Denmark as a Science Nation

Current status

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This report was produced by Elsevier's Research Networks Analyst **Paola Barr** during October and December 2025. Other contributors: **Federica Rosetta,** VP Academic Relations & Public Affairs, EMEA; **Miguel Santinhos**, Global Strategic Networks Associate.

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Executive summary

Denmark has a long-standing legacy of scientific excellence, with notable contributions from pioneering minds like Niels Bohr, a Nobel laureate in physics whose groundbreaking work helped shape our understanding of the atom.

Today, Denmark's innovation landscape is globally recognised through influential companies such as Novo Nordisk, a leader in diabetes care, and Vestas, a pioneer in sustainable energy solutions. Building on this foundation, Denmark's research ecosystem continues to play a vital role in driving technological and societal progress. This report explores how the country's strategic focus on key sectors, combined with its strong global connectivity, translates into scientific performance — particularly within an increasingly competitive international research environment.

Scientific performance and research excellence

Denmark consistently ranks among the world's top-performing countries in terms of **citation impact**. Among nations producing more than 50,000 papers annually, it is the second only to Hong Kong and Singapore. Clinical & Health research is a defining strength, representing 27% of Danish scholarly output compared to the EU average of 20%, and achieving the highest citation impact among all disciplines. Overall publication volume has grown at a higher rate than the EU average, and Danish authors are, on average, more prolific than their European peers.

International collaboration as a key driver of impact

International collaboration is a defining feature of the Danish research landscape. With **67% of publications involving foreign partners**, Denmark boasts one of the highest rates of international co-authorship globally. These partnerships are not only widespread but also highly effective: internationally co-authored papers achieve an average Field-Weighted Citation Index (FWCI) of 2.13, nearly doubling the citation impact of purely national research. Denmark maintains its strongest collaborative ties with the US, UK, and Germany, and multilateral collaborations are frequently pursued, particularly in key disciplines like physics, health and key technologies.

What is the research impact on innovation?

Academic-corporate collaboration is a cornerstone of the Danish R&I system. Both the volume of co-publications with industry and their citation impact are higher than those observed in G7 countries and China. Novo Nordisk is by far the most prolific corporate partner, playing a central role in interconnecting academia with the business sector. Danish research is also frequently highly cited in patents, with **patent citation rates above both the global and EU averages**. The Technical University of Denmark stands out, with 7% of its research cited in patents (compared with the national average of 4.5%).

What is the impact on policy and sustainability?

Danish research has a particularly strong influence on policy. **12.3% of Danish publications are cited in policy documents** — nearly twice the EU average — highlighting their real-world relevance. Sustainability is another area of strength: 39% of Danish research relates to at least one of the UN Sustainable Development Goals, compared with global and EU averages of 34%. SDG-related research also achieves higher impact (FWCI 2.10) than Denmark's overall average (FWCI 1.77), underscoring its contribution to addressing global sustainability challenges.

How is Denmark doing on key strategic technologies?

Denmark performs strongly in research related to **Artificial Intelligence (AI), Quantum Technologies, Biotechnology, Space Technologies and Clean Energy**. These five domains were selected for a deep dive due to their strategic importance, and in all five, the **quality and impact are exceptional**, with citation levels consistently and significantly exceeding both global and EU averages. This success is heavily underpinned by an **extraordinary commitment to collaboration**. Denmark records the highest rates of international partnership among comparator countries, particularly in fields like **quantum research (81%) and AI (72%)**. Furthermore, strong **academic-corporate partnerships** — such as 14% of biotechnology and 9% of AI publications co-authored with industry — drive rapid knowledge transfer, exemplified by **Danish biotechnology research being cited in patents at one of the highest rates worldwide (18.4%)**, showcasing its direct commercial relevance.

Which disciplines contribute the most to research impact?

In term of disciplines, **Clinical & Health Sciences** is both the largest and most impactful field in Denmark, making a decisive contribution to the country's overall research performance.

Diversity and gender equality are important drivers of innovation

In Denmark, **44% of active researchers are women**, placing the country within the gender parity range (40–60). However, under-representation remains in certain areas, particularly in STEM fields and at senior career levels, highlighting opportunities for further progress.

Introduction

How well is Denmark performing in science, and how does its research activity support national competitiveness? While the question may seem straightforward, evaluating Denmark's scientific standing requires a nuanced analysis from a kaleidoscope of perspectives.

This report examines the volume and impact of Danish research publications in both a European and global context, focusing on their influence on knowledge transfer, policy, key technologies and sustainability. The aim is to provide insights that inspire further discussion and support evidence-based decision-making.

Denmark's research system is guided by a strategic national framework that places science and innovation at the heart of its economic and societal development. Current policy priorities — such as the **Strategic Approach to Artificial Intelligence**[1], **Strategy for Quantum Technology**[2], **Strategy for Life Science toward 2030**[3], and the national **green transition goals** — seek to strengthen Denmark's position as a global leader in advanced technologies and sustainability.

These ambitions are further reinforced by the Danish government's ***Strategiske prioriteter for forskning og innovation 2026–2029*** **(Strategic priorities for research and innovation 2026–2029)**[4] which identifies three overarching priority areas: (1) critical technologies, (2) green transition, and (3) health. Together, these initiatives underscore Denmark's long-term commitment to consolidating its scientific excellence and addressing global challenges through research and innovation. These national priorities also resonate at the European level. During its **Presidency of the Council of the EU in the second half of 2025**, Denmark focused on advancing a common agenda on competitiveness, technological leadership, and the green transition. Assessing Denmark's research performance is therefore not only a matter of measuring outputs but also of understanding how they fit within the broader policy context.

1 Uddannelses- og Forskningsministeriet (2024) *Ny strategisk indsats for kunstig intelligens — Et styrket fundament for ansvarlig udvikling og anvendelse af kunstig intelligens i Danmark (New Strategic Initiative for Artificial Intelligence — A strengthened foundation for responsible development and use of AI in Denmark)*. Available at: https://www.digmin.dk/digitalisering/nyheder/nyhedsarkiv/2024/dec/ny-strategisk-indsats-skal-bane-vej-for-kunstig-intelligens-i-danmark

2 Uddannelses- og Forskningsministeriet (2023) Strategy for Quantum Technology: Part 1 — World Class Research and Innovation. Available at: https://ufm.dk/english/publications/2023/juni/strategy-for-quantum-technology-part-1-world-class-research-and-innovation/; Ministry of Industry, Business and Financial Affairs (2023) National Strategy for Quantum Technology: Part 2 — Commercialisation, Security and International Cooperation. Available at: https://www.eng.em.dk/publications/2023/national-strategy-for-quantum-technology

3 Uddannelses- og Forskningsministeriet (2024) *Strategy for Life Science Towards 2030*. Available at: https://www.eng.em.dk/publications/2024/strategy-for-life-science-towards-2030

4 Uddannelses- og Forskningsministeriet (2025) *Strategisk prioritet for forskning innovation og 2026–2029 (Strategic priorities for research and innovation 2026–2029)*. Available at: https://ufm.dk/publikationer/2025/strategiske-prioriteter-for-forskning-og-innovation-2026-2029

This report analyses Danish research performance through the lens of scholarly communication as a primary output of research. **Chapter 1** assesses Denmark's position in the global scientific landscape. **Chapter 2** examines the role of international collaboration, crucial for any country to be at the frontline of science and innovation. **Chapter 3** explores academic-corporate collaboration, a key strength of Danish research. **Chapter 4**, a key section in the report, investigates the impact of Danish research on policy, sustainability and key technologies such as AI, Quantum, Semiconductors, Space and Clean Energy. **Chapter 5** identifies the scientific disciplines and universities contributing the most to Denmark's success, and **Chapter 6** presents a summary of the findings.

In addition, the report includes reflections from Danish academic and policy leaders, who were invited to comment on the findings and share their perspectives on the country's research strengths and future opportunities. These insights are presented in the **Academic Leaders' Perspectives** section, which follows the Introduction. The report concludes with **Chapter 7**, which provides key definitions, and **Chapter 8**, detailing the data sources used in the analysis.

This report is part of a series of research landscape reports released by Elsevier over the years, covering topics such as Artificial Intelligence, Net Zero, Biodiversity, Gender Gap in Science, and country or region-focused reports. The goal of these reports is to stimulate discussions and support evidence-based policymaking.

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Academic leaders' perspectives

In this section, Danish academic and policy leaders share their reflections on the findings presented in this report. We sincerely thank all contributors for sharing their valuable perspectives.

Cecilie Brøkner,
CEO, Innovation Fund Denmark

The report Denmark as a Science Nation is an important contribution to the national conversation on research and innovation capacity. The report confirms that Denmark continues to perform at the highest international level in research quality, with particularly strong results in Clinical and Health Sciences, while also demonstrating strength in emerging and critical technologies such as quantum.

Another important highlight is the unusually high degree of international collaborations between Danish researchers and companies, and international researchers and companies. This connectivity is a defining feature of Denmark's research and innovation system and a key enabler of an open, export-oriented economy built on innovative solutions and a strong scientific backbone.

From our perspective, one of the most significant messages is this very strength of Denmark's cross-sector connectivity. A substantial share of Danish research output is produced through academic-corporate partnerships, and the fact that many of these collaborations are also international creates powerful network effects that support the translation of research into new solutions, growth and societal value.

In a time of increasing geopolitical uncertainty, the importance of international collaboration cannot be overstated. It is essential to ensuring Denmark's access to global knowledge, capital and talent in critical areas such as energy, defense and advanced technologies, and thereby to strengthening national resilience.

While the results presented in the report are strong, especially in our traditional positions of strength like Health, maintaining and expanding a leading position is a long-term endeavor. In emerging critical technologies such as AI and quantum, Denmark demonstrates high research quality, but must further strengthen scale, talent pipelines, testbeds, access to capital and pathways to deployment.

Achieving this will require new tools, new ways of thinking and new alliances. It will also require the courage to discontinue initiatives that do not deliver, in order to make room for those that can. In a rapidly intensifying global competition, standing still is not an option.

Per Michael Johansen,
Rector, Aalborg University

We are living in a turbulent era, where knowledge and development of technology is our best hope for the future. Therefore, it is very uplifting to read this report which documents the strengths of Danish science and innovation. As a small nation, Denmark clearly 'punches above its weight' and collaborates widely and with great impact.

It is clear from the findings of the report that Denmark benefits from a culture of collaboration, both across universities nationally and internationally, but also importantly with industrial and business partners. This is a testament to the ability of both researchers and institutions to work across borders — an ability which is particularly important in a world shaken by the geopolitical turmoil and rising concerns about research security.

Another important — and uplifting point of the report is the vital role that Danish research plays in relation to the Sustainable Development Goals and to key technologies, especially biotechnology and energy. As a representative from a university dedicated to sustainability and with a mission-driven approach to science, I am pleased to see this strong position documented, and at the same time it also provides indications of the next steps to take.

In a time where technological change is extremely rapid, it is important to remember that progress rests on research that takes many years. This also means that long-term investments are vital. As the report clearly shows, the Danish research system is extremely strong and, through our durable collaborative efforts, well equipped to help tackle the important challenges of the world. To maintain this strong position, we need to continue to build international relations, in particular our collaborations within Europe.

Susanne Ditlevsen, President, and
Thomas Sinkjær, Secretary General,
The Royal Danish Academy of Sciences and Letters

Denmark has long been recognized as one of the world's leading science nations. *Denmark as a Science Nation* reaffirms this position and highlights several noteworthy insights about the international standing of Danish research. In terms of citation impact, Denmark ranks among the very top globally. Although a recent report raised questions about this leading position[5], the findings presented here suggest that Denmark remains firmly in the major league of research-performing countries. The report also indicates that part of this success may stem from the highly internationalized nature of Danish science. This underscores the importance of maintaining strong international collaboration, even in the face of the shifting geopolitical landscape.

At the same time, we should remember that the value of science cannot be captured by citation metrics alone. While citations may reflect certain aspects of research quality, the broader societal benefits of scientific work are far more difficult to quantify. For that reason, it is particularly interesting that the report attempts to assess policy impact — an area in which Danish research appears to perform remarkably well compared with other countries. This attempt is a welcome supplement to the prevailing focus on measuring impact and societal value of science through classic innovation metrics like number of spinouts, patents, etc.

Finally, we should remember not to rest on our laurels. Even though it seems Danish research is doing good, we observe signs of a harmful hyper-competitive culture and funding structure in Denmark[6]. The increasing share of competitive funding vs. basic funding for universities along with the increasing use of temporal faculty positions threaten the protective space for creativity and high-quality science.

5 Schneider, Jesper W. & Norn, Maria Theresa, *The Scientific Impact of Danish research 1980–2020*, 2023.

6 Sinkjær, Thomas; Ditlevsen, Susanne & Lind, Jonas K., *"Det danske mirakel trues af hyperkonkurrence", Forskningspolitikk, 1:25, 2025* (https://www.fpol.no/det-danske-mirakel-trues-af-hyperkonkurrence/)

How does Danish science perform compared to other countries?

This section begins the assessment of Denmark's scientific performance by examining publication output and citation levels across selected regions.

To provide a broader context, the analysis first considers the aggregated performance of the Nordic countries — Denmark, Finland, Iceland, Sweden and Norway. This provides a foundation for the more focused, topic-specific analysis of Denmark's research that follows in subsequent sections.

Denmark's strong performance in science is more than a **marker of academic excellence** — it is a strategic pillar of the nation's competitiveness strategy. As a **research-intensive economy with a strong innovation profile**, Denmark leverages scientific leadership to sustain its position in advanced industries and to drive progress on key national priorities, including the green transition, digital leadership and health innovation.

These national ambitions are reflected in Denmark's strong commitment to research and innovation investment. According to Eurostat data reported by the European Commission, Denmark's gross domestic expenditure on R&D (GERD) reached approximately **3.07% of GDP in 2023, well above the EU average of 2.26%**.[7] This reflects a long-standing commitment to a knowledge-based economy.

In terms of research output, the number of scholarly publications serves as a key measure of scientific activity or productivity. For a proxy of academic or scientific impact, this report uses Field Weighted Citation Impact (FWCI). The FWCI is normalized to 1.0 for the world average, meaning an FWCI of 1.5 indicates that publications are cited 50% more frequently than the global average. A detailed definition can be found in Chapter 8.

Figure 1 illustrates the FWCI versus the relative share of scholarly output for selected countries and regions from 2020 to 2024. China and the European Union (EU27) together represent a significant share of global scholarly output, accounting for 24.3% and 22.3% respectively, while the US contributes 18.1%. Notably, China surpassed the US in scholarly outputs in 2019, and India overtook the United Kingdom in 2021 (data not shown).

The Nordics — with a combined population of 27 million — perform strongly well in both article share and citation impact, comparable to similarly sized nations such as Australia (26 million) and Canada (40 million). With an FWCI of 1.54, the region is well above the EU average (1.14) and the US (1.33).

A closer look at Denmark shows that, despite its small population of just under 6 million, it stands out as a research-intensive nation (see Figure 2). Danish scholarly output is notably higher than that of countries of similar size, including Finland, Norway, Ireland and Singapore. Danish research also enjoys a strong international reputation, with its publications cited more frequently than those from many research prolific countries, including the US, the UK and Germany. With a FWCI of 1.77, Denmark outperforms all other Nordic countries and the Netherlands, positioning itself among the highest-impact research systems in the world.

7 Eurostat (2023) *Gross Domestic Expenditure on Research and Development (GERD). European Commission — Eurostat*. Available at: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=R%26D_expenditure

Figure 1

Field Weighted Citation Impact (FWCI) vs relative share of scholarly output for selected world regions and countries

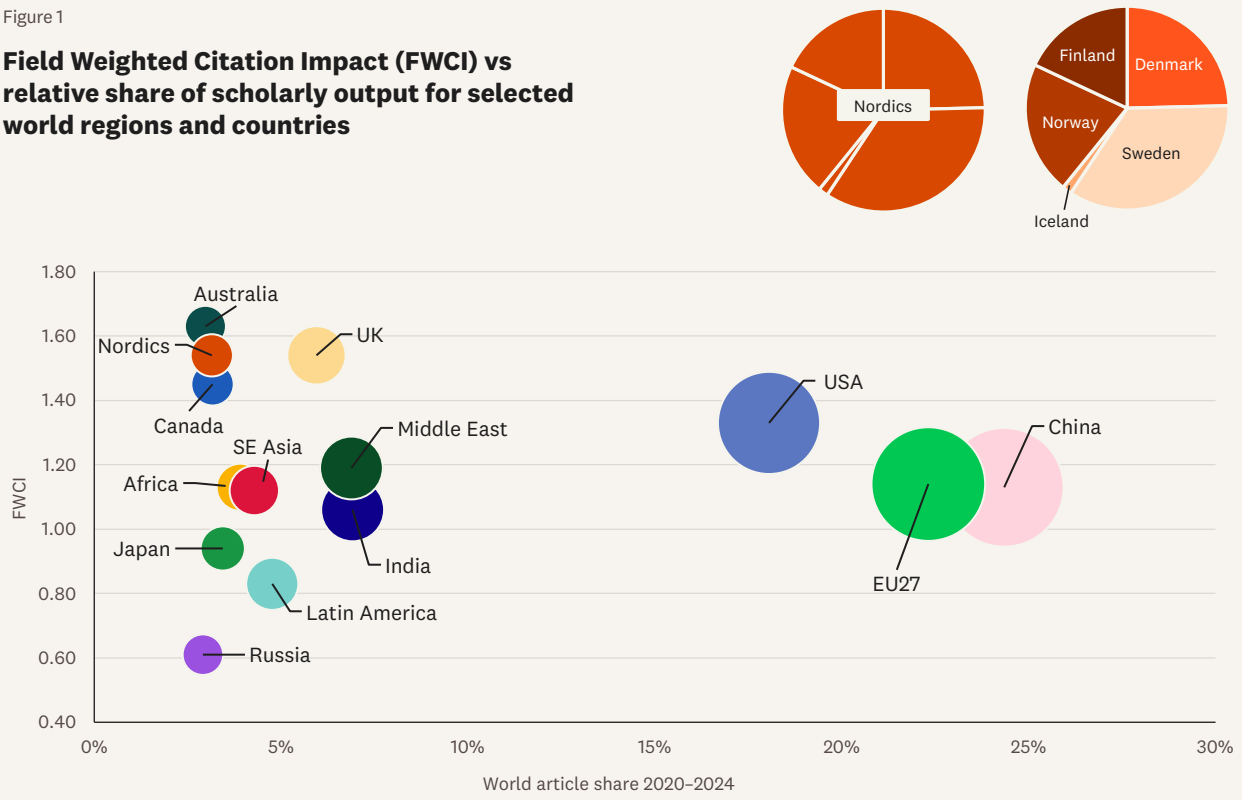


Figure 2

FWCI vs relative publication share of the 20 most prolific European countries

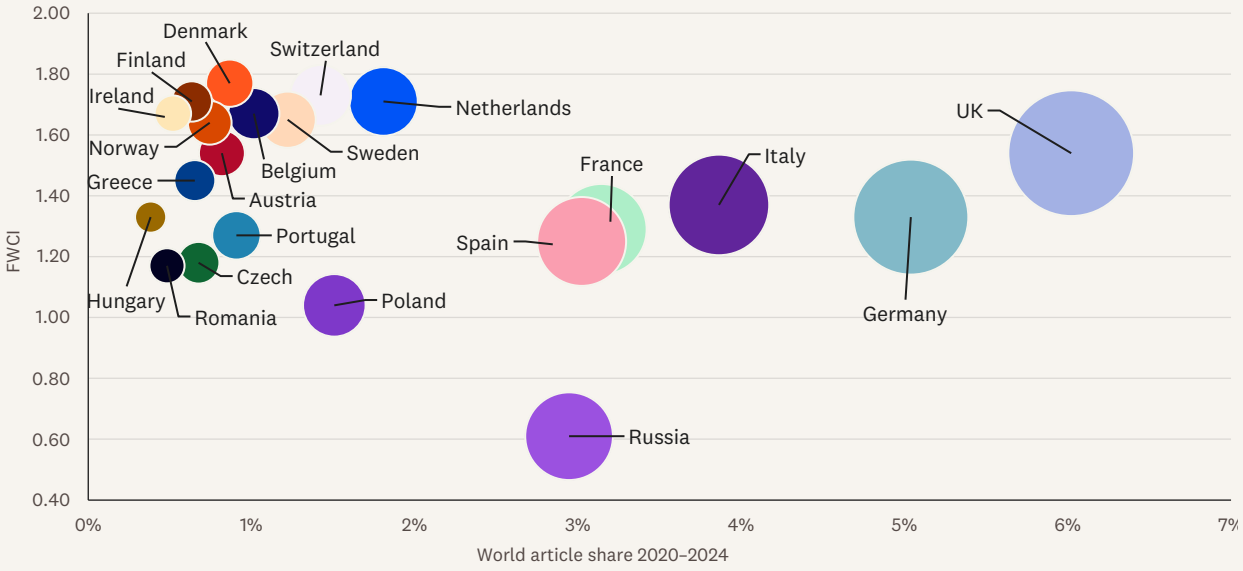


Figure 3

Academic research published in selected European region (2020–2024)

Country or region	FWCI	Scholarly output	Scholarly output (growth %)	Authors	Authors (growth %)
EU27	1.14	4,701,621	3.5%	3,371,100	10.3%
Nordics	1.54	662,735	8.0%	350,640	11.1%
UK	1.54	1,252,556	4.1%	732,125	9.6%
Germany	1.33	1,048,203	2.5%	690,447	8.4%
Netherlands	1.71	376,184	6.3%	214,941	11.2%
Denmark	**1.77**	**180,254**	**8.0%**	**90,150**	**12.5%**
Belgium	1.67	210,985	7.5%	113,956	11.5%
World	**1.00**	**20,803,548**	**16.2%**	**21,068,556**	**28.1%**

Over the last 5 years, Danish research output has grown by 8%, mirroring growth across the Nordics and outpacing the EU27 average (Figure 3). This growth has been accompanied by an even larger increase in the population of contributing authors (+12.5%), reflecting a healthy and expanding research base.

Globally, growth over the same period has been higher — exceeding 16% — driven primarily by China, India and emerging regions such as the Middle East and Africa. In contrast to the rising figures registered for Denmark, the UK and Germany — the most research-intensive countries in Europe — have experienced more modest growth over the same period.

Figure 4

Countries in the world with the highest FWCI (publications 2020–2024 and excluding low output regions, with less than 2,500 papers per year)

Rank	Country	FWCI	Rank	Country	FWCI
1	Hong Kong	2.05	9	Belgium	1.67
2	Singapore	1.96	10	Sweden	1.65
3	Denmark	1.77	11	Norway	1.64
4	United Arab Emirates	1.76	12	Australia	1.63
5	Switzerland	1.73	13	Saudi Arabia	1.56
6	Netherlands	1.71	14	New Zealand	1.55
7	Finland	1.71	15	UK	1.54
8	Ireland	1.67	16	Austria	1.54

The Nordic countries, as a whole, maintain exceptionally high citation levels, with Denmark leading the region. Although the COVID-19 pandemic affected countries differently, Denmark's citation performance has remained steadily strong (Figure 4).

Excluding regions with very low scholarly output (publishing on average fewer than 2,500 papers per year), Denmark ranks among the world's top countries for FWCI over the 2020–2024 period.

How does international collaboration contribute to overall research performance?

The global nature of contemporary challenges necessitates international scientific collaboration, which provides access to leading research environments, top-tier expertise, and state-of-the-art infrastructure.

The Danish government acknowledges international research and innovation collaboration with like-minded countries as a key factor in enhancing the quality and impact of Danish research (*Strategic priorities for research and innovation 2026–2029*, Uddannelses- og Forskningsministeriet, 2025). Denmark is committed to establishing the right framework conditions to enable its research communities to engage globally and collaborate with leading partners both within and beyond the Nordic countries and the EU, especially in strategically important research areas. The Danish Presidency of the Council of the EU also reflected this outward orientation, focusing on strengthening cross-border research and innovation cooperation to advance the green and digital transitions and support Europe's technological and strategic autonomy.

To assess international scientific collaboration, co-publications — research papers with authors from multiple countries — are used as the main indicators. A whole counting method is applied, meaning a paper with authors from Denmark and France is credited to both countries. **Figure 5 illustrates the share of internationally co-authored scholarly output for Denmark and its peers**, compared with global, EU, and Nordic averages.

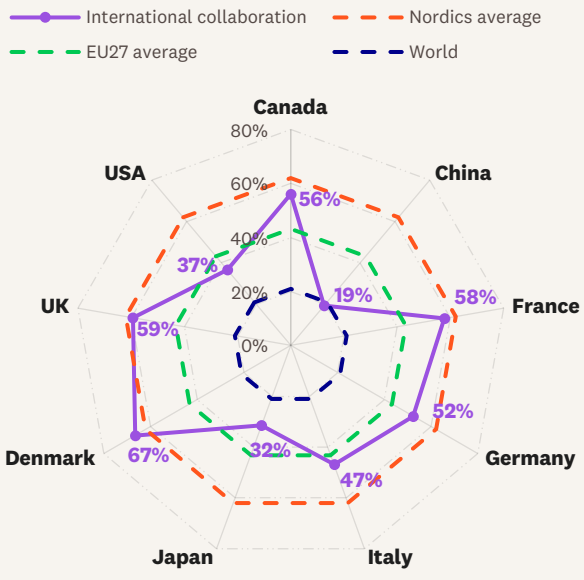
Denmark stands out as one of the most internationally collaborative research systems in the world. 67% of its research is internationally co-authored, compared with 62% for the Nordics, 43% for the EU, and 21% globally. Beyond the G7 and China, other notable figures include Australia (59%), Africa (53%), the Middle East (44%), Latin America (39%), India (22.5%), and Russia (21%).

This high level of international collaboration has a clear impact on research performance. **Internationally co-authored Danish publications have a FWCI of 2.13**, nearly double the **1.06 FWCI of publications co-authored nationally**. This is particularly significant given that the average FWCI for all Danish research is 1.77. This pattern — where international collaboration is associated with higher citation impact — is a well-documented global trend, observed consistently in all Nordic countries and other research-intensive regions such as the EU, the United States, and the United Kingdom.

Figure 5

International collaboration levels expressed as a percentage of total publications in selected countries (G7 and China)

The world average is 21%

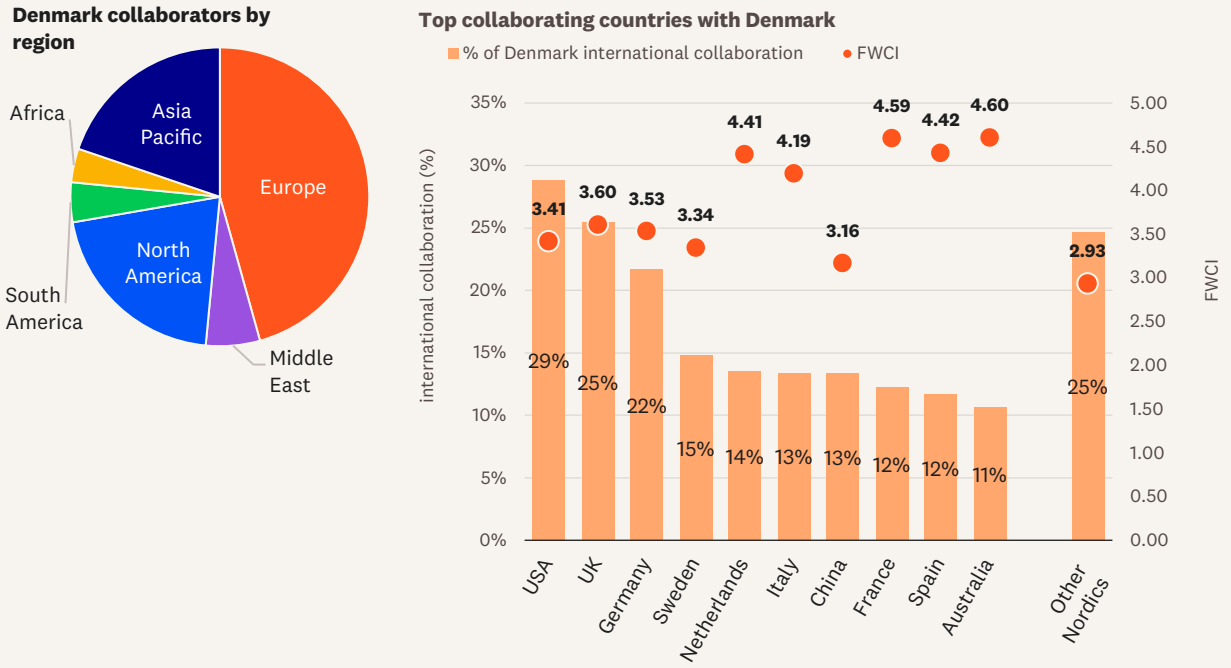


Which regions and countries does Denmark engage with the most?

Denmark's international research collaborations are **predominantly Europe-focused**, with nearly half of all partnerships taking place within the region. The United States and the Asia-Pacific region each account for one-fifth of Denmark's global collaboration portfolio (Figure 6).

Figure 6

Collaborations of Denmark by regions (pie chart) and most prolific countries collaborating with Denmark (shown as a percentage of Denmark's international publications) and citation impact measured as FWCI



At the country level, **the United States is Denmark's top partner, accounting for 29% of all international collaborations**. The United Kingdom follows with 25%, and Germany with 22%. Among neighboring countries, collaborations with (at least one of) the Nordic countries (25%), Sweden (15%) and the Netherlands (14%) are particularly prominent. Collaboration with China represents 13% of Denmark's research output.

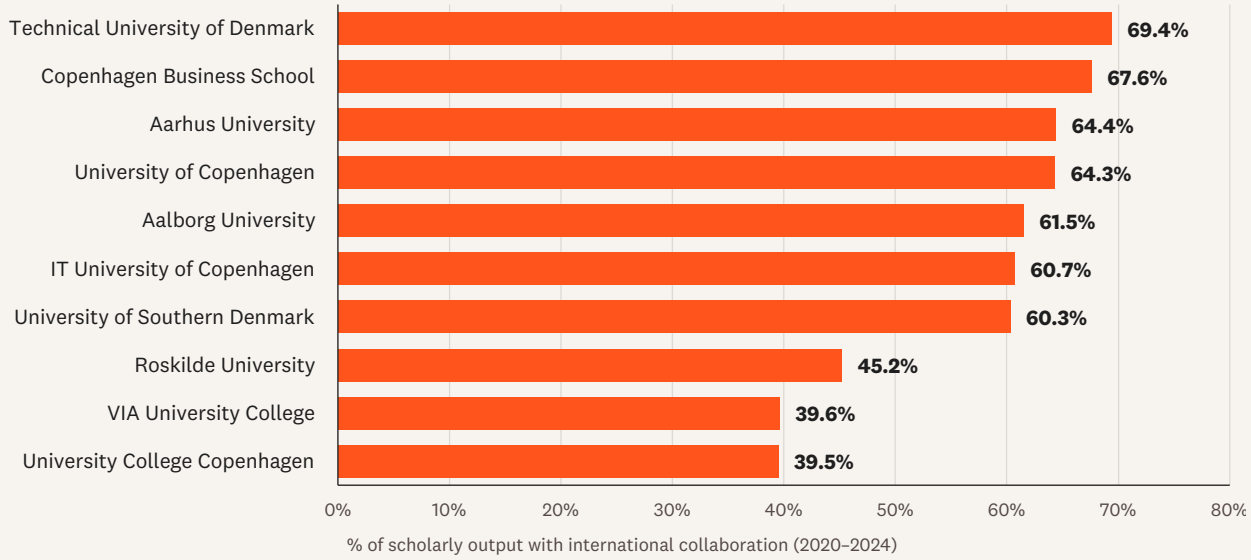
These partnerships are not only numerous but also highly impactful. The overall FWCI for Denmark's international publications is 2.13, while co-authorship with the United States and the United Kingdom reach FWCIs of 3.41 and 3.60, respectively. Even more striking are the **partnerships with the Netherlands, Italy, France, Spain, and Australia, all of which have FWCI values exceeding 4.00**.

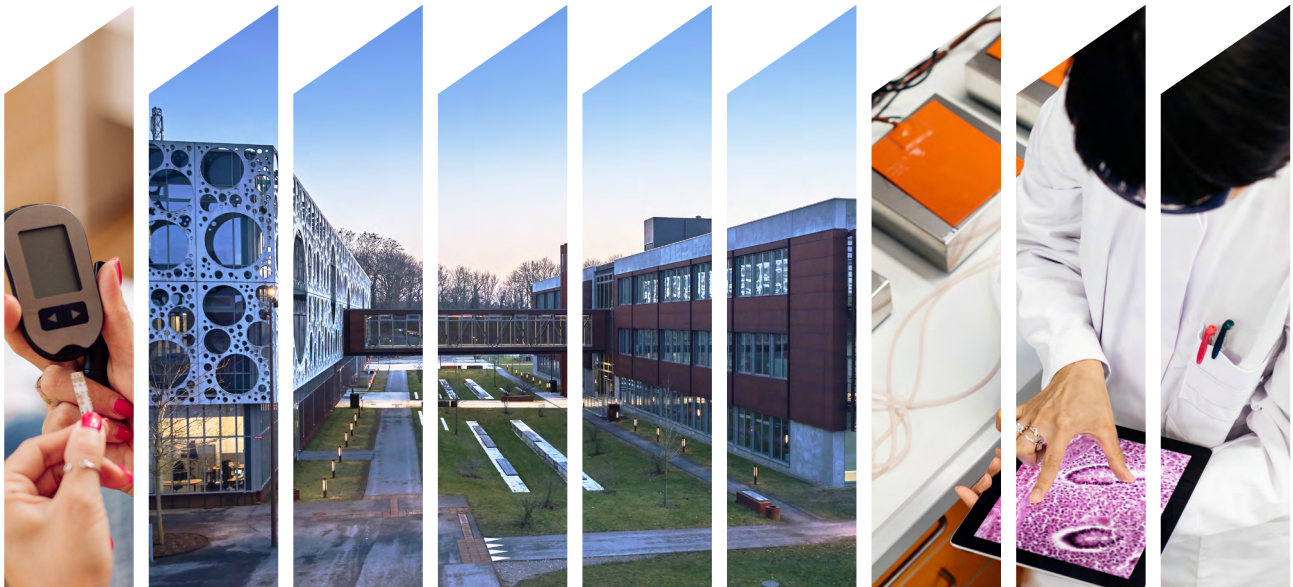
While these figures highlight the impressive impact of specific partnerships, they should not be interpreted as definitive measures of their strategic value. **International collaborations are increasingly multilateral rather than bilateral**, particularly in fields such as physics, energy and global health, where large infrastructures are often shared. For example, among the 35,000 co-publications between Denmark and the United States from 2020 to 2024, 36% also included the United Kingdom. Likewise, of the 31,000 co-publications with the UK, 35% also involved Germany. These patterns illustrate how deeply interconnected today's research networks have become.

At the institutional level, Danish universities display high levels of international engagement (Figure 7). **The Technical University of Denmark** has the highest share of internationally co-authored publications, followed by **Copenhagen Business School**. Other major universities also maintain robust global research ties, reflecting a deeply embedded culture of international collaboration across Denmark's research institutions.

Figure 7

Levels of international collaboration in the main universities in Denmark





The role of academic-corporate collaboration and impact on patents

Academic-corporate collaboration is a cornerstone of Denmark's research and innovation ecosystem. Strengthening the connection between universities and industry is a key priority in national R&I policy as reflected through national business clusters, research and innovation partnerships, and targeted funding programs such as those provided by the Innovation Fund Denmark.

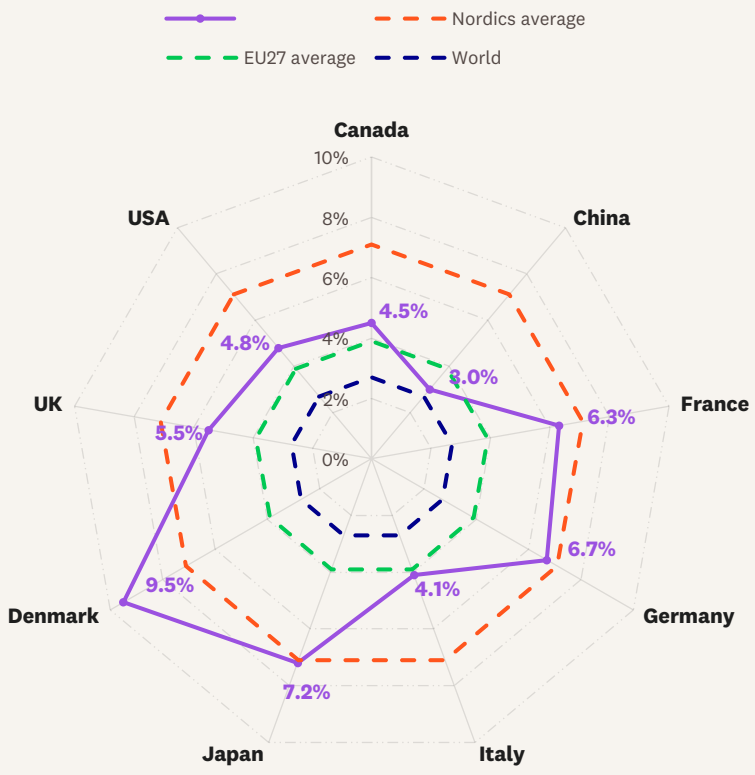
Two key indicators used in this report to assess the contribution of academia to innovation are **academic-corporate co-publications and citations of scientific research in patents**. While these indicators are partial measures — since not all knowledge exchange results in publications or patents — they remain valuable tools for understanding the translational impact of research to the wider innovation ecosystem.

Academic-corporate collaboration is a well-established strength of the Danish research system. As shown in Figure 8, the share of academic-corporate co-publications in Denmark significantly exceeds the EU27 average and surpasses all G7 countries as well as China. Between 2020 and 2024, **9.5% of Danish scholarly output involved co-publications between universities and industry**. This proportion is not only among the highest globally but also reflects a pronounced international dimension: **81% of these co-publications include international partners**.

Figure 8

Academic-corporate collaboration levels (ACCO) expressed as a percentage of total publications in selected countries (G7 and China)

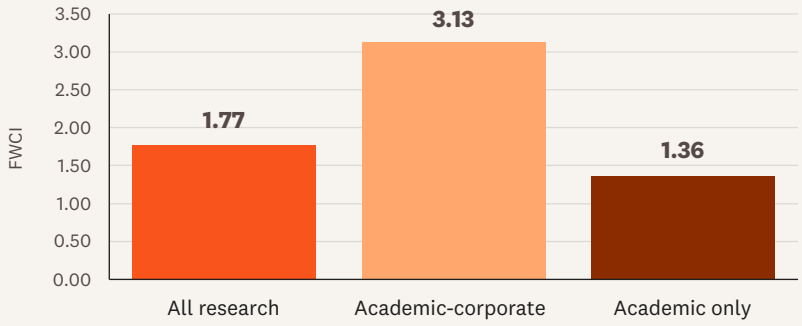
The world average is 2.7.



Partnerships between academia and industry bring together diverse skills and resources to address complex societal and technological challenges. Research produced through such collaborations also tends to have a greater impact, reflected in higher citation levels. In Denmark, **the FWCI of academic-corporate co-publications is more than double that of research produced solely within academia** (Figure 9) — a difference that reflects both their applied focus and their strong international connectivity.

Figure 9

Comparison of citation levels by sector collaboration in research



Which companies are collaborating with Denmark on research?

Novo Nordisk is by far the most prolific corporate collaborator in Danish research. This prominence reflects the structure of the **Novo Nordisk Foundation**, a self-governing enterprise foundation. Consequently, research outputs attributed to "Novo Nordisk" often encompass the combined contributions of several affiliated entities operating under the foundation's umbrella (Figure 10). Other major corporate collaborators in Danish research are **H. Lundbeck**, **AstraZeneca**, and **SINTEF**.

Figure 10

Table of most prolific corporates authoring or co-authoring with Danish researchers

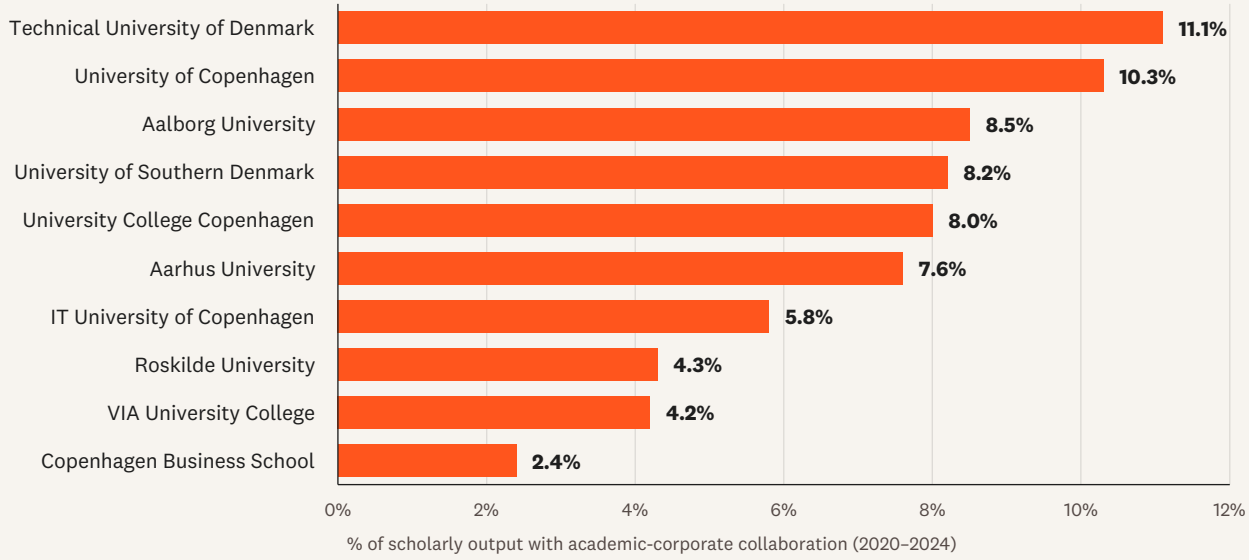
Country	Corporate	Scholarly output	FWCI
DKN	Novo Nordisk	4,574	2.74
DKN	H. Lundbeck A/S	687	2.63
GBR	AstraZeneca	406	5.44
NOR	SINTEF	349	1.57
DKN	Danish Technological Institute	334	1.50
DKN	Nordic Bioscience AS	294	1.58
GBR	GlaxoSmithKline	282	5.64
USA	Pfizer	278	9.55

Country	Corporate	Scholarly output	FWCI
CHE	F. Hoffmann-La Roche AG	264	6.92
USA	Johnson & Johnson	245	3.66
CHN	China National Nuclear Corporation	239	2.00
USA	Amgen Incorporated	237	5.65
DEU	Fresenius AG	225	7.07
CHE	Novartis	221	5.66
DKN	Arla Foods	208	1.12

At the institutional level, the Technical University of Denmark has the highest share of industry collaborators, followed by the University of Copenhagen (Figure 11). High levels of engagement with the private sector are observed across other major Danish universities, reflecting the systemic nature of academic-industry collaboration in Denmark.

Figure 11

Levels of academic-corporate collaboration in the main universities in Denmark



Patent citations as an indicators of innovation impact

Beyond scientific value, academic research plays a crucial role in driving **knowledge transfer** and technological development. One tangible way to assess the real-world impact of research is by examining how often scholarly work is **cited in patents**. These citations represent a direct link between fundamental research and the development of new technologies, offering insight into how scientific knowledge contributes to commercial innovation and societal progress.

As shown in Figure 12, **Danish research is cited in patents at a rate of 4.5%**, above the averages for both the Nordic region and the EU27. China, the United States and Japan record the highest shares globally. **Within Denmark, research produced in collaboration with industry** is particularly impactful: **9.5% of academic-corporate publications** are cited in patents, compared with **4.5% for overall Danish research** during the same period (Figure 13).

Figure 12

Scholarly output cited by patents (as a percentage of all articles from the country/region)
Publications 2015–2024

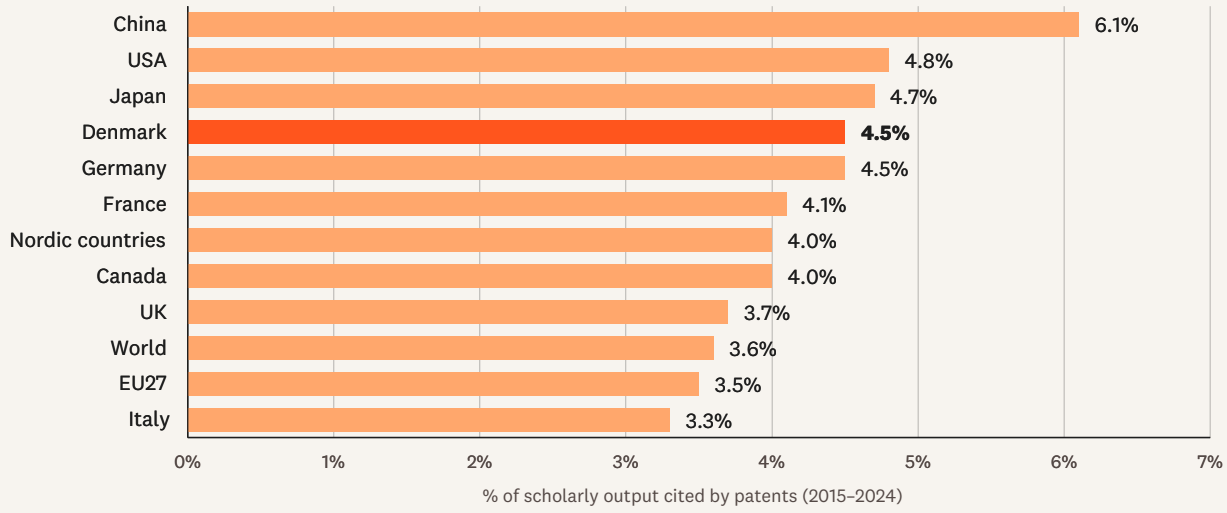
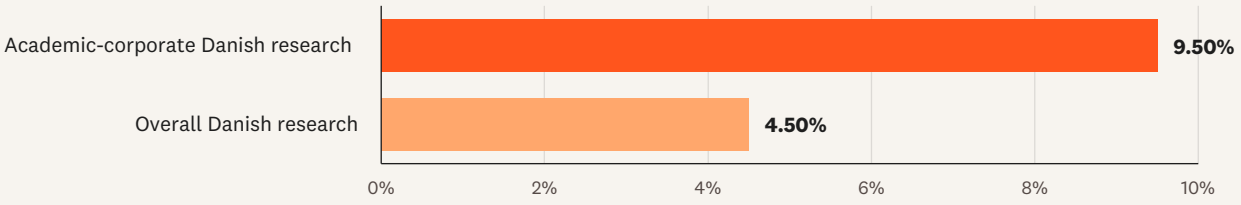


Figure 13

Scholarly output cited by patents: overall Danish research vs academic-corporate Danish research

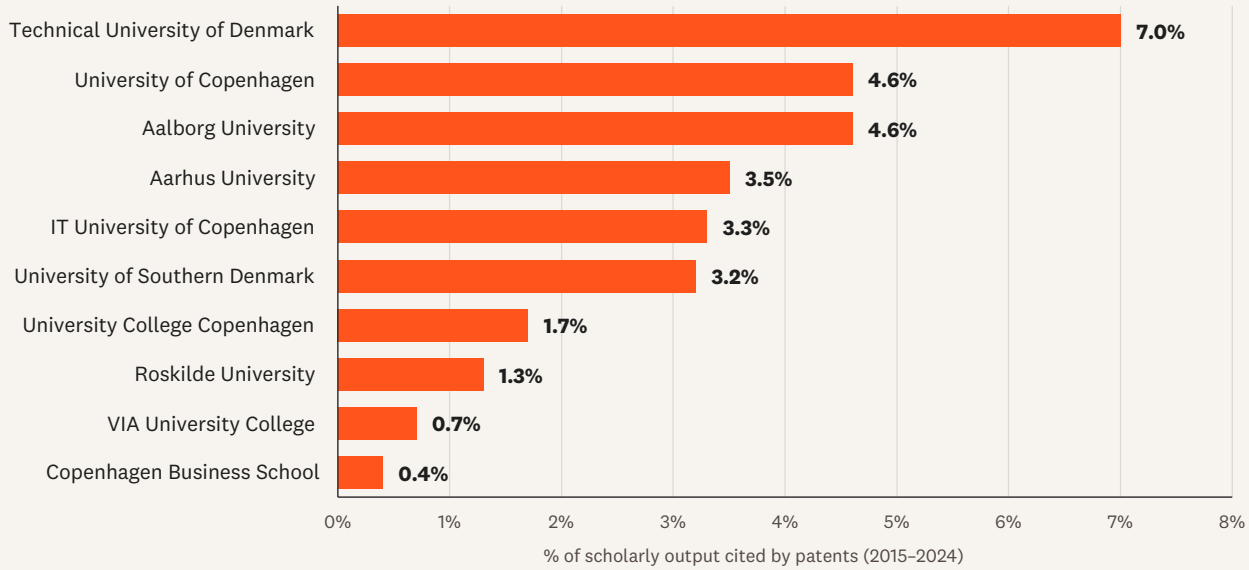


As shown in Figure 14, the Danish institutions with the highest shares of research cited in patents include the **Technical University of Denmark**, the **University of Copenhagen** and **Aalborg University**, indicating strong regional innovation linkages. Further analysis could explore which specific fields and entities most frequently draw on Danish scientific output in their patenting activities, offering valuable insights into technology transfer pathways and strategic opportunities for strengthening Denmark's innovation ecosystem.

Figure 14

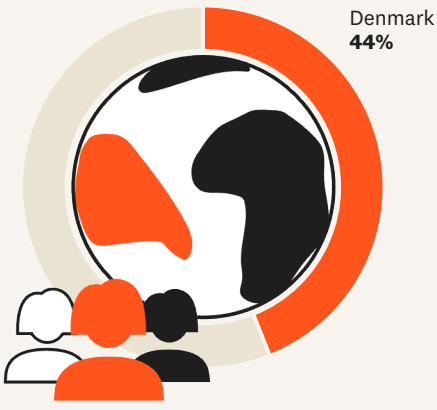
Scholarly output cited by patents (as a percentage of all articles from the university)

Publications 2015–2024



Representation and gender

Balanced representation in research is associated with stronger scientific performance and innovation capacity. Women now make up **42% of all active researchers in the EU** and **44% in Denmark**, placing the country within the gender parity range (40–60%).[8]



8 More data specific to Denmark can be found in the report 'Elsevier (2024) Progress Toward Gender Equality in Research & Innovation' — 2024 Review. Available at: https://www.elsevier.com/insights/gender-and-diversity-in-research

Impact of science on policy, sustainability and key technologies

Danish research plays a significant role beyond academia, contributing to policy development, sustainability goals and emerging technologies. These areas are closely aligned with Denmark's national R&I priorities, including the green transition, clean energy, emerging digital technologies and health innovation.

A practical way to assess the policy relevance of Danish research is to analyze how often scholarly outputs are cited in **policy documents**. Between 2015 and 2024, **12.3% of Danish publications were cited in policy — almost twice the EU27 average and higher than any comparator country or region** shown in Figure 15.

Figure 15

Scientific articles cited in policy documents (as a percentage of all articles from the country, region)

Publications 2015–2024

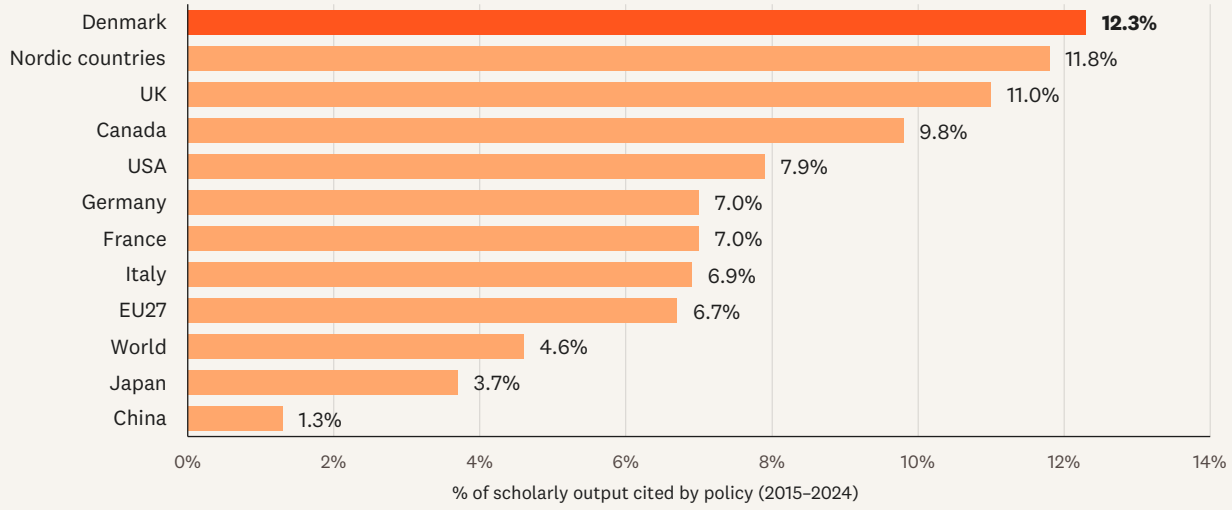
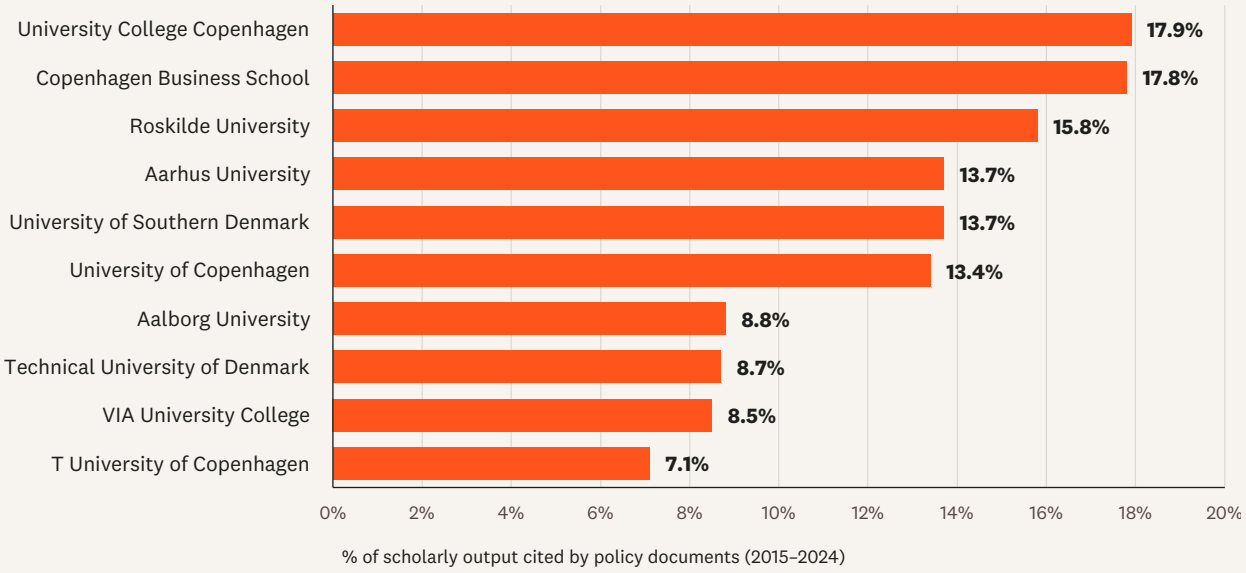


Figure 16

Scientific articles cited in policy documents (as a percentage of all articles from the institution)
Publications 2015–2024



At the institutional level, **University College Copenhagen and Copenhagen Business School stand out, with about 18% of their research cited** in policy documents. This suggests a strong orientation toward evidence-based policy-making.

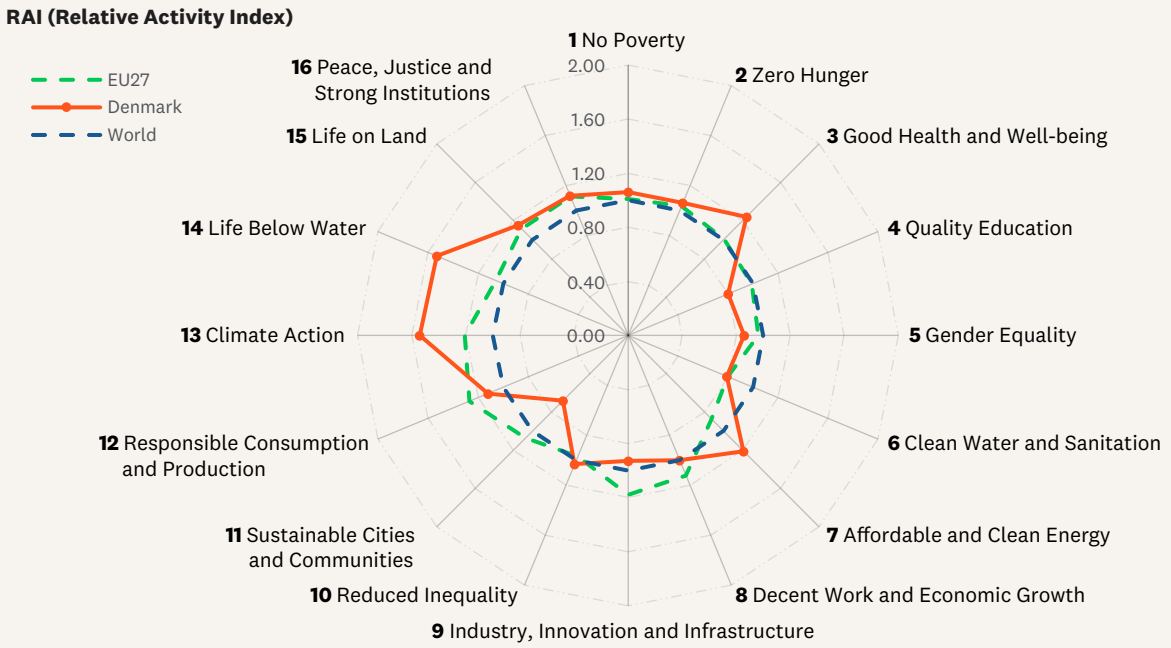
Additional analysis could examine which specific policy documents and policy institutions draw on Danish research, and in what contexts.

Sustainability

Danish research also makes a substantial contribution to addressing global sustainability challenges, reflecting national priorities around the green transition and sustainable development. This section analyses Denmark's research output related to 16 of the 17 SDGs, using a methodology based on the framework developed by Elsevier for the Times Higher Education (THE) Impact Rankings.

Figure 17

Denmark's research relating to the 16 SDGs, compared to the World (Normalized to 1.0) and the EU27 (2020–2024)



As shown in Figure 17, Denmark demonstrates **higher relative research activity than the EU27 average in nine SDGs**, and **above the world average in ten SDGs**. Activity is particularly strong in **Life Below Water (SDG 14)** and **Climate Action (SDG 13)**. Denmark also performs well in **Affordable and Clean Energy (SDG 7)**, with a RAI of 1.21, compared to 0.88 for the EU27 and 1.52 for China.

High relative activity is also observed in **Good Health and Well-being (SDG 3)**, reflecting its importance as an area of strategic national investment. In contrast, Denmark shows lower activity in **Industry, Innovation and Infrastructure (SDG 9)** and **Sustainable Cities and Communities (SDG 11)** — fields in which China has emerged as a global leader.

Figure 18

Relative size of each SDG in Denmark's research output

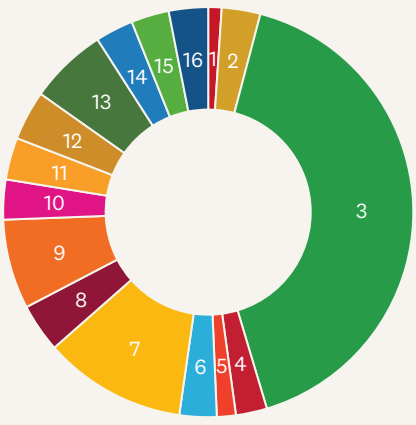
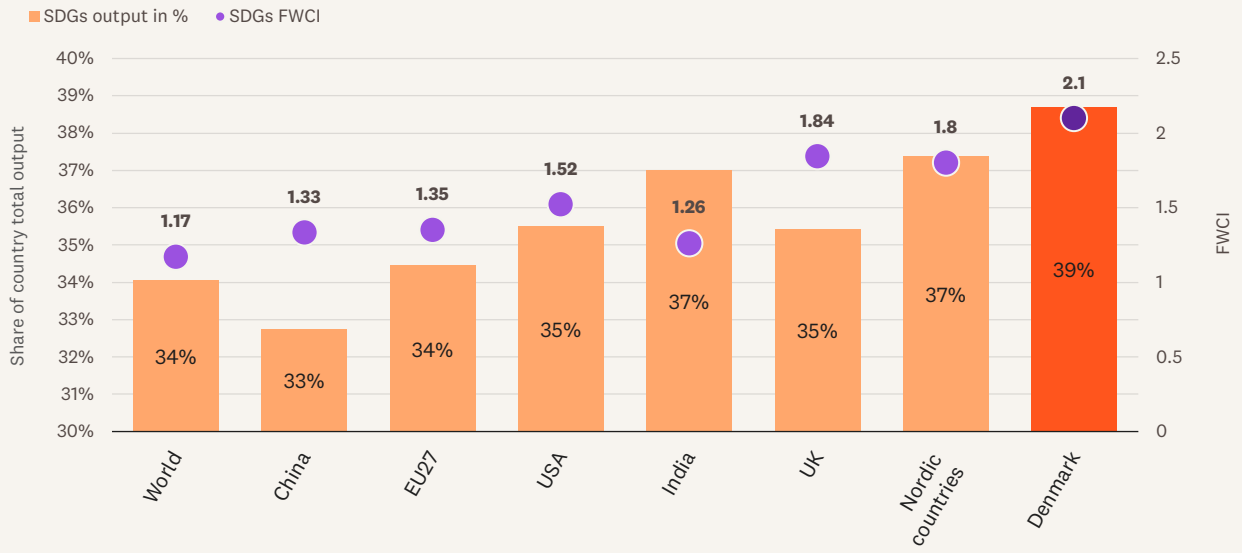


Figure 19

Share of scholarly output related to Sustainable Development Goals for Denmark and selected comparators (2020–2024)



A total of **39% of Denmark's scholarly output relates to at least one SDG**, exceeding both the global and EU27 averages of 34%. Beyond this strong volume, the impact of Danish sustainability research is also notably high. With a **Field-Weighted Citation Impact (FWCI) of 2.10**, Denmark outperforms the global, EU27, and Nordic averages, and surpasses comparator countries including China, the United States, and the United Kingdom. This high level performance underscores Denmark's role as a **leader in research supporting global sustainability objectives**, particularly in areas aligned with its national strengths.

Key strategic technologies

Several countries — including Denmark — have identified a set of technologies of strategic national importance to strengthen competitiveness and safeguard supply chains through government programs and funding frameworks. This section examines five key technologies of particular relevance to Denmark's research and innovation ecosystem: **Artificial Intelligence**, **Quantum Technologies**, **Biotechnology**, **Space Technologies** and **Clean Energy**. These areas align with the government's designation of "critical technologies", as outlined in its 2026–2029 research and innovation strategic priorities. While methodologies for defining research areas vary, the analytical approach used in this report is documented in the appendix, and all datasets are fully reproducible.

Overview of five technology areas

Artificial Intelligence

AI research is undergoing a period of rapid and transformative growth, moving from foundational principles to advanced real-world applications. Scholarly output — including academic publications and patents — serve as a key indicator of this momentum. While private corporations now lead in developing and commercializing cutting-edge models, academic institutions continue to play a critical role by producing fundamental, highly cited research that underpins technological breakthroughs. Globally, the AI research landscape is marked by an unprecedented increase in scholarly output. China leads in volume of AI publications and patents, while the United States remains dominant in the development of frontier AI models and in attracting private investment. The European Union, through its landmark AI Act, is actively shaping the global norms by emphasizing trustworthy and human-centric AI. Denmark's national strategy aligns closely with this approach, **emphasizing responsible and ethical use of AI as a driver of innovation and societal trust**.

Quantum Technologies

The field of quantum technologies is experiencing a significant surge in research and development activity, supported by growing public and private investments. Although still at an early stage of commercialization, research is rapidly advancing from theoretical foundations to practical applications in quantum computing, sensing, and secure communication. This global race to harness quantum technologies has both scientific and geopolitical dimensions. Denmark, **building upon a long-standing tradition of excellence in quantum physics**, traceable to the work of Niels Bohr, has established itself as a key contributor in this field. Danish universities and research institutions are at the forefront of quantum computing, sensing, and communication, forming the backbone of the national strategy for quantum technology. This research strength is supported by targeted national funding programs and partnerships designed to accelerate translation from research to commercial and societal benefits.

Biotechnology

Biotechnology is a multidisciplinary field that provides innovative solutions to many of society's most pressing challenges, including healthcare, food security and sustainable production. Denmark has cultivated a thriving biotechnology ecosystem, building on its longstanding strengths in areas such as industrial enzymes and pharmaceuticals. A distinctive feature of the Danish model is the strong integration of research, development, and commercial application. This close alignment between academic research and private industry supports high levels of knowledge transfer, enabling scientific discoveries to be translated into innovations that drive economic growth and address critical societal needs. Biotechnology remains **one of Denmark's most internationally competitive research domains** and a key pillar of its innovation strategy.

Space Technologies

Research in Space Technologies is increasingly important, and in Denmark, academic efforts — primarily led by DTU Space at the Technical University of Denmark — play a strategic role in advancing national and international space research. By focusing on high-tech niches such as miniaturization, advanced sensors, and Arctic Earth Observation, Danish researchers provide critical technology and data to key EU programs like Copernicus and Galileo. This work supports the EU's technological autonomy, advances Denmark's Green Transition objectives through climate monitoring, and **reinforces the country's strategic position within the competitive European space sector**.

Clean Energy

Clean Energy technologies are central to Denmark's green transition and long-term climate objectives. Research in this area supports the national target of achieving carbon neutrality by 2045 and contributes to the global effort to achieve net-zero emissions. Denmark's research institutions have built a **strong and internationally recognized research base in renewable energy technologies, sustainable agriculture, and the integration of smart grids**. This leadership is underpinned by close collaboration between academia, government and industry, which enables new technologies to move rapidly from research to real-world application. The Danish model places emphasis on interdisciplinary research and coordinated partnerships across sectors, ensuring that scientific discoveries translate into practical solutions. With this solid foundation in Clean Energy research and innovation, Denmark continues to serve as a global reference point for sustainable energy transitions.

Artificial Intelligence

AI publications

Although Denmark's contribution to global AI research is modest in volume, it is exceptional in quality and impact. Globally, the AI research landscape is dominated by China, which accounts for about 32% of global scholarly output. The United States and the EU27 each contribute about 15%, followed by India with 14.8% and the United Kingdom with around 5%.

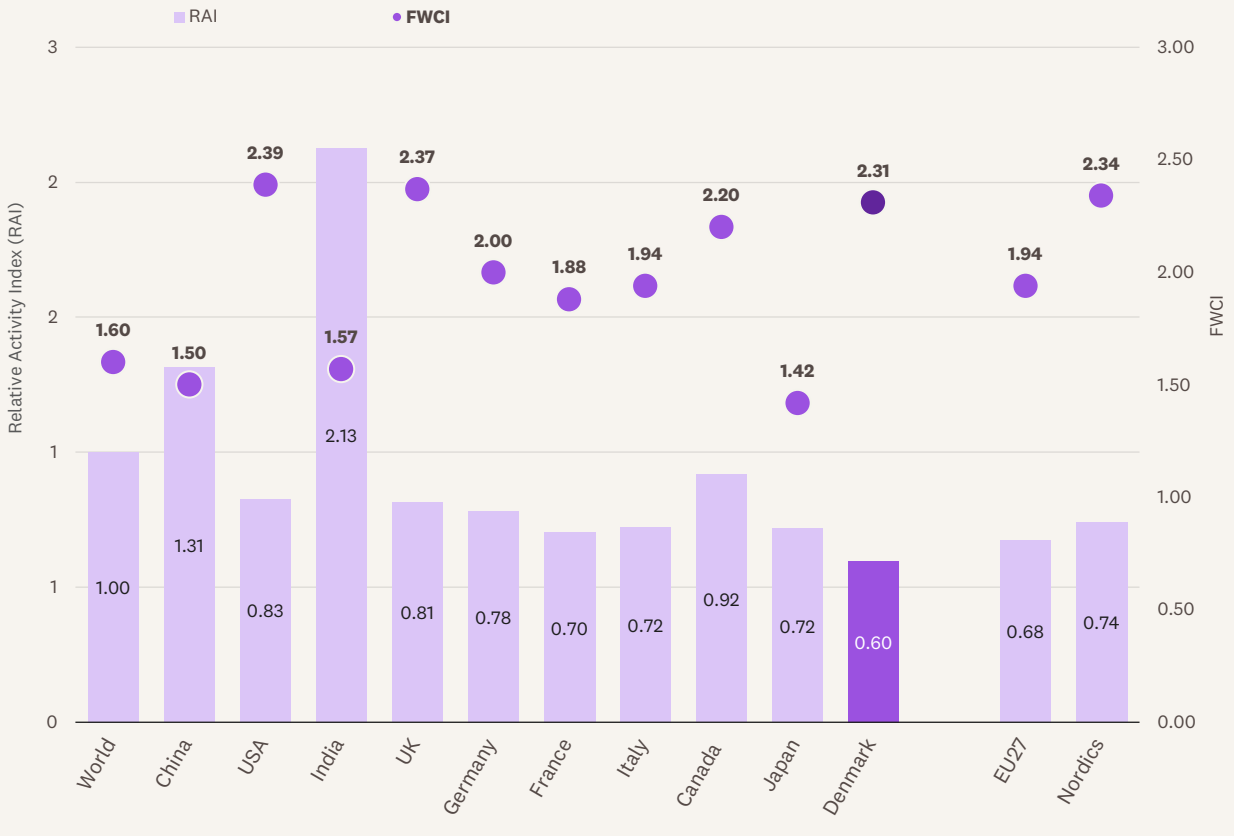
Denmark ranks 42nd globally and 14th in the EU27, with a 0.5% share of global AI publications.

AI-related publications account for just **3% of Denmark's total research output**, which is below the global average of 5% and also lower than the averages for the EU, the United States, and the United Kingdom (each at 4%). Despite this smaller scale — both in absolute terms and relative to total research output— Danish AI research stands out for its high citation impact (FWCI well above the world average), reflecting a focus on quality. This research field is led by **Aalborg University**, the **University of Copenhagen**, and the **Technical University of Denmark**.

Figure 20

AI research, volume (RAI) and citations (FWCI)

Publications 2020–2024



Academic-corporate collaborations

Germany, Japan and the United States have the highest level of academic-corporate collaboration when it comes to AI research. Denmark demonstrates strong connections between academia and industry. **9% of AI-research publications involve academic-corporate co-authorship**, significantly higher than the **EU average of 6.5%**.The leading corporate collaborators include Novo Nordisk, Oticon Danmark AS, Alphabet Inc., State Grid Corporation of China, F. Hoffmann-La Roche AF and H. Lundbeck A/S.

Patent citations

Patent citations provide an indication of how AI research contributes to technological innovation. The United States leads globally, with 10.7% of AI publications cited in patents, followed by China (9.2%). **Denmark's AI research demonstrates strong translational impact: 7.1% of its AI publications are cited in patents — on par with the Nordic average and notably above the EU27 benchmark of 6.3%.** Leading contributors include, the Technical University of Denmark, Aalborg University and the University of Copenhagen. Among corporates, Oticon Danmark AS stands out in this group.

International collaboration

Denmark's AI research is characterized by a high degree of international collaboration, exceeding the national collaboration levels observed across all disciplines. While **67% of all Danish research involves (at least one) international partner**, in AI this figure rises to **72% — the highest among G7 and comparator countries**.

The **United States is Denmark's largest AI partner**, with nearly 900 co-authored publications (25%). China follows with 725 (19%), and the United Kingdom with 670 (17.5%).

The top international institutions collaborating with Denmark in AI research include the University of Groningen (Netherlands, 137), the University of Geneva (Switzerland, 133), and Harvard University (USA, 118). These partnerships underline Denmark's strong integration in leading global AI research networks.

Figure 21

AI research, academic-corporate collaboration levels (%)

Publications 2020–2024

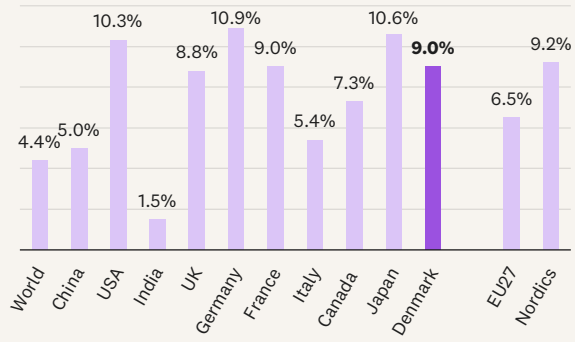


Figure 22

AI research, scholarly output cited by patent (%)

Publications 2015–2024

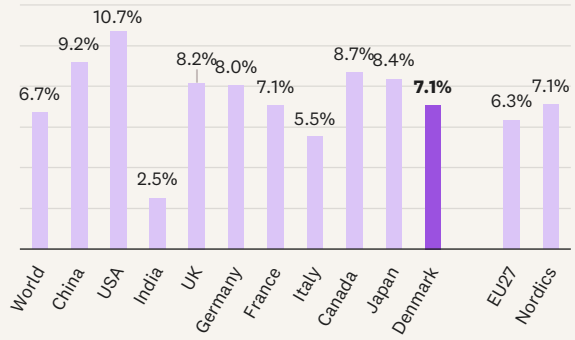
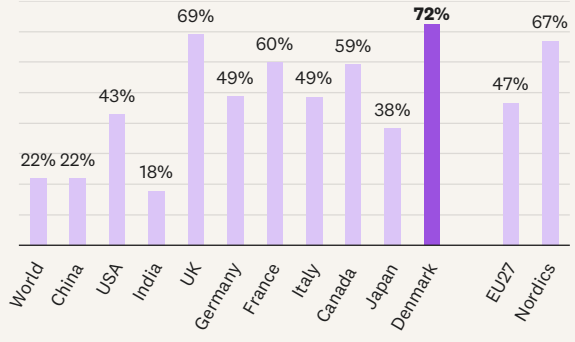


Figure 23

AI research, international collaboration levels (%)

Publications 2020–2024



Quantum Technologies

Quantum Technologies publications

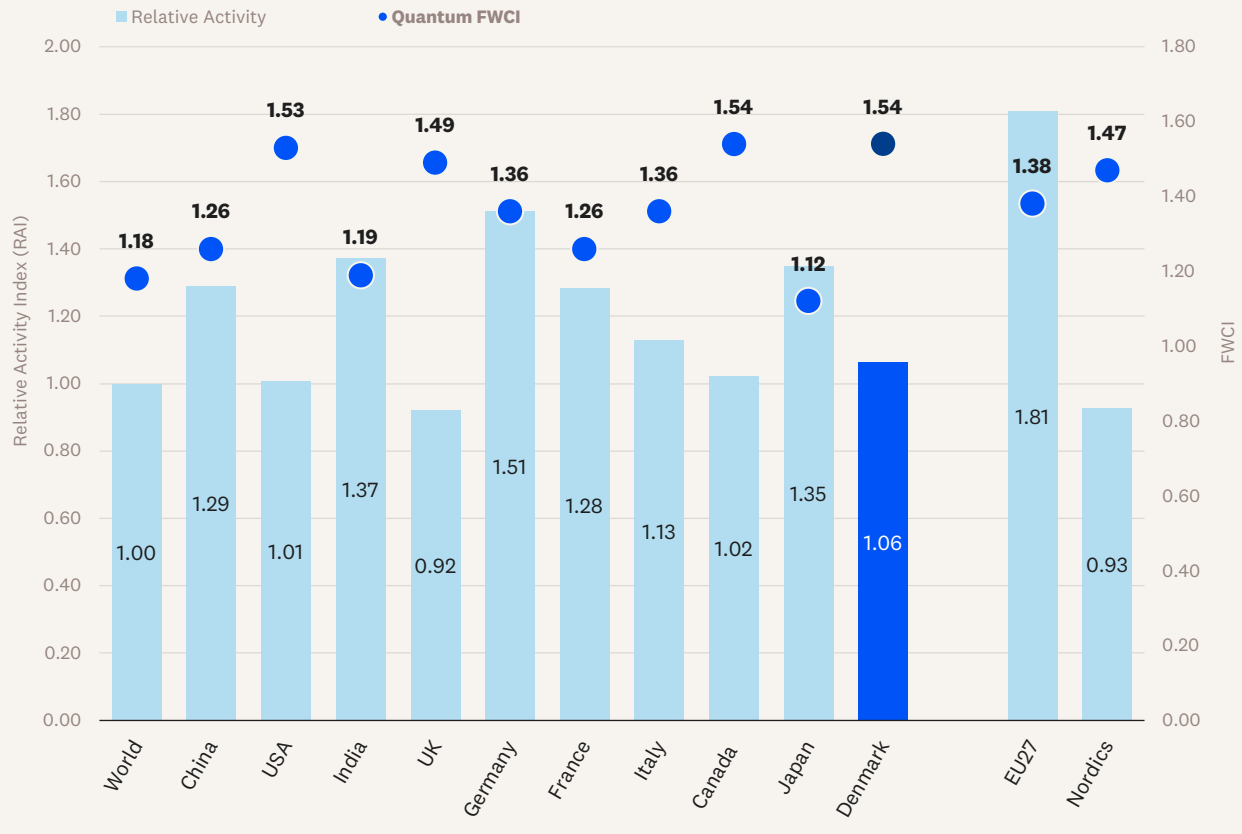
Between 2020 and 2024, around 1,500 Danish publications were directly related to Quantum Technologies. While this output places Denmark 28th globally and 9th within the EU27, the impact of its research is considerably higher. Danish publications in this field achieve a **citation impact well above the global and EU27 averages**, underscoring the country's strength in producing high-quality, influential research.

The most prolific Danish institutions in quantum research are the **University of Copenhagen** (approximately 600 publications), the **Technical University of Denmark** (490), and **Aarhus University** (290).

Figure 24

Quantum Technologies research, volume (RAI) and citations (FWCI)

Publications 2020–2024



Academic-corporate collaborations

Academic-corporate collaboration is also a defining feature of Denmark's quantum research ecosystem. Between 2020 and 2024, **6.5% of Danish quantum publications involved partnerships between academia and industry** — an indication of a strong translational research base. Collaboration spans multiple international corporations, though often with small numbers of co-authored publications. Microsoft (USA, 15) recorded the highest number of joint papers with Danish researchers, followed by IBM (USA, 6) and Quantum Motion Technologies (UK, 6). Among Danish corporations, H. Lundbeck contributed to 4 publications and NKT group to 3. This data reflects an emerging but diversifying academic-corporate landscape in quantum research.

Patent citations

Globally, patent citations in quantum research are dominated by the United States and China, followed in Europe by Germany and the United Kingdom. Despite its smaller volume, **Denmark performs well, with nearly 8% of its quantum-related publications cited in patents** — above both the Nordic (6.5%) and EU27 (5.5%) averages. This high citation rate demonstrates Denmark's strong contribution to **knowledge transfer and technological innovation**. Notably, **85% of Danish publications cited in patents involve international collaborators**, highlighting the importance of cross-border partnerships in advancing applied quantum research. The most frequent collaborating countries are the United States, Germany, the Netherlands and the United Kingdom, while China features in around 10% of these cases.

International collaboration

Quantum research in Denmark is marked by exceptionally high levels of international collaboration. While 67% of all Danish research involves (at least one) foreign partner, this rises to **81% in quantum technologies — the highest proportion** among the Nordic, EU27 and G7 countries. **Germany is Denmark's leading partner** in quantum technologies research, followed by the United States, the United Kingdom and China. At the institutional level, the Ruhr University Bochum (Germany) is Denmark's most frequent collaborator, followed by Lund University (Sweden) and Delft University of Technology (Netherlands).

Figure 25

Quantum Technologies research, academic-corporate collaboration levels (%)

Publications 2020–2024

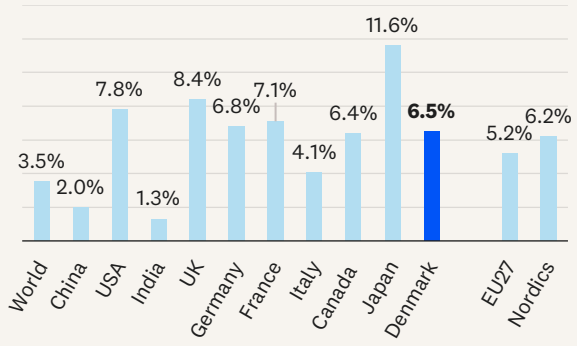


Figure 26

Quantum Technologies research, scholarly output cited by patent (%)

Publications 2015–2024

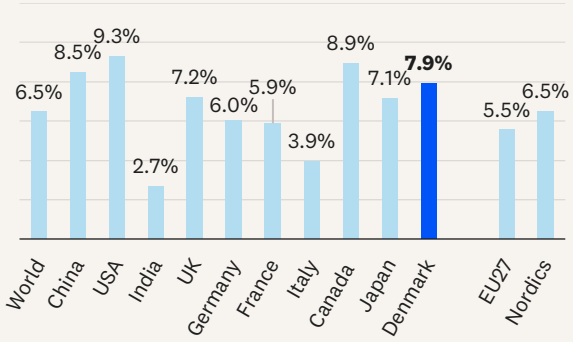
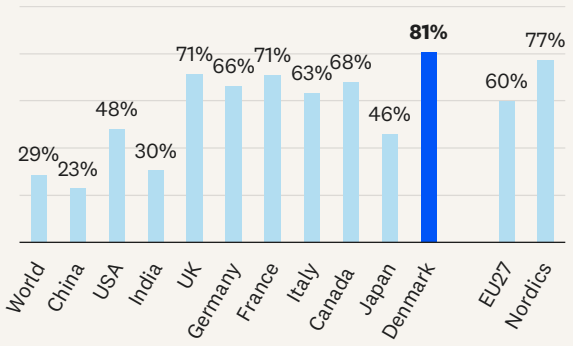


Figure 27

Quantum Technologies research, international collaboration levels (%)

Publications 2020–2024



Biotechnology

Biotechnology publications

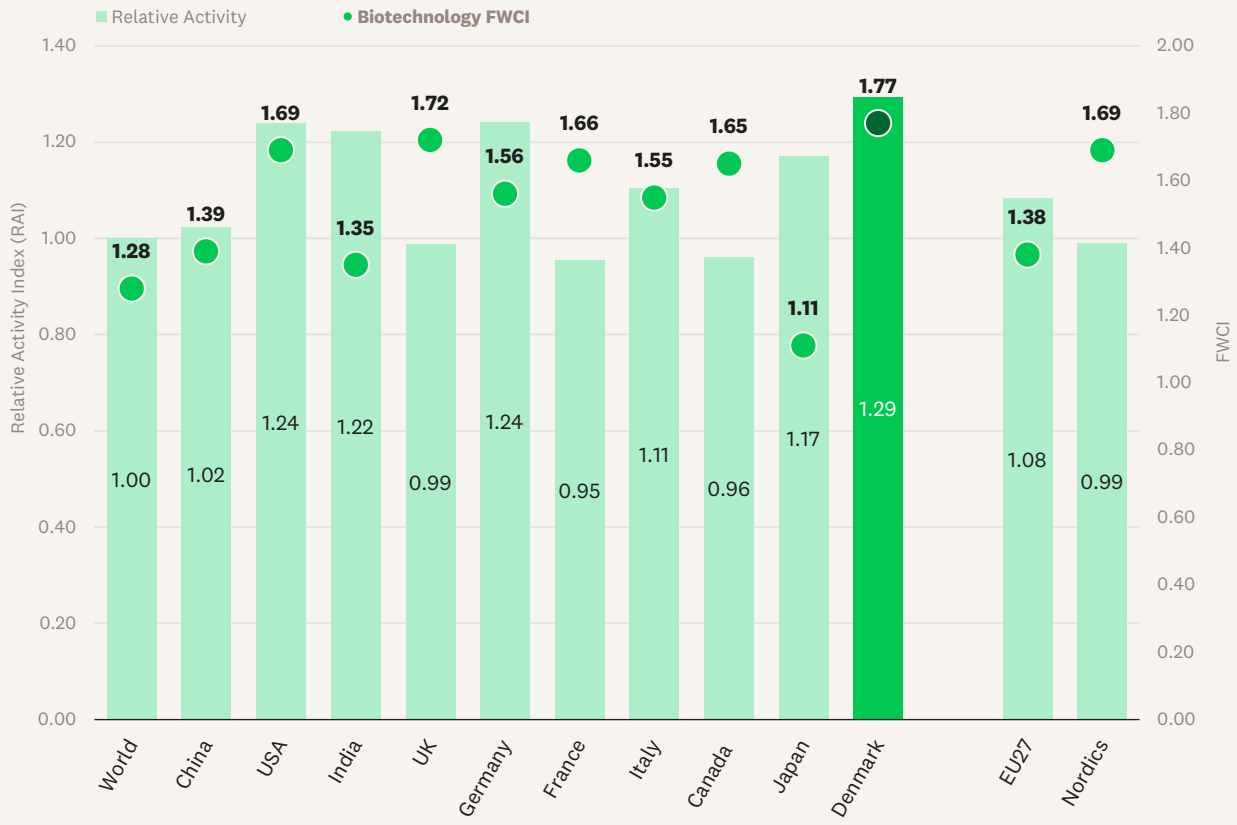
Between 2020 and 2024, approximately 3,000 Danish publications were related to biotechnology, representing 1.7% of Denmark's total research output. This share is higher than the global average (1.3%) and the EU27 average (1.4%), corresponding to a Relative Activity Index of 1.29. **Danish papers in biotechnology are also cited more frequently than those from any of the G7 countries, including the United States and the United Kingdom.**

The **University of Copenhagen** is the most prolific institution, producing about 1,000 publications with a FWCI of 1.53. The **Technical University of Denmark** follows with 780 publications and an FWCI of 1.70, while **Aalborg University** ranks third with 600 publications and a FWCI of 1.41.

Figure 28

Biotechnology research, volume (RAI) and citations (FWCI)

Publications 2020–2024



Academic-corporate collaborations

As in AI and Quantum Technologies, **Denmark excels in academic-corporate collaboration within biotechnologies**. Nearly 14% of Danish publications are co-authored by academic and industry partners — among the highest rates globally.

Novo Nordisk plays a particularly strong role, contributing to about 7% of all Danish biotechnology papers. The list of collaborative companies is long and international, led by F. Hoffmann-La Roche, AstraZeneca, Pfizer, Merck, GlaxoSmithKline, Johnson & Johnson, Genentech Inc, Novartis and Danish Bioneer A/S, among others.

These partnerships reflect Denmark's **integrated life science ecosystem**, supported by national initiatives such as the ***Life Sciences strategy*** and **Innovation Fund Denmark** programs, which promote collaboration between academia, industry and healthcare institutions.

Patent citations

Biotechnology research shows particularly strong performance in patent citations, indicating a high degree of knowledge transfer from science to innovation. Globally, the **United States leads with 19.6% of biotechnology publications cited in patents**, while **Denmark follows closely with 18.4%** — one of the highest levels worldwide.

This strong performance reflects the sector's capacity to translate academic excellence into commercially relevant technologies. Amongst Universities, the **Technical University of Denmark** reports the largest share of research cited in patents within this field.

International collaboration

Biotechnology research in Denmark is **highly international, with 75%** of research involving at least one external partner — the highest level among the G7 countries and other major research countries.

The United States is Denmark's largest partner, contributing to 680 co-authored publications, followed by China (470) and Germany (460). The top collaborating institutions are all located in Sweden, including Chalmers University of Technology (118), Karolinska (93), and Lund University (82).

Figure 29

Biotechnology research, academic-corporate collaboration levels (%)

Publications 2020–2024

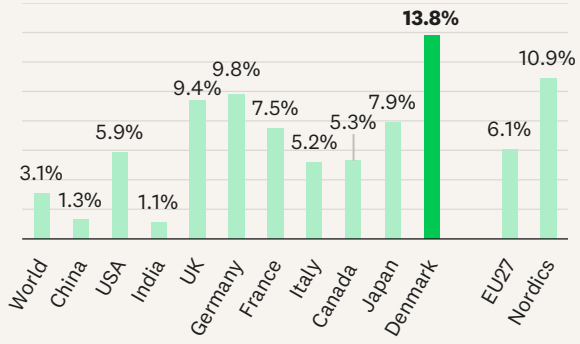


Figure 30

Biotechnology research, scholarly output cited by patent (%)

Publications 2015–2024

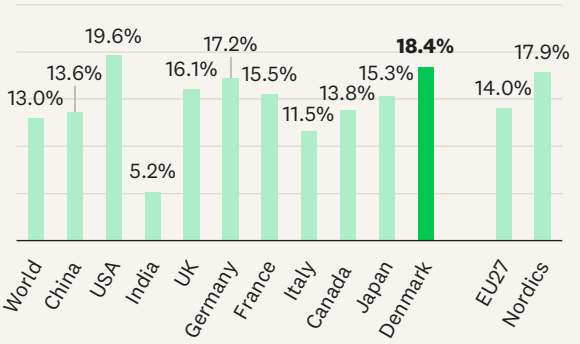
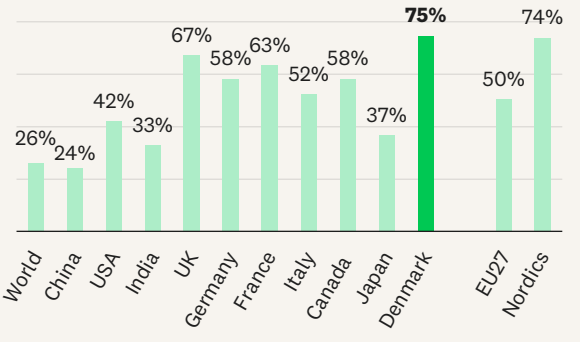


Figure 31

Biotechnology research, international collaboration levels (%)

Publications 2020–2024



Space Technologies

Space Technologies publications

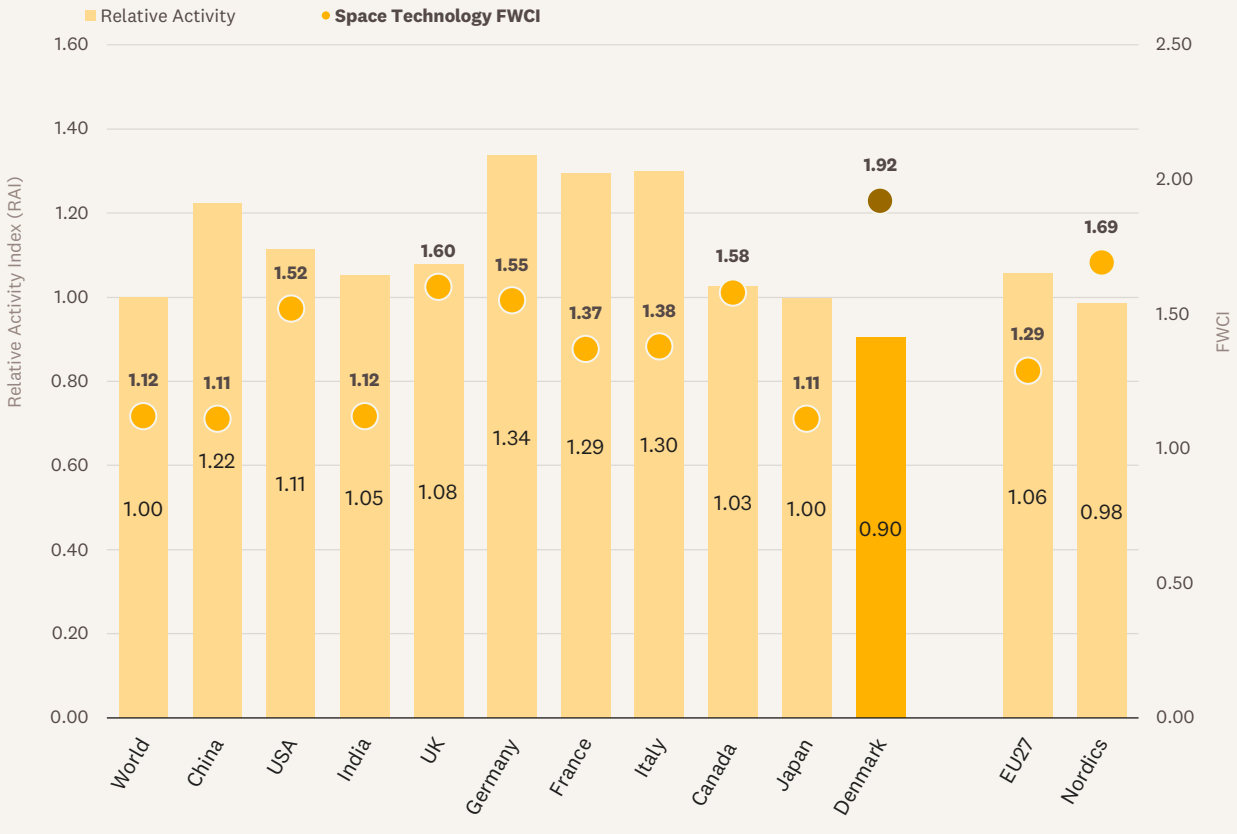
Between 2020 and 2024, Danish researchers produced approximately 2,150 publications in Space Technologies, representing **1.2% of the country's overall research output**. While this share is slightly below the global average (1.3%) and the EU average (1.4%), Danish publications stand out for their **exceptional citation impact**, outperforming all G7 countries, including the United States and the United Kingdom.

The **Technical University of Denmark (DTU)** leads the field with 580 publications and a FWCI of 2.16. The **University of Copenhagen** follows with 500 publications and FWCI of 2.83, reflecting the particularly high impact of its research. **Aarhus University** rounds out the top three, contributing 440 publications with a FWCI of 1.51.

Figure 32

Space Technologies research, volume (RAI) and citations (FWCI)

Publications 2020–2024



Academic-corporate collaborations

Denmark demonstrates a **strong record of collaboration** between academia and industry in Space Technologies, with nearly **12% of publications co-authored by academic and industry partners**. Among corporate partners, GomSpace stands out as a key contributor, appearing in 1.2% of all Danish space research publications.

A wide range of other companies also engage in these collaborations, including Novo Nordisk, Elecnor Deimos (Spain), and von Hoerner & Sulger GmbH (Germany).

Patent citations

Denmark demonstrates a solid presence in patent-cited research, with 5.5% of publications referenced in patents, placing it **on par with Germany**. Globally, **China leads in patent citations** with 7.5%, followed by the United States (6.5%) and Canada (5.9%).

International collaboration

Denmark's research is highly international, with 67% of all publications involving at least one external partner. This tendency is even stronger in **Space Technologies, where 74% of publications include international collaboration**.

The **United States is Denmark's largest collaborator** in Space Technologies, with 516 co-authored publications, followed by Germany (440) and the United Kingdom (403).

In addition to large international organizations such as CNRS, CSIC, and the European Space Agency, Danish researchers frequently collaborate with leading universities, including Sorbonne Université (84 publications), California Institute of Technology (83), Université Paris-Saclay (81), and both Harvard University and University College London (79 each).

Figure 33

Space Technologies research, academic-corporate collaboration levels (%)

Publications 2020–2024

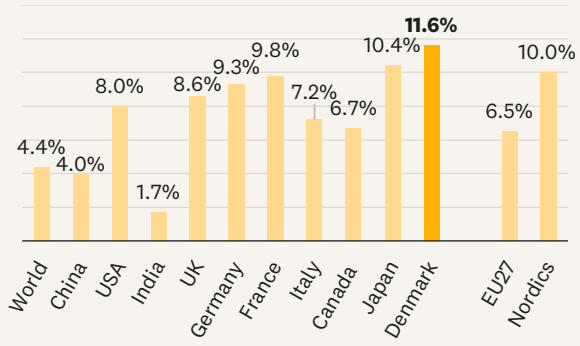


Figure 34

Space Technologies research, scholarly output cited by patent (%)

Publications 2015–2024

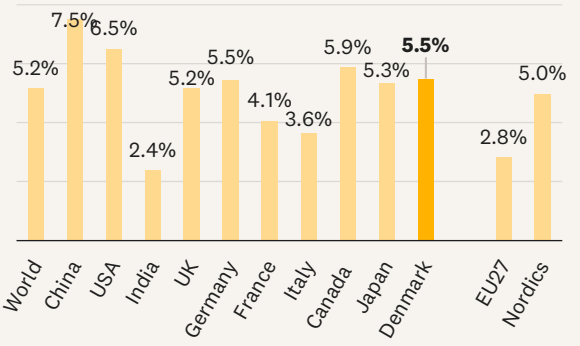
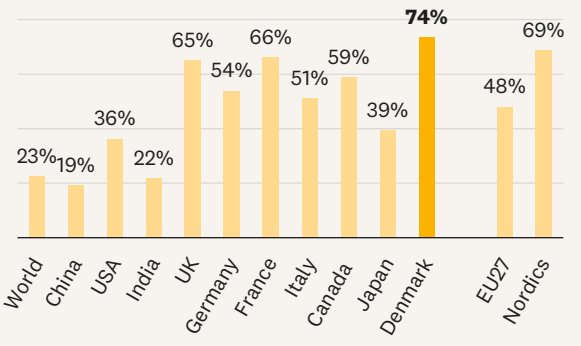


Figure 35

Space Technologies research, international collaboration levels (%)

Publications 2020–2024



Clean Energy and NetZero

Clean Energy and Net Zero publications

Clean Energy and Net Zero research is a cornerstone of Denmark's research and innovation agenda and underpins the country's Climate Act targets to achieve a 70% reduction in greenhouse gas emissions by 2030 and climate neutrality by 2045.

Between 2020 and 2024, approximately **10,500 Danish publications were related to Clean Energy and Net Zero, representing 6% of Denmark's total research output**. This corresponds to a Relative Activity Index of 1.77, higher than the global, EU27 and Nordic averages.

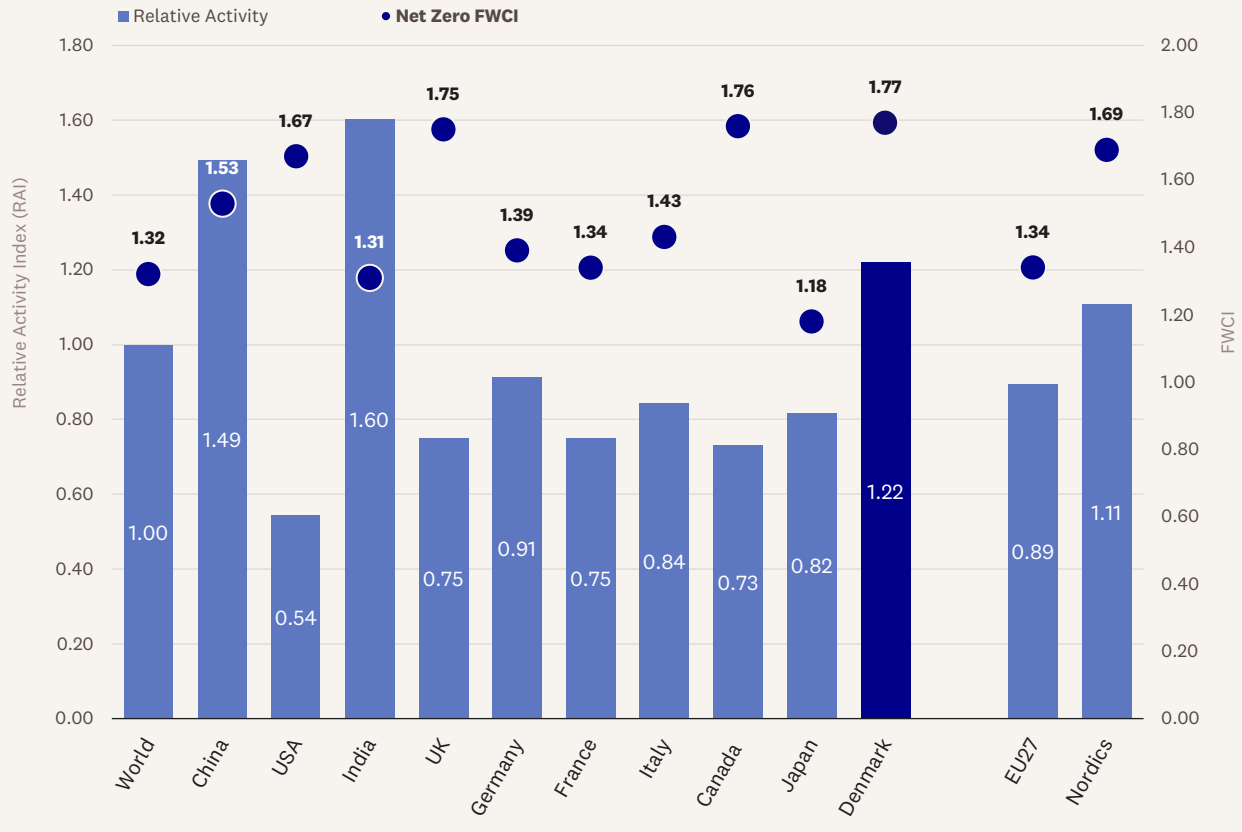
While this field is dominated by India and China, which record the highest Relative Activity Indexes, **Denmark's performance remains strong within Europe**. Globally, China accounts for 37% of all Clean Energy and Net Zero publications, followed by the EU27 (20%) and the United States (10%).

Within Denmark, the Technical University of Denmark is the leading institution, followed by Aalborg University and Aarhus University.

Figure 36

Clean Energy and NetZero research, volume (RAI) and citations (FWCI)

Publications 2020–2024



Academic-corporate collaborations

Denmark's Clean Energy and Net Zero research demonstrates **exceptionally strong collaboration between academia and industry**, with levels higher than the EU27 average and higher than any G7 country or China.

The list of key corporate partners is led by the State Grid Corporation of China, followed by a significant share of collaborators amongst Danish companies, including Ørsted, Vestas Wind Systems, Energinet, Danfoss, Haldor Topsoe, Ramboll Group, and SHI A/S. Notable Nordic partners include SINTEF (Norway) and Vattenfall (Sweden).

Patent citations

When it comes to patent citations in Clean Energy and Net Zero research, the United States and China lead globally, with 9.4% and 8.5% of their publications cited in patents, respectively, followed by Canada (7.8%) and Japan (7%).

Denmark also performs strongly, with **6.1% of its publications in this area cited in patents — above the EU27 and Nordic averages**.

International collaboration

Clean Energy and Net Zero research in Denmark is **highly collaborative across borders** with Denmark recording the **highest levels of international collaboration** among comparator countries. Other Nordic countries, as well as the United Kingdom and France, follow closely.

China is Denmark's largest international collaborator in this field, co-authoring 22% of Danish Clean Energy and Net Zero publications. The United States and the United Kingdom each account for approximately 10%.

The top collaborating institutions include the University of Tabriz (Iran, 160), the Norwegian University of Science and Technology (Norway, 145) and Lund University (Sweden, 144).

Figure 37

Clean Energy and Net Zero research, academic-corporate collaboration levels (%)

Publications 2020–2024

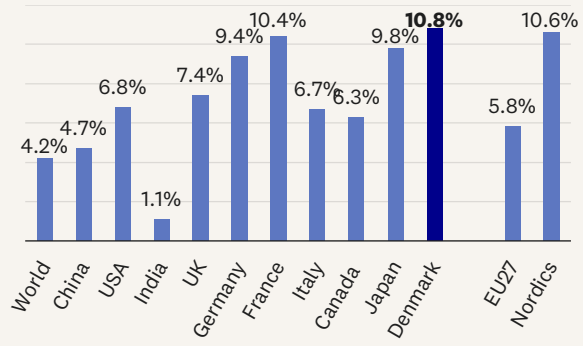


Figure 38

Clean Energy and NetZero research, scholarly output cited by patent (%)

Publications 2015–2024

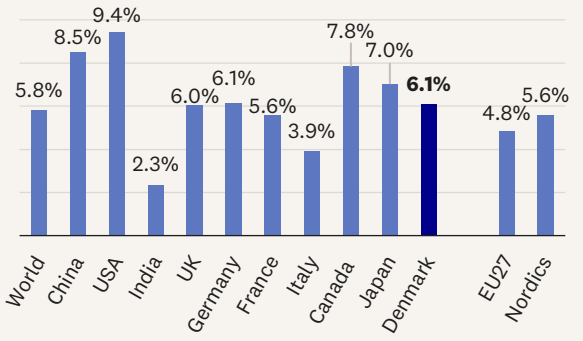
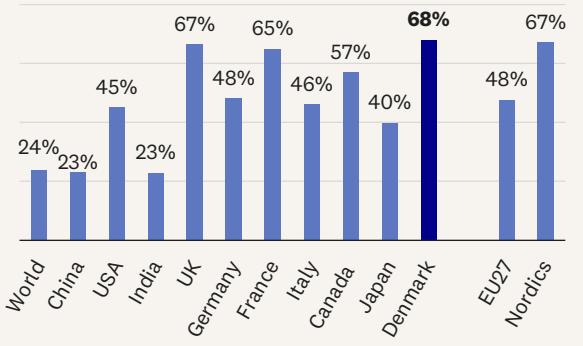


Figure 39

Clean Energy and NetZero research, international collaboration levels (%)

Publications 2020–2024



Which disciplines and universities contribute the most to Danish success?

An analysis of the size and citation levels of various disciplines within Danish research reveals the key contributors to Denmark's scientific strengths. **Clinical & Health** research is not only the largest discipline but also the most highly cited, followed by **Life Sciences**.

The overall research impact, measured as **Field-Weighted Citation Impact** for Danish research published during 2020–2024, stands at **1.77** (indicated by the horizontal dotted line in Figure 36). This means **Danish research is cited 77% more frequently than the global benchmark**.

Within individual fields of study, **Clinical & Health leads in both scale and impact (FWCI 2.06)**, highlighting the central role of medical research in Denmark's scientific profile. **Physical Sciences** is the second largest discipline (FWCI 1.56), followed by **Life Sciences** (FWCI 1.68).

In contrast, across the EU27, the largest research area is Physical Sciences (FWCI 1.09), while Clinical & Health Sciences ranks second (FWCI 1.24).

Figure 40

Contribution per discipline to Danish Science, in term of volume, share of country total output and FWCI (Times Higher Education subject areas)

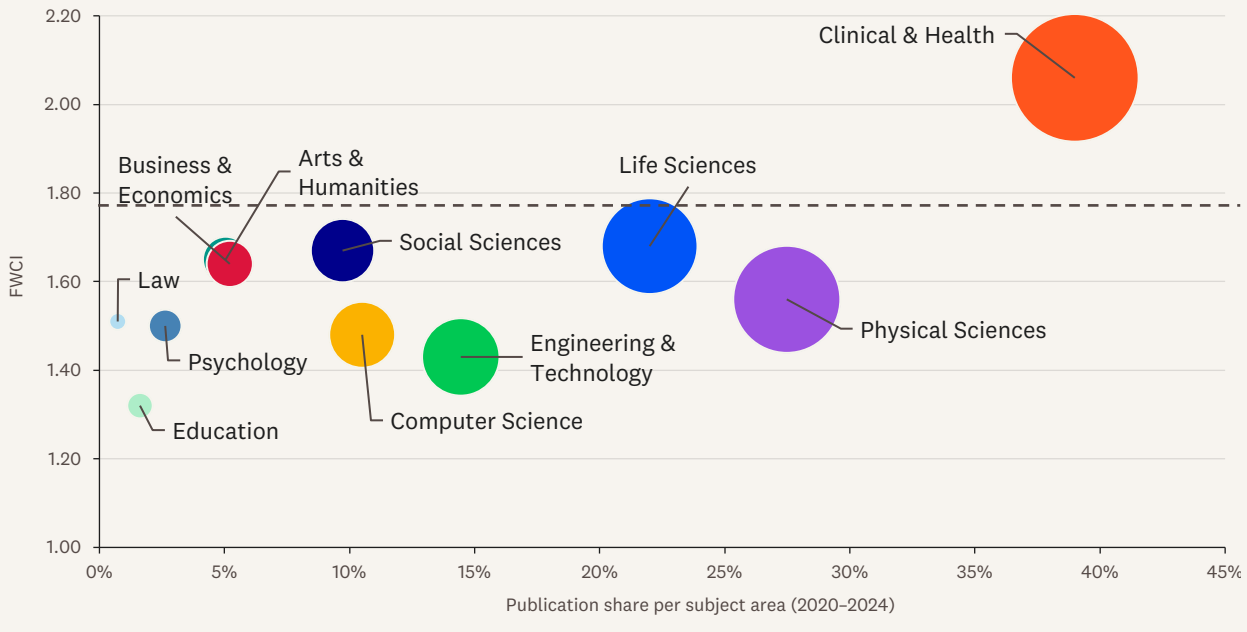
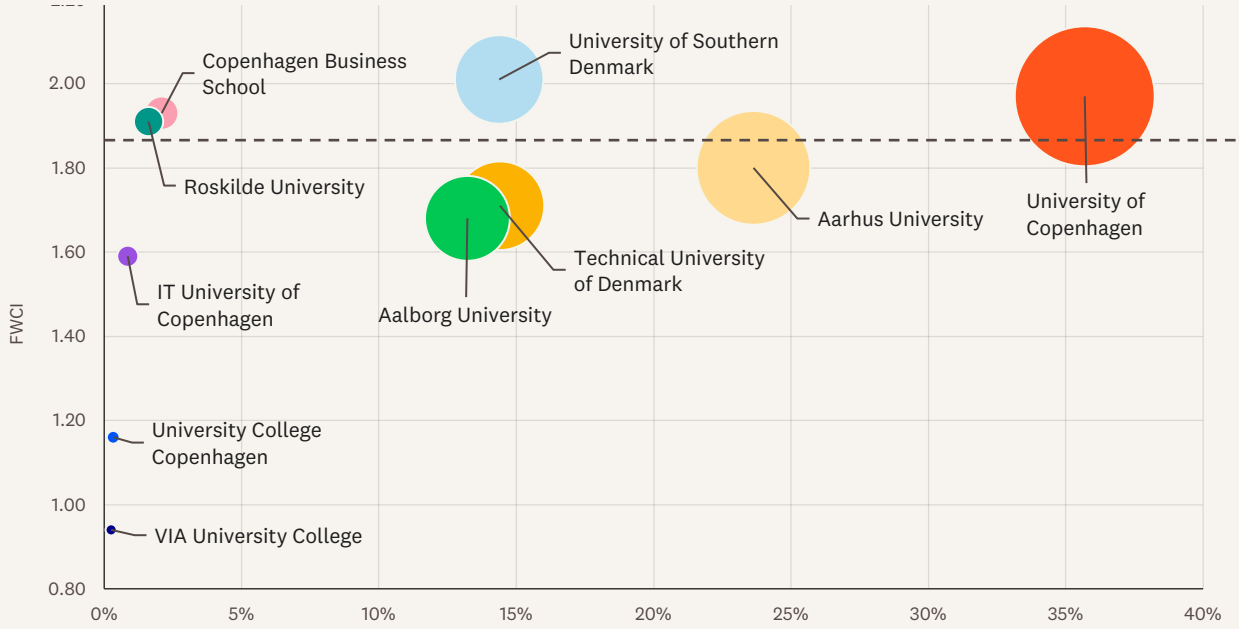


Figure 41

Most prolific Danish universities: Field-Weighted Citation Impact (FWCI) and scholarly output (volume/share of country total)



The University of Copenhagen leads in research productivity, with nearly 65,000 articles published between 2020 and 2024. Aarhus University follows with just over 42,500 publications over the same period. The Technical University of Denmark and the University of Southern Denmark are tied for third place, each producing around 26,000 publications. Aalborg University reports a comparable output, with approximately 25,000 publications.

In addition to the major universities, several smaller academic institutions are also active; this analysis includes only those producing around 100 publications per year or more. Among the five major universities, the University of Southern Denmark records the highest Field-Weighted Citation Impact (FWCI) at 2.01, followed closely by the University of Copenhagen with a FWCI of 1.97. Aarhus University ranks third with a FWCI of 1.71.

The University of Copenhagen is recognized as the fourth-largest institution in the European Union by scholarly output. Moreover, within the group of research-intensive institutions, it ranks among the leading EU universities for its exceptional Field-Weighted Citation Impact.[9]

For reference, the dotted line is a reminder of Denmark's average (FWCI 1.78). The EU average is FWCI 1.15 well below each of the universities shown above.

9 Find more information in Elsevier's Science Nation Insights: a curated collection of country-level research reports and dashboards that provide data-driven analysis of research performance, innovation, and policy. Available at: https://www.elsevier.com/academic-and-research-leader/science-nation

Top academic collaborators of the five most research-intensive universities in Denmark

Denmark's research ecosystem is characterized by a **strong domestic collaboration network and strategic, high-impact international partnerships**. The data for 2020–2024 show that the University of Copenhagen, Aarhus University, the Technical University of Denmark, the University of Southern Denmark and Aalborg University maintain extensive co-publication activity with each other. These national partnerships represent the highest volumes of co-authored research, reflecting the density and cohesion of Denmark's academic landscape.

In parallel, Danish universities are deeply embedded in global research networks through **targeted collaborations with leading international institutions**. Although the number of co-authored publications with international partners is smaller than with national partners, their **citation impact is significantly higher**, often exceeding an FWCI of 6. Notably, institutions such as Harvard University, Lund University, Karolinska Institutet, the University of Oslo, UCL and the University of Oxford feature prominently as collaborators across all major Danish universities, underscoring the importance of the strategic partnerships.

Nordic partners play a particularly important role, with Sweden and Norway appearing **consistently among the top collaborators**, highlighting the strength of regional research ties. Collaborations with top global institutions in the United States and the United Kingdom show some of the **highest FWCI scores**, reflecting Denmark's position as a trusted and valued research partner in international science. This combination of strong domestic networks and high-impact global collaborations contributes substantially to the visibility and influence of Danish research worldwide.

Figure 42

Most prolific academic collaborators of the 3 most research-intensive Danish universities

Publications 2020–2024

with Uni Copenhagen		Co-authored publications	FWCI
DKN	Aarhus	6,486	2.74
DKN	U. Southern Denmark	6,121	2.67
USA	Harvard	3,168	6.42
SWE	Lund	3,160	4.22
DKN	Tech U. Denmark	2,790	2.66
DKN	Aalborg	2,783	2.48
NOR	U. Oslo	2,677	4.29
SWE	Karolinska	2,559	5.91
GBR	U. Oxford	2,486	6.05
GBR	UCL	2,294	6.86

with Aarhus Uni		Co-authored publications	FWCI
DKN	Uni Copenhagen	6,486	2.74
DKN	U. Southern Denmark	3,971	3.07
DKN	Aalborg	2,878	2.27
SWE	Karolinska	1,305	7.67
NOR	U. Oslo	1,202	4.70
SWE	Lund	1,167	6.95
USA	Harvard	1,090	9.61
GBR	U. Oxford	1,072	8.94
FIN	U. Helsinki	963	9.29
GBR	UCL	959	10.05

with Tech Uni Denmark		Co-authored publications	FWCI
DKN	Uni Copenhagen	2,790	2.66
DKN	Aarhus	899	2.90
DKN	Aalborg	608	1.85
SWE	Lund	536	4.74
USA	Harvard	531	7.32
NOR	Norwegian U. Science Tech	495	3.55
GBR	UCL	494	10.08
GBR	U. Oxford	494	7.51
USA	MIT	476	3.65
SWE	Chalmers U. Tech	462	2.50

with U. Southern Denmark		Co-authored publications	FWCI
DKN	Uni Copenhagen	6,121	2.67
DKN	Aarhus	3,971	3.07
DKN	Aalborg	2,007	2.73
SWE	Karolinska	893	9.13
USA	Harvard	731	16.95
SWE	Lund	690	9.4
NOR	U. Oslo	686	5.55
ESP	Inst. Salud Carlos III	534	14.03
NLD	U. Amsterdam	525	13.87
GBR	U. Oxford	510	14.68

with Aalborg Uni		Co-authored publications	FWCI
DKN	Aarhus	2,878	2.27
DKN	Uni Copenhagen	2,783	2.48
DKN	U. Southern Denmark	2,007	2.73
GBR	U. Liverpool	621	4.29
DKN	Tech U. Denmark	608	1.85
CHN	U. Electr. Science Tech China	314	2.72
SWE	Lund	311	6.41
NOR	U. Oslo	304	9.44
GBR	Liverpool John Moores U.	301	5.52
NOR	Norwegian U. Science Tech	272	1.82

Top corporate collaborators of the five most research-intensive universities in Denmark

Corporate collaboration is a defining feature of Denmark's research ecosystem, and between 2020 and 2024, **Novo Nordisk emerges as by far the most prolific industry partner** across all five major universities. It leads in co-authored publication volume with the University of Copenhagen (1,980 publications), Aarhus University (965), the Technical University of Denmark (247), the University of Southern Denmark (826), and Aalborg University (489). This reflects Novo Nordisk's deep integration within Denmark's research landscape and its central role in health and life sciences innovation.

Beyond Novo Nordisk, other **notable Danish partners include H. Lundbeck A/S, Danish Technology Institute, Haldor Topsoe AS, Ramboll Foundation, Oticon Danmark AS, and NKT Group**, highlighting strong domestic industry engagement across health, technology and engineering fields.

International corporate partners also play an important role. Major collaborators include **AstraZeneca** (UK), **Amgen** and **Pfizer** (USA), **deCODE Genetics** (Iceland) and key technology companies such as **China National Nuclear Corp**, **Samsung**, **Huawei** and **Nokia**. While international partnerships represent a smaller share of total collaborations compared to Novo Nordisk, many exhibit **very high FWCI values**, often exceeding 5.

This pattern mirrors the **dual strength of Danish academic-industry collaboration**: **strong national integration**, with Danish companies embedded in research activities across institutions; and **targeted, high-impact international collaborations** with leading pharmaceutical, biotech and technology firms. In particular, partnerships in life sciences and health technologies dominate the landscape, reflecting Denmark's global leadership in this domain.

Figure 43

Most prolific corporate collaborators of the 5 most research-intensive Danish universities

Publications 2020–2024

with Uni Copenhagen		Co-authored publications	FWCI
DKN	Novo Nordisk	1,980	2.57
DKN	H. Lundbeck A/S	281	2.41
CHN	China Nat Nuclear Corp	230	2.04
GBR	AstraZeneca	224	7.72
USA	Amgen Inc	165	6.67
DEU	Fresenius AG	160	5.81
GBR	GlaxoSmithKline	136	9.38
CHE	Novartis	136	4.85
ISL	deCODE Genetics	132	6.78
USA	Pfizer	130	16.11

with Aarhus Uni		Co-authored publications	FWCI
DKN	Novo Nordisk	965	2.54
USA	Amgen Inc	121	6.53
DKN	H. Lundbeck A/S	108	3.86
ISL	deCODE Genetics	92	6.97
KOR	Samsung	85	10.03
DKN	Danish Tech Inst	84	1.43
USA	Pfizer	70	26.58
GBR	AstraZeneca	66	11.42
DKN	Arla Foods	64	1.01
USA	AbbVie	62	4.29

with Tech Uni Denmark		Co-authored publications	FWCI
DKN	Novo Nordisk	247	1.55
NOR	SINTEF	156	1.61
DKN	Danish Tech Inst	105	1.38
DKN	Haldor Topsoe AS	92	1.16
DKN	Ramboll Foundation	92	1.15
DKN	NKT Group	89	0.85
DKN	Oticon Danmark AS	67	1.3
DKN	DHI Water	58	1.15
DKN	COWI A/S	48	0.61
KOR	Samsung	46	6.55

with U. Southern Denmark		Co-authored publications	FWCI
DKN	Novo Nordisk	826	2.55
USA	Amgen Inc	56	5.72
USA	Johnson & Johnson	54	2.97
GBR	AstraZeneca	51	13.47
ISL	deCODE Genetics	48	6.4
CHE	F. Hoffmann-La Roche AG	43	17.77
DKN	H. Lundbeck A/S	41	2.12
DKN	Nordic Bioscience AS	37	1.07
GBR	GlaxoSmithKline	35	23.99
SGP	MOH Holdings Pte Ltd.	32	9.15

with Aalborg Uni		Co-authored publications	FWCI
DKN	Novo Nordisk	489	2.51
FIN	Nokia	90	2.26
CHN	State Grid Corp. China	87	1.93
CHN	Huawei Technologies	47	2.13
USA	Amgen Inc	43	5.16
ISL	deCODE Genetics	43	5.16
DKN	Danfoss AS	38	1.67
DKN	Danish Tech Inst	37	1.35
NOR	SINTEF	34	2.13
DKN	Oticon Danmark AS	33	1.95

Conclusions

Despite its relatively small population of approximately six million, Denmark exerts a disproportionately large influence on the global scientific landscape. This success is underpinned by a highly internationalized research ecosystem, a strong culture of academic collaboration, and consistently high citation impact. Denmark has established itself as a leader in key areas such as health, sustainability and emerging technologies, with its research frequently informing international policy and contributing to global scientific progress.

The analysis shows that Danish research is not only prolific but also exceptionally impactful on a global scale. Researchers in Denmark maintain a level of productivity above the European average, and their work consistently achieves higher-than-average citation rates. This reflects both the quality and global relevance of Danish science. A significant part of this success stems from the country's strength in **Clinical & Health research**, which stands out as a high-impact field that substantially elevates Denmark's overall scientific performance. This excellence is further amplified by a high level of **international collaboration**, particularly with leading partners in the United States, the United Kingdom, and Germany.

What distinguishes Danish research is its **real-world impact**. Collaboration between academia and the corporate sector plays a central role in translating scientific discoveries into innovation. Companies such as **Novo Nordisk** exemplify this integration, contributing to Denmark's reputation for effective knowledge transfer and translational research. This is reflected in the frequent citation of Danish publications in **patents and policy documents** worldwide, underscoring their relevance to both technological developments and evidence-based policymaking.

Denmark's strong engagement with research related to the **UN Sustainable Development Goals** further highlights its commitment to addressing global challenges. Danish contributions in sustainability-related fields are not only more prevalent but also more impactful than the global average.

While opportunities remain — particularly in certain emerging technologies and in advancing gender balance — the overall picture is clear: Denmark is a small nation with a globally significant and highly influential research footprint, consistently contributing to scientific excellence, innovation and sustainable development.

Appendix 1:
Definitions

This report is primarily based on Scopus data. Scopus is a large abstract and citation database launched in 2004 by Elsevier. It's one of the most prominent tools for researchers to find relevant academic publications, track citations, and analyze research trends. It covers 36,377 titles from 11,678 publishers. For more information see www.scopus.com.

Scholarly output
Scholarly Output describes the products of scholarly activity, such as journal articles, books, book chapters, conference papers, and other forms of research dissemination. Throughout the report, when looking at collaborations, we use whole counting, meaning that collaborating entities on a scholarly publication all get a full count in terms of contribution.

Citation
A citation is a formal reference to earlier work made in document, frequently to other scholarly papers, but also to policy documents or patents. A citation is used to credit the originator of an idea or finding and is typically used to indicate that the earlier work supports the claims of the work citing it. The number of citations received by a paper from subsequently published papers and/or policy documents as well as patents, can be used as a proxy of the quality, importance, societal impact or economic translational value of the reported research.

FWCI (Field-Weighted Citation Impact)
Field-weighted citation impact (FWCI) is an indicator of mean citation impact and compares the actual number of citations received by a paper with the expected number of citations for papers of the same document type (article, review, or conference proceeding), publication year, and subject area. When the paper is classified in two or more subject areas, the harmonic mean of the actual and expected citation rates is used. The indicator is therefore always defined with reference to a global baseline of 1.0 and intrinsically accounts for differences in citation accrual over time, differences in citation rates for different document types (e.g., reviews typically attract more citations than research articles), as well as subject specific differences in citation frequencies overall and over time and document types. It is one of the most sophisticated indicators in the modern bibliometric toolkit.

Subject area classification
The subject area classification used in this report is based on the Journal Classification (ASJC) used in Scopus database, further condensed using the classification by Times Higher Education for their subject rankings. Scopus uses a hierarchical structure with 27 main subject areas. Times Higher Education THE agglomerate these 27 areas into 11 broader subject areas which makes comparison more manageable. Each publication can be linked to multiple ASJCs and this means that when you look at the breakdown by subject area a publication will be counted twice if it appears in a Scopus Source mapped to two categories, as SciVal doesn't use fractionalization. Therefore, for most entities in SciVal, if you add up the percentage values in the pie or donut charts, they will equal more than 100%. The percentages represent the relative publication share per subject area.

International collaboration
International collaboration in this report is indicated by papers with at least two different countries listed in the authorship byline.

Academic-corporate collaboration
Academic-corporate collaboration in this report is indicated by papers with at least one author from an academic institution and one author from a corporate institution listed in the authorship byline

RAI (Relative Activity Index)
Relative Activity Index is defined as the share of an entity's publications in a subject relative to the global share of publications in the same subject. A value of 1.0 indicates that an entity's research activity in a field corresponds exactly with the global activity in that field; higher than 1.0 implies a greater emphasis while lower than 1.0 suggests a lesser focus.

Appendix 2:
Data sources

Scopus

Scopus is a comprehensive, source-neutral abstract and citation database curated by independent subject matter experts who are recognized leaders in their fields. 91+ million items include data from 7,000+ publishers, 94,000+ affiliation profiles and 17+ million authors. Scopus puts powerful discovery and analytics tools in the hands of researchers, librarians, research managers and funders to promote ideas, people and institutions Delivering a comprehensive overview of the world's research output in the fields of science, technology, medicine, social sciences, and arts and humanities, our state-of-the-art search tools and filters help uncover relevant information, monitor research trends, track newly published research and identify subject experts. Worldwide, Scopus is used by more than 3,000 academic, government and corporate institutions and is the main data source that supports the Elsevier Research Intelligence portfolio.

scopus.com

SciVal

SciVal is a web-based analytics solution with unparalleled flexibility that provides access to the research performance of over 20,000 academic, industry and government research institutions and their associated researchers, output and metrics. SciVal allows users to visualize research performance, benchmark relative to peers, develop strategic partnerships, identify and analyze emerging research trends, and create uniquely tailored reports.

scival.com

Overton

Overton is the world's largest searchable index of policy documents, guidelines, think-tank publications and working papers. Its database consists of more than 1.65 million policy documents, with data collected from 182 countries and over a thousand sources worldwide. These policy documents include white papers from international multilateral organizations, as well as guidelines from city councils, parliamentary transcripts and other classes of the so-called "gray literature." Around half of these documents make citations to academic or scholarly publications. More than 2 million distinct journal-based publications are cited by at least one policy document in the database.

overton.io

Appendix 3:
Datasets for key technologies

Key technologies	Dataset used (2019–2024)	How dataset was obtained
AI	Research Area in SciVal from Elsevier 2019 Report methodology	Created by RADs for the publication of the Elsevier AI report in 2019 and publicly available to SciVal subscribers.
Quantum Technologies	Research Area in SciVal created with an ad hoc string based on selected keyword(s)	((("qubits" OR "quantum information" OR "quantum sens*" OR "quantum comput*" OR (entanglement AND quantum) OR (teleportation AND quantum) OR "quantum cryptography" OR "quantum key" OR "quantum logic gate*" OR "quantum circuit" OR "quantum register" OR "quantum thermodynamics" OR "quantum metrology" OR "quantum key distribution" OR "quantum communicat*" OR "qumode" OR "quantum fluctuations" OR qkd OR "quantum optical communicat*" OR "quantum clock*" OR "quantum process*" OR "quantum processor*" OR "quantum algorithm*" OR "quantum imaging" OR "circuit qed" OR "cavity qed" OR "circuit quantum electrodynamics" OR "ion traps" OR "atom traps" OR "rydberg atom" OR "nanomechanical resonators" OR "quantum fluids" OR "quantum dots" OR "NV centers in diamond" OR ("nitrogen-vacancy" AND diamond) OR "superconducting qubits" OR "topological quantum computing" OR "adiabatic quantum computation" OR "quantum error correction" OR "quantum simul*" OR "adiabatic comput*" OR "quantum gates" OR "atom interferometer*" OR (SQUID AND quantum) OR (quantum AND optomechanics) OR "single phonon" OR (optical AND cooling) OR (parametric AND conversion AND optical) OR "optomechanics" OR (josephson AND qubit) OR (superconducting AND qubit) OR (quantum AND electromechanics) OR "quantum synchronization" OR "quantum random number" OR "ising machine" OR (nonhermitian AND optomechanics) OR "nonlocality" OR "non-locality" OR "Bell's theorem" OR (Kochen AND Specker) OR "quantum contextuality" OR "quantum repeater" OR "quantum internet" OR "quantum network" OR "quantum phase transition" OR "quantum illumination" OR "quantum photonics")))
Biotechnology	Research Area in SciVal created with an ad hoc string based on selected keyword(s)	(biotechnology OR "gene editing" OR "genome editing" OR "CRISPR-Cas9" OR "synthetic biology" OR "biopharmaceuticals" OR "gene therapy" OR "cell therapy" OR "bioreactors" OR "metabolic engineering" OR "protein engineering" OR "biocatalysis" OR "antibody engineering" OR "mRNA vaccine" OR "regenerative medicine" OR "tissue engineering")
Space Technology	Research Area in SciVal created with an ad hoc string based on selected keyword(s)	("space" OR "aerospace" OR "astronaut*" OR "cosmonautic*") AND ("satellite*" OR "spacecraft*" OR "capsule*" OR "crew module*" OR "service module*" OR "launch abort system*" OR "solar array*" OR "heat shield*" OR "backshell*" OR "avionics" OR "antenna*" OR "transponder*" OR "reaction wheel*" OR "star tracker*" OR "telecommunication*" OR "propellant tank*" OR "pressure vessel*" OR "low Earth orbit" OR "LEO" OR "medium Earth orbit" OR "MEO" OR "geostationary orbit" OR "GEO" OR "Sun-synchronous orbit" OR "SSO" OR "orbital mechanic*" OR "Earth observation" OR "remote sensing" OR "communication satellite*" OR "navigation satellite*" OR "GPS" OR "astronomical satellite*" OR "space observatory" OR "weather satellite*" OR "reconnaissance satellite*" OR "rocket*" OR "propulsion system*" OR "launch vehicle*" OR "rocket engine*" OR "propellant*" OR "combustion chamber*" OR "thrust" OR "specific impulse" OR "Isp" OR "nozzle*" OR "turbopump*" OR "injector*" OR "liquid propulsion" OR "solid propulsion" OR "hybrid propulsion" OR "cryogenic propellant*" OR "liquid oxygen" OR "LOX" OR "liquid hydrogen" OR "LH2" OR "hydrazine" OR "RP-1" OR "systems engineering" OR "system design" OR "requirements" OR "design trade-off*" OR "interface*" OR "concept of operations" OR "ConOps" OR "attitude control" OR "orbit control" OR "guidance navigation control" OR "GN&C" OR "mission design" OR "space environment*" OR "atmospheric entry" OR "manoeuvring" OR "artificial intelligence" OR "AI" OR "robotics" OR "drone*" OR "blockchain" OR "big data" OR "3D printing" OR "additive manufacturing" OR "nanotechnology" OR "laser communication" OR "autonomous system*" OR "life-support" OR "radiation protection")
Clean Energy and Net Zero	Net Zero Research Area	This Research Area was initially based on 2011–2020 dataset used in the report entitled "Pathways to Net Zero: The Impact of Clean Energy Research". The report aims to advance the understanding of research and innovation in clean-energy and how it supports the drive toward a net zero future. The current dataset is the updated version based on the latest Elsevier 2025 SDG mappings. It contains data from 2011 to 2025 and is updated yearly. Definition Query: The Net Zero dataset is a combination of publications from SDG 7 and energy related publications from SDG 13, looking at science and innovation trends in clean energy and carbon removal.

About Analytical & Data Services (ADS)

Analytical & Data Services connects trusted data across research, funding, and outcomes, applies advanced analytics, and provides expert interpretation. Through Custom Data, InsightGraph, and Analytical Services, we help research funders, governments, and academic institutions, explain performance, support defensible investment decisions, and demonstrate outcomes.

The approach in this report can be applied not only at national scale, but also at institutional level, using analytical services tailored to universities and research organizations.

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