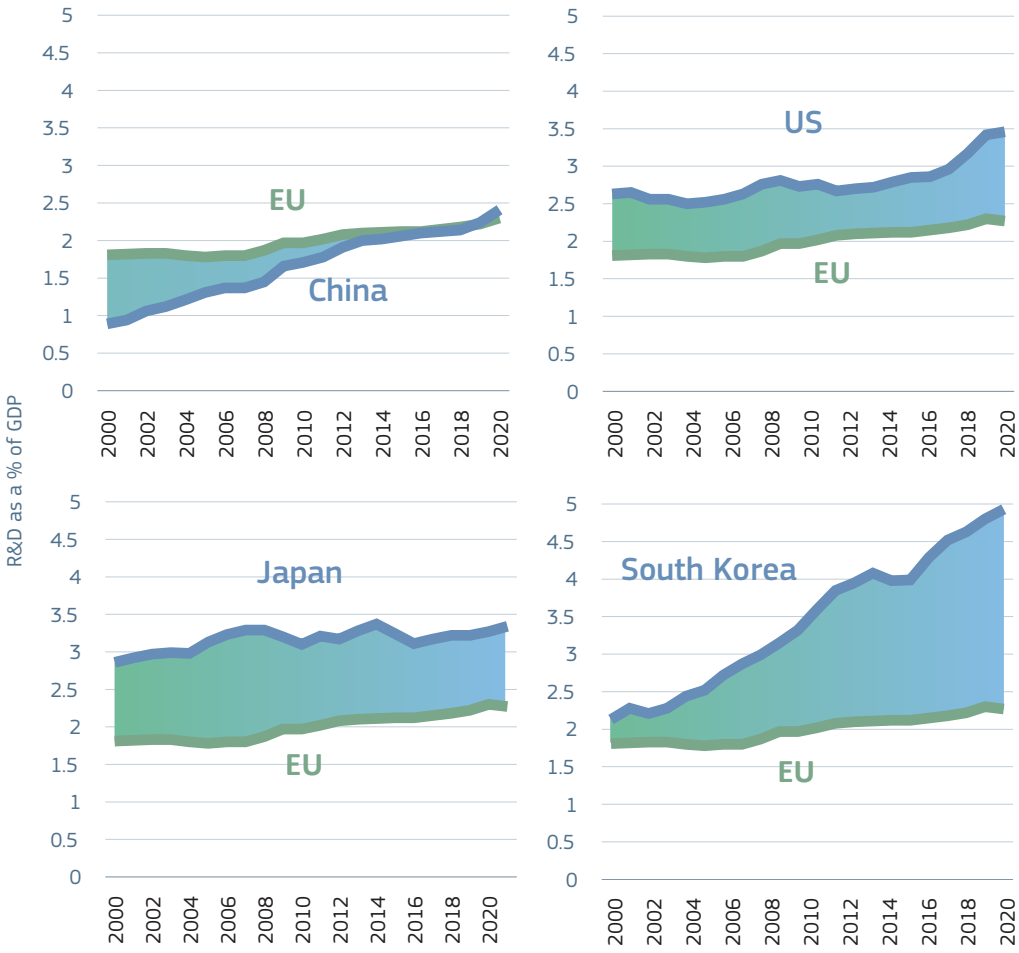
CHAPTER 1

KEY TRENDS

1. The EU has increased its R&D investments over the past two decades. Yet a gap remains to some of its main competitors, and the EU's relative weight in the global R&D landscape is decreasing.

Figure 1-1 The EU's R&D intensity gap with other major economies

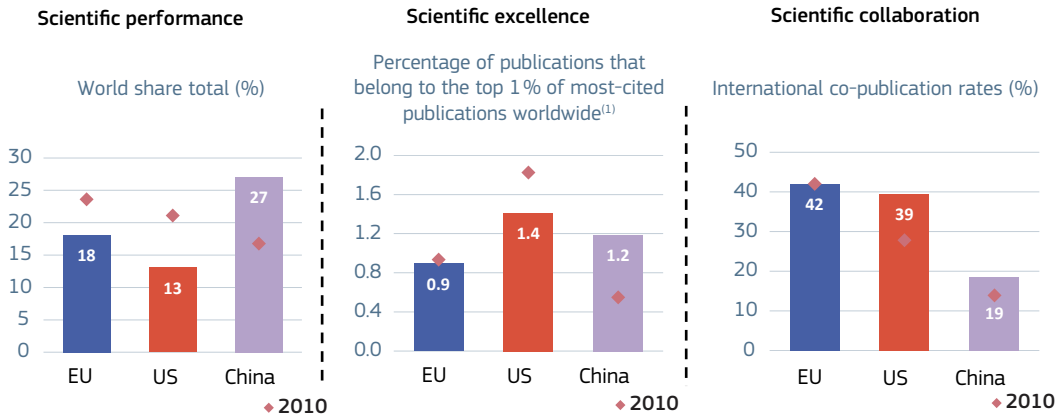


Science, research and innovation performance of the EU 2024

Source: DG Research and Innovation, Common R&I Strategy and Foresight Service, Chief Economist Unit, based on Eurostat and OECD data.

2. The EU has a strong research base and ranks second globally in terms of scientific output. Despite a lower level of scientific excellence than its main competitors, its performance has remained stable over time, with high rates of international co-publications.

Figure 1-2 Scientific performance, excellence and collaboration – EU, US and China, 2022



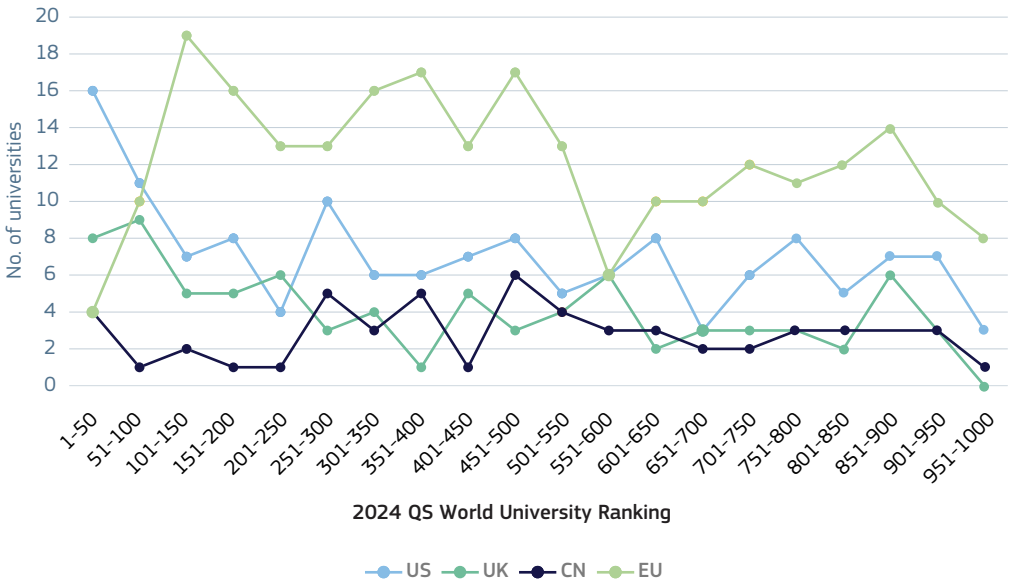
Science, research and innovation performance of the EU 2024

Source: DG Research and Innovation, Common R&I Strategy and Foresight Service, Chief Economist Unit, based on Science-Metrix data using the Scopus database.

Note: (1)2022 citation window: 2020-2022; 2010 citation window: 2008-2010.

3. Anglo-Saxon academic system features a concentration of high-performing institutions, while the EU exhibits a more uniform distribution, prioritising broad-based moderate quality over exceptional peaks.

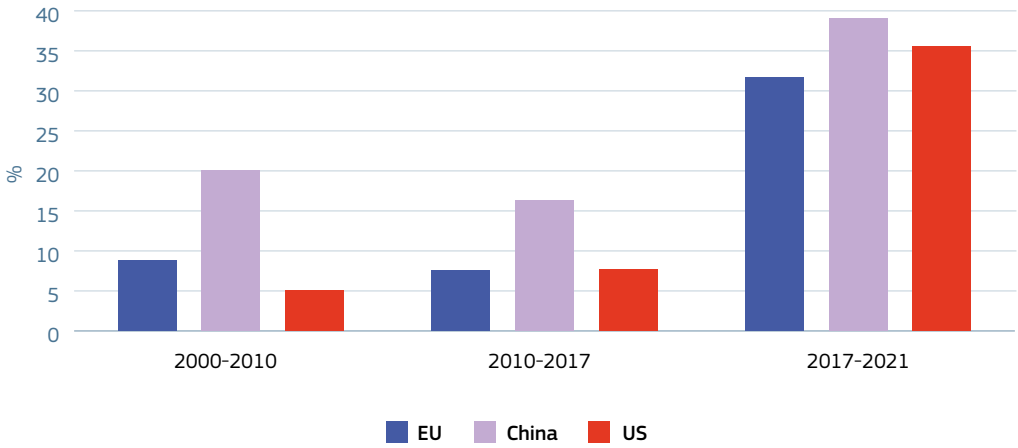
Figure 1-3 **Distribution of university quality (in absolute terms) worldwide**



Science, research and innovation performance of the EU 2024
Source: DG Research and Innovation, Common R&I Strategy and Foresight Service, Chief Economist Unit, based on QS World University Rankings 2024.

4. China is the global leader in terms of publications related to AI applications in science, followed by the EU and the US. Based on current growth rates, the gap between China and the EU is expected to widen in the future.

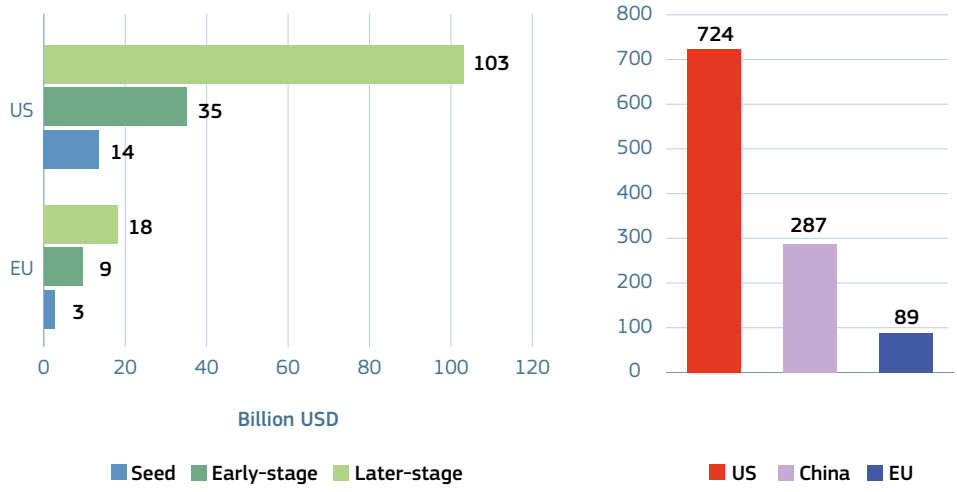
Figure 1-4 Average yearly growth in numbers of AI-related publications in the EU, the US and China, by period



Source: Arranz et al., (2023).

5. The financing gap between the EU and the US is observed at all stages of development but remains more prominent in the scale-up phase. As of November 2023, the numbers of companies with the status of unicorns in the US and China exceeded that in the EU by factors of 8 and 3, respectively.

Figure 1-5 Venture capital investments(1) in the EU and the US, by development stage, 2023 (left)
Number of unicorns(2) by world region, based on location of headquarters, as of November 2023 (right)



Science, research and innovation performance of the EU 2024

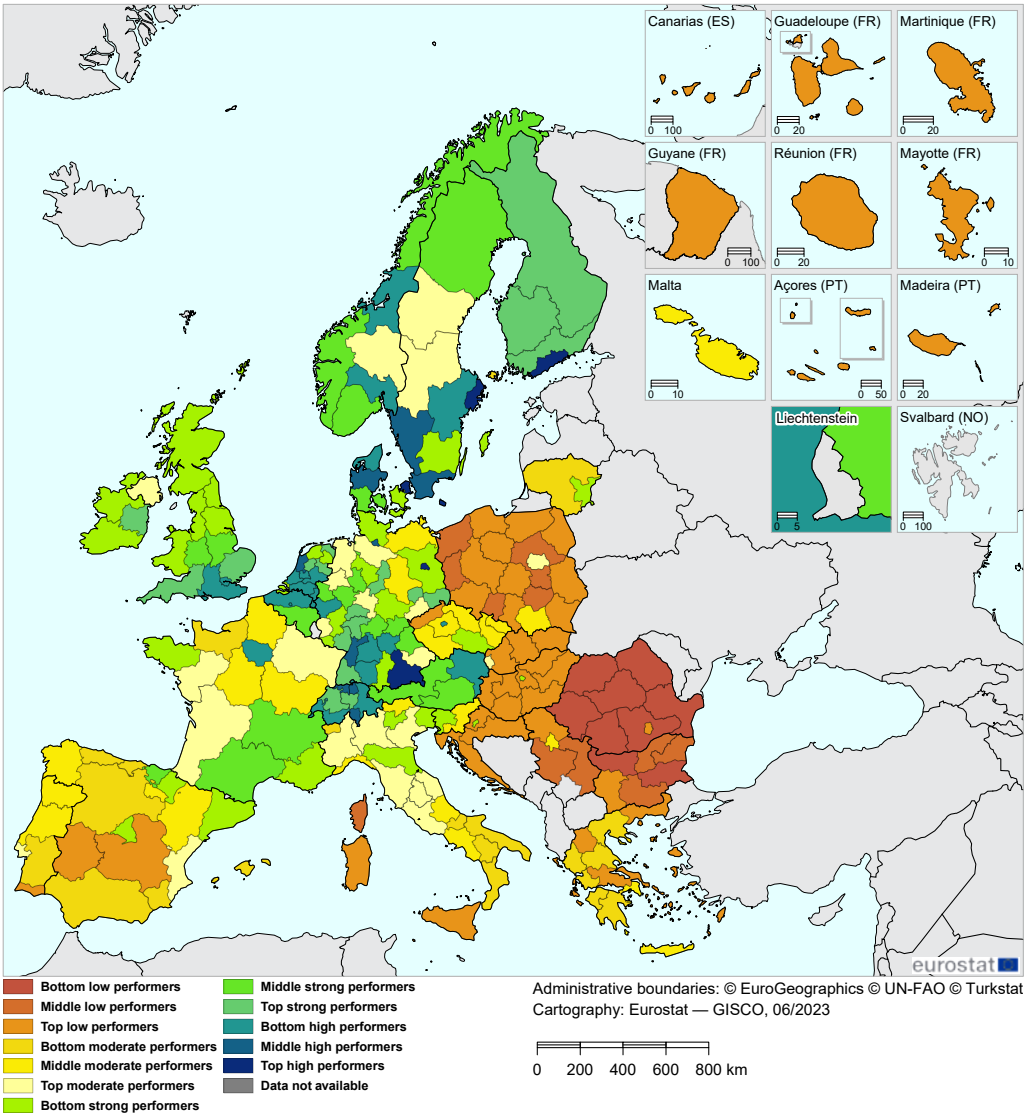
Source: PitchBook data, as of 20 November 2023.

Notes: (1)Investment values are calculated based on the countries in which the companies involved in completed deals have their headquarters.

(2)A unicorn is defined as a venture-backed company that has raised a venture round with a post-money valuation of at least USD 1 billion. An 'active' unicorn is one that has not exited, meaning that it is/was venture-backed as of the year shown.

6. Although innovation performance has increased in most EU Member States, the innovation divide within and between Member States persists. It also persists at regional level. More innovative regions tend to be found in highly innovative countries. However, regional 'pockets of excellence' can be seen in less innovative countries.

Figure 1-6 **Regional Innovation Scoreboard 2023**

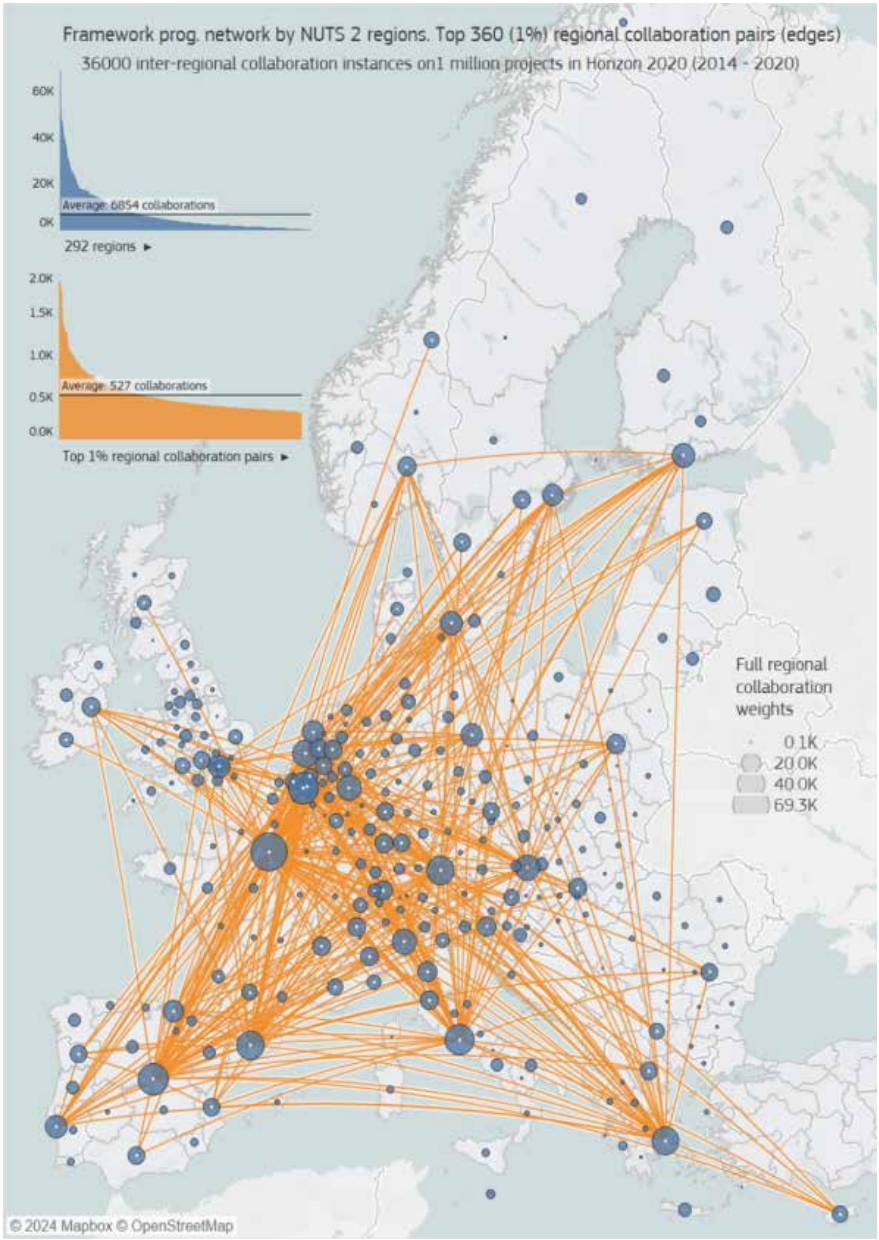


Science, research and innovation performance of the EU 2024

Source: Regional Innovation Scoreboard 2023, Publications Office of the European Union, 2023: https://data.europa.eu/doi/10.2777/70412.

7. The EU framework programme for R&I created an important R&I collaboration network during the 2014-2020 period.

Figure 1-7 Connection maps linking NUTS 2 regions in Europe based on organisations that are involved in collaborations under the EU FP for R&I 2014-2020

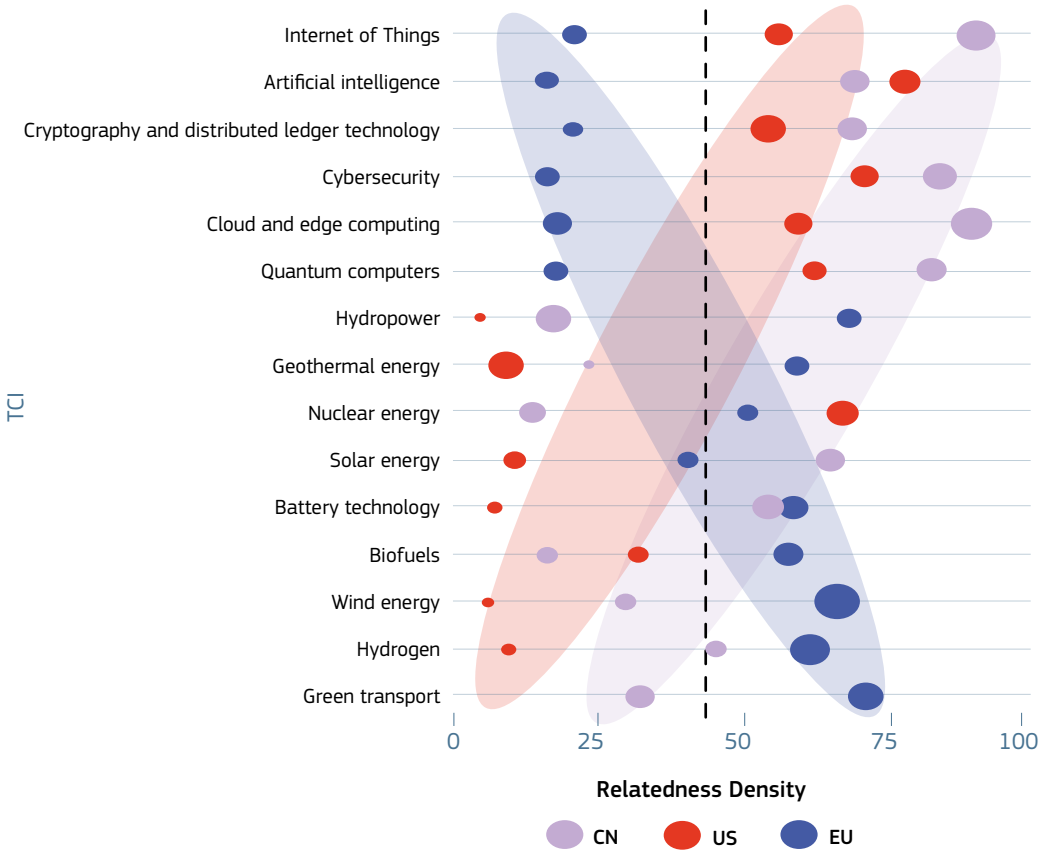


Science, research and innovation performance of the EU 2024

Source: Joint Research Centre, Innovation Policies and Economic Impact Unit; and DG Research and Innovation, Common R&I Strategy and Foresight Service, Chief Economist Unit, based on keep.eu and eCorda data.

8. The technological gap between the EU and other key players in strategic productivity-enhancing technologies persists, especially in digital fields such as AI, internet of things, blockchain technologies, quantum computers, etc.

Figure 1-8 The EU position in complex technologies vs. the US and China, 2019-2022



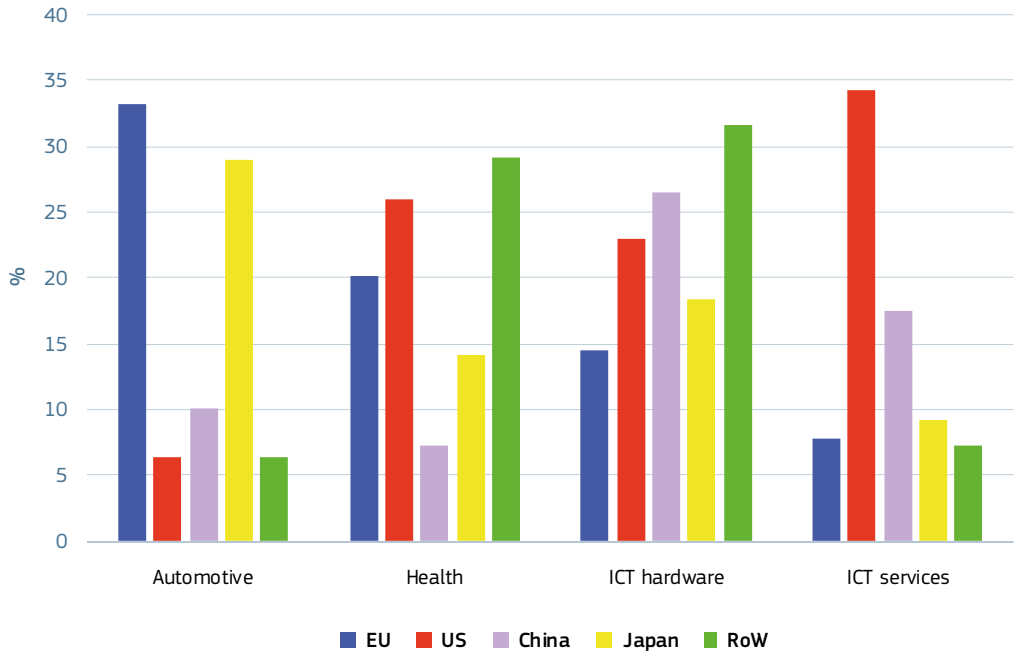
Science, research and innovation performance of the EU 2024

Source: DG Research and Innovation, Common R&I Strategy and Foresight Service, Chief Economist Unit, based on Google Patents data.

Note: The x-axis indicates the relatedness density in each technology field considered. On the y-axis, technologies are ranked by complexity level, normalised between 0 and 100. The size of the bubble captures the degree of specialisation that each country reports in a given technology field, measured by revealed comparative advantage (RCA).

9. Mid-tech industries, particularly the automotive sector, account for a significant proportion of EU business R&D.

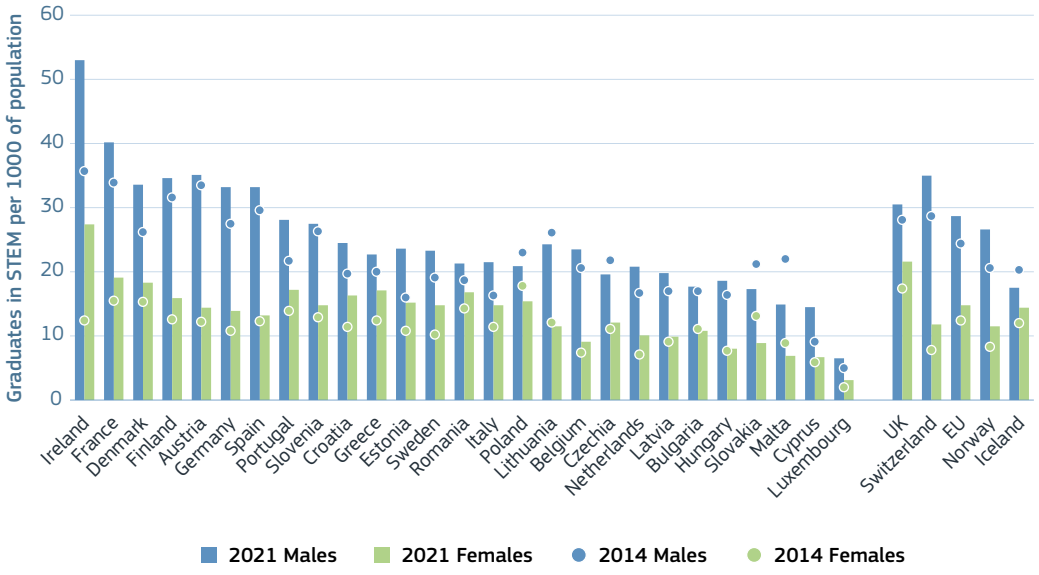
Figure 1-9 Share of private R&D investment by sector and region (% of Total Business R&D), 2022



Science, research and innovation performance of the EU 2024
Source: DG Research and Innovation, Common R&I Strategy and Foresight Service, Chief Economist Unit, based on data from the 2023 EU Industrial R&D Investment Scoreboard.
Note: Due to the scope of the scoreboard, the 'EU' data represents 17 Member States.

10. Across Europe, the number of tertiary graduates in science, mathematics, computing, engineering, manufacturing and construction is increasing for both males and females. Yet the gender gap is still substantial and, in many countries, even widening.

Figure 1-10 Graduates in science, mathematics, computing, engineering, manufacturing and construction, by sex

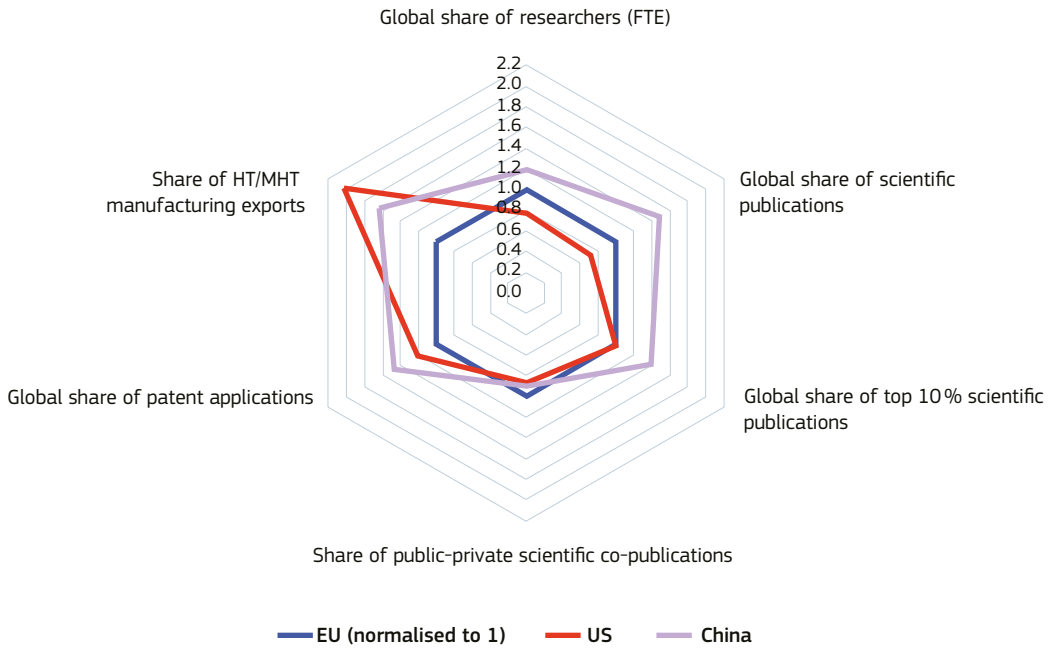


Science, research and innovation performance of the EU 2024

Source: DG Research and Innovation, Common R&I Strategy and Foresight Service, Chief Economist Unit, based on Eurostat (Online data code: educ_uoe_grad04).

11. Although it has a strong research workforce and close ties between academia and business, the EU continues to lag behind the US and China in several areas.

Figure 1-11 **Knowledge valorisation approach, latest available year**



Science, research and innovation performance of the EU 2024

Source: DG Research and Innovation, Common R&I Strategy and Foresight Service, Chief Economist Unit, based on Science-Metrix, Eurostat, JRC (INNOVA VI), OECD and UNESCO data.
Note: HT/MHT refers to high-tech and medium-high-tech.