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Global research and innovation – evolving insights

An Elsevier perspective

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The World of R&D in 2022

\$2.5 trillion invested in R&D

UK continues to lead the world of research

7% / 14%

UK research punches well above its weight: the UK accounts for 2% of the world's expenditure on R&D, 4% of the world's researchers... **yet 7% of the world's articles and 14% of the most highly-cited articles**

1.87

UK is highly **collaborative** internationally (57%) leading to the **highest academic impact globally** of international collaborative research output as measured by the Field Weighted Citation Impact (1.87).

27.8%

UK researchers are **highly mobile**. Only **27.8% of its researchers base has never experienced international mobility** during their publishing career, the **lowest** among its comparators

9%

9% of UK research articles are **cited in policy documents**, vs 6% in the US and 1% in China

7 in 50

UK ranks **2nd** in terms of **share of participating universities in the Top 50 of world university rankings**, with 7 universities among the **Top 50**.

Elsevier

We help researchers and healthcare professionals advance science and improve healthcare outcomes, striving to create a better future worldwide.



Global

- 14,000 academic and government institutions
- 71 of the top 100 R&D driven corporations
- 5,000+ healthcare institutions
- 180+ countries and regions



Leading scientific publisher

- 17% of global research output and 28% of citations
- 2,900 journals, including The Lancet and Cell, and 46,000+ ebook titles
- 3.2m article submissions in 2023, publishing 603,000 articles

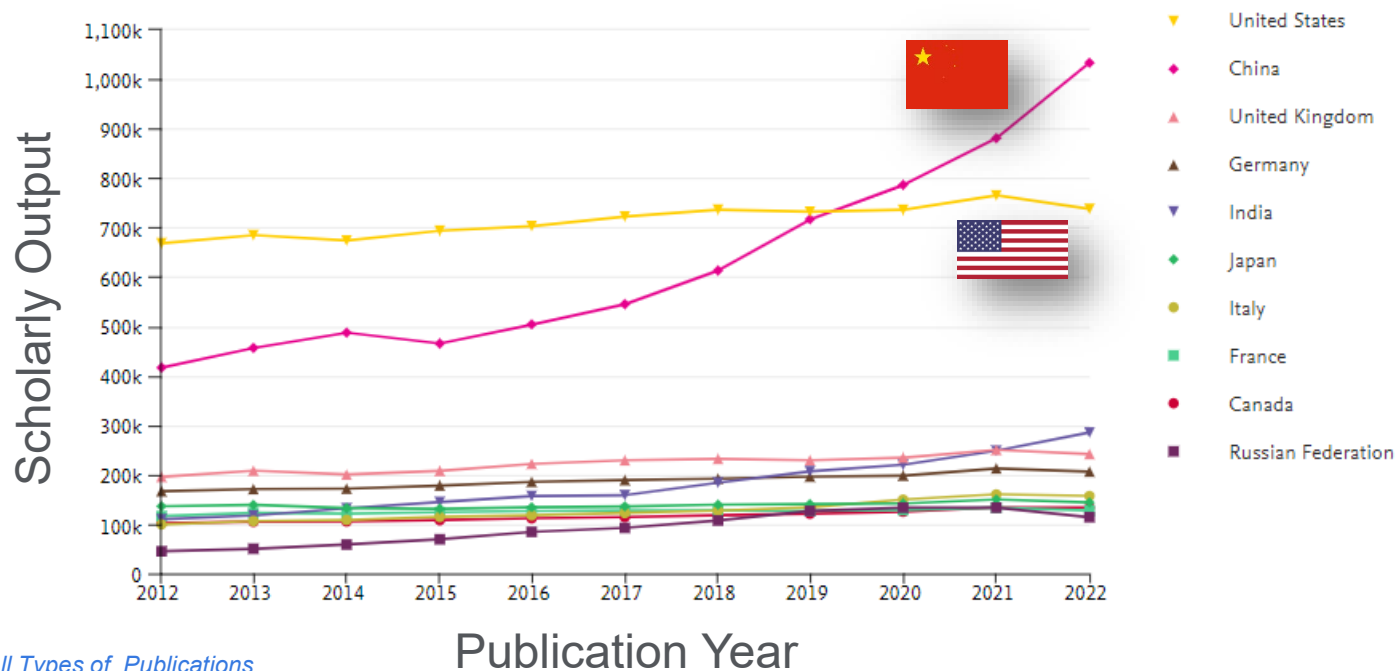


Insights and analytics

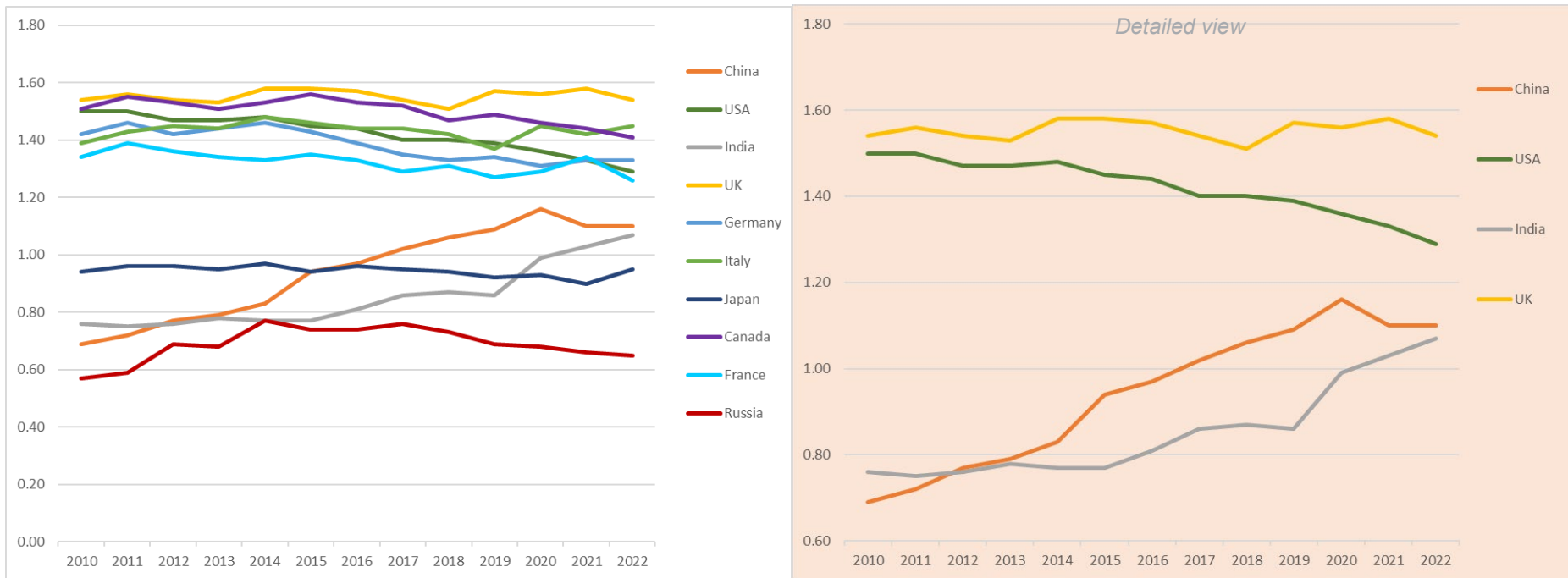
- Scopus data platform: 90m publication records from over 7,000 publishers worldwide
- Expertise in research and health domain
- Technology and analytics: Extractive and generative Artificial Intelligence

The World of Research 2012-2022 – Scholarly Output

- The world has seen a shift in research both in volume and quality towards Asia.
- China has in 2019 overtaken the United States in volume of Scholarly Output.
- India has overtaken both the UK in 2022 and Japan in 2019 in volume.



Field-Weighted Citation Impact (FWCI) trend in research-intensive countries 2012-2022



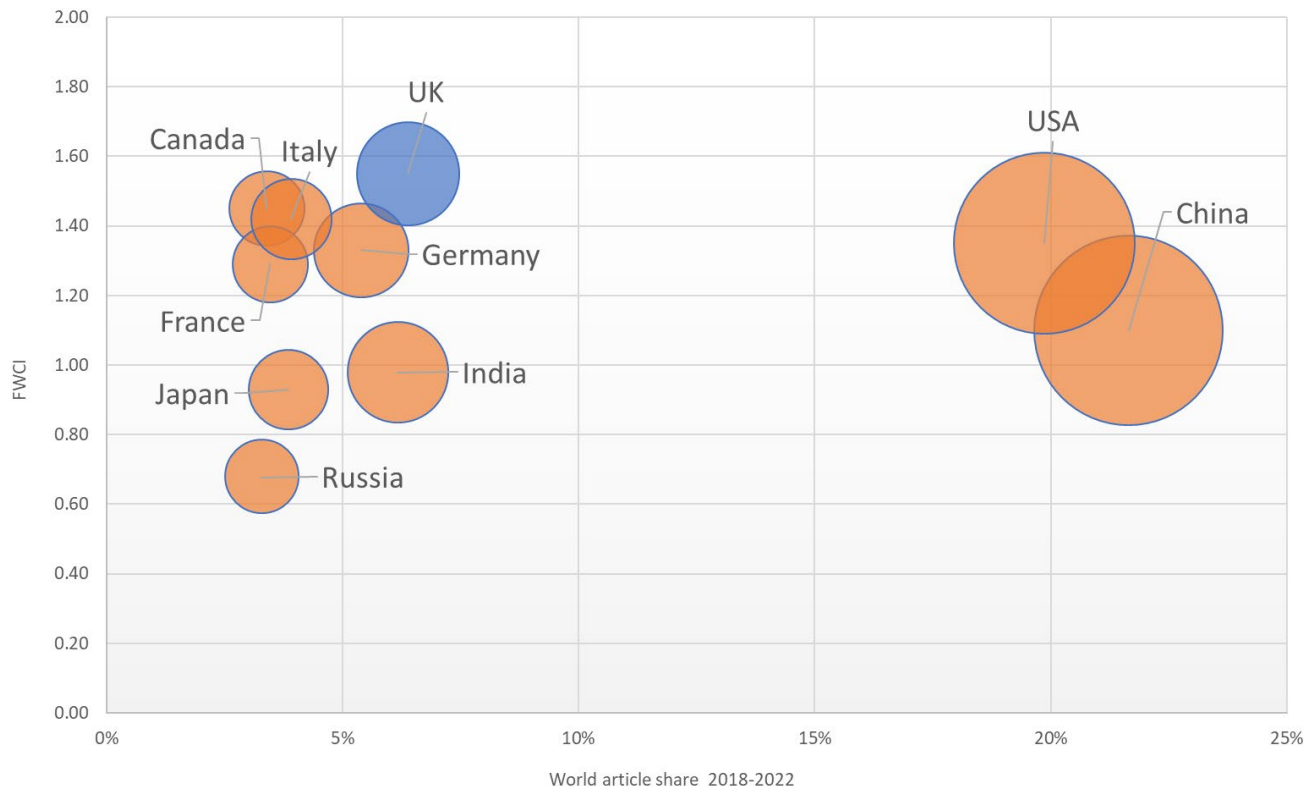
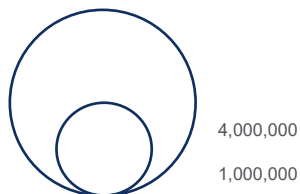
To note: The highest levels of FWCI are seen in UK research, following by Canada. The US has been declining but maintained its third place up until 2014 and fell further from 2020 arriving in 5th place in 2022. In 2022 Italy takes over Canada as the second highest FWCI in this group of 10 research-intensive countries. France and Germany have been slowly declining. The UK has maintained the highest levels year in year out, fluctuating only slightly between 1.53 to 1.58.

The FWCI of both China and India have been growing over the last ten years from around 0.70 (well below world average) to 1.10 (above world average).

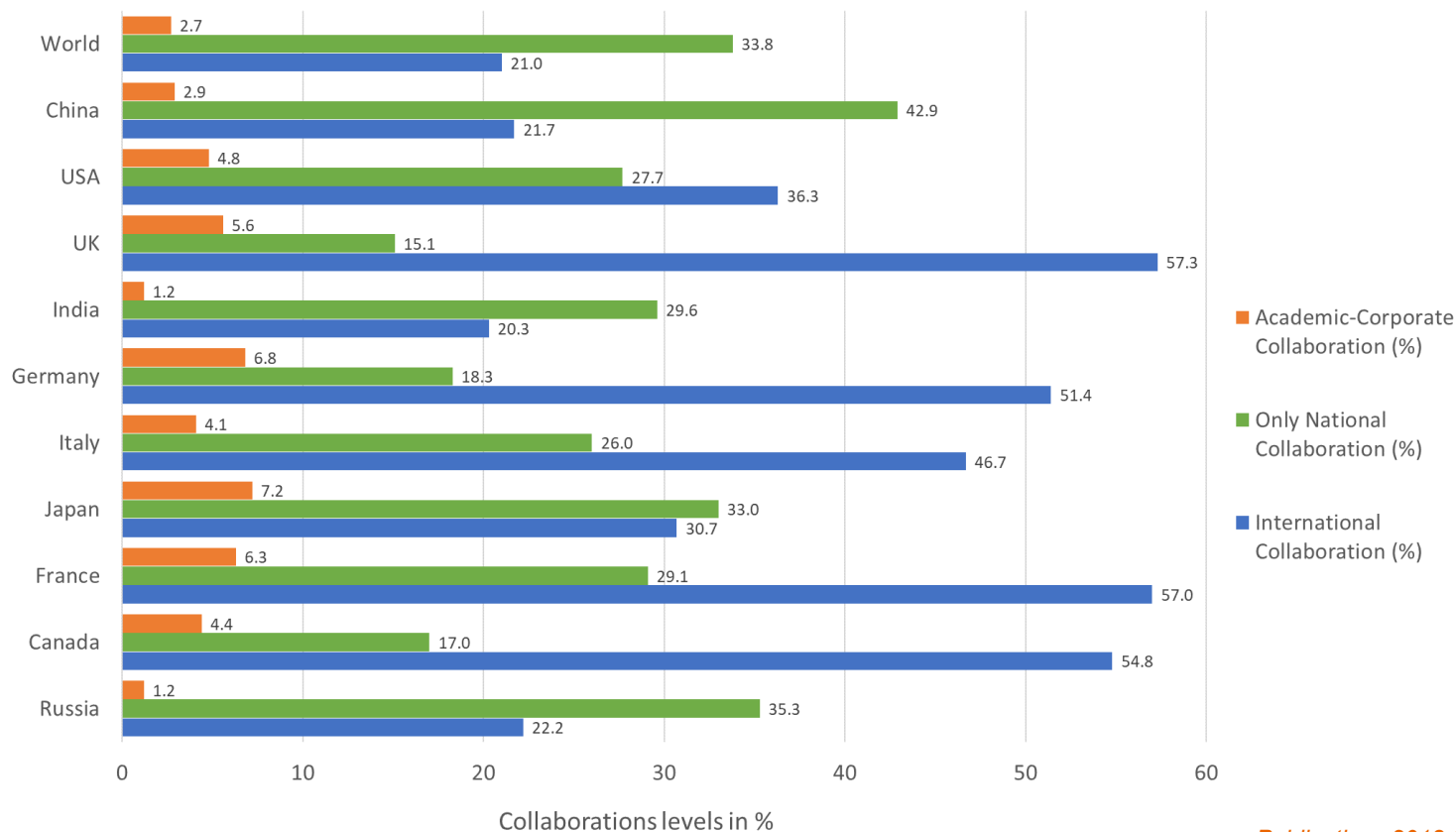
SciVal ia was on an upward trend until 2014 and has since been declining.

Article share and Field Weighted Citation Impact (FWCI) for the UK and research-intensive countries 2018-2022

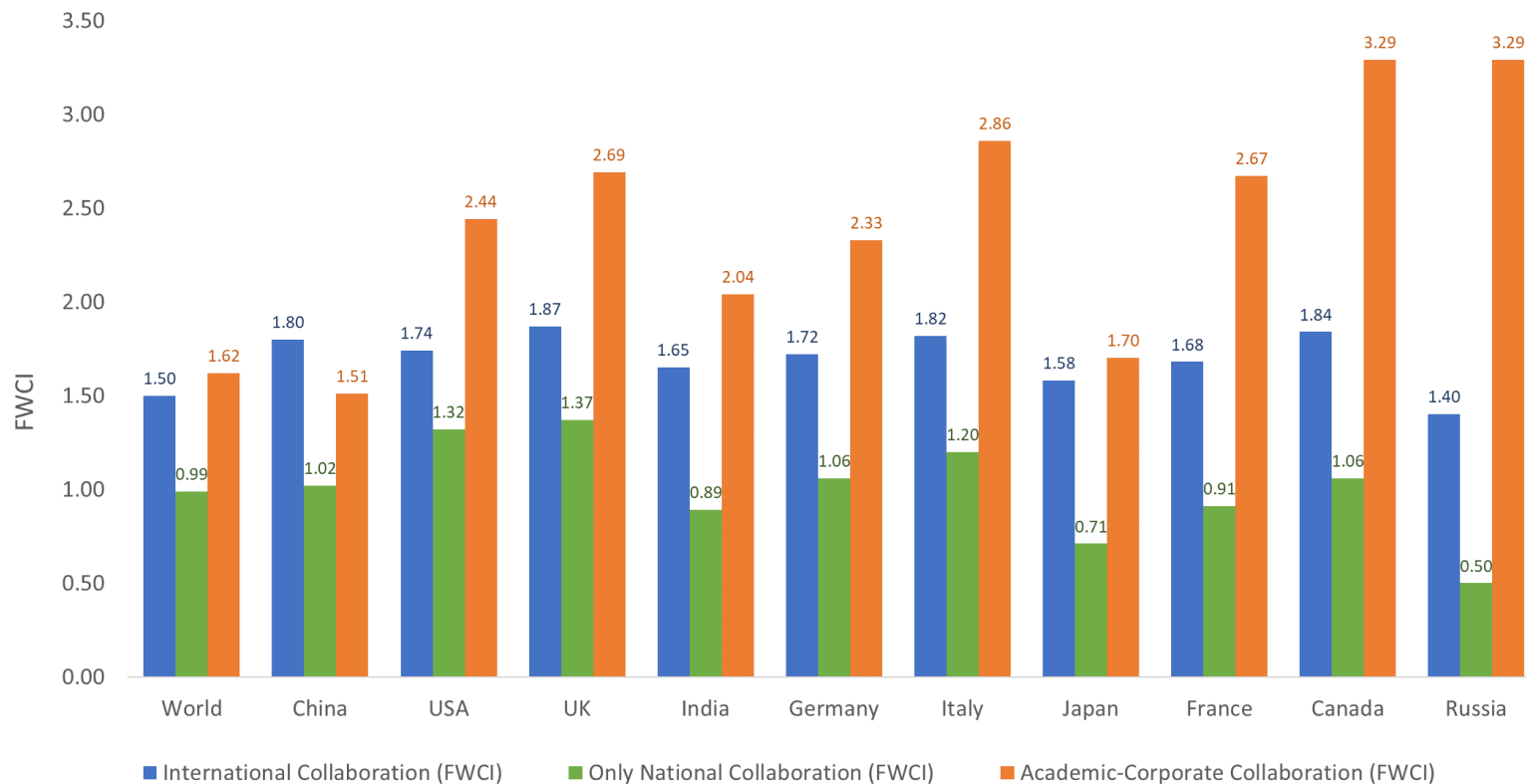
**United Kingdom:
Scholarly Output 1,185,585
World share 6.4%
Overall FWCI 1.55**



Collaborations levels % (based on co-authored scholarly output) for the research-intensive countries | 2018-2022

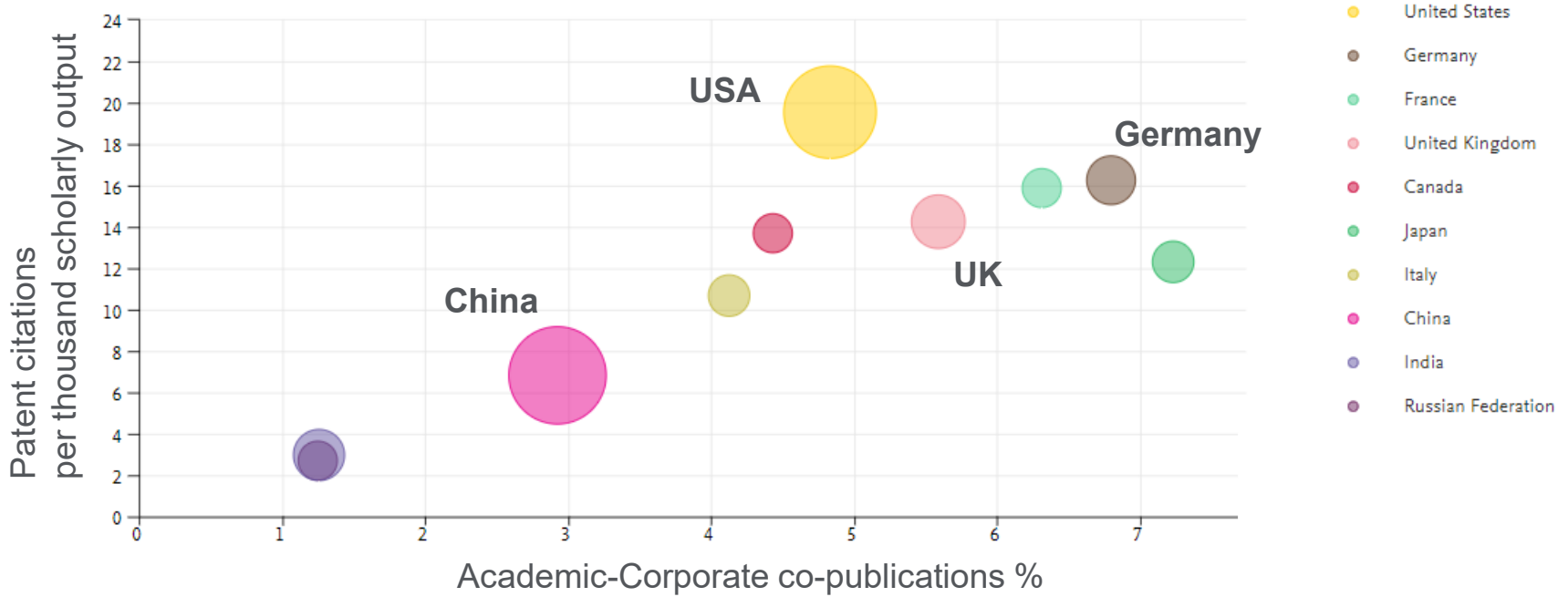


Impact of International, Only-National and Academic-Corporate research (FWCI) | 2018-2022

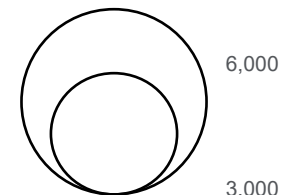
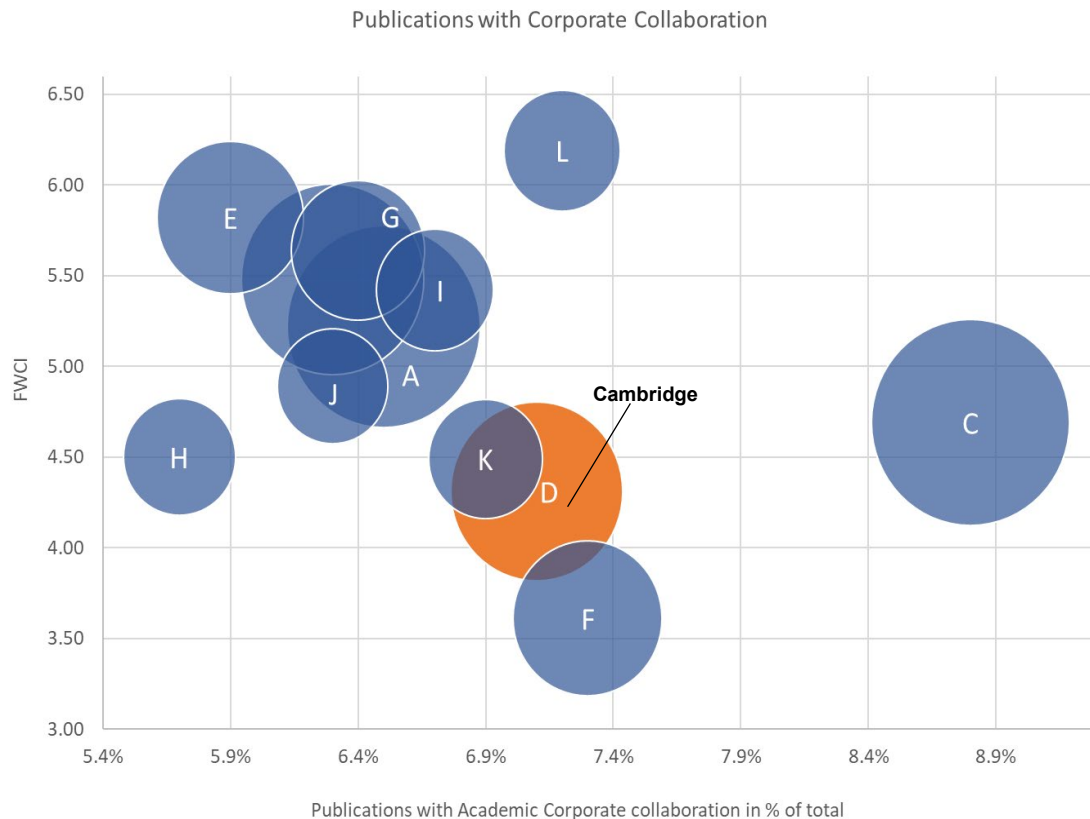


The World of Research 2018-2022

–Corporate Collaboration & Patent Citing Scholarly Output













Corporate Collaboration in selected universities



A	University College London
B	University of Oxford
C	Imperial College London
D	University of Cambridge
E	King's College London
F	University of Manchester
G	University of Edinburgh
H	University of Nottingham
I	University of Bristol
J	University of Birmingham
K	University of Southampton
L	University of Glasgow

Top Corporate Collaborators with Cambridge

Institution	Co-authored publications ↓	Co-authors at the University of Cambridge	Co-authors at the other Institution	Field-Weighted Citation Impact ↓
 AstraZeneca	329 ▲	930 ▲	534 ▲	6.93
 GlaxoSmithKline	248 ▲	529 ▲	404 ▲	3.96
 Novo Nordisk Foundation	211 ▲	388 ▲	211 ▲	6.57
 Microsoft USA	169	268	148 ▼	3.63
 Alphabet Inc.	137 ▲	152 ▲	239 ▲	15.02
 Rolls-Royce	117 ▼	119 ▼	69 ▼	1.60
 MOH Holdings Pte Ltd.	97 ▲	172 ▼	140 ▲	5.73
 Pfizer	94 ▼	217 ▲	130 ▲	5.92
 Merck	78 ▼	173 ▼	99 ▲	4.48
 Toshiba Corporation	77 ▼	54 ▼	67 ▼	1.44

Developing new insights around evaluation

Research Input

How much money/people/equipment \$ go into research programs?

Education

Are the right education/student outcomes driven?

Research process (Throughput)

Is researchers working environment inclusive and diverse?

Research Output

How good is the new knowledge that research is producing?

Research Outcome & Impact

What are the outcome and impact of the new knowledge?

Bringing Knowledge Back to Earth

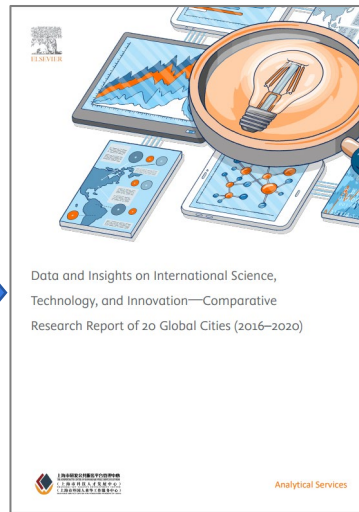
Landing real-world impact in research evaluation

<https://beta.elsevier.com/academic-and-government/research-evaluation-and-impact>

Nov 2023



Global Innovation Ecosystems



2013



2023

Mapping regional economic impact



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Innovation ecosystem dashboard



Welcome to the Oxfordshire Innovation Ecosystem Dashboard

Page 1 Gross value added of selected industries in Oxfordshire over time

Page 2 UK Innovation Survey 2021 results

Page 3 Innovate UK funding awarded to Local Enterprise Partnerships

Page 4 Business counts over time: selected industries

Page 5 Employee counts over time: selected industries

Page 6 Peer reviewed literature where an Oxfordshire based company is affiliated with an author

Page 7 Geographic distribution of innovative companies

Page 8 Counts of businesses and companies by different aspects of innovation

Page 9 Data sources

robot



Geographic distribution of innovative companies

View:

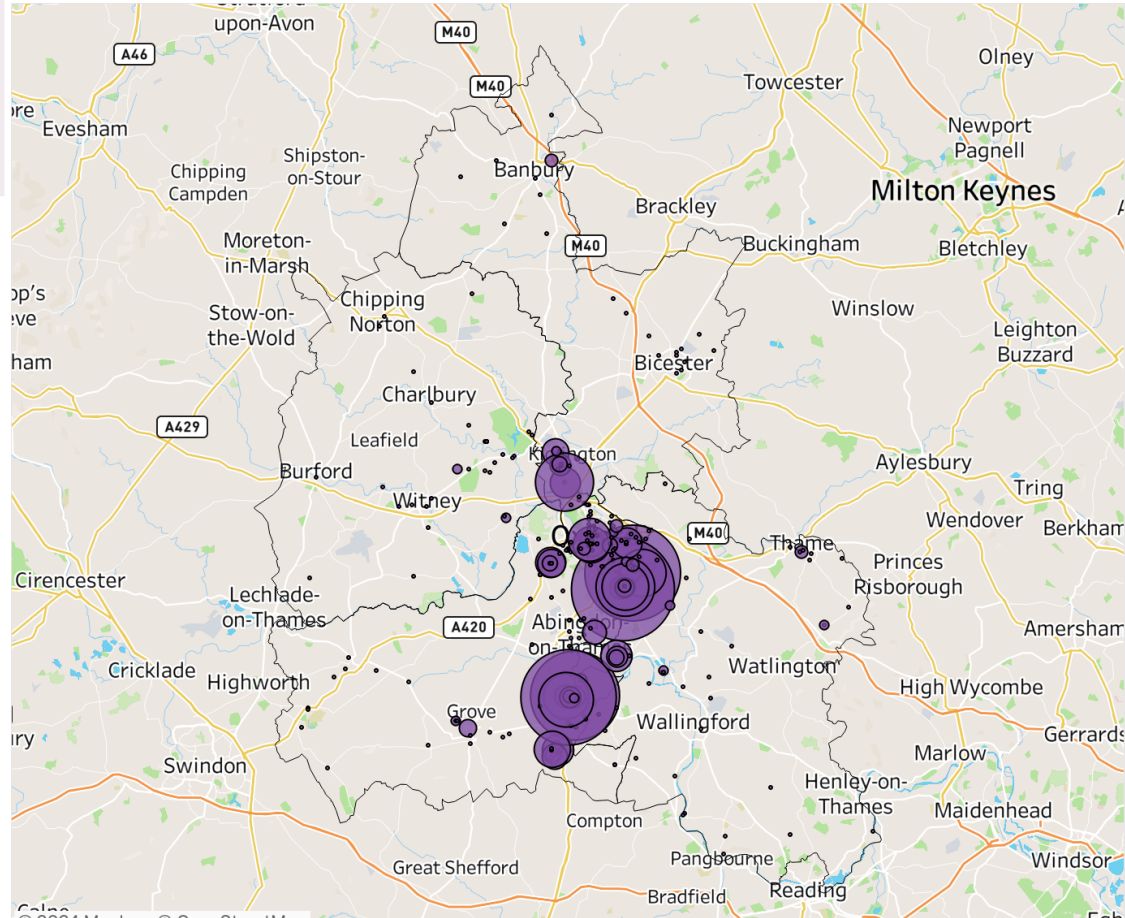
Show companies that:

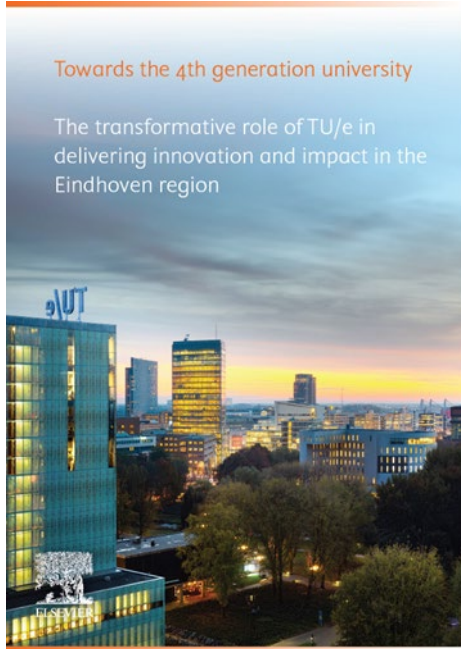
Company circle size (pointmap):

Company name and circle size value: (click on company name to filter map)

HR WALLINGFORD LIMITED,..	213
OXFORD NANOPORE TECHN..	160
PERSPECTUM LTD, PERSPEC..	138
EVOTEC (UK) LIMITED	137
TOKAMAK SOLUTIONS EBT ..	119
IMMUNOCORE NOMINEES LI..	93
EVOX THERAPEUTICS LIMIT..	51

Show notes





Download: 4thgenuniversity.com

About Technical University Eindhoven (TU/e)

- Leading Dutch Technical University
- Eindhoven Brainport region (5000 tech companies)

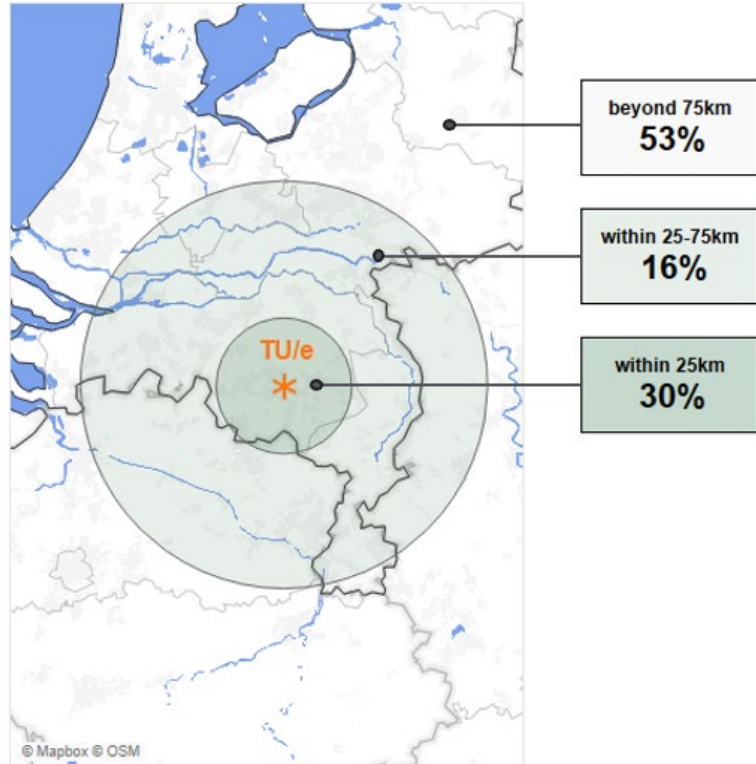
Key project with Elsevier

- co-develop and operationalize **economic impact indicators** enabling TU/e to measure and articulate its economic contributions to the Brainport region.
- Engage with like-minded institutions to gain adoption of the economic impact indicators to **enable comparative benchmarking**.



Expanding indicators

Talent: alumni stay rate



Education

- 1a. Students in relevant disciplines
- 1b. Stay rate of student in region %
- 1c. Job expectation for graduates %
- 1d. Graduates finding job in tech/ knowledge sector %

Scientific Impact

- 2a.1. Co-publications with companies
- 2a.2. Co-publications with local companies
- 2b.1. No professors with co-position/joint assignments in industry
- 2b.2. Authors with dual affiliation (public&private)
- 2c. Industry income
- 2d. Research output and impact in relevant research topics

International Impact

- 3a. International faculty
- 3b. International students
- 3c.1. Funding: private funding to TUE projects
- 3c.2. Funding: public funding together with private companies
- 3c.3. Funding: TUE participation in joint Horizon projects

Ecosystem Impact

- 4a.1. Patents: TUE held patents
- 4a.2. Patents: share of TUE patents also held by companies
- 4a.3. Patents: share of TUE patents also held by local companies
- 4a.4. Patents: Global patents citing TUE research
- 4b.1. start ups: # alumni founded start-ups (local/Europe/world)
- 4b.2. start-ups: # spinouts
- 4c. Media: TUE related stories (local/Europe/world)

NSF: Technology, Innovation and Partnerships (TIP) Directorate

TIP's New Signature Program: Regional Innovation Engines ("Engines") to advance translational and use-inspired research

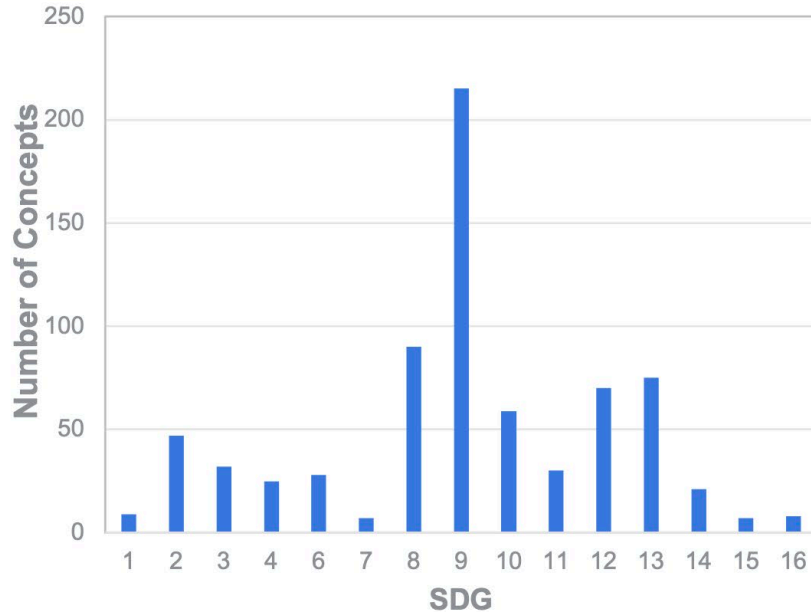
Titles, keywords, and brief

Concept Outlines of publicly submitted

project ideas were used to

link 442 of 679 projects (about 2/3)

to one or more SDGs.



"ENGINES" - SUBMITTED PROJECT CONCEPTS MAPPED TO SDGs



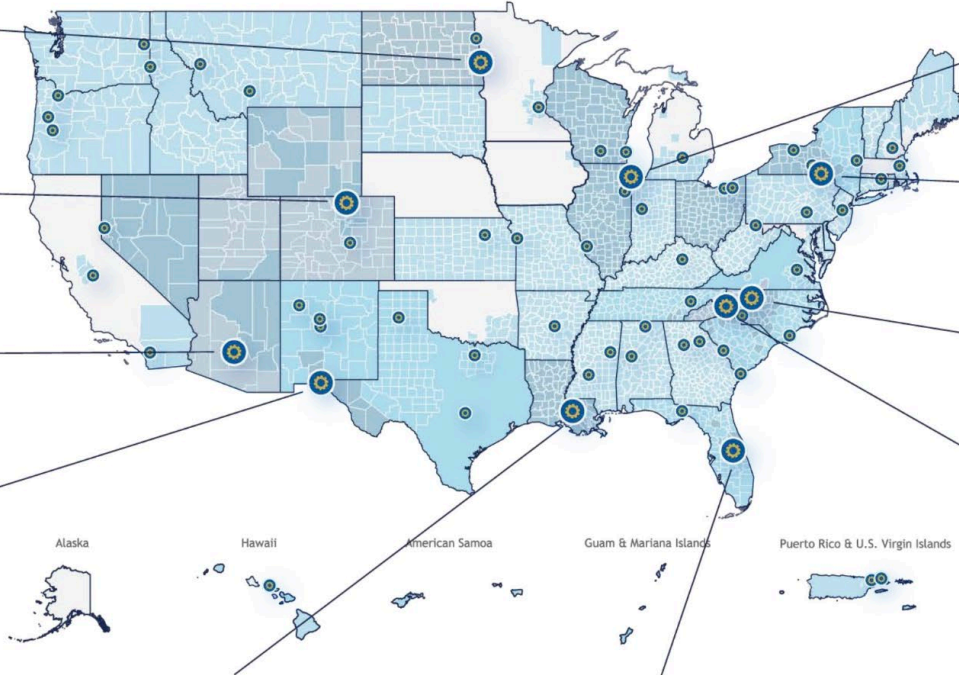
NSF Type 2 Engines Awards Portfolio

**North Dakota Advanced
Agriculture Technology
Engine**

**Colorado - Wyoming
Climate Resilience
Engine**

**Southwest Sustainability
Innovation Engine**

**Paso Del Norte Defense &
Aerospace Innovation
Engine**



**Great Lakes Water
Innovation Engine**

**Upstate New York
Energy Storage Engine**

**Piedmont Triad
Regenerative
Medicine Engine**

**North Carolina
Textile Innovation &
Sustainability Engine**

**Louisiana Energy
Transition Engine**

**Central Florida Semiconductor
Innovation Engine**

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EU funding 14 more European Universities Initiative alliances

By Nina Bo Wagner

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Image: [inkoly](#), via Getty Images

More than 560 institutions are now taking part in initiative supporting cross-border cooperation

Screenshot

Thank you

- What do we still need to capture to reflect the value and impact of innovation ecosystems?

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