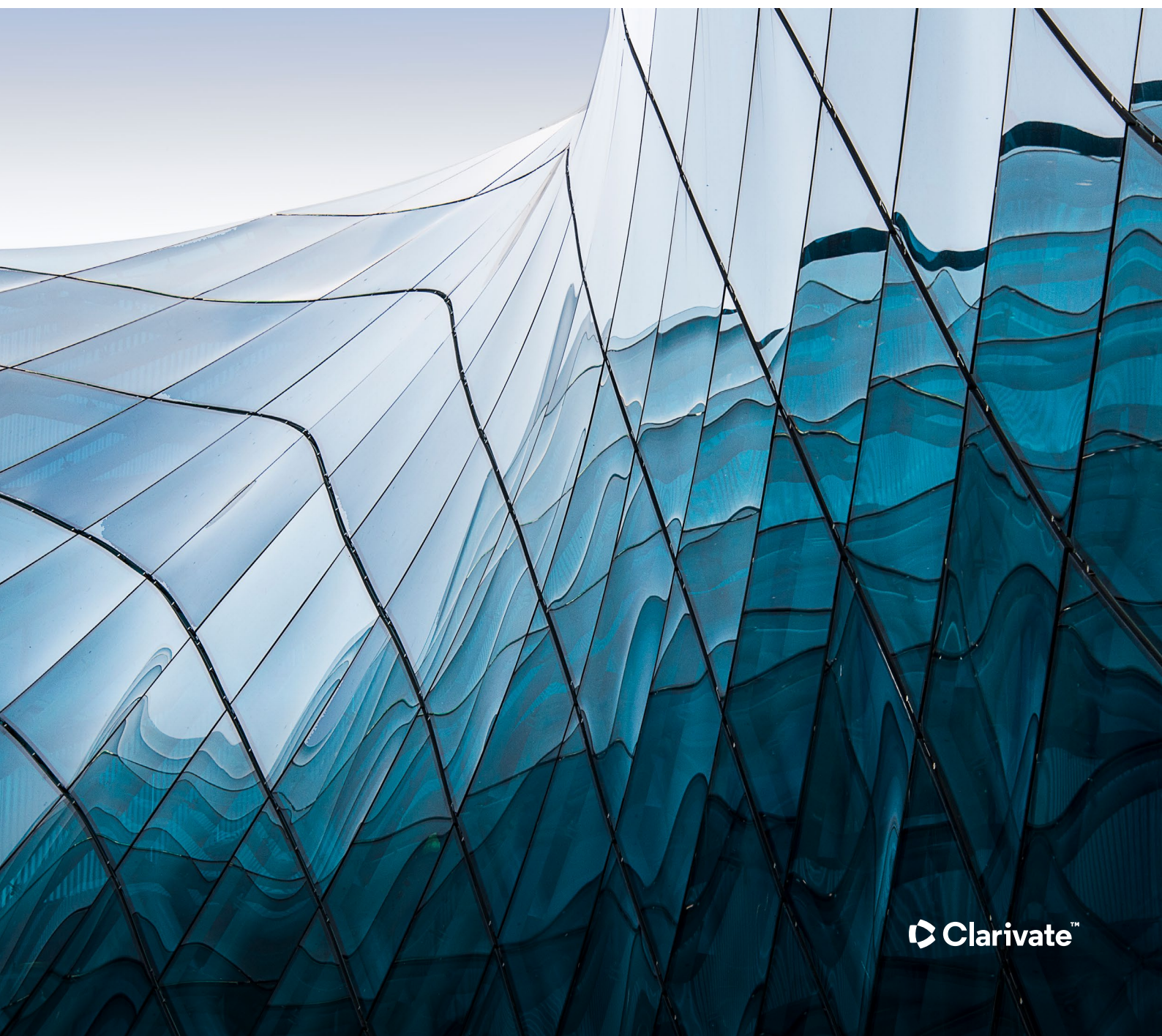# The Annual G20 Scorecard – Research Performance 2021

Jonathan Adams and Gordon Rogers

Author biographies

Jonathan Adams is Chief Scientist at the Institute for Scientific Information. He is also a Visiting Professor at King's College London, Policy Institute. In 2017 he was awarded an Honorary D.Sc. by the University of Exeter, for his work in higher education and research policy. ORCiD: https://orcid.org/0000-0002-0325-4431

Gordon Rogers is a Senior Data Scientist at the Institute for Scientific Information. He has worked in the fields of bibliometrics and data analysis for the past 10 years, supporting clients around the world in evaluating their research portfolio and strategy. ORCiD: https://orcid.org/0000-0002-9971-2731

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 whilst 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.
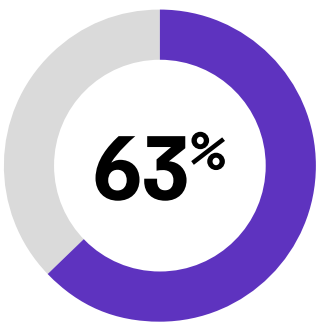
It disseminates that knowledge externally through events, conferences and publications whilst conducting primary research to sustain, extend and improve the knowledge base. For more information, please visit https://clarivate.com/isi.
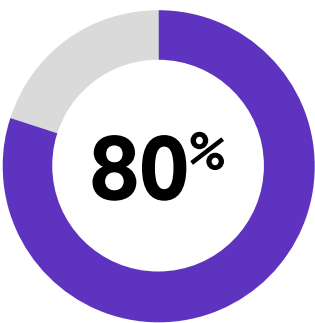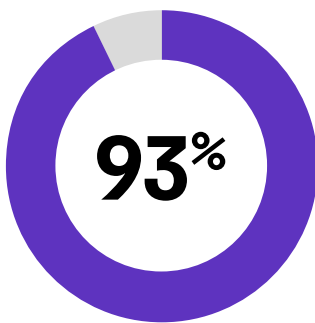
The G20:

Represents

63%

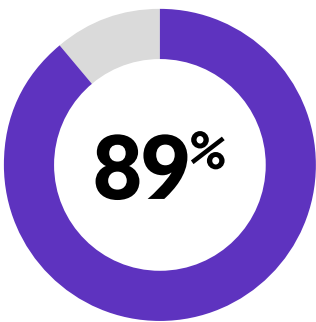of world population
(World Bank, 2020)

Produces

80%

of global GDP
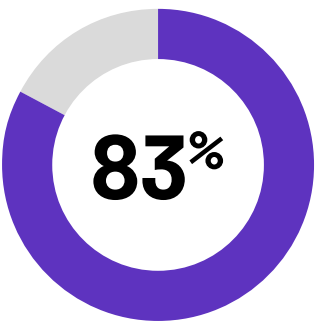(World Bank, 2020)

Spends

93%

of global R&D
(UNESCO, 2018*)

Employs

89%

of the world's researchers
(UNESCO, 2018*)

Publishes

83%

of global research papers
(Web of Science, 2020)

Cover image: Reflections on a glass facade in the business quarter in Stockholm

*Refers to the UNESCO Science Report 2021, p.32

Executive summary

Region	Snapshot of research footprint
Argentina	Research spend (Gross Expenditure on R&D, or GERD) continues to rise although it is still relatively low at 0.58% GDP. Indexed output per researcher is low and while open access output is high, in line with other nations in Latin America, this is mainly in the social sciences and humanities. Citation impact is around world average and international collaboration trends are typical of the G20. However, a dip in citation impact continues and patents/BERD are low.
Australia	Output continues to rise, doubling in a decade and driven by exceptional international collaboration. Productivity per researcher and per GERD is consequently relatively high. International collaboration boosts citation impact and share of highly cited papers (above G20 average and the highest overall) but domestic impact is marginally lower.
Brazil	Output is rising both domestically and for international collaboration. Open access output – especially for international papers – is very strong across all disciplines except technology. Citation impact, particularly for domestic output, is below the relevant G20 averages and continues to fall slightly on average, perhaps affected by a drop in funding.
Canada	Output per researcher continues to rise and overall output has risen by one-half in the past decade. However, although open access output has nearly trebled as a percentage of overall output over the same period, it remains below the G20 average. Citation impact is well above G20 averages with 38% of publications above world average citation impact compared with 32% for the G20 as a whole.
Mainland China	Two million researchers is a very large workforce and exceptional investment (GERD over 2% of a rising GDP) supports patents/Business Expenditure on R&D (BERD) that are twice that of most other G20 nations, aside from Japan and South Korea. The domestic research base continues to diversify, growing in all areas with an expanding focus on social sciences added to an established technology base. It has a growing share of world publications and gradually rising impact.
France	The domestic research base has some weakness where output is in decline on both per researcher and per GERD funding indices. Domestic impact is also below the G20 average. While citation impact remains relatively high in life sciences, this is boosted by a high 60% international collaboration. Open access remains well below G20 average in most fields despite EU initiatives.
Germany	GERD, as a share of GDP, is 3.2% and higher than EU neighbors while output per researcher is around G20 average. The citation impact of the research is relatively good, especially in life sciences, and it has a 14% share of the world's top 10% of papers. Output per GERD and per researcher is below the G20 average but has recently picked up.
India	Output remains relatively low for such a large economy (it has 20 times the population of Italy but slightly fewer papers). However, we cannot index productivity as there are no recent data on GERD or researchers. Open access has been adopted only in biomedicine. Low international collaboration (half the G20 average) contributes to a weak Impact Profile and low citation impact in all areas.
Indonesia	Output is low and, although volume has trebled in all disciplines since 2012, domestic output is only 20% of the total. Average citation impact (peaking above world average in 2012-2017) is therefore driven by the internationally collaborative output, which also shapes the Impact Profile. Average citation impact is relatively good where collaboration is substantial but more than 20% of domestic papers are uncited. Open access is driven by publications in medicine.
Italy	Productivity per GERD is well above G20 average, so output has not been constrained by consistently low government investment which leads to low GERD/GDP. Output is only just above G20 median. Citation impact is good in all areas and the impact of domestic research is rising. The Impact Profile shows that average performance is further boosted by international collaboration, accounting for 55% of total output.

Region	Snapshot of research footprint
Japan	Productivity is markedly below G20 average and citation impact is low for a well-established G7 research economy with a high level of GERD/GDP (3.3%). This may be associated with relatively low (30%) international collaboration Patents/BERD is one of the highest in the G20, but women represent only 17% of the researcher population.
Mexico	Research investment is low and continues to fall (GERD/GDP is 0.28%), but rising output is boosted by high and rising productivity. Citation impact is now slowing including international collaboration. The Impact Profile shows that the impact of the domestic base output is well below world average. However, average impact is good in medicine and health.
Russia	Russia's research profile is affected by slow recovery from post-Soviet disruption and recent incentives to publish in Russian-language outlets. This results in an artefactually low recorded output volume (and indexed productivity) leading to low international collaboration (34%) and recognition. Only 18% of papers have above world average citation impact and domestic research is cited much less.
Saudi Arabia	Domestic papers have been 20% of total output since 2010 so the Impact Profile reflects a strategic focus on international collaboration or affiliation. This has grown steeply while domestic research does not yet reflect this investment as domestic researcher numbers are not disclosed. Impact by discipline appears high and rising but this is largely international.
South Africa	International collaboration makes up 60% of output and the overall Impact Profile is close to G20 average. This has fallen slightly but is boosted by a strong performance in medicine and health research. Productivity is high and output has been rising. There are consistently high levels of publication via open access across disciplines and the country has the second-highest proportion of female researchers (45%).
South Korea	A large workforce and the highest G20 GERD/GDP (4.6%) translate into strong academic output in engineering, reflecting excellent private sector funding and activity. Citation impact is lower than expected but this may be due to below-average international collaboration. Open access is rising in all areas.
Turkey	Recent declines in output and productivity have been reversed but output is low for the size of the economy. Domestic impact has declined slightly. International collaboration remains low but boosts overall impact. Citation impact is in fact below world average in all areas and collaboration lifts the Impact Profile above the G20 average. Open access is declining, in contrast to the rest of the G20.
United Kingdom	The share of papers in the global top 10% (16.2% and rising) is the highest in the G20. The Impact Profile shows that even domestic research performs above G20 average. By discipline, average citation impact is strongest in life sciences and relatively high (above 1.2) in most other areas except art and design. International collaboration is exceptionally high, and rising, for such a large economy. The proportion of female researchers (39%) is above G20 average.
United States	Output is now second to Mainland China – the highest in the G20 in all areas – and citation impact is good, though less than the United Kingdom. The strong domestic research base is boosted less by international collaboration than other countries, as the Impact Profile shows. However, although investment is rising (GERD/GDP = 3.1%), output has plateaued and output per researcher is below the G20 average.

Introduction

The G20 economies are a leading force in the global research system. Together, they represent more than 80% of Gross Domestic Product (GDP) and two-thirds of the global population. The Institute for Scientific Information (ISI)™ is uniquely placed to deliver a comparative research snapshot for each G20 nation, setting Web of Science™ data alongside other key metrics on people, finance and patenting. It shows that collectively, the 19 nations of the G20 (the EU is an additional member) accounted for more than five million articles and reviews indexed in the Web of Science research publication and citation index for the last three years – over 70% of the global total.

This year's G20 Summit is scheduled for Rome, Italy, on October 30 and 31, 2021. Like last year's event scheduled for Riyadh, the meeting will be uniquely impacted by the COVID-19 pandemic, and so our 2021 Annual G20 Scorecard includes a special analysis of the G20 contribution to recent COVID-19 research. Complementing last year's audit, this year focuses on the different national responses and the link to each region's research investment and subject diversity.

Evidence from many studies in economics and ecology shows that diversity provides benefits, notably in resilience and responsiveness. The global pandemic caused by COVID-19 must represent one of the most severe challenges to the research base and its capacity to respond to citizens' needs. The question is therefore whether the data throw any light on the relationship between current research response and prior research diversity.

Our methodology for measuring subject diversity uses the 254 established Web of Science journal categories. We compare the distribution of articles and reviews that have at least one author affiliation for a region with the global background. We do so on an annual basis, using the global data to 'normalize' counts that naturally vary between categories of different sizes and from year to year. We then calculate a Gini index for these data, illustrating diversity graphically as (1-Gini) since that index is intended to express concentration and not evenness.

During the pandemic, innovative research topics emerged to tackle societal, economic and health issues that often draw on contributions from a broad spectrum of academic disciplines and are not aligned with conventional subject categories. Consequently, we turn to topic modelling to create a bespoke classification system of COVID-19 research rather than using national reference data.

We identified 67,756 papers (articles or reviews) indexed in the Web of Science and published in 2020-2021 that are related to COVID-19. We did so by searching titles, abstracts and keywords for terms such as 2019-nCoV, COVID-19, SARS-COV-2, novel coronavirus, etc. Text from the titles and abstracts of these papers was used to create a topic model which includes 40 topics. These covered areas of clinical practice, molecular biology, virology, immunology, epidemiology, virtual learning, mental health, food security, economics, crisis management, environmental impact, and so on. This model was then used to profile nations according to the number of papers produced in each topic, revealing the range of the responses to the pandemic and providing a mechanism for comparison. In the same manner, for each region, the relative paper count for each topic (i.e., the number of papers in each topic with an author from the region divided by the total number of papers in the topic) was used to calculate a measure of relative evenness (1-Gini). We use these data to compare the relative evenness of that region's research topics on COVID-19 with the diversity of each national research base over a recent period (2016-2020).

Our 2021 Annual G20 Scorecard includes a special analysis of the G20 contribution to recent COVID-19 research. This year we focus on the different national responses and the link to each region's research investment and subject diversity.

As anticipated, regions with more even research bases, especially the United States, Germany and the United Kingdom, tend to support a response across a wider range of COVID-19 topics. Other G20 nations had a more specialized response. For example, Brazil, Mainland China and India have a similar level of evenness in their research portfolio, which is less than the United Kingdom and United States.

Nonetheless, Brazil has a relatively high evenness for COVID-19 papers when compared to India and Mainland China. While all three had a substantial output in the core clinical topics, Brazil also published COVID-19 research in areas that were less prominent in Mainland China and India's COVID-19 portfolios, such as online learning, economics and digital media.

The overall pattern is clear: as in economics, diversity in national portfolios enables a rapid and agile response. Brazil is an exception that 'proves the rule' because its response reflects the strengths in its research portfolio, particularly around biosciences.

Figure 1. Comparison between the evenness of national publication portfolios (average, 2016-2020) and that of COVID-19 publications for the G20 nations. Points are scaled according to the volume of COVID-19 output (e.g., United States 18,578, Mainland China 9,171, Brazil 2,397, South Korea 1,213).
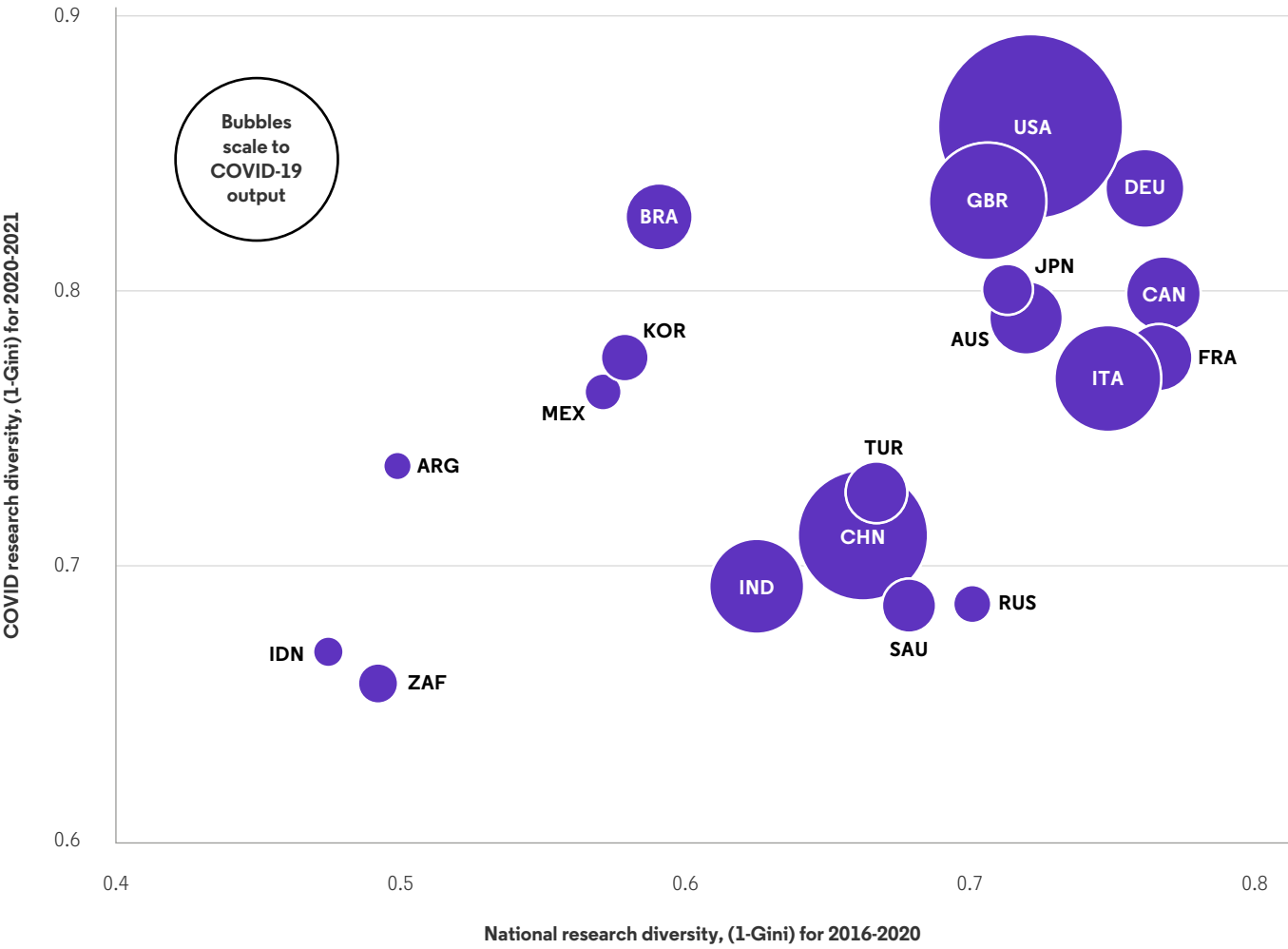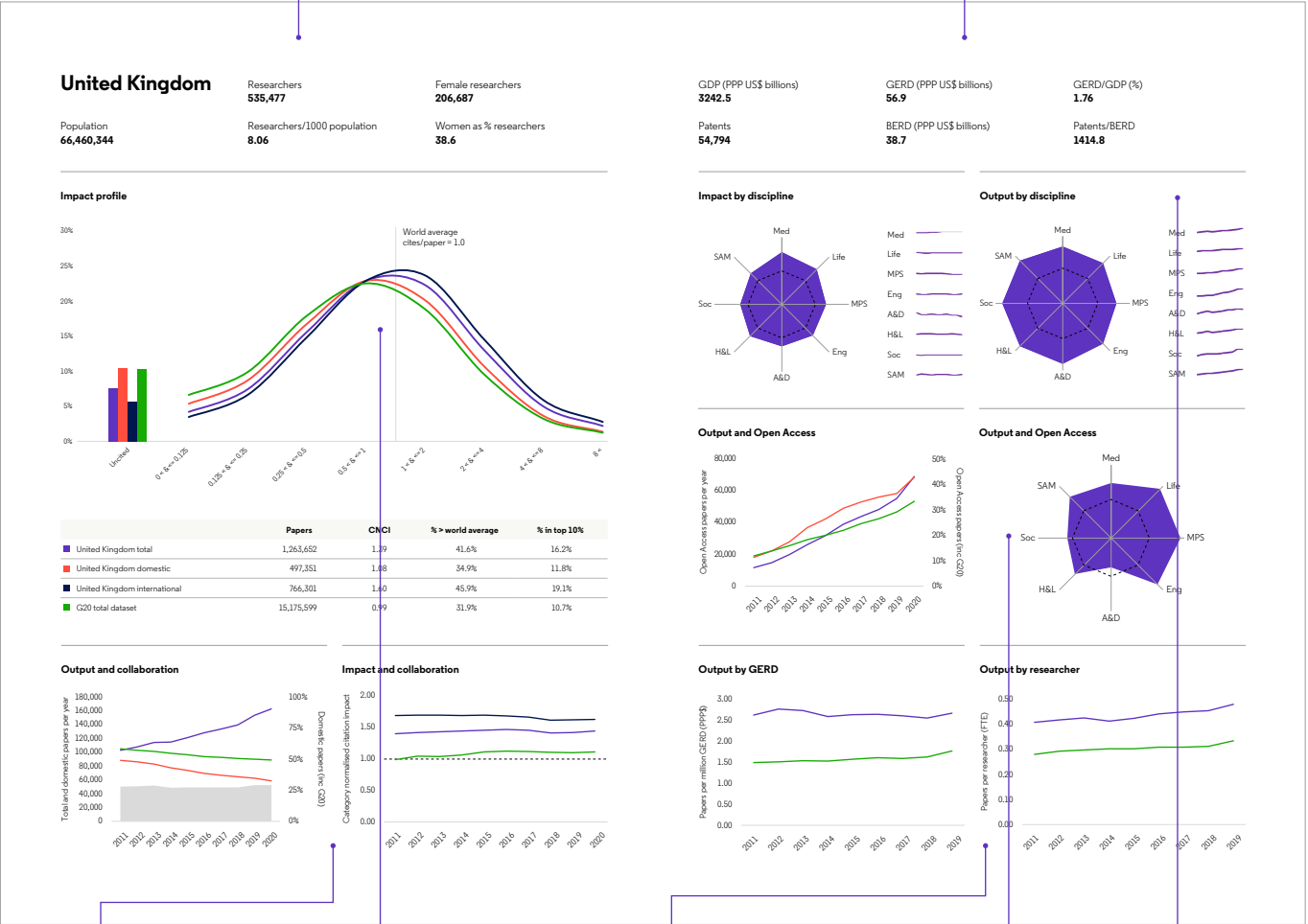
Understanding the G20 scorecards

The research profile

The research profile of each country is summarized across two pages of data, graphics and tables. Each profile is headed by key statistics for the country and graphs show the pattern of activity and performance by subject area or the distribution or trend in performance across the last ten years.

The headlines on the left-hand page are about people: the population, the abundance of researchers in that population and the percentage of those researchers who are female

The headlines on the right-hand page are about money and intellectual property: total GDP, Gross Expenditure on R&D (GERD), Business Expenditure on R&D (BERD) and the ratio of patents to BERD

United Kingdom

Researchers 535,477	Female researchers 206,687	
Population 66,460,344	Researchers/1000 population 8.06	Women as % researchers 38.6

GDP (PPP US$ billions) 3242.5	GERD (PPP US$ billions) 56.9	GERD/GDP (%) 1.76
Patents 54,794	BERD (PPP US$ billions) 38.7	Patents/BERD 1414.8

Impact profile

World average cites/paper = 1.0

	Papers	CNCI	% > world average	% in top 10%
United Kingdom total	1,263,652	1.39	41.6%	16.2%
United Kingdom domestic	497,351	1.08	34.9%	11.8%
United Kingdom international	766,301	1.40	45.9%	19.1%
G20 total dataset	15,175,599	0.99	31.9%	10.7%

Impact by discipline

Output by discipline

Output and Open Access

Output and Open Access

Output and collaboration

Impact and collaboration

Output by GERD

Output by researcher

Growth and impact of international collaboration

An Impact Profile shows the spread of citation impact across a country's research output

Trends in productivity by funding and researcher number

The growth of Open Access and its spread by subject area

Research Footprints show the balance of research impact by main field

Data sources

There are several sources of the data used in the headlines and elsewhere. The OECD is an important source of research information, particularly the Main Science and Technology Indicators (MSTI) but not all nations are OECD members and data may be missing where an OECD member has not consistently and recently updated their profile. Interpolation is used to fill these gaps.

| Data type	Source	Notes
Population, GDP	World Bank	GDP (PPP) data are in current international $. Data were retrieved using World Bank's API, documented at https://datahelpdesk.worldbank.org/knowledgebase/articles/1886701-sdmx-api-queries.
Researchers, GERD, BERD	OECD	GERD is Gross national Expenditure on R&D; BERD is Business-sector Expenditure on R&D. Most recent data for each item, matched to related data for the corresponding same year from for example the World Bank. For example, if Researcher data are from 2018, population and female researcher data are from 2018 to provide a meaningful comparison. OECD only includes data for OECD members and Argentina, Mainland China, Romania, Russia, Singapore, South Africa and Taiwan. Data are therefore absent for Brazil, India, Indonesia or Saudi Arabia, except where obtained from other, validated sources. Data may be missing where an OECD member has not consistently and recently updated their profile. For output by researcher or GERD, data are 2011 to 2019, linearly interpolated where not available, and extended with earliest or latest value to cover the start/end of the period. Data were retrieved using OECD's API, documented at https://data.oecd.org/api/sdmx-ml-documentation/.
Patents	WIPO	Data are for 2019 and were retrieved from the WIPO IP Statistics Data Centre https://www3.wipo.int/ipstats/index.htm?tab=patent.
Publications, citations	Web of Science	Data were taken from Web of Science (2011 to 2020). Data are from the Science Citation Index Expanded™, Social Sciences Citation Index™ and Arts & Humanities Citation Index™, and only cover Articles and Reviews.
Open Access	DOAJ, Unpaywall	Data were taken from Web of Science (2011 to 2020)

Benchmarks

A country's performance is better understood if it is contextualized, ideally against an appropriate reference value. The reference benchmark in the G20 scorecards is either the G20 average or the G20 median, and this is shown in all the graphics and tables. The reason for using median values in some instances is that research data can be very skewed, with many low values and a few high value outliers, so the average does not then reflect the mid-point of the distribution.

There are no direct comparisons between individual countries. The G20 nations vary significantly in size and research maturity so direct comparison would not always be informative. In future reports, we expect to add information that tracks the evolving state of each country, benchmarking its activity against its historical position.

Citation analysis

The significance of a paper (an article or review) in a research journal is measured by the number of times it is subsequently cited in later research. These citation counts grow over time at a rate that varies between research fields, so actual counts are 'normalized' for analysis using the global average for field and year of publication. This is called Category Normalized Citation Impact, or CNCI: values greater than 1.0 show a paper is cited more often than world average.

Impact Profiles

Impact Profiles display the distribution of CNCI values for a ten-year sample of journal papers. The profile is much more informative than a single average value for the whole sample. Papers are assigned to categories as either uncited, or cited less often (down to half, less than half to one-quarter and so on), or cited more often (up to 2 times, 2-4 times and so on) than the world average (Adams et al., 2007).

Impact profile. Three Impact Profile curves track CNCI for total national output, the impact for domestic papers and those with international collaborators

	Papers	CNCI	% > world average	% in top 10%
Argentina total	96,518	0.96	27.1%	8.2%
Argentina domestic	48,872	0.57	18.3%	3.4%
Argentina international	47,646	1.36	36.1%	13.1%
G20 total dataset	15,175,599	0.99	31.9%	10.7%
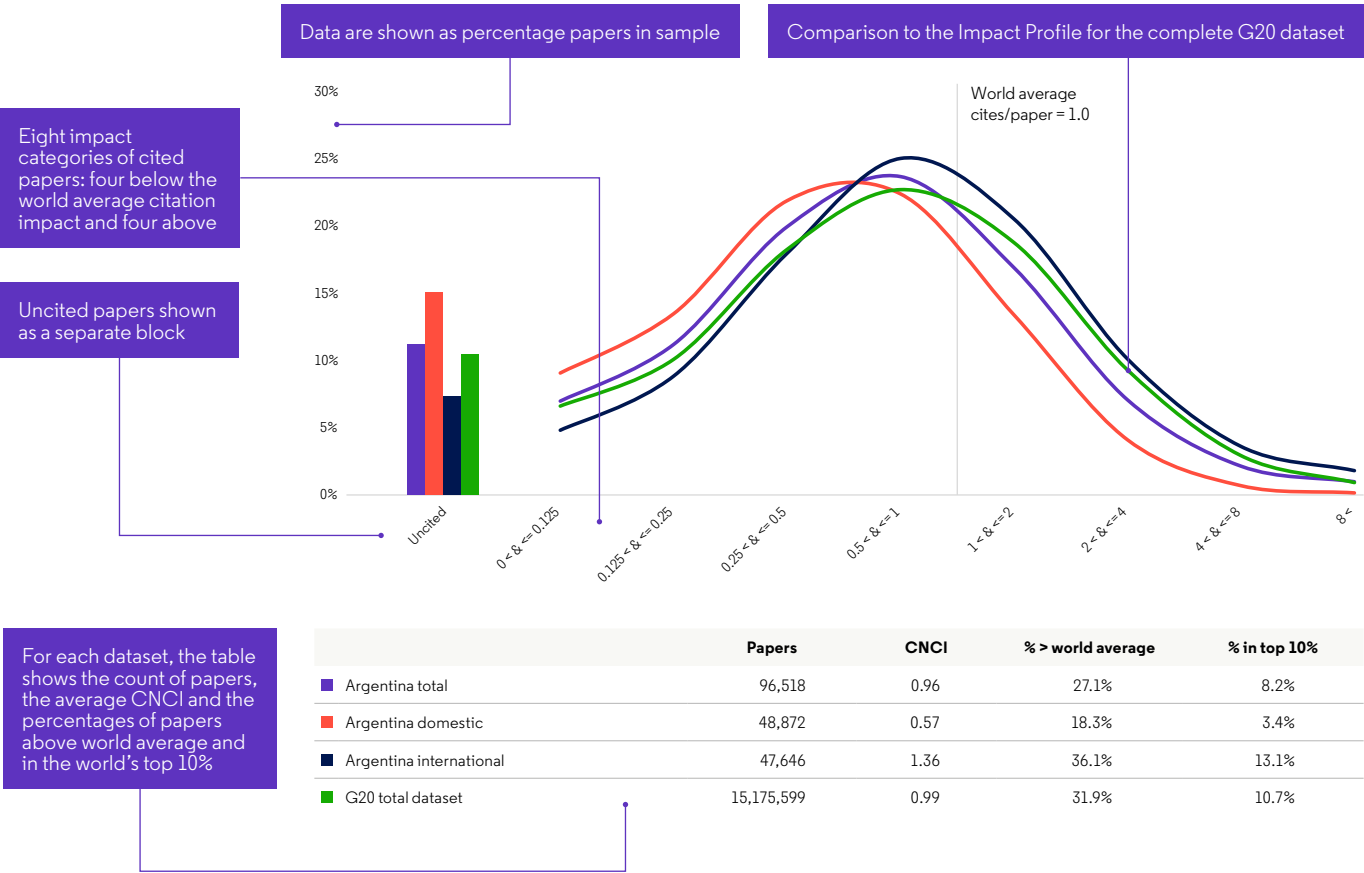
International collaboration

International collaboration in research has been growing and most of the world's most highly-cited research now has authors from two or more countries. As a result, the specifically domestic part of each country's research base has been shrinking and is contributing less to overall national impact (Adams, 2013). These graphs show the growth of collaboration and the contribution that it makes to average national citation impact.

Output and collaboration
The citation impact of collaboration is shown by comparing average national impact with the papers that have an international co-author

— Total paper count for the country
— The percentage of annual output that is still domestic
— G20 average percentage of annual output that is still domestic
▢ Grey block is the count of domestic papers, with no international co-author

Output trend is tracked over the last ten years
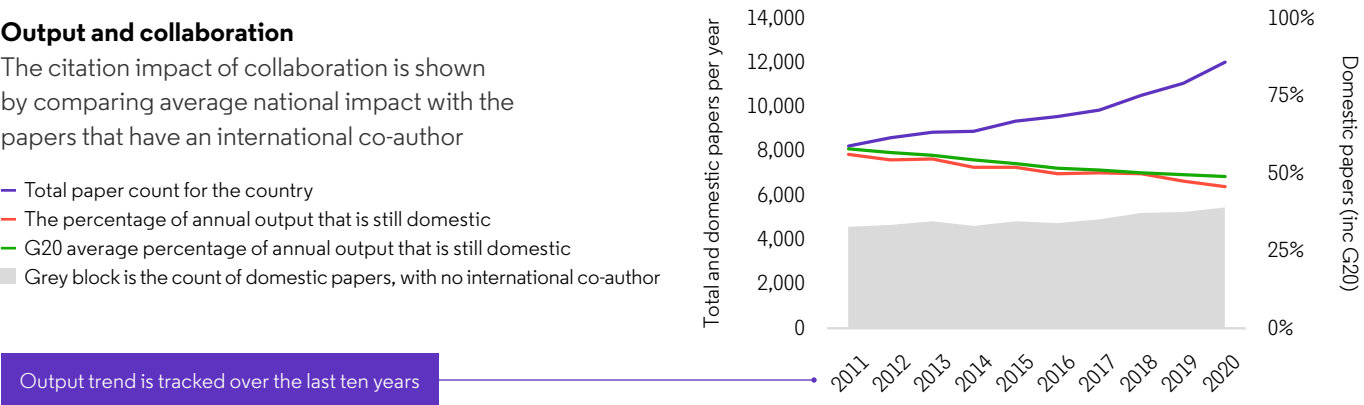
Impact and collaboration

— Country as a whole
— Papers with an international co-author
— G20 average CNCI

Average citation impact is shown relative to world average

Output trend is tracked over the last ten years
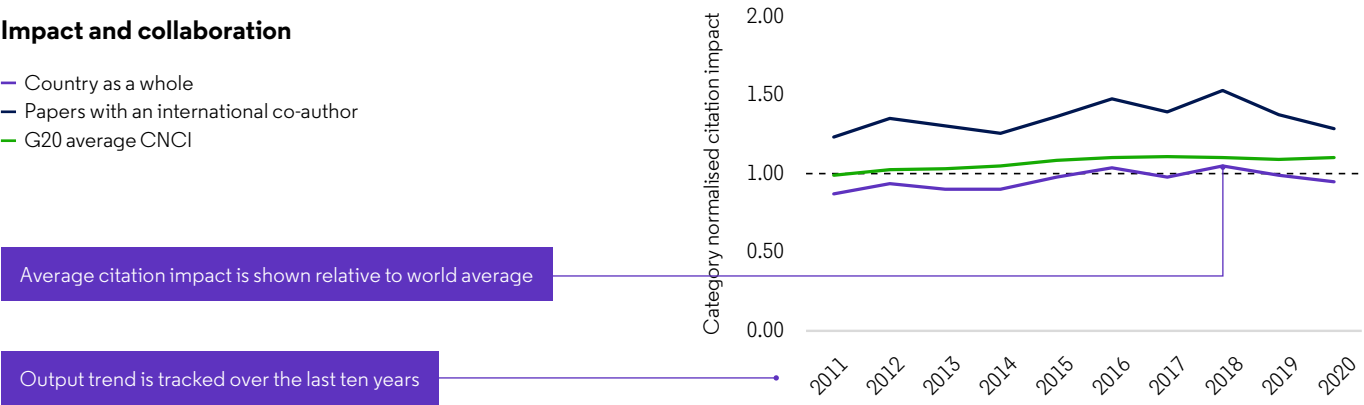
Research productivity
Research productivity is analyzed in terms of both output per unit GERD funding and output per researcher.

— National performance
— G20 average papers per unit activity
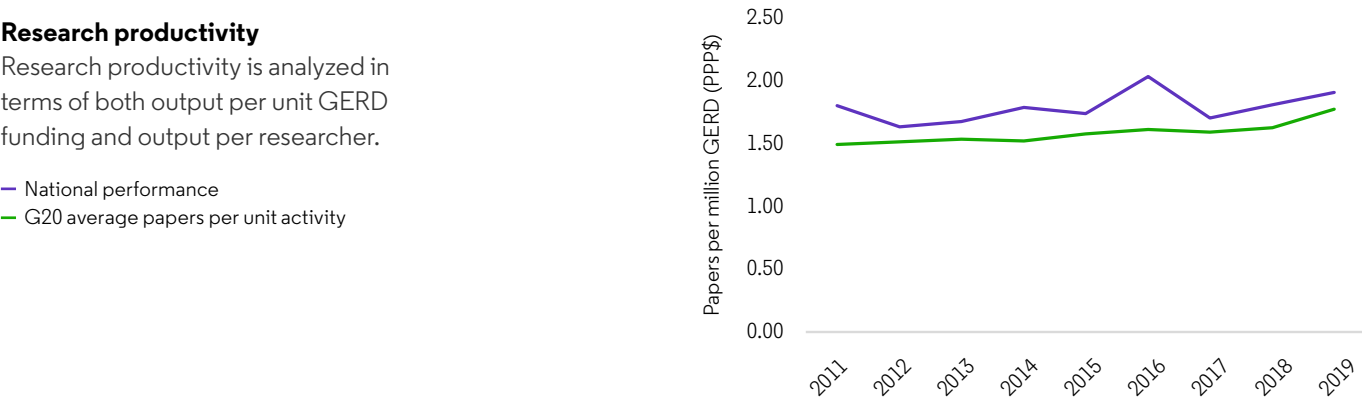
Research Footprints

Research Footprints show how a research activity or performance measure varies across disciplines. They show the 'footprint' of the country on the global research landscape.

The Research Footprints for publication output and for citation impact use eight major discipline groups (see key) within which there are broadly similar publication and citation patterns.

- **Med** = medicine
- **Life** = life sciences
- **MPS** = maths and physical sciences
- **Eng** = engineering and technology
- **A&D** = art and design
- **H&L** = humanities and languages
- **Soc** = social sciences
- **SAM** = subjects allied to medicine
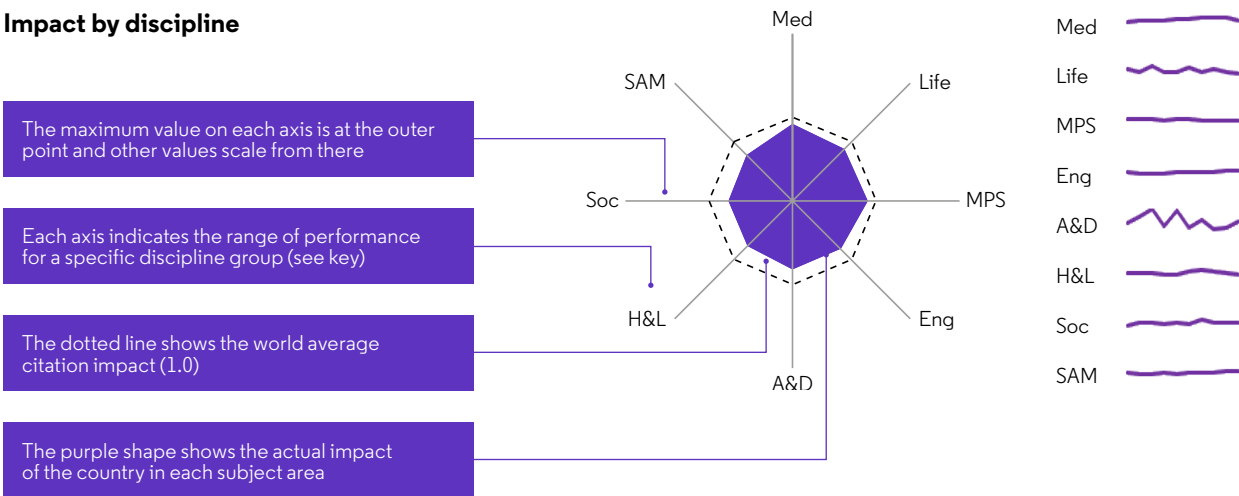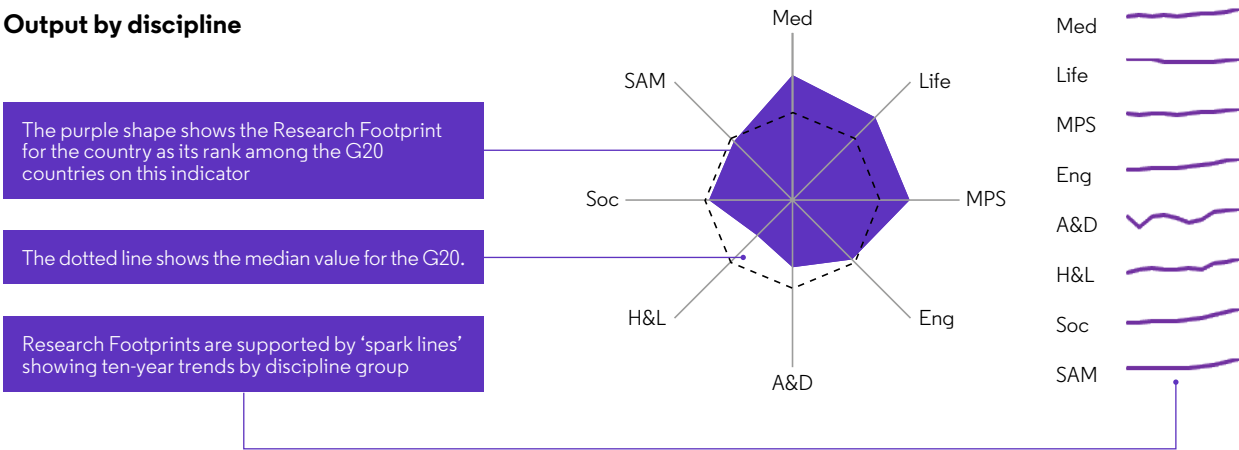
Open Access (OA) research publication

Open Access (OA) research publication, where the author or funder pays instead of the reader or a university library paying via journal subscription, is increasing in response to demands from research funders – including governments (see Global Research Report: The Plan S Footprint). The trends and patterns in OA research publication are shown in a graph and a Research Footprint.

Impact by discipline

The maximum value on each axis is at the outer point and other values scale from there

Each axis indicates the range of performance for a specific discipline group (see key)

The dotted line shows the world average citation impact (1.0)

The purple shape shows the actual impact of the country in each subject area

Output by discipline

The purple shape shows the Research Footprint for the country as its rank among the G20 countries on this indicator

The dotted line shows the median value for the G20.

Research Footprints are supported by 'spark lines' showing ten-year trends by discipline group

Output and Open Access

The dotted line shows the median value for the G20

The purple shape shows the Research Footprint for the country as its rank among the G20 countries on this indicator.

Output and Open Access

- Trends in national OA output
- OA as a share of total output
- G20 average OA papers per year

Argentina
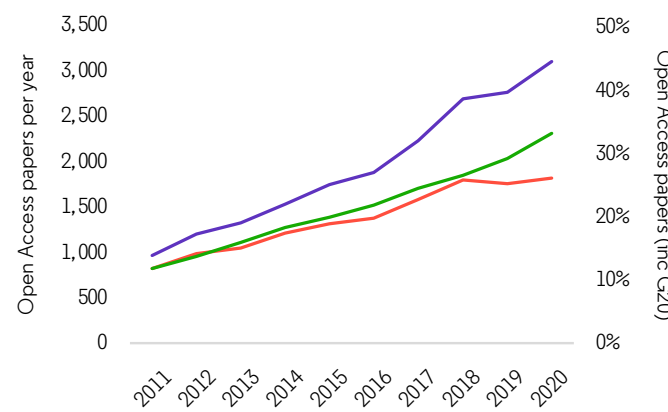
Researchers **84,284**	Female researchers **45,311**	
Population **44,044,811**	Researchers/1000 population **1.91**	Women as % researchers **53.8**
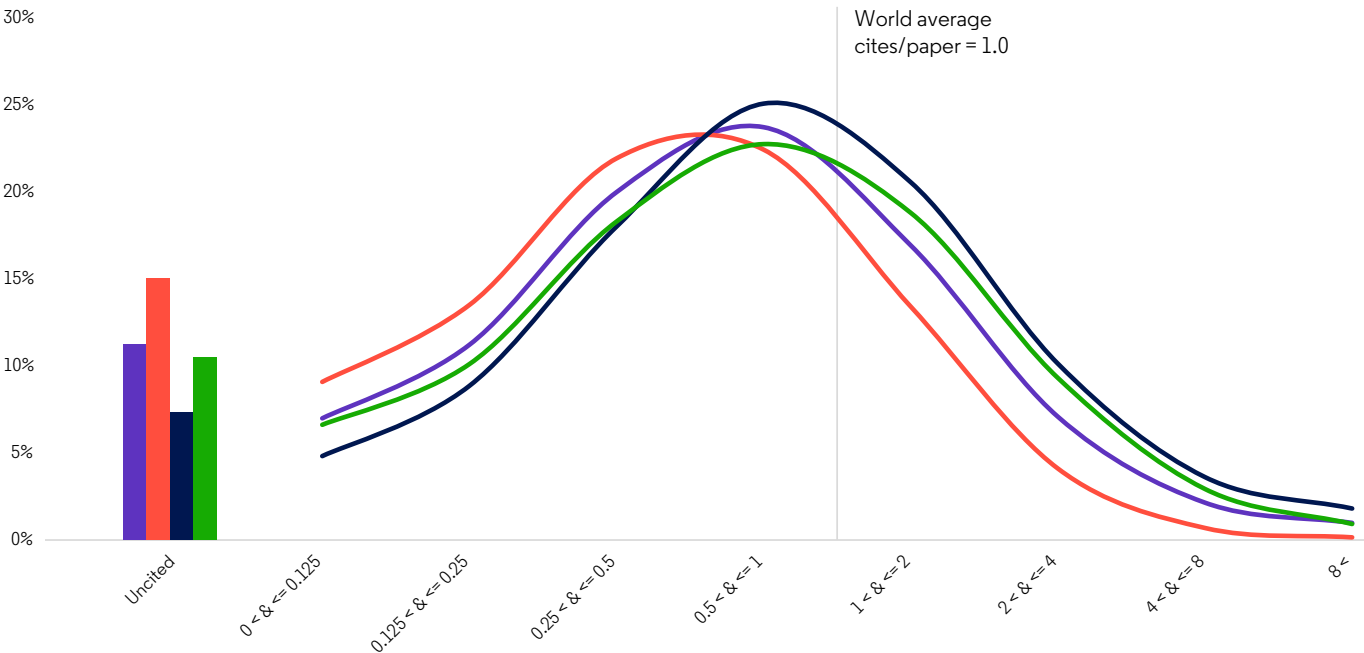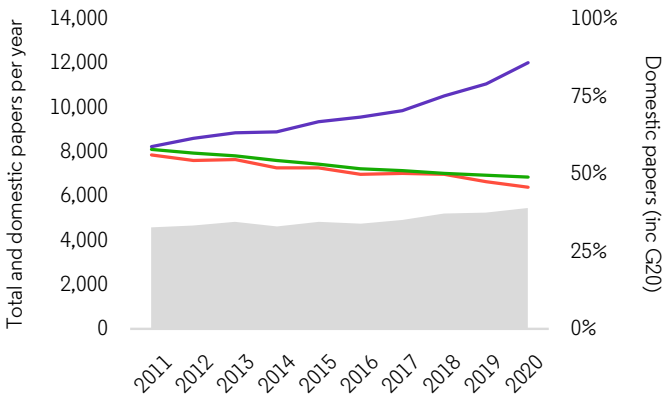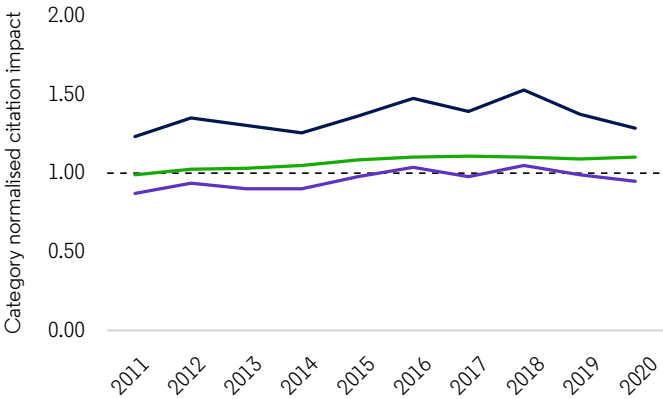
GDP (PPP US$ billions) **1039.3**	GERD (PPP US$ billions) **5.8**	GERD/GDP (%) **0.56**
Patents **815**	BERD (PPP US$ billions) **1.6**	Patents/BERD **520.7**

Impact profile
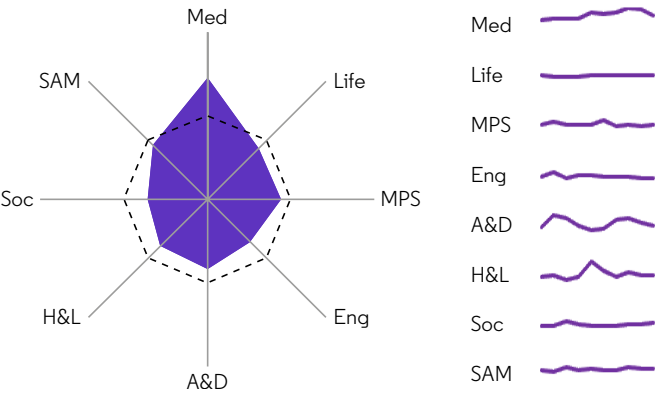
World average cites/paper = 1.0

	Papers	CNCI	% > world average	% in top 10%
■ Argentina total	96,518	0.96	27.1%	8.2%
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Impact by discipline

Output by discipline

Output and Open Access


Output and Open Access

Output and collaboration

Impact and collaboration
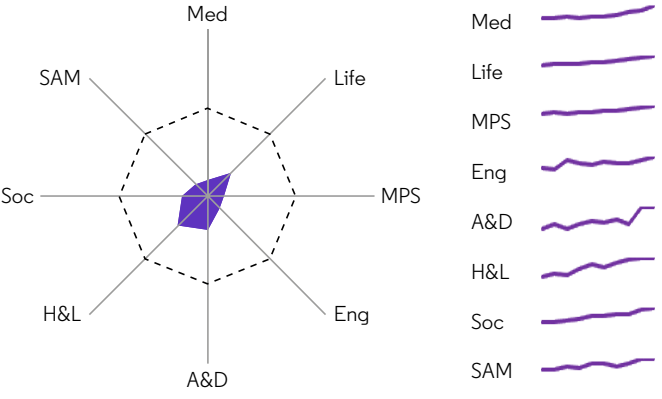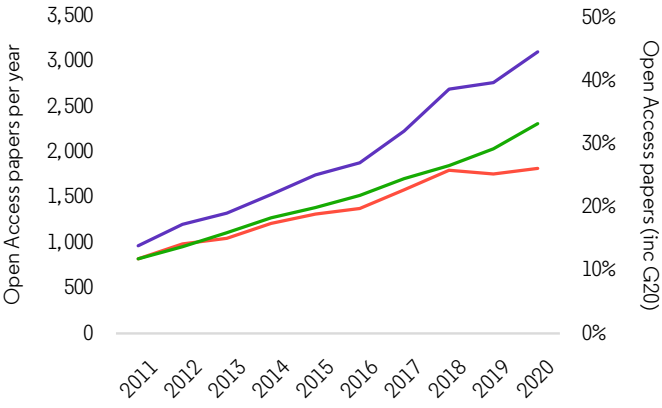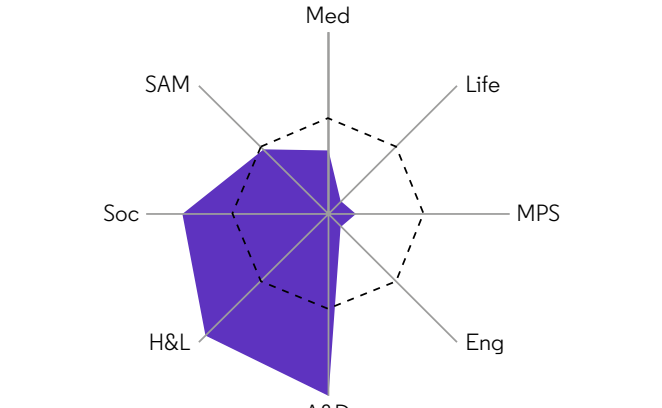
Output by GERD
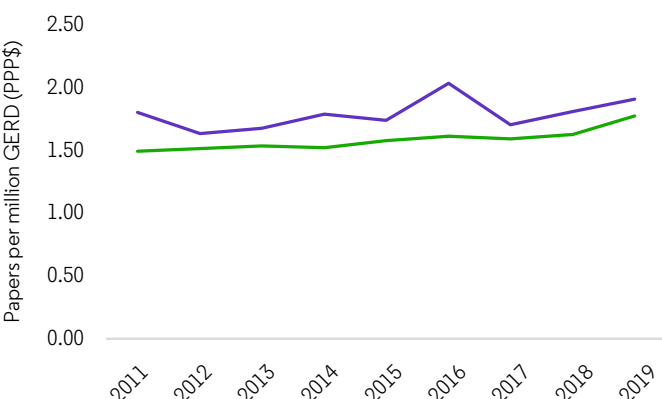
Output by researcher

Australia

Researchers	Female researchers	
–	–	
Population	**Researchers/1000 population**	**Women as % researchers**
25,687,041	–	–

GDP (PPP US$ billions)	GERD (PPP US$ billions)	GERD/GDP (%)
1192.8	**22.4**	**1.88**
Patents	**BERD (PPP US$ billions)**	**Patents/BERD**
12,611	**11.8**	**1068.6**

Impact profile

World average cites/paper = 1.0
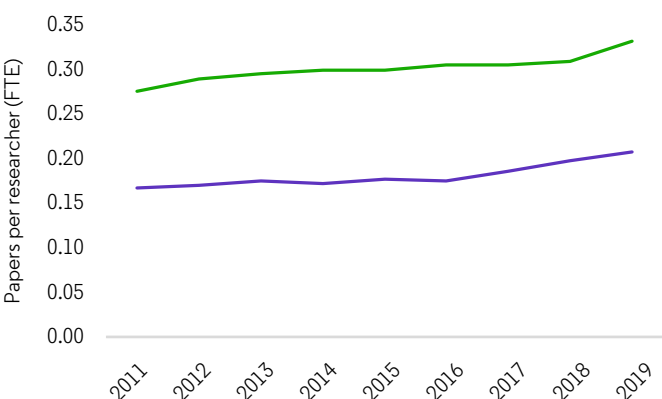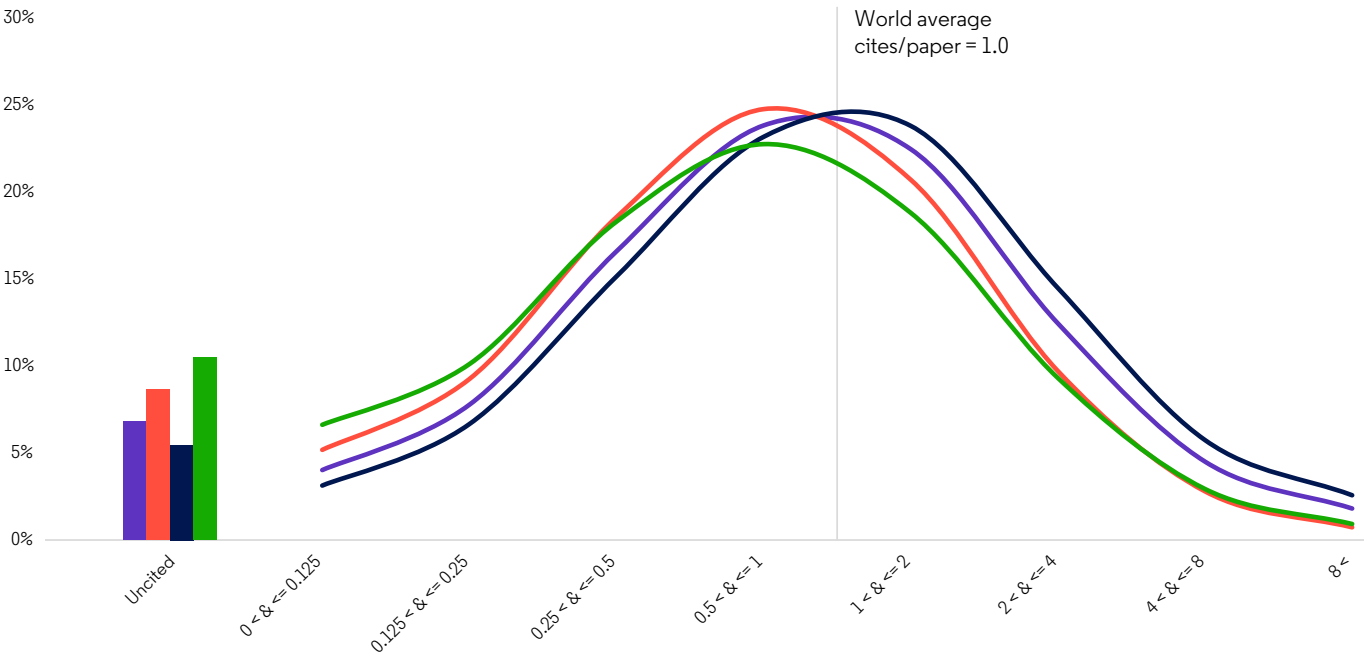
	Papers	CNCI	% > world average	% in top 10%
■ Australia total	656,467	1.37	41.1%	15.6%
■ Australia domestic	279,206	0.99	33.8%	10.4%
■ Australia international	377,261	1.65	46.5%	19.5%
■ G20 total dataset	15,175,599	0.99	31.9%	10.7%

Output and collaboration

Impact and collaboration

Impact by discipline
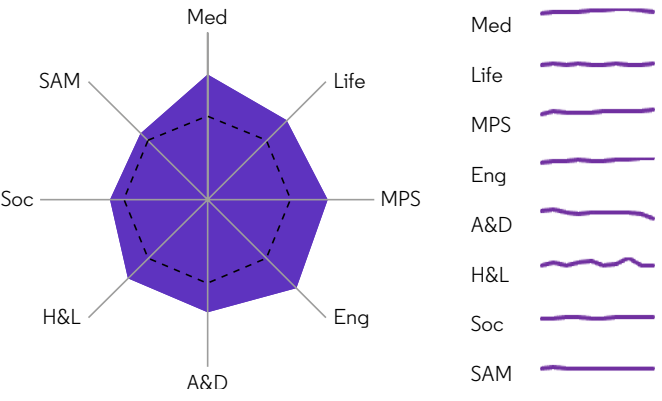
Output by discipline
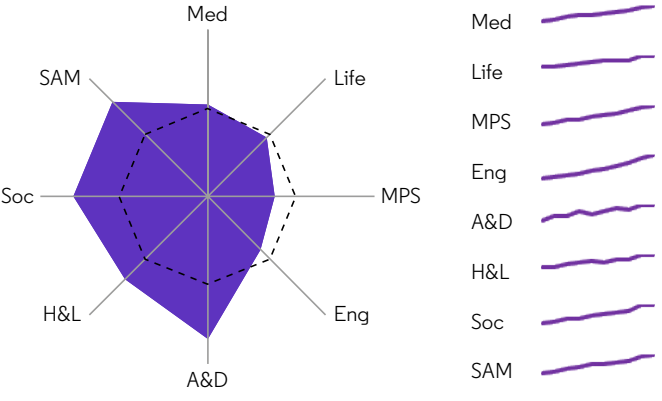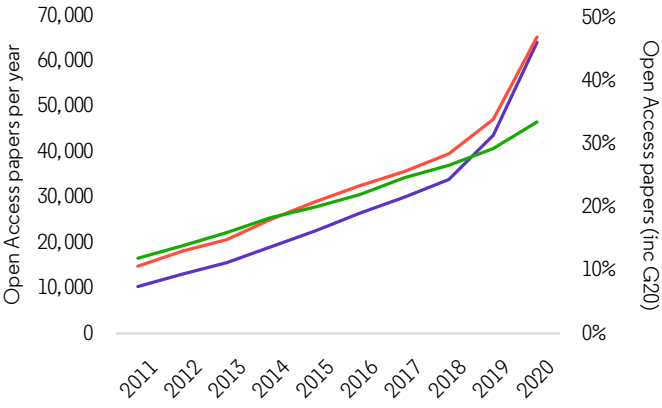

Output and Open Access
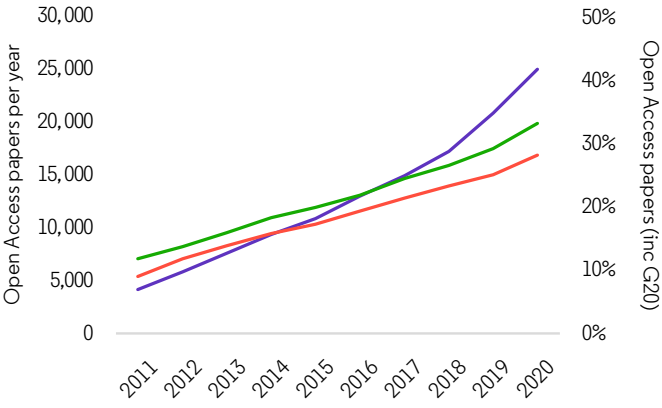
Output and Open Access
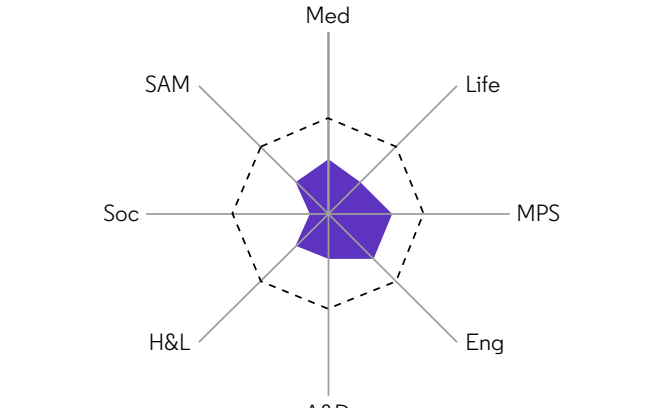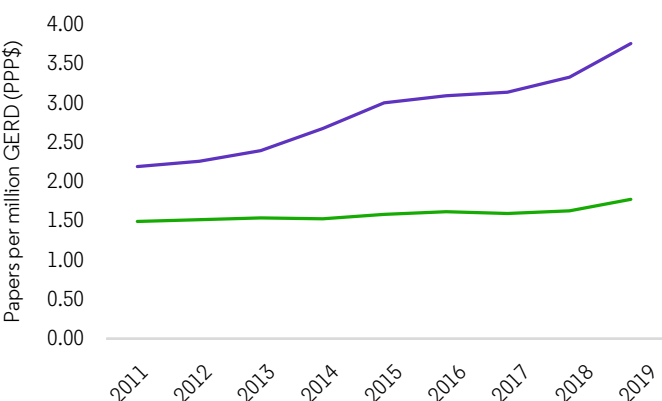
Output by GERD

Output by researcher

Brazil

Researchers	**Female researchers**	
–	–	
Population	**Researchers/1000 population**	**Women as % researchers**
212,559,409	–	–

GDP (PPP US$ billions)	**GERD (PPP US$ billions)**	**GERD/GDP (%)**
3153.6	–	–
Patents	**BERD (PPP US$ billions)**	**Patents/BERD**
7,458	–	–

Impact profile

World average cites/paper = 1.0
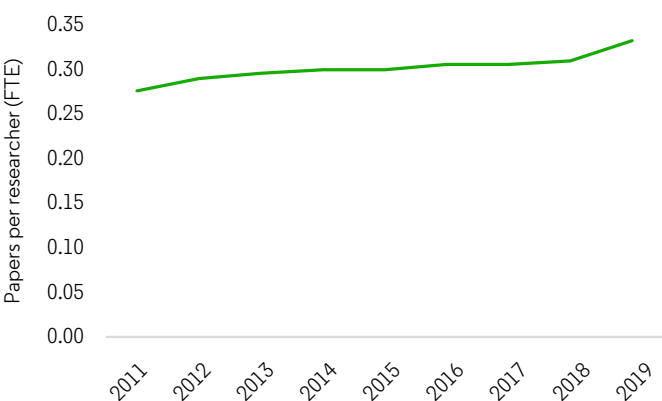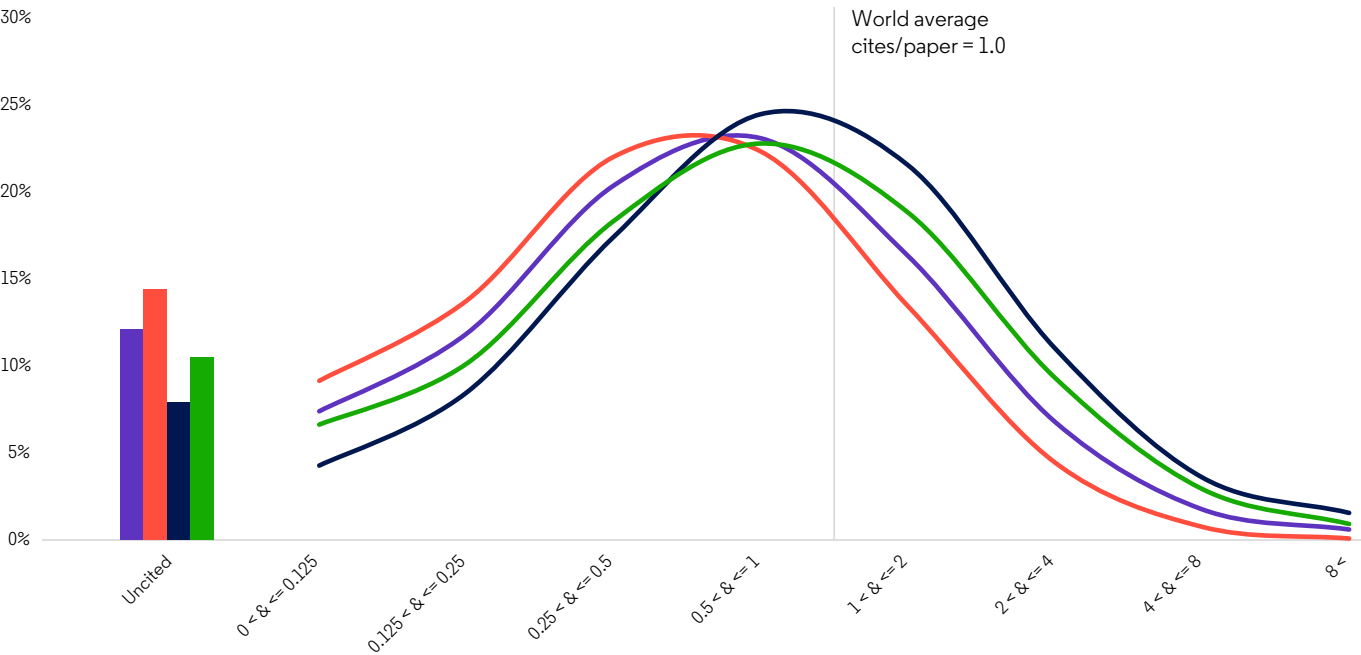
	Papers	CNCI	% > world average	% in top 10%
■ Brazil total	475,382	0.84	25.5%	7.3%
■ Brazil domestic	305,725	0.59	18.8%	4.0%
■ Brazil international	169,657	1.29	37.7%	13.4%
■ G20 total dataset	15,175,599	0.99	31.9%	10.7%
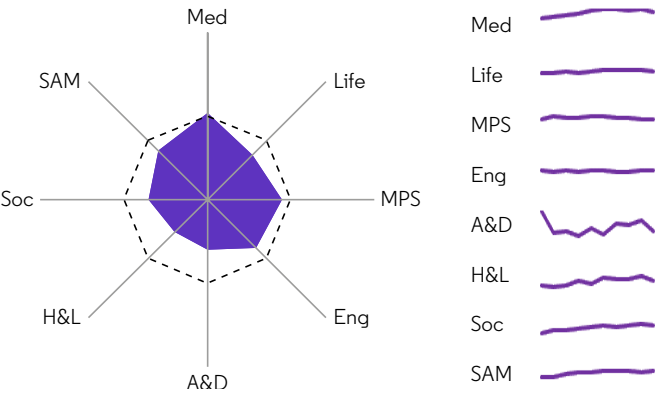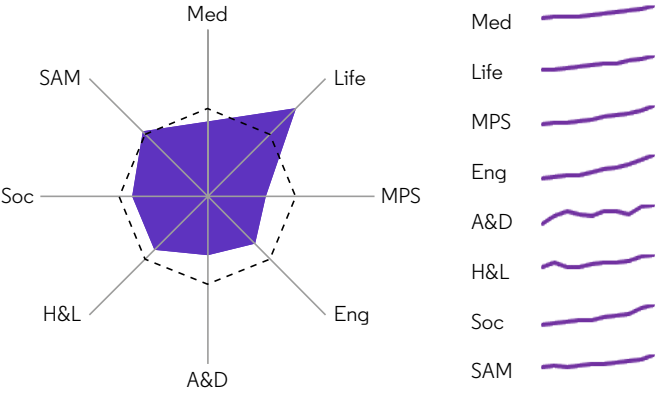
Output and collaboration

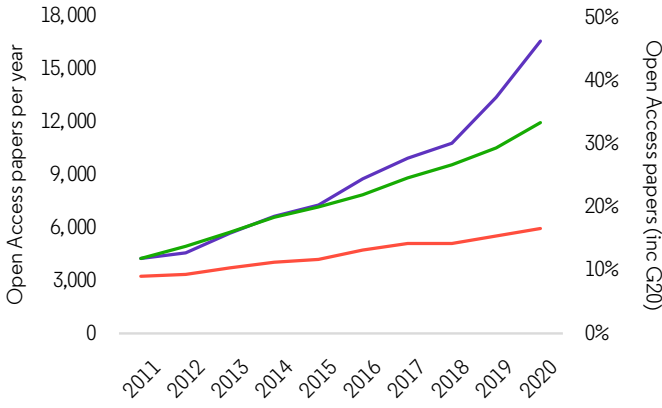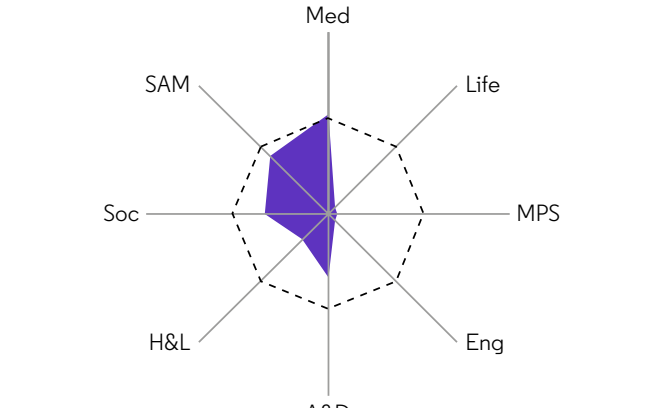## Impact and collaboration

Impact by discipline

Output by discipline
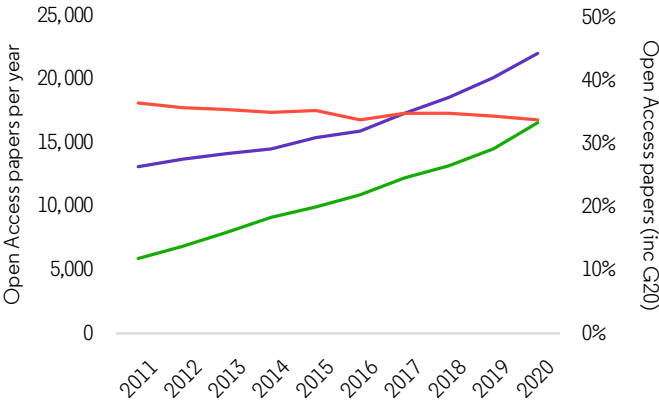
Output and Open Access

Output and Open Access
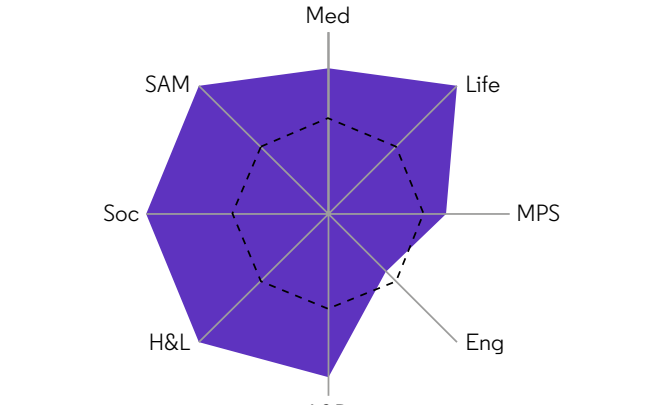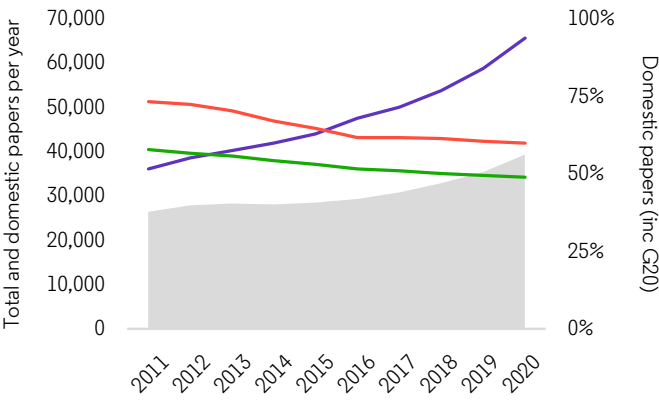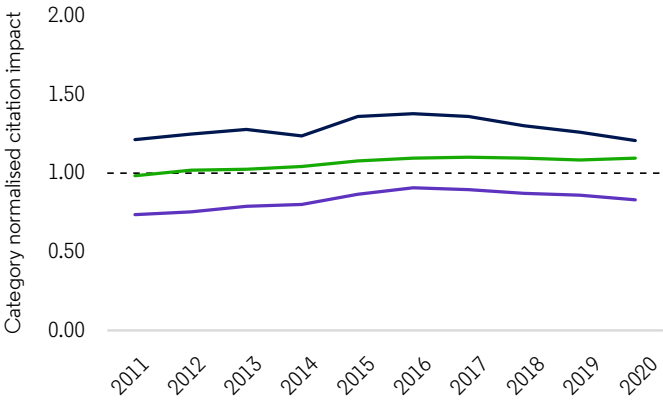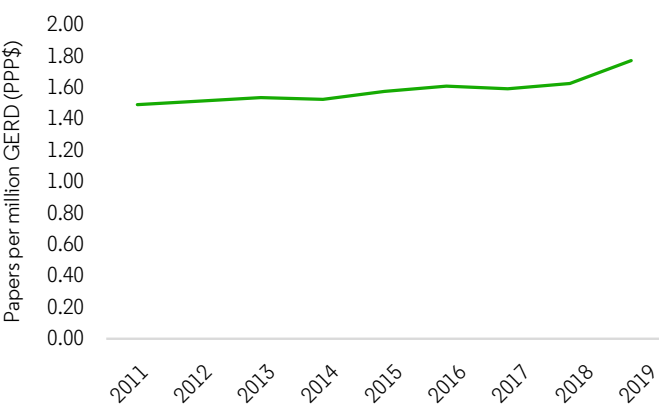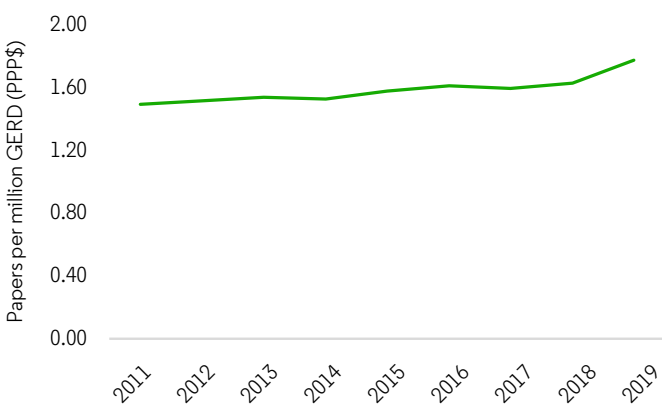

Output by GERD

Output by researcher

Canada
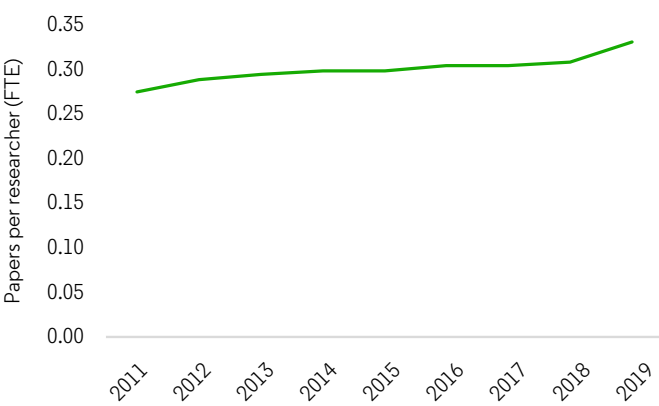
Researchers –	Female researchers –	
Population **38,005,238**	Researchers/1000 population –	Women as % researchers –

GDP (PPP US$ billions) **1904.5**	GERD (PPP US$ billions) **29.3**	GERD/GDP (%) **1.54**
Patents **25,174**	BERD (PPP US$ billions) **15.0**	Patents/BERD **1673.3**

Impact profile

World average
cites/paper = 1.0
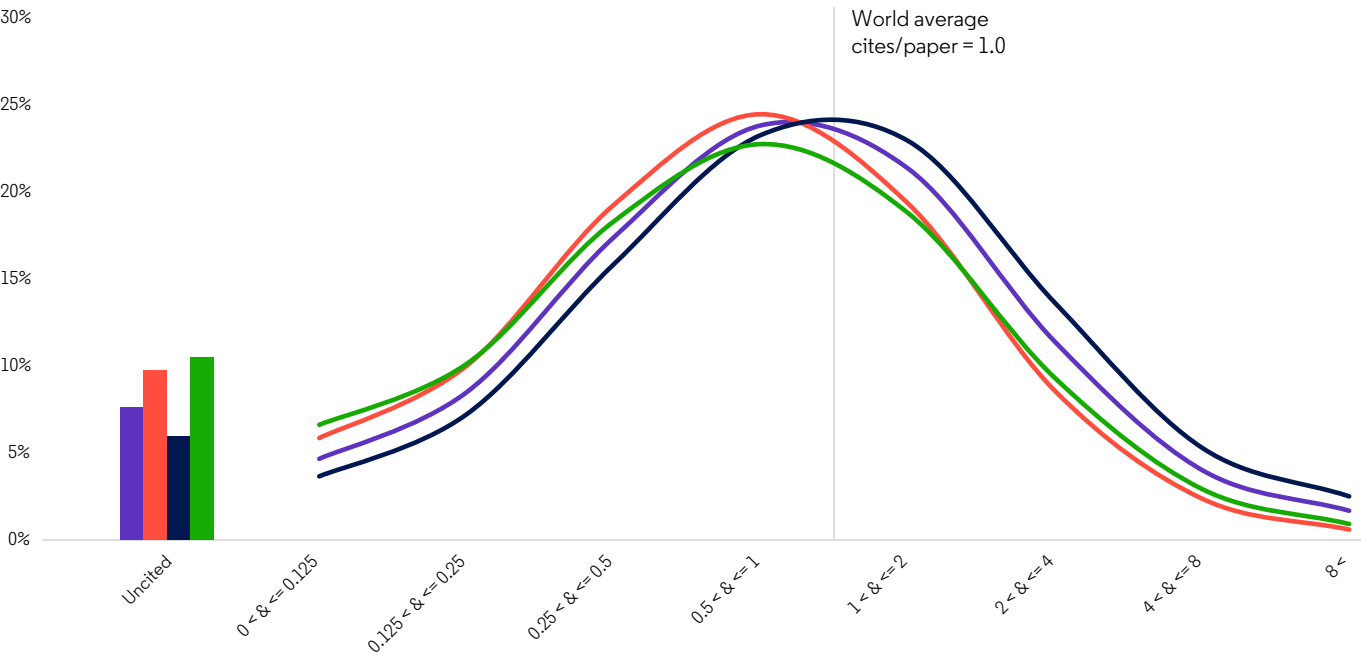
	Papers	CNCI	% > world average	% in top 10%
■ Canada total	722,410	1.29	38.3%	14.3%
■ Canada domestic	322,201	0.91	30.9%	9.2%
■ Canada international	400,209	1.60	44.3%	18.4%
■ G20 total dataset	15,175,599	0.99	31.9%	10.7%
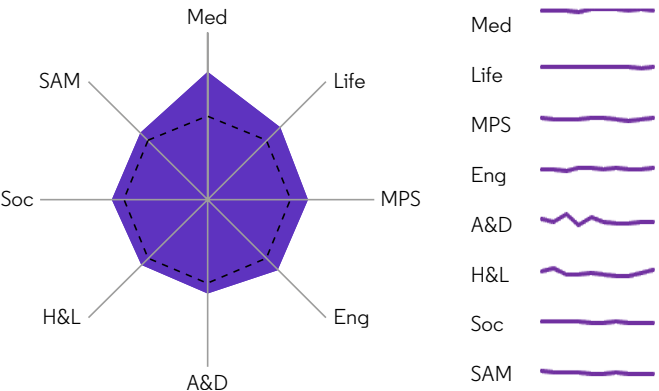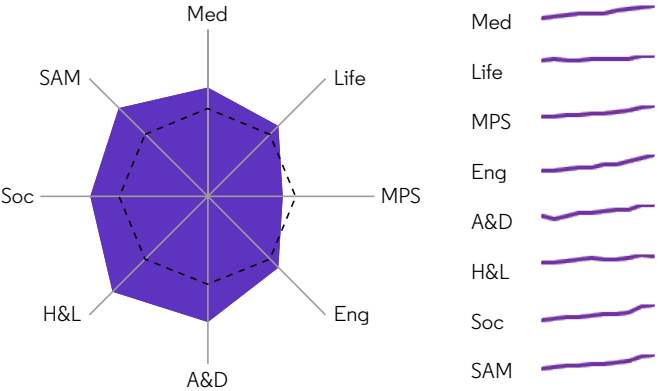
Impact by discipline

Output by discipline

Output and Open Access
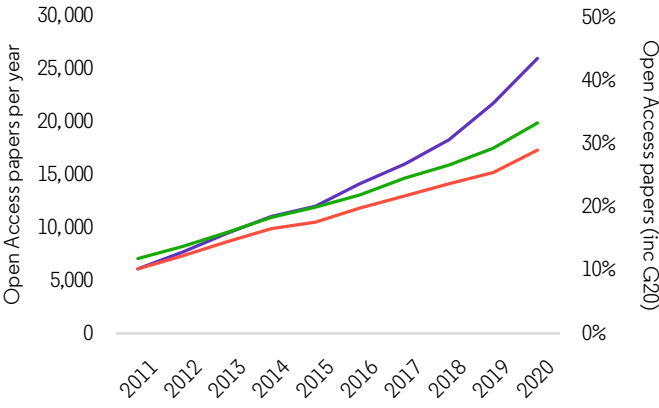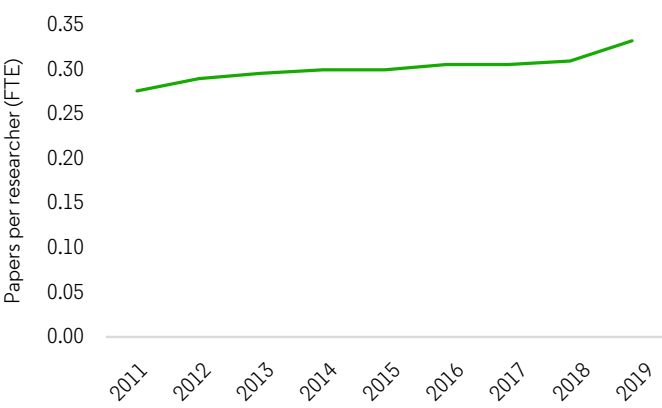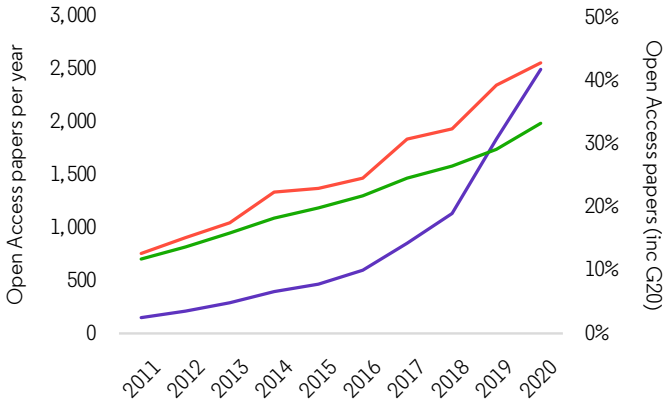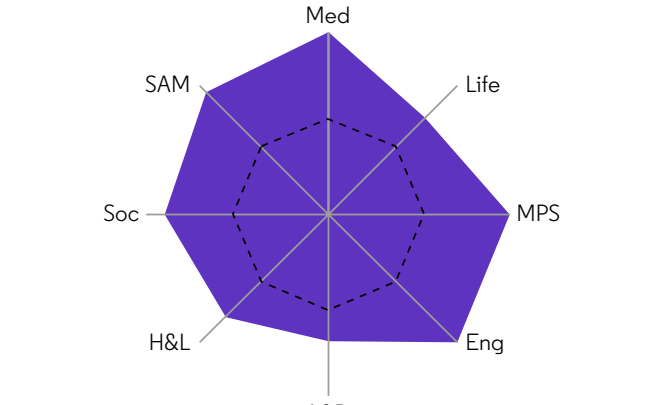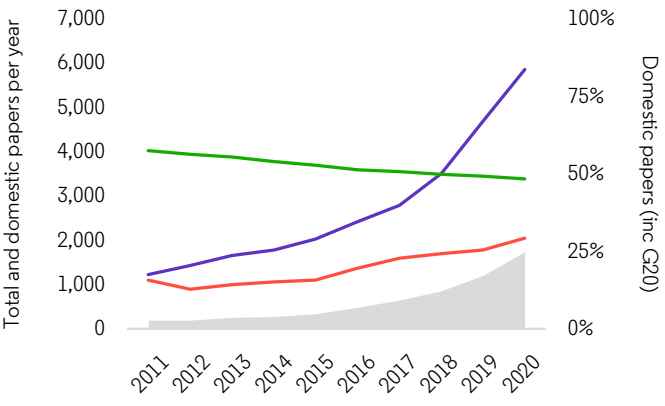

Output and Open Access
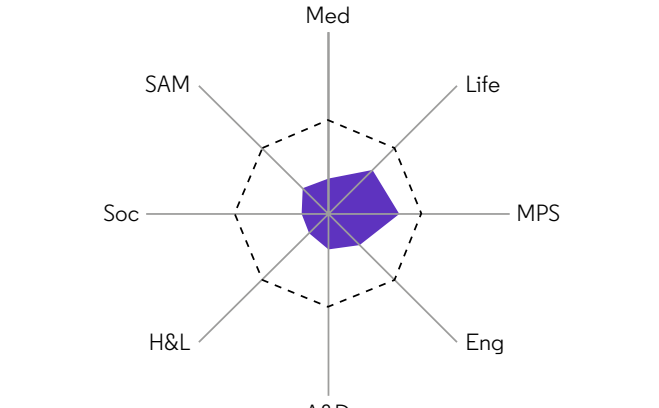
Output and collaboration
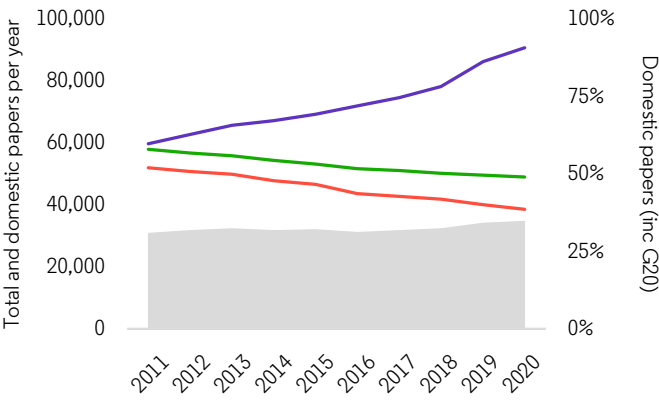
Impact and collaboration
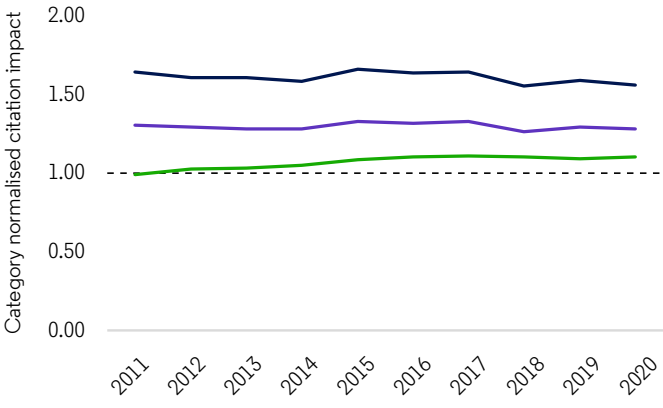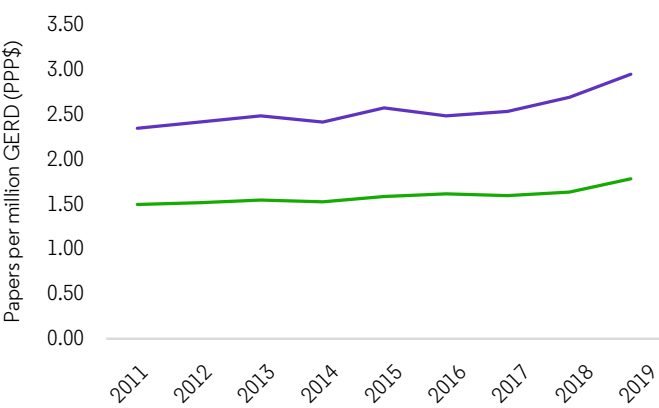
Output by GERD

Output by researcher

Mainland China
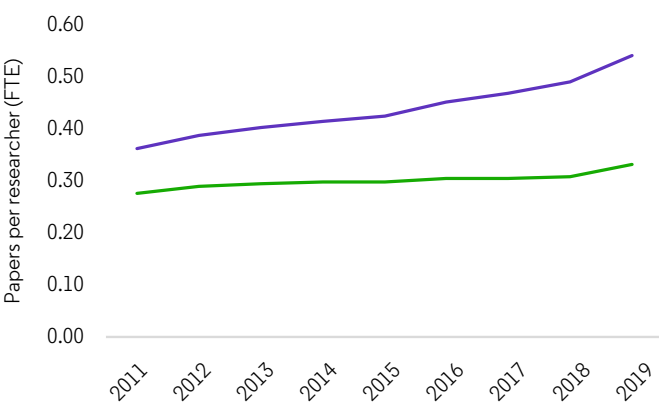
Researchers **2,069,650**	Female researchers **–**	
Population **1,350,695,000**	Researchers/1000 population **1.53**	Women as % researchers **–**

GDP (PPP US$ billions) **23443.7**	GERD (PPP US$ billions) **525.7**	GERD/GDP (%) **2.24**
Patents **1,328,067**	BERD (PPP US$ billions) **401.7**	Patents/BERD **3305.9**

Impact profile

World average cites/paper = 1.0
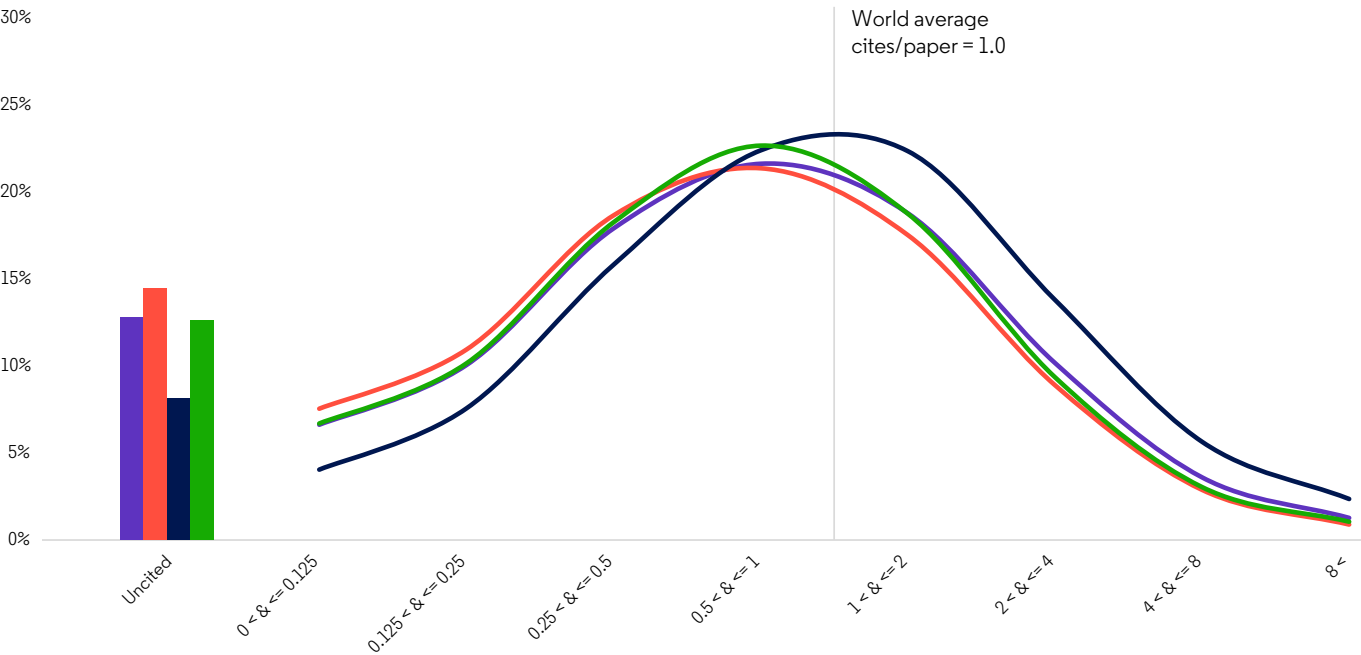
	Papers	CNCI	% > world average	% in top 10%
Mainland China total	3,262,654	1.05	33.4%	12.0%
Mainland China domestic	2,408,909	0.90	29.8%	9.9%
Mainland China international	853,745	1.46	43.8%	18.0%
G20 total dataset	15,175,599	0.99	31.9%	10.7%
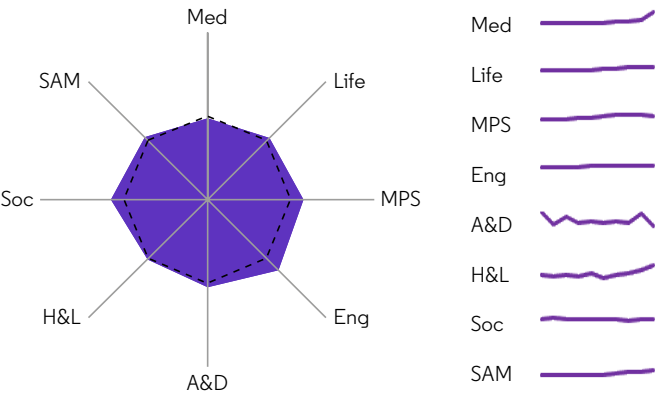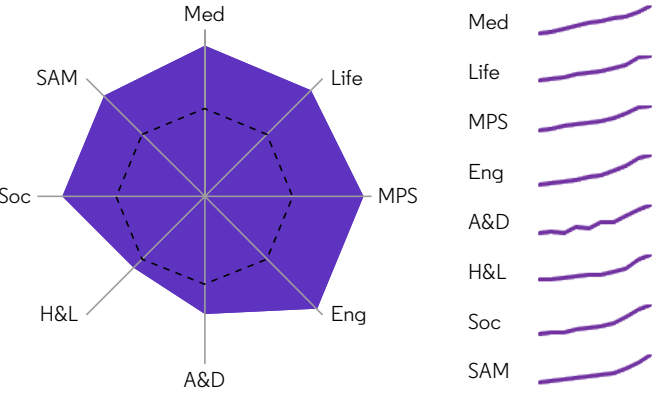
Impact by discipline

Output by discipline


Output and Open Access
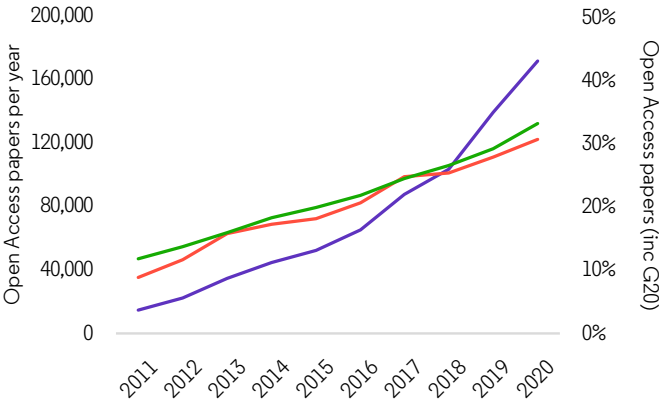

Output and Open Access
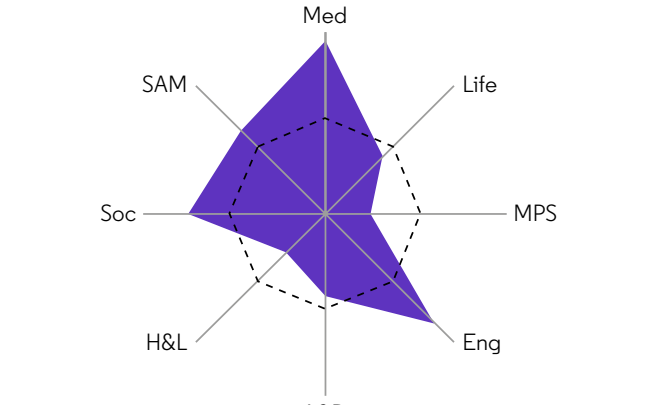
Output and collaboration
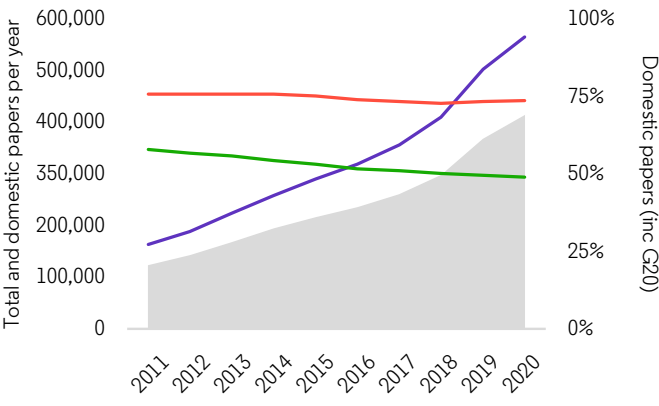
Impact and collaboration
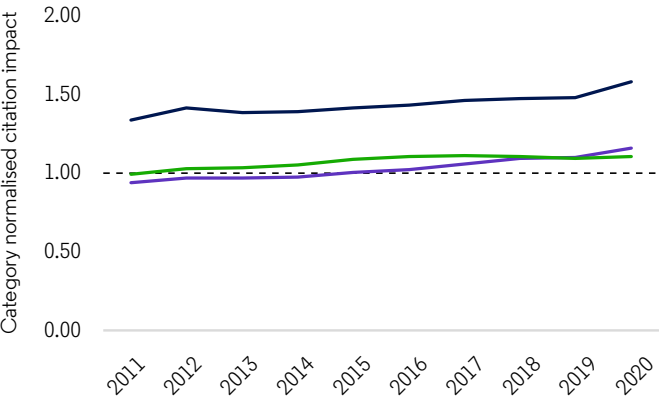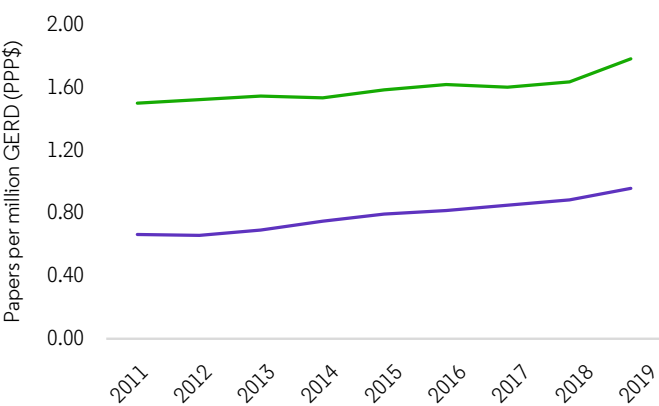
Output by GERD

Output by researcher

France
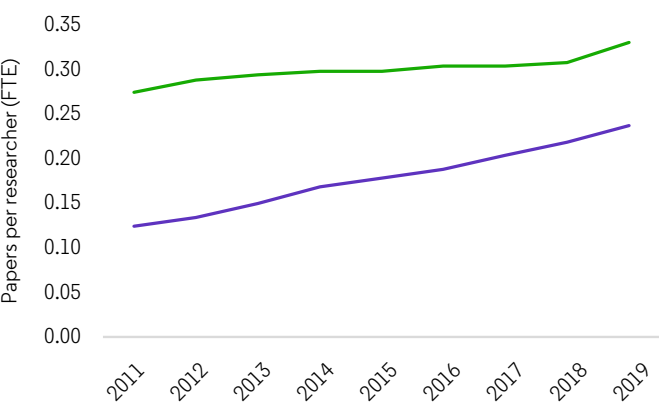
Researchers 429,959	**Female researchers** –	
Population 67,101,930	**Researchers/1000 population** 6.41	**Women as % researchers** –

GDP (PPP US$ billions) 3320.6	**GERD (PPP US$ billions)** 72.8	**GERD/GDP (%)** 2.19
Patents 67,390	**BERD (PPP US$ billions)** 47.8	**Patents/BERD** 1409.9

Impact profile
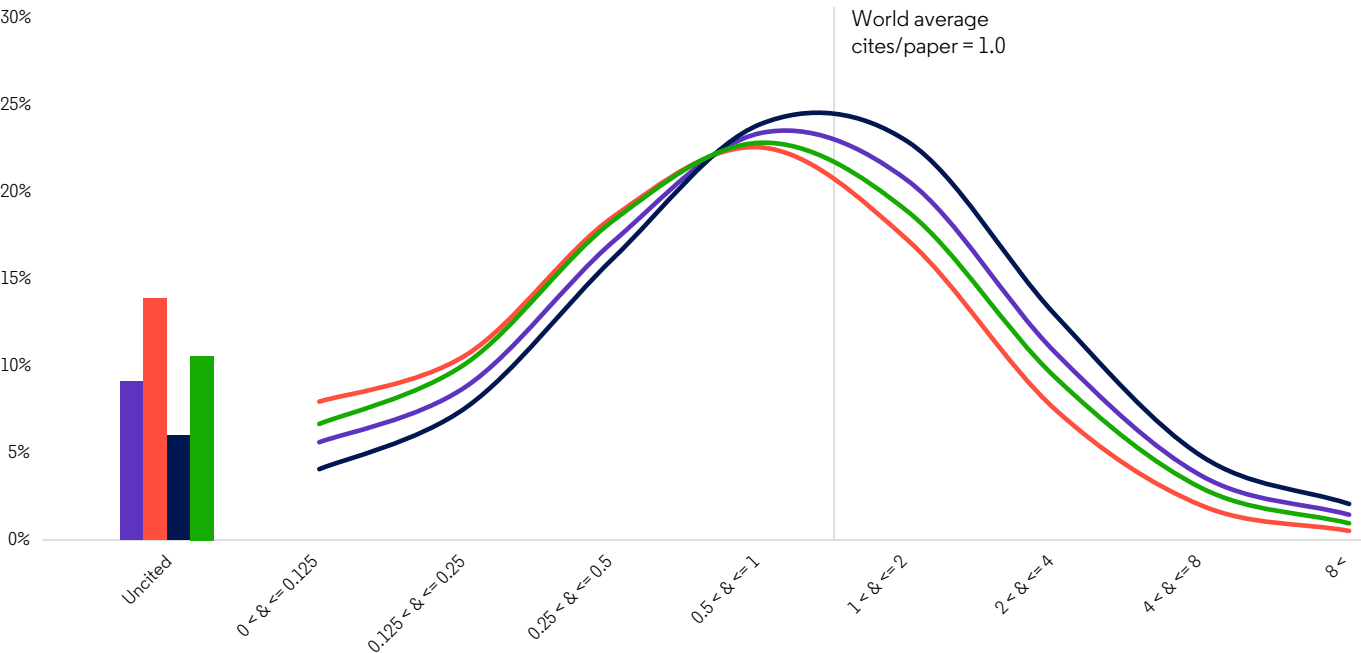
|	Papers	CNCI	% > world average	% in top 10%
France total	775,189	1.21	36.3%	13.2%
France domestic	308,863	0.80	27.0%	7.9%
France international	466,326	1.48	42.5%	16.8%
G20 total dataset	15,175,599	0.99	31.9%	10.7%
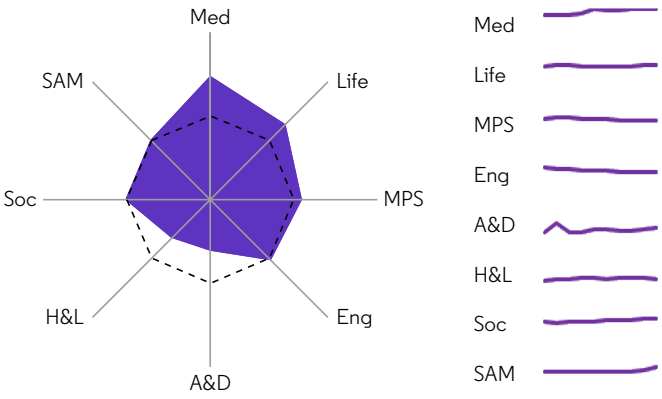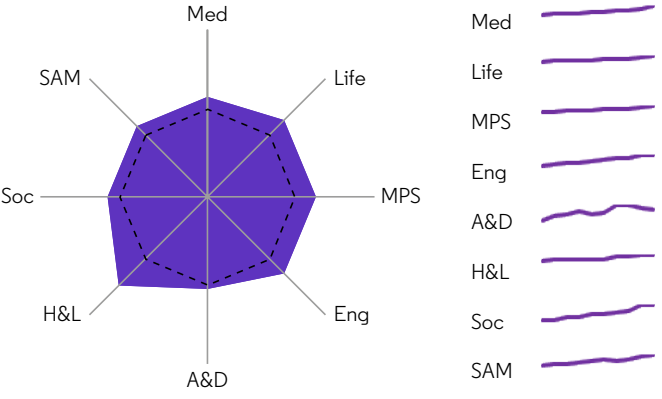
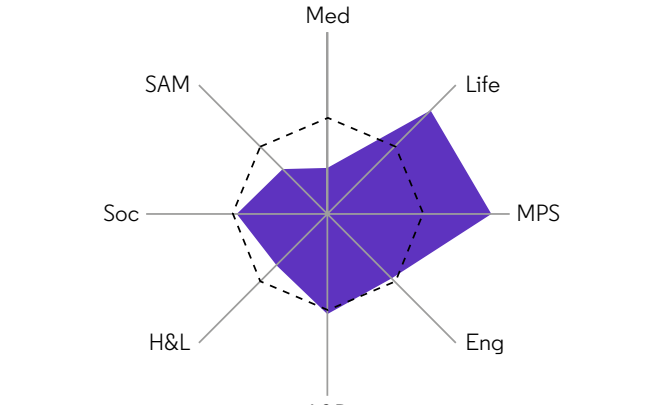## Impact by discipline

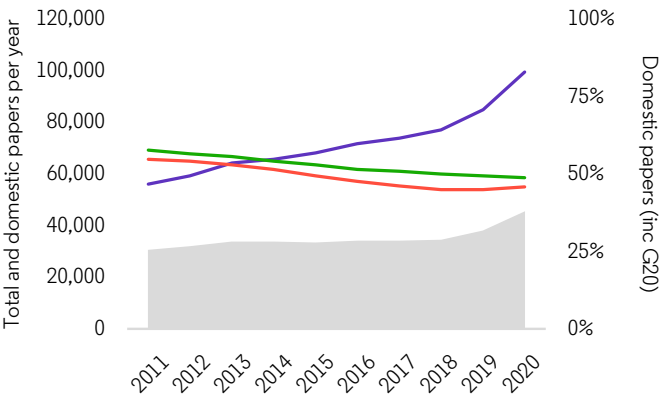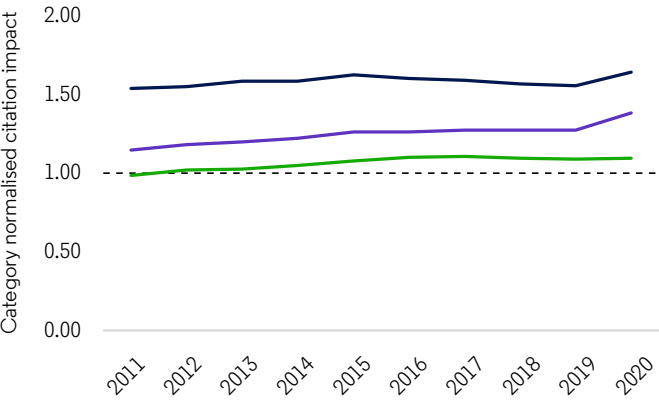## Output by discipline

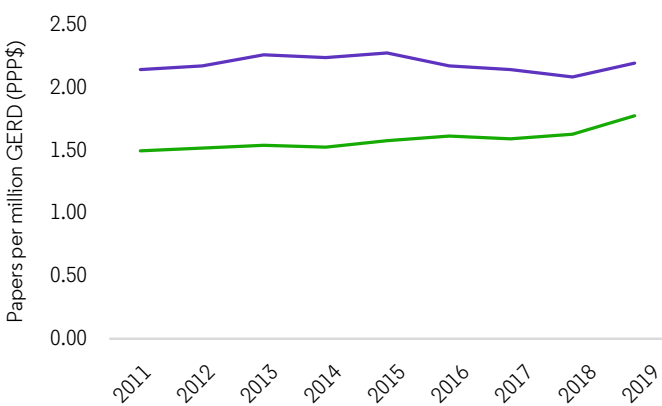## Output and Open Access
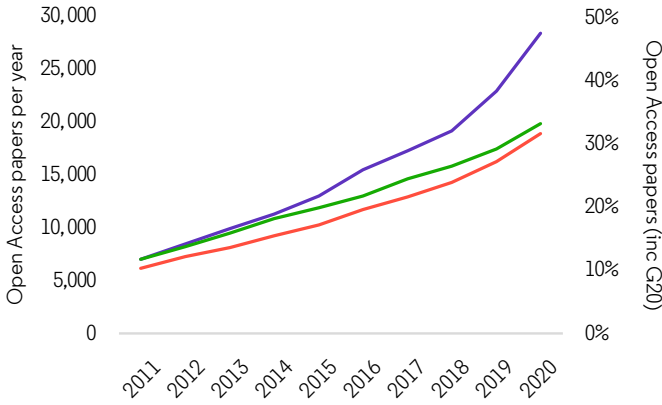
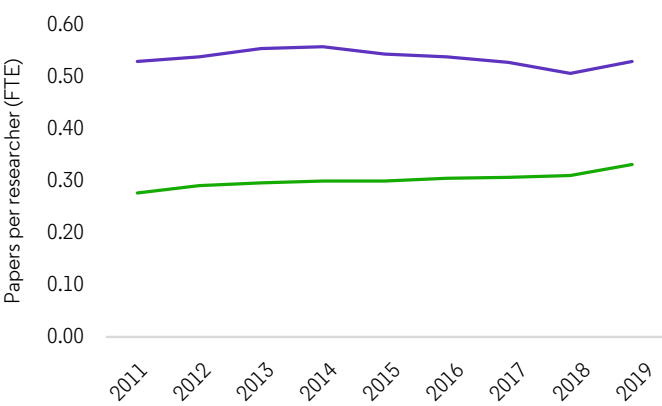## Output and Open Access
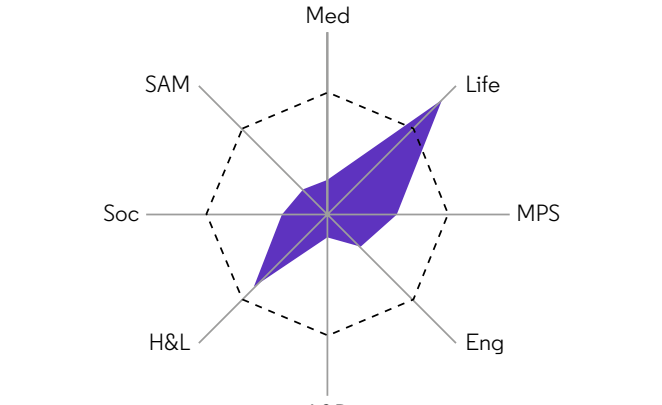
Output and collaboration
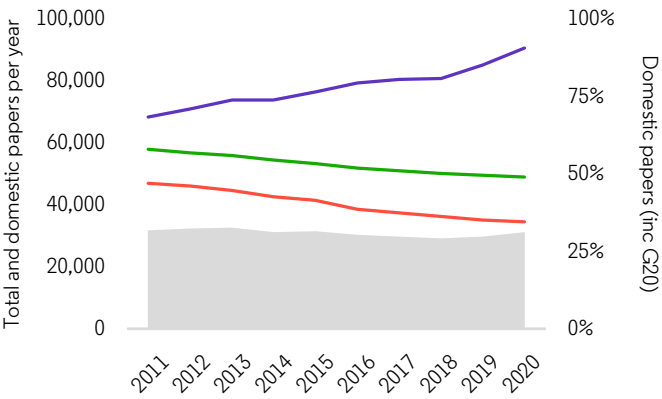
Impact and collaboration
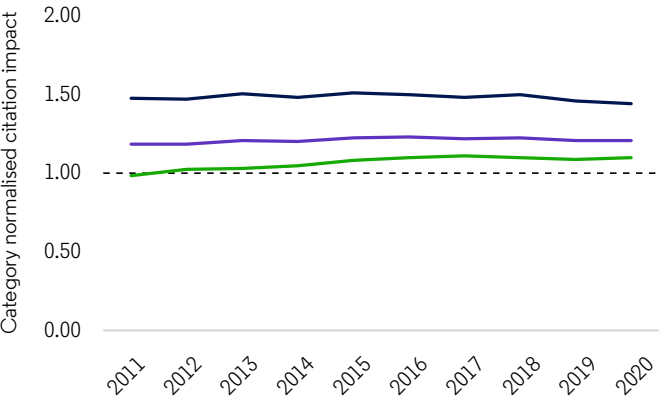
Output by GERD
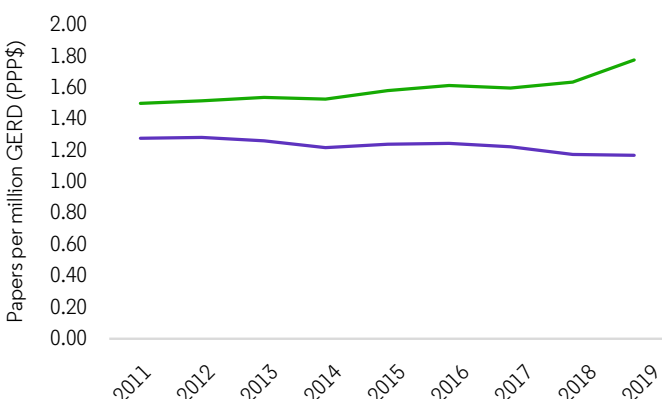
Output by researcher

Germany
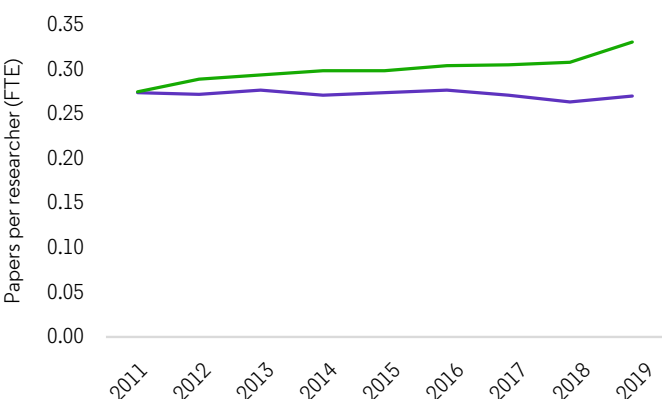
Researchers 623,125	**Female researchers** 173,700	
Population 82,657,002	**Researchers/1000 population** 7.54	**Women as % researchers** 27.9

GDP (PPP US$ billions) 4644.2	**GERD (PPP US$ billions)** 147.5	**GERD/GDP (%)** 3.18
Patents 178,359	**BERD (PPP US$ billions)** 101.7	**Patents/BERD** 1753.0

Impact profile
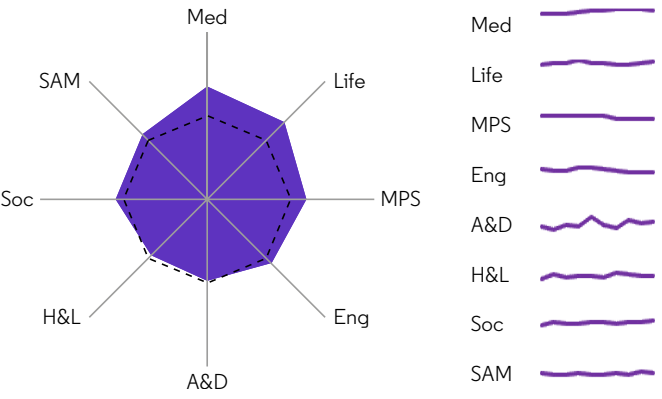
World average cites/paper = 1.0

	Papers	CNCI	% > world average	% in top 10%
■ Germany total	1,137,570	1.23	37.5%	13.9%
■ Germany domestic	490,636	0.86	28.7%	8.7%
■ Germany international	646,934	1.51	44.2%	17.8%
■ G20 total dataset	15,175,599	0.99	31.9%	10.7%

Impact by discipline

Output by discipline

Output and Open Access

Output and Open Access

Output and collaboration

Impact and collaboration
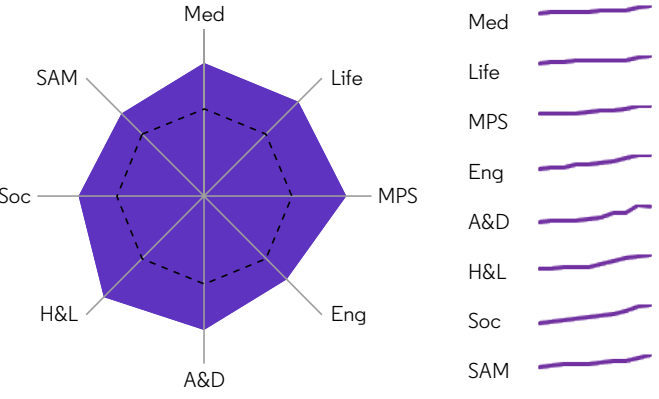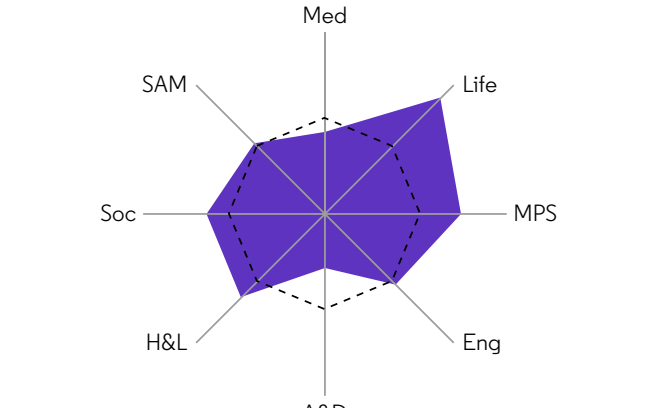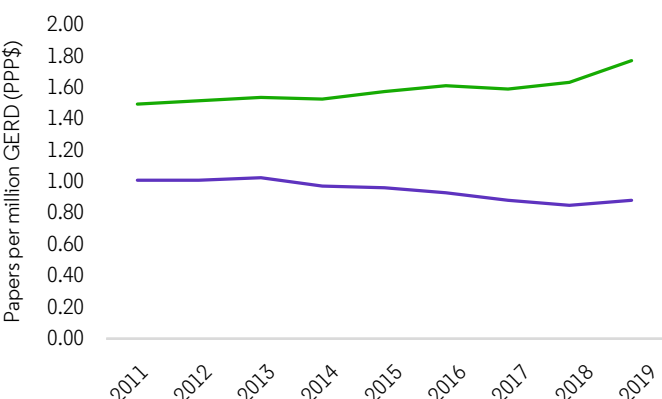
Output by GERD

Output by researcher

India
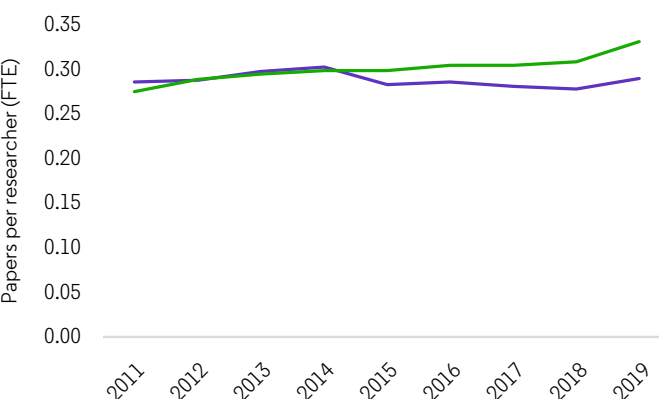
Researchers –	**Female researchers** –	
Population 1,380,004,385	**Researchers/1000 population** –	**Women as % researchers** –

GDP (PPP US$ billions) 8907.0	**GERD (PPP US$ billions)** –	**GERD/GDP (%)** –
Patents 34,052	**BERD (PPP US$ billions)** –	**Patents/BERD** –

Impact profile

World average cites/paper = 1.0
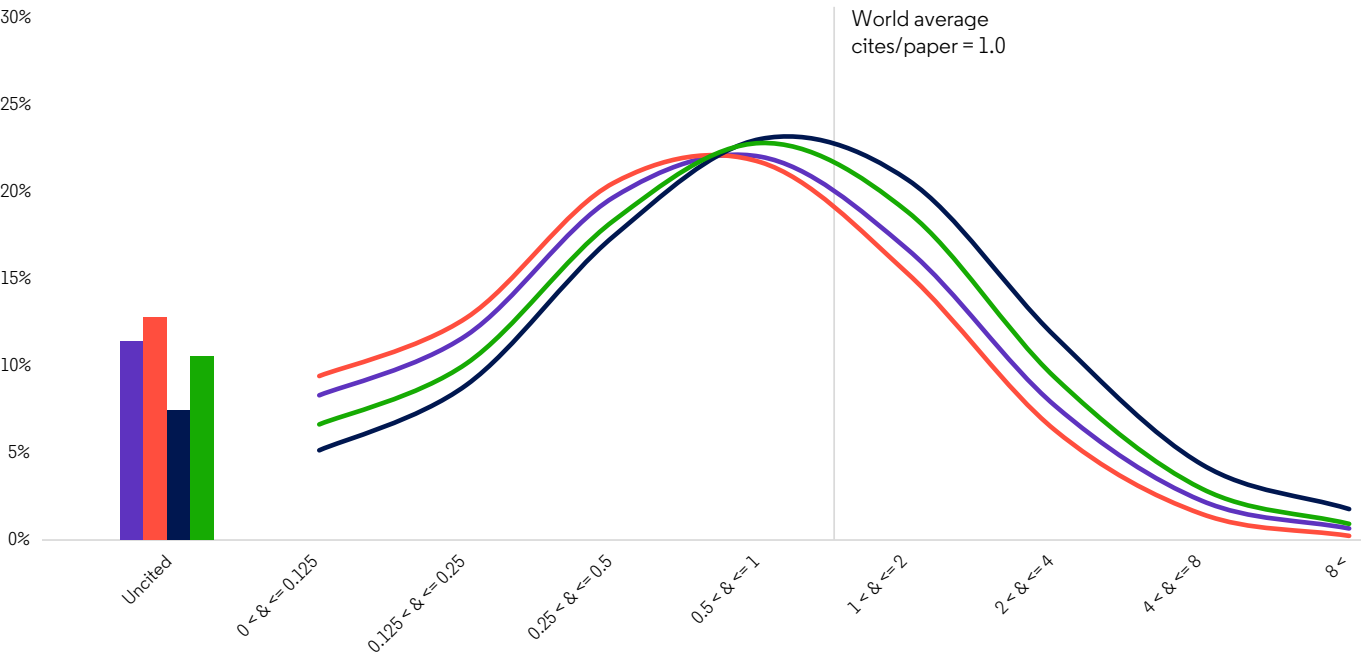
|	Papers	CNCI	% > world average	% in top 10%
India total	674,380	0.86	27.2%	8.5%
India domestic	499,321	0.70	23.3%	6.3%
India international	175,059	1.33	38.3%	14.8%
G20 total dataset	15,175,599	0.99	31.9%	10.7%
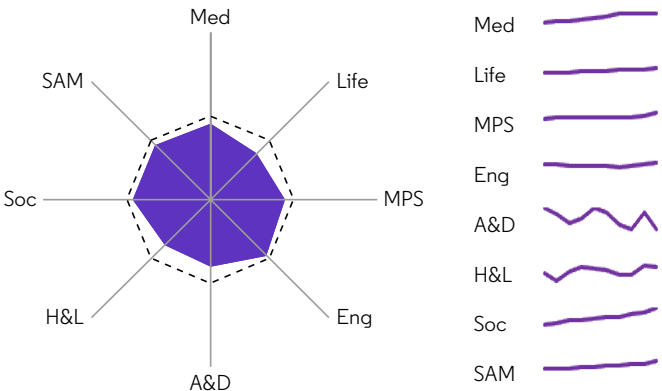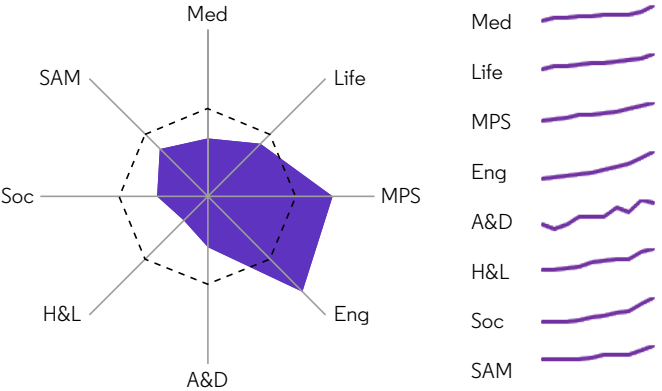
Output and collaboration

Impact and collaboration


Impact by discipline


Output by discipline

Output and Open Access

Output and Open Access
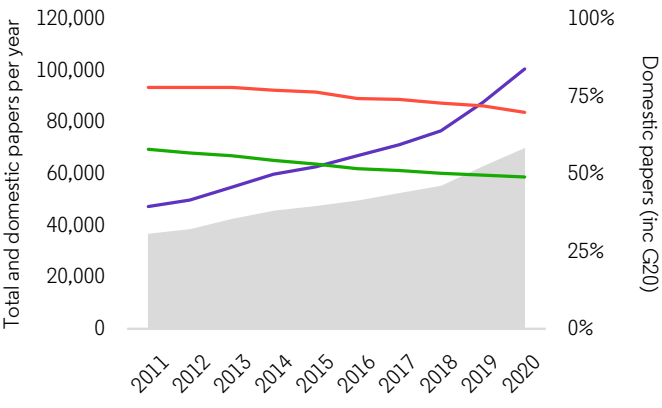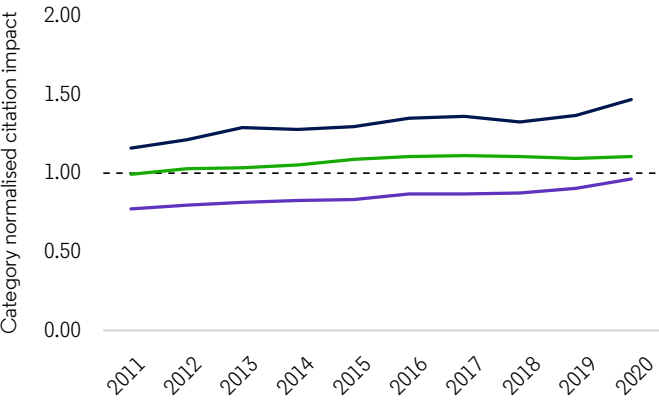
Output by GERD

Output by researcher

Indonesia

Researchers	Female researchers	GDP (PPP US$ billions)	GERD (PPP US$ billions)	GERD/GDP (%)
–	–	**3302.4**	–	–

Population	Researchers/1000 population	Women as % researchers	Patents	BERD (PPP US$ billions)	Patents/BERD
273,523,621	–	–	**3,141**	–	–

Impact profile

World average
cites/paper = 1.0
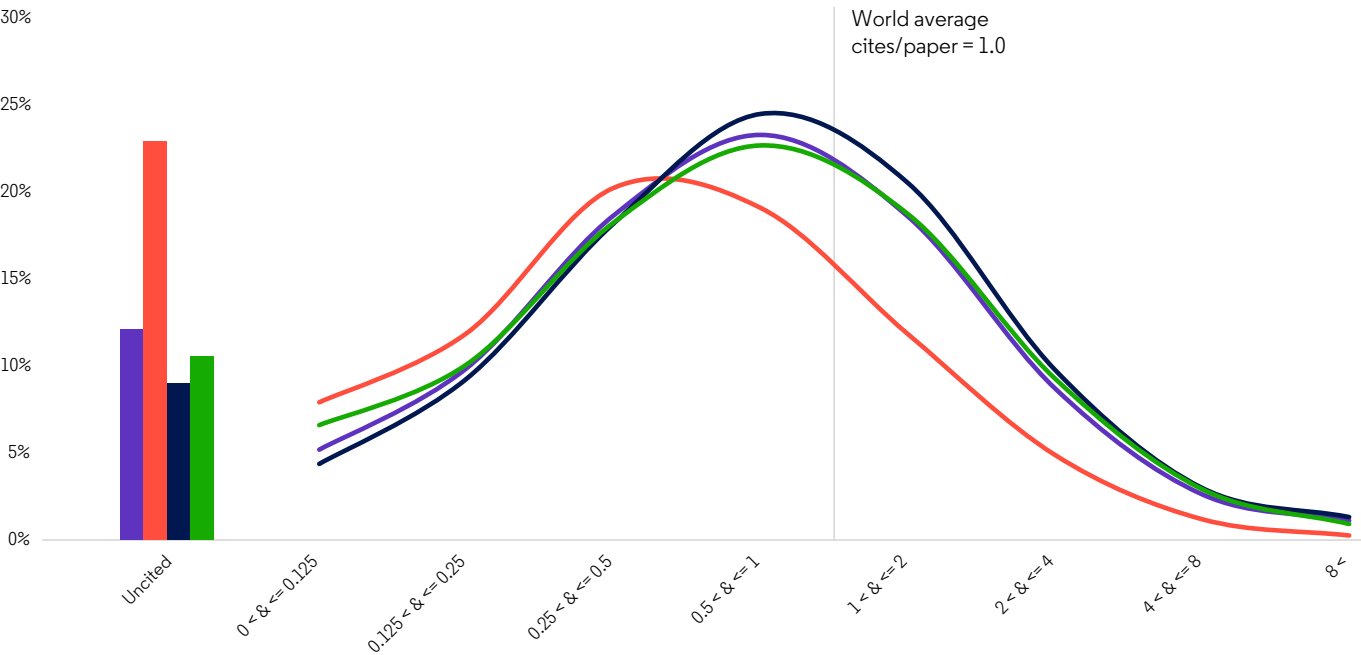
	Papers	CNCI	% > world average	% in top 10%
■ Indonesia total	27,410	1.09	31.0%	10.0%
■ Indonesia domestic	6,099	0.58	18.2%	4.5%
■ Indonesia international	21,311	1.24	34.7%	11.5%
■ G20 total dataset	15,175,599	0.99	31.9%	10.7%
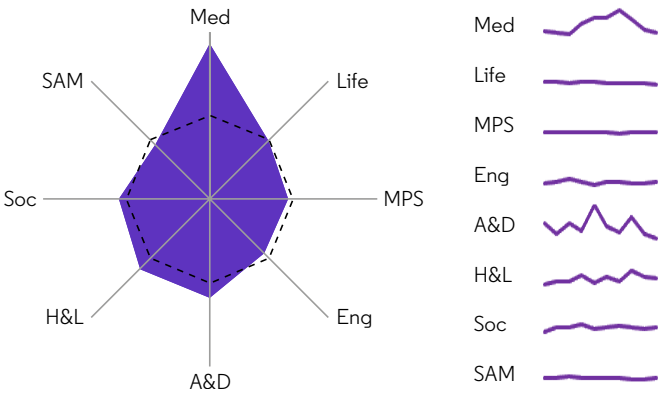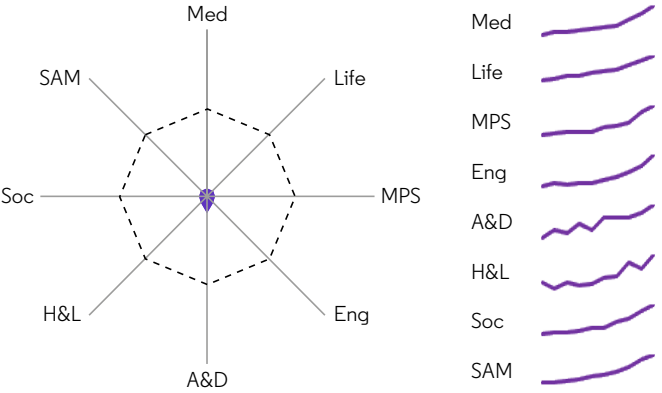
Output and collaboration

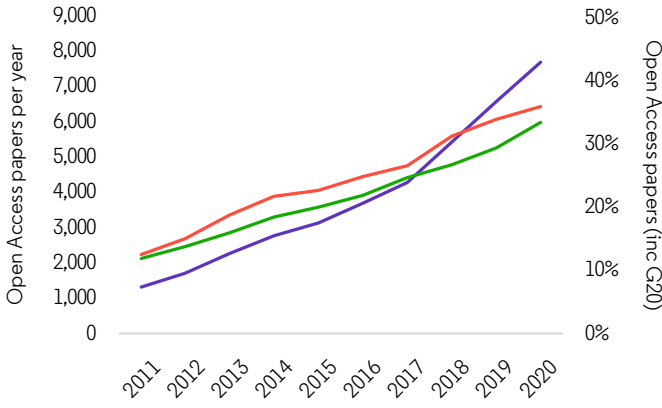## Impact and collaboration

Impact by discipline

## Output by discipline

Output and Open Access

Output and Open Access
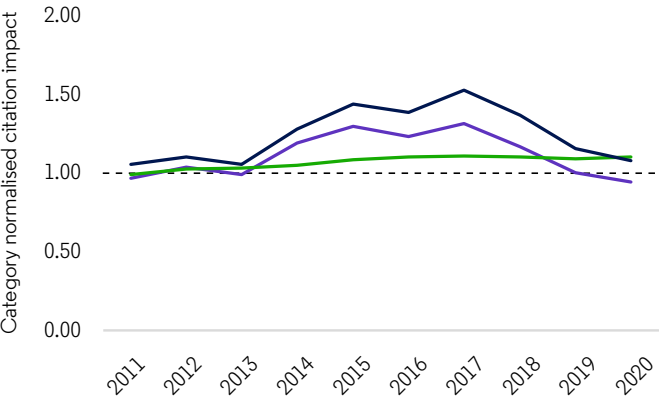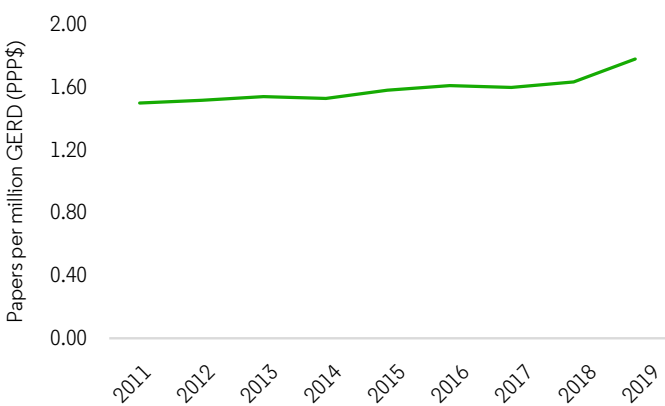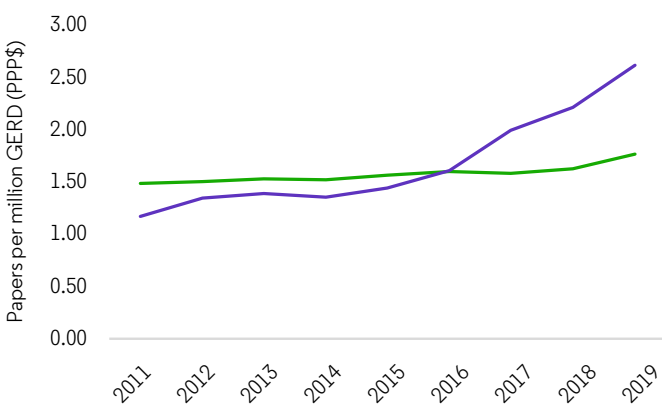

Output by GERD

Output by researcher

Italy
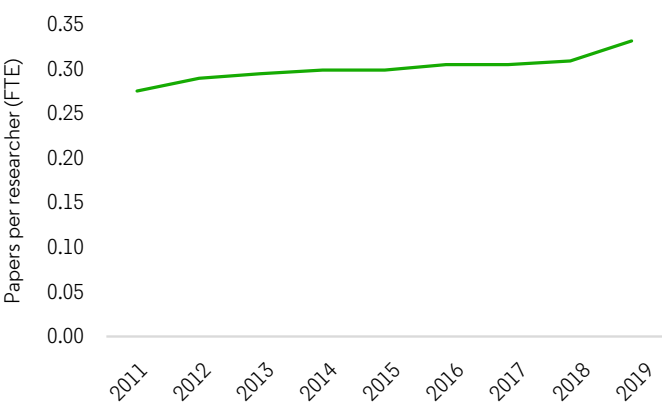
Researchers 212,671	**Female researchers** 72,177	
Population 60,421,760	**Researchers/1000 population** 3.52	**Women as % researchers** 33.9

GDP (PPP US$ billions) 2678.9	**GERD (PPP US$ billions)** 38.8	**GERD/GDP (%)** 1.45
Patents 32,028	**BERD (PPP US$ billions)** 24.3	**Patents/BERD** 1319.0

Impact profile

World average cites/paper = 1.0
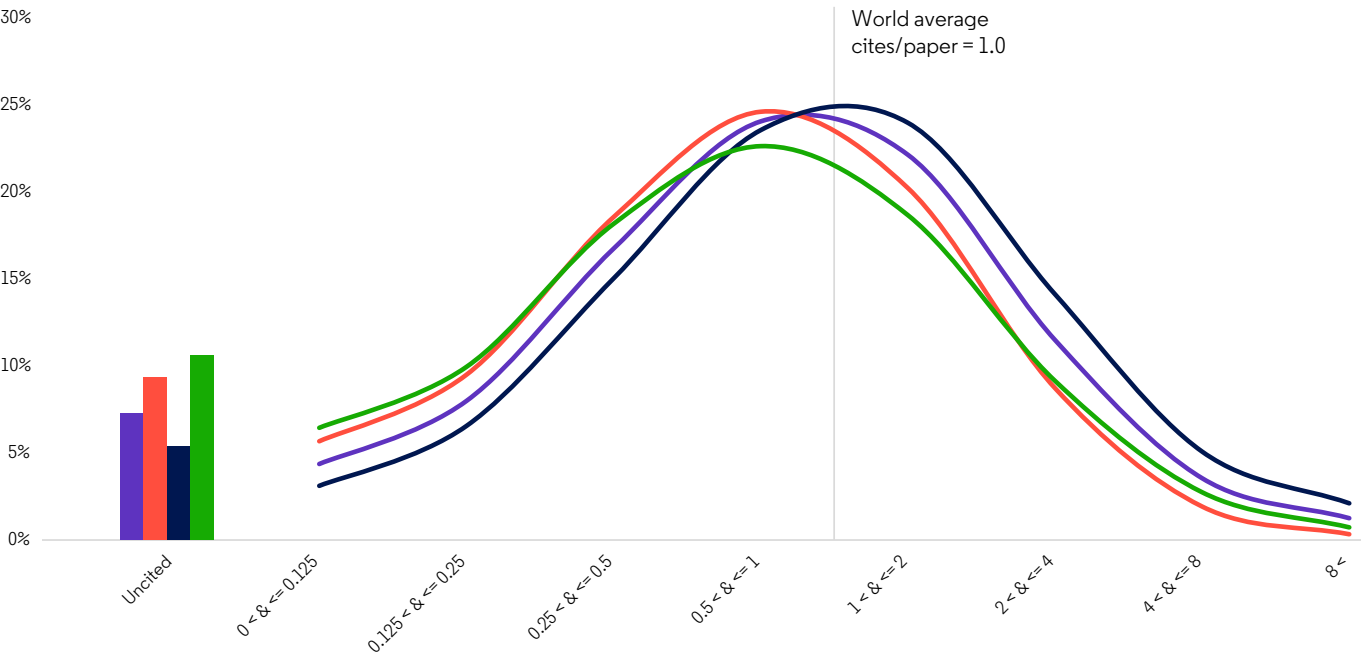
	Papers	CNCI	% > world average	% in top 10%
Italy total	719,429	1.26	39.1%	14.0%
Italy domestic	350,134	0.91	31.9%	9.1%
Italy international	369,295	1.59	45.9%	18.6%
G20 total dataset	15,175,599	0.99	31.9%	10.7%
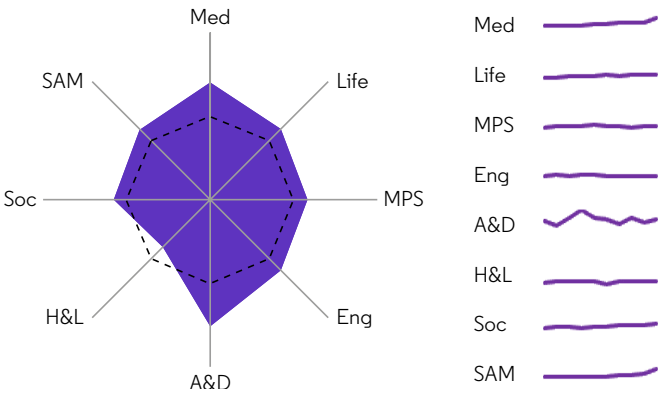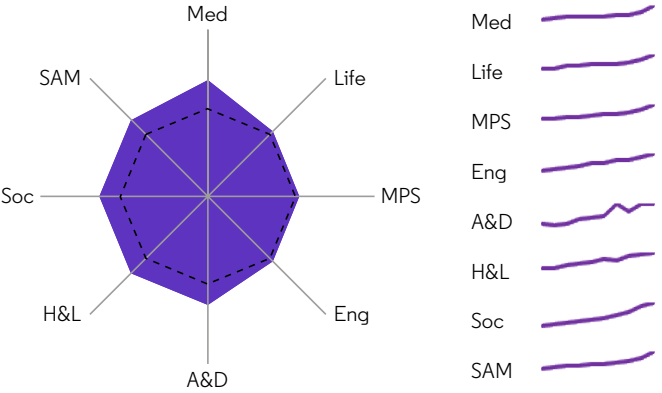
Impact by discipline

Output by discipline

Output and Open Access
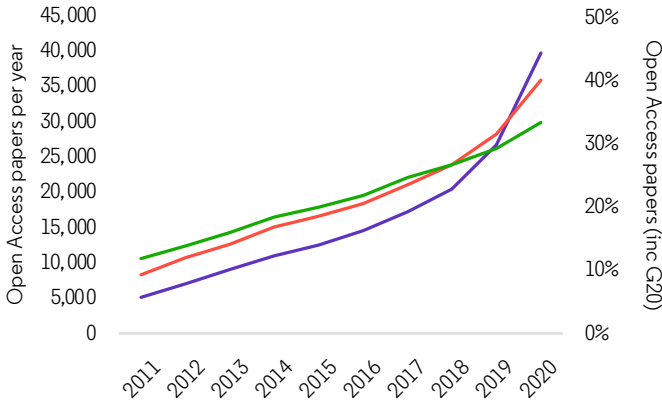
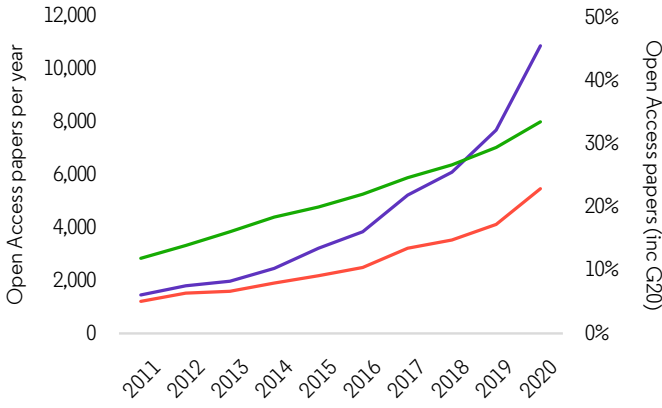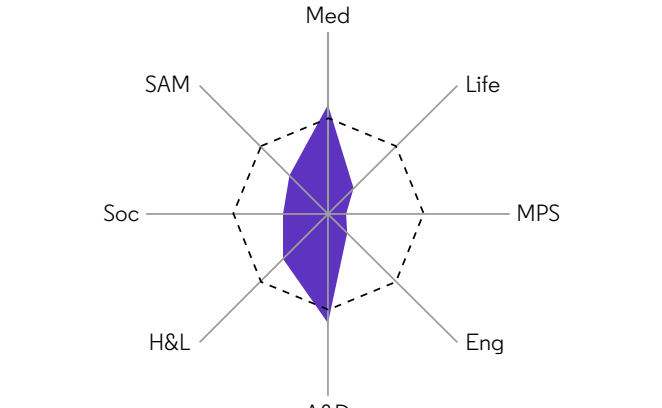## Output and Open Access

Output and collaboration

Impact and collaboration

Output by GERD

Output by researcher

Japan

Researchers 942,180	**Female researchers** 158,927	
Population 126,264,931	**Researchers/1000 population** 7.46	**Women as % researchers** 16.9

GDP (PPP US$ billions) 5328.0	**GERD (PPP US$ billions)** 173.3	**GERD/GDP (%)** 3.25
Patents 453,816	**BERD (PPP US$ billions)** 137.1	**Patents/BERD** 3308.9

Impact profile
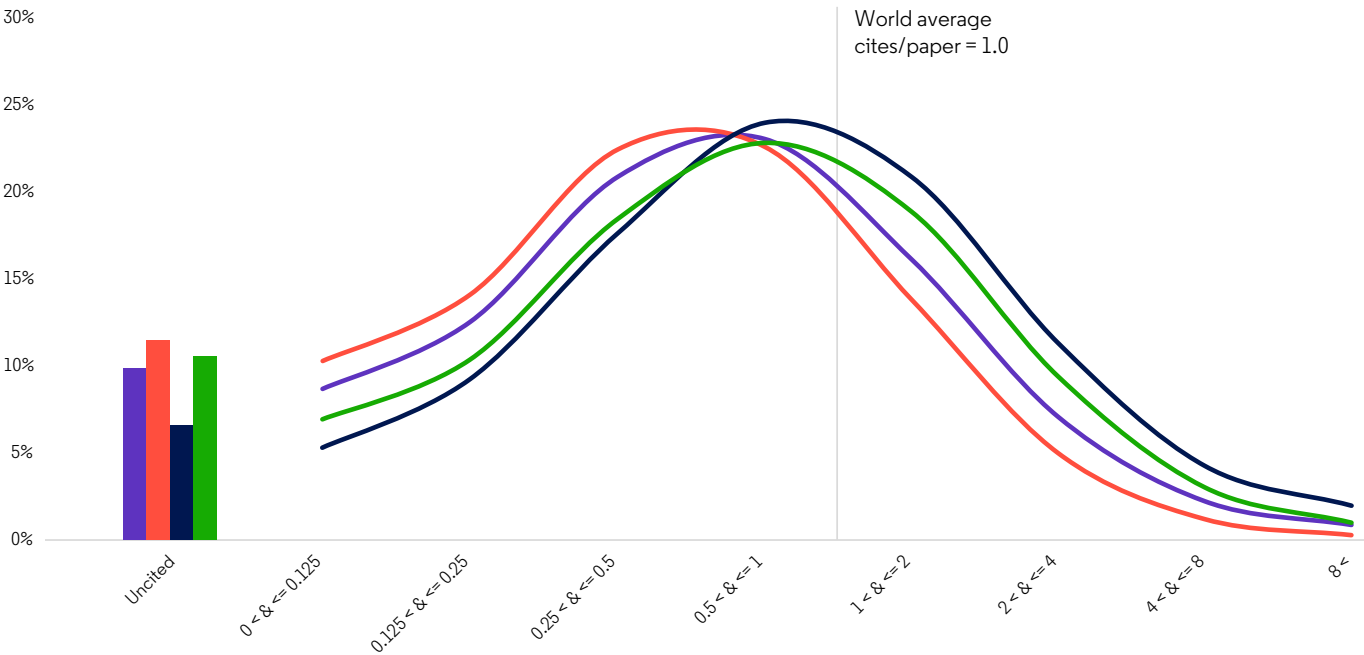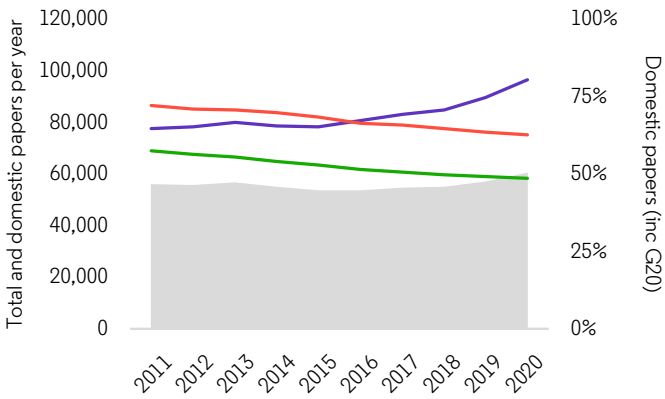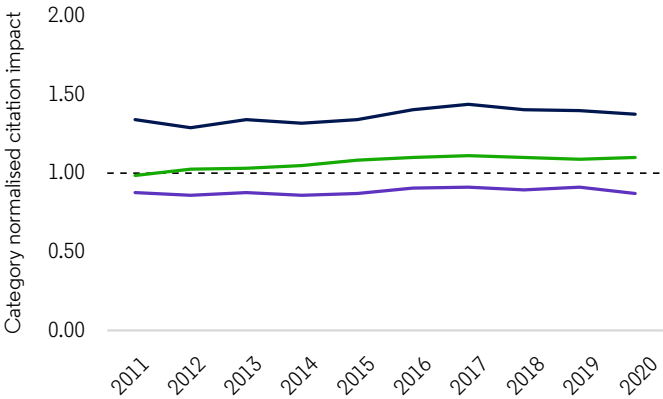
World average cites/paper = 1.0

	Papers	CNCI	% > world average	% in top 10%
■ Japan total	829,290	0.88	26.0%	8.2%
■ Japan domestic	559,485	0.65	20.1%	5.0%
■ Japan international	269,805	1.37	38.1%	14.8%
■ G20 total dataset	15,175,599	0.99	31.9%	10.7%

Output and collaboration

Impact and collaboration

Impact by discipline
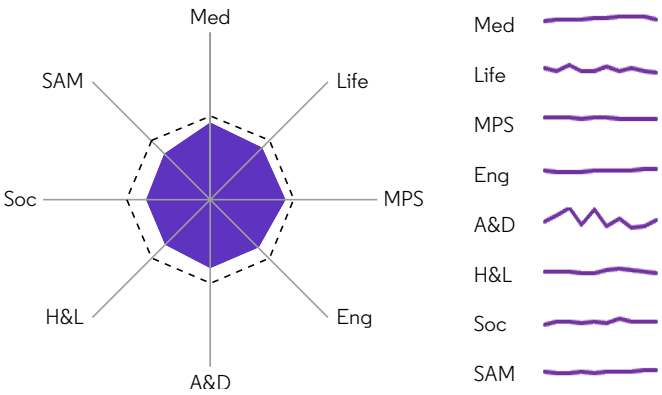
Output by discipline
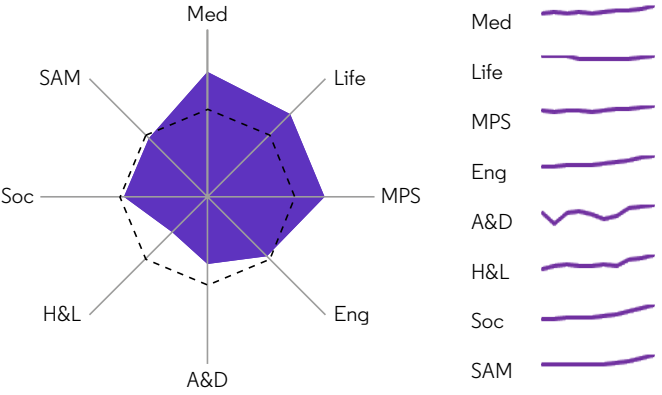
Output and Open Access
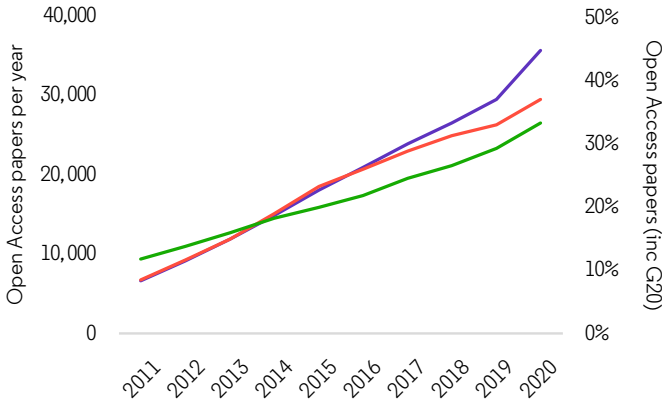

Output and Open Access
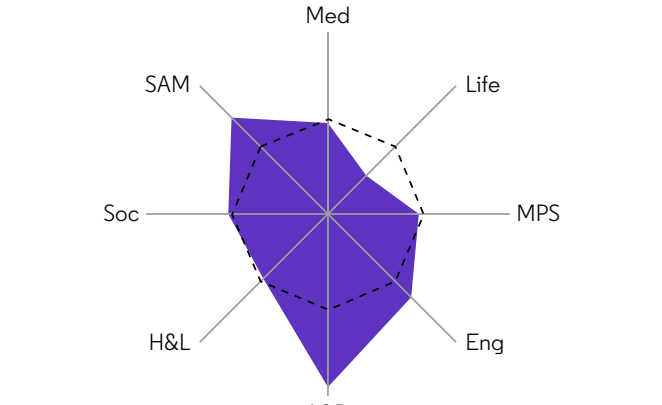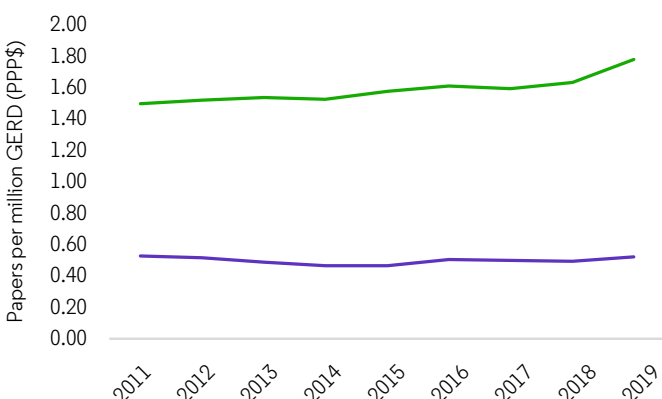
Output by GERD

Output by researcher

Mexico
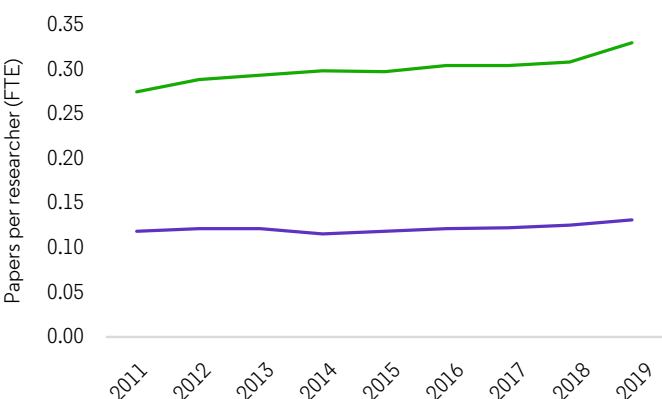
Researchers **58,013**	Female researchers **19,033**	
Population **127,575,529**	Researchers/1000 population **0.45**	Women as % researchers **32.8**

GDP (PPP US$ billions) **2608.6**	GERD (PPP US$ billions) **7.4**	GERD/GDP (%) **0.28**
Patents **2,535**	BERD (PPP US$ billions) **1.6**	Patents/BERD **1569.2**

Impact profile

World average cites/paper = 1.0
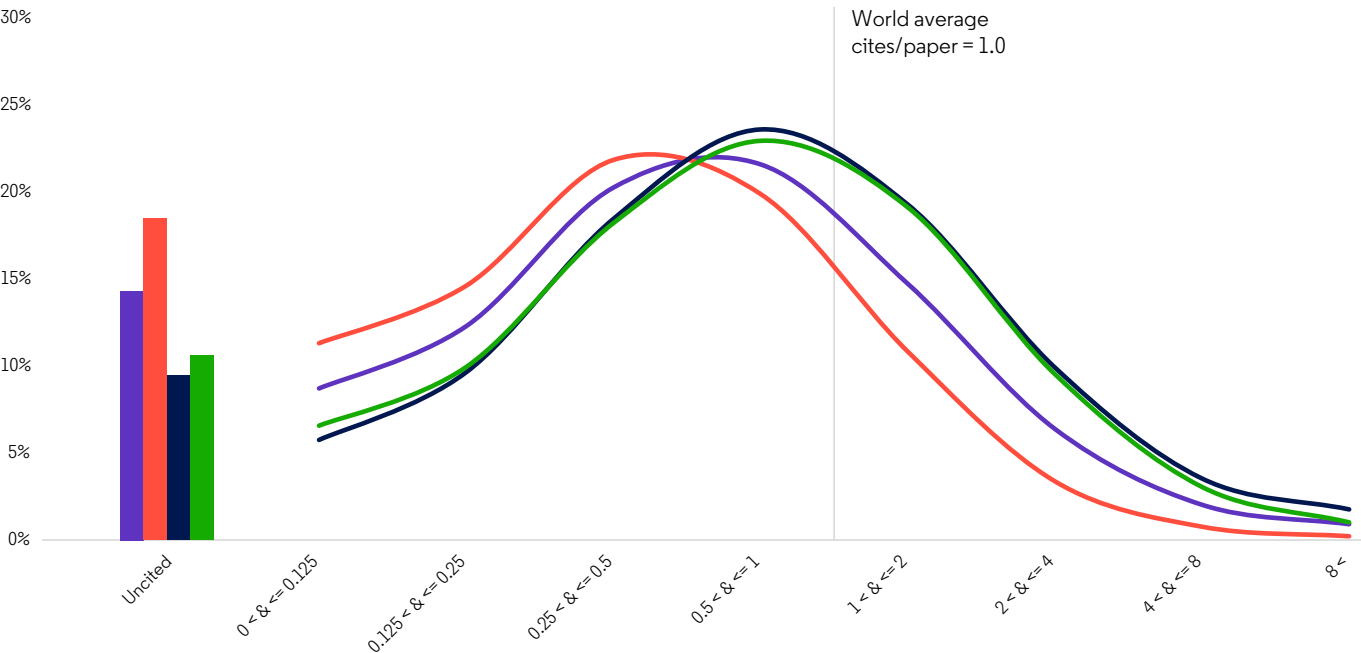
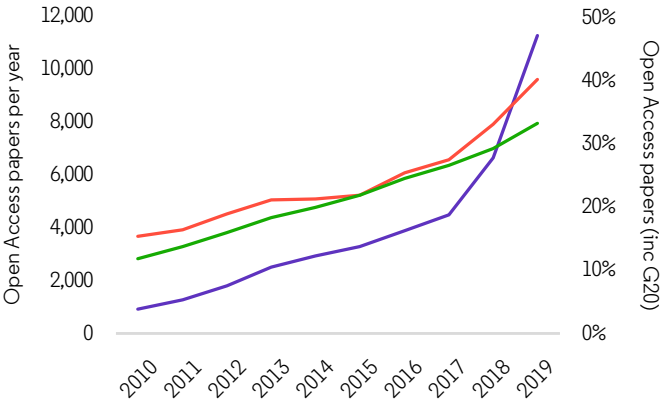|	Papers	CNCI	% > world average	% in top 10%
■ Mexico total	150,309	0.84	23.3%	7.2%
■ Mexico domestic	80,645	0.50	14.6%	2.9%
■ Mexico international	69,664	1.24	33.5%	12.1%
■ G20 total dataset	15,175,599	0.99	31.9%	10.7%
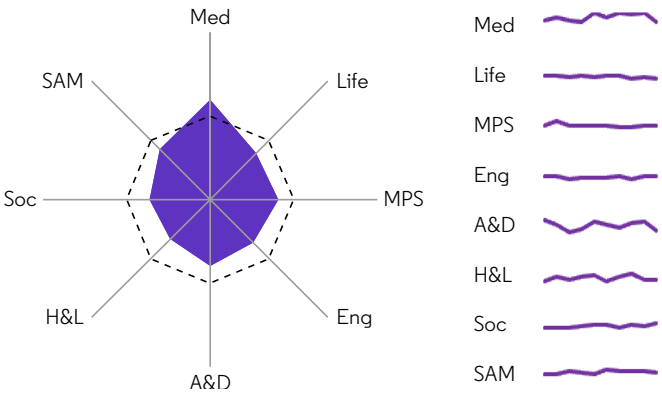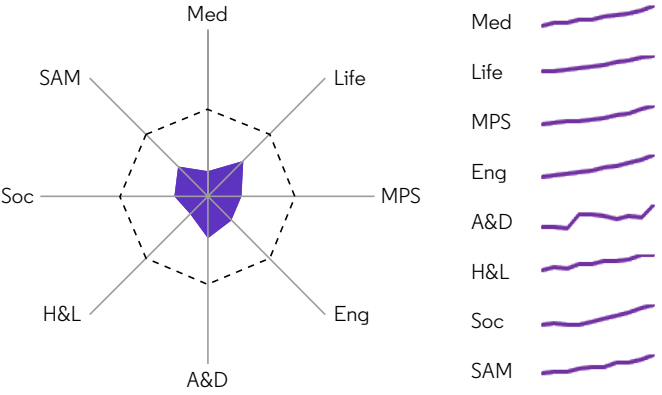
Impact by discipline

Output by discipline

Output and Open Access

Output and Open Access
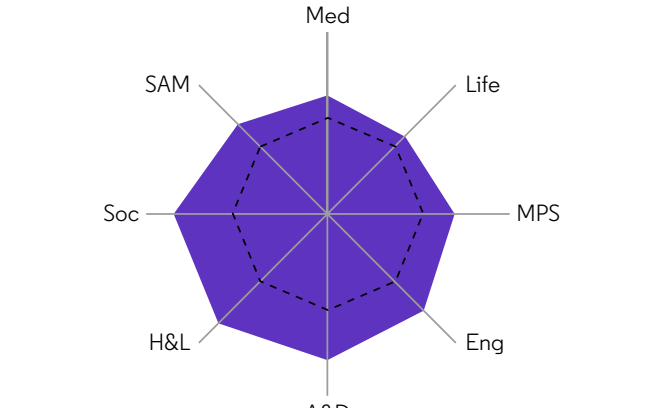
Output and collaboration
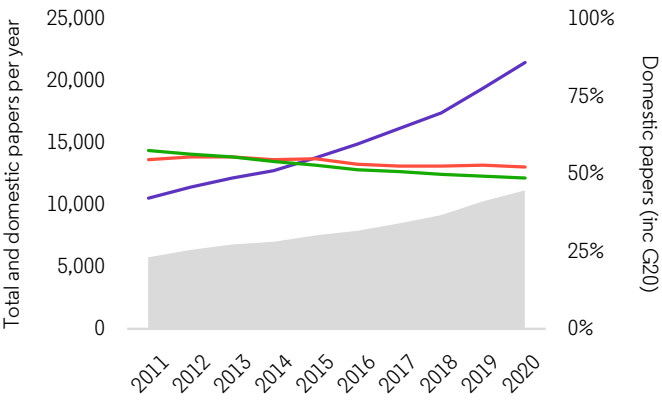
Impact and collaboration
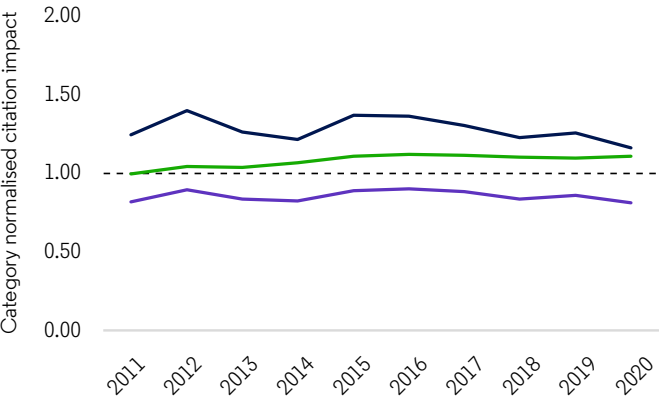
Output by GERD

Output by researcher

Russia
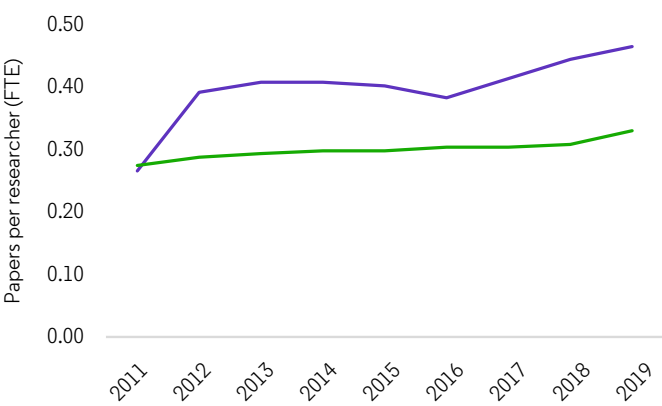
Researchers **348,221**		Female researchers **136,074**	GDP (PPP US$ billions) **4283.9**	GERD (PPP US$ billions) **44.5**	GERD/GDP (%) **1.04**
Population **144,406,261**	Researchers/1000 population **2.41**	Women as % researchers **39.1**	Patents **29,712**	BERD (PPP US$ billions) **27.0**	Patents/BERD **1100.7**

Impact profile

World average cites/paper = 1.0
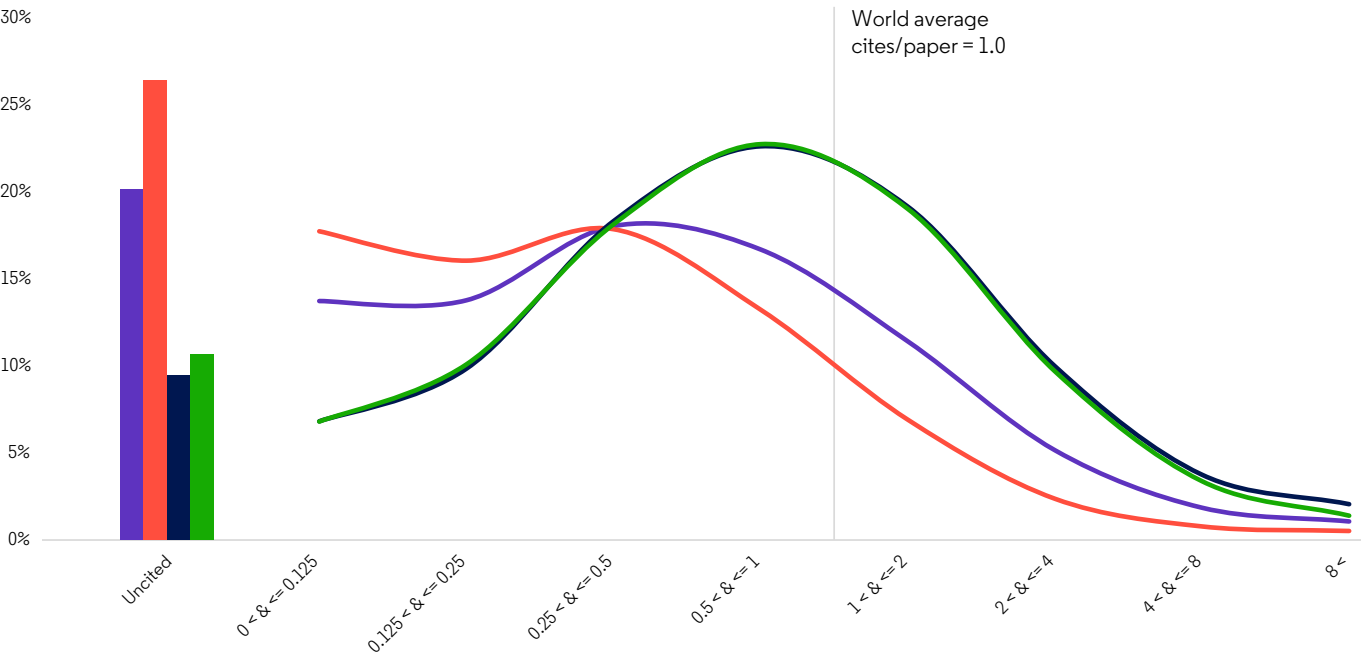
	Papers	CNCI	% > world average	% in top 10%
■ Russia total	364,339	0.67	17.9%	5.4%
■ Russia domestic	230,121	0.34	8.8%	1.5%
■ Russia international	134,218	1.25	33.5%	12.0%
■ G20 total dataset	15,175,599	0.99	31.9%	10.7%
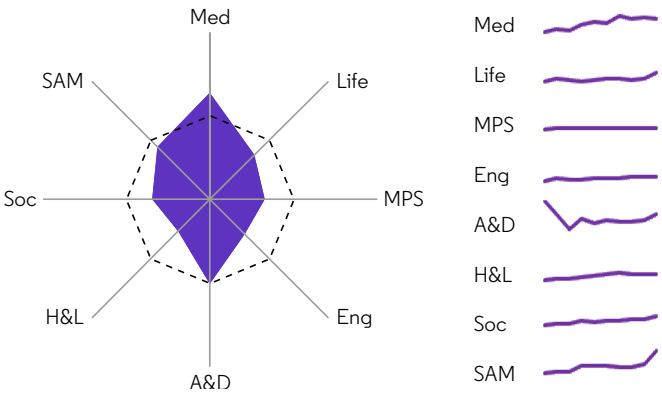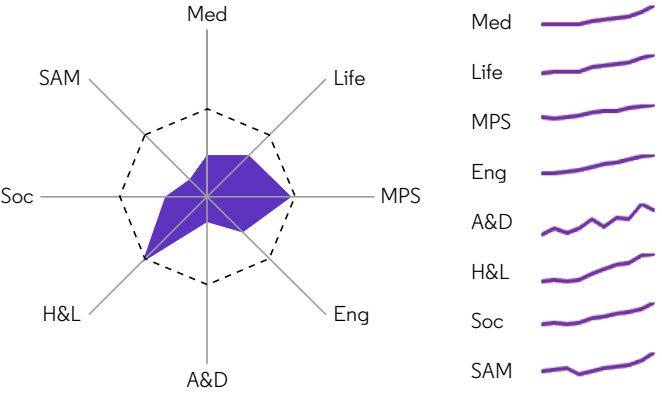
Impact by discipline

Output by discipline

Output and Open Access

Output and Open Access

Output and collaboration
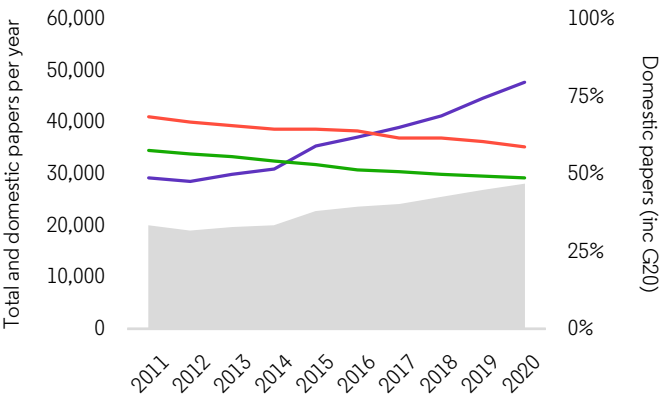
Impact and collaboration
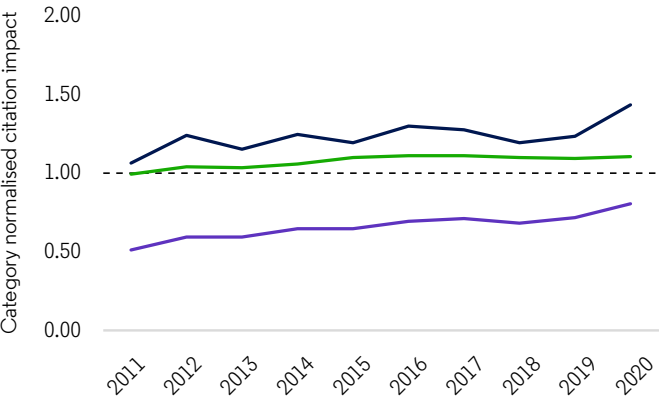
Output by GERD
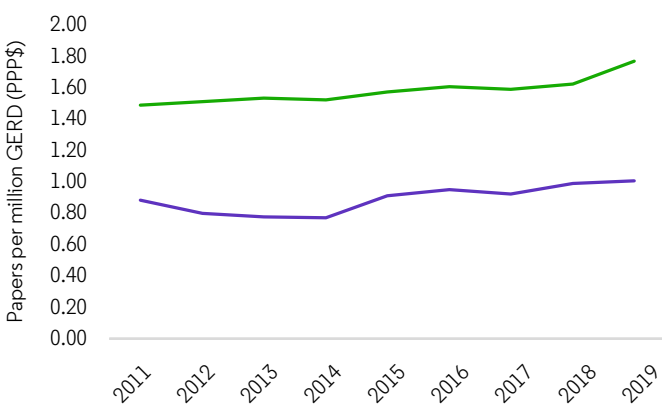
Output by researcher

Saudi Arabia
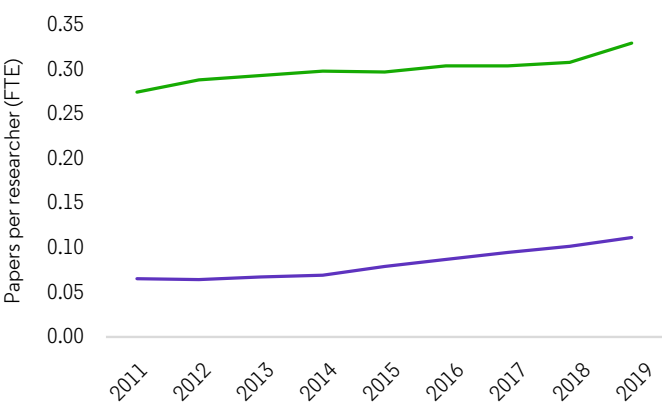
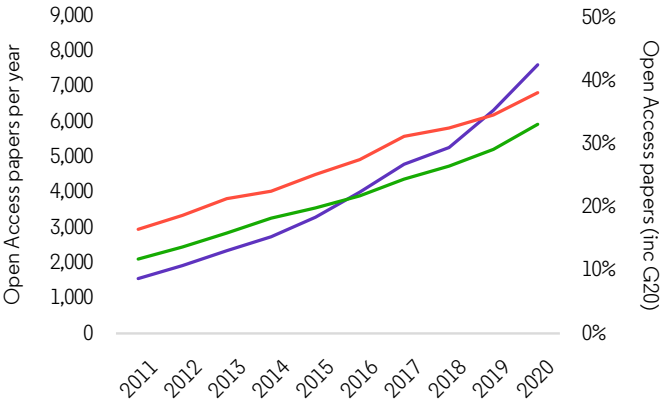|		
Researchers –	**Female researchers** –	
Population 34,813,867	**Researchers/1000 population** –	**Women as % researchers** –

GDP (PPP US$ billions) 1628.0	**GERD (PPP US$ billions)** –	**GERD/GDP (%)** –
Patents 7,401	**BERD (PPP US$ billions)** –	**Patents/BERD** –
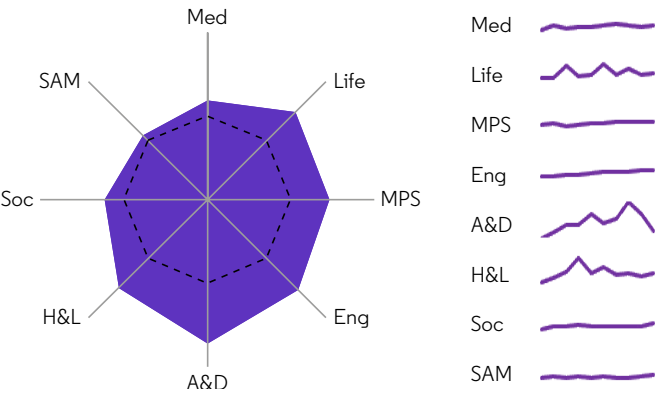
Impact profile

World average cites/paper = 1.0

	Papers	CNCI	% > world average	% in top 10%
■ Saudi Arabia total	143,884	1.34	37.4%	15.6%
■ Saudi Arabia domestic	28,781	0.77	24.0%	8.0%
■ Saudi Arabia international	115,103	1.48	40.7%	17.5%
■ G20 total dataset	15,175,599	0.99	31.9%	10.7%

Output and collaboration

Impact and collaboration

Impact by discipline

Output by discipline
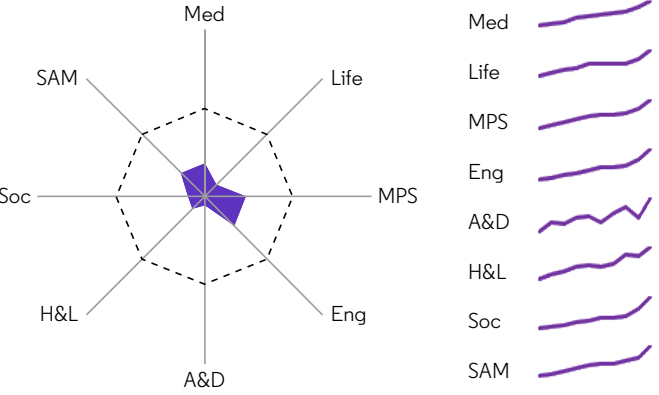
Output and Open Access

Output and Open Access
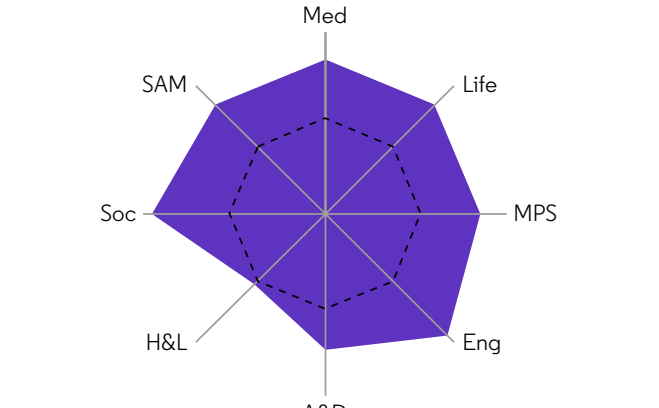
Output by GERD
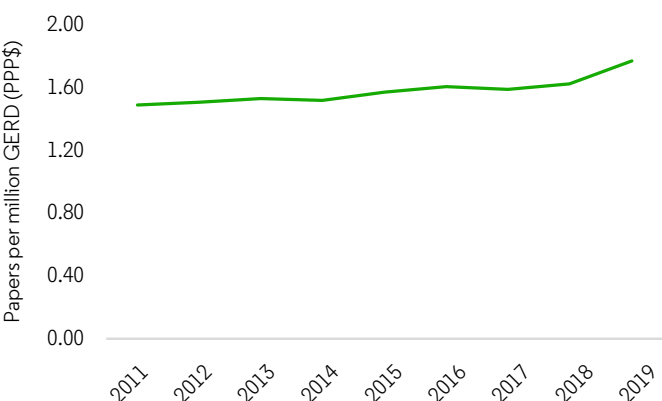
Output by researcher

South Africa
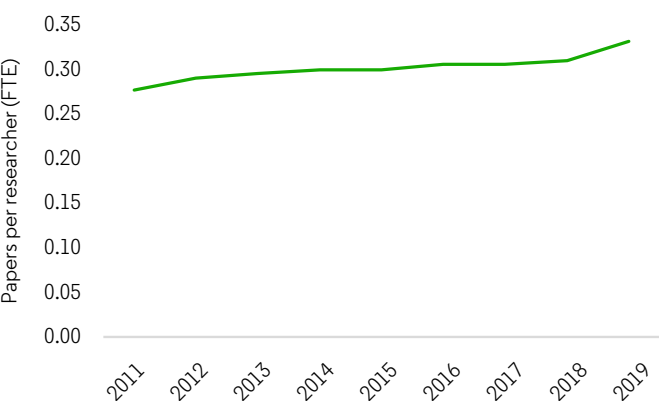
Researchers 61,840	**Female researchers** 27,774	
Population 57,009,751	**Researchers/1000 population** 1.08	**Women as % researchers** 44.9

GDP (PPP US$ billions) 724.1	**GERD (PPP US$ billions)** 6.0	**GERD/GDP (%)** 0.83
Patents 1,517	**BERD (PPP US$ billions)** 2.5	**Patents/BERD** 614.7

Impact profile
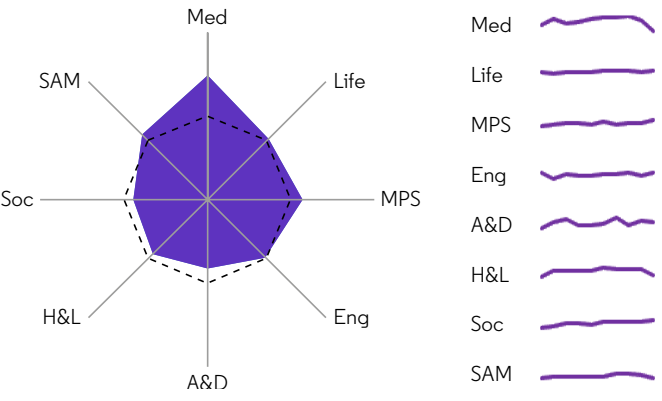
World average cites/paper = 1.0

	Papers	CNCI	% > world average	% in top 10%
■ South Africa total	140,845	1.12	31.9%	11.0%
■ South Africa domestic	58,049	0.62	20.4%	4.6%
■ South Africa international	82,796	1.48	40.0%	15.5%
■ G20 total dataset	15,175,599	0.99	31.9%	10.7%

Impact by discipline

Output by discipline

Output and Open Access

Output and Open Access

Output and collaboration

Impact and collaboration
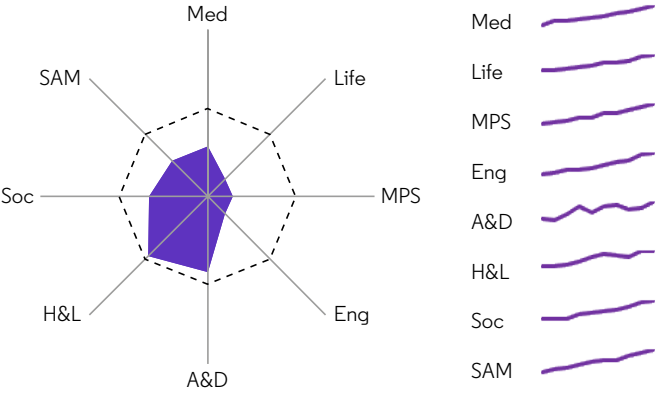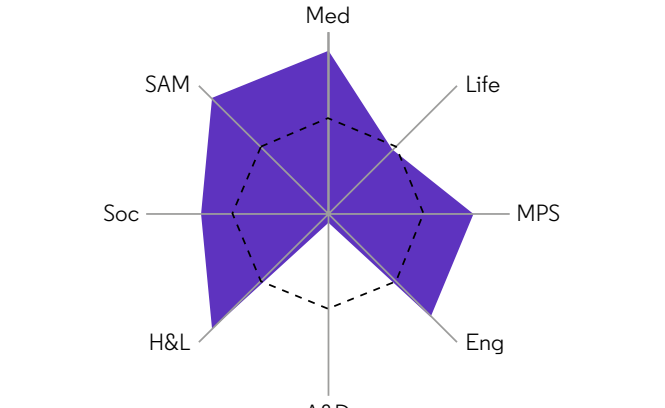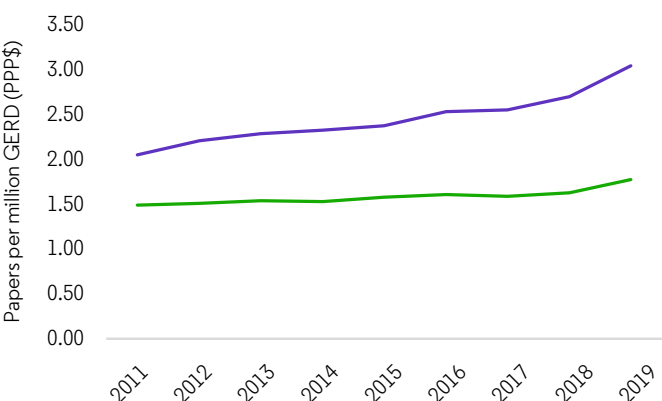
Output by GERD

Output by researcher

South Korea
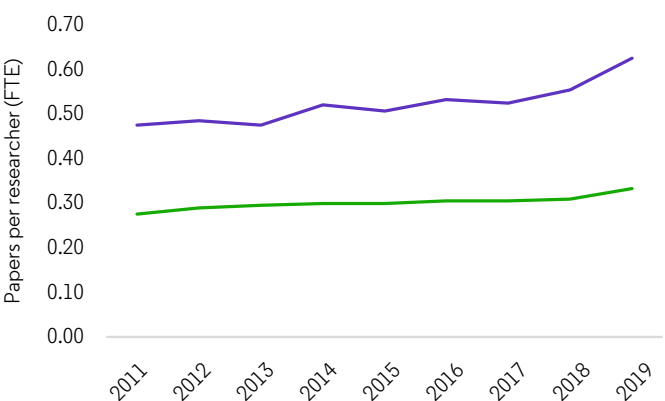
Researchers 538,136	**Female researchers** 113,187	
Population 51,709,098	**Researchers/1000 population** 10.41	**Women as % researchers** 21.0

|		
GDP (PPP US$ billions) 2209.4	**GERD (PPP US$ billions)** 102.5	**GERD/GDP (%)** 4.64
Patents 248,551	**BERD (PPP US$ billions)** 82.3	**Patents/BERD** 3019.1

Impact profile

World average cites/paper = 1.0
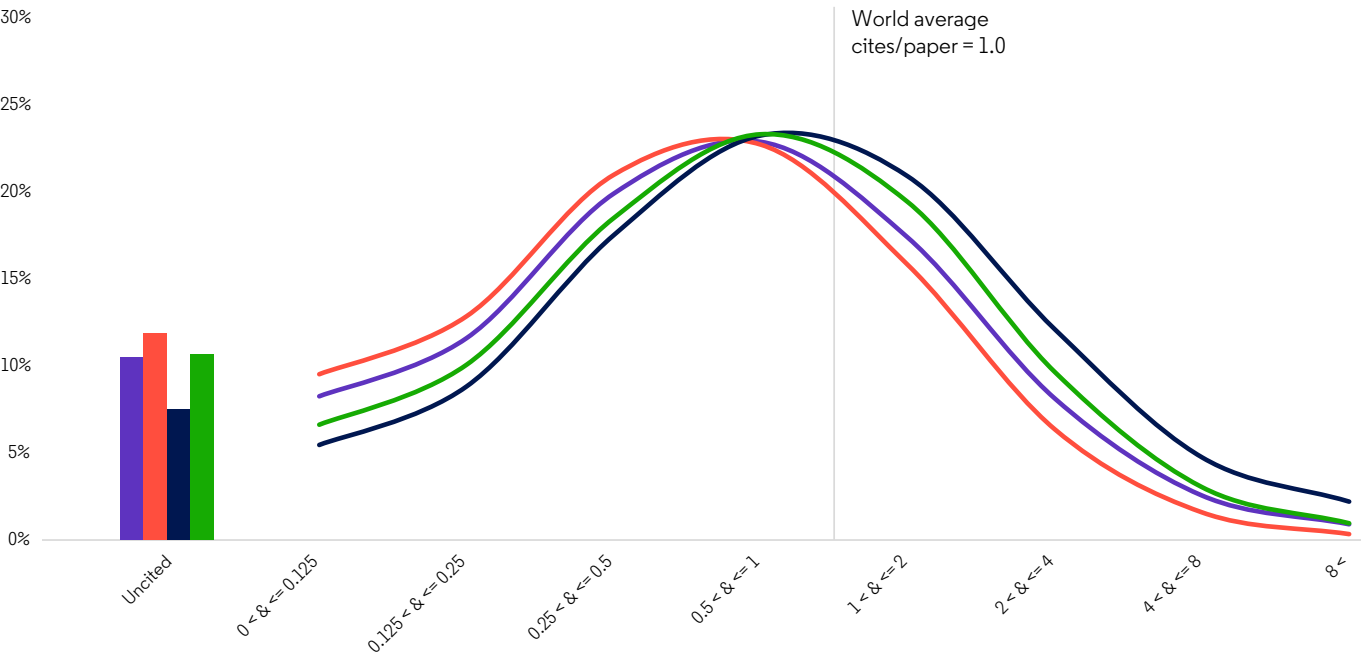
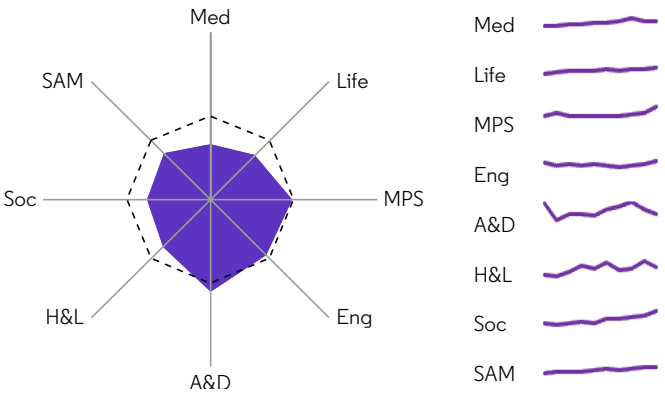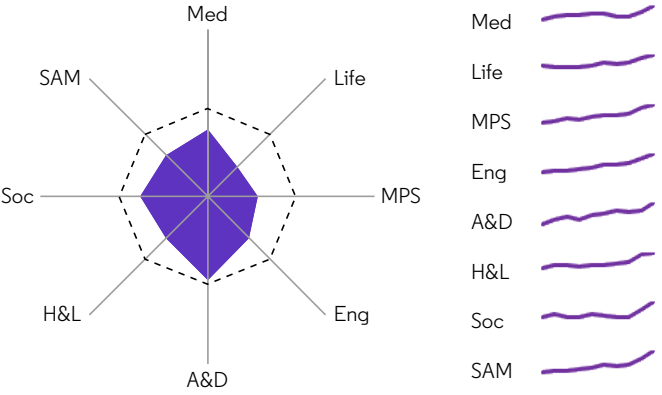|	Papers	CNCI	% > world average	% in top 10%
■ South Korea total	592,873	0.91	27.9%	9.1%
■ South Korea domestic	409,443	0.71	23.2%	6.3%
■ South Korea international	183,430	1.38	38.5%	15.4%
■ G20 total dataset	15,175,599	0.99	31.9%	10.7%
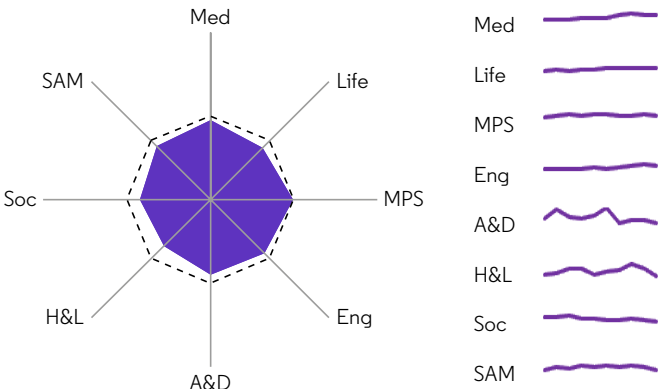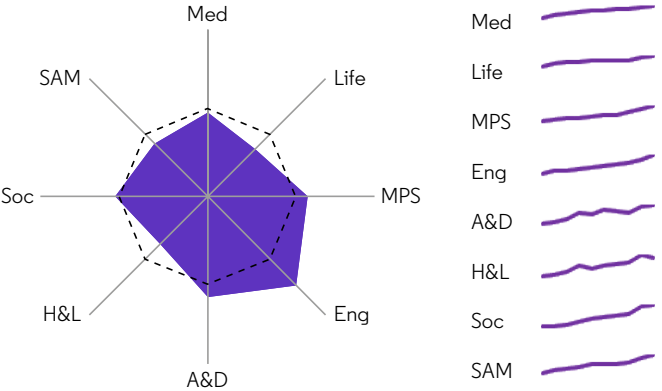
Output and collaboration

## Impact and collaboration

Impact by discipline

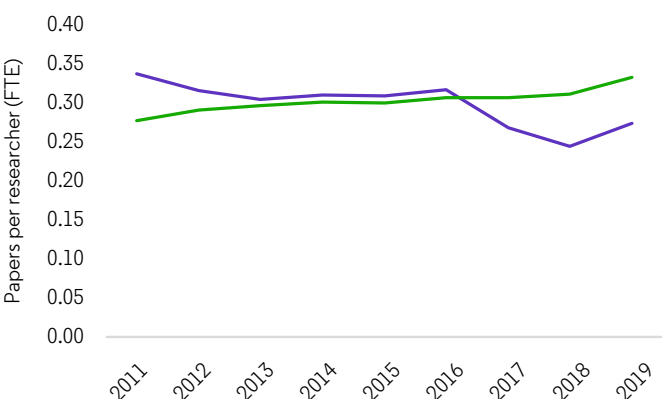## Output by discipline
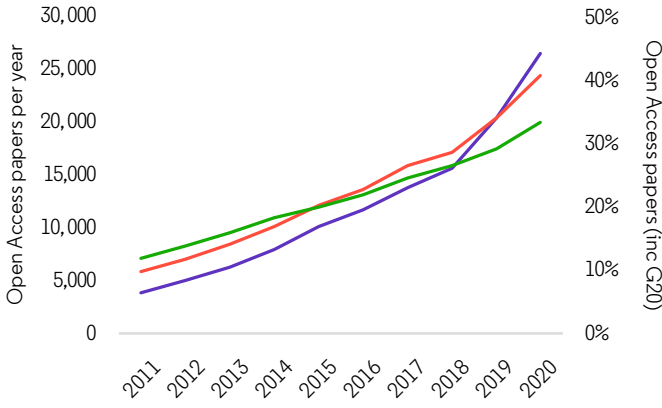
Output and Open Access

Output and Open Access
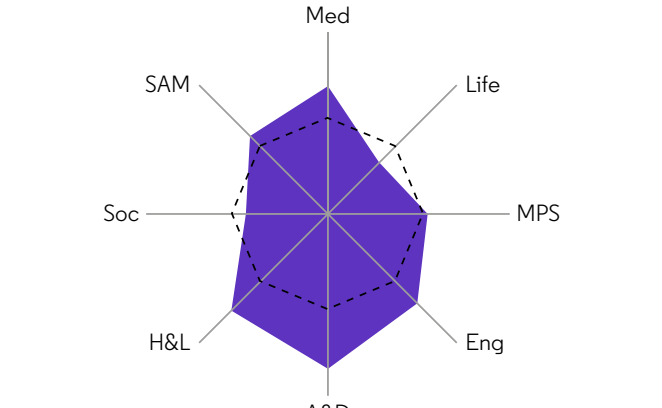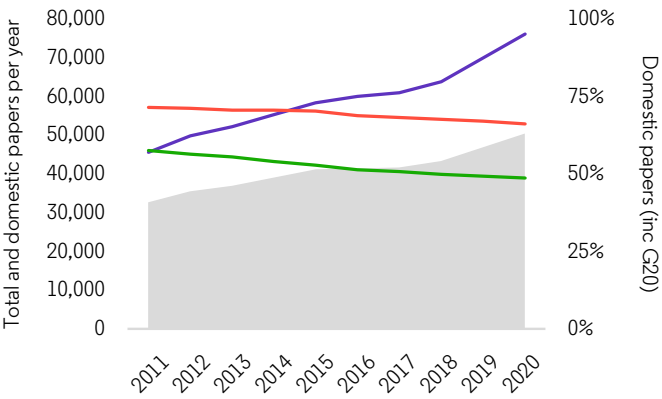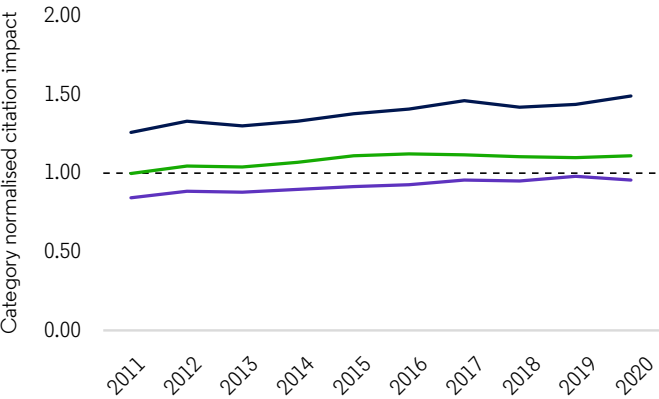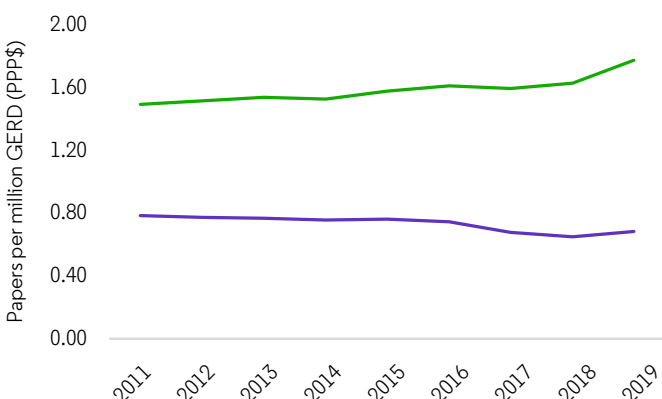
Output by GERD

Output by researcher

Turkey
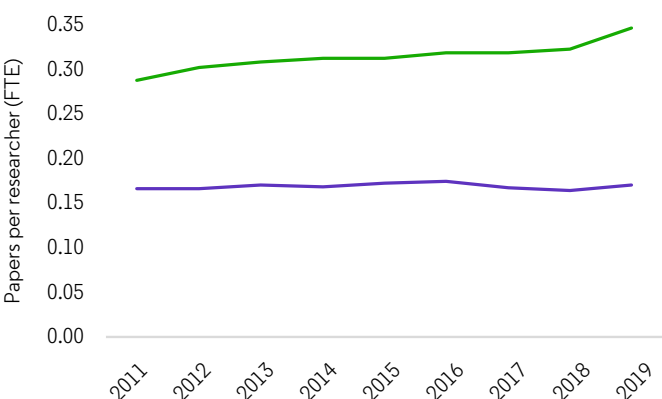
Researchers 243,773	**Female researchers** 90,168	
Population 83,429,607	**Researchers/1000 population** 2.92	**Women as % researchers** 37.0

GDP (PPP US$ billions) 2279.2	**GERD (PPP US$ billions)** 24.2	**GERD/GDP (%)** 1.06
Patents 10,047	**BERD (PPP US$ billions)** 15.6	**Patents/BERD** 645.6

Impact profile

World average cites/paper = 1.0

	Papers	CNCI	% > world average	% in top 10%
■ Turkey total	305,128	0.79	22.6%	7.2%
■ Turkey domestic	231,141	0.57	17.2%	4.4%
■ Turkey international	73,987	1.47	39.3%	16.2%
■ G20 total dataset	15,175,599	0.99	31.9%	10.7%

Impact by discipline

Output by discipline

Output and Open Access

Output and Open Access

Output and collaboration

Impact and collaboration
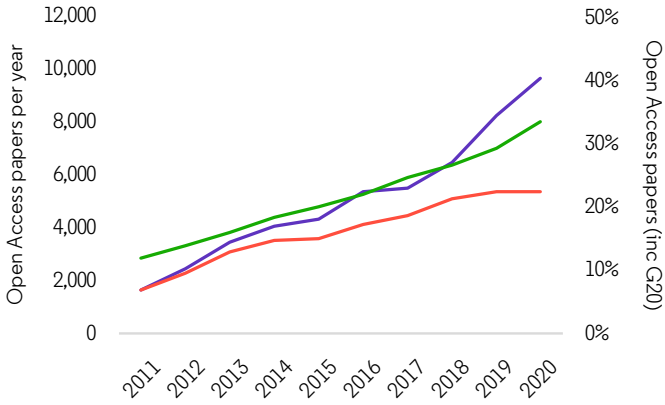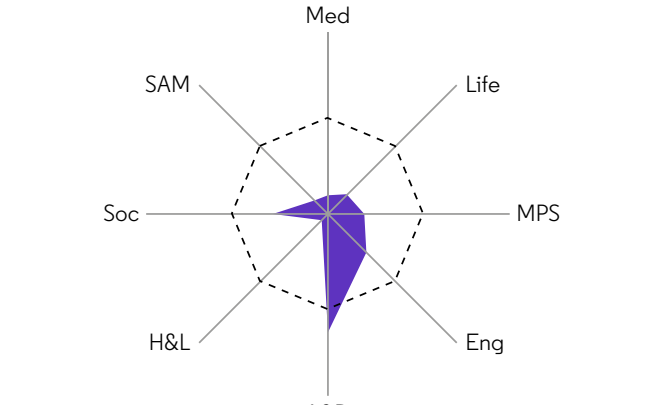
Output by GERD
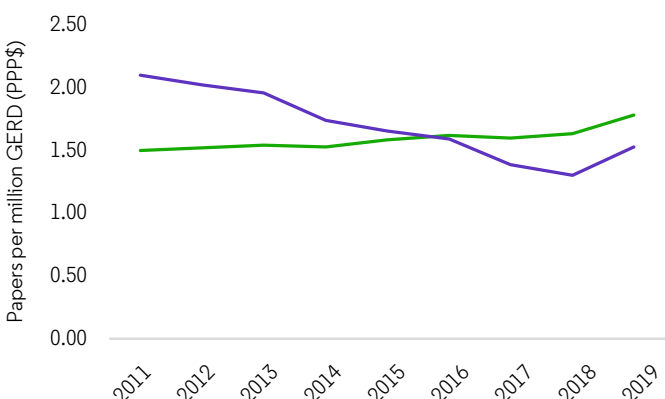
Output by researcher

United Kingdom

Researchers **535,477**	Female researchers **206,687**	
Population **66,460,344**	Researchers/1000 population **8.06**	Women as % researchers **38.6**

GDP (PPP US$ billions) **3242.5**	GERD (PPP US$ billions) **56.9**	GERD/GDP (%) **1.76**
Patents **54,794**	BERD (PPP US$ billions) **38.7**	Patents/BERD **1414.8**

Impact profile

World average cites/paper = 1.0
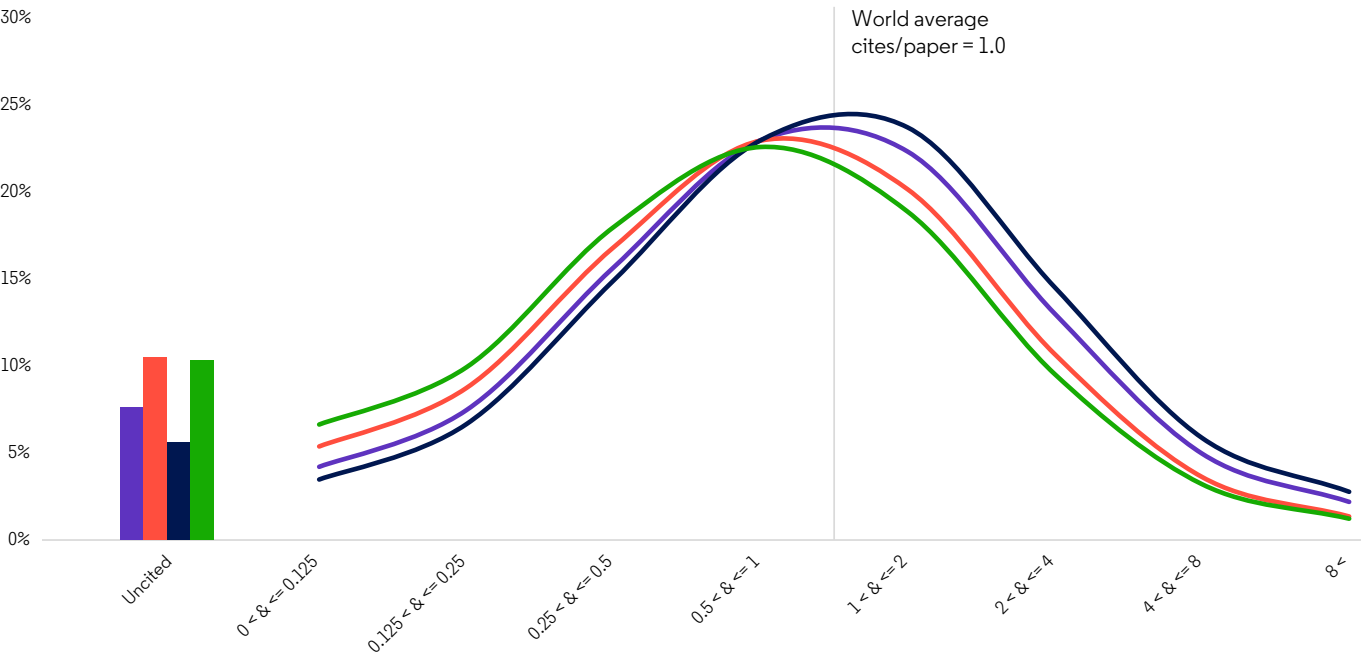
	Papers	CNCI	% > world average	% in top 10%
■ United Kingdom total	1,263,652	1.39	41.6%	16.2%
■ United Kingdom domestic	497,351	1.08	34.9%	11.8%
■ United Kingdom international	766,301	1.60	45.9%	19.1%
■ G20 total dataset	15,175,599	0.99	31.9%	10.7%

Output and collaboration

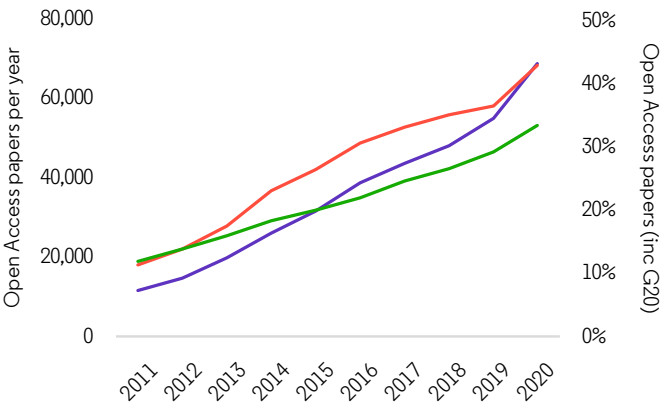## Impact and collaboration
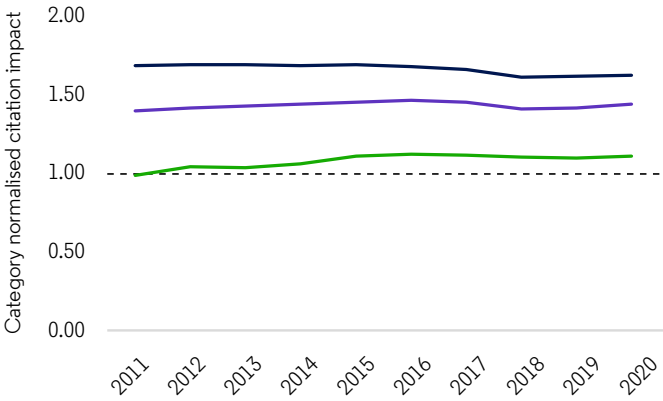
Impact by discipline
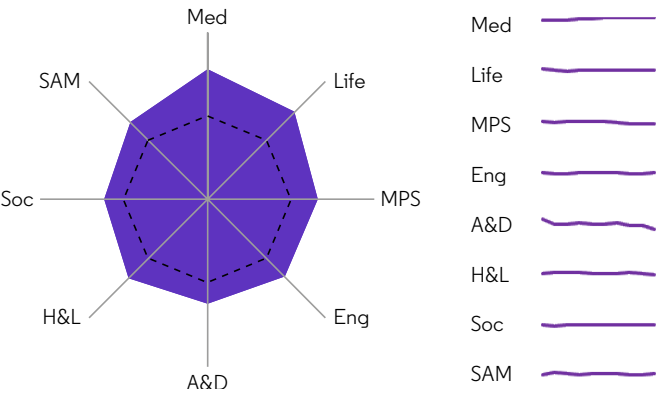
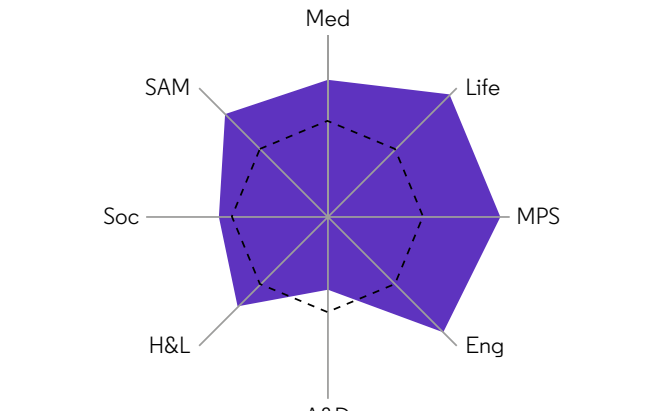## Output by discipline
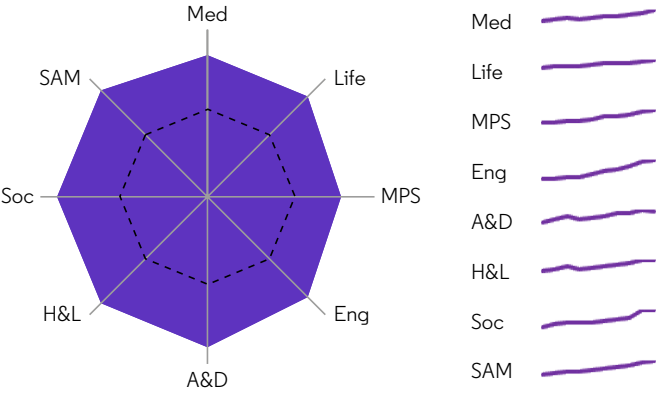
Output and Open Access

Output and Open Access

Output by GERD
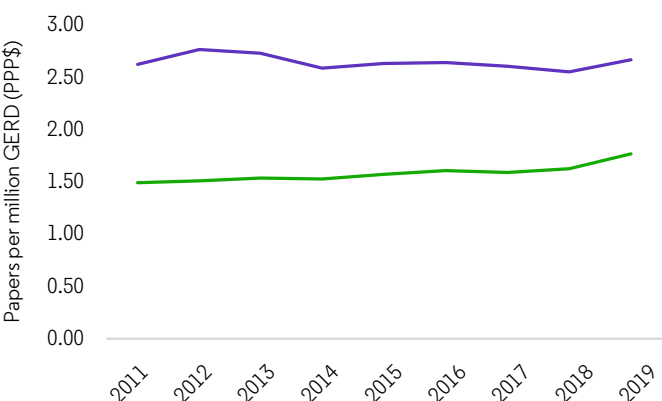
Output by researcher

United States

Researchers	Female researchers	
–	–	
Population	Researchers/1000 population	Women as % researchers
329,484,123	–	–

GDP (PPP US$ billions)	GERD (PPP US$ billions)	GERD/GDP (%)
21433.2	657.5	3.07
Patents	BERD (PPP US$ billions)	Patents/BERD
521,735	485.8	1073.9

Impact profile

World average cites/paper = 1.0
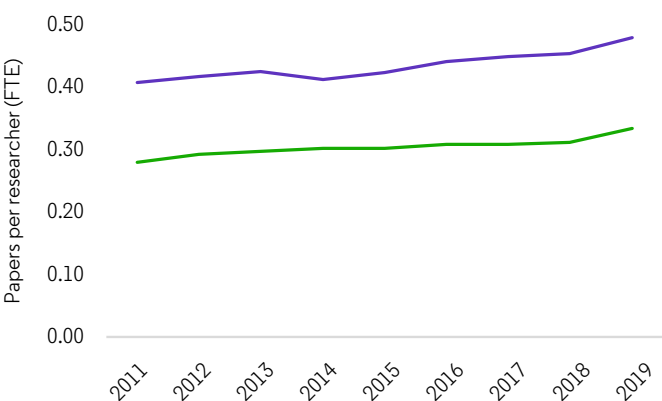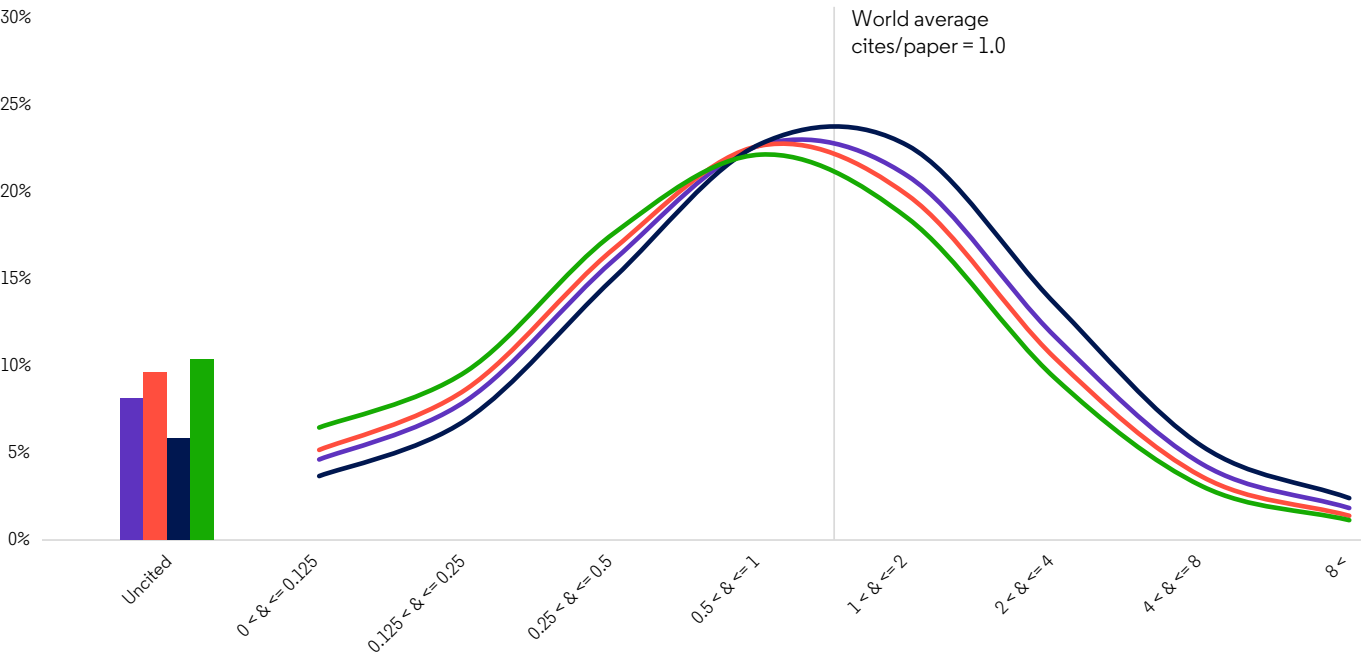
	Papers	CNCI	% > world average	% in top 10%
United States total	4,241,054	1.27	38.9%	14.8%
United States domestic	2,581,108	1.12	35.5%	12.7%
United States international	1,659,946	1.51	44.2%	18.2%
G20 total dataset	15,175,599	0.99	31.9%	10.7%
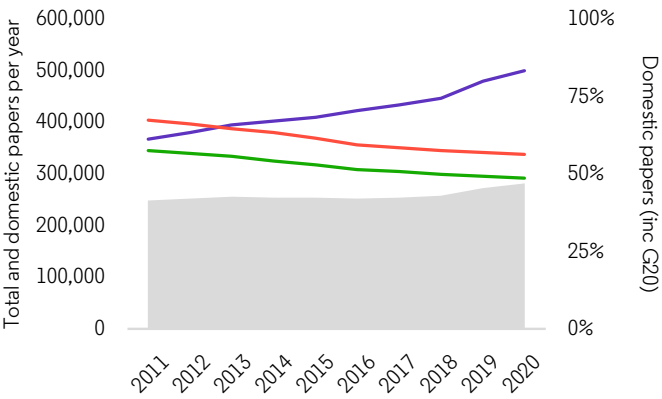
Impact by discipline

Output by discipline

Output and Open Access

Output and Open Access

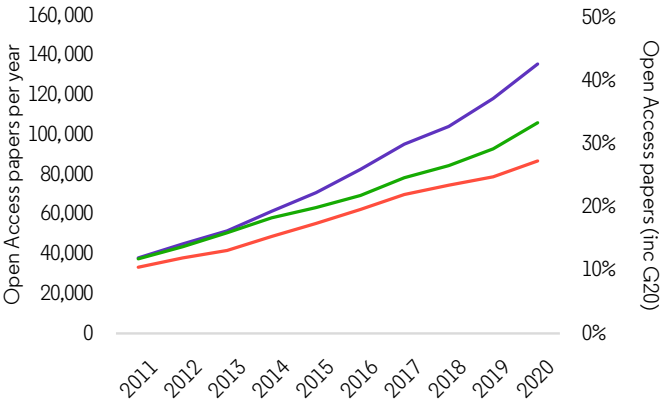## Output and collaboration

Impact and collaboration
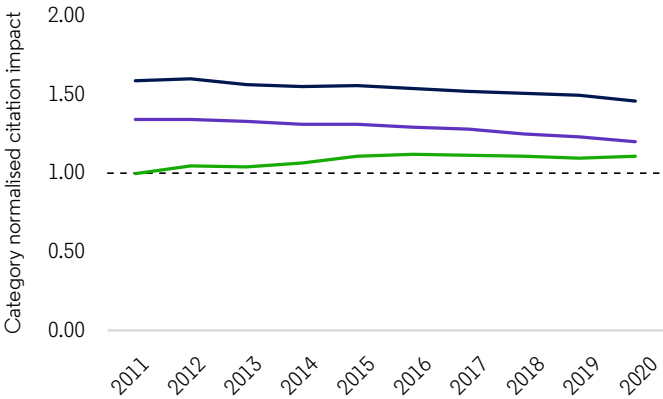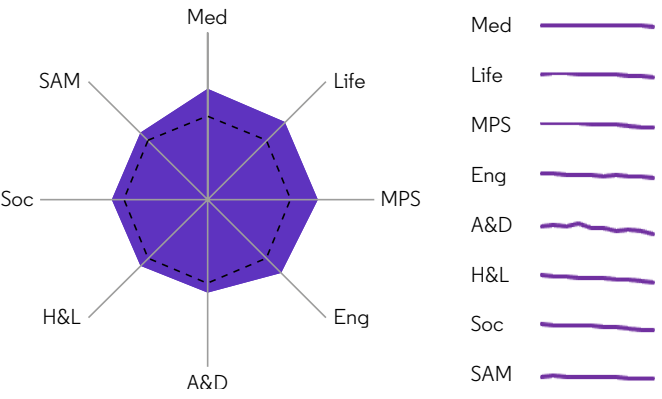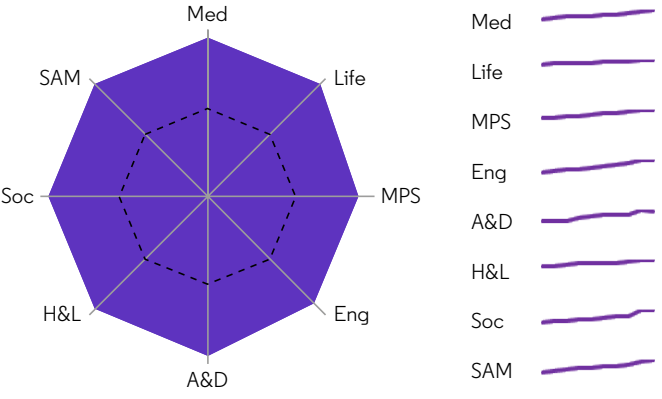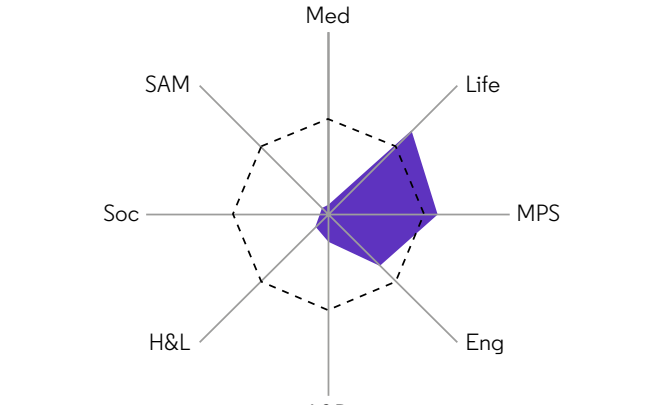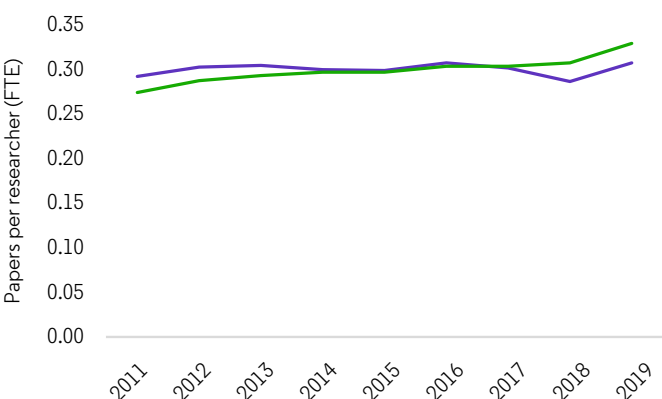

Output by GERD
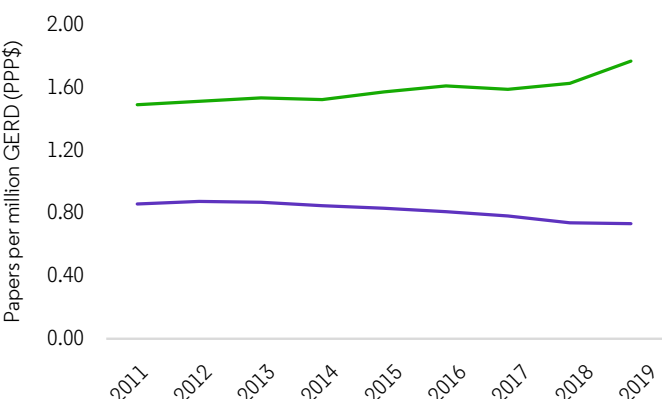
Output by researcher

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