs to understand the barriers to accessing funding. Awareness-raising, mentoring and training was provided to the selected SMEs, with 150 women entrepreneurs receiving training, mentoring and advice, at least 10 of whom went on to submit an SME instrument proposal. A further 3,000 women entrepreneurs were reached through awareness-raising activities[11].

The **international** 'Immersion: Women Founders' programme is a mentorship programme offered by Google to startups. It provides women entrepreneurs with guidance on hiring and managing teams, developing a business in response to customer behaviour, and setting and tracking goals[12].

In **Germany**, 'Female Entrepreneurs of the Future' is a public-private initiative that was launched in 2018 to provide coaching to women entrepreneurs with up to 30 employees. Participants can access 20 coaches and digital experts to help them to develop and implement a digital plan for their business. Among the first cohort of 18 participants, nine launched a new online shop or professionalised an existing online shop. After one year, these entrepreneurs had created 19 additional jobs[13].

Recent data also show that women-led start-ups receive only a fraction of all investment (investment from private individuals) in Europe: between 2016 and 2020, women-founded businesses in Europe received $32m in angel investment compared to $89m from mixed founding teams and $537m from men-founded businesses (Atomico, 2020), and more than 90% of European venture capital received by tech companies in 2018 went to teams without any female founders (Skonieczna and Castellano, 2020).

11 European Regional Development Fund, Interreg Europe (n.d.), 'Good practices from our projects and beyond', https://www.interregeurope.eu/policylearning/good-practices/

12 Google for Startups, 'Immersion: Women Founders', https://startup.google.com/intl/de/immersion-women-founders/#:~:text=What%20is%20Immersion%3A%20Women%20Founders%3F%20Immersion%3A%20Women%20Founders,communities%20across%20Europe%20including%20the%20UK%20and%20Israel

13 Women entrepreneurs of the future, https://www.aboutamazon.de/unternehmertum-f%C3%B6rdern/unternehmerinnen-der-zukunft

BOX 13 Increasing women entrepreneurs' access to funding

The **UK** government, together with 14 founding signatories, produced an 'Investing in Women Code' in 2019. Under the Code, organisations commit to having a specific member of senior staff with responsibility for supporting equality in interactions with entrepreneurs, reporting to the government on gender balance among businesses supported, and implementing internal practices to improve women entrepreneurs' access to the tools needed to develop their businesses. To date, the Code has been signed by more than further 60 organisations in addition to the founding 14[14].

At organisation level, investment firm Playfair Capital introduced 'Female Founder Office Hours' in 2019 to respond to the lack of access to investors and lack of funding granted to women business founders. The first edition of this initiative included 11 investors and 45 founders, while the latest edition comprised 61 investors, 156 female founders and took place over 624 meetings[15].

In **France**, SISTA aims to reduce funding inequalities between women and men entrepreneurs. It has established communities of women entrepreneurs and women investors, as well as creating the SISTA Charter, which asks venture capital funds to commit to using 25% of their financing to support startups founded or co-founded by women, by 2025. To date, 56 venture capital funds and 22 corporate venture capital funds have signed the Charter. SISTA also produce statistics on the position of women in technology and gender balance in financing of entrepreneurs in order to raise awareness. It provides provide training to introduce people from under-represented groups to the tech industry in the StartHer Academy[16].

In **Poland, Czechia, Bulgaria, Ukraine, Estonia, Slovenia** and **Hungary**, the European Women in VC [venture capital] network is a community for senior women investors, with more than 350 members. The aim of the network is to address the lack of gender diversity in the venture capital industry, which they see as having knock-on effects on women entrepreneurs' access to financing[17].

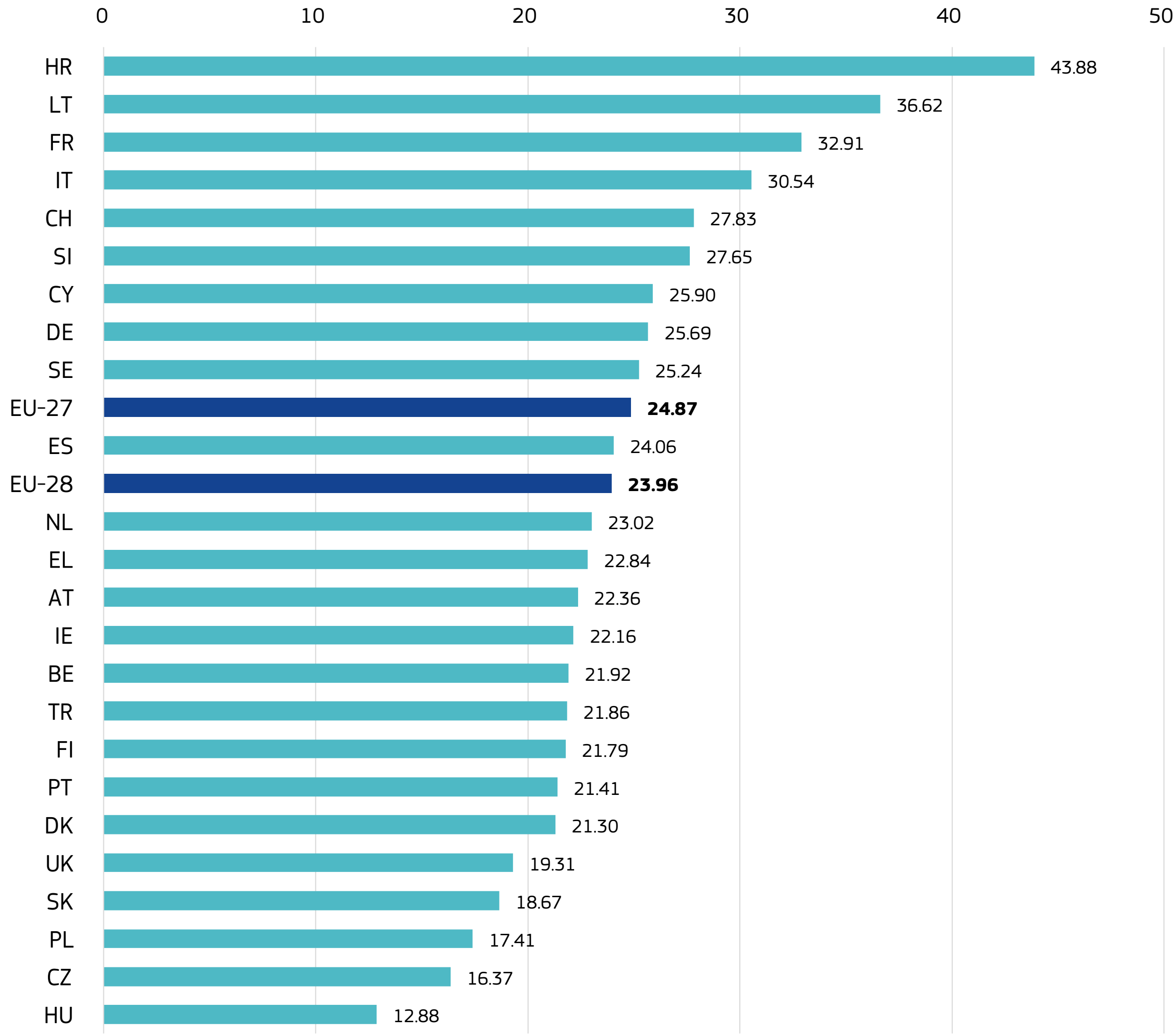
14 HM Treasury UK (2019). 'Investing in Women Code', https://www.gov.uk/government/publications/investing-in-women-code

15 Playfair Capital (2020). 'Female Founder Office Hours — The Story and What Happens Next', https://medium.com/playfair-capital-blog/female-founder-office-hours-the-story-and-what-happens-next-ccb8617dc649

16 SISTA, https://www.wearesista.com/

17 Experior Venture Fund, 'European Women in VC', http://evf.com.pl/en/european-women-vc#:~:text=European%20Women%20in%20VC%20is%20the%20community%20of,countries%20%28Poland%2C%20Czechia%2C%20Bulgaria%2C%20Ukraine%2C%20Estonia%2C%20Slovenia%2C%20Hungary%29.

Figure 3.6 Proportion (%) of self-employed women among S&E and ICT Professionals, 2018



Notes: Data are based on weighted values in thousands; Data not available for: BG, EE, LV, LU, MT, RO, IS, NO, ME, MK, AL, RS, BA, GE, AM, FO, MD, TN, IL, UA; low reliability (women) for: DK, IE, CY, HU, SI, SK; low reliability (women & total) for: HR, LT; break in time series (total): SE.

Source: Eurostat – Labour Force Survey Annual Average Quarterly data, 2018

3.5 The gender differences in unemployment among the tertiary educated labour force

Although the proportion of tertiary-educated women and men working as professionals or technicians is gender-balanced at European level, it is important to consider whether there are gender imbalances in the proportion of tertiary-educated people who are unemployed. This may indicate the extent to which there are equal opportunities for employment for tertiary-educated women and men, as well as shedding further light on the potential under-utilisation of educational attainments within the labour force.

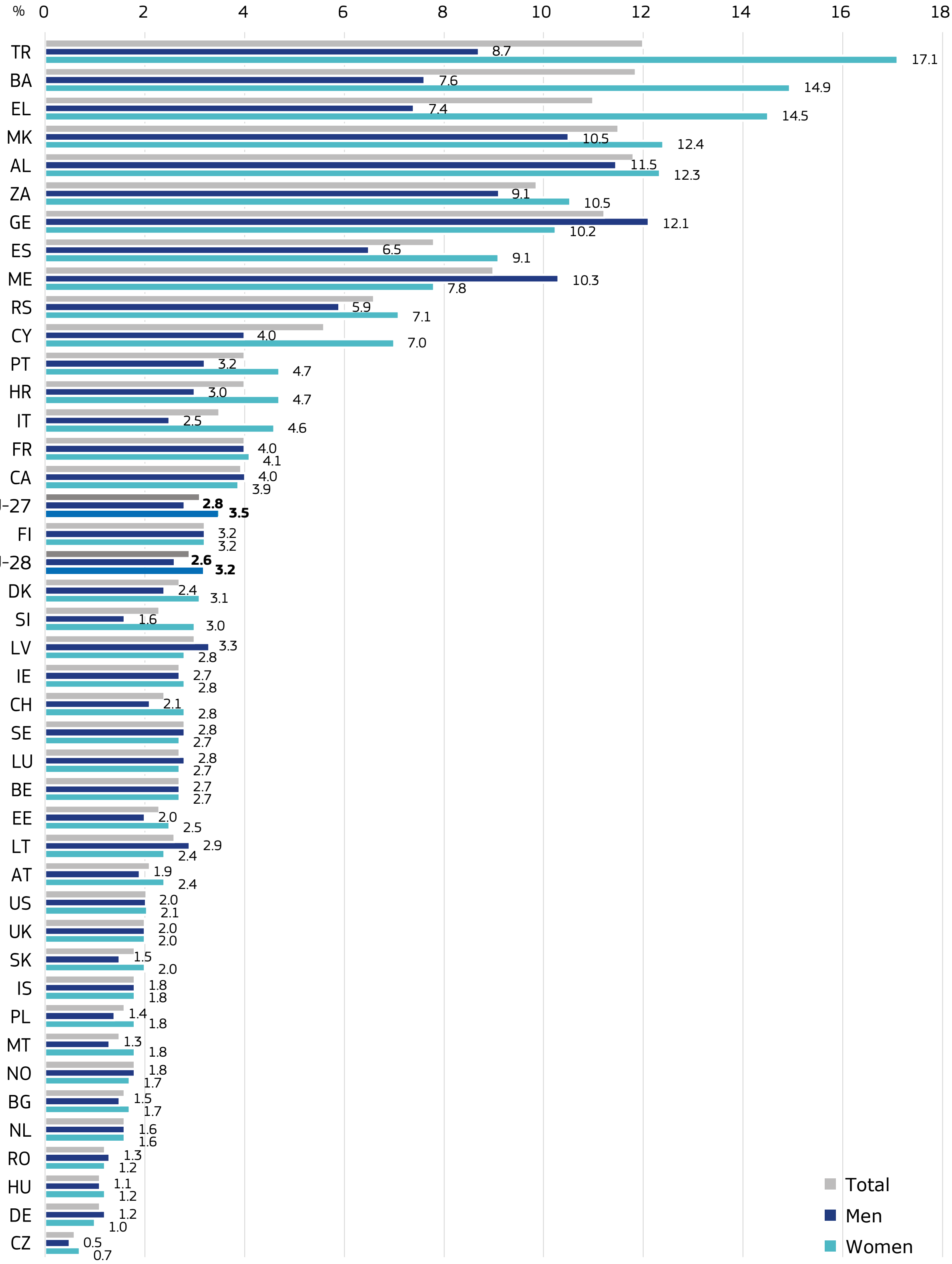
Tertiary-educated women were more likely to be unemployed than tertiary-educated men.

The data show that, in 2019, the unemployment rate of tertiary-educated people was 3.1% at European i.e. EU-27 level (Figure 3.7), with the unemployment rate of tertiary-educated women higher than that of tertiary-educated men (3.5% for women and 2.8% for men). Comparing the unemployment rates for women and men in the EU-28 shows that gender differences in the unemployment rate for tertiary education women and men were less pronounced since 2017. More specifically, in 2017, the unemployment rate for women was 3.8%, compared to rate of 2.9% for men, in the EU-28 (She Figures, 2018), while in 2019, the corresponding proportions were 3.2% and 2.9%, respectively. The gender gap in unemployment rates has therefore reduced in the EU-28.

Exploring the data at country level, the unemployment rate of tertiary-educated women was higher than that of tertiary-educated men in 26 of the 41 EU-27 Member States and Associated Countries with available data. The differences between women's and men's unemployment rate ranged from 0.1 p.p. in Hungary, Ireland and France, to 8.4 p.p. in Turkey. The most notable difference was in Montenegro, where the unemployment rate of tertiary-educated men exceeded that of women by a difference of 2.5 p.p. The difference in unemployment rate of tertiary-educated women and men was negligible in the Netherlands, Iceland, UK, Belgium and Finland.

Across all countries, the highest unemployment rates for tertiary-educated women were observed in Turkey (17.1%), Bosnia and Herzegovina (14.9%) and Greece (14.5%), while the lowest rates were found in Czechia (0.7%), Germany (1%), Hungary (1.2%) and Romania (1.2%).

Figure 3.7 Unemployment rate of tertiary educated people, 2019



Notes: Data not available for: AM, FO, MD, TN, IL, UA; Low reliability (men): HR, MT, SI, US; Low reliability (total, women & men): AL, BA, GE, ZA.

Source: Eurostat – Human resources in science and technology (online data codes: hrst_st_nunesex - custom extraction) and International Labour Organization - Database of labour statistics (online data: Unemployment by sex, age and education, Labour force by sex, age and education).

3.6 Women and men's participation in the higher education, government, and business enterprise sectors

As identified in the Staff Working Document and 2020 ERA Communication, one of the key goals of the EU is to increase public and private investment in R&D (European Commission, 2020g; European Commission, 2020a). Given the strategic importance of job creation in R&D occupations, the following indicators examine the composition of women's and men's participation in R&D occupations across various sectors of the economy.

The proportion of men researchers among men R&D personnel in all sectors of the economy combined was higher than the corresponding proportion of women researchers.

In 2018, at European level, of the employment categories of 'researcher', 'technician' and 'other supporting staff'[18], 60.4% of women R&D personnel in HES, GOV and BES were researchers (Figure 3.8), compared to 65.7% of men. These data suggest that gender differences persist in the choice of occupation for R&D personnel. Horizontal segregation in R&D professions and increased women's participation in research careers must be addressed to ensure inclusiveness of research careers in the EU.

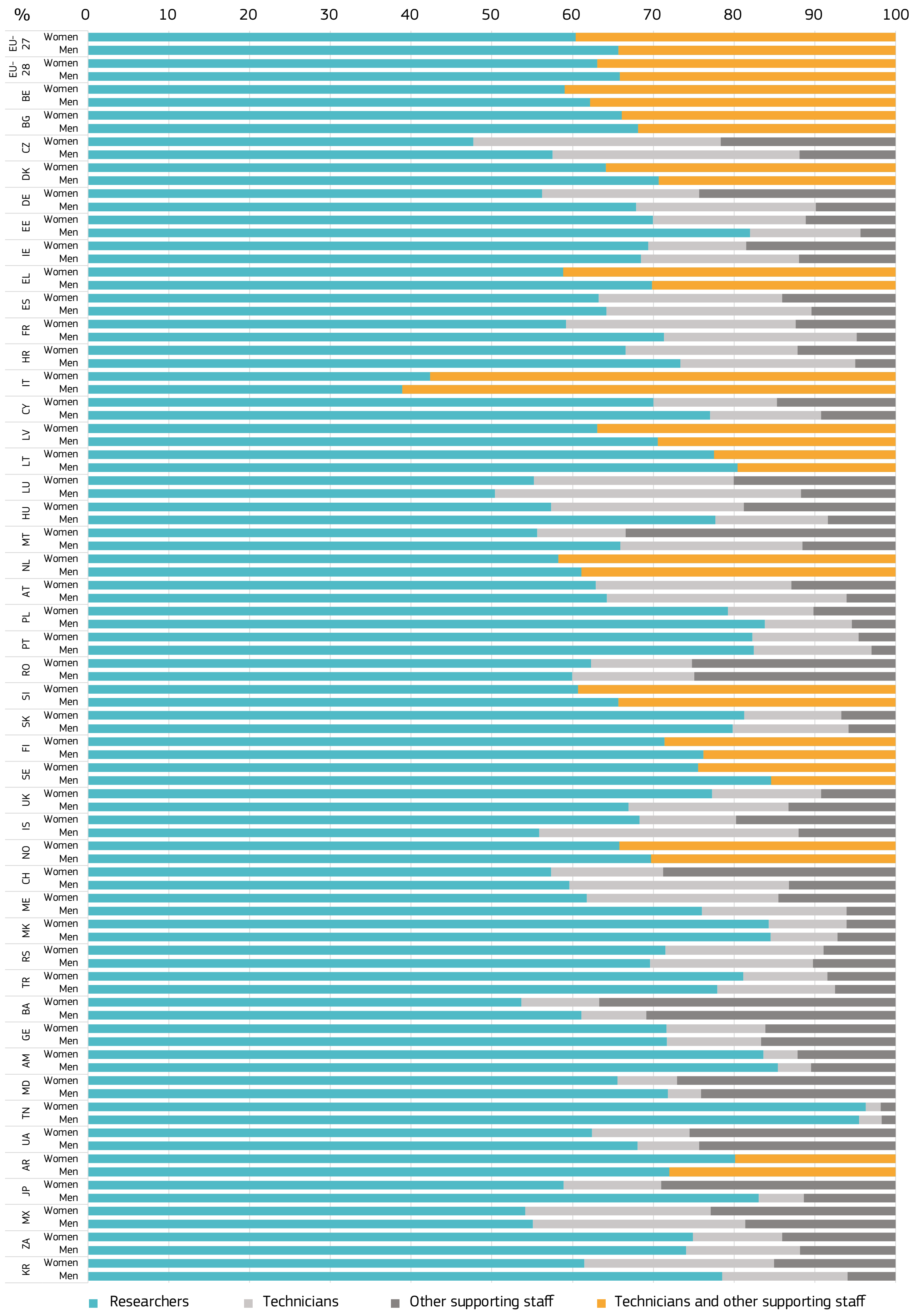
At country level, there were lower proportions of women researchers in the vast majority of EU-27 Member States and Associated Countries. In particular, the proportion of men was much higher than the proportion of women in Hungary, Montenegro and France (with differences of 20.4, 14.2 and 12.1 p.p., respectively). There was a higher proportion of women researchers compared to men in 10 EU-27 Member States and Associated Countries (IE, IT, LU, RO, SK, UK, IS, RS, TR, TN). Of these, the greatest differences were in Iceland, the UK and Luxembourg (12.5, 10.4 and 4.8 p.p., respectively). Among all countries, Tunisia had the highest proportion of women researchers (96.3%), followed by North Macedonia (84.3%) and Armenia (83.6%), while, among the EU-27, the highest proportions were in Portugal (82.3%), Slovakia (81.2%) and Poland (79.2%), with the lowest in Italy (42.4%), Czechia (47.7%) and Luxembourg (55.2%).

Compared to women researchers, the opposite trends were observed for women working as 'other supporting staff'. Across all sectors combined, the proportion of women in this occupation exceeded the relative proportion of men in all EU-27 Member States and Associated Countries, except the UK, North Macedonia, Serbia and Georgia. In these four countries, the proportion of men working as other supporting staff exceeded the proportion for women by only 0.5-4 p.p, with the greatest difference observed in the UK.

The proportion of men technicians among R&D personnel was larger than the corresponding proportion of women technicians in more than half of the EU-27 Member States and Associated Countries that provided data for this occupation (DE, IE, ES, HR, LU, MT, AT, PL, PT, RO, SK, UK, IS, CH, RS, TR, TN). Of these 17, Iceland had the largest difference in the proportion of women and men technicians (20.2 p.p.), followed by Switzerland (13.4 p.p.) and Luxembourg (13.1 p.p). Among the EU-27 Member States and Associated Countries that provided data for technicians and 'other supporting staff', the proportion of women exceeded the corresponding proportion of men in 11 out of 12 countries. The exception was Italy, where the proportion of men working as either technicians or 'other supporting staff' exceeded the corresponding proportion of women by 3.4 p.p.

18 Where 'technician' and 'other supporting staff' are presented as one category in some countries, but as two separate categories in others.

Figure 3.8 Distribution of R&D personnel across occupations in all sectors (business enterprise, government and higher education), by sex, 2018



Notes: Exceptions to the reference year: EU-27, EU-28, BE, BG, DK, EE, IE, EL, ES, FR, HR, IT, CY, LV, LT, LU, HU, MT, NL, AT, PL, RO, SI, FI, SE, UK, NO, CH, ME, TR, AR, JP, ZA, KR: 2017, BA: 2014, MX: 2013; Data not available for: AL, FO, IL; Data provisional for (Men & Women): CZ, FR (Researchers, Technicians, Other supporting staff), DK (Researchers, Technicians and other supporting staff); Data estimated for (Men & Women): IT (Researchers, Technicians and other supporting staff), UK (Researchers, Technicians, Other supporting staff); Definition differs, see metadata (Men & Women): DE, HR, TR & JP (Researchers, Technicians, Other supporting staff), NL (Researchers, Technicians and other supporting staff).

Other: Starting with reference year 2012, it is not compulsory for countries to report data on technicians separately from other supporting staff. The distribution computed for each country refers to the most 'detailed' occupations for which data were provided. When data were available for all three categories ('Researchers', 'Technicians' and 'Other supporting staff'), proportions were calculated for the three categories. Otherwise, the categories 'Technicians' and 'Other supporting staff' were combined. For DK, IT, NL & SI, the distribution is based on the sum of occupations for which data were available and not the reported total since these were different.

Source: Eurostat – Research and development statistics (online data code: rd_p_persocc) and UIS - Total R&D personnel by function and sector of employment

The proportion of men among researchers was higher than the corresponding proportion for women across all sectors examined.

In the HES, 68.6% of the total number of women R&D personnel at European level were researchers, compared to the far-higher 82.8% among men (Figure 3.8). A similar trend was observed in the EU-27 Member States and Associated Countries, where the proportion of men researchers exceeded the equivalent proportion for women researchers in all countries except the UK and Georgia. The proportion of women working as researchers was highest in Tunisia (100%), Armenia (97.5%), the UK (94.8%), Portugal (92.7%) and Slovakia (92.4%).

Conversely, the proportion of women working as 'other supporting staff' was higher than that of men in each of the EU-27 Member States and Associated Countries for which data were provided, except the UK (9.2% for women compared to 13.3% for men) and Georgia (15.9% for women compared to 16.7% for men). The proportion of women working as technicians was also higher than the equivalent proportion of men in most EU-27 Member States and Associated Countries, with the exception of eight countries (DK, IE, MT, RO, UK, IS, CH, AM). Notable exceptions are Malta and Denmark, where the proportion of men exceeded the corresponding proportion of women by 5.5 and 4.4 p.p., respectively.

In the GOV sector, women researchers represented 53.2% of the total number of women R&D personnel at European level, compared to 63.1% of all men researchers (Figure 3.9). Similar to the trends observed in the HES, the proportion of men researchers exceeded the equivalent proportion for women researchers in the majority of the EU-27 Member States and Associated Countries. There were, however, some exceptions, where the proportion of women researchers exceeded the proportion of men researchers in the GOV sector (BG, IE, CY, RO, IS, MK, RS, TR).

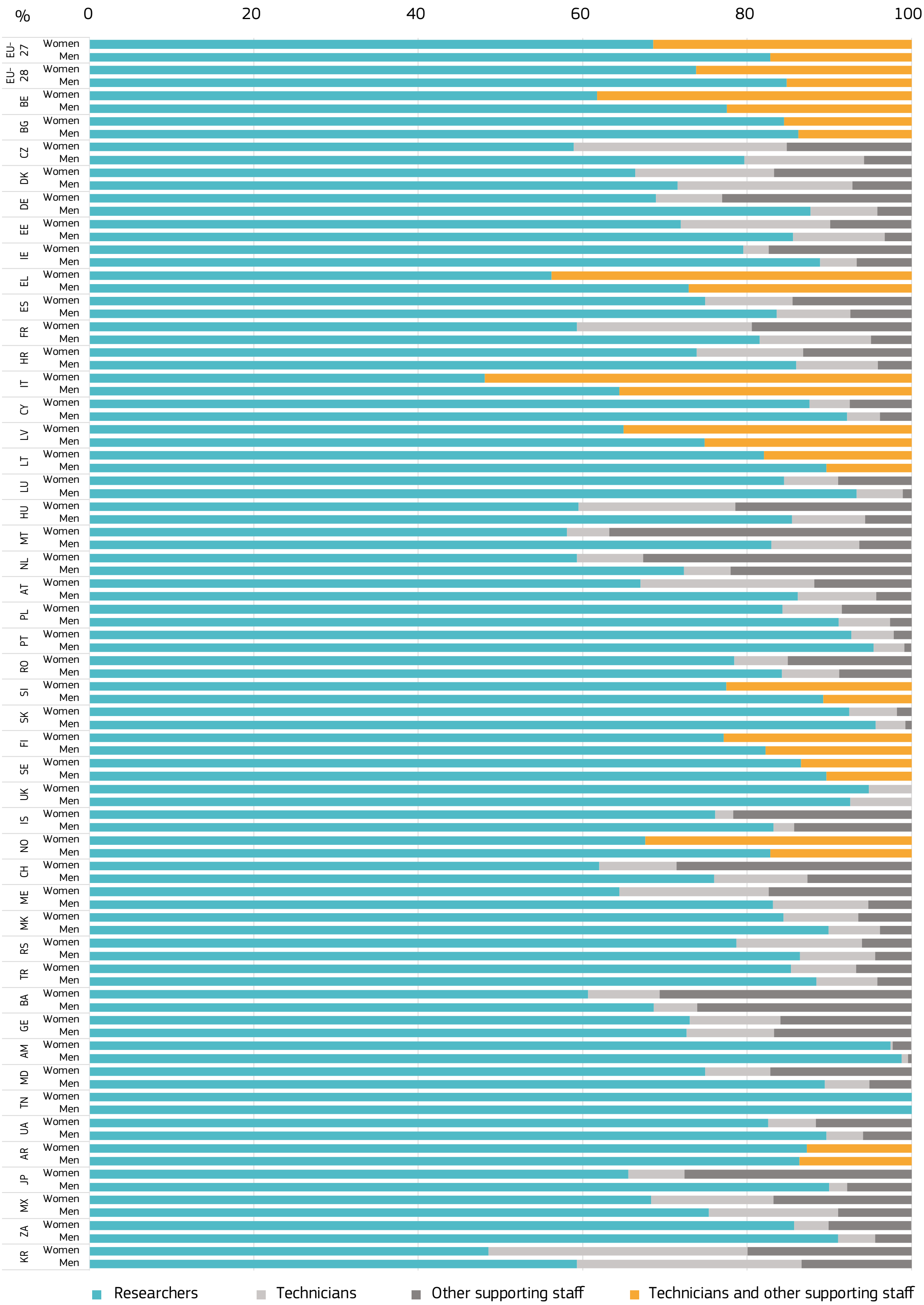
The proportion of women working as 'other supporting staff' in the GOV sector was greater than the proportion of men in the majority of the EU-27 Member States and Associated Countries, with the exception of seven countries (IE, CY, RO, MK, RS, TR, BA). This was also the case for the proportion of women working as technicians in the GOV sector, which exceeded the equivalent proportion for men in all but 10 of the EU-27 Member States and Associated Countries (IE, IT, MT, SI, UK, IS, MK, RS, TR, TN).

Similar to the findings in the HES and GOV sector, the proportion of men researchers among men R&D personnel in the BES exceeded the corresponding proportion for women researchers at the European level (51.9% of women researchers compared to 57.7% of men researchers) (Figure 3.10).

However, the proportion of women researchers exceeded the equivalent proportion for men researchers in the BES in several EU-27 Member States and Associated Countries (BE, ES, IT, LT, LU, MT, AT, RO, IS, NO, CH, MK RS, TR, BA). On the other hand, similar to the HES and GOV sector, the proportion of women working as 'other supporting staff' in the BES exceeded the corresponding proportion of men in most EU-27 Member States and Associated Countries, with the exception of only three (MK, RS, UA). In the case of technicians, the proportion of women exceeded the proportion of men in the majority of the EU-27 Member States and Associated Countries, although the opposite pattern was observed in several countries (CZ, IE, ES, CY, LU, MT, AT, RO, SI, IS, CH, MK, RS, TR, BA).

These data suggest that despite the evident gender balance among Doctoral graduates, women are less likely to work as researchers and more likely to work as 'other supporting staff' in the HES, GOV sector and BES. The situation is more varied among technicians, with women less likely to work as technicians in the HES, although more likely in the GOV sector and BES, in most countries.

Figure 3.9 Distribution of R&D personnel across occupations in the higher education sector, by sex, 2018

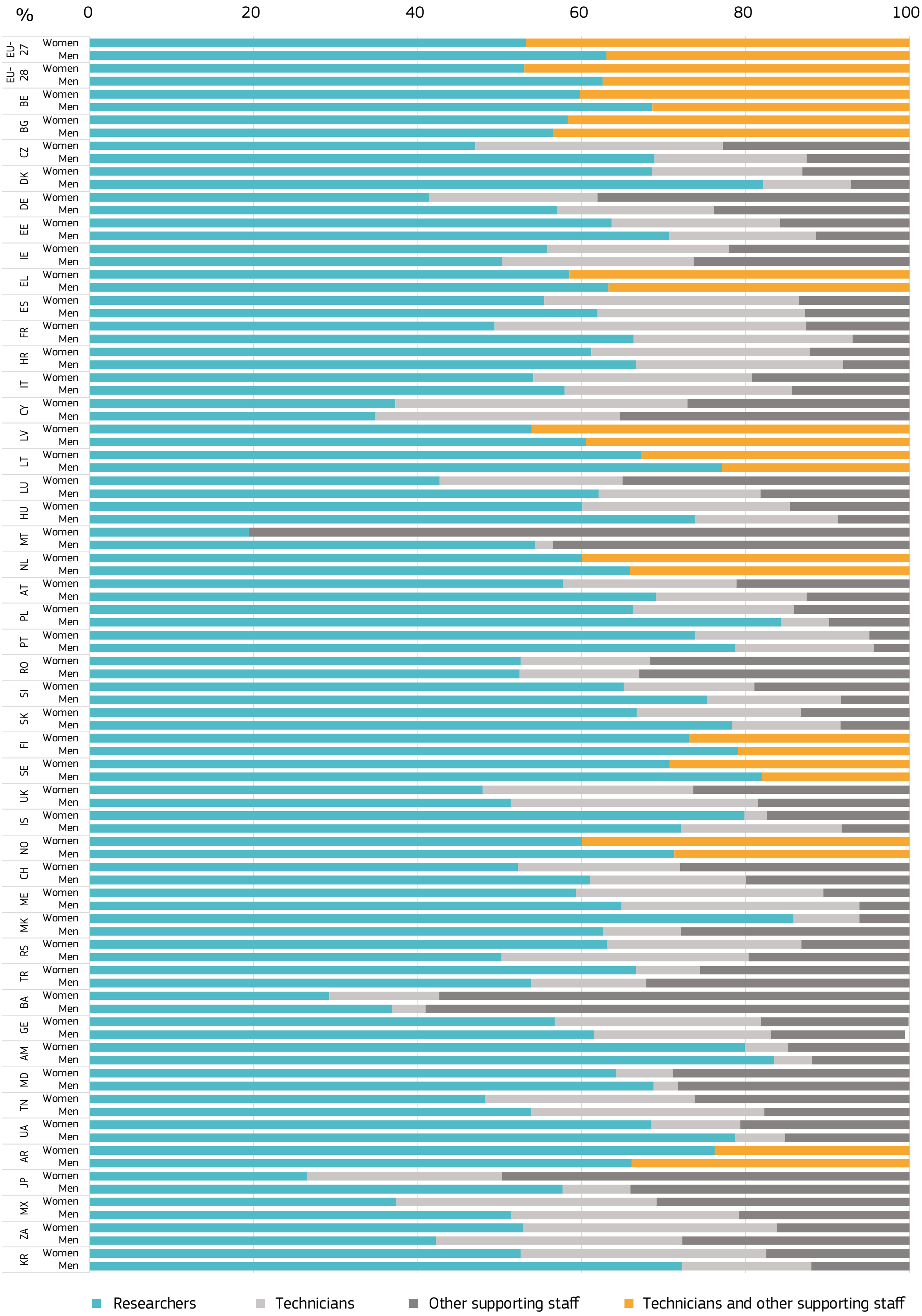


Notes: Exceptions to the reference year: EU-27, EU-28, BE, BG, DK, DE, EE, IE, EL, ES, FR, HR, IT, CY, LV, LT, LU, HU, MT, NL, AT, PL, RO, SI, FI, SE, UK, NO, CH, ME, TR, AR, JP, ZA, KR: 2017, BA: 2014, MX: 2013; Data not available for: AL, FO, IL; Data provisional for (Men & Women): CZ, DK & FR (Researchers, Technicians, Other supporting staff); Data estimated for (Men & Women): IT (Researchers, Technicians and other supporting staff), UK (Researchers, Technicians, Other supporting staff); Definition differs, see metadata: JP (Researchers, Technicians, Other supporting staff).

Other: Starting with reference year 2012, it is not compulsory for countries to report data on technicians separately from other supporting staff. The distribution computed for each country refers to the most 'detailed' occupations for which data were provided. For PL & AM, the distribution is based on the sum of occupations for which data were available and not the reported total since these were different.

Source: Eurostat – Research and development statistics (online data code: rd_p_persocc) and UIS - Total R&D personnel by function and sector of employment

Figure 3.10 Distribution of R&D personnel in the government sector across occupations, by sex, 2018

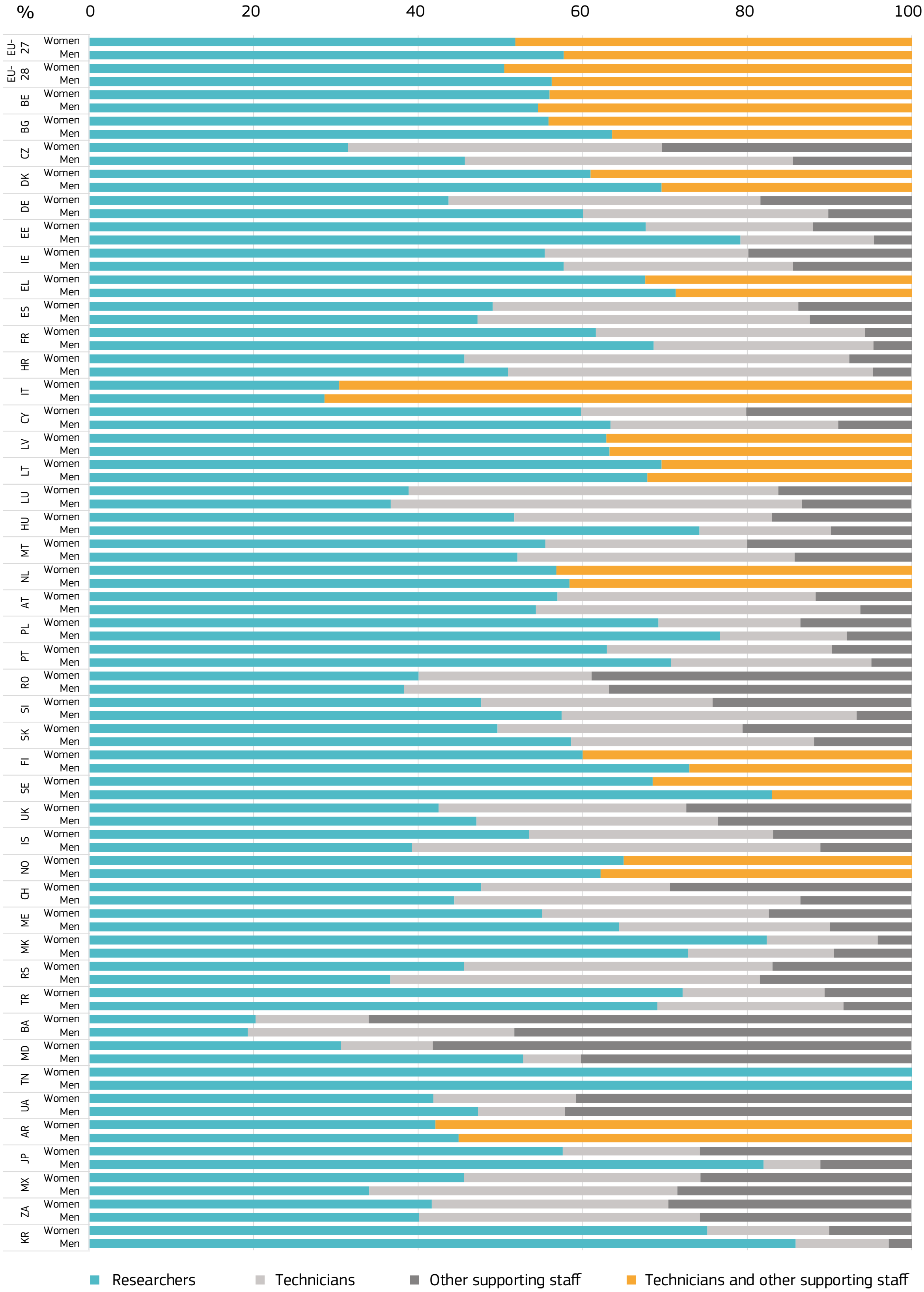


Notes: Exceptions to the reference year: EU-27, EU-28, BE, BG, DK, DE, EE, IE, EL, ES, FR, HR, IT, CY, LV, LT, LU, HU, MT, NL, AT, PL, RO, SI, FI, SE, UK, NO, CH, ME, TR, AR, JP, ZA, KR: 2017, BA: 2014, MX: 2013; Data not available for: AL, FO, IL; Data provisional for (Men & Women): CZ, DK & FR (Researchers, Technicians, Other supporting staff); Definition differs, see metadata (Men & Women): DE, HR, NL, TR & JP (Researchers, Technicians, Other supporting staff).

Other: Starting with reference year 2012, it is not compulsory for countries to report data on technicians separately from other supporting staff. The distribution computed for each country refers to the most 'detailed' occupations for which data were provided. For PL, SE (Men) & AM, the distribution is based on the sum of occupations for which data were available and not the reported total since these were different.

Source: Eurostat – Research and development statistics (online data code: rd_p_persocc) and UIS - Total R&D personnel by function and sector of employment

Figure 3.11 Distribution of R&D personnel across occupations in the business enterprise sector, by sex, 2018



Notes: Exceptions to the reference year: EU27, EU28, BE, BG, DK, DE, EE, IE, EL, ES, FR, HR, IT, CY, LV, LT, LU, HU, MT, NL, AT, PL, RO, SI, FI, SE, UK, NO, CH, ME, TR, AR, JP, ZA, KR: 2017, BA: 2014, MX: 2013; Data not available for: AL, GE, AM, FO, IL; Data provisional for (Men & Women): CZ, DK & FR (Researchers, Technicians, Other supporting staff); Definition differs, see metadata (Men & Women): JP (Researchers, Technicians, Other supporting staff).

Other: Starting with reference year 2012, it is not compulsory for countries to report data on technicians separately from other supporting staff. The distribution computed for each country refers to the most 'detailed' occupations for which data were provided. For PL, the distribution is based on the sum of occupations for which data were available and not the reported total since these were different.

Source: Eurostat – Research and development statistics (online data code: rd_p_persocc) and UIS - Total R&D personnel by function and sector of employment

In all countries, women researchers in the BES were less represented in Manufacturing, Services of the Business Economy and Other Economic Activities.

In the EU, the proportion of business investment in R&D is lower than other main economies. However, funding for business R&D has increased substantially, from 0.13% of GDP in 2007 to 0.2% of GDP in 2017 (European Commission, 2020g), suggesting increasing prioritisation of business investment within the EU. The following indicators look more closely at the distribution of women and men researchers in the BES and potential gender imbalances and differences in this sector.

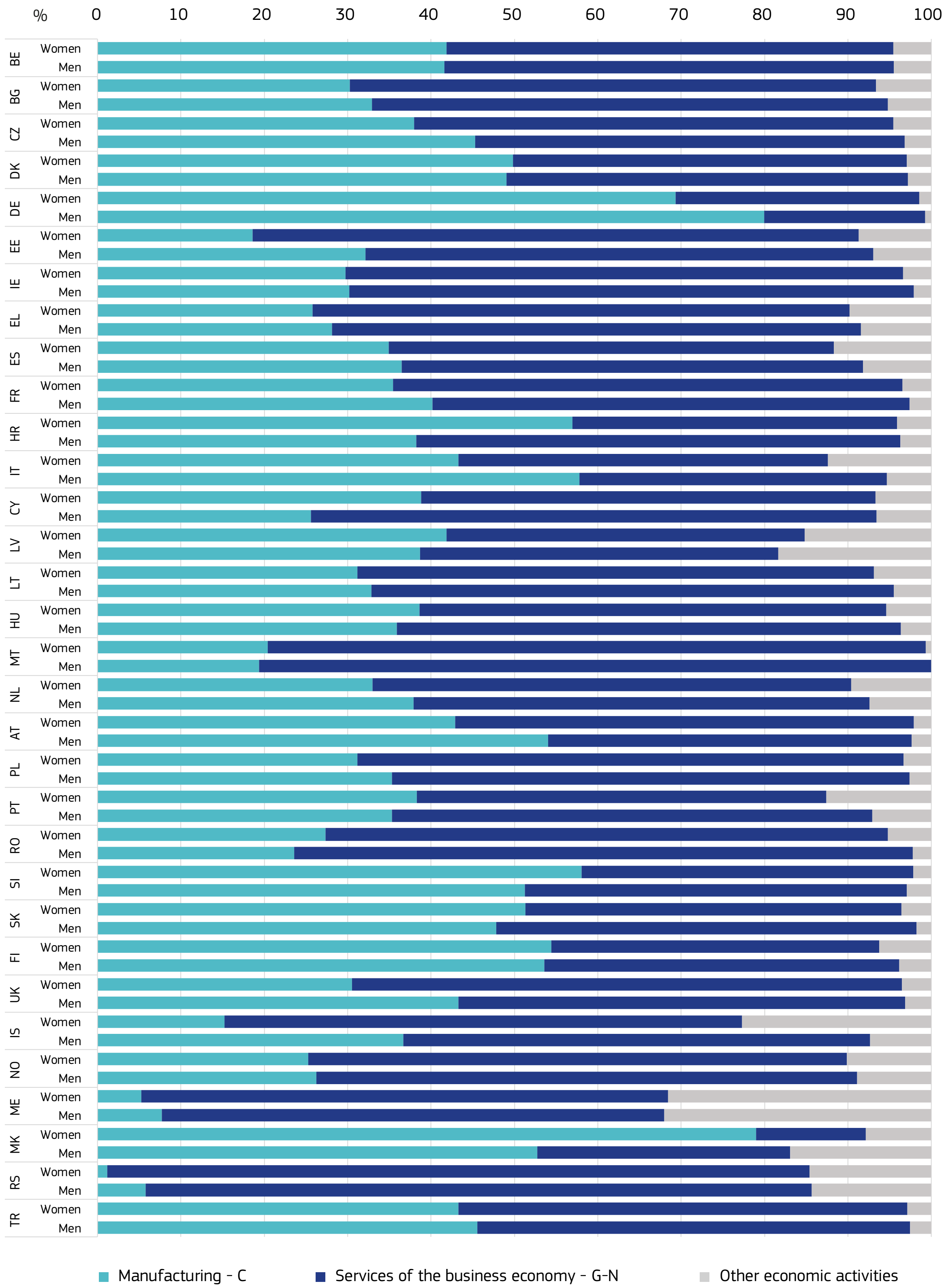
The data show that in 22 of the 31 countries for which data were available (BE, BG, CZ, EE, IE, EL, ES, FR, CY, LV, LT, HU, MT, NL, PL, PT, RO, UK, IS, NO, ME, RS, TR), women and men working as researchers in the BES were most likely to work in Services of the Business Economy, comprising between 43% and 84.2% of researchers (Figure 3.11). The second most popular activity for women and men researchers was Manufacturing (with the exception of IS, ME, and RS, where Other Economic Activities were more popular for women, men or both).

In five of the remaining nine countries (DE, DK, SI, FI, MK), both women and men researchers were most likely to work in Manufacturing (between 49.1% and 80.0%). In the remaining four countries, women were more likely than men to work in Manufacturing, with men more likely to work in Services of the Business Economy in two countries (HR and SK). That trend was reversed in Italy and Austria. In all but four countries (LV, IS, ME, MK), the proportion of women and men researchers working in Other Economic Activities was less than 15%.

Table 3.1 shows that women researchers were under-represented in Manufacturing in all but one country (MK). Women researchers were also under-represented in Services of the Business Economy in all countries. In both of these areas, women accounted for less than one-third of researchers in most countries (except BG, HR, CY, LV RO and MK for Manufacturing; BG, LV, RO, IS, ME, MK and RO for Services of the Business Economy). Women researchers were also less represented in Other Economic Activities compared to men in all but three countries (MT (although the value for MT reflects only one individual working in that area), RO and IS.)

The highest proportion of women researchers were present in the Manufacture of Basic Pharmaceutical Products & Pharmaceutical Preparations in 24 of the 32 countries for which data were available (BE, BG, DK, EL, ES, FR, HR, IT, CY, LV, LT, HU, AT, PL, PT, RO, SI, SK, FI, UK, IS, NO, MK, TR. Note that this includes absolute values of less than 30 for LT and IS). Women researchers also represented a majority or an equal share of total researchers in the Manufacture of Chemicals & Chemical Products in 12 of the 32 countries for which data were available (BG, EE, HR, LV, LT, LU, PL, PT, RO, SI, RS, TR. Again, this includes absolute values of less than 30 values for LV and RS).

Figure 3.12 Distribution of researchers in the business enterprise sector across economic activities (NACE Rev. 2), by sex, 2018



Notes: Reference year differs for: BE, BG, DK, DE, EE, IE, EL, ES, FR, HR, IT, CY, LV, LT, HU, MT, NL, AT, PL, RO, SI, FI, UK, NO, CH, ME, TR (2017); SI (2016). Data not available for EU-27, EU-28, AL, BA, AM, FO, GE, IL, MD, TN, UA (all categories); CH (services of the business economy and other economic activities). Data provisional: CZ, DK, FR (all fields). Data confidential: LU (for manufacturing and other economic activities), SE (for number of men in all fields and number of women in services of the business economy and other economic activities).

Source: Eurostat – Research and development statistics (online data code: rd_p_bempoccr2)

Table 3.1 Proportion (%) of women among researchers in the business enterprise sector, by selected economic activities (NACE Rev. 2), 2018

Country	C -Manufacturing	C20 - Manufacture of chemicals and chemical products	C21 - Manufacture of basis pharmaceutical products and pharmaceutical preparations	G-N - Services of the business economy	Other economic activities
BE	28.76	33.8	50.44	28.56	28.76
BG	34.1	58.96	76.84	36.46	41.67
CZ	10.68	34.83	31.87	13.73	16.9
DK	28.29	40.57	56.2	27.56	28.97
DE	13	27.54	46.14	20.72	25.42
EE	16.3	50	41.18 (7/17)	28.61	29.45
IE	25.03	41.65	39.03	25.1	35.36
EL	27.53	46.79	57.9	29.6	32.47
ES	29.99	45.23	64.67	30.17	38.92
FR	19.3	47.06	57.25	22.42	26.78
HR	45.14	78.43	80.57	27.05	37.84
IT	17.06	33.27	53.78	24.77	38.9
CY	40	-	54.05	26.07	31.03 (9/29)
LV	43.45	50 (14/28)	75.2	41.46	36.92
LT	29.47	67.04	58.62 (17/29)	30.32	40.39
LU	:	72.88	:	13.18	:
HU	18.88	37.04	54.06	16.7	24.21
MT	25.86	-	33.33 (5/15)	24.47	100 (1/1)
NL	16.25	28.61	43.69	18.97	22.5
AT	14.56	30.44	56.72	21.28	16.04
PL	22.4	62.22	72.24	25.68	29.59
PT	30.15	50.84	63.73	25.37	41.39
RO	39.14	70.97	85.28	33.55	56.25
SI	25.42	51.52	59.42	21.83	18.95
SK	16.89	49.53	74.29	14.5	27.52
FI	17.62	46.67	67.58	16.28	25.54
SE	19.45	:	11.75	25.54	49.86
UK	16.58	37.29	50.85	25.75	24.17
IS	18.83	30.43 (7/23)	100 (3/3)	38.25	63.22
NO	23.22	38.76	55.4	23.85	26.33
CH	23.47	21.32	44.79	30.21	:
ME	25 (2/8)	40 (2/5)	-	33.8	32.43
MK	67.68	46.15 (6/13)	83.19	37.76	39.29
RS	12	100 (3/3)	-	41.24	40.44
TR	24.79	50.82	63.69	26.46	28.3

Notes: Exceptions to the reference year: BE, BG, DK, DE, EE, IE, EL, ES, FR, HR, IT, CY, LV, LT, LU, HU, MT, NL, AT, PL, RO, SI, FI, SE, UK, NO, CH, ME, TR: 2017; LT (2015 for C21); SI (2016 for C21, G-N, and Other); SE (2015 for C; 2013 for C21; 2011 for G-N and Other) and CH (2012 for G-N). Data provisional: CZ, DK, FR (all fields). Data confidential: LT (C21 only). Break in time series: SE (C21 only). Definition differs: TR (C20 only). Data not available for: EU-27, EU-28, AL, BA, AM, FO, GE, IL, MD, TN, UA. Where the total number of individuals in a given field are less than 30, the actual number of women and total of people are shown in brackets.

Source: Eurostat – Research and development statistics (online data code: rd_p_bempoccr2)

3.7 Annex indicators

Annex 3.1 R&D personnel in the higher education sector, by sex and occupation, (headcount), 2018

Country	Researchers		Technicians		Other supporting staff		Technicians and other supporting staff	
	Women	Men	Women	Men	Women	Men	Women	Men
EU-27	**473 751**	**646 407**	**:**	**:**	**:**	**:**	**216 733**	**134 077**
EU-28	**635 930**	**836 199**	**:**	**:**	**:**	**:**	**225 570**	**149 363**
BE	13 661	18 811	:	:	:	:	8 474	5 443
BG	4 153	3 771	:	:	:	:	762	601
CZ	8 910	16 777	3 912	3 061	2 301	1 216	:	:
DK	11 308	14 553	2 872	4 323	2 853	1 461	:	:
DE	109 274	169 893	12 840	15 663	36 503	8 090	:	:
EE	2 092	2 297	528	298	287	88	:	:
IE	8 354	10 085	323	505	1 824	761	:	:
EL	11 799	17 646	:	:	:	:	9 200	6 561
ES	53 416	72 298	7 558	7 746	10 337	6 460	:	:
FR	49 396	74 497	17 667	12 393	16 210	4 511	:	:
HR	4 474	4 581	783	532	799	217	:	:
IT	32 014	45 623	:	:	:	:	34 575	25 127
CY	607	975	34	42	52	41	:	:
LV	2 947	2 516	:	:	:	:	1 590	845
LT	6 588	5 400	:	:	:	:	1 441	622
LU	502	851	39	51	53	10	:	:
HU	6 952	10 372	2 230	1 073	2 501	688	:	:
MT	324	599	29	77	205	46	:	:
NL	11 261	14 839	1 538	1 172	6 196	4 516	:	:
AT	15 227	22 106	4 788	2 446	2 692	1 104	:	:
PL	50 658	60 505	4 348	4 139	5 081	1 743	:	:
PT	28 639	28 893	1 598	1 131	660	265	:	:
RO	7 664	7 859	636	648	1 472	822	:	:
SI	1 827	2 547	:	:	:	:	532	306
SK	8 630	10 046	546	377	165	80	:	:
FI	10 920	11 513	:	:	:	:	3 232	2 490
SE	14 585	18 910	:	:	:	:	2 266	2 183
UK	162 179	189 792	8 837	15 286			:	:
IS	1 155	1 019	34	31	329	175	:	:
NO	13 189	13 904	:	:	:	:	6 323	2 890
CH	18 581	28 883	2 823	4 296	8 571	4 827	:	:
ME	408	503	115	70	110	32	:	:
MK	1 312	1 269	141	88	101	54	:	:
RS	5 915	5 918	1 144	626	455	305	:	:
TR	57 359	75 199	5 316	6 311	4 533	3 528	:	:
BA	745	939	107	72	376	357	:	:
GE	5 363	4 696	808	685	1 171	1 079	:	:
AM	421	242	1	2	10	1	:	:
MD	441	474	47	29	101	27	:	:
TN	18 393	13 086	:	:	:	:	0	0
UA	6 045	7 996	427	400	852	526	:	:
AR	27 852	21 226	:	:	:	:	4 055	3 353
JP	89 106	240 249	9 266	5 820	37 535	20 894	:	:
MX	8 281	15 673	1 808	3 274	2 034	1 862	:	:
ZA	22 972	27 577	1 132	1 352	2 700	1 341	:	:
KR	32 569	70 308	21 125	32 366	13 408	15 884	:	:

Notes**:** Exceptions to the reference year: EU-27, EU-28, BE, BG, DK, DE, EE, IE, EL, ES, FR, HR, IT, CY, LV, LT, LU, HU, MT, NL, AT, PL, RO, SI, FI, SE, UK, NO, CH, ME, TR, AR, JP, ZA, KR: 2017, BA: 2014, MX: 2013; Data not available for: AL, FO, IL; Data provisional for (Men & Women): CZ, DK & FR (Researchers, Technicians, Other supporting staff); Data estimated for (Men and Women): IT (Researchers, Technicians and other supporting staff) UK (Researchers, Technicians, Other supporting staff); Definition differs, see metadata (Men & Women): JP (Researchers, Technicians, Other supporting staff).

Other: Starting with reference year 2012, it is not compulsory for countries to report data on technicians separately from other supporting staff. ':' denotes that data were not available or that data for more detailed occupations are available.

Source: Eurostat – Research and development statistics (online data code: rd_p_persocc) and UIS - Total R&D personnel by function and sector of employment

Annex 3.2 R&D personnel in the government sector, by sex and occupation, (headcount), 2018

Country	Researchers		Technicians		Other supporting staff		Technicians and other supporting staff	
	Women	Men	Women	Men	Women	Men	Women	Men
EU-27	**120 547**	**154 236**	**:**	**:**	**:**	**:**	**106 008**	**90 350**
EU-28	**123 767**	**159 443**	**:**	**:**	**:**	**:**	**109 507**	**95 282**
BE	1 811	3 141	:	:	:	:	1 217	1 435
BG	2 852	2 085	:	:	:	:	2 038	1 602
CZ	4 320	6 487	2 775	1 744	2 089	1 183	:	:
DK	1 448	1 325	388	173	275	115	:	:
DE	23 233	40 629	11 514	13 601	21 325	16 972	:	:
EE	394	248	127	63	98	40	:	:
IE	299	378	119	176	118	198	:	:
EL	6 657	9 330	:	:	:	:	4 722	5 415
ES	17 534	16 659	9 806	6 795	4 270	3 433	:	:
FR	11 286	19 188	8 677	7 721	2 884	1 998	:	:
HR	1 478	1 250	643	473	294	151	:	:
IT	14 271	15 559	7 043	7 436	5 059	3 856	:	:
CY	113	78	108	67	82	79	:	:
LV	497	399	:	:	:	:	425	260
LT	1 513	1 370	:	:	:	:	736	406
LU	255	427	133	136	209	125	:	:
HU	2 640	3 473	1 111	823	642	410	:	:
MT	7	25	0	1	29	20	:	:
NL	5 336	7 730	:	:	:	:	3 552	4 000
AT	2 703	3 895	990	1 031	986	709	:	:
PL	3 090	2 692	917	188	656	313	:	:
PT	3 360	2 141	969	460	222	117	:	:
RO	3 352	3 504	1 005	973	2 013	2 203	:	:
SI	1 004	1 166	246	254	291	128	:	:
SK	2 327	2 301	697	390	462	247	:	:
FI	2 068	2 707	:	:	:	:	760	716
SE	7 017	6 363	:	:	:	:	2 903	1 397
UK	3 220	5 207	1 728	3 056	1 771	1 876	:	:
IS	115	140	4	38	25	16	:	:
NO	3 024	3 399	:	:	:	:	2 011	1 367
CH	378	673	143	209	202	220	:	:
ME	299	170	152	76	53	16	:	:
MK	225	126	21	19	16	56	:	:
RS	1 906	1 206	715	724	398	471	:	:
TR	2 451	4 928	286	1 285	939	2 939	:	:
BA	24	45	11	5	47	72	:	:
GE	401	419	178	147	127	111	:	:
AM	1 284	1 437	86	79	237	205	:	:
MD	1 012	955	109	42	455	392	:	:
TN	708	852	374	450	384	280	:	:
UA	14 165	14 856	2 257	1 153	4 267	2 855	:	:
AR	15 188	12 758	:	:	:	:	4 736	6 534
JP	6 394	28 204	5 734	4 053	11 984	16 651	:	:
MX	2 835	5 747	2 401	3 110	2 336	2 325	:	:
ZA	1 931	1 793	1 127	1 275	590	1 177	:	:
KR	7 752	21 981	4 417	4 798	2 569	3 641	:	:

Notes: Exceptions to the reference year: EU-27, EU-28, BE, BG, DK, DE, EE, IE, EL, ES, FR, HR, IT, CY, LV, LT, LU, HU, MT, NL, AT, PL, RO, SI, FI, SE, UK, NO, CH, ME, TR, AR, JP, ZA, KR: 2017, BA: 2014, MX: 2013; Data not available for: AL, FO, IL; Data provisional for (Men & Women): CZ, DK & FR (Researchers, Technicians, Other supporting staff); Definition differs, see metadata (Men & Women): DE, HR, TR & JP (Researchers, Technicians, Other supporting staff), NL (Researchers, Technicians and Other supporting staff).

Other: Starting with reference year 2012, it is not compulsory for countries to report data on technicians separately from other supporting staff. ':' denotes that data were not available or that data for more detailed occupations are available.

Source: Eurostat – Research and development statistics (online data code: rd_p_persocc) and UIS - Total R&D personnel by function and sector of employment

Annex 3.3 R&D personnel in the business enterprise sector, by sex and occupation, (headcount), 2018

Country	Researchers		Technicians		Other supporting staff		Technicians and other supporting staff	
	Women	Men	Women	Men	Women	Men	Women	Men
EU-27	**244 678**	**924 450**	**:**	**:**	**:**	**:**	**227 018**	**676 610**
EU-28	**278 939**	**1 046 002**	**:**	**:**	**:**	**:**	**273 330**	**812 905**
BE	11 706	29 147	:	:	:	:	9 190	24 244
BG	2 859	5 082	:	:	:	:	2 261	2 912
CZ	3 155	22 120	3 822	19 280	3 039	6 993	:	:
DK	9 252	23 840	:	:	:	:	5 918	10 421
DE	41 193	238 902	35 672	118 218	17 294	40 341	:	:
EE	553	1 647	166	337	98	95	:	:
IE	3 952	11 653	1 763	5 628	1 415	2 909	:	:
EL	4 589	11 082	:	:	:	:	2 198	4 449
ES	20 261	45 273	15 357	38 673	5 684	11 855	:	:
FR	54 656	201 691	29 079	78 576	5 013	13 544	:	:
HR	685	1 240	701	1 079	114	115	:	:
IT	17 665	64 395	:	:	:	:	40 352	160 654
CY	134	305	45	133	45	43	:	:
LV	475	670	:	:	:	:	280	389
LT	1 191	2 705	:	:	:	:	520	1 281
LU	237	1 268	274	1 727	99	459	:	:
HU	3 432	15 860	2 076	3 416	1 128	2 105	:	:
MT	147	444	65	287	53	121	:	:
NL	13 863	62 156	:	:	:	:	10 544	44 256
AT	6 901	32 172	3 800	23 360	1 416	3 678	:	:
PL	17 076	52 152	4 251	10 467	3 338	5 384	:	:
PT	9 233	23 178	4 014	7 992	1 425	1 594	:	:
RO	1 732	3 120	911	2 029	1 681	2 994	:	:
SI	1 698	5 771	1 003	3 596	861	673	:	:
SK	844	4 457	506	2 247	349	900	:	:
FI	4 565	21 687	:	:	:	:	3 042	8 013
SE	13 329	46 838	:	:	:	:	6 116	9 570
UK	34 261	121 553	24 247	75 506	22 064	60 790	:	:
IS	485	869	269	1 099	153	245	:	:
NO	5 839	18 579	:	:	:	:	3 140	11 311
CH	6 710	18 277	3 236	17 330	4 133	5 553	:	:
ME	38	78	19	31	12	12	:	:
MK	281	201	46	49	14	26	:	:
RS	506	760	416	933	188	383	:	:
TR	18 246	52 586	4 366	17 242	2 681	6 283	:	:
BA	40	34	27	57	130	85	:	:
MD	30	142	11	19	57	108	:	:
TN	670	1 564	:	:	:	:	0	0
UA	5 570	8 998	2 310	2 006	5 430	8 015	:	:
AR	1 678	3 965	:	:	:	:	2 304	4 862
JP	53 557	503 493	15 540	42 102	23 902	68 221	:	:
MX	2 365.803	6 175.248	1 492.682	6776,603	1 333.148	5 159.964	:	:

Notes: Exceptions to the reference year: EU-27, EU-28, BE, BG, DK, DE, EE, IE, EL, ES, FR, HR, IT, CY, LV, LT, LU, HU, MT, NL, AT, PL, RO, SI, FI, SE, UK, NO, CH, ME, TR, AR, JP, ZA, KR: 2017, BA: 2014, MX: 2013; Data not available for: AL, GE, AM, FO, IL; Data provisional for (Men & Women): CZ & FR (Researchers, Technicians, Other supporting staff), DK (Researchers, Technicians and other supporting staff); Definition differs, see metadata (Men & Women): HR, TR, JP (Researchers, Technicians, Other supporting staff) & NL (Researchers, Technicians and other supporting staff).

Other: Starting with reference year 2012, it is not compulsory for countries to report data on technicians separately from other supporting staff. ':' denotes that data were not available or that data for more detailed occupations are available.

Source: Eurostat – Research and development statistics (online data code: rd_p_persocc) and UIS - Total R&D personnel by function and sector of employment

Annex 3.4 Researchers in the business enterprise sector, by sex and selected economic activities (NACE Rev.2), 2018 (headcount)

Country	C -Manufacturing		C20 - Manufacture of chemicals and chemical products		C21 - Manufacture of basis pharmaceutical products and pharmaceutical preparations		G-N - Services of the business economy		Other economic activities	
	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
BG	865	1 672	125	87	136	41	1 804	3 144	190	266
CZ	1 198	10 020	171	320	80	171	1 813	11 392	144	708
DK	4 612	11 692	368	539	2 656	2 070	4 370	11 486	270	662
DE	28 563	191 103	2 701	7 106	4 553	5 315	12 028	46 033	602	1 766
EE	103	529	22	22	7	10	402	1 003	48	115
IE	1 176	3 523	237	332	169	264	2 642	7 885	134	245
EL	1 183	3 114	226	257	480	349	2 956	7 032	450	936
ES	7 072	16 507	1 128	1 366	1 772	968	10 825	25 056	2 364	3 710
FR	19 371	80 998	2 438	2 743	1 848	1 380	33 383	115 493	1 902	5 200
HR	390	474	40	11	170	41	267	720	28	46
IT	7 650	37 200	1 002	2 010	1 353	1 163	7 820	23 748	2 195	3 447
CY	52	78	0	0	40	34	73	207	9	20
LV	199	259	14	14	94	31	204	288	72	123
LT	371	888	120	59	17	12	738	1 696	82	121
LU	:	:	43	16	:	:	124	817	:	:
HU	1 325	5 693	50	85	713	606	1 922	9 588	185	579
MT	30	86	0	0	5	10	116	358	1	0
NL	4 576	23 585	847	2 114	388	500	7 953	33 975	1 334	4 596
AT	2 961	17 378	228	521	612	467	3 795	14 035	145	759
PL	5 319	18 425	891	541	817	314	11 186	32 368	571	1 359
PT	3 534	8 186	273	264	578	329	4 538	13 348	1 161	1 644
RO	474	737	66	27	168	29	1 168	2 313	90	70
SI	986	2 893	119	112	309	211	536	1 919	29	124
SK	433	2 131	53	54	26	9	381	2 247	30	79
FI	2 485	11 620	322	368	296	142	1 796	9 239	284	828
SE	5 424	25 791	:	:	195	1 464	2 847	8 301	539	542
UK	10 461	52 637	1 055	1 774	625	604	22 598	65 145	1 202	3 771
IS	74	319	7	16	3	0	301	486	110	64
NO	1 476	4 881	231	365	154	124	3 772	12 044	591	1 654
CH	3 399	11 082	219	808	2 180	2 687	2 186	5 050	:	:
ME	2	6	2	3	0	0	24	47	12	25
MK	222	106	6	7	188	38	37	61	22	34
RS	6	44	3	0	0	0	426	607	74	109
TR	7 893	23 941	806	780	735	419	9 824	27 305	529	1 340

Notes: Exceptions to the reference year: BG, DK, DE, EE, IE, EL, ES, FR, HR, IT, CY, LV, LT, LU, HU, MT, NL, AT, PL, RO, SI, FI, SE, UK, NO, CH, ME, TR: 2017; LT (2015 for C21); SE (2015 for men for C, 2013 for C21, 2011 for G-N and Other); CH (2012 for G-N). Provisional values: CZ, DK, FR. Data confidential: LU (values for C and Other economic activities); SI (values for C21, G-N, Other economic activities). Break in time series: SE (values for C21). Definition differs: TR (values for C20). Data not available: EU-27, EU-28, BE, AL, BA, AM, FO, GE, IL, MD, TN, UA.

Source: Eurostat – Research and development statistics (online data code: rd_p_bempoccr2)

CHAPTER 4
LABOUR MARKET PARTICIPATION OF RESEARCHERS

KEY TAKEAWAYS

At European level, and in most EU-27 Member States and Associated Countries, women are under-represented among researchers. However, the number of women researchers grew at a slightly faster rate than the number of men researchers between 2010 and 2018. Looking across different sectors of the economy, women were generally well represented in the HES and GOV sector, while men represented the vast majority in the BES. There continues to be a lack of gender balance within fields of R&D across all sectors of the economy.

- **Women represented around one-third (32.8%) of the total population of researchers at European level, and at both European and country level**, women researchers represented a lower proportion of the economically active population than men (Figure 4.3). However, the average growth rate of women researchers was 3.9% between 2010 and 2018, indicating some positive changes over time (Figure 4.2).

- Across the three main economic sectors (HES, GOV, BES), **the largest proportion of women researchers were employed in the HES, while the largest proportion of men researchers were employed in the BES** (Figure 4.4). This suggests that gender segregation in research careers persists across the main economic sectors, as noted by the Staff Working Document on the new ERA (European Commission, 2020g).

- The **average annual growth of women researchers was higher than that of men researchers between 2010 to 2018 across the three main economic sectors**, demonstrating some progress towards gender equality in research at European level. In the BES, the average annual growth rate for women and men researchers was higher than the other two sectors (HES and GOV), which may reflect the increase in public financial support for business R&D in the past decade (European Commission, 2020g).

- In 2018, in majority of EU-27 Member States and Associated Countries, women represented a greater share of researchers in the youngest age groups in the HES and GOV sector compared to men, but the pattern was reversed in favour of men in the over-55 researcher population. (Figure 4.11 and Figure 4.12). Hence, there were **more women than men in junior positions and more men than women in senior positions**. The relative under-representation of women in older age groups might be related to factors such as gender stereotypes related to care responsibilities or gender discrimination in the labour market.

- Some countries saw **an overall reduction in the disparities between women and men researchers in R&D**. More specifically, the Dissimilarity Index for the HES decreased in the majority of the EU-27 Member States and Associated Countries between 2014 and 2018. For the GOV sector, the Index also decreased in one-third of the EU-27 Member States and Associated Countries in the same time period (Table 4.1).

- Despite improvements in the proportion of women researchers in the HES and GOV sector between 2010 and 2018 across fields of R&D, the proportion **of men researchers in Natural Sciences and Engineering & Technology exceeded the corresponding proportion for women researchers in most countries** (Figure 4.13 and Figure 4.15). Horizontal gender segregation persists across fields of R&D, even in sectors where women researchers tend to be better represented.

- Women researchers in the BES were under-represented in the fields of Natural Sciences and Engineering & Technology in 2018 in the majority of countries with available data (Table 4.6). However, in contrast to the other two sectors, **women in the BES were also under-represented in several other fields of R&D.**

4.1 Introduction

Chapter 4 examines women's participation as researchers in detail, and assesses women's and men's patterns of employment across key sectors of the economy. Since 2012, gender equality and gender mainstreaming in research has been a key priority for the ERA (European Commission, 2012). The past decade has seen positive changes in many countries, with women in the EU making significant advances to increase their level of educational qualification and representing an almost equal share of Doctoral graduates. Despite this, men are still over-represented within the EU's researcher population.

The new ERA Communication recently reaffirmed the European Commission's commitment to promoting gender equality to strengthen European R&I potential. As of 2022, the Commission will support the development of inclusive GEPs through Horizon Europe (European Commission, 2020a). A key objective of the new ERA Communication is the principle of excellence to ensure that the best researchers with the best ideas obtain funding and remain the cornerstone for investment in the ERA (European Commission, 2020a). This chapter provides a deeper understanding of the extent of gender segregation in research careers in the EU that may hinder the principle of research excellence.

Section 4.2 analyses the gender gap in women's and men's participation as researchers. Women's under-representation in research within Europe is a longstanding issue, which, despite continuous policy attention, has progressed slowly and remains an ongoing challenge (European Commission, 2020a). Factors identified for this under-representation include discriminatory mechanisms (and women's anticipation of this discrimination) and a lack of attention to the constraints faced by women in their professional lives. In light of the renewed commitment to gender equality in research in the new ERA Communication, this section examines women's participation as researchers, as well as the trends in women's and men's participation since 2010.

Section 4.3 analyses the distribution of women and men researchers in key economic sectors, including the HES, GOV sector and the BES. The Staff Working Document on the new ERA observes that the share of women researchers in the EU varies considerably depending on the sector of activity, with a relatively higher share of women in the HES and GOV sector compared to the BES (European Commission, 2020g). This section compares the sectors in which women and men researchers work and considers the extent of gender segregation in research careers.

Section 4.4 explores the growth of women and men researchers in key economic sectors, including the HES, GOV sector and BES. According to the Staff Working Document on the new ERA, from 2007 to 2017, public financial support for business R&D has increased across most Member States (European Commission, 2020g). Historically, women in the EU have been under-represented in the BES, and this section examines how the employment of women and men researchers has changed over time across key economic sectors, given the increasing investment in the BES.

Section 4.5 explores women's and men's participation among researchers by age group. According to Eurostat, a higher proportion of women are outside the labour force due to caring responsibilities, including for children[1]. Compared to men, women take more career breaks and have shorter careers overall (European Commission, 2018). This section considers the age distribution of researchers as it may reveal differences in the career patterns of women and men at early and more advanced career stages.

Section 4.6 presents the Dissimilarity Index for researchers. The Dissimilarity Index provides a theoretical measurement of the percentage of women and men in a field of R&D who would have to move to another field of R&D to ensure that the proportions of women were the same across all possible fields of R&D. It thus shows the proportion of one sex or all employees that would need to change field in order to achieve a gender balance across those fields.

Section 4.7 analyses the evolution of women's representation as researchers in key economic sectors, by field of R&D. Although women are more likely than men to have a higher education degree, they remain over-represented in fields of study that are linked to traditional female roles (e.g. care-related fields) and are under-represented in science, mathematics, IT, engineering, and related careers. The gender differences in educational choices can translate to horizonal gender segregation in research careers. This section examines the extent of horizontal gender segregation in the HES, GOV sector and the BES, and how women's and men's employment in these sectors has changed over time.

1 In 2019, in the EU, 37.3% of women (aged 25 to 49) were outside the labour force due to looking after children or incapacitated adults. For men of the same age group outside of the labour force, the rate was 3.9% (Eurostat, 'Inactive Population – Main reason for not seeking employment – Distributions by sex and age (%)', data table *lfsa_igar*).

4.2 The gender gap in women's and men's participation as researchers

The last decade has seen significant developments to achieve gender balance in the overall pool of Doctoral graduates in the EU. Despite these achievements, data from previous editions of She Figures showed that women in the EU continued to be less represented among the population of researchers. The following indicators shed light on the extent of the gender gap in the proportion of researchers and how the share of women and men researchers has evolved over time. The final indicator compares the share of economically active women and men researchers to provide further insight into the gender gap in the proportion of researchers.

Gender imbalance persisted in the proportion of women researchers at both European and country level.

The data provide an insight into the degree of improvement (if any) in the gender balance among researchers (Figure 4.1).

At EU-27 level, women represented just under one-third (32.8%) of the total population of researchers in 2018. The EU-28 proportion (33.8%) shows little change since 2015, when women represented 33.4% of researchers (She Figures, 2018). These data suggest little improvement in gender balance among researchers, despite several policy commitments to gender equality in research.

Similarly, in more than half the EU-27 Member States and Associated Countries (22 of 40) examined, the proportion of women researchers was below 40%. Latvia and Lithuania had the highest proportions of women researchers (52.2% and 49.5%, respectively), while the Netherlands and Czechia had the lowest (26.4% and 26.6%, respectively).

At European level, the number of women researchers grew at a slightly faster rate than the number of men researchers, between 2010 and 2018.

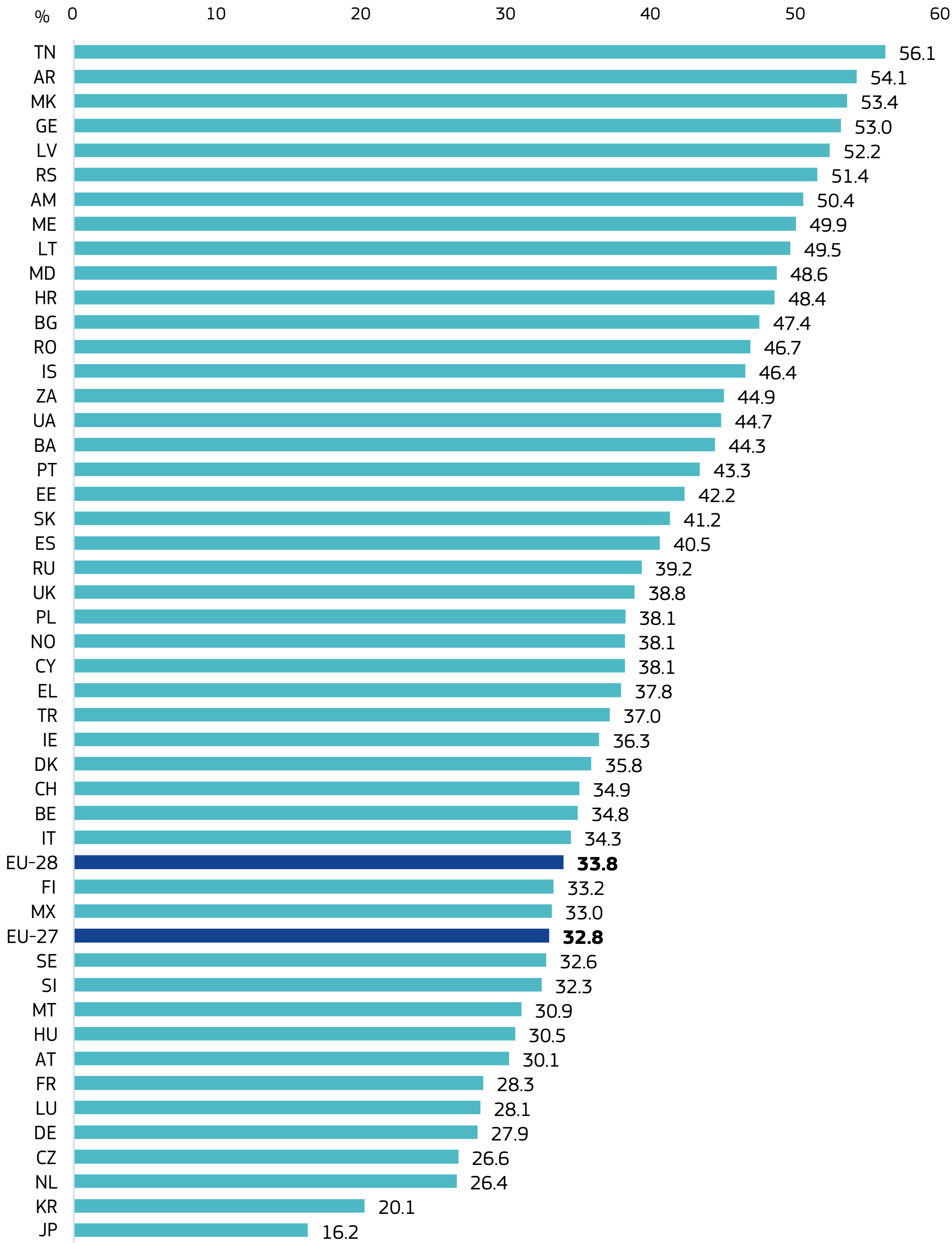
The data compiled the average annual rates at which the number of women and men researchers changed during the 2010-2018 period (Figure 4.2). At European level, the average annual growth rates of women and men researchers were 3.9% and 3.3%, respectively.

Overall, a similar pattern was observed at country level. Between 2010 and 2018, the number of women researchers grew at a faster rate than the number of men researchers in the majority of EU-27 Member States and Associated Countries. The highest growth rates for both women and men were observed in Bosnia and Herzegovina (71.4% for women and 39.7% for men), Georgia (32.1% for women and 30.9% for men) and Poland (8.9% for women and 9.5% for men).

Meanwhile, in six of the EU-27 Member States and Associated Countries (FI, MD, ME, RO, UA, AM), the number of women and men researchers decreased, on average. In Estonia, the average annual rate declined for women researchers (-0.67%) and increased slightly for men researchers (0.01%). By contrast, in Spain and Israel, the average annual rate declined for men researchers (-0.36% and -0.15%, respectively) but increased for women researchers (0.88% and 5.32%, respectively).

Notably, in some economies in the G-20 region, the number of women and men researchers grew at a faster rate than the European level: South Africa (8.4% for women and 6.37% for men) and South Korea (7.72% for women and 4.25% for men).

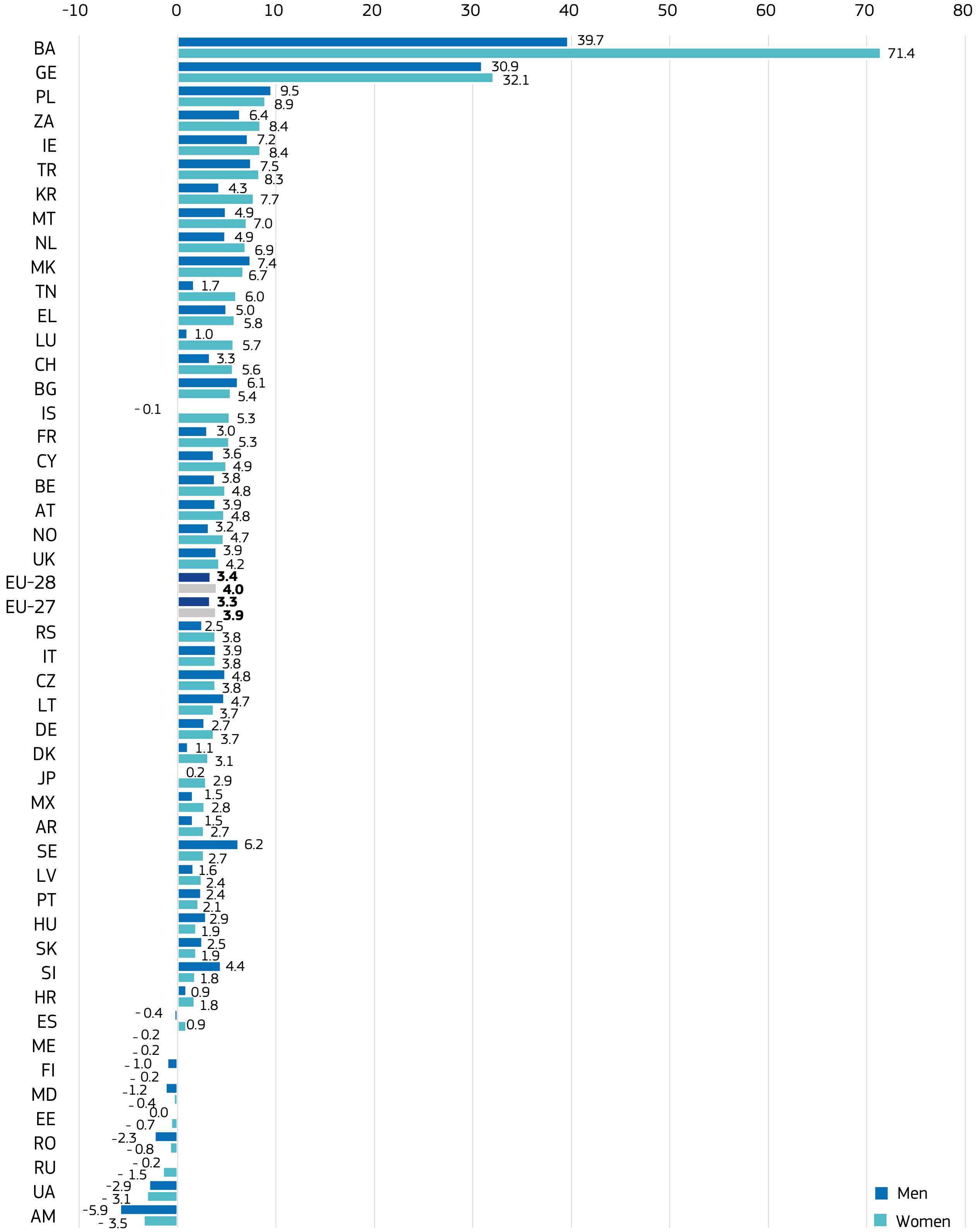
Figure 4.1 Proportion (%) of women among researchers, 2018



Notes: Exceptions to reference year: MX (2013), BA (2014), JP, KR, NL, DE, LU, FR, AT, HU, MT, SI, SE, EU-27, EU-28, FI, IT, BE, CH, DK, IE, TR, EL, CY, NO, PL, UK, ES, EE, ZA, RO, BG, HR, LT, ME, LV, AR (2017); Data not available for: AL, FO, IL; Definition differs for: JP; Data estimated for: UK; Provisional data for: CZ, FR, DK.

Source: Eurostat – Statistics on research and development (online data code: rd_p_persocc) and UIS - Total R&D personnel by function and sector of employment)

Figure 4.2 Compound annual growth rate for researchers, by sex, 2010-2018



Notes: Exceptions to reference period: RO, EE, FI, ES, HR, SI, HU, LV, AR, JP, DK, LT, IT, EU-28, UK, NO, BE, CY, FR, BG, CH, MT, KR, TR, IE, ZA, PL (2010-2017), ME, SE, DE, EU-27, AT, LU, EL, NL (2011-2017), IS (2011-2018), MX (2012-2013), BA (2012-2014), CH (2012-2017), GE (2013-2018); Data not available for: AL, FO, IL; Break in time series: EL, FR, NL, IS, (in earliest available year); Definition differs for: JP; Data estimated for: EU-28, DK(women only), IE, FR, SE, RU, (in earliest available year) and UK (both years); Provisional data for: CZ, DK, FR (in latest available year).

Source: Eurostat – Statistics on research and development (online data code: rd_p_persocc) and UIS - Total R&D personnel by function and sector of employment)

In the majority of countries, women researchers represented a lower proportion of the economically active population than men.

Given the historical tendency for the researcher population to be primarily comprised of men, Figure 4.3 shows the proportion of researchers among ‘economically active’ women and men.

At European level, the proportion of women researchers per thousand active women (8.7 per thousand) was approximately half that of men (15.1 per thousand) in 2018. Data from 2015 showed that, in the EU-28, the proportion of women researchers was 8.6 out of every thousand active women, while the proportion for men researchers was 14.5 out of every thousand active men (She Figures, 2018). In 2018, the corresponding proportions for women and men researchers were 9.2 per thousand and 15.5 per thousand, respectively. The EU-28 data indicate a slight increase in the overall proportion of women and men researchers among the economically active population.

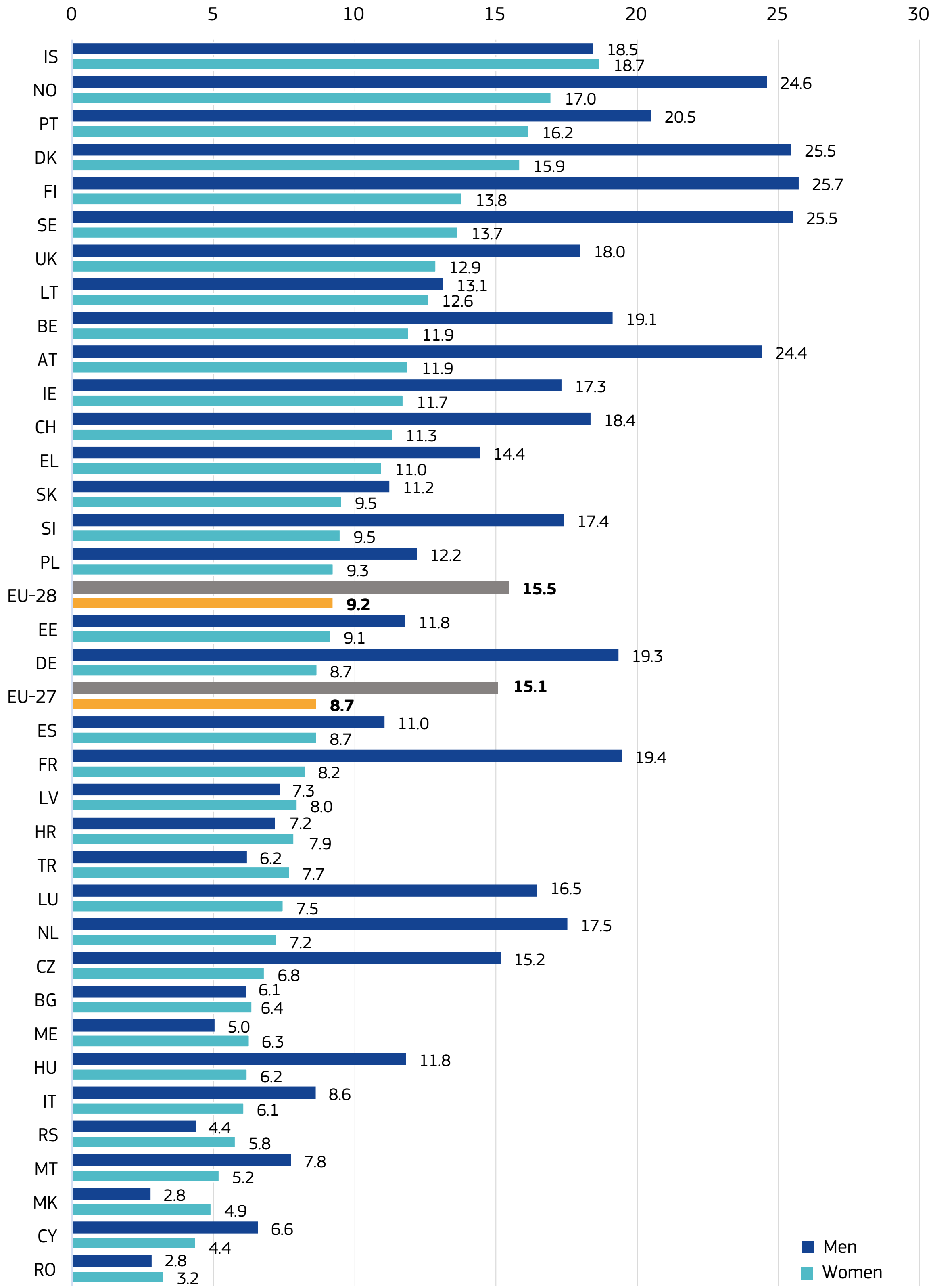
According to the EU-LFS, the labour force (‘active population’) is defined as the sum of employed and unemployed persons.

- Employed persons are ‘all persons aged 15 years or more who worked at least one hour for pay or profit or family gain during the reference week or were temporarily absent from such work’.
- Unemployed persons are ‘all persons aged 15 to 74 who were not employed during the reference week, were available to start work within the two weeks following the reference week and had been actively seeking work in the four weeks preceding the reference week or had already found a job to start within the next three months’.

At country level, approximately three-quarters of the EU-27 Member States and Associated Countries had a higher proportion of men researchers out of every thousand active men compared to women. The largest differences in the proportions in favour of men were observed in Austria (12.5 per thousand), Sweden and Finland (approximately 11.9 per thousand in both cases).

In nine EU-27 Member States and Associated Countries (BG, HR, IS, LV, ME, MK, RO, RS, TR), the proportion of researchers out of every thousand active women was higher than the corresponding proportion for men researchers. Differences were most evident in North Macedonia (approximately 2.2 per thousand), Turkey (approximately 1.5 per thousand) and Serbia (approximately 1.4 per thousand). The highest proportions of women researchers out of every thousand active women were observed in Iceland (18.7 per thousand), where the corresponding proportion of men researchers was similar (18.5 per thousand) and Norway (17.0 per thousand), where the corresponding proportion of men researchers was higher (24.6 per thousand).

Figure 4.3 Proportion (%) of researchers per thousand labour force, by sex, 2018



Notes: Exception to reference period: RO, CY, MT, IT, HU, ME, BG, NL, LU, TR, HR, LV, FR, ES, EU-27, EU-28, DE, EE, PL, SI, EL,CH, IE, AT, BE, LT, UK, SE, FI, DK, NO: 2017; Data unavailable for: AL, BA, AM, FO, GE, IL, MD, TN, UA; Break in time-series for: BE, DK, IE; Definition differs for: ME; Data estimated for: UK; Provisional data for: CZ, DK, FR.

Others: The numerator (researchers) is in headcount (HC) while the denominator (labour force age 15+) is per 1 000 active population.

Source: Eurostat – Research and development statistics (online data code: rd_p_persocc) and Labour Force Survey (online data code: lfsa_agan)

4.3 Distribution of women and men researchers across the main economic sectors

Given the observed gender gap in women's and men's participation as researchers, this section examines the distribution of women and men researchers across key economic sectors. The share of women researchers in the EU varies according to the sector of activity, with a relatively higher share of women working in the HES and GOV sector compared to the BES (European Commission, 2020g). The following indicators compare women's and men's representation across different sectors of the economy and the degree of gender segregation in those sectors.

Women tended to be well represented in the HES compared to the BES.

The distribution of women and men researchers across the four main sectors of the economy in 2018 is presented in Figure 4.4. The four sectors are: BES, GOV, HES and private non-profit (PNP).

In 2018, women researchers were more likely to work in the HES than in the other main sectors of the economy at European level. The largest proportion of women researchers worked in the HES (55.9%), followed by the BES (28.9%), GOV sector (14.2%) and PNP sector (1.0%). In contrast, men researchers were more likely to work in the BES (53.3%), followed by HES (37.3%), GOV sector (8.9%) and PNP sector (0.5%).

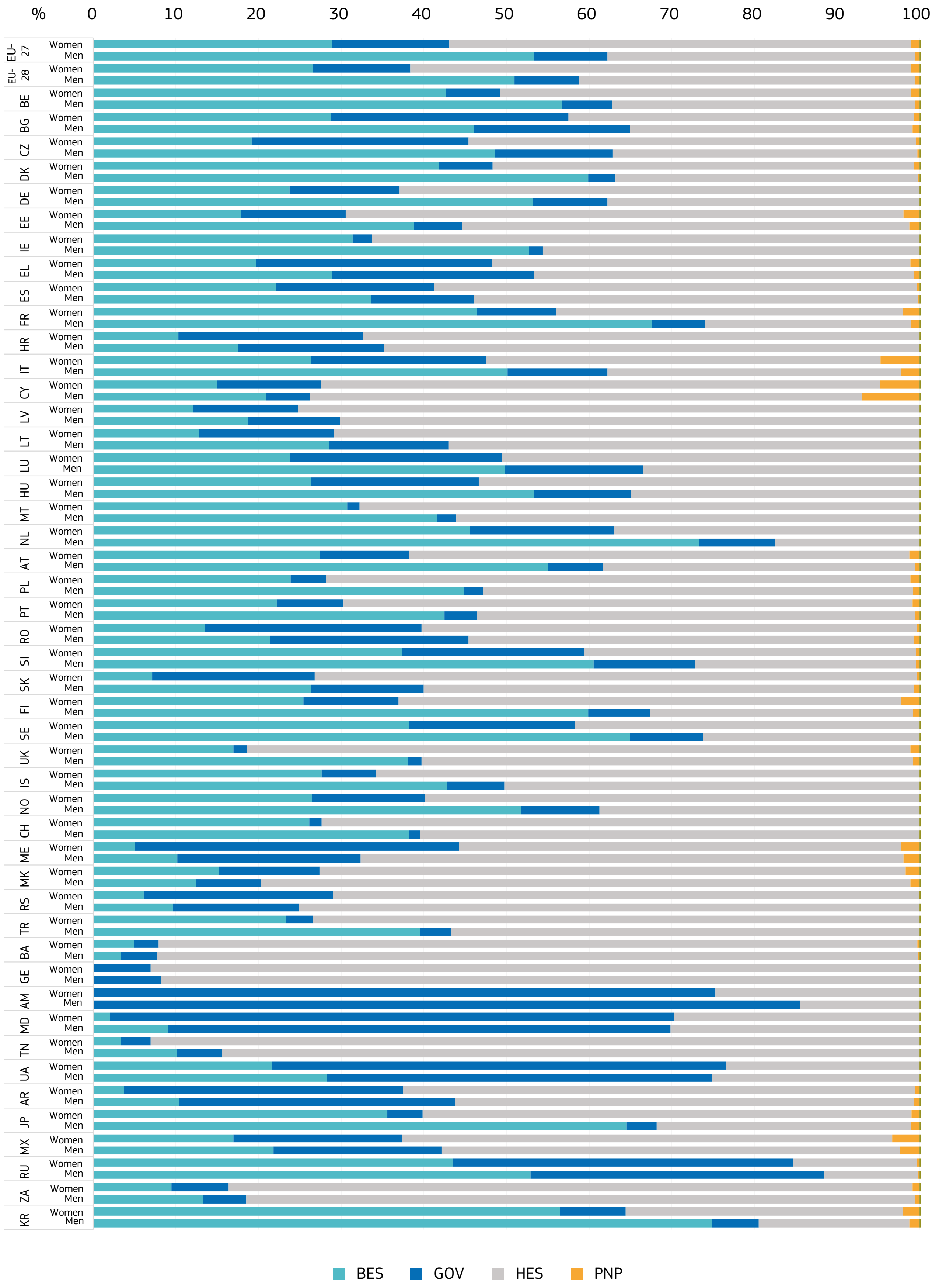
A similar pattern can be observed at country level. A larger proportion of women researchers than men researchers worked in the HES in all but five of the EU-27 Member States and Associated Countries (MD, ME, MK, RS, UA). Women researchers were also more likely to work in the HES than in other economic sectors in all but four EU-27 Member States and Associated Countries (FR, NL, MD, UA). The exceptions were France and the Netherlands, where women researchers had a higher concentration in BES (46.4% and 45.5%, respectively).

A larger proportion of men researchers than women researchers worked in the BES in all but two EU-27 Member States and Associated Countries (BA and MK). At European level, men were more likely to work in the BES than in other economic sectors, yet at country level this was only the case for 16 EU-27 Member States and Associated Countries. Rather, in the majority of cases, men researchers were more likely to work in the HES than in other economic sectors.

Unusually, in Armenia (75.3% for women, 85.6% for men), Moldova (68.2% for women and 60.8% for men) and Ukraine (55.0% for women and 46.6% for men), both women and men researchers were more likely to work in the GOV sector than in other economic sectors. However, data were not available for Georgia or Armenia for the BES, which may explain why the proportions for other sectors are higher in these countries.

Both women and men researchers were least likely to work in the PNP sector. No country had a concentration of researchers in the PNP sector above 7%, with the largest shares found among Cypriot men (7.0%) and women (4.8%).

Figure 4.4 Distribution of researchers across sectors of employment, by sex, 2018



Notes: Exceptions to reference period: MX (2013), BA (2014), EU27, EU28, BE, BG, DK, DE, EE, IE, EL, ES, FR, HR, IT, CY, LV, LT, LU, HU, MT, NL, AT, PL, RO, SI, FI, SE, UK, NO, CH, ME, TR, AR, JP, ZA, KR (2017); Data not available for: AL, FO, IL. Definition differs for: DE, HR, TR (GOV), NL (GOV, PNP), JP (all sectors); Data estimated for: EU-27, EU-28 (PNP), IT (HES), UK (HES for women, all sectors for men); Provisional data for: CZ, DK, FR (all sectors).

Source: Eurostat – Statistics on research and development (online data code: rd_p_persocc) and UIS - Total R&D personnel by function and sector of employment)

It is particularly important to consider the extent of the gender gap in the HES compared to other economic sectors, given that the HES is the main source of employment for researchers in the EU. According to the latest data (2017), almost half of the researchers in the EU (47.4%) were employed in the HES, with the other half divided between the three other sectors[2].

Across different sectors of the economy, women were relatively well represented in the HES and GOV sector. However, women were largely under-represented in the BES.

Women represented 42.3% of the total researcher population working in the HES at European level (Figure 4.5). The corresponding proportion of women researchers in the GOV sector was similar, where women represented 43.9% of researchers at European level (Figure 4.6). Meanwhile, the picture is different in the BES, with women representing only 20.9% of researchers at European level (Figure 4.7). These data show that while women researchers tend to be better represented in the HES and GOV sectors compared to men, they are less represented in the BES.

At country level, the current population of researchers in the HES and GOV sector is gender-balanced in the majority of EU-27 Member States and Associated Countries. The proportion of women researchers ranged between 40-60% in 33 of 41 EU-27 Member States and Associated Countries in the HES and 26 of 41 countries in the GOV sector (Figure 4.5 and Figure 4.6). In the HES, women were over-represented in only one country (Armenia), while in the GOV sector, women were over-represented in five countries (ES, ME, MK, PT, RS). In contrast, women were under-represented in the HES in seven countries (CZ, CH, CY, DE, FR, LU, MT), and in the GOV sector in 10 countries (BA, BE, CH, CZ, DE, FR, LU, MT, UK, TR). Example of measures taken to address the under-representation of women in these sectors are shown in Box 14.

BOX 14 Supporting gender balance in the HES and GOV sectors

In **Switzerland**, the ‘Equal opportunity and university development’ programme aims to achieve gender balance within higher education institutions, in addition to addressing other areas of inequality and diversity. Funding is made available to implement equal opportunity measures. Institutions may submit applications to receive funding during a three-year project term, with the first of these terms running from 2013-2016, the second from 2017-2020 (extended to 2021 due to the pandemic), and a third term planned[3].

In **France**, the ‘Sauvadet’ law, introduced in 2013, includes quotas of at least 40% of the under-represented sex in high-level civil servant positions by 2018[4]. In 2019/2020, the Global Government Forum’s Women Leaders Index[5] showed that women comprised 33% of the senior civil service workforce in France, the tenth highest among G-20 countries.

2 Eurostat, total R&D personnel by sectors of performance, occupation and sex [rd_p_persocc].

3 European Commission and OECD (2021). STIP Compass: International Database on Science, Technology and Innovation Policy (STIP), https://stip.oecd.org

4 EIGE (n.d.). ‘Gender Equality in Academia and Research’, https://eige.europa.eu/gender-mainstreaming/toolkits/gear

5 Global Government Forum, ‘Women Leaders Index’, https://www.womenleadersindex.com/data/

Given that the HES is the main source of employment for women researchers, it is not surprising that even in those countries where women researchers are under-represented, the proportion of women researchers in this sector is not very low. For example, among the EU-27 Member States and Associated Countries, the lowest proportion of women researchers in the HES was in Czechia (34.7%), with the highest in Armenia (63.5%). On the other hand, the variation in the proportion of women researchers is larger in the GOV sector, with 42.2 p.p. between the lowest and highest share for women researchers (the lowest being Malta, at 21.9%, and the highest being North Macedonia, at 64.1%).

In the BES, women researchers were under-represented in 36 of the 39 EU-27 Member States and Associated Countries for which data were available. More specifically, the proportion of women researchers was within the 40% to 60% range in only three countries (MK, BA, LV) (Figure 4.7). The country variation in the proportion of women researchers was also considerable in the BES, with the lowest share observed in Czechia (12.5%) and the highest in North Macedonia (58.3%) (Figure 4.7). Examples of measures to increase women's participation among researchers in the BES are shown in Box 15.

BOX 15 Increasing women's participation in BES research

In **Norway** in 2019, the Research Council of Norway set out a policy to promote gender balance in research. One of the focus areas of this policy was trade and industry, with actions including analysing the barriers to women's participation in innovation projects in the BES, developing measures to increase participation, promoting the importance of gender balance among relevant organisations, and utilising existing programmes (including their Programme on Commercialising R&D Results and the BALANSE programme to support change[6]).

In **Czechia**, the private equity firm ESPIRA Investments aims to support Czech and Slovak businesses that show potential for growth, with a focus on organisations with gender balanced management[7].

In **Greece**, the European Investment Bank and Greek banks committed to providing EUR 500 million of loans to businesses[8], EUR 100 million of which will be earmarked for companies that support female entrepreneurship and leadership[9].

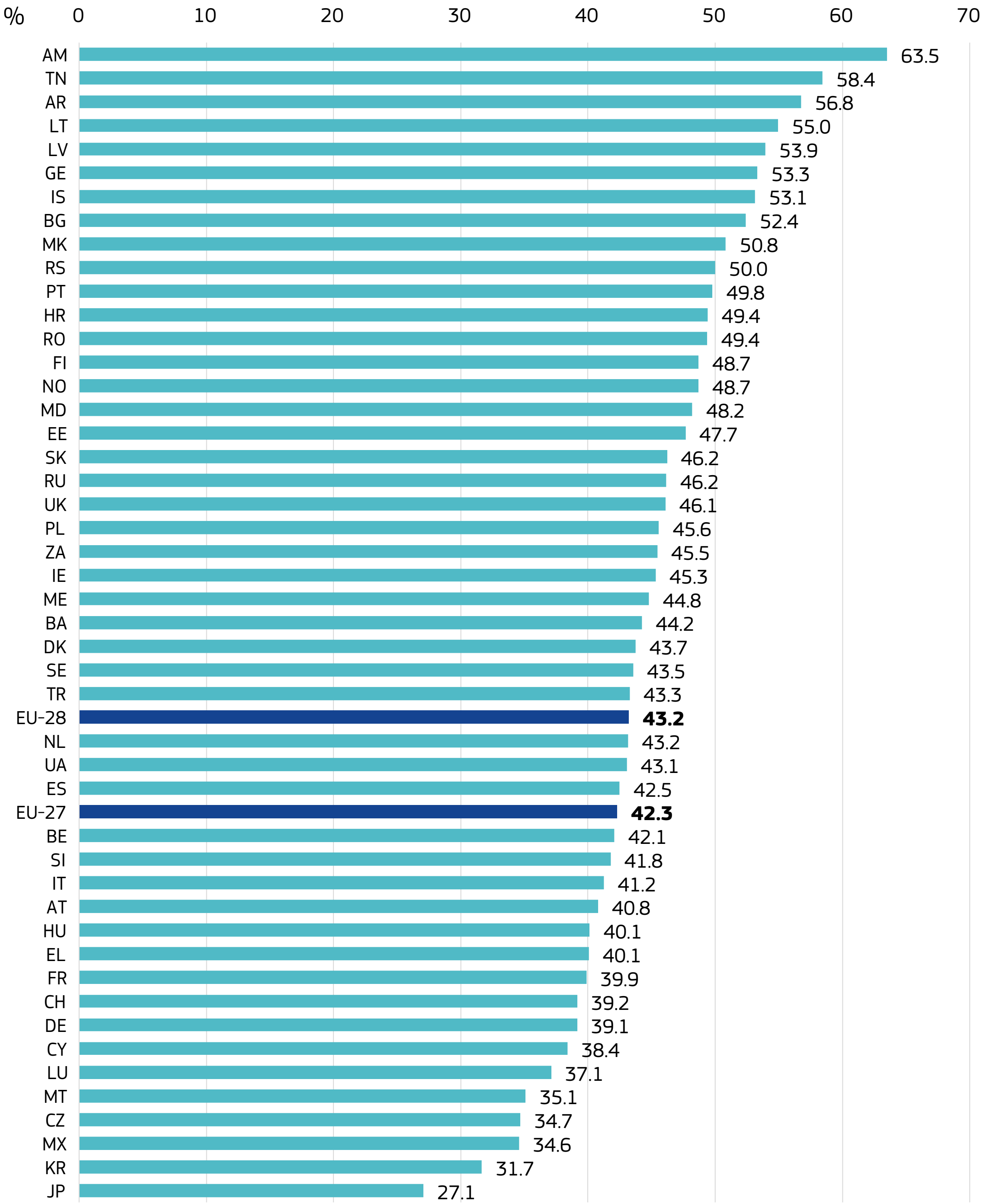
6 Research Council of Norway (2019). Policy for gender balance and gender perspectives in research and innovation, https://www.forskningsradet.no/contentassets/19527ed7d0b149d6b9b310f8bb354ce9/nfr_gender_policy_orig-1.pdf

7 European Commission (2020) Gender Smart Financing Investing In & With Women: Opportunities for Europe, https://ec.europa.eu/info/sites/default/files/economy-finance/dp129_en.pdf

8 Ibid.

9 European Investment Bank (2019). 'Greece: EUR 500m EIB backing for youth and female focused business investment', https://www.eib.org/en/press/all/2019-196-eur-500m-eib-backing-for-youth-and-female-focused-business-investment-in-greece#

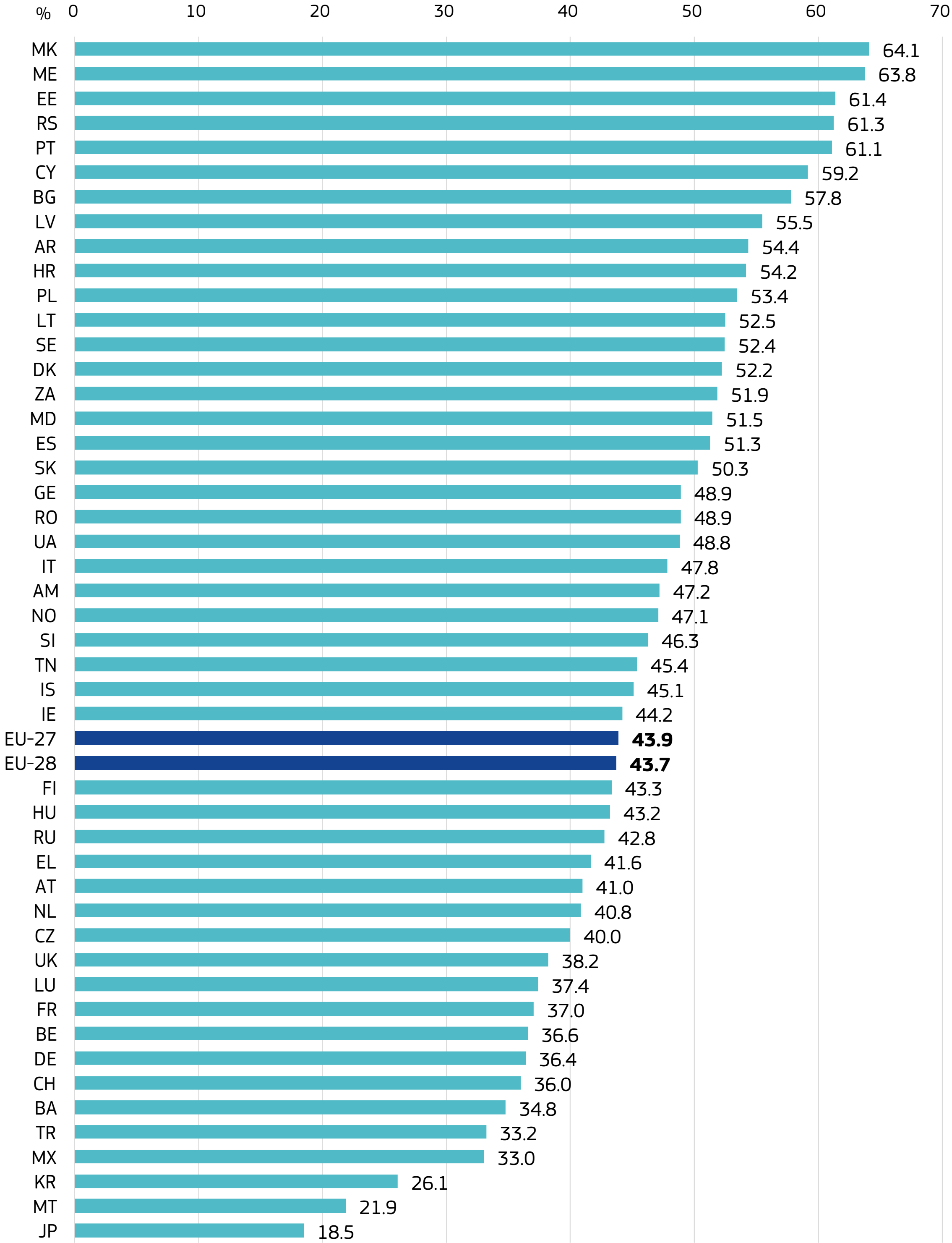
Figure 4.5 Proportion (%) of women among researchers in the higher education sector, 2018



Notes: Exceptions to reference period: MX (2013), BA (2014), AR, LT, LV, BG, HR, RO, FI, NO, EE, UK, PL, ZA, IE, ME, DK, SE, TR, EU-28, NL, ES, EU-27, BE, SI, IT, AT, HU, EL, FR, CH, DE, CY, LU, MT, KR, JP (2017). Data not available for: AL, FO, IL; Definition differs for: JP; Data estimated for: UK, IT; Provisional data for: CZ, DK, FR.

Source: Eurostat – Statistics on research and development (online data code: rd_p_persocc) and UIS - Total R&D personnel by function and sector of employment)

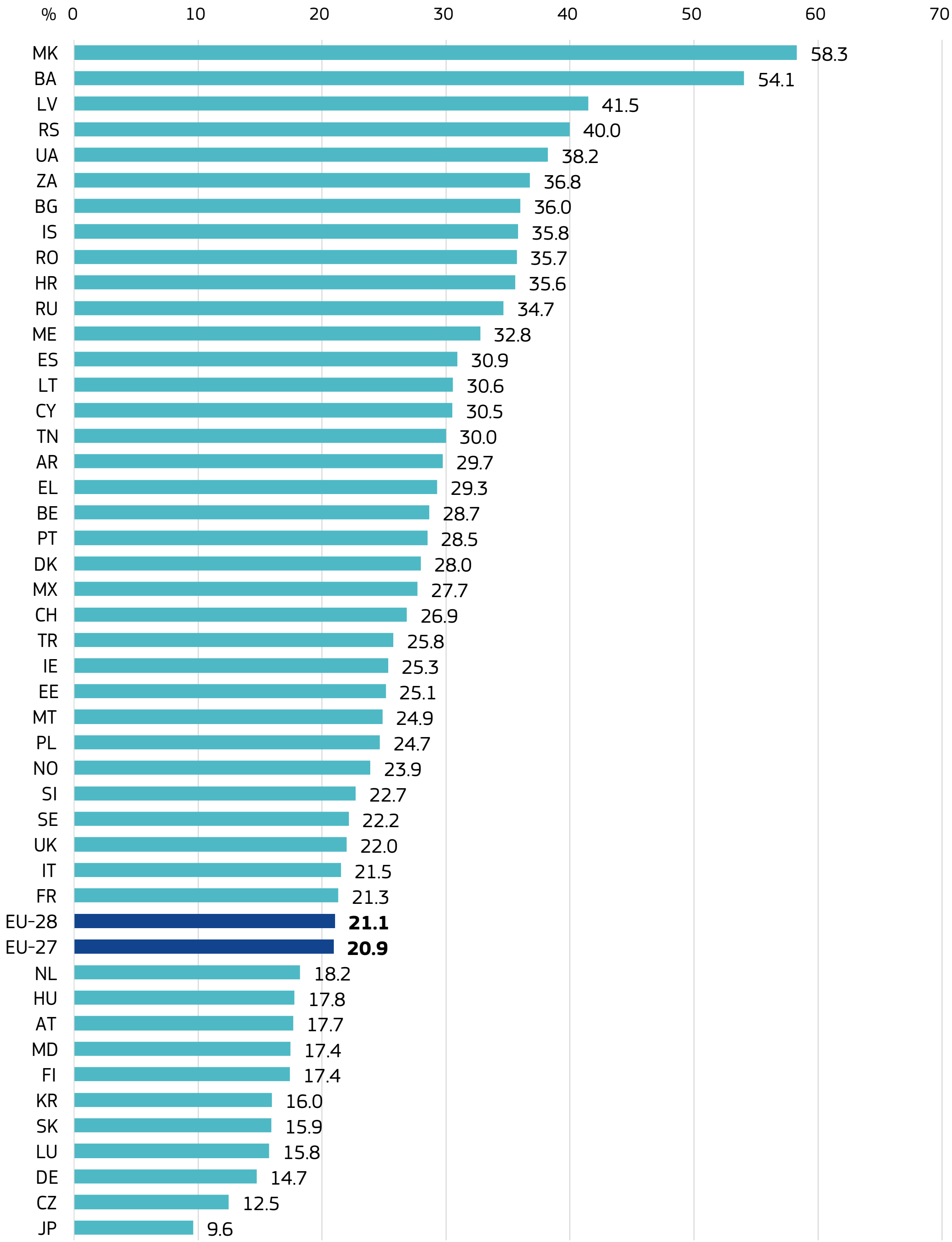
Figure 4.6 Proportion (%) of women among researchers in the government sector, 2018



Notes: Exceptions to reference period: MX (2013), BA (2014), AR, LT, LV, BG, HR, RO, FI, NO, EE, UK, PL, ZA, IE, ME, DK, SE, TR, EU-28, NL, ES, EU-27, BE, SI, IT, AT, HU, EL, FR, CH, DE, CY, LU, MT, KR, JP (2017). Data not available for: AL, FO, IL; Definition differs for: DE, HR, JP, NL, TR; Provisional data for: CZ, DK, FR.

Source: Eurostat – Statistics on research and development (online data code: rd_p_persocc) and UIS - Total R&D personnel by function and sector of employment)

Figure 4.7 Proportion (%) of women among researchers in the business enterprise sector, 2018



Notes: Exceptions to reference period: MX (2013), BA (2014), AR, LT, LV, BG, HR, RO, FI, NO, EE, UK, PL, ZA, IE, ME, DK, SE, TR, EU-28, NL, ES, EU-27, BE, SI, IT, AT, HU, EL, FR, CH, DE, CY, LU, MT, KR, JP (2017). Data not available for: AL, GE, AM, FO, IL; Definition differs for: JP; Provisional data for: CZ, DK, FR.

Source: Eurostat – Statistics on research and development (online data code: rd_p_persocc) and UIS - Total R&D personnel by function and sector of employment)

4.4 The growth in the number of women and men researchers across the main economic sectors

In light of the persisting gender gap in the total population of researchers across the main economic sectors, this section examines growth in the number of women and men researchers since 2010 in the HES, GOV sector and the BES. While public financial support for business R&D has increased across most EU Member States, women in the EU have been historically under-represented in the business sector (European Commission, 2020g). The following indicators provide an understanding of how the number of women and men researchers has changed over time in each economic sector and the potential disadvantages for women researchers compared to men researchers, given the increasing prioritisation of the business sector.

At European level, the number of women researchers grew at a faster rate than the number of men researchers in all sectors of the economy.

At European level, the data show that between 2010 and 2018, the average annual growth rate for women researchers was higher than that for men researchers in all sectors examined. More specifically, the number of women researchers in the HES grew by 3.1% on average per year, while the number of men researchers grew by 0.9% on average per year (Figure 4.8). Similarly, in the GOV sector, the number of women researchers grew by 3.1% on average per year, while the number of men researchers grew by 1.3% on average (Figure 4.9). In the BES, the average annual growth rate was higher than the other two sectors for both women and men researchers, which may reflect the increase in public financial support for business R&D in the past decade. Public support for business R&D I the EU (which includes direct funding, such as grants, loans, procurement, and indirect support, such as R&D tax incentives) tripled, from 0.04% of GDP in 2007 to 0.11% of GDP in 2017 (European Commission, 2020g). The data show that the number of women researchers in the BES grew by an average rate of 7.0% per year, compared to 5.8% for men researchers (Figure 4.10).

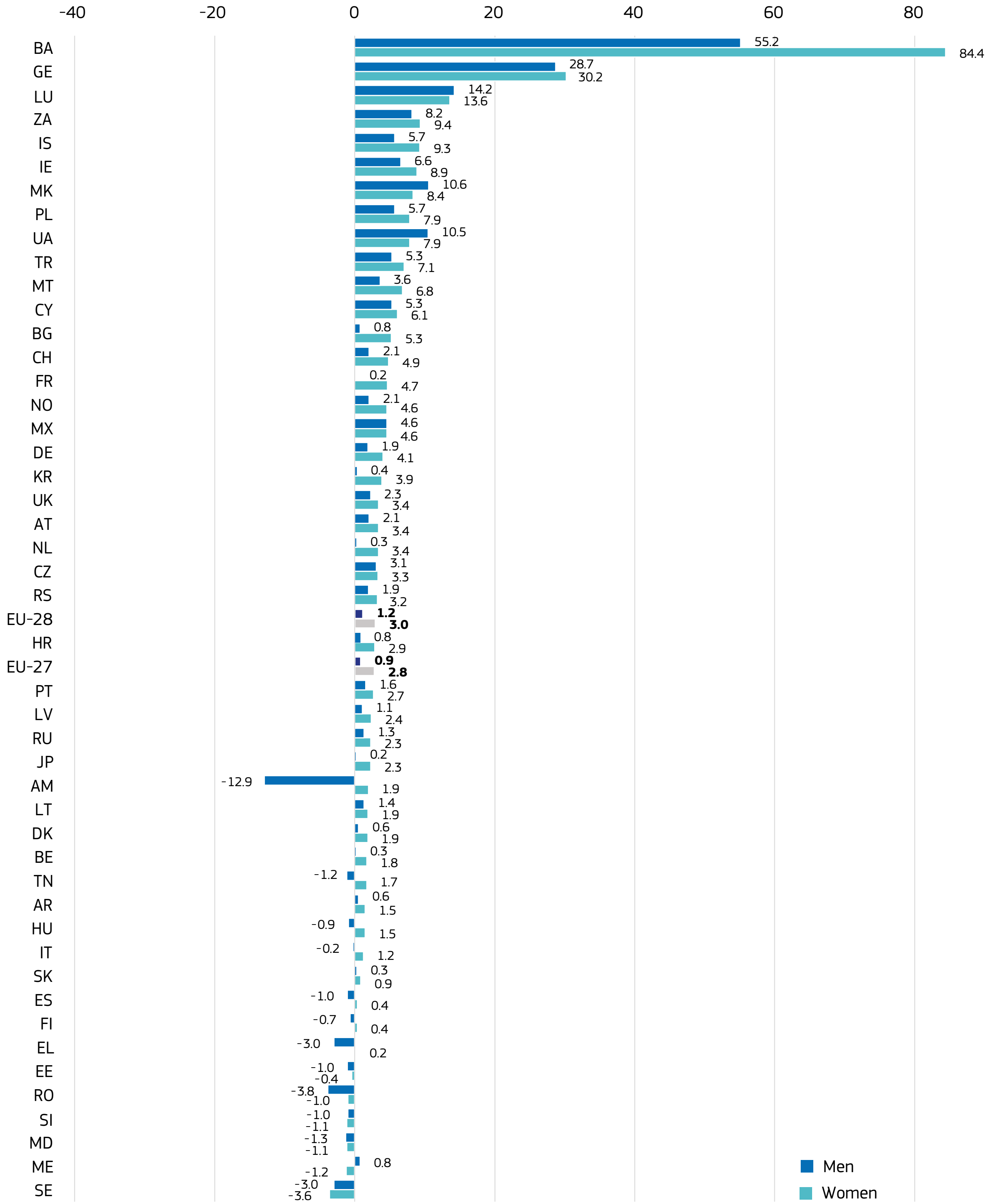
At country level, the average annual rate of growth for women researchers in the HES was higher than that for men researchers in the majority of the EU-27 Member States and Associated Countries (35 out of 41). However, in three countries with a higher CAGR for women than men (EE, RO, MD), the CAGR was negative for women and men researchers, indicating that the overall number of researchers declined, although the rate of decrease for women was lower than men. In Greece, Finland, Hungary, Italy, Spain, Tunisia and Armenia, the CAGR was only negative for men researchers, while in Montenegro, the CAGR was only negative for women researchers.

In the GOV sector, the CAGR for women researchers was higher than that for men researchers in the majority of the EU-27 Member States and Associated Countries (32 out of 41). However, the CAGR for women and men was negative in several countries: in 12 cases (AM, BG, EE, FI, HR, IS, MD, MK, PL, SI, UA, UK), the CAGR for both women and men researchers was negative, and in all but two (FI, UA), the rate of decrease for women was lower than that for men. A further 12 EU-27 Member States and Associated Countries (BA, CY, DE, DK, ES, HU, IE, LU, ME, NO, TN, TR), showed a negative CAGR for men, while the CAGR for women was positive. In Malta, the number of women researchers decreased by 11.1% per year on average, while the number of men researchers increased by 6.6% per year on average.

The CAGR for women researchers in the BES was higher than that for men in the majority of the EU-27 Member States and Associated Countries (21 out of 39). Of 30 EU-27 Member States and Associated Countries with positive growth rates for women and men researchers, the number of men researchers grew at a faster rate than the number of women researchers in 13 countries (BG, CZ, EL, IE, HR, HU, PT, LT, MK, SE, SI, SK, TN). The CAGR for both women and men researchers was negative in only four cases (FI, MD, RO, UA). In Bosnia and Herzegovina, Luxembourg and Iceland, the CAGR was negative only for men, while in Estonia and Montenegro, it was negative only for women.

Data at country level show that in the HES and BES, the CAGR for both women and men was positive for most countries between 2010 and 2018. However, in the GOV sector, the number of women and men researchers declined overall in several countries. Furthermore, in several countries, the number of men researchers in the BES grew at a faster rate than the number of women researchers. Given women researchers' under-representation in the BES (Figure 4.7), it is important to ensure that increasing investment in business R&D in Member States does not widen existing gender inequalities between researchers.

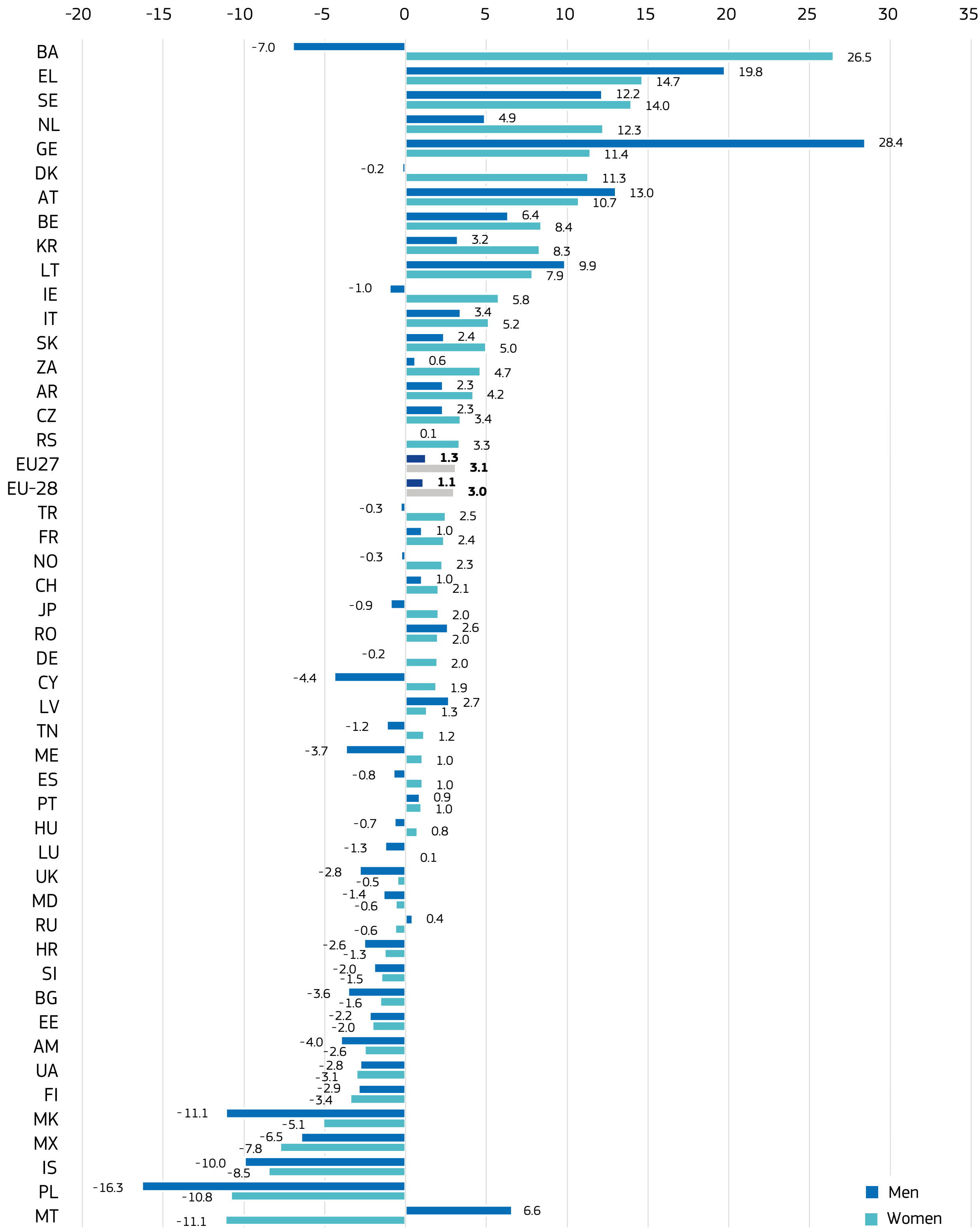
Figure 4.8 Compound annual growth rate for researchers in the higher education sector, by sex, 2010-2018



Notes: Exceptions to reference period: MX (2012-2013), BA (2012-2014), AT, EL, ME, SE (2011-2017), SI, RO, EE, FI, ES, HU, AR, BE, DK, LT, JP, LV, EU-27, EU-28, HR, NL, KR, DE, NO, FR, CH, BG, CY, MT, TR, PL, IE,ZA, LU (2010-2017), AM, IS, MD, UA (2011-2018), GE (2013-2018), TN (2014-2018); Data not available for: AL, FO, IL; Break in time series: EL, IS (in earliest available year); Definition differs for: JP (both years); Data estimated for: EU-27, EU-28, RU, FR (in earliest available year), UK (both years), IT (in latest available year); Provisional data for: FR, DK, CZ (in latest available year).

Source: Eurostat – Statistics on research and development (online data code: rd_p_persocc) and UIS - Total R&D personnel by function and sector of employment)

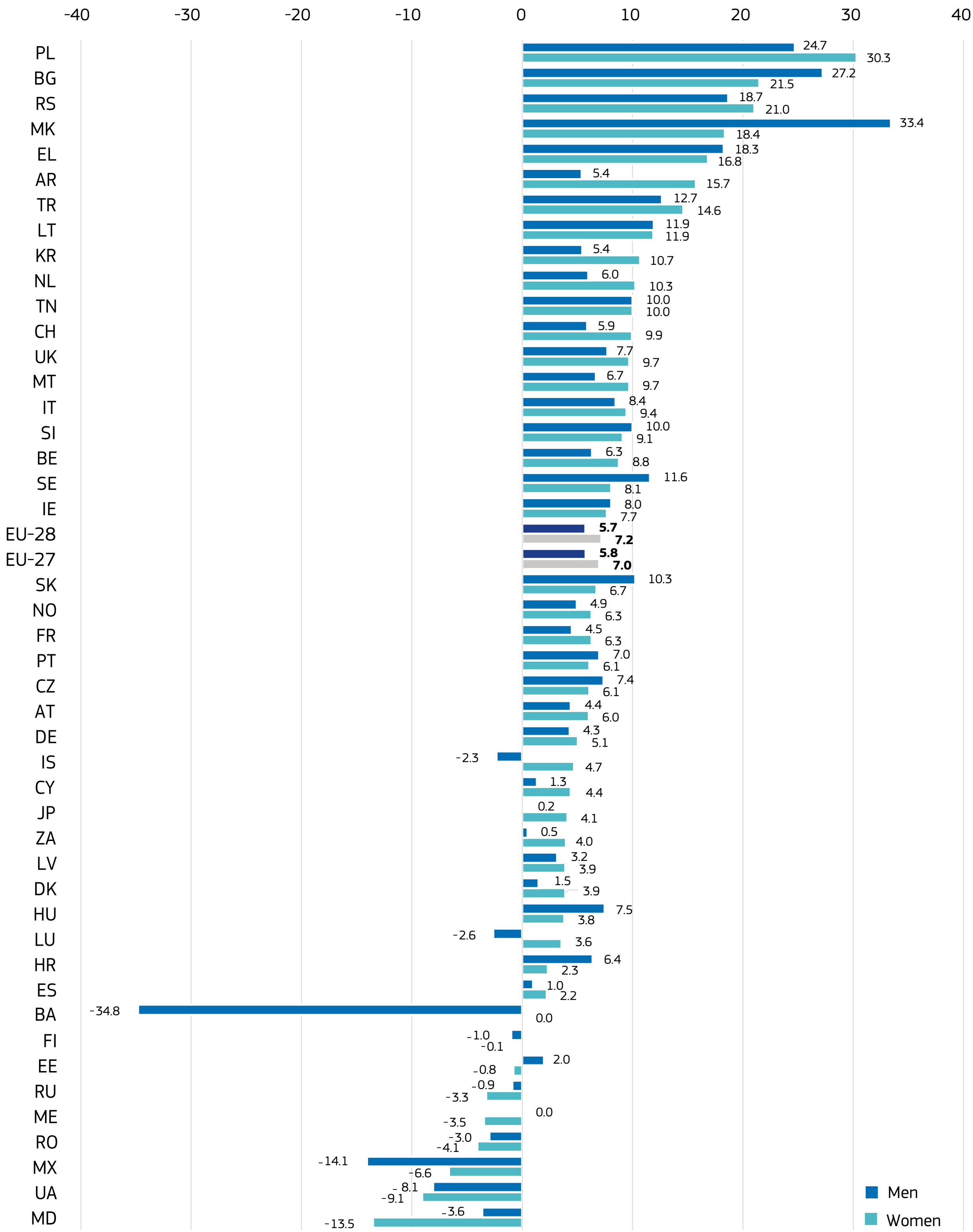
Figure 4.9 Compound annual growth rate for researchers in the government sector, by sex, 2010-2018



Notes: Exceptions to reference period: MX (2012-2013), BA (2012-2014), GE, TN (2014-2018), AT, EL, ME, SE (2011-2017), SI, RO, EE, FI, ES, HU, AR, BE, DK, LT, JP, LV, EU-27, EU-28, HR, NL, KR, DE, NO, FR, CH, BG, CY, MT, TR, PL, IE, ZA, LU (2010-2017), AM, IS, MD, UA (2011-2018). Data not available for: AL, FO, IL; Break in time series: EL, FR, SE, IS (in earliest available year); Data estimated for: EU-27, EU-28, FR, SE, RU (in earliest available year); Definition differs for: DE, HR, TR (in latest available year), CH, SK (in earliest available year), NL, JP (both years); Provisional: CZ, DK, FR (in latest available year).

Source: Eurostat – Statistics on research and development (online data code: rd_p_persocc) and UIS - Total R&D personnel by function and sector of employment)

Figure 4.10 Compound annual growth rate for researchers in the business enterprise sector, by sex, 2010-2018



Notes: Exceptions to reference period: MX (2010-2013), SI, RO, EE, FI, ES, HU, AR, BE, DK, LT, JP, LV, HR, KR, NO, FR, BG, CY, MT, TR, PL, IE, ZA, (2010-2017), AT, DE, EL, EU-27, EU-28, LU, ME, NL, SE (2011-2017), IS, MD, UA (2011-2018), BA (2012-2014), CH (2012-2017), TN (2014-2018); Data not available for: AL, GE, AM, FO, IL; Break in time series: EL, NL, IS (in earliest available year); Definition differs for: NO (in earliest available year), JP (both years); Data estimated for: DK, IE, RU (in earliest available year); Provisional data for: CZ, DK, FR (in latest available year).

Source: Eurostat – Statistics on research and development (online data code: rd_p_persocc) and UIS - Total R&D personnel by function and sector of employment)

4.5 Women's and men's participation among researchers by age group

This section presents indicators on the participation of researchers, by age group, to further assess gender differences in the patterns of employment of researchers. Women might be under-represented at certain age groups, for example, as women tend to have shorter careers than men (European Commission, 2018). The length of women's careers might be impacted by factors such as gender stereotypes in the division of care responsibilities or gender discrimination in typically male-dominated fields in the labour market. Existing research has shown that women in the EU remain a minority in top academic and decision-making positions (European Commission, 2020g; She Figures, 2018). By taking older age as a proxy for seniority, the following indicators can be used to gauge women's and men's relative presence in more senior research positions.

Women researchers were better represented in the younger age groups (under 35 and 35-44) in both the HES and GOV sector.

The data show that the proportion of researchers in different age categories follow similar patterns in the HES and GOV sector (Figure 4.11 and Figure 4.12). In most EU-27 Member States and Associated Countries, the highest proportion of women researchers were employed in the 35-44 age group. In contrast, the highest proportion of men researchers were employed in the 55+ age group. It is noteworthy that the proportion of women researchers in the 35-44 age group was higher than the corresponding proportion for men researchers in almost all of the countries examined, except Czechia and Cyprus in the HES, and Latvia, Cyprus, Hungary, Austria, Turkey and Bosnia and Herzegovina in the GOV sector.

The under-35 age group in the HES had a higher proportion of women researchers than men in 22 of the 29 EU-27 Member States and Associated Countries examined. In the next age group (35-44), the number countries where the proportion of women researchers was higher than men increased to 27, and then decreased to 18 in the subsequent age group (45-54). Significantly, none of the countries examined had a higher share of women researchers than men researchers in the oldest age group (55+).

BOX 16 Supporting women returning to research careers after parental leave in Higher Education Institutions

A number of European universities offer a reduction in teaching hours for academics returning from parental leave, to allow a greater focus on research. Some countries also have provisions at national level.

In **Ireland**, academics at Trinity College Dublin may apply for their teaching duties to be removed for a semester following their return from parental leave, while academics in the **Netherlands'** Faculty of Science at Utrecht University are offered four to six months of full-time research on return from maternity leave[10].

In **France**, under the 'Congés pour recherches ou conversions thématiques', researchers who have been employed for three or more years at higher education institutions may apply for a six-month period of leave following parental leave[11]. Additional provisions may be made at institutional level. For example, at the University of Strasbourg, academics returning from parental leave may apply for a reduction in teaching duties for up to two years[12].

Some universities offer mentoring or networking to researchers returning from parental leave. In the **UK**, researchers at the University of Edinburgh are offered a coaching programme on their return from parental leave to support their transition back to work, while the University of Oxford runs workshops and informal networking events for returning staff[13].

10 LERU (2020). Family Leave for Researchers at LERU Universities, https://www.leru.org/files/Publications/LERU-Family-Leave-Paper-Final.pdf

11 Ministry of Higher Education and Research (2011). 'Conditions for allocation and exercise and notification of quotas under UNC sections, from 2011 to 2012', https://www.education.gouv.fr/bo/2011/02/esrh1029404n.htm

12 LERU (2020) Family Leave for Researchers at LERU Universities, https://www.leru.org/files/Publications/LERU-Family-Leave-Paper-Final.pdf

13 Ibid.

Similarly, in the GOV sector, women under 35 represented a higher share of researchers compared to the corresponding share of men in the majority of EU-27 Member States and Associated Countries (21 of the 27). That number increased to 23 for both the 35-44 and 45-54 age groups. In the oldest age group (55+), a higher proportion of men researchers compared to women researchers were observed in all countries except Cyprus.

The data indicate that while more women researchers were represented in the under-35 and 35-44 age group in the HES and GOV sector, the pattern was reversed in favour of men at more senior age groups (55+). As mentioned before, the relative under-representation of women at older age groups might be related to factors such as gender stereotypes in relation to care responsibilities or gender discrimination in the labour market in terms of career progression and promotion. If older age is considered a proxy for seniority in research careers, the data show that women are likely to be less represented in more senior research positions. Examples of measures to support HES researchers on their return after parental leave are shown in Box 16, while Box 17 provides examples of national measures to support women back into tech careers following a career break.

BOX 17 Supporting women back into STEM and research careers after a career break

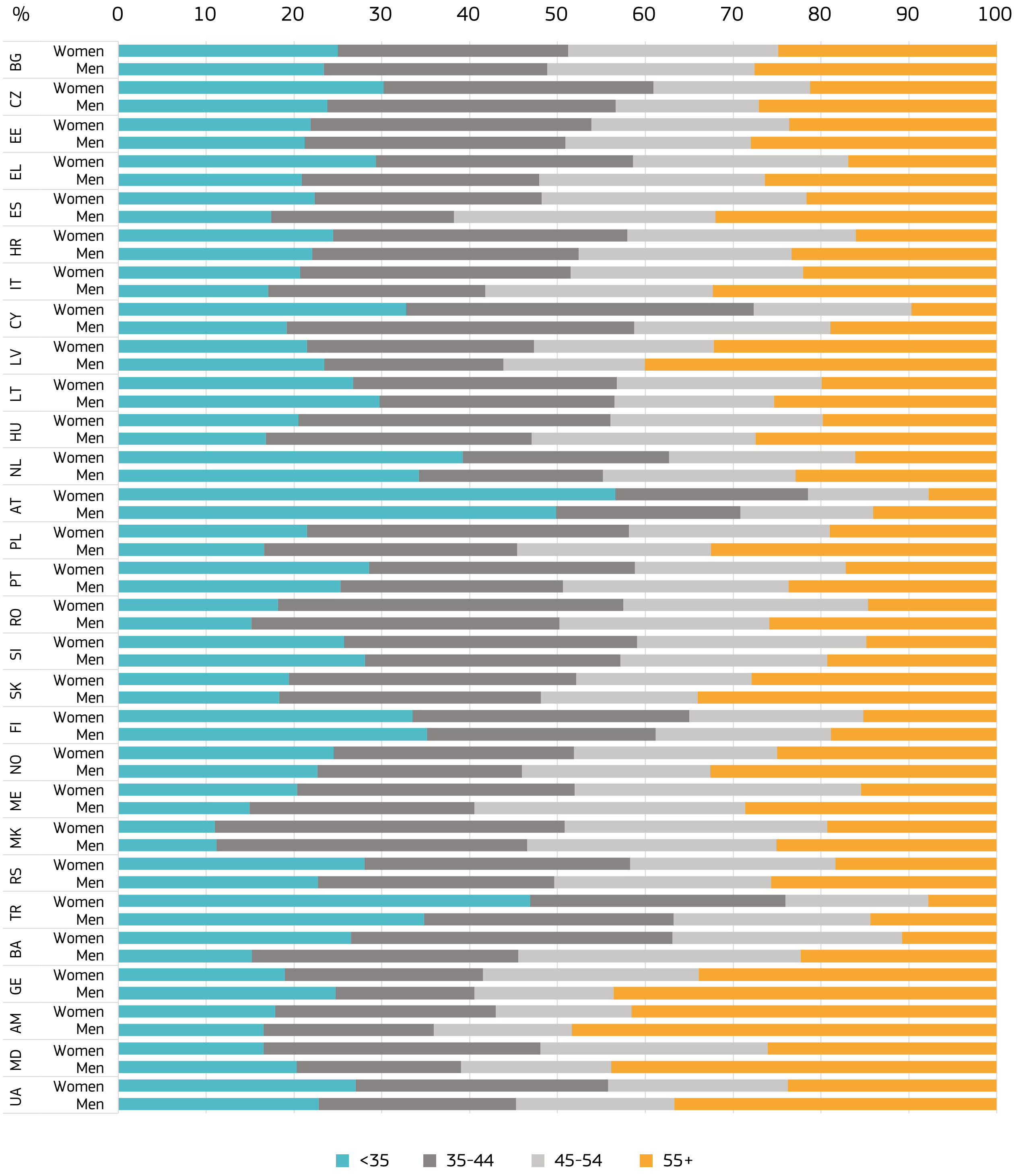
In **Ireland**, the 'Women Re-Boot' programme supports women with prior experience in the tech sector to get back into employment after a career break. The programme was developed by Technology Ireland's Software Skillnet network, the national training network for the software technology sector in Ireland, and is supported by a partnership of more than 40 tech companies. The programme provides both technical training and professional skills development. Their accelerated programme, in place since 2020, involves 10 days of e-learning followed by a 12-week paid work placement in a partner company. To date, the initiative has supported more than 100 women, 90% of whom are employed in technical roles[14].

In the **UK**, the Daphne Jackson Trust provide fellowships to support those returning to research careers following career breaks of two years or more. Fellowships typically last 2-3 years at 0.5 full-time equivalent (FTE) and entail 100 hours or more of retraining, in addition to a research project. Up to 25 fellowships are awarded each year, with 400 people supported to return to research careers[15].

14 Software Skillnet, 'Women ReBOOT LIVE – Returnships, https://www.softwareskillnet.ie/women-reboot/

15 Daphne Jackson Trust, https://daphnejackson.org/

Figure 4.11 Distribution of researchers in the higher education sector across age groups, by sex, 2018



Notes: Exceptions to reference year: BG, EE, EL, ES, HR, IT, CY, LT, HU, AT,PL, SI, NO, ME, TR: 2017, CZ, FI, LV: 2015, NL:2014; Data unavailable for: EU-28, EU-27, BE, DK, DE, IE, FR, LU, MT, SE, UK, IS, CH, AL, FO, IL, TN; Data estimated for: IT; Data included elsewhere under another category: AM (for age under 25);

Other: Percentages computed from data in head count (HC).

Source: Eurostat – Research and development statistics (online data code: rd_p_persage) and UIS - Researchers by sector of employment and age

Figure 4.12 Distribution of researchers in the government sector across age groups, by sex, 2018

Notes: Exceptions to reference period: NO: 2014; CZ, LV: 2015; SI: 2016; BG, EE, EL, ES, HR, IT, CY, LT, HU, AT, PL, SI, NO, ME, TR: 2017, Data unavailable for: EU-28, EU-27, BE, DK, DE, IE, FR, LU, FI, SE, MT, NL, UK, IS, CH, AL, TN, FO, IL; Definition differs for: HR, TR; Data estimated for: SI; Data not significant for: BA (for age under 25 and above 65); Data included elsewhere under another category: AM (for age under25)

Other: Percentages computed from data in head count (HC).

Source: Eurostat – Research and development statistics (online data code: rd_p_persage) and UIS - Researchers by sector of employment and age

4.6 Dissimilarity index for researchers

To provide further insight into extent of the gender gap in the researcher population, this section assesses the proportion of women and men who would have to move to a different scientific field in order to achieve a gender balance in researchers across those fields. By comparing the values of the Dissimilarity Index in the most recent year available[16] with values from 2014, the following indicator provides an understanding of whether the EU has progressed towards a more equal distribution of researchers.

The Dissimilarity Index (DI) provides a theoretical measurement of the percentage of either women or men in a field of R&D who would have to move to another field of R&D to ensure that the proportions of women or men were equal across all possible fields of R&D. Seven fields were considered in computing the Dissimilarity Index: Natural Sciences; Engineering & Technology; Medical & Health Sciences; Agricultural & Veterinary Sciences; Social Sciences; Humanities; and any other field of R&D. It should be noted that the Index does not ensure parity of the sexes in each scientific field.

The Dissimilarity Index may range between 0 and 1. The minimum value of 0 indicates a distribution between women and men within each occupation which is equal to the overall average proportion of women. The maximum value of 1 indicates the presence of only women or men in each of the scientific fields.

The Dissimilarity Index for the HES decreased in the majority of the EU-27 Member States and Associated Countries. For the GOV sector, the Index also decreased in one-third of the EU-27 Member States and Associated Countries.

At country level, the Dissimilarity Index ranged between 0.03 and 0.34 in the GOV sector, and 0.03 and 0.38 in the HES in the most recent year, compared to 0.04 and 0.36 for the GOV sector and 0.03 and 0.33 for the HES in 2014 (Table 4.1). Since the ranges of the Dissimilarity Index values are similar for both sectors, the data indicate that the distribution of women and men showed similar disparities in the HES and GOV sector across all fields of R&D.

Between 2014 and 2018, there was a decrease in the Dissimilarity Index in the HES in the majority of the EU-27 Member States and Associated Countries (29 out of 39), while, in the GOV sector, the Index decreased in less than half (15 of 39: BE, DK, EE, IE, HR, CY, LV, HU, SK, SE, UK, NO, TR, GE, AM). A decrease in the Index indicates more similarity in the distribution of women and men researchers across all fields of R&D, thus countries in which the Index decreased showed an overall improvement in the disparity between women and men researchers.

Notably, the Dissimilarity Index was lower for the GOV sector than the HES in 22 of 39 EU-27 Member States and Associated Countries in 2014 (BG, CZ, DK, DE, IE, HR, LV, LU, HU, AT, PL, PT, RO, FI, SE, IS, ME, MK, RS, AM, MD) and 19 of 39 countries in 2018 (BE, CZ, DK, DE, IE, HR, LV, LU, HU, AT, PT, SK, FI, SE, UK, NO, RS, AM, MD). These data indicate, therefore, that the distribution of women and researchers had fewer disparities in the GOV sector compared to the HES sector across all fields of R&D.

16 The reference year is 2018, but where data for 2018 was not available, the most recent year was used. This is specified in the footnote for Table 4.1.

Table 4.1 Evolution of the dissimilarity index for researchers in the higher education sector and government sector, 2014-2018

Country	2014		2018	
	HES	GOV	HES	GOV
BE	0.20	0.23	0.22	0.21
BG	0.18	0.11	0.05	0.16
CZ	0.21	0.14	0.20	0.17
DK	0.18	0.14	0.20	0.12
DE	0.23	0.17	0.23	0.18
EE	0.22	0.33	0.25	0.33
IE	0.25	0.21	0.22	0.16
EL	0.08	0.14	0.04	0.16
ES	0.03	0.11	0.03	0.13
HR	0.19	0.04	0.16	0.03
IT	0.12	0.12	0.13	0.15
CY	0.12	0.35	0.12	0.31
LV	0.25	0.20	0.27	0.16
LT	0.22	0.28	0.19	0.29
LU	0.32	0.12	0.38	0.23
HU	0.20	0.17	0.19	0.12
MT	0.25	:	0.23	:
NL	0.12	0.23	0.12	0.25
AT	0.23	0.15	0.23	0.16
PL	0.17	0.12	0.16	0.20
PT	0.15	0.06	0.14	0.08
RO	0.10	0.05	0.10	0.11
SI	0.22	0.22	0.08	0.25
SK	0.16	0.16	0.15	0.11
FI	0.27	0.21	0.28	0.25
SE	0.24	0.13	0.23	0.12
UK	:	:	0.22	0.16
IS	0.21	0.17	0.21	0.22
NO	0.18	0.20	0.18	0.16
CH	0.22	:	0.22	:
ME	0.13	0.07	0.13	0.18
MK	0.16	0.11	0.16	0.20
RS	0.15	0.09	0.13	0.10
TR	0.09	0.14	0.09	0.12
BA	0.16	:	0.15	:
GE	0.18	0.36	0.16	0.34
AM	0.33	0.15	0.16	0.08
MD	0.24	0.07	0.24	0.08
UA	0.11	0.21	0.23	0.23
JP	0.21	0.21	0.21	0.21
RU	0.25	0.15	0.23	0.17
KR	0.25	0.34	0.25	0.32

Notes: Exceptions to reference years: EL, AT, SI, SE, IS, CH (for HES only) and MK: 2015 (instead of 2014); BE, BG, DK, DE, EE, IE, El, ES, HR, IT, CY, LV, LT, LU, HU, MT, NL, AT, PL, RO, SI, FI, SE, UK, NO, CH, ME, TR: 2017 (instead of 2018); JP and KR: 2015 (instead of 2018). MT and BA were excluded for GOV due to low number of observations (<30) in each field; Break in time series: DE (2014, all fields for GOV other than “not specified”); Confidential: BG (HES, 2017: Engineering and Technology, Natural sciences (men only) and Agricultural sciences), PL (GOV 2014: Engineering and Technology, Medical and Health, Social Sciences and Humanities; GOV, 2017: Agricultural Sciences and Social Sciences), SI (HES, 2017: Natural Sciences, Engineering and Technology, Agricultural Sciences (men); GOV, 2017: Engineering and Technology and Agricultural Sciences); Definition differs: HR (Gov, 2014: Natural Sciences (men only), Humanities), NL, SK (GOV, 2014: all fields other than “not specified”), FI (GOV, 2014: all fields other than “not specified” and Medical and health (men only)), DE (HES, 2017: Natural sciences, Engineering and Technology, Medical and Health Sciences, Humanities), DE, NL, FI, TR (GOV, 2017: all fields other than “not specified”);

Estimated: SE, RU (GOV, 2015 and 2014 respectively: all fields other than “not specified”), ES (GOV, 2017: all fields other than “not specified”), UK, ES, IT (HES, 2017: all fields). RU (HES 2014, all fields other than “not specified); Magnitude nil or negligible: BA, MD (HES 2014, “not specified” only), AM (HES, 2014: Agricultural Sciences and “not specified”), BA, AM, MD, UA (HES, 2018: “not specified” only). Provisional: CZ and DK (HES and GOV 2018 and 2017 respectively, all fields but “not specified”).

Data not available for: EU-27, EU-28, FR, AL, TN, IL and FO.

Source: Eurostat – Research and development statistics (online data code: rd_p_perssci) and UIS - Researchers by sector of employment and field of R&D

4.7 Evolution of women's representation among researchers in key economic sectors, by field of R&D

The following section analyses the extent of gender segregation across fields of R&D in the main economic sectors of higher education, government, and business enterprise. Women Doctoral graduates remain under-represented among Doctoral graduates in ICT and Engineering, Manufacturing & Construction and over-represented in the field of Education (see Chapter 2). Given that educational pathways can determine women's and men's career choices and labour market outcomes, this section focuses on the extent of the gender gap for researchers in R&D fields and how women's representation in these fields has evolved over time.

The proportion of women researchers in the HES continued to increase between 2010 and 2018.

The HES is the main source of employment for women researchers in the EU, employing almost 55.9% of women researchers (see section 4.3). Assessing the extent of the gender segregation in this sector is thus particularly important. The data show that between 2010 and 2018, the proportion of women researchers in the HES increased in most countries and in most fields of R&D (Table 4.2). More specifically, the presence of women researchers increased in all fields of R&D in 12 EU-27 Member States and Associated Countries (BG, DE, IE, ES, HR, LV, HU, MT, PL, PT, NO, AM). Box 5 provides examples of approaches taken to incentivise the recruitment or promotion of women within higher education institutions.

Despite these improvements, women researchers remained under-represented (less than 40% representation) in the fields of Natural Sciences and Engineering & Technology in the majority of EU-27 Member States and Associated Countries in 2018. That same year, women researchers were over-represented (more than 60% representation) in the field of Medical & Health Sciences in around one-third of EU-27 Member States and Associated Countries (14 of 39). These data indicate that horizontal gender segregation persists, with women researchers being over-represented in care-related fields and under-represented in science and technology related careers. Such gender differences can have a direct influence on the gender pay gap, as STEM fields tend to be associated with higher levels of pay.

Some countries have shown notable improvements in women's representation in Natural Sciences and Engineering & Technology. In Natural Sciences, the proportion of women researchers increased in the majority of EU-27 Member States and Associated Countries. These increases led to a gender-balanced population of researchers in four countries (EL, PL, RO, SK), as the proportion of women researchers in 2018 ranged between 40% and 60% (compared to <40% in 2010). Similarly, the proportion of female researchers in the field of Engineering & Technology increased in the majority of EU-27 Member States and Associated Countries, with the increases leading to a gender-balanced population of researchers in 2018 in four countries (BG, RO, MK, AM).

Turning to the fields where women tend to be better represented - or in some cases over-represented - the data show that the proportion of women researchers in Medical & Health sciences increased in the majority of the EU-27 Member States and Associated Countries. In eight countries (EE, IE, LV, LT, PT, UK, IS, GE), that increase resulted in the over-representation of women researchers, with the proportion of women reaching above 60% in 2018. Similarly, in the field of Humanities, the presence of women researchers increased in the majority of EU-27 Member States and Associated Countries. The increase saw the UK reach a gender-balanced population of researchers in 2018 (54.3%), while Armenia created an over-representation of women (71.4%).

Similarly, in the field of Agricultural Sciences, the majority of the EU-27 Member States and Associated Countries experienced an increase in the proportion of women researchers in 2018, compared to 2010. In several of the countries (BG, CZ, EL, ES, HU, MK, BA), this increase resulted in a gender-balanced population of researchers, the proportion of women researchers remained below 40% in both 2010 and 2018 in four countries (CY, MT, TR, MD). Latvia was the only country where women researchers were over-represented, with the proportion reaching just above 60% in 2018.

Across the fields of R&D, the proportion of women researchers in Social Sciences increased in the largest number of EU-27 Member States and Associated Countries, resulting in gender balance in seven countries (CZ, DE, EL, MT, UK, TR, BA) in 2018. Two countries (AM, UA) saw the increase lead to an over-representation of women researchers in 2018 (66.9 and 66.8%, respectively) from a previously gender-balanced population of researchers in 2010. In Latvia, the presence of women researchers remained well above 60% in both 2010 (67.5%) and 2018 (70.4%). In four countries (DK, LT, ME, MD), the proportion of women researchers declined in 2018 while still remaining above 40%.

In most countries, the number of women researchers grew across all fields of R&D. In some, however, the number of women researchers in Natural Sciences and Engineering & Technology decreased between 2010 and 2018.

The CAGR for women researchers in the HES for each field of R&D in the 2010-2018 period is shown in Table 4.3. The CAGR of women researchers is accompanied by the trends in the number of women in each field of R&D. When all R&D fields are considered, the CAGR of women researchers in this period was found to be positive across all fields in 12 EU-27 Member States and Associated Countries (IE, CY, HU, AT, PL, PT, NO, CH, TR, BA, GE, UA). Overall, in each field of R&D, more than half of the EU-27 Member States and Associated Countries had a positive average annual growth rate of women researchers between 2010 and 2018.

BOX 18 Supporting women within science and technology research careers

In **Austria**, the w-fFORTE programme supports women researchers in science and technology through free training, workshops to promote interdisciplinary working, and networking events for women. Between 2008 and 2018, the programme provided EUR 15 million in funding to Laura Bassi Centres of Expertise programmes. This funding supported research based on the potential and current achievements of researchers applying for funding, with a focus on supporting excellent women researchers and promoting a culture of collaboration and equal opportunity[17,18].

The CAGR of women researchers in this period showed a decline in the number of women researchers in six EU-27 Member States and Associated Countries (EE, ES, LV, FI, AM, MD) in the field of Natural Sciences, and in nine countries (EE, EL, ES, RO, SI, SK, SE, UK, IS) in the field of Engineering & Technology. Given the relative under-representation of women researchers in these fields, the negative average annual growth rate indicates that the gender gap has widened in these countries.

In the field of Natural Sciences, Social Sciences and Humanities, the number of women researchers in the HES grew at the fastest rate on average per year in Ukraine (75.8% for Natural Sciences, 55.8% for Social Sciences and 128.8% for Humanities). In the fields of Engineering & Technology and Medical & Health sciences, the average annual growth rate was highest in Luxembourg (44.3% in Engineering & Technology, and 70.6% in Medical & Health Sciences), while in Agricultural Sciences, the highest average annual growth rate was recorded in North Macedonia (37.7%).

By contrast, the average annual growth rate declined most in Armenia in Natural Sciences (-7.2%) and Medical & Health Sciences (-18.8%), in Slovenia in Engineering & Technology (-9.8%) and in Serbia in Agricultural Sciences (-13.8%). In Romania, the number of women researchers declined most in the fields of Social Sciences (-22.3%) and Humanities (-18.7%). Box 18 shows an example of a measure to support women researchers in the fields of science and technology.

17 GENDERACTION (2020). D 3.2 Monitoring of ERA Priority 4 implementation, D3.2._MonitoringERApriority4implementation.pdf (genderaction.eu)

18 Austrian Federal Ministry of Economy, Family and Youth, 'Laura Bassi Centres of Expertise At the interface of science and industry', https://www.cvast.tuwien.ac.at/sites/default/files/140113_laura_bassi_broschuere_en_final.pdf

Table 4.2 Evolution of the proportion (%) of women among researchers in the higher education sector, by field of R&D, 2010-2018

Country	2010					
	Natural sciences	Engineering and technology	Medical and health sciences	Agricultural sciences	Social sciences	Humanities
BE	33.02	20.23	52.22	46.42	48.37	44.62
BG	44.48	33.67	45.37	38.22	50.96	56.77
CZ	28.88	22.33	45.53	33.66	39.47	41.3
DK	29.51	23.95	48.34	52.99	47.16	46.2
DE	27.45	18.4	46.81	46.22	34.22	48.47
EE	39.75	28	58.67	45.87	56.86	63.3
IE	34.22	20.75	59.81	48	48.12	51.07
EL	29.61	31.24	39.75	33.28	36.2	47.65
ES	40.49	36.7	42.03	38.15	41.27	41.44
HR	42.92	32.26	53.18	48.34	53.91	54.33
IT	40.68	24.27	33.99	37.83	41.13	51.69
CY	33.64	29.88	30 (6/20)	30 (3/10)	41.3	48.61
LV	40.21	31.6	56.32	46.84	67.52	68.46
LT	43.5	33.94	59.91	52.53	67.6	61.89
LU	25.47	10.53	20 (1/5)	-	53.5	46.51
HU	24.83	18.69	43.28	36.2	43.24	44.7
MT	24.24	14.81	44.44	22.22 (2/9)	37.89	23.62
NL	36.85	26.96	40.6	45.04	50.43	49.69
AT	29.11	21.55	46.31	56.01	49.32	52.03
PL	38.32	24.64	55.3	48.23	47.08	46.06
PT	49.85	29.36	55.35	50.61	51.93	48.19
RO	30.79	38.22	55.56	45.8	49.99	47.21
SI	29.7	31.76	51.85	53.57	43.3	52.12
SK	39.64	33.95	55.71	43.7	52.43	48.91
FI	32.71	24.91	63.36	55.27	58.14	55.87
SE	35.51	24.87	59.04	47.16	51.33	51.2
UK	43.52	39.5	49.54	59.65	38.74	38.12
IS	62.89	61.26	35.57	75.47	49.65	54.33
NO	31.02	24.7	55.2	50.5	46.45	46.18
CH	30.15	19.8	44.28	58.24	45.05	47.62
ME	50.7	37.99	90 (9/10)	52	46.64	53.45
MK	50 (8/16)	37.81	66.44	28.57	40.24	65.06
RS	50.42	33.32	43.89	56.56	48.07	54.73
TR	42.24	32.08	45.97	29.45	39.61	42.43
BA	51.95	29.67	60 (12/20)	39.68	33.9	29.41 (5/17)
GE	44.24	41.44	55.26	55.56	50.78	71.78
AM	44.26	18.92	64.08	:	50	40.98
MD	41.44	18.32	45.33	19.3	70.16	57.52
UA	66.13	35.52	68.35	51.42	57.54	23.53 (4/18)
JP	13.07	8.8	29.95	18.91	23.26	34.01
RU	42.41	27.73	59.21	50.34	57.64	69.95
KR	28.94	13.01	41.02	24.94	31.66	37.25

Country	2018					
	Natural sciences	Engineering and technology	Medical and health sciences	Agricultural sciences	Social sciences	Humanities
BE	36.65	21.88	53.12	38.35	51.59	50.15
BG	44.6	42.19	59.06	41.64	53.36	60.16
CZ	29.04	22.2	44.92	41.89	42.83	41.62
DK	31.16	25.36	53.63	54.53	46.69	48.27
DE	32.11	20.38	50.36	50.24	44.91	49.71
EE	38.05	27.29	63.88	46.7	59.98	59.69
IE	37.69	27.55	61.79	51.96	52.29	52.33
EL	40.13	35.25	40.96	41.54	41.31	43.33
ES	42.57	38.59	44.34	41.8	43.7	43.56
HR	48.48	34.73	55.08	50	56.2	58.63
IT	45.04	26.52	43.1	44.49	45.17	49.11
CY	34.05	30.58	43.24	33.33 (4/12)	44.58	42.11
LV	43.45	38.17	65.49	60.2	70.4	69.93
LT	48.69	35.17	62.25	54.14	63.58	62.95
LU	25.98	14.94	54.55	-	59	51.61
HU	29.2	22.7	48.25	41.62	48.47	46.15
MT	30.43	15.73	47.67	25 (2/8)	43.39	29.3
NL	39.7	29.27	43.1	44.82	53.66	50.85
AT	30.83	25.56	47.95	55.14	49.92	54.77
PL	42.34	29.15	58.38	52.26	49.55	49.41
PT	50.96	31.71	60.65	55.02	55.25	51.97
RO	48.61	44.4	58.53	51.43	58.39	39.42
SI	30.11	24.22	56.62	59.85	50.4	50.95
SK	44.34	32.67	57.7	50.35	53.18	47.62
FI	32.72	28.43	62.5	59.93	59.72	58.52
SE	30.11	27.27	55.42	49.37	51.93	49.69
UK	38.86	24.57	61.36	54.99	47.94	54.35
IS	37.61	20.34	63.01	65.63	57.33	50.92
NO	33.74	25.52	59.65	56.07	52.03	49.23
CH	31.96	24.67	47.89	57.48	48.55	51.6
ME	48.62	39.3	61.54 (8/13)	53.33	40.28	56.25
MK	41.08	45.86	73.52	46.91	46.63	59.43
RS	56.18	39.02	57.51	47.8	51.1	55.48
TR	44.59	33.65	48.72	33.32	44.04	41.7
BA	48.92	35.97	67.8	48.11	49.79	60.56
GE	46.25	40.32	62.14	55.93	52.54	67.24
AM	56.6	45.45	68.63	100 (1/1)	66.9	71.43
MD	46.57	25.75	57.98	31.33	62.14	54.84
UA	39.76	32.17	60.48	48.65	66.82	57.18
JP	14.16	10.23	32.15	21.16	29.24	35.86
RU	42.3	29.05	55.34	56.21	56.54	63.33
KR	30.61	14.16	44.34	28.35	36.5	40.88

Notes: Exceptions to the reference period: BG (field of R&D: 04): 2010-2014; JP, KR (all fields of R&D): 2010-2015; BG (fields of R&D: 01,02), SI (fields of R&D: 01,02,04): 2010-2016; BE, DK, DE, EE, IE, ES, HR, IT, CY, LV, LT, LU, HU, MT, PL, RO, UK, NO, TR (all fields of R&D): 2010-2017; BG, SI (fields of R&D: 03,05,06): 2010-2017; EL, NL, AT, FI, ME (all fields of R&D): 2011-2017; SE (fields of R&D: 01,02,03,04): 2011-2017; IS (all fields of R&D): 2011-2018; CH (all fields of R&D): 2012-2017; SE (fields of R&D: 05, 06): 2013-2017; BA (all fields of R&D): 2012-2018; AM (fields of R&D: 01-03,05,06), MD, UA (all fields of R&D): 2013-2018; GE (all fields of R&D): 2014-2018; Data unavailable for: EU-27, EU-28, FR,AL, FO, TN, IL (all years, all fields of R&D), AM (2010-2017, field of R&D: 04); Break in time series for: EL (2011 data; all fields of R&D); Definition differs for: DE (2017 data; field of R&D: 01, 02, 03, 06); Data estimated for: UK (2010 and 2017 data; all fields of R&D); BE, RU (2010 data; all fields of R&D); ES, IT: (2017 data; all fields of R&D); SE (2013 data; fields of R&D: 05, 06);Data provisional for: CZ (2018 data; all fields of R&D); DK (2017 data; all fields of R&D). Other: ':' indicates that data are unavailable; '-' indicates that denominator was zero; For proportions based on fewer than 30 graduates the numerators and denominators are displayed in brackets; Proportion computed from data in head count (HC).

Source: Eurostat – Research and development statistics (online data code: rd_p_perssci) and UIS - Researchers by sector of employment and field of R&D

Table 4.3 Compound annual growth rate (%) of women researchers in the higher education sector, by field of R&D, 2010-2018

Country	Natural sciences		Engineering and technology		Medical and health sciences		Agricultural sciences		Social sciences		Humanities	
	CAGR	Trend	CAGR	Trend	CAGR	Trend	CAGR	Trend	CAGR	Trend	CAGR	Trend
BE	0.17		2.24		2.97		-0.83		1.97		2.09	
BG	9.34		3.20		23.60		-0.32		-0.15		5.88	
CZ	9.06		2.09		1.14		0.41		8.75		-2.06	
DK	3.05		2.85		4.82		-2.21		-1.60		-1.77	
DE	1.15		8.10		3.64		3.09		11.24		-0.45	
EE	-1.52		-3.70		7.46		-1.62		1.38		-3.83	
IE	8.84		12.23		7.41		22.14		10.84		2.76	
EL	3.30		-4.79		-5.42		-1.57		8.06		4.07	
ES	-1.09		-1.54		2.77		1.93		2.26		-1.52	
HR	2.09		1.74		0.73		-0.04		3.93		8.39	
IT	0.97		7.86		1.50		9.34		0.91		-3.79	
CY	0.13		7.82		40.24		4.20		7.08		1.93	
LV	-2.48		13.02		9.65		13.25		-2.52		-3.05	
LT	5.46		0.16		7.12		3.35		1.86		-2.69	
LU	9.05		44.26		70.57		0.00		10.34		13.32	
HU	0.86		4.91		0.46		4.81		1.46		0.80	
MT	8.32		4.92		5.32		0.00		8.57		6.30	
NL	3.28		3.42		0.93		-1.89		2.36		3.58	
AT	2.18		7.58		2.43		3.81		3.68		2.97	
PL	9.89		8.27		6.01		8.67		6.83		8.99	
PT	1.69		6.14		2.53		4.04		2.27		2.34	
RO	43.98		-2.74		3.91		13.71		-22.34		-18.69	
SI	1.94		-9.81		-4.89		17.51		3.79		-5.09	
SK	5.24		-1.63		-0.92		3.19		0.91		1.90	
FI	-0.50		0.93		-0.75		-3.71		1.02		0.93	
SE	4.37		-7.49		-2.20		-10.29		-6.27		-10.71	
UK	1.77		-3.56		5.87		3.39		5.65		7.20	
IS	3.36		-8.69		15.48		0.70		11.95		7.03	
NO	4.99		1.13		4.14		2.35		7.60		2.10	
CH	1.68		10.18		4.43		6.21		4.64		3.06	
ME	6.66		0.57		-1.94		-1.33		2.27		-8.66	
MK	41.56		15.46		-4.02		37.67		18.02		2.59	
RS	6.92		6.96		21.28		-13.81		3.59		-2.81	
TR	1.51		7.10		8.30		2.03		7.99		6.40	
BA	25.73		14.45		37.19		0.33		50.78		71.90	
GE	9.41		4.00		20.84		35.34		19.84		5.16	
AM	-7.23		20.11		-18.78				18.89		39.06	
MD	-2.71		12.37		0.29		18.77		0.00		-12.16	
UA	75.83		24.70		11.57		25.60		55.79		128.84	
JP	5.42		0.64		2.73		2.65		13.12		-1.24	
RU	-1.54		0.45		-0.97		4.82		9.05		2.36	
KR	1.30		2.80		5.53		4.89		4.37		1.14	

Notes: Exceptions to the reference period: JP,KR (all fields of R&D): 2010-2015; BG (fields of R&D: 01,02), SI (fields of R&D: 01,02,04): 2010-2016; BE, DK, DE, EE, IE, ES, HR, IT, CY, LV, LT, LU, HU, MT, PL, RO, UK, NO, TR (all fields of R&D), BG, SI (fields of R&D: 03,05,06):2010-2017; BG (field of R&D: 04): 2010-2014; EL, NL, AT, FI, ME (all fields of R&D), SE (fields of R&D: 01,02,03,04): 2011-2017; CH (all fields of R&D):2012-2017; SE (fields of R&D: 05,06): 2013-2017; IS (all fields of R&D): 2011-2018; BA (all fields of R&D): 2012-2018; AM (fields of R&D: 01,02,03,05,06), MD, UA (all field of R&D): 2013-2018; GE (all fields of R&D): 2014-2018; Data unavailable for: EU-27, EU-28, FR, AL, FO, TN, IL (all years, all fields of R&D), AM (2010-2017, field of R&D: 04);Break in time series for: EL (2011 data; all fields of R&D); Definition differs for: DE (2017 data; field of R&D: 01, 02, 03, 06); Data estimated for: UK (2010 and 2017 data; all fields of R&D); BE, RU (2010 data; all fields of R&D); ES, IT: (2017 data; all fields of R&D); SE (2013 data; fields of R&D: 05, 06); Data provisional for: CZ (2018 data; all fields of R&D); DK (2017 data; all fields of R&D). Others: ':' indicates that data are unavailable; '-' indicates that denominator was zero; Proportion computed from data in head count (HC); In the 'Trend' columns, the scale is not the same across countries.

Source: Eurostat – Research and development statistics (online data code: rd_p_perssci) and UIS - Researchers by sector of employment and field of R&D

In the HES, women researchers were more likely to work in the fields of Social Sciences and Medical & Health Sciences, while men researchers were more likely to work in Natural Sciences and Engineering & Technology.

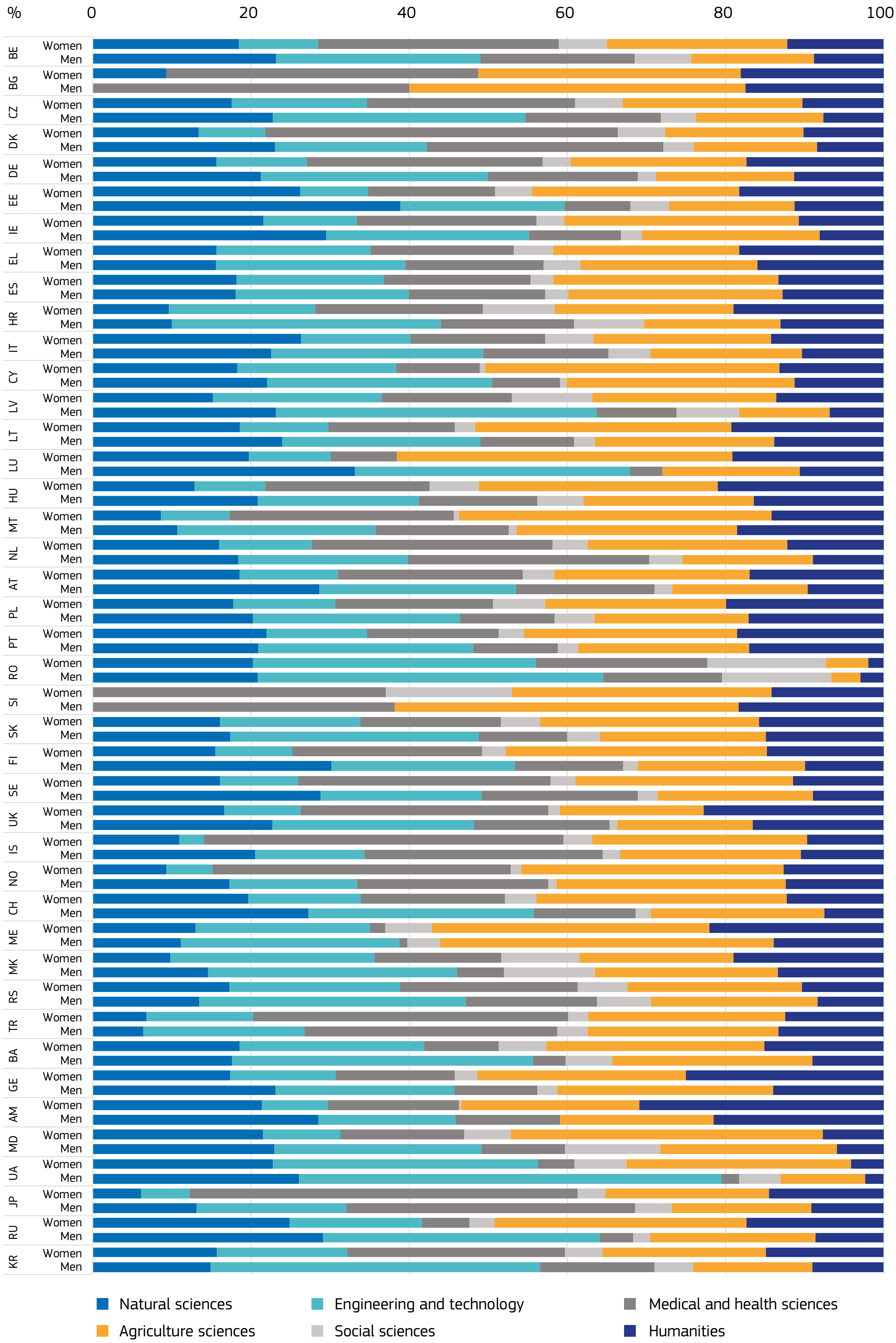
Looking at the distribution of women and researchers in the HES in more detail (Figure 4.13), it is evident that in most of the EU-27 Member States and Associated Countries, women researchers were more likely to work as researchers in Social Sciences (20 of 39) and Medical & Health Sciences (13 of 39). By comparison, men researchers were more likely to work as researchers in Engineering & Technology (20 of 39) and Natural Sciences (9 of 39).

Comparing the distribution of women and men shows that in the field of Social Sciences, the proportion of men researchers was higher than that of women researchers in only five EU-27 Member States and Associated Countries (BG, SI, ME, MK, GE). Similarly, in Medical & Health Sciences, the proportion of men researchers was higher than that of women in only three cases (BG, NL, SI). A larger proportion of women researchers worked in Agricultural Sciences compared to men, with only 10 EU-27 Member States and Associated Countries having higher representation of men researchers in this field (BE, EE, ES, CY, LT, MT, MK, RS, TR, MD).

A higher proportion of men researchers worked in the field of Engineering & Technology compared to women researchers in all EU-27 Member States and Associated Countries considered. Similarly, the proportion of men researchers was higher than that of women researchers in the field of Natural Sciences in all but nine EU-27 Member States and Associated Countries (EL, ES, IT, PT, SI, ME, RS, TR, BA).

The data below provide further evidence of horizontal gender segregation in the fields of R&D among the population of researchers. The persistence of these gender inequalities in the HES stands in sharp contrast to the ERA objective of ensuring that the best researchers obtain funding and remain the cornerstone for investment in the ERA (European Commission, 2020a). Efforts at education level can help to tackle gender stereotypes related to women and men's career interests, which are an obstacle to achieving equal representation in all fields of R&D. Chapter 2 (Box 6) shows examples of initiatives undertaken by research and higher education institutions to raise awareness of gender stereotypes in careers and encourage girls and boys to study subjects in which they are under-represented. At European level, the Commission Communication on achieving the European Education Area by 2025 (2020a) also focuses on challenging gender stereotypes related to fields of study and professions.

Figure 4.13 Distribution of researchers in the higher education sector across fields of R&D, by sex, 2018



Notes: Exceptions to the reference year: BE, BG, DK, DE, EE, EL, IE, ES, HR, IT, CY, LV, LT, LU, HU, MT, NL, AT, PL, RO, SI, FI, SE, UK, NO, CH, ME, RS, TR: (2017), JP, KR (2015); Data unavailable for: EU-27, EU-28, FR, AL, TN, FO, IL; Data confidential for: BG, SI (fields of R&D: natural sciences, engineering and agricultrual sciences); Definition differs for: DE (fields of R&D: natural sciences, engineering, medical sciences and humanities), JP (all fields); Data estimated for: ES, IT, UK; Data provisional for: CZ, DK.

Other: Percentages computed from data in head count (HC).

Source: Eurostat – Research and development statistics (online data code: rd_p_perssci) and UIS - Researchers by sector of employment and field of R&D

The GOV sector is also of interest when considering researchers' career patterns and the extent of horizontal gender segregation across fields of R&D, employing 14.2% of women researchers and 8.9% of men researchers (see section 4.3).

While there have been improvements across the R&D fields, women researchers in the GOV sector continued to be under-represented in the fields of Natural Sciences and Engineering & Technology.

The data show that, between 2010 and 2018, the proportion of women researchers increased overall in at least half of the EU-27 Member States and Associated Countries, in each field of R&D, except Humanities (Table 4.4). While there were improvements in women's representation in each field of R&D, women remained under-represented in Natural Sciences in more than one-third of the EU-27 Member States and Associated Countries (15 of 37). Similarly, in the majority of the EU-27 Member States and Associated Countries (28 of 35), women continued to be under-represented in Engineering & Technology. It is worth noting that since 2010, the proportion of women researchers has been more gender-balanced in the fields of Medical & Health Sciences, Agricultural Sciences, Social Sciences and Humanities. Similar to the situation in the HES, the data show that horizontal gender segregation persists in the GOV sector.

Some countries showed improvements in women's representation in Natural Sciences and Engineering & Technology. In 22 EU-27 Member States and Associated Countries for which data were available, the proportion of women researchers increased in the field of Natural Sciences. This increase resulted in a gender-balanced proportion of researchers in the field in three countries (EL, LU, FI). In the field of Engineering & Technology, the proportion of women researchers increased in 21 EU-27 Member States and Associated Countries where data were available. Of these, two remained gender-balanced in their population of researchers between 2010 and 2018 (ME, RS). Meanwhile, in three countries (BG, PT, AM), the increase resulted in gender balance among researchers in this field.

Women's representation among researchers increased in the fields in which they tend to be well represented. During the 2010-2018 period, the proportion of women researchers in Medical Sciences increased in 23 EU-27 Member States and Associated Countries. In Denmark, there was a significant increase from 24.3% in 2010 to around 59.6% women researchers in 2018. However, as women researchers were already well represented in this field, four countries (BE, SI, ME, AM) saw women researchers become over-represented. In the field of Social Sciences, the proportion of women researchers increased in 20 EU-27 Member States and Associated Countries. This included an improvement in Belgium, with 42.2% of women researchers in the field (compared to 28.6% in 2010). However, as with Medical Sciences, the increased representation of women resulted in over-representation in three countries (CY, RO, MK) in 2018.

In the field of Agricultural Sciences, the presence of women researchers increased in 26 EU-27 Member States and Associated Countries. Despite this increase, women remained under-represented in five countries (CY, MT, NL, AT, TR) during the 2010-2018 period. In two cases (EL, GE), this increase resulted in a more gender-balanced population of researchers, as the proportion of women researchers reached more than 40% in 2018.

The proportion of women researchers working in the field of Humanities increased in 17 EU-27 Member States and Associated Countries between 2010 and 2018. In Iceland and Latvia, this increase led to over-representation of women researchers. In the Netherlands, the increase (from 36.6% to 56.1%) led to almost gender parity in the field in 2018.

The number of women researchers working in the GOV sector increased between 2010 and 2018 in most of the countries examined.

To further examine how the distribution of women researchers has evolved over time in the GOV sector, the CAGR for women researchers for each field of R&D is shown in Table 4.5. When all R&D fields are considered, the CAGR of women researchers in this period was found to be positive across all fields in six EU-27 Member States and Associated Countries (BE, CZ, EL, LT, AT, SE).

However, the CAGR of women researchers showed a decline in the number of women researchers in Natural Sciences in more than one-third of EU-27 Member States and Associated Countries (14 of 38). In the field of Engineering & Technology, the CAGR was negative in more than half of the EU-27 Member States and Associated Countries (20 of 38), indicating that the number of women researchers in this field decreased. Given the existing under-representation of women researchers in these fields, the negative average annual growth rates indicate that the gender gap in this sector has widened in several countries.

The highest average annual growth rate in the field of Natural Sciences was recorded in North Macedonia (21.0%). In Engineering & Technology, the highest average annual growth rate was observed in Georgia (55.4%). In Agricultural Sciences and Social Sciences, the number of women researchers grew the fastest on average per year in Sweden (96.8% per year for Agricultural Sciences and 17.5% for Social Sciences), while in Medical & Health Science and Humanities, the highest annual average growth rate was observed in Bosnia and Herzegovina (73.2%) and the Netherlands (47.9%).

At the other end of the scale, the average annual growth rate for women researchers declined most in Natural Sciences in Malta (-100.0% per year) followed by Poland (-22.0% per year). For Engineering & Technology, five countries had declines of -100.0% per year (IE, HR, CY, MT, MK). As with Natural Sciences, Poland had the largest decline (-24.0% per year). In Medical & Health sciences, Malta also had a decline of -100.0% per year, while the UK had the largest decline among countries without small total numbers, at -10.1% per year. The number of women researchers declined most between 2010 and 2018 in Agricultural Sciences in Luxembourg (-18.0% per year) and Iceland (-15.8% per year), followed by Portugal (-7.9% per year). In Social Sciences, the average annual growth rate for women researchers declined most in Georgia (-46.4% per year) and North Macedonia (-27.0% per year), followed by Portugal (-13.3% per year). In Humanities, the greatest declines were seen in Luxembourg (-100.0% per year), followed by North Macedonia (-15.4% per year) and Portugal (-14.0% per year). When interpreting the results, it is important to note that the CAGR for several of the countries mentioned (MT, IE, HR, CY, MK, IS, LU) was based on small absolute numbers of less than 30 in some or all years.

Table 4.4 Evolution of the proportion (%) of women among researchers in the government sector, by field of R&D, 2010 & 2018

Country	2010						2018					
	Natural sciences	Engineering and technology	Medical and health sciences	Agricultural sciences	Social sciences	Humanities	Natural sciences	Engineering and technology	Medical and health sciences	Agricultural sciences	Social sciences	Humanities
BE	27.39	30.1	49.09	44.33	28.57	48.54	33.75	26.72	62.6	48.41	42.22	55.59
BG	51.2	35.99	69.94	58.88	65.71	69.72	53.76	40.12	83.18	65.06	66.67	63.85
CZ	29.61	27.49	55.02	48.25	47.49	45.57	33.47	30.45	58.8	48.19	53.7	41.61
DK	24.23	21.05 (4/19)	24.28	-	44.78	43.75	30.1	25 (1/4)	59.63	-	51.22	51.01
DE	29.94	24.48	50.43	40.99	45.16	49.12	34.86	23.05	51.86	45.78	52.87	50.52
EE	31.74	50	82.09	54.55	70.69	69.37	30	60.87 (14/23)	85.94	71.11	67.65	66.27
IE	28.57	22.96	91.18	28.52	48.05	-	30	0 (0/5)	86.11	42.01	49.75	-
EL	30.34	33.85	52.47	32.16	62.92	66.7	41.23	27.52	37.45	41.64	53.48	64.65
ES	44.91	37.2	51.97	49.62	49.29	50.27	46.01	35.67	56.97	49.66	49.83	45.35
HR	51.66	22.39	51.68	46.88	59.89	54.59	54.91	-	54.83	47.3	59.03	52.33
IT	39.86	31.3	52.6	42.95	53.63	58.3	39.69	38.66	54.45	48.69	59.04	58.75
CY	61.29	33.33 (2/6)	33.33 (1/3)	25.86	50.98	65.38 (17/26)	63.51	0 (0/1)	33.33 (2/6)	32.61	77.14	75.86 (22/29)
LV	59.32	16.05	77.42	67.84	81.82 (18/22)	28.57 (2/7)	56.92	27.42	86.76	54.84	80 (16/20)	62.79
LT	46.36	32.72	79.21	63.25	72.47	69.84	46.22	26.38	69.88	61.5	66.91	67.33
LU	39.73	26.9	66.67 (4/6)	23.53 (4/17)	37.56	14.29 (1/7)	46.92	19.5	70.37 (19/27)	100 (1/1)	36.42	-
HU	30.58	33.64	64.62	45.15	47.68	48.89	37.27	29.25	44.25	53.69	44.8	51.97
MT	80 (4/5)	40 (2/5)	100 (1/1)	0 (0/3)	52.94 (9/17)	0 (0/1)	-	-	-	17.65 (3/17)	28.57 (4/14)	0 (0/1)
NL	31.16	21.53	44.06	32.8	48.22	36.59	30.7	21.64	49.4	36.91	55.75	56.15
AT	29.2	40.67	53.36	29.6	48.74	55.69	36.37	30.93	42.07	35.31	50.04	51.95
PL	40.99	29.8	60.03	48.83	44.19	60.35	34.81	37.88	57.76	54.2	46.49	56.83
PT	63.43	37.84	61.85	61.39	71.52	68.05	59.39	41.74	62.86	66.15	71.05	66.22
RO	50.97	47.24	74.63	41.48	54.55	50	44.69	46.68	70.21	59.14	61.72	45.21
SI	37.7	31.02	58.21	47.98	57.53	51.59	35.19	22.5	67.42	42.76	46.96	58.81
SK	41.12	31.39	56.64	49.73	59.25	52.2	49.68	33.1	55.88	53.77	56.25	57.95
FI	38.41	30.93	64.62	48.74	56.32	68.01	41.52	28.91	64.34	48.88	56.08	71.67
SE	42.19	23.17	47.04	100 (1/1)	48.26	49.23	42.16	26.27	56.27	56.31	54.18	57.86
UK	26.69	14.07	45.34	40	56.76	55.34	37.95	19.35	45.25	43.7	51.11	55.51
IS	42.22	42.37	50 (1/2)	41.67 (10/24)	41.94	42.42	47.87	33.33	55.56 (15/27)	13.64 (3/22)	55.56 (5/9)	60.87
NO	34.74	21.12	52.78	40.46	48.81	53.03	37.3	30.52	55.3	46.06	50.2	58.77
ME	69.7	46.15 (6/13)	57.58	-	-	26.32 (5/19)	59.38	57.14 (12/21)	68.82	-	75.47	25
MK	54.84	50	64.29	44	48.24	56.02	54.93	-	75	50	68.75 (11/16)	57.14
RS	58.14	42.92	54.64	77.37	53.24	50.43	64.82	53.52	72.67	60.06	49.27	59.43
TR	28.22	25.38	47.96	29.55	41.43	41.94	33.25	26.67	41.24	39.93	45.12	29.27
BA	47.62 (10/21)	43.75	50 (1/2)	:	53.33 (8/15)	11.11	45.83 (11/24)	33.33 (3/9)	37.5 (9/24)	:	:	35.29 (6/17)
GE	75.35	33.33 (4/12)	72.5	34.96	59.09 (13/22)	76.12	50.23	10.95	71.01	41.38	14.29 (2/14)	74.31
AM	46.73	35.81	52	68.18	45.26	63.36	45.39	41.56	61.62	58.73	54.87	51.68
MD	48.62	34	56.03	50.29	65.64	50.4	51.98	24.81	54.22	55.26	60.33	49.79
UA	43.29	34.78	64.27	56.52	62.14	68.02	42.98	31.81	65.81	55.6	65.34	61.6
JP	15.57	6.57	31.92	14.88	26.38	30.21	15.1	7.73	34.8	17.54	30.32	28.93
RU	41.29	37.68	59.33	55.7	61.58	59.58	40.32	34.13	61.01	58.87	58.15	62.48
KR	29.71	9.98	55.82	16.19	35.94	50	30.93	12.82	58.32	27.67	42.8	49.84

Notes: Exceptions to the reference period: MK (field of R&D: 04): 2010-2012; PL (field of R&D: 04): 2010-2014; JP, KR (all fields of R&D), PL (field of R&D: 05), MK (field of R&D: 02): 2010-2015; SI (fields of R&D: 02, 04): 2010-2016; BE, BG, DK, DE, EE, IE, ES, HR, IT, CY, LV, LT, LU, HU, MT, RO, UK, NO, TR (all fields of R&D), PL (field of R&D: 01,02,03,06), SI (field of R&D: 01,03,05,06): 2010-2017; EL, NL, AT, SE, ME (all fields of R&D), FI (fields of R&D: 01,02,04,05,06): 2011-2017; IS (all fields of R&D): 2011-2018; BA (field of R&D: 01): 2012-2018; BA (field of R&D: 06): 2012-2018; AM, MD, UA (all fields of R&D): 2013-2018; GE (field of R&D: 01,03,04,06), BA (field of R&D: 03): 2014-2018; FI (field of R&D: 03), BA (field of R&D: 02): 2015-2017; GE (field of R&D: 02,05): 2015-2018; Data unavailable for: EU-27, EU-28, FR, CH, AL, FO, TN, IL; Break in time series for: EL, SE (2011 data; all fields of R&D); Definition differs for: NL, FI (2011 and 2017 data; all fields of R&D), SK (2010 data; all fields of R&D), DE, TR (2017 data; all fields of R&D); Data estimated for: ES (2017 data; all fields of R&D), SE(2011 data; all fields of R&D), RU (2010 data; all fields of R&D); Data provisional for: CZ (2018 data; all fields of R&D); DK (2017 data; all fields of R&D).

Other: ':' indicates that data are unavailable; '-' indicates that denominator was zero; For proportions based on fewer than 30 graduates the numerators and denominators are displayed in brackets; Proportion computed from data in head count (HC).

Source: Eurostat – Research and development statistics (online data code: rd_p_perssci) and UIS - Researchers by sector of employment and field of R&D

Table 4.5 Compound annual growth rates (%) of women researchers in the government sector, by field of R&D, 2010-2018

Country	Natural sciences		Engineering and technology		Medical and health sciences		Agricultural sciences		Social sciences		Humanities	
	CAGR	Trend	CAGR	Trend	CAGR	Trend	CAGR	Trend	CAGR	Trend	CAGR	Trend
BE	16.46		2.06		36.71		4.78		13.99		4.12	
BG	-1.80		-3.84		2.28		-3.57		7.03		-3.11	
CZ	4.82		4.75		0.77		1.28		8.57		1.23	
DK	2.36		-17.97		21.15		-		1.27		12.70	
DE	3.64		-2.26		-1.82		4.62		8.71		-1.51	
EE	-1.41		-3.53		-		-1.67		-7.93		-2.33	
IE	7.29		-100.00		-		7.46		14.93		-	
EL	9.44		3.19		30.35		19.04		9.14		4.77	
ES	-1.01		-1.67		3.71		-5.35		-2.15		-5.86	
HR	-2.80		-100.00		1.62		-0.98		-6.14		0.34	
IT	2.11		8.95		6.18		5.10		8.21		-5.00	
CY	3.08		-100.00		10.41		-		0.54		3.75	
LV	-1.11		14.72		13.71		-1.82		-1.67		45.04	
LT	5.13		11.59		23.72		3.21		5.37		3.55	
LU	2.16		-4.29		24.93		-17.97		-3.18		-100.00	
HU	3.86		-16.33		13.46		-0.77		-7.76		-0.57	
MT	-100.00		-100.00		-100.00		-		-10.94		-	
NL	-1.24		6.48		26.99		0.58		14.43		47.85	
AT	20.65		32.26		6.64		6.35		3.85		6.22	
PL	-22.03		-23.95		-6.23		-4.21		1.51		-2.32	
PT	-8.30		0.57		6.36		-7.85		-13.32		-14.02	
RO	1.18		-0.57		2.08		4.59		10.79		4.79	
SI	-1.66		-26.69		1.58		-3.99		-9.27		2.83	
SK	5.02		5.26		-4.30		0.18		6.99		11.46	
FI	-2.37		-4.47		-4.70		-4.62		-0.89		-7.20	
SE	12.93		10.94		40.44		96.75		17.46		19.24	
UK	2.33		9.98		-10.07		-2.87		1.25		-0.68	
IS	-10.12		-12.91		47.24		-15.80		-12.76		10.41	
NO	2.46		4.74		5.69		0.75		-1.73		2.38	
ME	16.33		12.25		-5.05		-		-		10.29	
MK	20.98		-100.00		18.92		12.82		-27.04		-15.43	
RS	3.81		0.98		-2.96		8.66		-1.14		8.93	
TR	1.91		2.60		-3.55		6.19		-9.23		-1.14	
BA	1.60		-62.20		73.21		:		:		4.66	
GE	-		55.36		14.01		13.75		-46.42		20.35	
AM	-6.17		5.32		9.36		4.28		11.53		-4.31	
MD	1.06		-0.60		-4.73		-0.35		0.74		-1.29	
UA	-6.53		-2.09		-1.13		-2.89		-3.33		-2.14	
JP	-0.83		1.12		2.75		1.84		2.86		-2.21	
RU	-0.36		0.17		-1.74		-2.09		-1.82		-0.59	
KR	6.97		10.42		13.93		13.72		11.44		6.58	

Notes: Exceptions to the reference period: MK (field of R&D: 04): 2010-2012; PL (field of R&D: 04): 2010-2014; PL (field of R&D: 05), MK (field of R&D: 02), JP,KR (all fields of R&D): 2010-2015; SI(field of R&D: 02,04): 2010-2016; BE, BG, DK, DE, EE, IE, ES, HR, IT, CY, LV, LT, LU, HU, MT, RO, UK, NO, TR (all fields of R&D), PL (field of R&D: 01,02,03,06), SI (field of R&D: 01,03,05,06): 2010-2017; EL, NL, AT, SE, ME (all fields of R&D), FI (fields of R&D: 01, 02, 04, 05, 06): 2011-2017; IS (all fields of R&D): 2011-2018; BA (field of R&D: 06): 2012-2016; BA (field of R&D: 01): 2012-2018; AM, MD, UA (all fields of R&D): 2013-2018; BA (field of R&D: 03), GE (fields of R&D: 01, 03, 04, 06): 2014-2018; FI (field of R&D: 03), BA (field of R&D: 02): 2015-2017; GE (field of R&D: 02,05): 2015-2018; Data unavailable for: EU-27, EU-28, FR, CH, AL, FO, TN, IL; Break in time series for: EL, SE (2011 data; all fields of R&D); Definition differs for: NL, FI (2011 and 2017 data; all fields of R&D), SK (2010 data; all fields of R&D), DE, TR (2017 data; all fields of R&D); Data estimated for: ES (2017 data; all fields of R&D), SE(2011 data; all fields of R&D), RU (2010 data; all fields of R&D); Data provisional for: CZ (2018 data; all fields of R&D); DK (2017 data; all fields of R&D).

Other: ':' indicates that data are unavailable; '-' indicates that denominator was zero; In the 'Trend' columns, the scale is not the same across countries.

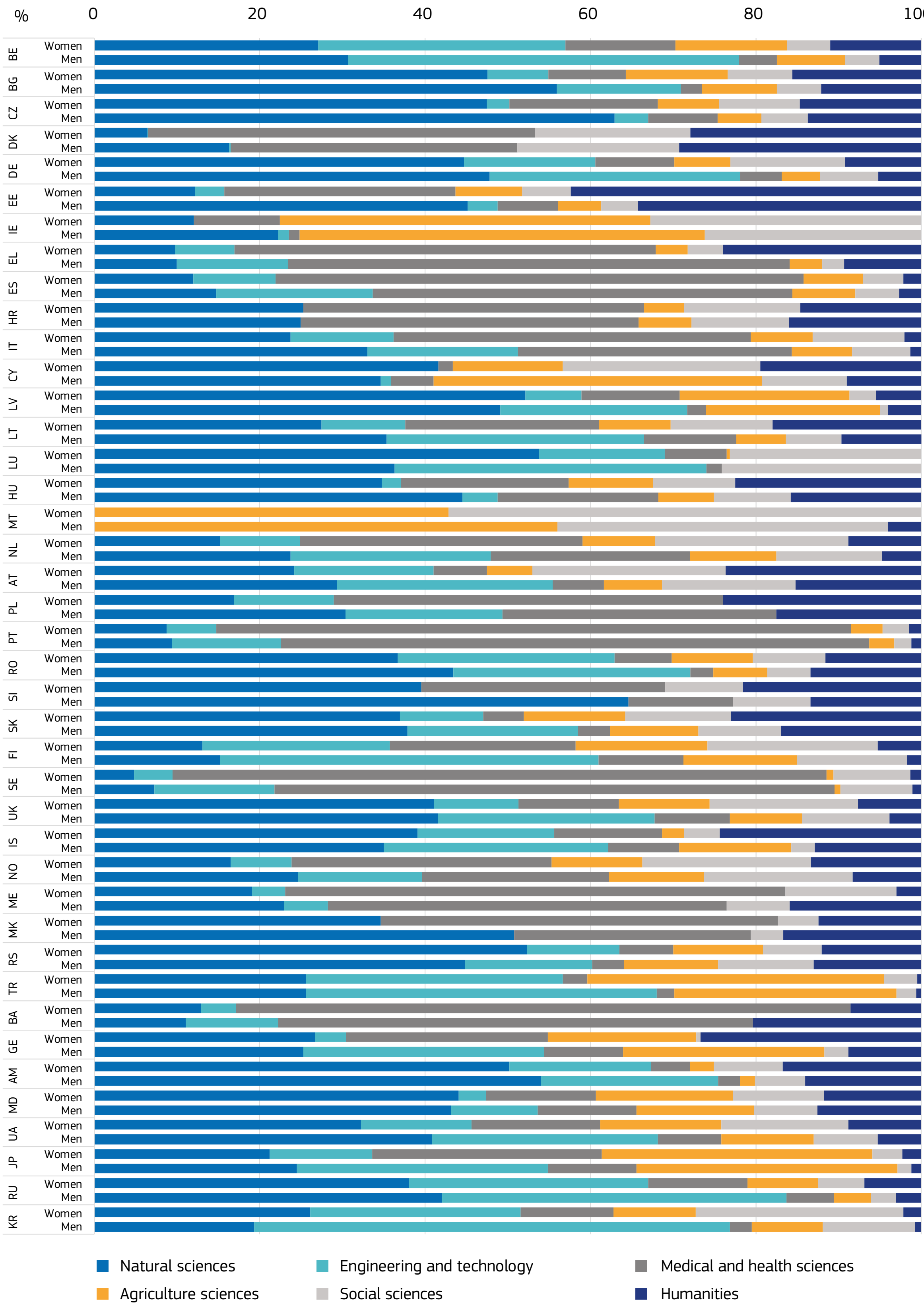
Source: Eurostat – Research and development statistics (online data code: rd_p_perssci) and UIS - Researchers by sector of employment and field of R&D

In contrast to the HES, both men and women researchers in the GOV sector were most likely to be employed in Natural Sciences and Medical & Health Sciences across several countries.

Figure 4.15 shows that the highest proportion of women researchers in the GOV sector worked in the fields of Natural Sciences in half of the EU-27 Member States and Associated Countries (19 of 38), and in Medical & Health Sciences in around one-third (13 of 38). Similarly, the highest proportion of men researchers in the GOV sector worked in Natural Sciences in half of the EU-27 Member States and Associated Countries (19 of 38) and in Medical & Health Sciences in more than one-quarter (10 of 38). The results indicate less horizontal gender segregation in Natural Sciences and Medical & Health Sciences in the GOV sector than in the HES, although this may also reflect differences in availability of research positions in different fields.

Similar to the HES, the proportion of men researchers in the fields of Engineering & Technology exceeded the corresponding proportion of women researchers in all EU-27 Member States and Associated Countries. In Natural Sciences, this was the case for all but 10 countries (HR, CY, LV, LU, IS, RS, TR, BA, GE, MD). The only EU-27 Member States and Associated Countries with a higher concentration of male researchers in Medical & Health Sciences were Greece (60.7% men and 50.9% women) and Cyprus (5.1% men and 1.8% women). By contrast, in Social Sciences, the proportion of women researchers exceeded the corresponding proportion of men researchers in all but 8 of the EU-27 Member States and Associated Countries in the GOV sector (DK, ES, LU, PL, SI, RS, BA, GE).

Figure 4.14 Distribution of researchers in the government sector across fields of R&D, by sex, 2018



Notes: Exceptions to the reference year: BE, BG, DK, DE, EE, EL, IE, ES, HR, IT, CY, LV, LT, LU, HU, MT, NL, AT, PL, RO, SI, FI, SE, UK, NO, ME, RS, TR: (2017), BA (2016), JP, KR (2015); Data unavailable for: EU-27, EU-28, FR, CH, AL, TN, IL, FO; Data confidential for: PL (fields of R&D: agricultural sciences and social sciences), SI (fields of R&D: engineering and agricultural sciences); Definition differs for: DE, HR, NL, FI, TR, JP; Data estimated for: ES; Data provisional for: CZ, DK.

Other: Percentages computed from data in head count (HC).

Source: Eurostat – Research and development statistics (online data code: rd_p_perssci) and UIS - Researchers by sector of employment and field of R&D

Given the increasing prioritisation of investment in the BES, the following indicator examines the extent of horizontal gender segregation in R&D fields in that sector. It is important to note that the number of countries with available data for the BES was much smaller than the other two sectors (HES and GOV). Careful attention must be paid to countries with low absolute values, where small changes can translate to large changes in proportions.

In the BES, the proportion of women researchers decreased in the fields of Natural Sciences and Humanities in the majority of countries between 2010 and 2018.

Similar to the other two sectors, the data show that women researchers in the BES remained under-represented in the fields of Natural Sciences and Engineering & Technology in 2018 in the majority of the EU-27 Member States and Associated Countries with available data (Table 4.6). In contrast to the other two sectors, women in the BES were also under-represented in Agricultural Sciences, Social Sciences and Humanities (although there were low total numbers for most countries in the field of Humanities, and in several countries for Social Sciences). The prevalence of a gender gap across several fields of R&D in this sector reinforces the finding that women researchers are very under-represented in the BES compared to the other two economic sectors examined (see section 4.3).

More specifically, in Natural Sciences, the proportion of women researchers increased in only four EU-27 Member States and Associated Countries (FR, CY, PT, TR) between 2010 and 2018. In Humanities, that increase was evident in five countries (FR, HU, MT, SK, BA; based on low absolute values). In Medical & Health Sciences, Engineering & Technology, Agricultural Sciences and Social Sciences, however, the presence of women researchers increased in a larger group of EU-27 Member States and Associated Countries.

The increase in the proportion of women researchers led to a more gender-balanced population of researchers in a number of EU-27 Member States and Associated Countries in some fields of R&D. In Engineering & Technology, in particular, the proportion of women researchers increased from 32.1% to 43.3% in Bosnia and Herzegovina. In Medical & Health Sciences, the proportion of researchers increased in two countries - Cyprus (from 29.0% to 43.5%) and Slovenia (from 34.8% to 55.3%). In three countries in Agricultural Sciences (CY, MT, BA), this increase led to a more gender-balanced proportion of researchers. In Social Sciences, the proportion of women researchers increased to a more gender-balanced representation in four countries (BG, HR, CY, SI), while in Humanities, the proportion of women researchers increased from 24.1% to 43.5% in Hungary.

In some countries, the increase in the presence of women researchers resulted in their over-representation within the population of researchers in 2018, compared to a previously gender-balanced proportion in 2010. In Serbia, for example, the proportion of women researchers in Medical & Health Sciences increased from 46.1% to 84.6%, while in Agricultural Sciences the corresponding proportion increased from 44.0% to 83.3%. However, it is important to note that these increases reflected low absolute values of less than 30 researchers. Similarly, in Romania, the increase in the presence of women researchers from 48.8% to 69.2% in Social Sciences resulted in their over-representation.

Table 4.6 Evolution of the proportion (%) of women among researchers in the business enterprise sector, by field of R&D, 2010 & 2018

Country	2010						2018					
	Natural sciences	Engineering and technology	Medical and health sciences	Agricultural sciences	Social sciences	Humanities	Natural sciences	Engineering and technology	Medical and health sciences	Agricultural sciences	Social sciences	Humanities
BG	:	30.82	:	60.45	:	:	:	:	66.19	:	53.97	:
CZ	19.24	8.28	58	41.3	35.78	18.18 (2/11)	15.7	10.78	51.34	39.26	26.74	0 (0/1)
EL	46.69	24.54	60.67	33.77	44.26	57.89 (11/19)	:	:	:	:	:	:
FR	24.98	13.64	59.25	44.96	36.37	45.22	25.13	13.73	60.3	39.87	37.13	50.32
HR	72.1	33.55	82.46	27.27 (6/22)	30.77 (4/13)	75 (3/4)	69.66	30.73	80.2	34.78 (8/23)	50 (4/8)	50 (1/2)
CY	34.27	13.99	28.95	0 (0/2)	37.25	-	37.59	18.18	43.48 (10/23)	50 (1/2)	52.17 (12/23)	-
HU	15.35	20.75	51.25	30.25	36.5	24.14 (7/29)	15.15	16.78	36.44	31.97	33.22	43.48 (10/23)
MT	24.68	11.25	73.08 (19/26)	0 (0/2)	0 (0/6)	0 (0/2)	18.64	23.96	43.48 (10/23)	50 (2/4)	33.33 (2/6)	66.67 (2/3)
NL	12.73	9.09	20.66	17.24	32.82	24.79	12.53	11.17	38.8	20.63	24.22	22.54
PL	23.13	13.99	63.23	58.86	58.59	51.28	19.63	14.07	65.55	47.13	36.47	42.31 (11/26)
PT	26.89	24.94	64.79	42.34	42.5	43.8	27.75	26.47	71.08	41.54	45.05	42.27
RO	35.49	32.5	74.87	56.82	48.84	50 (2/4)	33.55	35.61	74.01	40.26	69.23	25 (1/4)
SI	40.78	17.33	34.78	43.33 (13/30)	25	100 (1/1)	38.38	19.55	55.34	56.1	48.17	66.67 (14/21)
SK	40.69	15.11	52.73	47.69	50 (4/8)	:	38.98	13.41	54.67	51.72 (15/29)	42.86 (9/21)	36.36 (4/11)
ME	-	33.33	100 (2/2)	62.5 (10/16)	28.57 (4/14)	-	53.85 (14/26)	25.76	:	71.43 (10/14)	23.53 (4/17)	-
MK	:	78.49	90.53	:	:	:	31.37	29	84.51	:	60.49	:
RS	34.69	32.66	46.15 (6/13)	44 (11/25)	64.71 (11/17)	-	28.2	34.75	84.62 (11/13)	83.33 (5/6)	80 (20/25)	-
TR	23.49	21.61	55.3	31.65	44.78	54.23	28.64	21.63	47.46	31.6	28.49	36.76
BA	50 (1/2)	32.14	0	36.36 (8/22)	76.92	40 (4/10)	50 (1/2)	43.33	:	45 (9/20)	80 (4/5)	42.11 (8/19)
MD	5.71	33.18	:	11.11 (1/9)	:	:	4.76 (1/21)	18.62	100 (1/1)	20 (1/5)	:	:
UA	53.59	38.09	69.97	48.23	51.48	77.27 (17/22)	48.36	36.23	66.88	27.87	43.59	25
JP	12.44	4.68	27.82	21.9	:	:	13.32	4.99	29.81	27.11	:	:
RU	42.92	37.93	64.82	57.45	57.86	62.72	42.91	35.12	65.68	59.73	57.66	69.47
KR	23.43	8.39	41.27	23.69	28.5	47.84	26.44	10	47.18	25.28	32.48	58.74

Notes: Exceptions to the reference period: SI (all fields of R&D): 2010-2013; CZ, HR, CY, HU, MT, PT, RO, RS, TR (all fields of R&D), PL (fields of R&D: 02, 03, 04, 06), SK (fields of R&D: 01,02,03,04,06): 2010-2014; MK (field of R&D: 02), JP (fields of R&D: 01, 02, 03, 04), RU, KR (all fields of R&D): 2010-2015; FR (all fields of R&D): 2011-2013; NL (all fields of R&D), PL (fields of R&D: 01, 05), SK (field of R&D: 05), ME (fields of R&D: 01, 02, 04, 05, 06): 2011-2014; MK (field of R&D: 03): 2012-2015; BA (fields of R&D: 01, 02, 04, 06): 2012-2018; BA (field of R&D: 05): 2013-2017; MD (fields of R&D: 01, 02), UA (all field of R&D): 2013-2018; MD (field of R&D: 04): 2014-2018; Data unavailable for: EU-27, EU-28, BE, DK, DE, EE,IE, ES, IT, LV, LT, LU, AT, FI, SE, UK, IS, NO, CH, AL, AM, FO, GE, IL, TN; Break in time series for: EL (2011 data; all fields of R&D), NL (2011 data, all fields of R&D); Data estimated for: RU (2010 data, all fields of R&D); Definition differs: NL(2011 data, fields of R&D: 01, 02, 03, 04); Data confidential: SK (2010 data, field of R&D: 06) . Other: ':' indicates that data are unavailable; Data are in head count (HC); ME for Medical and health sciences and Humanities in 2013, and Medical and health sciences in 2014, the number of researchers is zero, although the Total numbers of researchers is not available; MK for Agricultural sciences and Humanities in 2015, the numbers of researchers is zero but the Total is not available; SK for Humanities in 2010, the numbers of researchers for Women is zero but it is not available for the Total.

Source: Eurostat – Research and development statistics (online data code: rd_p_perssci) and UIS - Researchers by sector of employment and field of R&D

4.8 Annex indicators

Annex 4.1 Number of researchers, by sex, 2014-2018

Country	2014		2015		2016	
	Women	Men	Women	Men	Women	Men
EU-27	**:**	**:**	**769 346**	**1 598 658**	**:**	**:**
EU-28	**:**	**:**	**961 120**	**1 903 837**	**:**	**:**
BE	:	:	25 148	48 561	:	:
BG	8 804	8 991	9 268	10 070	10 351	10 730
CZ	14 815	39 678	15 252	41 353	14 972	41 206
DK	:	:	20 469	40 023	:	:
DE	:	:	164 094	421 936	:	:
EE	3 399	4 322	3 151	4 030	2 981	3 864
IE	:	:	10 812	19 800	:	:
EL	:	:	23 078	37 658	:	:
ES	83 184	126 920	85 759	128 468	87 804	130 876
FR	96 708	273 291	:	:	111 034	285 560
HR	5 246	5 480	5 424	5 665	6 183	6 768
IT	60 532	107 542	62 828	111 499	65 431	120 485
CY	826	1 338	804	1 315	812	1 366
LV	:	:	3 993	3 834	3 861	3 539
LT	9 734	9 637	8 775	8 518	9 151	8 595
LU	780	1 214	909	2 298	:	:
HU	11 897	27 293	11 848	26 570	11 969	26 946
MT	410	939	403	1 009	422	1 048
NL	26 116	85 679	28 671	84 275	29 520	85 069
AT	:	:	23 020	55 031	:	:
PL	42 958	72 417	43 870	74 624	48 297	84 250
PT	34 874	43 862	35 757	45 248	37 293	48 487
RO	12 669	14 866	12 598	14 655	12 728	15 073
SI	4 387	7 768	4 126	7 182	3 893	7 389
SK	10 657	14 423	10 293	14 103	11 068	15 652
FI	17 818	37 697	17 995	37 733	17 479	36 273
SE	:	:	36 673	72 088	:	:
UK	183 012	306 169	191 774	305 179	197 576	313 404
IS	:	:	1 699	2 023	1 858	2 077
NO	18 725	31 300	19 507	32 674	20 520	34 081
CH	:	:	23 762	47 072	:	:
ME	839	869	840	926	:	:
MK	:	:	1 850	1 922	1 879	1 818
RS	7 452	7 711	8 044	8 294	8 032	8 560
TR	66 974	114 570	71 136	119 648	70 414	121 355
BA	811	1 020	:	:	:	:
GE	3 890	3 439	4 591	4 478	4 757	4 346
AM	2 227	1 917	2 023	1 833	1 917	1 765
MD	1 586	1 729	1 655	1 713	1 577	1 633
TN	18 323	15 673	18 869	15 720	20 610	16 566
UA	26 890	31 805	24 930	28 905	28 660	35 034
AR	44 341	39 121	43 262	39 134	45 970	40 592
JP	136 206	790 465	138 420	769 035	144 126	773 599
RU	151 492	222 413	152 929	226 482	:	:
ZA	21 471	27 008	23 334	28 543	25 591	31 170
KR	80 904	356 543	85 652	367 610	90 615	370 154

Country	2017		2018	
	Women	Men	Women	Men
EU-27	**847 730**	**1 734 472**	**:**	**:**
EU-28	**1 049 588**	**2 053 549**	**:**	**:**
BE	27 465	51 402	:	:
BG	9 935	11 036	:	:
CZ	16 005	43 784	16 461	45 505
DK	22 155	39 806	:	:
DE	173 700	449 425	:	:
EE	3 099	4 245	:	:
IE	12 605	22 116	:	:
EL	23 301	38 315	:	:
ES	91 499	134 496	:	:
FR	117 754	298 463	:	:
HR	6 637	7 071	:	:
IT	67 131	128 429	:	:
CY	897	1 460	:	:
LV	3 919	3 585	:	:
LT	9 292	9 475	:	:
LU	994	2 546	:	:
HU	13 024	29 705	:	:
MT	478	1 068	:	:
NL	30 460	84 725	:	:
AT	25 144	58 504	:	:
PL	71 611	116 294	:	:
PT	39 148	50 511	41 576	54 547
RO	12 790	14 577	:	:
SI	4 549	9 530	:	:
SK	11 259	15 602	11 843	16 912
FI	17 948	36 191	:	:
SE	34 931	72 111	:	:
UK	201 858	319 078	:	:
IS	1 755	2 028	1 755	2 028
NO	22 052	35 882	:	:
CH	25 669	47 833	:	:
ME	762	766	:	:
MK	1 749	1 597	1 850	1 614
RS	8 098	8 084	8 329	7 884
TR	78 056	132 713	:	:
BA	:	:	:	:
GE	4 782	4 296	5 764	5 115
AM	1 868	1 720	1 705	1 679
MD	1 542	1 638	1 483	1 571
TN	:	:	19 771	15 502
UA	26 533	32 859	25 780	31 850
AR	44 982	38 208	:	:
JP	150 545	780 175	:	:
RU	142 290	217 503	136 431	211 423
ZA	27 774	34 066	:	:
KR	97 042	385 754	:	:

Notes: Data not available for: AL, FO, IL; Break in time series: FR (2014), IT (2016); Definition differs for: ME (2015), JP (2014-2017); Data estimated for: RU, FR (2014), EU-27, EU-28, SE (2015), UK (2014-2017); Provisional data for: DK, FR (2017), CZ (2018).

Other: ':' indicates that data are unavailable.

Source: Eurostat – Statistics on research and development (online data code: rd_p_persocc) and UIS - Total R&D personnel by function and sector of employment)

Annex 4.2 Number of researchers in the higher education sector, by sex, 2014-2018

Country	2014		2015		2016	
	Women	Men	Women	Men	Women	Men
EU-27	**434 206**	**630 520**	**442 973**	**628 592**	**449 054**	**625 112**
EU-28	**585 184**	**822 238**	**600 261**	**818 342**	**610 868**	**818 935**
BE	14 150	20 827	13 270	18 639	13 580	18 946
BG	4 146	4 359	4 086	3 816	4 572	4 242
CZ	8 115	15 164	8 427	15 536	8 064	15 378
DK	11 525	15 906	11 769	16 231	11 682	14 555
DE	101 520	164 391	104 622	165 721	105 854	166 099
EE	2 276	2 535	2 183	2 427	2 066	2 253
IE	8 276	10 023	7 167	8 698	6 058	7 373
EL	:	:	14 135	23 328	:	:
ES	49 708	69 582	50 782	70 379	51 315	70 590
FR	40 120	73 097	:	:	48 878	74 571
HR	3 397	3 569	3 582	3 737	4 120	4 287
IT	31 949	47 271	31 198	45 205	31 938	45 867
CY	578	949	571	949	570	945
LV	2 935	2 604	2 953	2 719	2 917	2 478
LT	7 494	6 038	6 991	5 609	6 841	5 426
LU	481	746	492	798	:	:
HU	6 204	9 721	6 170	9 473	6 398	9 641
MT	292	557	286	577	282	571
NL	10 616	14 780	10 900	14 910	10 940	14 623
AT	:	:	14 655	22 044	:	:
PL	30 633	40 138	30 792	39 866	34 552	44 458
PT	24 958	26 966	25 428	26 897	26 477	27 771
RO	6 953	7 790	7 308	7 749	7 301	7 782
SI	1 865	2 511	1 810	2 376	1 575	2 201
SK	8 072	9 596	7 632	8 933	8 207	9 655
FI	10 601	11 673	10 583	11 590	10 519	11 194
SE	:	:	19 696	24 215	:	:
UK	151 059	191 637	157 301	189 737	161 870	193 767
IS	:	:	1 078	980	1 236	1 036
NO	11 077	12 327	11 709	12 895	12 305	13 233
CH	:	:	17 814	28 118	:	:
ME	478	591	446	555	:	:
MK	:	:	1 419	1 546	1 357	1 408
RS	5 241	5 528	5 694	5 936	5 667	5 835
TR	53 323	72 723	56 503	76 013	53 326	71 393
BA	745	939	:	:	:	:
GE	3 630	3 285	4 279	4 275	4 441	4 147
AM	726	494	511	321	467	223
MD	453	547	464	498	465	491
TN	17 189	13 712	17 656	13 621	19 332	14 343
UA	2 756	3 217	2 570	2 702	8 085	9 744
AR	29 778	23 765	26 960	21 796	28 990	23 060
JP	83 428	238 143	84 622	237 478	86 847	239 386
RU	20 369	23 973	21 308	24 659	:	:
ZA	17 321	21 060	19 148	22 491	21 125	24 903
KR	29 164	70 153	29 437	70 433	31 336	71 830

Country	2017		2018	
	Women	Men	Women	Men
EU-27	**473 751**	**646 407**	**:**	**:**
EU-28	**635 930**	**836 199**	**:**	**:**
BE	13 661	18 811	:	:
BG	4 153	3 771	:	:
CZ	8 618	16 392	8 910	16 777
DK	11 308	14 553	:	:
DE	109 274	169 893	:	:
EE	2 092	2 297	:	:
IE	8 354	10 085	:	:
EL	11 799	17 646	:	:
ES	53 416	72 298	:	:
FR	49 396	74 497	:	:
HR	4 474	4 581	:	:
IT	32 014	45 623	:	:
CY	607	975	:	:
LV	2 947	2 516	:	:
LT	6 588	5 400	:	:
LU	502	851	:	:
HU	6 952	10 372	:	:
MT	324	599	:	:
NL	11 261	14 839	:	:
AT	15 227	22 106	:	:
PL	50 658	60 505	:	:
PT	26 850	27 457	28 639	28 893
RO	7 664	7 859	:	:
SI	1 827	2 547	:	:
SK	8 280	9 510	8 630	10 046
FI	10 920	11 513	:	:
SE	14 585	18 910	:	:
UK	162 179	189 792	:	:
IS	1 155	1 019	1 155	1 019
NO	13 189	13 904	:	:
CH	18 581	28 883	:	:
ME	408	503	:	:
MK	1 229	1 236	1 312	1 269
RS	5 746	5 790	5 915	5 918
TR	57 359	75 199	:	:
BA	:	:	:	:
GE	4 457	4 096	5 363	4 696
AM	418	319	421	242
MD	460	497	441	474
TN	:	:	18 393	13 086
UA	6 584	8 563	6 045	7 996
AR	27 852	21 226	:	:
JP	89 106	240 249	:	:
RU	19 516	22 597	20 537	23 952
ZA	22 972	27 577	:	:
KR	32 569	70 308	:	:

Notes: Data not available for: AL, FO, IL; Break in time series: FR (2014), DE (2016); Definition differs for: ME (2015), JP (2014-2017); Data estimated for: FR (2014), RU (2014), EU-27, EU-28 (2014-2016), UK (2014-2017), IT (2015-2017); Provisional data for: DK, FR (2017), CZ (2018).

Other: ':' indicates that data are unavailable.

Source: Eurostat – Statistics on research and development (online data code: rd_p_persocc) and UIS - Total R&D personnel by function and sector of employment)

Annex 4.3 Number of researchers in the government sector, by sex, 2014-2018

Country	2014		2015		2016	
	Women	Men	Women	Men	Women	Men
EU-27	**107 522**	**149 306**	**115 617**	**154 902**	**114 715**	**149 260**
EU-28	**110 737**	**154 964**	**118 796**	**160 114**	**117 888**	**154 344**
BE	1 642	2 830	1 675	2 826	1 734	3 035
BG	3 023	2 153	2 689	2 141	2 913	2 066
CZ	3 625	5 885	3 847	6 058	3 966	5 899
DK	1 161	1 233	1 284	1 301	1 262	1 181
DE	21 389	39 835	22 247	40 543	22 426	40 414
EE	446	292	409	259	379	244
IE	209	335	235	338	:	:
EL	:	:	6 772	8 986	:	:
ES	15 094	16 000	16 257	16 114	17 143	16 497
FR	9 928	18 475	:	:	11 151	19 063
HR	1 352	1 230	1 297	1 180	1 334	1 207
IT	13 276	15 038	13 838	15 220	13 883	15 241
CY	98	76	99	78	102	74
LV	513	391	549	398	526	381
LT	928	833	963	923	1 357	1 286
LU	299	468	270	408	:	:
HU	2 688	3 569	2 698	3 592	2 606	3 544
MT	9	18	9	25	10	23
NL	4 153	6 943	4 984	6 988	5 132	7 143
AT	:	:	1 742	2 005	:	:
PL	6 718	9 332	6 469	8 999	2 312	1 661
PT	2 645	1 865	2 723	1 897	2 810	1 804
RO	3 313	3 486	3 472	3 560	3 461	3 582
SI	1 041	1 036	964	963	970	988
SK	1 937	2 038	1 958	1 999	2 160	2 262
FI	2 274	2 905	2 160	2 728	1 812	2 579
SE	:	:	5 574	6 657	:	:
UK	3 171	5 702	3 172	5 219	3 145	5 112
IS	:	:	97	145	98	143
NO	2 853	3 380	2 960	3 411	2 964	3 386
CH	379	710	394	701	:	:
ME	301	190	315	258	:	:
MK	:	:	208	210	256	239
RS	1 699	1 221	1 851	1 385	1 727	1 284
TR	2 206	5 045	2 188	5 011	2 416	5 067
BA	24	45	:	:	:	:
GE	260	154	312	203	316	199
AM	1 501	1 423	1 512	1 512	1 450	1 542
MD	1 055	991	1 116	1 012	1 086	991
TN	676	893	709	925	724	931
UA	16 006	16 478	15 288	15 399	14 725	15 467
AR	13 679	12 077	14 518	12 632	15 171	13 005
JP	5 741	28 326	6 062	28 089	6 216	28 019
RU	58 910	73 886	59 294	75 500	:	:
ZA	1 562	1 769	1 744	1 901	1 857	2 009
KR	6 885	20 623	7 223	21 763	7 553	22 018

Country	2017		2018	
	Women	Men	Women	Men
EU-27	**120 547**	**154 236**	**:**	**:**
EU-28	**123 767**	**159 443**	**:**	**:**
BE	1 811	3 141	:	:
BG	2 852	2 085	:	:
CZ	4 308	6 261	4 320	6 487
DK	1 448	1 325	:	:
DE	23 233	40 629	:	:
EE	394	248	:	:
IE	299	378	:	:
EL	6 657	9 330	:	:
ES	17 534	16 659	:	:
FR	11 286	19 188	:	:
HR	1 478	1 250	:	:
IT	14 271	15 559	:	:
CY	113	78	:	:
LV	497	399	:	:
LT	1 513	1 370	:	:
LU	255	427	:	:
HU	2 640	3 473	:	:
MT	7	25	:	:
NL	5 336	7 730	:	:
AT	2 703	3 895	:	:
PL	3 090	2 692	:	:
PT	3 214	2 113	3 360	2 141
RO	3 352	3 504	:	:
SI	1 004	1 166	:	:
SK	2 167	2 241	2 327	2 301
FI	2 068	2 707	:	:
SE	7 017	6 363	:	:
UK	3 220	5 207	:	:
IS	115	140	115	140
NO	3 024	3 399	:	:
CH	378	673	:	:
ME	299	170	:	:
MK	230	178	225	126
RS	1 819	1 215	1 906	1 206
TR	2 451	4 928	:	:
BA	:	:	:	:
GE	325	200	401	419
AM	1 450	1 401	1 284	1 437
MD	1 058	984	1 012	955
TN	:	:	708	852
UA	14 136	14 906	14 165	14 856
AR	15 188	12 758	:	:
JP	6 394	28 204	:	:
RU	56 141	73 940	56 159	75 207
ZA	1 931	1 793	:	:
KR	7 752	21 981	:	:

Annex 4.4 Number of researchers in the business enterprise sector, by sex, 2014-2018

Country	2017		2018	
	Women	Men	Women	Men
EU-27	**244 678**	**924 450**	**:**	**:**
EU-28	**278 939**	**1 046 002**	**:**	**:**
BE	11 706	29 147	:	:
BG	2 859	5 082	:	:
CZ	2 990	20 988	3 155	22 120
DK	9 252	23 840	:	:
DE	41 193	238 902	:	:
EE	553	1 647	:	:
IE	3 952	11 653	:	:
EL	4 589	11 082	:	:
ES	20 261	45 273	:	:
FR	54 656	201 691	:	:
HR	685	1 240	:	:
IT	17 665	64 395	:	:
CY	134	305	:	:
LV	475	670	:	:
LT	1 191	2 705	:	:
LU	237	1 268	:	:
HU	3 432	15 860	:	:
MT	147	444	:	:
NL	13 863	62 156	:	:
AT	6 901	32 172	:	:
PL	17 076	52 152	:	:
PT	8 774	20 636	9 233	23 178
RO	1 732	3 120	:	:
SI	1 698	5 771	:	:
SK	763	3 725	844	4 457
FI	4 565	21 687	:	:
SE	13 329	46 838	:	:
UK	34 261	121 553	:	:
IS	485	869	485	869
NO	5 839	18 579	:	:
CH	6 710	18 277	:	:
ME	38	78	:	:
MK	249	158	281	201
RS	532	1 078	506	760
TR	18 246	52 586	:	:
BA	:	:	:	:
MD	24	157	30	142
TN	:	:	670	1 564
UA	5 813	9 390	5 570	8 998
AR	1 678	3 965	:	:
JP	53 557	503 493	:	:
RU	66 085	120 262	59 321	111 884
ZA	2 627	4 515	:	:
KR	54 768	288 599	:	:

Notes: Data not available for: AL, BA, GE, FO, IL; Break in time series: IT (2016); Definition differs for: NO (2014), ME (2015), JP (2014-17); Data estimated for: EU-27, EU-28 (2015), RU (2014); Provisional data for: CZ (2018), DK, FR (2017).

Other: ':' indicates that data are unavailable

Source: Eurostat – Statistics on research and development (online data code: rd_p_persocc) and UIS - Total R&D personnel by function and sector of employment)

Annex 4.5 Number of researchers in the higher education sector, by field of R&D and sex, 2018

Country	Natural sciences		Engineering and technology		Medical and health sciences		Agricultural sciences	
	Women	Men	Women	Men	Women	Men	Women	Men
BE	2 525	4 365	1 360	4 856	4 163	3 674	831	1 336
BG	316	590	732	1 003	1 340	929	93	220
CZ	1 563	3 819	1 529	5 357	2 344	2 874	532	738
DK	1 518	3 354	947	2 787	5 041	4 359	674	562
DE	17 097	36 151	12 510	48 866	32 553	32 092	3 898	3 860
EE	549	894	179	477	336	190	99	113
IE	1 802	2 979	982	2 582	1 900	1 175	292	270
EL	1 843	2 750	2 300	4 225	2 144	3 090	582	819
ES	9 698	13 085	9 944	15 821	9 935	12 473	1 509	2 101
HR	431	458	828	1 556	949	774	406	406
IT	8 436	10 292	4 415	12 232	5 472	7 225	1 943	2 424
CY	111	215	122	277	64	84	4	8
LV	448	583	629	1 019	484	255	301	199
LT	1 227	1 293	735	1 355	1 052	638	170	144
LU	99	282	52	296	42	35	0	0
HU	892	2 163	621	2 115	1 449	1 554	432	606
MT	28	64	28	150	92	101	2	6
NL	1 799	2 733	1 314	3 176	3 433	4 532	502	618
AT	2 821	6 330	1 891	5 507	3 563	3 868	612	498
PL	8 994	12 250	6 521	15 852	10 134	7 226	3 344	3 055
PT	6 289	6 052	3 643	7 844	4 776	3 099	905	740
RO	1 552	1 641	2 742	3 433	1 661	1 177	1 153	1 089
SI	165	383	247	773	492	377	212	106
SK	1 387	1 741	1 533	3 160	1 532	1 123	428	422
FI	1 691	3 477	1 060	2 668	2 622	1 573	326	218
SE	2 345	5 443	1 442	3 846	4 651	3 742	467	479
UK	26 435	41 600	15 245	46 812	49 789	31 358	2 271	1 859
IS	126	209	36	141	523	307	42	22
NO	1 223	2 402	769	2 244	4 975	3 365	180	141
CH	3 438	7 319	2 496	7 622	3 192	3 473	688	509
ME	53	56	90	139	8	5	24	21
MK	129	185	338	399	211	76	129	146
RS	1 023	798	1 276	1 994	1 329	982	369	403
TR	3 872	4 811	7 749	15 279	22 866	24 070	1 455	2 912
BA	158	165	200	356	80	38	51	55
GE	930	1 081	716	1 060	806	491	151	119
AM	90	69	35	42	70	32	1	0
MD	95	109	43	124	69	50	26	57
UA	1 378	2 088	2 023	4 266	280	183	397	419
JP	4 460	27 035	4 428	38 877	35 557	75 025	2 554	9 515
RU	5 112	6 972	3 432	8 383	1 239	1 000	656	511
KR	4 622	10 479	4 838	29 334	8 119	10 193	1 376	3 477

Country	Social sciences		Humanities		Not specified	
	Women	Men	Women	Men	Women	Men
BE	3 115	2 923	1 667	1 657	0	0
BG	1 128	986	613	406	0	0
CZ	2 030	2 710	912	1 279	:	:
DK	1 985	2 266	1 143	1 225	:	:
DE	24 226	29 717	18 989	19 208	:	:
EE	547	365	382	258	0	0
IE	2 478	2 261	899	819	41	42
EL	2 777	3 946	2 153	2 816	:	:
ES	15 213	19 596	7 117	9 222	:	:
HR	1 011	788	849	599	0	0
IT	7 192	8 729	4 556	4 721	213	197
CY	226	281	80	110	0	0
LV	685	288	400	172	:	:
LT	2 135	1 223	1 269	747	:	:
LU	213	148	96	90	:	:
HU	2 101	2 234	1 457	1 700	:	:
MT	128	167	46	111	3	7
NL	2 837	2 450	1 376	1 330	:	:
AT	3 764	3 776	2 576	2 127	0	0
PL	11 568	11 779	10 098	10 341	:	:
PT	7 709	6 244	5 317	4 914	:	:
RO	407	290	149	229	:	:
SI	436	429	188	181	:	:
SK	2 391	2 105	1 359	1 495	:	:
FI	3 611	2 436	1 610	1 141	:	:
SE	4 012	3 714	1 667	1 688	472	440
UK	28 868	31 351	36 166	30 379	3 392	6 999
IS	313	233	111	107	9	28
NO	4 376	4 034	1 666	1 718	81	54
CH	5 549	5 881	2 139	2 006	:	:
ME	143	212	90	70	:	:
MK	256	293	249	170	:	:
RS	1 305	1 249	613	492	0	0
TR	14 275	18 141	7 142	9 986	:	:
BA	235	237	129	84	4	9
GE	1 415	1 278	1 338	652	7	15
AM	95	47	130	52	:	:
MD	174	106	34	28	:	:
UA	1 716	852	251	188	1 611	1 635
JP	15 007	36 321	10 523	18 819	6 541	25 519
RU	6 532	5 021	3 566	2 065	:	:
KR	6 098	10 610	4 384	6 340	:	:

Notes: Exceptions to the reference year: BE, IS (Not specified: women and men): 2011; BG (Not specified: women and men): 2012; AT, SE, UK, BA (Not specified: women and men): 2013; BG (Agricultural sciences: men), IE, HR, IT, CY, NO, RS (Not specified: women and men): 2014; JP, KR (all available fields of R&D: women and men), EE, MT, UA (Not specified: women and men): 2015; BG (natural sciences: men, engineering: women and men, agricultural sciences: women), SI (natural sciences and engineering : women and men, agricultural sciences: men): 2016; BE, DK, DE, EE, IE, EL, ES, HR, IT, CY, LV, LT, LU, HU, MT, NL, AT, PL, RO, FI, SE, UK, NO, CH, ME, TR (all available fields of R&D - except not specified: women and men), BG(natural sciences: women, medical sciences, social sciences and humanities: women and men), SI (medical sciences, social sciences and humanitites: women and men, agricultural sciences: women) : 2017; Data unavailable for: EU-27, EU-28, FR, AL, FO, IL, TN; Definition differs for: DE (fields of R&D: natural sciences, engineering, medical sciences, humanities, women and men); Data estimated for: ES, IT, UK (all available fields of R&D, women and men); Data provisional for: CZ, DK (all available fields of R&D, women and men), MT (field of R&D: not specified, women and men).

Other: ':' indicates that data are unavailable; Data are in head count (HC).

Source: Eurostat – Research and development statistics (online data code: rd_p_perssci) and UIS - Researchers by sector of employment and field of R&D

Annex 4.6 Number of researchers in the government sector, by field of R&D and sex, 2018

Country	Natural sciences		Engineering and technology		Medical and health sciences		Agricultural sciences	
	Women	Men	Women	Men	Women	Men	Women	Men
BE	491	964	541	1 484	241	144	244	260
BG	1 357	1 167	209	312	267	54	352	189
CZ	2 053	4 081	116	265	775	543	320	344
DK	93	216	1	3	678	459	0	0
DE	10 391	19 416	3 692	12 324	2 207	2 049	1 583	1 875
EE	48	112	14	9	110	18	32	13
IE	36	84	0	5	31	5	134	185
EL	651	928	478	1 259	3 390	5 661	259	363
ES	2 099	2 463	1 745	3 147	11 196	8 456	1 254	1 271
HR	369	303	0	0	602	496	70	78
IT	3 384	5 142	1 786	2 834	6 158	5 152	1 074	1 132
CY	47	27	0	1	2	4	15	31
LV	259	196	34	90	59	9	102	84
LT	416	484	153	427	355	153	131	82
LU	137	155	39	161	19	8	1	0
HU	918	1 545	62	150	535	674	269	232
MT	0	0	0	0	0	0	3	14
NL	813	1 835	516	1 869	1 820	1 864	471	805
AT	654	1 144	455	1 016	175	241	149	273
PL	331	620	236	387	923	675	826	698
PT	294	201	202	282	2 578	1 523	129	66
RO	1 230	1 522	879	1 004	231	98	330	228
SI	361	665	9	31	269	130	65	87
SK	860	871	235	475	114	90	285	245
FI	323	455	557	1 370	554	307	393	411
SE	336	461	330	926	5 547	4 311	58	45
UK	1 324	2 165	327	1 363	391	473	354	456
IS	45	49	19	38	15	12	3	19
NO	498	837	224	510	950	768	333	390
ME	57	39	12	9	181	82	0	0
MK	78	64	0	0	108	36	42	42
RS	997	541	213	185	125	47	206	137
TR	628	1 261	761	2 092	73	104	880	1 324
BA	11	13	3	6	9	15	:	:
GE	107	106	15	122	98	40	72	102
AM	645	776	219	308	61	38	37	26
MD	446	412	33	100	135	114	168	136
UA	4 571	6 064	1 894	4 060	2 204	1 145	2 074	1 656
JP	1 170	6 580	682	8 140	1 530	2 866	1 803	8 478
RU	21 373	31 629	16 230	31 330	6 772	4 327	4 773	3 335
KR	1 885	4 210	1 840	12 517	810	579	717	1 874

Country	Social sciences		Humanities		Not specified	
	Women	Men	Women	Men	Women	Men
BE	95	130	199	159	0	0
BG	222	111	445	252	0	0
CZ	421	363	635	891	:	:
DK	272	259	404	388	0	:
DE	3 223	2 873	2 136	2 092	:	:
EE	23	11	167	85	0	0
IE	98	99	0	0	:	:
EL	284	247	1 595	872	:	:
ES	870	876	371	447	:	:
HR	206	143	213	194	0	0
IT	1 577	1 094	292	205	:	:
CY	27	8	22	7	0	0
LV	16	4	27	16	:	:
LT	186	92	272	132	:	:
LU	59	103	0	0	:	:
HU	263	324	593	548	:	:
MT	4	10	0	1	0	0
NL	1 246	989	470	367	:	:
AT	631	630	639	591	0	0
PL	430	495	470	357	:	:
PT	108	44	49	25	:	:
RO	295	183	387	469	:	:
SI	85	96	197	138	:	:
SK	297	231	536	389	:	:
FI	507	397	129	51	:	:
SE	654	553	92	67	1 855	1 272
UK	577	552	247	198	:	:
IS	5	4	28	18	30	42
NO	617	612	402	282	:	:
ME	40	13	9	27	:	:
MK	11	5	28	21	:	:
RS	135	139	230	157	0	0
TR	97	118	12	29	:	:
BA	8	7	6	11	8	38
GE	2	12	107	37	1	0
AM	107	88	215	201	:	:
MD	111	73	119	120	:	:
UA	2 177	1 155	1 245	776	181	144
JP	198	455	127	312	:	:
RU	3 157	2 272	3 854	2 314	:	:
KR	1 817	2 428	154	155	:	:

Notes: Exceptions to the reference year: BE, SE, IS (not specified: women and men), DK (not specified: women): 2011; BG (not specified: women and men), MK (agricultural sciences: women and men): 2012; AT (not specified: women and men), BA (social sciences: women and men): 2013; HR, CY, RS, GE (not specified: women and men), PL (agricultural sciences: women and men): 2014; EE, MT, UA (not specified: women and men), PL (social sciences: women and men), MK (engineering and technology: women and men), JP, KR (all available fields: women and men): 2015; SI (engineering and technology, agricultural sciences: women and men), BA (humanities: women and men): 2016; BE, BG, DK, DE, EE, IE, EL, ES, HR, IT, CY, LV, LT, LU, HU, MT, NL, AT, RO, FI, SE, UK, NO, ME, TR (all fields of R&D except not specified: women and men), PL (natural sciences, engineering and technology, medical sciences, humanities: women and men), SI (natural sciences, medical sciences, social sciences, humanities: women and men), BA (engineering and technology, not specified: women and men): 2017; Data unavailable for: EU-27, EU-28, FR, CH, AL, FO, TN, IL; Break in series: SE (not specified: women and men); Definition differs for: DE, NL, FI, TR (all fields of R&D except not specified: women and men); Data estimated for: ES (all fields of R&D except not specified: women and men), SE (not specified: women and men); Data provisional for: CZ, DK (all fields of R&D except not specified: women and men), MT (not specified: women and men).

Others: ':' indicates that data are unavailable; Data are in head count (HC).

Source: Eurostat – Research and development statistics (online data code: rd_p_perssci) and UIS - Researchers by sector of employment and field of R&D

Annex 4.7 Number of researchers in the business enterprise sector, by field of R&D and sex, 2018

Country	Natural sciences		Engineering and technology		Medical and health sciences		Agricultural sciences	
	Women	Men	Women	Men	Women	Men	Women	Men
BG	127	:	294	660	701	358	52	53
CZ	922	4 950	1 539	12 732	249	236	128	198
EL	155	177	1 101	3 385	378	245	52	102
FR	15 654	46 628	18 495	116 187	4 899	3 225	1 849	2 788
HR	62	27	264	595	158	39	8	15
CY	53	88	18	81	10	13	1	1
HU	795	4 452	1 748	8 667	207	361	148	315
MT	44	192	46	146	10	13	2	2
NL	1 826	12 750	4 989	39 679	2 259	3 563	1 142	4 394
PL	863	3 533	2 985	18 228	1 383	727	222	249
PT	1 015	2 643	3 779	10 496	1 322	538	226	318
RO	105	208	1 694	3 063	487	171	31	46
SI	532	854	758	3 119	57	46	23	18
SK	184	288	372	2 402	41	34	15	14
ME	14	12	17	49	0	0	10	4
MK	16	35	29	71	120	22	0	:
RS	97	247	375	704	11	2	5	1
TR	1 682	4 190	8 458	30 652	794	879	273	591
BA	1	1	39	51	:	:	9	11
MD	1	20	27	118	1	0	1	4
UA	1 064	1 136	4 309	7 586	103	51	68	176
JP	16 992	110 598	18 722	356 640	4 856	11 432	4 013	10 787
RU	7 338	9 763	61 972	114 468	733	383	261	176
KR	9 480	26 376	25 602	230 334	1 684	1 885	871	2 575

Country	Social sciences		Humanities		Not specified	
	Women	Men	Women	Men	Women	Men
BG	34	29	:	:	0	0
CZ	138	378	0	1	:	:
EL	108	136	11	8	:	:
FR	1 129	1 912	315	311	1 421	5 508
HR	4	4	1	1	0	0
CY	12	11	0	0	0	0
HU	97	195	10	13	:	:
MT	2	4	2	1	3	6
NL	1 038	3 247	94	323	:	:
PL	62	108	11	15	:	:
PT	546	666	41	56	0	0
RO	27	12	1	3	:	:
SI	92	99	14	7	:	:
SK	9	12	4	7	:	:
ME	4	13	0	0	:	:
MK	49	32	0	0	:	:
RS	20	5	0	0	0	0
TR	102	256	136	234	0	0
BA	4	1	8	11	1	4
MD	:	:	:	:	:	:
UA	17	22	9	27	167	170
JP	:	:	:	:	:	:
RU	1 486	1 091	314	138	:	:
KR	2 020	4 200	7 527	5 288	:	:

Notes: Exceptions to the reference year: BG (engineering and technology: women and men, agricultural studies: men): 2010; EL (all available fields: women and men), ME (medical sciences: men): 2011; BG, PT (not specified: women and men): 2012; BG (natural sciences, agricultural sciences: women), FR, SI (all available fields of R&D: women and men): 2013; BG (medical sciences, social sciences: women andn men), CZ, HR, CY, HU, MT, NL, PL, RO, SK, RS, TR (all available fields of R&D: women and men), PT (all fields of R&D except not specified: women and men), ME (all fields of R&D for women an men with exception to medical sciences: men): 2014; MK, JP, RU, KR (all available fields of R&D: women and men), UA (not specified: women and men): 2015; BA (social sciences: women and men): 2017; Data unavailable for: EU-27, EU-28, BE, DK, DE, EE, IE, ES, IT, LV, LT, LU, AT, FI, SE, UK, IS, NO, CH, AL, GE, AM, FO, TN, IL; Break in series: EL (all available fields of R&D: women and men). Others: ':' indicates that data are unavailable; Data are in head count (HC); For some countries the latest available year is not the same for Women and Men due to unavailability of Total.

Source: Eurostat – Research and development statistics (online data code: rd_p_perssci) and UIS - Researchers by sector of employment and field of R&D

CHAPTER 5

WORKING CONDITIONS OF RESEARCHERS

KEY TAKEAWAYS

The past decade has seen the EU take action to address precarious work, including directives on transparent and predictable working conditions and work-life balance (European Parliament and the Council, 2019), and relevant policy initiatives such as the New Skills Agenda for Europe (European Commission, 2020f), the Digital Europe Programme (European Commission, 2021b) and the Gender Equality Strategy for 2020-2025 (European Commission, 2020b). Precarious work continues to be an issue, however. The COVID-19 pandemic has exacerbated the issue, particularly for women with caring responsibilities (European Parliament, 2020). The data presented in this chapter show that a higher proportion of women researchers than men researchers worked part-time and under precarious working contracts in the HES across the EU. Women and men researchers at earlier career stages were more likely to work under precarious contracts. In terms of mobility, which is another measure of working conditions, men researchers were more mobile than women researchers at more advanced career stages. When it comes to spending per researcher, some countries demonstrated an inverse relationship between R&D expenditure and the proportion of women researchers.

- Similar to the trends observed in previous years, in 2019, the **proportion of women researchers working part-time was higher than the corresponding proportion of men researchers** by 3.9 p.p. (11.1% for women and 7.2% for men) at European level (Figure 5.1). In addition, 9% of women researchers and 7.7% of men researchers in the HES worked in precarious contracts at European level (Figure 5.2). The 2020 ERA Communication committed to strengthening measures to reduce the precariousness of researchers in the EU (European Commission, 2020a). To support this objective, a gender-sensitive approach is needed to address the gendered patterns in precariousness and part-time work.

- In the HES, a **higher proportion of women researchers who were in a couple with children worked under a precarious contract** in 2019, although the situation was more varied at country level (Table 5.1). While the Work-Life Balance Directive (European Parliament and the Council, 2019) promotes equal sharing of care responsibilities between parents, more institutional support is needed at research organisations to support the reconciliation of work and family.

- Reflecting concerns raised in the ERA Communication (European Commission, 2020a) on precarious employment for new entrants in research, European-level data show that **both women and men researchers were more likely to be employed under precarious contracts at the earliest career stage** in 2019 (Table 5.2).

- In 2019, there was no prominent gender difference in the international mobility of researchers during their PhD (Figure 5.3). **Men researchers in more advanced career stages were more mobile than women researchers, at European level**, although this pattern varied between countries (Figure 5.4). Given the importance of career mobility for a truly open and excellence-driven ERA, it is essential to support women's mobility at more advanced career stages.

- At European level, **R&D expenditure was** 160,841 purchasing power standards (PPS)[1] per researcher in 2018, an amount that was **lower than the equivalent expenditure in competing economies** such as China (except Hong Kong) (189,108), Japan (171,120) and the United States (US) (269,044). Some countries with high spending on R&D expenditure per researcher had low representation of women researchers.

- Demonstrating current efforts to implement institutional change measures for gender equality in research organisations, data from web-scraping show that, in 2020, **the majority of organisations considered in the EU-27 Member States and Associated Countries took actions and measures towards gender equality**, as demonstrated on their websites.

1 An artificial common currency used to eliminate the differences in price levels between countries - one unit of PPS buys the same volume of goods and services in all countries.

5.1 Introduction

This chapter examines the comparative working conditions of women and men researchers and assesses the importance of institutional Gender Equality Plans (GEPs) for promoting gender equality in research careers. The 2012 ERA Communication prioritised an open labour market for women and men researchers, as well as gender equality and gender mainstreaming in research, both of which entail promoting equal working conditions for women and men (European Commission, 2012).

The European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers (EURAXESS, 2005a; 2005b) form part of the ERA instruments for improved working conditions. Both the Charter and the Code are implemented through the Human Resources Strategy for Researchers (HRS4R) and have been an important driving force in removing barriers to researchers' mobility and the fragmentation of research careers in Europe. Along with the other actions underpinning mobility (e.g. EURAXESS, Marie Skłodowska-Curie actions), the Charter & Code have played an important role in supporting researchers' careers (European Commission, 2020g).

However, more effort is needed to implement common standards for researchers' working conditions and to ensure that research careers remain attractive and sustainable for women and men across the EU (European Commission, 2020g).

Recognising the need for a more comprehensive approach, the 2020 ERA Communication (European Commission, 2020a) committed to delivering, by the end of 2024, a toolbox of support to researchers, which will include: i) a Researcher Competence Framework, ii) a mobility scheme to support exchange between industry and academia, iii) training under Horizon Europe, and iv) a one-stop shop portal for enhanced mobility. More effort is also needed to ensure that gender equality is fully embedded in the revised European framework for researchers and transformational agenda for universities.

Steps are now being taken in the direction of comprehensive uptake of the gender equality priority, in the context of the ongoing process of revision of the Charter & Code, which will strengthen and bring to the forefront gender equality in its set of principles. As highlighted by the Commission's Gender Equality Strategy 2020-2025 (2020b), women carry a disproportionate burden of unpaid care work due to stereotypes related to women's caring responsibilities. The COVID-19 pandemic also presented new challenges to ensuring equal working conditions for women and men and created new barriers to mobility. During the COVID-19 pandemic, women likely experienced adverse effects of gender inequalities in relation to part-time and precarious work. A report by the Commission's Joint Research Centre warned that women feel pressured to reduce their workload or quit their job temporarily to meet growing household demands due to the pandemic, for example (Blasko et al, 2020). A survey of 4,535 principal investigators in scientific projects in Europe and the U.S. also found that women academics, especially, scientists with young children, have experienced a substantial decline in research time (Myers et al, 2020). It is therefore essential that research organisations implement measures to address the potential gendered impact of the COVID-19 pandemic (GENDERACTION, 2020a).

Section 5.2 analyses data on women and men researchers' employment in part-time contracts and precarious working contracts (where 'precarious' means those with no contracts, with fixed-term contracts of up to one year, or with other contracts often associated with student status). The 2020 ERA Communication asserts that the precariousness of employment, particularly for new entrants, has not improved sufficiently in recent years, which might push talented researchers to work outside Europe (European Commission, 2020a). Women in the EU tend to be over-represented in part-time work, which might be linked to gender norms and stereotypes related to family responsibilities and gender segregation in employment. To address the issue, the Commission promoted the equal sharing of care responsibilities between parents through the Work-Life Balance Directive (European Parliament and the Council, 2019). This section provides an understanding of the prevalence of part-time and precarious working contracts in the HES for women and men researchers, in light of both family status and career stage.

Section 5.3 explores gender differences in the mobility of women and men researchers. Career mobility has been a core priority of the ERA since its inception, as a means of ensuring a truly open and excellence-driven ERA, supported by tools such as the EURAXESS pan-European portal for research jobs (European Commission, 2020g). The 2020 ERA Communication reasserted commitments to enhanced mobility by broadening the EURAXESS to the ERA Talent Platform, offering a one-stop shop for people to manage their learning and careers (European Commission, 2020a). Given that career mobility is an important measure of a well-functioning ERA, it is essential to examine potential gender differences in this area.

Section 5.4 analyses the R&D expenditure per researcher as they relate to women's participation in the research workforce and sector. Increased dependence on short-lived, project-based funding has contributed to imbalances between the number of PhD graduates and the number of tenure-track positions in the public science systems (European Commission, 2020a). R&D expenditure as a percentage of GDP has been shown to be lower in the EU than in other countries, with the US, Japan and South Korea all increasing their R&D expenditure (European Commission, 2020g). This section examines the comparative level of R&D expenditure per researcher and considers the potential correlation between R&D expenditure and the presence of women researchers.

Section 5.5 explores the implementation of institutional change to promote gender equality in research organisations. Tackling the systemic barriers that continue to hinder progress towards gender equality in research careers requires structural and cultural transformation of institutions. Since the 2012 ERA Communication (European Commission, 2012), gender equality as a priority has been progressively strengthened. Three objectives were identified: gender equality in careers at all levels; gender equality in decision-making; and the integration of the gender dimension into R&I content. To achieve these objectives, Member States have been invited to develop ERA national action plans addressing these objectives and to engage in partnerships with funding agencies, research organisations and universities to foster institutional change through GEPs. The European Commission has supported such change within research funding and research performing organisations, including universities, through the implementation of GEPs, funded under the Seventh Framework Programme (FP7) and Horizon 2020.

One of the 14 actions mentioned in the 2020 ERA Communication (European Commission, 2020a) is the development of inclusive GEPs with the EU Member States, Associated Countries and relevant stakeholders, building on the heightened priority set on gender equality and inclusiveness in the Horizon Europe Framework Programme for R&I (2021-2027). One of the key new provisions in Horizon Europe to support the ERA objectives is the requirement for all research organisations, higher education institutions and public bodies from Member States and Associated Countries to have a GEP in place, as an eligibility criterion to participate in the programme (European Commission, 2021a). A new indicator is presented in this section, which considers the current state of play in the implementation of measures to promote gender equality in research organisations.

5.2 Women and men researchers working in part-time employment and precarious working contracts

Data from previous She Figures editions showed that the proportion of women employed under precarious working contracts and working in part-time employment was higher than that of men in most countries examined. Given the European Commission's renewed commitment to supporting researchers in the ERA, the following indicators examine the level of progress made towards reducing the gender gap in part-time and precarious work. To further examine the potential factors that increase precarious working conditions of women and men researchers, this section provides new disaggregation, taking into account family status and career stage.

MORE survey:

The MORE Surveys are part of the Mobility and Career Paths of Researchers in Europe (MORE) Project (European Commission, 'MORE', 'MORE2', 'MORE3' and 'MORE4'), funded by the European Commission. She Figures uses data from the survey of higher education institutions. The most recent survey of over 10,000 individual researchers working in the EU was conducted between April and May 2019. The survey addressed researchers with both EU and non-EU citizenship, and included researchers who had been mobile outside the EU but who had returned to work in the EU. It did not include EU and non-EU researchers working outside the EU when the survey was carried out. The sampling and survey strategy guaranteed representative data at country level. (European Commission, 2019d).

Women represented a higher proportion of the part-time researchers employed in the HES.

Part-time work is an important feature of women's and men's working conditions that could shed light on underlying gender inequalities. The predominance of women in part-time work could be explained by gender stereotypes related to increased family responsibilities. Nevertheless, part-time work could also be a means of increasing labour market participation of people who were previously excluded from the labour market, such as mothers (European Commission, 2016). Different types of work flexibility may have fewer negative, gender-specific consequences, as a critical analysis of part-time work in the Netherlands showed (Vinkenburg et al., 2015).

As a first step towards a better understanding of the situation, Figure 5.1 considers the relative propensity of women and men researchers to be employed part-time in the HES.

The data show that, in 2019, at European level, the proportion of women researchers employed part-time in the HES exceeded that of men by 3.9 p.p. (11.1% for women and 7.2% for men) (Figure 5.1). Box 19 provides examples of efforts by higher education institutions to support work-life balance among researchers with caring responsibilities.

BOX 19 Promoting work-life balance in research careers

In **Austria**, the Federal Ministry of Education, Science and Research promotes a range of gender-sensitive actions in research, including more gender-appropriate career models and selection procedures in public universities that take into account different life-phase and biographical circumstances, such as the reconciliation of work and study with care responsibilities[2].

In **Sweden**, universities proactively support staff who have been on parental leave to reintegrate into the workforce. Uppsala University's 'Parental Policy', for example, offers staff and postgraduate students a planning discussion with their manager or supervisor prior to and after their leave[3].

In **Spain**, a legislative change in 2019 (Real Decreto 103/2019) aiming to promote science and research included provisions to ensure that researchers within universities and national research organisations are not negatively impacted by career breaks, in respect of recruitment and evaluation processes[4].

Among the EU-27 Member States and Associated Countries, the proportion of women researchers working part-time in the HES was larger than that of men in most countries for which data were available (25 of 31). The largest difference between women and men working in part-time employment was found in Austria (17.8 p.p.), Iceland (12.3 p.p.) and Hungary (12.1 p.p.). The lowest proportions of part-time employment among women researchers in the HES were found in Italy (2.1%), France (3.1%) and Croatia (3.2%).

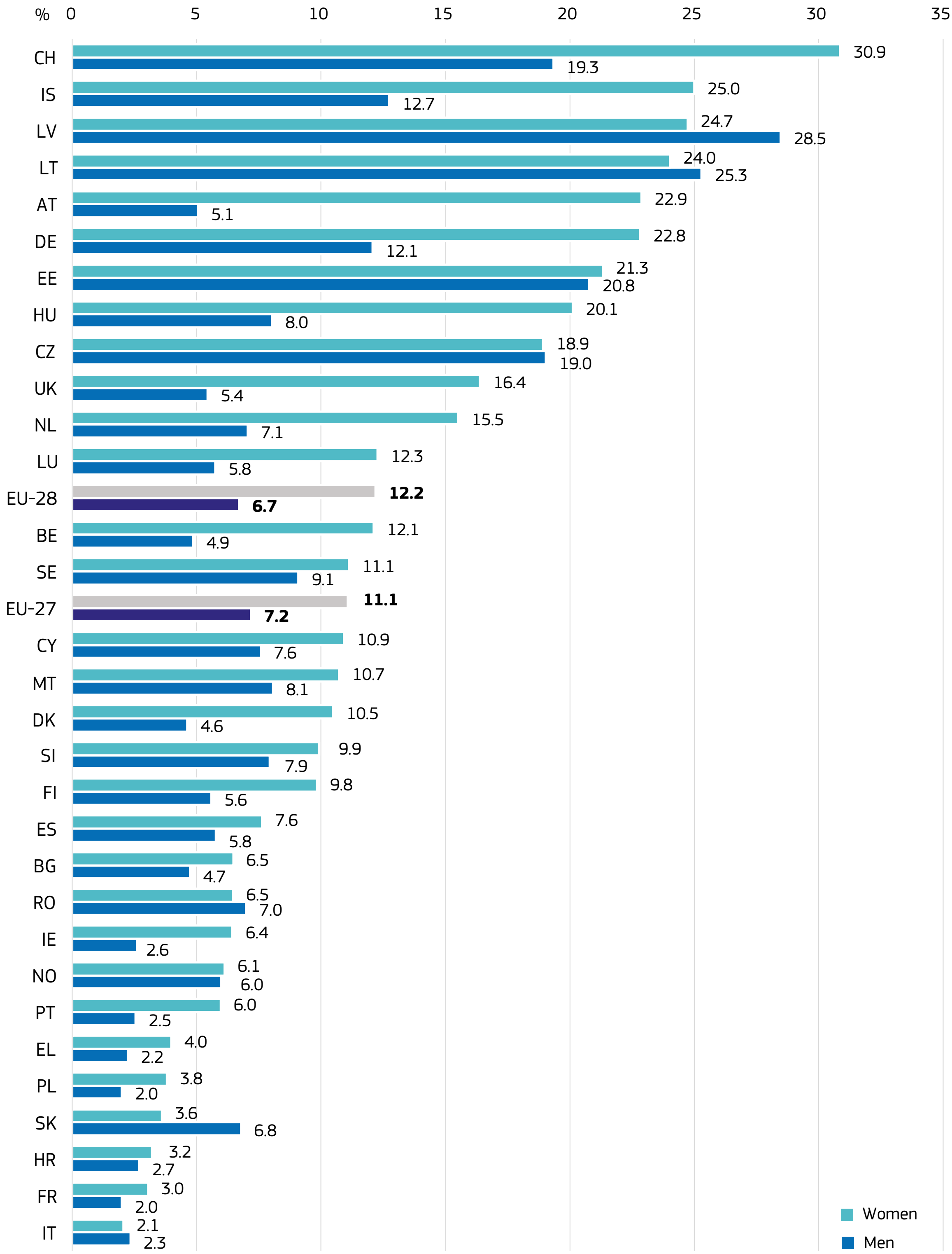
In the six countries (CZ, IT, LT, LV, RO, RO) where the proportion of men researchers working in part-time employment exceeded the equivalent proportion of women researchers, the difference between these proportions was smaller than 4 p.p. Czechia had the smallest difference (0.1 p.p.), while Latvia had the largest, at 3.7 p.p.

2 GENDERACTION policy brief on 'disruptive measures for gender equality in R&I', https://genderaction.eu/policy-advice/gender-equality-in-era/

3 Ireland National Framework for Gender Equality in Higher Education, https://hea.ie/assets/uploads/2017/06/HEA-National-Review-of-Gender-Equality-in-Irish-Higher-Education-Institutions.pdf

4 European Commission and OECD (2021). STIP Compass: International Database on Science, Technology and Innovation Policy (STIP), https://stip.oecd.org

Figure 5.1 Proportion (%) of part-time employed among researchers in HES, by sex, 2019



Notes: Data unavailable for: ME, MK, AL, RS, TR, BA, AM, FO, GE, IL, MD, TN, UA.

Others: This indicator compares the part-time employment rate amongst women researchers and men researchers respectively (each calculated as a percentage of the respective total number of women and men researchers). It includes researchers at all career stages and in all fields of education; Countries are defined by researchers' country of current employment; Weighting applied to increase representativeness of sample; Data are weighted by Field of Study.

Source: MORE4 survey

Consistent with the approach followed in the MORE2 and MORE3 surveys, researchers with precarious working contracts are those with no contracts, with fixed term contracts of up to one year or less, or with other contracts (often associated with student status)[5] (Figure 5.2).

The prevalence of 'precarious contracts' in the HES was higher among women in over two-thirds of countries where data were available.

The data show that, in 2019, a greater proportion of women researchers worked under precarious contracts in the HES at European level (9% for women, compared to 7.7% for men).

The higher prevalence of precarious working contracts in EU Member States adds to the concerns raised in the 2020 ERA Communication of the potential for talented researchers to leave Europe due to precarious employment (European Commission, 2020a). However, it is important to note that while data can give an indication of the relative working conditions for women and men researchers in the EU, Figure 5.2 does not explore the reasons behind potential differences, nor does it provide a value judgement on the relative merits of working on different contracts. Based on the data alone, it is not possible to judge the extent to which the use of different contracts is a free choice or a constraint. Box 20 provides an example of work to reduce and explore the impacts of precarious contracts at national level.

BOX 20 Measures to reduce the use of precarious contracts

In 2019, in **Norway**, the Research Council of Norway set out a policy to promote gender balance in research. One aspect of this policy was the aim to reduce the frequency of temporary contracts, as well as investigating the impact of temporary contracts on researchers[6].

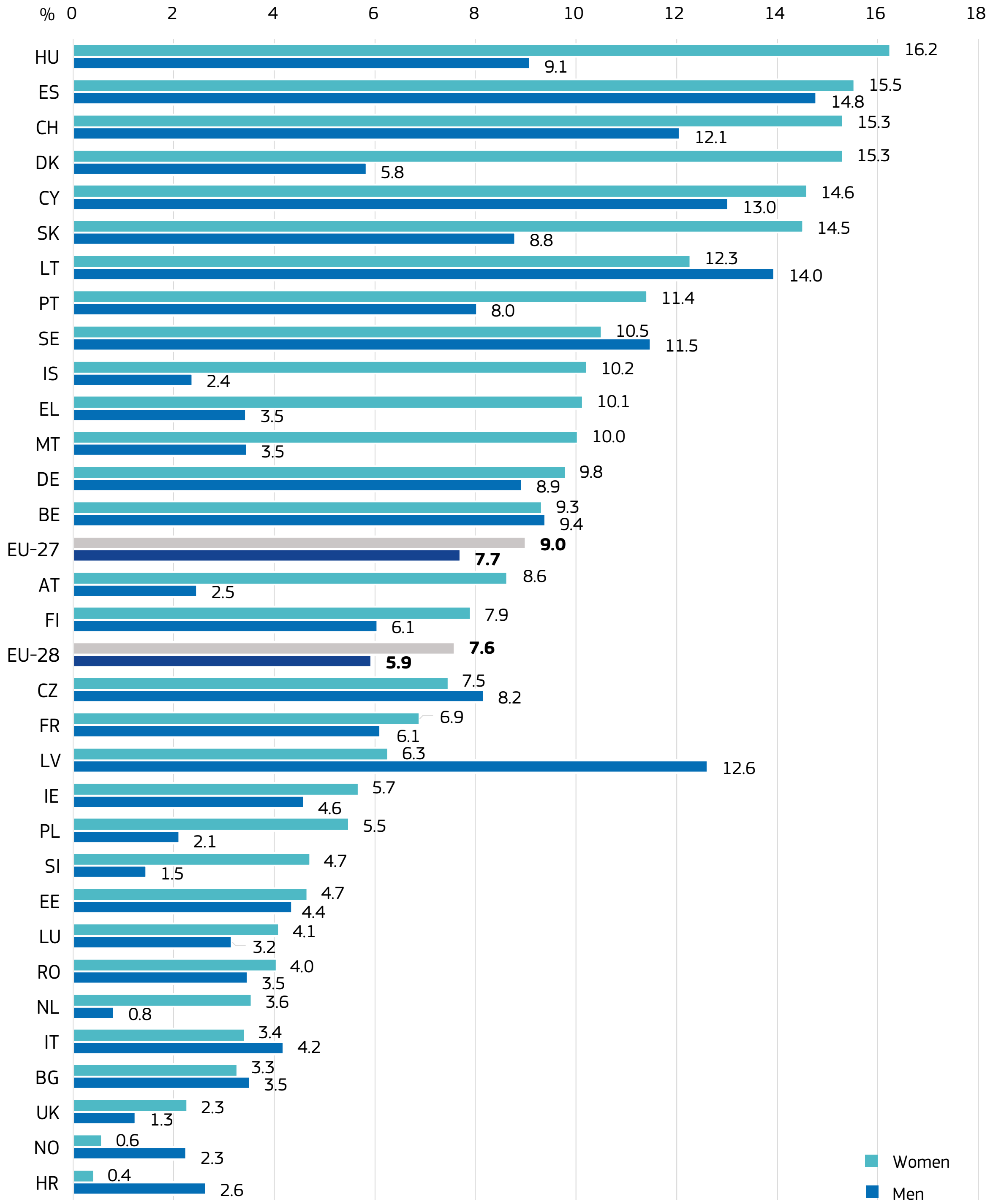
At country level, the proportion of women researchers working under precarious employment was larger than that of men researchers in over two-thirds of the EU-27 Member States and Associated Countries considered (22 of 31). The largest difference was evident in Denmark and Iceland (9.5 p.p. and 7.8 p.p., respectively). For women researchers, the highest proportions of employment under precarious contracts were found in Hungary (16.3%), Spain (15.5%), Switzerland (15.3%) and Denmark (15.3%).

The opposite pattern was observed in nine countries (BE, BG, CZ, HR, LT, LV, NO, SE), where the proportion of men researchers working under precarious contracts exceeded that of women researchers, although the differences were smaller. The largest differences were observed in Latvia (6.4 p.p.) and Croatia (2.2 p.p.). The smallest differences between women and men, regardless of pattern, were found in Belgium (0.1 p.p.) and Bulgaria (0.3 p.p.).

5 The type of contract was indicated by researchers who responded to the MORE4 survey.

6 Research Council of Norway (2019). Policy for gender balance and gender perspectives in research and innovation, https://www.forskningsradet.no/contentassets/19527ed7d0b149d6b9b310f8bb354ce9/nfr_gender_policy_orig-1.pdf

Figure 5.2 Proportion (%) of researchers in HES working under 'precarious' contracts, by sex, 2019



Notes: Data unavailable for: ME, MK, AL, RS, TR, BA, AM, FO, GE, IL, MD, TN, UA.

Others: This indicator compares the proportion of researchers working in the Higher Education Sector working under a precarious contract amongst women researchers and men researchers respectively (each calculated as a percentage of the respective total number of women and men researchers); Data are weighted by Field of Study.

Source: MORE4 survey

To further examine the factors which might influence the precarity of research careers, the following indicators consider how family status and career stage relate to the prevalence of precarious working contracts for women and men researchers. Women tend to have unequal caring responsibilities when they are in couple with children, which may result in differences in working conditions. The 2020 ERA Communication emphasises that new entrants are more likely to work under precarious contracts (European Commission, 2020a).

Among researchers who were in a couple with children, more women than men worked under precarious contracts.

Data from Table 5.1 show that among researchers who were in a couple with children, a higher proportion of women researchers working in the HES were employed under a precarious contract compared to men, at European level (7.2% women vs 4.4% men). Among researchers who were in a couple without children, similar proportions of women and men researchers worked under precarious contracts (10.5% women vs 11.1% men). These data suggest that gender differences in the working conditions of women and men researchers might be related to unequal caring responsibilities. It is important to acknowledge that dual career couples are common, with researchers often living in a couple with a partner who also works as a researcher. The career conditions of women researchers related to working hours, type of contracts and mobility readiness may be influenced by the fact that care responsibilities are chiefly borne by women, even when both partners work.

At country level, the trends were more varied. In just under half of the EU-27 Member States and Associated Countries (14 of 31), the proportion of men researchers working under precarious contracts exceeded that of women researchers among couples with children, while in more than half (17 of 31), the proportion of men researchers in precarious contracts exceeded that of women researchers among couples without children.

Among researchers who were single, however, a higher proportion of men researchers than women researchers worked under precarious contracts.

When looking at researchers who were single, a greater proportion of men, both with children (6.4% men vs 1.2% women) and without children (18.4% men vs 13.8 women), worked under precarious contracts compared to single women, at European level.

As with researchers in couples, the trends for researchers who were single and who did not have children varied at country level. In almost half of the EU-27 Member States and Associated Countries (15 of 31), the proportion of single women without children working under precarious contracts exceeded that of single men without children. However, among researchers who were single with children, the European-level trend of more men than women with precarious contracts was seen in all but two EU-27 Member States and Associated Countries (DK and FI, although data were unavailable, or the proportion was 0 for both women and men in this category in 11 countries, and where data were available they tended to be based on small total numbers). When interpreting results, it is important to consider that several countries have a value of 0 for the proportion of single women and men with children. Such values were partly driven by low sample sizes, as several respondents to the MORE4 Survey did not provide information on their family status.

The four categories of career stages are defined using the European Framework for Research Careers (DG Research and Innovation, 2012):

- First-stage researchers (R1): researchers up to the point of PhD
- Recognised researchers (R2): PhD holders (or equivalent) who are not yet fully independent
- Established researchers (R3): researchers who have developed a level of independence
- Leading researchers (R4): researchers leading their research area or field

Both women and men researchers were more likely to work under precarious contracts at earlier career stages.

To further examine the link between career stage and precarious employment, Table 5.2 presents 2019 data on the proportion of researchers in the HES working under precarious contracts, disaggregated by sex and career stage.

Reflecting concerns raised in the 2020 ERA Communication about precarious employment (European Commission, 2020a), European-level data show that both women and men researchers were most likely to be employed under precarious contracts at the earliest career stage (33.7% men and 26.9% women in R1). A similar trend was observed at country level, where the highest proportion of women and men researchers working under precarious contracts was in the earlier career stage in 16 of 29 EU-27 Member States and Associated Countries.

BOX 21 Supporting early-stage researchers

In **Italy**, the University of Trento provided mentoring through an online platform, targeted at early-stage researchers, especially those in the STEM and social science and humanities (SSH) departments of the university in 2016. The platform aimed to provide online advice and information to researchers, with the platform and choice of mentors designed to overcome gender asymmetries[7].

In **Switzerland**, the Swiss National Science Foundation (SNSF) offers a gender equality grant for young women scientists participating in other SNSF funding schemes. The value of the grant is CHF 1,000 for each 12 months of their project, and it is intended to support career development[8].

7 R&I Peers (2018). D6.2 - GE policies and best practices, http://ripeers.eu/wp-content/uploads/2018/11/R_I-PEERS_D6.2_v.final_31.10.2018.pdf

8 SNSF (n.d.). 'Gender equality grant', http://www.snf.ch/en/funding/supplementary-measures/gender-equality-grant/Pages/default.aspx

Table 5.1 Proportion (%) of researchers in HES working under 'precarious' contracts, by sex and family status, 2019

Country	In couple with children		In couple without children	
	Men	Women	Men	Women
EU-27	**4.36**	**7.24**	**11.08**	**10.53**
EU-28	**3.61**	**5.68**	**8.37**	**9.31**
BE	7.14	11.11	12.50	4.17
BG	3.39	3.75	0.00	7.69
CZ	7.23	6.90	13.33	11.11
DK	6.14	9.38	6.45	17.39
DE	2.44	2.56	11.76	12.50
EE	6.90	0.00	20.00	0.00
IE	0.00	2.27	14.29	7.41
EL	1.69	11.90	0.00	0.00
ES	8.09	19.74	22.86	22.22
FR	2.73	4.29	9.09	4.76
HR	1.39	0.00	5.88	3.13
IT	3.00	1.67	0.00	2.70
CY	8.16	26.32	37.50	50.00
LV	15.00	9.76	0.00	8.33
LT	11.63	9.43	30.77	23.08
LU	7.14	0.00	10.00	0.00
HU	3.39	11.11	30.77	21.43
MT	9.76	0.00	0 (0/22)	0 (0/10)
NL	0.00	2.86	0.00	4.17
AT	2.53	0.00	0.00	4.00
PL	2.38	0.00	0.00	0.00
PT	6.67	10.77	18.75	12.50
RO	3.61	3.85	2.86	3.70
SI	3.03	0.00	0.00	16.67
SK	6.12	7.41	0.00	27.27
FI	3.70	1.82	0.00	26.67
SE	10.47	11.29	19.44	5.26
UK	0.00	0.00	0.00	5.88
IS	5.00	11.54	6.67	9.09
NO	1.14	0.00	9.09	0.00
CH	1.96	3.57	26.32	15.79

Country	Single with children		Single without children	
	Men	Women	Men	Women
EU-27	**6.39**	**1.23**	**18.43**	**13.83**
EU-28	**5.31**	**1.11**	**17.18**	**14.53**
BE	0.00	0.00	25.00	18.18
BG	0.00	0.00	13.33	10.00
CZ	0.00	0.00	12.00	50.00
DK	0.00	11.11	10.71	23.81
DE	0.00	0.00	23.40	14.29
EE	0.00	0.00	0.00	10.00
IE	33.33	0.00	9.09	17.65
EL	20.00	0.00	0.00	12.50
ES	16.67	0.00	28.57	16.00
FR	16.67	0.00	20.00	10.87
HR	0.00	0.00	7.14	0.00
IT	0.00	0.00	12.50	4.35
CY	33.33 (8/23)	0.00	12.50	0.00
LV	:	0.00	20.00	12.50
LT	100.00	12.50	27.27	13.33
LU	0 (0/27)	0.00	0.00	7.69
HU	:	20.00	7.14	27.27
MT	0.00	0 (0/15)	0 (0/22)	20.00
NL	0.00	0.00	0.00	12.50
AT	16.67	0.00	0.00	19.44
PL	0.00	0.00	0.00	10.00
PT	0.00	0.00	18.18	15.79
RO	0.00	0.00	0.00	5.26
SI	0.00	0 (0/15)	0.00	14.29
SK	33.33	0.00	13.04	31.25
FI	0.00	25.00	0.00	0.00
SE	0.00	0.00	11.11	8.33
UK	0.00	0.00	7.14	18.18
IS	0 (0/24)	0.00	0.00	0 (0/19)
NO	0.00	0.00	7.69	0.00
CH	0.00	0.00	33.33	27.59

Notes: Data unavailable for: ME, MK, AL, RS, TR, BA, AM, FO, GE, IL, MD, TN, UA. EU-27 and EU-28 aggregates are calculated as the sums of values of EU-27 and EU2-8 MS respectively.

Other: When indicators are related to family status, weighting by sex is used; The Total is a compilation of all sample population except the researchers who did not disclosed their family status; Where the denominator of less than or equal to 30, the raw numbers are given inside a parenthesis.

Source: MORE4 survey

Table 5.2 Proportion (%) of researchers in HES working under 'precarious' contracts, by sex and career stage, 2019

Country	R1		R2	
	Men	Women	Men	Women
EU-27	**33.68**	**26.92**	**11.12**	**10.36**
EU-28	**29.83**	**26.66**	**10.01**	**9.62**
BE	19.96	21.71	18.67	5.60
BG	22.16	0.00	12.42	14.22
CZ	50.28	43.23	12.19	11.31
DK	11.98	4.67	22.07	35.67
DE	43.37	24.74	5.82	8.52
EE	13.92	34.88	9.34	7.12
IE	9.81	0.00	23.78	13.30
EL	0.00	43.03	25.15	9.46
ES	40.30	43.70	38.27	30.01
FR	13.26	20.77	23.55	3.39
HR	0.00	0.00	19.26	3.11
IT	39.04	12.46	0.00	7.06
CY	32,85 (8/24)	100.00	29.33	13.48
LV	5.93	7.96	51.42	3.06
LT	38.59	22.40	17.49	37.46
LU	0.00	12.44	7.47	0.00
HU	31.76	40.46	5.48	28.28
MT	0 (0/9)	27.07	0.00	13.63
NL	0.00	9.12	3.63	7.73
AT	4.83	18.19	11.55	17.75
PL	66.67	76.53	0.00	0.00
PT	38.51	7.99	9.00	21.52
RO	61.60	23.76	0.00	4.13
SI	4.85	18.44	0.00	2.79
SK	41.61	58.03	8.93	9.19
FI	31.11	39.06	9.46	5.83
SE	39.82	44.15	4.70	4.84
UK	0.00	24.31	0.00	5.72
IS	4.76	58.34	0.00	0.00
NO	5.44	0.00	12.82	0.00
CH	43.51	36.14	18.36	14.34

Country	R3		R4	
	Men	Women	Men	Women
EU-27	**4.05**	**4.40**	**3.44**	**5.10**
EU-28	**3.14**	**3.22**	**2.84**	**4.13**
BE	5.49	0.00	1.78	5.56
BG	0.00	2.07	0.00	0.00
CZ	3.71	2.55	1.16	0.00
DK	1.46	6.81	3.00	16.45
DE	4.50	4.08	0.00	3.41
EE	0.00	0.00	3.72	0.00
IE	1.96	3.08	0.00	5.05
EL	4.56	5.02	1.22	12.18
ES	9.92	10.13	11.65	10.31
FR	1.02	2.45	2.86	6.79
HR	2.15	0.00	0.00	0.00
IT	2.01	2.64	4.21	2.65
CY	10.93	7.95	9.81	8.72
LV	3.12	9.48	9.69	2.29
LT	9.52	8.52	7.17	0.00
LU	0.00	0.00	5.35	0 (0/28)
HU	7.18	5.97	5.04	10.45
MT	1.74	4.02	7.66	9.28
NL	0.97	0.00	0.00	0.00
AT	0.00	1.50	1.29	0.00
PL	1.10	0.00	1.48	0.00
PT	2.41	9.56	8.24	6.54
RO	0.00	0.74	5.03	3.15
SI	2.19	0.00	0.00	4.89
SK	3.92	5.57	5.93	15.53
FI	4.16	2.23	3.93	0.00
SE	5.46	2.89	9.87	9.00
UK	1.28	0.00	1.46	0.00
IS	1.81	1.38	2.40	0.00
NO	1.00	0.00	1.03	2.29
CH	2.70	6.54	0.00	0.00

Notes: Data unavailable for: ME, MK, AL, RS, TR, BA, AM, FO, GE, IL, MD, TN, UA. EU-27 and EU-28 aggregates are calculated as the sums of values of EU-27 and EU-28 MS respectively.

Other: Where the denominator of less than or equal to 30, the raw numbers are given inside a parenthesis.

Source: MORE4 survey

5.3 International mobility of women and men researchers

Priority 3 of the 2012 ERA Communication for an open labour market emphasised that mobility contributes to research excellence and increases the attractiveness of research careers (European Commission, 2012). The attractiveness of research careers for women and men is often driven by research job characteristics that influence researchers' scientific productivity, such as international networking, career perspectives and the quality of engagement with peers (European Commission, 2017a). Since 2012, significant progress has been made in removing geographical barriers to researchers' mobility, through instruments such as the EURAXESS pan-European network of support services for researchers (European Commission, 2020g). Given the renewed commitment to increase mobility in the ERA (European Commission, 2020a), the following indicators examine potential gender differences in international mobility of researchers.

At European level, there was no clear gender-associated pattern of international mobility of researchers at early career stages.

To assess the relative mobility of women and men researchers in the HES, Figure 5.3 shows the difference in the proportions of women and men researchers who – during their PhD – moved for at least three months to a country other than that where they attained (or will attain) their PhD. It refers only to researchers in the early stages of their careers (R1 and R2). A positive result indicates that women's rate of mobility was higher, while a negative result indicates that men's rate of mobility was higher.

The data show that in 2019, the difference between the mobility of women researchers and men researchers was 0.31 p.p. in favour of women, at European level. Data from 2016 showed a difference of 3.6 p.p. in favour of men, while in 2012, the difference was 9 p.p. in favour of men in the EU-28 (She Figures, 2018; European Commission, 2012). These results indicate that considerable improvement in women's comparative mobility since 2012. At European level, instruments such as the Charter & Code, EURAXESS and the Marie Sklodowska-Curie actions have been important driving forces in removing barriers to researchers' mobility. Box 22 provides examples of national and institutional measures implemented to provide funding to women PhD candidates and researchers to support their academic careers and facilitate international mobility.

BOX 22 Encouraging women to continue in academia and supporting international mobility

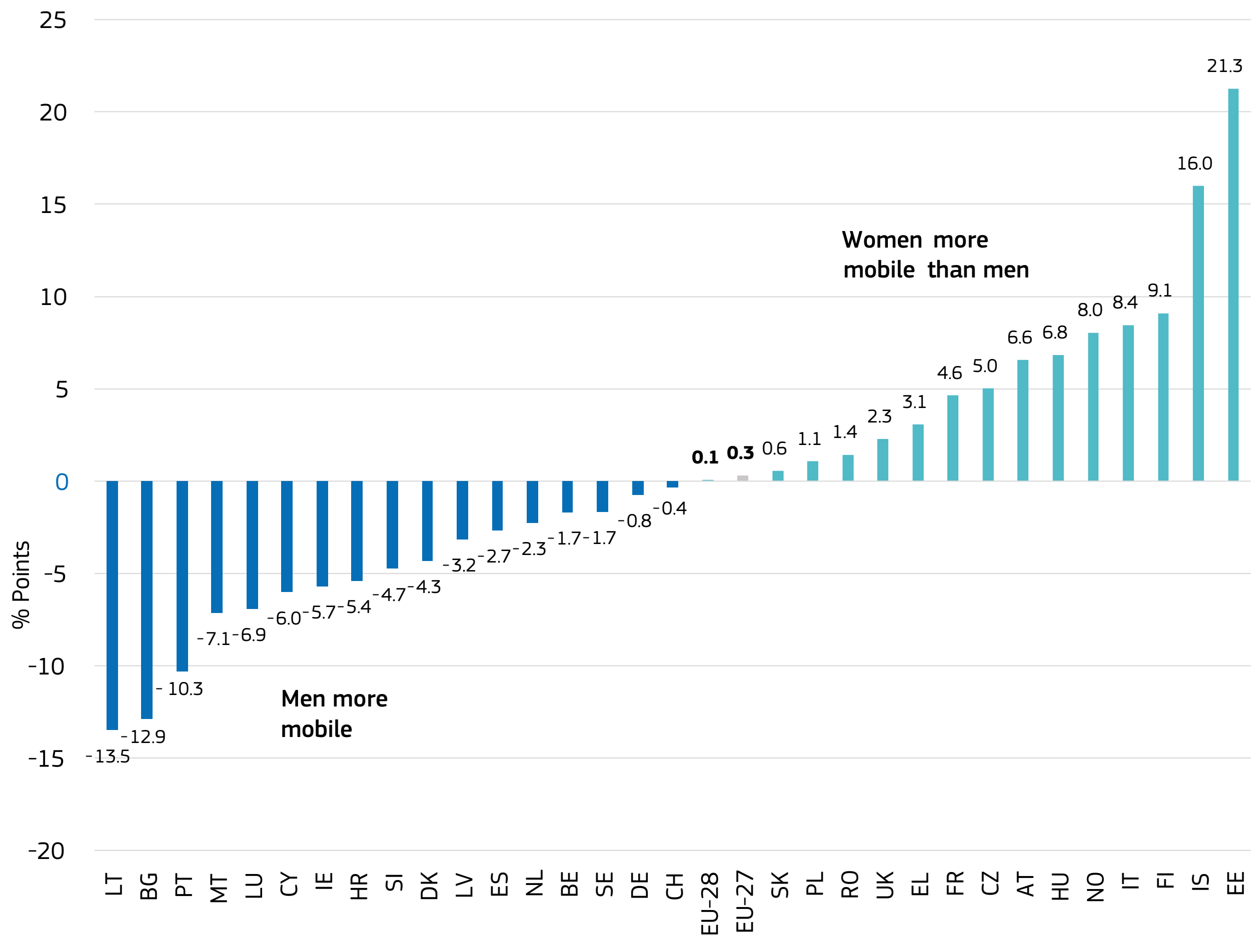
In **the Netherlands**, the Radboud University Nijmegen provides the Christine Mohrmann Grant to female PhD candidates. The aim of the grant is to encourage female researchers to continue their academic careers. Recipients are encouraged to use their grant to spend time at a university in another country. In 2020/2021, 10 women received this award.

In **Switzerland, Finland** and **Germany**, caregivers who conduct research abroad are able to claim additional stipends to cover childcare costs9. The amount of stipend issued varies. For example, the German Research Foundation adds an additional 12 months of stipend payments for parents who have children under 12 years old or alternatively, covers the cost of childcare.

The situation was more varied at country level in 2019, with slightly more countries in which men researchers were more mobile (17 of 31) compared to countries in which women researchers were more mobile (14 of 31 countries). The mobility of women researchers ranged from 21.3 p.p. higher than that of men researchers in Estonia (32.2% for women and 10.9% for men) to 13.5 p.p. lower than men in Lithuania (14.6% for women and 28.1% for men).

9 Zippel, K (2011) How gender neutral are state policies on science and international mobility of academics? Sociologica. Accessible: https://www.rivisteweb.it/doi/10.2383/34631

Figure 5.3 Sex differences in international mobility of researchers in HES during their PhD, 2019



Notes: Data unavailable for: ME, MK, AL, RS, TR, BA, AM, FO, GE, IL, MD, TN, UA.

Other: This indicator compares the proportion of internationally mobile researchers amongst women researchers and men researchers respectively (each calculated as a percentage of the respective total number of women and men researchers); The Total is a compilation of researchers at career stages R1+ R2 (during Doctoral or equivalent level); The Difference is calculated using the repective proprotion of women and men researchers; Data are weighted by Field of Study.

Source: MORE4 survey

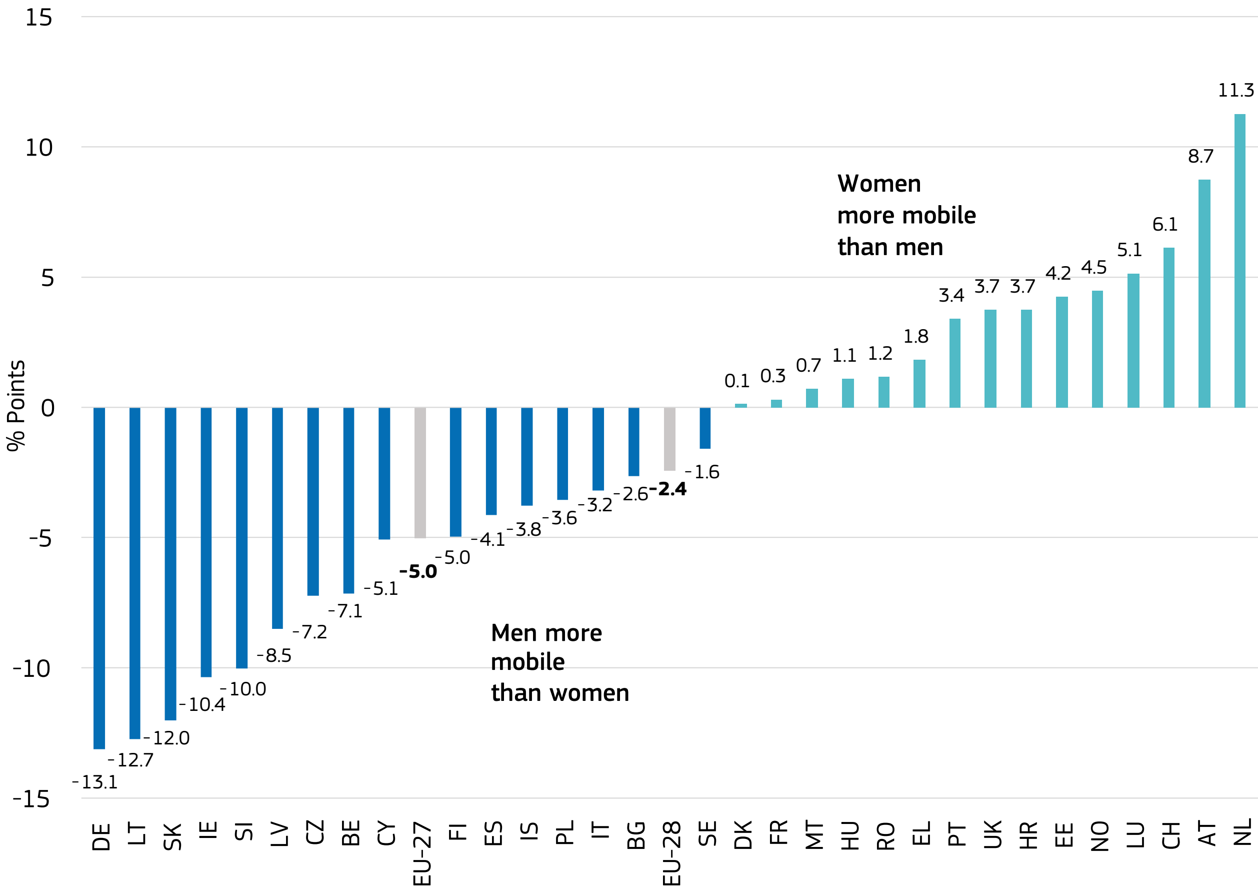
At more advanced stages of their careers, men researchers were more mobile than women researchers.

To examine potential gender differences in mobility at more advanced stages of careers (R2, R3 and R4), Figure 5.4 presents the difference between the proportions of women and men researchers who, in the last 10 years, moved for at least three months to a country other than that in which they attained their highest educational qualification. A positive result indicates that women's rate of mobility was higher, while a negative result indicates that the men's rate was higher.

The data show that in 2019, men researchers were more mobile than women researchers at European level, with a difference of 5 p.p. (corresponding to a mobility rate of 19.8% for women and 24.9% for men). In contrast to the findings for early career researchers (Figure 5.3), there is a clear difference in mobility at more advanced career stages. The gendered pattern of mobility after gaining a PhD might relate to gender roles related to care responsibilities that limit women's mobility (Schiebinger et al, 2011-2021). Many researchers in dual career couples return to their countries or the country of their partner due to lack of opportunities for the accompanying partner, suggesting that integration services are needed for researchers and their families (European Commission, 2020g).

In contrast to the EU-level differences, data for EU-27 Member States and Associated Countries show that women researchers were more mobile in nearly half of the countries for which data were available (15 of 31). The rate of mobility for women researchers ranged from approximately 11 p.p. higher than that of men researchers in the Netherlands (30.0% for women and 18.8% for men) to approximately 13 p.p. lower than men researchers in Germany (16.9% for women and 30.0% for men).

Figure 5.4 Sex differences in international mobility of researchers in HES in post-PhD stages, 2019



Notes: Data unavailable for: ME, MK, AL, RS, TR, BA, AM, FO, GE, IL, MD, TN, UA.

Other: This indicator compares the proportion of internationally mobile researchers amongst women researchers and men researchers respectively (each calculated as a percentage of the respective total number of women and men researchers); The Total is a compilation of researchers at career stages R2+R3+R4 (postdoctoral or equivalent level); The difference is calculated using the repective proportion of women and men researchers; Data are weighted by Field of Study.

Source: MORE4 survey

5.4 Country differences in R&D expenditures per researcher

Another measure of working conditions for researchers is the level of national investment in R&D. Current EU policy reflections on the ERA have observed low levels of R&D expenditure in the EU compared to other economies (European Commission, 2020g). Given the 2020 ERA Communication's renewed commitment to retaining and attracting the best talent in Europe (European Commission, 2020a), the following indicators provide an insight into the level of R&D expenditure by country and sector. They also examine the potential correlation between national R&D expenditure and the presence of women researchers in a country.

The data shown in Figure 5.5 present the R&D expenditure per researcher in full-time equivalent (FTE) roles and the proportion of women researchers in FTE roles in 2018. R&D expenditure is expressed in purchasing power standards (PPS), an artificial common currency used to eliminate the differences in price levels between countries - one unit of PPS buys the same volume of goods and services in all countries. Thus, R&D expenditure per researcher for each country was calculated as the total R&D divided by the total number of researchers in FTE. Both variables cover all sectors of the economy (HES, GOV sector, BES, PNP sector).

At European level, R&D expenditure was 160,841 PPS per researcher in 2018, lower than the equivalent expenditure in other main economies, such as China except Hong Kong (189,108), Japan (171,120) and the US (269,044). In the EU-28, R&D expenditure was 154,666 per researcher in 2018. Data from 2015 showed that R&D expenditure per researcher in 2015 was 157,138 PPS in the EU-28 (She Figures, 2018). At the EU-28 level, therefore, there was an overall decrease in R&D expenditure per researcher from 2015 to 2018.

The definition of FTE and expenditure on R&D is based on the Frascati Manual (OECD, 2015):

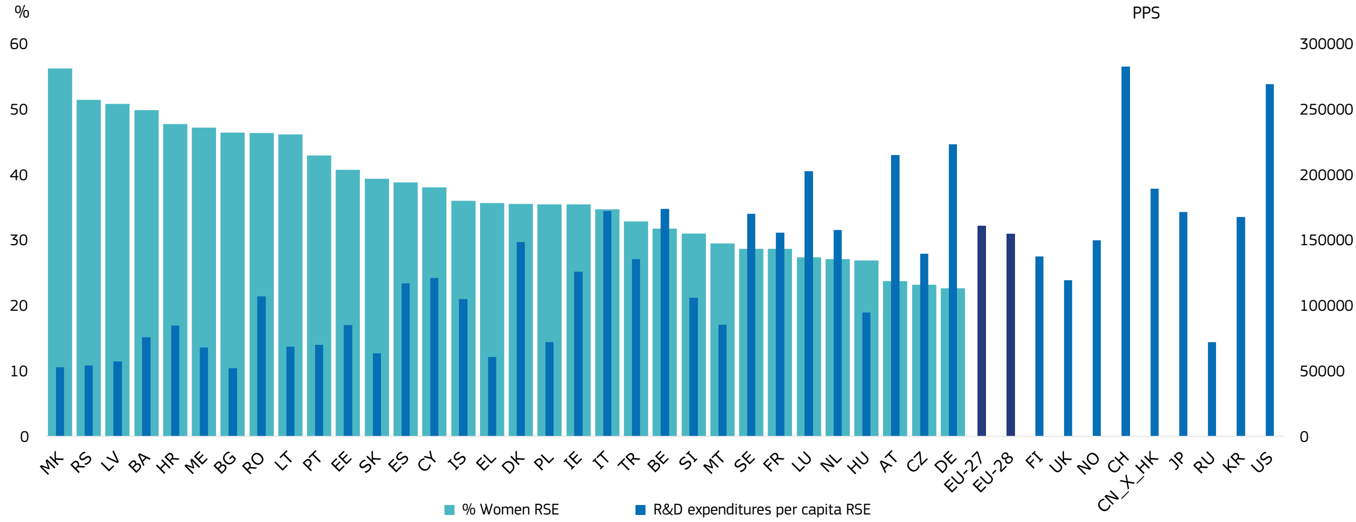
- The FTE unit of measurement of personnel employed in R&D corresponds to one year's work by one person on R&D. The FTE is different from the headcount (HC) unit of measurement, which corresponds to the number of persons engaged in R&D at a given date (calendar year).
- The Frascati Manual defines intramural expenditures on R&D as all expenditures for R&D performed within a statistical unit or sector of the economy during a specific period, whatever the source of funds. It recommends using purchasing power parities (PPP) to express R&D statistics in monetary terms.

In some countries, the proportion of women researchers and R&D expenditure per researcher had an inverse relationship.

Among the EU-27 Member States and Associated Countries, expenditure ranged from 52,026 PPS (BG) to 282,372 PPS (CH). Only seven countries (AT, BE, CH, DE, IT, LU, SE) had a higher level of expenditure than the EU-27 value. A higher proportion of women researchers tended to be associated with lower R&D expenditure per researcher (Figure 5.5). Among the 11 EU-27 Member States and Associated Countries where the workforce comprised 40% or more women (MK, RS, LV, BA, HR, ME, BG, RO, LT, PT, EE), expenditure was under 100,000 PPS for all but one country (RO, where it was 106,960 PPS).

By contrast, expenditure was only less than 100,000 PPS in five of the 21 countries with a research workforce comprised of less than 40% women (EL, HU, PL, MT, SI). In three of the EU-27 with the highest levels of expenditure (DE, AT, LU), women represented only around one-quarter of researchers (22.6%, 23.7% and 27.3%, respectively). This may indicate greater exclusion of women from research in countries where research attracts more expenditure (and is, therefore, a more attractive career option). It may also indicate a lower valuation of research in countries where it is 'feminised' (i.e. where the workforce is comprised of a higher proportion of women). A 2018 US study indicated an increasing negative relationship between the proportion of women and the level of pay in a given occupation between 1960 and 2015 when controlling for factors such as education (Mandel, 2018).

Figure 5.5 Proportion (%) of women among researchers (in FTE) and R&D expenditure (in PPS) per capita researcher (in FTE), 2018



Notes: Exceptions to reference period: BE, IS (2011) BA (2014), EL, CN_X_HK, RU, KR (2015), US (2016), LV, HR, ME, BG, RO, LT, EE, ES, CY, DK, PL, IE, IT, TR, SI, MT, SE, FR, LU, NL, HU, AT, CH, JP (2017); Data not available for: AL, GE, AM, FO, MD, TN, IL, UA; Break in time series: IS (numerator and denominator for proportion of women among RSE (in FTE) and for R&D expenditures (in PPS) per capita RSE (in FTE)); Definition differs, see metadata (denominator for R&D expenditures (in PPS) per capita RSE (in FTE); Estimated: IS (numerator for R&D expenditures (in PPS) per capita RSE (in FTE)), US (denominator for R&D expenditures (in PPS) per capita RSE (in FTE)); Provisional: CZ, DK, FR (numerator and denominator for proportion of women among RSE (in FTE) and for R&D expenditures (in PPS) per capita RSE (in FTE)), UK (numerator and denominator for R&D expenditures (in PPS) per capita RSE (in FTE)), US (numerator fo R&D expenditures (in PPS) per capita RSE (in FTE).

Other: Purchasing power parities (PPP) are used for R&D statistics. PPP are currency conversion rates that convert to a common currency and equalise the purchasing power of different currencies.

Source: Eurostat – R&D expenditures per researcher and proportion of women RSE in FTE (online data code: rd_p_persocc)

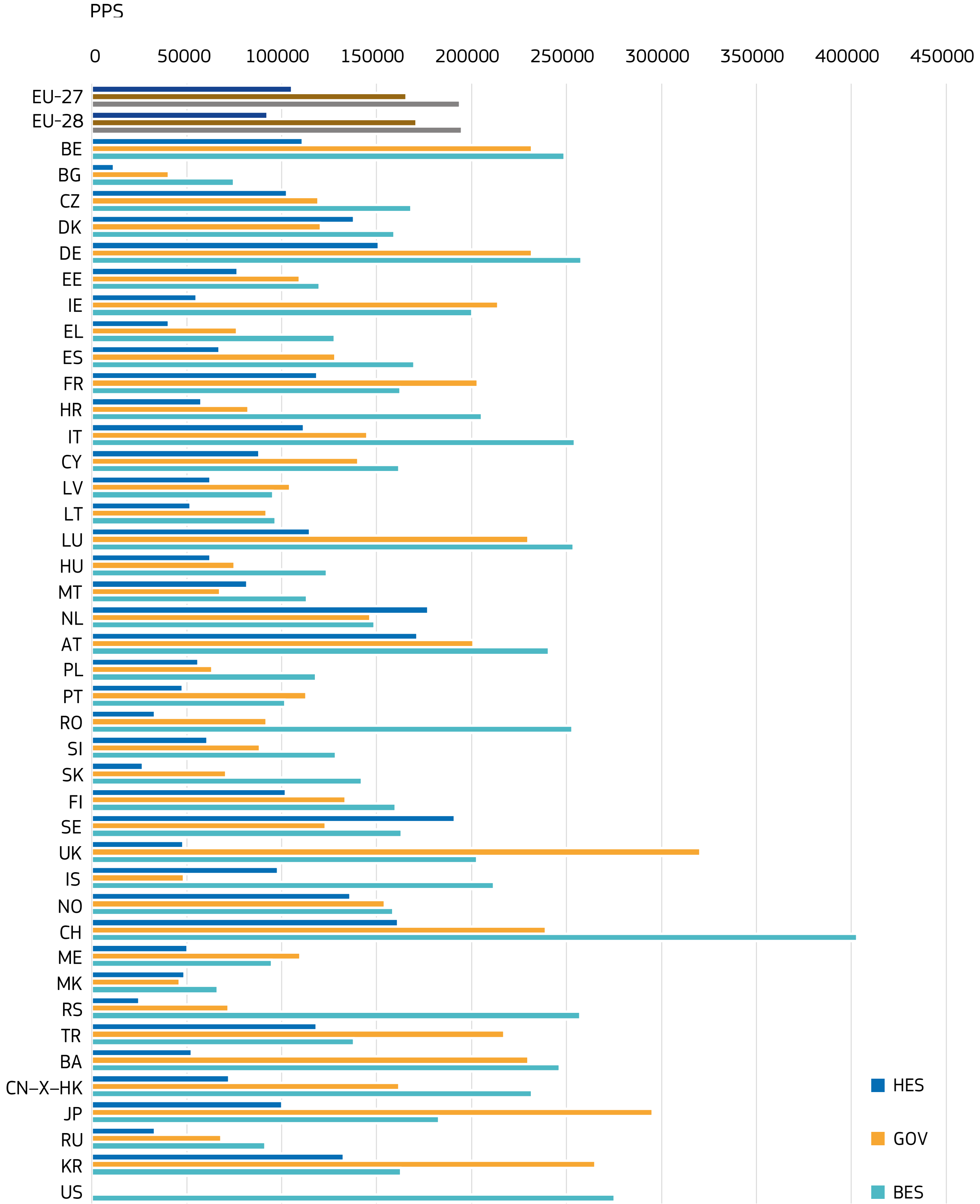
The BES had the highest spending per researcher. However, there were countries with high reported proportions of women that also presented some of the lowest expenditure per researcher.

Figure 5.6 shows R&D expenditure per researcher (in PPS) in FTE for each of the three main sectors (HES, GOV sector, BES). At European level, 193,948 PPS was spent per researcher in the BES, compared with 165,763 PPS in the GOV sector and 105,504 PPS in the HES.

In line with the European trend, most EU-27 Member States and Associated Countries (28 of 37) had the highest spending per researcher in the BES (all except IE, FR, LV, NL, PT, SE, UK, ME, TR), and expenditure ranged from 66,463 PPS (MK) to 403,149 PPS (CH). Similarly, in 31 of the 37 countries (all except DK, MT, NL, SE, IS, MK), the R&D expenditure per researcher was higher in the GOV sector than in the HES, ranging from 40,634 PPS (BG) to 320,360 PPS (UK) in the GOV sector and 11,695 PPS (BG) to 191,221 PPS (SE) in the HES. The Netherlands and Sweden were the only two Member States that spend most in the HES.

Comparing these results with those in Figure 4.7 (see Chapter 4), it is evident that some of the EU-27 Member States and Associated Countries with relatively higher proportions of women researchers in the BES (e.g. MK, LV, BG, ME, LT), ranging from 58.3% in North Macedonia to 30.6% in Lithuania, have some of the lowest BES expenditure per researcher compared to other countries (ranging from 66,463 (NK) to 96,824 (LT)). However, the situation is varied in other countries, with higher representation of women researchers in the BES. In Bosnia and Herzegovina, Serbia, Island, Romania and Croatia, where the proportion of women in BES ranged from 54.1% (BA) to 35.6% (HR), spending in the BES was among the highest compared to other countries, ranging from 205,603 in Croatia to 257,365 in Serbia. Similar to the data in Figure 5.5, the results indicate that in some countries, women might be excluded from research when research attracts more expenditure (and is therefore a more attractive career option).

Figure 5.6 R&D expenditure (in PPS) per capita researcher (in FTE), by sector of employment, 2018



Notes : Exceptions to reference period: CH, TR, JP (2017), US (2016), CN_X_HK, RU, KR (2015), BA (2014); Data not available for: AL, GE, AM, FO, MD, TN, IL, UA; Definition differs, see metadata: HU (numerator for BES, GOV, RES), JP (denominator for BES, GOV, RES), DE, TR (numerator and denominator for GOV), US (numerator for BES); Estimated: FR (numerator and denominator for BES, GOV, HES), DE (numerator and denominator for HES), LU (numerator for GOV, HES); Provisional: BE, CZ, DK, EE, EL, HR, IT, CY, LT, MT, NL, AT, SI, UK (numerator and denominator for BES, GOV, HES), LU (numerator and denominator for BES, denominator for GOV, HES).

Other: Purchasing power parities (PPP) are used for R&D statistics. PPP are currency conversion rates that convert to a common currency and equalise the purchasing power of different currencies.

Source: Eurostat – R&D expenditures per researcher and proportion of women RSE in FTE (online data code: rd_p_persocc)

5.5 Institutional change to promote gender equality in research organisations

A key instrument for institutional change - and thus improved working conditions - is the development and implementation of targeted actions and measures towards gender equality in research organisations. Increasingly, these take the form of GEPs. Since the 2012 ERA Communication setting gender equality and gender mainstreaming in research as a key priority, organisations have been invited to implement institutional change through GEPs (European Commission, 2012). The 2015 Council Conclusions further encouraged Member States and research organisations to develop and implement GEPs (Council of the EU, 2015).

The European Commission has supported the implementation of GEPs in over 200 research performing and research funding organisations through dedicated funding allocated, under the Science-in-Society work programme of the 7th Framework Programme and the Science-with-and-for-Society (SwafS) work programme of Horizon 2020, to 30 GEP-implementing projects, for a total budget of over EUR 72 million[10].

The 2020 ERA Communication (European Commission, 2020a) commits to deepening existing priorities through an opening to inclusive gender equality policies, while the 2020 Council Conclusions on the new ERA explicitly 'call on the Commission and Member States for a renewed focus on gender equality and mainstreaming, including through the instrument of gender equality plans and the integration of the gender dimension into R&I content (Council of the EU, 2020c)'.

Key to achieving the objectives of the ERA is the Horizon Europe Framework programme for R&I (2021-2027). Horizon Europe reaffirms the European Commission's efforts towards institutional change through the introduction of an eligibility criterion requiring research organisations, higher education institutions and public bodies from EU Member States and Associated Countries to have a GEP in place (European Commission, 2021a). Horizon Europe will also offer funding for the development of inclusive gender equality policies and plans in R&I organisations.

Within the policy context of a renewed commitment towards institutional change, a new indicator has been developed to measure the prevalence of measures to promote gender equality within research organisations.

The indicator presented in this section relies on web-scraping techniques to capture the proportion of research organisations whose websites report that they have taken actions and measures towards gender equality[11]. The results are reported by type of organisation: higher education institutions and public research organisations (PROs). It is a similar indicator to the 'Proportion of RPOs that have adopted GEPs' that was published in previous editions of She Figures.

The web-scraping was performed using SerpApi, a Google search application programming interface (API) though Python scripts. The organisations' websites were scraped using a specific list of terms and phrases, translated into each country's official language(s). The final list of search phrases (in English) was:

- Gender equality
- Gender equality plan
- Equal opportunities officer
- Equal participation officer
- Eliminate/prevent sex discrimination
- Eliminate/prevent harassment
- Harassment policy
- Gender diversity committee
- Gender diversity office
- Gender diversity task force

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10 Including EUR 43.9 million under SwafS until the 2019 work programme (see Gender Equality - Achievements in Horizon 2020 and recommendations on the way forward, https://op.europa.eu/en/web/eu-law-and-publications/publication-detail/-/publication/8cf2353d-cbc9-11ea-adf7-01aa75ed71a1) and over EUR 51.7 million counting in the three additional GEP projects supported under the 2020 SwafS work programme.

11 The results of this indicator are estimates, and the accuracy of this indicator was calculated at 86% during the exploratory web-scraping phase (i.e. the indicator correctly assigned organisations as having/not having taken actions and measures towards gender equality in 86% of cases).

For most countries, more than 50% of higher education institutions mentioned actions and measures towards gender equality on their websites.

The data show that in 2020, in the majority of the EU-27 Member States and Associated Countries (19 of 27), more than 50% of higher education institutions mentioned actions and measures towards gender equality on their websites. In nine countries (DE, IE, ES, MT, SE, IS, NO, CH, TR), that figure rose to more than 80%. However, it is important to note that for countries such as Ireland, Malta and Iceland, the results are based on a low sample size, which can translate to large percentages. In two countries, Poland and Slovenia, less than 40% of higher education institutions mentioned actions and measures towards gender equality on their websites (36.7% and 26%, respectively).

Compared to HEIs, a lower proportion of PROs mentioned actions or measures towards gender equality on their websites. Of the countries with more than 30 PROs identified, only three (IT, SI, FI) had higher proportions of PROs that mentioned gender equality actions or measures compares to HEIs. The proportion of PROs mentioning gender equality actions or measures on their websites ranged from to 15.0% (BA) to 78.1% (SE), compared to a range of 26.0% (SI) to 100.0% (SE) for HEIs among countries with more than 30 PROs and HEIs identified. Box 23 provides examples of measures implemented to support institutional change in higher education institutions and research organisations (see Chapter 3 for further examples).

BOX 23 Institutional change in Higher Education Institutions

In **Austria**, performance agreements (contracts between universities and the Ministry of Education, Science and Research) set out universities' budgets for a three-year period and establish targets. This includes three gender equality goals, based on the ERA gender equality objectives. The goals are to achieve gender balance in all positions and functions, achieve structural change, and integrate the gender dimension into research content[12].

In **Germany**, the German Research Foundation's 'Research-Oriented Standards on Gender Equality' set structural and personnel standards that aim to achieve sustainable gender equality policies. This includes the use of the cascade model to help to increase the number of women at all levels of academic careers, and a Toolbox, which provides examples of existing gender equality measures in higher education institutions[13].

In **Ireland**, in 2018, all Irish universities committed to a Charter for Irish Universities. The Charter encompasses six priority areas, one of which is 'Developing the potential of our staff and improving equality'. Under this priority area, Irish universities commit to ensuring equal opportunities for staff and implementing the recommendations of the Gender Equality Taskforce on Higher Education[14]. These recommendations include setting short-term and long-term targets on gender balance among staff at different levels, producing gender action plans and providing annual updates to the Higher Education Authority, reaching and retaining a Bronze Athena SWAN award, and ensuring good practices in recruitment and promotion (striving for gender balance in the final pools of candidates, implementing the cascade model at a minimum, and addressing stereotyping in 'female' and 'male' roles)[15].

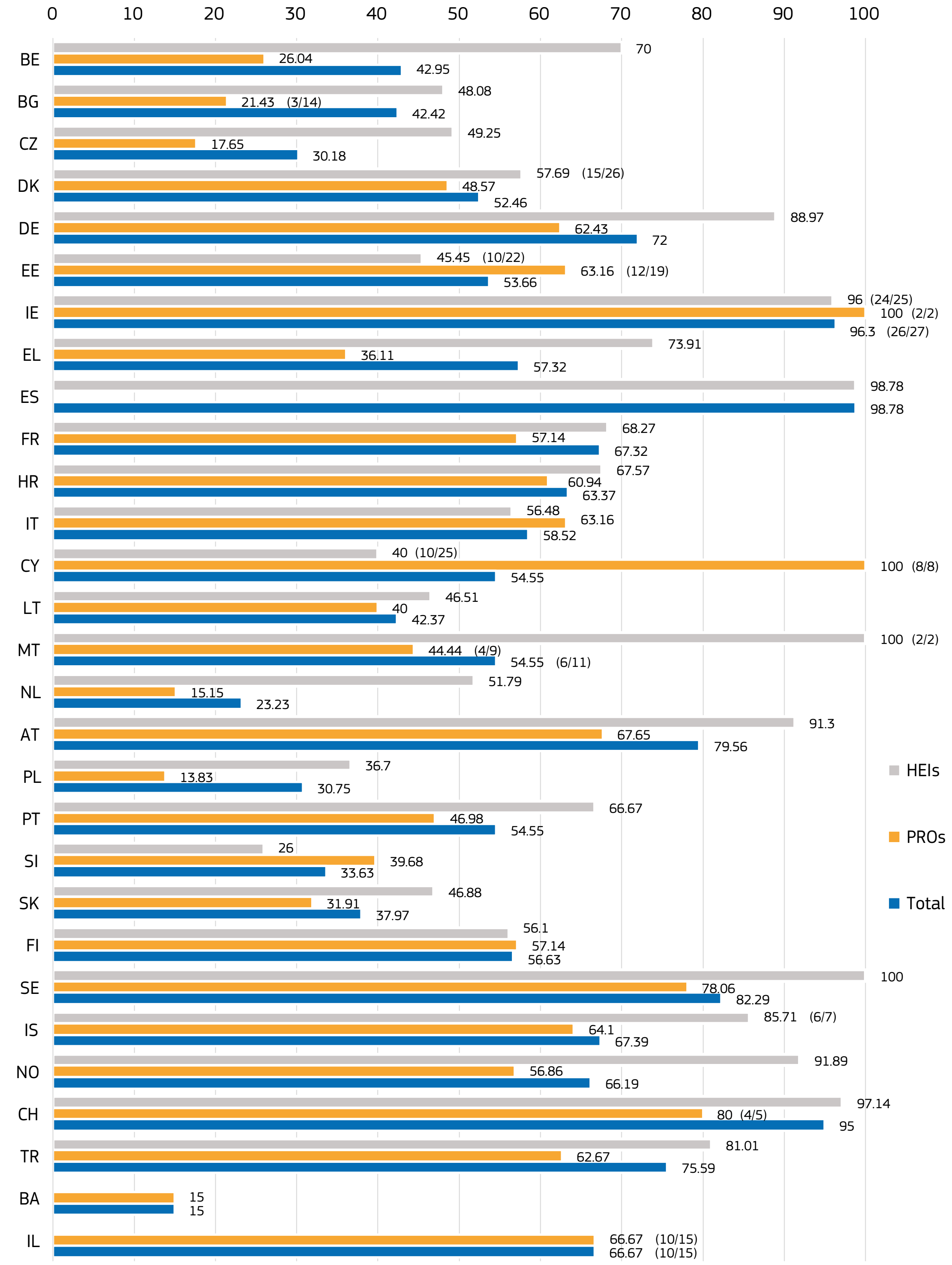
12 GENDERACTION (2020). D 3.2 Monitoring of ERA Priority 4 implementation, https://genderaction.eu/wp-content/uploads/2020/03/D3.2._MonitoringERApriority4implementation.pdf

13 Ibid.

14 Irish Universities Association (2018). 'Ireland's Future Talent – A Charter for Irish Universities', https://www.iua.ie/ouruniversities/charter-for-irish-universities/

15 Higher Education Authority (2018). Accelerating Gender Equality in Irish Higher Education Institutions Gender Action Plan 2018-2020, https://hea.ie/assets/uploads/2018/11/Gender-Equality-Taskforce-Action-Plan-2018-2020.pdf

Figure 5.7 Proportion (%) of Research Organisations that take actions or measures towards gender equality, by type of organisation, 2020



Notes: Data not available for: LV, LU, HU, RO, UK, ME, MK, AL, RS, GE, AM, MD, TN, UA; For BE: websites were searched in French OR Dutch; For IE and MT: websites were searched in English; For CH: websites were searched in In French, German OR Italian.

Other: Countries with proportion < 50 % and national legislation on gender equality / gender mainstreaming are: BA, BE, BG, SE and SK. For countries with more than one official language, websites were searched either only with one of the official languages (IE, MT: English) or with all official languages (BE and CH). In the latter case, national Statistical Correspondents indicated which organisations' websites should be scrapped with which language.

Source: information scraped, between October 2020 and January 2021 depending on the country, from the websites of higher education institutions listed in the European Tertiary Education Register (ETER), and of public bodies and research organisations that participated in projects under FP7 and H2020 and/or that were indicated by the Statistical Correspondents.

The results from Figure 5.7 also complement the results of a survey carried out by the ERAC Standing Working Group on Gender in Research and Innovation (ERAC SWG GRI, 2021) discussed below.

Results from the report by the ERAC SWG GRI on Gender Equality Plans as a catalyst for change[16]

The report found that:

- **Six EU-27 Member States and Associated Countries (DE, DK, FI, SE, IS, NO) required the adoption of GEPs in all sectors including HEIs and RPOs**
- **13 EU-27 Member States and Associated Countries (AT, DE, DK, ES, FI, FR, IE, PT, SE, IL, IS, NO, CH) had specific GEP requirements for HEIs, at national or regional level**
- **France, Ireland, Spain and Switzerland had the most extensive requirements for GEPs**, established by law or public policies on building blocks, support structures, monitoring and evaluation mechanisms, sanctions or funding for the development of GEPs.

For the six countries identified in the SWG GRI report as requiring the adoption of GEPs in all sectors (DE, DK, FI, SE, IS, NO), web-scraping results from She Figures showed that more than 50% of organisations in these countries (HEIs and PROs) mentioned actions or measures towards gender equality on their web-sites, ranging from 52.5% in Denmark to 82.3% in Sweden (Figure 5.7). With the exceptions of Malta and Turkey, the countries in Figure 5.7 with more than 80% of HEIs mentioning actions and measures towards gender equality on their websites (AT, DE, DK, ES, IE, SE, IS, NO, CH) were also among the 13 countries with specific GEP requirements for HEIs. The countries with the highest proportion of total organisations that mention actions or measures towards gender equality on their websites (Ireland (96.3%), Spain (98.8%) and Switzerland (95%)) were among those identified in the SWG GRI report as having the most extensive requirements for GEPs.

According to the report, Ireland had the most comprehensive policy on requirements for GEPs. The Higher Education Authority (HEA) in Ireland funds the Athena SWAN charter which includes dedicated resources and training to support HEIs to develop GEPs. Moreover in Spain, the Organic Law on Effective Equality between Women and Men (3/2007) provided the impetus for the establishment of gender equality structures and policies at universities in Spain. Similarly, in Switzerland, the Federal Act on the Funding and Coordination of the Higher Education Sector includes equal opportunities and gender equality as one of the criteria for the accreditation of HEIs. In addition, the Federal P-7 Programme of Equal Opportunities and University Development provides funding to HEIs and RPOs to develop and implement GEPs.

However, as stated by the report, the non-existence of a GEP requirement does not imply a lack of overall developments in gender equality in research. Figure 5.7 shows that, of the countries with no GEP require-ments at the national level, Turkey (75.6%), Croatia (63.4%) and Italy (58.5%) had the highest proportion of organisations' websites that mentioned actions or measures towards gender equality. The results from these countries might be related to other developments at national level. For example, In Turkey, 107 of 207 universities have Gender Equality Research Centres, established with the encouragement of the Council of Higher Education (CoHE). These centres keep records on indicators related to gender equality and carry out research and awareness-raising on the topic. In Italy, there is a legal requirement for national, regional, and local public authorities and non-profit institutions (including RPOs) to adopt a three-year Positive Action Plan that aims to remove obstacles hindering the full realisation of equal opportunities.

Similarly, in Croatia, Estonia, Italy and other EU-27 Member States and Associated Countries, research organisations have GEPs due to their participation in Horizon 2020 Science with and for Society (SwafS) calls.

16 ERAC SWG on Gender in Research and Innovation (2021). Gender in Research and Innovation on Gender Equality Plans as a catalyst for change. Available at: https://data.consilium.europa.eu/doc/document/ST-1202-2021-INIT/en/pdf; It is important to acknowledge that while complementary results are discussed, the results from She Figures and the ERAC SWG survey are based on different data collection methods.

5.6 Annex indicators

Annex 5.1 International mobility rates (%) of higher education sector researchers during their PhD, by sex, 2019

Country	Men	Women
EU-27	**22.18**	**22.49**
EU-28	**20.31**	**20.38**
BE	17.35	15.66
BG	26.85	13.96
CZ	13.34	18.36
DK	47.19	42.87
DE	17.33	16.57
EE	10.91	32.17
IE	19.66	13.95
EL	15.70	18.77
ES	49.92	47.24
FR	20.61	25.26
HR	24.64	19.24
IT	43.06	51.51
CY	24.87	18.84
LV	12.34	9.19
LT	28.09	14.60
LU	10.11	3.19
HU	17.39	24.22
MT	17.88	10.75
NL	16.04	13.78
AT	16.99	23.55
PL	21.94	23.01
PT	33.11	22.83
RO	7.39	8.83
SI	22.30	17.56
SK	26.19	26.75
FI	11.89	20.98
SE	14.45	12.78
UK	4.51	6.79
IS	10.21	26.20
NO	18.20	26.24
CH	10.13	9.77

Notes: Data unavailable for: ME, MK, AL, RS, TR, BA, AM, FO, GE, IL, MD, TN, UA.

Other: The Total is a compilation of researchers at career stages R1+ R2 (during Doctoral or equivalent level); Data are weighted by Field of Study (weiFOS); EU-27, EU-28 aggregates are calculated as the sums of values of EU-27 and EU-28 MS respectively.

Source: MORE4 survey

Annex 5.2 International mobility rates (%) of higher education sector researchers in post-PhD career stages, by sex, 2019

Country	Men	Women
EU-27	**24.85**	**19.82**
EU-28	**21.99**	**19.56**
BE	23.54	16.40
BG	16.93	14.29
CZ	17.92	10.70
DK	35.51	35.62
DE	30.01	16.90
EE	20.89	25.13
IE	32.28	21.91
EL	22.22	24.03
ES	26.62	22.48
FR	17.54	17.84
HR	11.19	14.93
IT	22.81	19.63
CY	27.90	22.82
LV	19.94	11.45
LT	25.38	12.64
LU	47.22	52.35
HU	20.43	21.53
MT	8.62	9.33
NL	18.75	30.01
AT	31.32	40.05
PL	18.42	14.86
PT	15.37	18.76
RO	26.25	27.42
SI	32.53	22.52
SK	29.24	17.23
FI	25.79	20.83
SE	25.98	24.38
UK	14.92	18.66
IS	29.86	26.08
NO	31.67	36.15
CH	28.73	34.85

Notes: Data unavailable for: ME, MK, AL, RS, TR, BA, AM, FO, GE, IL, MD, TN, UA.

Other: The Total is a compilation of researchers at career stages R1+ R2 (during Doctoral or equivalent level); Data are weighted by Field of Study (weiFOS); EU-27, EU-28 aggregates are calculated as the sums of values of EU-27 and EU-28 MS respectively.

Source: MORE4 survey

Annex 5.3 Total intramural R&D expenditure for the business, government, and higher education sectors in million PPS, 2018

Country	BES	GOV	HES
EU-27	**188 558**	**33 076**	**62 154**
EU-28	**214 030**	**35 327**	**70 458**
BE	8 077	1 087	2 219
BG	600	184	45
CZ	3 560	940	1 234
DK	4 481	209	2 261
DE	67 491	13 262	17 380
EE	198	54	208
IE	2 444	140	687
EL	1 284	593	757
ES	9 229	2 748	4 312
FR	31 041	5 935	9 730
HR	372	154	248
IT	15 495	3 163	5 873
CY	49	13	55
LV	65	60	137
LT	274	146	236
LU	333	142	121
HU	2 481	357	417
MT	51	1	32
NL	9 980	860	4 043
AT	7 734	791	2 484
PL	6 701	197	3 211
PT	1 708	176	1 382
RO	1 176	607	194
SI	806	147	130
SK	558	219	250
FI	3 417	433	1 312
SE	8 936	455	3 189
UK	25 473	2 251	8 305
IS	185	12	91
NO	2 646	711	1 778
CH	9 236	109	3 669
ME	5	15	13
MK	27	9	51
RS	307	221	257
TR	8 612	1 450	5 080
BA	14	14	47
CN_X_HK	235 115	49 479	21 577
JP	91 188	9 043	13 902
RU	19 080	10 012	3 091
KR	46 253	7 006	5 426
US	267 766	37 506	48 462

Notes: Exceptions to reference period: CH, TR, JP (2017), US (2016), CN_X_HK, RU, KR (2015), BA (2014); Data not available for: AL, GE, AM, FO, MD, TN, IL, UA; Definition differs, see metadata: HU (BES, GOV, HES), DE, TR (GOV), US (BES, HES); Estimated: DE (HES), FR (BES, GOV, HES), LU (GOV, HES); Provisional: BE, CZ, DK, EE, EL, HR, IT, CY, LT, MT, NL, AT, SI, UK (BES, GOV, HES), LU (BES).

Source: Eurostat – R&D expenditures per researcher and proportion of women RSE in FTE (online data code: rd_p_persocc)

CHAPTER 6
CAREER ADVANCEMENT AND PARTICIPATION IN DECISION-MAKING

KEY TAKEAWAYS

Overall, women are under-represented at the highest level of academia (grade A), with only very small improvements between 2015 and 2018. In addition, the proportion of women among grade A staff (equivalent to full professorship positions) varies by field of R&D. Women are relatively well represented among grade A staff in the field of Humanities, but have a minimal presence in the field of Engineering & Technology.

While some progress has been achieved in gender equality in R&I, progress has been particularly slow and insufficient in the area of gender equality in leadership positions (European Commission, 2020a). The data analysis in this chapter shows that there have indeed been improvements in respect of the representation of women among the heads of higher education institutions. However, the progress varies among countries. Likewise, women remain under-represented among board members and leaders. Overall, despite policy efforts towards increasing women's representation at the highest research positions, a strong gender gap persists.

- **While women represented more than half of Bachelor's and Master's i.e. ISCED 6 & 7 students (54%) and graduates (59%) and almost half of academic staff in grade C positions (47%), women's representation decreased at grade B (40%) and grade A (26%)** positions with little improvement since 2015 (Figure 6.1 & She Figures, 2018). The under-representation of women in grade A positions has been recognised in the new ERA Communication (2020a) which contains further actions to strengthen gender equality in R&I.

- **In STEM fields, the share of women is even smaller among Bachelor's and Master's students (32%) and graduates (35%) and across all grades of academic staff** (grade C: 35%; grade B: 28%; grade A: 19%), as shown in Figure 6.2.

- At European level, **the proportion of women among grade A academic staff increased only slightly between 2015 and 2018 from 24.1% to 26.2%** (Figure 6.3). In 2018, men were twice as likely as women to hold grade A positions at the European level (15.7% for men and 7.6% for women) (Figure 6.4).

- **In each field of R&D, women represented no more than around one-third of grade A staff at European level in 2018** (Table 6.2). The highest proportion of women among grade A staff was observed in Humanities (35.0%) and Social Sciences (30.9%) while the lowest proportion of women among grade A staff were in Natural Sciences (22.0%) and Engineering & Technology (17.9%). Horizontal gender segregation in the participation of women and men in fields of R&D also may in turn lead to greater vertical segregation. In other words, under-representation in particular professions may limit women's prospects for career advancement in certain fields.

- EU policies such as the Gender Equality Strategy 2020-2025 (European Commission, 2020b) have emphasised the importance of increasing women's representation in decision-making and leadership positions. **The data show that at European level, 23.6% of women were heads of institutes in higher education in 2019** (Figure 6.8), 2.4 p.p. higher than in 2016 (21.3%) (Annex 6.4). These data suggest that some progress has been made in improving women's representation in decision-making and leadership positions in this sector.

- **In 2019, just over 3 in 10 board members were women (31.1%) and under one-quarter of board leaders (24.5%) were women at European level** (Figure 6.9).

6.1 Introduction

Chapter 6 compares women's and men's representation in different grades of academic careers and in particular at the highest positions at which research is conducted. It examines women's participation in decision-making and leadership positions in academia. In 2012, Member States were invited to ensure that at least 40% of underrepresented sex participation in recruitment and career progression committees and institutions, and were encouraged to implement GEPs (European Commission, 2012). Furthermore, in 2015, the Council of the EU invited Member States, institutions and relevant authorities to develop targets for gender balance among professors (Council of the EU, 2015) which tends to be the highest academic position (grade A) in most countries. Since 2012, an increasing number of institutions or research organisations have adopted a variety of measures to make improvements (Gvozdanović and Maes, 2018), including leadership training, implicit bias training for recruitment and promotion committees, and full-fledged GEPs (see Chapter 5) as well as through the Human Resources Strategy for Researchers (HRS4R) (Cameron et al, 2015)[1]. Despite efforts, the under-representation of women in senior academic and decision-making positions in the EU continues to be a significant issue, thus hindering the growth of the European Research Area (ERA) (European Commission, 2020g).

The under-representation of women researchers and women in grade A positions can be understood through the 'leaky pipeline' and 'glass ceiling' phenomenon. The former refers to the effect of women leaving the career pipeline at different stages. As a result, an increase in the share of women among graduates (or at a later stage in the career ladder) does not automatically lead to an increase in the share of women among researchers or the share of women among grade A academic staff. The glass ceiling effect refers to the structural barriers such as discrimination and gender bias that impede women's access to top decision-making and managerial positions. The new ERA Communication recognises the lack of progress to improve gender balance in research leadership positions and commits to the development of inclusive GEPs, building on the Horizon Europe Programme (European Commission, 2020a). GEPs should cover a number of areas linked to career progression including: work-life balance and organisational culture; gender balance in leadership and decision-making; gender equality in recruitment and career progression; integration of the gender dimension into research and teaching content; and measures against gender-based violence, including sexual harassment. This chapter examines the progress made in women's presence at the highest level of the academic career path.

Section 6.2 analyses the pattern of women and men's representation in a typical academic career. More specifically, this section considers the proportion of women and men present as students and graduates at Bachelor's and Master's or equivalent level (ISCED 6 and 7) and as academic staff at different grades of an academic career. The causes for vertical segregation in academic careers are multiple, complex and intertwined. They include institutional cultures which can exclude women (including lack of work-life balance), societal perceptions of appropriate gender roles and unconscious gender biases which affect the assessment of women's scientific performances (European University Association, 2017; European University Associated, 2020). As a result, lower rates of women, relative to men, are awarded full professorship positions (considered to be a pre-requisite for top level decision-making positions such as faculty leads, or university rectors). In examining sex-disaggregated data on the proportion of students, graduates and academic staff, this section provides an indication of women's representation at each level of academia in order to observe progress – if any - towards reducing vertical segregation.

Section 6.3 analyses the gender gap in career progression and senior positions in academia. This section focuses on the gender gap in grade A positions i.e. the highest position at which research is typically conducted. Since 2005, the Council of the EU has invited Member States to increase the number of women, particularly in leadership positions, in the public sector and industrial research and technology (Council of the EU, 2005). In 2015, a similar invitation was made to Member States, institutions and relevant authorities to develop targets for gender balance among professors (Council of the EU, 2015) which tends to be the highest research position in most countries. This section first assesses how women's representation among grade A academic staff has evolved over time. Previous editions of She Figures have showed that while the pool of Doctoral graduates was closer to gender parity, gender differences tended to persist across fields of study. Differences in women and men's educational pathways may lead to horizontal segregation of career pathways (EIGE, 2021a). This section thus also considers how women's and men's representation in grade A academic positions varies by field of R&D.

1 The HRS4R supports organisations involved in delivering or funding research to implement principles of the European Charter for Researchers (EURAXESS, 2005) and the Code of Conduct for the Recruitment of Researchers (ALLEA, 2017). In line with this, the 'HR Excellence in Research Award' recognises organisations that provide and support a stimulating and favourable working environment (Cameron et al, 2015).

Section 6.4 explores the Glass Ceiling Index (GCI), or the 'glass ceiling' phenomenon – where structural barriers impede women's access to top decision-making and managerial positions in organisations of all types and domains. Both the Gender Statistics Database on women and men in decision-making and the Gender Equality Index of EIGE demonstrate the under-representation of women in positions of power, across a wide range of sectors in the EU (EIGE, 2021b; EIGE, 2020). The GCI provides a way of measuring the extent of potential disadvantages faced by women in the research community specifically. The GCI is the ratio of the proportion of women in academia (grades A, B, and C) to the proportion of women in top academic positions (grade A positions; equivalent to full professorships in most countries). This section indicates the opportunity, or lack of it, for women to move up the hierarchical ladder in their academic profession.

Section 6.5 analyses women's representation among grade A staff by age group in order to compare how the presence of women and men in top levels of academia changes across different age groups. Women might be under-represented at certain age groups for a multitude of reasons stemming from gender biases and stereotypes. Gender biases exist in relation to a lack of acknowledgment of women's competencies, lower recognition of women's achievements (including in relation to citations), lower visibility of women in decision-making positions, lower availability of effective networks, among others. Furthermore, this is combined with gender stereotypes in relation to leadership, caregiving and the role of the 'breadwinner', which may lead to asymmetrical work-life balance (European University Association, 2017). According to Eurostat, a higher proportion of women are outside of the labour force due to caring responsibilities. In comparison to men, women take more career breaks and have shorter careers overall (European Union, 2018). This section considers the distribution of grade A academic staff by age group, given that such positions typically require several years' academic experience.

Section 6.6 explores women's participation in leadership positions in research. A lack of gender equality in leadership positions in research implies a considerable loss and waste of talent that detrimentally affects institutional decision-making by removing opportunities for women to shape and influence the research agenda (GenPORT, 2017). More broadly, the Gender Equality Strategy 2020-2025 emphasises that inclusive and diverse leadership is needed to bring forward new ideas and innovative approaches that better serve EU society (European Commission, 2020b). For the private sector, there have been delays in the adoption of the 2012 proposal for a Directive on improving the gender balance on corporate boards (European Commission, 2020c). The proposal was brought forward to be implemented by the current College of Commissioners (2019-2024). In light of the importance of increasing women's representation in decision-making and leadership positions, this section specifically examines the share of women in top decision-making and leadership positions in research (i.e. heads of institutions or members of boards).

6.2 Pattern of women and men's representation in a typical academic career

Existing research has shown that women in the EU remain under-represented in top academic positions with only slight recent improvements (European Commission, 2020b). Previous data showed that the share of women among academic staff rapidly declines as they advance to higher positions in academia (She Figures 2018). The following indicators consider women's representation at different levels as students and academic staff in order to further examine progress towards reducing vertical segregation at European level. This section specially examines representation in the field of STEM as the gender gap between women and men tends to widen in this field across all education levels and academic positions.

The share of women among academic staff declined steeply as they advanced to higher positions, with little improvement since 2015.

The typical academic career begins as a student, then a graduate at Bachelor's and Master's or equivalent level (ISCED levels 6 & 7) followed by Doctoral level or equivalent (ISCED level 8). An individual may then progress through grades C to A of academic staff, with grade A being the highest level at which research is typically conducted. In most countries, grade A is equivalent to a full professorship.

The data show that women represented 54.4% of Bachelor's and Master's (ISCED 6 & 7) students (53.5% of ISCED 6 and 57.2% of ISCED 7) and 58.7% of Bachelor's and Master's graduates (58.9% of ISCED 6 and 58.2% of ISCED 7) at European level in 2018 (Figure 6.1). Moreover, the proportion of women students and graduates at the Doctoral level (ISCED 8) was close to gender parity (around 48%) at the European level. It is important to note that the students in 2018 are not the same people as the graduates in 2018.

However, the share of women among academic staff in the EU declined considerably at higher positions in academia. In 2018, the proportion of women declined from 46.6% in grade C positions to 40.3% in grade B positions, with a decline to around one-quarter of women (26.2%) represented in the highest positions (grade A). There was no change since 2015 across all education levels, with little change across all grades of academic staff (at most, approximately 2 p.p. difference between values at grade A).

The data suggests that between 2015 and 2018, there has been very slight improvement in women's representation in grade A positions at European level.

The academic staff grades presented in She Figures are based on national mappings according to the following definitions:

- A: The single highest grade / post at which research is normally conducted within the institutional or corporate system
- B: All researchers working in positions that are not as senior as the top position (A) but definitely more senior than the newly qualified PhD holders (C) (i.e. below A and above C)
- C: The first grade/post into which a newly qualified PhD (ISCED 8) graduate would normally be recruited within the institutional or corporate system
- D: Either postgraduate students not yet holding a PhD (ISCED 8) degree who are engaged as researchers (on the payroll) or researchers working in posts that do not normally require a PhD

The share of women was considerably smaller among students and graduates at all tertiary education levels and academic staff of all three higher grades in STEM compared to the total share of women students and graduates across all fields.

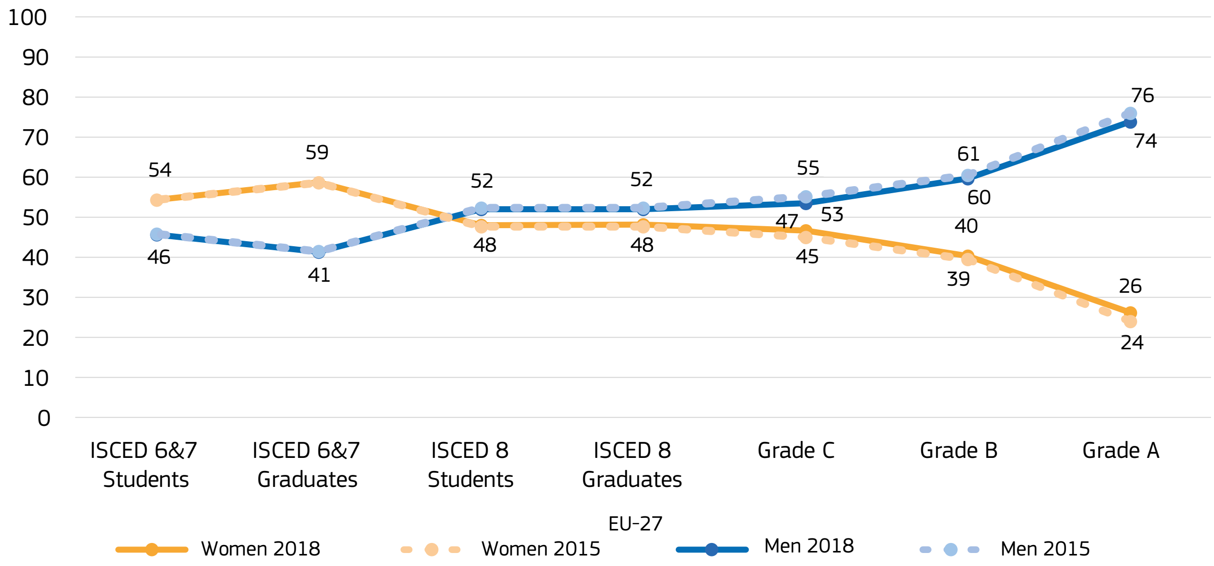
In 2018, women represented less than 40% of Doctoral graduates in several narrow fields of STEM such as Physical Sciences, Mathematics & Statistics, ICT and Engineering & Engineering Trades (see Chapter 2). Figure 6.2 shows the same information as Figure 6.1, but focuses on academic careers in STEM. The data show that women were under-represented at all levels in this field. More specifically, in 2018, women represented 31.7% of Bachelor's and Master's students (30.1% of ISCED 6 & 35.6% of ISCED 7) and 35% of Bachelor's and Master's graduates (32.9% of ISCED 6 37.7% for ISCED 7) in STEM at European level. These proportions were 22 p.p. and 24 p.p. lower than those for all fields of education (Figure 6.1). At Doctoral level (ISCED 8), women represented 36.8% of students and 37.9% of graduates in STEM at European level.

An even wider gender gap is observed across different grades of academic staff. Women represented 34.9% of academic staff in grade C positions within STEM, declining to 28.2% of staff in grade B positions and less than 20% of staff in grade A positions. As with the proportions of women and men at different grades across all fields, there was little or no change between 2015 and 2018 (at most, a change of 2 p.p. at grade A). Women's shares across all academic grades were considerably smaller than the respective shares for all fields together (Figure 6.1).

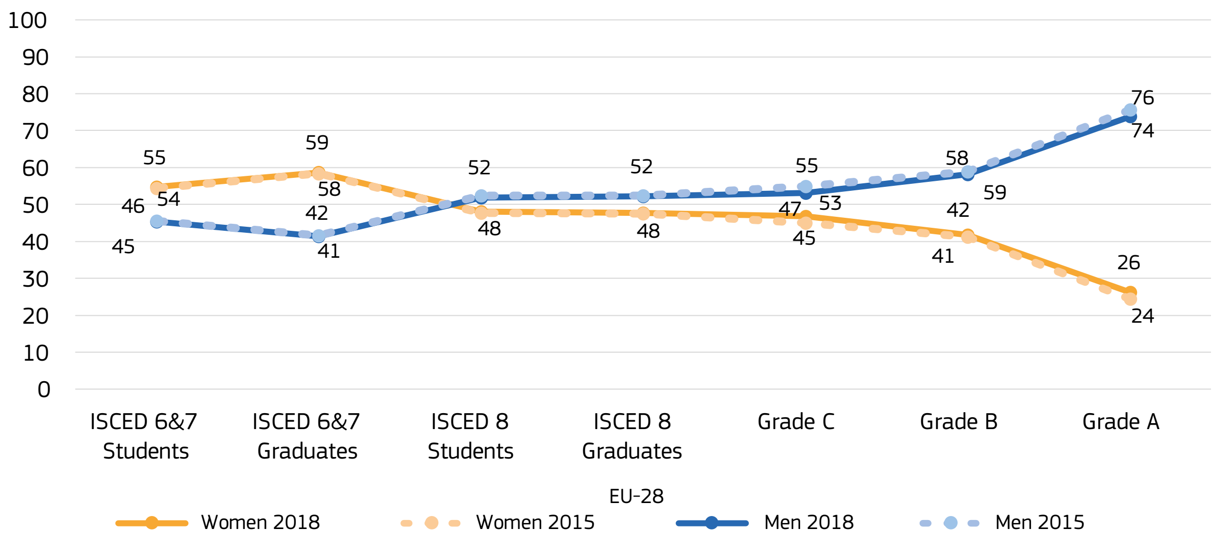
These data suggest that the extent of vertical segregation in career paths for women in academic is more pronounced in the field of STEM. The Gender Equality Strategy 2020-2025 emphasises the importance of tackling the gender gap in the proportion of STEM graduates within the context of an EU economy that is rapidly transforming towards digitalisation (European Commission, 2020b). Women's relatively low participation in STEM contributes to the gender pay gap, as STEM fields tend to be associated with higher levels of pay compared to Education and Humanities fields in which women tend to be over-represented. Considering both the importance of this field to the EU economy and the potential disadvantages to women, there has been a renewed policy commitment towards women's participation in STEM. For example, the WiD Declaration (European Commission, 2020d) recognised the need to integrate awareness of gender bias across all relevant sectors through measures such as unconscious bias training for teachers, addressing structural barriers related to work conditions and culture and increasing visibility of role models. The ERA has also committed to strengthening the focus on participation of women in STEM fields (European Commission, 2020a).

Figure 6.1 Proportion (%) of men and women in a typical academic career, students and academic staff, EU-27 & EU-28, 2015-2018

EU-27



EU-28

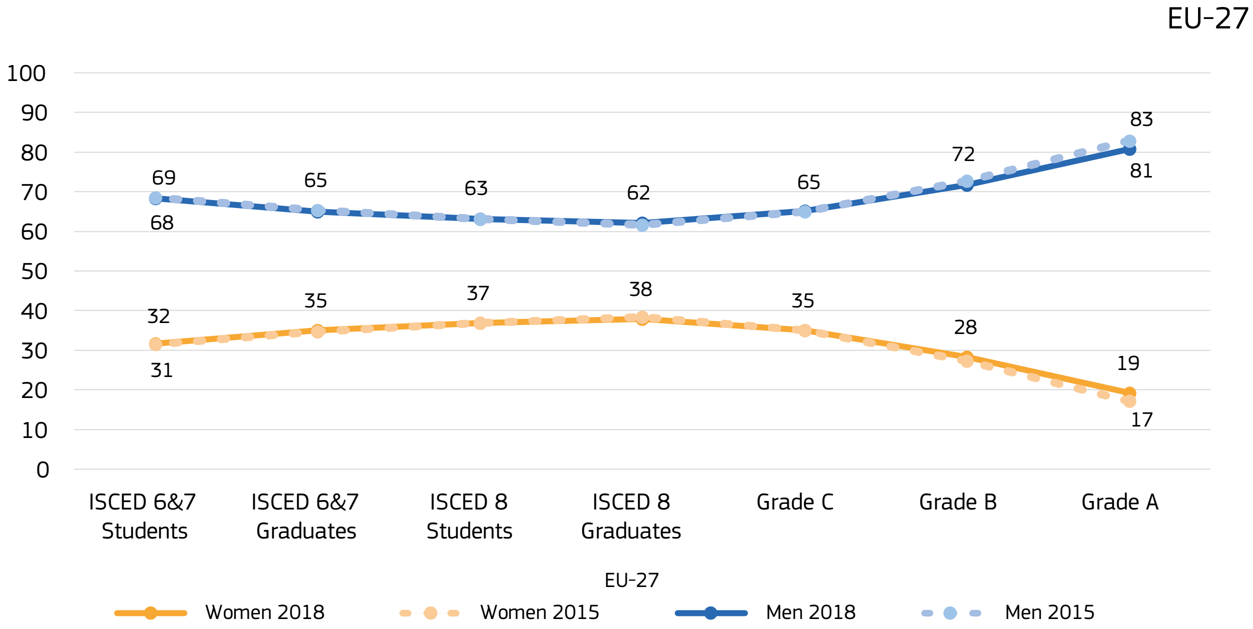


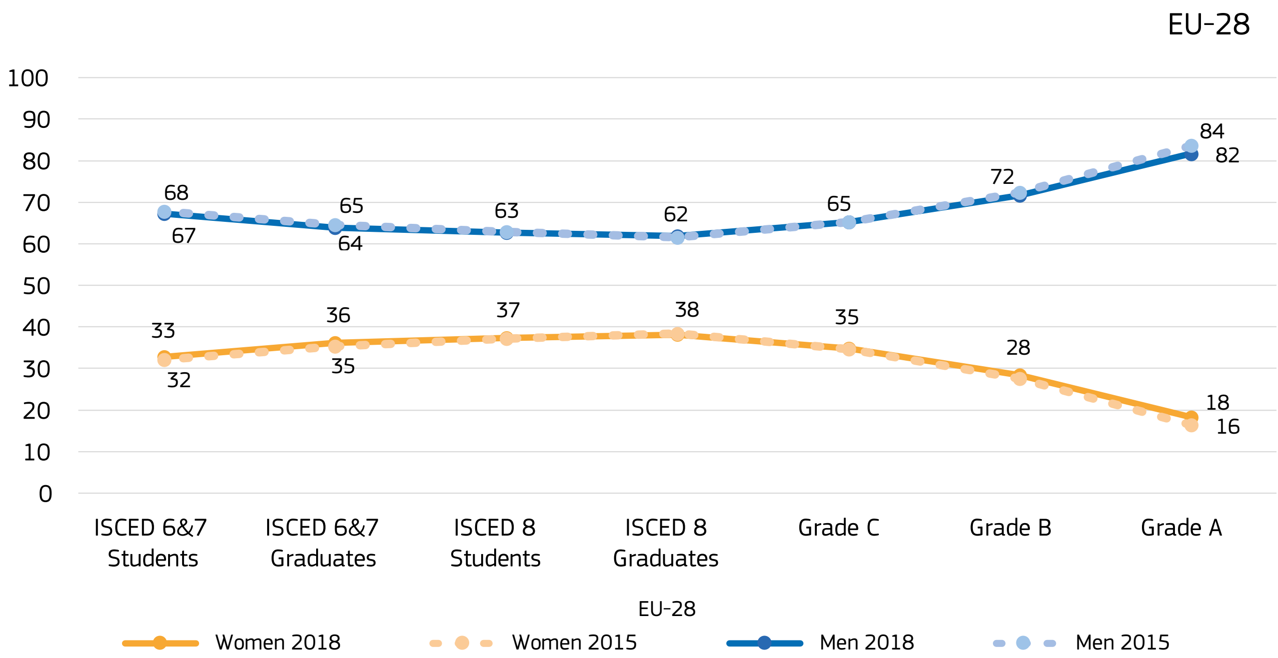
Notes: Data are in headcounts (HC); Data for BE is the result of: BE (FL) + BE (FR); In case data for researchers is not available or incomplete, data for Academic staff are presented; Reference years for Eurostat and WiS data: 2015-2018; Exceptions to the reference year for: EL, FR, CY, AT: 2015-2017; HR: 2017-2019; LU, UK: 2015-2016; LT, SK: 2016-2018; Data for Researchers is not available for IS, IE, IL, NL, SK, SE; Data for Academic staff is not available for BE (FR, FL), CY, CZ, DK, EE, FI, NO, PT; Data not applicable for: BG (Unknown sex); Definition differs for Eurostat data: EU-27, EU-28: Graduates at Doctoral or equivalent level (Females, Males, Total: 2015); Definition differs for Eurostat data: EU-27, EU-28: Students enrolled at Doctoral or equivalent level (Females, Males, Total: 2015); Data available only for all grades: CZ, EE.

Other: break in time series: DE: 2016, ES:2015, SI: 2017, AT: data refer only to Public Universities (without the Public, “Danube University Krems”), University Hospitals and Universities of Arts and not to the total Higher Education Sector, BE (FR): Data refer to Universities and High schools (Hautes écoles / Hooge Scholen); Arts schools; Architecture schools, FI: Only Universities included (not including National Defence University),IE: Private colleges and other institutions providing formal tertiary education programmes not receiving a core grant from the Irish Exchequer are not included, IT: staff of Higher Education in Art, Music and Dance and the Academic staff with fixed-term contracts not included, NL: Only Universities are covered (without the ‘Hogescholen’(‘Universities of Applied Sciences’). The same person may be counted in several grades and fields of R&D: SE, Academic staff based on UOE definition: BG, CH, DE, EL, HR, IT, MT, PL, SI.

Source: Women in Science database, DG Research and Innovation - T1_questionnaires, Education Statistics (online data codes: educ_uoe_enrt03, educ_uoe_grad02)

Figure 6.2 Proportion (%) of men and women in a typical academic career in science and engineering, students and academic staff, EU-27 & EU-28, 2015-2018





Notes: Data are in headcounts (HC); Data for BE is the result of: BE (FL) + BE (FR); In case data for researchers is not available or incomplete, data for Academic staff are presented; Reference years for Eurostat and WiS data: 2015-2018; Reference years for Eurostat and WiS data: 2015-2018; Exceptions to the reference year for: LU, UK: 2015-2016; EL, CY, AT: 2015-2017: LT, SK: 2016-2018; HR: 2017-2019; Data for Researchers is not available for IS, IE, IL, NL, SK, SE; Data for Academic staff is not available for BE (FR, FL), CY, CZ, DK, EE, FI, NO, PT; Data unavailable for: HU; Data not applicable for: BG (Unknown sex); Definition differs for Eurostat data: EU-27, EU-28: Graduates at Doctoral or equivalent level (Females, Males, Total: 2015); Definition differs for Eurostat data: EU-27, EU-28: Students enrolled at Doctoral or equivalent level (Females, Males, Total: 2015); Data not broken down by field of R&D: BG, CZ, EE, IE, FR, IS; Data not broken down by field for grades A, B, or C: HU.

Other: break in time series: DE: 2016, ES:2015, SI: 2017, AT: data refer only to Public Universities (without the Public, "Danube University Krems"), University Hospitals and Universities of Arts and not to the total Higher Education Sector, BE (FR): Data refer to Universities and High schools (Hautes écoles / Hooge Scholen); Arts schools; Architecture schools, IE: Private colleges and other institutions providing formal tertiary education programmes not receiving a core grant from the Irish Exchequer are not included. IT: staff of Higher Education in Art, Music and Dance and the Academic staff with fixed-term contracts are excluded, NL: Only Universities are covered (without the 'Hogescholen'('Universities of Applied Sciences'), The same person may be counted in several grades and fields of R&D: SE, Academic staff based on UOE definition: BG, CH, DE, EL, HR, IT, MT, PL, SI.

Source: Women in Science database, DG Research and Innovation - T1_questionnaires, Education Statistics (online data codes: educ_uoe_enrt03, educ_uoe_grad02)

6.3 The gender gap in career progression and senior positions in academia

In 2005, the Council of the EU invited Member States to increase the numbers of women in leadership positions, going on to invite relevant stakeholders to develop targets for gender balance among professors in 2015 (Council of the EU, 2005; 2015). Despite these efforts, previous editions of She Figures showed that relatively fewer women reach grade A positions in their academic career. Furthermore, the reaffirmed 2020 Council Conclusions on the new ERA (Council of the EU, 2020c) noted that there 'continues to be a major gender imbalance preventing Europe from using the full potential of its R&I system aiming for excellence'. To assess the gender gap in career progression and senior positions in academia, the following indicators first show women's representation across all grades of academic staff and then analyse their representation at the highest level of academia (grade A). In light of the persistence of gender segregation in certain fields of study (see Chapter 2) and occupational gender segregation in certain fields of R&D (see Chapter 3), this section also provides data on women's representation in grade A positions by field of R&D.

At both European and country level, the representation of women declines dramatically at the highest level of academia (grade A).

The data show that in 2018, women represented more than 40% of total academic staff at European level (Table 6.1). There were considerable differences by grade, however. While women represented an average of nearly half of grade C and D staff (46.6% of grade C staff and 47.1% of grade D staff) and 40.3% of grade B staff at European level, they occupied only around one-quarter of grade A staff positions (26.2%).

These trends are generally reflected at country level. In all except eight EU-27 Member States and Associated Countries (CZ, DE, EL, FR, CY, LU, IS, CH), women represented more than 40% of total academic staff.

At lower grades (grade C and grade D), women represented more than 40% of staff in most EU-27 Member States and Associated Countries (exceptions: BE, EL, FR, LU, MT for grade C, and MT for grade D). Women also represented more than 40% of staff at grade B in half of the EU-27 Member States and Associated Countries for which data were available (16 of 32: BG, ES, FR, HR, LV, LT, MT, PT, RO, SI, SK, FI, SE, UK, NO, BA).

At the highest grade (grade A), women represented more than 40% of staff in only six EU-27 Member States and Associated Countries (HR, LV, LT, MT, RO, BA). The highest proportion of women in grade A positions was observed in Romania (50.8%). Women accounted for less than one-quarter of grade A staff in 12 EU-27 Member States and Associated Countries (BE, DK, DE, EL, ES, IT, CY, LU, HU, NL, CH, IL). There are some examples of positive practice to increase women's career progression in academia, for example, the PRIMA grants in Switzerland, described in Box 24.

BOX 24 Supporting women's progression within academic careers

In **Switzerland**, PRIMA grants are provided by the Swiss National Science Foundation and aim to offer a 'stepping stone' to professorships for women researchers. The grant includes funding that covers the researcher's salary and project costs for a five-year period. Since 2017, when the funding scheme was introduced, 59 grants have been awarded, with an average amount of CHF 1.4 million per project. As of January 2021, two women who received PRIMA grants were subsequently appointed as professors[2].

In **Germany**, the Collaborative Research Centre alongside the service unit Human Research Development at the Karlsruhe Institute of Technology, created a 'Development Programme for High Potentials in Chemistry'[3]. The programme aimed to increase the number of female researchers in Principle Investigators positions through mentoring with experienced staff and personalised development plans[4].

2 Swiss National Science Foundation, 'PRIMA', http://www.snf.ch/en/funding/careers/prima/Pages/default.aspx

3 Karlsruhe Institute of Technology: Development Program for High-Potentials: https://www.sfb1176.kit.edu/563.php, https://www.sfb1176.kit.edu/563.php

4 The programme was open to male and female postdoctoral researchers. Eight out of eleven researchers selected for the programme were women.

Table 6.1 Proportion (%) of women among academic staff, by grade and total, 2018

Country	Grade A	Grade B	Grade C	Grade D	Total
EU-27	**26.18**	**40.29**	**46.61**	**47.08**	**42.32**
EU-28	**26.22**	**41.75**	**46.87**	**47.13**	**42.42**
BE	20.29	31.37	38.17	49.08	42.19
BG	39.70	46.95	:	54.91	50.26
CZ	:	:	:	:	34.69
DK	22.55	34.37	43.35	51.01	43.66
DE	20.47	26.93	44.80	43.55	39.73
EE	:	:	:	:	48.2
IE	25.63	38.35	49.49	:	54.14
EL	22.29	32.47	36.72	51.13	36.54
ES	23.90	44.11	49.95	47.54	42.38
FR	27.65	43.78	38.89	42.4	39.47
HR	43.02	52.55	63.57	55.53	51.29
IT	23.74	38.41	46.77	50.13	40.48
CY	13.30	31.05	40.50	48.80	38.37
LV	44.65	51.47	57.85	:	55.41
LT	40.40	54.85	63.18	64.99	57.29
LU	17.67	34.22	31.64	41.8	36.64
HU	21.64	32.89	45.3	42.52	40.37
MT	43.75	50.00	23.08 (3/13)	36.36 (4/11)	46.39
NL	22.25	29.49	43.27	45.86	41.33
AT	25.09	27.64	41.92	44.12	40.07
PL	25.22	39.25	50.53	51.2	45.09
PT	27.15	41.36	49.41	53.16	49.83
RO	50.78	59.16	49.91	53.09	53.25
SI	32.95	40.77	52.18	49.59	45.92
SK	27.23	41.18	50.64	59.96	45.81
FI	30.32	49.74	50.21	49.29	47.07
SE	28.22	46.47	45.87	51.62	46.3
UK	26.41	45.68	51.28	59.17	43.11
IS	26.32	36.04	51.17	:	37.21
NO	30.91	48.09	48.71	57.85	49.75
CH	24.08	36.37	42.49	43.55	39.96
TR	30.46	38.26	45.15	49.57	43.65
BA	46.56	41.30	48.57	51.18	47.71
IL	19.45	35.70	51.53	57.25	47.96

Notes: Data are Headcounts (HC) ; Data for Researchers is not available for IS, IE, IL, NL, SK, SE. Data for Academic staff is not available for BE (FR), BE (FL), CY, CZ, DE, EE, FI, NO, PT, HU; Researchers used as reference population for BE, CZ, DK, DE, EE, ES, FR, HR, CY, LU, HU, MT, AT, PL, PT, RO, FI, UK, NO, CH, TR, BA. Reference year differs: IS (2012), LU, UK (2016), EL, FR, CY, AT (2017), HR (2019); Data not available: ME, MK, AL, RS, AM, FO, GE, MD, TN, UA. WiS 2018 data used: LU, UK (all grades and total). Grade not applicable: BG (grade C).

Other: Data for BE is the result of data for BE (FL) + BE (FR); ":" indicates that data are not available, break in time series: DE:2016, ES:2015, SI: 2017, AT: data refer only to Public Universities (without the Public, "Danube University Krems"), University Hospitals and Universities of Arts and not to the total Higher Education Sector, BE (FR): Data refer to Universities and High schools (Hautes écoles / Hooge Scholen); Arts schools; Architecture schools, FI: Only Universities included (not including National Defence University), FR: Higher Education Sector also includes University hospitals and cancer centers, IE: Private colleges and other institutions providing formal tertiary education programmes not receiving a core grant from the Irish Exchequer are not included, IL: Universities, public, private colleges and Colleges of education are included, IT: staff of Higher Education in Art, Music and Dance and the Academic staff with fixed-term contracts are excluded, NL: Only Universities are covered. The 'Hogescholen'('Universities of Applied Sciences') which are part of the Higher Education Sector are not covered, ES: some researchers cannot be assigned to a Grade; The total does not equal the sum of head counts by Grade, The same person may be counted in several grades and fields of R&D: SE, BE (FL), Academic staff based on UOE definition: BG, CH, DE, EL, HR, IT, MT, PL, SI.

Source: Women in Science database, DG Research and Innovation - T1_questionnaires

The following section focuses on the proportion of women occupying grade A academic positions and the number of women and men in grade A positions among all academic staff.

There was some improvement in women's representation among grade A staff between 2015 and 2018.

The data show that despite low levels of representation among grade A staff at European level (Table 6.1 and Figure 6.1), the proportion of women slightly increased between 2015 and 2018 from 24.1% to 26.2% (Figure 6.3).

In more detail, in all but two of the EU-27 Member States and Associated Countries with available data (MT, RO), the proportion of women among grade A staff increased between 2015 and 2018. In most countries, the increases were less than 5 p.p. but some larger increases were observed in Bulgaria (from 34.0% to 39.7%), Ireland (from 20.6% to 25.6%), Latvia (from 39.1% to 44.6%) and Israel (from 14.3% to 19.5%).

Men were much more likely than women to reach grade A positions.

Despite improvements in the proportion of women among grade A academic staff, Figure 6.4 shows that in 2018, men were twice as likely as women to hold a grade A positions at the European level (15.7% for men and 7.6% for women). Data from 2016 showed that 16.7% of men and 7.4% of women were in grade A positions in the EU-28 (She Figures 2018). These data thus suggest only a slight reduction in the gender gap at the highest level of academia among the Member States since 2016.

At country level, in every EU-27 Member State and Associated Country for which data were available, a greater proportion of men held grade A positions. In 14 of the 32 countries (CY, DK, EL, ES, FI, IL, IT, LU, NL, NO, PL, SE, SK, UK), men were more than twice as likely as women to hold grade A positions. In Cyprus (16.7% compared to 4.1%) and Israel (14.0% compared to 3.7%) men were four times as likely as women to hold such a position. By contrast, in two EU-27 Member States and Associated Countries (BA, RO), there was a smaller gender gap (less than 1 p.p. difference between the proportion of men and women grade A staff. Box 25 highlights examples of measures to increase the number of women among grade A staff through funding schemes.

BOX 25 Funding programmes to increase women's representation among Grade A staff

In **the Netherlands**, the Westerdijk Talent Scheme ran from 2017-2018 and provided funding to support the appointment of 100 female professors. The scheme was launched in response to the low proportion of female professors in the Netherlands (18% in 2015).[5] The programme successfully led to the appointment of 100 additional female professors, with the proportion of women among grade A staff increasing by just over 4 p.p. in 2018 compared to 2015 (Figure 6.3).

In **Germany**, the Women Professors Programme was jointly funded by the Federal Ministry of Science and Research and the Länder (German Federal States). It ran from 2008-2012 and 2013-2017, with a total budget of EUR 300 million, and aimed to increase the proportion of women professors. Between 2007 and 2017, 260 new professorships for women were created[6], with an impact assessment finding that 'the proportion of women professors increased more than would have been expected in the absence of the programme'[7]. Other similar programmes are in place currently: the Leibniz Programme for Women Professors, which has been in place since 2018 and offers funding of up to EUR 1.7 million for five years to support a professorship position[8]. Similarly, the Helmholtz Association's funding programmes for leading female scientists aim to fund first-time appointments of women professors and attract international senior women scientists[9].

5 Westerdijk Talent Scheme, https://www.nwo.nl/en/researchprogrammes/westerdijk-talent-scheme

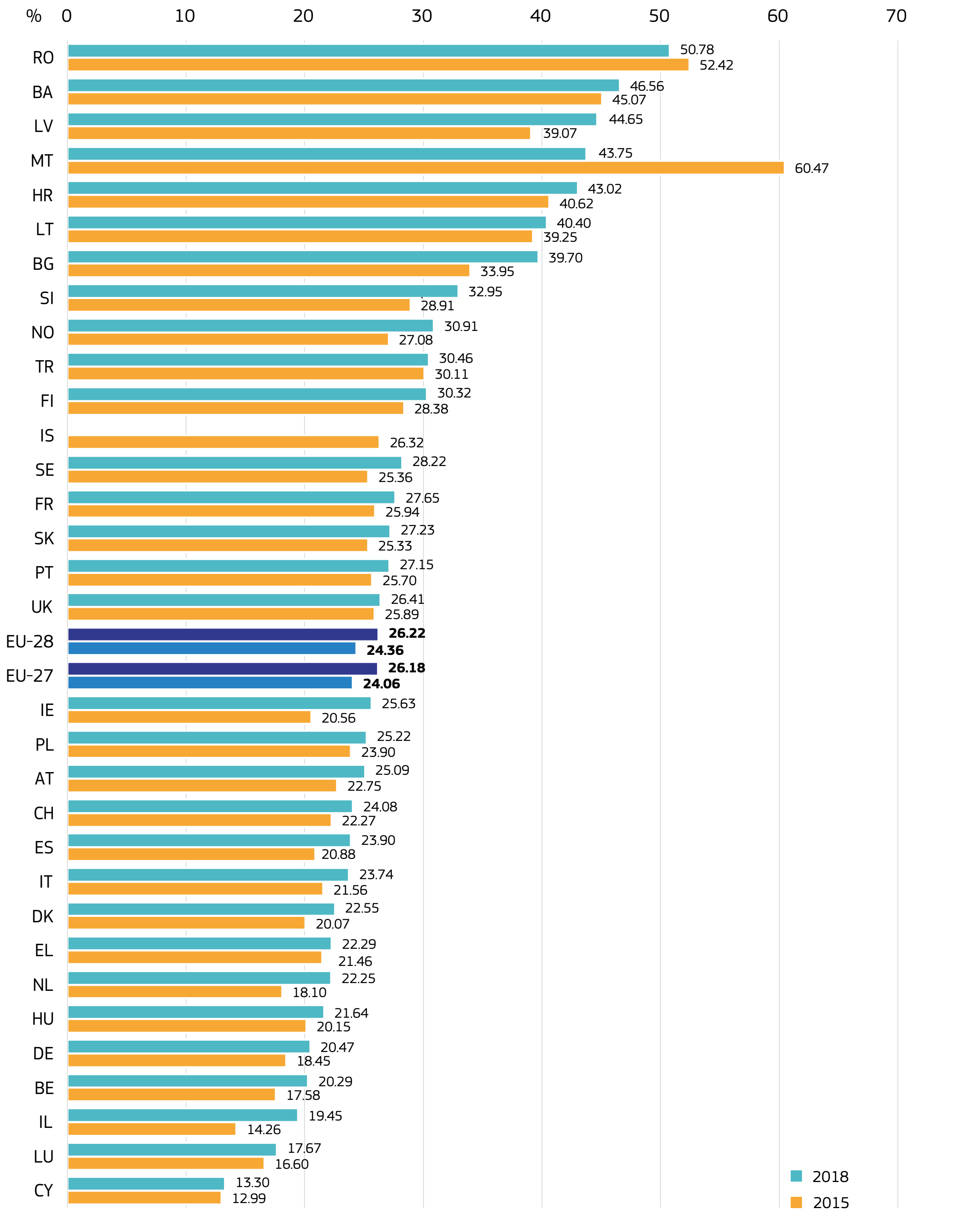
6 Best et al. (2012). 'Gender and STEM in Germany: Policies Enhancing Women's Participation in Academia', http://genderandset.open.ac.uk/index.php/genderandset/article/viewFile/304/523

7 Löther, A. (2019). 'Is It Working? An Impact Evaluation of the German "Women Professors Programme', https://www.mdpi.com/2076-0760/8/4/116

8 Leibniz Association, 'Leibniz Programme for Women Professors', https://www.leibniz-gemeinschaft.de/en/research/leibniz-competition/leibniz-programme-for-women-professors.html

9 Helmholtz Association, 'Funding programs for leading female scientists', https://www.helmholtz.de/en/jobs-talent/science/senior-scientists/funding-programs-for-leading-female-scientists/

Figure 6.3 Evolution of the proportion (%) of women among Grade A positions, 2015 vs. 2018

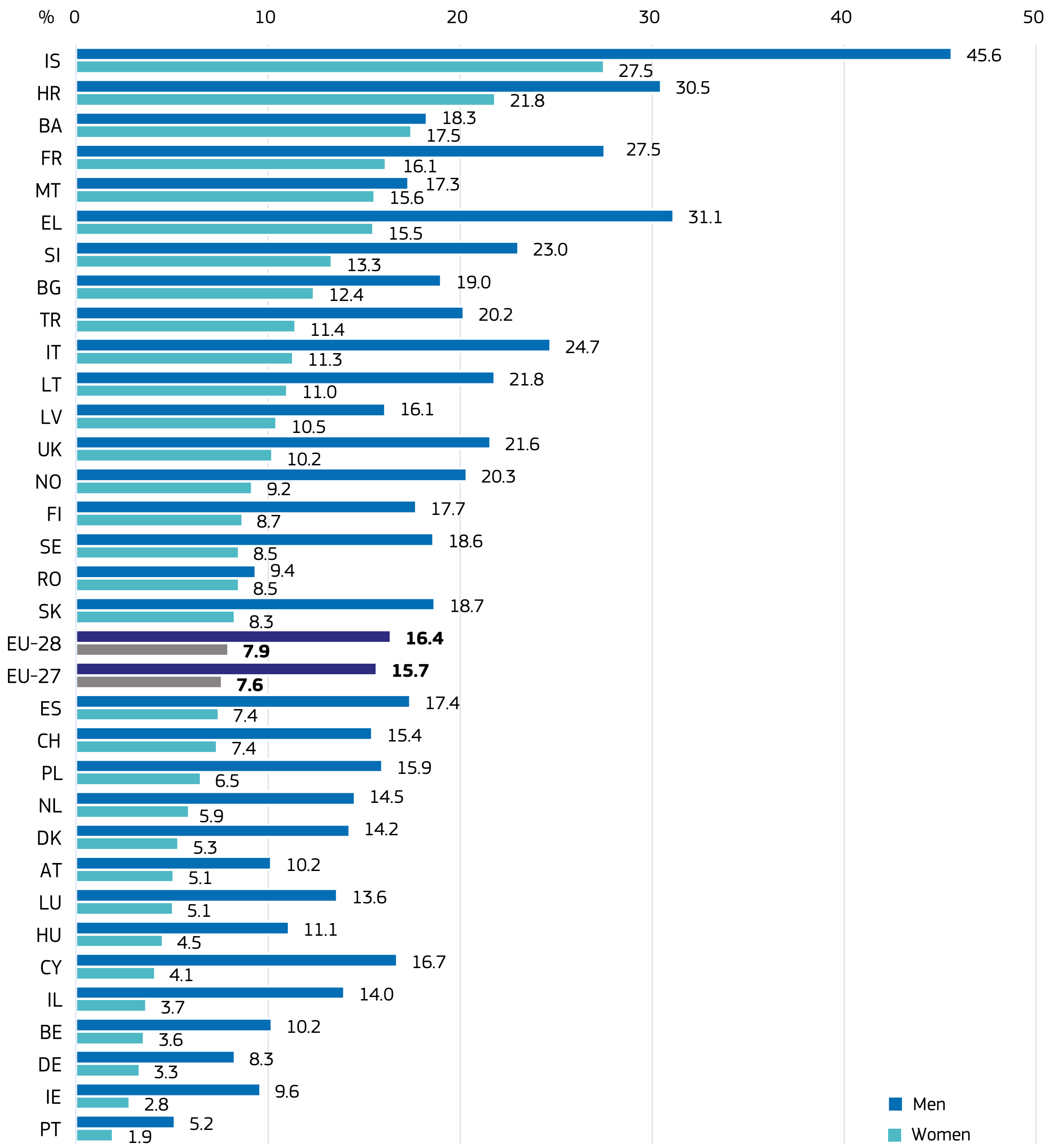


Notes: Data are Headcounts (HC), In case data for researchers is not available or incomplete, data for Academic staff are presented. Data for BE is the result of the data for BE (FL) + BE (FR). WiS 2018 questionnaires were used: LU, UK, Data for Researchers is not available for BG, IE, EL, IT, LT, NL, SI, SK, SE, IS, IL. Data for Academic staff is not available for BG (FR), BE (FL), CY, CZ, DK, EE, FI, NO, PT. Data not available for CZ and EE (totals available only), IS (2018 data), ME, MK, AL, RS, AM, FO, GE, MD, TN, UA. Reference year differs: IS (2012 used in place of 2015); LT, SK, TR, BA (2016 used in place of 2015); LU, UK (2016 used in place of 2018); EL, FR, CY, AT (2017 used in place of 2018); HR (2017 used in place of 2015. 2019 used in place of 2018).

Other: break in time series: DE:2016, ES:2015, SI: 2017, AT: data refer only to Public Universities (without the Public, "Danube University Krems"), University Hospitals and Universities of Arts and not to the total Higher Education Sector, BE (FR): Data refer to Universities and High schools (Hautes écoles / Hooge Scholen); Arts schools; Architecture schools, FI: Only Universities included (not including National Defence University), FR: Higher Education Sector also includes University hospitals and cancer centers, IE: Private colleges and other institutions providing formal tertiary education programmes not receiving a core grant from the Irish Exchequer are not included, IL: Universities, public, private colleges and Colleges of education are included, IT: staff of Higher Education in Art, Music and Dance and the Academic staff with fixed-term contracts are excluded, NL: Only Universities are covered. The 'Hogescholen'('Universities of Applied Sciences') which are part of the Higher Education Sector are not covered, ES: Some Researchers can not be assigned to a Grade; The total does not equal the sum of head counts by Grade, The same person may be counted in several grades and fields of R&D: SE, BE (FL), Academic staff based on UOE definition: BG, CH, DE, EL, HR, IT, MT,PL, SI.

Source: Women in Science database, DG Research and Innovation - T1_questionnaires

Figure 6.4 Proportion (%) of grade A staff among all academic staff, by sex, 2018



Notes: Data are Headcounts (HC); Data for BE is the result of the data for BE (FL) + BE (FR). For LU, UK the WiS 2018 questionnaires were used. Researchers used in place of academic staff where data for academic staff was not available. Researchers used as reference population for: BE, CZ, DK, DE, EE, ES, FR, HR, CY, LU, HU, MT, AT, PL, PT, RO, FI, UK, NO, CH, TR, BA. Data for Researchers is not available for: IS, IE, IL, NL, SK, SE; Data for Academic staff is not available for: BE (FR), BE (FL), CY, CZ, DK, EE, FI, NO, PT. Data not available for CZ and EE (totals available only), ME, MK, AL, RS, AM, FO, GE, MD, TN, UA. Reference year differs: IS (2012), LU, UK (2016), EL, FR, CY, AT (2017), HR (2019).

Other: break in time series: DE: 2016, ES: 2015, SI: 2017, AT: data refer only to Public Universities (without the Public, “Danube University Krems”), University Hospitals and Universities of Arts and not to the total Higher Education Sector, BE (FR): Data refer to Universities and High schools (Hautes écoles / Hooge Scholen); Arts schools; Architecture schools, FI: Only Universities included (not including National Defence University). FR: Higher Education Sector also includes University hospitals and cancer centers, IE: Private colleges and other institutions providing formal tertiary education programmes not receiving a core grant from the Irish Exchequer are not included, IL: Universities, public, private colleges and Colleges of education are included, IT: staff of Higher Education in Art, Music and Dance and the Academic staff with fixed-term contracts are excluded, NL: Only Universities are covered. The ‘Hogescholen’(‘Universities of Applied Sciences’) which are part of the Higher Education Sector are not covered, ES: Some Researchers can not be assigned to a Grade; The total does not equal the sum of head counts by Grade, The same person may be counted in several grades and fields of R&D: SE, BE (FL), Academic staff based on UOE definition: BG, CH, DE, EL, HR, IT, MT, PL, SI.

Source: Women in Science database, DG Research and Innovation - T1_questionnaires

In addition to the gender gap in grade A positions overall, the findings from Chapter 2 and 4 suggest that the extent of the gender gap may vary by field of R&D. The following indicators show the differences in the proportion of women and men among grade A academic staff by field of R&D and compare the distribution of women and men grade A academic staff by field of R&D.

Women were under-represented among grade A academic staff in every field of R&D, but the lowest representation is observed in the fields of Engineering & Technology and Natural Sciences.

In each field of R&D, women represented no more than around one-third of grade A staff at European level in 2018 (Table 6.2). The highest proportion of women among grade A staff was observed in Humanities (35.0%), followed by Social Sciences (30.9%), Medical Sciences (30.1%) and Agricultural Sciences (28.5%). By contrast, the lowest proportion of women among grade A staff were observed in Natural Sciences (22.0%) and Engineering & Technology (17.9%). These trends are similar to the data provided in Chapter 4, which showed that men researchers in Natural Sciences and Engineering & Technology exceeded the corresponding proportion for women researchers in most countries. Horizontal gender segregation in the participation of women and men in fields of R&D also affects women's relative presence at the highest level of academia in different fields of R&D.

At country level, the differences in women's representation among grade A staff largely reflect the patterns seen at European level. The highest proportion of women among grade A academic staff was observed in Humanities for 15 of 26 countries for which data were available (BE, DK, DE, EL, ES, IT, LV, LT, NL, AT, PT, SI, FI, SE, CH). The lowest proportion of women among grade A academic staff was observed in Engineering & Technology for all but five countries (CY, LU, MT, SI, IL).

Women represented more than 40% of grade A academic staff in one or more academic fields in only nine countries (HR and LV, for all fields but Engineering & Technology; LT, for Medical Sciences, Social Sciences and Humanities; MT, for all fields for which data were available, except Natural Sciences – but the absolute values were low; RO, for Natural Sciences, Medical Sciences and Social Sciences; SI, Humanities only; FI, Agricultural Sciences and Humanities; NO, Medical Sciences only; and BA, for Natural Sciences, Medical Sciences, Agricultural Sciences and Social Sciences). In a small number of countries, women's representation exceeded 60% in a given field (LV for Medical Sciences, Agricultural Sciences, Social Sciences and Humanities, MT for Medical and Social Sciences based on low absolute values and BA for Medical Sciences).

Box 26 provides an example of a funding scheme to increase women's representation among grade A staff, similar to those presented in Box 26, but with a focus on specific sectors of under-representation.

BOX 26 Targeted measures to address women's under-representation in senior academic positions

In **Ireland**, the Senior Academic Leadership Initiative (SALI) was launched in 2019 to 'assist in accelerating gender balance at senior levels', with a focus on areas where women are significantly under-represented. Organisations that apply for funding under SALI are required to put in place plans for future developments to support gender equality, thereby encouraging institutional change. Funding is provided for a 10-year period, after which the higher education institute is required to incorporate the costs of the additional positions created[10]. For 2020, this included senior positions in the fields of computer science, physics, mathematics, engineering, biological sciences, geography, healthcare, economics and history[11].

10 Higher Education Authority, 'Senior Academic Leadership Initiative', https://hea.ie/funding-calls/senior-academic-leadership-initiative/

11 Irish Universities Association (2020), 'Universities awarded 14 of 20 Posts approved under phase 1 of the Senior Academic Leadership Initiative', https://www.iua.ie/press-releases/universities-awarded-14-of-20-posts-approved-under-phase-1-of-the-senior-academic-leadership-initiative/

Women in grade A positions were more likely than men to work in the fields of Humanities and Social Sciences, and less likely than men to work in Natural Sciences and Engineering & Technology.

In 2018, the highest proportion of women grade A staff were in Social Sciences (27.4%) compared to all other fields at European level (Figure 6.5). By contrast, the highest proportion of men grade A staff were in Natural Sciences (23.1%) compared to all other fields at European level. For both women and men, the lowest proportion of grade A staff were in Agricultural Sciences. There was a higher proportion of women than men in grade A positions in the fields of Humanities (20.2% for women and 13.9% for men), Social Sciences (27.4% for women and 22.7% for men), Medical Sciences (18.1% for women and 15.5% for men) and Agricultural Sciences (4.4% for women and 4.1% for men). However, a higher proportion of men than women in grade A positions was evident in Natural Sciences (17.3% for women and 23.1% for men) and Engineering & Technology (12.2% for women and 20.7% men). These data suggest that the gender gap at the highest level of academia is most pronounced in the R&D field of Engineering & Technology.

Similar patterns were observed at country level. In the majority of EU-27 Member States and Associated Countries, the proportion of women in grade A positions exceeded the corresponding proportion for men in Medical Sciences, Social Sciences and Humanities. Only a minority of countries had equal or higher proportions of men in grade A positions compared to women in these fields (DE, IT, LU, AT, CH for Medical Sciences; CY and TR for Social Sciences; LU, MT, RO, TR and BA for Humanities). By contrast, the proportion of men in grade A positions was larger than the corresponding proportion for women in Natural Sciences and Engineering & Technology for all but a handful of countries (HR, IT, PT and RO for Natural Sciences and CY for Engineering & Technology).

In the field of Agricultural Sciences, the difference between women and men was more varied with the proportion of women exceeding the corresponding proportion of men in 13 of 27 EU-27 Member States and Associated Countries (BE, DK, DE, HR, LV, PL, PT, SI, FI, SE, UK, CH, IL). The difference at country level was quite small (between 0 and 3 p.p.), reflecting the small differences between proportions of women and men in grade A positions in this field at European level (0.3 p.p.).

Table 6.2 Proportion (%) of women among grade A staff, by main field of R&D, 2018

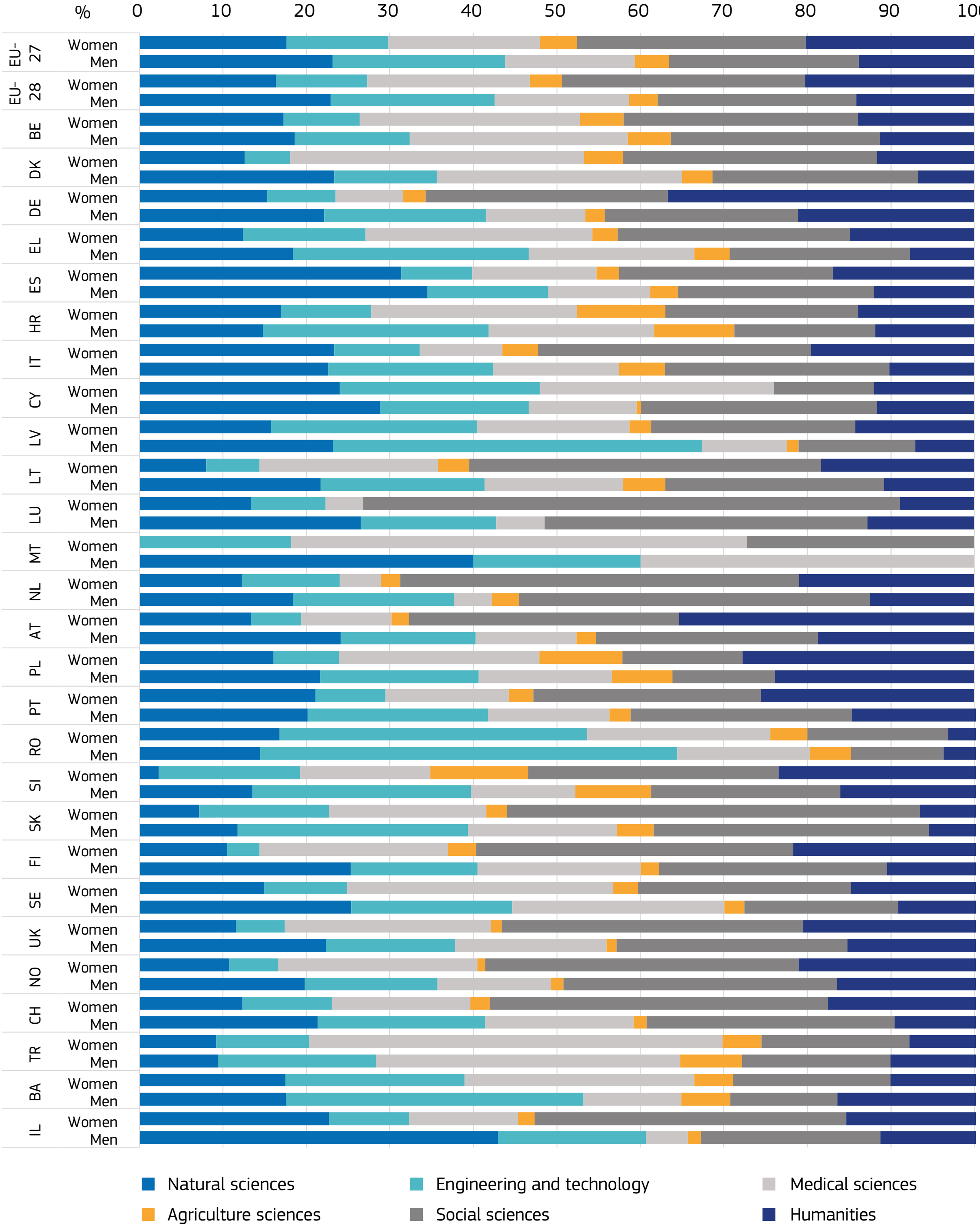
Country	Natural Sciences	Engineering and technology	Medical sciences	Agricultural sciences	Social sciences	Humanities
EU-27	**21.99**	**17.91**	**30.08**	**28.50**	**30.85**	**34.95**
EU-28	**20.75**	**16.95**	**30.74**	**28.37**	**31.08**	**34.41**
BE	19.10	14.37	20.43	20.29	22.14	23.89
DK	13.59	11.48	25.86	27.27	26.42	33.48
DE	15.13	9.79	15.02	22.46	24.44	30.97
EL	16.19	12.97	28.25	17.12	26.91	35.76
ES	22.21	15.54	27.69	20.33	25.54	30.69
HR	46.48	23.22	48.34	45.48	50.82	46.92
IT	24.30	13.84	17.05	19.45	27.46	37.43
CY	11.32	17.14	25 (7/28)	0 (0/1)	6.12	13.64 (3/22)
LV	42.72	38.05	66.41	67.27	65.67	69.03
LT	20	18	46.67	33.33	52.19	53.42
LU	9.78	10.50 (2/19)	14.30 (1/7)	-	26.29	13.30 (2/15)
MT	0 (0/4)	50 (2/4)	60 (6/10)	-	100 (3/3)	-
NL	16.07	14.85	23.90	17.31	24.58	32.53
AT	15.71	10.96	23.05	23.73	28.92	38.73
PL	20.04	12.18	33.70	31.46	28.27	28.21
RO	44.24	33.49	48.65	38.06	50.92	36.73
PT	28.08	12.57	27.49	30.77	27.68	39.32
SI	7.61	23.96	37.80	38.71	39.15	41.62
SK	18.60	17.38	28.38	17.46	35.95	30.85
FI	15.28	10.07	33.40	40.63	37.71	47.31
SE	18.69	16.88	32.94	32.94	35.10	38.87
UK	15.59	11.85	32.75	26.67	31.77	32.51
NO	19.57	14.23	43.85	21.82	33.92	36.36
CH	15.53	14.51	22.88	32.32	30.24	36.98
TR	29.95	20.41	37.31	21.75	30.39	25.32
BA	46.43	34.41	67.21	41.18	56.00	34.88
IL	11.37	11.64	38.84	24.14	29.63	24.83

Notes: Proportions are based on headcounts. In case data for researchers are not available or incomplete, data for Academic staff are presented. Academic staff was used as the reference population for EL, IT, IL, LT, NL, SI, SK, SE. Data for BE is the result of BE (FL) + BE (FR). Data for Researchers is not available for: IS, IE, IL, NL, SK, SE; Data for Academic staff is not available for: BE (FR), BE (FL), CY, CZ, DK, EE, FI, NO, PT. HU. Data are not available for BG, CZ, EE, IE, FR, IS (data was not provided by field), ME, MK, AL, RS, AM, FO, GE, MD, TN, UA. Reference year differs: LU, UK (2016), EL, CY, AT (2017), HR (2019). Data source differs for LU, UK (WiS 2018 questionnaires were used).

Other: break in time series: DE: 2016, ES: 2015, SI: 2017, AT: data refer only to Public Universities (without the Public, “Danube University Krems”), University Hospitals and Universities of Arts and not to the total Higher Education Sector. BE (FR): Data refer to Universities and High schools (Hautes écoles / Hooge Scholen); Arts schools; Architecture schools, FI: Only Universities included (not including National Defence University), IL: Universities, public, private colleges and Colleges of education are included, IT: staff of Higher Education in Art, Music and Dance and the Academic staff with fixed-term contracts are excluded, NL: Only Universities are covered. The ‘Hogescholen’(‘Universities of Applied Sciences’) which are part of the Higher Education Sector are not covered, ES: Some Researchers can not be assigned to a Grade; The total does not equal the sum of head counts by Grade, The same person may be counted in several grades and fields of R&D: SE, BE (FL), Academic staff based on UOE definition: CH, DE, EL, HR, IT, MT, PL, SI.

Source: Women in Science database, DG Research and Innovation - T1_questionnaires

Figure 6.5 Distribution of grade A staff across fields of R&D, by sex, 2018



Notes: Data are Headcounts (HC); In case data for researchers are not available or incomplete, data for Academic staff are presented. Academic staff are the reference population for EL, IT, LT, NL, SI, SK, SE, IL. Reference year differs: LU, UK (2016), EL, CY, AT (2017), HR (2019). Data for BE is the result of BE (FL) + BE (FR). For LU and UK the WiS 2018 questionnaires were used. Data for Researchers is not available for: IS, IE, IL, NL, SK, SE; Data for Academic staff is not available for: BE (FR), BE (FL), CY, CZ, DK, EE, FI, NO, PT. HU.

Data not available: BG, CZ, EE, IE, FR, IS (disaggregation by field not available); HU (disaggregated by grade not available); ME, MK, AL, RS, AM, FO, GE, MD, TN, UA.

Other: break in time series: DE: 2016, ES: 2015, SI: 2017, AT: data refer only to Public Universities (without the Public, "Danube University Krems"), University Hospitals and Universities of Arts and not to the total Higher Education Sector, BE (FR): Data refer to Universities and High schools (Hautes écoles / Hooge Scholen); Arts schools; Architecture schools, FI: Only Universities included (not including National Defence University), FR: Higher Education Sector also includes University hospitals and cancer centers, IT: staff of Higher Education in Art, Music and Dance and the Academic staff with fixed-term contracts are excluded, NL: Only Universities are covered. The 'Hogescholen'('Universities of Applied Sciences') which are part of the Higher Education Sector are not covered, IL: Universities, public, private colleges and Colleges of education are included, IE: Private colleges and other institutions providing formal tertiary education programmes not receiving a core grant from the Irish Exchequer are not included, ES: Some Researchers can not be assigned to a Grade ; The total does not equal the sum of head counts by Grade, The same person may be counted in several grades and fields of R&D: SE, BE (FL), Academic staff based on UOE definition: CH, DE, EL, HR, IT, MT, PL, SI.

Source: Women in Science database, DG Research and Innovation - T1_questionnaires

6.4 The Glass Ceiling Index

This section explores the 'glass ceiling' effect – where structural barriers impede women's access to top decision-making and managerial positions in organisations of all types and domains. As part of the objective for 'leading equally throughout society', the Gender Equality Strategy 2020-2025 recognises that even if gender parity exists at lower levels, there are far fewer women in leading positions (European Commission, 2020b). Within this context, the Strategy notes that if men predominantly hold top positions for a long time, this may shape the recruitment pattern for successors due to unconscious bias. The following indicator provides an indication of the glass ceiling effect in academia. In comparison to the other indicators in this chapter, this indicator corrects for the relative presence of women (compared to men) to measure the relative chance for women (compared to men) to reach a top academic position.

The **Glass Ceiling Index** (GCI) is a relative index comparing the proportion of women in academia (grades A, B, and C) to the proportion of women in top academic positions (grade A positions, equivalent to full professorships in most countries) in a given year. The GCI can range from 0 to infinity. A GCI of 1 indicates that there is no difference between women and men for being promoted. A score of less than 1 means that women are over-represented at grade A level and a GCI score of more than 1 points towards a glass ceiling effect, meaning that women are under-represented in grade A positions. In other words, the interpretation of the GCI is that the higher the value, the stronger the glass ceiling effect and the more difficult it is for women to move into a higher position[12].

While there have been some slight improvements, women faced greater difficulties than men in advancing to the top academic positions.

While there have been some slight improvements, women face greater difficulties than men in advancing to the top academic positions.

At European level, the GCI value was around 1.5 in 2018, compared to a value of around 1.6 in 2015 (Figure 6.6). This indicates the presence of a glass ceiling effect for women academics, which has reduced slightly overtime.

The reasons for this effect are manifold and include: the persistence of gender stereotypes and biases about women's skills and role in society which leads to direct and indirect discrimination during their careers (NPWDPE, 2012, p. 3; Liff and Ward, 2001). Additionally, the 'gatekeeper' phenomenon, whereby leaders (often men) may act unconsciously to support the careers of those similar to themselves (Van den Brink, 2010; ENLEFGE, 2012; NPWDPE, 2012). Furthermore, working cultures that are not 'gender-sensitive' include a lack of arrangements that are compatible with family commitments[13]; incidents of sexual harassment, bullying, gender-based violence; and gender differences in individual choices and behaviour are further barriers to career progression.

At country level, the situation has improved since 2015, with the GCI decreasing in most countries considered. More specifically, all but four EU-27 Member States and Associated Countries (DE, MT, RO, TR) had a (slightly) lower GCI in 2018 than in 2015, indicating gradual progress towards equal chances for women and men of being promoted to top academic positions. The greatest improvements were observed in Israel (2.3 to 1.9), Ireland (2.2 to 1.8), Spain (1.9 to 1.7), Latvia (1.4 to 1.2) and the Netherlands (1.7 to 1.5). In the four countries where the situation deteriorated, the GCI increased from 1.3 to 1.7 (Germany), 0.9 to 1.1 (Malta) but based on low absolute numbers, 1.2 to 1.3 (Turkey) and 1.0 to 1.1 (Romania). Box 27 provides examples of measures to support gender balance among academic staff.

12 The glass ceiling index can also be analysed through consideration of the differential rate of career progression/promotion between women and men - often called the "male advantage index". It is considered through this ratio: (% of men in grade A positions among male academics) / (% of women in grade A positions among female academics): (% grade A men among Grades A+B+C male population) / (% grade A women among grades A+B+C female population).

13 For example, the importance attributed to the working culture is reflected in Inter-Parliamentary Union (2012). Action Area 4 is 'Institute or improve gender-sensitive infrastructure and parliamentary culture'. This includes suggestions for sitting hours that are compatible with family commitments, as well as proposals to include gender-awareness training for all Members of Parliaments and to promote a gender-based analysis of parliamentary rituals, dress codes, language and conventions.

BOX 27 Promoting gender equality among academic staff at all levels

Since 2016, four of **Ireland's** seven universities have implemented measures such that the proportion of women and men to be promoted or recruited is based on the proportion of each gender at the grade immediately below. This has been done through the use of quotas, cascade quotas or cascade monitoring tools. The remaining three universities are reviewing their processes or are already monitoring gender equality during promotion processes in other ways[14].

In **Denmark**, the University of Copenhagen has set out an aim to increase the proportion of the underrepresented gender over three years by five p.p. to a total of 32 percent.[15] To enable this, the university now requests at least one applicant of either gender to apply before a vacant post for research and management positions can be filled. There is also a requirement to have at least one person of each gender in all appointment and review committees. The university has introduced search committees who aim to seek out promising national and international candidates, including women applicants to fill positions[16].

In **Italy**, the University of Ferrara's Gender Report[17] supports the promotion of gender equality among academic staff through improved monitoring of the participation of women in the organisation among students, professors, clerical workers, and all decision-making bodies. The quantitative data collected follows the She Figures indicators and is produced in cooperation with the statistical office of the Ministry of Education, University and Research. The report also details the equal opportunity bodies present at the university as well as the Positive Action Plan objectives and achievements[18].

14 Accelerating Gender Equality in Irish Higher Education Institutions – Gender Action Plan 2018-2020 https://hea.ie/assets/uploads/2018/11/Gender-Equality-Taskforce-Action-Plan-2018-2020.pdf

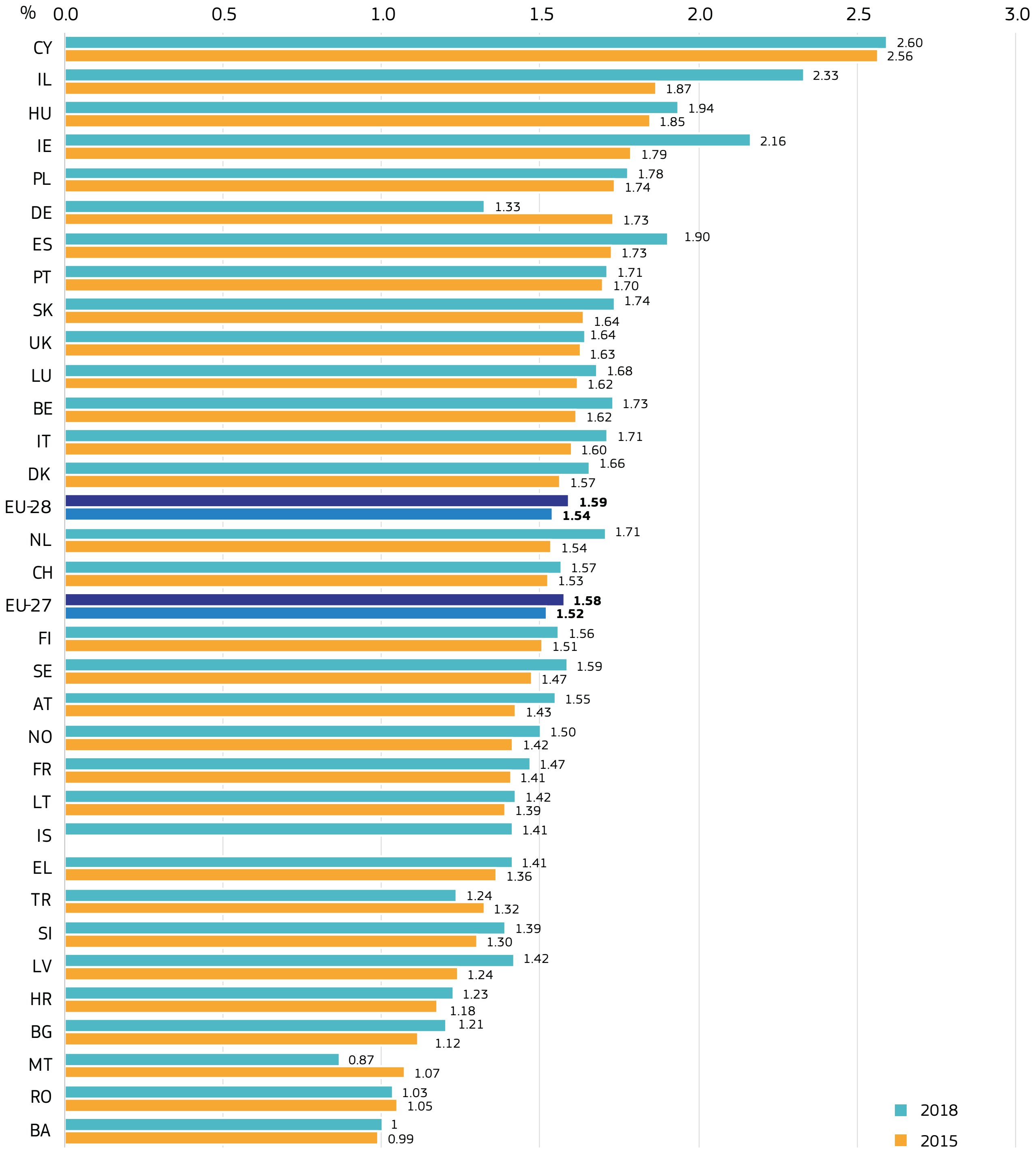
15 New target: Women in all application piles https://nyheder.ku.dk/alle_nyheder/2015/02/kvinder-i-alle-ansoegningsbunker

16 Women represented in all rounds of applicants (DK) https://eige.europa.eu/gender-mainstreaming/toolkits/gear/examples/women-represented-all-rounds-applications

17 'Bilancio di Genere'

18 Gender Report (IT) http://www.unife.it/progetto/equality-and-diversity/bilancio-di-genere

Figure 6.6 Glass Ceiling Index, 2015-2018



Notes: In case data for researchers is not available or incomplete, data for Academic staff are presented. Academic staff used as reference population for BG, IE, EL, IT, LV, LT, NL, SI, SK, SE, IS, IL. Data for BE is the result of BE (FL) + BE (FR). For LU, UK WiS 2018 questionnaires were used (grade A for latest and earliest reference year for UK, and for all grades for both years for LU). Reference years differ: IS (2012 in place of 2015); LT, SK, TR, BA (2016 in place of 2015); HR (2017 in place of 2015); LU, UK (2016 in place of 2018); EL, FR, CY, AT (2017 in place of 2018); HR (2019 in place of 2018). Data for Researchers is not available for: IS, IE, IL, NL, SK, SE; Data for Academic staff is not available for: BE (FR), BE (FL), CY, CZ, DK, EE, FI, NO, PT. HU. Not applicable: BG, Grade C for both years.

Other: break in time series: DE:2016, ES:2015, SI: 2017, AT: data refer only to Public Universities (without the Public, "Danube University Krems"), University Hospitals and Universities of Arts and not to the total Higher Education Sector, BE (FR): Data refer to Universities and High schools (Hautes écoles / Hooge Scholen); Arts schools; Architecture schools, FI: Only Universities included (not including National Defence University), FR: Higher Education Sector also includes University hospitals and cancer centers, IE: Private colleges and other institutions providing formal tertiary education programmes not receiving a core grant from the Irish Exchequer are not included, IL: Universities, public, private colleges and Colleges of education are included, IT: staff of Higher Education in Art, Music and Dance and the Academic staff with fixed-term contracts are excluded, NL: Only Universities are covered. The 'Hogescholen'('Universities of Applied Sciences') which are part of the Higher Education Sector are not covered; The same person may be counted in several grades and fields of R&D: SE, BE (FL), ES: Some Researchers can not be assigned to a Grade, the total does not equal the sum of head counts by Grade; Academic staff based on UOE definition: BG, CH, DE, EL, HR, IT, MT, PL, SI.

Source: Women in Science database, DG Research and Innovation - T1_questionnaires

6.5 Women's representation among grade A staff by age group

The previous sections have shown that women are considerably under-represented at the highest level of academia across all fields of R&D. This section assesses the pattern of women's representation in grade A positions by age group. Given that grade A positions typically require several years of academic experience, the following indicators provide an insight into whether women's under-representation varies at different age groups.

Women were most under-represented among grade A staff aged 55 years or more.

In 2018, in nine of 21 EU-27 Member States and Associated Countries with available data (BE, BG, DE, HR, LT, AT, RO, UK, CH), the proportion of women among grade A staff was lowest in the 55+ age group (Table 6.3). No country had the highest proportion of women in grade A positions in the 55+ age category. However, no clear pattern could be determined as 11 out of 21 EU-27 Member States and Associated Countries (BE, ES, HR, IT, LT, MT, PL, SI, FI, SE, NO) showed the highest proportion of women in grade A positions in the 45-54 age group.

It is important to note that most proportions shown in Table 6.3 in the under 35 category are based on low absolute numbers of less than 30. The interpretation of women's representation across different age groups is also limited by the fact that small changes in numbers can translate into large changes in percentage terms for low absolute values.

For both women and men, the highest proportion of grade A staff were found in the 55 years or more age group.

Figure 6.7 shows the age distribution of grade A staff by sex in 2018. Unlike the previous figure, it does not give an indication of the number of women or men in a given age category. At European level, more than half of women and men in grade A positions were in the 55+ age group (61.2% of women and 65.5% of men respectively). The next age category with the highest proportion of grade A staff was the 45-54 category, with around 3 in 10 of women and men grade A staff in this age group at European level (31.1% of women and 27.8% of men). Less than 10% of women and men grade A staff were aged 35-44 (7.4% of women and 6.6% of men), and around 0.2% were under 35, at European level.

At country level, the highest proportions of both women and men grade A staff were aged 55+ in 13 of the 21 EU-27 Member States and Associated Countries for which data were available (BG, ES, HR, IT, LT, PL, PT, RO, SI, SK, FI, SE, NO). For women, the proportion of grade A staff in this age category ranged between 35.7% (RO) and 88.1% (PL), while for men this ranged between 50.1% (BE) and 89.4% (PL). In Austria, Belgium, Germany, the Netherlands and the UK, the proportion of women in grade A positions was highest in the 45-54 age group, while the equivalent proportion for men was highest in the 55 and over age group.

There was more variation at country level in the 35-44 age group. Here, the proportion of women and men ranged from less than 1% of women and men grade A staff in Poland (0.6% and 0.8% respectively) to 29.8% of women (CH) and 50.0% of men (MT). The proportion of women and men aged under 35 was generally consistent with the European level trend: only four countries had more than 1% of either women or men grade A staff in this age group (LU, MT, RO, CH). Similar to the data shown at European level, in all countries with available data (except for MT), the proportion of women and men in grade A positions was lowest in the under 35 age group. Overall, the data show that the under-representation of women among in the 55+ age group (Table 6.3) might be a significant issue, as this is the age group in which the majority of both women and men grade A staff fall.

Table 6.3 Proportion (%) of women among grade A staff, by age group, 2018

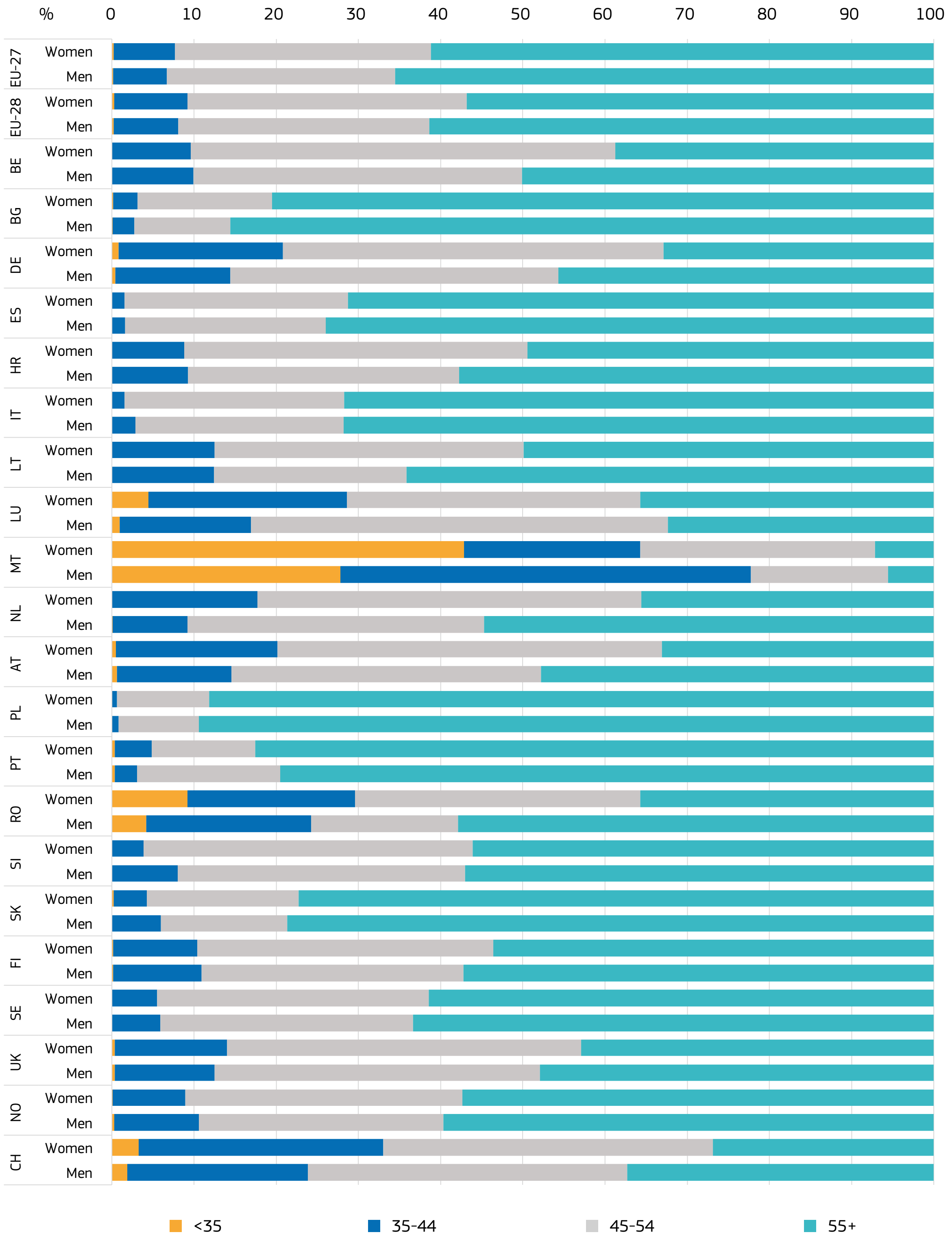
Country	% Women				
	<35	35-44	45-54	55+	Total
BE	-	19.77	24.73	16.46	20.29
BG	50 (2/4)	42.55	47.95	38.25	39.70
DE	33.33	26.89	23.01	15.62	20.47
ES	-	23.08	25.90	23.24	23.90
HR	:	41.80	48.85	39.26	43.02
IT	:	14.76	24.67	23.72	23.74
LT	-	40.46	52.12	34.53	40.40
LU	50 (1/2)	24.53 (5/22)	13.11	19.16	17.67
MT	54.55 (6/11)	25 (3/12)	57.14 (4/7)	50 (1/2)	43.75
NL	0 (0/2)	35.75	27.02	15.69	22.25
AT	20 (3/15)	32.09	29.38	18.82	25.09
PL	0 (0/2)	20.27	28.04	24.94	25.22
PT	28.57 (2/7)	38.10	21.32	27.94	27.15
RO	69.23 (9/13)	51.28	66.67	38.89	50.78
SI	-	19.05	36.02	32.59	32.95
SK	100 (1/1)	20.22	30.94	26.90	27.23
FI	25 (1/4)	29.37	32.98	28.94	30.32
SE	:	26.84	29.72	27.60	28.22
UK	27.78	28.73	28.06	24.31	26.41
NO	11.11 (1/9)	27.76	33.65	30.07	30.91
CH	35.43	30.06	24.66	18.61	24.08

Notes: Data are Headcounts (HC). In case data for researchers is not available or incomplete, data for Academic staff are presented. Academic staff used as the reference population for: BG, IT, LT, NL, SI, SK, SE. Data for BE is the result of BE (FL) + BE (FR). "-" indicates that the denominator is zero. Reference year differs: LU, UK (2016); AT (2017); HR (2019). WiS data 2018 used for UK (for all age categories except "unknown") and LU (all categories). Not applicable: BG ("unknown" age category only). Data for Researchers is not available for: IS, IE, IL, NL, SK, SE; Data for Academic staff is not available for: BE (FR), BE (FL), CY, CZ, DK, EE, FI, NO, PT. HU. Data not available: EE, CZ, ME, MK, AL, RS, AM, FO, GE, MD, TN, UA, Data broken down by age group not available: DK, IE, EL, FR, CY, LV, IS, TR, BA, HU, IL.

Other: break in time series: DE:2016, ES:2015, SI: 2017, AT: data refer only to Public Universities (without the Public, "Danube University Krems"), University Hospitals and Universities of Arts and not to the total Higher Education Sector, BE (FR): Data refer to Universities and High schools (Hautes écoles / Hooge Scholen); Arts schools; Architecture schools, FI: Only Universities included (not including National Defence University), IT: staff of Higher Education in Art, Music and Dance and the Academic staff with fixed-term contracts are excluded, NL: Only Universities are covered. The 'Hogescholen'('Universities of Applied Sciences') which are part of the Higher Education Sector are not covered; The same person may be counted in several grades and fields of R&D: SE, BE (FL), ES: Some Researchers cannot be assigned to a Grade. The total does not equal the sum of head counts by Grade; Academic staff based on UOE definition: CH, DE, HR, IT, MT, PL, SI.

Source: Women in Science database, DG Research and Innovation - T1_questionnaires

Figure 6.7 Distribution of grade A staff across age groups, by sex, 2018



Notes: Data are Headcounts (HC). In case data for researchers is not available or incomplete, data for Academic staff are presented. Academic staff used as reference population for: BG, IT, LT, NL, SI, SK, SE. Data for BE is the result of BE (FL) + BE (FR). Data for Researchers is not available for: IS, IE, IL, NL, SK, SE; Data for Academic staff is not available for: BE (FR), BE (FL), CY, CZ, DK, EE, FI, NO, PT. HU. Data not available: DK, IE, EL, FR, CY, LV, IS, TR, BA, HU, IL, Reference year differs: LU, UK (2016); AT (2017); HR (2019), WiS data 2018 used: LU, UK. Not applicable: BE (FR) and AT (men, "unknown" age category). Data broken down by age group not available: DK, IE, EL, FR, CY, LV, UK, IS, TR, BA, HU, IL.

Other: break in time series: DE:2016, ES:2015, SI: 2017, AT: data refer only to Public Universities (without the Public, "Danube University Krems"), University Hospitals and Universities of Arts and not to the total Higher Education Sector, BE (FR): Data refer to Universities and High schools (Hautes écoles / Hooge Scholen); Arts schools; Architecture schools, FI: Only Universities included (not including National Defence University, IT: staff of Higher Education in Art, Music and Dance and the Academic staff with fixed-term contracts are excluded, NL: Only Universities are covered. The 'Hogescholen'('Universities of Applied Sciences') which are part of the Higher Education Sector are not covered; The same person may be counted in several grades and fields of R&D: SE, BE (FL), ES: Some Researchers can not be assigned to a Grade; The total does not equal the sum of head counts by Grade; Academic staff based on UOE definition: CH, DE, HR, IT, MT, PL, SI.

Source: Women in Science database, DG Research and Innovation - T1_questionnaires

6.6 Women's participation in leadership positions in research

The under-representation of women in leadership positions in research has been acknowledged by the new ERA Communication, which commits to the development of inclusive GEPs through the Horizon Europe Programme in 2021 (European Commission, 2020a). Similar concerns were raised in the Gender Equality Strategy 2020-2025 which emphasises more generally, the importance of inclusive and diverse leadership to bring forward new ideas and innovative approaches in the EU (European Commission, 2020b). In order to specifically examine progress towards improving women's participation in leadership positions in research, the following indicators provide information on women's participation among heads of institutions in the HES and women's participation as board members and leaders.

The presence of women among the heads of higher education institutions improved at European level but the situation was more mixed at country level.

At European level, the proportion of women among heads of institutes in the HES stood at 23.6% in 2019 (Figure 6.8), which was 2.4 p.p. higher than the proportion in 2016 (21.3%) (Annex 6.4). These data suggest that there has been some progress towards improving women's representation in decision-making and leadership positions in the HES.

At country level in 2019, women represented less than half of the heads of institutions in all of the EU-27 Member States and Associated Countries for which data were available. The countries with the highest proportions of women among heads of higher education institutions were Latvia (44.4%), Sweden (41.7%), Iceland (40.0%), Lithuania (39.0%), and Belgium (37.0%). In 2019, the lowest proportions of women among heads of higher education institutions (excluding LU which has only one higher education institution) were observed in Cyprus (9.1%), Romania (11.1%), France (12.1%), Greece (16.0%), Czechia and Hungary (17.2% each). Box 28 provides examples of how women have been supported in leadership positions in universities.

BOX 28 Supporting women to become university leaders

Switzerland launched the High Potential University Leaders Identity & Skills Training (H.I.T.) Programme in 2019 and aims to support female professors within Swiss universities who are interested in becoming university leaders. It encompasses networking, training workshops, personalised leadership development, and gender and diversity projects for a cohort of 20 women[19].

The **European Women Rectors Association** (EWORA) is a non-profit association that was established in 2015 to promote the role of women in leadership positions at the European and international level. EWORA organises conferences that bring together women in leadership positions in universities and research organisations, gender experts and members of higher education networks. For example, the 6th European Women Rectors Conference held in 2019 focused on responding to evolving challenges and building best practices for women leadership in academia. Similarly, the 7th conference held in 2021 focused on leadership in higher education and research in times of global change[20].

While the situation at European level has improved since 2016, the situation at national level shows a mixed picture (Annex 6.4). In 10 of 34 EU-27 Member States and Associated Countries (EE, HR, CY, MT, AT, PT, RO, NO, CH, IL), the proportion of women decreased in 2019 compared to 2016. Among the EU-27 Member States and Associated Countries with the highest proportions of women, Latvia experienced an increase of 19.4 percentage points, Belgium of 10.9 p.p., Iceland 10 p.p. and Lithuania 9.5 percentage points. The proportion of women among heads of institutions was stable in Sweden from 2016 to 2019. By contrast, among the countries with the highest proportion in 2016, Malta witnessed a decline from 38.5% to 29.3%, Norway from 36.1% to 25.8% and Croatia from 30.8% to 26.5%.

19 University of Zurich, 'H.I.T. - High Potential University Leaders Identity & Skills Training Program - Gender Sensitive Leaders in Academia', https://www.gleichstellung.uzh.ch/de/politik/kooperationsprojekte/hit_project.html

20 EWORA, '7th European Women Rectors Conference "Leadership in Higher Education and Research in Times of Dynamic Global Change", https://www.ewora.org/7thconference-program

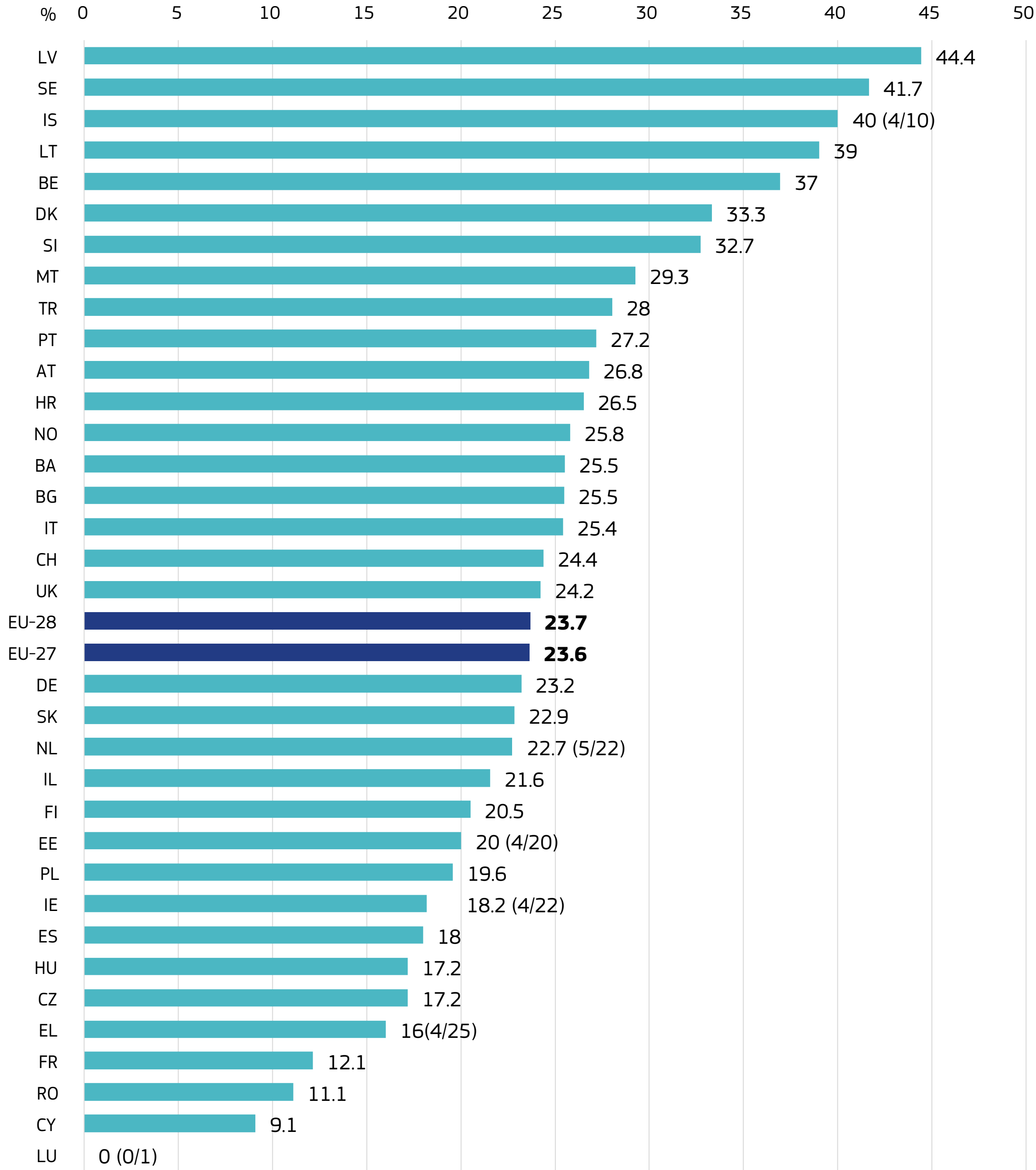
The presence of women among heads of universities or assimilated institutions accredited to deliver PhDs improved overtime at European level. However, several countries still lagged behind.

Table 6.4 shows the proportion of women among heads of universities or assimilated institutions. Here, the scope is limited to universities or assimilated institutions based on capacity to deliver PhDs. These differ from general 'institutions in the higher education sector' (Figure 6.8), as the HES also includes institutions that may not offer PhD programmes.

At European level, the proportion of women among heads of universities or assimilated institutions was 17.9% which is slightly larger than the proportion of 14.3% observed in 2016 (Annex 6.5). Despite this improvement, it is clear that women remain considerably under-represented among institution heads.

At country level, the proportion of women among institution heads ranged from 0% in Estonia, Cyprus, Luxembourg and Israel, to 47.1% in Sweden. The proportion of women institution heads was higher than 30% in only three other countries, Latvia (43.8%), Norway (40.0%) and Slovenia (31.8%). However, it is important to note that the values for Latvia and Norway are based on total counts of less than 30. Compared to 2016 (Annex 6.5), 18 EU-27 Member States and Associated Countries (BG, CZ, DE, EL, ES, IT, LV, LT, HU, MT, RO, SI, SK, SE, IS, NO, TR, BA) experienced an increase in the proportion of women among institution heads, with the largest increase observed in Iceland (25 p.p.) although this increase was based on low absolute values. Meanwhile, a decrease in the proportion of women institution heads was observed in seven countries (HR, AT, PL, PT, FI, CH, IL). The largest of these decreases was in Israel (from 12.5% to 0%, although based on a small total number of heads of universities), followed by Switzerland (from 33.3% to 25.0%) and Austria (from 33.3% to 22.8%).

Figure 6.8 Proportion (%) of women among heads of institutions in the Higher Education Sector (HES), 2019



Notes: Exceptions to the reference year: LU, UK: 2018; Data unavailable for: AL, RS, AM, FO, GE, MD, TN, UA; Data provided for all Institutions, except of Universities: BE (FR); Data provided for BE is the result of: BE (FL) + BE (FR); For proportions based on low numbers of headcounts (i.e. <30), the numerators and denominators are presented in parentheses in the table.

Other: Data are in headcounts (HC); break in time series: EL:2019, IL: 2016; AT: Institutions and Universities without rector/head and only interim management are added to the total causing a discrepancy between the total of institutions and total of heads, BA: Total of Heads includes numbers of Rectors of Universities and the number of Faculty Deans causing a discrepancy between the Total of institutions, TR: number of heads of institutions is lower than exact number of institutions due to newly established or not active institutions for which a head is not appointed, ES: Only the public Spanish universities are included, IE: Private colleges and other institutions providing formal tertiary education programmes not receiving a core grant from the Irish Exchequer are not included.

Source: Women in Science database, DG Research and Innovation - T7_questionnaires

Table 6.4 Proportion (%) of women among heads of universities or assimilated institutions based on capacity to deliver PhDs, 2019

Country	Women	Men
EU-27	**17.9**	**82.1**
EU-28	**18.0**	**82.0**
BE	9.1 (1/11)	90.9 (10/11)
BG	26.7	73.3
CZ	10.3 (3/29)	89.7 (26/29)
DK	27.3 (3/11)	72.7 (8/11)
DE	24.6	75.4
EE	0 (0/7)	100 (7/7)
EL	16.7 (4/24)	83.3 (20/24)
ES	18.0	82.0
FR	11.8	88.2
HR	16.7 (2/12)	83.3 (10/12)
IT	9.2	90.8
CY	0 (0/8)	100 (8/8)
LV	43.8 (7/16)	56.3 (9/16)
LT	28 (7/25)	72 (18/25)
LU	0 (0/1)	100 (1/1)
HU	10.0	90.0
MT	20 (1/5)	80 (4/5)
NL	21.4 (3/14)	78.6 (11/14)
AT	25.8	74.2
PL	10.9	89.1
PT	20.5	79.5
RO	7.7	92.3
SI	31.8	68.2
SK	21.9	78.1
FI	21.4 (3/14)	78.6 (11/14)
SE	47.1 (8/17)	52.9 (9/17)
UK	20.0	80.0
IS	25 (1/4)	75 (3/4)
NO	40 (4/10)	60 (6/10)
CH	25 (3/12)	75 (9/12)
TR	10.2	89.8
BA	25.5	74.5
IL	0 (0/8)	100 (8/8)

Notes: Exceptions to the reference year: UK (2016), FR, LU (2017), BG, DE, CY, PT, IL (2018); Data Unavailable for: IE, LU, ME, MK, AL, RS, GE, AM, FO, MD, TN, UA; Data are in headcounts (HC); Women in Science Questionnaire 2018 used: LU, UK (total, females and males). Data for BE is the result of BE (FL) + BE (FR).

Other: break in time series: EL: 2019; AT: Institutions and Universities without rector/head and only interim mangagement are added to the total causing a discrepancy between the total of institutions and total of heads, BA: Total of Heads includes numbers of Rectors of Universities and the number of Faculty Deans causing a discrepancy between the Total of institutions, ES: Only public Spanish universities are included, NO: Only universities are included.

Source: Women in Science database, DG Research and Innovation - T8_questionnaires

The boards of research organisations can exercise extensive influence on scientific policy, either through directing core aspects of the agenda or through supporting research in an advisory and coordinating role. Given that both advisory and executive boards have considerable decision-making power, the following indicator assesses the proportion of women involved in such boards in order to further investigate decision-making by women in academic careers.

Women were under-represented among board members and leaders at the European and country level.

Figure 6.9 shows the presence of women on boards, such as scientific and administrative boards, or advisory boards of a research organisation, publicly or privately managed and financed.

At European level, in 2019, just over 3 in 10 board members were women (31.1%) and under one-quarter of board leaders (24.5%) were women. Research organisations were far from meeting the 40% gender balance target for members on advisory bodies set in Horizon 2020 (European Parliament and the Council, 2013).[21] As scientific boards review research funding applications, gender diversity and equal representation of both women and men board members is crucial for addressing unconscious gender bias in reviewing applicants. Equal representation of women among board members in research organisations is not only essential to ensure equality in decision-making, but also to allow equal access to funding.

At country level, the proportion of women members on boards ranged between 14.3% (HR) and 54.0% (BG), and between 0% (BA, CZ, CY, FR, MT, NL, RO, SK) and 66.7% (IE, LV) for women board leaders (based on low absolute values of less than 30). Only 13 of 33 EU-27 Member States and Associated Countries had more than 40% women among board members (AT, BG, ES, FI, IE, IS, LT, LV, LU, NO, RO, SE, SI), while five had less than 20% of women among board members (BA, CZ, EE, EL, HR; BA has a small total number of board members).

Similarly, only 10 EU-27 Member States and Associated Countries had 40% or more women board leaders (BG, DK, IE, IS, FI, LV, LT, LU, SE, SI, all of which have small total numbers of board leaders). In comparison, three countries had less than 10% of women board leaders (DE, EE, IT) and a further eight countries had no women board leaders (BA, CZ, CY, FR, MT, NL, RO, SK), all of which have small total numbers of board leaders. Box 29 provides examples of measures taken to increase women's representation within boards at Higher Education Institutions.

BOX 29 Increasing women's representation among research organisation board members

In **Belgium**, in 2014, Ghent University adopted new election procedures for its highest decision-making body, the Board of Governors, requiring that women and men each comprise at least 40% of members and that faculties must have at least one woman and one man candidate for elections. As a result, gender balance was achieved in the Board of Governors for the first time in the institution's history[22].

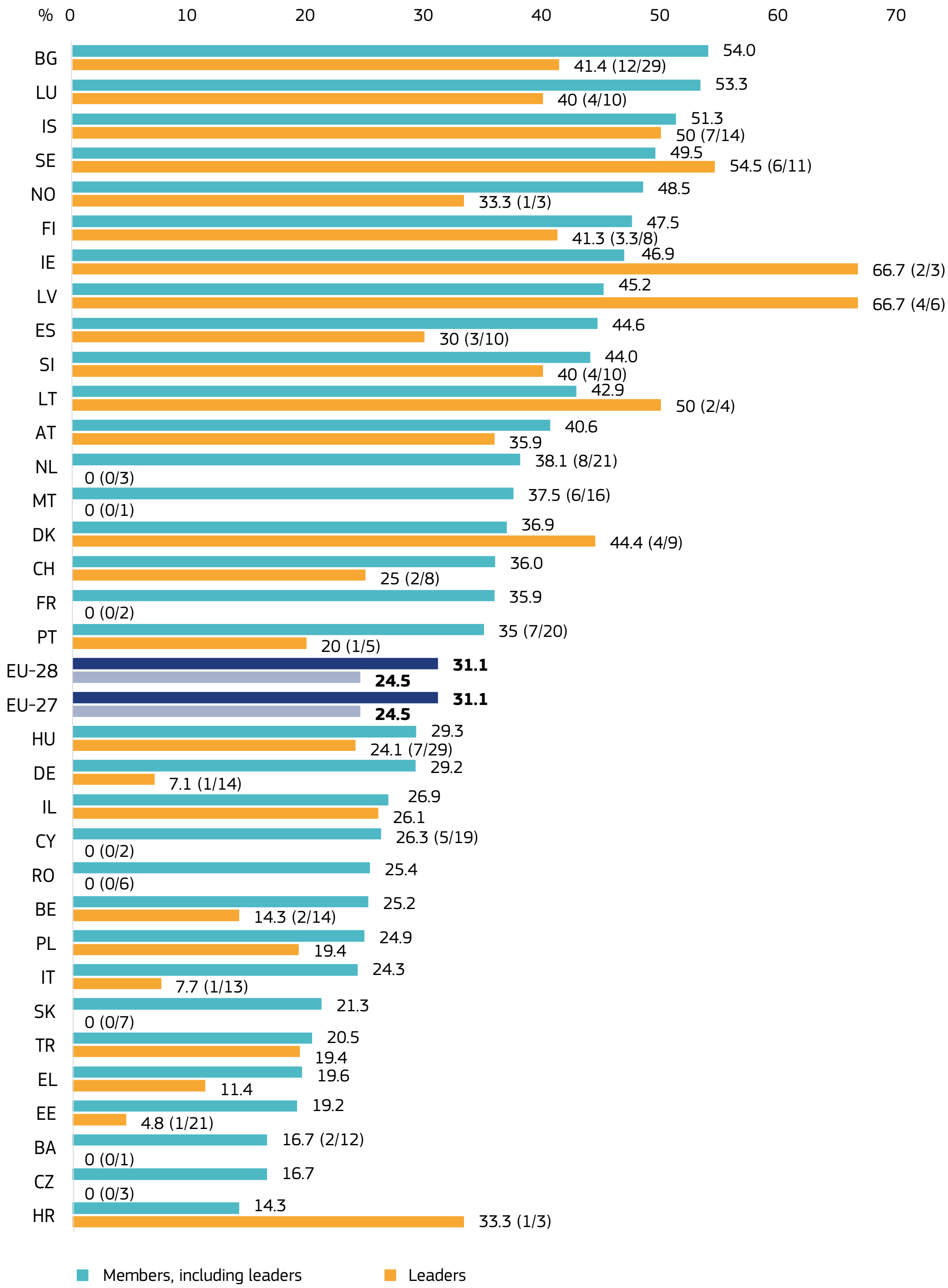
In **Lithuania**, work was undertaken under the FP7-funded EU INTEGER project to increase women's representation in the Šiauliai University Council through searching for and supporting suitable women candidates in the 2014 Council election and lobbying activities. Subsequently, the proportion of women on the Council increased substantially, from 0% in 2010 to 36.3% in 2014[23].

21 This target has now been updated to 50% for Horizon Europe. Horizon Europe, REGULATION (EU) 2021/695 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32021R0695&from=EN

22 Ghent University, "Good Governance", https://www.ugent.be/en/ghentuniv/principles/diversity-and-gender/good-governance

23 Prof. Dr. Virginija Šidlauskienė (2016), LEARNING AND DISSEMINATION SEMINAR
Panel 2: Leadership and decision making: ELECTIONS FOR THE UNIVERSITY'S COUNCIL OF ŠIAULIAI UNIVERSITY [presentation], https://geincee.act-on-gender.eu/resources/good-practice-integer-project

Figure 6.9 Proportion (%) of women on boards, members, and leaders, 2019



Notes: Data are Headcounts (HC). WiS 2018 questionnaires are used: LU, UK. Data not available for UK (therefore, EU-28 and EU-27 values are the same), ME, MK, AL, RS, AM, FO, GE, MD, TN, UA. BE (FR) is used for BE (data not available for BE (FL)), Data for 2019 not available for all boards: IL (for unavailable data boards, 2017 data were used instead).

Other: Head counts are averages of counts in different time points of the reference year: FI; For proportions based on low numbers of headcounts (i.e. <30) the numerator and denominator are presented in brackets (number of women members and leaders compared to the total number of members and leaders, respectively).

Source: Women in Science database, DG Research and Innovation - T5 & T6_questionnaires

6.7 Annex indicators

Annex 6.1 Number of academic staff, by grade and sex, 2018

Country	Grade A		Grade B		Grade C	
	Women	Men	Women	Men	Women	Men
EU-27	**33 299**	**93 877**	**117 723**	**174 484**	**110 009**	**125 998**
EU-28	**39 874**	**112 202**	**167 553**	**233 734**	**117 104**	**132 738**
BE	542	2 129	1 585	3 467	2 886	4 674
BG	1 356	2 060	2 905	3 282	:	:
CZ	:	:	:	:	:	:
DK	642	2 205	1 697	3 240	2 195	2 868
DE	3 181	12 359	11 297	30 651	28 311	34 877
EE	:	:	:	:	:	:
IE	152	441	764	1 228	3 674	3 749
EL	824	2 873	864	1 797	1 427	2 459
ES	2 714	8 640	24 028	30 443	2 449	2 454
FR	10 185	26 651	37 415	48 050	4 789	7 525
HR	1 478	1 958	3 744	3 380	651	373
IT	3 130	10 055	7 984	12 800	9 492	10 801
CY	25	163	68	151	290	426
LV	296	367	298	281	2 237	1 630
LT	425	627	1 131	931	1 771	1 032
LU	22	104	46	88	68	146
HU	327	1 184	1 183	2 414	4 517	5 454
MT	14	18	69	69	3	10
NL	779	2 722	834	1 994	2 633	3 452
AT	656	1 959	1 001	2 621	3 908	5 415
PL	2 536	7 518	7 830	12 113	20 844	20 383
PT	540	1 449	2 163	3 067	9 623	9 854
RO	98	95	255	176	286	287
SI	312	635	276	401	611	560
SK	445	1 189	1 162	1 660	3 238	3 156
FI	771	1 772	2 346	2 371	2 296	2 277
SE	1 849	4 704	6 778	7 809	1 810	2 136
UK	6 575	18 325	49 830	59 250	7 095	6 740
IS	80	224	80	142	131	125
NO	1 273	2 846	4 347	4 693	1 396	1 470
CH	1 388	4 376	2 183	3 819	5 609	7 593
TR	6 854	15 647	5 184	8 367	23 506	28 556
BA	149	171	133	189	288	305
IL	363	1 502	1 796	3 234	1 171	1 102

Country	Grade D		Total	
	Women	Men	Women	Men
EU-27	**170 221**	**191 330**	**443 136**	**603 969**
EU-28	**171 076**	**191 920**	**507 486**	**688 874**
BE	10 230	10 614	15 243	20 884
BG	6 673	5 480	10 934	10 822
CZ	:	:	8 910	16 777
DK	7 469	7 173	12 003	15 486
DE	58 733	76 133	101 522	154 020
EE	:	:	2 168	2 330
IE	:	:	5 418	4 590
EL	2 200	2 103	5 315	9 232
ES	7 194	7 939	36 502	49 620
FR	10 709	14 546	63 098	96 772
HR	894	716	6 767	6 427
IT	7 071	7 034	27 677	40 690
CY	224	235	607	975
LV	:	:	2 831	2 278
LT	531	286	3 858	2 876
LU	308	428	443	767
HU	1 205	1 629	7 232	10 682
MT	4	7	90	104
NL	8 958	10 577	13 204	18 745
AT	7 298	9 243	12 863	19 238
PL	7 770	7 132	38 980	47 146
PT	15 602	13 747	27 928	28 117
RO	516	456	1 155	1 014
SI	1 141	1 160	2 340	2 756
SK	533	356	5 378	6 361
FI	3 483	3 583	8 896	10 003
SE	11 475	10 753	21 774	25 257
UK	855	590	64 350	84 905
IS	:	:	291	491
NO	6 837	4 981	13 853	13 990
CH	9 691	12 560	18 871	28 348
TR	24 459	24 885	60 003	77 455
BA	283	270	853	935
IL	6 576	4 911	9 906	10 750

Notes: Data are in headcounts (HC); Data for BE is the result of : BE (FL) + BE (FR); In case data for researchers is not available or incomplete, data for Academic staff are presented; Exceptions to the reference year: AT, EL: 2017, LU, UK: 2016; Data unavailable for: ME, MK, AL, RS, AM, FO, GE, MD, TN, UA; Data for Researchers is not available for: IE, IL, IS, NL, SK, SE; Data for Academic staff is not available for BE (FR, FL), CY, CZ, DK, EE, FI, NO, PT.

Other: break in time series: DE: 2016, ES:2015, SI: 2017, AT: data refer only to Public Universities (without the Public, "Danube University Krems"), University Hospitals and Universities of Arts and not to the total Higher Education Sector, BE (FR): Data refer to Universities and High schools (Hautes écoles / Hooge Scholen); Arts schools; Architecture schools, FI: Only Universities included (not including National Defence University), FR: Higher Education Sector also includes University hospitals and cancer centers, IE: Private colleges and other institutions providing formal tertiary education programmes not receiving a core grant from the Irish Exchequer are not included, IL: Universities, public, private colleges and Colleges of education are included, IT: staff of Higher Education in Art, Music and Dance and the academic staff with fixed-term contracts are excluded, NL: Only Universities are covered. The 'Hogescholen'('Universities of Applied Sciences') which are part of the Higher Education Sector are not covered; The same person may be counted in several grades and fields of R&D: SE, BE(FL), Some Researchers can not be assigned to a Grade. The total does not equal the sum of head counts by Grade: ES; Academic staff based on UOE definition: BG, CH, DE, EL, HR, IT, MT, PL, SI.

Source: Women in Science database, DG Research and Innovation - T1_questionnaires

Annex 6.2 Number of senior academic staff (grade A), by field of R&D and sex, 2018

Country	Natural sciences		Engineering and technology		Medical sciences		Agricultural sciences		Social sciences		Humanities		Unknown		Total	
	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
EU-27	**4 364**	**15 481**	**3 027**	**13 877**	**4 484**	**10 421**	**1 101**	**2 762**	**6 784**	**15 206**	**4 998**	**9 302**	**78**	**286**	**24 825**	**67 299**
EU-28	**5 109**	**19 516**	**3 402**	**16 667**	**6 079**	**13 696**	**1 181**	**2 982**	**9 114**	**20 211**	**6 318**	**12 042**	**208**	**546**	**31 400**	**85 624**
BE	93	394	49	292	142	553	28	110	151	531	75	239	4	10	542	2 129
DK	81	515	35	270	226	648	30	80	195	543	75	149	0	0	642	2 205
DE	480	2 693	256	2 359	254	1 437	84	290	909	2 811	1 152	2 568	46	201	3 181	12 359
EL	102	528	121	812	224	569	25	121	229	622	123	221	:	:	824	2 873
ES	851	2 981	230	1 250	404	1 055	73	286	696	2 029	460	1 039	:	:	2 714	8 640
HR	251	289	160	529	364	389	156	187	341	330	206	233	:	1	1 478	1 958
IT	731	2 277	319	1 986	310	1 508	135	559	1 023	2 702	612	1 023	0	0	3 130	10 055
CY	6	47	6	29	7	21	0	1	3	46	3	19	:	:	25	163
LV	440	590	689	1 122	510	258	74	36	681	356	399	179	:	:	2 793	2 541
LT	34	136	27	123	91	104	16	32	179	164	78	68	:	:	425	627
LU	3	27,7	2	17	1	6	0	0	14,4	40,4	2	13,3	0	0	22,4	104,4
MT	0	4	2	2	6	4	0	0	3	0	0	0	3	8	14	18
NL	94	491	90	516	38	121	18	86	367	1126	161	334	11	48	779	2722
AT	88	472	39	317	71	237	14	45	212	521	232	367	0	0	656	1959
PL	408	1627	198	1428	608	1195	252	549	365	925	704	1792	1	2	2536	7518
PT	114	292	45	313	80	211	16	36	147	384	138	213	0	0	540	1449
RO	192	242	423	840	252	266	51	83	193	186	36	62	:	:	1147	1679
SI	7	85	52	165	48	79	36	57	92	143	72	101	5	5	312	635
SK	32	140	69	328	84	212	11	52	220	392	29	65	0	0	445	1189
FI	81	449	30	268	174	347	26	38	293	484	167	186	0	0	771	1772
SE	276	1201	185	911	590	1201	56	114	471	871	274	431	8	11	1849	4704
UK	745	4 035	375	2 790	1 595	3 275	80	220	2 330	5 005	1 320	2 740	130	260	6 575	18 325
NO	137	563	75	452	303	388	12	43	478	931	268	469	0	0	1 273	2 846
CH	169	919	146	860	227	765	32	67	554	1 278	240	409	20	78	1 388	4 376
TR	631	1 476	758	2 955	3 396	5 706	321	1 155	1 215	2 783	533	1 572	:	:	6 854	15 647
BA	26	30	32	61	41	20	7	10	28	22	15	28	0	0	149	171
IL	80	623,35	34	258	46,113	72,624	7	22	131,75	312,86	54	163,5	10	50	362,863	1 502.334

Notes: Data are in headcounts (HC); Data for BE is the result of: BE (FL) + BE (FR); In case data for researchers is not available or incomplete, data for Academic staff are presented; Exceptions to the reference year: LU, UK: 2016; AT: 2017; HR: 2019; Data for Researchers is not available for IS, IE, IL, NL, SK, SE; Data for Academic staff is not available for BE (FR, FL), CY, CZ, DK, EE, FI, NO, PT; Data unavailable for: CZ, DK, EE, IE, EL, FR, CY, LV, HU, IS, ME, MK, AL, RS, TR, BA, AM, FO, GE, IL, MD, TN, UA; Data not applicable for: BG (Unknown sex).

Other: break in time series: DE: 2016, ES:2015, SI: 2017, AT: data refer only to Public Universities (without the Public, “Danube University Krems”), University Hospitals and Universities of Arts and not to the total Higher Education Sector, BE (FR): Data refer to Universities and High schools (Hautes écoles / Hooge Scholen); Arts schools; Architecture schools, FI: Only Universities included (not including National Defence University), IL: Universities, public, private colleges and Colleges of education are included,IT: staff of Higher Education in Art, Music and Dance and the Academic staff with fixed-term contracts are excluded, NL: Only Universities are covered. The ‘Hogescholen’(‘Universities of Applied Sciences’) which are part of the Higher Education Sector are not covered, The same person may be counted in several grades and fields of R&D: SE, BE (FL), Some Researchers can not be assigned to a Grade.The total does not equal the sum of head counts by Grade: ES; Academic staff based on UOE definition: BG, CH, DE, ES, HR, IT, MT, PL, SI.

Source: Women in Science database, DG Research and Innovation - T1_questionnaires

Annex 6.3 Number of academic staff (grade A), by age group and sex, 2018

Country	<35		35–44		45–54	
	Women	Men	Women	Men	Women	Men
EU-27	**51**	**91**	**1 547**	**3 930**	**6 493**	**16 672**
EU-28	**76**	**156**	**2 442**	**6 150**	**9 323**	**23 927**
BE	0	0	52	211	280	852
BG	2	2	40	54	222	241
DE	26	52	636	1 729	1 474	4 932
ES	0	0	42	140	738	2 111
HR	:	:	130	181	617	646
IT	:	2	49	283	835	2 549
LT	0	0	53	78	160	147
LU	1	1	5,4	16,7	8	53
MT	6	5	3	9	4	3
NL	0	2	138	248	364	983
AT	3	12	129	273	307	738
PL	0	2	15	59	286	734
PT	2	5	24	39	68	251
RO	9	4	20	19	34	17
SI	:	:	12	51	125	222
SK	1	0	18	71	82	183
FI	1	3	79	190	278	565
SE	:	1	102	278	611	1 445
UK	25	65	895	2 220	2 830	7 255
NO	1	8	113	294	429	846
CH	45	82	413	961	557	1 702

Country	55+		Total		Unknown	
	Women	Men	Women	Men	Women	Men
EU-27	**12 755**	**39 292**	**20 848**	**59 993**	**2**	**9**
EU-28	**15 575**	**48 072**	**27 423**	**78 318**	**2**	**9**
BE	210	1 066	542	2 129	0	0
BG	1 092	1 763	1 356	2 060	:	:
DE	1 045	5 646	3 181	12 359	:	:
ES	1 934	6 389	2 714	8 640	:	:
HR	731	1 131	1 478	1 958	:	:
IT	2 246	7 221	3 130	10 055	:	:
LT	212	402	425	627	:	:
LU	8	33,75	22,4	104,4	0	0
MT	1	1	14	18	0	0
NL	277	1 489	779	2 722	:	:
AT	217	936	656	1 959	0	0
PL	2 235	6 723	2 536	7 518	0	0
PT	444	1 145	540	1 449	2	9
RO	35	55	98	95	:	:
SI	175	362	312	635	:	:
SK	344	935	445	1 189	0	0
FI	413	1 014	771	1 772	:	:
SE	1 136	2 980	1 849	4 704	:	:
UK	2 820	8 780	6 575	18 325	:	:
NO	730	1 698	1 273	2 846	0	0
CH	373	1 631	1 388	4 376	0	0

Notes: Data are in headcounts (HC); Data for BE is the result of: BE (FL) + BE (FR); In case data for researchers is not available or incomplete, data for Academic staff are presented; Exceptions to the reference year: LU, UK: 2016; AT: 2017; HR: 2019; Data for Researchers is not available for IS, IE, IL, NL, SK, SE; Data for Academic staff is not available for BE (FR, FL), CY, CZ, DK, EE, FI, NO, PT; Data unavailable for: CZ, DK, EE, IE, EL, FR, CY, LV, HU, IS, ME, MK, AL, RS, TR, BA, AM, FO, GE, IL, MD, TN, UA; Data not applicable for: BG (Unknown sex).

Other: break in time series: DE: 2016, ES:2015, SI: 2017, AT: data refer only to Public Universities (without the Public, "Danube University Krems"), University Hospitals and Universities of Arts and not to the total Higher Education Sector, BE (FR): Data refer to Universities and High schools (Hautes écoles / Hooge Scholen); Arts schools; Architecture schools, FI: Only Universities included (not including National Defence University), IL: Universities, public, private colleges and Colleges of education are included,IT: staff of Higher Education in Art, Music and Dance and the Academic staff with fixed-term contracts are excluded, NL: Only Universities are covered. The 'Hogescholen'('Universities of Applied Sciences') which are part of the Higher Education Sector are not covered, The same person may be counted in several grades and fields of R&D: SE, BE (FL), Some Researchers can not be assigned to a Grade.The total does not equal the sum of head counts by Grade: ES; Academic staff based on UOE definition: BG, CH, DE, ES, HR, IT, MT, PL, SI.

Source: Women in Science database, DG Research and Innovation - T1_questionnaires

Annex 6.4 Number of heads of institutions in the Higher Education Sector (HES) by sex, 2019 and 2016

Country	2019				
	Reference year	Women	Men	Total	% Women
EU-28	**:**	**701**	**2 262**	**2 963**	**23.7**
EU-27	**:**	**661**	**2 137**	**2 798**	**23.6**
BE	2019	17	29	46	37.0
BG	2019	13	38	51	25.5
CZ	2018	11	53	64	17.2
DK	2019	13	26	39	33.3
DE	2018	97	321	418	23.2
EE	2019	4	16	20	20.0
IE	2019	4	18	22	18.2
EL	2019	4	21	25	16.0
ES	2019	9	41	50	18.0
FR	2017	13	94	107	12.1
HR	2019	35	97	132	26.5
IT	2019	135	396	531	25.4
CY	2018	5	50	55	9.1
LV	2017	20	34	54	37.0
LT	2019	16	25	41	39.0
LU	2017	0	1	1	0.0
HU	2017	11	53	64	17.2
MT	2019	12	29	41	29.3
NL	2019	5	17	22	22.7
AT	2019	26	71	97	26.8
PL	2019	93	382	475	19.6
PT	2018	31	83	114	27.2
RO	2016	15	82	97	15.5
SI	2019	36	74	110	32.7
SK	2019	8	27	35	22.9
FI	2019	8	31	39	20.5
SE	2019	20	28	48	41.7
UK	2016	40	125	165	24.2
IS	2019	4	6	10	40.0
NO	2019	8	23	31	25.8
CH	2019	10	31	41	24.4
TR	2019	1 026	2 633	3 659	28.0
BA	2019	49	143	192	25.5
IL	2018	11	40	51	21.6

Country	2016				
	Reference year	Women	Men	Total	% Women
EU-28	**:**	**615**	**2 276**	**2 891**	**21.3**
EU-27	**:**	**580**	**2 151**	**2 731**	**21.2**
BE	2017	12	34	46	26.1
BG	2016	7	47	54	13.0
CZ	2016	9	53	62	14.5
DK	2017	11	30	41	26.8
DE	2016	67	305	372	18.0
EE	2016	7	18	25	28.0
IE	2016	4	20	24	16.7
EL	2016	3	33	36	8.3
ES	2016	3	47	50	6.0
FR	2012	13	114	127	10.2
HR	2017	41	92	133	30.8
IT	2016	118	375	493	23.9
CY	2016	5	43	48	10.4
LV	2014	4	12	16	25.0
LT	2016	13	31	44	29.5
LU	2016	0	1	1	0.0
HU	2016	11	55	66	16.7
MT	2016	10	16	26	38.5
NL	2016	5	17	22	22.7
AT	2016	26	67	93	28.0
PL	2016	93	407	500	18.6
PT	2016	35	86	121	28.9
RO	2015	14	85	99	14.1
SI	2016	35	73	108	32.4
SK	2017	6	29	35	17.1
FI	2016	8	33	41	19.5
SE	2017	20	28	48	41.7
UK	2015	35	125	160	21.9
IS	2016	3	7	10	30.0
NO	2016	13	23	36	36.1
CH	2016	12	28	40	30.0
TR	2018	934	2 458	3 392	27.5
BA	2018	49	143	192	25.5
IL	2016	10	35	45	22.2

Notes: Exceptions to the reference year: BE, SK, SE, BA (2019-2017), BG (2018-2013), DE, PT (2018-2016), FR (2017), HR (2019-2017), CY, IL (2018-2016), LU, (2017-2016), UK (2016-2015) ; Data not available for: IE, LU, ME, MK, AL, RS, GE, AM, FO, MD, TN, UA, Women in Science Data Questionnaire 2018: LU, UK (total, females and males). Data for BE is the result of BE (FL) + BE (FR).

Other: Data are in headcounts (HC); break in time series: EL:2019, IL: 2016; AT: Institutions and Universities without rector/head and only interim mangagement are added to the total causing a discrepancy between the total of institutions and total of heads, BA: Total of Heads includes numbers of Rectors of Universities and the number of Faculty Deans causing a discrepancy between the Total of institutions, DE: Differences between number of institutions and total of heads due to vacant positions and two or more heads for one institution, ES: Only the public Spanish universities are included, TR: Number of Heads of institutions is lower than exact number of institution due to newly established or not active institutions for which a head is not appointed.

Source: Women in Science database, DG Research and Innovation - T7_questionnaires

Annex 6.5 Number of heads of universities or assimilated institutions based on capacity to deliver PhDs by sex and proportion (%) of women, 2019 and 2016

Country	2019				
	Reference year	Women	Men	Total	% Women
EU-27	**:**	**185**	**851**	**1 036**	**18**
EU-28	**:**	**205**	**931**	**1 136**	**18**
BE	2019	1	10	11	9
BG	2018	12	33	45	27
CZ	2019	3	26	29	10
DK	2019	3	8	11	27
DE	2018	32	98	130	25
EE	2019	0	7	7	0
EL	2019	4	20	24	17
ES	2019	9	41	50	18
FR	2017	8	60	68	12
HR	2019	2	10	12	17
IT	2019	9	89	98	9
CY	2018	0	8	8	0
LV	2019	7	9	16	44
LT	2019	7	18	25	28
LU	2017	0	1	1	0
HU	2019	3	27	30	10
MT	2019	1	4	5	20
NL	2019	3	11	14	21
AT	2019	8	23	31	26
PL	2019	22	179	201	11
PT	2018	8	31	39	21
RO	2019	4	48	52	8
SI	2019	21	45	66	32
SK	2019	7	25	32	22
FI	2019	3	11	14	21
SE	2019	8	9	17	47
UK	2016	20	80	100	20
IS	2019	1	3	4	25
NO	2019	4	6	10	40
CH	2019	3	9	12	25
TR	2019	20	177	197	10
BA	2019	49	143	192	26
IL	2018	0	8	8	0

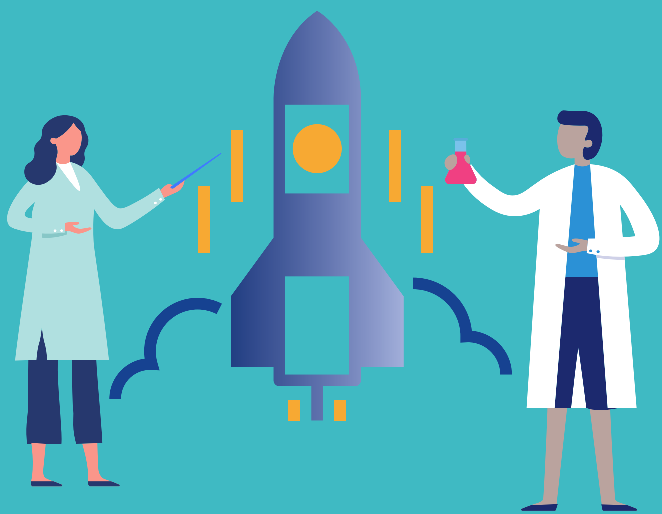
Country	2016				
	Reference year	Women	Men	Total	% Women
EU-27	**:**	**134**	**802**	**936**	**14**
EU-28	**:**	**154**	**882**	**1 036**	**15**
BE	2017	1	10	11	9
BG	2013	3	38	41	7
CZ	2016	2	27	29	7
DK	2016	3	8	11	27
DE	2016	18	99	117	15
EE	2016	0	7	7	0
EL	2016	3	19	22	14
ES	2016	3	47	50	6
FR	:	:	:	:	:
HR	2017	2	8	10	20
IT	2016	8	89	97	8
CY	2016	0	8	8	0
LV	2016	6	11	17	35
LT	2016	6	21	27	22
LU	2016	0	1	1	0
HU	2016	2	27	29	7
MT	2016	0	3	3	0
NL	2016	3	11	14	21
AT	2016	9	18	27	33
PL	2016	24	178	202	12
PT	2016	10	34	44	23
RO	2016	4	51	55	7
SI	2016	13	43	56	23
SK	2017	5	22	27	19
FI	2016	4	11	15	27
SE	2017	5	11	16	31
UK	2015	20	80	100	20
IS	2016	0	3	3	0
NO	2016	3	5	8	38
CH	2016	4	8	12	33
TR	2016	15	162	177	8
BA	2017	30	124	154	19
IL	2016	1	7	8	13

Notes: Exceptions to the reference year: BE, SK, SE, BA (2019-2017), BG (2018-2013), DE, PT (2018-2016), FR (2017), HR (2019-2017), CY, IL (2018-2016), LU, UK (2016-2015) ; Data not available for: IE, LU, ME, MK, AL, RS, GE, AM, FO, MD, TN, UA.; Women in Science Data Questionnaire 2018: LU, UK (total, females and males). Data for BE is the result of BE (FL) + BE (FR).

Others: Data are in headcounts (HC); AT: Institutions and Universities without rector/head and only interim management are added to the total causing a discrepancy between the total of institutions and total of heads, BA: Total of Heads includes numbers of Rectors of Universities and the number of Faculty Deans causing a discrepancy between the Total of institutions, ES: Only public Spanish universities are included, NO: Only universities are included. Other higher education institutions that deliver PhDs are not included.

Source: Women in Science database, DG Research and Innovation - T8_questionnaires

CHAPTER 7
RESEARCH AND INNOVATION OUTPUT



KEY TAKEAWAYS

The data show that despite the benefits of gender diversity regarding scientific excellence and the societal relevance of R&I outputs (Nielsen et al, 2017), gender gaps persist in authorships of research publications and in inventorships. Measures for gender equality in R&I outputs have been gradually strengthened in the EU. For example, the framework programme for R&I, Horizon Europe (2021-2027) encourages gender balance in research teams and strengthens the integration of gender dimension in R&I content (European Commission, 2021a). Moreover, the Council of the European Union has invited Member States and funding organisations to advance measures to ensure that allocation of research funding is not affected by gender bias (Council of the EU, 2020b).

- **Among the pool of authors actively publishing, the number of men authors exceeded the number of women authors at all seniority levels between 2015-2019** (Figure 7.1). At the European level, the ratio of women to men for active authors was closest to gender parity i.e. 1.0 among early-stage authors (0.8), and furthest for senior authors (0.5). These data show a widening gender gap among active authors as their level of seniority increases.

- When data are disaggregated by field of R&D, **gender gaps in active authorship are particularly evident in the fields of Natural Sciences and Engineering & Technology** (Table 7.1). This gender gap was present for all levels but was most evident at the highest seniority level. Such differences can be partly explained by the persistence of gender segregation in fields of study where women tend to be under-represented among Doctoral graduates in Physical Sciences, Mathematics & Statistics, ICT and Engineering & Engineering Trades (see Chapter 2).

- **At both European and country level, between 2015-2019, women and men published a similar number of publications at early stages of their career.** As authors become more senior, women published increasingly less than men (Figure 7.3). Nevertheless, data on the field-weighted citation impact of women and men authors show that at both European and country level, publications authored by women have a similar impact to men regardless of seniority level (Figure 7.4).

- **At European and country level, men accounted for a greater share of research team members than women between 2015-2019** (Figure 7.5). Women were under-represented the most in authorship teams within the fields of Natural Sciences and Engineering & Technology (Table 7.4).

- Indicators on corresponding authorship provide some insight into how women's and men's publication outputs vary as lead authors (i.e. corresponding authors). The data show that **between 2015-2019, women were more likely to be under-represented among active authors who lead research** (Figure 7.7).

- **Between 2015-2018, women were substantially under-represented among inventors at European level**. For every 10 inventorships held by men, just over one inventorship was held by a woman (Figure 7.9). In the vast majority of EU-27 Member States and Associated Countries, more than five times as many inventorships were held by men than women.

- **In 2019, the funding success rate was 3.9 p.p. higher for men than women at European level** (Figure 7.12). The same pattern was reflected in the majority of the EU-27 Member States and Associated Countries for which data were available.

- **A very small proportion (just under 2%) of publications included a gender dimension between 2015-2019 at European level** (Table 7.14). The highest percentage of publications with a gender dimension in research content was observed in the Medical & Health sciences, while the lowest percentage was observed in Engineering & Technology (Table 7.15).

- **At European level, around 1.7% of all Horizon 2020 projects integrated a gender dimension** (Figure 7.13).

7.1 Introduction

Chapter 7 examines women's and men's participation in R&I output, funding success rate differences between women and men, as well as the integration of gender dimension in R&I content. More specifically, this chapter considers the gender gap in R&I by analysing gender differences in the number of active authors publishing research, frequency of publication, citation impact of women's and men's publications, representation within authorship teams, patent output and representation in academic-corporate collaboration teams. Throughout this section, publications refer to peer-reviewed publications, that is, articles, reviews, and conference papers.

Gender diversity in R&I - who designs research and for whom, as well as the research methodology and topics addressed - is important for several reasons. In 2012, gender mainstreaming was highlighted in the ERA under Priority 4 to ensure that gender diversity is fully utilised in research to avoid a 'waste of talent' (European, Commission, 2012). Since then, gender equality provisions have been gradually strengthened, reaching a high momentum with Horizon Europe, the framework programme for R&I (2021-2027) (European Commission, 2021a), and the new ERA Communication (European Commission, 2020a). Some of these provisions include the mandatory integration of the gender dimension in R&I content and a new eligibility criterion for Horizon Europe applicants (European Commission, 2020a; Council of the European Union, 2020b).

Moreover, equal participation of women and men in R&I is associated with higher quality research (GENDERACTION, 2020b) and tendency for greater innovation and productivity outcomes. For instance, positive correlations have been found between the European Innovation Scoreboard, the Adjusted Research Excellence Indicator and Gender Equality Index indicating that Europe's performance in terms of innovation continues to improve with better gender equality. As highlighted by the GENDERACTION project (2020b), this may simply be due to a greater utilisation of existing talent or may stem from the benefit of having a more diverse workforce with different perspectives and experiences which can lead to more innovative solutions.

The EU has emphasised the importance of diversity in R&I in recent years. For example, in a 2020 Council proposal on Horizon Europe, the Council of the EU highlighted gender equality as a crucial factor for sustainable economic growth and stated that embracing diversity is key to good science, as evidence shows that science benefits from diversity (Council of the EU, 2020b). In the Communication on the new ERA, the European Commission identified a need for ambitious targets to support change within R&I institutions and foster a pipeline of female talent (European Commission, 2020a). Furthermore, the 2020 ERA Council Conclusions emphasised the role of Member States and research funders to ensure that the allocation of research funding is free from bias (Council of the EU, 2020c).

Section 7.2 analyses women's and men's representation among active authors and among all authors. Women's and men's relative contribution to research publications is partly dependent on the available workforce of authors. By assessing the ratio of women to men actively publishing, i.e. those who published 10 or more papers in the last 20 years (2000-2019) and at least 1 paper in the last 5 years (2015-2019) OR those who published 4 or more papers in last 5 years (2015-2019), this section sheds light on the level of gender balance among active authors by seniority level and field of research. It also assesses the number of women and men among all authors (i.e. those who published at least one publication during the period 2015-2019), to explore whether the gender balance between authors varies when author productivity is considered when assessing representation.

Section 7.3 analyses the gender gap in the average number of publications of active authors. One of the ways of assessing a researchers' productivity is looking at their number of publications. Moreover, citations of an author's publications in other research publications can provide insight into the uptake of the research, i.e. the citation impact of their publications. This section first compares the average publication count for women and men among active authors, by seniority level and field of research and then the average citation impact of publications by women and men active authors by seniority level.

Section 7.4 explores women's and men's representation in authorship teams. Representation of diverse viewpoints can affect how research questions are designed and answered. The EU has also emphasised the importance of gender parity in research teams for ensuring that R&I outputs are societally relevant. For example, a key objective of the Commission's guidelines on Horizon 2020 was to foster gender balance in research teams. Similarly, the European Commission is committed to encouraging gender balance among researchers involved in funded projects through Horizon Europe (European Commission, 2021a). Considering these priorities, this section looks at women's and men's relative representation in authorship teams and examines how representation varies by field of research and whether representation has moved closer to gender parity over time. Existing research shows that women are less likely than men to author publications resulting from international collaboration (Elsevier, 2020) and less likely to be internationally mobile over the course of their careers (Elsevier, 2017; Cañibano, Fox and

Otamendi, 2015), which may impact the academic reach of their publications. This section this considers women's and men's relative representation on international authorship teams.

Section 7.5 analyses women's and men's contributions as active corresponding authors. In several fields, authorship positions can be indicative of the level of an author's contribution to the research. Analysis of author contribution statements reveals that first authors are more likely to have conceived, performed and analysed the research than middle and last authors. Last authors are more likely to have conceived and written the research than first or middle authors; further, the first and last authors are often also the corresponding author (Sauermann and Haeussler, 2017). This section specifically focuses on gender balance among active authors in the position of corresponding author, as the person who – often - leads the research. By examining the ratio of publications in which women and men are the corresponding author, this section considers how gender balance in research leadership varies by field of research and whether there have been any improvements towards gender parity overtime. This section also compares women's and men's contributions as corresponding authors in internationally collaborated publications.

Section 7.6 analyses the gender gap in inventorship and innovation, in terms of patent output and women's and men's representation in academic-corporate collaboration teams. Overall, Europe lags behind when it comes to converting research outcomes into innovation (European Commission, 2020a). This can be in part due to the extremely low representation of women amongst Europe's innovators, which is an area of focus to strengthen the ERA (European Commission, 2020a; Council of the EU, 2020c). There are gender biases at play in the area of inventorship and innovation that limit women's participation in and benefit from R&I, including who can produce innovations, what constitutes an innovation and who is imagined as the target user of innovations (with a male end-user typically envisioned) (ERAC SWG GRI, 2019). The section allows a deeper examination into the extent of the gender gap in patent outputs, patent application teams and academic-corporate collaboration teams.

Section 7.7 explores differences in research funding success rates for women and men. Gender differences in funding success rates partly contribute to the gender gap in authorships and innovation outputs such as patents. Such differences in funding success rates for women and men can lead to a vicious cycle where lower funding could lead to a decreased R&I output (e.g. fewer publications), which in turn could lead to slimmer chances of being funded. Following the 2020 ERA Communication, the Council invited Member States and funding organisations to advance measures to ensure that allocation of research funding is not affected by gender bias (Council of the EU, 2020b).

Section 7.8 explores the integration of gender dimension in research and innovation content. The European Commission has been promoting the integration of gender analysis, and more recently intersectional analysis, to research design and process as a means of scientific excellence and of preventing bias in research. A failure to integrate gender dimension in research can have social and economic costs, for example impacts on health, recalls of drugs or products from the market, and reputational damage to organisations (ERAC SWG GRI, 2019). Recently, the Commission has emphasised the importance of a gender and intersectional perspective, stating in the Gender Equality Strategy 2020-2025 that funding will be made available for gender and intersectional research in Horizon Europe (European Commission, 2020b).

As part of Horizon Europe, the integration of gender dimension in R&I content becomes a requirement by default across the whole programme (European Commission, 2021a). Applicants have to describe how gender analysis is taken into account in the project's content unless the topic description explicitly mentions that the integration of the gender dimension is not mandatory. The EU-funded Horizon 2020 expert group on Gendered Innovations (European Commission, 2020h) published a report providing guidance for researchers and innovators through concrete case studies and methodological tools for applying sex, gender and intersectional analysis in different scientific fields and intersectional work. Building on this context, this section focuses on the proportion of publications that incorporate gender dimension and presents two new indicators on the integration of gender dimension and intersectional aspects in Horizon 2020 projects.

A note on authorship indicators:

Peer-reviewed publications are often used to determine if researchers should recieve funding. However, the metrics related to peer-reviewed publications – publication count, collaboration, or citations – are subject to gender bias. Therefore, understanding gender-disaggregated trends related to research output can be valuable to funders and hiring committees, which may consider using these metrics as tools for evaluating potential applicants. As research is influenced by the unique lens of the researcher, understanding the gender composition of authors can be informative about what can be expected of the research portfolio with respect to, for example, indicators such as the integration of a gender dimension in research content.

In compiling the indicators on authorship, information on authors' gender and country must first be obtained. The gender is inferred from the authors' names, while the country of origin is obtained using the affiliation address of the authors' first publication as indicated in scientific publications. For gender, analysts require access to the complete name of an author, including their full given name[1] (not just initials) and surname. For country, analysts require access to a link associating each author of a publication with their corresponding affiliation address.

1 NamSor is used to infer the gender of authors. NamSor treats gender as a binary variable and can only infer gender as 'woman' or 'man'. The authors acknowledge that this limits the full assessment of gender inclusivity.

7.2 The gender gap among active authors and all authors

Since 2012, ERA Priority 4 for gender equality and gender mainstreaming has emphasised the need to end waste of talent and to diversify views in research (European Commission, 2012). While significant progress has been made in increasing women's participation in research in the past decade, disparities continue to exist, including the authorship of research publications (Elsevier, 2020). To provide further insight into the gender gap in women's and men's participation as authors on research publications, the following indicators assess how far the existing pool of 'active' authors and all authors is from reaching gender parity. Disaggregations by seniority level and field of research are provided to analyse how the pool of authors differs across these categories. Gender parity between women and men in this section is indicated by a ratio of 1.0.

Active authors are defined as those that produced 10 or more papers in the last 20 years (2000-2019) and at least one paper in the last five years or those who produced four or more papers in last five years. **Seniority level** is estimated via the time elapsed since an author's first publication in a journal indexed in Scopus and has three categories:

- <5 years or 'early-stage': authors whose first paper in Scopus was published up to and including the years 2015-2019;
- 5 to 10 years or 'middle-stage': authors whose first paper in Scopus was published in the years 2010-2014;
- >10 years or 'senior' authors: authors whose first paper in Scopus was published in the year 2009 or earlier.

In Figure 7.1 and Table 7.1, a ratio of 1.0 indicates as many active women authors as men authors at a given seniority level. If the ratio is above 1.0, it means that the number of active women authors in the group exceeded the number of active men authors and if it is below 1.0, it means that the number of men authors in the group exceeded the number of women authors.

There were more men than women among active authors. Among early-stage authors, the gender gap was generally smaller, but as the seniority level increases, the gap widened to twice as many men as women authors.

Figure 7.1 shows that between 2015-2019, among active authors, the ratio of women to men was closest to parity among early-stage authors at the European level (0.8 for less than five years since the first publication). By contrast, the ratio was furthest from parity among senior authors (0.5 for more than 10 years since the first publication). The ratio of those first publishing 5-10 years ago fell between the early-stage and senior author groups. In every seniority category, the European level values were closer to gender parity than the values worldwide (difference of between 0.1-0.2). These data suggest that the gender gap among active authors widens as seniority level increases.

The trends seen at European level were generally observed at country level. In 34 of 43 EU-27 Member States and Associated Countries, the ratio was below 1.0 across all seniority levels, indicating that the number of active men authors exceeded the number of active women authors. A similar situation was observed in the G-20 region where the ratio was below 1.0 across all seniority levels in all economies except Argentina (1.12 for 5-10 years category).

However, considerable variation was observed among the EU-27 Member States and Associated Countries. Among early-stage authors, the number of active women authors was greater than the number of active men authors in eight EU-27 Member States and Associated Countries (BG, LV, PL, PT, RO, ME, MK, TN). Similar to European level findings, at the most senior level, the number of active authors did not reach gender parity in any of the EU-27 Member States and Associated Countries. For the middle seniority category, the ratio was greater than 1.0 in only four countries (BG, IT, PT, RO).

Women were least represented as active authors in the fields of Natural Sciences and Engineering & Technology and most represented in Medical & Health Sciences and Agricultural & Veterinary sciences.

Table 7.1 shows the same ratio of active authorship disaggregated by fields of R&D. During the 2015-2019 period, the lowest ratios were observed in Natural Sciences and Engineering & Technology across all seniority levels with the gap widening at the most senior category. More specifically, at European level, the ratio of women to men among active authors in Natural Sciences was 0.6 for early-stage authors and middle-stage authors, further decreasing to 0.5 among senior authors. The ratio in Engineering & Technology was even lower, at 0.4 for early-stage authors and middle-stage authors and decreasing to 0.3 for senior authors. The highest ratios were observed in Medical & Health Sciences and Agricultural & Veterinary Sciences where, the ratio of women to men among active authors was greater than 1.0 for early-stage and middle-stage authors at European level. Such differences by field of R&D can be partly explained by the persistence of gender segregation in fields of study, with women under-represented among Doctoral graduates in Physical Sciences, Mathematics & Statistics, ICT and Engineering & Engineering Trades (see Chapter 2).

At country level, in most of the EU-27 Member States and Associated Countries, the number of active men authors in Natural Sciences and Engineering & Technology was greater than the number of active women authors for all seniority levels. In the majority of cases, the number of women exceeded the number of men among active authors in the fields of Medical & Health Sciences and Agricultural & Veterinary sciences in both the early-stage and middle-stage categories. However, the pattern was reversed for the most senior category, with the number of men exceeding the number of women among active authors in these fields. Across the G-20 region, the ratio was lowest, i.e. between 0.1 and 0.2 in China except Hong Kong, Hong Kong, Japan and South Korea across several R&D fields (including Natural Sciences, Engineering & Technology, Medical & Health Sciences, Agricultural & Veterinary Sciences, Social Sciences).

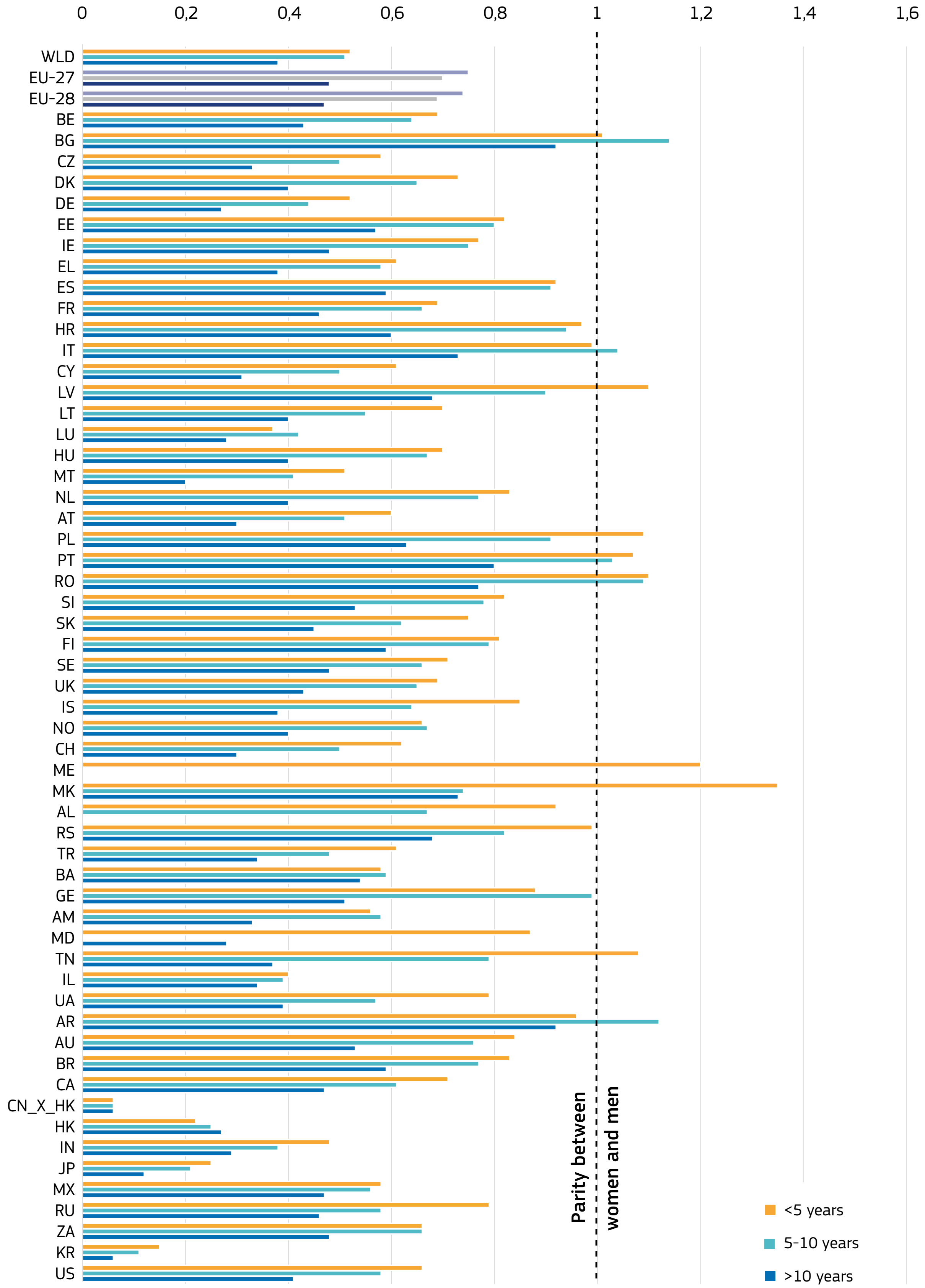
There were gendered patterns in the frequency of publication: women were better represented among authors than active authors

Figure 7.2 shows the ratio of women to men among all authors in all fields of R&D, by seniority level, for 2015-2019 (i.e. those who published at least one publication during the period 2015-2019). As mentioned before, a ratio of 1.0 indicates gender parity among all authors.

Between 2015-2019, the ratio of women to men was higher in every seniority category than among active authors, at European level (Figure 7.1). This suggests that women were not publishing enough to meet the productivity threshold used to define active authorship and therefore, more women than men are excluded from the active author calculation than from the all-author calculation. The implications of the gender gap in publishing rate are discussed further in section 7.3. Further to those implications, these data indicate that minimum publication thresholds applied as part of awards or career opportunities may have a greater impact on women than men.

A similar trend can be observed at country level. Among the EU-27 Member States and Associated Countries, the ratio of women to men among all authors, was greater than the ratio of women to men among active authors in in every seniority category (Figure 7.1). Exceptions where the ratio for active authors slightly exceeded the ratio for all authors were observed in Bulgaria and Serbia for all categories, the Netherlands, Montenegro and Tunisia (<5 years category), and Romania (<5 years and 5-10 years categories).

Figure 7.1 Ratio of women to men among active authors in all fields of R&D, per seniority level, 2015-2019



Notes: Countries are listed in protocol order; world, EU-27 and EU-28 values are at the top. The percentage of authors to which a gender could be assigned varies. For EU-27, the proportion of authors for whom gender could be inferred was 0.84, with the lowest value among EU-27 Member States being 0.59 for Croatia and the lowest value among all regions being 0.27 for China. For ME (5-10, >10), AL (>10) and MD (5-10), the count of women or men was less than 30. Data not available for: FO.

Source: Computed by Elsevier using Scopus data.

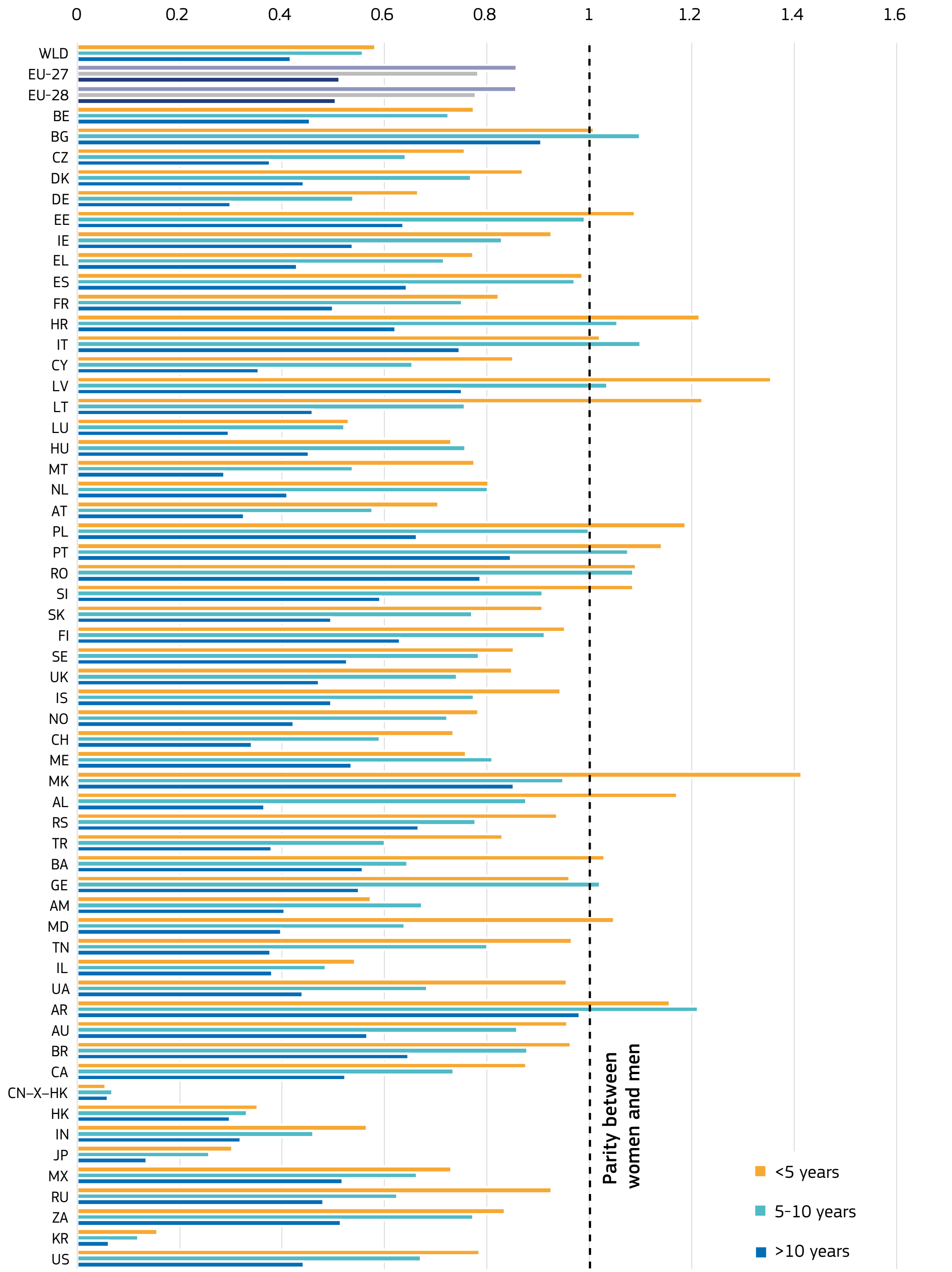
Table 7.1 Ratio of women to men among active authors, by field of R&D and seniority level, 2015-2019

Country	Natural sciences			Engineering and technology			Medical and health sciences			Agricultural and veterinary sciences			Social sciences			Humanities and the arts		
	<5 years	5-10 years	>10 years	<5 years	5-10 years	>10 years	<5 years	5-10 years	>10 years	<5 years	5-10 years	>10 years	<5 years	5-10 years	>10 years	<5 years	5-10 years	>10 years
WLD	0.4	0.4	0.3	0.3	0.3	0.2	0.8	0.8	0.5	0.7	0.7	0.5	0.9	0.8	0.6	0.9	0.8	0.5
EU-27	**0.6**	**0.6**	**0.5**	**0.4**	**0.4**	**0.3**	**1.3**	**1.2**	**0.7**	**1.2**	**1.1**	**0.7**	**1.0**	**0.9**	**0.5**	**0.8**	**0.7**	**0.5**
EU-28	**0.6**	**0.6**	**0.4**	**0.4**	**0.4**	**0.3**	**1.2**	**1.1**	**0.7**	**1.2**	**1.1**	**0.7**	**1.0**	**0.9**	**0.6**	**0.8**	**0.8**	**0.5**
BE	0.5	0.6	0.4	0.3	0.3	0.3	1.2	1.1	0.6	1.0	1.0	0.5	1.0	0.8	0.5	0.8	0.7	0.4
BG	1.0	1.1	0.9	0.7	0.9	0.8	1.6	1.6	1.4	1.4	1.1	1.0	1.6	1.6	0.8	l	l	l
CZ	0.6	0.5	0.3	0.4	0.3	0.2	1.2	0.9	0.5	0.8	0.9	0.4	0.7	0.5	0.4	0.7	0.4	0.3
DK	0.6	0.5	0.3	0.3	0.3	0.2	1.1	1.0	0.6	1.1	0.8	0.5	0.9	0.7	0.4	0.8	0.6	0.5
DE	0.4	0.4	0.3	0.3	0.2	0.2	1.0	0.8	0.4	1.0	0.9	0.4	0.8	0.7	0.4	0.7	0.6	0.4
EE	0.7	0.6	0.5	0.4	0.3	0.3	2.6	1.7	1.1	1.1	0.8	0.7	1.1	1.9	0.7	l	l	0.6
IE	0.6	0.6	0.4	0.4	0.4	0.2	1.2	1.2	0.7	0.9	1.1	0.5	1.0	1.2	0.7	0.8	0.9	0.7
EL	0.6	0.6	0.4	0.4	0.4	0.3	0.8	0.8	0.5	1.1	0.9	0.5	0.7	0.6	0.4	0.8	1.1	0.6
ES	0.8	0.8	0.6	0.6	0.5	0.4	1.4	1.5	0.8	1.4	1.3	0.8	0.9	0.9	0.6	0.7	0.7	0.5
FR	0.6	0.6	0.4	0.4	0.4	0.3	1.1	1.1	0.7	1.2	1.0	0.6	0.8	0.7	0.5	0.7	0.6	0.5
HR	1.0	0.8	0.6	0.6	0.5	0.3	1.5	1.5	0.8	1.5	1.2	0.9	0.8	1.2	0.7	l	0.7	0.4
IT	0.9	1.0	0.8	0.6	0.6	0.5	1.5	1.6	1.0	1.3	1.2	0.9	1.2	1.1	0.7	0.9	0.9	0.6
CY	0.5	0.4	0.3	0.4	0.4	0.2	1.2	0.9	0.5	l	l	l	0.7	0.7	0.4	l	l	l
LV	1.0	0.8	0.6	0.8	0.7	0.5	l	1.8	1.3	1.5	1.3	1.1	1.8	l	l	l	l	l
LT	0.6	0.5	0.4	0.4	0.4	0.3	1.1	0.9	0.6	l	1.0	0.6	1.3	1.0	0.7	l	l	l
LU	0.3	0.3	0.3	l	l	l	0.9	1.1	0.4	l	l	l	l	0.7	l	l	l	l
HU	0.7	0.6	0.4	0.4	0.4	0.3	1.0	1.1	0.6	0.9	0.8	0.4	0.7	0.7	0.4	l	l	0.5
MT	l	l	l	l	l	l	0.7	0.7	l	l	l	l	l	l	l	l	l	l
NL	0.6	0.6	0.3	0.3	0.3	0.2	1.3	1.2	0.5	0.9	0.9	0.4	1.2	1.1	0.5	1.0	0.8	0.4
AT	0.5	0.5	0.3	0.3	0.3	0.2	1.1	0.8	0.4	1.1	1.0	0.4	0.8	0.7	0.4	0.6	0.6	0.4
PL	1.0	0.9	0.6	0.8	0.6	0.4	1.9	1.6	1.1	1.8	1.6	1.0	1.2	1.1	0.7	1.2	1.0	0.7
PT	0.9	0.9	0.8	0.6	0.7	0.6	1.6	1.5	1.2	1.8	1.6	1.3	1.1	1.3	0.8	1.4	1.2	0.9
RO	1.0	1.1	0.8	1.0	1.1	0.7	1.7	1.8	1.2	1.4	1.3	1.1	1.1	1.2	0.9	1.3	0.8	0.7
SI	0.8	0.6	0.5	0.5	0.5	0.3	1.4	1.1	0.8	1.3	1.1	0.9	1.0	1.2	0.7	l	1.3	0.5
SK	0.7	0.6	0.4	0.5	0.4	0.3	1.8	1.4	0.8	1.4	0.8	0.6	0.8	0.8	0.6	0.8	l	l
FI	0.6	0.6	0.5	0.4	0.4	0.3	1.5	1.5	1.0	1.4	1.3	0.7	1.2	1.2	0.8	1.0	1.1	0.8
SE	0.6	0.5	0.4	0.4	0.3	0.2	1.1	1.1	0.7	1.1	1.0	0.6	1.1	0.9	0.6	0.8	0.8	0.5
UK	0.5	0.5	0.4	0.3	0.3	0.2	1.1	0.9	0.6	1.0	1.0	0.5	1.0	0.9	0.6	0.8	0.8	0.6
IS	0.8	0.6	0.3	l	l	l	1.0	1.1	0.4	l	l	l	l	l	0.7	l	l	l
NO	0.5	0.5	0.3	0.3	0.3	0.2	1.1	1.1	0.6	0.9	0.9	0.5	0.9	0.7	0.5	0.9	0.6	0.6
CH	0.5	0.4	0.3	0.3	0.3	0.2	0.9	0.8	0.4	1.1	1.0	0.5	0.9	0.8	0.4	1.1	0.7	0.4
ME	l	l	l	l	l	l	l	l	l	l	l	l	l	l	l	l	l	l
MK	1.1	0.7	0.6	l	0.7	0.5	2.0	1.4	1.0	l	l	l	l	l	l	l	l	l
AL	l	l	l	l	l	l	l	l	l	l	l	l	l	l	l	l	l	l
RS	1.0	0.8	0.7	0.7	0.6	0.6	1.4	1.2	0.9	1.6	1.2	1.0	0.8	0.7	0.5	l	l	l
TR	0.6	0.5	0.3	0.4	0.3	0.3	0.8	0.6	0.4	0.9	0.5	0.3	0.6	0.5	0.4	0.6	0.5	0.6
BA	0.5	0.5	0.4	l	l	l	0.9	1.0	0.8	l	l	l	l	l	l	l	l	l
GE	0.8	0.9	0.5	l	l	0.6	1.4	l	0.8	l	l	l	l	l	l	l	l	l
AM	0.5	0.5	0.3	l	l	0.3	l	l	0.8	l	l	l	l	l	l	l	l	l
MD	l	l	0.3	l	l	0.3	l	l	l	l	l	l	l	l	l	l	l	l
TN	1.1	0.7	0.3	0.9	0.6	0.2	1.3	1.3	0.6	2.2	0.8	0.5	1.0	0.5	0.3	l	l	l
IL	0.3	0.3	0.3	0.2	0.2	0.2	0.6	0.6	0.4	0.4	0.5	0.4	0.5	0.6	0.5	0.5	0.5	0.4
UA	0.7	0.6	0.4	0.6	0.5	0.3	1.7	1.2	0.8	0.7	l	0.8	0.9	0.6	0.4	l	l	l
AR	1.0	1.2	1.0	0.6	0.8	0.8	1.3	1.5	1.1	1.6	1.6	1.1	1.2	1.1	1.0	0.8	0.8	0.9
AU	0.6	0.5	0.4	0.3	0.3	0.2	1.3	1.2	0.7	1.1	0.8	0.4	1.4	1.3	0.8	1.4	1.2	0.8
BR	0.7	0.7	0.5	0.5	0.5	0.4	1.3	1.2	0.9	0.9	0.8	0.6	0.7	0.7	0.6	0.9	0.9	0.8
CA	0.5	0.4	0.4	0.3	0.2	0.2	1.1	0.9	0.7	1.0	0.8	0.5	1.3	1.1	0.8	1.0	0.9	0.7
CN_X_HK	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	l	l	l
HK	0.1	0.2	0.2	0.1	0.1	0.1	0.4	0.4	0.4	l	l	l	0.5	0.4	0.3	l	0.4	0.5
IN	0.5	0.4	0.3	0.4	0.3	0.2	0.6	0.5	0.4	0.5	0.4	0.2	0.5	0.4	0.3	0.6	0.5	0.6
JP	0.2	0.2	0.1	0.1	0.1	0.1	0.3	0.3	0.2	0.4	0.3	0.2	0.3	0.3	0.2	0.2	0.3	0.2
MX	0.6	0.5	0.5	0.4	0.4	0.3	0.8	0.8	0.8	0.7	0.6	0.5	0.7	0.6	0.5	0.6	l	0.6
RU	0.7	0.5	0.5	0.5	0.4	0.4	1.3	1.3	1.0	1.1	1.1	0.9	1.6	1.0	0.6	1.6	0.9	0.5
ZA	0.5	0.5	0.4	0.3	0.3	0.3	1.1	1.1	0.7	1.0	0.7	0.5	0.7	0.9	0.6	0.6	0.6	0.6
KR	0.1	0.1	0.1	0.1	0.1	0.0	0.2	0.1	0.1	0.2	0.2	0.1	0.2	0.2	0.1	l	l	l
US	0.5	0.4	0.3	0.3	0.2	0.2	1.0	0.8	0.6	0.9	0.8	0.4	1.3	1.1	0.7	0.9	0.8	0.6

Notes: Cells are colour coded relative to gender parity (defined mathematically as 1.0). Blue = More men than women; White = Parity; Orange = More women than men. Countries are listed in protocol order; world, EU-27 and EU-28 values are at the top. The average proportion of authors to which a gender could be assigned varies. For EU-27, the proportion of authors for whom gender could be inferred was 0.84, with the lowest value among EU-27 Member States being 0.59 for Croatia and the lowest value among all regions being 0.27 for China. l indicates that the count of women or men in the category was less than 30. Data not available for: FO.

Source: Computed by Elsevier using Scopus data.

Figure 7.2 Ratio of women to men among all authors in all fields of R&D, per seniority level, 2015-2019



Notes: Countries are listed in protocol order; world, EU-27 and EU-28 values are at the top. The average proportion of authors to which a gender could be assigned varies. For EU-27, the proportion of authors for whom gender could be inferred was 0.86, with the lowest value among EU-27 Member States being 0.69 for Croatia and the lowest value among all regions being 0.27 for China. Data not available for: FO.

Source: Computed by Elsevier using Scopus data.

7.3 The gender gap in the average number of publications of active authors

Studies suggest a relationship between various aspects of research and gender, particularly research method selection and the reporting of results (Donde and Smith, 2011; Thelwall, Bailey, Tobin and Bradshaw, 2019; Sugimoto et al., 2019). In addition, researcher sex or gender have been implicated as a factor influencing results in both human and animal studies (Chapman, Benedict and Schiöth, 2018; de Abreu and Kalueff, 2020). With regards to research topic choice, studies suggest a link between aspects of researcher identity such as race/ethnicity and gender and topic selection (Hoppe et al., 2019; Santos, Horta and Amâncio, 2020). Therefore, the research portfolio is likely to reflect both women's representation among authors and the relative publication output of women. This section examines the potential differences in the average number of publications of women and men active authors. Some studies have shown a high correlation between productivity (the number of papers published) and impact (number of citations) (Bosquet & Combes, 2013; Besselaar & Sandström, 2016; Siudem et al, 2020). This section also compares the citation impact of women and men researchers, which may provide insight into whether author citation behaviour (i.e. how authors choose to cite publications by other authors) represents a potential barrier to women in contributing to the advancement of knowledge. Disaggregations by seniority level are provided to analyse how productivity and impact vary across seniority categories.

Here, a ratio of 1.0 indicates that, on average, women and men (at that seniority level) published the same number of publications. A ratio above 1.0, means that, on average, women authors published more than men authors, and the opposite is true if the ratio is below 1.0.

At the early stages of their careers, women and men published a similar number of publications. As authors became more senior, women published increasingly fewer publications compared to men.

Figure 7.3 presents the ratio of the average number of publications by women to those by men in all fields for 2015-2019, disaggregated by seniority level. At European level, the ratio of the average number of publications was the lowest for the most senior category (0.7 for >10 years) and almost at gender parity at the early-stage category (0.9 for < 5 years). For the middle-stage category, the ratio was in the middle of the other two categories (0.8 for 5-10 years). The European level values were similar to values worldwide for every seniority category.

A similar trend can be seen at country level, where among early-stage authors, the ratio of women to men was equal to or exceeded the ratio observed for the most senior category in all but five EU-27 Member States and Associated Countries (EE, ME, AL, GE, AM). On the other hand, the group of EU-27 Member States and Associated Countries for which the ratio for the middle-stage category was greater than the most senior category was smaller with 14 exceptions (BG, EL, MT, PL, SK, FI, IS, NO, AL, RS, TR, BA, AM, IL).

When data are disaggregated by field of R&D, a similar trend is evident (Table 7.2). There were only a few exceptions where the ratio of average publications for the most senior category was slightly higher than the early-stage category: Natural Sciences (EE, GE, AM), Engineering & Technology (SI, IL), Medical & Health Sciences (HR, RS, TR), Agricultural & Veterinary Sciences (SK, RS, UA), Social Sciences (DK, IE, FR, HR, LT, HU, NL, PT, SI, FI, RS, IL, UA), Humanities & Arts (IE, IT, NL, PT, RO, UK, NO, CH, IL). Country level data indicate that in Social Sciences and Humanities & Arts, the average number of publications for senior authors is closer to gender parity than other fields.

Overall, the data suggest that early-stage women authors publish almost as much as men authors across fields of R&D, but, as seniority increases, the gender gap between women and men widens with women publishing less than men, on average. There are likely multiple and intertwined factors that lead to a wider gender gap at more senior positions. For example, a study has found that men are invited to submit papers to journals twice more than women (Holmen et al, 2018). Another potential explanation is women's substantial under-representation at the highest level of academic i.e. grade A positions (Chapter 6).

Women's and men's publications tended to have equal citation impact.

Given that, on average, and particularly at the most senior category, women publish less than men (Figure 7.3), Figure 7.4 presents the ratio of average field-weighted citation impact (FWCI) of publications by women to that of men, in all fields of R&D for 2015-2019, by seniority level.

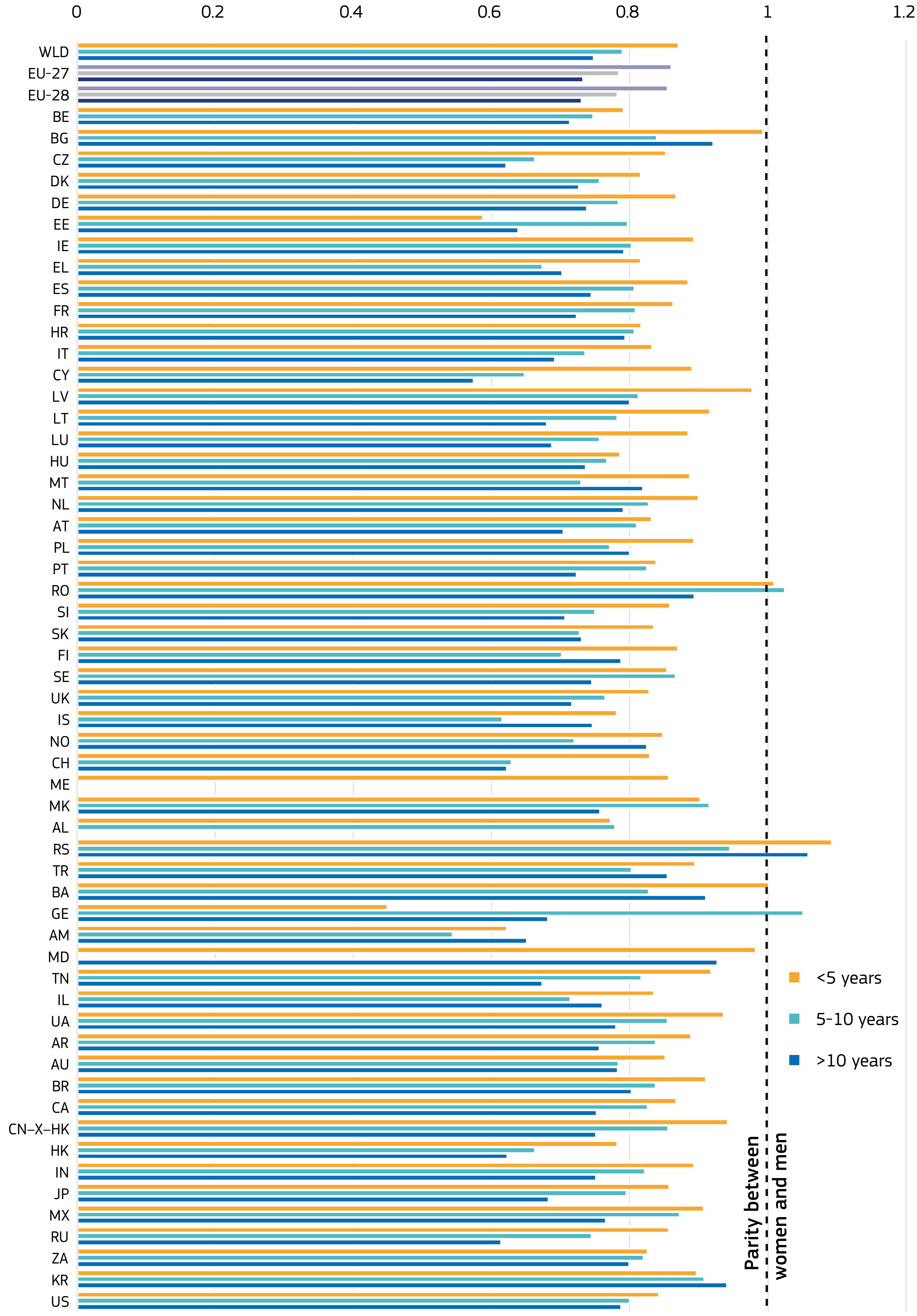
Field-weighted citation impact (FWCI) is an indicator of citation impact of a publication based on the actual number of citations received by an article compared to the expected number of citations for articles of the same document type (article, review or conference proceeding paper), publication year and subject field. A score above 1.0 indicates that women produced publications that, on average, had a higher impact than men's publications whereas a score below 1.0 means the opposite.

The data provide an understanding of the impact of women's publications relative to men (Figure 7.4). The results show that the women-to-men ratio of FWCI at European level was approximately 1.0 (gender parity), regardless of seniority level. Notably, the values at world level were slightly higher than 1.0 across all seniority levels, indicating that women produced publications that had a slightly higher impact than men's publications, on average.

At country level, the data show that majority of the EU-27 Member States and Associated Countries were closer to the value indicating gender parity for the average FWCI. Some notable country exceptions with a ratio of less than 0.7 were observed in each of the three categories for seniority: <5 years (ME, AL, AM), 5-10 years (BG, AM), >10 years (GE, AM).

A similar picture is evident when the ratio of average FWCI is disaggregated by field of R&D (Table 7.3). The data shows that regardless of field, the ratio was approximately 0.9 or 1.0 at European level. A similar trend is seen at country level, where, across all fields, the ratio of average FWCI is close to 1 for each of the EU-27 Member States and Associated Countries. However, there were some exceptions where men's publications had a considerably higher impact than women's publications. In Natural Sciences, the ratio was closer to 0 in Armenia (0.3 for <5 years); in Medical & Health sciences, the ratios were closer to 0 in Cyprus (0.2 for 5-10 years), Georgia (0.2 for > 10 years), Armenia (0.3 for > 10 years) and Ukraine (0.4 for 5-10 years). Overall, the data suggest that even though senior women authors publish less than men, their publications have a similar impact indicating that the lower publication output of women has a limited effect on the citations accrued. However, as citation practices are complex and reflective of many contributing factors, further analyses are required to ascertain this.

Figure 7.3 Ratio of average number of publications by women to those by men in all fields of R&D, per seniority level, 2015-2019



Notes: Countries are listed in protocol order; world, EU-27 and EU-28 values are at the top. The percentage of authors to which a gender could be assigned varies. For EU-27, the proportion of authors for whom gender could be inferred was 0.86, with the lowest value among EU-27 Member States being 0.59 for Croatia and the lowest value among all regions being 0.27 for China. For ME (5-10, >10), AL (>10) and MD (5-10), the count of women or men was less than 30. Data not available for: FO.

Source: Computed by Elsevier using Scopus data.

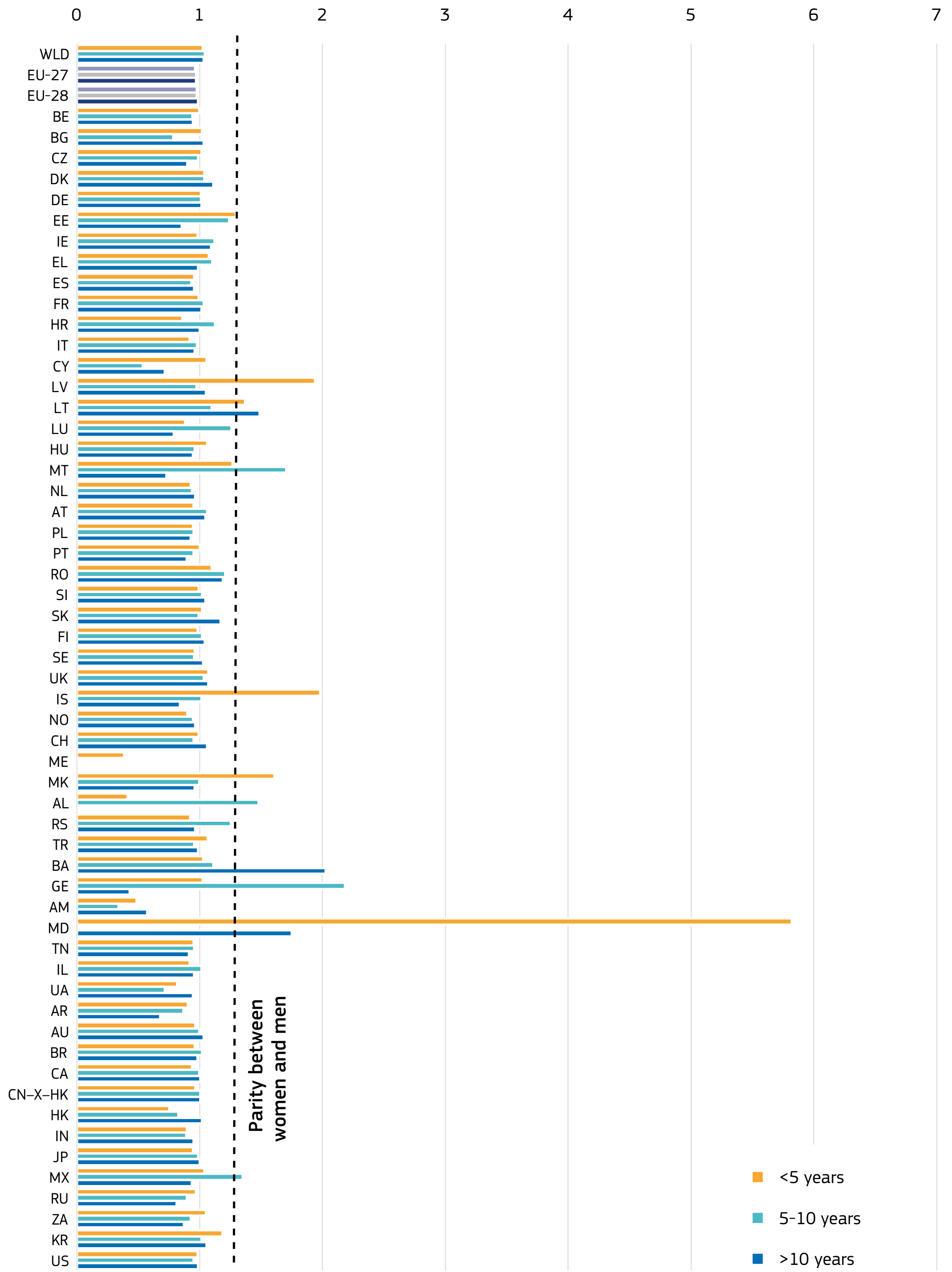
Table 7.2 Ratio of average number of publications by women to those by men, by field of R&D, per seniority level, 2015-2019

Country	Natural sciences			Engineering and technology			Medical and health sciences			Agricultural and veterinary sciences			Social sciences			Humanities and the arts		
	<5 years	5-10 years	>10 years	<5 years	5-10 years	>10 years	<5 years	5-10 years	>10 years	<5 years	5-10 years	>10 years	<5 years	5-10 years	>10 years	<5 years	5-10 years	>10 years
WLD	0.9	0.8	0.7	0.9	0.8	0.8	0.9	0.8	0.8	0.9	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9
EU-27	**0.9**	**0.8**	**0.7**	**0.9**	**0.9**	**0.8**	**0.9**	**0.8**	**0.7**	**0.9**	**0.9**	**0.8**	**0.9**	**0.9**	**0.9**	**0.9**	**0.9**	**0.9**
EU-28	**0.9**	**0.8**	**0.7**	**0.9**	**0.9**	**0.8**	**0.9**	**0.8**	**0.7**	**0.9**	**0.9**	**0.8**	**0.9**	**0.9**	**0.9**	**0.9**	**0.9**	**0.9**
BE	0.8	0.7	0.7	0.8	0.8	0.8	0.9	0.8	0.7	0.9	0.9	0.7	1.0	0.9	0.8	1.0	0.9	0.8
BG	1.0	0.8	0.9	1.0	0.9	0.9	1.0	0.9	1.0	1.1	1.0	1.0	1.2	1.1	0.7	l	l	l
CZ	0.9	0.6	0.6	1.0	0.8	0.7	0.9	0.8	0.7	0.8	0.7	0.7	0.9	0.9	0.9	1.1	1.0	0.7
DK	0.8	0.8	0.7	0.8	0.7	0.7	0.8	0.7	0.7	0.9	0.8	0.7	0.9	0.9	0.9	1.0	0.7	0.9
DE	0.9	0.8	0.7	0.9	0.9	0.8	0.9	0.8	0.7	0.9	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9
EE	0.6	0.9	0.6	0.9	0.7	0.7	0.9	0.7	0.7	0.9	0.7	0.8	0.8	0.8	0.8	l	l	0.7
IE	0.9	0.8	0.8	0.9	0.8	0.8	0.9	0.9	0.8	0.9	0.9	0.8	0.9	0.9	0.9	0.8	0.9	1.0
EL	0.8	0.7	0.7	0.9	0.8	0.7	0.8	0.7	0.8	1.0	0.9	0.9	0.9	0.8	0.8	1.0	0.9	0.7
ES	0.9	0.8	0.7	0.9	0.9	0.7	0.9	0.9	0.8	0.9	0.9	0.8	0.9	0.9	0.9	1.0	0.8	0.9
FR	0.9	0.8	0.7	0.9	0.9	0.8	0.9	0.7	0.7	1.0	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9
HR	0.8	0.9	0.7	0.9	0.9	0.8	1.0	0.7	1.0	1.0	1.0	0.9	0.9	0.8	0.9	l	1.0	0.9
IT	0.8	0.7	0.7	0.9	0.9	0.8	0.9	0.8	0.7	1.0	0.8	0.8	1.0	0.9	0.9	1.0	1.0	1.1
CY	0.9	0.7	0.6	1.0	0.8	0.7	0.9	0.9	0.7	l	l	l	1.1	0.7	0.8	l	l	l
LV	1.0	0.8	0.8	1.1	1.0	0.8	l	1.0	0.8	0.9	0.9	0.7	0.8	l	l	l	l	l
LT	1.0	0.8	0.7	0.9	0.8	0.7	0.9	0.7	0.8	l	1.0	0.8	0.9	0.7	1.3	l	l	l
LU	0.9	0.8	0.7	l	l	l	1.0	0.8	0.7	l	l	l	l	0.7	l	l	l	l
HU	0.7	0.7	0.8	0.9	0.8	0.8	0.9	0.9	0.8	1.0	0.7	0.8	0.9	1.1	0.9	l	l	1.0
MT	l	l	l	l	l	l	0.8	1.0	l	l	l	l	l	l	l	l	l	l
NL	0.9	0.8	0.8	0.8	0.8	0.8	0.9	0.8	0.7	0.9	0.9	0.8	0.9	0.9	1.0	0.8	0.9	1.0
AT	0.8	0.8	0.7	0.9	0.8	0.7	0.9	0.8	0.7	0.9	0.9	0.8	1.0	0.9	0.9	0.8	0.8	0.8
PL	0.9	0.8	0.8	1.0	0.9	0.9	0.9	0.9	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.8	0.9
PT	0.8	0.8	0.7	0.9	0.9	0.8	0.9	0.9	0.8	1.0	1.0	0.8	0.9	0.9	1.0	1.0	0.9	1.1
RO	1.0	1.0	0.9	1.0	1.1	0.9	1.0	1.1	0.9	1.0	1.1	1.0	1.0	0.9	1.0	1.0	1.0	1.2
SI	0.9	0.7	0.7	0.8	0.8	0.8	1.0	0.9	0.9	1.0	0.9	0.9	0.9	0.8	1.0	l	1.0	0.9
SK	0.8	0.7	0.7	0.9	0.8	0.8	0.9	0.8	0.9	0.9	0.9	0.9	1.0	0.9	0.7	1.0	l	l
FI	0.9	0.7	0.8	0.8	0.8	0.7	0.9	0.8	0.7	0.9	0.8	0.9	0.8	0.8	0.9	0.7	0.9	0.8
SE	0.9	0.9	0.7	0.9	0.9	0.8	0.8	0.8	0.7	0.9	0.9	0.8	0.9	0.9	0.9	1.0	0.8	1.0
UK	0.8	0.7	0.7	0.9	0.7	0.7	0.9	0.9	0.8	0.9	0.9	0.8	0.9	0.9	0.9	0.9	0.9	0.9
IS	0.7	0.5	0.8	l	l	l	1.0	1.0	0.7	l	l	l	l	l	0.9	l	l	l
NO	0.9	0.7	0.8	0.9	1.0	0.8	0.8	0.8	0.8	0.8	0.9	0.8	0.9	0.7	0.9	0.8	0.9	1.0
CH	0.9	0.6	0.6	0.9	0.9	0.8	0.9	0.8	0.7	0.9	0.9	0.7	1.0	0.9	0.8	0.9	0.8	1.1
ME	l	l	l	l	l	l	l	l	l	l	l	l	l	l	l	l	l	l
MK	0.9	0.9	0.8	l	1.0	0.8	0.9	1.0	0.7	l	l	l	l	l	l	l	l	l
AL	l	l	l	l	l	l	l	l	l	l	l	l	l	l	l	l	l	l
RS	1.1	0.9	1.0	1.1	1.1	1.0	1.0	1.0	1.1	0.9	0.9	1.1	0.8	0.8	0.9	l	l	l
TR	0.9	0.8	0.8	0.9	0.8	0.7	0.9	0.8	0.9	0.9	0.8	0.9	0.9	0.8	0.9	0.9	0.7	0.9
BA	1.0	0.8	0.9	l	l	l	1.1	0.8	0.9	l	l	l	l	l	l	l	l	l
GE	0.3	0.9	0.7	l	l	0.7	0.8	l	0.7	l	l	l	l	l	l	l	l	l
AM	0.6	0.5	0.7	l	l	0.8	l	l	0.9	l	l	l	l	l	l	l	l	l
MD	l	l	0.9	l	l	1.0	l	l	l	l	l	l	l	l	l	l	l	l
TN	0.9	0.8	0.6	0.9	0.8	0.6	0.9	0.8	0.8	1.0	0.8	0.6	0.9	0.8	0.7	l	l	l
IL	0.8	0.7	0.7	0.8	0.9	0.8	0.9	0.8	0.8	0.9	1.0	0.7	0.9	0.9	1.0	0.9	1.0	1.1
UA	0.9	0.9	0.8	1.0	0.9	0.8	1.0	1.0	0.8	0.8	l	0.9	0.9	0.9	0.9	l	l	l
AR	0.9	0.8	0.7	0.9	0.9	0.8	0.9	0.9	0.8	0.9	0.9	0.8	0.9	1.0	0.8	0.9	0.8	1.0
AU	0.8	0.7	0.7	0.8	0.7	0.6	0.9	0.9	0.8	0.9	0.9	0.8	0.9	0.8	1.0	1.0	0.9	1.1
BR	0.9	0.8	0.8	0.9	0.8	0.8	0.9	0.8	0.8	0.9	0.8	0.8	1.0	0.8	0.9	0.9	0.9	1.0
CA	0.9	0.8	0.7	0.8	0.8	0.8	0.9	0.8	0.7	0.9	0.8	0.8	1.0	0.9	0.9	0.8	0.9	0.8
CN_X_HK	0.9	0.9	0.8	0.9	0.8	0.8	0.9	0.9	0.8	0.9	0.9	0.8	0.9	0.8	0.7	l	l	l
HK	0.8	0.6	0.6	0.8	0.8	0.5	0.9	0.8	0.7	l	l	l	0.8	0.8	0.8	l	0.9	1.3
IN	0.9	0.8	0.7	0.9	0.8	0.7	0.9	0.9	0.8	0.9	0.8	0.8	0.9	0.8	0.7	1.0	0.7	0.9
JP	0.9	0.8	0.7	0.9	0.8	0.8	0.8	0.8	0.7	1.0	0.8	0.8	0.9	0.9	0.8	0.6	0.6	0.5
MX	0.9	0.9	0.8	0.9	0.9	0.8	0.9	0.9	0.8	0.9	0.9	0.8	1.0	0.9	0.8	0.8	l	0.9
RU	0.9	0.8	0.6	0.9	0.8	0.7	0.9	0.8	0.8	0.9	0.7	0.7	1.0	1.0	0.9	1.0	1.0	1.0
ZA	0.8	0.8	0.8	0.8	0.9	0.8	0.9	0.9	0.9	0.9	0.8	0.8	0.9	0.8	0.8	0.8	0.8	0.9
KR	0.9	0.9	1.0	0.9	0.9	0.9	0.9	0.9	0.8	1.0	0.9	0.9	1.0	0.8	0.9	l	l	l
US	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.8	0.8	0.9	0.8	0.8	1.0	1.0	1.0	0.9	0.9	0.9

Notes: Cells are colour coded relative to gender parity (defined mathematically as 1.0). Blue = Men publish more than women; White = Parity; Orange = Women publish more than men. Countries are listed in protocol order; world, EU-27 and EU-28 values are at the top. The average proportion of authors to which a gender could be assigned varies. For EU-27, the proportion of authors for whom gender could be inferred was 0.84, with the lowest value among EU-27 Member States being 0.59 for Croatia and the lowest value among all regions being 0.27 for China. l indicates that the count of women or men in the category was less than 30. Data not available for: FO.

Source: Computed by Elsevier using Scopus data.

Figure 7.4 Ratio of average FWCI of publications by women to that of men in all fields of R&D, per seniority level, 2015-2019



Countries are listed in protocol order; world, EU-27 and EU-28 values are at the top. The percentage of authors to which a gender could be assigned varies. For EU-27, the proportion of authors for whom gender could be inferred was 0.84, with the lowest value among EU-27 Member States being 0.59 for Croatia and the lowest value among all regions being 0.27 for China. For ME (5-10, >10), AL (>10) and MD (5-10), the count of women or men was less than 30. Data not available for: FO.

Source: Computed by Elsevier using Scopus data.

Table 7.3 Ratio of average FWCI of publications by women to that of men, by field of R&D, per seniority level, 2015-2019

Country	Natural sciences			Engineering and technology			Medical and health sciences			Agricultural and veterinary sciences			Social sciences			Humanities and the arts		
	<5 years	5-10 years	>10 years	<5 years	5-10 years	>10 years	<5 years	5-10 years	>10 years	<5 years	5-10 years	>10 years	<5 years	5-10 years	>10 years	<5 years	5-10 years	>10 years
WLD	1.0	1.0	1.1	0.9	0.9	1.0	1.0	1.0	0.9	1.1	1.1	1.1	1.0	1.0	1.0	0.8	0.9	1.0
EU-27	**1.0**	**1.0**	**1.0**	**0.9**	**0.9**	**1.0**	**1.0**	**1.0**	**0.9**	**1.0**	**1.0**	**1.0**	**0.9**	**0.9**	**1.0**	**1.0**	**0.9**	**1.1**
EU-28	**1.0**	**1.0**	**1.0**	**0.9**	**0.9**	**1.0**	**1.0**	**1.0**	**0.9**	**1.0**	**1.0**	**1.0**	**0.9**	**1.0**	**1.0**	**1.0**	**0.9**	**1.1**
BE	1.0	1.0	1.0	1.0	0.9	1.0	0.9	0.9	0.8	1.0	0.9	0.9	1.0	1.0	1.0	1.1	0.8	1.2
BG	0.9	0.9	1.1	0.8	1.0	1.0	1.0	0.6	0.8	1.0	0.9	1.1	1.1	0.6	0.8	l	l	l
CZ	1.0	1.0	1.0	1.0	1.0	1.0	1.1	0.9	0.8	0.9	1.1	1.3	0.8	0.8	0.8	0.7	0.9	1.2
DK	1.0	1.0	1.1	1.0	1.0	1.0	1.1	1.0	1.0	1.0	0.9	1.1	0.9	0.9	1.1	1.0	0.7	1.1
DE	1.0	1.0	1.0	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.9	1.0	1.0	1.0	1.3
EE	1.1	1.2	1.1	0.8	1.0	1.1	1.5	1.3	0.5	0.9	1.2	1.0	0.8	0.7	1.1	l	l	1.2
IE	1.1	1.1	1.2	0.9	0.9	1.0	0.9	1.2	1.0	1.3	1.0	1.0	0.9	1.1	1.2	0.8	1.3	1.3
EL	1.0	1.0	1.0	1.2	0.9	1.0	1.1	1.2	0.9	0.9	0.9	1.1	1.0	0.9	1.0	2.1	1.5	1.1
ES	1.0	0.9	1.0	1.0	0.9	1.0	0.9	0.9	0.9	1.0	1.0	1.1	1.0	1.1	1.0	0.9	0.9	1.0
FR	1.0	1.1	1.0	1.0	1.0	1.0	1.0	1.0	0.9	1.0	1.0	1.0	0.9	0.9	1.0	0.7	0.8	1.0
HR	1.0	1.0	1.0	1.0	1.0	1.1	0.8	1.4	0.9	1.2	1.2	1.2	0.8	0.9	0.8	l	0.7	0.7
IT	0.9	1.0	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.9	1.0	1.1	1.0	1.1
CY	1.0	1.2	0.7	1.1	1.0	0.7	1.0	0.2	0.6	l	l	l	1.5	1.0	0.9	l	l	l
LV	1.4	1.1	1.3	1.0	1.0	0.8	l	0.8	0.8	1.0	1.0	0.7	0.9	l	l	l	l	l
LT	1.5	1.1	1.3	1.0	1.2	1.2	1.2	1.0	1.3	l	0.8	0.9	0.7	1.1	1.2	l	l	l
LU	0.9	1.4	1.0	l	l	l	0.9	1.2	0.6	l	l	l	l	1.0	l	l	l	l
HU	0.9	1.0	1.0	0.8	1.0	0.8	1.2	0.9	0.9	1.1	1.1	0.9	1.3	1.1	1.0	l	l	1.5
MT	l	l	l	l	l	l	1.4	1.9	l	l	l	l	l	l	l	l	l	l
NL	0.9	1.0	1.0	1.0	1.0	1.0	0.9	0.9	0.9	1.0	0.9	1.0	0.8	0.9	1.0	1.0	0.8	1.2
AT	1.0	1.1	1.0	0.9	1.0	0.9	0.9	1.1	1.0	0.9	0.9	0.9	1.0	0.9	1.0	0.8	0.7	1.3
PL	1.0	0.9	0.9	1.0	0.9	0.9	0.9	1.0	0.8	1.0	1.0	1.0	1.0	0.9	0.8	1.2	0.7	1.0
PT	1.0	1.0	1.0	1.0	1.0	1.0	1.1	1.0	0.7	1.0	1.1	1.0	0.9	1.0	0.9	1.0	0.9	0.9
RO	1.0	1.1	1.0	1.0	1.0	1.0	1.1	1.3	1.1	1.0	0.9	1.1	1.0	0.9	1.3	1.5	1.0	0.8
SI	1.0	1.1	1.0	1.0	1.4	1.0	1.0	0.8	1.1	0.9	1.1	1.0	0.9	1.1	0.8	l	0.7	0.9
SK	0.9	1.0	1.0	1.0	1.1	1.0	0.7	0.9	1.2	1.1	1.1	1.0	0.9	0.9	0.8	1.2	l	l
FI	1.0	1.0	1.1	0.9	1.0	1.0	1.0	0.9	0.9	1.1	1.0	1.2	1.0	1.1	1.1	1.3	1.0	1.2
SE	1.0	1.0	1.1	0.9	1.0	1.0	0.8	0.8	0.9	1.3	1.1	1.0	0.9	0.9	1.0	1.0	1.0	0.9
UK	1.1	1.0	1.2	1.0	1.0	1.0	1.0	1.0	1.0	1.1	1.0	1.1	1.0	1.0	1.0	0.9	1.0	1.1
IS	0.9	1.1	1.0	l	l	l	2.9	0.8	0.6	l	l	l	l	l	1.3	l	l	l
NO	0.9	1.0	1.1	0.9	1.0	1.0	0.8	0.8	0.8	1.1	1.1	1.1	0.8	1.0	1.1	1.0	1.1	1.3
CH	1.0	1.0	1.1	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.1	1.2	0.9	0.9	0.9	0.9	0.7	0.9
ME	l	l	l	l	l	l	l	l	l	l	l	l	l	l	l	l	l	l
MK	1.1	1.0	1.2	l	1.1	1.3	2.8	0.9	0.8	l	l	l	l	l	l	l	l	l
AL	l	l	l	l	l	l	l	l	l	l	l	l	l	l	l	l	l	l
RS	1.1	1.0	1.0	1.0	1.0	1.1	0.7	1.6	0.8	1.2	1.0	1.2	0.5	1.0	1.1	l	l	l
TR	1.0	0.9	0.9	1.0	0.9	1.0	1.3	1.1	1.0	1.0	1.0	1.2	1.0	0.9	1.0	0.7	0.5	0.7
BA	1.0	1.1	1.2	l	l	l	1.4	1.2	2.2	l	l	l	l	l	l	l	l	l
GE	0.8	0.6	0.8	l	l	0.8	0.7	l	0.2	l	l	l	l	l	l	l	l	l
AM	0.3	0.8	0.7	l	l	0.8	l	l	0.3	l	l	l	l	l	l	l	l	l
MD	l	l	0.9	l	l	0.9	l	l	l	l	l	l	l	l	l	l	l	l
TN	0.9	0.9	1.0	0.9	0.9	1.0	1.0	1.1	0.8	1.1	1.1	1.0	0.9	0.8	1.0	l	l	l
IL	0.9	1.0	1.2	1.0	0.9	1.3	0.9	1.1	0.8	0.8	1.2	1.1	0.9	1.0	1.1	0.7	0.9	1.1
UA	0.9	0.8	0.9	0.9	0.8	0.9	0.6	0.4	0.6	0.6	l	1.1	0.8	0.7	0.5	l	l	l
AR	1.1	0.9	0.8	1.2	1.1	1.1	0.7	0.8	0.5	1.1	1.0	0.9	1.1	1.3	0.8	1.0	1.3	1.0
AU	0.9	1.0	1.0	0.9	0.9	1.0	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.1	1.1	1.1	1.1
BR	1.0	1.0	1.0	1.0	1.0	1.0	0.9	1.0	0.8	1.0	1.2	1.1	1.1	0.8	0.9	0.7	1.0	0.9
CA	1.0	1.0	1.0	0.9	0.9	0.9	0.9	1.0	0.9	1.0	1.1	1.0	0.8	0.9	1.0	0.5	0.7	1.0
CN_X_HK	1.0	1.0	1.0	1.0	1.0	1.0	0.9	1.0	1.0	1.1	1.0	1.0	0.9	0.9	1.2	l	l	l
HK	0.7	0.8	1.0	0.8	0.9	0.9	0.9	0.9	1.0	l	l	l	0.8	0.9	1.0	l	1.1	0.9
IN	0.9	0.9	1.0	0.9	0.9	0.9	0.9	0.9	0.9	1.0	0.9	1.2	0.9	1.0	1.0	0.7	0.9	0.7
JP	0.9	1.0	1.0	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.6	0.4	0.8
MX	1.0	1.1	1.0	1.0	1.0	1.1	0.9	1.4	0.7	1.2	1.1	1.1	1.0	1.0	1.1	1.7	l	2.2
RU	1.0	0.9	0.9	1.0	0.9	0.9	0.9	0.7	0.7	1.0	0.9	1.0	1.1	1.1	1.0	1.1	1.1	1.0
ZA	1.0	1.1	1.1	0.9	1.0	1.0	0.9	0.7	0.6	1.2	1.1	1.0	0.9	1.1	0.9	1.1	1.0	1.1
KR	1.0	1.0	1.1	1.0	1.0	1.1	1.4	1.0	1.0	1.0	1.0	1.1	1.0	1.0	1.0	l	l	l
US	1.0	1.0	1.0	0.9	0.9	0.9	1.0	0.9	0.9	1.0	1.0	1.1	0.9	0.9	1.0	0.7	0.7	1.0

Notes: Cells are colour coded relative to gender parity (defined mathematically as 1.0). Blue = Men's publications render a higher FWCI than women's on average; White = Parity; Orange = Women's publications render a higher FWCI than men's. Countries are listed in protocol order; world, EU-27 and EU-28 values are at the top. The average proportion of authors to which a gender could be assigned varies. For EU-27, the proportion of authors for whom gender could be inferred was 0.84, with the lowest value among EU-27 Member States being 0.59 for Croatia and the lowest value among all regions being 0.27 for China. l indicates that the count of women or men in the category was less than 30. Data not available for: FO.

Source: Computed by Elsevier using Scopus data.

7.4 Women's representation in authorship teams

Numerous studies have shown that gender diversity in research teams enhances knowledge outcomes through collective problem solving or team collaboration, effective use of expertise and new discoveries due to broadening viewpoints, all of which contribute towards better innovation and productivity outcomes (Nielsen et al, 2017). The EU recognises the importance of gender diversity in research teams and a key objective of Horizon 2020 was to foster gender balance in research teams at all levels (European Commission, 2017b). In 2021, the European Commission has renewed its commitment towards encouraging gender balance in research teams through Horizon Europe (Council of EU, 2021b). In light of the recognised advantages of gender equality in research teams and the European Commission's recent prioritisation of the issue, the following indicators focus on measuring women and men's representation in authorship teams.

Existing research shows that women are less likely to publish in a country or region that was different from their home country (Elsevier, 2020). Among EU-28 authors, women were observed to have a slightly lower share of international collaborators on average than men (Elsevier, 2017). Both results may have effects on the impact of their publications (as measured by citations). This section thus provides indicators on women's and men's representation in international authorship teams. Disaggregations by field of research are provided to analyse how the extent of representation of teams may vary by field. The average annual growth rate of women's presence in authorship team assesses progress -if any - towards gender parity in authorship teams. Gender parity between women and men in this section is indicated by an average proportion of 0.5.

A note on the metrics:

Chapter 7 presents author metrics in two ways to give a holistic perspective on the representation of women. 'Ratio of women to men' among authors, which is presented in section 7.2, is an assessment of the representation of women among all authors in a given group (country, field of R&D, seniority level). 'Average proportion of women among authors', which is presented in section 7.4 is an assessment of women's representation within authorship teams (i.e. the list of authors on a given publication). Together, these related but different metrics provide insights into the author pool and authorship inclusion trends.

For the indicators in this section, a value near 0.5 indicates that, on average, women and men were represented at equal proportions on authorship teams. A value above 0.5 indicates that, on average, women were more highly represented than men on teams and a value below 0.5 indicates that, on average, men were more highly represented than women on teams.

In the period between 2015 and 2019, women were under-represented in authorship teams.

Figure 7.5 shows the average proportion of women among authors on publications in all fields of R&D for 2015-2019. The data show that, at European level, men were more highly represented on teams than women (average proportion of women is 0.3). This reflects the general under-representation of women within the researcher population at EU-27 level (see Chapter 4). A similar picture is evident among EU-27 Member States and Associated Countries, where the average proportion of women among authors fell below 0.5 for all countries. There was some variation among these countries with Bulgaria, Latvia, Romania and North Macedonia closest to parity (0.4) and Germany, Luxembourg and Armenia furthest from parity (0.2). Box 30 provides an example of how the French National Research Agency encouraged greater gender balance within research teams through several measures for gender equality in research.

BOX 30 Supporting gender balance within research teams and the inclusion of a gender dimension in research

In **France**, the French National Research Agency (ANR) incorporated gender equality within its 2017 Work Programme, its code of ethics and scientific integrity, revised in 2018, and its 2020-2023 Action Plan for Gender Equality and Gender Mainstreaming. To date, its work has included analysing responses to calls for proposals to try to identify possible gender biases, seeking gender parity in evaluation panels, and providing training on gender bias. The ANR encourages researchers to consider a gender dimension in their work as part of generating high quality knowledge[2].

Women were least represented in authorship teams in the field of Natural Sciences and Engineering & Technology.

When data are disaggregated by field of R&D, it is apparent that the average proportion of women varies across fields (Table 7.4). During the period 2015-2019, women were most under-represented (average proportions of 0.2) in authorship teams in Natural Sciences and Engineering & Technology. Compared to the average proportions for 2010-2014, there was a small improvement in the average proportions in 2015-2019 (less than 20% increase).

A similar situation is evident at country level. During the periods 2010-2014 and 2015-2019, in the majority of EU-27 Member States and Associated Countries (31 out of 43), the average proportion of women among authors in Natural Sciences and Engineering & Technology fields was equal to or less than 0.2. The proportion was only observed to increase by at least 20% in Natural Sciences in one of the EU-27 Member States and Associated Countries (UA) and in Engineering & Technology in six of the EU-27 Member States and Associated Countries (CY, MT, IS, AM, TN, UA). The under-representation of women in authorship teams in Natural Sciences and Engineering & Technology corresponds to the finding that, across the main economic sectors, the proportion of men researchers in Natural Sciences and Engineering & Technology exceeded the corresponding proportion for women researchers in the majority of EU-27 Member States and Associated Countries (see Chapter 4).

In both time periods, women were better represented in authorship teams in Medical & Health Sciences, Agricultural & Veterinary Sciences, Social Sciences, and Humanities & Arts. In some EU-27 Member States and Associated Countries, the average proportion of women was at gender parity level in these fields (0.5 at both time periods): Medical & Health Sciences (BG, HR, LV, PL, PT, RO, MK, RS); Agricultural & Veterinary Sciences (BG, HR, LV, PL, PT, RO, RS); Social Sciences (BG, EE, HR, RO, UA); Humanities & Arts (EE, PL). In Latvia, women were more highly represented (average proportions of more than 0.5) than men on publication teams in Social Sciences and Humanities & Arts. Across the G-20 region, the average proportion of women was lowest (ranged between 0.1 and 0.2 for both time periods) in China except Hong Kong, Hong Kong, Japan and South Korea across all R&D fields.

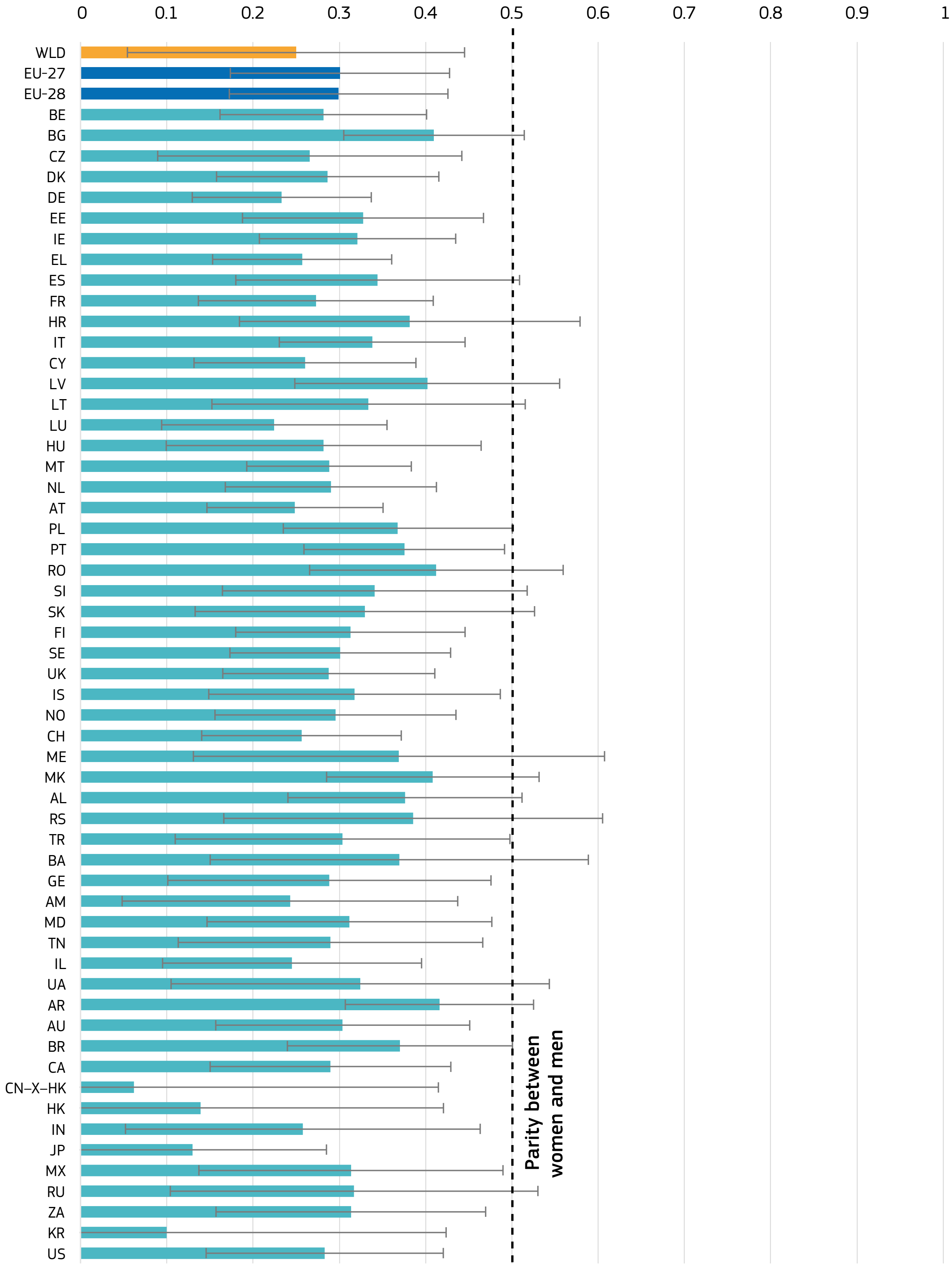
Women's representation within authorship teams has increased overtime.

Table 7.5 shows the growth rate of the proportion of women on teams across fields of R&D from 2010-2019. Growth rates were positive at European and world level across all fields of R&D. The highest growth rates were observed in Engineering & Technology (1.7 per year) and Social Sciences (1.7 per year), while the lowest growth rates were observed in Agricultural Sciences (1.2 per year) and Medical Sciences (1.3 per year). The growth rate at European level was higher than the world level in most fields of R&D, except in Engineering & Technology and Humanities & Arts.

Similarly, in the majority of the EU-27 Member States and Associated Countries, the growth rate was positive across all fields of R&D between 2010 and 2019. These findings correspond to the finding that overall, women's representation on teams has improved slightly across countries and fields of R&D (Table 7.4).

2 ANR, 'Gender Aspects', https://anr.fr/en/anrs-role-in-research/values-and-commitments/gender-aspects/

Figure 7.5 Average proportion of women among authors on publications in all fields of R&D, 2015-2019



Notes: Values represent the proportion for publications during the period 2015-2019; EU-27, EU-28 and world values are highlighted in the chart. The lower limit of the error bars corresponds to the value of the proportion if all authors whose gender could not be inferred were men, while the upper limit corresponds to the value of the proportion if all authors whose gender could not be inferred were women. The average proportion of authors to which a gender could be assigned varies. For EU-27, the average proportion of authors for whom gender could be inferred was 0.75, with the lowest value among EU-27 Member States being 0.61 for Croatia and Slovakia and the lowest value among all regions being 0.29 for China. Data not available for: FO.

Source: Computed by Elsevier using Scopus data.

Table 7.4 Average proportion of women among authors on publications, by field of R&D, 2010-2014 and 2015-2019

Country	Natural sciences		Engineering and technology		Medical and health sciences		Agricultural and veterinary sciences		Social sciences		Humanities and the arts	
	2010-2014	2015-2019	2010-2014	2015-2019	2010-2014	2015-2019	2010-2014	2015-2019	2010-2014	2015-2019	2010-2014	2015-2019
WLD	0.2	0.2	0.1	0.2	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4
EU-27	**0.2**	**0.3**	**0.2**	**0.2**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**
EU-28	**0.2**	**0.3**	**0.2**	**0.2**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**
BE	0.2	0.2	0.2	0.2	0.3	0.4	0.3	0.3	0.3	0.4	0.3	0.4
BG	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.5
CZ	0.2	0.2	0.2	0.2	0.4	0.4	0.3	0.3	0.3	0.4	0.3	0.4
DK	0.2	0.2	0.2	0.2	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.4
DE	0.2	0.2	0.1	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
EE	0.3	0.3	0.2	0.2	0.5	0.4	0.4	0.4	0.5	0.5	0.5	0.5
IE	0.2	0.2	0.2	0.2	0.4	0.4	0.3	0.4	0.4	0.4	0.4	0.4
EL	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.3	0.3	0.4	0.4
ES	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
FR	0.2	0.2	0.2	0.2	0.4	0.4	0.3	0.4	0.3	0.4	0.4	0.4
HR	0.3	0.3	0.3	0.3	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.4
IT	0.3	0.3	0.2	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
CY	0.2	0.2	0.1	0.2	0.3	0.4	0.3	0.3	0.3	0.3	0.4	0.5
LV	0.3	0.4	0.3	0.3	0.5	0.5	0.5	0.5	0.6	0.6	0.5	0.6
LT	0.2	0.3	0.2	0.3	0.4	0.4	0.4	0.4	0.4	0.5	0.4	0.4
LU	0.2	0.2	0.1	0.1	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4
HU	0.2	0.3	0.2	0.2	0.4	0.4	0.3	0.3	0.3	0.4	0.4	0.4
MT	0.2	0.2	0.1	0.2	0.3	0.4	0.3	0.3	0.3	0.3	0.2	0.3
NL	0.2	0.2	0.1	0.2	0.3	0.4	0.3	0.3	0.3	0.4	0.3	0.4
AT	0.2	0.2	0.1	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4
PL	0.3	0.3	0.3	0.3	0.5	0.5	0.5	0.5	0.4	0.5	0.5	0.5
PT	0.3	0.3	0.3	0.3	0.5	0.5	0.5	0.5	0.4	0.5	0.4	0.5
RO	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
SI	0.3	0.3	0.2	0.3	0.4	0.4	0.4	0.4	0.4	0.5	0.4	0.5
SK	0.3	0.3	0.2	0.3	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.4
FI	0.2	0.3	0.2	0.2	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5
SE	0.2	0.2	0.2	0.2	0.4	0.4	0.3	0.4	0.4	0.4	0.4	0.4
UK	0.2	0.2	0.1	0.2	0.4	0.4	0.3	0.3	0.4	0.4	0.4	0.4
IS	0.2	0.3	0.1	0.2	0.4	0.4	0.3	0.4	0.4	0.5	0.3	0.4
NO	0.2	0.2	0.2	0.2	0.4	0.4	0.3	0.3	0.3	0.4	0.4	0.4
CH	0.2	0.2	0.1	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4
ME	0.3	0.3	0.3	0.3	0.4	0.4	0.3	0.4	0.4	0.4	p	0.5
MK	0.3	0.4	0.4	0.4	0.5	0.5	0.4	0.4	0.5	0.4	p	0.4
AL	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.5	0.4	0.6	0.5
RS	0.4	0.4	0.3	0.3	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.5
TR	0.3	0.3	0.2	0.2	0.3	0.4	0.3	0.3	0.4	0.4	0.4	0.4
BA	0.3	0.3	0.2	0.2	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.4
GE	0.2	0.2	0.2	0.2	0.5	0.4	0.4	0.3	0.4	0.5	p	0.5
AM	0.2	0.2	0.2	0.2	0.4	0.4	0.3	0.3	0.4	0.3	p	0.3
MD	0.2	0.3	0.2	0.3	0.4	0.4	p	0.5	0.3	0.4	p	0.3
TN	0.2	0.3	0.2	0.2	0.4	0.4	0.3	0.4	0.3	0.3	0.3	0.3
IL	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.4	0.3	0.3
UA	0.2	0.3	0.2	0.3	0.4	0.5	0.4	0.4	0.5	0.5	0.3	0.5
AR	0.4	0.4	0.4	0.3	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
AU	0.2	0.2	0.1	0.1	0.4	0.4	0.3	0.3	0.4	0.4	0.4	0.5
BR	0.3	0.3	0.3	0.3	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4
CA	0.2	0.2	0.1	0.1	0.4	0.4	0.3	0.3	0.4	0.4	0.4	0.4
CN_X_HK	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
HK	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3
IN	0.2	0.2	0.2	0.2	0.3	0.3	0.2	0.3	0.3	0.3	0.3	0.4
JP	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
MX	0.3	0.3	0.2	0.2	0.4	0.4	0.3	0.3	0.4	0.4	0.4	0.4
RU	0.3	0.3	0.2	0.3	0.4	0.5	0.4	0.4	0.4	0.5	0.5	0.5
ZA	0.2	0.3	0.2	0.2	0.4	0.4	0.3	0.3	0.4	0.4	0.3	0.4
KR	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2
US	0.2	0.2	0.1	0.2	0.3	0.4	0.3	0.3	0.4	0.4	0.4	0.4

Notes: Cells are colour coded relative to gender parity (defined mathematically as 0.50). Blue = More men than women; White = Parity; Orange = More women than men. The average proportion of authors to which a gender could be assigned varies. For EU-27, the average proportion of authors for whom gender could be inferred was 0.75, with the lowest value among EU-27 Member States being 0.61 for Croatia and Slovakia and the lowest value among all regions being 0.29 for China. p indicates that the count of publications in the category was less than 100. Data not available for: FO.

Source: Computed by Elsevier using Scopus data.

Table 7.5 Compound annual growth rate (%) of average proportion of women among authors on publications, by field of R&D, 2010-2019

Country	All Fields		Natural Sciences		Engineering and technology		Medical and health sciences		Agricultural and veterinary sciences		Social sciences		Humanities and the arts	
	CAGR	Trend	CAGR	Trend	CAGR	Trend	CAGR	Trend	CAGR	Trend	CAGR	Trend	CAGR	Trend
WLD	1.35		0.97		1.97		1.03		0.91		1.15		1.63	
EU-27	**1.74**		**1.35**		**1.72**		**1.34**		**1.19**		**1.75**		**1.52**	
EU-28	**1.72**		**1.31**		**1.65**		**1.40**		**1.36**		**1.58**		**1.61**	
BE	1.84		1.26		0.97		1.52		1.03		1.83		0.94	
BG	0.15		0.13		-1.35		-0.80		-0.37		0.10		-2.13	
CZ	1.28		0.95		1.08		1.15		0.48		0.68		1.86	
DK	1.92		1.25		0.18		1.66		1.23		2.66		4.67	
DE	2.42		1.81		2.07		2.20		1.78		2.25		2.52	
EE	-0.17		-0.54		-1.52		-1.43		-2.13		0.06		1.05	
IE	2.78		2.18		2.19		2.03		2.07		1.54		2.47	
EL	1.87		1.89		1.96		1.74		2.06		1.40		1.07	
ES	1.26		0.81		0.68		0.68		0.94		1.46		0.21	
FR	1.13		0.86		0.89		0.79		1.12		0.38		0.95	
HR	0.78		0.99		1.21		0.63		1.79		-0.49		-1.15	
IT	1.11		0.93		1.70		0.46		0.70		1.45		1.61	
CY	4.15		3.29		2.92		1.85		2.63		2.43		1.04	
LV	1.61		2.14		2.09		-0.10		-1.00		-0.10		0.32	
LT	2.73		2.89		3.11		0.51		-0.10		1.81		3.36	
LU	1.65		0.75		0.40		0.54		2.70		0.68		1.46	
HU	1.13		1.07		1.38		-0.07		1.55		1.08		0.24	
MT	3.51		1.72		6.75		2.88		2.32		2.12		5.14	
NL	2.99		2.71		3.01		2.23		2.81		3.03		2.67	
AT	2.77		2.59		3.39		1.92		1.82		2.70		1.14	
PL	1.40		1.88		3.06		0.23		0.69		1.80		0.80	
PT	1.51		0.95		0.81		0.83		-0.04		1.61		1.06	
RO	0.77		0.63		1.24		-0.89		-0.69		0.51		2.38	
SI	1.43		0.82		0.46		0.80		1.05		0.49		2.31	
SK	1.04		0.62		0.20		1.17		0.64		-0.77		0.39	
FI	1.41		0.79		-0.07		0.76		0.88		1.68		1.09	
SE	1.78		1.18		2.31		1.18		0.69		2.50		0.88	
UK	1.71		1.22		1.36		1.49		2.51		1.23		1.84	
IS	2.45		2.26		3.02		2.44		3.15		1.59		1.72	
NO	2.53		1.60		2.44		2.34		1.73		2.84		3.41	
CH	2.58		1.98		2.16		2.03		1.77		2.63		2.19	
ME	5.18		4.62		3.19		2.64		12.87		0.79		10.90	
MK	0.48		-0.42		0.80		0.57		1.14		0.25		22.79	
AL	2.01		2.10		-2.26		3.46		9.19		-1.49		8.87	
RS	0.87		0.50		0.89		0.16		0.00		1.81		3.01	
TR	1.50		1.30		1.04		2.36		2.55		0.61		0.78	
BA	1.15		2.59		5.42		0.12		4.48		0.64		0.26	
GE	1.33		0.66		0.03		-2.21		-2.79		0.67		3.33	
AM	2.43		2.89		4.26		-0.86		8.77		-1.66		1.47	
MD	1.75		0.50		-0.96		0.58		3.46		-5.33		-10.93	
TN	2.21		2.79		4.58		1.08		3.55		4.12		4.64	
IL	1.38		0.93		1.03		1.11		0.30		0.92		-0.40	
UA	5.62		4.50		5.04		2.39		2.80		6.75		3.22	
AR	0.29		-0.08		0.26		-0.01		0.16		1.04		1.02	
AU	1.21		0.53		-0.07		1.10		2.31		0.52		0.99	
BR	0.37		0.44		1.32		0.18		1.30		-0.27		-0.05	
CA	1.64		1.28		1.58		1.04		2.20		1.01		0.60	
CN_X_HK	0.00		-0.56		-1.20		0.49		-0.02		1.32		5.25	
HK	0.37		0.82		1.44		0.24		-0.74		-0.60		-0.33	
IN	1.79		1.71		2.83		2.32		2.09		0.88		0.60	
JP	2.41		2.36		3.61		1.18		2.51		2.09		1.37	
MX	1.67		1.66		2.10		1.02		1.57		0.90		0.39	
RU	3.01		1.94		2.15		0.68		0.75		3.64		2.83	
ZA	0.83		0.43		1.32		1.50		1.48		-0.42		0.95	
KR	4.20		3.89		4.67		3.28		3.59		2.08		6.32	
US	1.71		1.19		1.74		1.36		1.73		1.14		1.21	

Notes: The height of the bars in the trend column indicates relative annual values for average proportion of women among authors on publications, and scaling is not the same across countries or fields of R&D. Count of publications in all categories was greater than or equal to 100. Data not available for: FO.

Source: Computed by Elsevier using Scopus data.

Studies have revealed gender disparities in international research collaboration dependent on the interaction of a number of factors including academic discipline, institutional affiliation, academic position, age, partner employment status, and having children (reviewed in Aksnes, Piro and Rørstad, 2019; Kwiek and Roszka, 2020). The following indicators specifically examine the extent of women's representation in international authorship teams. Although the data presented do not investigate the causes of any observed disparities, it may indicate the need to explore factors such as those listed above, which may be influencing women's participation in international collaborations in comparison to men.

International collaboration is defined as multi-authored research outputs, where at least one author is from an institution inside the country of interest and at least one author is from an institution outside the country of interest (or EU, for EU-27 and EU-28 calculations). A value near 0.5 indicates that, on average, women and men are represented at equal proportions on international authorship teams; a value above 0.5 indicates that, on average, women were more highly represented than men on international authorship teams; a value below 0.5 indicates that, on average, men were more highly represented than women on international authorship teams.

Women were particularly under-represented on international authorship teams. This is the case for all fields of R&D, and follows the trends of overall authorship, with the lowest representation evident in Natural Sciences and Engineering & Technology.

Figure 7.6 shows the average proportion of women among authors on publications resulting from international collaboration, in all fields of R&D, from 2015-2019. At European level, the average proportion of women on international authorship teams was slightly lower (0.26) than the average proportion overall (0.30), suggesting that women are further under-represented in international teams (Figure 7.6). Comparing the proportion of women on international teams with the proportion on national teams (defined as multi-authored research outputs listing author affiliations that include more than one institution within the same country) (Annex 7.4) further emphasises this point as the proportion of women among international authorship teams was less than the proportion of women among national authorship teams (0.35) (Figure 7.6).

A similar trend was observed in the EU-27 Member States and Associated Countries, with all countries having an average proportion of women on international authorship teams below 0.5. For most countries, the value was lower than the country values in Figure 7.5, except Germany, Luxembourg, Malta and Switzerland.

When data are disaggregated by field of R&D (Table 7.6), a similar trend is observed: across all fields of R&D at the European level, the average proportion of women on international authorship teams was slightly lower than that shown in Table 7.4. For both time periods, in slightly more than half of the EU-27 Member States and Associated Countries (22 of 43), the average proportion of women was in the range of 0.1 and 0.2 in international authorship teams within Natural Sciences and Engineering & Technology. By contrast, women were better represented on international teams in Medical & Health Sciences, Social Sciences and Humanities & arts with several EU-27 Member States and Associated Countries having average proportions of 0.4 in both time periods. However, compared to Table 7.4, only a handful among EU-27 Member States and Associated Countries reached gender parity in international authorship teams between 2015-2019: Latvia in Social Sciences, and Cyprus, Portugal and Slovenia in Humanities & Arts.

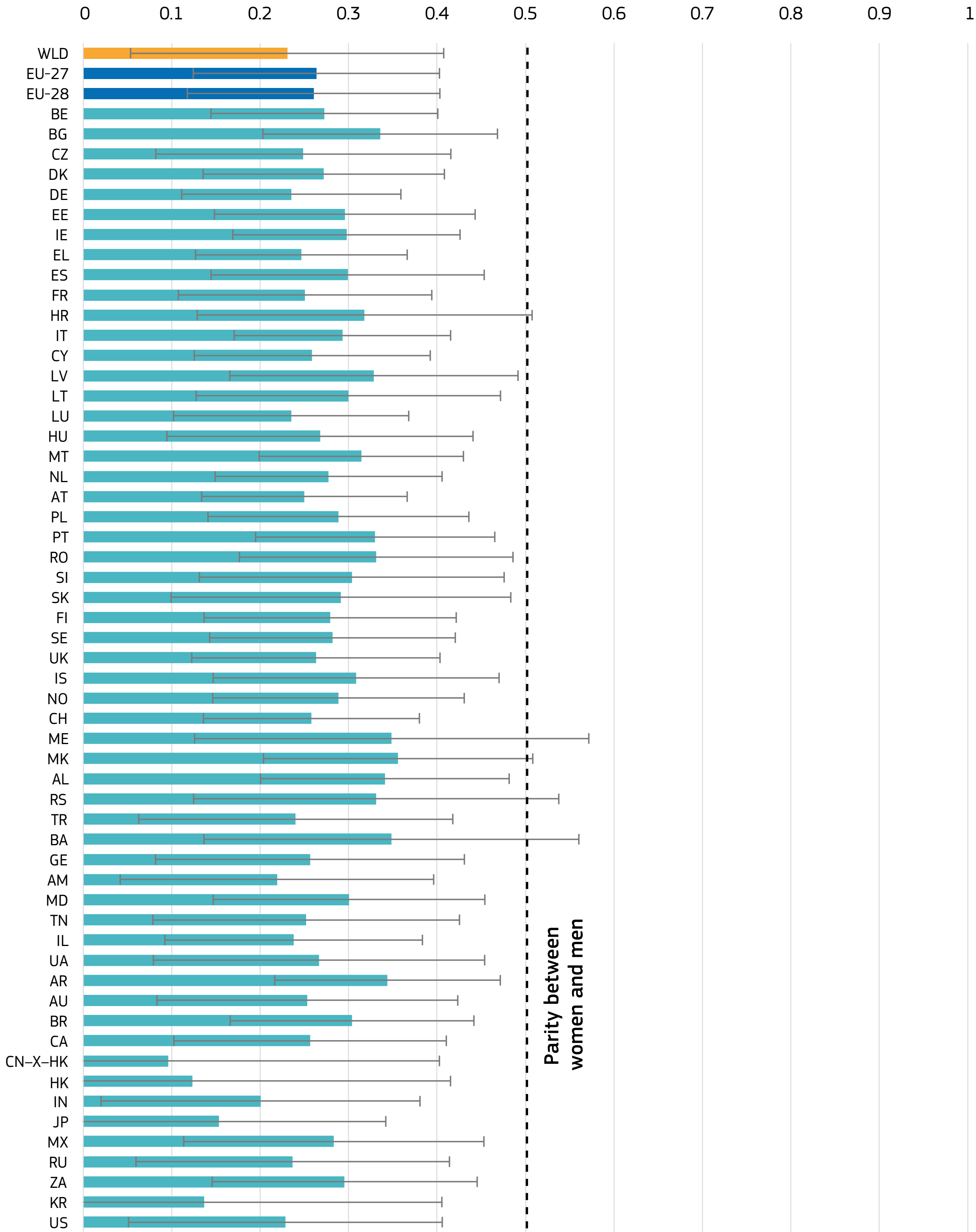
At European level, women's representation within international authorship teams has grown at a faster rate than their participation in overall authorship teams in several fields.

Table 7.7 shows the average annual growth rate of the proportion of women on international teams across fields of R&D from 2010-2019. Compared to Table 7.5, which is based on average proportion of women among authors on all publications, the growth rate for the average proportion of women among authors on international publications was higher in Agricultural Sciences (1.5 compared to 1.2), Social Sciences (2.1 compared to 1.7) and Humanities & Arts (2.3 compared to 1.5) at European level. However, compared to Table 7.5, the average proportion of women among authors on international publications was lower in Natural Sciences (1.3 compared to 1.4) and Engineering & Technology (1.4 compared to 1.7).

The situation is considerably varied at country level with faster growth rates in women's representation on international authorship teams (defined as at least 0.2 p.p. greater CAGR) compared to overall rates (Table 7.5). This pattern was observed in approximately half of EU-27 Member States and Associated Countries in the Agricultural Sciences (21 of 43 countries), Social Sciences (22 countries), and Humanities & Arts (24 countries).

Compared to Table 7.5, faster growth rates (defined as at least 0.2 p.p. greater CAGR) in international authorships teams were observed in less than half of the EU-27 Member States and Associated Countries in Natural Sciences (17 countries), Engineering & Technology (13 countries) and Medical Sciences (15 countries). These data suggest that in Engineering & Technology, a field in which the gender gap among active authors tends to be the largest, progress towards gender parity was slower within international authorship teams compared to overall authorship teams.

Figure 7.6 Average proportion of women among authors on publications resulting from international collaboration in all fields of R&D, 2015-2019



Notes: Values represent the average proportion of women among authors on publications resulting from international collaboration during the period 2015-2019; EU-27, EU-28 and world values are highlighted in the chart. The lower limit of the error bars corresponds to the value of the proportion if all authors whose gender could not be inferred were men, while the upper limit corresponds to the value of the proportion if all authors whose gender could not be inferred were women. The average proportion of authors to which a gender could be assigned varies. For EU-27, the average proportion of authors for whom gender could be inferred was 0.72, with the lowest value among EU-27 Member States being 0.62 for Croatia and Slovakia and the lowest value among all regions being 0.39 for China. Data not available for: FO.

Source: Computed by Elsevier using Scopus data.

Table 7.6 Average proportion of women among authors on publications resulting from international collaboration, by field of R&D, 2010-2014 and 2015-2019

Country	Natural sciences		Engineering and technology		Medical and health sciences		Agricultural and veterinary sciences		Social sciences		Humanities and the arts	
	2010-2014	2015-2019	2010-2014	2015-2019	2010-2014	2015-2019	2010-2014	2015-2019	2010-2014	2015-2019	2010-2014	2015-2019
WLD	0.2	0.2	0.1	0.1	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4
EU-27	**0.2**	**0.2**	**0.2**	**0.2**	**0.3**	**0.4**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.4**
EU-28	**0.2**	**0.2**	**0.2**	**0.2**	**0.3**	**0.4**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.4**
BE	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4
BG	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	p	0.4
CZ	0.2	0.2	0.2	0.2	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.3
DK	0.2	0.2	0.2	0.2	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.4
DE	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4
EE	0.3	0.3	0.2	0.2	0.4	0.4	0.4	0.3	0.4	0.4	0.4	0.4
IE	0.2	0.2	0.2	0.2	0.4	0.4	0.3	0.3	0.3	0.4	0.4	0.4
EL	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4
ES	0.3	0.3	0.2	0.2	0.4	0.4	0.4	0.4	0.3	0.4	0.4	0.4
FR	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4
HR	0.3	0.3	0.2	0.2	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
IT	0.3	0.3	0.2	0.2	0.4	0.4	0.4	0.4	0.3	0.4	0.4	0.4
CY	0.2	0.2	0.1	0.2	0.3	0.4	0.3	0.3	0.3	0.3	0.4	0.5
LV	0.3	0.3	0.2	0.3	0.4	0.4	0.4	0.4	0.4	0.5	p	p
LT	0.2	0.3	0.2	0.2	0.4	0.4	0.3	0.4	0.4	0.4	p	0.4
LU	0.2	0.2	0.1	0.2	0.3	0.3	0.3	0.3	0.3	0.3	p	0.3
HU	0.2	0.2	0.2	0.2	0.3	0.4	0.3	0.3	0.3	0.4	0.3	0.3
MT	0.2	0.3	0.1	0.2	0.4	0.4	p	0.3	0.4	0.4	p	p
NL	0.2	0.2	0.1	0.2	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.4
AT	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
PL	0.2	0.3	0.2	0.2	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.4
PT	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5
RO	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
SI	0.3	0.3	0.2	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5
SK	0.2	0.3	0.2	0.2	0.4	0.4	0.3	0.4	0.3	0.4	0.3	0.4
FI	0.2	0.2	0.2	0.2	0.4	0.4	0.4	0.4	0.3	0.4	0.4	0.4
SE	0.2	0.2	0.2	0.2	0.4	0.4	0.3	0.3	0.3	0.4	0.4	0.4
UK	0.2	0.2	0.1	0.1	0.3	0.4	0.3	0.3	0.3	0.3	0.4	0.4
IS	0.2	0.3	0.1	0.2	0.4	0.4	0.3	0.4	0.3	0.4	0.3	0.4
NO	0.2	0.2	0.1	0.2	0.4	0.4	0.3	0.3	0.3	0.4	0.4	0.4
CH	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4
ME	0.3	0.3	p	0.3	0.4	0.4	0.3	0.4	p	0.4	p	p
MK	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	p	p
AL	0.3	0.3	0.3	0.3	0.4	0.4	p	0.4	0.3	0.4	p	p
RS	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.3	0.4	0.3	0.4
TR	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4
BA	0.3	0.3	0.2	0.2	0.4	0.4	0.3	0.4	0.3	0.4	p	p
GE	0.2	0.2	0.2	0.2	0.4	0.4	0.4	0.3	0.4	0.4	p	p
AM	0.2	0.2	p	0.2	0.4	0.4	0.3	0.3	p	0.4	p	p
MD	0.2	0.3	p	p	0.4	0.4	p	p	p	p	p	p
TN	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.2	0.3	p	0.2
IL	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
UA	0.2	0.3	0.2	0.2	0.3	0.4	0.3	0.4	0.3	0.4	p	0.4
AR	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
AU	0.2	0.2	0.1	0.1	0.3	0.4	0.3	0.3	0.3	0.3	0.4	0.4
BR	0.3	0.3	0.2	0.2	0.4	0.4	0.3	0.3	0.3	0.4	0.4	0.4
CA	0.2	0.2	0.1	0.1	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4
CN_X_HK	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.2
HK	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3
IN	0.2	0.2	0.1	0.2	0.3	0.3	0.2	0.2	0.3	0.3	0.3	0.3
JP	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
MX	0.2	0.3	0.2	0.2	0.4	0.4	0.3	0.3	0.4	0.4	0.4	0.4
RU	0.2	0.2	0.2	0.2	0.3	0.4	0.3	0.3	0.3	0.4	0.3	0.4
ZA	0.2	0.2	0.2	0.2	0.4	0.4	0.3	0.3	0.4	0.4	0.3	0.4
KR	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.2	0.2	0.2	0.3	0.3
US	0.2	0.2	0.1	0.1	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4

Notes: Cells are colour coded relative to gender parity (defined mathematically as 0.50). Blue = More men than women; White = Parity; Orange = More women than men. The average proportion of authors to which a gender could be assigned varies. For EU-27, the average proportion of authors for whom gender could be inferred was 0.72, with the lowest value among EU-27 Member States being 0.62 for Croatia and Slovakia and the lowest value among all regions being 0.39 for China. p indicates that count of publications in the category was less than 100. Data not available for: FO.

Source: Computed by Elsevier using Scopus data.

Table 7.7 Compound annual growth rate (%) of average proportion of women among authors on publications resulting from international collaboration, by field of R&D, 2010-2019

Country	All Fields		Natural Sciences		Engineering and technology		Medical and health sciences		Agricultural and veterinary sciences		Social sciences		Humanities and the arts	
	CAGR	Trend	CAGR	Trend	CAGR	Trend	CAGR	Trend	CAGR	Trend	CAGR	Trend	CAGR	Trend
WLD	1.23		0.54		0.69		1.09		1.31		1.22		1.56	
EU-27	**1.89**		**1.34**		**1.37**		**1.36**		**1.52**		**2.13**		**2.27**	
EU-28	**1.76**		**1.14**		**1.09**		**1.37**		**1.60**		**1.85**		**1.90**	
BE	2.08		1.41		0.95		1.57		1.61		2.83		1.68	
BG	0.43		0.02		-0.24		0.28		-1.50		0.99		-3.48	
CZ	1.47		1.06		0.06		1.12		1.21		0.19		0.98	
DK	2.00		1.36		0.26		1.53		1.77		2.34		4.05	
DE	2.09		1.62		1.47		1.54		1.59		2.05		2.83	
EE	0.53		0.47		-0.70		-0.46		-0.66		0.78		2.93	
IE	2.65		1.82		1.85		1.97		2.48		1.91		3.06	
EL	2.12		1.67		1.82		1.55		2.22		1.55		2.55	
ES	1.66		1.28		0.77		0.71		1.50		1.73		2.26	
FR	1.49		1.08		1.16		0.85		1.33		1.46		2.17	
HR	1.40		0.94		1.36		0.67		1.93		0.08		2.90	
IT	1.51		1.18		1.47		0.75		1.47		1.37		2.44	
CY	4.88		3.75		3.97		1.83		2.87		3.63		4.63	
LV	1.96		1.35		4.30		0.37		1.74		-0.31		0.80	
LT	2.61		2.82		1.90		1.51		2.30		0.10		4.53	
LU	2.64		1.76		2.51		1.53		4.32		1.39		2.06	
HU	1.40		1.21		2.01		0.14		0.83		2.59		-1.13	
MT	1.49		-0.07		3.76		1.41		4.00		0.54		-3.16	
NL	2.90		2.35		2.51		2.13		2.17		3.22		1.88	
AT	2.78		2.56		3.18		2.03		1.71		2.69		4.22	
PL	2.30		2.07		2.74		0.58		0.41		3.03		0.68	
PT	1.66		1.06		-0.03		1.12		1.15		1.76		6.60	
RO	1.55		1.37		1.19		-0.53		0.24		1.63		4.91	
SI	2.23		1.48		0.04		1.70		2.22		1.47		5.49	
SK	2.25		1.37		0.89		1.48		0.04		0.09		1.10	
FI	1.88		1.07		0.89		1.05		0.53		2.66		1.99	
SE	1.70		1.18		1.76		1.22		1.04		2.64		0.39	
UK	1.57		0.75		0.59		1.42		2.14		1.39		1.16	
IS	2.36		2.14		2.50		1.63		2.37		3.85		0.37	
NO	2.22		1.40		1.66		2.03		1.54		3.28		3.12	
CH	2.42		1.75		1.76		1.86		1.83		2.68		3.23	
ME	4.96		4.97		5.68		0.29		10.99		-1.85		p	
MK	-0.44		-1.38		-0.02		0.70		-0.95		0.99		p	
AL	2.99		3.42		-4.80		1.65		4.99		-0.81		p	
RS	2.16		1.77		1.60		0.88		1.91		3.76		13.95	
TR	1.39		1.28		-0.24		1.39		2.18		0.62		2.33	
BA	2.39		3.58		3.71		-0.13		6.64		1.33		-1.11	
GE	1.26		0.28		-2.07		-1.52		-3.99		-1.68		-2.16	
AM	3.11		3.75		4.80		-1.78		5.88		-3.20		p	
MD	1.84		0.97		-1.30		-1.45		0.27		-10.04		p	
TN	2.29		2.45		3.69		0.83		1.89		3.74		18.75	
IL	1.88		1.20		2.15		1.30		1.53		1.99		0.52	
UA	4.74		4.21		4.06		2.42		4.56		3.71		0.99	
AR	0.81		0.46		1.40		0.63		0.22		0.36		3.23	
AU	1.28		0.30		-0.13		1.34		1.71		0.78		0.35	
BR	1.36		1.27		1.57		0.70		1.74		0.44		1.41	
CA	1.75		0.98		1.22		1.36		2.22		1.52		0.47	
CN_X_HK	0.09		-0.21		0.30		0.00		-0.51		0.00		3.03	
HK	0.75		0.97		2.15		0.61		0.13		-0.70		-1.02	
IN	1.11		1.13		1.30		1.52		2.03		-0.84		0.76	
JP	1.88		1.39		2.48		1.46		1.79		2.07		0.24	
MX	2.16		1.94		2.30		1.08		1.82		1.90		1.32	
RU	2.78		2.03		1.83		0.22		2.03		3.25		3.83	
ZA	0.96		0.27		1.49		1.63		1.30		-0.05		1.85	
KR	2.66		2.25		3.09		2.06		3.57		1.62		4.36	
US	1.22		0.51		0.61		1.00		1.48		0.90		1.15	

Notes: The height of the bars in the trend column indicates relative annual values for average proportion of women among authors on publications resulting from international collaboration, and scaling is not the same across countries or fields of R&D. p indicates that the count of publications in the category was less than 100. Data not available for: FO.

Source: Computed by Elsevier using Scopus data.

7.5 Women and men's contribution as active corresponding authors

In addition to the gender gap in the average number of publications (see section 7.3), existing research has shown that the gender gap in the number of publications can vary depending on authorship positions, which is linked to contributions (Elsevier, 2017; Elsevier, 2020; Sauermann and Haeussler, 2017). A lack of gender equality in leadership positions in research can mean that the research agenda is less shaped by women. More generally, the Gender Equality Strategy 2020-2025 emphasises that inclusive and diverse leadership is needed to bring forward new ideas and innovative approaches that better serve EU society (European Commission, 2020b). While leadership may be interpreted as academics holding grade A positions (see Chapter 6), assessing leadership in authorship teams may provide a window into exploring leadership roles. The following indicators provide insight into how women's and men's publication outputs vary as lead authors (i.e. corresponding authors). This section also considers how gender balance in corresponding authorships varies by field of research and whether there have been any improvements towards gender parity overtime. Similar to the previous section, this section also compares women's and men's contributions as corresponding authors in internationally collaborated publications.

Gender parity between women and men is indicated by a ratio of 1.0 in this section. A score above 1.0 shows that women in a given country contributed more to the research output as corresponding authors than men whereas a score below 1.0 means the opposite.

All authors versus corresponding authors:

Throughout Chapter 7, authors are defined as those individuals who contributed to research publications and whose names are listed in the author byline. The **corresponding author** is the single individual with primary responsibility for communication with the journal during the publication process and they are responsible for several critical aspects at each stage of a study's dissemination, before and after publication. Generally, corresponding authors are senior researchers or group leaders. A corresponding author not only contributes to the paper significantly but also has the ability to ensure that it goes through the publication process smoothly and successfully, and to answer questions about the research after it has been published. This section compares the number of publications for which the corresponding author was a woman versus those whose corresponding author was a man.

Women contributed to fewer research outputs as corresponding authors than men.

Focusing on corresponding authors is relevant because the corresponding author is often the author who leads the research. Figure 7.7 shows the ratio of publications with woman corresponding authors to those with men corresponding authors, in all fields of R&D from 2015-2019.

At European level, the ratio of women to men as corresponding authors is approximately 0.5, which indicates that women were corresponding authors on half as many research publications as men. Along with the findings that women represented less than half of authorship teams on average (Figure 7.5) and women contributed less to publications than men (Figure 7.3), this suggests a compounded situation in which women may have the possibility to shape the research portfolio less than men.

A similar trend can be found in EU-27 Member States and Associated Countries, with all countries having value below 1.0. North Macedonia (0.9), Bulgaria (0.8) and Romania (0.8) are notable exceptions where the ratio indicates closeness to gender parity for representation as corresponding authors although error bars indicate the accuracy of these values may be low.

At European level, the highest ratio of women to men corresponding authorships were observed in Humanities & Arts, Social Sciences and Agricultural & Veterinary Sciences.

Looking at the women-to-men ratio of corresponding authorship by field of R&D, Table 7.8 shows that European level values were higher than the world values across all fields. The women to men ratio of corresponding authorships increased across all R&D fields between 2010-2014 and 2015-2019 at European level. Between 2015-2019, the highest women-to-men ratio (approximately 0.7) was observed in Humanities & Arts, Social Sciences, and Agricultural & Veterinary services. Similar to the findings in the previous sections, the data suggests that the lowest research output of women as corresponding authors compared to men was observed in Natural Sciences and Engineering & Technology (ratios between 0.3-0.4).

Similarly, between 2015-2019, among the EU-27 Member States and Associated Countries, the group of countries in which women and men contributed equally (ratio of 1.0) as corresponding authors was largest in Humanities & Arts (EE, FI, IS, AL, GE, UA) and Social Sciences (BG, EE, FI, IS, AL, UA). In some cases, between 2015-2019, women contributed more to research output as corresponding authors than men (ratio of more than 1.0) in Medical & Health Sciences (BG, MK), Agricultural & Veterinary Sciences (PL, PT, RO, MD), Social Sciences (LV, RO, MK) and Humanities & Arts (BG, LV, RO, ME). Notably, an equal contribution of women and men as corresponding authors (i.e., a ratio of 1.0) was not observed for any EU-27 Member States and Associated Countries in the fields of Natural Sciences or Engineering & Technology.

Across the G-20 region, women's representation as corresponding authors compared to men was lowest (between 0.0 and 0.2 for both time periods) in China except Hong Kong, Japan, and South Korea across all R&D fields.

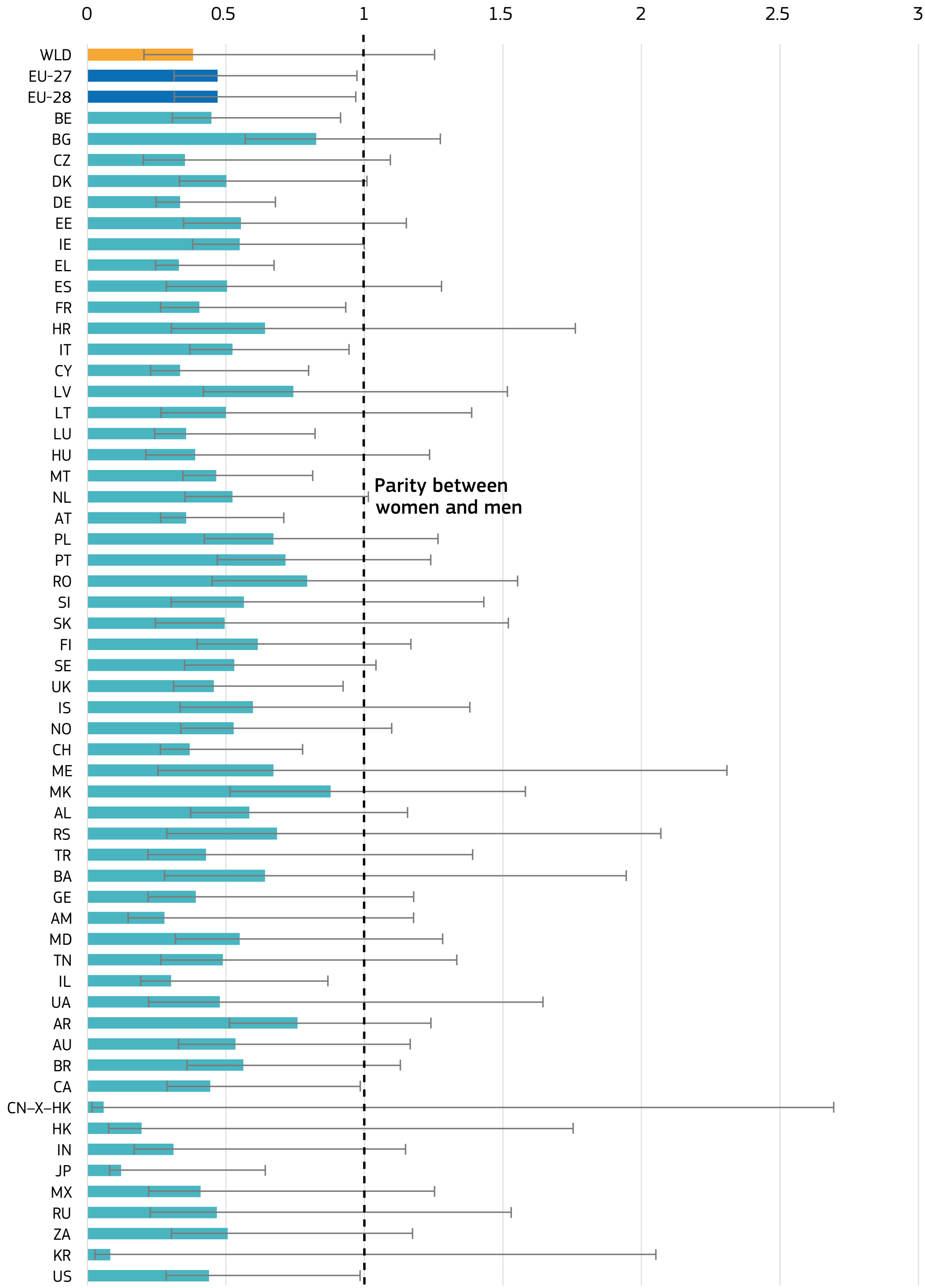
The proportion of women corresponding authors compared to men has increased overtime.

The average annual growth rates across fields of R&D from 2010-2019 are shown in Table 7.9. The data indicate that, at European level, the ratio of women to men corresponding authors increased across all R&D fields. From 2010-2019, the highest average annual growth was observed in Social Sciences (3.6 per year) and Engineering & Technology (3.5 per year) and the lowest average annual growth rate was observed in Agricultural Sciences (2.2 per year) and Medical Sciences (2.6), at European level. **In Natural Sciences and Engineering & Technology – fields in which women authors tend to be under-represented – positive growth rates of 3.2 per year and 3.5 per year, respectively were observed.** There is therefore some positive indication that women are contributing more as corresponding or lead authors in these fields compared to a decade ago.

There is considerable variation among the EU-27 Member States and Associated Countries with several countries having values above the European level average indicating a greater representation of women as corresponding authors in the field of Agricultural Sciences, (DK, DE, IE, EL, HR, IT, LU, MT, NL, AT, UK, IS, CH, AL, TR, BA, AM, TN, UA) and Medical Sciences (DE, IE, MT, NL, AT, SK, IS, NO, CH, ME, MK, TR, BA, UA). By contrast, several countries had values below the European level average in the field of Social Sciences (BE, BG, CZ, EE, IE, EL, ES, FR, HR, CY, LV, LT, LU, HU, PT, RO, SI, SK, FI, UK, IS, ME, MK, AL, TR, GE, MD, IL).

Several countries also had values above the European level average in Natural Sciences (DE, IE, HR, IT, CY, LV, LT, NL, AT, PL, SI, SK, SI, CH, ME, BA, AM, MD, UA) and Engineering & Technology (DE, IE, HR, IT, LV, LT, MT, AT, PL, RO, SE, CH, ME, MK, BA, AM, MD, TN, UA), indicating quicker progress towards better representation of women authors in these fields.

Figure 7.7 Ratio of publications for which a woman is corresponding author to those for which a man is corresponding author, in all fields of R&D, 2015-2019



Notes: Values represent the ratio based on publications during the period 2015-2019; EU-27, EU-28 and world values are highlighted in the chart. The lower limit of the error bars corresponds to the value of the ratio if all authors whose gender could not be inferred were men, while the upper limit corresponds to the value of the ratio if all authors whose gender could not be inferred were women. The average proportion of authors to which a gender could be assigned varies. For EU-27, the proportion of corresponding authors for whom gender could be inferred was 0.75, with the lowest value among EU-27 Member States being 0.59 for Croatia and Slovakia and the lowest value among all regions being 0.29 for China. Data not available for: FO.

Source: Computed by Elsevier using Scopus data.

Table 7.8 Ratio of publications for which a woman is corresponding author to those for which a man is corresponding author, by field of R&D, 2010-2014 and 2015-2019

Country	Natural sciences		Engineering and technology		Medical and health sciences		Agricultural and veterinary sciences		Social sciences		Humanities and the arts	
	2010-2014	2015-2019	2010-2014	2015-2019	2010-2014	2015-2019	2010-2014	2015-2019	2010-2014	2015-2019	2010-2014	2015-2019
WLD	0.2	0.3	0.2	0.2	0.5	0.5	0.4	0.5	0.6	0.7	0.6	0.7
EU-27	**0.3**	**0.4**	**0.3**	**0.3**	**0.5**	**0.6**	**0.6**	**0.7**	**0.6**	**0.7**	**0.6**	**0.7**
EU-28	**0.3**	**0.4**	**0.3**	**0.3**	**0.5**	**0.6**	**0.6**	**0.7**	**0.6**	**0.7**	**0.6**	**0.7**
BE	0.3	0.4	0.2	0.3	0.5	0.6	0.6	0.6	0.6	0.7	0.5	0.6
BG	0.7	0.8	0.8	0.7	1.2	1.1	0.9	1.0	0.9	1.0	0.8	1.2
CZ	0.3	0.3	0.2	0.3	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.5
DK	0.3	0.4	0.2	0.3	0.6	0.7	0.6	0.6	0.5	0.6	0.5	0.6
DE	0.2	0.3	0.2	0.2	0.3	0.4	0.5	0.6	0.4	0.6	0.5	0.6
EE	0.4	0.4	0.3	0.3	0.9	0.8	0.7	0.6	0.9	1.0	1.0	1.0
IE	0.3	0.4	0.2	0.3	0.7	0.7	0.5	0.6	0.7	0.8	0.7	0.8
EL	0.3	0.3	0.2	0.2	0.4	0.4	0.4	0.5	0.4	0.4	0.6	0.8
ES	0.4	0.4	0.3	0.4	0.6	0.6	0.7	0.7	0.6	0.7	0.6	0.7
FR	0.3	0.4	0.3	0.3	0.5	0.5	0.6	0.6	0.5	0.6	0.6	0.7
HR	0.5	0.5	0.3	0.4	0.7	0.8	0.9	0.9	0.9	0.9	0.7	0.6
IT	0.4	0.5	0.3	0.4	0.5	0.6	0.7	0.8	0.6	0.7	0.6	0.7
CY	0.2	0.2	0.2	0.2	0.4	0.4	0.3	0.3	0.5	0.5	0.7	0.8
LV	0.5	0.6	0.5	0.6	0.8	0.7	1.0	1.0	1.6	1.7	p	2.2
LT	0.3	0.4	0.3	0.3	0.7	0.8	0.7	0.7	0.7	0.7	0.5	0.5
LU	0.3	0.3	0.2	0.2	0.4	0.5	0.3	0.5	0.5	0.5	0.7	0.8
HU	0.3	0.3	0.3	0.3	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6
MT	0.3	0.4	0.2	0.3	0.5	0.6	p	0.5	0.5	0.6	0.3	0.4
NL	0.3	0.4	0.2	0.3	0.6	0.7	0.5	0.6	0.6	0.7	0.5	0.7
AT	0.2	0.3	0.2	0.2	0.3	0.4	0.5	0.6	0.4	0.6	0.5	0.6
PL	0.5	0.6	0.4	0.5	1.0	1.0	1.0	1.2	0.8	0.9	1.1	0.9
PT	0.5	0.6	0.5	0.5	0.9	1.0	1.1	1.1	0.8	0.9	0.8	0.9
RO	0.6	0.7	0.6	0.8	1.1	1.0	1.1	1.1	1.0	1.1	0.9	1.1
SI	0.4	0.5	0.3	0.4	0.7	0.7	0.9	0.9	0.8	0.9	0.8	0.9
SK	0.3	0.4	0.3	0.4	0.7	0.8	0.6	0.6	0.6	0.7	0.7	0.7
FI	0.4	0.4	0.3	0.3	0.9	0.9	0.8	0.8	0.8	1.0	0.8	1.0
SE	0.3	0.4	0.2	0.3	0.7	0.8	0.6	0.7	0.6	0.8	0.6	0.7
UK	0.3	0.3	0.2	0.2	0.5	0.6	0.5	0.6	0.6	0.7	0.6	0.7
IS	0.4	0.5	0.2	0.2	0.6	0.8	0.5	0.7	0.7	1.0	0.5	1.0
NO	0.3	0.4	0.2	0.3	0.7	0.8	0.5	0.6	0.5	0.7	0.5	0.7
CH	0.3	0.3	0.2	0.2	0.4	0.4	0.5	0.6	0.4	0.6	0.5	0.7
ME	0.5	0.6	0.7	0.5	0.4	0.7	0.6	1.0	0.7	0.7	p	1.2
MK	0.6	0.7	0.6	0.7	1.1	1.4	1.0	0.9	1.0	1.1	p	p
AL	0.6	0.5	0.4	0.4	0.5	0.7	0.6	0.6	1.1	1.0	1.2	1.0
RS	0.5	0.7	0.6	0.6	0.8	0.8	1.0	1.0	0.6	0.7	0.6	0.7
TR	0.3	0.4	0.3	0.3	0.4	0.5	0.4	0.4	0.5	0.6	0.5	0.6
BA	0.4	0.5	0.3	0.4	0.8	0.9	0.5	0.8	0.5	0.6	0.5	0.6
GE	0.2	0.3	0.3	0.3	0.7	0.6	0.7	0.4	0.6	0.8	p	1.0
AM	0.2	0.2	0.2	0.3	0.6	0.5	0.2	0.3	0.4	0.4	p	0.4
MD	0.4	0.5	0.3	0.4	0.6	0.8	p	1.3	p	0.7	p	p
TN	0.4	0.5	0.3	0.4	0.7	0.7	0.4	0.6	0.3	0.5	0.5	0.5
IL	0.2	0.2	0.1	0.2	0.3	0.4	0.3	0.3	0.5	0.6	0.5	0.5
UA	0.3	0.4	0.3	0.4	0.6	0.8	0.6	0.7	0.8	1.0	0.4	1.0
AR	0.7	0.8	0.6	0.6	0.8	0.8	1.0	1.0	0.9	1.0	1.0	0.9
AU	0.3	0.3	0.2	0.2	0.7	0.8	0.5	0.5	0.8	0.9	0.8	0.9
BR	0.4	0.5	0.3	0.4	0.8	0.8	0.6	0.6	0.7	0.7	0.7	0.7
CA	0.3	0.3	0.2	0.2	0.5	0.6	0.5	0.5	0.7	0.8	0.7	0.8
CN_X_HK	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
HK	0.1	0.1	0.1	0.1	0.3	0.3	0.2	0.3	0.3	0.3	0.4	0.4
IN	0.3	0.3	0.2	0.2	0.4	0.4	0.3	0.3	0.4	0.4	0.6	0.7
JP	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3
MX	0.3	0.4	0.3	0.3	0.5	0.5	0.4	0.4	0.6	0.6	0.7	0.6
RU	0.3	0.4	0.3	0.4	0.6	0.7	0.5	0.7	0.6	1.0	0.9	1.0
ZA	0.4	0.4	0.2	0.2	0.7	0.8	0.5	0.6	0.7	0.7	0.5	0.6
KR	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3
US	0.2	0.3	0.2	0.2	0.5	0.6	0.4	0.5	0.6	0.8	0.6	0.7

Notes: Cells are colour coded relative to gender parity (defined mathematically as 1.0). Blue = More men than women; White = Parity; Orange = More women than men. The average proportion of authors to which a gender could be assigned varies. For EU-27, the average proportion of corresponding authors for whom gender could be inferred was 0.75, with the lowest value among EU-27 Member States being 0.61 for Croatia and Slovakia and the lowest value among all regions being 0.29 for China. p indicates that count of publications in the category was less than 100. Data not available for: FO.

Source: Computed by Elsevier using Scopus data.

Table 7.9 Compound annual growth rate (%) of the ratio of publications for which a woman is corresponding author to those for which a a man is corresponding author, by field of R&D, 2010-2019

Country	All Fields		Natural Sciences		Engineering and technology		Medical and health sciences		Agricultural and veterinary sciences		Social sciences		Humanities and the arts	
	CAGR	Trend	CAGR	Trend	CAGR	Trend	CAGR	Trend	CAGR	Trend	CAGR	Trend	CAGR	Trend
WLD	3.21		2.76		3.16		2.28		1.79		2.91		2.97	
EU-27	**3.68**		**3.22**		**3.49**		**2.60**		**2.21**		**3.57**		**3.05**	
EU-28	**3.50**		**3.11**		**3.25**		**2.42**		**2.41**		**3.21**		**2.99**	
BE	3.05		2.03		1.37		2.27		-0.19		2.74		3.61	
BG	0.05		0.19		-2.46		-2.82		0.20		-1.34		-4.22	
CZ	2.82		2.38		2.92		2.41		-1.20		2.35		4.41	
DK	3.71		2.63		1.56		2.56		3.37		5.15		7.22	
DE	4.62		3.93		4.25		3.52		3.29		4.37		4.31	
EE	1.65		3.20		0.21		-3.02		-0.55		-2.83		1.46	
IE	5.54		5.52		4.80		2.64		3.45		3.31		4.28	
EL	2.03		2.30		2.55		1.00		3.33		2.32		0.15	
ES	2.30		1.50		1.28		1.41		1.14		3.02		0.24	
FR	2.17		1.94		1.27		1.25		1.48		1.54		2.60	
HR	2.76		4.46		4.34		0.93		4.09		-0.36		-2.69	
IT	3.87		3.83		4.35		2.59		2.87		4.29		3.98	
CY	4.39		3.59		1.72		1.76		-0.26		1.84		3.12	
LV	2.69		4.15		3.71		-1.57		-2.40		-0.43		2.51	
LT	5.21		6.22		6.76		1.96		0.18		0.97		3.76	
LU	2.35		0.78		2.69		0.34		12.48		1.24		-4.73	
HU	2.82		3.18		1.54		-0.10		0.14		3.05		0.54	
MT	3.38		-0.44		4.39		3.34		4.90		3.59		9.43	
NL	4.54		3.64		3.34		2.72		2.89		5.11		5.46	
AT	5.26		4.91		5.48		3.74		4.04		6.09		2.59	
PL	3.26		4.33		5.60		0.26		1.97		3.90		1.30	
PT	2.79		2.47		2.25		0.31		1.28		2.77		1.85	
RO	2.90		3.13		4.36		-1.61		-2.36		3.38		6.72	
SI	3.33		3.33		0.80		0.38		2.48		2.04		3.58	
SK	3.01		3.62		1.54		3.14		1.61		0.09		-1.35	
FI	3.06		2.23		1.31		0.62		0.69		2.68		3.81	
SE	3.35		2.51		3.71		1.49		0.40		4.32		2.16	
UK	2.64		2.77		2.41		1.38		3.67		2.42		3.13	
IS	5.75		4.70		2.96		9.10		8.45		1.37		9.80	
NO	3.89		1.92		2.06		2.92		2.05		5.22		7.38	
CH	4.92		4.11		3.81		3.79		3.58		6.34		5.34	
ME	12.59		9.24		5.84		12.70		-		0.89		11.79	
MK	3.63		2.23		6.58		3.54		2.14		3.12		-	
AL	2.31		2.44		-0.94		2.51		8.42		-1.01		-	
RS	2.08		1.99		2.76		0.29		-0.19		4.22		2.74	
TR	2.88		2.64		1.40		3.96		3.70		0.95		1.39	
BA	6.06		6.41		8.42		4.16		16.45		5.74		7.07	
GE	4.08		2.57		-0.82		-2.92		-6.32		2.77		15.99	
AM	6.03		5.01		6.05		-3.96		16.65		9.52		14.93	
MD	3.40		4.11		3.71		-2.69		-0.71		-10.33		-11.49	
TN	1.63		2.58		3.55		-0.48		5.02		6.30		7.42	
IL	2.47		1.89		2.18		1.57		0.00		2.14		-0.20	
UA	7.47		6.94		9.20		4.20		11.65		10.12		2.64	
AR	0.91		0.82		2.49		0.26		0.37		0.34		0.03	
AU	2.64		2.48		0.50		1.67		3.19		1.65		2.19	
BR	0.77		1.27		1.96		0.14		1.89		-1.27		-1.39	
CA	3.16		3.19		1.77		1.08		2.64		2.94		1.94	
CN_X_HK	0.79		0.27		-1.01		2.00		2.75		2.41		10.77	
HK	2.59		3.34		2.44		1.59		3.08		0.78		4.61	
IN	-0.96		-1.26		-0.15		-0.34		-1.92		-2.39		1.04	
JP	2.83		3.68		5.27		0.23		3.95		4.23		4.24	
MX	2.87		2.77		3.45		2.96		1.44		1.53		0.75	
RU	7.41		6.69		5.48		5.64		8.61		8.51		3.42	
ZA	-0.37		-0.65		-1.73		-0.18		1.91		-1.40		-0.42	
KR	2.55		2.12		2.86		1.70		1.46		0.01		11.20	
US	3.93		3.49		2.78		2.34		2.26		3.76		2.73	

Notes: The height of the bars in the trend column indicates relative annual values for women to men ratio of corresponding authorship, and scaling is not the same across countries or fields of R&D. p indicates that the count of publications in the category was less than 100. "-" indicates that the value at the beginning or end of the period was unavailable for CAGR calculations, either because the value at the beginning of the period was zero or because the number of publications at the beginning was zero. Data not available for: FO.

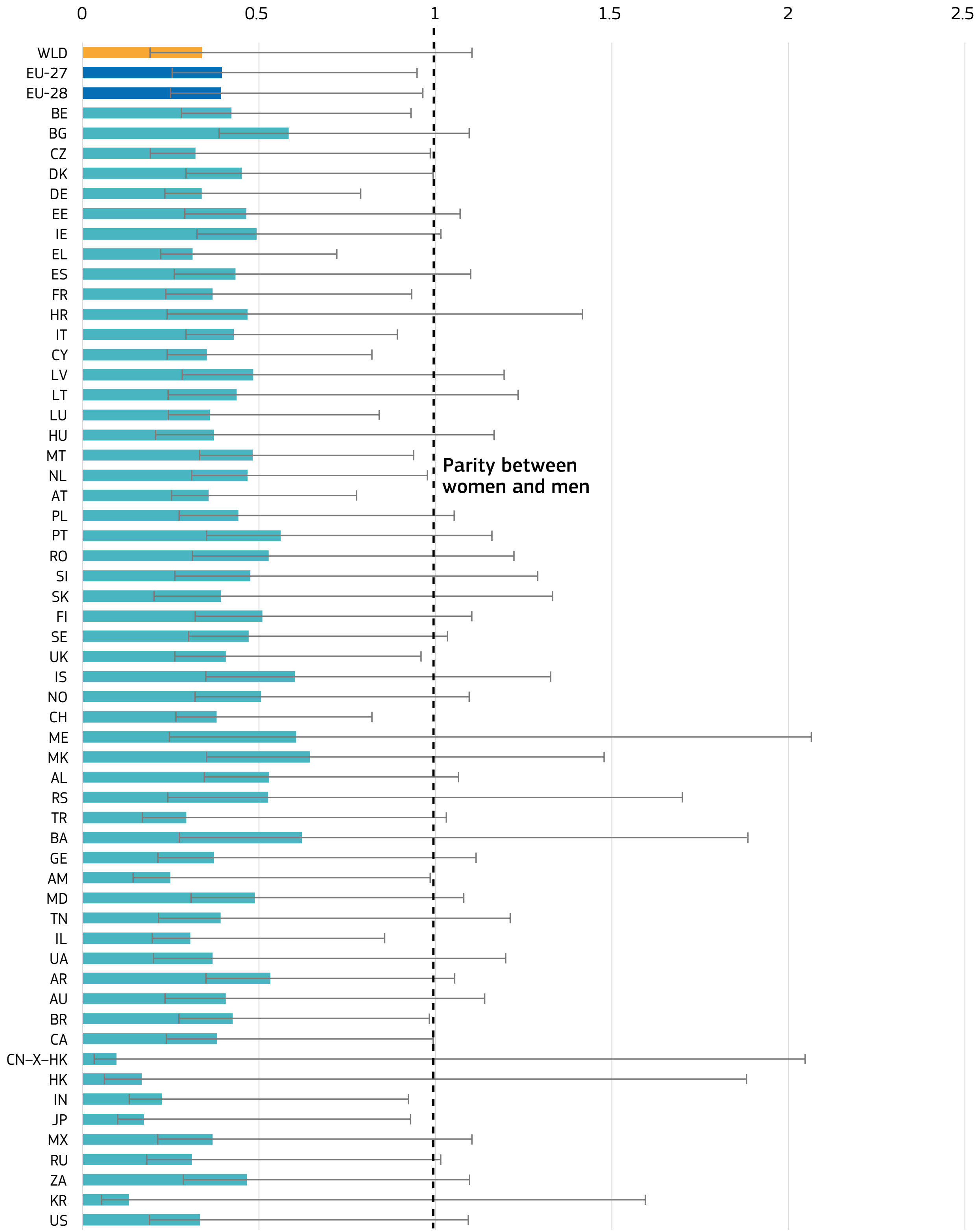
Source: Computed by Elsevier using Scopus data.

Women were further under-represented as corresponding authors on internationally collaborated publications.

Figure 7.8 considers the women-to-men ratio of corresponding authors across all fields for internationally collaborated publications. At both European (0.39 compared to 0.47) and world level (0.34 compared to 0.38), the ratio was smaller for internationally collaborated publications compared to all publications (Figure 7.7).

The same trend is observed across the EU-27 Member States and Associated Countries, except Germany (0.34 compared to 0.33), Cyprus (0.35 compared to 0.33), Luxembourg (0.36 compared to 0.36), Malta (0.48 compared to 0.46), Switzerland (0.38 compared to 0.37), and Israel (0.31 compared to 0.30), where the opposite pattern holds. The data suggest that with the exception of the EU-27 Member States and Associated Countries noted, women active authors were better represented as corresponding authors on publications overall than on internationally collaborated publications.

Figure 7.8 Ratio of publications resulting from international collaboration for which a woman is corresponding author to those for which a man is corresponding author in all fields of R&D, 2015-2019



Notes: Values represent the ratio based on publications during the period 2015-2019; EU-27, EU-28 and world values are highlighted in the chart. The lower limit of the error bars corresponds to the value of the ratio if all authors whose gender could not be inferred were men, while the upper limit corresponds to the value of the ratio if all authors whose gender could not be inferred were women. The average proportion of authors to which a gender could be assigned varies. For EU-27, the proportion of corresponding authors for whom gender could be inferred was 0.72, with the lowest value among EU-27 Member States being 0.60 for Slovakia and the lowest value among all regions being 0.35 for China. Data not available for: FO.

Source: Computed by Elsevier using Scopus data.

7.6 The gender gap in inventorship and innovation

Another measurement of women's representation in scientific output is the gender gap in the number of patent applications. The new ERA Communication recognises that the number of women among patent holders remains extremely low in the EU (European Commission, 2020a). In grant competitions in some fields of R&D, the number of patent applications on which a researcher is listed as an inventor might prove to be a decisive factor in a funding decision. A lower number of patent applications could therefore lead to reduced chances of being funded (or the receipt of lower funding amounts), which could in turn decrease scientific output and patent applications, creating a vicious circle. Taking these potential disadvantages into account, the following indicators focus on the gender gap in patent applications (inventorships) and collaboration in patent applications, by various disciplines, and examine improvements – if any - overtime.

The ERA Communication emphasises that the career development of researchers places insufficient focus on opportunities outside academia which could serve as an obstacle for retaining talent (European Commission, 2020a). The Innovation Union Scoreboard (2019) considers public-private co-publications as one measure of Member States' overall innovation performance. Such publications represent successful research coorperation and knowledge transfer from knowledge-producing organisations to knowledge-using organisations (Tijssen, 2011). Diffusion of innovation through knowledge transfer is identified as a key area of improvement in the new ERA Communication (European, Commission, 2020a). For that reason, a new indicator in this chapter considers the extent of gender balance in academic-corporate collaboration teams.

Women were still under-represented among inventors.

Figure 7.9 shows the number of inventorships, calculated based on the number of patent applications and the corresponding number of inventors (for example, a team of 10 inventors for a given patent application would each be attributed a tenth of that invention). A ratio of women to men inventorships of greater than 1.0 would indicate that women produced a larger share of inventions than men, whereas a value of less than 1.0 would indicate the opposite (and a value of 1.0 would indicate gender parity, with women and men producing an equal number of inventions).

The data show that between 2015-2018, women were very under-represented among inventors, both at European level and worldwide. At European level, the ratio was 0.12, indicating that for every 10 inventorships held by men, just over one (1.2) was held by women.

In the vast majority of the EU-27 Member States and Associated Countries (38 of 43), the ratios of women to men inventorship were 0.2 or less[3], indicating that more than five times as many inventorships were held by men. Of the EU-27 Member States and Associated Countries with a ratio above 0.2 (EE, HR, PT, LV, ES), these values ranged from 0.23 (ES) to 0.30 (EE). Notably, economies in the G-20 region had the highest ratios of women to men inventorship, indicating that the EU is lagging behind some of its main competitors. For example, in China except Hong Kong and South Korea, for every five inventorships held by men, there were over two inventorships held by women.

Given the wide gender gap in patenting, Table 7.10 compares the ratio of women-to-men inventorships in 2005-2008 and 2015-2018, showing how the situation has changed overtime. It also disaggregates inventorships by Internal Patent Classification (IPC) sections to allow for exploration of any differences by discipline. Box 31 provides examples of ways in which gender equality in innovation has been promoted.

3 Due to the margin of error, a further seven EU-27 Member States and Associated Countries could have a ratio above 0.2 (AM, AL, BA, GE, IS, TN and MD).

BOX 31 Promoting gender equality in innovation

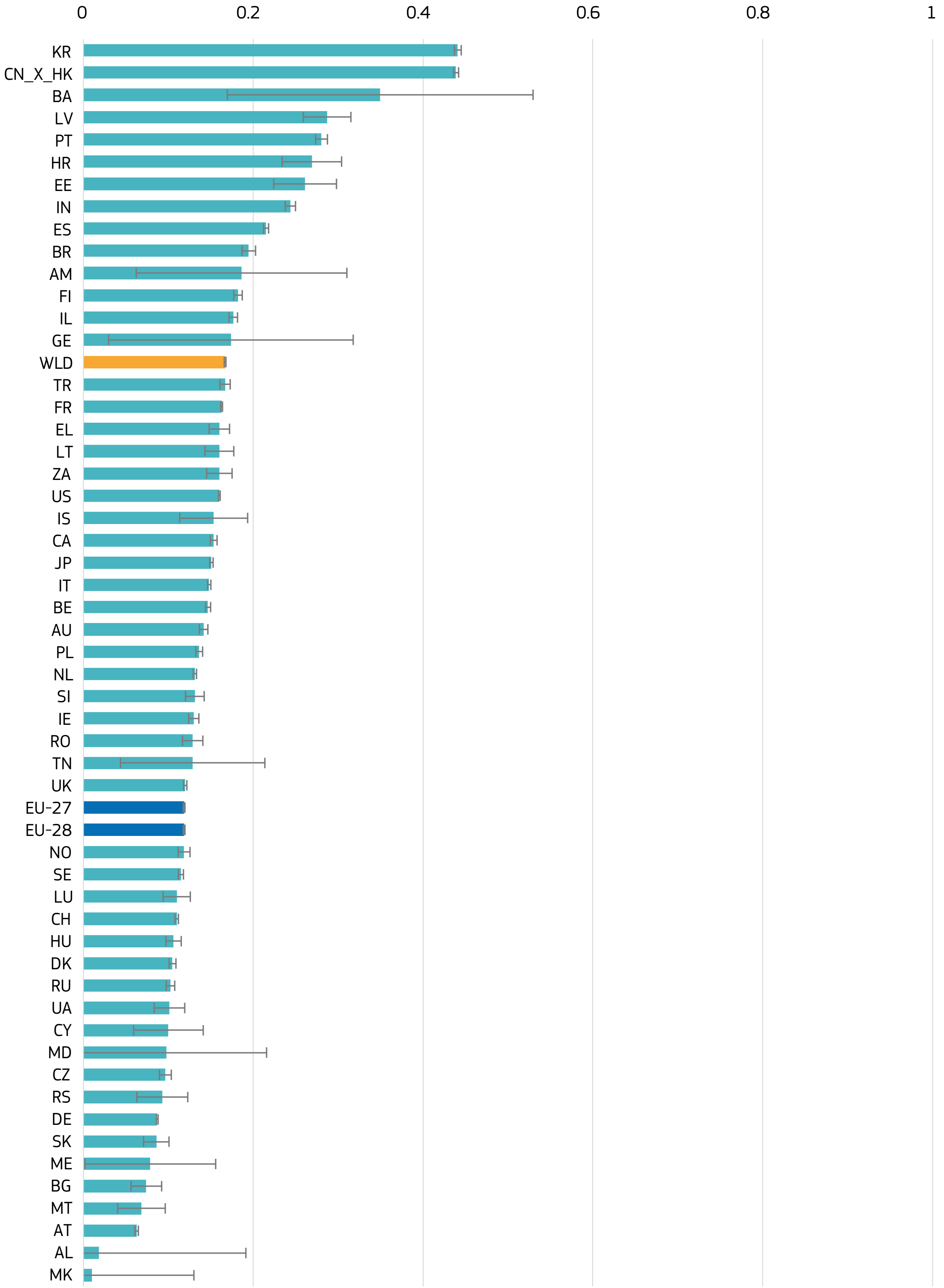
In **Poland**, the 'Girls Go Start-Up! Academy' ran from 2016-2018 and provided training to help women students and graduates in STEM subjects to develop the necessary skills to launch a start-up. The training focused on IT, biotechnology, nanotechnology, energy, and creative industries, as well as interdisciplinary projects. The Academy provided participants with structured mentoring from women innovators for 12 months. In the first edition of the programme in 2016, 18 STEM start-ups were created[4].

In **Denmark**, the Innovation Fund launched four initiatives in 2018 to improve the gender balance among applicants for funding. This entailed appointing role models to encourage women applicants, incorporating gender diversity in the Innovation Fund's strategy, including a gender perspective in the application process, and improving gender diversity among candidates for panels and awards[5].

4 Girls Go Start Up! Academy, http://www.girls-startup.pl/.

5 Gender Balance Initiatives in Research Funding, https://vbn.aau.dk/ws/portalfiles/portal/306503018/Gender_balance_initiatives_in_research_funding.pdf.

Figure 7.9 Women to men ratio of inventorships, 2015-2018



Notes: Error bars represent the margin of error associated with the share of female inventorship with EPO applications.

Other: CY, LV, MT, ME, MK, AL, RS, BA, GE, AM, MD, TN have fewer than 100 patent applications in total during the time period, Data not available for: FO.

Source: Computed by using European patent applications (kind codes A1 and A2) in PATSTAT

Women inventors were strongly under-represented in almost every country and IPC section.

The data shows strong under-representation of women as inventors at European level and in every IPC section during both time periods (Table 7.10). At European level, the ratio of women to men inventorships in 2015-2018 was highest in sections A (Human necessities: 0.20) and C (Chemistry & metallurgy: 0.28). By contrast, the lowest ratios in 2015-2018 of 0.06 were observed in sections E (Fixed constructions) and F (Mechanical engineering, lighting, heating, weapons & blasting) indicating that for every 100 inventorships held by men, only six were held by women. The extent of women's under-representation as inventors thus varies by discipline.

At country level, for both periods (2005-2008 and 2015-2018), women inventors were under-represented in all EU-27 Member States and Associated Countries and all IPC sections. There were a handful of exceptions in Bosnia and Herzegovina in 'Humanities Necessities' (1.28 for 2015-18), Cyprus in 'Chemistry & Metallurgy' (1.09 for 2005-08), Georgia in 'Physics' (199 for 2005-08 and 2.73 for 2015-18), and Armenia in 'Electricity' (2.98 for 2005-08) where the number of women inventors exceeded the number of men inventors. However, Bosnia and Herzegovina, Cyprus and Georgia all had fewer than 100 patent applications in total during the 2015-2018 time period.

There was considerable variation across the EU-27 Member States and Associated Countries in the 2015-2018 period with values ranging from: 0.01 (ME, MD) to 1.28 (BA) for 'Human Necessities'; 0.01 (GE) to 0.36 (EE) for 'Performing Operations & Transporting'; 0.01 (ME) to 0.85 (BA) for 'Chemistry & Metallurgy'; 0.0 (TN) to gender parity i.e. 1.0 (CY) for 'Textiles & Paper'; 0.0 (CY) to 0.27 (MD) for 'Fixed Constructions'; 0.0 (CY) to almost gender parity i.e. 0.98 (AM) for 'Mechanical Engineering, Lighting, Heating, Weapons & Blasting'; 0.01 (MK) to 2.73 (AM) for 'Physics'; and 0.01 (ME) to almost gender parity, 0.99 (MD) for 'Electricity'.

Despite the substantial under-representation of women, a very small amount of progress towards gender parity can be seen. At European level, the ratio for each IPC section increased by between 0.01 and 0.06 from 2005-2008 to 2015-2018 (Table 7.10). In majority of the EU-27 Member States and Associated Countries, the ratio increased between the two time periods across all IPC sections but there were a number countries where the ratio decreased: 14 countries in 'Human Necessities'; nine in 'Performing Operations & Transporting'; 13 in 'Chemistry & Metallurgy'; seven in 'Textiles & Paper'; 11 in 'Fixed Constructions'; 13 in 'Mechanical Engineering, Lighting, Heating, Weapons & Blasting'; 12 in 'Physics'; and 17 in 'Electricity'. These findings complement the data on the average annual growth rate of the ratio of inventorships between 2006 and 2018 (Table 7.12).

At European level, there has been slow progress towards women's representation as inventors' overtime.

At European level, the ratio of women to men inventorships grew slightly, at an average rate of 0.02 per year across all IPC sections between 2006 and 2018 (Table 7.11). The highest average annual growth rate of 0.04 was in 'Textiles & Paper,' a discipline where women remained strongly under-represented (ratio of 0.14 for 2015-18). The lowest average annual growth rate of close to 0 (i.e. 0.002) was observed in 'Human Necessities', a discipline in which women inventors were better represented between 2015-2018 (ratio of 0.20). Even here, however, growth rates were extremely modest.

At country level, there a number of EU-27 Member States and Associated Countries had negative average annual growth rates, indicating that women inventors were even more under-represented in 2018 than in 2006: 16 countries in 'Human Necessities'; nine in 'Performing Operations & Transporting'; 16 in 'Chemistry & Metallurgy'; six in 'Textiles & Paper'; 10 in 'Fixed Constructions'; 15 in 'Mechanical Engineering, Lighting, Heating, Weapons & Blasting'; 10 in 'Physics'; and 14 countries in 'Electricity'.

These data suggest slow progress towards reducing the gender gap in inventorships, with the EU still some distance from reaching gender parity in any discipline of patents. In some of the EU-27 Member States and Associated Countries, women's under-representation in some disciplines had worsened in 2018.

Table 7.10 Women to men ratio of inventorships by IPC section, 2005-08 vs 2015-18

Country	A		B		C		D		E		F		G		H	
	2005-2008	2015-2018	2005-2008	2015-2018	2005-2008	2015-2018	2005-2008	2015-2018	2005-2008	2015-2018	2005-2008	2015-2018	2005-2008	2015-2018	2005-2008	2015-2018
WLD	0.19	0.22	0.09	0.12	0.22	0.27	0.13	0.19	0.06	0.08	0.07	0.10	0.13	0.17	0.13	0.18
EU-27	**0.19**	**0.20**	**0.06**	**0.09**	**0.21**	**0.28**	**0.10**	**0.14**	**0.05**	**0.06**	**0.05**	**0.06**	**0.08**	**0.11**	**0.07**	**0.09**
EU-28	**0.19**	**0.20**	**0.06**	**0.09**	**0.21**	**0.27**	**0.10**	**0.15**	**0.05**	**0.06**	**0.05**	**0.06**	**0.08**	**0.11**	**0.07**	**0.09**
BE	0.22	0.20	0.11	0.13	0.26	0.29	0.09	0.10	0.06	0.07	0.07	0.07	0.11	0.13	0.10	0.11
BG	0.35	0.15	0.08	0.10	0.23	0.23	0.01	0.08	0.00	0.06	0.07	0.11	0.17	0.07	0.08	0.02
CZ	0.15	0.23	0.04	0.06	0.10	0.20	0.11	0.10	0.05	0.09	0.03	0.06	0.05	0.08	0.02	0.04
DK	0.21	0.15	0.07	0.07	0.24	0.28	0.15	0.18	0.05	0.05	0.04	0.05	0.10	0.09	0.05	0.09
DE	0.15	0.15	0.04	0.06	0.15	0.22	0.07	0.11	0.04	0.05	0.04	0.05	0.06	0.07	0.04	0.06
EE	0.37	0.30	0.08	0.36	0.63	0.55	z	0.46	z	0.16	0.05	0.86	0.18	0.16	0.12	0.12
IE	0.12	0.18	0.09	0.10	0.23	0.38	0.27	0.25	0.04	0.04	0.03	0.05	0.09	0.11	0.08	0.08
EL	0.22	0.24	0.05	0.10	0.32	0.33	0.04	0.01	0.09	0.14	0.02	0.05	0.14	0.07	0.10	0.09
ES	0.31	0.36	0.11	0.16	0.45	0.53	0.11	0.22	0.10	0.08	0.11	0.13	0.16	0.18	0.14	0.15
FR	0.28	0.30	0.09	0.12	0.30	0.36	0.17	0.19	0.07	0.08	0.07	0.08	0.13	0.15	0.11	0.11
HR	0.46	0.53	0.04	0.13	0.61	0.81	z	0.05	0.03	0.01	0.01	0.04	0.40	0.12	0.06	0.02
IT	0.19	0.21	0.08	0.12	0.32	0.35	0.09	0.14	0.08	0.11	0.08	0.09	0.13	0.14	0.12	0.12
CY	0.07	0.18	0.16	0.06	1.09	0.36	0.01	1.00	0.10	0.00	0.12	0.02	0.07	0.15	0.04	0.06
LV	0.20	0.39	0.11	0.05	0.38	0.38	z	0.01	0.04	0.06	0.02	0.01	0.09	0.24	0.13	0.01
LT	0.30	0.22	0.08	0.08	0.35	0.43	z	0.01	0.01	0.01	0.00	0.01	0.11	0.08	0.07	0.06
LU	0.02	0.16	0.06	0.10	0.11	0.22	0.07	0.17	0.09	0.08	0.05	0.03	0.05	0.14	0.05	0.05
HU	0.28	0.20	0.04	0.08	0.33	0.26	0.05	0.01	0.10	0.02	0.11	0.07	0.06	0.11	0.04	0.06
MT	0.14	0.43	0.10	0.01	0.43	0.10	z	z	0.01	0.01	0.03	0.03	0.01	0.16	0.02	0.02
NL	0.16	0.18	0.07	0.09	0.17	0.21	0.15	0.15	0.05	0.06	0.07	0.09	0.08	0.13	0.06	0.09
AT	0.11	0.11	0.04	0.04	0.16	0.19	0.08	0.15	0.02	0.03	0.02	0.04	0.05	0.06	0.04	0.04
PL	0.21	0.27	0.08	0.10	0.37	0.40	0.42	0.29	0.09	0.08	0.02	0.04	0.07	0.09	0.05	0.05
PT	0.26	0.41	0.17	0.17	0.33	0.74	0.21	0.75	0.20	0.08	0.03	0.09	0.16	0.24	0.08	0.16
RO	0.49	0.33	0.15	0.12	0.78	0.54	0.20	0.01	0.14	0.02	0.06	0.04	0.08	0.13	0.18	0.11
SI	0.35	0.16	0.11	0.13	0.39	0.42	0.03	0.20	0.03	0.06	0.06	0.04	0.09	0.12	0.07	0.06
SK	0.26	0.13	0.03	0.07	0.27	0.21	0.06	0.71	0.03	0.08	0.02	0.05	0.08	0.12	0.03	0.09
FI	0.24	0.25	0.11	0.15	0.33	0.37	0.17	0.26	0.11	0.12	0.08	0.12	0.16	0.15	0.14	0.16
SE	0.22	0.18	0.08	0.08	0.28	0.24	0.14	0.19	0.07	0.05	0.06	0.05	0.08	0.10	0.07	0.12
UK	0.17	0.18	0.06	0.09	0.20	0.26	0.10	0.22	0.04	0.05	0.04	0.05	0.08	0.11	0.08	0.10
IS	0.16	0.24	0.11	0.13	0.19	0.30	z	0.07	z	0.10	0.29	0.08	0.13	0.07	0.21	0.14
NO	0.16	0.20	0.08	0.07	0.23	0.27	0.05	0.19	0.04	0.05	0.07	0.05	0.08	0.10	0.08	0.08
CH	0.14	0.16	0.04	0.08	0.16	0.22	0.04	0.08	0.03	0.07	0.04	0.06	0.06	0.08	0.05	0.08
ME	z	0.01	z	z	z	0.01	z	z	z	z	z	z	z	0.57	z	0.01
MK	z	z	z	0.01	0.00	0.01	z	z	z	0.01	0.01	z	z	0.01	0.90	z
AL	0.02	z	z	0.01	z	z	z	z	z	z	0.02	0.02	z	0.01	z	z
RS	0.11	0.12	0.01	0.09	0.01	0.07	0.01	z	0.01	0.10	0.01	0.01	0.01	0.06	2.19	0.18
TR	0.17	0.32	0.10	0.12	0.38	0.43	0.18	0.18	0.07	0.10	0.10	0.11	0.11	0.12	0.10	0.10
BA	0.01	1.28	0.01	0.02	0.00	0.85	z	z	z	0.01	0.04	z	0.22	0.15	0.03	0.03
GE	0.64	0.29	0.07	0.01	0.58	0.49	z	z	z	0.12	0.07	0.02	199.00	0.06	2.98	0.05
AM	0.12	0.14	z	0.12	0.24	0.14	z	z	0.14	z	0.14	0.98	0.01	2.73	0.01	0.14
MD	0.25	0.01	0.01	0.01	0.24	z	z	z	0.02	0.27	0.01	0.05	0.04	0.99	0.07	0.99
TN	0.08	0.12	0.06	0.11	0.34	0.44	0.02	0.00	z	z	z	0.17	0.11	0.16	0.08	0.11
IL	0.27	0.21	0.14	0.15	0.47	0.37	0.19	0.27	0.11	0.09	0.10	0.12	0.15	0.16	0.12	0.13
UA	0.16	0.29	0.15	0.10	0.07	0.10	z	0.01	0.01	0.04	0.03	0.00	0.10	0.09	0.05	0.04
AR	0.18	0.11	0.12	0.08	0.36	0.16	0.56	z	0.04	0.01	0.02	0.01	0.08	0.06	0.05	0.05
AU	0.17	0.20	0.10	0.10	0.22	0.28	0.13	0.14	0.05	0.05	0.05	0.06	0.12	0.14	0.09	0.10
BR	0.33	0.40	0.10	0.10	0.31	0.32	0.12	0.35	0.04	0.07	0.05	0.06	0.11	0.14	0.09	0.09
CA	0.22	0.21	0.09	0.10	0.28	0.27	0.15	0.22	0.07	0.07	0.07	0.07	0.14	0.12	0.12	0.16
CN_X_HK	0.40	0.44	0.38	0.41	0.47	0.47	0.40	0.42	0.34	0.39	0.37	0.39	0.40	0.43	0.43	0.46
HK	0.22	0.30	0.34	0.28	0.25	0.36	0.20	0.39	0.24	0.28	0.25	0.35	0.18	0.29	0.23	0.30
IN	0.31	0.29	0.20	0.19	0.32	0.29	0.31	0.40	0.18	0.18	0.16	0.18	0.24	0.26	0.24	0.22
JP	0.18	0.20	0.12	0.14	0.15	0.19	0.13	0.15	0.11	0.14	0.11	0.12	0.14	0.15	0.13	0.14
MX	0.46	0.33	0.11	0.14	0.20	0.39	0.03	0.00	0.01	0.04	0.09	0.07	0.10	0.26	0.06	0.12
RU	0.21	0.24	0.14	0.09	0.28	0.17	0.07	0.30	0.05	0.05	0.04	0.07	0.09	0.06	0.07	0.04
ZA	0.19	0.31	0.12	0.09	0.26	0.35	0.15	0.12	0.04	0.05	0.03	0.03	0.05	0.08	0.09	0.09
KR	0.39	0.43	0.35	0.40	0.39	0.45	0.38	0.49	0.34	0.41	0.33	0.43	0.38	0.43	0.37	0.46
US	0.19	0.21	0.10	0.11	0.23	0.26	0.17	0.20	0.07	0.09	0.07	0.08	0.12	0.15	0.12	0.15

Notes: IPC sections: A = Human necessities; B = Performing operations & transporting; C = Chemistry & metallurgy; D = Textiles & paper; E = Fixed constructions; F = Mechanical engineering, lighting, heating, weapons & blasting; G = Physics; H = Electricity; Colouring of cells is relative to parity (defined mathematically at 50 %–50 %): Blue = More men than women; White = Parity; Orange = More women than men; Grey (z) = Not applicable (no applications by male applicants therefore no calculation possible); CY, LV, MT, ME, MK, AL, RS, BA, GE, AM, MD, TN have fewer than 100 patent applications in total during the 2015-2018 time period. EE, CY, LT, MT, ME, MK, AL, RS, BA, GE, AM, MD, TN have fewer than 100 patent applications in total during the 2005-2008 time period. Data unavailable for: FO.

Source: Computed by using Eupean patent applications (kind codes A1 and A2) in PATSTAT

Table 7.11 Compound annual growth rate (%) of the four-year ratio of women inventorships, by IPC section, 2006-2018

Country	All IPC sections		A		B		C		D		E		F		G		H	
	CAGR	Trend	CAGR	Trend	CAGR	Trend	CAGR	Trend	CAGR	Trend	CAGR	Trend	CAGR	Trend	CAGR	Trend	CAGR	Trend
WLD	0.02		0.01		0.03		0.02		0.04		0.03		0.03		0.03		0.04	
EU-27	**0.02**		**0.00**		**0.03**		**0.03**		**0.04**		**0.02**		**0.03**		**0.02**		**0.02**	
EU-28	**0.02**		**0.00**		**0.03**		**0.03**		**0.04**		**0.02**		**0.03**		**0.02**		**0.02**	
BE	0.00		-0.02		0.01		0.01		-0.02		0.01		0.01		0.01		0.02	
BG	-0.04		-0.13		0.01		-0.01		0.27		z		0.03		-0.08		-0.12	
CZ	0.03		0.03		0.06		0.07		0.02		0.07		0.08		0.02		0.06	
DK	-0.01		-0.04		0.01		0.02		-0.04		-0.02		0.02		0.00		0.05	
DE	0.02		0.00		0.04		0.04		0.06		0.04		0.04		0.03		0.04	
EE	0.04		-0.03		0.16		-0.02		z		-0.12		0.48		0.00		0.03	
IE	0.02		0.03		0.02		0.05		0.13		0.01		0.08		-0.01		0.01	
EL	0.03		0.01		0.09		0.00		-0.07		0.14		0.10		-0.06		-0.03	
ES	0.01		0.01		0.02		0.02		0.08		-0.02		0.03		0.00		0.00	
FR	0.01		0.01		0.03		0.02		0.01		0.01		0.02		0.02		0.00	
HR	0.01		0.01		-0.04		0.04		z		0.03		0.19		-0.12		-0.09	
IT	0.02		0.01		0.04		0.01		0.04		0.04		0.01		0.02		0.00	
CY	-0.03		0.07		-0.07		-0.11		0.65		-0.33		-0.18		0.10		0.05	
LV	0.00		0.06		-0.10		-0.02		z		0.06		-0.07		0.11		-0.28	
LT	0.00		-0.03		0.04		-0.02		z		0.08		-0.08		0.08		0.02	
LU	0.06		0.18		0.03		0.07		0.24		0.00		-0.05		0.12		0.00	
HU	-0.01		-0.02		0.07		-0.02		-0.21		-0.12		-0.04		0.08		0.02	
MT	0.01		0.14		-0.20		-0.06		z		0.09		0.00		z		-0.01	
NL	0.03		0.01		0.02		0.03		0.00		0.02		0.03		0.04		0.03	
AT	0.00		-0.01		0.02		0.01		0.03		0.01		0.05		-0.02		0.00	
PL	0.00		0.01		0.02		0.00		0.01		-0.01		0.10		0.04		-0.02	
PT	0.04		0.04		0.05		0.08		0.19		-0.07		0.23		0.07		0.01	
RO	-0.03		-0.05		0.01		-0.08		-0.45		-0.21		-0.04		0.09		-0.04	
SI	-0.06		-0.07		0.00		0.01		0.14		0.07		-0.03		0.04		-0.01	
SK	0.02		-0.07		0.06		-0.04		0.34		0.11		0.06		0.05		0.14	
FI	0.01		0.01		0.03		0.01		0.04		0.04		0.04		0.00		0.01	
SE	0.01		-0.01		-0.01		-0.02		0.01		-0.02		-0.01		0.02		0.06	
UK	0.02		0.01		0.03		0.03		0.08		0.01		0.04		0.03		0.02	
IS	0.01		0.05		0.02		0.06		0.14		z		-0.10		-0.01		0.00	
NO	0.00		0.01		-0.01		0.01		0.15		0.02		-0.03		0.02		-0.01	
CH	0.03		0.01		0.06		0.03		0.09		0.07		0.03		0.02		0.05	
ME	z		z		z		z		z		z		z		z		z	
MK	-0.35		z		z		-0.07		z		z		z		z		z	
AL	-0.03		z		z		z		z		z		-0.01		z		z	
RS	0.02		0.03		-0.13		-0.07		z		0.40		0.06		-0.03		-0.24	
TR	0.02		0.07		0.00		0.02		0.01		0.04		-0.01		0.03		0.00	
BA	0.36		0.85		0.09		0.81		z		z		z		0.18		-0.01	
GE	-0.09		-0.07		-0.25		-0.03		z		z		-0.14		-0.24		-0.60	
AM	0.08		-0.01		z		-0.12		z		z		0.24		0.97		0.36	
MD	-0.01		-0.34		0.00		z		z		z		0.25		0.23		z	
TN	-0.04		0.02		0.17		0.02		-0.12		z		z		0.14		0.02	
IL	-0.01		-0.02		0.01		-0.02		0.02		-0.04		0.03		0.00		0.01	
UA	0.02		0.10		-0.01		0.01		z		0.18		-0.23		0.12		0.00	
AU	-0.07		-0.04		-0.07		-0.10		z		-0.26		-0.11		-0.03		-0.06	
BR	0.01		0.02		0.00		0.02		0.11		0.04		0.02		0.02		0.01	
CA	0.01		0.02		-0.01		0.00		0.12		-0.06		0.05		0.03		-0.03	
CN_X_HK	0.00		0.00		0.00		0.00		0.06		0.01		0.01		-0.02		0.03	
IN	0.01		0.01		0.01		0.00		0.00		0.02		0.01		0.01		0.01	
JP	0.02		0.02		-0.02		0.06		0.09		-0.01		0.04		0.04		0.03	
RU	-0.01		0.00		-0.01		-0.01		0.02		-0.02		0.00		0.00		-0.02	
ZA	0.01		0.01		0.02		0.02		0.02		0.03		0.01		0.01		0.01	
KR	0.00		-0.03		0.03		0.07		-0.31		0.15		-0.01		0.13		0.14	
US	-0.04		0.01		-0.03		-0.06		0.17		0.02		0.09		-0.06		-0.06	

Notes: IPC sections: A = Human necessities; B = Performing operations & transporting; C = Chemistry & metallurgy; D = Textiles & paper; E = Fixed constructions; F = Mechanical engineering, lighting, heating, weapons & blasting; G = Physics; H = Electricity; CAGR: The compound annual growth rate of the proportion of women inventorships computed on years.Trend: Shows the trend in the proportion of women inventorships using four-year moving periods (the scale is not the same across countries and IPC sections). z = Not applicable (no applications by male applicants therefore no calculation possible). ME, MK, AL, BA, GE, AM, MD have fewer than 100 patent applications in total during the 2006-2018 time period. Data not available for: FO.

Source: Computed by using European patent applications (kind codes A1 and A2) in PATSTAT

Another measure of gender diversity is inventorships is the team composition of patent applications. Each patent application can have one named inventor (a single/individual inventor) or multiple inventors (working collaboratively as part of a team). The determination of the sex of each named inventor permits mutually exclusive sets of applications to be identified, i.e. those referring to a woman (or man) working alone, those developed by teams of the same sex, and those referring to mixed-sex teams. The following indicators shed light on the propensity of the two sexes to work alone or in same-sex teams versus working in mixed-sex teams, as well as how such collaboration patterns vary between countries and evolve over time.

Between 2015 and 2018, there was a considerable gender gap in inventors' teams

Figure 7.10 shows the distribution of patent applications by the sex composition of teams of inventors. At European level, between 2015-2018, the most uncommon team composition was a team where all members were women (only 0.6% of teams). This was followed by teams with a single woman inventor (1.3%), teams with 60% or more woman inventors (1.4%) and mixed teams (5.7%). In all countries, fewer than 10% of teams fell into one of these four categories. By contrast, the most common team composition was a team where all members were men, representing half of all patent application teams (50.5%), followed by teams with a single man inventor (29.7%) and teams with 60% or more men inventors (10.7%).

These trends were also reflected at country level: patent applications in all EU-27 Member States and Associated Countries were most commonly filed by teams with only men inventors or with a single man inventor. Only exception was Montenegro - ME (followed by BA, TN – but all based on small patent numbers). By contrast, teams with only women inventors or with a woman female inventor represented no more than 10% of inventor teams. In 13 EU-27 Member States and Associated Countries, no teams had only women inventors (CZ, CY, LV, MT, ME, MK, AL, RS, BA, GE, AM, MD, TN) and single woman inventors (BG, CY, LV, LT, IS, ME, MK, AL, BA, GE, AM, MD, TN).

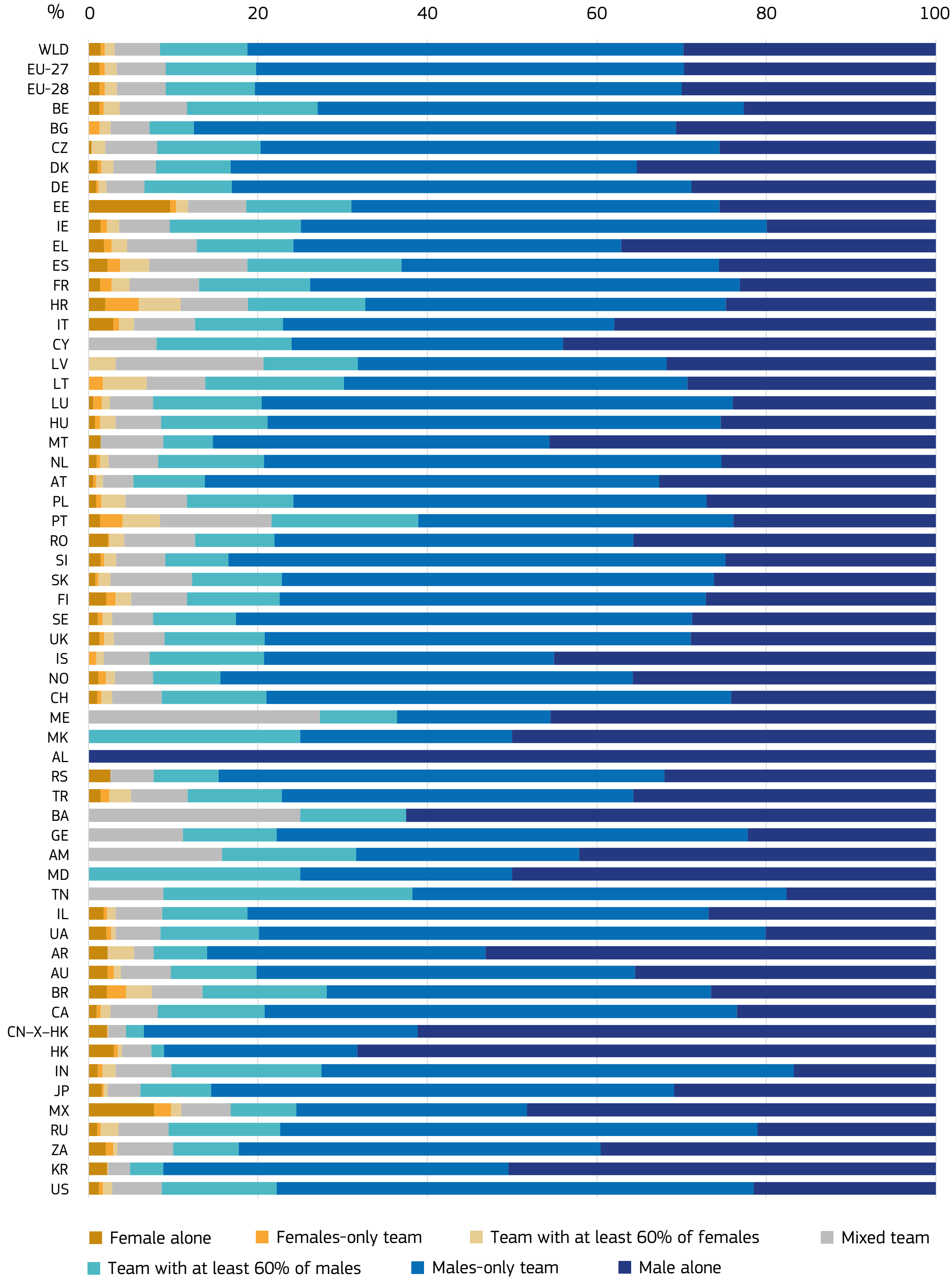
At European level, there has been a small increase in inventorships teams composed solely or mostly of women inventors.

Table 7.13 shows that, at European level, the number of teams composed of only women inventors or mostly women inventors increased slightly (0.03% per year) between 2006 and 2018. There was also a very small increase (0.01% per year) in the number of mixed teams and teams with mostly men inventors, and a decrease (-0.02% per year) in teams with only men inventors. There was no change in teams with only a single woman or man inventor (0.00% per year).

At country level, the situation varies across the EU-27 Member States and Associated Countries. Between 2006 and 2018, the highest average four-year growth rate for teams with a single woman inventor was observed in Ukraine (0.17% per year) and the lowest average annual growth rates (-1.0% per year) were observed in four countries (BG, CY, LV, GE) indicating that the number of teams composed of a single woman inventor, decreased here. For teams composed of only women inventors, the highest average annual growth rate was observed in Luxembourg (0.2%) and the lowest average annual growth rate (-0.1%) was observed in Czechia and Georgia. Similarly, for teams composed of mostly female inventors, the highest average annual growth rate was observed in Turkey (0.28%) and the lowest in Tunisia (-1.0%).

The gender gap in inventorship teams widened in several countries. In nine of the EU-27 Member States and Associated Countries (BE, CZ, DK, EL, FR, MT, SE, NO, IL), the CAGR for teams with a single woman inventor was negative (they decreased between 2006 and 2018), while the CAGR for a man inventor was positive (they increased in the same time period). Similarly, in Denmark, Estonia, and Slovenia, the CAGR for teams composed of only women inventors was negative, while the corresponding CAGR for teams composed of only men inventors was positive, between 2006 and 2018. In Israel, the CAGR for teams composed of mostly women inventors was negative, while the CAGR for teams composed of mostly men inventors was positive (0.001%).

Figure 7.10 Distribution of patent applications by sex composition of the inventors' team (%), 2015-18



Notes: CY, LV, MT, ME, MK, AL, RS, BA, GE, AM, MD, TN have fewer than 100 patent aplications in total during the 2015-2018 time period. Data not available for: FO.

Source: Computed by using European patent applications (kind codes A1 and A2) in PATSTAT

Table 7.12 CAGR (%) of the four-year numbers of patent applications, by sex composition of the inventors' team, 2006–2018

Country	Female alone		Females-only team		Team with at least 60% of females		Mixed team		Team with at least 60% of males		Males-only team		Male alone	
	CAGR	Trend	CAGR	Trend	CAGR	Trend	CAGR	Trend	CAGR	Trend	CAGR	Trend	CAGR	Trend
WLD	0.00		0.02		0.02		0.01		0.01		-0.02		0.00	
EU-27	**0.00**		**0.03**		**0.03**		**0.01**		**0.01**		**-0.02**		**0.00**	
EU-28	**0.00**		**0.03**		**0.03**		**0.01**		**0.01**		**-0.02**		**0.00**	
BE	-0.01		0.00		0.03		0.00		0.01		-0.01		0.01	
BG	-1.00		z		0.00		-0.03		-0.08		0.05		0.08	
CZ	-0.02		-1.00		0.24		0.14		0.06		0.05		0.05	
DK	-0.03		-0.01		0.05		-0.02		-0.01		0.00		0.02	
DE	0.00		0.02		0.03		0.01		0.00		-0.02		-0.01	
EE	z		-0.07		0.00		0.03		-0.01		0.05		0.03	
IE	0.08		0.11		0.05		0.01		0.06		-0.01		0.02	
EL	-0.02		0.03		0.08		-0.01		0.07		-0.02		0.01	
ES	0.00		0.04		0.03		0.04		0.04		-0.01		0.02	
FR	-0.01		0.03		0.01		0.01		0.02		-0.02		0.01	
HR	-0.07		0.17		-0.05		-0.09		-0.05		-0.06		-0.01	
IT	0.02		0.06		0.01		0.01		0.01		-0.03		0.00	
CY	-1.00		z		z		0.00		0.12		-0.02		0.02	
LV	-1.00		z		z		0.02		-0.14		0.08		-0.06	
LT	z		z		0.22		0.08		0.12		0.17		0.07	
LU	-0.06		0.20		0.20		0.05		0.11		-0.01		-0.01	
HU	0.05		0.11		0.06		-0.04		-0.01		0.03		0.00	
MT	-0.11		z		z		0.20		0.17		0.04		0.07	
NL	0.00		0.00		0.03		0.02		0.03		-0.02		0.00	
AT	0.00		0.09		0.06		0.03		0.03		0.01		0.03	
PL	0.14		0.17		0.10		0.12		0.12		0.12		0.12	
PT	0.00		0.12		0.11		0.09		0.08		0.03		0.05	
RO	0.13		z		0.03		0.17		0.10		0.19		0.10	
SI	0.08		-0.13		-0.08		-0.04		-0.07		0.04		0.06	
SK	z		z		0.06		0.15		0.03		0.08		0.04	
FI	0.01		0.07		0.05		-0.01		0.02		-0.03		-0.01	
SE	-0.03		-0.01		0.01		0.00		0.02		-0.02		0.00	
UK	-0.01		0.04		0.02		0.01		0.01		-0.02		0.00	
IS	z		z		0.00		0.00		-0.01		0.07		-0.07	
NO	-0.03		0.11		0.05		-0.01		-0.01		-0.01		0.00	
CH	0.05		0.03		0.03		0.02		0.01		-0.02		0.01	
ME	z		z		z		z		z		z		z	
MK	z		z		z		-1.00		z		0.08		0.00	
AL	z		z		z		z		z		0.00		-1.00	
RS	0.08		z		z		0.17		0.22		0.07		0.15	
TR	0.11		0.18		0.28		0.15		0.14		0.11		0.10	
BA	z		z		z		z		z		0.03		-1.00	
GE	-1.00		-1.00		z		0.00		-0.07		0.00		-0.05	
AM	z		z		z		0.13		0.13		0.08		0.11	
MD	z		z		z		-1.00		0.00		0.17		-0.13	
TN	z		z		-1.00		0.05		0.11		-0.03		0.11	
IL	-0.01		-0.05		-0.03		-0.02		0.00		-0.01		0.01	
UA	0.17		z		0.00		0.03		-0.01		0.01		0.03	
AU	-0.06		-1.00		-0.03		-0.14		-0.02		-0.03		0.01	
BR	0.00		0.08		-0.07		-0.02		-0.01		-0.02		-0.03	
CA	0.01		0.06		0.05		-0.04		0.00		-0.02		0.01	
CN_X_HK	-0.04		-0.02		-0.05		-0.03		-0.03		-0.04		-0.03	
IN	0.03		0.26		0.10		0.11		0.16		0.07		0.14	
JP	0.00		z		z		z		0.13		0.00		0.07	
RU	0.03		0.14		0.15		0.06		0.09		0.09		0.09	
ZA	0.01		0.02		0.00		0.00		-0.01		-0.03		-0.03	
KR	0.07		0.17		-0.17		-0.01		0.02		0.03		-0.02	
US	-0.02		-0.05		-0.02		-0.04		-0.02		-0.01		0.01	

Notes: IPC sections: A = Human necessities; B = Performing operations & transporting; C = Chemistry & metallurgy; D = Textiles & paper; E = Fixed constructions; F = Mechanical engineering, lighting, heating, weapons & blasting; G = Physics; H = Electricity; CAGR: The compound annual growth rate of the proportion of women inventorships computed on four-year moving periods (e.g. 2006–2009, 2007–2010, 2008–2011, and so on); Trend: Shows the trend in the proportion of women inventorships using four-year moving periods (the scale is not the same across countries and IPC sections); z = Not applicable (no applications by male applicants therefore no calculation possible). ME, MK, AL, BA, GE, AM, MD have fewer than 100 patent applications in total during the 2006-2018 time period. Data not available for: FO.

Source: Computed by using European patent applications (kind codes A1 and A2) in PATSTAT

Figure 7.11 shows the results of a new indicator that looks at the average proportion of women among authorship teams resulting from collaboration between a corporate entity and any other entity (e.g. academic, governmental organisations, medical organisations such as hospitals) across all fields of R&D between 2015-2019. A value near 0.5 indicates that, on average, women and men were represented at equal proportions on authorship teams. A value above 0.5 indicates that, on average, women were more highly represented than men on teams, and a value below 0.5 indicates that, on average, men were more highly represented than women on teams.

This indicator builds on an indicator of the Innovation Union Scoreboard (2019) which considers public-private co-publications as a measure of Member States' overall innovation performance.

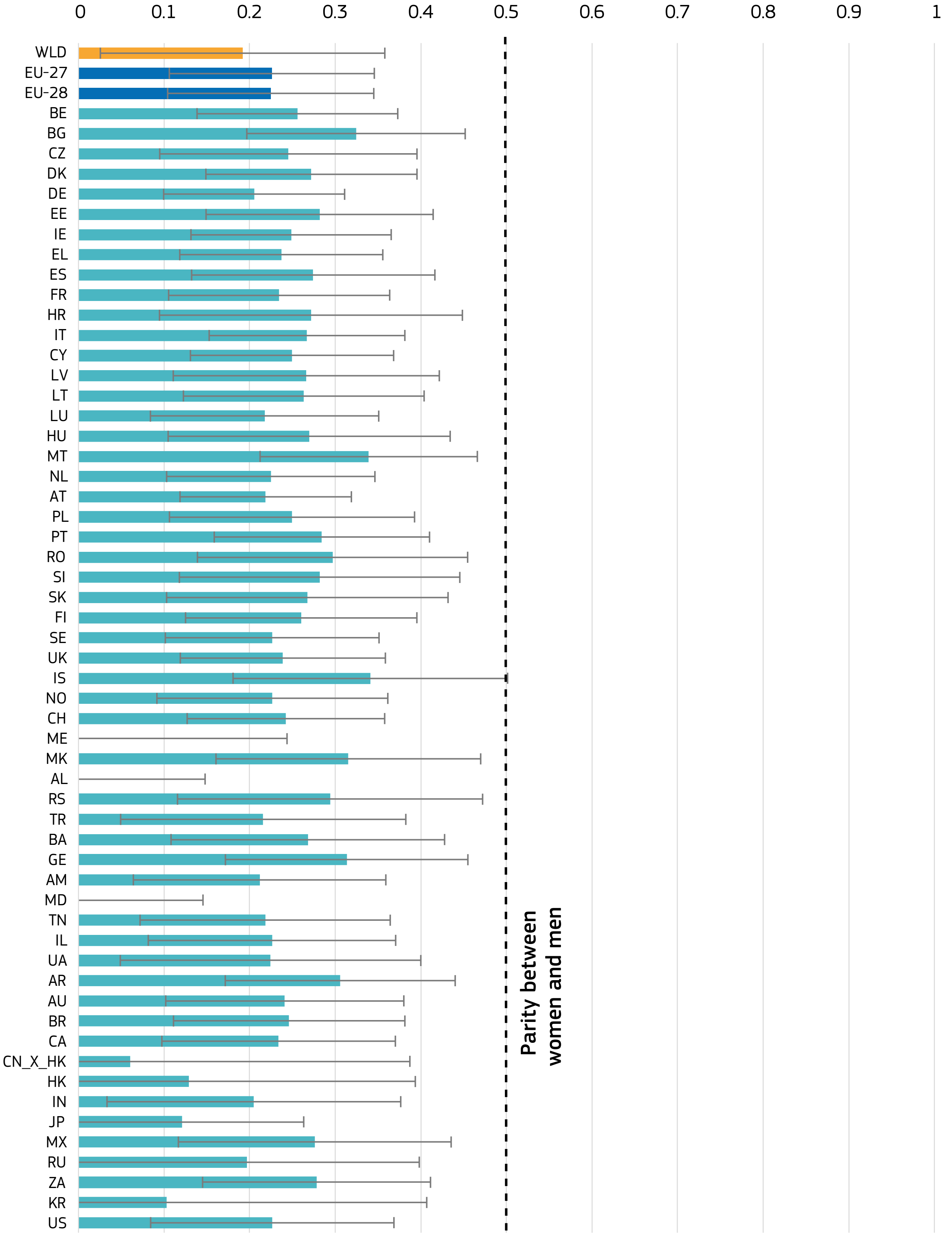
Fewer women than men were authors on academic-corporate collaboration teams.

The data show that, at European level, the proportion of women among authors on academic-corporate collaborations was 0.22, indicating that on average, women represent less than a quarter of authors on teams involved in academic-corporate collaboration.

Similarly, across all EU-27 Member States and Associated Countries, the proportion of women among authors on academic-corporate collaborations was less than 0.5. Although there was some variation, even when accounting for error in the values (captured by the error bars), all countries showed a proportion of women among authors of below 0.5. For nearly all countries, including the G-20 region, this value represented a slightly lower value than the proportion of women on teams involved in international collaboration (Figure 7.6). This suggests that the barriers to women's inclusion in corporate collaboration exceed those related to international collaboration.

While the European Commission (2020a) recognises diffusion of innovation through knowledge transfer and public-private cooperation as an area of improvement for the ERA, more attention is needed to ensure that there is more progress towards gender parity in research teams involved in such collaborations.

Figure 7.11 Average proportion of women among authors on publications that list, among the author affiliations, both a corporate entity and any other entity, in all fields of R&D, 2015-2019



Notes: Values represent the average proportion of women among authors on publications resulting from collaboration between a corporate entity and any other entity during the period 2015-2019; EU-27, EU-28 and world values are highlighted in the chart. The lower limit of the error bars corresponds to the value of the proportion if all authors whose gender could not be inferred were men, while the upper limit corresponds to the value of the proportion if all authors whose gender could not be inferred were women. The average proportion of authors to which a gender could be assigned varies. For EU-27, the average proportion of authors for whom gender could be inferred was 0.76, with the lowest value among EU-27 Member States being 0.64 for Croatia and the lowest value among all regions being 0.34 for China. For ME, AL and MD, the count of publications was less than 100. Data not available for: FO.

Source: Computed by Elsevier using Scopus data.

7.7 Differences in funding success rates for women and men

The previous sections have shown a persisting gender gap in both publication and innovation output in the EU. The Council of the EU (2020b) has invited Member States and funding organisations to advance measures to ensure that the allocation of research funding is not affected by gender bias. Gender differences in funded success rates stand in opposition to the ERA principle of excellence (European Commission, 2020a).

Differences in funding success rates for women and men can further exacerbate the gender gap in R&I output, as it may lead to a vicious cycle where lower funding leads to lower publication and innovation output, which further reduces the chances of being funded. The following indicators examine the extent of the differences in funding success rates for women and men.

In 2019, women were less likely to be successful in accessing funding than men.

Figure 7.12 presents the differences in the success rate of women and men applying for research funding in 2019. This funding success rate is calculated as the number of beneficiaries of a research grant over the number of applicants. Positive values indicate that the success rate for women was higher than the success rate for men.

At European level, the funding success rate was higher for men than women by 3.9 p.p., showing that gender differences persist in access to funding. Among the EU-27 Member States and Associated Countries, this funding difference in favour of men was seen in most countries with available data (19 of 28), with the largest difference found in Slovakia (7.7 p.p.). Conversely, in nine EU-27 Member States and Associated Countries (BE, BG, DK, LV, LU, MT, RO, SI, IS), the funding success rate was higher for women than men. Iceland had the largest difference in favour of women (10.6 p.p.), followed by Bulgaria (7.8 p.p.). Funding success rates were closer to gender parity (difference of -0.5 to 0.5 percentage points) for Germany (-0.2), Slovenia (0.4), Finland (0.0) and Sweden (-0.1).

There has been a push towards achieving gender balance in R&I through funding incentives and requirements. The European Research Area and Innovation Committee (ERAC SWG GRI, 2019) recommended that innovation policy and public funding for innovation should encourage gender balance from teams receiving funding. The European Commission has committed to ensuring gender balance in evaluation panels and advisory bodies in the Horizon Europe programme, with gender balance among researchers to be taken into account for equally ranked proposals (European Commission, 2021a)

Women were less likely to benefit when applying for research funds in all but two fields of R&D.

Table 7.13 presents the difference in research funding success between men and women across the different fields of R&D in 2019. At European level, in all fields of R&D except Agricultural Sciences and Humanities & Arts, women were less successful than men when applying for research funds. More specifically, the largest difference in favour of women was in Agricultural Sciences (0.8), while the largest difference in favour of men was in Natural Sciences (-2.5).

There was some variation at country level. The difference in funding success rate was in favour of women in eight of the EU-27 Member States and Associated Countries in Natural Sciences (BG, DK, LU, NL, RO, FI UK, NO), Medical Sciences (BG, DK, DE, IT, HU, RO, SI, IS), Agricultural Sciences (DK, EE, LV, HU, AT, RO, SE, TR) and Humanities & Arts (DK, EE, NL, AT, PL, SI, FI, NO). In more than half of the countries with available data Engineering & Technology (BG, DK, DE, LV, HU, AT, PT, RO, FI, SE, IS, NO, TR) and Social Sciences (BG, DK, EE, CY, LV, RO, SI, SE, UK, IS, CH, TR, IL), the difference in funding success rate was in favour of women. Box 32 provides an example of how gender bias in the allocation of funding has been addressed.

BOX 32 Using funding assessment criteria to support gender balance within research teams and the integration of the gender dimension in R&I content.

Since 2019 in **Sweden**, the Governmental Agency for Innovation Systems, VINNOVA, encourages applicants to aim for a gender-balanced team ensuring equal opportunities for power and influence within the proposed project. Where this is not achieved, applicants must comment on this in their application for funding, or mention, for example, how this may be achieved at a later stage in the project. Applicants are also obliged to consider whether and how a gender dimension may be applicable to the intended outcomes of proposed projects[6].

In **Switzerland**, the Swiss National Science Foundation launched the SPIRIT funding programme in 2019 to promote collaborative, international research, with a focus on promoting women scientists and gender-specific research questions. Specifically, one of the assessment criteria is the 'contribution towards raising gender awareness and promoting equal opportunities', and when applications are evaluated, where all other assessment criteria are equal, preference will be given to applications submitted by women or which show greater gender awareness. Applicants can request between 50,000 and 500,000 Swiss Francs over a 2-4 year period under this scheme[7].

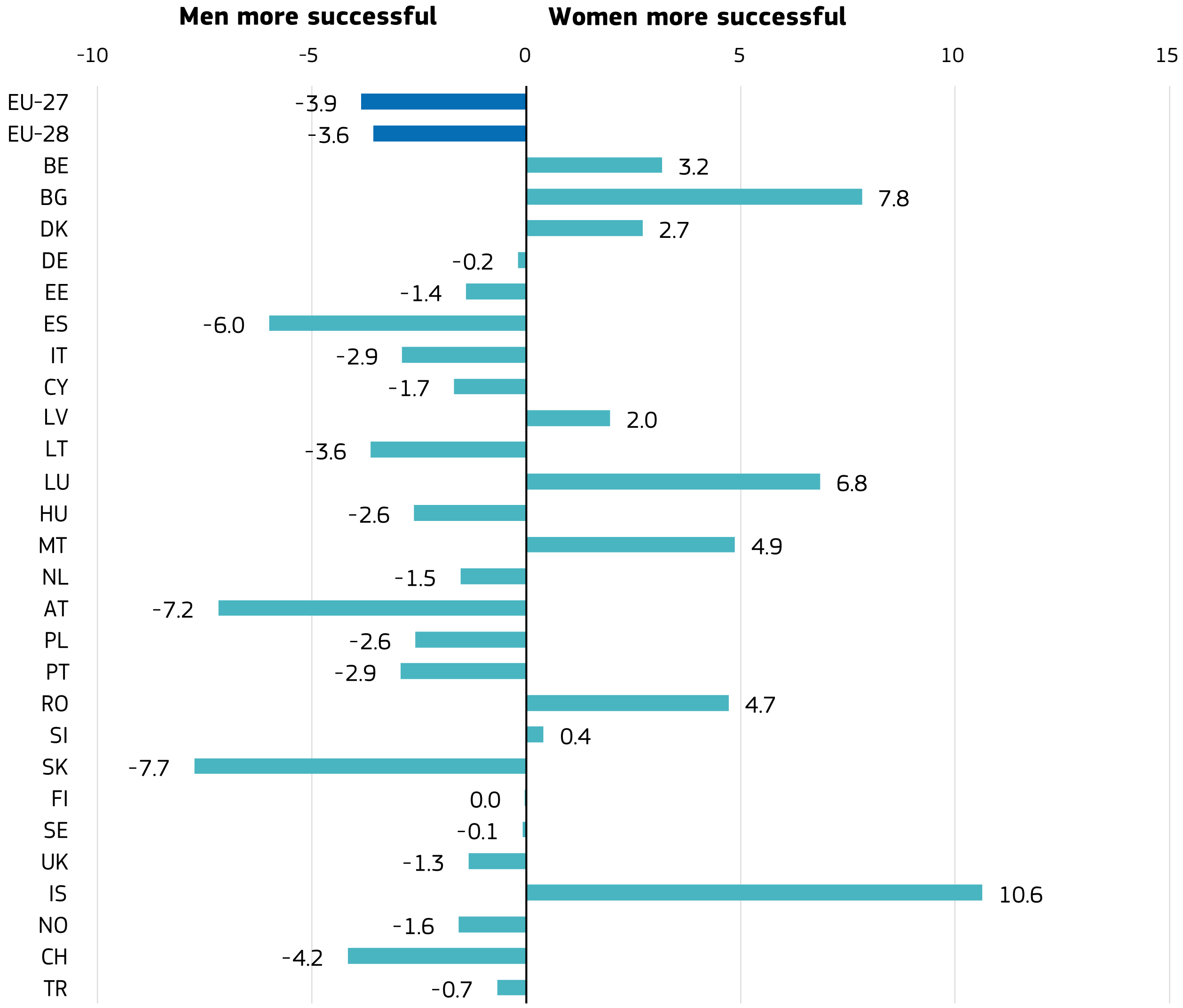
In **Ireland**, the Irish Research Council introduced a gender-blind grant assessment process in 2014. This has led to substantial increases in the proportion of women recipients of STEM postdoctoral programme awards, from 35% in 2013 to 44% in 2014 and 57% in 2017[8].

6 Vinnova, 'Equal funding of innovations', https://www.vinnova.se/en/m/equal-innovation/

7 Swiss National Science Foundation, SPIRIT – Swiss Programme for International Research by Scientific Investigation Teams, http://www.snf.ch/en/funding/programmes/spirit/Pages/default.aspx#Evaluation%20procedure%20and%20decision-making

8 Irish Research Council (2018) Gender Strategy & Actions, https://research.ie/assets/uploads/2018/08/04108-IRC-Gender-flyer-proof03-single.pdf

Figure 7.12 Research funding success rate differences between women and men, 2019



Notes: Exceptions to reference year: BG (2012), LU, UK (2016), ES, PT (2018), IT(2017;data of 2018 are provisional and partial); Data unavailable for: CZ, IE, EL, FR, HR, ME, MK, AL, RS, BA, GE, AM, FO, MD, TN, UA; 2018 WiS questionnaires used: LU, UK; Data for BE is the result of BE (FL) + BE (FR); Data for team leaders is not available for: BA, BG (only 2012), HR, CZ, IE; Data for applicants not available for: EL, FR. Other: break in time series: CH (2019); ES (2018); Values were calculated from headcounts and only from the institutes that provided both applicants and beneficiaries; positive values represent that success rate is higher for women while negative values that success rate is higher for men.

Source: Women in Science database, DG Research and Innovation - T3_questionnaires

Table 7.13 Research funding success rate differences between women and men, by field of R&D, 2019

Country	Natural sciences	Engineering and technology	Medical and health sciences	Agricultural and veterinary sciences	Social sciences	Humanities and the arts	Multi - disciplinary
EU-27	**-2.49**	**-0.29**	**-1.70**	**0.81**	**-2.18**	**0.04**	**:**
EU-28	**-2.40**	**-0.29**	**-1.70**	**0.81**	**-1.69**	**0.04**	**:**
BG	18.03	7.65	9.55	-2	0	-	:
DK	0.93	4.03	3.91	17.02	1.29	5.48	-26.67
DE	-1.09	0.64	0.83	-	-0.88	-	:
EE	-0.45	-2.61	-22.46	9.85	9.72	2.80	:
ES	-6.21	-5.59	-6.98	-5.04	-5.13	-3.90	-
IT	-4.39	-6.94	3.18	-9.03	-4.55	-3.42	-
CY	-2.61	-0.99	-20.59	-	7.83	-12.50	:
LV	-2.32	11.52	-5.84	4.02	8.01	-7.12	:
LU	22.13	-7.58	:	:	-1.33	-12.22	:
HU	-8.22	21.06	4.48	1.00	-4.13	-0.18	:
MT	-18.18	-	-33.33	-	-	-	0.00
NL	0.59	-8.14	0.00	:	-0.95	21.69	:
AT	-0.60	7.52	-0.69	3.57	-0.04	3.94	-
PL	-3.82	-2.07	-3.76	-2.92	-3.37	3.44	-
PT	-3.76	2.17	-4.58	-0.88	-3.09	-6.80	4.76
RO	3.76	4.24	5.34	8	2.15	-7	-
SI	-4.45	-2.15	9.39	-3.03	5.86	2.27	-1.41
SK	-11.26	-10.42	-6.96	-6.12	-0.64	-14.19	-
FI	0.81	0.54	-6.69	0.00	-0.04	6.62	:
SE	-0.07	7.33	-1.34	10.22	1.44	-0.20	-
UK	0.12	:	:	:	5.06	:	:
IS	-6.76	36.36	9.88	-	8.52	-2.86	-1.45
NO	5.24	3.03	-6.23	-2.60	-1.44	8.35	:
CH	-1.77	-16.67	-0.36	-25.00	0.02	-2.41	-4.25
TR	-5.43	1.67	-0.88	0.28	3.05	-10.77	-0.33
IL	-12.98	-30.83	-4.54	-	1.09	-6.12	-

Notes: Exceptions to reference year: BG – all available fields (2012), DE – AS, H (2013), NL – MS (2014), SI – MU (2015), ES – MU, LU – all, UK – NS, SS (2016), MT – ET, AS, SS, H, MU, NL – H, ES – NS, ET, MS, AS, SS, H, PT – all available fields (2018), IT – all available fields (2017 data used; data of 2018 are provisional and partial); Data unavailable for: BE, CZ, IE, EL, FR, HR, LT, ME, MK, AL, RS, BA, GE, AM, FO, MD, TN, UA; 2018 WiS questionnaires used: LU, UK; Data for BE is the result of BE (FL) + BE (FR); Data for team leaders leaders not available for: BA, BG (only 2012), HR, CZ, IE; Data for applicants not available for: EL, FR; No data available broken down by field: LT, BE (FL);

Other: break in time-series for: CH (2019); ES (2018); values were calculated from headcounts and only from the institutes that provided both applicants and beneficiaries; positive values represent that success rate is higher for women while negative values that success rate is higher for men. ":" denotes that data is not available or field of R&D is not applicable; "-" denotes zero denominator meaning zero applicants. For some countries (e.g. IS) the success rate for Women has been denoted with "-" and thus the difference of success rate between men and women has been also denoted with "-", although for men the rate exists;

Source: Women in Science database, DG Research and Innovation - T3_questionnaires

7.8 The integration of gender dimension in research and innovation content

The integration of the gender dimension in R&I content is emphasised in several policies and entails mainstreaming gender analysis throughout all stages of research process, from research questions and design, carrying out research, to its dissemination (Schiebinger, 2008; European Commission, 2013). The Council conclusions on the new ERA calls for a renewed focus on the integration of gender dimension in R&I content as part of Priority 4 for gender equality and gender mainstreaming (Council of the EU, 2020b). Most notably, the Strategic Plan 2021-2024 for Horizon Europe pledges that the integration of the gender dimension will be a default requirement in R&I content across the whole programme, unless its nonrelevance is duly justified (European Commission, 2021a). The proposal application forms for participation in Horizon Europe explicitly require applicants to describe how the gender dimension is considered in the project's content or to provide justification for why the gender dimension is not relevant to the proposed project[9].

The European Commission's (2020h) expert group on Gendered Innovations 2.0 developed tools for innovators to use in applying the gender perspective in their innovations, demonstrating how this will enhance the innovation processes and outcomes. More generally, the Gender Equality Strategy 2020-2025 emphasises the importance of a gender and intersectional perspective in all EU policies and processes (European Commission, 2020b). Taking into account these renewed policy commitments, the following indicators examine the extent of the integration of a gender dimension in publications and Horizon 2020 projects.

Fewer than 2% of publications included a gender dimension.

Assessing whether gender has been considered in research design and content is challenging in part because the bibliometric data available is limited to publication titles and abstracts. Therefore, as a proxy to identify research that considers both sexes, a query was developed to identify if the title or abstract either mentions women and men or explicitly references gender differences. Table 7.14 shows the proportion of countries' publications that have a gender dimension in their research content for 2015-2019, as well the growth over time between 2010 and 2019. At European level, a very small proportion (just under 2%) of publications included a gender dimension. This increased by just under 1 p.p. since 2010. As the trend line shows, while there have been some fluctuations in the proportion of publications with a gender dimension, there was only a very slight increase per year, with the highest percentage (1.83% and 1.88%) observed in 2018 and 2019 respectively.

At country level, for the EU-27 Member States and Associated Countries, the proportion of publications with a gender dimension ranged between 0.79% (UA) and 4.3% (BA), while the growth rate ranged between -4.9% (IS) and 17.7% (UA). In addition, 14 (of 42 EU-27 Member States and Associated Countries with available data) had a negative CAGR (CZ, DK, EL, HR, MT, PL, FI, IS, NO, RS, TR, BA, TN), compared to 27 countries with a positive CAGR (CAGR for MD could not be calculated because the percentage of publications in this category in 2010 was zero). In addition to the example shown in Box 31, Box 33 presents an example of an international project to encourage the inclusion of a gender dimension in research, as well as promoting gender equality in access to funding and within institutions.

9 https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/temp-form/af/af_he-ria-ia_en.pdf

BOX 33 Supporting the inclusion of a gender dimension and fostering gender equality in research

The Horizon-2020 funded **GENDER NET Plus ERA-NET Cofund**, which is coordinated by the National Centre for Scientific Research in **France** and includes participating organisations from **Austria, Belgium, Canada, Cyprus, Czechia, Estonia, France, Ireland, Israel, Italy, Norway, Spain** and **Sweden**, aims to promote the inclusion of gender analysis in research, as well as promoting institutional change and assessing gender differences and biases in access to funding. The programme was launched in 2017 and runs until 2022[10].

The EU-funded **GENDER STI** project is an international research project, aiming to solve problems associated with the integration of the gender perspective in science, technology and innovation (STI) dialogues with third countries. The project's focuses on gender balance in scientific careers, decision making, and the integration of integrating gender dimension in R&I content. Among others, its actions aim to map how gender equality is considered and promoted in STI in bilateral and multilateral agreements between EU Member States, Associated Countries and selected third countries, and form recommendations to improve the integration of gender equality objectives in STI dialogues between Europe and third countries[11].

The Horizon 2020-funded **Gender Equality in Engineering through Communication and Commitment (GEECCO)** aims to establish tailor-made Gender Equality Plans in four universities in Europe as well as implementing the gender dimension in two research funding organisations. The activities aim to contribute to achieving gender equality within the STEM field. Examples of activities undertaken include setting up change framework, GEPs and gender criteria, establishing self-reflective learning environments to address resistance to change, and evaluating GEP implementation The project will also lead to a guideline document for how research funding organisations and research performing organisations can promote gender equality in STEM fields[12].

Publications in Medical & Health Sciences were the most likely to contain a gender dimension, while publications in Engineering & Technology were least likely.

Table 7.15 presents this information disaggregated by field of R&D for 2010-2014 and 2015-2019. At the European level, publications in the field of Medical & Health Sciences were most likely to contain a gender dimension in both 2010-2014 and 2015-2019 (3.9% and 3.8% for each of the time periods). However this proportion decreased very slightly overtime (around 0.1 p.p.). The field of Social Sciences had the next largest proportion of publications with a gender dimension at around 3.0%, which remained stable between the two time periods. The fields with the lowest proportions of publications with a sex of gender dimension were Engineering & Technology (0.2% for both time periods), followed by Natural Sciences (0.8% for both time periods). For both fields, there was very slight increase when comparing 2010-2014 to 2015-2019 (no more than 0.06 p.p.).

These trends were generally reflected at country level for EU-27 Member States and Associated Countries. In all cases, Medical & Health sciences contained the greatest proportion of publications with a gender dimension in 2015-2019, ranging from 2.99% (IT) to 11.05% (ME). In 20 countries, more than 5% of publications in Medical & Health Sciences contained a gender dimension in 2015-2019 (EE, HR, CY, LV, LT, MT, PL, SK, FI, SE, IS, NO, ME, MK, AL, RS, TR, BA, GE, TN). Reflecting the EU-level trend, slightly over half of the EU-27 Member States and Associated Countries had a lower proportion of publications in this field with a gender dimension in 2015-2019 compared to 2010-2014 (23 out of 43; CZ, DK, DE, IE, ES, IT, CY, HU, NL, AT, PL, RO, SI, FI, SE, IS, NO, CH, AL, TR, BA, GE, TN).

Social Sciences tended to have the next highest proportion of publications with a gender dimension in 2015-2019, ranging between 0.49% (MD) and 6.4% (IS), followed by Agricultural & Veterinary Sciences (from 0.76% to 3.74%) and Humanities & Arts (from 0% to 5.29%). Social Sciences, Agricultural & Veterinary Sciences and Humanities & Arts saw a small increase in proportion in more than half of the EU-27 Member States and Associated Countries (25 for Social Sciences; 26 for Agricultural & Veterinary Sciences; 24 for Humanities & Arts) from 2010-2014 to 2015-2019.

10 ERA LEARN, GENDER NET Plus, https://www.era-learn.eu/network-information/networks/gender-net-plus
11 Gender STI, https://www.gender-sti.org/what-is-gender-sti/; https://cordis.europa.eu/project/id/872427
12 GEECCO, https://cordis.europa.eu/project/id/741128.

Similar to the trends at European level, Engineering & Technology had the smallest proportion of publications with a gender dimension, ranging from 0.05% (UA) to 1.48% (AL) in 2015-2019. For all but five EU-27 Member States and Associated Countries (HR, RO, MK, AL, BA), fewer than 0.5% of publications included a gender dimension in 2015-2019. The next lowest proportion of publications with a gender dimension in 2015-2019 was in Natural Sciences, with a range of 0.21% (AM) to 1.53% (IS). However, most countries saw a small increase in the proportion of publications with a gender dimension in Natural Sciences (32 of 43) and Engineering & Technology (34 of 43) compared to 2010-2014.

Table 7.14 Percentage of a country's publications with a gender dimension in their research and innovation content, 2015-2019, compound annual growth rate (%) and trend of the percentage, 2010-2019

Country	GDRIC	CAGR %	Trend
	2015-2019	2010-2019	2010-2019
WLD	1.66	0.47	
EU-27	**1.80**	**0.95**	
EU-28	**1.81**	**0.95**	
BE	1.76	3.59	
BG	1.79	2.12	
CZ	1.76	-0.88	
DK	2.42	-1.21	
DE	1.46	1.77	
EE	2.44	1.45	
IE	1.90	1.94	
EL	2.05	-1.36	
ES	2.17	2.61	
FR	1.30	1.56	
HR	3.03	-0.41	
IT	1.48	0.68	
CY	2.46	1.08	
LV	1.18	5.36	
LT	2.45	3.41	
LU	1.60	9.58	
HU	1.89	1.36	
MT	2.96	-3.88	
NL	2.09	0.17	
AT	1.87	0.64	
PL	2.03	-0.51	
PT	1.93	3.06	
RO	1.17	5.94	
SI	1.73	1.15	
SK	1.95	0.52	
FI	2.73	-1.78	
SE	3.20	-0.13	
UK	1.94	1.31	
IS	4.01	-4.88	
NO	2.96	-1.14	
CH	1.80	2.24	
ME	3.60	16.87	
MK	2.70	3.07	
AL	3.74	16.21	
RS	2.27	-0.20	
TR	3.71	-1.23	
BA	4.30	-4.72	
GE	2.54	11.14	
AM	0.94	12.04	
MD	1.13	-	
TN	1.65	-3.38	
IL	2.17	2.41	
UA	0.79	17.69	
AR	2.20	-0.64	
AU	2.18	0.91	
BR	2.22	-0.44	
CA	2.12	1.10	
CN_X_HK	0.70	2.36	
HK	1.31	-0.82	
IN	1.07	-1.26	
JP	1.66	1.48	
MX	2.45	1.04	
RU	1.00	8.83	
ZA	2.95	0.55	
KR	1.64	2.72	
US	2.06	1.74	

Notes: The height of the bars in the trend column indicates relative annual values for the percentage of a country's publications with a gender dimension in their research and innovation content; scaling is not the same across countries. "-" indicates that the value at the beginning of the period was unavailable for CAGR calculations because the number of publications at the beginning was zero. Data not available for: FO.

Source: Computed by Elsevier using Scopus data.

Table 7.15 Percentage of a country's publications with a gender dimension in their research and innovation content, by field of R&D, 2010-2014 and 2015-2019

Country	Natural Sciences		Engineering and technology		Medical and health sciences	
	2010-2014	2015-2019	2010-2014	2015-2019	2010-2014	2015-2019
WLD	0,72	0,72	0,14	0,18	3,62	3,63
EU-27	**0,76**	**0,80**	**0,15**	**0,21**	**3,88**	**3,76**
EU-28	**0,78**	**0,80**	**0,16**	**0,21**	**3,77**	**3,69**
BE	0,80	0,92	0,11	0,22	2,97	3,14
BG	0,78	0,88	0,37	0,34	4,57	4,82
CZ	0,89	0,99	0,12	0,16	4,99	4,45
DK	1,22	1,19	0,17	0,26	4,98	4,53
DE	0,61	0,66	0,13	0,14	3,10	3,08
EE	1,03	1,11	0,09	0,23	7,02	7,24
IE	0,65	0,78	0,23	0,30	3,49	3,34
EL	0,80	0,84	0,26	0,22	4,65	4,65
ES	0,79	0,87	0,13	0,22	4,09	4,02
FR	0,61	0,62	0,10	0,16	2,99	3,05
HR	0,97	1,04	0,44	0,59	5,68	6,17
IT	0,69	0,69	0,13	0,17	3,16	2,99
CY	0,60	1,15	0,27	0,40	6,97	5,06
LV	0,49	0,38	0,11	0,13	3,75	5,22
LT	0,65	1,04	0,23	0,45	6,98	7,61
LU	0,31	0,42	0,00	0,08	4,13	4,43
HU	0,83	0,94	0,18	0,20	4,43	4,05
MT	1,64	1,34	0,00	0,28	4,97	5,72
NL	1,03	1,07	0,14	0,24	3,58	3,36
AT	0,90	0,95	0,24	0,19	4,10	3,91
PL	0,88	0,92	0,12	0,24	6,22	5,73
PT	0,64	0,80	0,14	0,20	4,08	4,11
RO	0,39	0,64	0,20	0,51	3,43	3,39
SI	0,78	0,83	0,24	0,14	4,65	4,15
SK	0,80	0,92	0,14	0,18	5,60	6,19
FI	1,45	1,15	0,25	0,25	7,19	6,56
SE	1,43	1,34	0,30	0,31	6,87	6,23
UK	0,98	0,93	0,18	0,20	3,41	3,49
IS	2,30	1,53	0,10	0,35	9,84	8,41
NO	1,33	1,16	0,16	0,24	7,33	6,24
CH	0,79	0,89	0,18	0,16	3,29	3,28
ME	0,94	1,44	0,00	0,32	7,78	11,05
MK	0,66	0,41	0,00	0,57	6,47	6,72
AL	0,58	1,27	0,00	1,48	8,03	7,49
RS	0,76	0,85	0,24	0,23	5,51	5,66
TR	1,38	1,12	0,37	0,37	7,63	7,13
BA	0,82	0,94	0,57	0,51	11,25	8,59
GE	0,38	0,80	0,14	0,18	6,00	5,83
AM	0,14	0,21	0,00	0,08	4,37	4,42
MD	0,06	0,36	0,00	0,18	1,28	4,39
TN	0,77	0,53	0,08	0,15	6,17	5,92
IL	0,71	0,77	0,28	0,23	3,85	4,05
UA	0,21	0,26	0,01	0,05	2,15	4,30
AR	1,75	1,52	0,17	0,17	3,75	3,70
AU	1,15	1,15	0,23	0,25	3,79	3,72
BR	1,24	1,24	0,17	0,21	4,14	4,18
CA	1,00	1,05	0,16	0,20	3,67	3,72
CN_X_HK	0,32	0,36	0,07	0,08	2,47	2,30
HK	0,46	0,46	0,10	0,12	4,00	3,44
IN	0,53	0,45	0,13	0,17	2,85	3,02
JP	0,70	0,79	0,12	0,15	3,56	3,67
MX	1,27	1,29	0,18	0,24	5,43	5,18
RU	0,32	0,39	0,02	0,08	3,50	4,67
ZA	1,58	1,54	0,20	0,28	5,59	5,93
KR	0,50	0,62	0,15	0,19	3,76	4,07
US	0,91	0,97	0,19	0,24	3,31	3,49

Country	Agricultural and veterinary sciences		Social sciences		Humanities and the arts	
	2010-2014	2015-2019	2010-2014	2015-2019	2010-2014	2015-2019
WLD	2,40	2,38	2,93	2,94	2,19	2,26
EU-27	**2,29**	**2,43**	**2,96**	**3,05**	**2,09**	**2,09**
EU-28	**2,42**	**2,49**	**2,92**	**2,99**	**2,17**	**2,18**
BE	2,08	2,37	2,29	2,83	1,54	1,82
BG	2,30	2,43	1,68	2,56	2,99	2,53
CZ	2,39	2,70	2,93	3,12	2,37	1,96
DK	2,42	2,72	2,57	2,51	1,84	2,14
DE	2,54	2,72	2,46	2,84	1,57	1,79
EE	2,64	2,53	3,58	3,17	2,97	2,44
IE	1,65	1,91	2,82	3,01	2,30	3,13
EL	1,59	2,09	2,89	2,44	2,90	2,13
ES	1,98	2,30	3,91	4,30	2,34	2,33
FR	2,28	2,20	2,14	2,19	1,48	1,55
HR	3,14	2,43	7,27	5,10	6,79	3,74
IT	1,84	1,93	2,24	2,23	1,26	1,47
CY	2,06	2,07	2,94	4,09	1,71	4,50
LV	1,67	0,78	0,99	1,91	2,29	1,45
LT	2,20	3,01	1,86	2,93	1,63	1,83
LU	0,27	1,98	2,09	2,79	2,30	2,29
HU	2,52	3,11	3,00	2,92	0,99	1,74
MT	5,31	2,73	1,61	2,72	1,92	0,95
NL	2,61	2,74	2,92	2,89	2,46	2,69
AT	3,51	3,26	3,34	3,04	2,74	2,24
PL	2,23	2,32	3,69	3,35	2,49	2,20
PT	1,92	2,25	3,50	3,76	2,55	2,98
RO	1,38	2,12	1,45	1,64	1,01	1,44
SI	2,84	1,90	2,73	2,49	2,49	2,05
SK	2,08	1,90	2,19	2,88	1,58	2,20
FI	4,07	3,06	4,43	3,66	3,63	3,31
SE	3,67	3,74	5,35	4,64	4,53	4,36
UK	3,42	3,03	2,84	2,81	2,44	2,52
IS	2,89	2,42	5,07	6,40	1,74	5,29
NO	3,25	2,96	4,37	4,13	2,91	2,84
CH	2,83	3,05	2,58	2,92	1,68	1,88
ME	3,86	3,19	2,31	4,33	2,08	2,89
MK	1,33	2,07	1,35	3,02	1,33	1,49
AL	1,75	1,99	2,85	4,81	2,95	4,71
RS	1,85	2,39	2,88	3,18	3,25	1,62
TR	3,02	2,85	5,20	5,03	3,27	3,83
BA	2,90	1,98	3,54	5,05	5,70	4,74
GE	2,29	3,33	4,79	4,10	0,84	1,39
AM	1,56	2,94	3,80	2,20	1,25	2,74
MD	0,00	0,76	0,74	0,49	0,00	0,00
TN	2,68	2,29	1,35	1,58	6,37	4,29
IL	2,16	2,24	3,86	4,30	2,03	3,07
UA	2,96	1,77	0,46	0,70	0,95	1,35
AR	3,73	3,29	2,82	3,33	0,84	1,42
AU	3,34	3,18	3,02	3,05	2,75	3,02
BR	2,30	2,38	3,18	2,83	1,79	2,10
CA	2,82	2,60	3,89	3,83	3,10	3,23
CN_X_HK	1,63	1,48	0,91	1,32	1,54	1,65
HK	2,35	2,70	2,63	2,42	2,71	2,29
IN	1,84	1,83	2,38	1,96	4,17	4,40
JP	2,61	3,14	3,00	3,14	2,00	1,72
MX	3,46	3,17	5,25	4,35	2,20	2,32
RU	1,99	2,44	1,76	2,12	1,38	1,58
ZA	3,94	3,98	4,21	3,78	3,86	3,60
KR	2,03	2,29	2,38	2,37	1,93	2,27
US	2,70	2,76	3,66	3,71	2,74	2,71

Data unavailable for: FO.

Source: Computed by Elsevier using Scopus data.

At country level, less than 10% of Horizon 2020 projects integrated a gender dimension.

Strengthening the integration of gender dimension into R&I content is one of the gender equality priorities set for Horizon Europe, the EU Framework Programme for R&I 2021-2027 (European Commission, 2021a). A new indicator aims to reveal the extent to which existing projects stemming from Horizon 2020 (the European Union's Framework Programme for R&I, 2014-2020) integrated a gender dimension as part of the project content.

To ensure consistency with the above indicator on the percentage of countries' publications integrating a gender dimension in research content, the same query was used, but for all available text fields (like summaries, titles, objectives, results etc.). Various files available from the EU Open Data Portal were used, linked by the project ID. However, only files containing report summaries, projects, publications and project deliverables were included in this process, therefore the calculated values may underestimate the correct values.

The data show that, at European level, 1.7% of all Horizon 2020 projects integrated a gender dimension (Figure 7.13). At country level, the percentage of projects that integrated a gender dimension was higher than the European level value in 19 EU-27 Member States and Associated Countries (ME, BA, GE, MD, MK, MT, SI, UA, TR, IE, EE, SK, IS, PT, BG, TN, SE, PL, UK). However, the values remained low ranging from 6.7% in Montenegro to 0% in Albania and Armenia. It is important to note that for Bosnia and Herzegovina, Georgia, Moldova, Montenegro, North Macedonia and Tunisia, the values were based on fewer than 100 Horizon 2020 projects in total. Considering the low shares of projects that integrated a gender dimension, Horizon Europe offers an opportunity for improvement as the integration of a gender dimension becomes a default requirement in R&I content across the whole programme (European Commission, 2021a).

An exploratory indicator has been developed to measure the integration of intersectional aspects in Horizon 2020 projects.

Exploratory analysis on integration of intersectionality:

An exploratory indicator analyses the text fields used for the indicator on the gender dimension of research content in Horizon 2020 projects and combines the results with search queries on intersectional aspects of research. Data produced for She Figures 2021 are an exploratory draft to give a starting point for discussions and further analysis in the future.

The bibliometric analysis is based on the strategy following the gender dimension of research content for Horizon 2020 projects. For each project, the projects were tagged based on available text fields (like abstracts, titles, objectives, results etc):

Horizon 2020 projects integrating a gender dimension were identified using the same approach as the indicator on gender dimension of research content in Horizon 2020 projects.

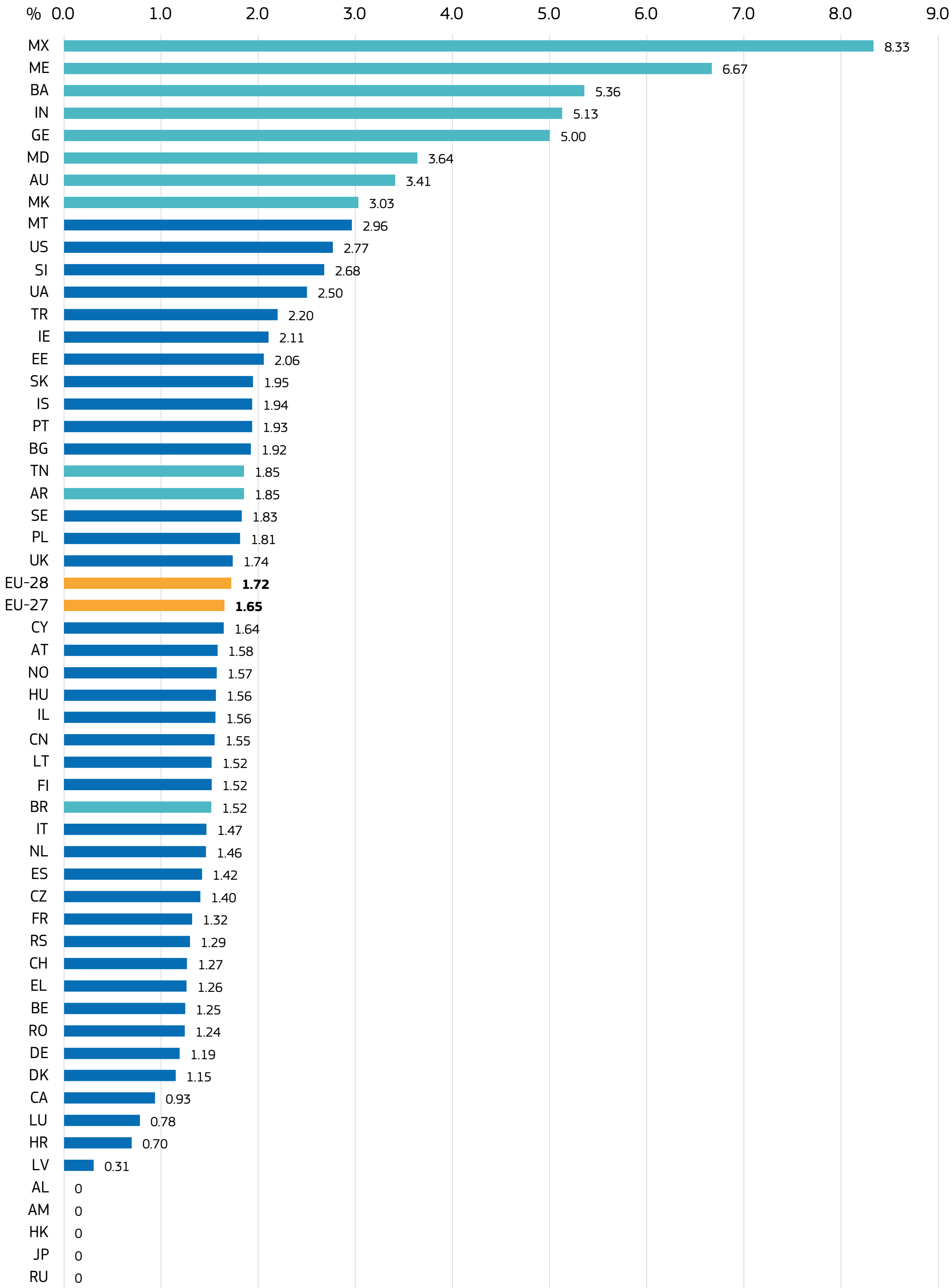
- The resulting Horizon 2020 projects were again queried, using a shortlist of keywords from the Gendered innovations 2 report (European Commission, 2020c). The keywords used for the queries were: 'intersectional*', 'disabilit*', 'ethnic', 'LGBT*', 'race' OR 'racis*', 'socio-economic', 'religion', 'belief', 'class', 'social origin', 'sexual orientation', 'vulnerable group' OR 'vulnerable population'
- This shortlist is not exhaustive and requires additional work, but serves as an entry point into addressing intersectional aspects in Horizon 2020 projects.

This indicator is relevant for the EU's wider objective to improve understandings of how gender intersects with other characteristics (such as age, disability status and ethnicity) to affect experiences of disadvantage and discrimination (European Commission, 2020b). The Gendered Innovations 2 report developed and highlighted a methodology for intersectional research, which was applied for this indicator (European Commission, 2020h).

The results of the exploratory analysis show that, at European level, only 0.19% of Horizon 2020 projects integrated an intersectional approach as defined by the search query for this indicator.

At country level, the highest percentage of projects that integrated an intersectional approach was observed in Turkey (0.47%) followed by Ireland (0.29%). However, in the majority of the EU-27 Member States and Associated Countries, no projects integrated an intersectional approach, although it should be borne in mind these values are based on very low numbers of identified projects. Specifically, in total, the exploratory analysis identified only 58 projects out of 30,084 projects including intersectional aspects.

Figure 7.13 Proportion (%) of Horizon 2020 projects integrating a gender dimension

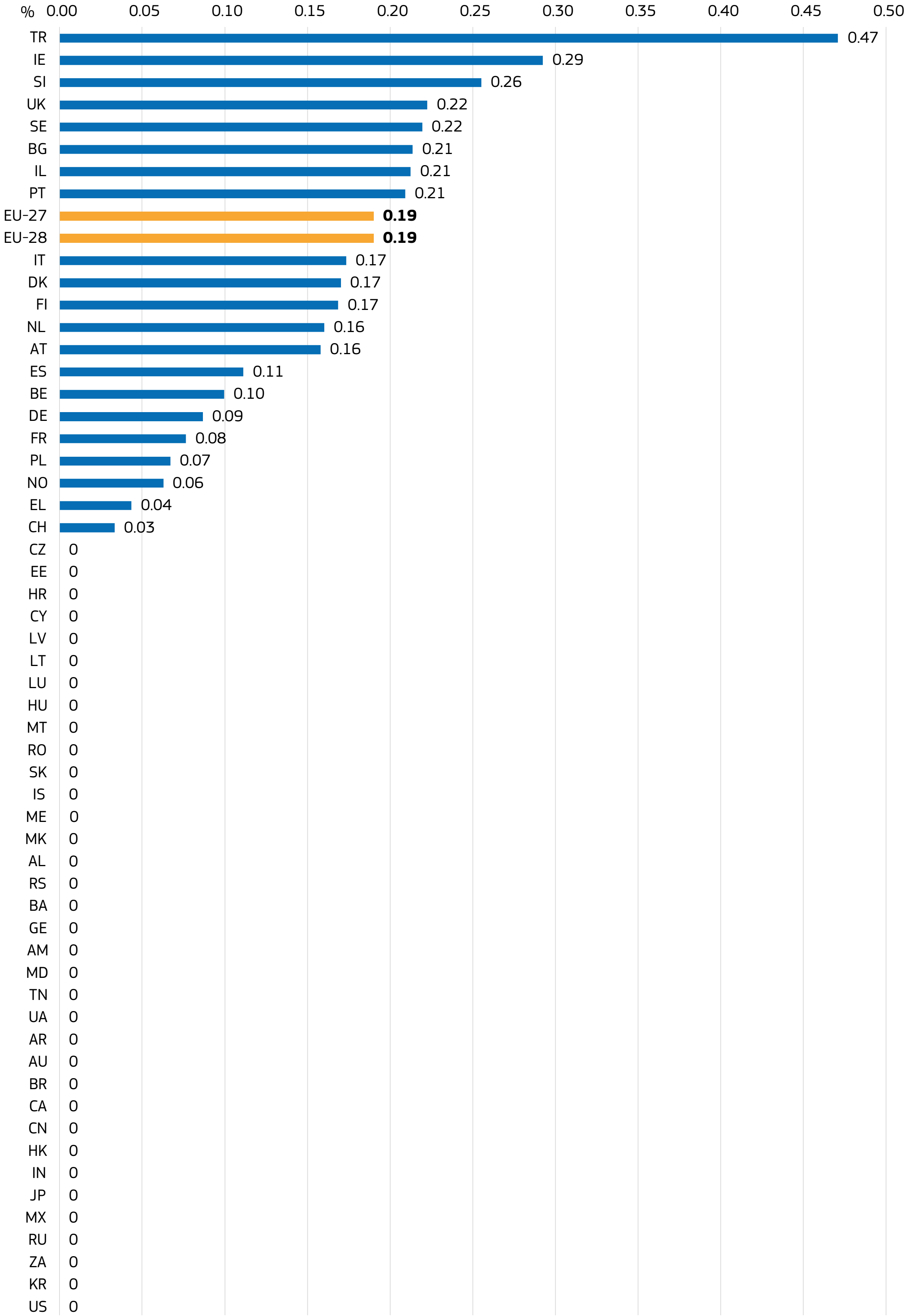


Notes: Data not available for: FO.

Other: Countries in light blue have less than 100 Horizon 2020 projects in total; the total share of Horizon 2020 projects integrating a gender dimension is indicated as EU-28 in purple; WLD value is not displayed as participation of associated and other countries in Horizon 2020 Framework Programme for R&I is limited to collaboration with EU-28 partners, and therefore WLD would have the same number of projects as EU-28.

Source: EU Open Data Portal: https://data.europa.eu/data/datasets/cordish2020projects?locale=en

Figure 7.14 Proportion (%) of Horizon 2020 projects integrating an intersectionality approach



Notes: Data not available for: FO.

Other: Countries in light blue have less than 100 Horizon 2020 projects in total; the total share of Horizon 2020 projects integrating intersectional aspects is indicated as EU-28 in purple. WLD value is not displayed as participation of associated and other countries in Horizon 2020 Framework Programme for R&I is limited to collaboration with EU-28 partners, and therefore WLD would have the same number of projects as EU-28.

Source: EU Open Data Portal: https://data.europa.eu/data/datasets/cordish2020projects?locale=en

7.9 Annex indicators

Annex 7.1 Ratio of women to men among active authors, by selected SDGs and seniority level, 2015-2019

Country	SDG 8			SDG 12		
	<5 years	5-10 years	>10 years	<5 years	5-10 years	>10 years
WLD	0.7	0.6	0.4	0.6	0.6	0.4
EU-27	**0.9**	**0.9**	**0.5**	**0.8**	**0.8**	**0.5**
EU-28	**0.9**	**0.8**	**0.5**	**0.8**	**0.7**	**0.5**
BE	1.1	0.8	0.3	0.8	0.7	0.3
BG	l	l	l	l	l	l
CZ	l	l	l	0.6	l	l
DK	1.0	l	0.4	0.7	l	0.5
DE	0.6	0.6	0.3	0.5	0.4	0.3
EE	l	l	l	l	l	l
IE	l	l	0.7	l	l	l
EL	l	l	0.4	1.0	0.9	0.4
ES	0.9	0.8	0.5	1.0	1.0	0.7
FR	0.8	0.6	0.4	0.5	0.6	0.5
HR	l	l	l	l	l	l
IT	1.0	1.1	0.5	1.1	1.0	0.7
CY	l	l	l	l	l	l
LV	l	l	l	l	l	l
LT	l	l	l	l	l	l
LU	l	l	l	l	l	l
HU	l	l	l	l	l	l
MT	l	l	l	l	l	l
NL	0.7	0.7	0.3	0.7	0.7	0.3
AT	0.8	l	0.4	0.6	0.5	0.3
PL	1.1	0.9	0.6	1.6	0.8	0.8
PT	0.7	0.9	0.8	0.9	0.9	0.9
RO	1.5	2.0	1.2	1.7	1.1	1.2
SI	l	l	l	l	l	l
SK	l	l	l	l	l	l
FI	l	l	0.6	0.9	1.1	0.4
SE	1.1	0.9	0.4	0.9	0.6	0.5
UK	0.6	0.7	0.5	0.6	0.7	0.4
IS	l	l	l	l	l	l
NO	l	l	0.4	l	l	0.3
CH	1.0	0.6	0.3	0.8	0.5	l
ME	l	l	l	l	l	l
MK	l	l	l	l	l	l
AL	l	l	l	l	l	l
RS	l	l	l	l	l	l
TR	l	l	0.4	l	0.7	0.4
BA	l	l	l	l	l	l
GE	l	l	l	l	l	l
AM	l	l	l	l	l	l
MD	l	l	l	l	l	l
TN	l	l	l	l	l	l
IL	l	l	l	l	l	l
UA	l	l	l	l	l	l
AR	l	l	l	l	l	1.3
AU	0.7	0.9	0.5	0.9	0.6	0.5
BR	0.6	0.6	0.3	0.8	0.8	0.5
CA	0.7	0.7	0.5	0.6	0.6	0.4
CN_X_HK	0.1	l	l	0.1	0.1	l
HK	l	l	l	l	l	l
IN	0.6	0.4	0.3	0.5	0.4	0.3
JP	l	l	0.2	0.3	l	0.1
MX	l	l	l	l	l	0.7
RU	2.0	1.0	0.4	1.6	l	l
ZA	0.6	0.4	0.4	0.7	l	0.4
KR	l	l	l	l	l	l
US	0.7	0.7	0.4	0.6	0.6	0.4

Notes: Data are based on the analysis of publications related to SDG 8 (Decent work and economic growth) and SDG 12 (Responsible consumption and production). Cells are colour coded relative to gender parity (defined mathematically as 1.0). Blue = More men than women; White = Parity; Orange = More women than men. Countries are listed in protocol order; world, EU-27 and EU-28 values are at the top. The average proportion of authors to which a gender could be assigned varies. For EU-27, the proportion of authors for whom gender could be inferred was 0.84, with the lowest value among EU-27 Member States being 0.59 for Croatia and the lowest value among all regions being 0.27 for China. l indicates that the count of women or men in the category was less than 30. Data not available for: FO.

Source: Computed by Elsevier using Scopus data.

Annex 7.2 Ratio of women to men among all authors, by field of R&D and selected SDGs and seniority level, 2015-2019

Country	Natural sciences			Engineering and technology			Medical and health sciences			Agricultural and veterinary sciences		
	<5 years	5-10 years	>10 years	<5 years	5-10 years	>10 years	<5 years	5-10 years	>10 years	<5 years	5-10 years	>10 years
WLD	0.4	0.5	0.4	0.3	0.3	0.2	0.9	0.9	0.6	0.8	0.7	0.5
EU-27	**0.7**	**0.7**	**0.5**	**0.5**	**0.4**	**0.3**	**1.4**	**1.3**	**0.7**	**1.2**	**1.2**	**0.7**
EU-28	**0.7**	**0.7**	**0.5**	**0.4**	**0.4**	**0.3**	**1.3**	**1.2**	**0.7**	**1.2**	**1.1**	**0.7**
BE	0.6	0.6	0.4	0.4	0.4	0.3	1.2	1.1	0.6	1.0	1.0	0.6
BG	0.9	1.1	0.9	0.7	0.9	0.8	1.5	1.6	1.3	1.2	1.1	1.0
CZ	0.7	0.6	0.4	0.4	0.4	0.2	1.4	1.2	0.6	1.1	1.0	0.5
DK	0.7	0.6	0.4	0.4	0.3	0.2	1.4	1.2	0.6	1.2	0.9	0.5
DE	0.6	0.5	0.3	0.3	0.3	0.2	1.2	1.0	0.4	1.2	1.0	0.5
EE	0.9	0.8	0.6	0.5	0.4	0.3	2.1	2.0	1.2	1.4	1.1	0.8
IE	0.6	0.6	0.4	0.4	0.4	0.3	1.4	1.2	0.7	1.1	1.1	0.6
EL	0.7	0.7	0.4	0.5	0.5	0.3	1.0	0.9	0.6	1.1	0.9	0.5
ES	0.8	0.9	0.6	0.5	0.6	0.4	1.4	1.5	0.9	1.1	1.3	0.8
FR	0.7	0.7	0.5	0.4	0.4	0.3	1.3	1.3	0.8	1.1	1.1	0.7
HR	1.0	0.9	0.6	0.6	0.6	0.3	1.8	1.5	0.8	1.5	1.3	0.9
IT	0.9	1.0	0.8	0.6	0.6	0.5	1.5	1.7	1.0	1.3	1.2	0.9
CY	0.7	0.5	0.3	0.6	0.5	0.2	1.3	1.0	0.5	1.0	l	0.7
LV	1.1	0.8	0.6	0.9	0.7	0.5	2.2	2.2	1.5	1.6	1.5	1.0
LT	0.9	0.6	0.4	0.8	0.6	0.3	1.7	1.3	0.8	1.6	0.9	0.6
LU	0.4	0.4	0.3	0.2	0.3	l	1.1	1.2	0.4	0.8	l	l
HU	0.7	0.7	0.4	0.4	0.4	0.3	1.0	1.2	0.7	0.9	0.8	0.5
MT	0.5	0.4	l	0.4	l	l	1.1	0.9	0.4	l	l	l
NL	0.6	0.6	0.3	0.3	0.3	0.2	1.3	1.2	0.6	1.0	1.0	0.4
AT	0.6	0.5	0.3	0.4	0.3	0.2	1.2	0.9	0.5	1.2	1.1	0.5
PL	1.1	0.9	0.6	0.8	0.6	0.4	2.0	1.7	1.1	1.8	1.6	1.0
PT	0.9	1.0	0.8	0.7	0.7	0.6	1.7	1.6	1.3	1.6	1.5	1.3
RO	1.0	1.1	0.8	0.9	1.0	0.7	1.6	1.6	1.2	1.2	1.3	1.0
SI	0.9	0.7	0.5	0.6	0.5	0.3	1.7	1.4	0.9	1.7	1.2	1.0
SK	0.8	0.7	0.4	0.5	0.5	0.3	1.7	1.6	0.9	1.3	0.9	0.6
FI	0.7	0.7	0.5	0.4	0.4	0.3	1.6	1.6	1.0	1.4	1.5	0.8
SE	0.6	0.6	0.4	0.4	0.4	0.3	1.3	1.3	0.8	1.1	1.2	0.7
UK	0.6	0.6	0.4	0.4	0.3	0.2	1.2	1.0	0.6	1.1	1.0	0.6
IS	0.7	0.7	0.4	0.5	l	l	1.4	1.2	0.7	1.0	l	0.5
NO	0.6	0.6	0.4	0.4	0.3	0.2	1.3	1.2	0.6	1.1	1.1	0.5
CH	0.6	0.5	0.3	0.3	0.3	0.2	1.1	0.9	0.5	1.1	1.0	0.5
ME	0.7	l	l	0.6	l	l	1.0	l	l	l	l	l
MK	1.1	0.8	0.7	1.2	0.6	0.6	1.9	1.7	1.4	1.8	0.7	l
AL	1.0	0.8	0.4	0.8	l	l	1.4	1.1	l	1.2	l	l
RS	0.8	0.8	0.7	0.6	0.5	0.5	1.3	1.2	0.9	1.1	1.0	1.0
TR	0.7	0.6	0.3	0.6	0.4	0.3	1.0	0.7	0.5	1.0	0.7	0.3
BA	0.7	0.6	0.4	0.6	0.3	0.3	1.6	0.9	0.8	1.1	l	l
GE	0.8	1.0	0.5	0.8	0.7	0.6	1.3	1.5	1.0	1.2	l	l
AM	0.5	0.6	0.4	0.4	l	0.4	1.0	1.5	0.9	0.9	l	l
MD	0.8	0.7	0.4	0.7	0.6	0.4	1.7	l	l	1.3	l	l
TN	1.0	0.8	0.3	0.9	0.7	0.2	1.1	1.1	0.6	1.3	0.9	0.5
IL	0.4	0.4	0.3	0.3	0.3	0.2	0.7	0.7	0.5	0.6	0.6	0.5
UA	0.8	0.6	0.4	0.7	0.6	0.4	1.5	1.2	1.0	1.0	1.0	0.7
AR	1.1	1.3	1.1	0.7	0.8	0.8	1.4	1.5	1.2	1.5	1.6	1.2
AU	0.6	0.6	0.4	0.4	0.3	0.2	1.3	1.3	0.8	1.0	0.9	0.5
BR	0.8	0.8	0.6	0.6	0.5	0.4	1.4	1.3	1.0	1.0	0.9	0.7
CA	0.6	0.5	0.4	0.4	0.3	0.2	1.3	1.1	0.8	1.1	1.0	0.5
CN_X_HK	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
HK	0.2	0.2	0.2	0.1	0.1	0.1	0.6	0.6	0.4	0.5	0.5	0.3
IN	0.5	0.4	0.3	0.5	0.4	0.2	0.7	0.5	0.4	0.6	0.5	0.3
JP	0.3	0.2	0.1	0.2	0.1	0.1	0.4	0.3	0.2	0.5	0.4	0.2
MX	0.7	0.6	0.5	0.5	0.5	0.4	0.9	0.9	0.8	0.8	0.6	0.5
RU	0.7	0.6	0.5	0.6	0.4	0.4	1.3	1.3	1.0	1.2	1.2	0.9
ZA	0.6	0.6	0.4	0.4	0.4	0.3	1.3	1.2	0.8	1.0	0.8	0.5
KR	0.2	0.1	0.1	0.1	0.1	0.0	0.2	0.1	0.1	0.2	0.2	0.1
US	0.6	0.5	0.3	0.3	0.3	0.2	1.1	0.9	0.6	1.0	0.9	0.5

Country	Social sciences			Humanities and the arts		
	<5 years	5-10 years	>10 years	<5 years	5-10 years	>10 years
WLD	0.9	0.9	0.6	1.0	0.8	0.6
EU-27	**1.1**	**0.9**	**0.6**	**1.0**	**0.9**	**0.5**
EU-28	**1.1**	**0.9**	**0.6**	**1.0**	**0.9**	**0.6**
BE	1.1	0.9	0.5	1.0	0.9	0.4
BG	1.3	1.4	1.0	1.4	0.7	l
CZ	0.9	0.7	0.5	1.0	0.6	0.4
DK	1.0	0.8	0.5	0.8	0.8	0.5
DE	0.9	0.7	0.4	0.9	0.7	0.4
EE	1.4	1.6	0.7	1.7	2.4	0.7
IE	1.3	1.2	0.7	1.2	1.0	0.7
EL	0.9	0.8	0.4	1.2	1.2	0.8
ES	1.0	0.9	0.6	0.8	0.7	0.6
FR	1.0	0.9	0.6	1.0	0.8	0.6
HR	1.5	1.3	0.8	1.0	0.9	0.6
IT	1.2	1.1	0.8	1.1	0.9	0.7
CY	1.0	1.0	0.4	1.6	l	l
LV	2.2	1.6	1.1	2.4	l	l
LT	2.0	1.1	0.7	1.6	0.7	l
LU	0.7	0.8	0.3	l	l	l
HU	0.8	0.8	0.5	0.7	0.7	0.5
MT	1.0	l	l	l	l	l
NL	1.1	1.0	0.5	1.0	1.0	0.4
AT	1.0	0.7	0.4	1.0	0.8	0.5
PL	1.3	1.1	0.7	1.2	1.2	0.7
PT	1.2	1.2	0.8	1.3	1.2	0.9
RO	1.3	1.2	0.9	1.3	1.0	0.7
SI	1.4	1.3	0.8	1.5	1.3	0.7
SK	1.0	0.9	0.6	1.1	1.1	0.4
FI	1.5	1.3	0.8	1.4	1.2	0.8
SE	1.2	1.0	0.6	1.1	1.0	0.6
UK	1.2	1.0	0.7	1.1	0.9	0.6
IS	1.6	0.9	0.8	1.4	l	l
NO	1.0	0.8	0.5	1.0	0.9	0.5
CH	0.9	0.8	0.4	0.9	0.8	0.5
ME	0.8	l	l	1.0	l	l
MK	1.4	1.1	l	1.0	l	l
AL	1.1	0.9	l	1.3	l	l
RS	1.0	0.8	0.5	1.1	0.9	l
TR	0.9	0.7	0.5	0.8	0.7	0.6
BA	0.9	0.6	l	0.7	l	l
GE	1.5	1.2	0.8	1.0	l	l
AM	0.5	l	l	l	l	l
MD	1.1	l	l	l	l	l
TN	1.1	0.7	0.3	0.7	l	l
IL	0.8	0.7	0.5	0.7	0.6	0.5
UA	1.3	1.0	0.5	1.5	l	l
AR	1.4	1.3	1.1	1.2	1.1	1.1
AU	1.4	1.3	0.8	1.5	1.2	0.8
BR	1.0	0.9	0.7	1.0	0.9	0.9
CA	1.4	1.2	0.8	1.2	1.1	0.7
CN_X_HK	0.1	0.1	0.1	0.1	0.1	0.1
HK	0.6	0.5	0.4	0.6	0.5	0.6
IN	0.6	0.5	0.4	0.7	0.7	0.8
JP	0.4	0.4	0.2	0.4	0.3	0.2
MX	0.9	0.8	0.6	0.8	0.7	0.6
RU	1.6	1.0	0.6	1.8	1.0	0.5
ZA	1.0	0.9	0.7	1.0	0.8	0.6
KR	0.3	0.2	0.1	0.3	0.2	l
US	1.3	1.1	0.7	1.1	1.0	0.6

Country	SDG 8			SDG 12		
	<5 years	5-10 years	>10 years	<5 years	5-10 years	>10 years
WLD	0.7	0.7	0.5	0.6	0.6	0.4
EU-27	**0.9**	**0.8**	**0.5**	**0.8**	**0.8**	**0.5**
EU-28	**0.9**	**0.8**	**0.5**	**0.8**	**0.7**	**0.5**
BE	0.9	0.7	0.4	0.6	0.8	0.4
BG	1.4	l	l	1.2	l	l
CZ	0.9	0.8	0.7	0.7	0.6	0.4
DK	0.9	1.0	0.4	0.8	0.9	0.5
DE	0.8	0.6	0.4	0.6	0.5	0.3
EE	1.0	l	l	l	l	l
IE	0.8	0.6	0.8	0.6	0.6	l
EL	0.8	0.8	0.5	0.9	0.8	0.5
ES	0.9	0.8	0.6	0.8	0.9	0.7
FR	0.8	0.7	0.4	0.7	0.6	0.5
HR	1.5	1.5	0.7	1.3	l	l
IT	1.0	1.0	0.6	1.0	0.9	0.7
CY	l	l	l	0.6	l	l
LV	2.4	l	l	1.4	0.9	l
LT	2.3	l	l	1.4	l	l
LU	l	l	l	l	l	l
HU	0.8	l	l	0.7	0.8	l
MT	l	l	l	l	l	l
NL	0.7	0.7	0.3	0.7	0.6	0.3
AT	0.7	0.6	0.4	0.6	0.5	0.3
PL	1.3	0.9	0.7	1.3	0.9	0.7
PT	1.1	1.0	0.9	1.0	0.9	1.0
RO	1.5	1.6	1.1	1.4	1.1	1.1
SI	1.4	l	l	1.0	l	l
SK	1.2	l	l	0.9	l	l
FI	1.2	1.3	0.7	1.1	1.1	0.5
SE	1.0	1.0	0.5	0.9	0.8	0.5
UK	0.8	0.8	0.5	0.7	0.7	0.4
IS	l	l	l	l	l	l
NO	0.8	0.8	0.4	0.8	0.5	0.4
CH	0.8	0.7	0.3	0.7	0.5	0.2
ME	l	l	l	l	l	l
MK	l	l	l	l	l	l
AL	l	l	l	l	l	l
RS	0.8	0.9	l	1.1	0.8	l
TR	0.7	0.6	0.5	0.9	0.8	0.5
BA	l	l	l	l	l	l
GE	l	l	l	l	l	l
AM	l	l	l	l	l	l
MD	l	l	l	l	l	l
TN	0.7	l	l	1.3	l	l
IL	0.5	l	l	0.7	l	l
UA	1.6	l	l	1.3	l	l
AR	1.1	1.3	1.0	1.4	2.1	1.6
AU	0.8	0.9	0.6	0.7	0.8	0.6
BR	0.9	0.8	0.5	0.9	0.8	0.6
CA	1.0	0.7	0.5	0.7	0.7	0.4
CN_X_HK	0.1	0.1	0.1	0.1	0.1	0.1
HK	0.4	l	l	0.3	l	l
IN	0.6	0.6	0.4	0.6	0.5	0.3
JP	0.4	0.3	0.2	0.3	0.1	0.1
MX	0.7	0.5	0.5	0.7	0.7	0.7
RU	1.7	1.0	0.5	1.5	0.8	0.5
ZA	0.8	0.5	0.4	0.9	0.6	0.4
KR	0.2	l	l	0.1	l	l
US	0.9	0.7	0.5	0.7	0.6	0.4

Notes: Data related to SDG 8 and SDG 12 are based on the analysis of publications related to SDG 8 (Decent work and economic growth) and SDG 12 (Responsible consumption and production). Cells are colour coded relative to gender parity (defined mathematically as 1.0). Blue = More men than women; White = Parity; Orange = More women than men. Countries are listed in protocol order; world, EU-27 and EU-28 values are at the top. The average proportion of authors to which a gender could be assigned varies. For EU-27, the proportion of authors for whom gender could be inferred was 0.86, with the lowest value among EU-27 Member States being 0.69 for Croatia and the lowest value among all regions being 0.27 for China. l indicates that the count of women or men in the category was less than 30. Data not available for: FO.

Source: Computed by Elsevier using Scopus data.

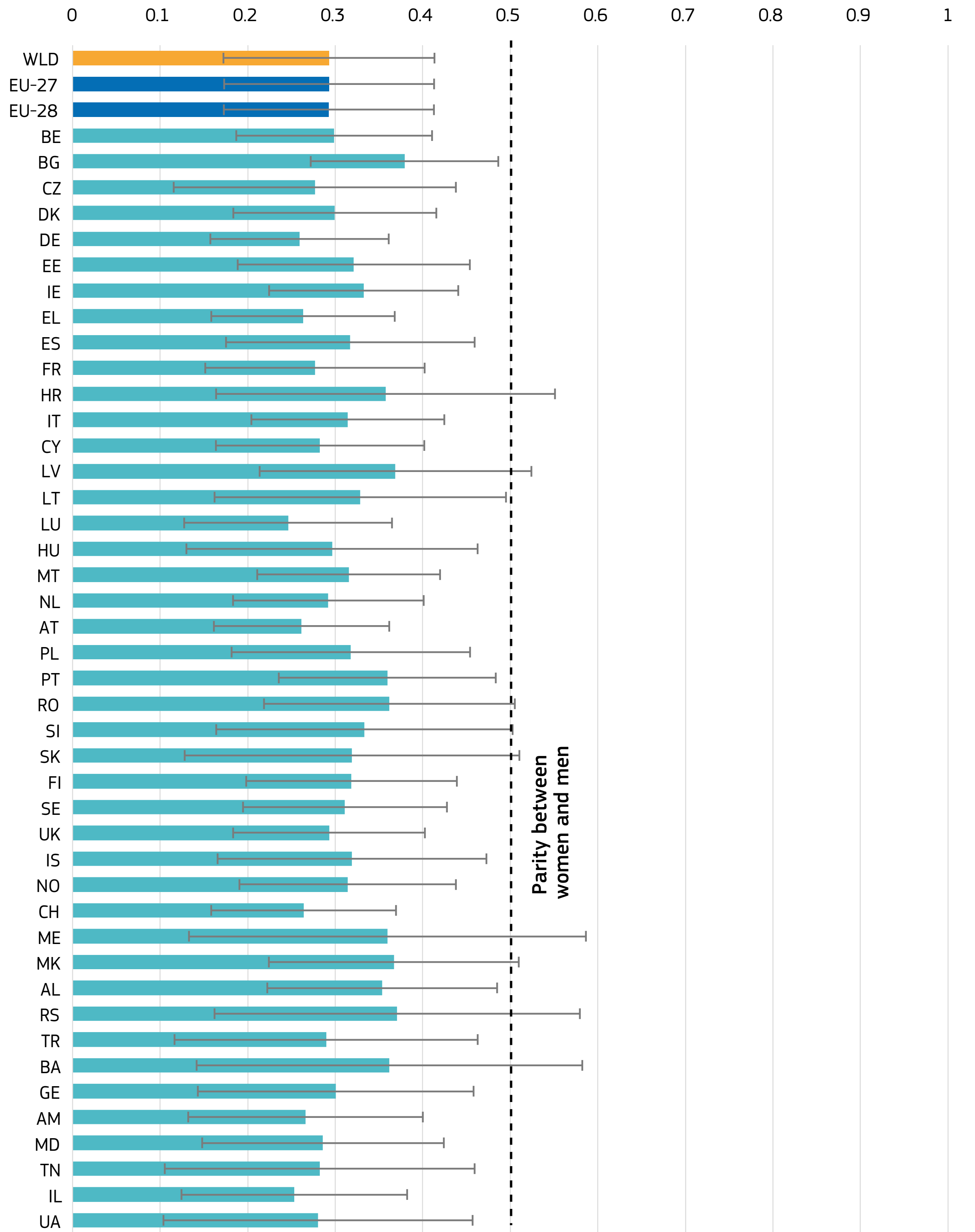
Annex 7.3 Average proportion of women among authors on publications, by selected SDGs, 2010-2014 and 2015-2019

Country	SDG 8		SDG 12	
	2010-2014	2015-2019	2010-2014	2015-2019
WLD	0.3	0.3	0.3	0.3
EU-27	**0.3**	**0.4**	**0.3**	**0.3**
EU-28	**0.3**	**0.4**	**0.3**	**0.3**
BE	0.3	0.3	0.2	0.3
BG	0.4	0.5	0.5	0.5
CZ	0.4	0.4	0.3	0.3
DK	0.3	0.3	0.3	0.3
DE	0.3	0.3	0.2	0.3
EE	0.4	0.4	0.3	0.3
IE	0.4	0.3	0.3	0.3
EL	0.3	0.3	0.3	0.3
ES	0.3	0.4	0.4	0.4
FR	0.3	0.3	0.3	0.3
HR	0.4	0.4	0.4	0.4
IT	0.3	0.4	0.4	0.4
CY	0.2	0.3	0.3	0.3
LV	0.6	0.7	0.5	0.5
LT	0.5	0.5	0.4	0.4
LU	p	0.3	0.3	0.3
HU	0.3	0.4	0.3	0.3
MT	p	p	p	p
NL	0.3	0.3	0.2	0.3
AT	0.2	0.3	0.2	0.3
PL	0.4	0.5	0.4	0.5
PT	0.4	0.4	0.4	0.4
RO	0.6	0.5	0.5	0.5
SI	0.4	0.4	0.4	0.4
SK	0.4	0.5	0.4	0.4
FI	0.4	0.4	0.3	0.3
SE	0.3	0.4	0.3	0.3
UK	0.3	0.3	0.3	0.3
IS	p	0.5	p	0.4
NO	0.3	0.3	0.3	0.3
CH	0.3	0.3	0.2	0.3
ME	p	p	p	p
MK	p	p	p	p
AL	p	p	p	p
RS	0.4	0.4	0.4	0.4
TR	0.3	0.3	0.4	0.3
BA	p	p	p	p
GE	p	p	p	p
AM	p	p	p	p
MD	p	p	p	p
TN	0.3	0.2	0.3	0.3
IL	0.3	0.3	0.2	0.3
UA	0.7	0.5	0.3	0.4
AR	0.4	0.4	0.5	0.5
AU	0.3	0.3	0.3	0.3
BR	0.4	0.4	0.4	0.4
CA	0.3	0.3	0.3	0.3
CN_X_HK	0.1	0.1	0.1	0.1
HK	0.2	0.2	0.2	0.1
IN	0.2	0.3	0.2	0.2
JP	0.1	0.2	0.1	0.1
MX	0.3	0.3	0.3	0.3
RU	0.4	0.5	0.3	0.5
ZA	0.3	0.3	0.3	0.3
KR	0.1	0.1	0.1	0.1
US	0.3	0.3	0.3	0.3

Notes: Data is based on the analysis of publications related to SDG 8 (Decent work and economic growth) and SDG 12 (Responsible consumption and production). Cells are colour coded relative to gender parity (defined mathematically as 0.50). Blue = More men than women; White = Parity; Orange = More women than men. The average proportion of authors to which a gender could be assigned varies. For EU-27, the average proportion of authors for whom gender could be inferred was 0.75, with the lowest value among EU-27 Member States being 0.61 for Croatia and Slovakia and the lowest value among all regions being 0.29 for China. p indicates that the count of publications in the category was less than 100. Data not available for: FO.

Source: Computed by Elsevier using Scopus data.

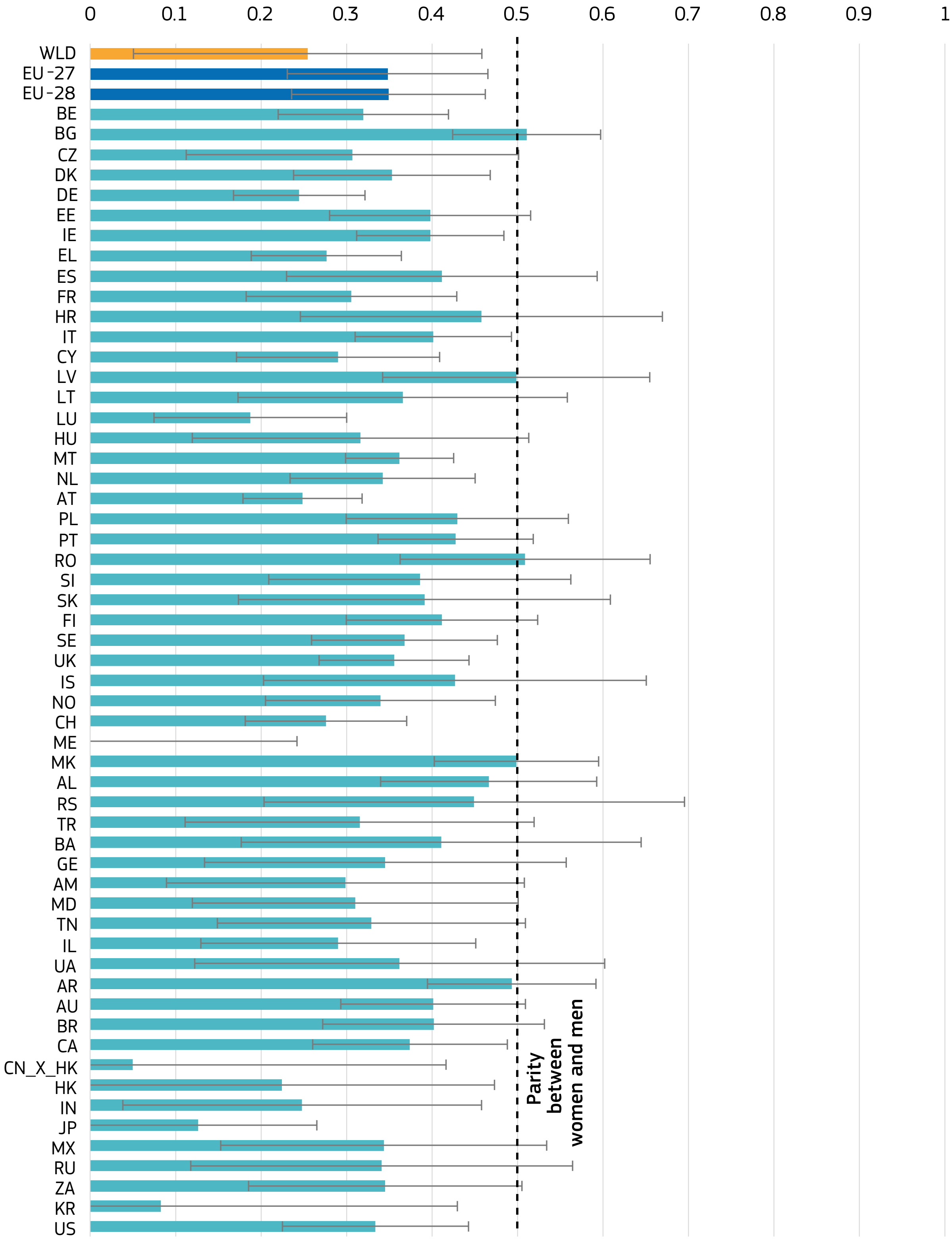
Annex 7.4 Average proportion of women among authors on publications resulting from intra-EU27+ collaboration in all fields of R&D, 2015-2019



Notes: Values represent the average proportion of women among authors on publications resulting from intra-EU27+ collaboration during the period 2015-2019; EU-27, EU-28 and world values are highlighted in the chart. Error bars represent +/- the average proportion of authors for whom gender could not be inferred. The average proportion of authors to which a gender could be assigned varies. For EU-27, the average proportion of authors for whom gender could be inferred was 0.76, with the lowest value among EU-27 Member States being 0.61 for Croatia and the lowest value among all regions being 0.58 for Serbia. Data not available for: FO.

Source: Computed by Elsevier using Scopus data.

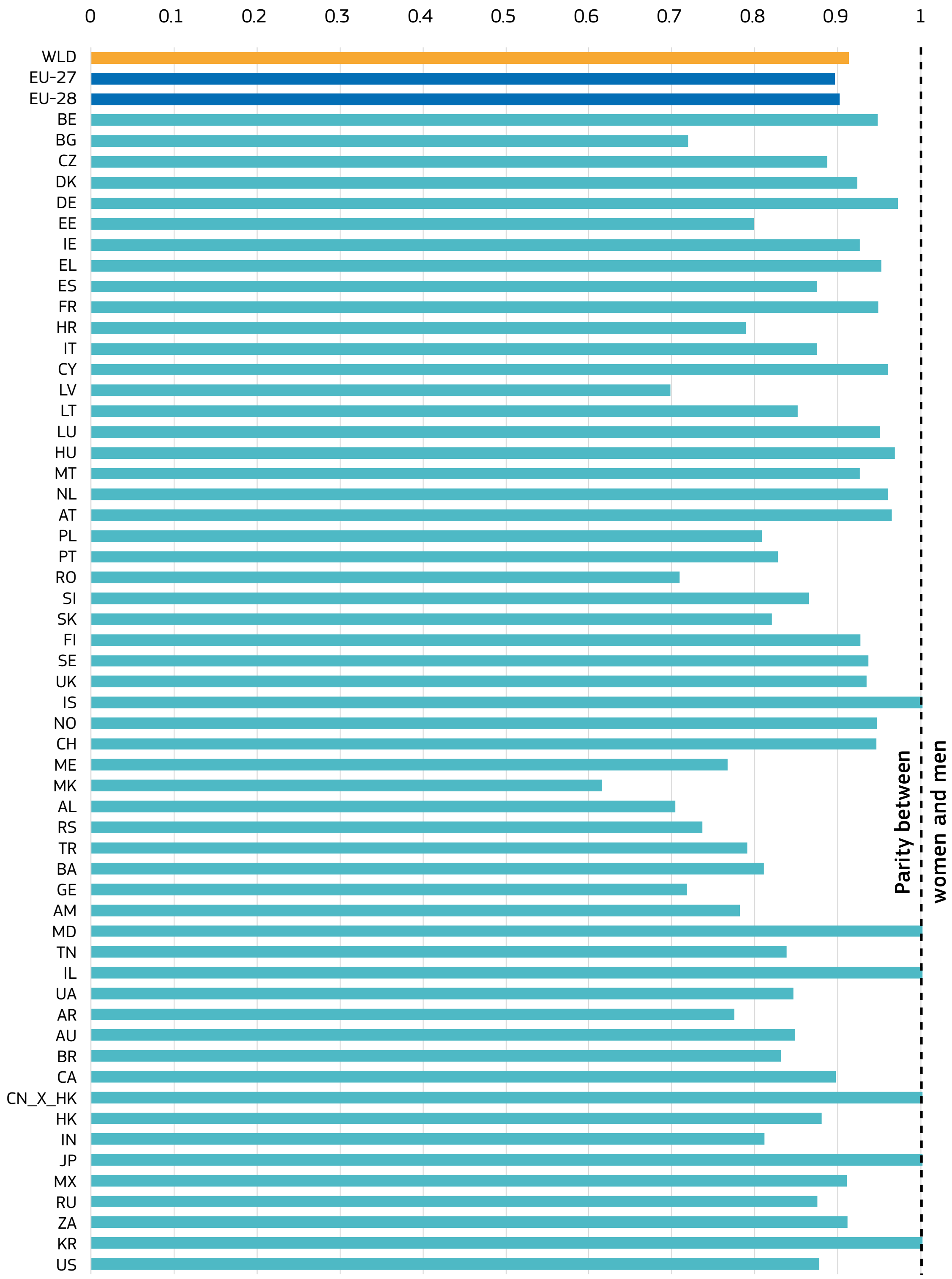
Annex 7.5 Average proportion of women among authors on publications resulting from national collaboration in all fields of R&D, 2015-2019



Notes: Values represent the average proportion of women among authors on publications resulting from national collaboration during the period 2015-2019; EU-27, EU-28 and world values are highlighted in the chart. Error bars represent +/- the average proportion of authors for whom gender could not be inferred. The average proportion of authors to which a gender could be assigned varies. For EU-27, the average proportion of authors for whom gender could be inferred was 0.77, with the lowest value among EU-27 Member States being 0.56 for Slovakia and the lowest value among all regions being 0.27 for China. For ME, the count of publications was less than 100. Data not available for: FO.

Source: Computed by Elsevier using Scopus data.

Annex 7.6 Ratio of FWCI for women to men based on fractional authorship on publications in all fields of R&D, 2019



Notes: Values represent the ratio for publications during the year 2019; EU-27, EU-28 and world values are highlighted in the chart. The average proportion of authors to which a gender could be assigned varies. For EU-27, the average proportion of authors for whom gender could be inferred was 0.75, with the lowest value among EU-27 Member States being 0.61 for Croatia and Slovakia and the lowest value among all countries being 0.29 for China. Data not available for: FO.

Source: Computed by Elsevier using Scopus data.

Annex 7.7 Ratio of FWCI for women to men based on fractional authorship on publications, by field of R&D, 2014 and 2019

Country	Natural sciences		Engineering and technology		Medical and health sciences		Agricultural and veterinary sciences		Social sciences		Humanities and the arts	
	2014	2019	2014	2019	2014	2019	2014	2019	2014	2019	2014	2019
WLD	0.9	0.9	1.0	0.9	1.0	1.0	1.0	1.0	0.9	0.9	1.0	0.9
EU-27	**0.9**	**0.9**	**0.9**	**0.9**	**0.9**	**0.9**	**1.0**	**0.9**	**0.9**	**0.9**	**0.9**	**0.9**
EU-28	**0.9**	**0.9**	**0.9**	**0.9**	**0.9**	**0.9**	**1.0**	**1.0**	**0.9**	**0.9**	**0.9**	**0.9**
BE	1.0	1.0	0.9	1.0	0.9	0.9	1.1	0.9	0.9	0.9	1.0	0.9
BG	0.7	0.8	0.7	0.9	0.5	0.6	0.8	0.9	0.6	1.1	p	1.2
CZ	0.9	0.9	0.9	0.9	0.8	0.8	0.9	0.8	0.8	0.8	0.8	1.1
DK	0.9	1.0	0.9	0.9	0.9	0.9	1.0	1.0	0.9	0.8	0.9	0.7
DE	0.9	1.0	0.9	0.9	1.0	0.9	1.0	0.9	0.9	0.9	1.0	0.8
EE	1.0	0.9	1.0	0.7	0.6	0.7	1.2	0.9	0.9	0.6	0.8	1.0
IE	1.0	1.0	1.0	0.9	0.9	0.8	1.0	0.9	0.9	0.9	1.4	1.4
EL	1.0	1.0	0.8	1.0	0.9	1.0	1.0	0.9	1.0	1.0	1.0	0.9
ES	0.9	0.9	0.9	0.9	0.8	0.8	1.0	1.0	0.9	0.9	0.9	0.9
FR	1.0	1.0	0.9	0.9	0.9	0.9	1.0	0.9	0.8	0.8	0.7	0.8
HR	0.8	0.9	0.8	0.9	0.8	0.7	0.9	1.0	0.9	0.7	1.0	0.8
IT	0.9	0.9	0.8	0.9	0.8	0.8	0.9	1.0	0.8	0.9	0.9	0.8
CY	0.9	1.1	0.8	1.1	0.7	0.9	p	1.3	0.8	0.9	0.7	0.8
LV	0.9	0.8	0.9	0.8	0.7	0.6	0.9	0.7	0.6	0.6	p	p
LT	0.9	1.0	0.9	1.0	0.9	0.8	1.0	0.9	0.8	0.6	1.7	0.6
LU	0.8	0.9	1.0	0.7	0.8	0.8	p	p	0.6	1.0	p	p
HU	0.9	0.9	1.0	0.9	0.8	1.0	0.9	1.0	0.9	0.9	0.9	0.9
MT	1.1	1.0	p	0.9	0.7	0.9	p	p	p	0.8	p	p
NL	1.0	1.0	1.0	1.0	0.9	0.9	1.0	0.9	0.9	0.9	0.9	1.0
AT	1.0	1.0	1.0	0.9	1.0	0.9	1.0	1.0	0.9	0.9	0.7	0.8
PL	0.8	0.9	0.9	0.9	0.7	0.7	1.0	0.9	0.6	0.8	0.8	0.8
PT	0.9	0.9	0.9	0.8	0.8	0.8	1.0	1.0	0.8	0.8	1.0	0.9
RO	0.7	0.7	0.8	0.8	0.6	0.7	0.9	0.8	0.8	0.9	0.9	0.8
SI	0.8	0.8	0.9	1.0	0.8	0.8	0.9	1.0	0.6	1.0	0.7	1.4
SK	0.8	0.8	0.8	0.8	0.7	0.6	0.9	0.8	0.7	0.8	0.6	1.0
FI	0.9	0.9	0.9	0.8	0.8	0.9	1.0	1.0	0.9	0.9	1.2	1.2
SE	1.0	1.0	0.9	0.9	0.8	0.8	1.0	0.9	0.9	0.9	1.0	0.9
UK	1.0	0.9	0.9	0.9	0.9	0.9	1.0	0.9	0.9	0.9	1.0	0.9
IS	0.9	1.1	0.5	1.1	0.7	0.9	1.2	1.0	0.9	1.2	p	p
NO	1.0	1.0	0.9	1.0	0.9	0.8	1.0	1.0	0.9	0.9	0.9	0.8
CH	1.0	1.0	1.0	1.0	1.0	0.9	1.0	1.0	0.8	0.9	0.8	0.9
ME	1.3	0.9	3.4	0.9	p	0.9	p	p	p	0.7	p	p
MK	0.9	0.5	0.9	0.6	0.4	0.7	p	p	p	0.6	p	p
AL	0.8	0.6	p	p	1.1	0.8	p	p	0.8	p	2.0	p
RS	0.8	0.8	0.8	0.8	0.6	0.7	1.0	0.8	1.0	0.8	1.6	1.0
TR	0.8	0.8	0.9	0.8	1.0	0.9	1.0	0.9	0.8	0.9	0.9	0.9
BA	1.1	0.8	1.6	0.9	0.8	0.8	p	1.0	p	1.0	p	p
GE	0.9	0.7	0.8	0.4	0.4	0.8	p	p	p	1.0	p	p
AM	0.9	0.8	0.7	0.7	1.3	0.7	p	p	p	p	p	p
MD	0.8	1.0	1.0	0.6	p	0.9	p	p	p	p	p	p
TN	1.0	0.9	0.9	0.9	0.7	0.8	1.0	0.8	0.7	0.9	p	p
IL	0.9	1.0	1.0	1.0	0.9	1.0	1.1	0.9	0.9	1.0	0.9	0.9
UA	0.8	0.9	0.9	1.0	0.5	0.5	0.7	0.7	0.4	0.9	0.6	0.4
AR	0.8	0.9	0.9	0.9	0.7	0.7	0.9	1.0	0.8	0.8	0.9	0.7
AU	0.9	0.8	0.8	0.8	0.9	0.9	1.0	0.9	1.0	0.9	1.1	0.8
BR	0.9	0.9	1.0	0.9	0.8	0.7	1.0	1.0	0.8	0.7	1.0	0.7
CA	0.9	0.9	0.9	0.8	0.9	0.8	1.0	0.9	0.9	0.9	1.0	0.8
CN_X_HK	1.1	1.0	1.1	1.0	1.3	1.1	1.1	1.1	1.2	1.0	1.5	0.9
HK	0.8	0.9	0.8	0.8	1.0	0.9	1.0	0.9	1.0	0.9	1.0	1.0
IN	0.9	0.8	0.9	0.8	0.9	0.9	1.0	0.9	0.9	0.8	0.8	0.8
JP	1.0	1.0	0.9	1.0	1.1	1.1	1.1	1.1	1.0	1.0	1.2	1.0
MX	1.0	0.9	1.0	0.9	0.8	0.9	1.1	1.0	0.9	0.9	1.0	1.7
RU	0.8	1.0	1.1	0.9	0.6	0.6	0.9	0.8	0.8	0.8	1.0	0.7
ZA	1.0	0.9	0.9	0.8	0.8	0.9	1.0	1.0	0.9	0.9	1.0	0.9
KR	1.1	1.0	1.1	1.1	1.3	1.2	1.2	1.0	1.2	1.1	1.1	0.8
US	0.9	0.9	0.9	0.8	0.9	0.9	1.0	0.9	0.9	0.9	1.0	0.8

Notes: Cells are colour coded relative to gender parity (defined mathematically as 1.0). Blue = Men contribute more to publications with a high FWCI; White = Parity; Orange = Women contribute more to publications with a high FWCI. The average proportion of authors to which a gender could be assigned varies. For EU-27, the average proportion of authors for whom gender could be inferred was 0.75, with the lowest value among EU-27 Member States being 0.61 for Croatia and Slovakia and the lowest value among all regions being 0.29 for China. p indicates that the count of publications in the category was less than 100. Data not available for: FO.

Source: Computed by Elsevier using Scopus data.

Annex 7.8 CAGR (%) of ratio of FWCI for women to men based on fractional authorship on publications, by field of R&D, 2010-2019

Country	All Fields		Natural sciences		Engineering and technology		Medical and health sciences		Agricultural and veterinary sciences		Social sciences		Humanities and the arts	
	CAGR	Trend	CAGR	Trend	CAGR	Trend	CAGR	Trend	CAGR	Trend	CAGR	Trend	CAGR	Trend
WLD	-0.82		-0.79		-1.51		-0.67		-0.65		-0.56		-1.34	
EU-27	**0.24**		**0.21**		**-0.09**		**-0.13**		**-0.08**		**0.56**		**0.70**	
EU-28	**0.08**		**0.08**		**-0.27**		**-0.23**		**-0.05**		**0.14**		**0.00**	
BE	0.47		0.52		1.07		-0.08		-0.78		0.95		-0.60	
BG	-0.09		0.20		1.07		-2.99		0.91		6.28		11.91	
CZ	0.83		0.27		-0.39		0.97		-1.71		-1.24		8.28	
DK	0.24		0.50		0.50		0.09		0.03		-2.11		-2.57	
DE	0.00		0.16		-0.42		-0.67		-0.46		-0.02		-0.79	
EE	-0.87		-0.71		-2.79		-1.32		0.49		-2.10		3.29	
IE	-0.31		-0.60		-2.38		-0.77		-0.48		0.67		3.63	
EL	0.41		0.42		0.89		0.15		-0.54		0.30		1.52	
ES	0.02		0.04		-0.24		-0.11		0.50		0.84		1.06	
FR	0.71		0.60		-0.47		0.41		-0.48		0.65		2.34	
HR	-0.58		0.52		1.90		-2.25		-0.39		-2.30		-1.62	
IT	0.25		0.29		-0.41		0.33		0.60		1.93		-0.34	
CY	0.42		1.86		2.78		-1.10		1.48		1.97		-4.72	
LV	1.11		-1.36		0.86		6.13		0.78		-1.35		-15.20	
LT	-1.48		0.22		0.85		-0.73		-2.04		-4.01		1.00	
LU	0.55		0.07		-2.38		-0.05		-3.86		4.14		9.83	
HU	1.41		0.71		0.97		2.90		-0.06		-0.45		-4.36	
MT	-1.40		-2.55		-3.06		-1.99		7.77		-0.17		-3.23	
NL	-0.25		-0.14		0.14		-0.54		-1.27		0.04		-1.72	
AT	0.19		0.03		0.28		-0.23		-0.19		1.12		2.58	
PL	0.81		0.34		0.22		0.35		-0.07		1.13		-2.49	
PT	-0.77		-0.81		-1.63		-0.70		-0.52		-0.32		-0.65	
RO	-0.89		-0.81		0.10		-0.06		0.94		-0.60		-0.74	
SI	0.13		-1.03		-1.72		-0.07		0.47		6.19		6.36	
SK	0.56		-0.57		0.06		-1.89		-2.97		0.20		2.25	
FI	0.33		0.24		0.58		0.46		0.01		-0.57		5.48	
SE	-0.02		0.09		-0.16		-0.34		-1.14		0.10		1.14	
UK	-0.31		-0.17		-0.55		-0.45		-0.44		-0.42		-1.52	
IS	-1.62		-2.89		-4.10		0.03		-1.44		5.88		6.58	
NO	-0.35		0.32		1.16		-1.10		-0.34		-0.56		-2.08	
CH	-0.33		0.15		0.40		-0.66		1.80		1.34		0.28	
ME	-2.02		-0.73		0.17		-5.15		-4.10		-6.72		-100.00	
MK	-2.76		-4.72		-3.03		-1.24		-7.89		5.32		-7.93	
AL	2.55		-2.52		19.37		7.41		-6.16		3.35		-24.64	
RS	-0.20		0.05		-1.89		-1.10		-2.65		-2.61		8.03	
TR	-1.22		-1.50		-2.17		-1.58		-2.01		0.95		1.60	
BA	-1.11		-2.72		-0.68		-1.89		5.57		-1.32		-2.10	
GE	-0.70		-2.52		-10.52		5.95		2.04		-0.87		-7.10	
AM	0.42		-0.03		-2.47		-1.30		-16.08		-4.84		13.52	
MD	4.66		3.87		-0.88		-0.81		8.42		-16.37		-	
TN	-0.58		-0.88		-0.46		0.13		-1.28		-4.67		5.21	
IL	0.79		0.87		0.06		-0.40		-1.79		1.12		-0.98	
UA	0.94		2.44		2.61		-6.13		-1.84		1.48		-11.35	
AR	-0.16		1.13		-0.57		-1.45		2.10		4.10		3.34	
AU	-1.41		-1.61		-3.21		-0.81		-0.43		-0.54		-2.43	
BR	-0.25		0.39		-0.63		-1.14		0.67		1.34		-0.51	
CA	-0.38		-0.26		-1.59		-0.28		-0.62		0.03		-1.59	
CN_X_HK	-0.46		-0.15		0.25		-1.26		-1.09		-1.59		-3.23	
HK	-0.10		-0.64		-0.36		-0.67		-5.00		1.35		3.92	
IN	-1.26		-0.92		-1.44		-1.00		-2.05		-1.61		-3.46	
JP	0.57		0.04		-0.33		0.69		-0.64		0.55		1.26	
MX	0.33		-0.63		-0.34		0.34		0.37		0.10		10.35	
RU	1.27		2.70		0.44		-3.86		1.28		3.47		-1.89	
ZA	-1.66		-1.52		-2.56		-0.65		-1.45		-1.61		-2.23	
KR	-1.96		-2.44		-0.86		0.23		-0.76		-0.41		-5.67	
US	-0.58		-0.55		-1.49		-0.56		-0.31		-0.41		-1.77	

Notes: The height of the bars in the trend column indicates relative annual values for ratio of FWCI for women to men based on fractional authorship, and scaling is not the same across countries or fields of R&D. “-” indicates that the value at the beginning or end of the period was unavailable for CAGR calculations because the value was zero. Data not available for: FO.

Source: Computed by Elsevier using Scopus data.

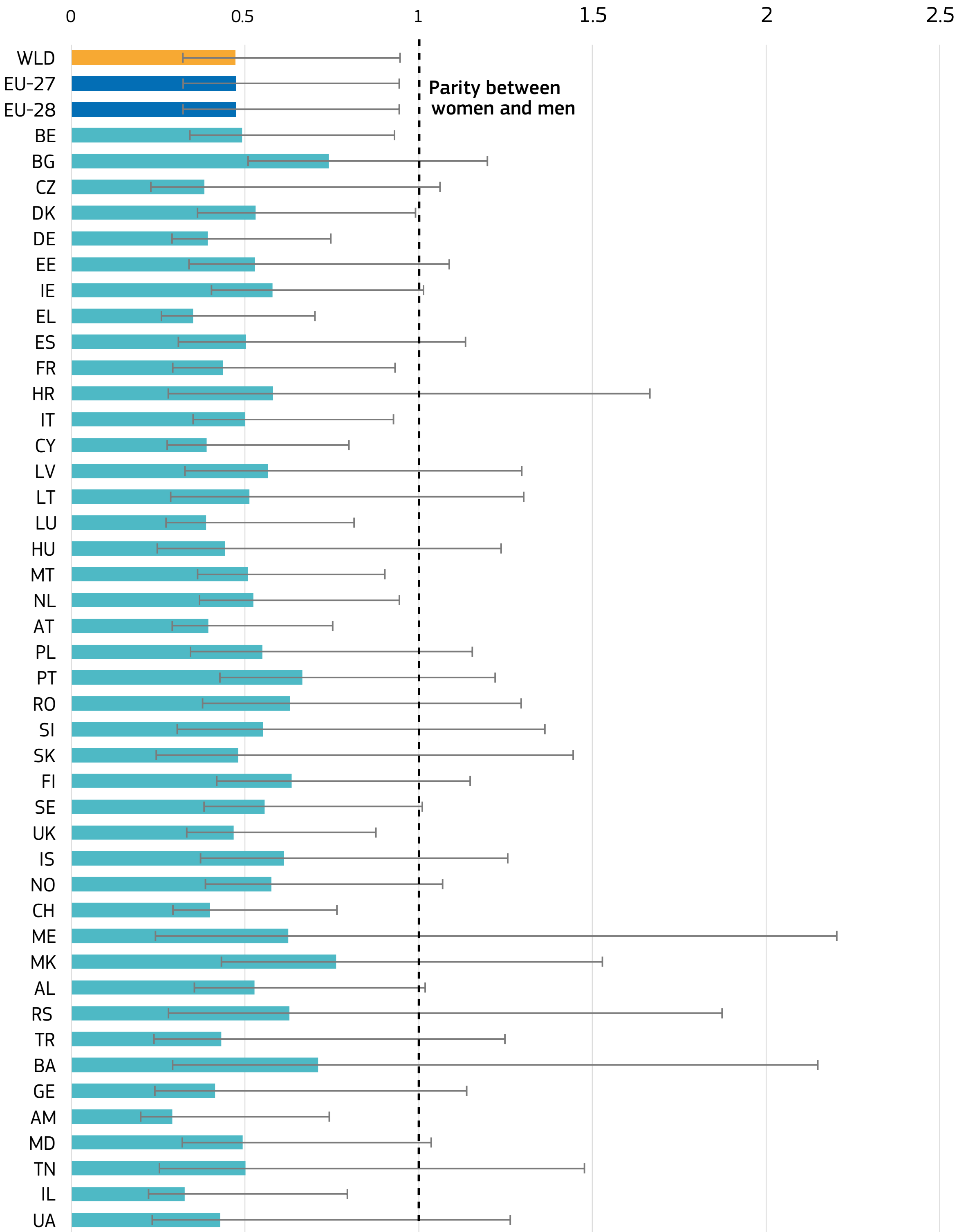
Annex 7.9 Ratio of publications for which a woman is corresponding author to those for which a man is corresponding author, by selected SDGs, 2010-2014 and 2015-2019

Country	SDG 8		SDG 12	
	2010-2014	2015-2019	2010-2014	2015-2019
WLD	0.4	0.5	0.4	0.5
EU-27	**0.5**	**0.6**	**0.5**	**0.6**
EU-28	**0.5**	**0.6**	**0.5**	**0.6**
BE	0.5	0.6	0.4	0.5
BG	p	1.1	0.9	1.1
CZ	0.8	0.7	0.3	0.4
DK	0.4	0.6	0.5	0.6
DE	0.4	0.4	0.3	0.4
EE	0.8	0.7	0.5	0.4
IE	0.6	0.6	0.5	0.6
EL	0.3	0.4	0.4	0.4
ES	0.5	0.6	0.6	0.6
FR	0.5	0.5	0.4	0.5
HR	0.8	0.7	0.8	0.7
IT	0.5	0.7	0.6	0.7
CY	0.3	0.2	0.2	0.3
LV	1.5	2.2	1.3	1.2
LT	1.1	0.7	0.7	0.6
LU	p	0.4	p	0.4
HU	0.5	0.6	0.5	0.5
MT	p	p	p	p
NL	0.4	0.5	0.4	0.5
AT	0.3	0.5	0.4	0.4
PL	0.9	1.1	0.9	1.0
PT	0.7	0.8	0.8	0.9
RO	1.4	1.2	1.2	1.1
SI	0.7	0.8	0.7	0.7
SK	0.9	0.8	0.4	0.7
FI	0.8	0.8	0.7	0.7
SE	0.6	0.6	0.5	0.6
UK	0.5	0.5	0.4	0.4
IS	p	1.1	p	0.9
NO	0.4	0.5	0.4	0.5
CH	0.4	0.5	0.3	0.5
ME	p	p	p	p
MK	p	p	p	p
AL	p	p	p	p
RS	0.7	0.7	0.8	0.9
TR	0.4	0.4	0.5	0.5
BA	p	p	p	p
GE	p	p	p	p
AM	p	p	p	p
MD	p	p	p	p
TN	0.3	0.3	0.3	0.6
IL	0.4	0.4	0.3	0.5
UA	p	1.1	p	0.8
AR	0.7	0.8	0.9	1.2
AU	0.5	0.5	0.5	0.5
BR	0.6	0.6	0.6	0.6
CA	0.5	0.5	0.4	0.4
CN_X_HK	0.1	0.1	0.1	0.1
HK	0.3	0.2	0.2	0.2
IN	0.4	0.4	0.3	0.3
JP	0.1	0.2	0.1	0.2
MX	0.6	0.4	0.4	0.5
RU	0.6	1.0	0.4	1.0
ZA	0.5	0.5	0.5	0.4
KR	0.1	0.1	0.1	0.1
US	0.4	0.5	0.4	0.4

Notes: Data is based on the analysis of publications related to SDG 8 (Decent work and economic growth) and SDG 12 (Responsible consumption and production). Cells are colour coded relative to gender parity (defined mathematically as 1.0). Blue = More men than women; White = Parity; Orange = More women than men. The average proportion of authors to which a gender could be assigned varies. For EU-27, the average proportion of corresponding authors for whom gender could be inferred was 0.75, with the lowest value among EU-27 Member States being 0.61 for Croatia and Slovakia and the lowest value among all regions being 0.29 for China. p indicates that count of publications in the category was less than 100. Data not available for: FO.

Source: Computed by Elsevier using Scopus data.

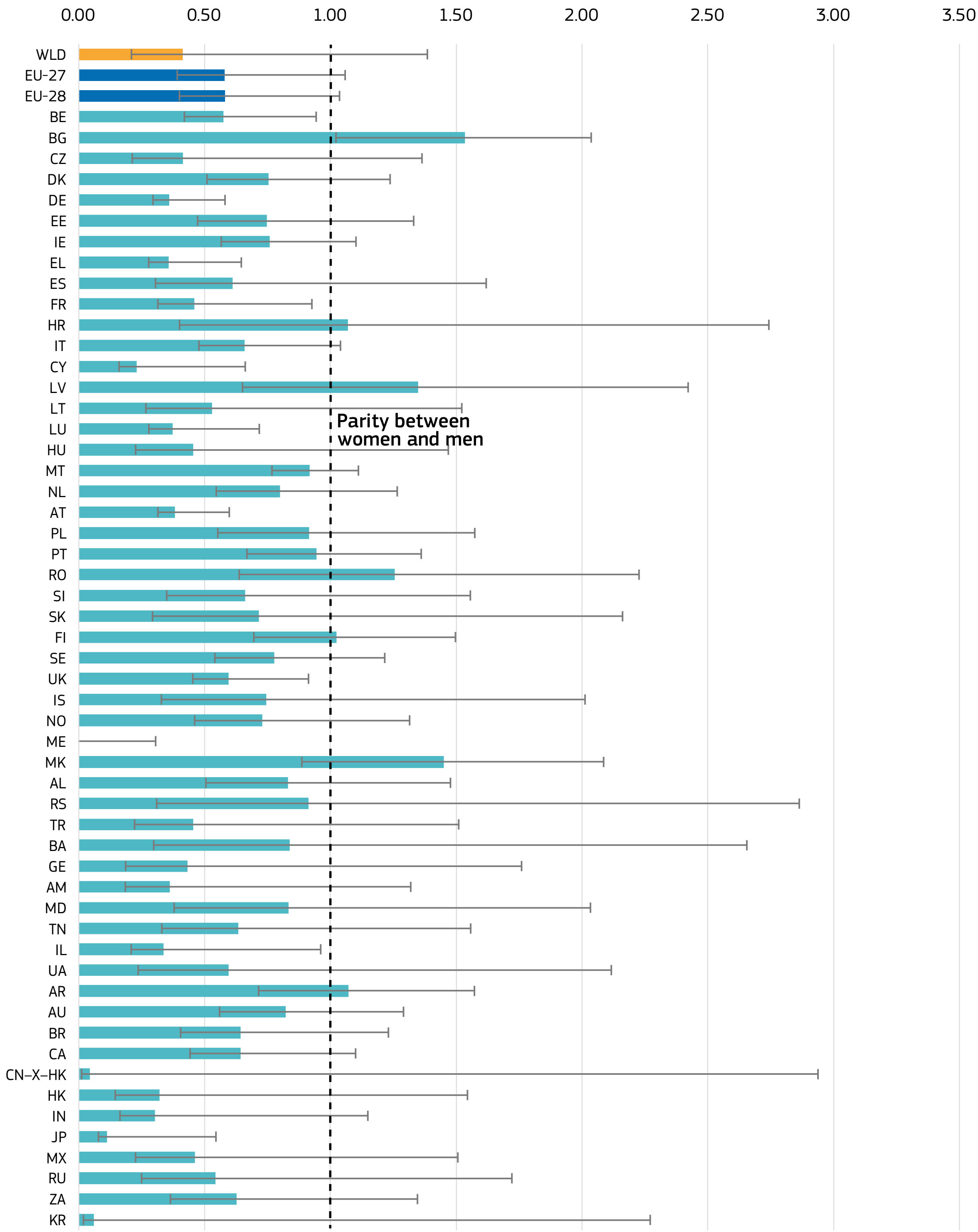
Annex 7.10 Ratio of publications for which a woman is corresponding author to those for which a man is corresponding author, by selected SDGs, 2010-2014 and 2015-2019



Notes: Values represent the ratio based on publications during the period 2015-2019; EU-27, EU-28 and world values are highlighted in the chart. The lower limit of the error bars corresponds to the value of the ratio if all authors whose gender could not be inferred were men, while the upper limit corresponds to the value of the ratio if all authors whose gender could not be inferred were women. The average proportion of authors to which a gender could be assigned varies. For EU-27, the proportion of corresponding authors for whom gender could be inferred was 0.76, with the lowest value among EU-27 Member States being 0.59 for Croatia and the lowest value among all regions being 0.51 for Montenegro. Data not available for: FO.

Source: Computed by Elsevier using Scopus data.

Annex 7.11 Ratio of publications resulting from intra-EU27+ collaboration for which a woman is corresponding author to those for which a man is corresponding author in all fields of R&D, 2015-2019



Notes: Values represent the ratio based on publications during the period 2015-2019; EU-27, EU-28 and world values are highlighted in the chart. The lower limit of the error bars corresponds to the value of the ratio if all authors whose gender could not be inferred were men, while the upper limit corresponds to the value of the ratio if all authors whose gender could not be inferred were women. The average proportion of authors to which a gender could be assigned varies. For EU-27, the proportion of corresponding authors for whom gender could be inferred was 0.76, with the lowest value among EU-27 Member States being 0.59 for Croatia and the lowest value among all regions being 0.51 for Montenegro. For ME, the count of publications was less than 100. Data not available for: FO.

Source: Computed by Elsevier using Scopus data.

Annex 7.12 Ratio of publications resulting from international collaboration for which a woman is corresponding author to those for which a man is corresponding author, by field of R&D, 2010-2014 and 2015-2019

Country	Natural sciences		Engineering and technology		Medical and health sciences	
	2010-2014	2015-2019	2010-2014	2015-2019	2010-2014	2015-2019
WLD	0.3	0.3	0.2	0.2	0.4	0.5
EU-27	**0.3**	**0.3**	**0.2**	**0.3**	**0.4**	**0.5**
EU-28	**0.3**	**0.3**	**0.2**	**0.3**	**0.5**	**0.5**
BE	0.3	0.4	0.2	0.3	0.5	0.5
BG	0.5	0.6	0.6	0.5	0.7	0.7
CZ	0.3	0.3	0.2	0.3	0.4	0.4
DK	0.3	0.4	0.2	0.2	0.5	0.6
DE	0.3	0.3	0.2	0.2	0.4	0.4
EE	0.4	0.4	0.3	0.2	0.8	0.7
IE	0.3	0.4	0.2	0.3	0.6	0.6
EL	0.3	0.3	0.2	0.2	0.4	0.4
ES	0.4	0.4	0.3	0.3	0.5	0.5
FR	0.3	0.3	0.2	0.3	0.4	0.5
HR	0.4	0.4	0.3	0.3	0.6	0.6
IT	0.4	0.4	0.3	0.3	0.4	0.5
CY	0.2	0.3	0.2	0.2	0.4	0.5
LV	0.4	0.4	0.3	0.3	0.5	0.5
LT	0.3	0.4	0.2	0.3	0.6	0.6
LU	0.3	0.3	0.2	0.2	0.4	0.5
HU	0.3	0.3	0.3	0.3	0.4	0.5
MT	0.3	0.4	0.1	0.4	0.4	0.6
NL	0.3	0.4	0.2	0.3	0.5	0.6
AT	0.3	0.3	0.2	0.2	0.3	0.4
PL	0.3	0.4	0.3	0.4	0.5	0.6
PT	0.4	0.5	0.4	0.4	0.7	0.7
RO	0.4	0.5	0.5	0.5	0.7	0.7
SI	0.3	0.4	0.4	0.4	0.5	0.6
SK	0.3	0.4	0.3	0.3	0.5	0.6
FI	0.3	0.4	0.2	0.3	0.7	0.7
SE	0.3	0.4	0.2	0.3	0.6	0.6
UK	0.3	0.3	0.2	0.2	0.5	0.5
IS	0.4	0.5	0.2	0.3	0.7	0.8
NO	0.4	0.4	0.2	0.3	0.7	0.7
CH	0.3	0.3	0.2	0.2	0.4	0.5
ME	0.6	0.5	p	0.5	0.5	0.6
MK	0.6	0.6	p	0.7	0.8	0.8
AL	0.4	0.5	p	0.3	0.6	0.7
RS	0.4	0.5	0.5	0.5	0.5	0.6
TR	0.2	0.3	0.2	0.2	0.4	0.4
BA	0.4	0.6	0.3	0.4	0.6	0.7
GE	0.2	0.3	p	0.3	0.6	0.5
AM	0.2	0.2	p	p	0.6	0.4
MD	0.4	0.5	p	p	0.6	0.7
TN	0.3	0.4	0.3	0.3	0.5	0.5
IL	0.2	0.3	0.2	0.2	0.3	0.4
UA	0.3	0.4	0.3	0.3	0.4	0.5
AR	0.5	0.6	0.4	0.5	0.6	0.6
AU	0.3	0.3	0.2	0.2	0.5	0.6
BR	0.3	0.4	0.3	0.3	0.5	0.6
CA	0.3	0.3	0.2	0.2	0.4	0.5
CN_X_HK	0.1	0.1	0.1	0.1	0.1	0.1
HK	0.1	0.1	0.1	0.1	0.2	0.3
IN	0.2	0.2	0.1	0.1	0.3	0.3
JP	0.1	0.2	0.1	0.1	0.2	0.2
MX	0.3	0.3	0.3	0.3	0.5	0.5
RU	0.2	0.3	0.2	0.3	0.4	0.4
ZA	0.3	0.4	0.2	0.2	0.6	0.7
KR	0.1	0.1	0.1	0.1	0.2	0.2
US	0.2	0.3	0.1	0.2	0.4	0.4

Country	Agricultural and veterinary sciences		Social sciences		Humanities and the arts	
	2010-2014	2015-2019	2010-2014	2015-2019	2010-2014	2015-2019
WLD	0.4	0.5	0.5	0.5	0.6	0.7
EU-27	**0.5**	**0.6**	**0.5**	**0.6**	**0.6**	**0.7**
EU-28	**0.5**	**0.5**	**0.5**	**0.6**	**0.6**	**0.7**
BE	0.5	0.5	0.5	0.6	0.6	0.7
BG	0.7	0.8	0.6	0.7	p	p
CZ	0.5	0.4	0.4	0.5	0.3	0.6
DK	0.5	0.6	0.4	0.6	0.4	0.7
DE	0.5	0.5	0.4	0.5	0.6	0.7
EE	0.6	0.6	0.7	0.7	0.5	0.6
IE	0.5	0.6	0.6	0.7	0.7	1.0
EL	0.4	0.5	0.4	0.4	0.5	0.7
ES	0.6	0.6	0.5	0.6	0.6	0.8
FR	0.5	0.6	0.4	0.5	0.6	0.7
HR	0.8	0.6	0.6	0.7	0.6	0.7
IT	0.6	0.6	0.5	0.6	0.6	0.7
CY	0.3	0.4	0.4	0.5	p	0.9
LV	0.6	0.7	0.9	1.0	p	p
LT	0.4	0.6	0.6	0.6	p	p
LU	0.3	0.6	0.4	0.5	p	0.5
HU	0.4	0.5	0.5	0.6	0.6	0.7
MT	p	0.5	0.7	0.9	p	p
NL	0.5	0.5	0.6	0.7	0.6	0.7
AT	0.5	0.6	0.4	0.5	0.4	0.6
PL	0.6	0.7	0.6	0.7	0.5	0.8
PT	0.8	0.9	0.6	0.7	0.7	1.0
RO	0.8	0.7	0.7	0.8	0.9	0.9
SI	0.7	0.7	0.5	0.7	0.7	1.0
SK	0.4	0.5	0.4	0.6	p	0.7
FI	0.7	0.7	0.6	0.8	0.7	0.9
SE	0.6	0.6	0.5	0.7	0.6	0.8
UK	0.5	0.6	0.5	0.6	0.6	0.7
IS	0.5	0.7	0.7	0.9	p	1.0
NO	0.5	0.6	0.5	0.6	0.6	0.8
CH	0.5	0.6	0.5	0.6	0.5	0.9
ME	0.6	0.8	p	0.5	p	p
MK	0.8	0.7	p	1.1	p	p
AL	p	0.6	p	1.0	p	p
RS	0.7	0.7	0.4	0.6	p	0.5
TR	0.3	0.3	0.4	0.5	0.6	0.6
BA	0.5	0.7	0.5	0.6	p	p
GE	p	0.4	p	0.7	p	p
AM	p	p	p	p	p	p
MD	p	p	p	p	p	p
TN	0.4	0.5	0.2	0.4	p	p
IL	0.3	0.3	0.4	0.5	0.5	0.6
UA	0.4	0.6	0.6	0.7	p	0.5
AR	0.7	0.7	0.6	0.7	0.7	0.7
AU	0.4	0.5	0.5	0.6	0.6	0.8
BR	0.5	0.5	0.5	0.6	0.7	0.7
CA	0.4	0.5	0.5	0.6	0.7	0.7
CN_X_HK	0.1	0.1	0.1	0.1	0.2	0.2
HK	0.2	0.3	0.3	0.3	0.3	0.5
IN	0.3	0.3	0.3	0.3	0.5	0.6
JP	0.2	0.2	0.2	0.3	0.3	0.4
MX	0.4	0.4	0.6	0.5	0.7	0.6
RU	0.4	0.5	0.5	0.6	0.8	0.8
ZA	0.5	0.5	0.7	0.7	0.7	0.8
KR	0.1	0.2	0.2	0.2	0.3	0.4
US	0.4	0.4	0.5	0.5	0.6	0.7

Notes: Cells are colour coded relative to gender parity (defined mathematically as 1.0). Blue = More men than women; White = Parity; Orange = More women than men. The average proportion of authors to which a gender could be assigned varies. For EU-27, the proportion of corresponding authors for whom gender could be inferred was 0.72, with the lowest value among EU-27 Member States being 0.60 for Slovakia and the lowest value among all regions being 0.35 for China. p indicates that the count of publications in the category was less than 100. Data not available for: FO.

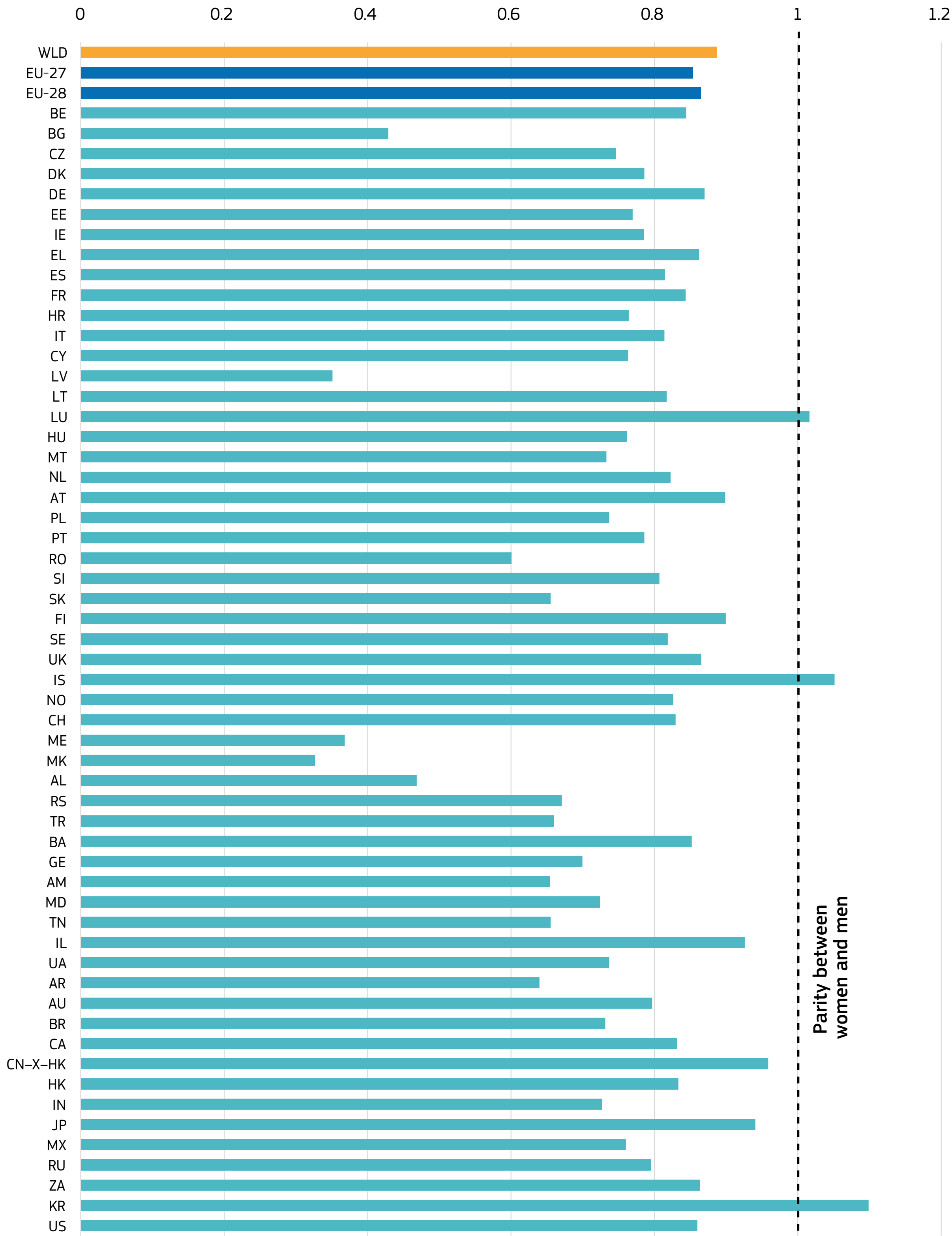
Annex 7.13 CAGR (%) of ratio of publications resulting from international collaboration for which a woman is corresponding author to those for which a man is corresponding author, by field of R&D, 2010-2019

Country	All Fields		Natural Sciences		Engineering and technology		Medical and health sciences		Agricultural and veterinary sciences		Social sciences		Humanities and the arts	
	CAGR	Trend	CAGR	Trend	CAGR	Trend	CAGR	Trend	CAGR	Trend	CAGR	Trend	CAGR	Trend
WLD	2.55		1.56		0.88		2.06		1.69		2.52		3.23	
EU-27	**3.47**		**2.67**		**2.34**		**2.43**		**1.87**		**3.87**		**5.09**	
EU-28	**3.35**		**2.50**		**2.04**		**2.45**		**2.08**		**3.49**		**4.01**	
BE	3.66		2.37		1.00		2.74		0.10		4.60		7.86	
BG	0.15		0.60		-1.63		-1.64		-1.35		-3.30		-12.52	
CZ	3.21		2.62		0.31		3.15		-0.66		3.41		13.83	
DK	3.84		2.79		2.02		2.23		5.11		5.20		4.86	
DE	3.88		3.21		2.97		2.62		1.90		4.12		5.27	
EE	3.19		5.87		2.74		-2.13		2.64		-4.13		6.75	
IE	5.92		5.72		4.59		3.16		5.15		2.96		7.02	
EL	2.48		1.81		2.54		1.51		1.01		2.96		3.18	
ES	2.54		1.91		1.58		1.11		1.68		2.00		3.25	
FR	2.71		2.17		1.07		1.83		1.94		3.36		5.12	
HR	3.33		4.06		4.97		-1.12		1.26		2.73		21.37	
IT	3.41		3.15		3.59		1.95		2.27		3.61		5.86	
CY	6.58		5.75		5.73		0.75		-0.47		3.08		24.14	
LV	6.52		9.50		7.40		2.79		7.60		-3.34		p	
LT	6.76		6.93		9.39		4.28		4.33		-3.05		11.51	
LU	2.51		1.10		3.44		-0.09		11.08		1.09		-9.27	
HU	3.48		3.90		0.62		-0.10		1.54		4.93		-5.54	
MT	0.05		-3.80		3.25		0.98		2.33		0.62		p	
NL	4.14		3.03		2.78		2.55		1.83		5.56		4.63	
AT	4.99		4.73		4.55		4.00		2.89		6.99		9.63	
PL	3.95		3.76		3.65		1.36		0.69		4.85		2.15	
PT	2.61		2.40		0.64		0.72		3.53		2.02		7.85	
RO	2.27		2.19		1.95		-1.57		-1.83		3.70		25.52	
SI	4.41		4.36		-0.29		1.19		2.91		1.08		4.79	
SK	5.85		5.51		3.34		3.10		0.02		9.13		5.21	
FI	4.12		3.16		2.09		1.93		-0.55		4.55		10.34	
SE	3.30		2.37		2.02		2.01		0.94		5.09		3.19	
UK	3.05		2.15		2.12		2.25		2.84		2.91		2.52	
IS	5.30		3.95		2.49		8.15		6.63		2.82		12.65	
NO	2.92		1.14		0.11		2.19		1.74		3.98		4.94	
CH	4.76		3.65		2.76		3.67		2.85		6.93		9.59	
ME	10.67		8.44		3.25		5.34		-		0.57		p	
MK	3.81		1.31		3.75		5.00		-2.24		24.78		p	
AL	4.05		4.09		-6.97		2.11		8.12		-		p	
RS	4.29		3.80		3.57		2.50		2.45		7.28		8.01	
TR	1.67		1.56		-1.64		1.74		0.46		1.82		-3.15	
BA	10.26		8.03		5.23		8.03		16.65		11.79		8.59	
GE	6.43		4.91		5.58		-1.57		-8.17		3.48		p	
AM	6.11		4.58		1.89		-1.86		14.93		17.55		p	
MD	3.43		6.65		4.75		-3.80		p		p		p	
TN	1.20		2.05		1.20		-1.83		3.37		4.35		17.55	
IL	3.26		2.41		1.67		1.72		0.33		5.12		2.43	
UA	4.05		4.57		3.67		0.08		13.63		3.87		-16.37	
AR	0.58		0.50		2.78		0.24		-0.46		-2.41		-1.27	
AU	3.36		2.02		0.72		3.15		1.97		2.33		2.31	
BR	2.07		1.78		2.29		0.67		1.16		0.50		-2.07	
CA	3.60		3.04		1.88		1.87		2.30		3.93		1.90	
CN_X_HK	1.76		1.12		0.61		1.72		3.02		1.43		7.67	
HK	3.18		2.99		3.13		2.74		0.19		0.61		14.15	
IN	-0.36		-0.61		-0.83		0.25		0.10		-1.82		1.68	
JP	3.26		2.79		3.62		2.35		2.79		4.67		0.18	
MX	2.45		1.62		0.69		2.76		0.06		0.57		5.21	
RU	4.39		3.95		3.59		0.52		5.55		4.78		4.99	
ZA	0.72		-0.59		-1.24		0.61		3.99		1.17		1.99	
KR	2.26		1.95		3.19		2.72		1.77		-1.59		13.49	
US	3.22		2.52		1.43		2.16		2.42		2.81		2.33	

Notes: The height of the bars in the trend column indicates relative annual values for the ratio of publications resulting from international collaboration for which a woman is corresponding author to those for which a man is corresponding author, and scaling is not the same across countries or fields of R&D. p indicates that the count of publications in the category was less than 100. "-" indicates that the value at the beginning or end of the period was unavailable for CAGR calculations, either because the value was zero or because the number of publications was zero. Data not available for: FO.

Source: Computed by Elsevier using Scopus data.

Annex 7.14 CAGR (%) of ratio of publications resulting from international collaboration for which a woman is corresponding author to those for which a man is corresponding author, by field of R&D, 2010-2019



Notes: Values represent the ratio for publications during the year 2019; EU-27, EU-28 and world values are highlighted in the chart. The average proportion of authors to which a gender could be assigned varies. For EU-27, the proportion of corresponding authors for whom gender could be inferred was 0.75, with the lowest value among EU-27 Member States being 0.59 for Croatia and Slovakia and the lowest value among all regions being 0.29 for China. Data not available for: FO.

Source: Computed by Elsevier using Scopus data.

Annex 7.15 Ratio of average FWCI for publications with women as corresponding authors to average FWCI for publications with men as corresponding authors, by field of R&D, 2014 and 2019

Country	Natural sciences		Engineering and technology		Medical and health sciences		Agricultural and veterinary sciences		Social sciences		Humanities and the arts	
	2014	2019	2014	2019	2014	2019	2014	2019	2014	2019	2014	2019
WLD	0.9	0.9	0.9	0.8	1.0	0.9	1.0	0.9	1.0	0.9	1.0	0.9
EU-27	**0.9**	**0.9**	**0.9**	**0.9**	**0.9**	**0.8**	**0.9**	**0.9**	**0.9**	**0.9**	**0.9**	**0.9**
EU-28	**0.9**	**0.9**	**0.9**	**0.9**	**0.9**	**0.8**	**0.9**	**0.9**	**0.9**	**0.9**	**1.0**	**0.9**
BE	0.9	0.8	0.9	0.9	0.8	0.8	0.9	1.0	0.9	0.9	1.0	0.9
BG	0.6	0.7	0.8	0.7	0.5	0.2	0.8	0.9	0.5	0.9	p	0.8
CZ	0.9	0.9	1.0	0.8	0.8	0.6	0.9	0.7	0.8	0.7	1.0	0.9
DK	0.9	0.8	0.9	0.9	0.8	0.7	0.8	0.8	0.9	0.9	1.0	0.6
DE	0.9	0.9	0.9	0.9	0.9	0.8	0.9	0.9	0.9	0.9	1.1	0.9
EE	1.0	0.9	1.2	0.6	1.4	0.9	0.8	0.9	0.9	0.5	1.2	0.5
IE	0.9	0.8	0.9	0.8	0.9	0.7	0.9	0.9	0.9	0.9	1.7	1.5
EL	1.0	0.8	1.0	0.8	1.2	0.9	0.8	0.9	1.1	1.0	1.5	0.8
ES	0.9	0.9	0.9	1.0	0.8	0.7	1.0	0.9	0.9	0.9	1.0	0.9
FR	0.9	0.9	0.9	0.9	0.8	0.8	0.9	0.9	0.8	0.8	0.7	0.8
HR	0.8	0.8	0.8	0.7	0.8	0.8	1.0	0.8	0.9	0.7	1.5	0.6
IT	0.8	0.9	0.8	0.9	0.8	0.8	0.8	0.9	0.9	0.9	1.1	0.9
CY	0.9	0.9	0.7	0.8	0.5	0.5	p	1.0	0.8	0.9	p	0.8
LV	0.8	0.6	0.8	0.6	0.5	0.3	0.6	0.7	0.5	0.6	p	p
LT	0.8	1.0	0.6	1.0	0.6	0.7	1.0	1.2	1.3	0.7	4.1	0.3
LU	0.8	1.0	0.9	0.6	1.1	0.9	p	p	0.7	1.4	p	p
HU	1.0	0.9	1.1	0.9	0.7	0.6	0.9	0.9	1.1	1.0	1.1	1.2
MT	1.0	0.7	p	0.4	2.2	0.8	p	p	p	0.8	p	p
NL	0.9	0.9	0.9	0.9	0.8	0.7	0.9	0.9	0.9	0.9	1.1	1.0
AT	1.0	1.0	0.9	1.0	0.7	0.8	0.8	0.9	0.8	1.0	0.7	0.9
PL	0.8	0.8	0.9	0.9	0.6	0.5	0.9	0.9	0.7	0.9	0.8	1.0
PT	0.9	0.8	0.9	0.8	0.7	0.7	1.1	1.0	0.7	0.8	1.6	1.1
RO	0.7	0.6	0.8	0.7	0.4	0.6	0.8	0.8	0.8	0.7	1.5	0.7
SI	0.9	0.8	0.8	0.8	0.8	0.7	1.1	1.0	0.6	0.8	0.8	1.3
SK	0.8	0.7	0.9	0.7	0.5	0.5	0.9	0.9	0.7	0.6	0.6	1.2
FI	0.8	1.0	0.8	0.9	0.9	0.8	0.9	0.8	1.0	0.9	1.4	1.1
SE	0.9	0.9	0.8	1.0	0.8	0.7	0.9	0.8	1.0	0.9	1.0	1.0
UK	0.9	0.9	1.0	0.9	0.9	0.8	1.0	0.9	0.9	0.9	1.0	0.9
IS	0.6	1.1	0.9	1.0	0.4	1.3	0.8	0.7	1.0	1.1	p	p
NO	0.9	0.9	0.8	1.0	1.0	0.7	0.9	0.9	0.9	0.9	0.8	0.8
CH	0.9	0.9	0.9	1.0	0.9	0.8	0.9	1.0	0.9	0.9	0.9	0.8
ME	1.3	0.4	p	p	p	0.3	p	p	p	p	p	p
MK	1.1	0.5	1.4	0.5	0.4	0.2	p	p	p	p	p	p
AL	1.0	0.4	p	p	1.1	0.6	p	p	1.0	p	2.3	p
RS	0.7	0.7	0.7	0.5	0.4	0.7	1.1	0.7	1.0	0.4	3.2	1.5
TR	0.7	0.6	0.8	0.6	0.7	0.7	0.8	0.7	0.8	0.8	0.6	0.6
BA	1.0	0.7	0.6	0.4	0.4	0.8	p	p	p	1.0	p	p
GE	0.7	0.6	p	0.1	2.9	1.0	p	p	p	1.1	p	p
AM	0.8	0.7	0.5	0.3	1.2	0.6	p	p	p	p	p	p
MD	0.6	0.7	0.5	0.6	p	p	p	p	p	p	p	p
TN	0.8	0.7	0.7	0.7	0.6	0.5	0.9	0.8	0.7	1.0	p	p
IL	1.0	0.9	0.9	0.9	0.9	0.9	1.0	0.9	0.9	1.1	1.1	1.2
UA	0.7	0.9	0.8	0.9	0.5	0.3	1.1	1.0	0.6	0.5	p	0.2
AR	0.7	0.8	0.9	0.8	0.4	0.5	0.9	0.9	0.9	0.7	1.1	0.8
AU	0.9	0.8	0.8	0.7	0.9	0.8	0.9	0.9	1.0	0.9	1.2	0.9
BR	0.9	0.8	1.0	0.8	0.8	0.6	1.0	0.9	0.8	0.8	1.0	0.9
CA	0.9	0.9	1.0	0.8	0.9	0.7	0.9	1.0	0.9	0.9	1.1	0.9
CN_X_HK	1.0	0.9	1.0	0.9	1.7	1.1	1.2	1.0	1.2	0.9	1.9	0.7
HK	0.9	0.8	0.8	0.7	0.7	0.9	1.1	1.3	0.8	0.9	0.9	1.1
IN	0.7	0.7	0.7	0.7	0.9	0.8	0.9	0.8	0.8	0.7	0.8	0.7
JP	1.0	0.9	0.9	0.9	1.2	1.0	1.0	1.0	1.0	0.8	1.4	0.5
MX	0.8	0.8	0.8	0.8	1.2	0.6	1.0	0.9	0.9	0.9	1.3	1.3
RU	0.7	0.9	1.1	0.8	1.0	0.4	0.8	0.7	0.9	0.7	1.1	0.7
ZA	0.9	0.8	1.0	0.6	0.9	0.8	0.9	1.0	1.1	1.0	1.2	1.0
KR	1.0	1.0	1.1	0.9	2.0	1.3	1.0	0.9	1.3	0.9	1.4	0.6
US	0.9	0.9	0.9	0.8	0.9	0.9	0.9	0.9	0.9	0.9	1.0	0.9

Notes: Cells are colour coded relative to gender parity (defined mathematically as 1.0). Blue = Men contribute more to publications with a high FWCI; White = Parity; Orange = Women contribute more to publications with a high FWCI. The average proportion of authors to which a gender could be assigned varies. For EU-27, the proportion of corresponding authors for whom gender could be inferred was 0.75, with the lowest value among EU-27 Member States being 0.59 for Croatia and Slovakia and the lowest value among all regions being 0.29 for China. p indicates that the count of publications in the category was less than 100. Data not available for: FO.

Source: Computed by Elsevier using Scopus data.

Annex 7.16 CAGR (%) of ratio of average FWCI for publications with women as corresponding authors to average FWCI for publications with men as corresponding authors, by field of R&D, 2010-2019

Country	All Fields		Natural sciences		Engineering and technology		Medical and health sciences		Agricultural and veterinary sciences		Social sciences		Humanities and the arts	
	CAGR	Trend	CAGR	Trend	CAGR	Trend	CAGR	Trend	CAGR	Trend	CAGR	Trend	CAGR	Trend
WLD	-0.33		-0.50		-1.41		-0.57		-0.62		-0.20		-0.31	
EU-27	**0.33**		**0.45**		**0.45**		**-0.53**		**-0.49**		**0.60**		**1.84**	
EU-28	**0.20**		**0.36**		**0.20**		**-0.61**		**-0.37**		**0.31**		**0.69**	
BE	0.64		0.48		1.17		-0.23		0.96		1.58		1.45	
BG	-4.81		-0.64		-2.86		-10.98		5.02		7.88		9.38	
CZ	1.50		1.57		-1.30		1.69		-1.41		1.50		10.03	
DK	-0.93		-0.73		0.46		-1.67		-1.62		-0.44		-3.25	
DE	-0.16		0.16		-0.30		-1.76		-0.31		0.76		2.50	
EE	0.62		2.41		-4.19		3.88		-1.71		-4.01		-6.57	
IE	-1.31		-1.33		-1.53		-2.36		0.05		0.25		2.76	
EL	0.40		-0.31		-1.87		1.63		-1.13		0.26		0.03	
ES	0.08		0.53		1.14		-0.59		-0.39		1.94		1.98	
FR	0.41		1.01		-0.32		-0.60		0.22		1.06		2.10	
HR	0.53		0.21		-1.08		2.79		-4.72		-3.18		0.09	
IT	-0.09		0.05		-0.28		-0.13		-0.26		1.01		1.74	
CY	-2.25		5.44		5.35		-13.36		7.14		2.80		-5.49	
LV	-8.97		-5.68		-3.40		-6.94		0.72		1.50		-2.03	
LT	-0.38		2.43		5.75		-2.18		5.84		-1.03		-3.90	
LU	1.39		1.69		-5.64		-3.08		3.88		10.61		10.45	
HU	-0.69		1.14		0.91		-3.11		4.42		-6.49		0.94	
MT	-4.74		-7.27		-13.02		-9.90		-1.97		2.97		-6.57	
NL	-0.62		0.48		-0.01		-1.21		-1.98		0.11		-0.91	
AT	0.41		1.24		2.63		-1.84		0.22		3.25		6.47	
PL	0.68		0.45		0.30		-1.31		0.08		5.44		-0.56	
PT	-0.49		-0.61		-0.03		-1.11		1.11		0.41		-0.24	
RO	-1.58		-1.47		0.52		0.96		0.27		-2.40		-4.33	
SI	-1.19		-2.06		-5.58		-0.39		0.94		-3.93		6.34	
SK	0.78		-0.53		3.07		-2.64		0.52		-0.87		5.10	
FI	1.11		1.84		2.54		0.11		-1.68		0.29		7.48	
SE	-0.45		0.50		0.83		-1.07		-1.79		-0.44		2.77	
UK	-0.26		0.39		-0.18		-0.80		-0.52		-0.06		-0.98	
IS	-3.00		-3.23		-8.15		2.80		-3.98		2.50		-1.09	
NO	-0.89		0.18		0.62		-2.13		-0.39		-0.78		-1.53	
CH	-0.39		-0.22		0.08		-0.96		1.79		3.34		-0.02	
ME	-8.40		-6.97		-27.00		11.87		-		-2.67		-	
MK	-6.74		-5.04		-6.44		-6.99		-8.40		19.25		-	
AL	-3.52		-1.50		-8.93		-5.53		-9.26		-2.57		-	
RS	0.79		0.44		-5.84		3.17		-2.90		-12.34		15.71	
TR	-2.46		-3.26		-5.43		-2.83		-2.97		2.18		-3.28	
BA	2.26		-5.20		-7.77		2.68		-1.68		0.22		9.16	
GE	2.37		1.53		-21.67		5.13		14.74		8.73		-13.88	
AM	9.25		10.35		-0.42		-1.40		-3.28		-7.87		29.88	
MD	12.03		13.65		17.88		5.44		7.29		-		-	
TN	-2.00		-1.63		-1.35		-3.57		-1.59		-2.78		6.05	
IL	-0.16		0.42		0.14		-2.18		-3.80		3.50		2.97	
UA	-1.12		0.96		-0.13		-10.23		5.38		-1.42		-29.42	
AR	-1.27		0.67		-1.06		-4.58		4.30		6.70		2.11	
AU	-1.40		-1.59		-4.48		-1.29		0.41		-0.22		-0.91	
BR	0.08		1.09		-0.58		-1.81		-0.11		2.36		5.92	
CA	-0.67		0.48		-0.68		-1.37		-0.10		0.95		-0.20	
CN_X_HK	-0.17		-0.40		-0.66		1.35		-1.84		-0.24		-0.59	
HK	0.44		-1.43		-4.38		0.08		-0.93		1.93		8.15	
IN	-0.23		-0.41		0.75		0.43		1.44		-0.58		-6.14	
JP	0.91		-0.41		-0.24		1.20		-1.26		-0.44		-7.25	
MX	-0.63		-1.06		-1.89		-0.37		-0.53		1.44		3.26	
RU	1.61		2.43		0.43		-3.47		1.94		4.38		-5.23	
ZA	-0.01		-2.04		-3.70		2.26		-1.15		0.77		-1.98	
KR	-1.11		-2.05		-4.48		1.93		0.62		-3.13		-11.98	
US	0.12		0.49		-0.66		-0.32		0.30		0.15		-0.56	

Notes: The height of the bars in the trend column indicates relative annual values for the ratio of average FWCI for publications with women as corresponding authors to that with men as corresponding authors, and scaling is not the same across countries or fields of R&D. Count of publications in all categories was greater than or equal to 100. "-" indicates that the value at the beginning or end of the period was unavailable for CAGR calculations, either because the value was zero or because the number of publications was zero. Data not available for: FO.

Source: Computed by Elsevier using Scopus data.

Annex 7.17 Number of applicants and beneficiaries of research funding, by sex, 2019

Country	Applicants		Beneficiaries	
	Females	Males	Females	Males
EU-27	**36 427**	**59 485**	**10 034**	**18 679**
EU-28	**39 892**	**67 585**	**10 999**	**21 044**
BE	1 279	2 044	399	573
BG	355	560	159	207
DK	982	2 105	195	361
DE	3 283	9 169	1 090	3 062
EE	126	240	25	51
ES	7 272	9 816	2 038	3 340
IT	1 350	3 528	161	523
CY	73	328	3	19
LV	185	229	23	24
LT	400	410	85	102
LU	66	227	24	67
HU	384	813	83	197
MT	5	37	2	13
NL	2 385	3 645	687	1 106
AT	2 445	7 592	1 195	4 256
PL	6 125	6 188	1 228	1 401
PT	2 417	2 530	935	1 053
RO	1 592	1 294	630	451
SI	297	499	100	166
SK	1 021	2 465	220	722
FI	934	1 533	141	232
SE	3 451	4 233	611	753
UK	3 465	8 100	965	2 365
IS	293	542	109	144
NO	2 325	3 831	680	1 181
CH	1 615	3 308	688	1 547
TR	4 537	6 810	680	1 067
IL	1 422	3 476	319	944

Notes: Exceptions to reference year: BG (2012), LU, UK (2016), RO (2017), ES, PT (2018), IT(2017;data of 2018 are provisional and partial); Data unavailable for: CZ, IE, EL, FR, HR, ME, MK, AL, RS, BA, GE, AM, FO, MD, TN, UA; 2018 WiS questionnaires used: LU, UK; Data for BE is the result of BE (FL) + BE (FR); Data for team leaders leaders not available for: BA, BG (only 2012), HR, CZ, IE; Data for applicants not available for: EL, FR;

Other: break in time-series for: CH (2019);ES (2018); values were calculated from headcounts.

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Annex 7.18 Number of women applicants and beneficiaries of research funding, by field of R&D, 2019

Country		Natural sciences	Engineering and technology	Medical and health sciences	Agricultural and veterinary sciences	Social sciences	Humanities and the arts	Multi - disciplinary	Unknown
EU-27	**Applicants**	**8 854**	**3 464**	**6 512**	**2 549**	**8 604**	**3 062**	**:**	**3 027**
	Beneficiaries	**2 305**	**994**	**1 740**	**720**	**2 036**	**756**	**:**	**1 411**
EU-28	**Applicants**	**9 249**	**3 464**	**6 512**	**2 549**	**9 179**	**3 062**	**:**	**5 522**
	Beneficiaries	**2 425**	**994**	**1 740**	**720**	**2 191**	**756**	**:**	**2 101**
BE	Applicants	29	8	163	0	37	23	4	1 015
	Beneficiaries	11	3	73	0	12	11	0	289
BG	Applicants	34	41	66	36	178	0	:	0
	Beneficiaries	16	17	23	17	86	0	:	0
DK	Applicants	225	70	268	41	237	115	18	8
	Beneficiaries	38	18	62	15	35	19	6	2
DE	Applicants	443	369	1426	0	1 045	0	:	0
	Beneficiaries	159	118	480	0	333	0	:	0
EE	Applicants	36	9	24	11	24	22	:	0
	Beneficiaries	9	1	4	2	5	4	:	0
ES	Applicants	2 300	965	1 185	942	1 035	821	0	24
	Beneficiaries	620	298	298	273	304	233	0	12
IT	Applicants	390	96	280	88	245	251	0	0
	Beneficiaries	42	7	43	3	29	37	0	0
CY	Applicants	19	19	12	0	20	3	:	:
	Beneficiaries	0	1	0	0	2	0	:	:
LV	Applicants	27	41	43	19	36	19	:	:
	Beneficiaries	3	7	3	3	5	2	:	:
LU	Applicants	25	3	0	0	25	13	0	0
	Beneficiaries	12	1	0	0	8	3	0	0
HU	Applicants	158	8	68	39	68	43	:	:
	Beneficiaries	29	3	16	9	14	12	:	:
MT	Applicants	2	0	3	0	0	0	1	0
	Beneficiaries	0	0	2	0	0	0	1	0
NL	Applicants	366	130	7	:	1 236	72	:	653
	Beneficiaries	119	37	0	:	297	29	:	234
AT	Applicants	404	47	217	21	182	254	0	1320
	Beneficiaries	128	13	46	6	38	91	0	873
PL	Applicants	2 108	438	1 007	548	1 381	643	0	0
	Beneficiaries	484	75	175	125	236	133	0	0
PT	Applicants	585	445	567	228	400	180	12	0
	Beneficiaries	217	199	209	84	153	63	10	0
RO	Applicants	472	244	239	218	284	131	0	4
	Beneficiaries	171	83	98	96	134	47	0	1
SI	Applicants	59	54	55	30	55	44	76	:
	Beneficiaries	18	19	23	10	18	12	7	:
SK	Applicants	232	207	161	158	193	70	0	0
	Beneficiaries	52	35	36	32	51	14	0	0
FI	Applicants	316	87	138	18	258	115	:	2
	Beneficiaries	50	14	16	4	39	18	:	0
SE	Applicants	624	183	583	152	1 665	243	0	1
	Beneficiaries	127	45	133	41	237	28	0	0
UK	Applicants	395	:	:	:	575	:	:	2 495
	Beneficiaries	120	:	:	:	155	:	:	690
IS	Applicants	9	3	25	0	50	10	196	0
	Beneficiaries	8	3	22	0	45	9	22	0
NO	Applicants	485	454	378	108	700	200	:	23
	Beneficiaries	149	192	80	41	169	49	:	12
CH	Applicants	397	103	285	3	484	265	37	41
	Beneficiaries	189	37	110	0	208	113	9	22
TR	Applicants	1 084	617	1205	560	536	10	311	214
	Beneficiaries	196	117	188	87	49	2	1	40
IL	Applicants	30	23	173	0	400	140	0	656
	Beneficiaries	1	0	20	0	103	52	0	143

Notes: Exceptions to reference year: BG – all available fields (2012), DE – AS, H, U, EE – U, NL – MS (2014), SI – MU (2015), ES – MU, LU – all available fields, UK – NS, SS, U (2016), MT – ET, AS, SS, H, MU, U, NL – H(2017), ES – NS, ET, MS, AS, SS, H, U, PT – all available fields, NO – U (2018), IT – all available fields(2017; data of 2018 are provisional and partial); Data unavailable for: CZ, IE, EL, FR, HR, LT, ME, MK, AL, RS, BA, GE, AM, FO, MD, TN, UA; WiS questionnaires 2018 used: LU, UK; Data for BE is the result of BE (FL) + BE (FR); Data for team leaders not available for: BA, BG (only 2012), HR, CZ, IE; Data for applicants not available for: EL, FR; No data available broken down by field: LT, BE (FL); For MT, 2019 Females fields ET, H and MU are not applicable, 2017 data presented; Other: break in time-series for: CH (2019); ES (2018); Values were calculated from headcounts and only from the institutes that provided both applicants and beneficiaries; ":" denotes that data is not available or field of R&D is not applicable.

Women in Science database, DG Research and Innovation - T3_questionnaires

Annex 7.19 Number of men applicants and beneficiaries of research funding, by field of R&D, 2019

Country		Natural sciences	Engineering and technology	Medical and health sciences	Agricultural and veterinary sciences	Social sciences	Humanities and the arts	Multi - disciplinary	Unknown
EU-27	**Applicants**	**17 170**	**10 593**	**8 120**	**2 165**	**9 046**	**3 775**	**:**	**8 280**
	Beneficiaries	**4 898**	**3 076**	**2 322**	**594**	**2 334**	**925**	**:**	**4 424**
EU-28	**Applicants**	**18 145**	**10 593**	**8 120**	**2 165**	**9 731**	**3 775**	**:**	**14 720**
	Beneficiaries	**5 193**	**3 076**	**2 322**	**594**	**2 484**	**925**	**:**	**6 344**
BE	Applicants	113	65	254	0	51	36	11	1 514
	Beneficiaries	39	27	123	0	13	10	4	357
BG	Applicants	124	139	83	45	169	0	:	0
	Beneficiaries	36	47	21	22	81	0	:	0
DK	Applicants	846	249	463	46	319	154	15	13
	Beneficiaries	135	54	89	9	43	17	9	5
DE	Applicants	2 085	2 243	3 137	0	1 704	0	:	0
	Beneficiaries	771	703	1030	0	558	0	:	0
EE	Applicants	110	51	23	12	18	26	:	0
	Beneficiaries	28	7	9	1	2	4	:	0
ES	Applicants	3 612	2391	859	726	1 200	979	0	49
	Beneficiaries	1 198	872	276	247	414	316	0	17
IT	Applicants	1 214	548	649	217	476	424	0	0
	Beneficiaries	184	78	79	27	78	77	0	0
CY	Applicants	115	112	34	13	46	8	:	:
	Beneficiaries	3	7	7	0	1	1	:	:
LV	Applicants	67	72	39	17	17	17	:	:
	Beneficiaries	9	4	5	2	1	3	:	:
LU	Applicants	143	22	0	0	45	17	0	0
	Beneficiaries	37	9	0	0	15	6	0	0
HU	Applicants	380	73	105	77	89	89	:	:
	Beneficiaries	101	12	20	17	22	25	:	:
MT	Applicants	11	13	4	8	0	0	1	0
	Beneficiaries	2	5	4	1	0	0	1	0
NL	Applicants	921	489	2	:	1 313	113	:	922
	Beneficiaries	294	179	0	:	328	21	:	305
AT	Applicants	948	139	265	20	196	254	0	5 770
	Beneficiaries	306	28	58	5	41	81	0	3 737
PL	Applicants	2 450	1 042	596	241	1 134	725	0	
	Beneficiaries	656	200	126	62	232	125	0	0
PT	Applicants	776	705	374	114	358	189	14	0
	Beneficiaries	317	300	155	43	148	79	11	0
RO	Applicants	465	309	143	86	171	115	0	5
	Beneficiaries	151	92	51	31	77	49	0	0
SI	Applicants	123	150	74	33	67	52	113	:
	Beneficiaries	43	56	24	12	18	13	12	:
SK	Applicants	591	933	191	292	303	155	0	0
	Beneficiaries	199	255	56	77	82	53	0	0
FI	Applicants	646	315	175	27	198	166	:	6
	Beneficiaries	97	49	32	6	30	15	:	3
SE	Applicants	1 430	533	650	191	1 172	256	0	1
	Beneficiaries	292	92	157	32	150	30	0	0
UK	Applicants	975	:	:	:	685	:	:	6 440
	Beneficiaries	295	:	:	:	150	:	:	1 920
IS	Applicants	23	11	32	1	27	14	434	0
	Beneficiaries	22	7	25	0	22	13	55	0
NO	Applicants	993	1 373	438	143	723	161	0	0
	Beneficiaries	253	539	120	58	185	26	0	0
CH	Applicants	1 130	618	480	8	561	273	105	133
	Beneficiaries	558	325	187	2	241	123	30	81
TR	Applicants	1 361	1 706	886	957	689	13	618	580
	Beneficiaries	320	295	146	146	42	4	4	110
IL	Applicants	141	133	356	0	442	245	0	2 159
	Beneficiaries	23	41	65	0	109	106	0	600

Notes: Exceptions to reference year: BG – all available fields (2012), DE – AS, H, U, EE – U, NL – MS (2014), SI – MU (2015), ES – MU, LU – all available fields, UK – NS, SS, U (2016), MT – AS, SS, U, NL – H, ES – NS, ET, MS, AS, SS, H, U,PT – all available fields (2018), IT – all available fields (2017;data of 2018 are provisional and partial); Data unavailable for: CZ, IE, EL, FR, HR, LT, ME, MK, AL, RS, BA, GE, AM, FO, MD, TN, UA; WiS questionnaires 2018 used: LU, UK; Data for BE is the result of BE (FL) + BE (FR); Data for team leaders not available for: BA, BG (only 2012), HR, CZ, IE; Data for applicants not available for: EL, FR; No data available broken down by field: LT, BE (FL);

Other: break in time-series for: CH (2019);ES (2018), values were calculated from headcounts and only from the institutes that provided both applicants and beneficiaries; ":" denotes that data is not available or field of R&D is not applicable;

Source: Women in Science database, DG Research and Innovation - T3_questionnaires

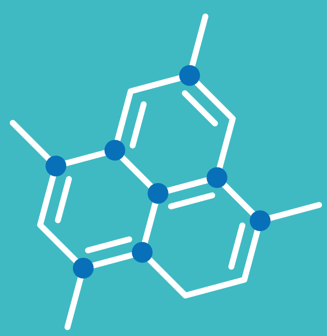
Annex 7.20 Number of a country's publications with a gender dimension in their research and innovation content, by field of R&D, 2010-2014 and 2015-2020

Country	Natural Sciences		Engineering and technology		Medical and health sciences		Agricultural and veterinary sciences		Social sciences		Humanities and the arts	
	2010-2014	2015-2019	2010-2014	2015-2019	2010-2014	2015-2019	2010-2014	2015-2019	2010-2014	2015-2019	2010-2014	2015-2019
WLD	49 421	60 037	5 229	8 048	133 644	151 837	18 817	21 552	41 986	54 524	10 013	12 403
EU-27	**14 640**	**17 042**	**1 240**	**2 065**	**38 663**	**41 228**	**5 227**	**5 967**	**10 945**	**15 428**	**2 616**	**3 477**
EU-28	**17 237**	**19 680**	**1 451**	**2 336**	**45 350**	**48 467**	**6 274**	**6 904**	**14 402**	**19 306**	**3 662**	**4 713**
BE	653	831	35	79	1 477	1 854	242	297	410	661	107	136
BG	104	144	19	23	186	267	45	54	20	51	10	17
CZ	558	814	34	62	1 203	1 225	222	291	207	415	72	100
DK	725	879	34	71	2 041	2 413	227	296	300	457	62	96
DE	2 978	3 522	253	333	7 112	7 811	1 128	1 264	1 799	2 756	313	476
EE	80	110	3	9	165	232	32	37	74	95	29	37
IE	218	282	30	45	698	831	78	103	240	359	56	102
EL	414	469	56	52	1 388	1 410	84	124	275	276	58	48
ES	1 848	2 207	111	227	4 764	5 518	685	865	1 896	3 052	425	624
FR	2 139	2 258	133	234	4 499	5 085	786	742	1 051	1 307	314	348
HR	145	176	32	50	527	622	96	80	363	294	215	123
IT	1 866	2 232	140	230	5 067	5 652	548	717	859	1 410	165	311
CY	30	85	6	13	119	171	7	13	50	122	7	29
LV	25	30	4	6	40	81	18	14	9	27	3	5
LT	60	113	12	27	173	291	32	51	56	122	14	21
LU	15	28	0	2	60	101	1	9	23	54	4	6
HU	256	324	18	24	632	650	117	139	140	213	22	47
MT	16	25	0	2	42	86	6	7	6	18	3	2
NL	1 351	1 556	65	129	3 674	4 010	437	500	1 197	1 471	257	317
AT	589	735	57	58	1 342	1 489	249	267	352	446	72	90
PL	1 032	1 453	61	181	3 064	3 289	316	433	393	707	114	187
PT	412	612	39	70	971	1 365	159	230	404	750	60	118
RO	183	351	53	155	413	489	43	69	152	174	38	60
SI	133	152	19	12	296	308	65	46	120	141	51	56
SK	154	242	14	25	369	491	61	71	59	171	20	56
FI	776	705	53	63	1 735	1 844	282	225	567	671	107	144
SE	1 379	1 530	116	148	4 050	4 457	419	468	1 136	1 440	211	277
UK	3 968	4 373	270	378	9 343	11 020	1 577	1 501	4 148	4 975	1 172	1 431
IS	86	72	1	5	210	222	20	19	38	76	5	20
NO	646	693	27	55	1 951	2 149	266	279	594	840	95	128
CH	904	1153	66	72	2 189	2 716	336	408	459	716	73	116
ME	9	19	0	2	20	58	8	9	3	19	1	5
MK	14	11	0	7	73	98	4	9	7	24	1	2
AL	5	15	0	5	33	55	3	5	19	24	13	9
RS	161	198	25	27	535	631	63	86	92	139	23	19
TR	1 192	1 279	156	211	5 744	6 107	440	460	941	1 262	120	196
BA	15	26	6	8	176	198	9	10	21	42	13	10
GE	12	36	1	2	55	170	4	11	14	31	1	4
AM	6	10	0	1	29	40	2	4	6	7	1	4
MD	1	6	0	2	3	24	0	1	1	1	0	0
TN	145	157	7	22	460	504	74	68	27	62	13	14
IL	362	438	47	46	1 094	1 367	104	108	529	773	99	209
UA	77	133	2	14	70	323	35	38	12	50	3	16
AR	665	645	17	20	660	737	362	362	147	274	20	67
AU	2 254	2 797	168	252	4 614	6 120	1 080	1 228	2 081	2 840	424	600
BR	1 996	2 698	91	159	4 310	5 253	1 193	1 554	899	1 374	98	194
CA	2 546	2 883	163	237	5 592	6 813	966	946	2 598	3 146	546	656
CN_X_HK	4 388	7 565	755	1085	8 869	12 995	1 571	2 338	789	1 863	163	241
HK	225	298	29	46	765	799	55	81	364	468	72	82
IN	1 780	2 417	226	546	4 297	5 545	760	834	759	1 279	136	246
JP	2 986	3 264	276	323	7 468	7 727	899	1 074	748	973	96	95
MX	749	980	41	73	1 292	1 672	397	498	427	615	44	87
RU	614	1 351	20	136	839	2 834	164	362	197	1 008	52	305
ZA	637	939	29	65	1 130	1 833	367	479	683	1 030	265	278
KR	1 153	1 684	218	328	4 015	5 246	393	583	404	741	60	113
US	13 906	15 511	1223	1651	33 790	39 715	4 653	4 945	16 002	18 735	3 202	3 519

Note: Data not available for: FO.

Source: Computed by Elsevier using Scopus data.

APPENDICES



APPENDIX 1

Correspondence table between different editions of the She Figures

Name of indicator	SF2021 label	SF2018 label	SF2015 label	SF2012 label
Proportion (%) of women among Doctoral graduates, 2018	Figure 2.1	Figure 2.1	Figure 2.2	Figure 2.1
Proportion (%) of women among Doctoral graduates, 2010 and 2018	Table 2.1	Table 2.1	Table 2.1	n/a
Compound annual growth rate of Doctoral graduates, by sex, 2010-2018	Figure 2.2	Figure 2.2	Figure 2.3 (ISCED 6 graduates according to ISCED-97)	Figure 2.2
Proportion (%) of women among Doctoral graduates, by broad field of study, 2018	Table 2.2	Table 2.2	Table 2.3	Table 2.1
Distribution (%) of Doctoral graduates across broad fields of study, by sex, 2018	Table 2.3	Figure 2.3	Figure 2.4 (ISCED 6 graduates according to ISCED-97)	Figure 2.3
Proportion (%) of women among Doctoral graduates, by narrow field of study in Natural Sciences, ICT and Engineering, 2015 and 2018	Table 2.4	Table 2.3	Table 2.5	Table 2.3
Compound annual growth rate (CAGR, %) and trend of Doctoral graduates (number), by sex and narrow field of study in Natural Sciences, ICT and Engineering, 2015-2018	Table 2.5	Table 2.4	Table 2.6 (ISCED 6 graduates according to ISCED-97)	Table 2.2
Ratio of bachelor graduates to bachelor entrants, by sex and broad field of study, 2018	Table 2.6	Table 2.5	n/a	n/a
Ratio of Doctoral entrants to master graduates, by sex and broad field of study, 2018	Table 2.7	Table 2.6	n/a	n/a
Ratio of Doctoral entrants to master graduates, by sex and narrow field of study in Natural Sciences, ICT and Engineering, 2018	Table 2.8	Table 2.7	n/a	n/a
Number of Doctoral (ISCED level 8) graduates, by sex, 2013 - 2018	Annex 2.1	Annex 2.1	Annex 2.2	Annex 2.1
Number of Doctoral (ISCED level 8) graduates by sex and broad field of study, 2018	Annex 2.2	Annex 2.2	Annex 2.4	Annex 2.2
Number of Doctoral (ISCED level 8) graduates by sex and narrow field of study in Natural Science and engineering (fields EF4, EF5 and EF6), 2018	Annex 2.3	Annex 2.3	Annex 2.6	Annex 2.3

Name of indicator	SF2021 label	SF2018 label	SF2015 label	SF2012 label
Ratio of Doctoral graduates to Doctoral entrants, by sex and broad field of study, 2018	Annex 2.4	Table 2.8	n/a	n/a
Proportion (%) of women in the EU-27 and EU-28 among total employment, the population of tertiary-educated professionals or technicians (HRSTC), and the population of scientists and engineers (S&E) and compound annual growth rate (CAGR) and trends in the number of women and men in the EU-27 and EU-28 in the same populations, 2015-2019	Figure 3.1	Figure 3.1	Figure 3.1	Figure 1.1
Proportion (%) of tertiary educated and employed as professionals and technicians (HRSTC) among tertiary educated (HRSTE), by sex, 2019	Figure 3.2	Figure 3.2	Figure 3.2	Figure 1.2
Proportion (%) of scientists and engineers among total labour force, by sex, 2019	Figure 3.3	Figure 3.3	Figure 3.3	Figure 1.3
Proportion (%) of employed population in KIA among total employment, by sex, 2019	Figure 3.4	Figure 3.4	Figure 3.4	Figure 1.4
Proportion (%) of employed in KIABI among total employment, by sex, 2019	Figure 3.5	Figure 3.5	Figure 3.5	Figure 1.5
Proportion (%) of self-employed women among S&E and ICT Professionals, 2018	Figure 3.6	n/a	n/a	n/a
Unemployment rate of tertiary educated people, 2019	Figure 3.7	Figure 3.6	n/a	n/a
Distribution of R&D personnel across occupations in all sectors (business enterprise, government and higher education), by sex, 2018	Figure 3.8	Figure 3.7	Figure 3.6	Figure 3.9
Distribution of R&D personnel across occupations in the higher education sector, by sex, 2018	Figure 3.9	Table 3.8	Figure 3.7	Figure 3.10
Distribution of R&D personnel in the government sector across occupations, by sex, 2018	Figure 3.10	Figure 3.9	Figure 3.8	Figure 3.11
Distribution of R&D personnel across occupations in the business enterprise sector, by sex, 2018	Figure 3.11	Figure 3.10	Figure 3.9	Figure 3.12
Distribution of researchers in the business enterprise sector across economic activities (NACE Rev. 2), by sex, 2018	Figure 3.12	Figure 3.11	Figure 3.10	Figure 2.6
Proportion (%) of women among researchers in the business enterprise sector, by selected economic activities (NACE Rev. 2), 2018	Table 3.1	Table 3.1	Table 3.1	Table 2.8
R&D personnel in the higher education sector, by sex and occupation (headcount), 2018	Annex 3.1	Annex 3.1	Annex 3.1	Annex 3.4

Name of indicator	SF2021 label	SF2018 label	SF2015 label	SF2012 label
R&D personnel in the government sector, by sex and occupation, (headcount), 2018	Annex 3.2	Annex 3.2	Annex 3.2	Annex 3.5
R&D personnel in the business enterprise sector, by sex and occupation, (headcount), 2018	Annex 3.3	Annex 3.3	Annex 3.3	Annex 3.5
Researchers in the business enterprise sector, by sex and selected economic activities (NACE Rev.2), 2018 (headcount)	Annex 3.4	n/a	n/a	n/a
Proportion (%) of women among researchers, 2018	Figure 4.1	Figure 4.1	Figure 4.1	Figure 1.6
Compound annual growth rate for researchers, by sex, 2010-2018	Figure 4.2	Figure 4.2	Figure 4.2	Figure 1.7
Proportion (%) of researchers per thousand labour force, by sex, 2018	Figure 4.3	Figure 4.3	Figure 4.3	Figure 1.8
Distribution of researchers across sectors of employment, by sex, 2018	Figure 4.4	Figure 4.4	Figure 4.4	Figure 1.10
Proportion (%) of women among researchers in the higher education sector, 2018	Figure 4.5	Figure 4.5	Figure 4.5	Figure 1.9
Proportion (%) of women among researchers in the government sector, 2018	Figure 4.6	Figure 4.6	Figure 4.6	Figure 1.9
Proportion (%) of women among researchers in the business enterprise sector, 2018	Figure 4.7	Figure 4.7	Figure 4.7	Figure 1.9
Compound annual growth rate for researchers in the higher education sector, by sex, 2010-2018	Figure 4.8	Figure 4.8	Figure 4.8	Figure 1.11
Compound annual growth rate for researchers in the government sector, by sex, 2010-2018	Figure 4.9	Figure 4.9	Figure 4.9	Figure 1.12
Compound annual growth rate for researchers in the business enterprise sector, 2010-2018	Figure 4.10	Figure 4.10	Figure 4.10	Figure 1.13
Distribution of researchers in the higher education sector across age groups, by sex, 2018	Figure 4.11	Figure 4.11	Figure 4.11	Figure 1.14
Distribution of researchers in the government sector across age groups, by sex, 2018	Figure 4.12	Figure 4.12	Figure 4.12	Figure 1.15
Evolution of the dissimilarity index for researchers in the higher education sector and government sector, 2014-2018	Table 4.1	n/a	n/a	n/a
Evolution of the proportion (%) of women among researchers in the higher education sector, by field of R&D, 2010-2018	Table 4.2	Table 4.2	Table 4.2	Table 2.5
Compound annual growth rate (%) of women researchers in the higher education sector, by field of R&D, 2010-2018	Table 4.3	Table 4.3	Table 4.3	Table 2.4

Name of indicator	SF2021 label	SF2018 label	SF2015 label	SF2012 label
Distribution of researchers in the higher education sector across fields of R&D, by sex, 2018	Figure 4.13	Figure 4.13	Figure 4.13	Figure 2.4
Evolution of the proportion (%) of women among researchers in the government sector, by field of R&D, 2010 & 2018	Table 4.4	Table 4.4	Table 4.4	Table 2.7
Compound annual growth rates (%) of women researchers in the government sector, by field of R&D, 2010-2018	Table 4.5	Table 4.5	Table 4.5	Table 2.6
Distribution of researchers in the government sector across fields of R&D, by sex, 2018	Figure 4.14	Figure 4.14	Figure 4.14	Figure 2.5
Evolution in the proportion (%) of women among researchers in the business enterprise sector, by field of R&D, 2010 & 2018	Table 4.6	Table 4.6	Table 4.6	Table 2.9
Number of researchers, by sex, 2014-2018	Annex 4.1	Annex 4.1	Annex 4.1	Annex 1.1
Number of researchers in the higher education sector, by sex, 2014-2018	Annex 4.2	Annex 4.2	Annex 4.2	Annex 1.2
Number of researchers in the government sector, by sex, 2014-2018	Annex 4.3	Annex 4.3	Annex 4.3	Annex 1.3
Number of researchers in the business enterprise sector, by sex, 2014-2018	Annex 4.4	Annex 4.4	Annex 4.4	Annex 1.4
Number of researchers in the higher education sector, by field of R&D and sex, 2018	Annex 4.5	Annex 4.5	Annex 4.5	Annex 2.4
Number of researchers in the government sector, by field of R&D and sex, 2018	Annex 4.6	Annex 4.6	Annex 4.6	Annex 2.5
Number of researchers in the business enterprise sector, by field of R&D and sex, 2018	Annex 4.7	Annex 4.7	Annex 4.7	n/a
Proportion (%) of part-time employed among researchers in HES, by sex, 2019	Figure 5.1	Figure 5.1	Figure 5.1	n/a
Proportion (%) of researchers in HES working under 'precarious' contracts, by sex, 2019	Figure 5.2	Figure 5.2	Figure 5.2	n/a
Proportion (%) of researchers in HES working under 'precarious' contracts, by sex and family status, 2019	Table 5.1	n/a	n/a	n/a
Proportion (%) of researchers in HES working under 'precarious' contracts, by sex and career stage, 2019	Table 5.2	n/a	n/a	n/a
Sex differences in international mobility of researchers in HES during their PhD, 2019	Figure 5.3	Figure 5.3	Figure 5.3	n/a, although see (non-comparable) Figure 1.16 for reference

Name of indicator	SF2021 label	SF2018 label	SF2015 label	SF2012 label
Sex differences in international mobility of researchers in HES in post-PhD stages, 2019	Figure 5.4	Figure 5.4	Figure 5.4	n/a, although see (non-comparable) Figure 1.16 for reference
Proportion (%) of women among researchers (in FTE) and R&D expenditure (in PPS) per researcher (in FTE), 2018	Figure 5.5	Figure 5.5	Figure 5.5	Figure 4.4
R&D expenditure (in PPS) per capita researcher (in FTE), by sector of employment, 2018	Figure 5.6	Figure 5.6	Figure 5.6	Figure 4.5
Proportion (%) of Research Organisations that take actions or measures towards gender equality, by type of organisation, 2020	Figure 5.7	n/a	n/a	n/a
International mobility rates (%) of higher education sector researchers during their PhD, by sex, 2019	Annex 5.1	Annex 5.1	Annex 5.4	n/a
International mobility rates (%) of higher education sector researchers in post-PhD career stages, by sex, 2019	Annex 5.2	Annex 5.2	Annex 5.5	n/a
Total intramural R&D expenditure for the business, government and higher education sectors in million PPS, 2018	Annex 5.3	Annex 5.3	Annex 5.3	Annex 4.4
Proportion (%) of men and women in a typical academic career, students and academic staff, EU-27 & EU-28, 2015-2018	Figure 6.1	Figure 6.1	Figure 6.1	Figure 3.1
Proportion (%) of men and women in a typical academic career in science and engineering, students and academic staff, EU-27 & EU-28, 2015-2018	Figure 6.2	Figure 6.2	Figure 6.2	Figure 3.2
Proportion (%) of women among academic staff, by grade and total, 2018	Table 6.1	Table 6.1	Table 6.1	Table 3.1
Evolution of the proportion (%) of women among Grade A positions, 2015 vs. 2018	Figure 6.3	Figure 6.3	Figure 6.3	Figure 3.3
Proportion (%) of grade A staff among all academic staff, by sex, 2018	Figure 6.4	Figure 6.4	Figure 6.4	Figure 3.4
Proportion (%) of women among grade A staff, by main field of R&D, 2018	Table 6.2	Table 6.2	Table 6.2	Table 3.2
Distribution of Grade A staff across fields of R&D, by sex, 2018	Figure 6.5	Figure 6.5	Figure 6.5	Figure 3.5
Glass Ceiling Index, 2015-2018	Figure 6.6	Figure 6.6	Figure 6.6	Figure 3.6
Proportion (%) of women among grade A staff, by age group, 2018	Table 6.3	Table 6.3	Table 6.3	Table 3.3
Distribution of grade A staff across age groups, by sex, 2018	Figure 6.7	Figure 6.7	Figure 6.7	Figure 3.7

Name of indicator	SF2021 label	SF2018 label	SF2015 label	SF2012 label
Proportion (%) of women among heads of institutions in the Higher Education Sector (HES), 2019	Figure 6.8	Figure 6.8	Figure 6.8	Figure 4.1
Proportion (%) of women among heads of universities or assimilated institutions based on capacity to deliver PhDs, 2019	Table 6.4	Table 6.4	Table 6.4	Table 4.1
Proportion (%) of women on boards, members and leaders, 2019	Figure 6.9	Figure 6.9	Figure 6.9	Figure 4.2
Number of academic staff, by grade and sex, 2018	Annex 6.1	Annex 6.1	Annex 6.1	Annex 3.1
Number of senior academic staff (grade A), by field of R&D and sex, 2018	Annex 6.2	Annex 6.2	Annex 6.2	Annex 3.2
Number of academic staff (grade A), by age group and sex, 2018	Annex 6.3	Annex 6.3	Annex 6.3	Annex 3.3
Number of heads of institutions in the Higher Education Sector (HES) by sex, 2019 and 2016	Annex 6.4	n/a	n/a	n/a
Number of heads of universities or assimilated institutions based on capacity to deliver PhDs by sex and proportion (%) of women, 2019 and 2016	Annex 6.5	n/a	n/a	n/a
Ratio of women to men among active authors in all fields of R&D, per seniority level, 2015-2019	Figure 7.1	n/a	n/a	n/a
Ratio of women to men among active authors, by field of R&D and seniority level, 2015-2019	Table 7.1	n/a	n/a	n/a
Ratio of women to men among all authors in all fields of R&D, per seniority level, 2015-2019	Figure 7.2	n/a	n/a	n/a
Ratio of average number of publications by women to those by men in all fields of R&D, per seniority level, 2015-2019	Figure 7.3	n/a	n/a	n/a
Ratio of average number of publications by women to those by men, by field of R&D, per seniority level, 2015-2019	Table 7.2	n/a	n/a	n/a
Ratio of average FWCI of publications by women to that of men in all fields of R&D, per seniority level, 2015-2019	Figure 7.4	n/a	n/a	n/a
Ratio of average FWCI of publications by women to that of men, by field of R&D, per seniority level, 2015-2019	Table 7.3	n/a	n/a	n/a
Average proportion of women among authors on publications in all fields of R&D, 2015-2019	Figure 7.5	n/a	n/a	n/a
Average proportion of women among authors on publications, by field of R&D, 2010-2014 and 2015-2019	Table 7.4	n/a	n/a	n/a

Name of indicator	SF2021 label	SF2018 label	SF2015 label	SF2012 label
Compound annual growth rate (%) of average proportion of women among authors on publications, by field of R&D, 2010-2019	Table 7.5	n/a	n/a	n/a
Average proportion of women among authors on publications resulting from international collaboration in all fields of R&D, 2015-2019	Figure 7.6	n/a	n/a	n/a
Average proportion of women among authors on publications resulting from international collaboration, by field of R&D, 2010-2014 and 2015-2019	Table 7.6	n/a	n/a	n/a
Compound annual growth rate (%) of average proportion of women among authors on publications resulting from international collaboration, by field of R&D, 2010-2019	Table 7.7	n/a	n/a	n/a
Ratio of publications for which a woman is corresponding author to those for which a man is corresponding author, in all fields of R&D, 2015-2019	Figure 7.7	Figure 7.2	Figure 7.1	n/a
Ratio of publications for which a woman is corresponding author to those for which a man is corresponding author, by field of R&D, 2010-2014 and 2015-2019	Table 7.8	Table 7.4	Table 7.1	n/a
Compound annual growth rate (%) of the ratio of publications for which a woman is corresponding author to those for which a man is corresponding author, by field of R&D, 2010-2019	Table 7.9	Table 7.2	n/a, although see (part comparable) Table 7.2	n/a
Ratio of publications resulting from international collaboration for which a woman is corresponding author to those for which a man is corresponding author in all fields of R&D, international collaboration, 2015-2019	Figure 7.8	Figure 7.3	n/a	n/a
Women to men ratio of inventorships, 2015-2018	Figure 7.9	Figure 7.11	Figure 7.4	n/a
Women to men ratio of inventorship by IPC class, 2005-08 vs 2015-18	Table 7.10	Table 7.15	Table 7.7	n/a
Compound annual growth rate (%) of the four-year ratio of women inventorships, by IPC section, 2006-2018	Table 7.11	Table 7.16	Table 7.8	n/a
Distribution of patent application by sex composition of the inventors' team (%), 2015-18	Figure 7.10	Figure 7.12	n/a	n/a
CAGR (%) of the four-year time moving periods of patent applications, by sex composition of the inventors' team, 2006–2018	Table 7.12	Table 7.17	n/a	n/a

Name of indicator	SF2021 label	SF2018 label	SF2015 label	SF2012 label
Average proportion of women among authors on publications that list, among the author affiliations, both a corporate entity and any other entity, in all fields of R&D, 2015-2019	Figure 7.11	n/a	n/a	n/a
Research funding success rate differences between women and men, 2019	Figure 7.12	Figure 7.13	Figure 7.5	Figure 4.3
Research funding success rate differences between women and men, by field of R&D, 2019	Table 7.13	Table 7.18	Table 7.9	Table 4.2
Percentage of a country's publications with a gender dimension in their research and innovation content, 2015-2019 and compound annual growth rate (%) and trend of the percentage, 2010-2019	Table 7.14	Table 7.19	n/a	n/a
Percentage of a country's publications with a gender dimension in their research and innovation content, by field of R&D, 2010-2014 and 2015-2019	Table 7.15	Table 7.20	n/a, although see (noncomparable) Table 7.10	n/a
Proportion (%) of Horizon 2020 projects integrating a gender dimension	Figure 7.13	n/a	n/a	n/a
Proportion (%) of Horizon 2020 projects integrating intersectional aspects	Figure 7.14	n/a	n/a	n/a
Ratio of women to men among active authors, by selected SDGs and seniority level, 2015-2019	Annex 7.1.	n/a	n/a	n/a
Ratio of women to men among all authors, by field of R&D and selected SDGs and seniority level, 2015-2019	Annex 7.2	n/a	n/a	n/a
Average proportion of women among authors on publications, by selected SDGs, 2010-2014 and 2015-2019	Annex 7.3	n/a	n/a	n/a
Average proportion of women among authors on publications resulting from intra-EU27+ collaboration in all fields of R&D, 2015-2019	Annex 7.4	n/a	n/a	n/a
Average proportion of women among authors on publications resulting from national collaboration in all fields of R&D, 2015-2019	Annex 7.5	n/a	n/a	n/a
Ratio of FWCI for women to men based on fractional authorship on publications in all fields of R&D, 2019	Annex 7.6	n/a	n/a	n/a
Ratio of FWCI for women to men based on fractional authorship on publications, by field of R&D, 2014 and 2019	Annex 7.7	n/a	n/a	n/a
CAGR (%) of ratio of FWCI for women to men based on fractional authorship on publications, by field of R&D, 2010-2019	Annex 7.8	n/a	n/a	n/a

Name of indicator	SF2021 label	SF2018 label	SF2015 label	SF2012 label
Ratio of publications for which a woman is corresponding author to those for which a man is corresponding author, by selected SDGs, 2010-2014 and 2015-2019	Annex 7.9	n/a	n/a	n/a
Ratio of publications resulting from intra-EU27+ collaboration for which a woman is corresponding author to those for which a man is corresponding author in all fields of R&D, 2015-2019	Annex 7.10	n/a	n/a	n/a
Ratio of publications resulting from national collaboration for which a woman is corresponding author to those for which a man is corresponding author in all fields of R&D, 2015-2019	Annex 7.11	n/a	n/a	n/a
Ratio of publications resulting from international collaboration for which a woman is corresponding author to those for which a man is corresponding author, by field of R&D, 2010-2014 and 2015-2019	Annex 7.12	Table 7.8	Table 7.3	n/a
CAGR (%) of ratio of publications resulting from international collaboration for which a woman is corresponding author to those for which a man is corresponding author, by field of R&D, 2010-2019	Annex 7.13	Table 7.6	Table 7.4	n/a
Ratio of average FWCI for publications with women as corresponding authors to average FWCI for publications with men as corresponding authors, in all fields of R&D, 2019	Annex 7.14	n/a	n/a	n/a
Ratio of average FWCI for publications with women as corresponding authors to average FWCI for publications with men as corresponding authors, by field of R&D, 2014 and 2019	Annex 7.15	n/a	n/a	n/a
CAGR (%) of ratio of average FWCI for publications with women as corresponding authors to average FWCI for publications with men as corresponding authors, by field of R&D, 2010-2019	Annex 7.16	n/a	n/a	n/a
Number of applicants and beneficiaries of research funding, by sex, 2019	Annex 7.17	Annex 7.1	Annex 7.1	Annex 4.2
Number of women applicants and beneficiaries of research funding, by field of R&D, 2019	Annex 7.18	Annex 7.2	n/a	n/a
Number of men applicants and beneficiaries of research funding, by field of R&D, 2019	Annex 7.19	Annex 7.3	Annex 7.2 (part)	Annex 4.3 (part)
Number of a country's publications with a gender dimension in their research and innovation content, by field of R&D, 2010-2014 and 2015-2019	Annex 7.20	n/a	n/a	n/a

APPENDIX 2

Methodological notes

These notes are intended to provide the reader with a brief reference guide about the coverage, identification and definition of groups, units and concepts presented and used in this publication.

For more detailed methodological notes on the data presented in She Figures 2021 main publication, please access the She Figures 2021, Handbook, available at:

https://data.europa.eu/doi/10.2777/003736

Data sources

The majority of the She Figures data comes from Eurostat (the statistical office of the European Union) and is publicly available. This includes the indicators on ISCED 2011 level 8 graduates, knowledge intensive activities, research and experimental development (R&D) expenditure and most indicators on researchers and R&D personnel. In particular, the publication draws upon Eurostat's databases on:

- Education and Training: https://ec.europa.eu/eurostat/web/education-and-training/data/database
- Science, Technology and Innovation: https://ec.europa.eu/eurostat/web/science-technology-innovation/data/database

Data on education and on R&D for countries that are not EU MS nor EFTA countries were also collected from:

- UNESCO Institute of Statistics: http://data.uis.unesco.org/ (Subjects: a) Science, Technology and Innovation and b) National monitoring)
- OECD: https://stats.oecd.org/ (Education and Training)

Data on population, labour force, unemployment and labour under-utilisation for countries that are not EU MS nor EFTA countries were also collected from the International Labour Organization (ILO): https://www.ilo.org/ilostat/ (subjects: a) population and labour force and b) unemployment and labour under-utilisation).

National Statistical Correspondents report data by sex on researchers and academic staff (see Seniority grades/ Academic staff below), on the applicants and beneficiaries of research funding, on boards of research organisations and on heads of institutions in the Higher Education Sector (HES), and in universities or assimilated institutions to the Women in Science (WiS) database on a goodwill basis. A complete list of the research funds and of the boards can be found at the end of this Appendix.

Statistics on inventorships were produced using data from the EPO Worldwide Patent Statistical Database (PATSTAT). Statistics on authorships, scientific quality/impact and the gender dimension in peer-reviewed publications were produced using data from Elsevier's Scopus database. Statistics on the gender dimension and on the integration of intersectional aspects in Horizon 2020 projects were produced using data from the EU Open Data Portal.

Data concerning the mobility and employment status (part time/precarious employment) of researchers come from the Mobility Patterns and Career Paths of the EU Researchers (MORE4) Survey (European Commission, 2019). The results and the methodological notes are available online at https://www.more-4.eu/surveys.

Data concerning the gender equality actions of Research Performing Organisations (RPOs) come from scraping websites of

- Higher education institutions (found in ETER project: https://www.eter-project.com/); and
- Public Research Organisations (the public bodies and research organisations that participated in projects under Framework Programme 7 (FP7) and Horizon 2020 (H2020) Framework Programme for R&I; found in CORDIS database https://cordis.europa.eu/projects/en and revised from statistical correspondents).

Throughout She Figures 2021, the data source for each indicator is presented below the corresponding figure/table.

Statistical terms and classifications

Students and Graduates

The International Standard Classification of Education (ISCED) is the UN framework for classifying educational programmes at different levels. Data presented in the She Figures 2021 have been collected in line with the ISCED 2011 classification (UNESCO, 2011).

Tertiary (or Higher) Education is comprised of four levels: short-cycle tertiary education (level 5), Bachelor's or equivalent (level 6), Master's or equivalent (level 7) and Doctoral or equivalent (level 8).

Entry into the ISCED level 5 programmes requires the successful completion of ISCED level 3 or 4 with access to tertiary education. ISCED level 8 programmes are designed primarily to lead to 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.

Data referring to the reference year 2012 or earlier have been collected in line with the ISCED 1997 classification (UNESCO, 1997). The equivalents to ISCED 2011 levels 6-7 and 8 are the ISCED-97 levels 5A and 6 respectively used in previous publications.

The number of graduates refers to those graduating in the reference year and not to the number of graduates in the population. The number of graduates also refers to non-national students graduating in the country, but does not include national students graduating abroad.

Science and Technology (S&T) fields of education and training

The ISCED-F 2013 classification (UNESCO Institute of Statistics, 2014) distinguishes 29 narrow fields of education and training organised in 10 broad groups: education; humanities and arts; social sciences, journalism and information; business administration and law; natural sciences, mathematics and statistics; information and communication technology; engineering, manufacturing and construction; agriculture, forestry, fisheries and veterinary; health and welfare; and services. In other words, the student and graduate population analysed in this publication covers all fields.

International Standard Classification of Occupations (ISCO)

The International Standard Classification of Occupations (ISCO) is the International Labour Organization classification structure for organising information on labour and jobs. ISCO is a tool for organising jobs into a clearly defined set of groups according to the tasks and duties undertaken in the job. The first version of ISCO, adopted in 1957 and named ISCO-58, was followed by ISCO-68 and ISCO-88. Many current national occupational classifications are based on one of these three ISCO versions. ISCO was updated in 2007 to take into account developments in the world of work since 1988 and to make improvements in the light of experience gained in using ISCO-88. The update did not change the basic principles and the top structure of ISCO-88 (i.e. the ten major groups). However, significant sub structural changes were made in some areas. The updated classification is known as ISCO-08. The ILO provides a correspondence table linking ISCO-08 to ISCO-88 (ILO, 2012).

Among the ten major groups the She Figures looks at is Professionals and Technicians and associate professionals. Professionals are subdivided into six sub major groups: science and engineering professionals; health professionals; teaching professionals; business and administration professionals; information and communications technology professionals; and legal, social and cultural professionals.

Technicians and associate professionals are subdivided into five sub major groups: science and engineering associate professionals; health associate professionals; business and administration associate professionals; legal, social, cultural and related associate professionals; and information and communications technicians.

Human Resources in Science and Technology (HRST)

The Canberra Manual (OECD, 1995) proposes a methodology to identify individuals from the European Union Labour Force Survey case data, according to educational attainment and occupation, to approximate Human Resources in Science and Technology (HRST). The types of HRST presented in this publication are:

- HRSTE: HRST Education – people who have successfully completed tertiary education in any field of education and training (see Science and Technology – S&T – fields of education and training below)
- HRSTO: HRST Occupation – people who are employed in S&T occupations as ‘Professionals’ or ‘Technicians and Associate Professionals’ (see ISCO definitions for explanation of S&T occupations)
- HRSTC: HRST Core – people who are both HRSTE and HRSTO.

Knowledge intensive activities (KIA and KIABI)

An activity is classified as knowledge intensive if tertiary educated people employed (according to ISCED97, levels 5 to 6 or ISCED11, levels 5 to 8) represent more than 33% of the total employment in that activity. The definition is based on the average number of employed persons aged 15-64 at aggregated EU-27 level in 2008 and 2009 according to the NACE Rev. 2 at 2-digit (see ‘NACE categories’ below), using the EU Labour Force Survey data.

There are two aggregates in use based on this classification: total Knowledge-Intensive Activities (KIA) and Knowledge-Intensive Activities – Business Industries (KIABI). Further reference can be found at Chapter 3.

Scientists and Engineers (S&E) in employment

With the new ISCO-08 classification, S&E are defined as people who work as:

- Science and engineering professionals (ISCO-08, Code 21)
- Health professionals (ISCO-08, Code 22)
- Information and communications technology professionals (ISCO-08, Code 25).

Researchers and R&D personnel

The Frascati Manual (OECD, 2015) provides an international definition for R&D personnel (§5.6): ‘R&D personnel in a statistical unit 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).’.

R&D personnel has three categories:

- Researchers (§5.35):’Researchers are professionals engaged in the conception or creation of new knowledge, products, processes, methods and systems and also in the management of the projects concerned’.
- Technicians and equivalent staff (§5.40): ‘Technicians and equivalent staff are persons whose main tasks require technical knowledge and experience in one or more fields of engineering, physical and life sciences or social sciences and humanities. They participate in R&D by performing scientific and technical tasks involving the application of concepts and operational methods, normally under the supervision of researchers. Equivalent staff perform the corresponding R&D tasks under the supervision of researchers in the social sciences and humanities’.
- Other supporting staff (§5.43): ‘Other supporting staff includes skilled and unskilled craftsmen, secretarial and clerical staff participating in R&D projects or directly associated with such projects’.

It must be noted that from the reference year 2012 onwards, it is not compulsory for countries to report technicians separately from other supporting staff when providing data for their R&D personnel to Eurostat.

Main fields of Research and Development (FORD)

The Frascati Manual (OECD, 2015) defines six main fields of R&D (FORD):

- Natural sciences
- Engineering and technology
- Medical and health sciences
- Agricultural and veterinary sciences
- Social sciences
- Humanities and the arts.

These are adhered to in this publication, with one exception: in chapter 4, the field designations used by Eurostat are adopted.

The breakdown of researchers by field of R&D is based on the field where they work and not according to the field of their qualification.

Indicators about scientific publications were also produced by the above FORD. Scientific publications in Scopus are assigned to several major and minor subject areas. Major subject areas are defined according to 27 All Science Journal Classification (ASJC) categories. Each of the 27 subject categories is further subdivided into a total of 334 minor sub-categories. As some journals can be classified as multi-category (i.e., more than one subject), each publication may fall into more than one subject classification. For She Figures 2021, the ASJC classifications were mapped to the FORD. A full table of the mapping of FORD with the ASJC sub-categories can be found in the She Figures 2021 Handbook.

Sectors of the economy

The Frascati Manual (OECD, 2015) identifies and defines five sectors of the economy: the higher education sector (HES), the government sector (GOV), the business enterprise sector (BES), the private non-profit sector (PNP) and the 'Rest of the world' sector. The definitions for the first four sectors are:

HES (§3.67): 'It comprises all universities, colleges of technology and other institutions providing formal tertiary education programmes, whatever their source of finance or legal status, and all research institutes, centres, experimental stations and clinics that have their R&D activities under the direct control of, or administered by, tertiary education institutions'.

GOV (§3.60): 'The Government sector consists of the following groups of resident institutional units: all units of central (federal), regional (state) or local (municipal) government including social security funds, except those units that provide higher education services or fit the description of higher education institutions provided in this manual. It consists also of all non-market NPIs that are controlled by government units that are not part of the Higher education sector'.

BES (§3.51): 'The Business enterprise sector comprises all resident corporations, including not only legally incorporated enterprises, regardless of the residence of their shareholders. This group also includes all other types of quasi-corporations, i.e. units capable of generating a profit or other financial gain for their owners that are recognised by law as separate legal entities from their owners and set up for purposes of engaging in market production at prices that are economically significant. It comprises also the unincorporated branches of non-resident enterprises that are deemed to be resident because they are engaged in production on the economic territory on a long-term basis and all resident NPIs that are market producers of goods or services or serve business'.

PNP (§3.75):'The Private non-profit sector comprises all non-profit institutions serving households (NPISH), as defined in the SNA 2008, except those classified as part of the Higher education sector. For completeness of presentation it comprises also, households and private individuals engaged or not engaged in market activities, as explained in the section "Criteria for the classification of institutional sectors for R&D statistics" earlier in this chapter'.

The 'Rest of the world' sector is not referred to in this publication.

NACE categories

Researchers in the business enterprise sector are categorised using the Statistical Classification of Economic Activities in the European Community, Rev. 2 (NACE Rev.2). For a full listing of the NACE Rev.2 categories please see https://ec.europa.eu/eurostat/web/products-manuals-and-guidelines/-/KS-RA-07-015

Units – Head Count & Full Time Equivalent

The units of measurement of personnel employed on R&D as proposed by the Frascati Manual (OECD, 2015) are:
- HC (§5.58): Head count. The number of persons engaged in R&D at a given date, the average number of persons engaged in R&D during the (calendar) year, or the total number of persons engaged in R&D during the (calendar) year.
- FTE (§5.49): Full time equivalent. It 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.

Data in this publication are presented in HC, unless indicated otherwise.

R&D expenditure

The Frascati Manual (OECD 2015) defines intramural expenditures on R&D (§4.10) as all current expenditures plus gross fixed capital expenditures for R&D performed within a statistical unit during a specific reference period, whatever the source of funds.189

Seniority grades of researchers/academic staff

Statistics on researchers/academic staff have been collected by sex, grade, main field of R&D and age group (for latest reference year only) using the Women in Science (WiS) questionnaire. The statistics on the seniority of researchers/academic staff are collected at the national level through Higher Education and R&D Surveys or directly from higher education institutions as part of their own monitoring systems and from administrative records. It is important to note that these data are not always completely cross country comparable as the seniority grades have not yet been implemented following the publication of the revised Frascati Manual guidelines (OECD 2015). Furthermore, since it was not always possible for countries to provide data on the preferred reference population in the She Figures 2021 – that is for researchers in the HES as defined by the Frascati Manual (OECD, 2015) – some countries provided data for an alternative reference population, namely 'academic staff' (see definition in UNESCO – Institute for Statistics et al, 2017) in the HES.

The grades presented in this publication are based upon national mappings according to the following definitions:
- A: The single highest grade/post at which research is normally conducted within the institutional or corporate system;
- B: All researchers working in positions which are not as senior as the top position (A) but definitely more senior than the newly qualified PhD holders (C); i.e.: below A and above C;
- C: The first grade/post into which a newly qualified PhD graduate would normally be recruited within the institutional or corporate system;
- D: Either postgraduate students not yet holding a PhD degree who are engaged as researchers (on the payroll) or researchers working in posts that do not normally require a PhD.

Internationally mobile researchers

Two 'She Figures 2021' indicators present the mobility rates of researchers, based on data from the MORE 4 Survey of Higher Education Institutions (European Commission, 2017c). One focuses on mobility during PhD for researchers in the early stages of their careers (R1 and R2 combined) and another focuses on mobility in the last 10 years for researchers in the post PhD phases of their careers (R2–R4).

The precise categories of mobility are as follows:
- 'International mobility during PhD' applies to researchers who have moved abroad for at least three months during their PhD to a country other than the one where they completed (or will obtain) their PhD. In She Figures 2021, the derived indicator is based on a direct question in the MORE4 Survey.
- 'International mobility in the post PhD career stages' applies to researchers who have worked abroad for more than three months at least once in the last 10 years, since obtaining their highest educational qualification (PhD or other). In She Figures 2021, the derived indicator is based on a direct question in the MORE4 Survey of Higher Education Institutions.

The MORE4 Survey also asks researchers to classify their career stage, using the categories defined in the European Framework for Research Careers (European Commission, 2011). These are:
- R1: First Stage Researcher (up to the point of PhD);
- R2: Recognised Researcher (PhD holders or equivalent who are not yet fully independent);
- R3: Established Researcher (researchers who have developed a level of independence); and
- R4: Leading Researcher (researchers leading their research area or field).

The MORE4 Survey applies the Frascati Manual (OECD, 2015) definition of researchers (see above).

Part time and precarious employment

Three indicators based on the MORE4 Survey focus on the employment status of researchers in the HES.

'Part time employment' covers respondents who self reported any of these three statuses: 'part time: more than 50 %'; 'part time: 50 %'; 'part time: less than 50 %'. It should be kept in mind that part-time employment is sometimes the choice of the researchers while sometimes it has been forced upon them. The indicator does not distinguish between these two cases.

'Precarious employment' includes:
- Researchers who indicated that they have a fixed term contract of one year or less;
- Researchers who indicated that they have no contract;
- Researchers who indicated that they have an 'other' non-fixed term, non-permanent type of contract (often associated with student status), unless they stated explicitly that they had a contract of indefinite duration.

This definition of 'precarious' employment differs from that of the Labour Market and Labour Force Statistics which describes as 'precarious' contracts with duration of three months or less (https://ec.europa.eu/eurostat/web/labour-market/quality-of-employment).

Actions and measures taken towards Gender Equality

Two indicators in She Figures 2021 refer to the implementation of actions and measures towards Gender Equality by research performing organisations, based on web-scraping data. The search phrases that were used to indicate that organisations had taken actions and measures to promote Gender Equality include:

- Gender Equality
- Gender Equality Plan
- Equal opportunities officer
- Equal participation officer
- Eliminate/Prevent sex discrimination
- Eliminate/Prevent harassment
- Harassment policy
- Gender diversity committee
- Gender diversity office
- Gender diversity task force

More details on how these search phrases were created and the process of web-scraping techniques are presented in the She Figures 2021 Handbook.

Technological fields (IPC sections)

Statistics on inventorships were produced by using data from the EPO Worldwide Patent Statistical Database (PATSTAT). All EPO patent applications are classified based on the International Patent Classification (IPC) of the World Intellectual Property Organization (WIPO) in PATSTAT. This hierarchical classification is divided into eight sections (level 1), which are further divided into classes (level 2), sub-classes (level 3), main groups (level 4) and sub-ingroups (lower level). This classification is not mutually exclusive (i.e. each patent application is classified into one or more sections, classes, subclasses, main groups and subgroups). Thus, a given patent application can contribute to the scores of more than one of the eight sections for which statistics on inventorships were calculated:

- A: Human necessities
- B: Performing operations & transporting
- C: Chemistry & metallurgy
- D: Textiles & paper
- E: Fixed constructions
- F: Mechanical engineering, lighting, heating, weapons & blasting
- G: Physics
- H: Electricity.

Other data considerations

Age groups

Data referring to the labour force refer to all persons aged 15 and over living in private households and include the employed and the unemployed. Data referring to HRST refer to the age group 25-64.

Small numbers

For some countries with small populations, raw data relating to small numbers of people have been reported. The percentages and indicators have not always been included (mostly growth rates) and this is identified in the footnotes to the indicators. The reader is therefore asked to bear this in mind when interpreting the most disaggregated data, in particular for Cyprus, North Macedonia, Luxembourg and Malta, and, in some cases, for Estonia, Iceland, Latvia and Bosnia and Herzegovina.

EU estimates

EU totals estimated by DG Research and Innovation are based upon existing data for the reference year (n) in combination with the next available year if the reference year is unavailable, in the following sequence (n-1, n+1, n-2, n+2 etc…).191

The aggregates were estimated by DG Research and Innovation only when at least 60% of the EU population on a given indicator was available. These estimates are intended as an indication for the reader only.

Rounding error

In some cases, the row or column totals do not match the sum of the data. This may be due to rounding error.

Decimal places

All figures and tables display data up to the precision level of two decimal places. However, when needed, the text discusses the data at full precision.

Cut-off date

Data from Eurostat (Education and Training; and Science, Technology and Innovation), ILO, UIS and OECD were downloaded between June and July 2020. Data from Eurostat (Labour Market) were customely extracted in February 2021. Web-scrapping was performed in November 2020 and some updated web-scrapes were performed on January 2021. The planned data collection period of the WiS questionnaire was between May and July 2018, however the greatest part of the data collection was not finalized until September 2020. Three countries appointed a SCs in January 2021 and delivered the data on February of the same year.

Country codes

EU Member States			
BE	Belgium	LT	Lithuania
BG	Bulgaria	LU	Luxembourg
CZ	Czechia	HU	Hungary
DK	Denmark	MT	Malta
DE	Germany	NL	Netherlands
EE	Estonia	AT	Austria
IE	Ireland	PL	Poland
EL	Greece	PT	Portugal
ES	Spain	RO	Romania
FR	France	SI	Slovenia
HR	Croatia	SK	Slovakia
IT	Italy	FI	Finland
CY	Cyprus	SE	Sweden
LV	Latvia		

European Free Trade Association (EFTA)	
IS	Iceland
NO	Norway
CH	Switzerland

EU Candidate Countries	
ME	Montenegro
MK	North Macedonia
AL	Albania
RS	Serbia
TR	Turkey

Other Countries			
AM	Armenia	IN	India
AR	Argentina	JP	Japan
AU	Australia	KR	South Korea
BA	Bosnia and Herzegovina	MD	Moldova
BR	Brazil	MX	Mexico
CA	Canada	RU	Russia
CN_X_HK	China except Hong Kong	TN	Tunisia
FO	Faroe Islands	UA	Ukraine
GE	Georgia	UK	United Kingdom
HK	Hong Kong	US	United States
IL	Israel	ZA	South Africa

Flags

The following flags have been used, where necessary:

z = not applicable

: = data not available or data excluded due to the small number of statistical units

: = (only for indicators about R&D personnel by occupation) data are available for more detailed occupation groups but not for the aggregate groups displayed in the results

: = (only for the numbers of applicants and beneficiaries of research funding, by field of R&D) the field of R&D is not applicable

d = definition differs

p = (not for bibliometric indicators) provisional

p = (bibliometric indicators only) count of publications in the category was less than 100

e = estimated

r = revised

f = forecast

u = low reliability

c = confidential

b = break in time series

n = not significant

- = (not for bibliometric indicators) the denominator that should be used for the calculation of proportions or ratios is zero

- = (bibliometric indicators only) the value at the beginning or end of the period was unavailable for CAGR calculations, either because the value at the beginning of the period was zero or because the number of publications at the beginning was zero

l = (bibliometric indicators only) the count of women or men in the category was less than 30

Researchers/academic staff

The following list provides country-specific metadata for the reference population used in producing statistics on the seniority of researchers/academic staff using the Women in Science (WiS) questionnaire. The first column identifies the reference population used in producing She Figures 2021 by country. The preferred reference population was researchers in the HES as defined by the Frascati Manual. Otherwise, data on academic staff in the HES as defined by the UOE 2019 manual were used instead.

Country	Reference population	Grade	National classification	Minimum level of education required	Responsibilities of the post
BELGIUM	Researchers	Dutch-speaking community			
		A	ZAP1 - "Gewoon/buitengewoon hoogleraar" + ZAP2 - "Hoogleraar"	-	-
		B	ZAP3 - "Hoofddocent" + ZAP4 - "Docent" + ZAP5 - "Other"	-	-
		C	AAP2 - Doctor-assistant + WP3 - Postdoctoral of unlimited duration + WP4 - Postdoctoral of limited duration + Unpaid researchers (postdoctoral)	-	-
		D	AAP1 - Assistant + AAP3 - Other + WP1 - Predoctoral of unlimited duration + WP2 - Predoctoral of limited duration + Unpaid researchers (predoctoral)	-	-
		French speaking community			
		A	Ordinary and extraordinary professors, Research Directors (F.R.S.-FNRS)	PhD	-
		B	Other professors, Senior Research Associates (F.R.S.-FNRS)	PhD	-
		C	Assistant professors (or equivalent, including "Chargé de cours"), Lecturers (Maîtres de conférence), Research Associates (F.R.S.-FNRS)	PhD	-
		D	Scientific staff : Postdoctoral researchers, Scientific Research Workers, Teaching assistants, Research Fellows (or equivalent)	MSc	-
Comments		Dutch-speaking community: Classification provided by VLIR (Flemish Interuniversity Council). French-speaking community: With respect to T1 (head counts), a researcher who holds different positions within different Grade categories (A, B, C, D) could be counted several times.			

Country	Reference population	Grade	National classification	Minimum level of education required	Responsibilities of the post
BULGARIA	Academic staff	A	Professors	ISCED 8	Teaching and Research
		B	Associate professors	ISCED 8	Teaching and Research
		C	-	-	-
		D	Assistants, Lecturers, Science assistants	ISCED 7	Teaching and Research
Comments		No comments			
CZECHIA	Researchers	A	-	-	-
		B	-	-	-
		C	-	-	-
		D	-	-	-
Comments		No comments			
DENMARK	Researchers	A	Professor	PhD	-
		B	Associate professors, Senior researchers	PhD	-
		C	Assistant professors, Post docs	PhD	-
		D	PhD Students, other researchers (R&D advisors, research assistants and other VIPs)	MSc	-
Comments		No comments			
GERMANY	Academic staff	A	professors: W3/C4	Habilitation or equivalent	Teaching and Research
		B	C3, C2 auf Dauer, C2 auf Zeit, W2, Juniorprofessuren W1, Gastprofessuren (hauptberuflich), Hochschuldozenten, Universitätsdozenten, Oberassistenten, Oberingenieure, wissenschaftliche und künstlerische Mitarbeiter (höchster Abschluss: Habilitation)	PhD + professional experience outside the academia (universities of applied sciences) or habilitation or equivalent (universities)	Teaching and Research
		C	Hochschulassistenten, Wissenschaftliche und künstlerische Assistenten, Akademische (Ober)Räte-auf Zeit, wissenschaftliche und künstlerische Mitarbeiter (höchster Abschluss: Promotion), Lehrkräfte für besondere Aufgaben (höchster Abschluss: Promotion oder Habilitation)	PhD	Normally both; some staff is only involved in research, some only in teaching
		D	wissenschaftliche und künstlerische Mitarbeiter (höchster Abschluss: Master/ Diplom oder Äquivalent), Lehrkräfte für besondere Aufgaben (höchster Abschluss: Master/ Diplom oder Äquivalent)	MA	Normally both; some staff is only involved in research, some only in teaching

Country	Reference population	Grade	National classification	Minimum level of education required	Responsibilities of the post
Comments		No comments			
ESTONIA	Researchers	A	-	-	-
		B	-	-	-
		C	-	-	-
		D	-	-	-
Comments		No comments			
IRELAND	Academic staff	A	Full Professor on appropriate salary (€101,404 – €136,276). Grade A staff members are found in the universities. While there are some staff members who are in the IoTs who are styled as professors, these are not returned as academic staff in the HEA returns, and therefore do not fit the definition of Grade A staff (the highest grade/post at which research is normally conducted).	Varies depending on institution and date of appointment.	Teaching and Research
		B	Senior Lecturer (all grades), Associate Professor, (it would be expected that once the staff database is established Grade B staff will also include Lecturer 'above the bar', as these positions are held by those 'more senior than newly qualified PhD holders').	Varies depending on institution and date of appointment.	Teaching and Research
		C	Lecturer (and 'Assistant Lecturer' in the IoTs)	Varies depending on institution and date of appointment.	Teaching and Research
		D	-	-	-
Comments		No comments			
GREECE	Academic staff	A	Professor	ISCED8	Teaching and Research
		B	Deputy Professor	ISCED8	Teaching and Research
		C	Assistant Professor, Lecturer	ISCED8	Teaching and Research
		D	other academic staff	ISCED8& ISCED 7	Teaching and Research
Comments		No comments			

Country	Reference population	Grade	National classification	Minimum level of education required	Responsibilities of the post
SPAIN	Researchers	A	Full professor	-	-
		B	Associate Professor (civil servant and non-civil servant permanent) and Post-Doc contract for outstanding research careers (non-permanent)	-	-
		C	Assistant Professor (PhD holder), Other researchers in non-permanent positions that require a PhD	-	-
		D	PhD Candidate engaged as researcher and Researchers in non-permanent post that do not require a PhD	-	-
Comments		No comments			
FRANCE	Researchers	A	-	ISCED8	Teaching and Research
		B	-	ISCED7/8	Teaching and Research
		C	-	ISCED7/8	Research
		D	-	ISCED8	Teaching and Research
Comments		No comments			
CROATIA	Researchers	A	Researchers with highest scientific title	PhD	Research
		B	Researchers with highest scientific title	PhD	Research
		C	Researchers without scientific title	PhD	Research
		D	Researchers (Postgraduate students without PhD)	Postgraduate level that is no PhD	Teaching and Research
Comments		No comments			

Country	Reference population	Grade	National classification	Minimum level of education required	Responsibilities of the post
ITALY	Academic staff	A	FULL PROFESSORS (permanent employment)	Since 2010, a reform of the University (Law 240/2010) has reorganized the recruitment procedures of the academic staff and has established a "national scientific qualification" which is a necessary prerequisite for access to grades A and B. Before then, it was enough to hold a degree and passing a specific public competition.	Teaching and Research
		B	ASSOCIATE PROFESSORS (permanent employment - lower level)	cfr. A - Minimum level of education required	Teaching and Research
		C	ACADEMIC RESEARCHERS (permanent employment and fixed-term employment)	Since 2010, ISCED 8 level (PhD) attainment. ISCED 7 level attainment before 2010.	Teaching and Research but they are more involved in research activities than in teaching.
		D	FELLOWSHIP RESEARCHERS	PhD or equivalent is an advantage to the attribution of grants.	Research
Comments		No comments			
CYPRUS	Researchers	A	Professors	PhD	Teaching and Research
		B	Associate Professors	PhD	Teaching and Research
		C	Assistant Professors, Lecturers & Teaching Support Staff	PhD (for Assistant Professors); MSc and/or PhD (for Lecturers & Teaching Support Staff)	Teaching and Research
		D	Research Associates & Other Staff	Other post-secondary diplomas to PhD	Research
Comments		Academic staff usually do a mixture of teaching and research. The data reported cover only the academic staff that engage (fully or partly) in research. However, there exist cases where staff only engages in teaching; this staff is not included. In essence, the academic staff reported in the WiS questionnaire corresponds to Higher Education Researchers, as defined in the Frascati Manual. Research associates working in certain projects only undertake research.			

Country	Reference population	Grade	National classification	Minimum level of education required	Responsibilities of the post
LATVIA	Academic staff	A	full professors	PhD	Teaching and Research
		B	associate professors	PhD	Teaching and Research
		C	assistant Professors, assistants, lecturers, researchers	-	-
		D	-	-	-
Comments		No comments			
LITHUANIA	Academic staff	A	Professor - teaching staff, Chief Researcher - research staff	PhD	Teaching and Research
		B	Associate professor - teaching staff, Senior Researchers - research staff	PhD	Teaching and Research
		C	Lecturers - teaching staff, Researchers - research staff	At least a Master's qualification degree or higher education qualification equivalent	Teaching and Research
		D	Assistants - teaching staff, Junior Researchers - research staff.	At least a Master's qualification degree or higher education qualification equivalent	Teaching and Research
Comments		No comments			
LUXEMBOURG	Researchers	A	-	PhD	Teaching and Research
		B	-	PhD	Teaching and Research
		C	-	PhD	Teaching and Research
		D	-	PhD	Teaching and Research
Comments		No comments			
HUNGARY	Researchers	A	Professors	ISCED 8	Teaching and Research
		B	Assistant Professors	ISCED 8	-
		C	Lecturers	ISCED 8	-
		D	-	-	-
Comments		No comments			

Country	Reference population	Grade	National classification	Minimum level of education required	Responsibilities of the post
MALTA	Researchers	A	Associate Professor/Professor	University of Malta (UM): PhD, Malta College of Arts, Science & Technology (MCAST): EQF 8	University of Malta (UM): Teaching and Research, Malta College of Arts, Science & Technology (MCAST): Research
		B	Lecturer/Senior Lecturer	University of Malta (UM): PhD, Malta College of Arts, Science & Technology (MCAST): EQF 8	University of Malta (UM): Teaching and Research, Malta College of Arts, Science & Technology (MCAST): Teaching and Research
		C	Assistant Lecturer	University of Malta (UM): First Degree, Malta College of Arts, Science & Technology (MCAST): EQF 8	University of Malta (UM): Teaching and Research, Malta College of Arts, Science & Technology (MCAST): Teaching and Research
		D	Junior College Lecturer	University of Malta (UM): First Degree, Malta College of Arts, Science & Technology (MCAST): EQF 5	University of Malta (UM): Teaching, Malta College of Arts, Science & Technology (MCAST): Teaching and Research
Comments		No comments			

Country	Reference population	Grade	National classification	Minimum level of education required	Responsibilities of the post
NETHERLANDS	Academic staff	A	Full professor	-	Teaching and Research
		B	Associate Professor	-	Teaching and Research
		C	Assistant professor	-	Teaching and Research
		D	Other scientific personnel and Postgraduates	-	Depends on the subcategory. Some subcatego-ries within “other scientific person-nel” are oriented to education, some to research. Postgraduades have a small educational task.
Comments		No comments			
AUSTRIA	Researchers	A	Universitätsprofessor/in, Stiftungsprofessor/in, Gastprofessor/in nur mit F&E-Tätigkeit, Emeritierte/r Universitätsprofessor/in und Professor/in im Ruhestand nur mit F&E-Tätigkeit	-	Teaching and Research
		B	Assoziierte/r Professor/in, Universitätsdozent/in, Vertragsdozent/in, Assistenzprofessor/in	-	Teaching and Research
		C	Ass.Prof. (KV), Universtitätsassistent/in mit PhD, Staff Scientist, Senior Scientist/Artist, Assistenzarzt/-ärztin, Arzt/Ärztin, Projektmitarbeiter/in und Sonstiges wissenschaftliches Personal mit PhD	-	Teaching and Research
		D	Universitätsassistent/in ohne PhD Projektmitarbeiter/in und Sonstiges wissenschaftliches Personal ohne PhD, Senior Lecturer, Bundes- und Vertragslehrer/in, Wissenschaftliche Beamte, Wissenschaftliche Vertragsbedienstete, Studentische/r Mitarbeiter/in (mit F&E-Tätigkeit).	-	-
Comments		Projektmitarbeiter/innen and Sonstiges wissenschaftliches Personal with PhD: Grade C, without PhD Grade D (separated since 2013). Studentische/r Mitarbeiter/in without R&D are not included (since 2013)			

Country	Reference population	Grade	National classification	Minimum level of education required	Responsibilities of the post
POLAND	Researchers	A	Profesor	Doctor habilis with the title of professor	Teaching and Research
		B	Doktor habilitowany (Doctor habilis / Habilitated PhD)	Habilitation	Teaching and Research
		C	Doktor (PhD)	PhD	Teaching and Research
		D	Magister	Masters Degree	Teaching and Research
Comments		Responsibilities of scientists does not depend on their grade, but on job title and the scope of duties. For most scientists, both research and teaching are obligatory			
PORTUGAL	Researchers	A	Professor Catedrático Professor Coordenador Principal (from 2010) Investigador Coordenador	PhD	Teaching and Research
		B	Professor Associado (com e sem agregação) Professor Coordenador (com e sem agregação) Investigador Principal	PhD	Teaching and Research
		C	Professor Auxiliar Professor Adjunto Investigador Auxiliar	PhD	Teaching and Research
		D	Assistentes Leitor Monitor Outros	PhD and others	Teaching and Research
Comments		Not all the researchers are classified by grades in the national R&D survey			
ROMANIA	Researchers	A	Principal scientist 1	ISCED 8 (PhD)	Research
		B	Principal scientist 2	ISCED 8 (PhD)	Research
		C	Principal scientist	ISCED 8 (new qualified PhD)	Teaching and Research
		D	Research assistant/postgraduate students not yeld holding a PhD/ Researcher who works in positions that do not require the title of doctorate holder	ISCED7	Research
Comments		No comments			
SLOVENIA	Academic staff	A	Full professors	-	-
		B	Associate professors	-	-
		C	Assistant professors, senior lecturers, lecturers, lectors	-	-
		D	Young researchers	-	-
Comments		No comments			

Country	Reference population	Grade	National classification	Minimum level of education required	Responsibilities of the post
SLOVAKIA	Academic staff	A	Full professor (“profesor”)	degree of “docent” , successful completion of appointment procedure	Teaching and Research
		B	Associate professor (“docent”)	higher education of the third level, habilitation	Teaching and Research
		C	Lecturer (“odborný asistent”)	higher education of the third level (or second level) - majority of them has “PhD”, if not they educate themselves to receive it	Teaching and Research
		D	Assistant lecturer, lector (“asistent”, “lektor”)	higher education of the second level, HE Institution creates for assistent lecturer space for education leading to “PhD” (lector - second or first level)	Assistant lecturer: Teaching and Research, lector: teaching
Comments		Data cover both full and part time academic staff			
FINLAND	Researchers	A	Research career model, 4th stage: professorship (Previously: Professors)	-	-
		B	Research career model, 3rd stage: independent research and education professionals capable of academic leadership (Previously: Lecturers, senior assistants)	-	-
		C	Research career model, 2nd stage: career phase of researchers who have recently completed their doctorate (Previously: Assistants, full-time teachers)	-	-
		D	Research career model, 1st stage: young researchers working on their Doctoral dissertation (Previously: researchers)	-	-
Comments		No comments			

Country	Reference population	Grade	National classification	Minimum level of education required	Responsibilities of the post
SWEDEN	Academic staff	A	Professor	Phd	Teaching and Research
		B	Associate professor, senior researcher, other academic staff with a Doctoral degree	Phd	Teaching and Research
		C	Assistant professor, Post.Doc fellowship holders	Phd	Teaching and Research
		D	Graduate students, junior lecturers, other academic staff without Doctoral degree	Generally requires ISCED 5 Degree	Teaching and Research
Comments		No comments			
UNITED KINGDOM	Researchers	A	A0 to F2	-	-
		B	I0 to K0	-	-
		C	L0	-	-
		D	M0 to P0	-	-
Comments		Definitions of National Classifications come from Staff record 2016/17 - Combined levels - see https://www.hesa.ac.uk/collection/c16025/combined_levels Staff with an academic function of either 'Research only' or 'both Teaching and Research' - see https://www.hesa.ac.uk/collection/c16025/a/acempfun			
ICELAND	Academic staff	A	Full professors	-	Teaching and Research (Requirements: Teaching 48%; research 40%; administration 12%)
		B	Associate professors	-	Teaching and Research (Requirements: Teaching 52%; research 42%; administration 6%)
		C	Assistant professors	-	Teaching and Research (Requirements: Teaching 52%; research 42%; administration 6%)
		D	-	-	-
Comments		Other staff at tertiary level include other teachers than ABC (large group of part time teachers), professionals and managers e.g.			

Country	Reference population	Grade	National classification	Minimum level of education required	Responsibilities of the post
NORWAY	Researchers	A	Full professor	-	Teaching and Research
		B	Associate professor, college reader, senior lecturer, dean, head of department, researchers with a doctorate awarded more than five years ago, senior physicians and senior researchers at university hospitals	Requires a PhD or equal competence. For researchers employed in temporary positions (related to projects), only those with a PhD older than 5 years are included in Grade B	Teaching and Research
		C	Post doctor, researcher with a doctorate awarded less than six years ago, junior physician and clinical psychologist at university hospitals with a Doctoral degree	Post doctor positions, and researchers with a doctorate less than 6 years ago	Research
		D	Lecturer, research fellow, research assistant, other positions not requiring Doctoral competence	MSc	Teaching and Research
Comments		Classification from 2011 and onwards is revised. This is mainly based on more detailed division of personnel regarding when they received a PhD.			
SWITZERLAND	Researchers	A	-	-	-
		B	-	-	-
		C	-	-	-
		D	-	-	-
Comments		No comments			
• TURKEY	Researchers	A	Professor	-	Teaching and Research
		B	Associate professor	-	Teaching and Research
		C	Assistant Professor, lecturer that has a PhD, Research Assistant that has a PhD	PhD	Teaching and Research
		D	Lecturer (Bachelor's Degree), Lecturer (Master's Degree), Research Assistant (Bachelor's Degree), Research Assistant (Maters Degree)	BSc, MSc (depending on the case)	-
Comments		No comments			
BOSNIA & HERZEGOVINA	Researchers	A	-	ISCED 8	-
		B	-	ISCED 8	-
		C	-	ISCED 8	-
		D	-	ISCED6, ISCED 7	-
Comments		No comments			

Country	Reference population	Grade	National classification	Minimum level of education required	Responsibilities of the post
ISRAEL	Academic staff	A	Full Professor	PhD and post doctorate abroad	Teaching and research
		B	Associate Professor, senior lecturer	PhD and post doctorate abroad	Teaching and research
		C	Lecturer	PhD and post doctorate abroad	Teaching and research
		D	Junior staff, research fellows	MA	Teaching and/or research
Comments		No comments			

Research funds

The following list details each of the national funding bodies which have provided data for both applicants and beneficiaries of research funds.

Country	Research Funds
BELGIUM	• Fonds de la Recherche Scientifique (FNRS) • Funds from Flanders Innovation & Entrepreneurship (VLAIO) • Funds from Research Foundation Flanders (FWO)
DENMARK	• Independent Research Fund Denmark (IRFD; former reported as DCIR - Danish Council for Independent Research) • Innovation Fund Denmark (IFD) • The Danish National Research Foundation (DNRF)
GERMANY	• Funds from Deutsche Forschungsgemeinschaft (DFG; German Research Foundation) • Funds from BMBF
ESTONIA	• Estonian Research Council • Estonian Science Fund
GREECE	• National Funding (National Strategic Reference Programme)
SPAIN	• Funds from National R&D plan - DGIC INNCORPORA • Funds from National R&D plan –Fellowships • Funds from National R&D plan - Projects
ITALY	• FIRST-PRIN (Research Projects of National Interest) - (Co-financing MIUR+Universities+RPO) • FIRST-FARE (Framework per l'Attrazione e il Rafforzamento delle Eccellenze per la ricerca in Italia) - (Co-financing MIUR+Universities+RPO) • FFO - Programma "Rita Levi Montalcini" (Programme for the recruitment of young researchers "Rita Levi Montalcini") - (funded by MIUR) • FIRB (Investment Fund for Basic Research) • FIRST-SIR (Scientific Independence of young Researchers) - (Co-financing MIUR+Universities+RPO) • FIRST-FIR (Program "Futuro in Ricerca")- (Co-financing MIUR+Universities+RPO)
CYPRUS	• Research Promotion Foundation (RPF)
LATVIA	• Latvian Council of Science (Fundamental and Applied Research Projects)
LITHUANIA	• State budget allocations from Ministry of Education and Science • State budget allocations from Lithuaniana State Science and Studies Foundation
LUXEMBOURG	• Fonds National de la Recherche • European Commission - Horizon 2020 (h2020)
HUNGARY	• National Research, Development and Innovation Fund (NRDIF; previously known as OTKA)
MALTA	• The R&I FUSION Programme (funded by Malta Council for Science and Technology, MCST) • Internationalisation Unit (funded by Malta Council for Science and Technology, MCST) • REACH HIGH Scholars Programme - Postdoctoral Grants (funded by Ministry for Education and Employment, MEDE)

NETHERLANDS	• NWO - programmes/ thematic research • NWO - individual talent programmes • NWO - free competition • NWO - research facilities • NWO – other • ZonMW (Medical research funding)
AUSTRIA	• FwF (Fonds zur Förderung der wissenschaŠlichen Forschung - Austrian Science Fund) • ÖAW (Österreichische Akademie der WissenschaŠen - Austrian Academy of Sciences) • FFG (Austrian Research Promotion Agency) • CDG (Christian Doppler Research Association)
POLAND	• National Science Centre
PORTUGAL	• R&D Projects (funded by, Fundação para a Ciência e a Tecnologia (FCT)) • R&D Units (funded by, Fundação para a Ciência e a Tecnologia (FCT))
ROMANIA	• HUMAN RESOURCES - Postdoctoral Research Projects (PD) • HUMAN RESOURCES - Young Research Teams Projects (TE) • HUMAN RESOURCES - Researcher Mobility Projects (MC) • HUMAN RESOURCES - Mobility Projects for Experienced Researchers from Diaspora (MCD) • RESEARCH, DEVELOPMENT AND INNOVATION-Experimental demonstration project (PED) • RESEARCH, DEVELOPMENT AND INNOVATION Solutions (SOL) –SOL • RESEARCH, DEVELOPMENT AND INNOVATION Innovation Vouchers (CI) • INSTITUTIONAL PERFORMANCE Complex projects completed in consortia (PCCDI) • BILATERAL CO_OPERATION COMPETITIONS - Bilateral Co-operation Romania-France (CNRS) • BILATERAL CO_OPERATION COMPETITIONS - Bilateral Co-operation Romania-China • AAL • EUREKA • ERA _NET • EEA & Norway Grants, Collaborative Research Projects • CLUSTER • Solutii
SLOVENIA	• F1 (Slovenian Research Agency) • F2 (Slovenian Research Agency) • F3 (Slovenian Research Agency)
SLOVAKIA	• Funds from Slovak Research and Development Agency • Funds from Ministry of Education, Science, Research and Sport: Incentives for Research and Development
FINLAND	• Academy of Finland-Research project funding team leaders • Academy of Finland-Academy Professor • Academy of Finland-Academy Research Fellow • Academy of Finland-Postdoctoral Researcher
SWEDEN	• Funds from Swedish Research Council • Funds from Swedish Research Council for Health, Working Life and Welfare • Funds from Swedish Research Council Formas

UNITED KINGDOM	• AHRC (Arts and Humanities Research Council) • BBSRC (Biotechnology and Biological Science Research Council) • EPSRC (Enginering and Physical Sciences Research Council) • ESRC (Economic and Social Research Council) • MRC (Medical Research Council) NERC (Natural Environment Research Council) • NERC (Natural Environment Research Council) • STFC (Science and Technologies Facilities Council) • Innovate UK • Research England • UKRI (UK Research and Innovation)
ICELAND	• F11 The Research Fund of the University of Iceland • F13 The Research Fund (as of 2004) • F14 The Technology Development Fund (as of 2004) • F15 AVS R&D Fund of Ministry of Fisheries (and Agriculture) in Iceland (as of 2003) • F17 The Research Fund of the University of Akureyri (as of 2004) • Infrastructure Fund (as of 2013)
NORWAY	The Research Council of Norway
SWITZERLAND	• Project Funding Basic Research • Career Funding (Ambizione, Professorships, Eccellenza, MHV, PRIMA, Doc.CH) • Fellowships (Advanced Postdoc.Mobility + Early Postdoc.Mobility + Doc.Mobility) • Sinergia • Innovation Projects
TURKEY	• Scientific and Technological Research Council of Turkey as Funding Organization (TÜBİTAK) • 1512 - TECHNO-ENTREPRENEURSHİP SUPPORT PROGRAM (TÜBİTAK) • Turkish Academy of Sciences (TÜBA) • Basic Research Project Call (TÜSEB) • 2214-A International Research Fellowships for Phd Students • 2218- National Postdoctoral Research Scholarship Programme • 2219- International Postdoctoral Research Fellowship Program for Turkish Citizens • 2232- International Fellowship for Outstanding Researchers Program • 2221 Fellowships for Visiting Scientists and Scientists on Sabbatical Leave • 1505 - UNIVERSITY – INDUSTRY COLLABORATION SUPPORT PROGRAM
ISRAEL	• NSF-BSF joint program • U.S.-Israel Binational Science Foundation (BSF) • German-Israeli Foundation for Scientific Research and Development (GIF) • Israel Science Foundation (ISF) • Ministry of Science and Technology (MOST) • Ministry of Health (MOH)-Medical Research & Development Fund for Health Services

Boards

A **scientific board** of a research organisation is defined as 'A publicly or privately managed and financed group of elected or appointed experts that exists to implement scientific policy by, amongst other things, directing the research agenda, resource allocation and management within scientific research'.

Country	Boards
BELGIUM	• FNRS
BULGARIA	• Executive Board and Expert boards of National science fund • Bilateral Cooperation • The governing council of the Bulgarian Academy of Sciences • Executive bureau and Management board of the Agricultural academy
CZECHIA	• Czech Academy of Sciences - Council for Sciences • Technology Agency of the Czech Republic - Scientific Board • Grant Agency of the Czech Republic - Scientific Advisory Board
DENMARK	• IRFD (Independent Research Fund Denmark) • DCRIP (Danish Council for research and innovation policy) • DNRF (Danish National Research Foundation) • IFD (Innovation Fund Denmark) • IRFD | Social Sciences (former reported as DSSR) • IRFD | Technology and Production (former reported as DRCTP) • IRFD | Humanities (former reported as DRCH) • IRFD | Natural Sciences (former reported as DNR) • IRFD | Medical Sciences (former reported as DMR)
GERMANY	• DFG (German Research Foundation) - Executive Committee • DFG (German Research Foundation) - Senate • DFG (German Research Foundation) - Review Boards • DFG (German Research Foundation) - Joint Committee • German Federal Environmental Foundation • German Foundation for Peace Research • German Federation of Industrial Research Associations - Expert Groups
ESTONIA	• The Research and Development Council • Research Policy Committee of the Estonian Ministry of Education and Research • Centres of Excellence COUNCIL • Evaluation committee of the Estonian Research Council
IRELAND	• Science Foundation Ireland • Irish Research Council • Health Research Board
GREECE	• National Council for Research and Technology (NCRT) • Special Permanent Committee on Research and Technology • Sectorial Scientific Councils • Hellenic Foundation for Research and Innovation

SPAIN	• The Spanish National Research Council (CSIC) Governing Board • Institute of Health Carlos III (ISCIII) Governing Board • Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (CIEMAT) Governing Board • National Institute for Agricultural and Food Research and Technology (INIA) Governing Board • Spanish Institute of Oceanography (IEO) Governing Board • The Geological Survey of Spain (Instituto Geológico y Minero de España (IGME) Governing Board • The Canarian Institute of Astrophysics (IAC) Governing Board • National Institute of Aerospace Technology (INTA) Governing Board • State Research Agency (AEI) Scientific and Technical Committee
FRANCE	• ANR (Agence Nationale de la Recherche/ French National Research Agency)
CROATIA	• The Board of Croatian Science Foundation • The National Council for Science, Higher Education and Technological Development
ITALY	• Ministry of Education, University and Research (MIUR) - Directorate-General for the coordination, promotion and enhancement of research • Consiglio Nazionale delle Ricerche (CNR) – National Research Council • Istituto Nazionale di Fisica Nucleare (INFN) – National Institute for Nuclear Physics • Agenzia Nazionale per le nuove tecnologie, l’Energia e lo Sviluppo economico sostenibile (ENEA) – National Agency for New Technologies, Energy and Sustainable Economic Development • Consiglio per la ricerca in agricoltura e l’analisi dell’economia agraria (CREA) – Agricultural Research Council • Agenzia Spaziale Italiana (ASI) - Italian Space Agency
CYPRUS	• National Board for Research and Innovation (NBRI) • Cyprus Scientific Council (CySC) • Research and Innovation Foundation (RIF)
LATVIA	• Expert commission on natural sciences and mathematics/Latvian Council of Science (From 2019: Natural Sciences) • Expert commission on engineering and computer science /Latvian Council of Science (From 2019: Engineering and Technology) • Expert commission on biology and medical sciences /Latvian Council of Science (From 2019: Medicine and Health sciences) • Expert commission on agricultural, environmental, and forest sciences /Latvian Council of Science • Expert commission on humaritan and social sciences/Latvian Council of Science (From 2019: social sciences) • Expert commission on humanities and arts/Latvian Council of Science (as from 2019)
LITHUANIA	• Research Council of Lithuania
LUXEMBOURG	• Fonds National de la Recherche (FNR)
HUNGARY	• National Research, Development and Innovation Office (basic research funding)
MALTA	• Malta Council for Science and Technology
NETHERLANDS	• Royal Netherlands Academy of Arts and Sciences (KNAW) • The Netherlands Organisation for Scientific Research (NWO) • ZonMw

AUSTRIA	•	Council for Research and Technology Development
	•	Scientific Advisory Boards of OeAW-Institutes
	•	Research Board of OeAW - Austrian Academy of Sciences
	•	Austrian Science Board
	•	FWF Board (Kuratorium
	•	International START-Wittgenstein Jury
	•	PEEK Board (Programme for Arts-based Research)
	•	WissKomm Jury (Science Communication Programme)
	•	KLIF-Jury (Programme Clinical Research)
	•	Christian Doppler Forschungsgesellschaft Scientific board / Senat
POLAND	•	Board of the National Centre for Research and Development
	•	Board of the National Science Centre
	•	Central Commission for Academic Degrees and Titles
	•	Committee for Evaluation of Scientific Research Institutions
	•	Polish Accreditation Committee
PORTUGAL	•	Foundation of Science and Technology
	•	Agency for Competitiveness and Innovation (IAPMEI)
	•	National Innovation Agency (ANI)
	•	COMPETE 2020 - (Managing Authority of the Operational Thematic Competitiveness and Internationalization Programme)
ROMANIA	•	Ministry of Research and Innovation
	•	Consulting Council for RD&I (CCCDI))
	•	National Council for Ethics of Scientific Research, Technological Development and Innovation (CNECSDTI)
	•	National Council for Technology Transfer and Innovation (CNTTI)
	•	National Council for Scientific Research (CNCS)
SLOVENIA	•	Scientific Council of the Slovenian Research Agency
	•	Scientific research councils for individual fields (of the Slovenian Research Agency)
SLOVAKIA	•	The Council of Government of the Slovak Republic for Science, Technology and Innovation
	•	The Presidium of the Slovak Research and Development Agency
	•	Scientific Council of the Slovak Academy of the Sciences
FINLAND	•	Scientific board, Academy of Finland
	•	Research council for Biosciences and Environment
	•	Research council for Culture and Society
	•	Research Council for Natural Sciences and Engineering
	•	Research Council for Health
	•	FIRI (Finnish Research Infrastructure Committee)
	•	Strategic Research Council

SWEDEN	• Board of the Swedish Research Council • Scientific Council for Humanities and Social Sciences of the Swedish Research Council • Scientific Council for Medicine and Health of the Swedish Research Council • Scientific Council for Natural and Engineering Sciences of the Swedish Research Council • Committee for Educational Sciences of the Swedish Research Council • Council for Research Infrastructures of the Swedish Research Council • Board of the Swedish Research Council for Health, Working Life and Welfare • Board of the Swedish Research Council Formas • Board of VINNOVA, Sweden's innovation agency • Committee of Clinical Therapy Research of Swedish Research Council • Committee for Development Research of the Swedish Research Council
ICELAND	• Council for Science and Technology Policy • Council for Science and Technology Policy - Science Board • Council for Science and Technology Policy - Technology board
NORWAY	• The Research Council of Norway (RCN) Executive Board • The Research Council of Norway (RCN) Division for Science • The Research Council of Norway (RCN) Division for Innovation • The Research Council of Norway (RCN) Division for Energy, Resources and the Environment • The Research Council of Norway (RCN) Division for Society and Health
SWITZERLAND	• SNSF National Research Council • SNSF Presidency of National Research Council • Innovation Council of the Innosuisse
TURKEY	• Turkish Academy of Sciences (TÜBA) • Scientific and Technological Research Council of Turkey as Funding Organization (TÜBİTAK) • Scientific and Technological Research Council of Turkey as Research Organization (TÜBİTAK)
BOSNIA & HERZEGOVINA	• Board for Economic Sciences • Board for Pedagogical Sciences • Board for Legal Sciences • Board for Social Sciences • Board for History Sciences • Board for Psychiatric and neurological research • Board for Cardiovascular Pathology • Board for the study of antimicrobial resistance • Board for the Malignant diseases • Board for the Natural resources • Other Boards (of the Croatian Academy of Sciences and Arts of Bosnia and Herzegovina)
ISRAEL	• Ministry of Science Technology and Space - Chief Scientist Forum • ISF - Call Committee • BSF - Call Committee • GIF - Call Committee • Ministry of Health (MOH)

An **administrative/advisory board** of a research organisation is defined as ‘A publicly or privately managed and financed group of elected or appointed experts that exists to support the research agenda in a non-executive function by, among other things, administering research activities, consulting and coordinating different actors and taking a general advisory role’.

Country	Boards
BULGARIA	• Executive board of the National Science Fund • The governing council of the Bulgarian Academy of Sciences • Executive bureau and Management board and Board of Directors of Agricultural Academy
CZECHIA	• Research, Development and Innovation Council (Government of the Czech Republic)
DENMARK	• IRFD (Independent Research Fund Denmark) • DFIR (Danish Council for Research and Innovation Policy)
GERMANY	• German Science Council • German Federation of Industrial Research Associations - Scientific Council • German Rectors’ Conference - Executive Board • German Rectors’ Conference - Senate
ESTONIA	• Board of the Estonian Research Council • Supervisory Board of the Archimedes Foundation • Estonian Academy of Science
GREECE	• Hellenic Universities Rectors’ Synod • Hellenic Technological Institute Presidents’ Synod • Hellenic Research Institutes Presidents’ Synod
SPAIN	• The Spanish National Research Council (CSIC) Governing Board • Institute of Health Carlos III (ISCIII) Governing Board • Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (CIEMAT) Governing Board • National Institute for Agricultural and Food Research and Technology (INIA) Governing Board • Spanish Institute of Oceanography (IEO) Governing Board • The Geological Survey of Spain (Instituto Geológico y Minero de España – IGME) Governing Board • The Canarian Institute of Astrophysics (IAC) Governing Board • National Institute of Aerospace Technology (INTA) Governing Board • State Research Agency (AEI) Governing Board
FRANCE	• ANR (Agence Nationale de la Recherche/ French National Research Agency)
CROATIA	• Croatian Academy of Sciences and Arts (Presidency)
ITALY	• Ministry of Education, University and Research (MIUR) Directorate-General for the coordination, promotion and enhancement of research • Ministry of Education, University and Research (MIUR) National Committee of Guarantors for Research • Consiglio Nazionale delle Ricerche (CNR) – National Research Council - Board of Directors • National Institute for Nuclear Physics - Executive Board • National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA) Board of Directors • Consiglio per la ricerca in agricoltura e l’analisi dell’economia agraria (CREA) Agricultural Research Council - Board of Directors • Italian Space Agency - Board of Directors
CYPRUS	• National Board for Research and Innovation (NBRI) - Board of Directors • Cyprus Scientific Council (CySC) • Research and Innovation Foundation (RIF) - Board of Directors

LITHUANIA	• Agency for Science, Innovation and Technology - Board of Social Sciences • Agency for Science, Innovation and Technology - Board of Biomedical and Agricultural Sciences • Agency for Science, Innovation and Technology - Board of Physical and Technological Sciences • Research Council of Lithuania - Committee of Humanities and Social Sciences • Research Council of Lithuania - Committee of Natural and Technical Sciences
LUXEMBOURG	• Fonds National de la Recherche (FNR) • Luxembourg Institute of Science and Technology (LIST) • Institute of Socio-economic Research (LISER) • Luxembourg Institute of Health (LIH)
HUNGARY	• National Research, Development and Innovation Office - Innovation Board
AUSTRIA	• Council for Research and Technology Development - Administrative board • Administrative / advisory board OeAw - Fellowship Committees • Austrian Science Board (Österreichischer Wissenschaftsrat) • FWF Executive Board (Präsidium) • FWF Managing Director (Geschäftsführung) • FWF Supervisory Board (Aufsichtsrat) • CDG (Christian Doppler Forschungsgesellschaft) Kuratorium / Executive Board • FWF Strategic Advisory Board • Austrian Research Promotion Agency (FFG) - Management Board
POLAND	• Main Council of Science and Higher Education • Main Council of Research Institutes • Ministry of Science and Higher Education - Committee for Science Policy • Presidium of the Conference of Rectors of Academic Schools in Poland • Presidium of the Conference of Rectors of Non-Academic Higher Education Institutions in Poland • Ministry of Science and Higher Education - Council of Young Scientists • Council of the Polish National Agency for Academic Exchange • Ministry of Science and Higher Education -Board of the National Programme for the Development of Humanities
PORTUGAL	• Fundação para a Ciência e a Tcnologia (Foundation of Science and Technology) • IAPMEI - Agência para a Competitividade e Inovação, I. P. (Agency for Competitiveness and Innovation) • ANI - Agência Nacional de Inovação, S.A. (National Innovation Agency) • Academia de Ciências de Lisboa (Lisbon Academy of Sciences)
ROMANIA	• National Council for Scientific Research (CNCS) • Consulting Council for RD&I (CCCDI)) • National Council for Ethics of Scientific Research, Technological Development and Innovation (CNECSDTI) • National Council for Technology Transfer and Innovation (CNTTI) • Romanian Research Infrastructure Committee (CRIC) • Committee for the Coordination of Smart Specialisation (CCSI)
SLOVENIA	• Slovenian Research Agency (ARRS) - Management Board
SLOVAKIA	• Board of Slovak Academy of the Sciences Assembly (Výbor Snemu SAV) • The Presidium of the Slovak Academy of the Sciences • Presidium of the Council of Universities of the Slovak Republic (Predsedníctvo Rady vysokých škôl) • Slovak Rectors' Conference (Slovenská rektorská konferencia) • The Council of Government of the Slovak Republic for Science, Technology and Innovation
FINLAND	• Tekes - Finnish Funding Agency for Innovation - Management team • Tekes - Finnish Funding Agency for Innovation - Board of directors • Innovation Funding Agency Business Finland -Board of directors • Innovation Funding Agency Business Finland - Management Team

ICELAND	• Icelandic Research Fund board • Icelandic Research Fund advisory boards • Infrastructure Fund board • Infrastructure Fund advisory board • Technology Development Fund Board • Technology Development Fund advisory boards • AVS Fund board • AVS Fund Advisory boards
NORWAY	• Universities Norway • The Norwegian Academy of Science and Letters
SWITZERLAND	• SNSF (Executive Committee of the Foundation Council) • Innosuisse Board
TURKEY	• Turkish Academy of Sciences (TÜBA) • Scientific and Technological Research Council of Turkey as Funding Organization (TÜBİTAK) • Scientific and Technological Research Council of Turkey as Funding Organization/Advisory Board (TÜBİTAK) • Scientific and Technological Research Council of Turkey as Funding Organization/Science Centers Advisory Board (TÜBİTAK) • Scientific and Technological Research Council of Turkey as Funding Organization/Efficiency Challenge Advisory Board (TÜBİTAK) • Scientific and Technological Research Council of Turkey as Funding Organization/Secondary School Drone Competition Advisory Board (TÜBİTAK) • Scientific and Technological Research Council of Turkey as Funding Organization/4004-4005-4006-4007 Support Programmes Advisory Board (TÜBİTAK) • Scientific and Technological Research Council of Turkey as Funding Organization/Books Advisory Board (TÜBİTAK) • Scientific and Technological Research Council of Turkey as Funding Organization/Science for Children Advisory Board (TÜBİTAK) • Scientific and Technological Research Council of Turkey as Funding Organization/Curious Child Journal (TÜBİTAK) • Scientific and Technological Research Council of Turkey as Research Organization Administrative board (TÜBİTAK) • Scientific and Technological Research Council of Turkey as Research Organization MAM-EE Administrative board (TÜBİTAK) • Scientific and Technological Research Council of Turkey as Research Organization MAM-ÇTÜE Advisory board (TÜBİTAK) • Scientific and Technological Research Council of Turkey as Research Organization MAM-GE advisory board (TÜBİTAK) • Scientific and Technological Research Council of Turkey as Research Organization MAM-GMBE advisory board (TÜBİTAK) • Scientific and Technological Research Council of Turkey as Research Organization MAM-KTE advisory board (TÜBİTAK) • Scientific and Technological Research Council of Turkey as Research Organization MAM-ME advisory board (TÜBİTAK) • Scientific and Technological Research Council of Turkey as Research Organization MAM-YDBE advisory board (TÜBİTAK) • Scientific and Technological Research Council of Turkey as Research Organization MAM Directory-Administrative board (TÜBİTAK)
BOSNIA & HERZEGOVINA	• Council for Science of Bosnia and Herzegovina, BiH • National Commission of Bosnia and Herzegovina for Cooperation with UNESCO
ISRAEL	• Universities - Hiring and Advancement Boards, Tenure Boards, etc. • Chief Scientist Office, Ministry of Health (MOH)

Heads of institutions in the higher education sector – Heads of universities or assimilated institutions

An institution is assimilated to a university if it is accredited to deliver PhD degrees.

APPENDIX 3

List of Statistical Correspondents

Country	Contact person	Organisation	E-mail	Website
Belgium	Ms Elena PHALET	BELSPO (Federal Science Policy office)	elena.phalet@belspo.be	http://www.belspo.be/
	Dr Jeoffrey MALEK MANSOUR	BELSPO (Federal Science Policy office)	jeoffrey.malekmansour@belspo.be	http://www.belspo.be/
Bulgaria	Dr Elitsa DIMITROVA	IPHS - BAS	elitsa_kdimitrova@yahoo.com	https://www.iphs.eu/n/en/departament-demografiya-2/vazproizvodstveni-protzesi-i-strukturi-na-naselenieto.html
Czechia	Mr Marek Vojtěch ŘEZANKA	Czech Statistical Office	marek.rezanka@czso.cz	https://www.czso.cz/
	Ms Zuzana WEISGÄRBEROVÁ	Ministry of Education, Youth and Sports	zuzana.weisgarberova@msmt.cz	https://www.msmt.cz/
Denmark	Mr David Vestergaard ERIKSEN	Agency for Science and Higher Education	dav@ufm.dk	https://ufm.dk/
	Ms Mette Venås OVERBALLE-PETERSEN	Ministry of Higher Education and Science	mvo@ufm.dk	https://ufm.dk/
Germany	Dr Andrea LÖTHER	GESIS – Leibniz Institute for the Social Sciences	andrea.loether@gesis.org	https://www.gesis.org/
	Dr Anke LIPINSKY	GESIS – Leibniz Institute for the Social Sciences	Anke.lipinsky@gesis.org	https://www.gesis.org/
Estonia	Ms Marianne LEPPIK	Ministry of Education and Research	marianne.leppik@hm.ee	https://www.hm.ee/
	Ms Tiina PÄRSON	Statistics Estonia	tiina.parson@stat.ee	https://www.stat.ee/
Ireland	Dr Aedín MINOGUE	Higher Education Authority	aminogue@hea.ie	https://hea.ie/
	Dr Ross WOODS	Higher Education Authority	rwoods@hea.ie	https://hea.ie/
Greece	Ms Eleni MALLIOU	National Documentation Centre (EKT)	nmalliou@ekt.gr	https://www.ekt.gr/
	Ms Evi SACHINI	National Documentation Centre (EKT)	director@ekt.gr	https://www.ekt.gr/
	Ms Sofia DIMITROPOULOU	General Secretariat of Research and Technology	s.dimitropoulou@gsrt.gr	http://www.gsrt.gr

Country	Contact person	Organisation	E-mail	Website
Spain	Dr Zulema ALTAMIRANO	Women & Science Unit	umyc@ciencia.gob.es	https://www.ciencia.gob.es
	Dr Manuel GONZÁLEZ-BEDIA	Ministerio de Universidades	manuel.gonzalez@universidades.gob.es	https://www.ciencia.gob.es
France	Ms Severine MAYO-SIMBSLER	Ministre de l'Enseignement supérieur, de la Recherche et de l'Innovation	severine.mayo-simbsler@recherche.gouv.fr	https://www.enseignementsup-recherche.gouv.fr/
	Ms Pierrette SCHUHL	Ministre de l'Enseignement supérieur, de la Recherche et de l'Innovation	pierrette.schuhl@enseignementsup.gouv.fr	https://www.enseignementsup-recherche.gouv.fr/
Croatia	Ms Amalija BABIC	Ministry of Science and Education	Amalija.Babic@mzo.hr	https://mzo.gov.hr/
	Ms Ana BUTKOVIC	Ministry of Science and Education	Ana.Butkovic@mzo.hr	https://mzo.gov.hr/
Italy	Ms Maria Teresa MORANA	Ministry of Education and Research (MIUR)	mariateresa.morana@miur.it	http://miur.it
	Ms Simonetta SAGRAMORA	Ministry of Education and Research (MIUR)	simonetta.sagramora@miur.it	http://miur.it
Cyprus	Mr Isidoros KYPRIDAKIS	Statistical Service of Cyprus	ikypridakis@cystat.mof.gov.cy	https://www.mof.gov.cy/
	Mr Georgios DOGORITIS	Statistical Service of Cyprus	gdogoritis@cystat.mof.gov.cy	https://www.mof.gov.cy/
Latvia	Ms Anna LEIŠKALNE	Ministry of Education and Science	Anna.Leiskalne@izm.gov.lv	https://www.izm.gov.lv/
Lithuania	Ms Egle Elena SATAITE	Agency for Science, Innovation and Technology	egle.elena.sataite@mita.lt	https://mita.lrv.lt/
	Ms Dovilė GALDAUSKAITĖ	Statistic Lithuania Population Statistics Division	dovile.galdauskaite@stat.gov.lt	https://www.stat.gov.lt/en
Luxembourg	Dr Bruno RODRIGUES	Ministry of Higher Education and Research	bruno.rodrigues@mesr.etat.lu	www.mesr.public.lu
	Mr Robert KERGER	Ministry of Higher Education and Research	robert.kerger@mesr.etat.lu	www.mesr.public.lu
Hungary	Ms Gabriella EGLESZ	National Research, Development and Innovation Office (NRDIO)	gabriella.eglesz@nkfih.gov.hu	https://nkfih.gov.hu/
	Mr Gábor CSIRIKUSZ	National Research, Development and Innovation Office (NRDIO)	gabor.csirikusz@nkfih.gov.hu	https://nkfih.gov.hu/
Malta	Ms Sarah MIFSUD ATTARD	Malta Council for Science and Technology	sarah.mifsud-attard@gov.mt	https://www.gov.mt/
	Dr Jennifer CASINGENA HARPER	Malta Council for Science and Technology	jennifer.harper@gov.mt	https://www.gov.mt/
Netherlands	Ms Alexandra VENNEKENS	Rathenau Instituut	a.vennekens@rathenau.nl	https://www.rathenau.nl/
	Ms Iris GLAS	Rathenau Instituut	i.glas@rathenau.nl	https://www.rathenau.nl/

Country	Contact person	Organisation	E-mail	Website
Austria	Ms Gabriele SPÖRKER	Statistics Austria	gabriele.spoerker@statistik.gv.at	http://statistik.gv.at/
	Mr Dieter BAUMANN	Statistics Austria	Dieter.Baumann@statistik.gv.at	http://statistik.gv.at/
Poland	Ms Anna KNAPIŃSKA	National Information Processing Institute	anna.knapinska@opi.org.pl	https://opi.org.pl/
	Dr Aldona TOMCZYŃSKA	National Information Processing Institute	aldona.tomczynska@opi.org.pl	https://opi.org.pl/
Portugal	Ms Filomena OLIVEIRA	General Directorate of Statistics of Education and Science	filomena.oliveira@dgeec.mec.pt	https://www.dgeec.mec.pt/
	Ms Catarina CARREIRA	General Directorate of Statistics of Education and Science	catarina.carreira@dgeec.mec.pt	https://www.dgeec.mec.pt/
Romania	Ms Rodica DUMITRIU	National Institute of Statistics	Rodica.Dumitriu@insse.ro	https://insse.ro/
	Ms Camelia COŞCA	National Institute of Statistics	Camelia.Cosca@insse.ro	https://insse.ro/
Slovenia	Ms Urška ARSENJUK	Statistical Office of the Republic of Slovenia	urska.arsenjuk@gov.si	https://www.stat.si/
	Mrs Andreja KOZMELJ	Statistical Office of the Republic of Slovenia	andreja.kozmelj@gov.si	https://www.stat.si/
Slovak Republic	Ms Marta MOSNÁ	Ministry of Education, Science, Research and Sport of the Slovak Republic	marta.mosna@minedu.sk	https://www.minedu.sk
Finland	Ms Marjut PIETILÄINEN	Statistics Finland	marjut.pietilainen@stat.fi	https://stat.fi/
	Ms Heidi PIRKOLA	Statistics Finland	heidi.pirkola@stat.fi	https://stat.fi/
Sweden	Ms Helena WINTGREN	Swedish Higher Education Authority (UKÄ)	helena.wintgren@uka.se	https://english.uka.se/
	Ms Lena SAHLIN	Statistics Sweden	lena.sahlin@scb.se	https://scb.se/
Turkey	Prof Zeliha Koçak TUFAN	Yükseköğretim Kurulu (YÖK)	zeliha.kocaktufan@yok.gov.tr	https://www.yok.gov.tr/
	Ms Sonay GONENLI	The Scientific and Technological Research Council of Turkey Türkiye Bilimsel ve Teknolojik Araştırma Kurumu (TÜBİTAK)	sonay.gonenli@tubitak.gov.tr	https://tubitak.gov.tr/
Bosnia and Herzegovina	Ševala KORAJČEVIĆ, MSc	Agency for Statistics of Bosnia and Herzegovina	sevala.korajcevic@bhas.GOV.ba	http://bhas.gov.ba/
Switzerland	Mr Alexandre KÖRSGEN	Office fédéral de la statistique OFS	alexandre.koersgen@bfs.admin.ch	https://www.statistique.admin.ch
	Ms Katja BRANGER	Office fédéral de la statistique OFS	katja.branger@bfs.admin.ch	https://www.statistique.admin.ch

Country	Contact person	Organisation	E-mail	Website
Iceland	Ms Þóra KristínÞÓRSDÓTTIR	Statistics Iceland	thora.thorsdottir@hagstofa.is	https://statice.is/
Israel	Dr Sharon RASHI-ELKELES	Ministry of Innovation, Science & Technology	sharon.rashi1@gmail.com	https://www.gov.il/en/departments/units/most_women_council
Norway	Ms Kaja Kathrine WENDT	NIFU Nordic Institute for Studies in Innovation, Research and Education	kaja.wendt@nifu.no	http://www.nifu.no/
	Mr Bo SARPEBAKKEN	NIFU Nordic Institute for Studies in Innovation, Research and Education	bo.sarpebakken@nifu.no	http://www.nifu.no/

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