

# The top 50 universities powering global innovation

The flow of university research to patented inventions

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# Author biography

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## Foundational past, visionary future

### About the Institute for Scientific Information

The Institute for Scientific Information at Clarivate has pioneered the organization of the world's research information for more than half a century. Today it remains committed to promoting

integrity in research while improving the retrieval, interpretation and utility of scientific information. It maintains the knowledge corpus upon which the Web of Science index and related information and analytical content and services are built.

It disseminates that knowledge externally through events, conferences and publications while conducting primary research to sustain, extend and improve the knowledge base.

For more information, please visit [www.clarivate.com/isi](http://www.clarivate.com/isi)

### About ISI Insights

ISI Insights is a series of analyses from the Institute for Scientific Information. Each paper offers a concise and informative analysis of topical research trends, using best-in-class citation data and analytics from Clarivate.

This paper analyzes how academic research influences innovation by examining patent citations with the identification of the top 50 universities whose papers were most cited by patented inventions on the [Clarivate list](#) of Top 100 Global Innovators 2024.

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# Introduction

Global universities share a common commitment to advancing education, research and service for the betterment of society.

The University of California explicitly states that its mission is, *"To serve society as a center of higher learning, providing long-term societal benefits through transmitting advanced knowledge, discovering new knowledge, and functioning as an active working repository of organized knowledge."* Tsinghua University articulates its mission as being, *"Committed to the advancement and well-being of the nation and the world through teaching, research and innovation."* Similarly, the University of Cambridge defines its purpose as, *"To contribute to society through the pursuit of education, learning, and research at the highest international levels of excellence,"* all of which encapsulate the fundamental role of any university.

However, the primary output of university research – an academic paper – often does not directly translate into broader societal impact. To address this gap, the Institute for Scientific Information (ISI) recently published a framework methodology for assessing the societal impact of research. Given the broad nature of societal impact, the framework encompasses eight facets – ranging from Legal & Governance, through Medical to Environmental – and employs a variety of leading and lagging indicators. Lagging indicators give an indication of the performance of past outputs and provide a tangible demonstration of where those outputs are already making an impact. Leading indicators focus on signals from more recent work, to see where any future impact may lie. This analysis focuses on a specific lagging indicator: citations to academic papers from granted patents.

For 13 years, Clarivate has published the *Top 100 Global Innovators* list, a compilation of organizations at the forefront of global technology and innovation. The list is developed by the Clarivate Center for IP and Innovation Research and is derived from patent data available in the Derwent World Patents Index (DWPI) and Derwent Patents Citation Index. The 2024 list distills insights from 61 million inventions created by more than 1.1 million innovators and organizations, spotlighting the top 0.01% innovators.

Innovation rarely occurs in isolation; many groundbreaking inventions draw heavily on the foundational work of academics, whose findings are disseminated through journal publications.

**"This analysis identifies the 50 universities named on the academic papers which received the highest number of citations from the patents granted to the companies and organizations identified in the Clarivate 2024 Top 100 Global Innovators list."**

# Methodology

This top 50 universities analysis builds upon the results of the *Top 100 Global Innovators* from Clarivate, which identifies leading organizations driving innovation worldwide. In this study, we concentrate our attention on individual universities, to highlight the significant contributions of discrete academic research institutions to the global innovation landscape.

This study focuses on academic (higher education) institutions only, referred to as “universities” for simplicity. Other organization types, such as university systems (e.g. University of London), national academies (e.g. Chinese Academy of Sciences) or research institutes (e.g. Centre National de la Recherche Scientifique - CNRS) are deliberately excluded from the scope of this analysis. However, given the significant contribution of some of them to knowledge transfer, they may become part of separate, further studies.

Each of the innovators featured in the Top 100 Global Innovators has filed more than 500 inventions since 2000 and has been granted patents for more than 100 unique inventions over the period from 2018 to 2022. These patents build on earlier work, either published in other patents or in academic papers. Such citations may have been added by the inventor or by the patent examiner as part of the patent application review process. All distinct citations from any of these patents to any academic work indexed in Web of Science Core Collection - dating back to 1900 - were considered, regardless of document type (articles, reviews, conference proceedings etc.).

A company might file patents for the same invention in multiple jurisdictions. Such collections of granted patents are called patent families, meaning that each invention is associated with a single patent family. Therefore, each patent family, and its citations to academic material, is only counted once per cited paper, regardless of how many patents are involved. However, if multiple patent families cite the same paper, each such citation is counted separately. For the sake of simplicity, hereinafter, patent families are referred to as inventions.

The total number of citations from inventions to papers were counted for each university, and the top 50 were identified and ranked. By design, the total number of citations is a size-dependent metric, therefore bigger institutions have more chances to be ranked higher in this analysis. Size-normalized metrics of societal impact are in the scope of our further studies.

# Top 50 universities

**Table 1: Top 50 universities influencing patented inventions in the Top 100 Global Innovators 2024 list**

Organization	Country / region	Citations	No. of unique citing inventions	No. of unique cited papers
1. Harvard University	U.S.	8,315	3,291	3,720
2. Stanford University	U.S.	4,727	3,089	2,163
3. Massachusetts Institute of Technology (MIT)	U.S.	4,693	3,218	2,284
4. University of California, Berkeley	U.S.	3,176	2,413	1,519
5. Université Paris Cite	France	2,908	1,532	1,848
6. University of Cambridge	U.K.	2,760	1,641	915
7. University of Washington, Seattle	U.S.	2,641	1,687	1,076
8. University of California, San Diego	U.S.	2,559	1,812	1,240
9. University of Michigan	U.S.	2,526	1,897	1,338
10. University of Toronto	Canada	2,476	1,722	1,352
11. Johns Hopkins University	U.S.	2,452	1,501	1,238
12. University of California, Los Angeles	U.S.	2,293	1,602	1,222
13. University College London	U.K.	2,240	1,518	973
14. University of Oxford	U.K.	2,237	1,439	1,117
15. Cornell University	U.S.	2,111	1,432	1,025
16. University of Pennsylvania	U.S.	2,089	1,284	1,133
17. Université Paris Saclay	France	2,039	1,407	1,356
18. Columbia University	U.S.	1,949	1,257	903
19. University of California, San Francisco	U.S.	1,929	1,144	968
20. Imperial College London	U.K.	1,907	1,411	1,011
21. ETH Zurich	Switzerland	1,879	1,528	1,015
22. University of California, Santa Barbara	U.S.	1,843	734	441
23. Duke University	U.S.	1,654	929	758

24. Technical University of Munich	Germany	1,594	1,342	805
25. University of Tokyo	Japan	1,571	1,172	945
26. University of Illinois Urbana-Champaign	U.S.	1,563	1,294	774
27. Sorbonne Université	France	1,524	1,039	998
28. Tsinghua University	China, Mainland	1,509	1,369	1,013
29. Yale University	U.S.	1,498	932	757
30. University of Wisconsin-Madison	U.S.	1,437	1,118	794
31. Carnegie Mellon University	U.S.	1,409	1,162	767
32. Seoul National University (SNU)	South Korea	1,408	1,208	861
33. Georgia Institute of Technology	U.S.	1,385	1,171	867
34. Washington University (WUSTL)	U.S.	1,372	820	750
35. Kyoto University	Japan	1,369	882	675
36. National University of Singapore	Singapore	1,334	1,158	834
37. University of Southern California	U.S.	1,311	1,016	680
38. University of North Carolina Chapel Hill	U.S.	1,302	936	624
39. Pennsylvania State University	U.S.	1,280	1,033	518
40. New York University	U.S.	1,233	969	605
41. California Institute of Technology	U.S.	1,222	933	589
42. KU Leuven	Belgium	1,214	975	767
43. University of Pittsburgh	U.S.	1,210	787	694
44. École Polytechnique Fédérale de Lausanne (EPFL)	Switzerland	1,209	1,045	638
45. University of Texas Austin	U.S.	1,204	988	723
46. Université Paris Science et Lettres (PSL)	France	1,204	814	722
47. Purdue University	U.S.	1,201	904	556
48. Ohio State University	U.S.	1,189	788	614
49. University of British Columbia	Canada	1,180	945	633
50. Osaka University	Japan	1,178	910	619

# Distribution of top 50 universities

Figure 1: Number of universities in top 50 most cited by Top 100 Global Innovators, per country/region

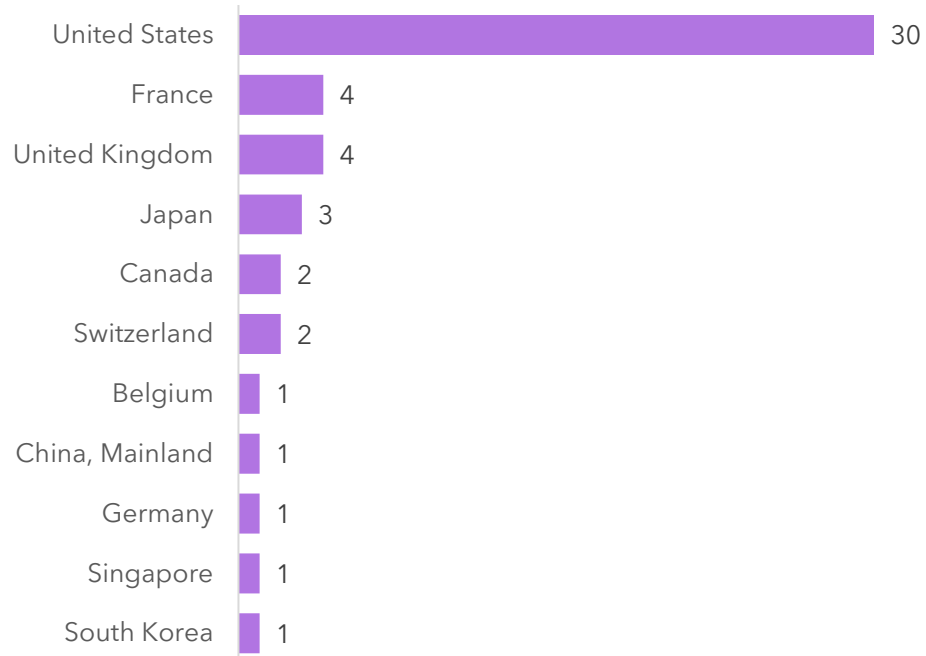


Figure 1 shows the distribution of these 50 universities by country/region, with more than half of them based in the United States.

When we examine the data more closely, some key trends and observations emerge.

The dominance of U.S. universities such as Harvard, Stanford, and MIT in Table 1 reflects their global influence on research and innovation. Harvard's leading position is consistent with its extremely high volume of published research outputs (over one million of documents since 1900), which naturally contributes to a larger pool of citations and related innovations. By contrast, MIT's strong performance is particularly noteworthy as it achieves a comparable level of unique citing inventions despite publishing significantly fewer outputs than Harvard (around 295,000 documents in the same period). This suggests that MIT's research is exceptionally impactful and efficiently translated into innovative applications, underscoring the quality and relevance of its scientific contributions.

Figure 1 highlights that five of the top 100 innovators provide more than half (51.4%) of the citations to these 50 universities: Roche (16.6%); Johnson & Johnson (16.2%); Centre National de la Recherche Scientifique (CNRS) (10.1%); Samsung Electronics (4.8%) and Siemens (3.6%). Unsurprisingly for many of the institutions in the Top 50, the leading citing organization is Roche, Johnson & Johnson or CNRS.



# Innovator - university relationships

**Table 2: The top 20 innovator-university citation relationships, ranked by percentage of citations**

Cited university	Citing innovator	Citations given by citing innovator	Total citations to university	%
University of California, Santa Barbara	Kyocera	1,070	1,843	58.1
Université PSL	CNRS	524	1,204	43.5
Université Paris Cité	CNRS	1,239	2,908	42.6
University of Cambridge	Roche	1,164	2,760	42.2
Sorbonne Université	CNRS	626	1,524	41.1
Duke University	Johnson & Johnson	643	1,654	38.9
Yale University	Roche	512	1,498	34.2
Université Paris Saclay	CNRS	670	2,039	32.9
University of California, San Francisco	Roche	616	1,929	31.9
University of Pennsylvania	Johnson & Johnson	664	2,089	31.8
University College London	Roche	711	2,240	31.7
Harvard University	Johnson & Johnson	2,628	8,315	31.6
Purdue University	Johnson & Johnson	355	1,201	29.6
University of Pittsburgh	Johnson & Johnson	346	1,210	28.6
Imperial College London	Johnson & Johnson	530	1,907	27.8
Columbia University	Roche	537	1,949	27.6
Washington University (WUSTL)	Johnson & Johnson	373	1,372	27.2
University of Washington, Seattle	Roche	706	2,641	26.7
University of Washington, Seattle	Johnson & Johnson	696	2,641	26.4

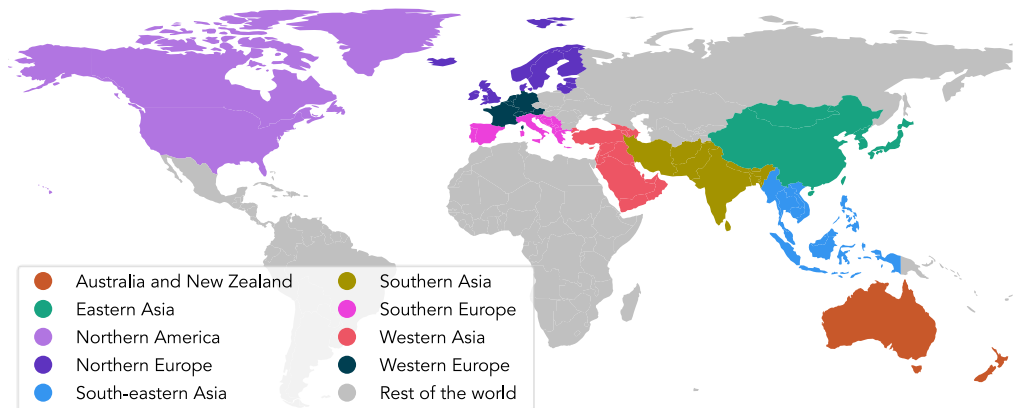
# Flow of knowledge from university to industry

Expanding our analysis to the Top 1000 Global Innovators and considering all papers cited by their inventions, reveals a more extensive picture of the flow of knowledge from universities to industry. Figures 2 and 3 illustrate the global pathways of this academic knowledge transfer.

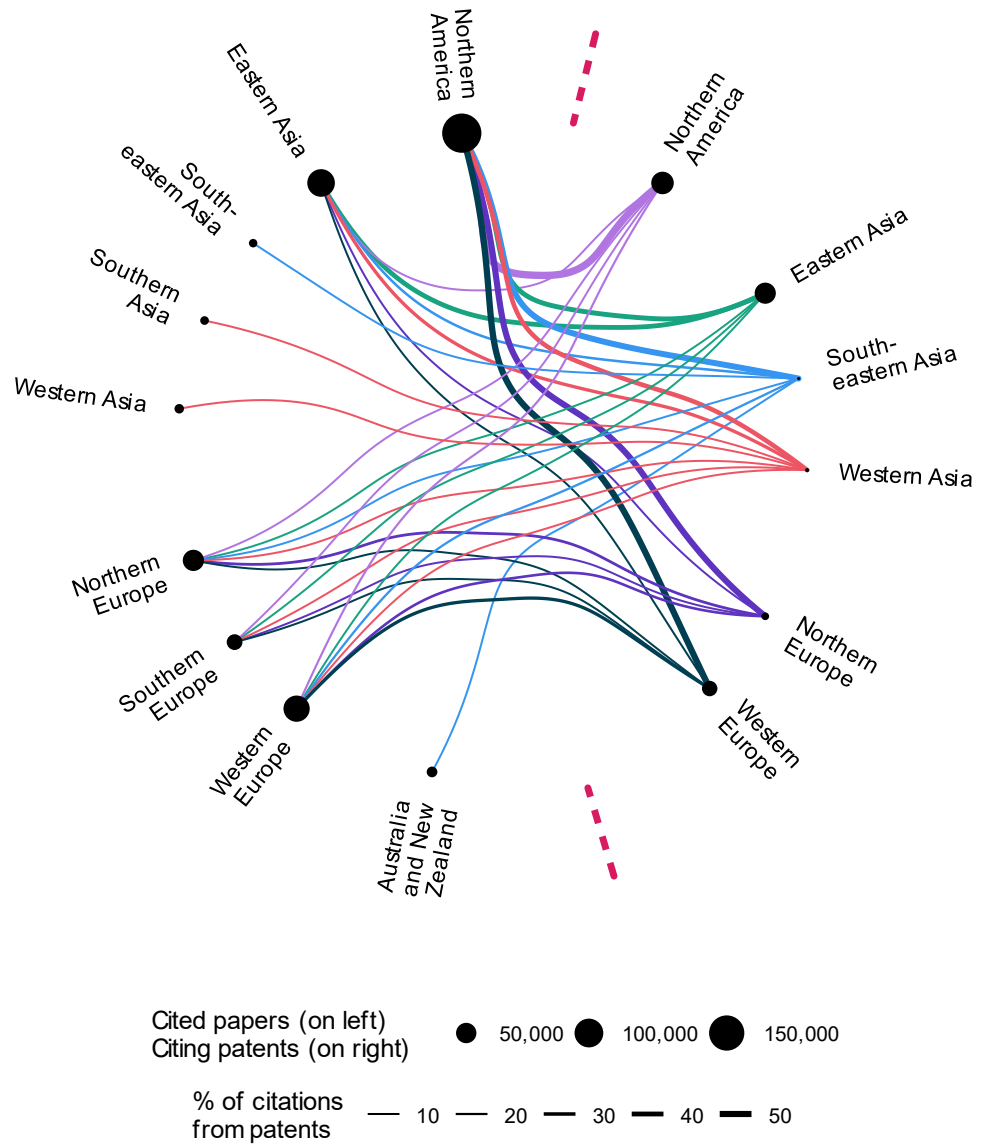
Figure 2 presents this flow at the level of UN sub-regions, while Figure 3 provides finer detail, focusing on individual countries. The left-hand side of both figures shows the regions or countries where the academic research was conducted, while the right-hand side shows the locations of the headquarters of the companies whose inventions cited that research. The lines are color-coded according to the citing region/country with line thickness reflecting the percentage of citations from the citing region/country to the cited region/country. For example, a 30% line means 30% of citations from the citing region refer to research from the linked cited region. The size of the disks represents the volume of citing inventions or cited papers that are associated with each region or country.

Both figures only include regions/countries with at least 1,000 inventions filed by the Top 1000 Global Innovators or at least 1,000 papers cited by those inventions. To highlight dominant trends, the analysis focuses on countries or regions with at least 5% of citations from an innovator's region or country.

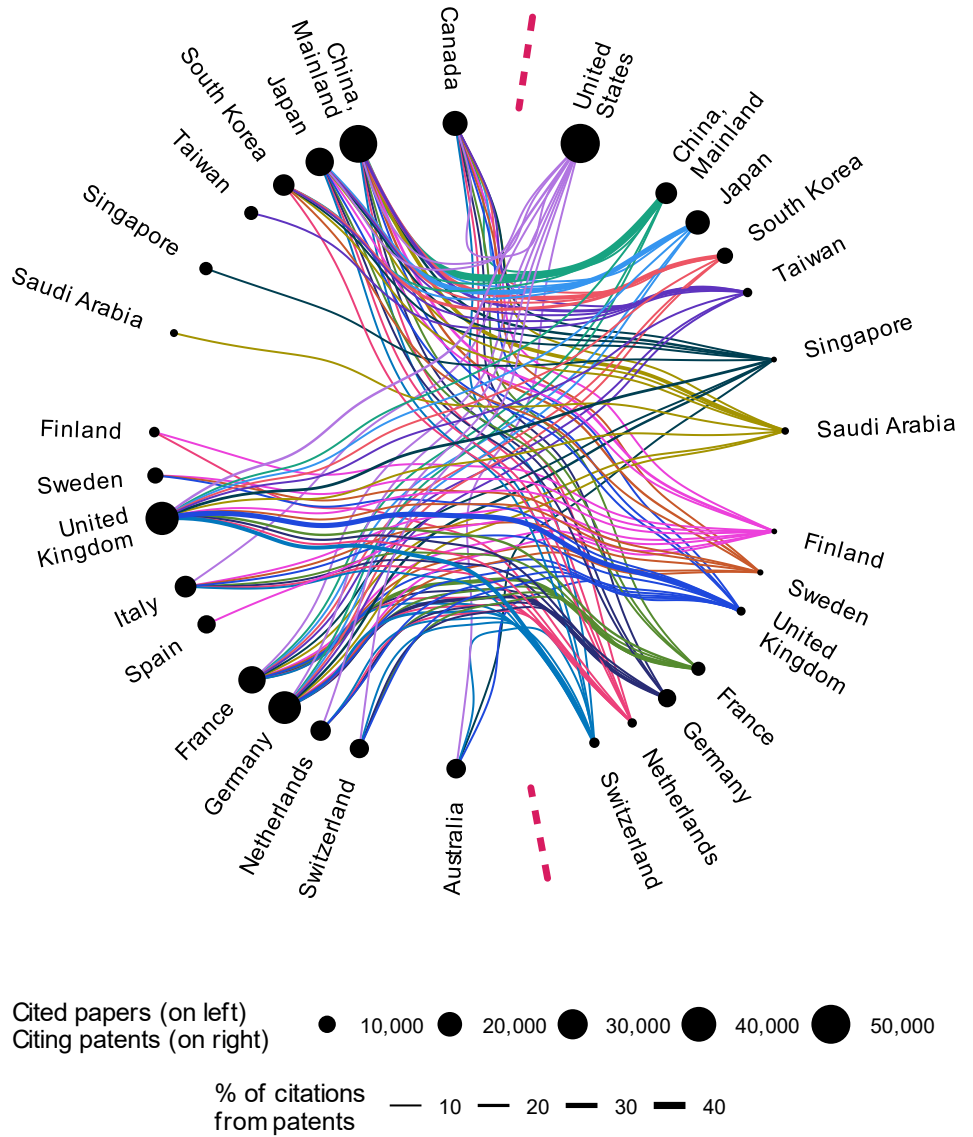
Map 1: Identification of countries within the UN sub-regions highlighted in Figures 2 & 3.



**Figure 2:** The flow of knowledge from academic papers by UN sub-region (left side of the red dashed lines) to inventions by UN sub-region, each denoted by a different color (right side of the dashed lines). Lines represent the percentage of each sub-region's inventions that cite papers from a given sub-region. Only sub-regions with 1,000 papers or inventions, or a contribution of at least 5% of inventions from a UN sub-region are included. Sub-regions are grouped by UN region. Relevant UN sub-regions are shown in the map above.



**Figure 3:** The flow of knowledge from academic papers by country/region (left side of the red dashed lines) to inventions by country/region, each denoted by a different color (right side of the dashed lines). Lines represent the percentage of each country's inventions that cite papers from a given country/region. To help clarify the finer details, as the largest contributor of research knowledge for each country is the United States (see Figure 2), this country has been removed from the chart on the cited paper side. Only countries/regions with 1,000 papers or inventions, or a contribution of at least 5% of inventions from a country/region are included. Countries are grouped by UN region and sub-region.



# Key observations

## Dominance of Northern America

- Northern America, predominantly the United States, is by far the largest source of research cited by inventions (as seen in Figure 2).
- Figure 3 specifically excludes the United States as a source, to show trends from elsewhere in the world.
- Regional hubs are present in the data. Eastern Asia draws on a lot of its own research, although other regions in Asia also draw on Eastern Asia's research to a lesser degree. Northern and Western European inventions are also slightly more likely to cite research from Northern and Western Europe.

## Country-level trends

- At the country-level, Figure 3 reveals distinct patterns in how companies cite academic research.
- Companies headquartered in Mainland China predominantly rely on domestic research, with 41% of citations directed to studies carried out within the area while Japanese companies are more likely to cite research from Japan, accounting for 29.7% of their citations.
- South Korean inventions show a more balanced distribution, citing research from both Mainland China (25.4%) and South Korea (19.2%).
- Taiwanese inventions, however, display a broader distribution, with citations distributed across four key countries and regions in Eastern Asia: 19.2% are to Mainland China; 13.5% to Taiwan itself; 11.8% to Japan and 9.1% to South Korea.
- **Strong intra-European ties**
  - Ties between European countries remain notably strong, with a clear pattern of companies citing domestic research:
  - 29.8% of inventions from the U.K. cite research conducted domestically.
  - Similarly, 22.4% of German inventions and 24.4% of French inventions cite research originating from Germany and France respectively.
  - But, while many countries contribute to research cited by inventions from many other countries to some degree, the U.K. is an especially strong contributor to such research. In particular, 24% of inventions from Switzerland cite U.K. research, as does 16.0% from France.
  - These patterns highlight the role of the U.K. in acting as a bridge in the global exchange of academic knowledge.

- **Neighbouring regional research patterns**

- While companies in many countries benefit from research carried out in Mainland China, Japan, the U.K., France and Germany, there are strong tendencies to rely on research from the same region:
- Most Asian countries predominantly cite research from Mainland China and Japan.
- Most European countries tend to draw more heavily on research from the U.K., France and Germany.
- Singapore, however, is a notable exception acting as a bridge between regions. Its inventions cite research from the U.K. (17.9%) and Germany (16.5%) as frequently as from Mainland China (16.6%) and more than from Japan (10.6%). Singapore also relies more on external research than domestic contributions, with only 13.2% of citations directed to itself.

This analysis highlights that groundbreaking ideas driving the world's most innovative companies and institutions often originate from academic research. By fostering collaborations between academia and industry, these ideas not only fuel technological advancements, but also contribute to solutions for societal challenges - spanning healthcare, sustainability and economic development. The exchange of knowledge across countries and regions underscores the global nature of innovation and its potential to create a positive and far-reaching impact on society.

This paper is the second in a series to highlight the ongoing developments by the Institute for Scientific Information to create a responsible framework for evaluating the societal impact of research. We will include this framework in our forthcoming new Web of Science Research Intelligence platform - a transformational, AI-native software solution that will enable research institutions to responsibly aggregate metrics to suit their own needs to showcase societal impact. It will offer both an institutional and global view of research and researchers on an intuitive platform that enables an analysis of multiple research output types, including publications, patents, grants, policy documents, clinical trials and more.

Additional reading: [A responsible framework for evaluating the societal impact of research](#)

# Data sources

**Web of Science™** is the world's largest publisher-neutral citation index and research intelligence platform. It organizes the world's research information to enable academia, corporations, publishers and governments to accelerate the pace of research.

**Derwent World Patents Index™ (DWPI)**  
A database of the patented ideas, DWPI records where and when inventions are protected across 60 patent-issuing states and authorities, with each idea distilled into English-language summaries and categorized into the industry, the technology and the need. Created by thousands of Clarivate science and engineering expert editors over more than 60 years, DWPI acts as the library of global human invention and patented problem solving.

**Derwent Patents Citation Index™**  
A sister database to DWPI, Derwent Patents Citation Index focuses on inventions that have been referenced by applicants and patent examiners in later, downstream patent applications. Emulating DWPI invention-level structure, Derwent Patents Citation Index automatically removes double, triple (or more) counting of citation events between the same patented ideas. Accessing the same distillation of industry and technology, it provides a record of the links between ideas as they develop.

# About Clarivate

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