

# The Annual G20 Scorecard – Research Performance 2019

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Science  
Group

A Clarivate  
Analytics  
company

# Author biographies

## About the Web of Science Group

The Web of Science Group organizes the world's research information to enable academia, corporations, publishers and governments accelerate the pace of research. It is powered by the *Web of Science* – the world's largest publisher-neutral citation index and research intelligence platform. Its many well-known brands also include Converis, EndNote, Kopernio, Publons, ScholarOne and the Institute for Scientific Information (ISI). The 'university' of the Web of Science Group, ISI maintains the knowledge corpus upon which the index and related information and analytical content, products, and services are built.

The Web of Science Group is a Clarivate Analytics Plc company.

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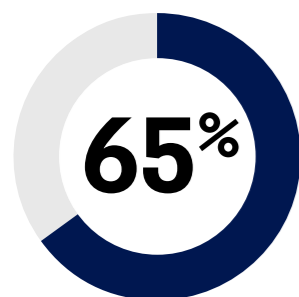
**Dr. Martin Szomszor** is Head of Research Analytics at the Institute for Scientific Information. He joined from Digital Science, where, as Chief Data Scientist he applied his extensive knowledge of machine learning, data integration and visualization techniques to found the Global Research Identifier Database. He was named a 2015 top-50 UK Information Age data leader for his work in creating the REF2015 impact case studies database for the Higher Education Funding Council for England (HEFCE).

**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.



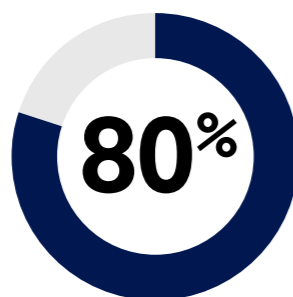
# The G20:

## Represents



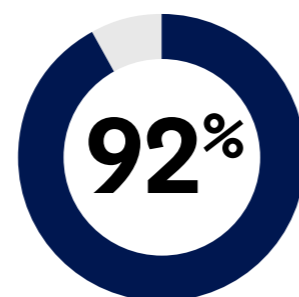
of world population  
(World Bank, 2018)

## Produces



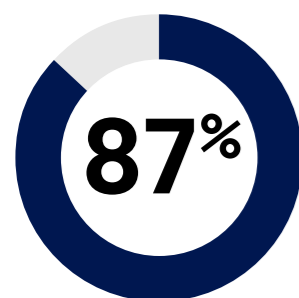
of global GDP  
(World Bank, 2018)

## Spends



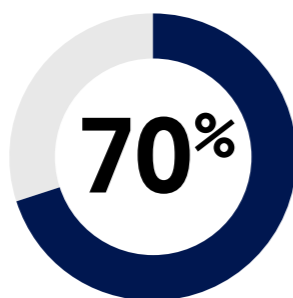
of global R&D  
(OECD, 2015)

## Employs



of the world's researchers  
(OECD, 2015)

## Publishes



of global research papers  
(Web of Science, 2018)

# Introduction

**The 2019 G20 Summit takes place in Osaka, Japan on June 28-29. What happens in the G20 affects the world and the G20 group is undoubtedly a driver in the global research system.**

**G20 is a group of 19 leading economies, spread regionally around the globe, with the EU as an additional member, that represents more than 80% of GDP and two-thirds of global population.**

This meeting, as the world's 'premier forum for international co-operation' takes place against a backdrop of increasing global trade tensions. Expectations are high that the G20 will continue to play a positive role in fostering economic opportunity and addressing challenges in the global landscape. The world's most prosperous economies are also among the most innovative ones and innovation is driven first and foremost by research. Research boosts economic growth and drives progress as the benefits of research are realized through economic, social and cultural outcomes.

Japan believes that more international co-operation is a driver of shared global prosperity and has asserted a G20 focus on three core issues: trade reform; technology as a creator of an innovative and inclusive society; and sustainability.

In considering likely outcomes, it is valuable to recognize the influence not only of the G20 as a group, but also to assess the diverse profile and trajectories of each member. Collectively, the 19 countries in the G20 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. That is over 70%

of the global total. 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.

The countries profiled within this report are selective. We have chosen topics of current policy interest that we know, through our work with research funders and research institutions, are good signals of the health of the research base. Key factors that contribute to impactful research include:

- Relative research funding within the wider economy: the EU's ambition is for at least 3% of GDP by 2020
- Gender balance in the research workforce: UNESCO reports a global average of 30% of researchers to be female
- International engagement: international collaboration accounts for about half of G20 output and produces some of the most impactful research
- Open access to research: the EU is driving Plan S to make all publicly-funded research publications immediately accessible and one-third of G20 output in 2018 was published in an OA format
- We also summarise publication output and citation impact and deconstruct these indicators by main research areas in sciences and humanities.

The data are visualized through graphic analyses that include the *Impact Profiles* and *Research Footprints* that we have developed. These were discussed in detail in our January 2019 report 'Profiles, not metrics' (GRR 1). For this publication, the benchmark is either the average or the median for the G20 group as a whole. These visualizations are explained in notes preceding the national profile pages.

There is no ranking of the countries profiled here, because that would not be meaningful. This is a not a report on comparative performance. These profiles cover some large, mature economies and some economies that are smaller or still building their research base. The time trend graphs show the progress of that development. These scorecards will help policy-makers, observers and reporters to track, applaud and critique that progress, including the diversification of the research workforce, the allocation of strong research funding and the shift to Open Access.

# Executive summary

| Country          | Summary of research footprint   |
|------------------|---|
| <b>Argentina</b> | GERD remains low at 0.53% GDP, and patenting is also relatively low, but while the research workforce is relatively small it is gender-balanced (53% female). Output per researcher is half G20 average. Publication via Open Access (OA) models is relatively high, especially in social sciences and humanities. The citation impact of publications is boosted by international collaboration: 11% of these papers are in the global top 10%.  |
| <b>Australia</b> | Output has doubled in a decade – and is relatively high per researcher and per GERD - but it is levelling-out and purely domestic output is now dropping. Overall citation impact is above G20 average, boosted by international collaboration where 17.5% of papers are in the global top 10%. OA is around G20 average in science but well below this in other areas.   |
| <b>Brazil</b>    | OA has been a strong feature of output across all disciplines. The absence of key OECD data for Brazil means some other indicators are absent. Output growth has been steady, driven as much by domestic activity as by collaboration and is strongest in life sciences. As elsewhere, collaboration is a significant aspect of citation impact, which is otherwise below G20 average.  |
| <b>Canada</b>    | Output has risen by around 30% in a decade, and is strong in social sciences and health but, despite above average productivity, domestic output has been flat and is dropping. Citation impact is relatively good with 38% of publications above world average citation impact compared to 31% for the G20 as a whole. It is strongest in health and natural sciences.   |
| <b>China</b>     | There is an enormous research workforce (2 million researchers), a strong level of investment (GERD as 2% GDP) and relatively high patenting rates. Its output productivity is domestically driven, although below G20 average, and is particularly strong in science and technology. Average citation impact is rising and has reached G20 average, and the Impact Profile shows that 10% of its papers are in the global top 10%.               |
| <b>France</b>    | Only 27% of researchers are female, OA is below G20 average in most fields, and output both per researcher and per GERD funding is below average. Citation impact is relatively good in science, boosted by a high level of international collaboration now accounting for over 60% of all output while domestic output has been in decline: output per researcher has been static.   |
| <b>Germany</b>   | Investment is high with GERD at 3% of GDP, and output per GERD is below G20 average whereas output per researcher is around average. The citation impact of this research is relatively good, across both international and domestic activity, and secures a 12.6% share of the world's top 10% of papers. Only 28% of researchers are female. OA has been below G20 average but is rising.   |
| <b>India</b>     | There is no readily available recent data on GERD for researchers, so we cannot index productivity, but volume output appears to be relatively low for such a large economy. International collaboration remains relatively low level and Open Access has been adopted only in bio-medicine. These factors all contribute to a relatively weak Impact Profile and low citation impact across all areas.   |
| <b>Indonesia</b> | Research output is small but has trebled in a decade, across all disciplines. More than 75% of this output is internationally collaborative, so that also influences the Impact Profile. Average citation impact is relatively good in medicine and in social science and humanities, but domestic impact remains relatively low and over 40% of domestic papers are uncited. OA take up is good, but this is driven by very high OA in medicine. |
| <b>Italy</b>     | Citation impact is relatively good in all areas, but output is only just above G20 median, which is surprising for a G7 research economy. The Impact Profile shows that average performance is boosted by international collaboration, which accounts for 55% of total output. Productivity figures (per GERD and per researcher) are well above average, so output is not constrained by consistently low investment.                            |

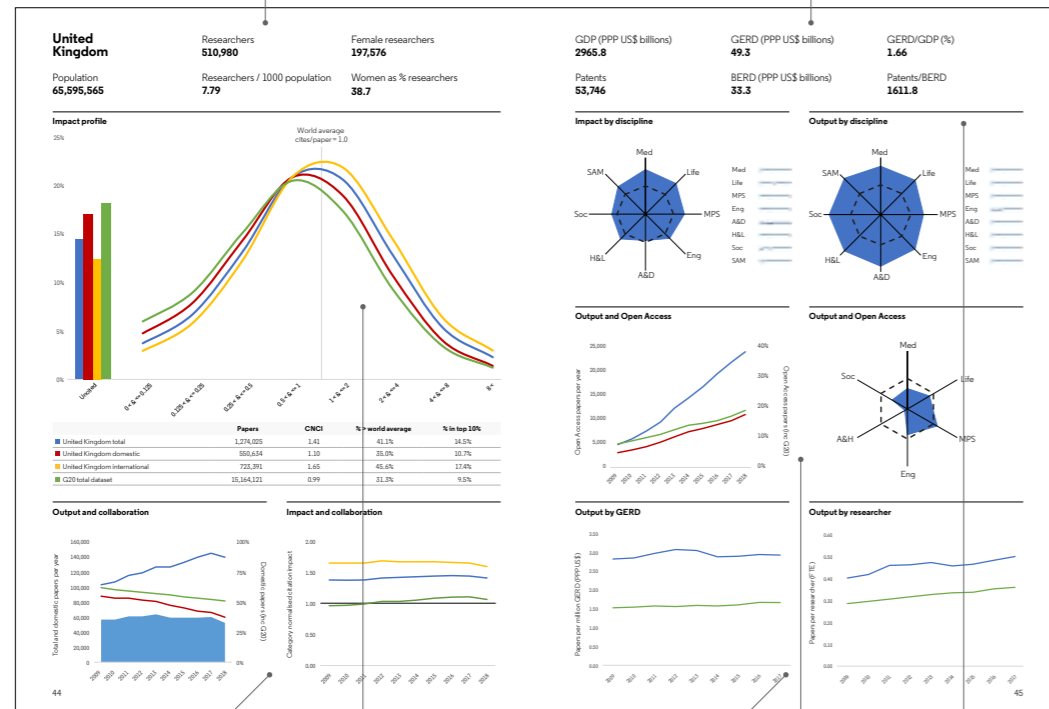
| Country               | Summary of research footprint  |
|-----------------------|--|
| <b>Japan</b>          | Citation impact is relatively low for a well-established research economy with a high level of GERD/GDP (3.2%). The Impact Profile shows that performance is lifted above the G20 average through international collaboration, although this is relatively low, at 30% of a total output that has remained very flat over the decade. Productivity is well below average and only 16% of the researcher population are female.                                   |
| <b>Mexico</b>         | Research investment remains relatively low (GERD/GDP is 0.49%) but rising output is boosted by high researcher productivity. However, citation impact has been flat over the decade and the Impact Profile shows that the performance of the domestic base remains below world average and overall impact has recently fallen compared to that benchmark. Only in medicine and health does impact match the world average.                                       |
| <b>Russia</b>         | Output has been recovering slowly from post-Soviet disruption and is close to G20 median in physical sciences but still low in engineering. Citation impact is boosted by rising international collaboration (38% of total) but share of global top 10% papers is low (4.2%) and the Impact Profile shows that domestic research is generally cited less than world average. Productivity by GERD and researcher is relatively low, and OA is exceptionally low. |
| <b>Saudi Arabia</b>   | Average citation impact appears very high as only 20% of papers are domestic, and the bulk of the Impact Profile reflects a policy orientation towards international collaboration, or affiliation, that has grown steeply while domestic capacity has remained relatively static. Impact by discipline is consequently relatively high in all areas, compared both to G20 average and to the country's substantive activity.                                    |
| <b>South Africa</b>   | The overall Impact Profile is close to G20 average, boosted by international collaboration (60% of output) that underpins a strong performance in medicine and health research. Productivity is high and output has been rising, although it remains relatively low in the G20. Open Access publication rates across disciplines are consistently high and female researchers make up an impressive 45% of the workforce.  |
| <b>South Korea</b>    | GERD/GDP (4.5%) is exceptionally high. This has not yet been translated into output, where productivity is well below G20 averages, or citation impact. The latter may partly be due to lower international collaboration than the G20 average. Female researchers are a relatively small part (20%) of the workforce. OA is rising and is already above G20 benchmarks.   |
| <b>Turkey</b>         | Output has recently declined and productivity by GERD and researcher has fallen throughout the decade. Citation impact has remained well below world average in all areas, boosted by international collaboration which remains low at 25% total output. Output is also relatively low across all areas, given the size of the economy and Open Access is declining relative to the G20 generally.   |
| <b>United Kingdom</b> | The share of papers in the global top 10% (14.5%) is the highest in the G20 and the Impact Profile shows that the domestic research base is also well above group average. By discipline, average citation impact is relatively high (above 1.18) in most areas and only low in art and design. International collaboration is exceptionally high (63%) for such a large economy. The number of female researchers (39%) is above G20 average.                   |
| <b>United States</b>  | Citation impact is consistent, though less than the UK, across all disciplines. The Impact Profile shows that the domestic research base is boosted less by international collaboration than for other countries. However, although GERD/GDP (2.8%) remains high, output and impact are in decline and output/researcher has fallen below the G20 average. Publishing via OA models is on the rise but is below the G20 average.                                 |

# Understanding the G20 scorecards

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



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 & 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 \$ <a href="https://databank.worldbank.org/data/reports.aspx?source=2&amp;series=SP.POP.TOTL&amp;country=#">https://databank.worldbank.org/data/reports.aspx?source=2&amp;series=SP.POP.TOTL&amp;country=#</a> or <a href="https://databank.worldbank.org/data/reports.aspx?source=2&amp;series=NY.GDP.MKTP.PP.CD&amp;country=#">https://databank.worldbank.org/data/reports.aspx?source=2&amp;series=NY.GDP.MKTP.PP.CD&amp;country=#</a>   |
| Researchers, GERD, BERD | OECD, MSTI           | Most recent data for each, matched to related data for the corresponding same year from e.g. the World Bank. For example, if researcher data are from 2016, population and female researcher data are from 2016 to provide a meaningful comparison <a href="https://stats.oecd.org/index.aspx">https://stats.oecd.org/index.aspx</a><br>GERD is Gross national Expenditure on R&D; BERD is Business-sector Expenditure on R&D; MSTI only includes data for OECD members and Argentina, 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. |
| Researchers/GERD        | OECD                 | Data are 2009-2017 linearly interpolated where not available, and extended with earliest or latest value to cover the start/end of the period   |
| Patents                 | WIPO                 | Data are for 2017: <i>World Intellectual Property Indicators 2018</i> , Geneva: World Intellectual Property Organization. Table A59, p73  |
| Publications, citations | Web of Science Group | InCites or Web of Science depending on the data point (2009-2018). 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                 | Data taken from WoS Group InCites, based on DOAJ  |

**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.

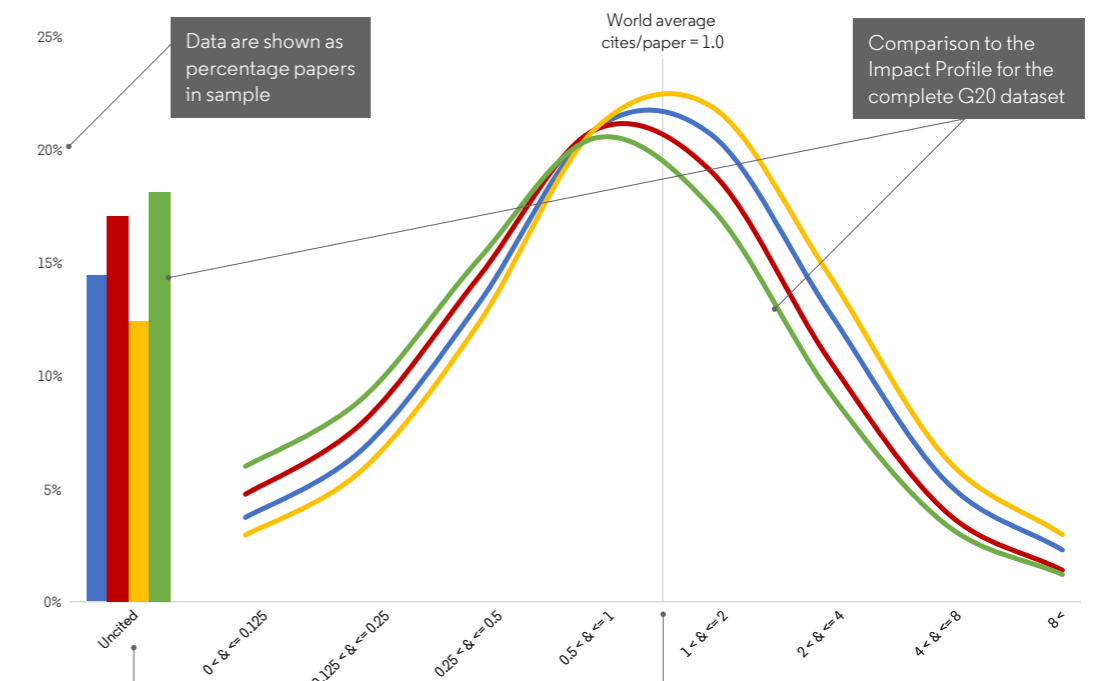
There are no direct comparisons between individual countries. The G20 nations vary significantly in size and research maturity so direct comparison would not always be informative. In future reports, we expect to add information that tracks the evolving state of each country, benchmarking its activity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



Uncited papers shown as a separate block

Eight impact categories of cited papers: four below the world average citation impact and four above

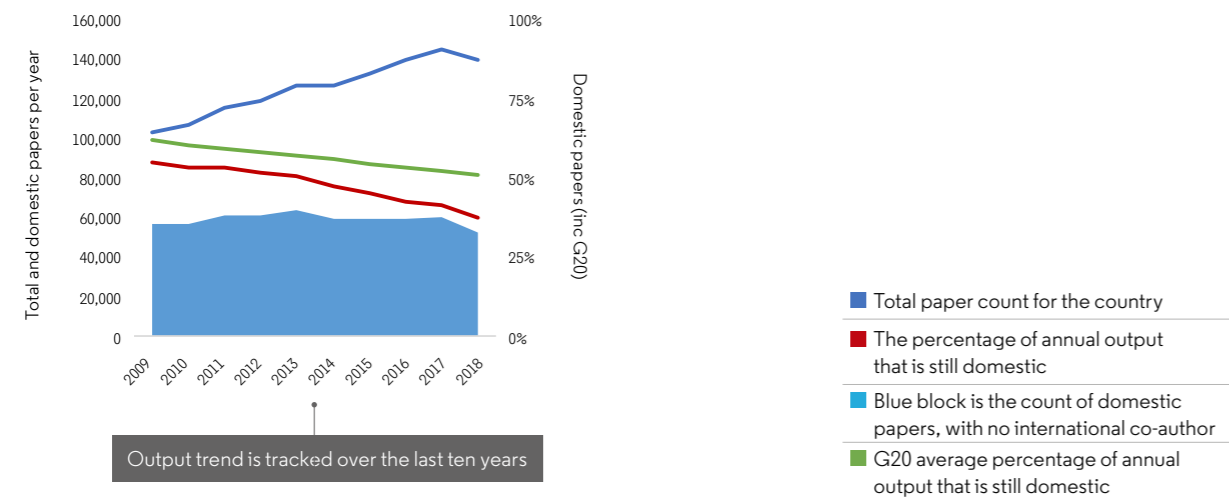
|                              | Papers     | CNCI | % > world average | % in top 10% |
|------------------------------|------------|------|-------------------|--------------|
| United Kingdom total         | 1,274,025  | 1.41 | 41.1%             | 14.5%        |
| United Kingdom domestic      | 550,634    | 1.10 | 35.0%             | 10.7%        |
| United Kingdom international | 723,391    | 1.65 | 45.6%             | 17.4%        |
| G20 total dataset            | 15,164,121 | 0.99 | 31.3%             | 9.5%         |

For each dataset, the table shows the count of papers, the average CNCI and the percentages of papers above world average and in the world's top 10%

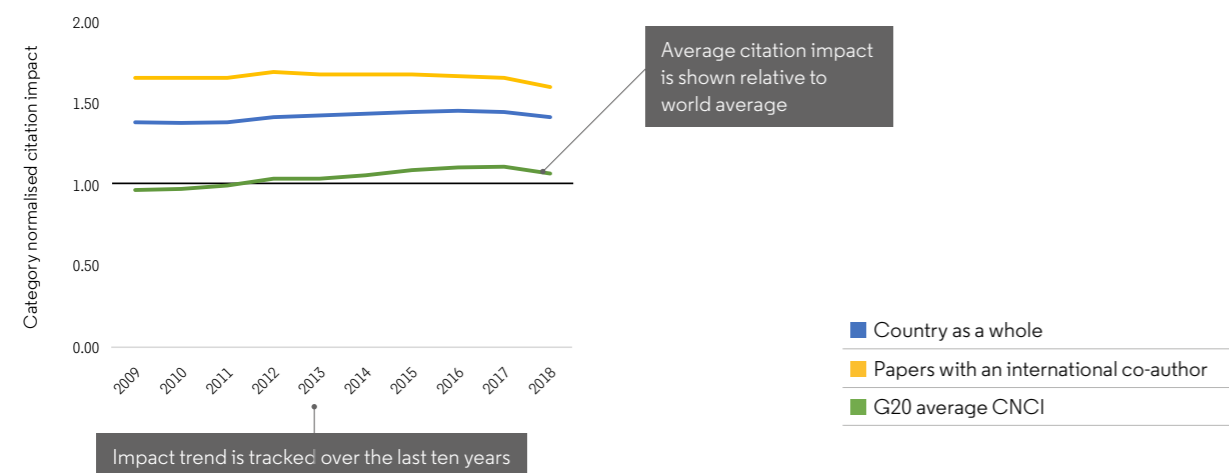
**International collaboration** in research has been growing and most of the world's most highly-cited research now has authors from two or more countries. As a result, the specifically domestic part of each country's research base has been shrinking and is contributing less to overall national impact (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

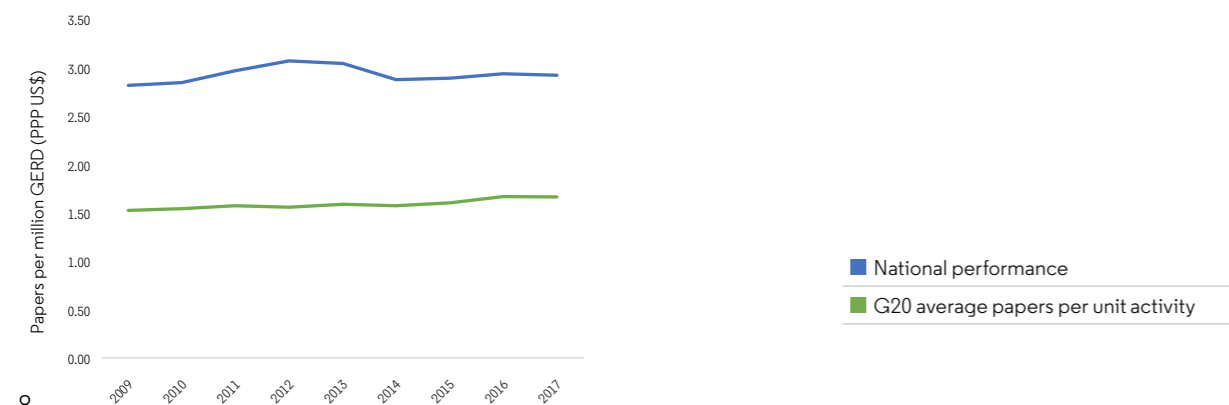


### Impact and collaboration



### Research productivity

is analysed in terms of both output per unit GERD funding and output per researcher.

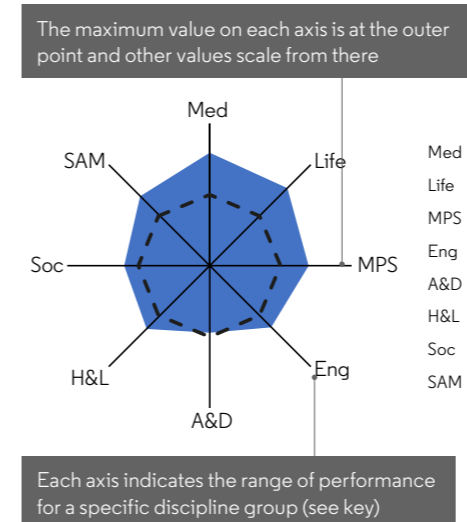


**Research Footprints** show how a research activity or performance measure varies across disciplines. They show the 'footprint' of the country on the global research landscape.

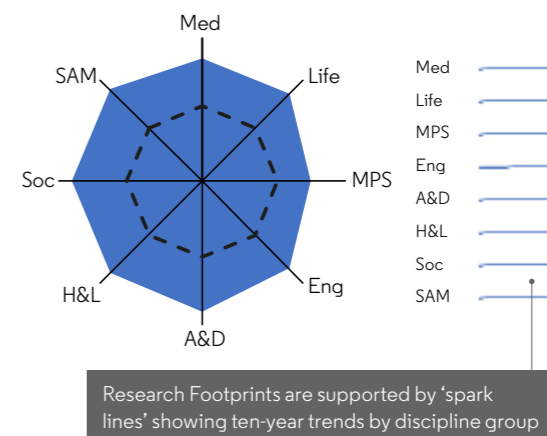
The Research Footprints for publication output and for citation impact use eight major discipline groups (see key) within which there are broadly similar publication and citation patterns.

**Med** = medicine **Life** = life sciences **MPS** = maths and physical sciences **Eng** = engineering and technology  
**Soc** = social sciences **A&H** = arts and humanities **A&D** = art and design **H&L** = humanities and languages  
**SAM** = subjects allied to medicine

### Impact by discipline



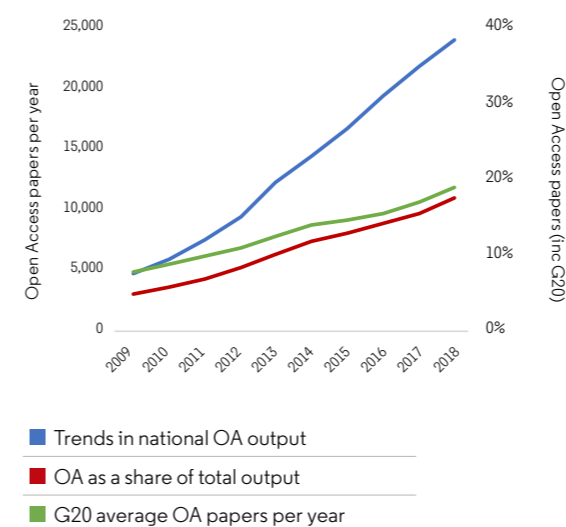
### Output by discipline



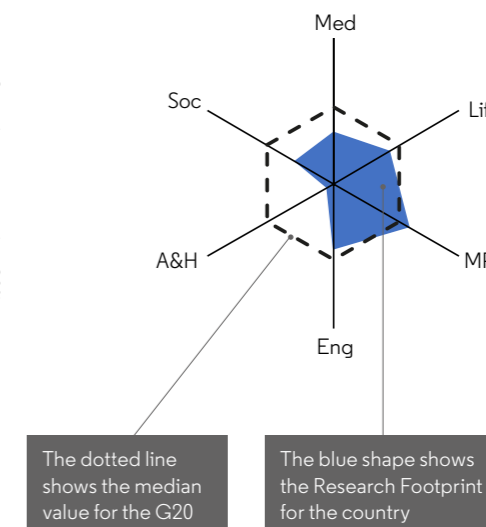
**'Open Access' (OA) research publication**, where the author or funder pays instead of the reader or a university library paying via journal subscription, is increasing in response to demands from research funders – including governments (see Global Research Report 2: The Plan S Footprint). The trends and patterns in OA research publication are shown in a graph and a Research Footprint.

The Research Footprint uses only six axes because OA is still relatively scarce in humanities and social sciences.

### Output and Open Access



### Output and Open Access



# Argentina

Researchers  
**83,947**

Female researchers  
**44,521**

GDP (PPP US\$ billions)  
**879.8**

GERD (PPP US\$ billions)  
**4.7**

GERD/GDP (%)  
**0.53**

Population  
**43,847,430**

Researchers / 1000 population  
**1.91**

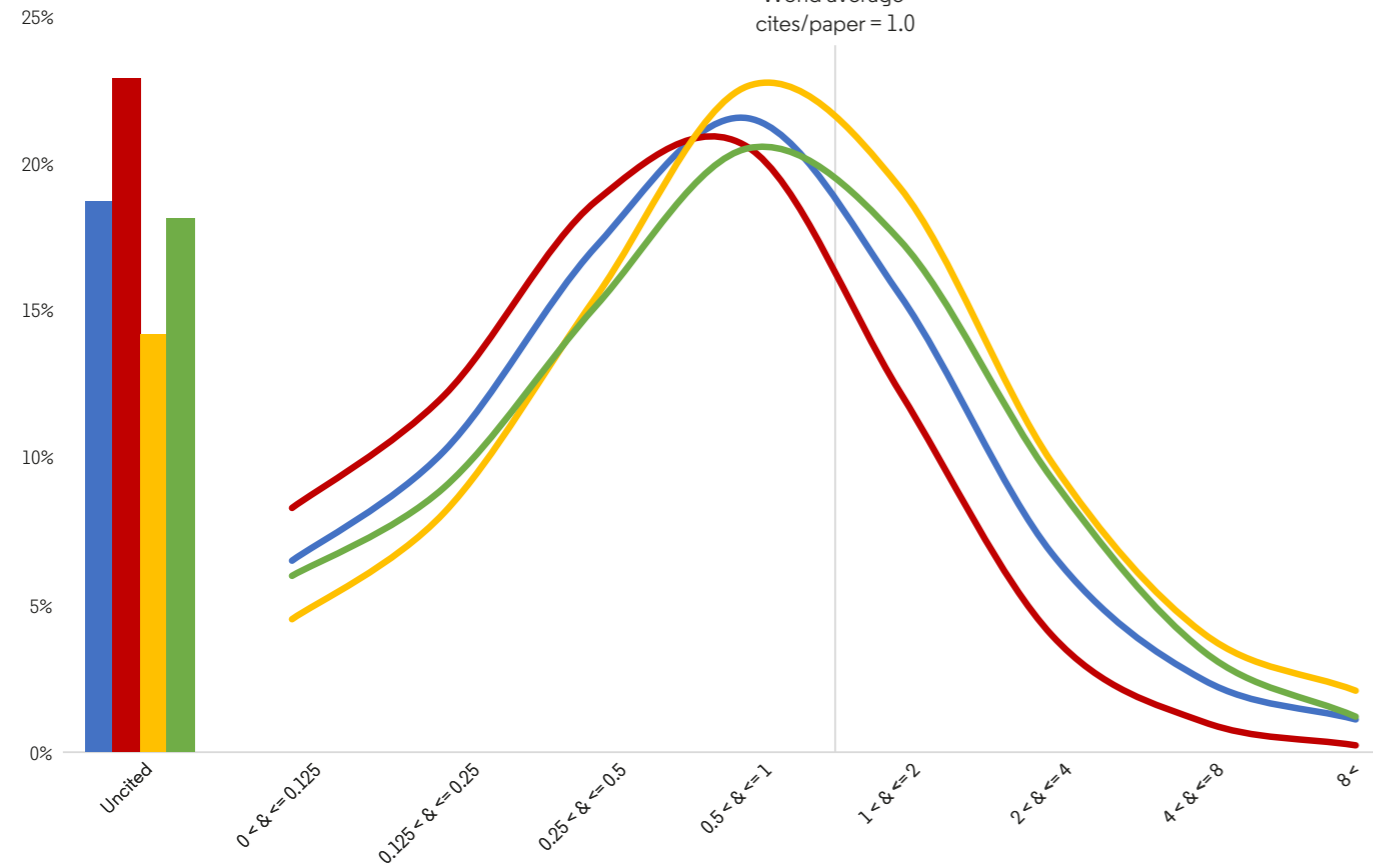
Women as % researchers  
**53.0**

Patents  
**766**

BERD (PPP US\$ billions)  
**1.1**

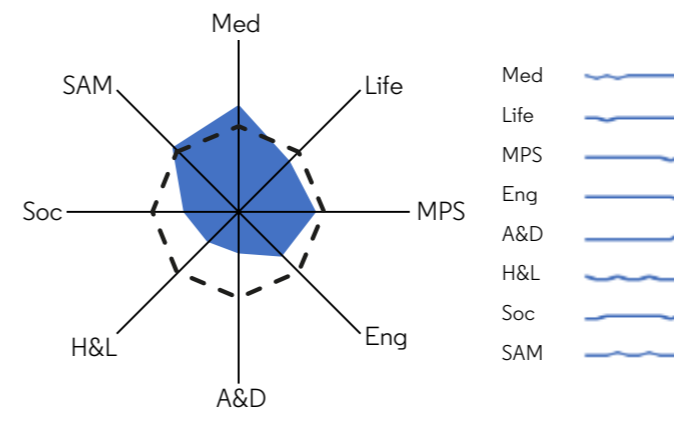
Patents/BERD  
**684.7**

## Impact profile

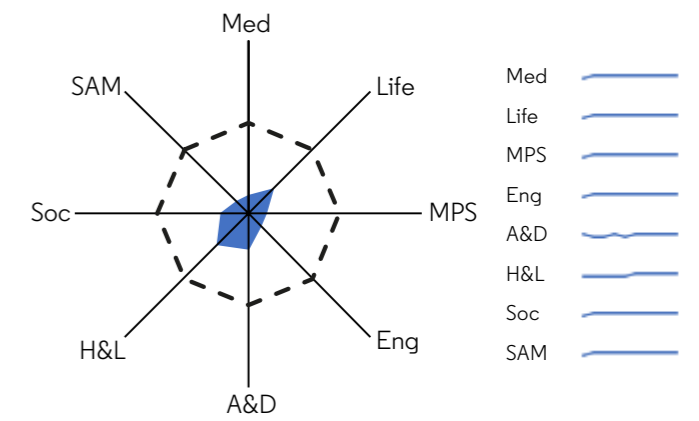


|                         | Papers     | CNCI | % > world average | % in top 10% |
|-------------------------|------------|------|-------------------|--------------|
| Argentina total         | 98,448     | 0.92 | 25.8%             | 6.9%         |
| Argentina domestic      | 51,792     | 0.54 | 17.4%             | 2.9%         |
| Argentina international | 46,656     | 1.34 | 35.1%             | 11.3%        |
| G20 total dataset       | 15,164,121 | 0.99 | 31.3%             | 9.5%         |

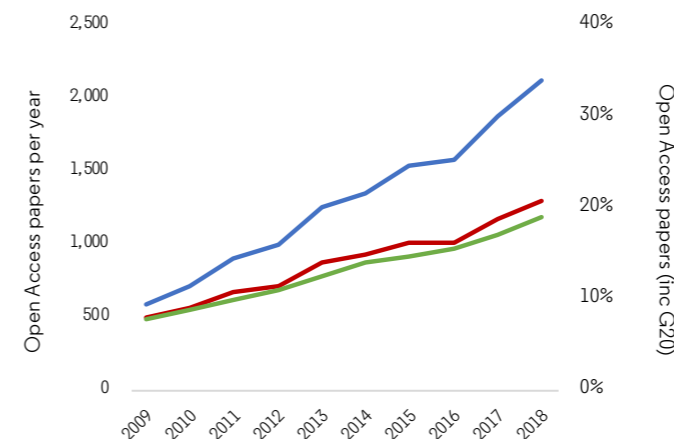
## Impact by discipline



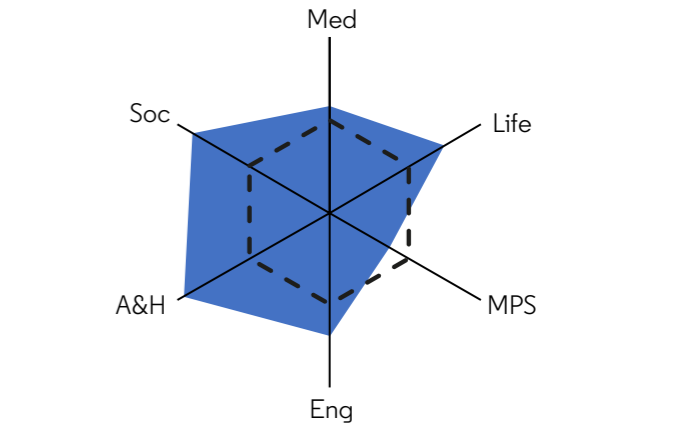
## Output by discipline



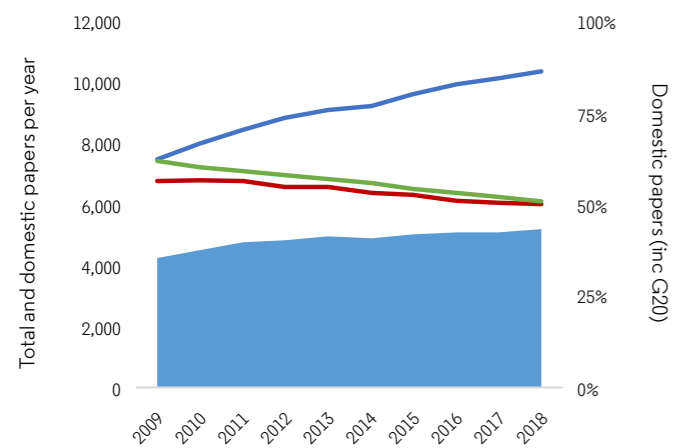
## Output and Open Access



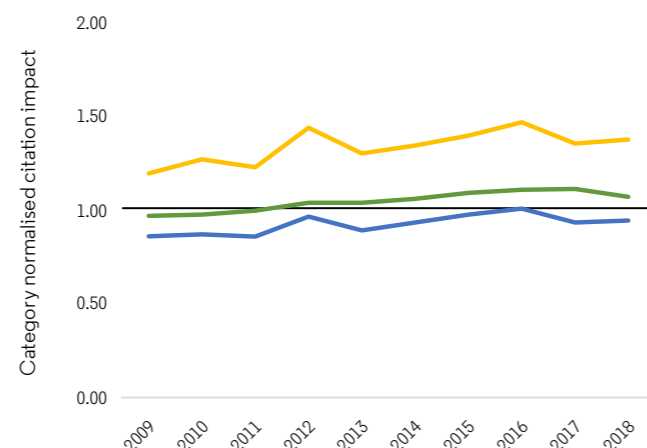
## Output and Open Access



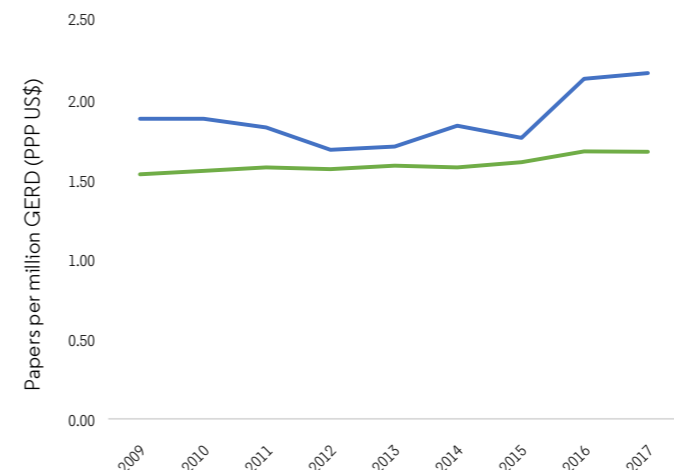
## Output and collaboration



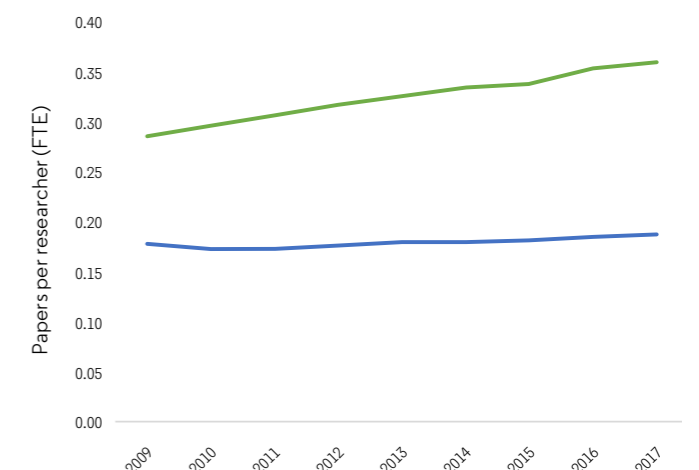
## Impact and collaboration



## Output by GERD



## Output by researcher





# Australia

Researchers

-

Female researchers

-

Population  
**24,601,860**

Researchers / 1000 population

-

Women as % researchers

**40%**

GDP (PPP US\$ billions)  
**1099.9**

GERD (PPP US\$ billions)  
**21.2**

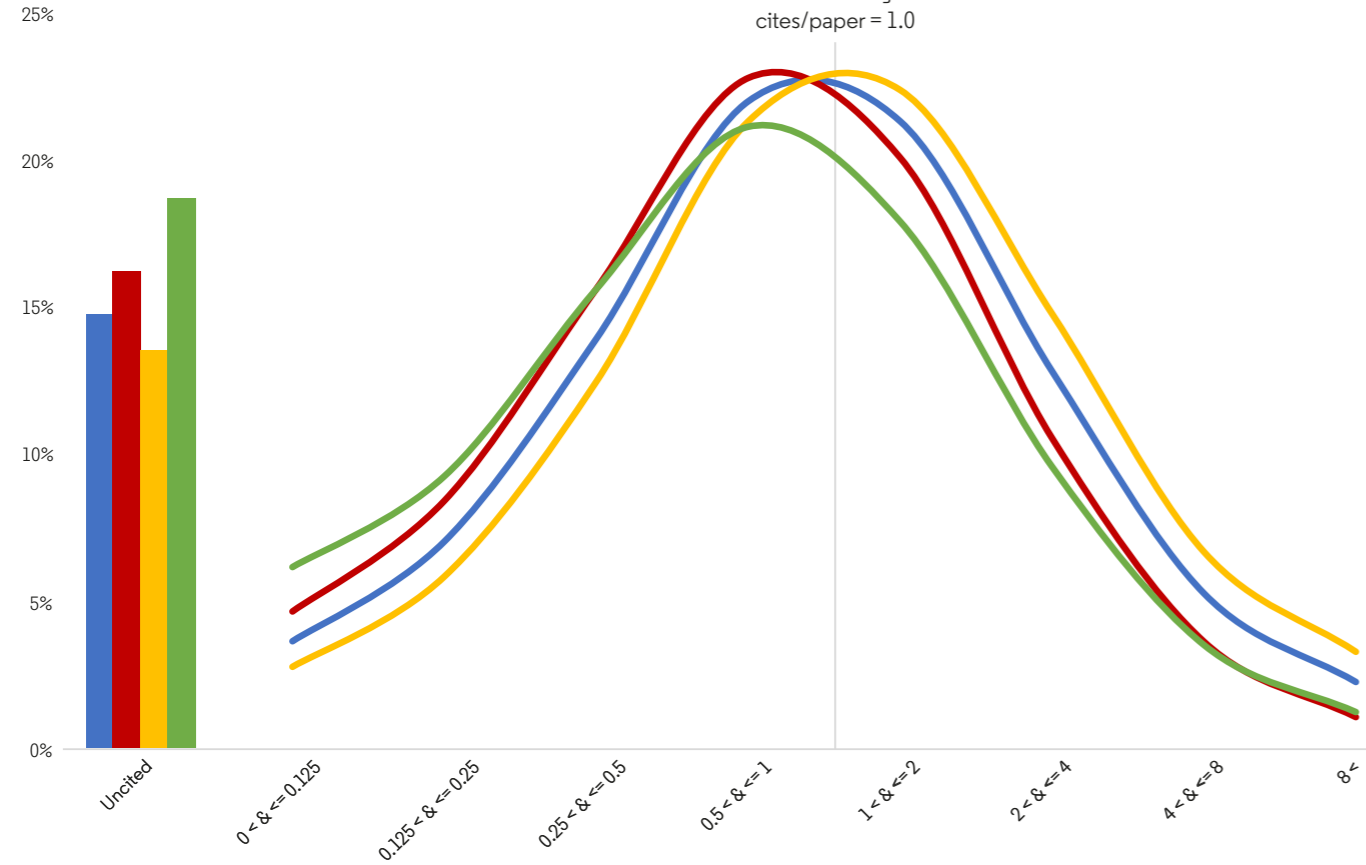
GERD/GDP (%)  
**1.92**

Patents  
**11,656**

BERD (PPP US\$ billions)  
**11.3**

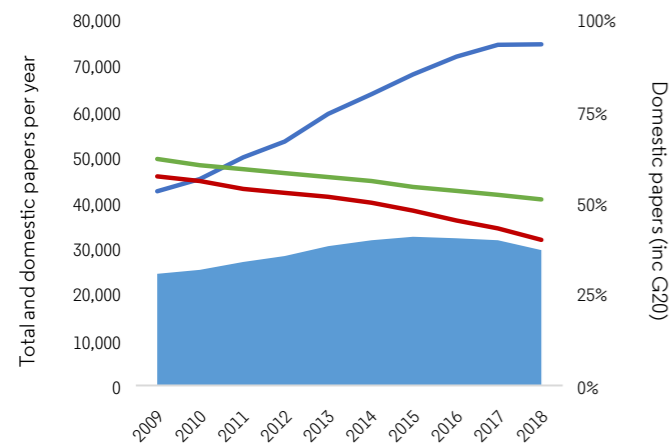
Patents/BERD  
**1031.4**

## Impact profile

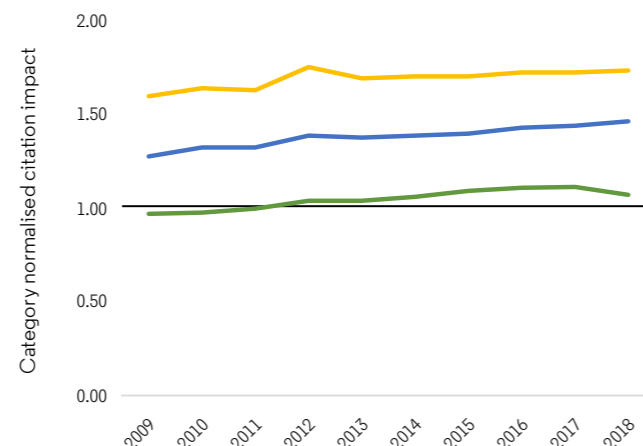


|                         | Papers     | CNCI | % > world average | % in top 10% |
|-------------------------|------------|------|-------------------|--------------|
| Australia total         | 624,023    | 1.38 | 40.4%             | 14.0%        |
| Australia domestic      | 288,459    | 1.02 | 34.3%             | 9.8%         |
| Australia international | 335,564    | 1.69 | 45.7%             | 17.5%        |
| G20 total dataset       | 15,164,121 | 0.99 | 31.3%             | 9.5%         |

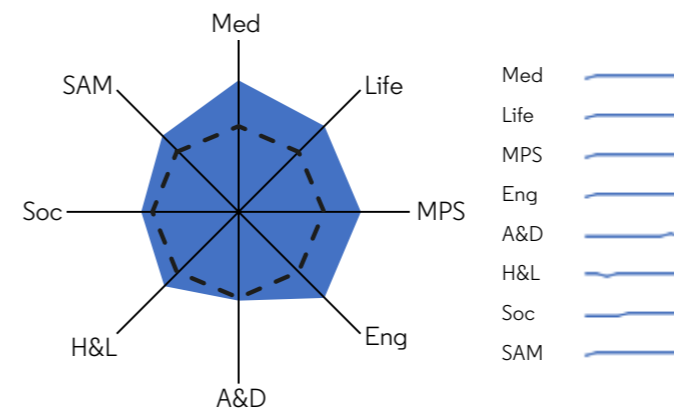
## Output and collaboration



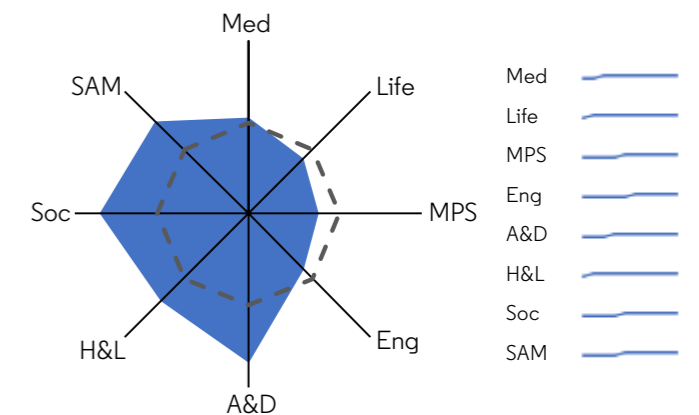
## Impact and collaboration



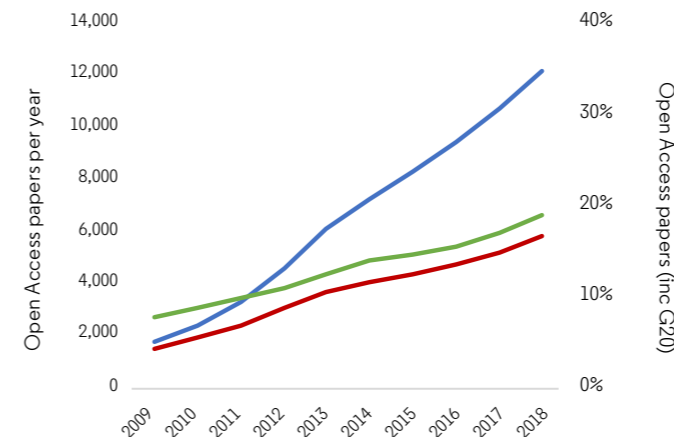
## Impact by discipline



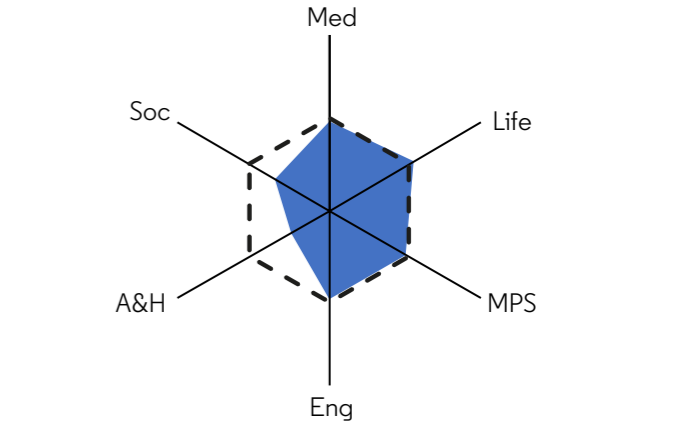
## Output by discipline



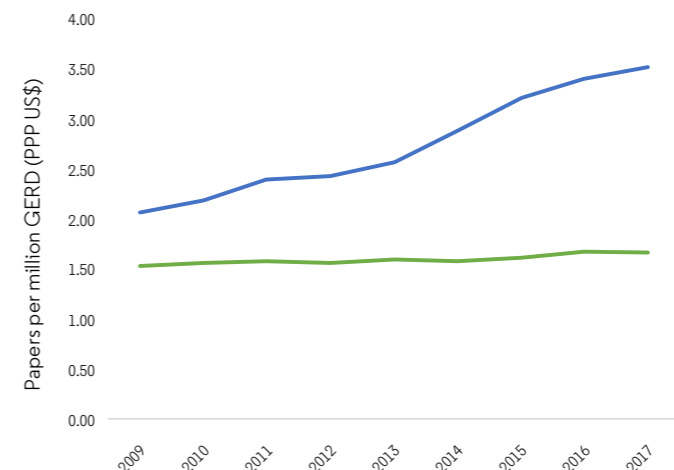
## Output and Open Access



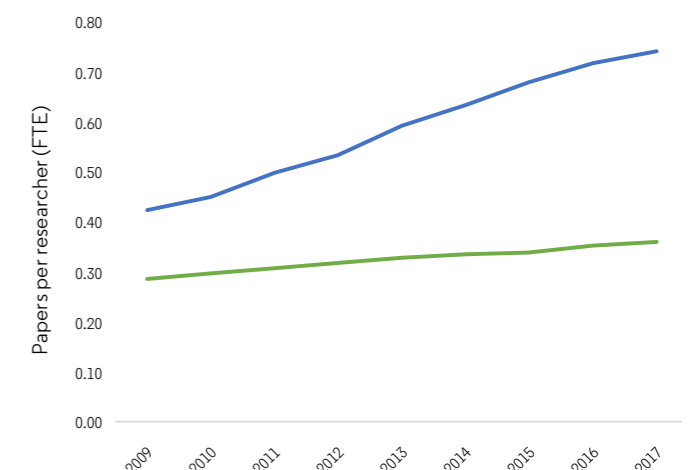
## Output and Open Access



## Output by GERD



## Output by researcher





# Brazil

Researchers

-

Female researchers

-

Population  
**209,288,278**

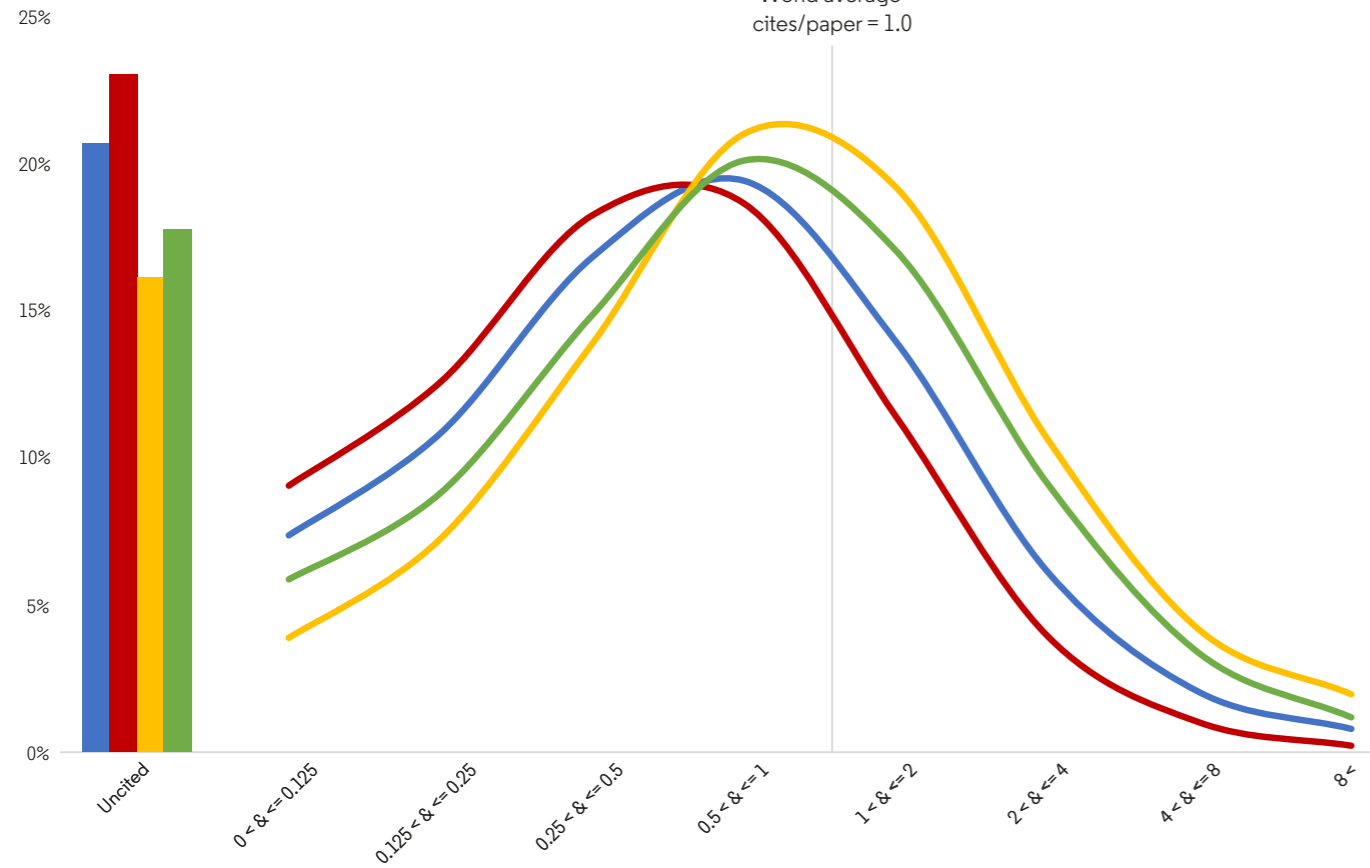
Researchers / 1000 population

-

Women as % researchers

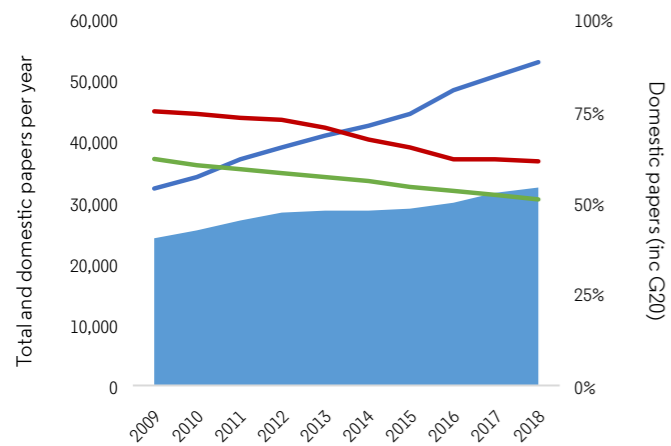
-

## Impact profile

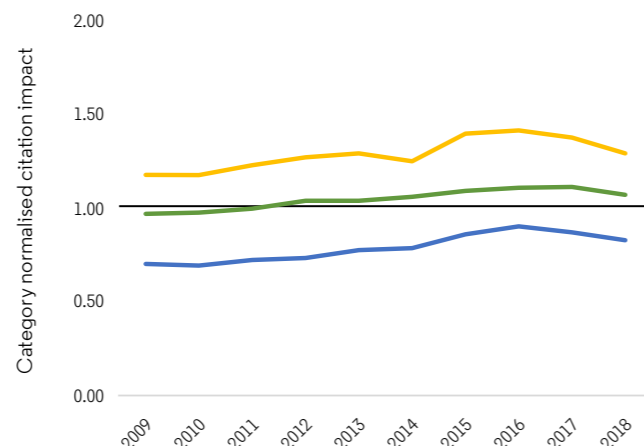


|                      | Papers     | CNCI | % > world average | % in top 10% |
|----------------------|------------|------|-------------------|--------------|
| Brazil total         | 463,357    | 0.79 | 23.3%             | 5.9%         |
| Brazil domestic      | 311,969    | 0.54 | 16.9%             | 3.1%         |
| Brazil international | 151,388    | 1.30 | 36.6%             | 11.9%        |
| G20 total dataset    | 15,164,121 | 0.99 | 31.3%             | 9.5%         |

## Output and collaboration



## Impact and collaboration



GDP (PPP US\$ billions)  
**3255.1**

GERD (PPP US\$ billions)

-

GERD/GDP (%)

-

Patents  
**7,505**

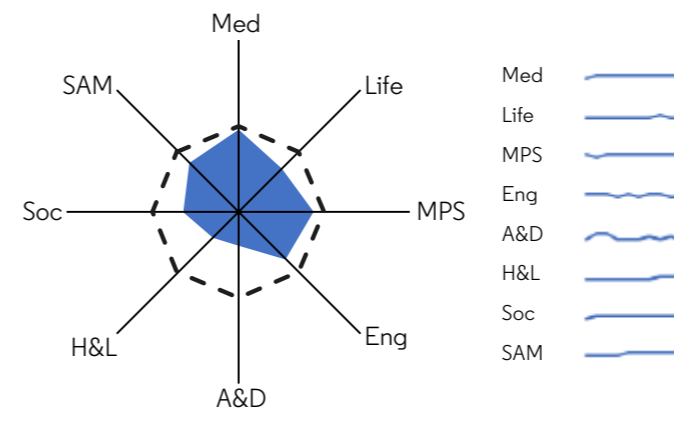
BERD (PPP US\$ billions)

-

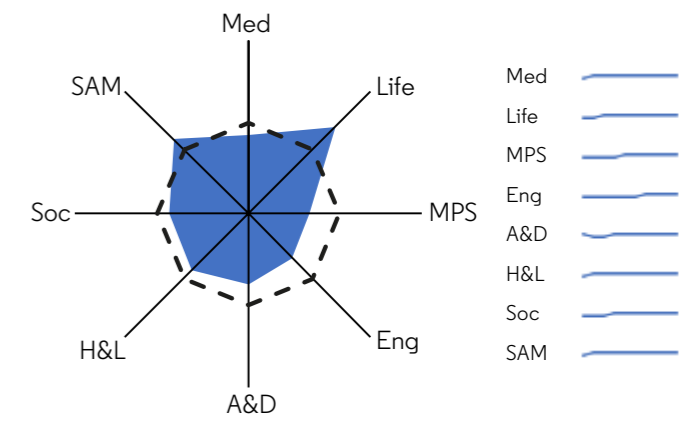
Patents/BERD

-

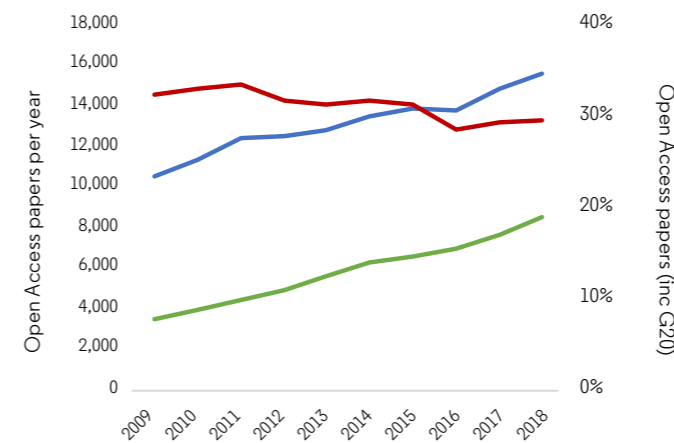
## Impact by discipline



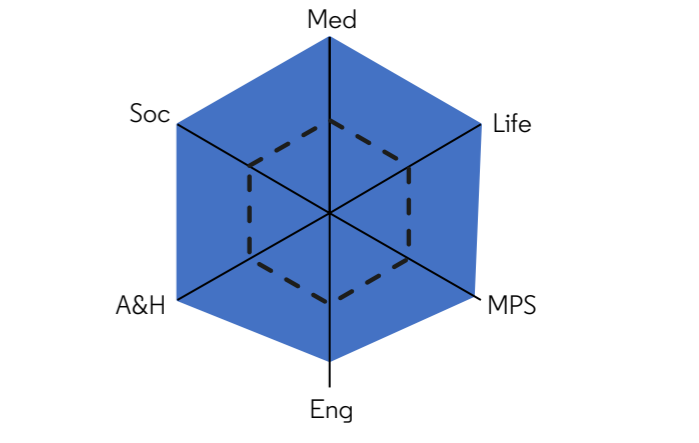
## Output by discipline



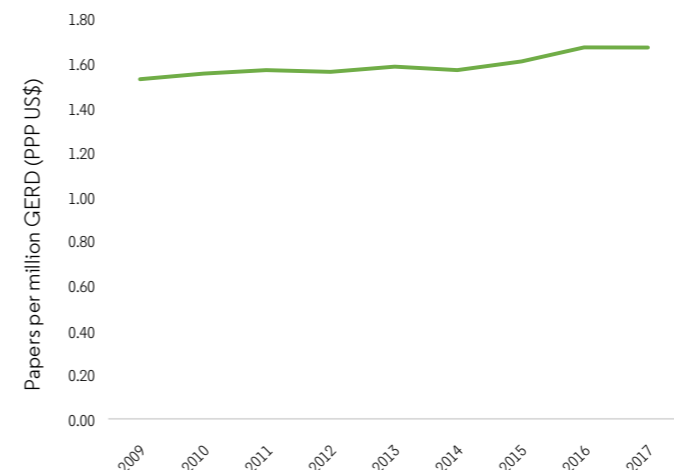
## Output and Open Access



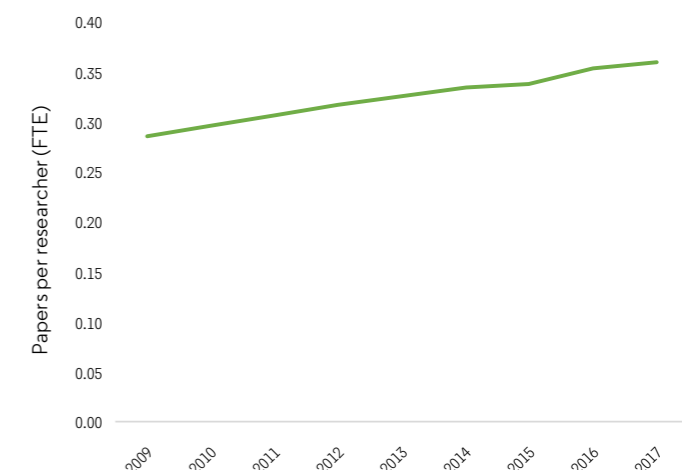
## Output and Open Access



## Output by GERD



## Output by researcher



# Canada

Researchers

-

Female researchers

-

Population  
**36,708,083**

Researchers / 1000 population

-

Women as % researchers

-

GDP (PPP US\$ billions)  
**1707.3**

GERD (PPP US\$ billions)  
**27.2**

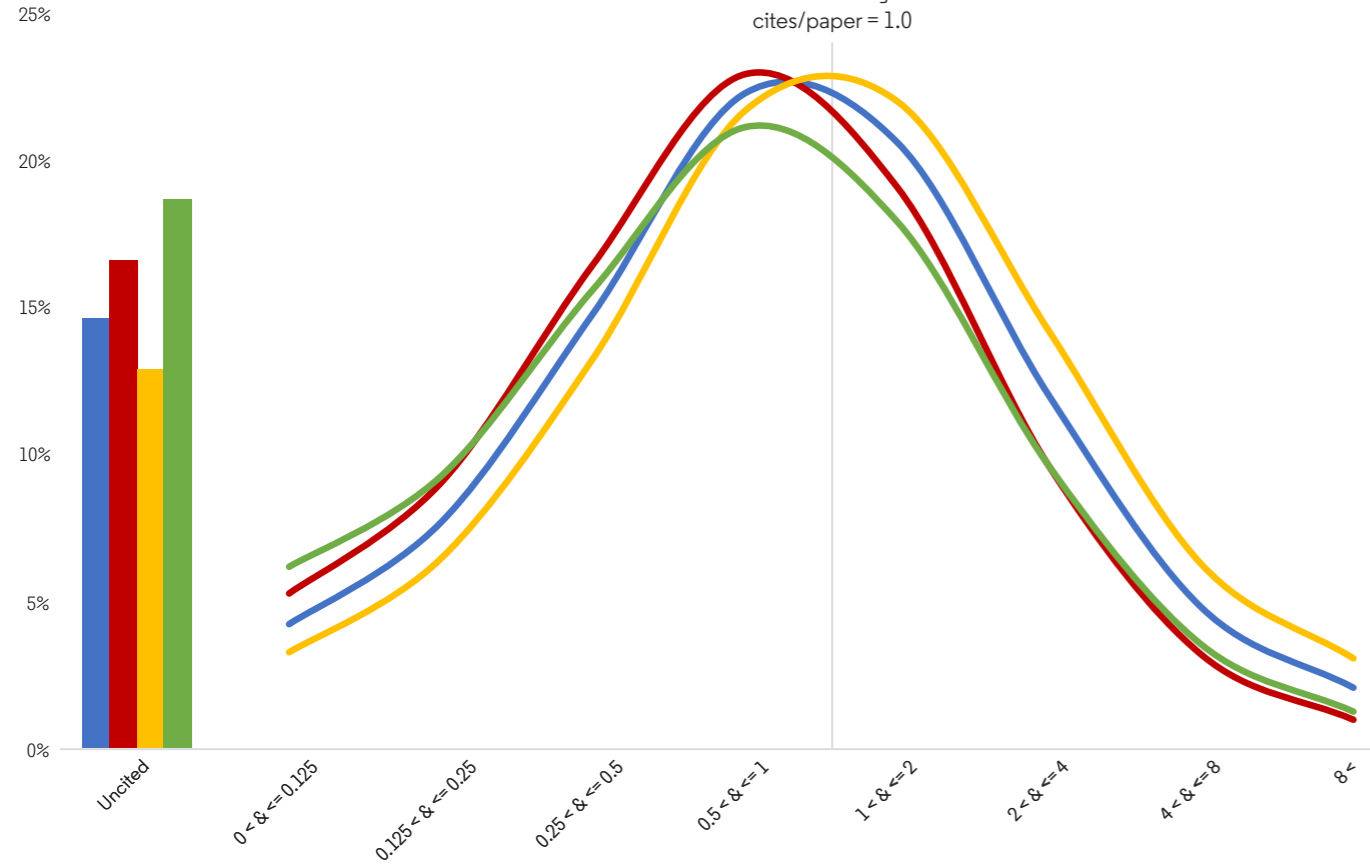
GERD/GDP (%)  
**1.59**

Patents  
**23,914**

BERD (PPP US\$ billions)  
**14.1**

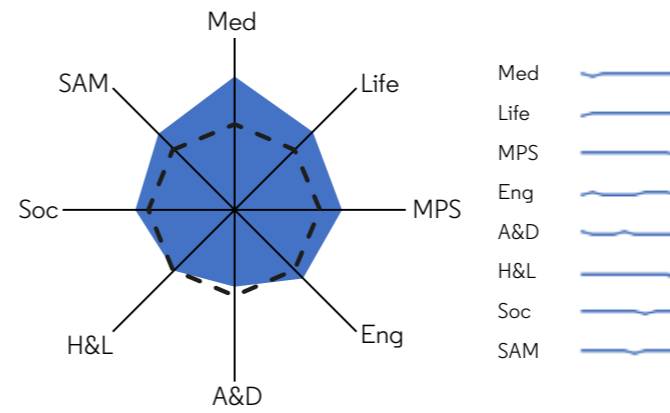
Patents/BERD  
**1700.9**

## Impact profile

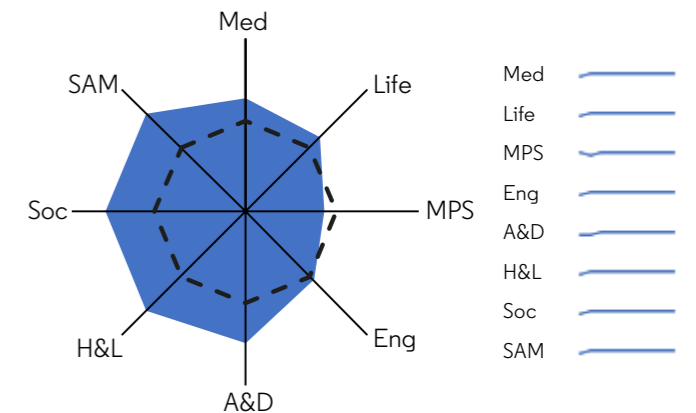


|                      | Papers     | CNCI | % > world average | % in top 10% |
|----------------------|------------|------|-------------------|--------------|
| Canada total         | 736,856    | 1.31 | 38.2%             | 12.8%        |
| Canada domestic      | 352,119    | 0.95 | 31.8%             | 8.6%         |
| Canada international | 384,737    | 1.64 | 44.1%             | 16.6%        |
| G20 total dataset    | 15,164,121 | 0.99 | 31.3%             | 9.5%         |

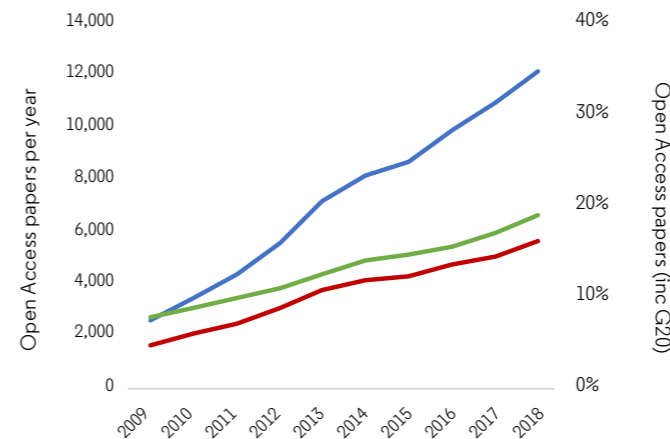
## Impact by discipline



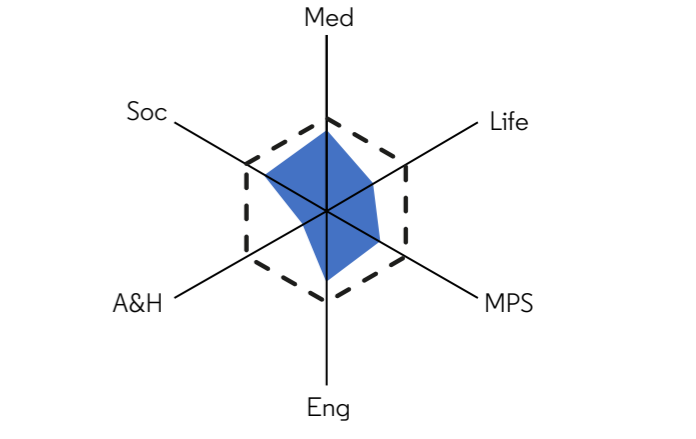
## Output by discipline



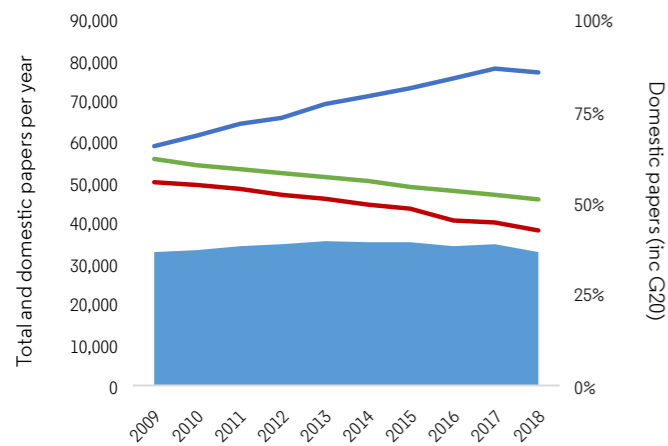
## Output and Open Access



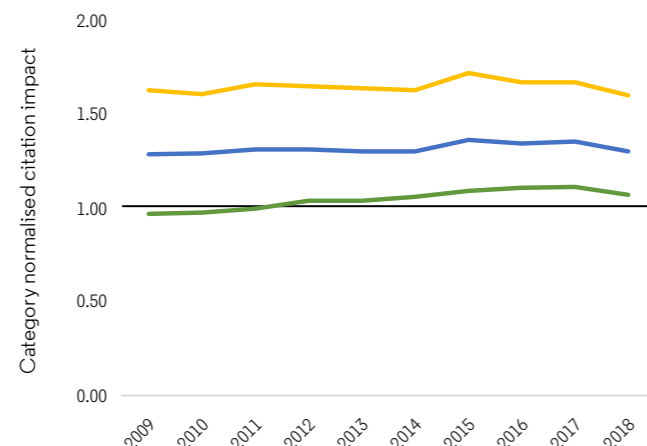
## Output and Open Access



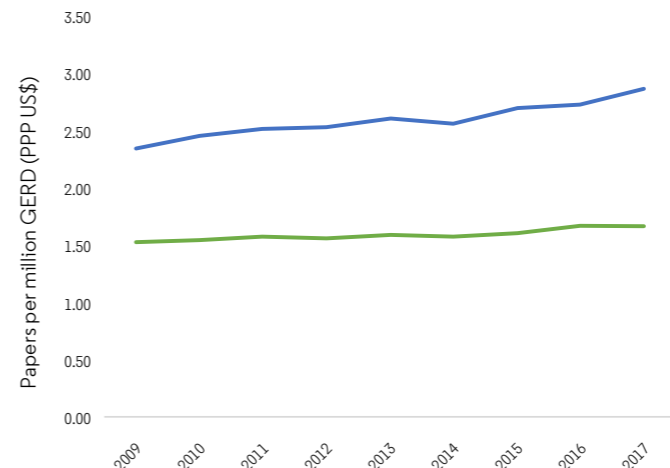
## Output and collaboration



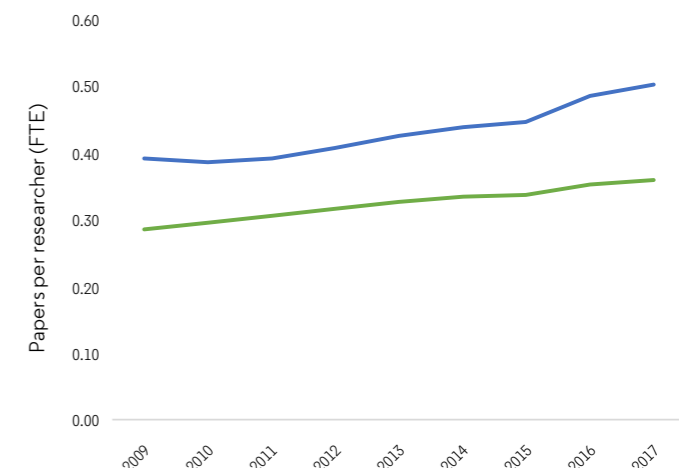
## Impact and collaboration



## Output by GERD



## Output by researcher



# China

Researchers  
**2,069,650**

Female researchers  
-

GDP (PPP US\$ billions)  
**23350.2**

GERD (PPP US\$ billions)  
**496.0**

GERD/GDP (%)  
**2.12**

Population  
**1,350,695,000**

Researchers / 1000 population  
**1.53**

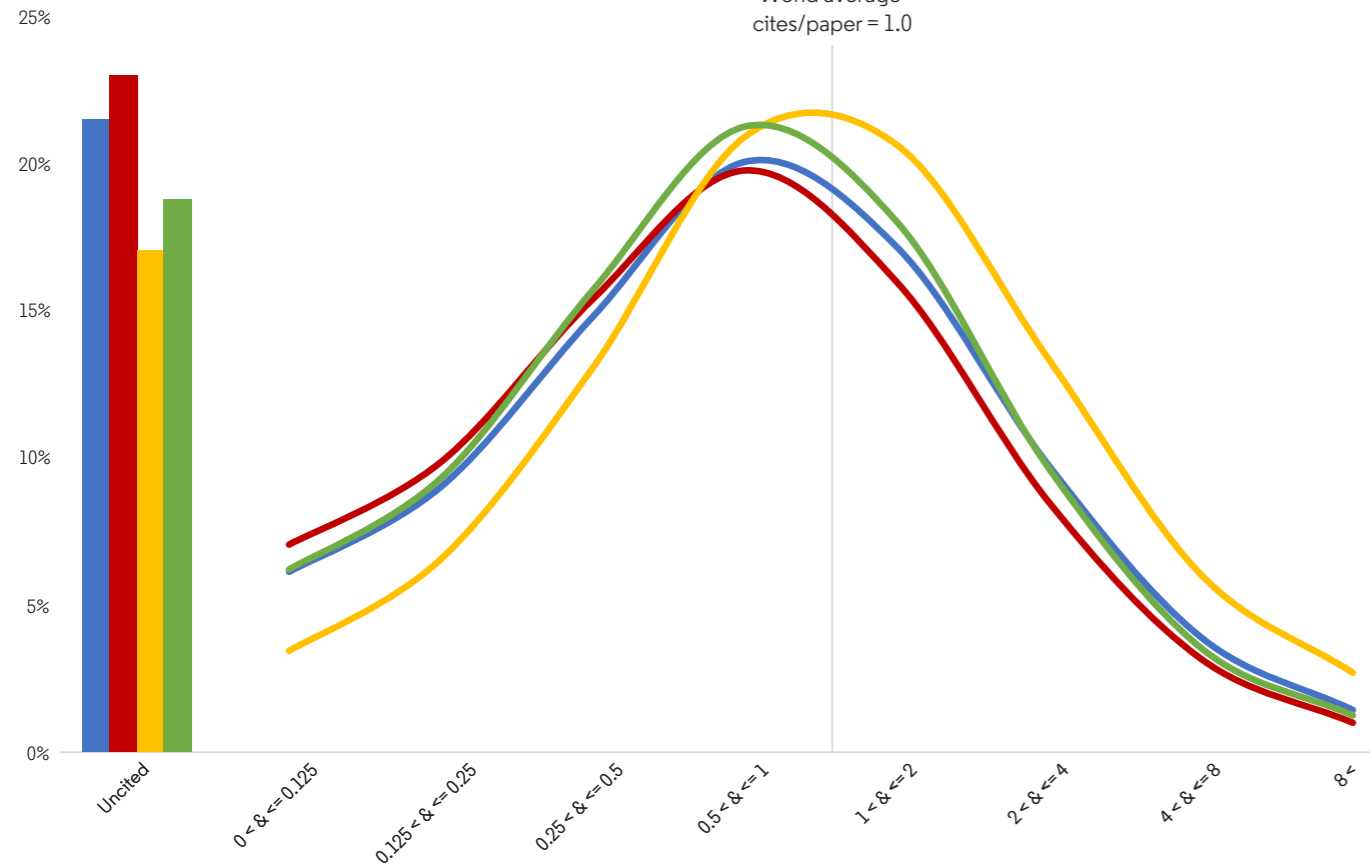
Women as % researchers  
-

Patents  
**1,306,019**

BERD (PPP US\$ billions)  
**384.8**

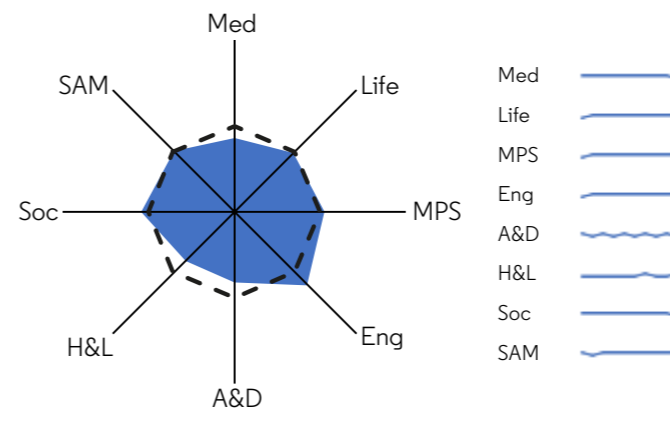
Patents/BERD  
**3393.8**

## Impact profile

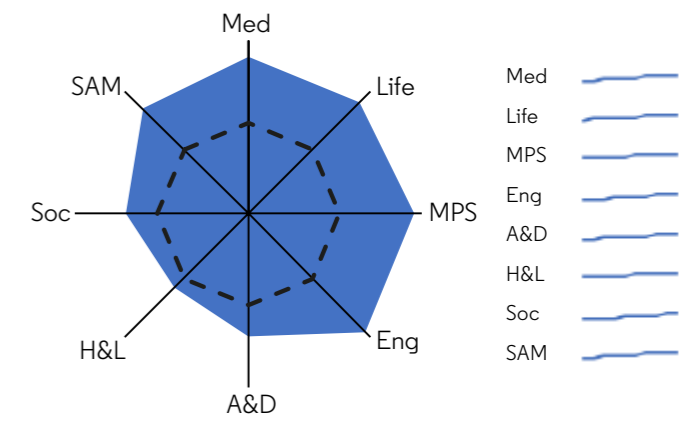


|                     | Papers     | CNCI | % > world average | % in top 10% |
|---------------------|------------|------|-------------------|--------------|
| China total         | 2,741,465  | 1.01 | 31.1%             | 10.1%        |
| China domestic      | 2,039,968  | 0.86 | 27.6%             | 8.3%         |
| China international | 701,497    | 1.44 | 41.2%             | 15.4%        |
| G20 total dataset   | 15,164,121 | 0.99 | 31.3%             | 9.5%         |

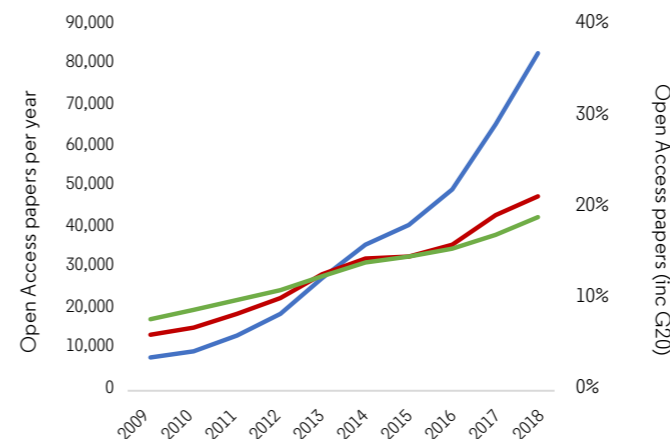
## Impact by discipline



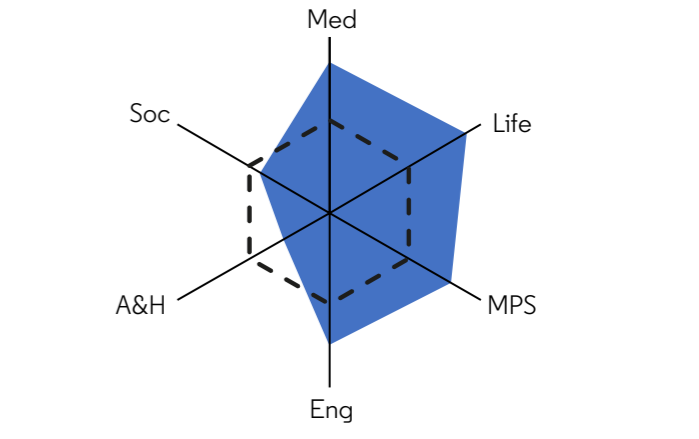
## Output by discipline



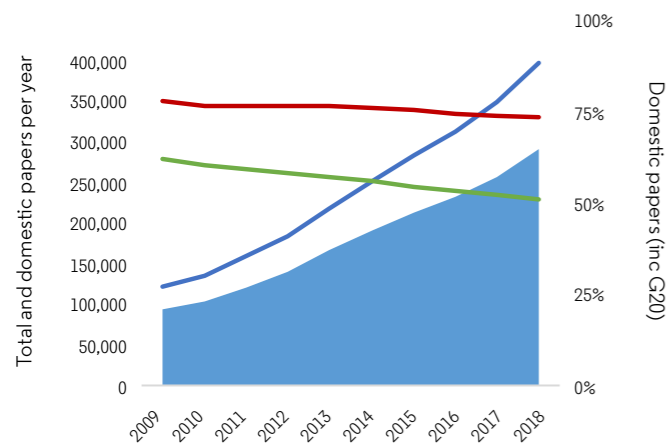
## Output and Open Access



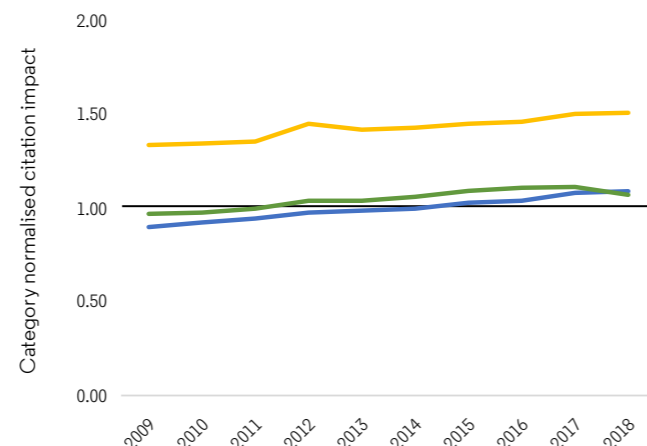
## Output and Open Access



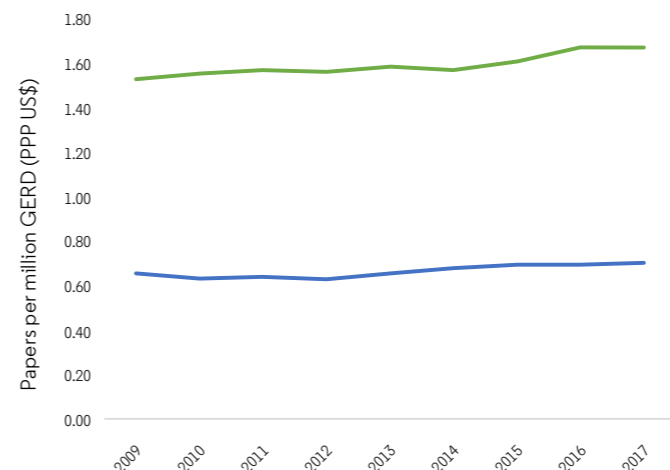
## Output and collaboration



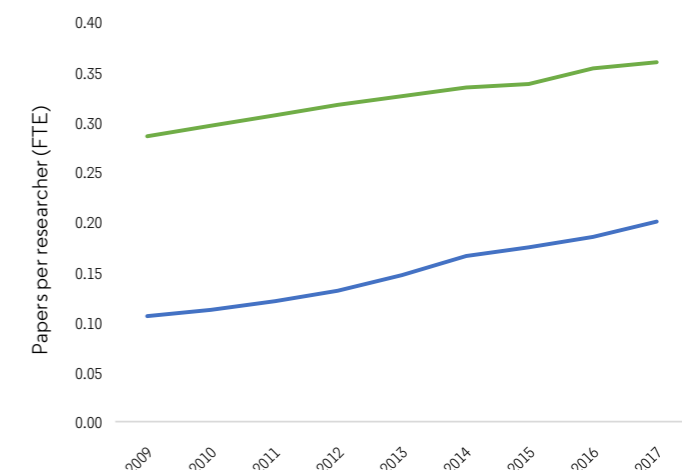
## Impact and collaboration



## Output by GERD



## Output by researcher





# France

Researchers  
**383,843**

Female researchers  
**103,521**

Population  
**66,593,366**

Researchers / 1000 population  
**5.76**

Women as % researchers  
**27.0**

GDP (PPP US\$ billions)  
**2954.9**

GERD (PPP US\$ billions)  
**64.7**

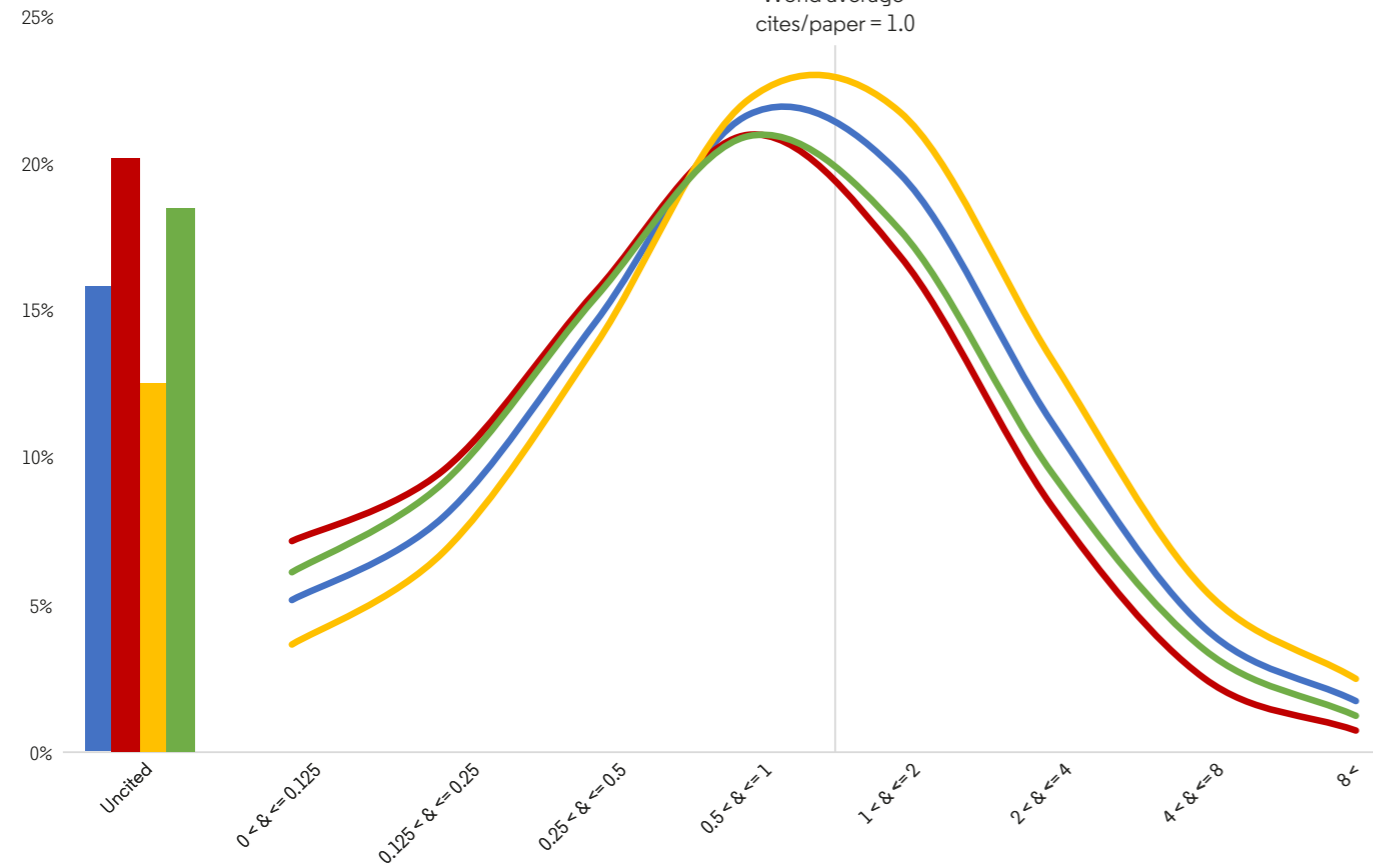
GERD/GDP (%)  
**2.19**

Patents  
**70,939**

BERD (PPP US\$ billions)  
**42.0**

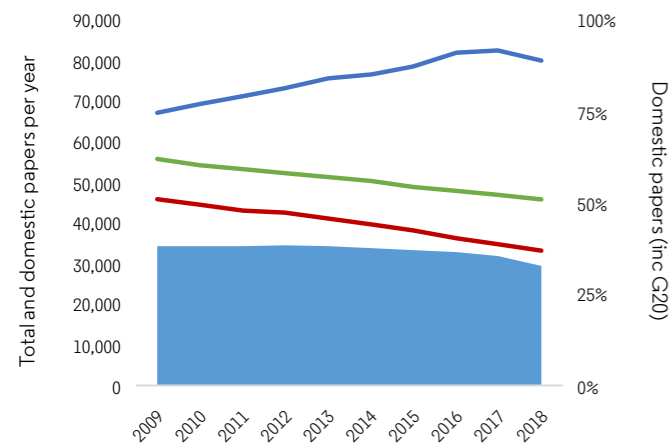
Patents/BERD  
**1688.8**

## Impact profile

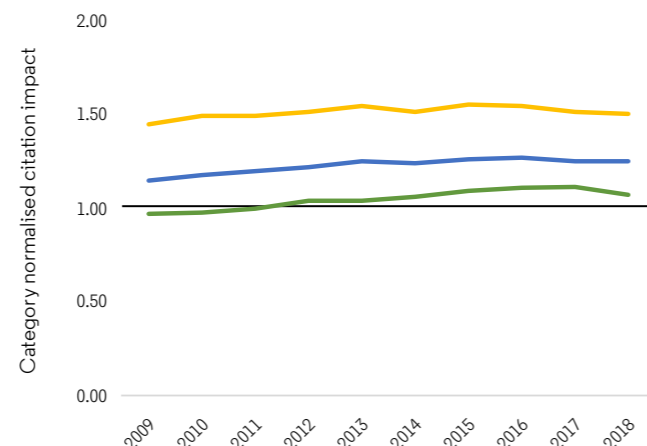


|                      | Papers     | CNCI | % > world average | % in top 10% |
|----------------------|------------|------|-------------------|--------------|
| France total         | 818,118    | 1.22 | 36.0%             | 11.9%        |
| France domestic      | 351,729    | 0.83 | 27.8%             | 7.5%         |
| France international | 466,389    | 1.50 | 42.2%             | 15.2%        |
| G20 total dataset    | 15,164,121 | 0.99 | 31.3%             | 9.5%         |

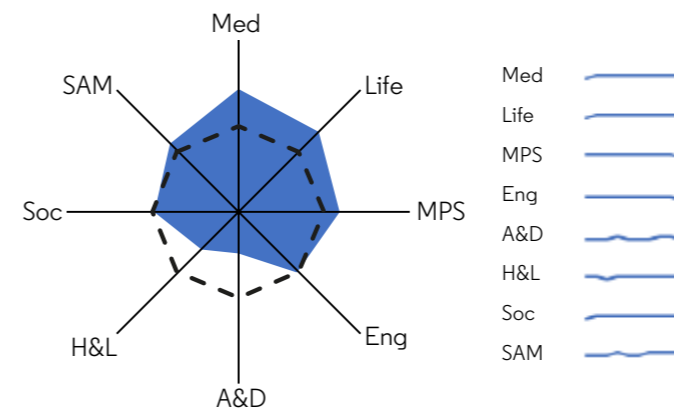
## Output and collaboration



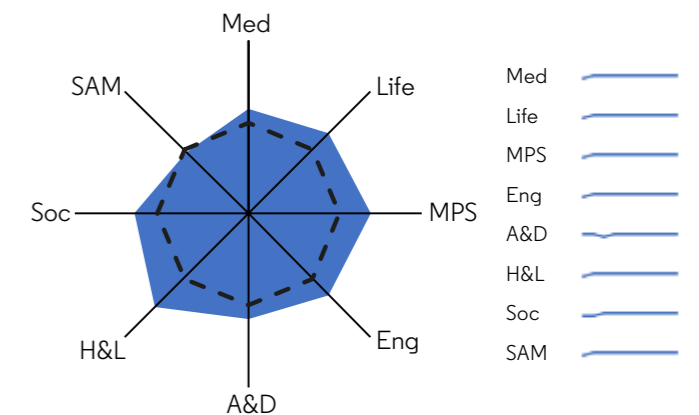
## Impact and collaboration



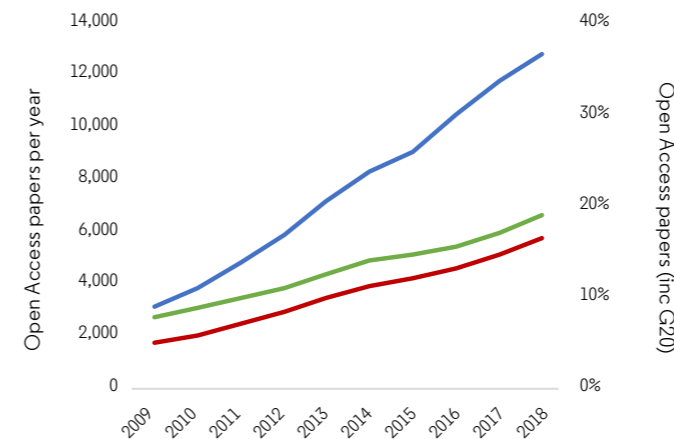
## Impact by discipline



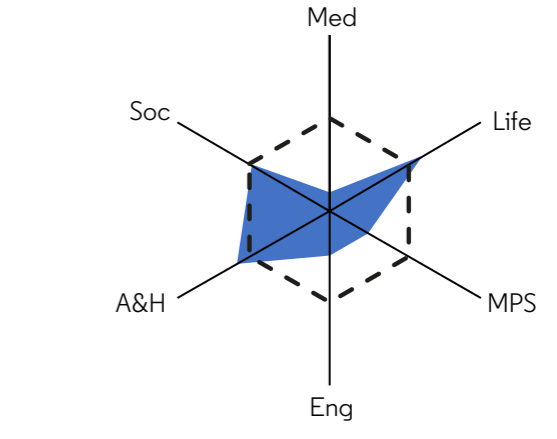
## Output by discipline



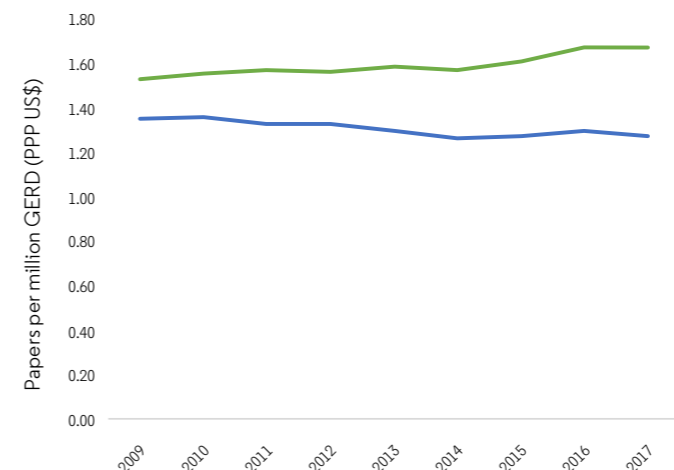
## Output and Open Access



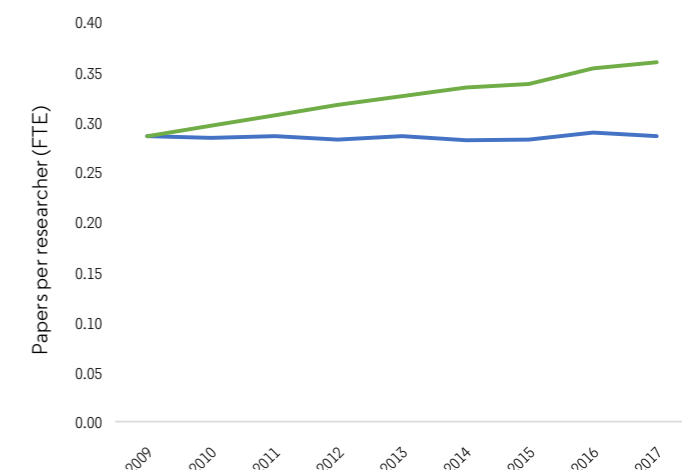
## Output and Open Access



## Output by GERD



## Output by researcher



# Germany

Researchers  
**586,030**

Female researchers  
**164,095**

GDP (PPP US\$ billions)  
**4345.6**

GERD (PPP US\$ billions)  
**131.3**

GERD/GDP (%)  
**3.02**

Population  
**81,686,611**

Researchers / 1000 population  
**7.17**

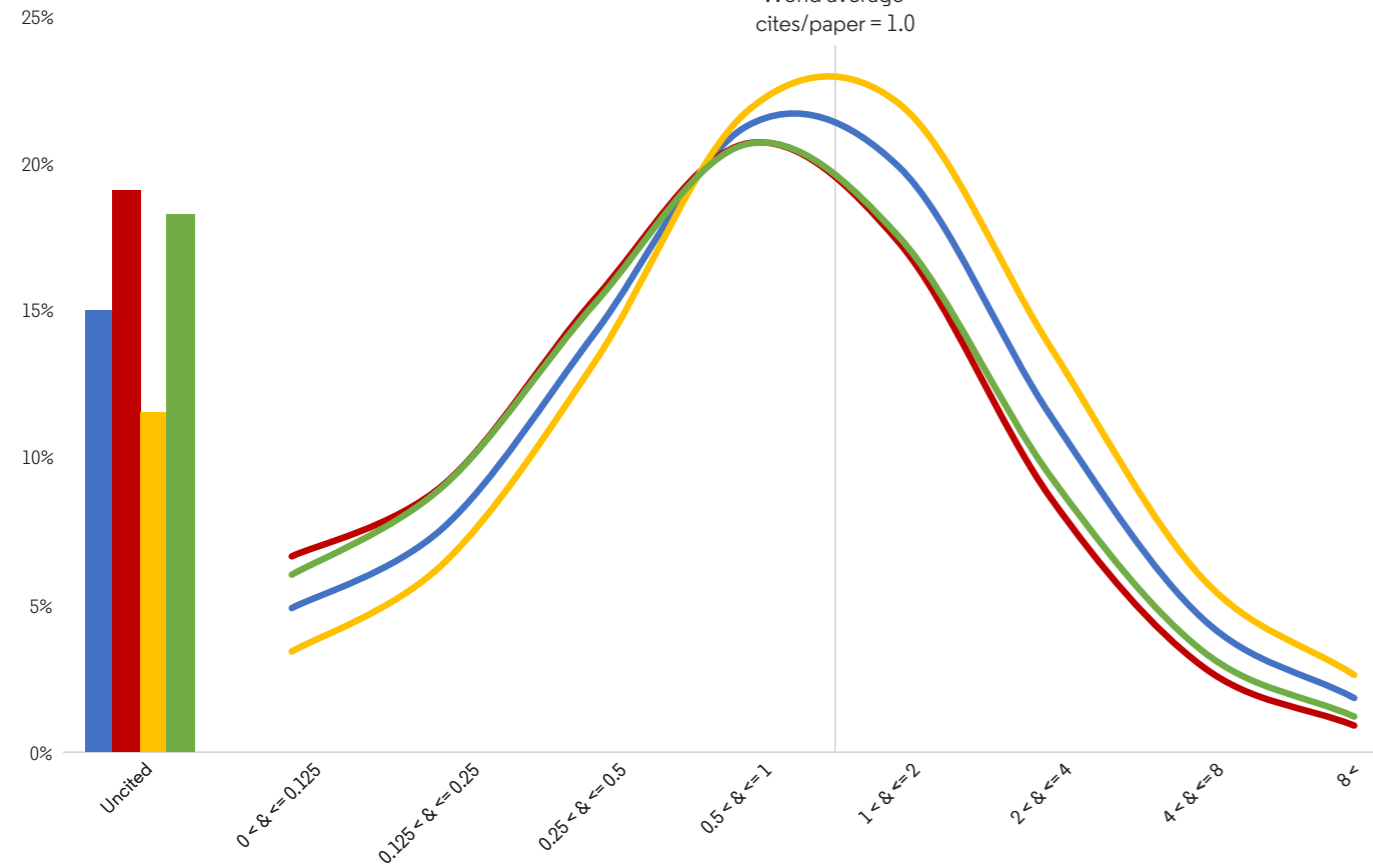
Women as % researchers  
**28.0**

Patents  
**176,235**

BERD (PPP US\$ billions)  
**91.0**

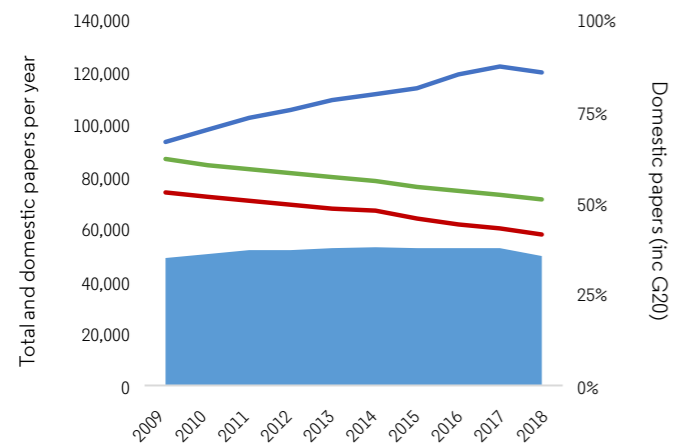
Patents/BERD  
**1936.2**

## Impact profile

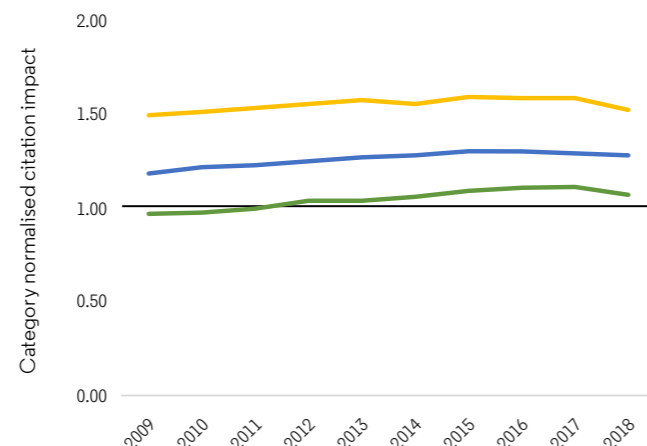


|                       | Papers     | CNCI | % > world average | % in top 10% |
|-----------------------|------------|------|-------------------|--------------|
| Germany total         | 1,172,143  | 1.25 | 37.4%             | 12.6%        |
| Germany domestic      | 534,443    | 0.90 | 29.5%             | 8.3%         |
| Germany international | 637,700    | 1.54 | 44.0%             | 16.2%        |
| G20 total dataset     | 15,164,121 | 0.99 | 31.3%             | 9.5%         |

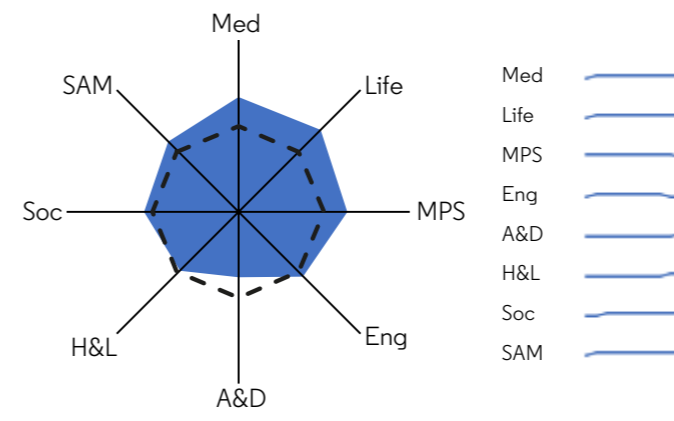
## Output and collaboration



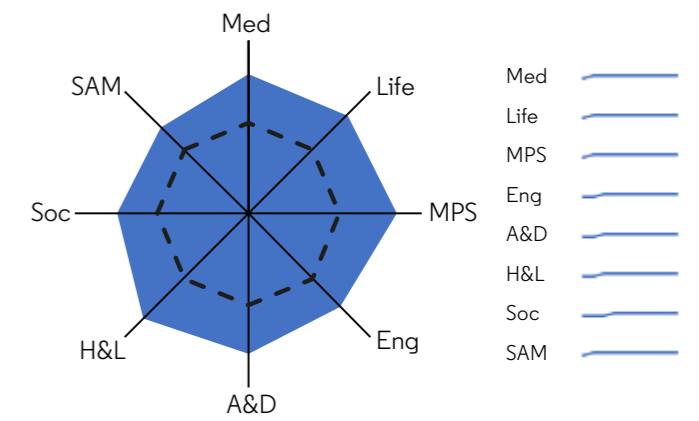
## Impact and collaboration



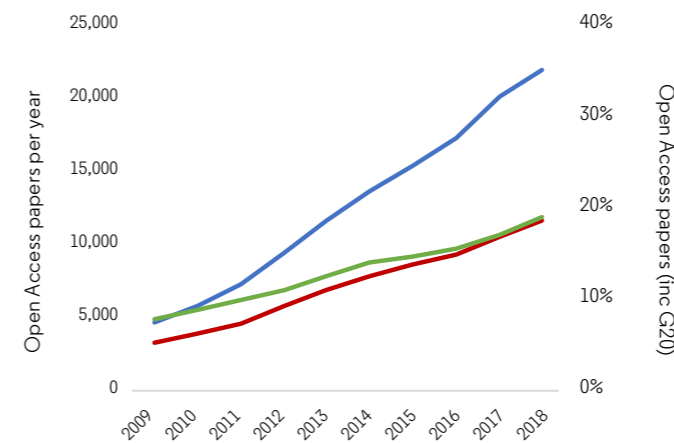
## Impact by discipline



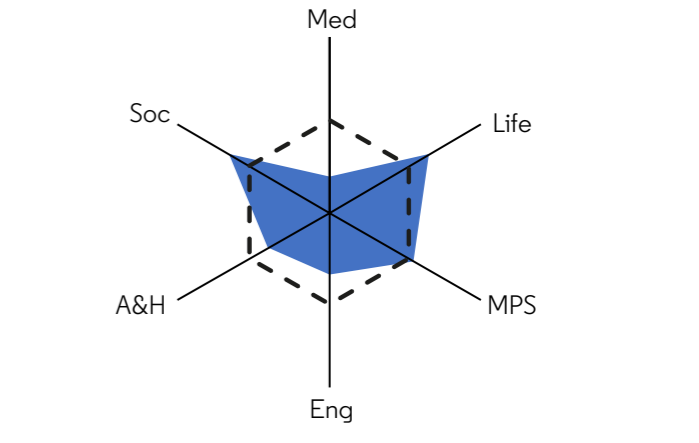
## Output by discipline



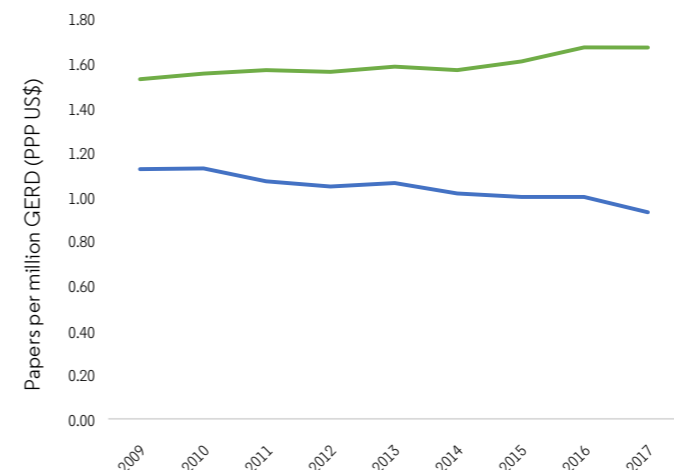
## Output and Open Access



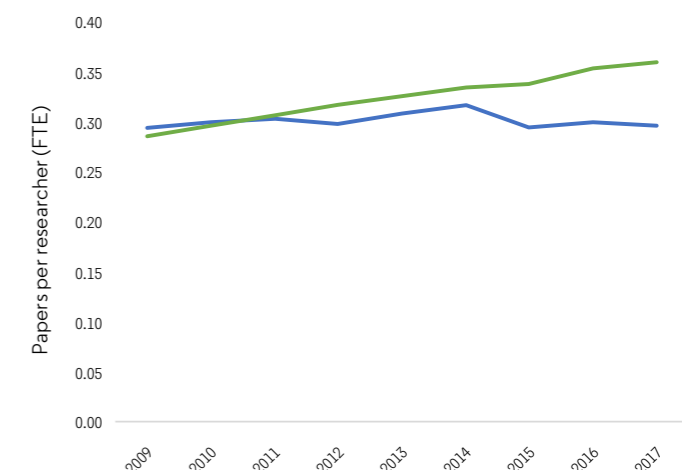
## Output and Open Access



## Output by GERD



## Output by researcher



# India

Population  
**1,339,180,127**

Researchers

-

Female researchers

-

Researchers / 1000 population

-

Women as % researchers

-

GDP (PPP US\$ billions)  
**9596.8**

GERD (PPP US\$ billions)

-

GERD/GDP (%)

-

Patents  
**27,985**

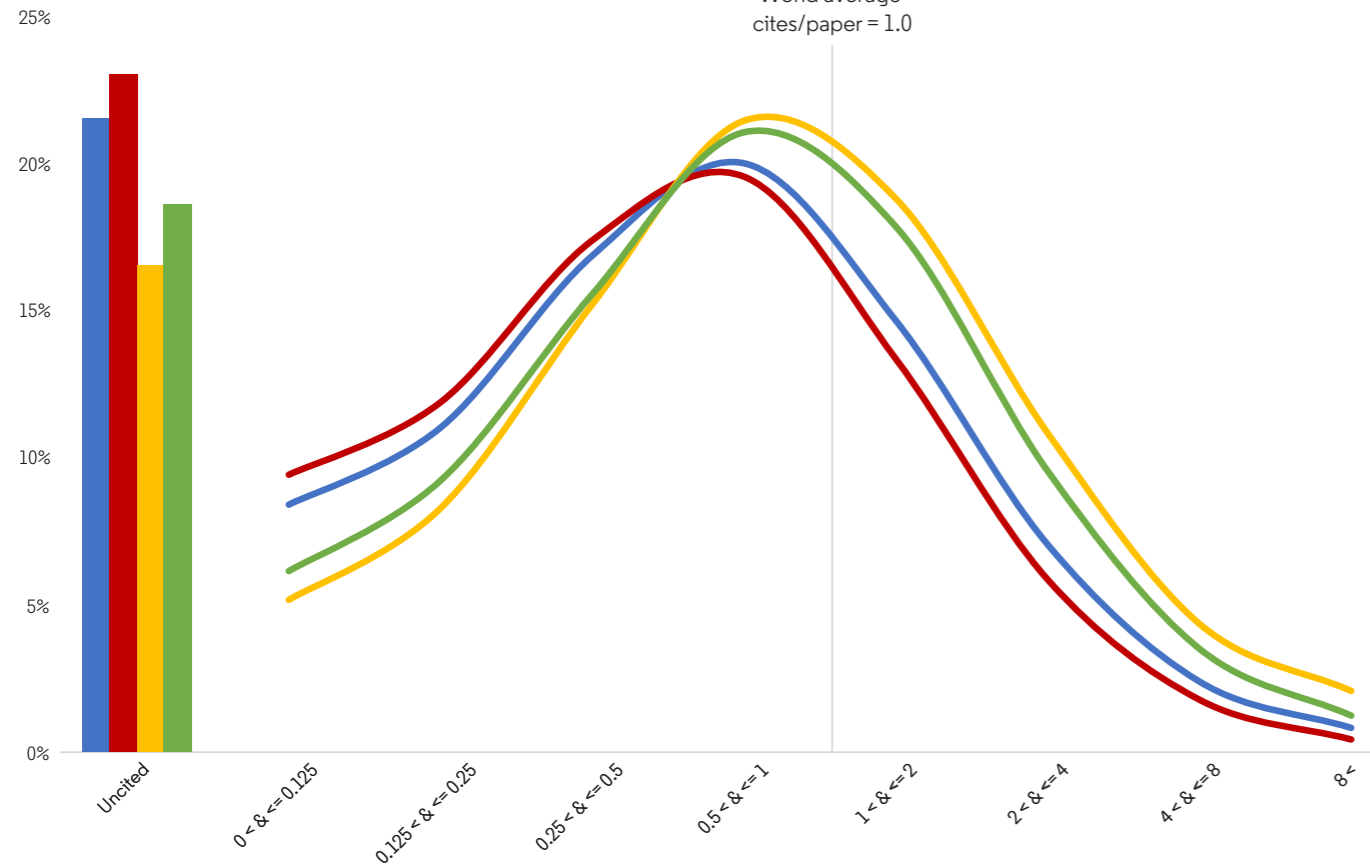
BERD (PPP US\$ billions)

-

Patents/BERD

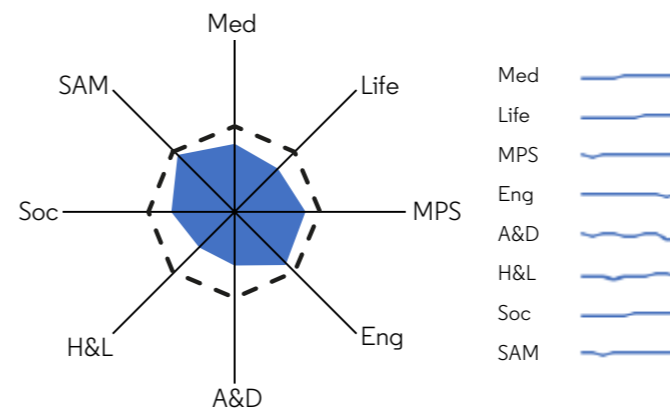
-

## Impact profile

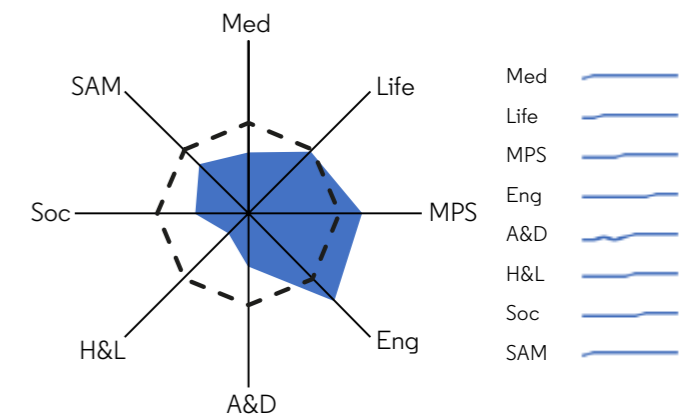


|                     | Papers     | CNCI | % > world average | % in top 10% |
|---------------------|------------|------|-------------------|--------------|
| India total         | 633,300    | 0.79 | 24.2%             | 6.6%         |
| India domestic      | 481,840    | 0.64 | 20.8%             | 5.0%         |
| India international | 151,460    | 1.26 | 35.1%             | 11.9%        |
| G20 total dataset   | 15,164,121 | 0.99 | 31.3%             | 9.5%         |

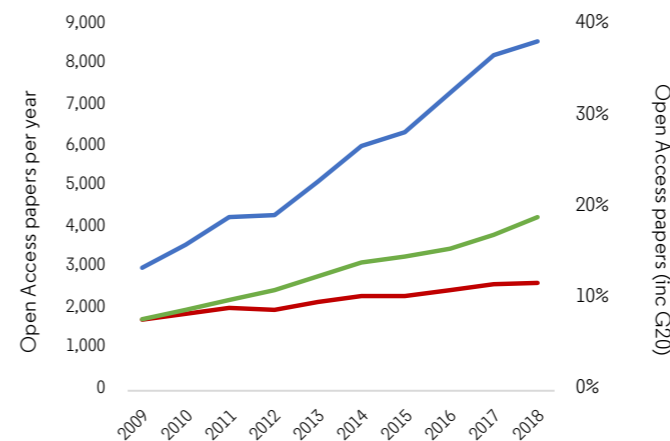
## Impact by discipline



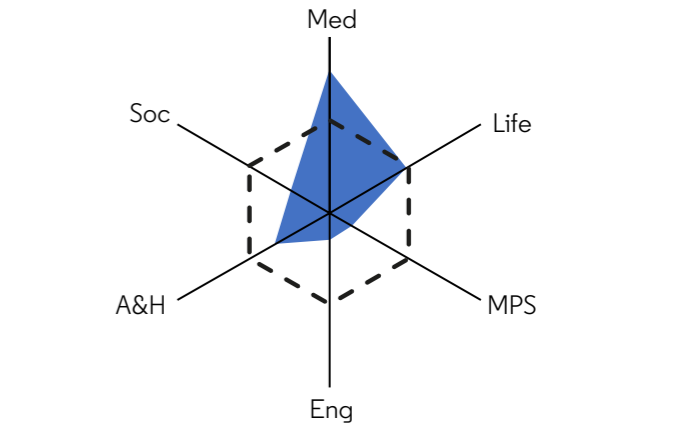
## Output by discipline



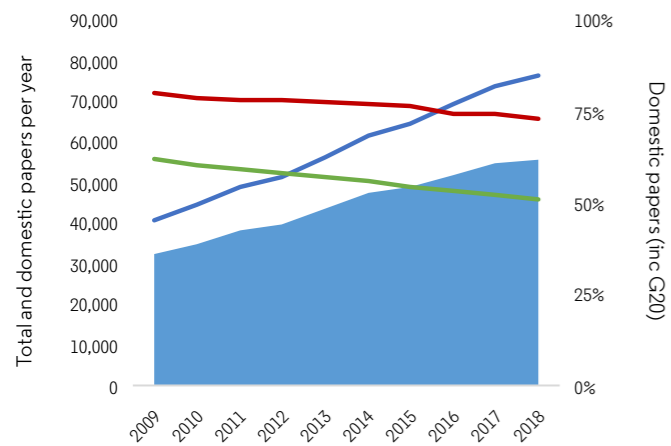
## Output and Open Access



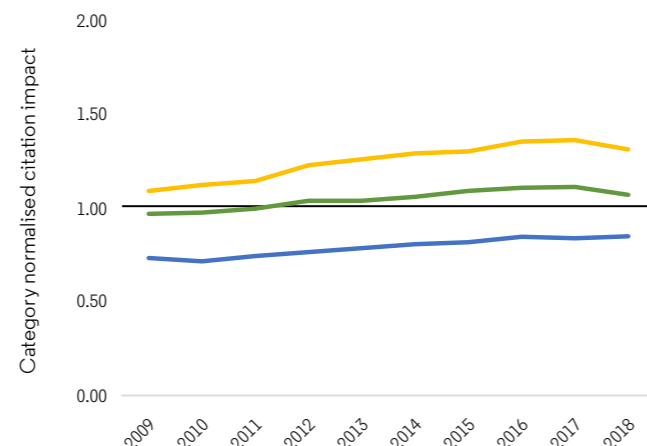
## Output and Open Access



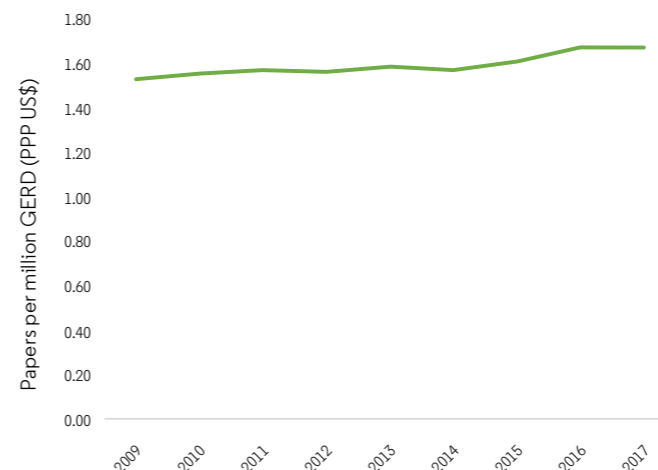
## Output and collaboration



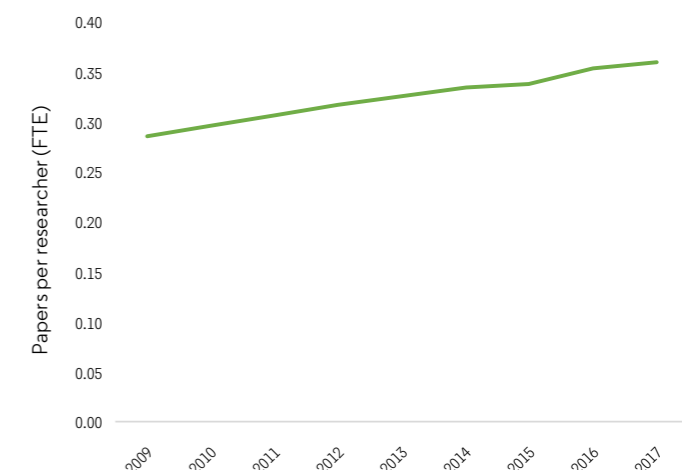
## Impact and collaboration



## Output by GERD



## Output by researcher





# Indonesia

Researchers

-

Female researchers

-

Population  
**263,991,379**

Researchers / 1000 population

-

Women as % researchers

-

GDP (PPP US\$ billions)  
**3249.6**

GERD (PPP US\$ billions)

-

GERD/GDP (%)

-

Patents  
**2,320**

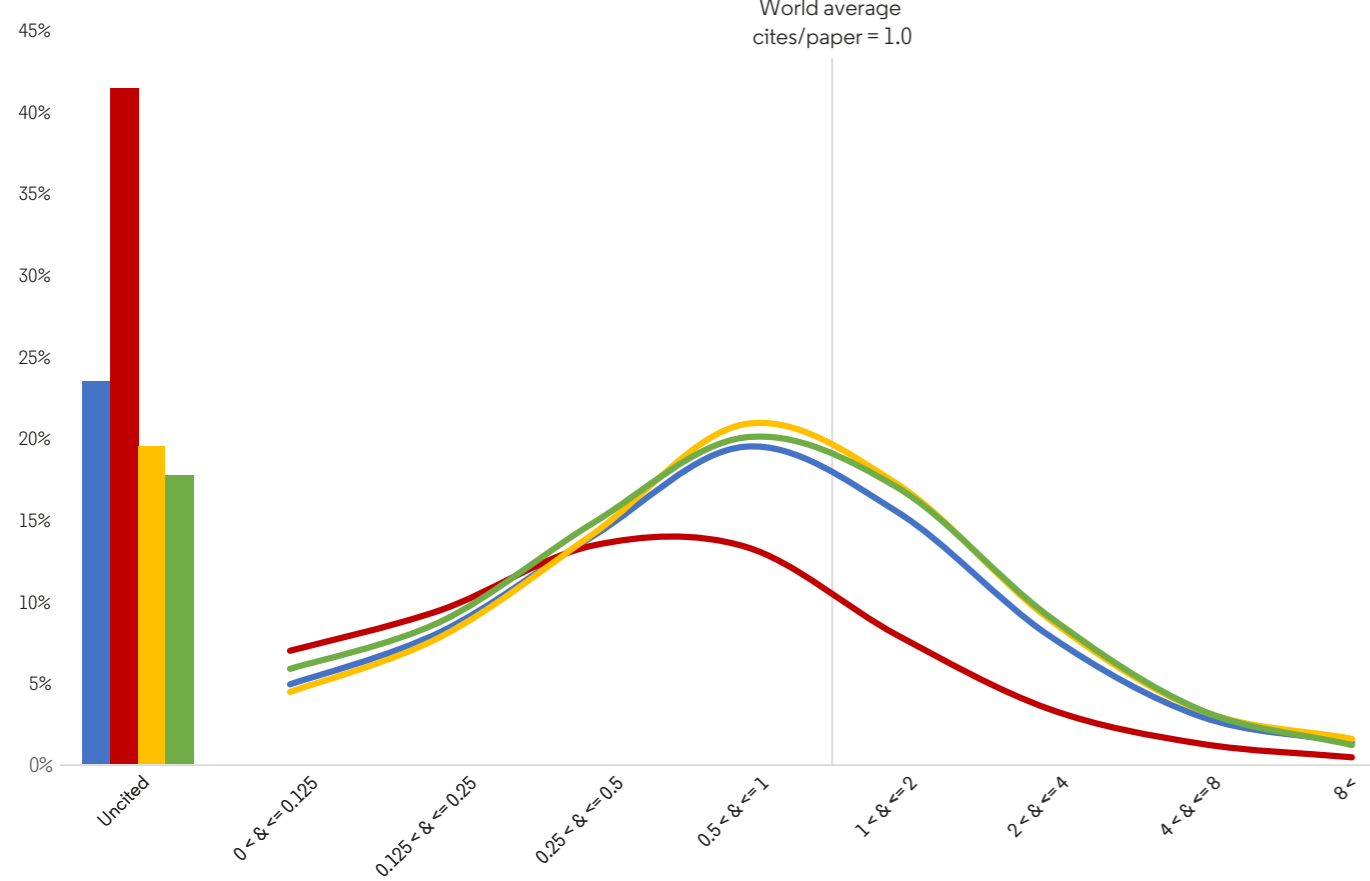
BERD (PPP US\$ billions)

-

Patents/BERD

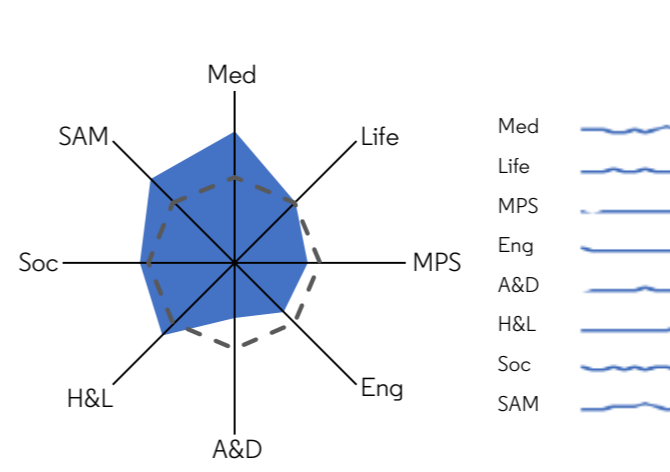
-

## Impact profile

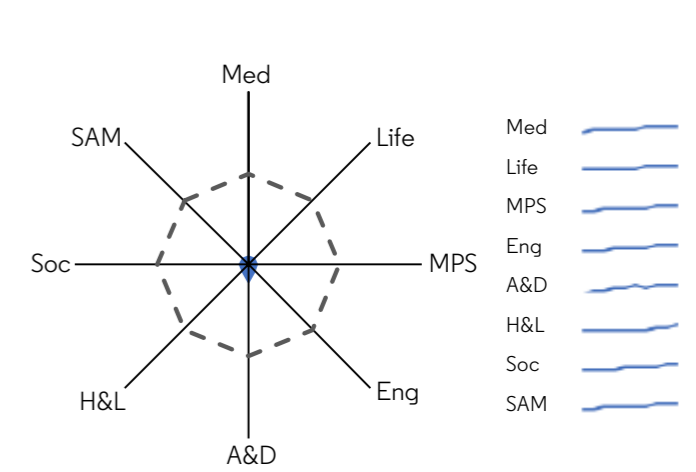


|                         | Papers     | CNCI | % > world average | % in top 10% |
|-------------------------|------------|------|-------------------|--------------|
| Indonesia total         | 20,828     | 1.05 | 28.3%             | 8.1%         |
| Indonesia domestic      | 3,838      | 0.44 | 13.3%             | 2.7%         |
| Indonesia international | 16,990     | 1.18 | 31.7%             | 9.4%         |
| G20 total dataset       | 15,164,121 | 0.99 | 31.3%             | 9.5%         |

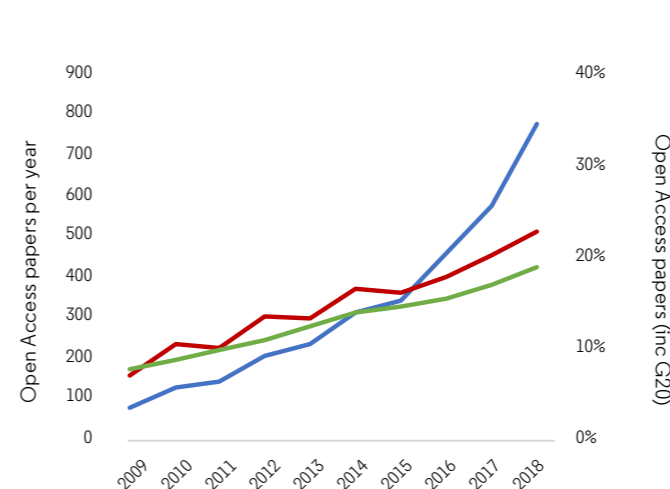
## Impact by discipline



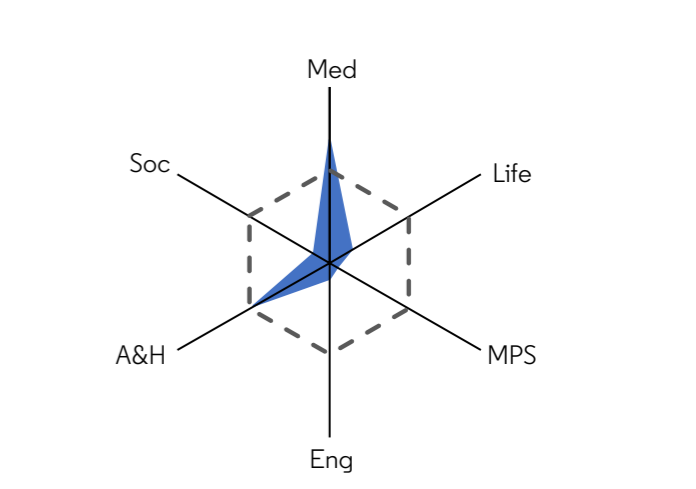
## Output by discipline



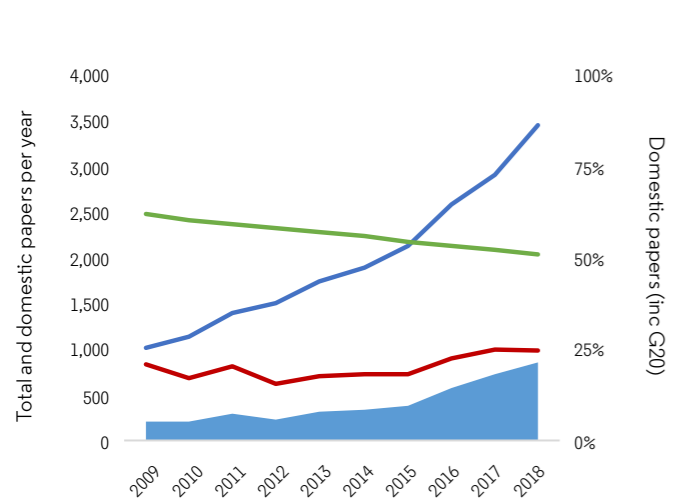
## Output and Open Access



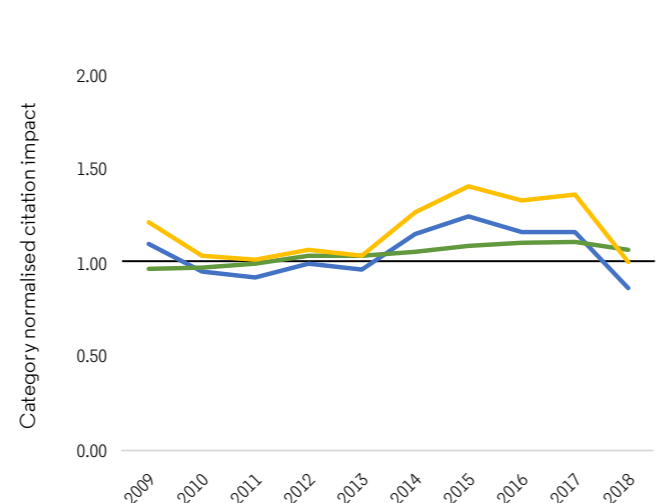
## Output and Open Access



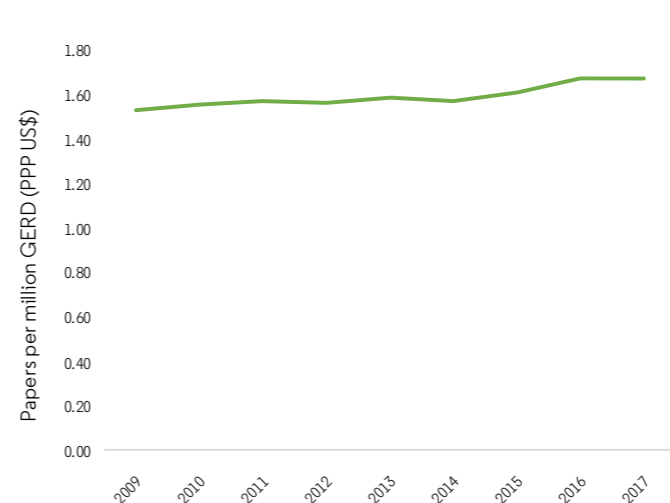
## Output and collaboration



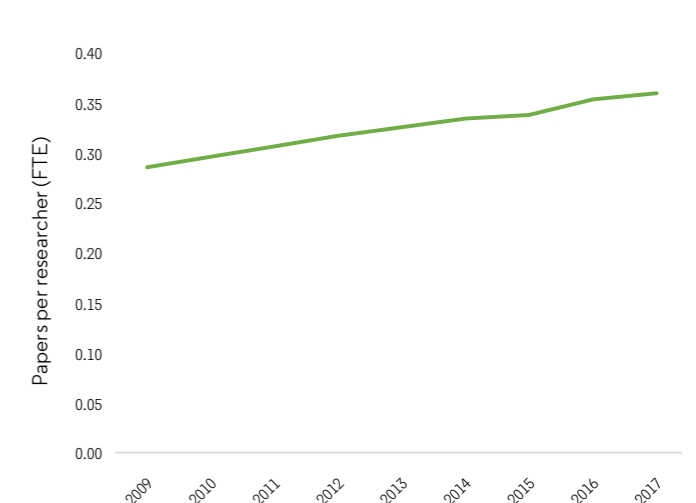
## Impact and collaboration



## Output by GERD



## Output by researcher



# Italy

Researchers  
**185,916**

Female researchers  
**65,431**

GDP (PPP US\$ billions)  
**2477.4**

GERD (PPP US\$ billions)  
**33.5**

GERD/GDP (%)  
**1.35**

Population  
**60,627,498**

Researchers / 1000 population  
**3.07**

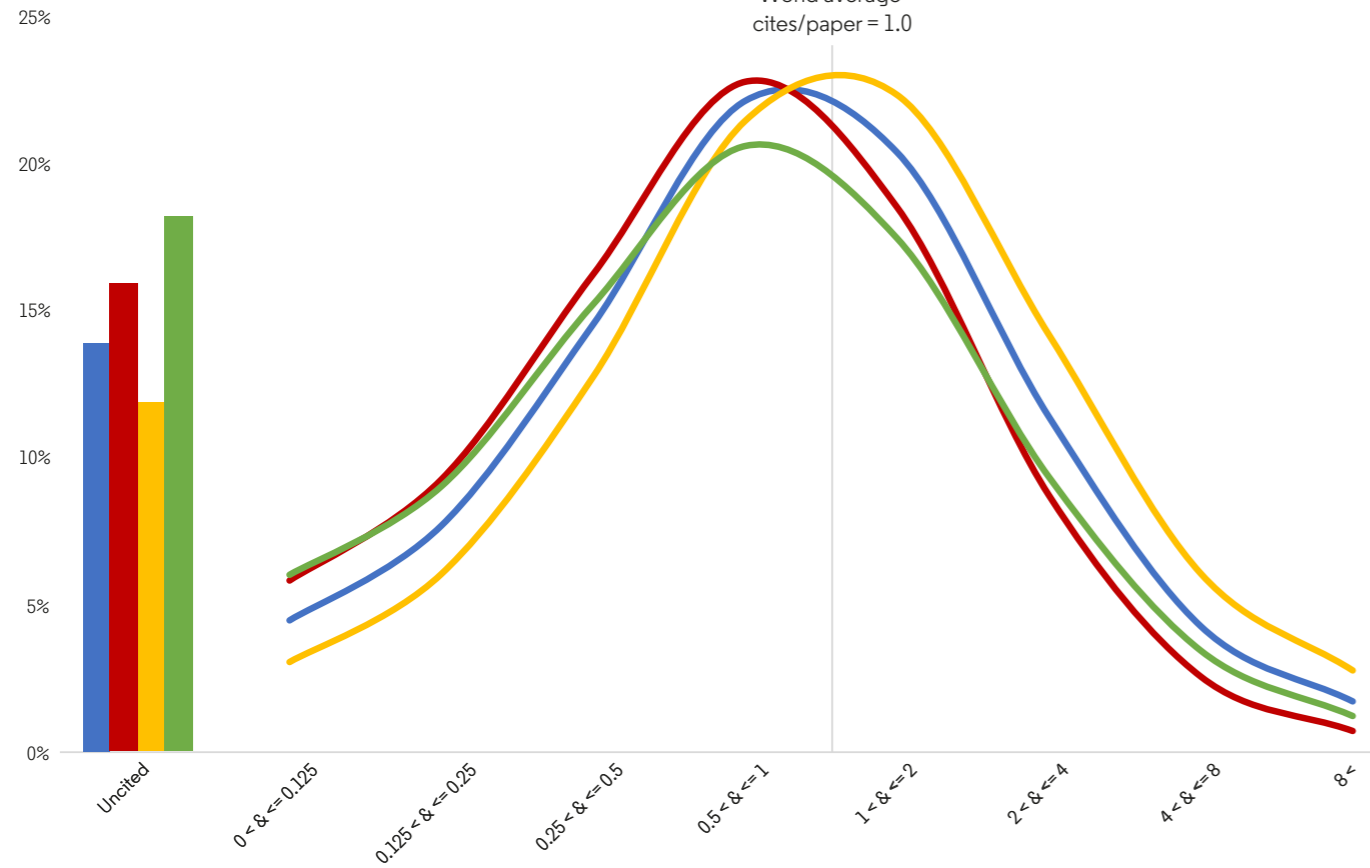
Women as % researchers  
**35.2**

Patents  
**31,346**

BERD (PPP US\$ billions)  
**20.6**

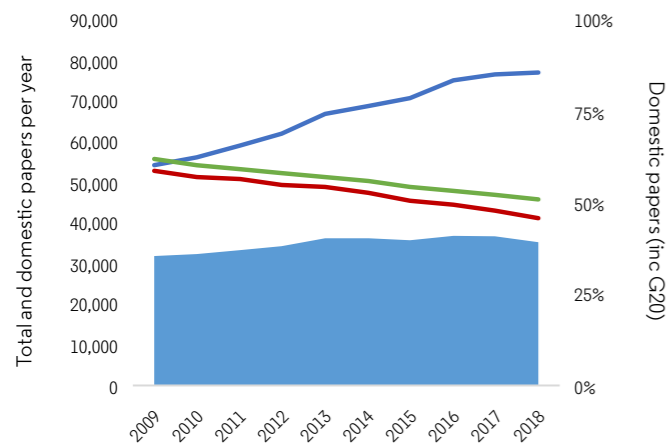
Patents/BERD  
**1521.3**

## Impact profile

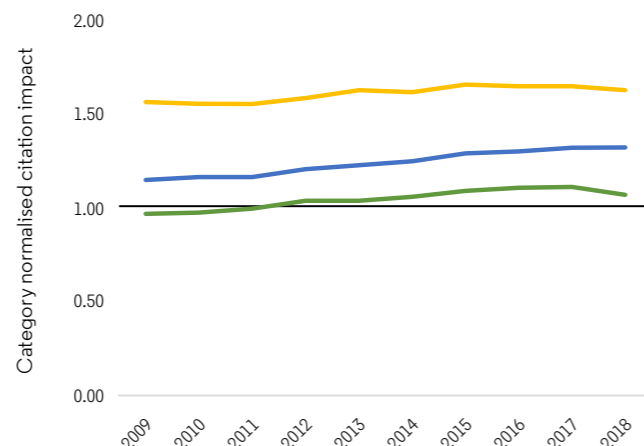


|                     | Papers     | CNCI | % > world average | % in top 10% |
|---------------------|------------|------|-------------------|--------------|
| Italy total         | 713,369    | 1.24 | 37.5%             | 12.1%        |
| Italy domestic      | 364,725    | 0.88 | 30.3%             | 7.7%         |
| Italy international | 348,644    | 1.61 | 45.1%             | 16.6%        |
| G20 total dataset   | 15,164,121 | 0.99 | 31.3%             | 9.5%         |

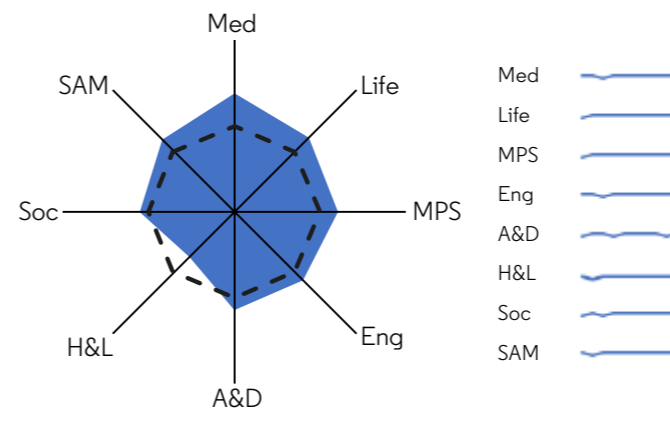
## Output and collaboration



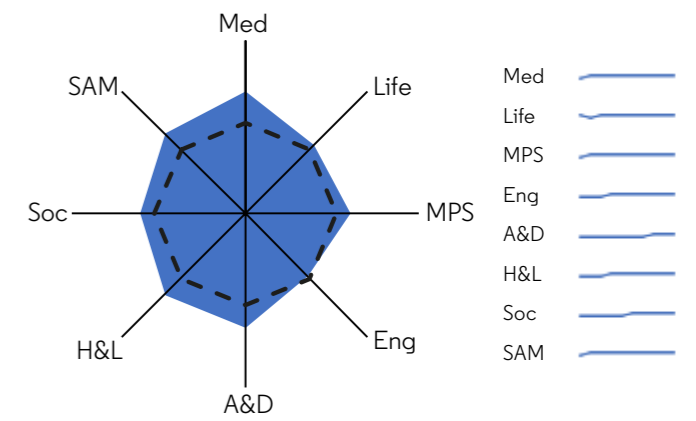
## Impact and collaboration



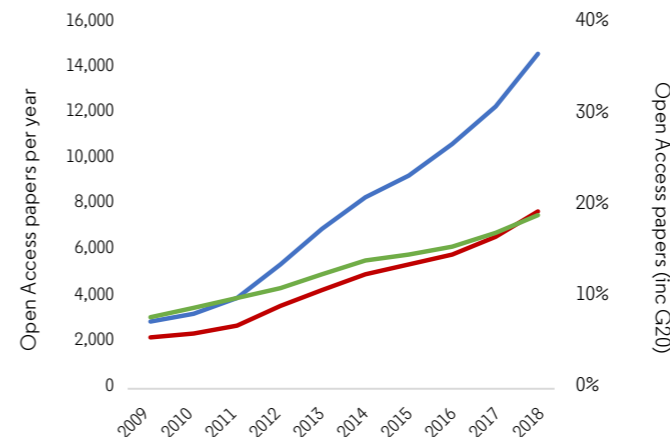
## Impact by discipline



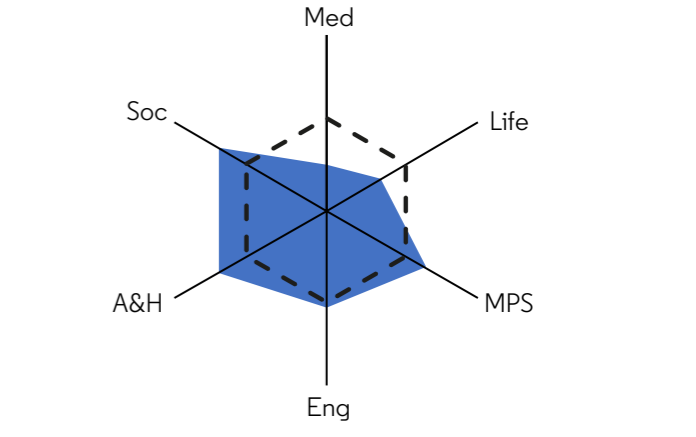
## Output by discipline



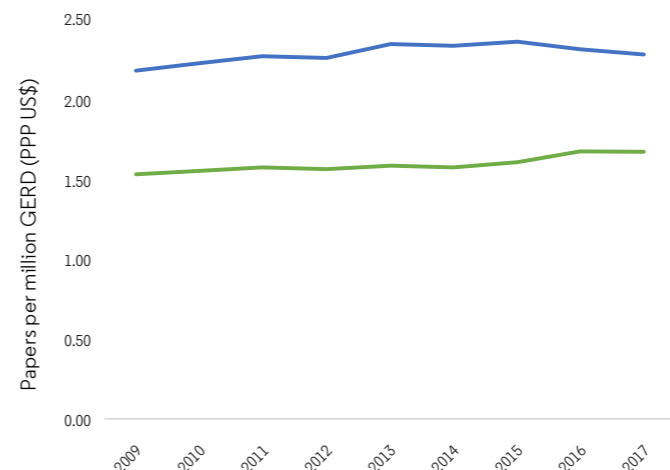
## Output and Open Access



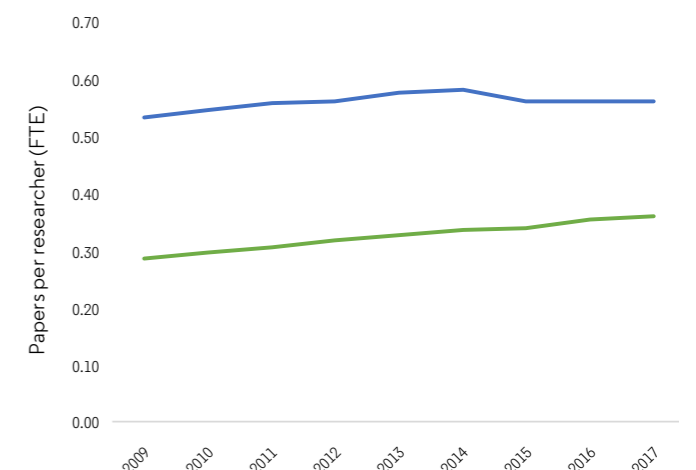
## Output and Open Access



## Output by GERD



## Output by researcher



# Japan

Researchers  
**930,720**

Female researchers  
**150,545**

GDP (PPP US\$ billions)  
**5333.4**

GERD (PPP US\$ billions)  
**170.9**

GERD/GDP (%)  
**3.20**

Population  
**126,785,797**

Researchers / 1000 population  
**7.34**

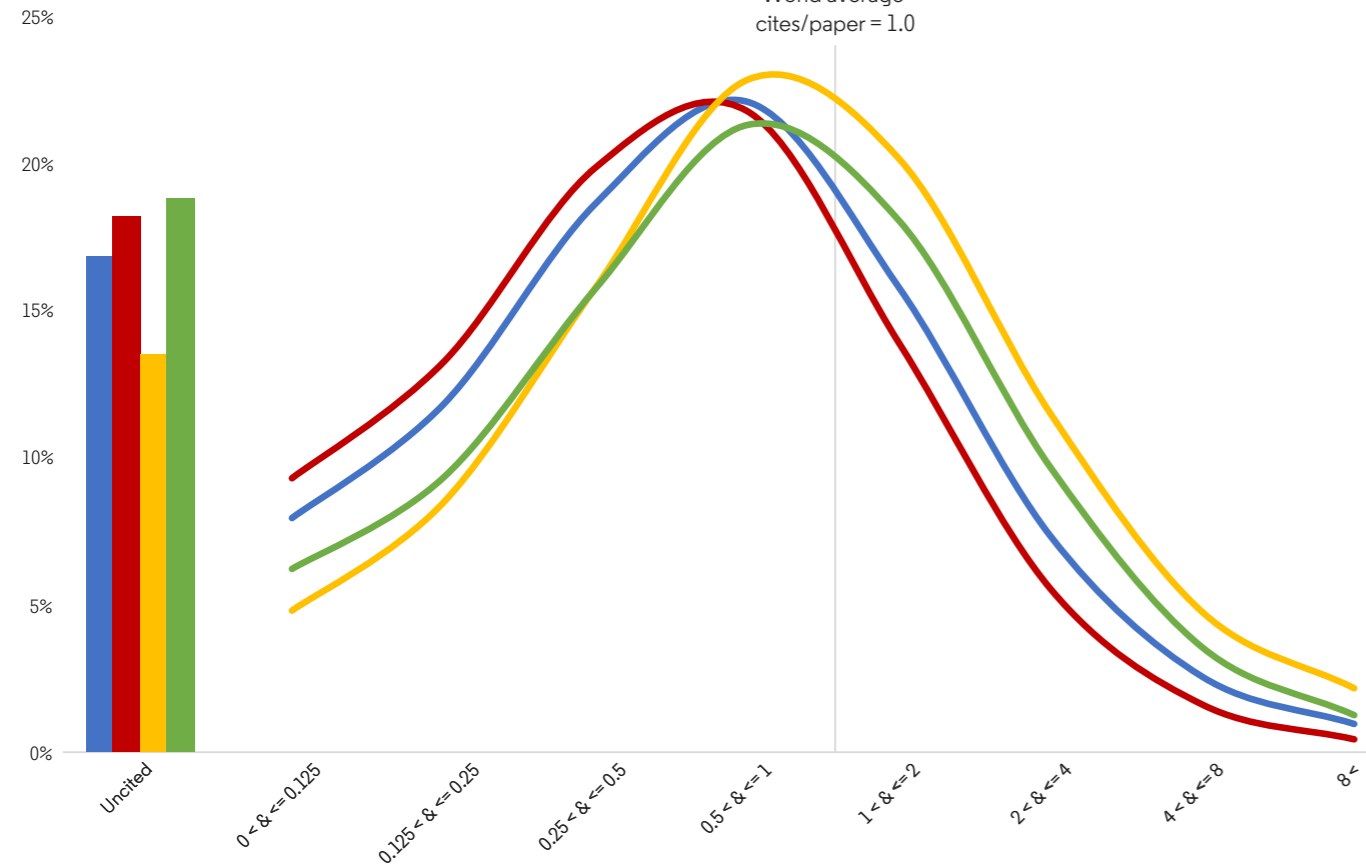
Women as % researchers  
**16.2**

Patents  
**460,660**

BERD (PPP US\$ billions)  
**134.7**

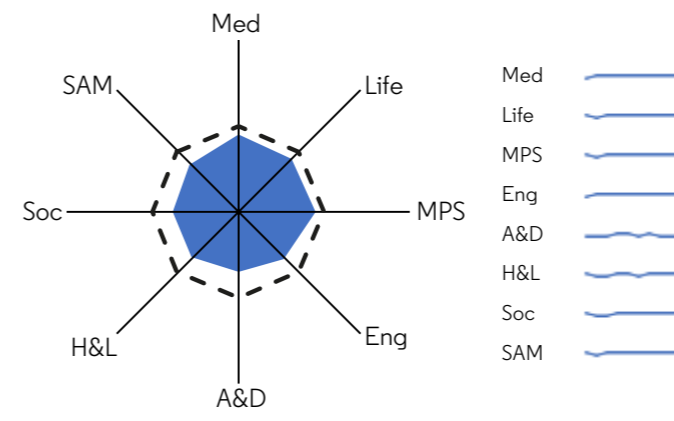
Patents/BERD  
**3420.9**

## Impact profile

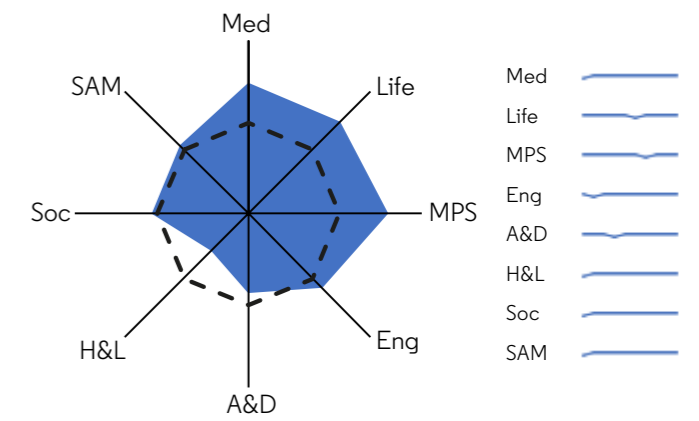


|                     | Papers     | CNCI | % > world average | % in top 10% |
|---------------------|------------|------|-------------------|--------------|
| Japan total         | 899,903    | 0.87 | 25.6%             | 7.1%         |
| Japan domestic      | 629,161    | 0.66 | 20.6%             | 4.6%         |
| Japan international | 270,742    | 1.34 | 37.1%             | 12.8%        |
| G20 total dataset   | 15,164,121 | 0.99 | 31.3%             | 9.5%         |

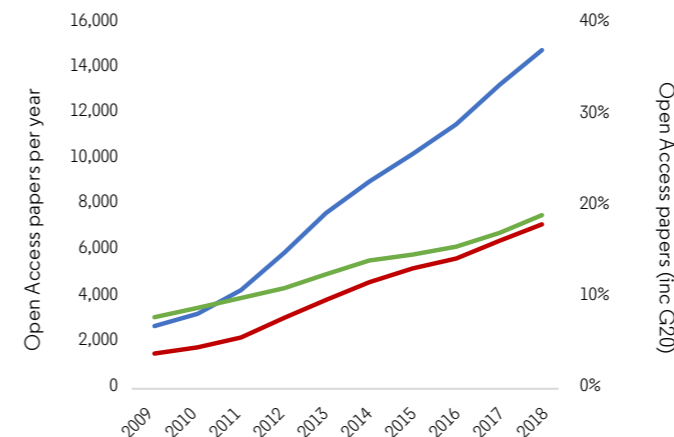
## Impact by discipline



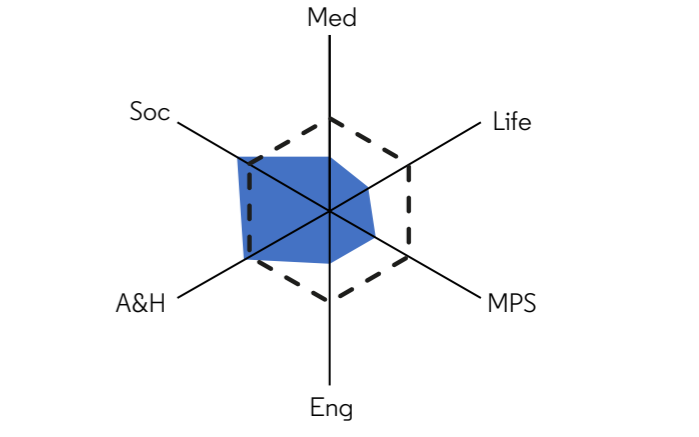
## Output by discipline



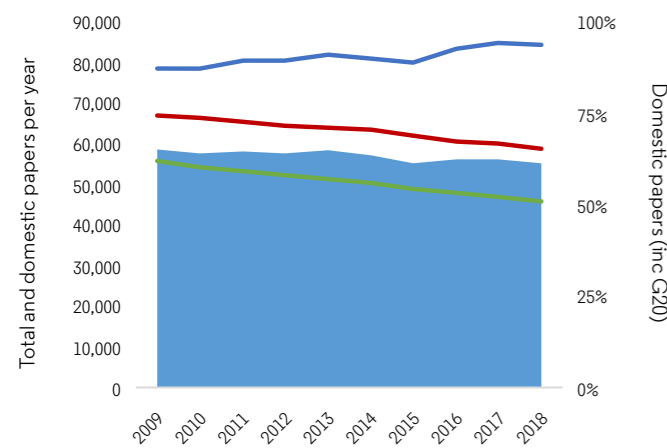
## Output and Open Access



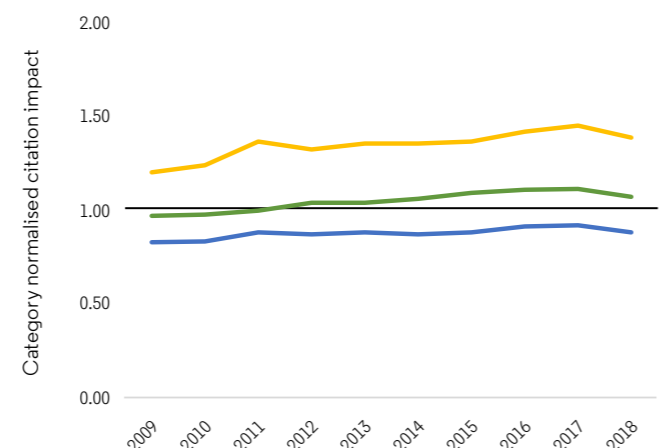
## Output and Open Access



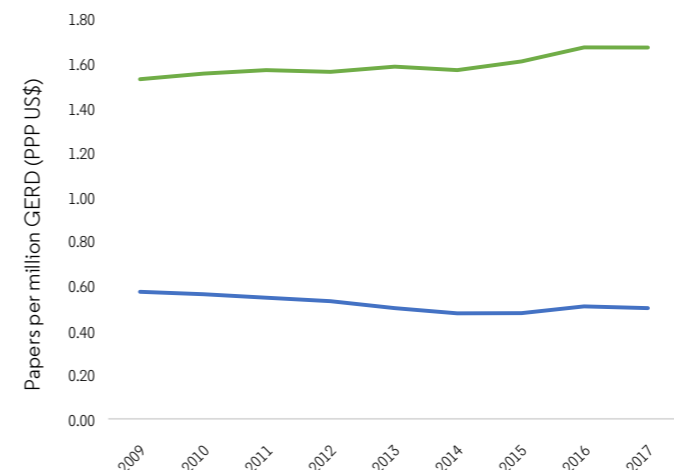
## Output and collaboration



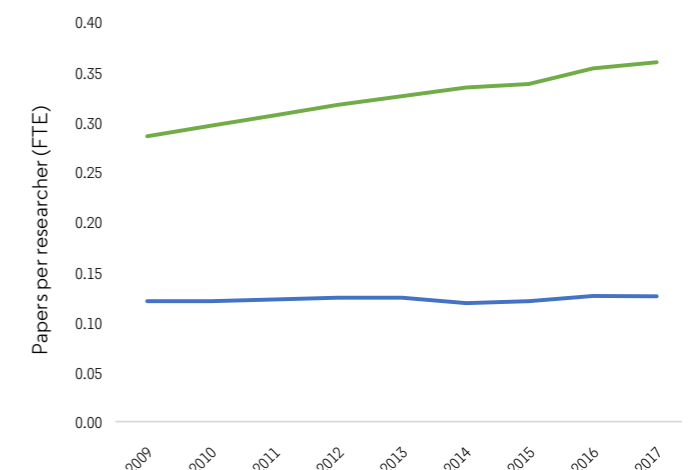
## Impact and collaboration



## Output by GERD



## Output by researcher





# Mexico

Researchers  
**42,222**

Female researchers  
**13,943**

GDP (PPP US\$ billions)  
**2316.3**

GERD (PPP US\$ billions)  
**11.3**

GERD/GDP (%)  
**0.49**

Population  
**122,535,969**

Researchers / 1000 population  
**0.34**

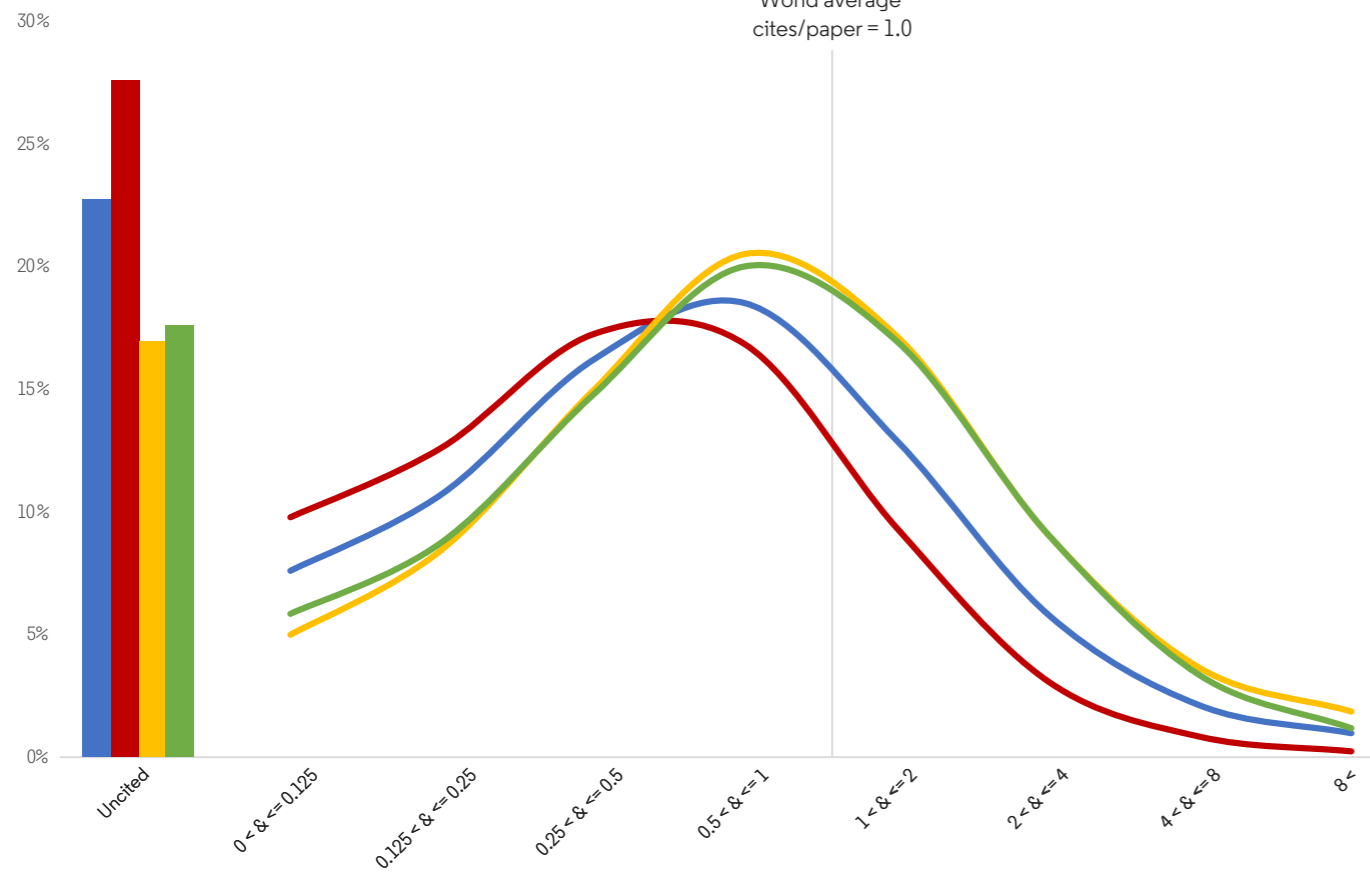
Women as % researchers  
**33.0**

Patents  
**2,522**

BERD (PPP US\$ billions)  
**3.4**

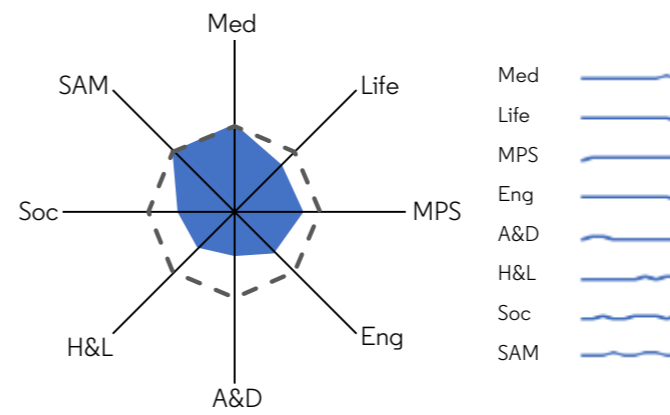
Patents/BERD  
**733.0**

## Impact profile

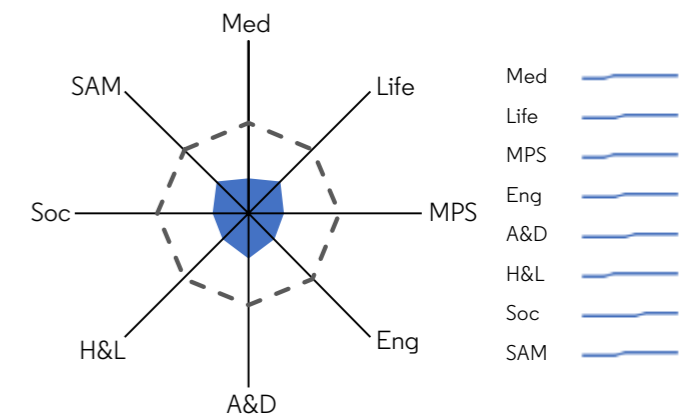


World average cites/paper = 1.0

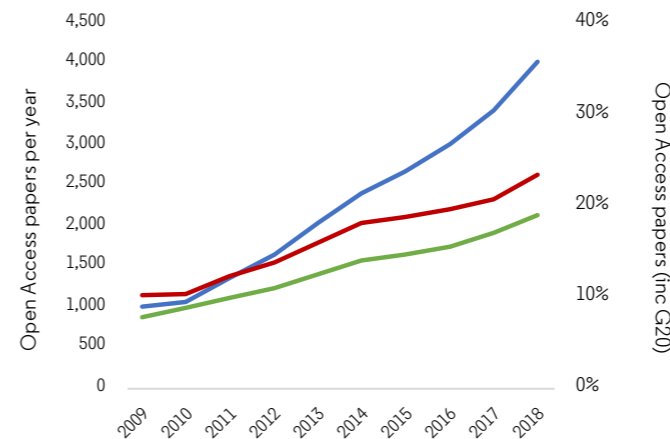
## Impact by discipline



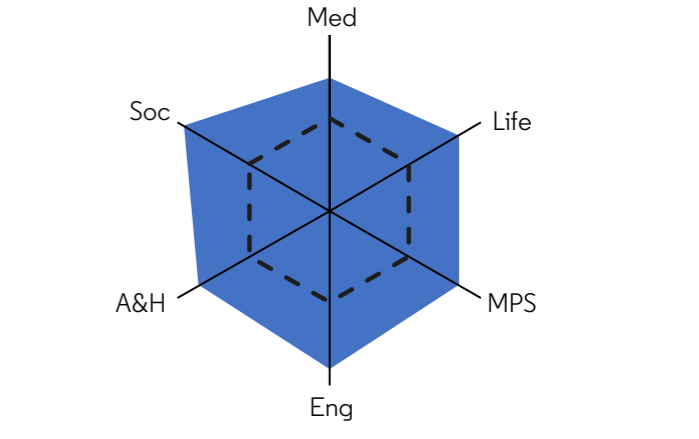
## Output by discipline



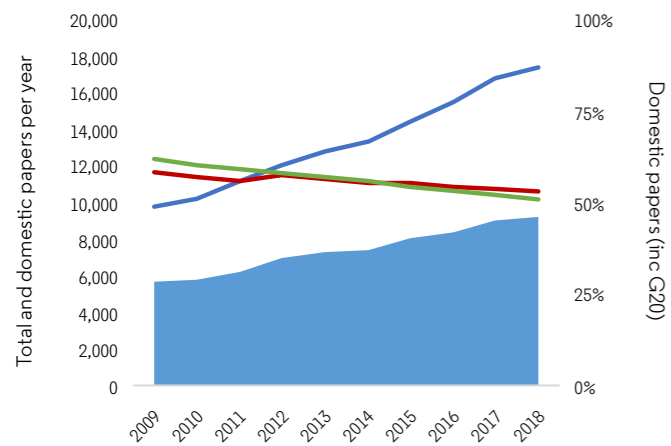
## Output and Open Access



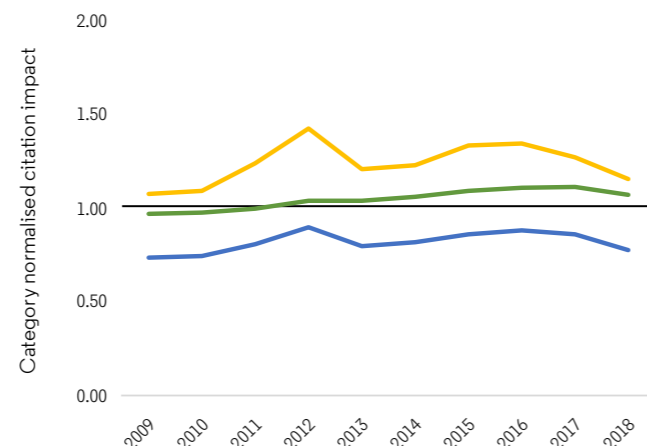
## Output and Open Access



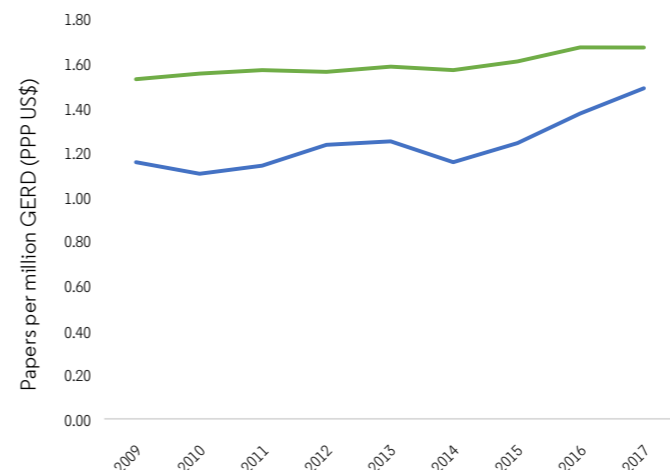
## Output and collaboration



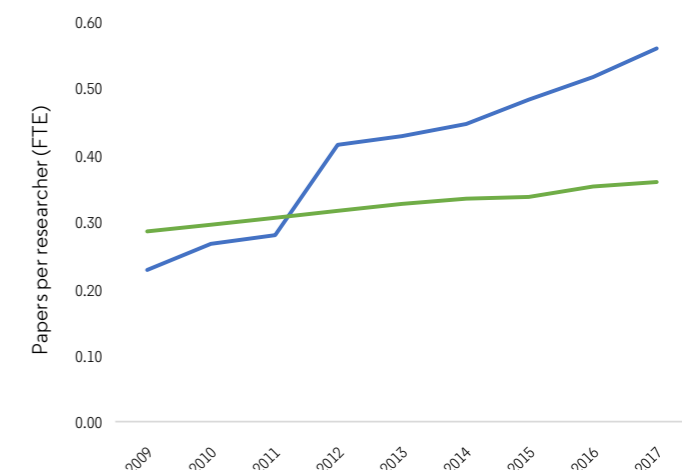
## Impact and collaboration



## Output by GERD



## Output by researcher



# Russia

Researchers  
**359,793**

Female researchers  
**142,290**

GDP (PPP US\$ billions)  
**3783.1**

GERD (PPP US\$ billions)  
**41.9**

GERD/GDP (%)  
**1.11**

Population  
**144,496,740**

Researchers / 1000 population  
**2.49**

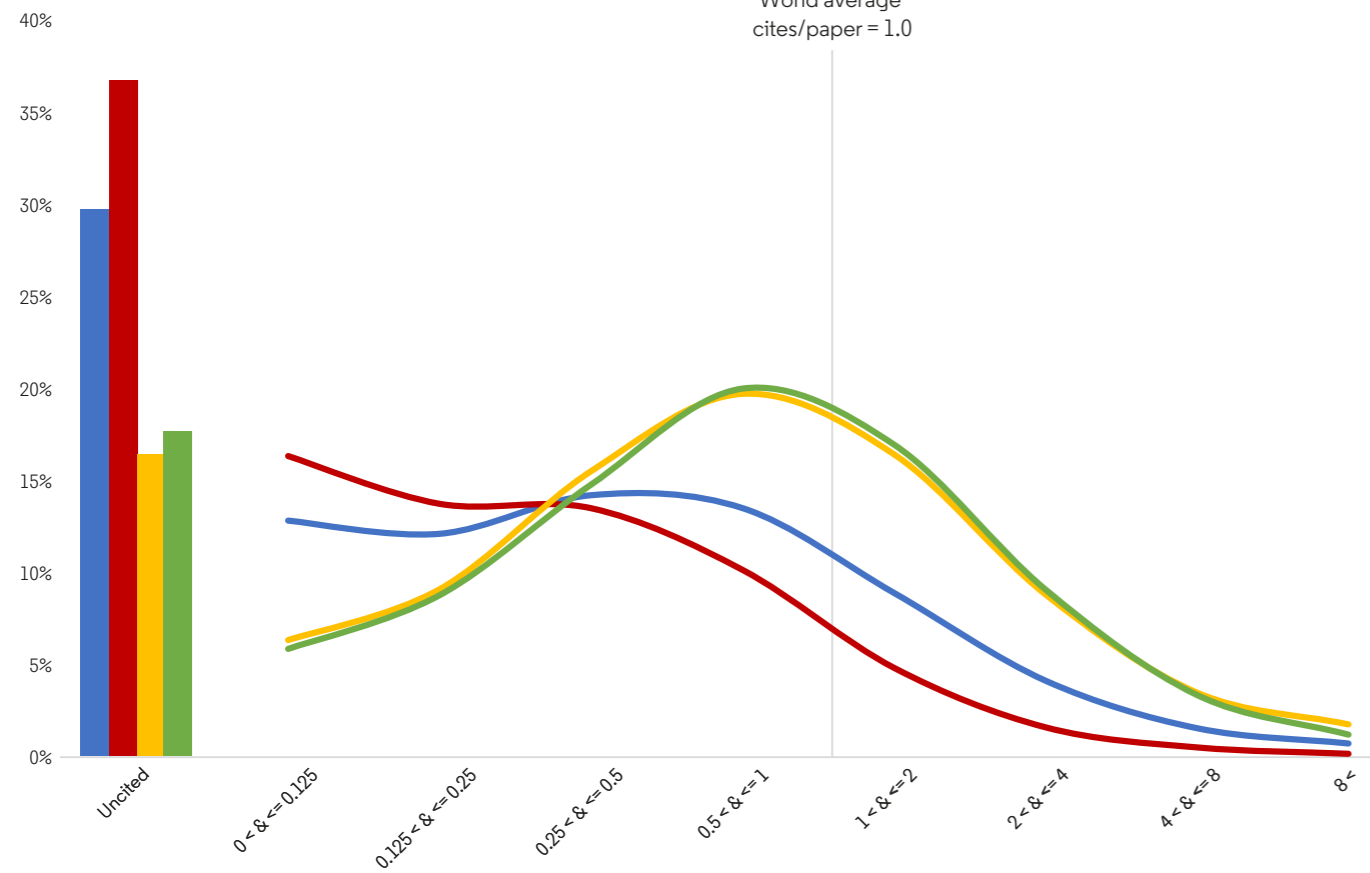
Women as % researchers  
**39.5**

Patents  
**27,782**

BERD (PPP US\$ billions)  
**25.2**

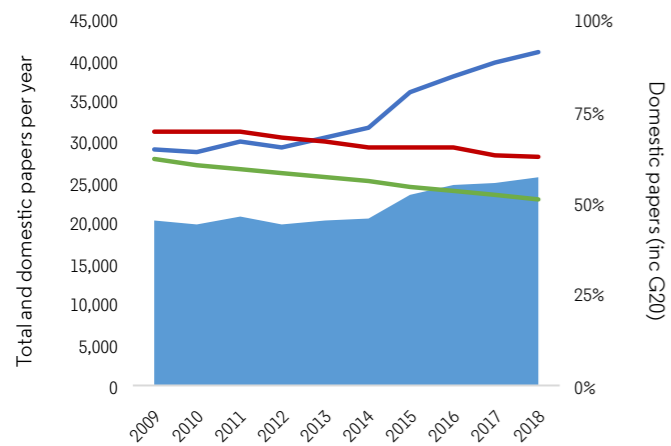
Patents/BERD  
**1103.3**

## Impact profile

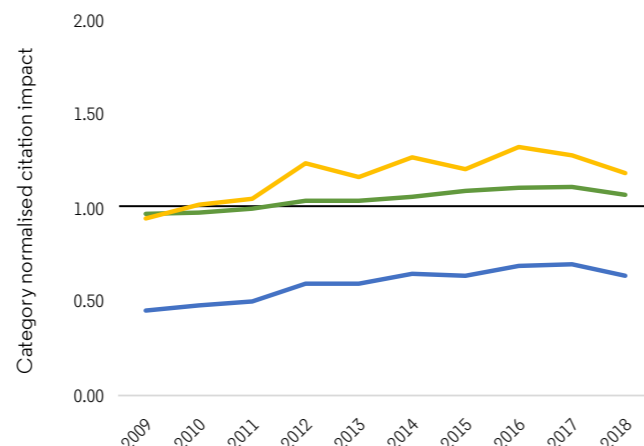


|                      | Papers     | CNCI | % > world average | % in top 10% |
|----------------------|------------|------|-------------------|--------------|
| Russia total         | 366,639    | 0.59 | 15.5%             | 4.2%         |
| Russia domestic      | 237,990    | 0.28 | 7.1%              | 1.2%         |
| Russia international | 128,649    | 1.18 | 31.2%             | 9.9%         |
| G20 total dataset    | 15,164,121 | 0.99 | 31.3%             | 9.5%         |

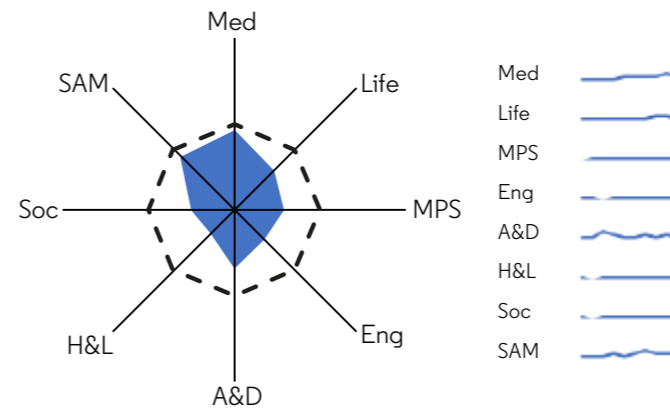
## Output and collaboration



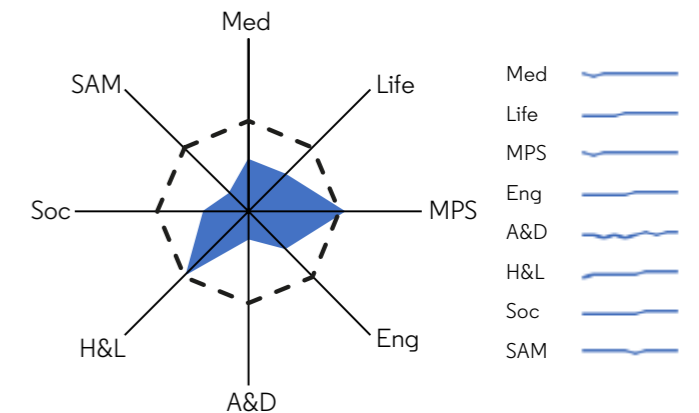
## Impact and collaboration



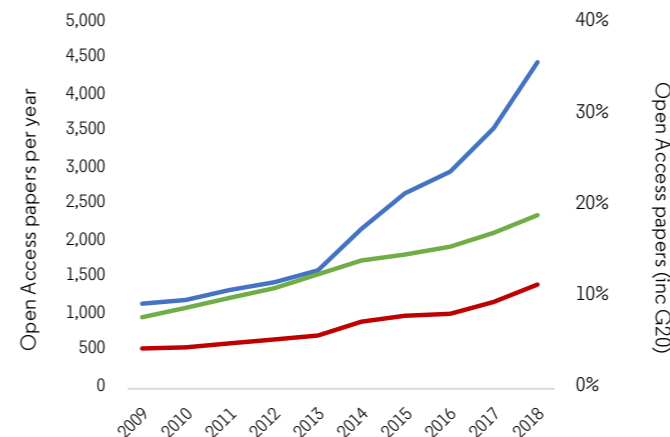
## Impact by discipline



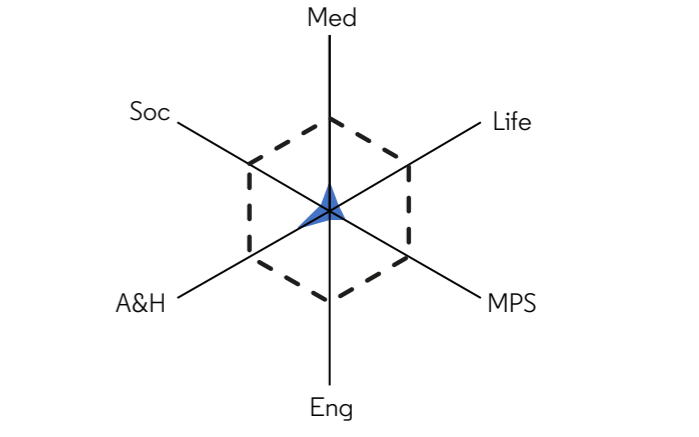
## Output by discipline



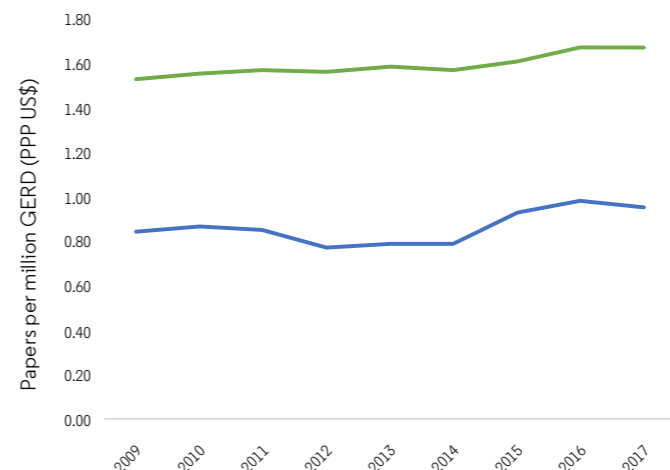
## Output and Open Access



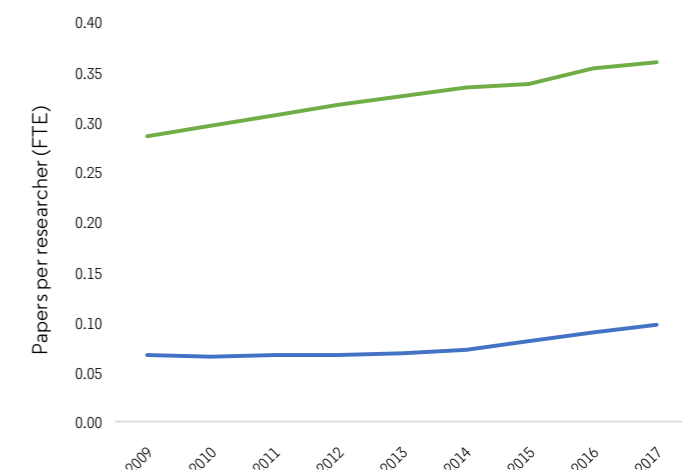
## Output and Open Access



## Output by GERD



## Output by researcher



# Saudi Arabia

Researchers

-

Female researchers

-

Population  
**32,938,213**

Researchers / 1000 population

-

Women as % researchers

-

GDP (PPP US\$ billions)  
**1775.1**

GERD (PPP US\$ billions)

-

GERD/GDP (%)

-

Patents  
**4,405**

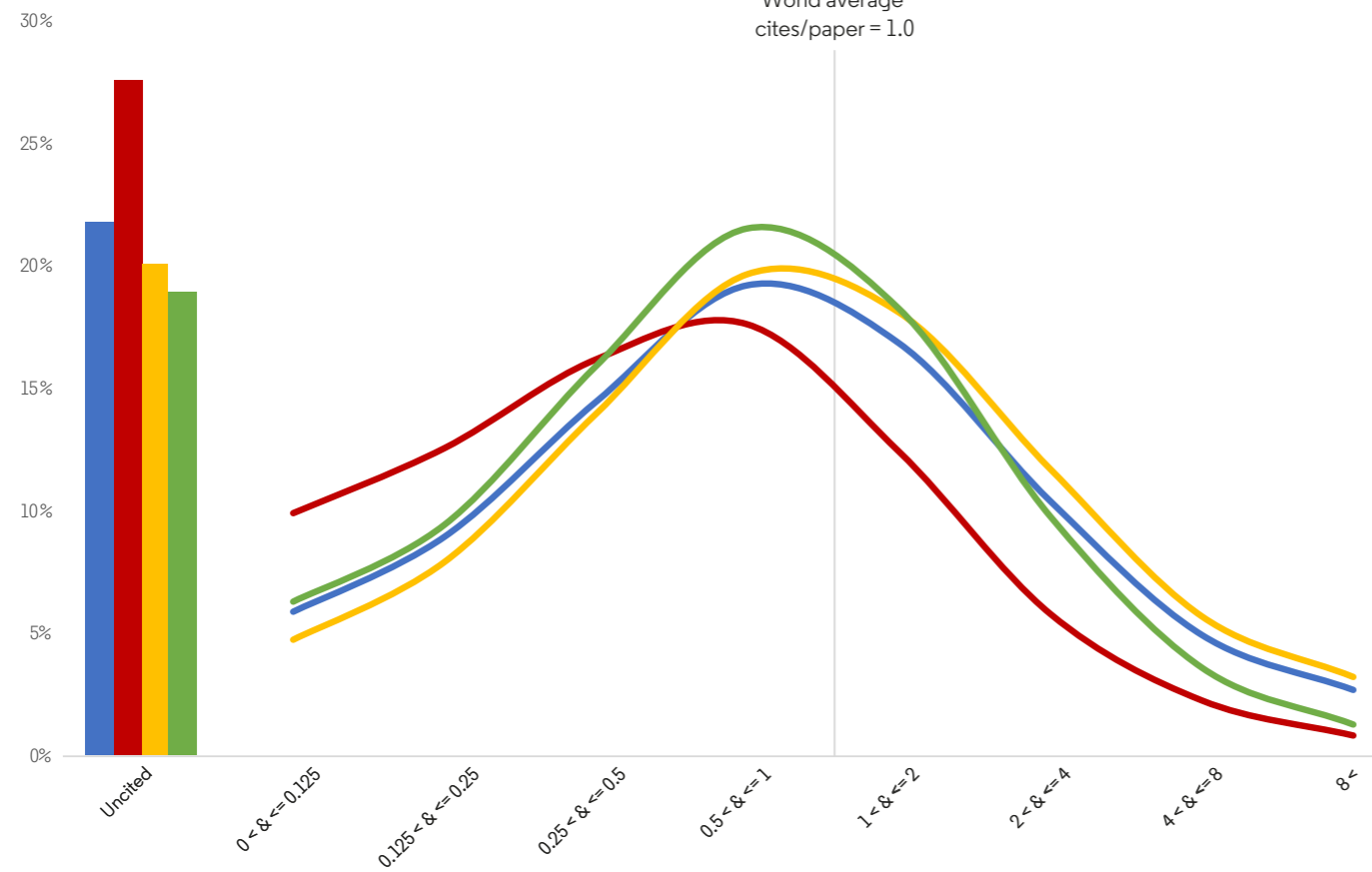
BERD (PPP US\$ billions)

-

Patents/BERD

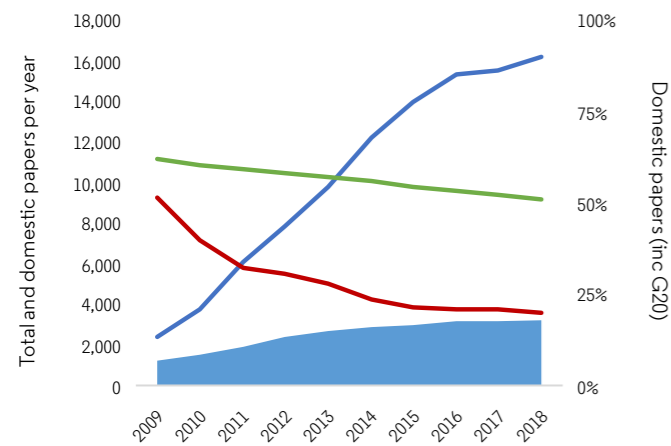
-

## Impact profile

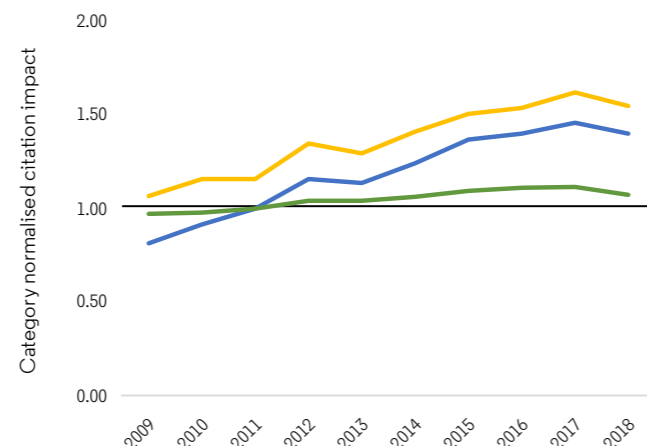


|                            | Papers     | CNCI | % > world average | % in top 10% |
|----------------------------|------------|------|-------------------|--------------|
| Saudi Arabia total         | 109,417    | 1.27 | 33.1%             | 12.7%        |
| Saudi Arabia domestic      | 24,217     | 0.66 | 20.2%             | 5.6%         |
| Saudi Arabia international | 85,200     | 1.45 | 36.8%             | 14.7%        |
| G20 total dataset          | 15,164,121 | 0.99 | 31.3%             | 9.5%         |

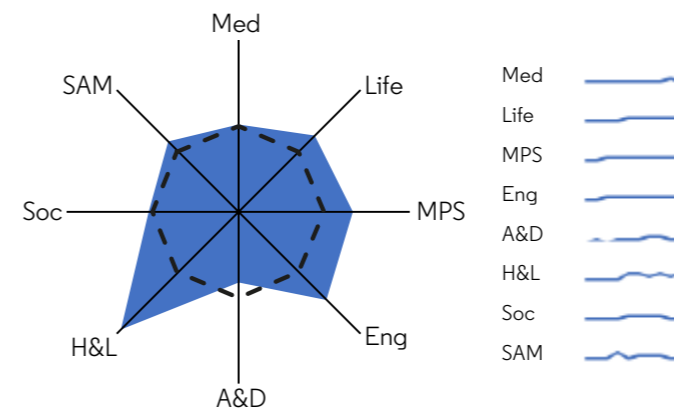
## Output and collaboration



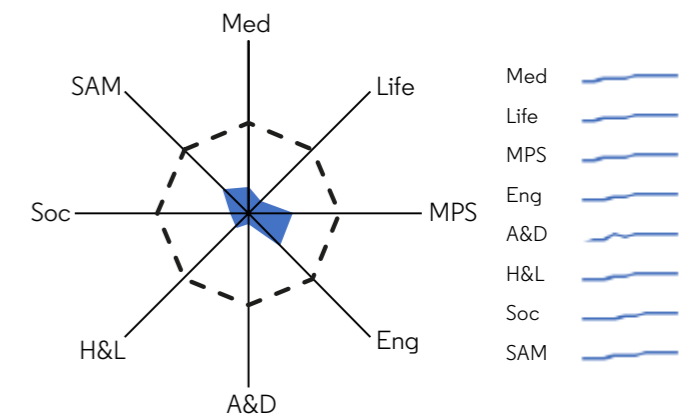
## Impact and collaboration



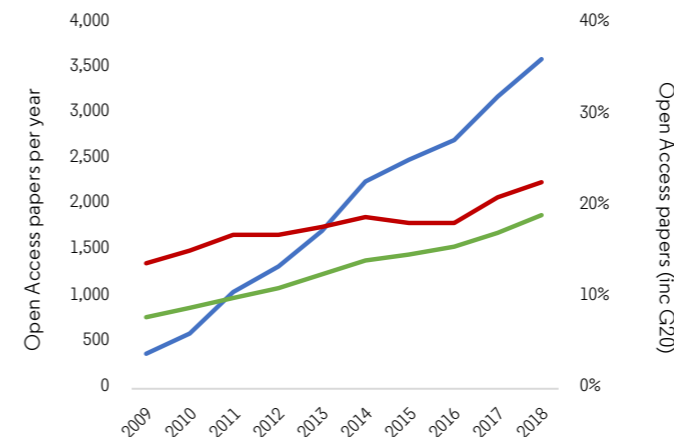
## Impact by discipline



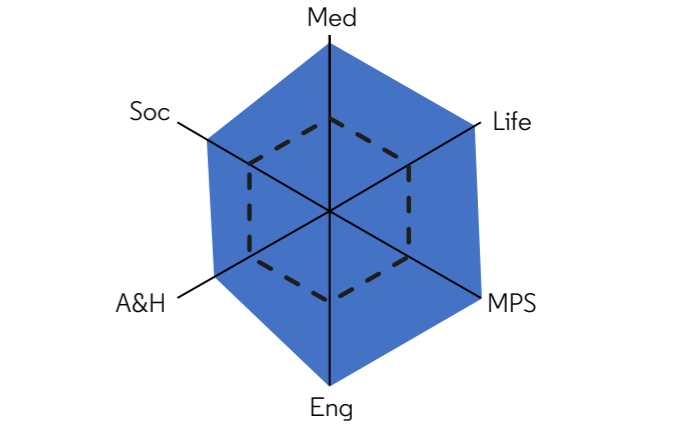
## Output by discipline



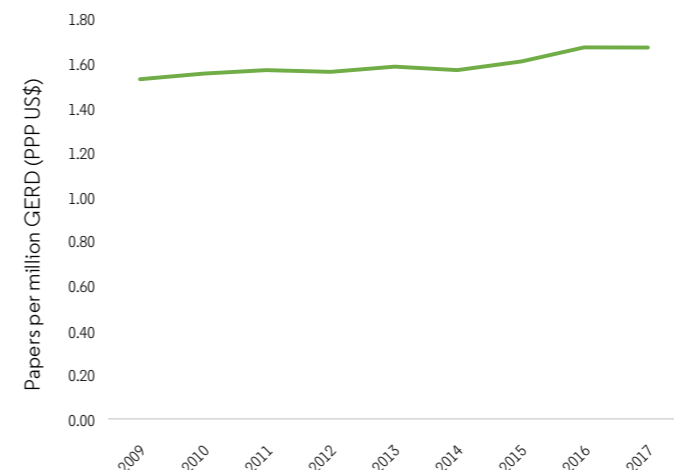
## Output and Open Access



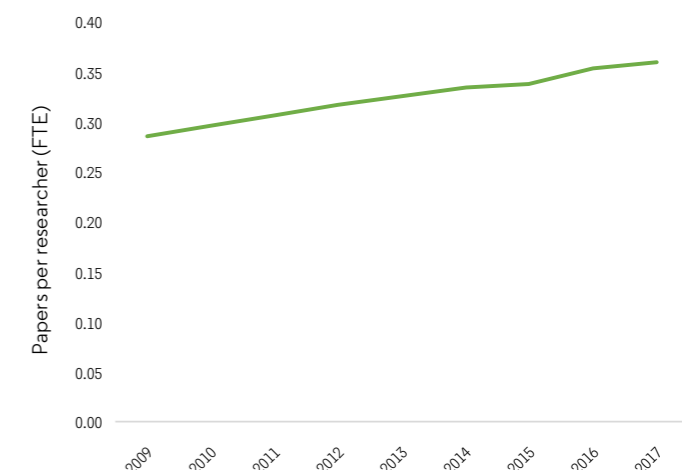
## Output and Open Access



## Output by GERD



## Output by researcher



# South Africa

Researchers  
**51,877**

Female researchers  
**23,334**

GDP (PPP US\$ billions)  
**730.9**

GERD (PPP US\$ billions)  
**5.8**

GERD/GDP (%)  
**0.80**

Population  
**55,291,225**

Researchers / 1000 population  
**0.94**

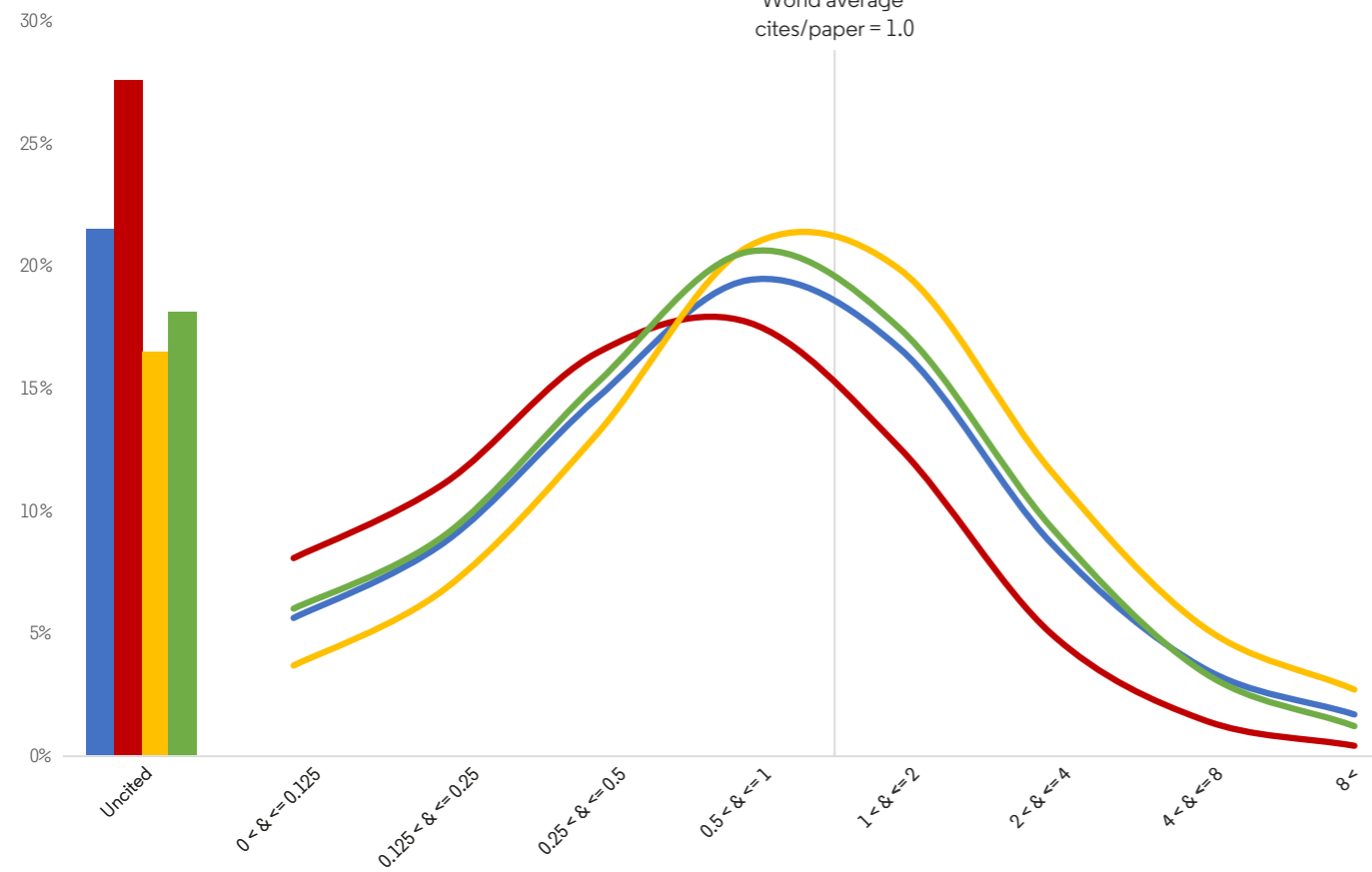
Women as % researchers  
**45.0**

Patents  
**2,178**

BERD (PPP US\$ billions)  
**2.5**

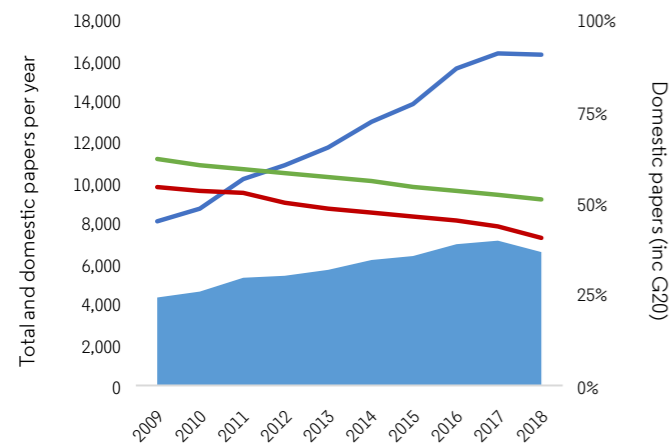
Patents/BERD  
**876.4**

## Impact profile

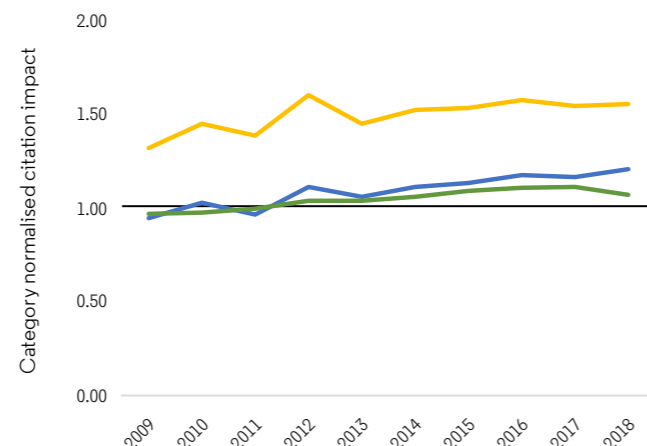


|                            | Papers     | CNCI | % > world average | % in top 10% |
|----------------------------|------------|------|-------------------|--------------|
| South Africa total         | 130,175    | 1.10 | 30.4%             | 9.5%         |
| South Africa domestic      | 57,665     | 0.59 | 19.3%             | 3.8%         |
| South Africa international | 72,510     | 1.50 | 39.3%             | 14.1%        |
| G20 total dataset          | 15,164,121 | 0.99 | 31.3%             | 9.5%         |

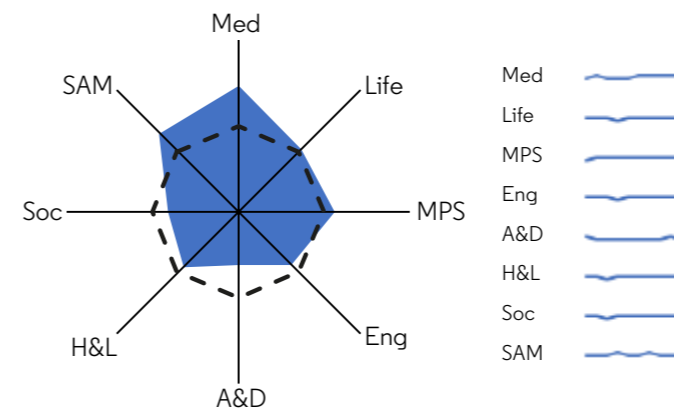
## Output and collaboration



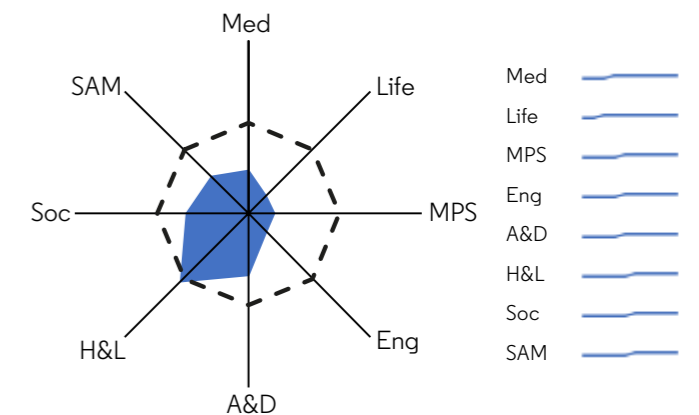
## Impact and collaboration



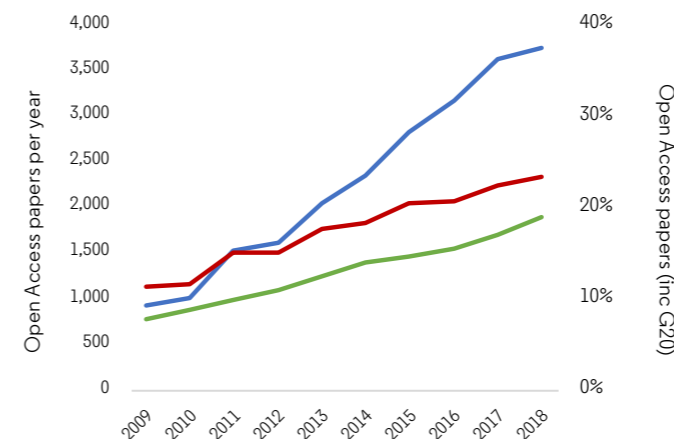
## Impact by discipline



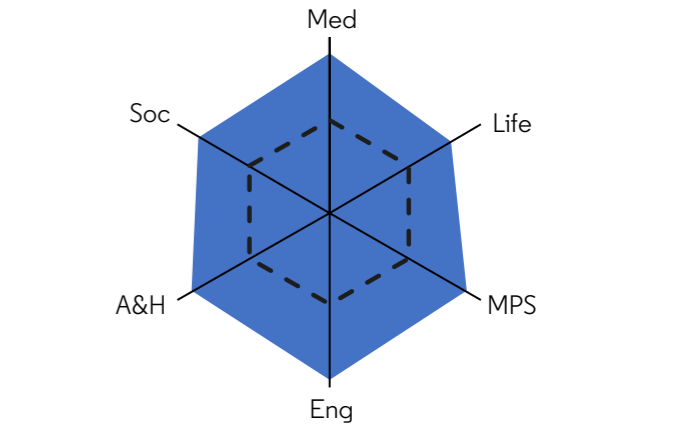
## Output by discipline



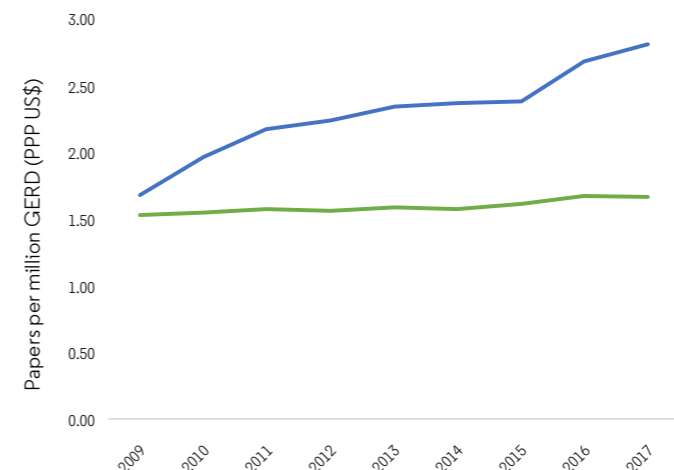
## Output and Open Access



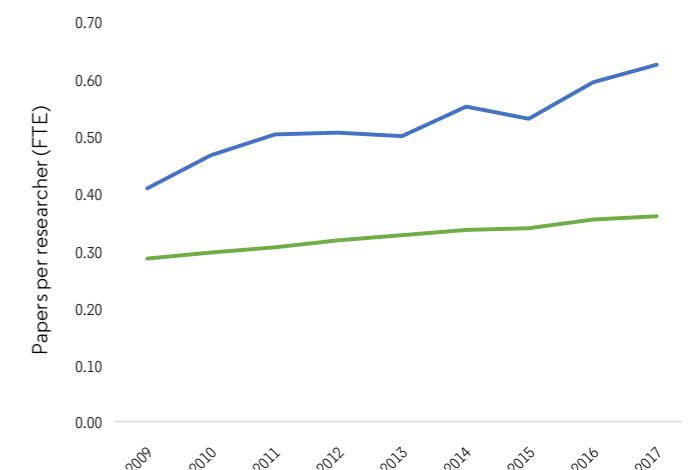
## Output and Open Access



## Output by GERD



## Output by researcher



# South Korea

Researchers  
**482,796**

Female researchers  
**97,042**

GDP (PPP US\$ billions)  
**1998.1**

GERD (PPP US\$ billions)  
**91.0**

GERD/GDP (%)  
**4.55**

Population  
**51,466,201**

Researchers / 1000 population  
**9.38**

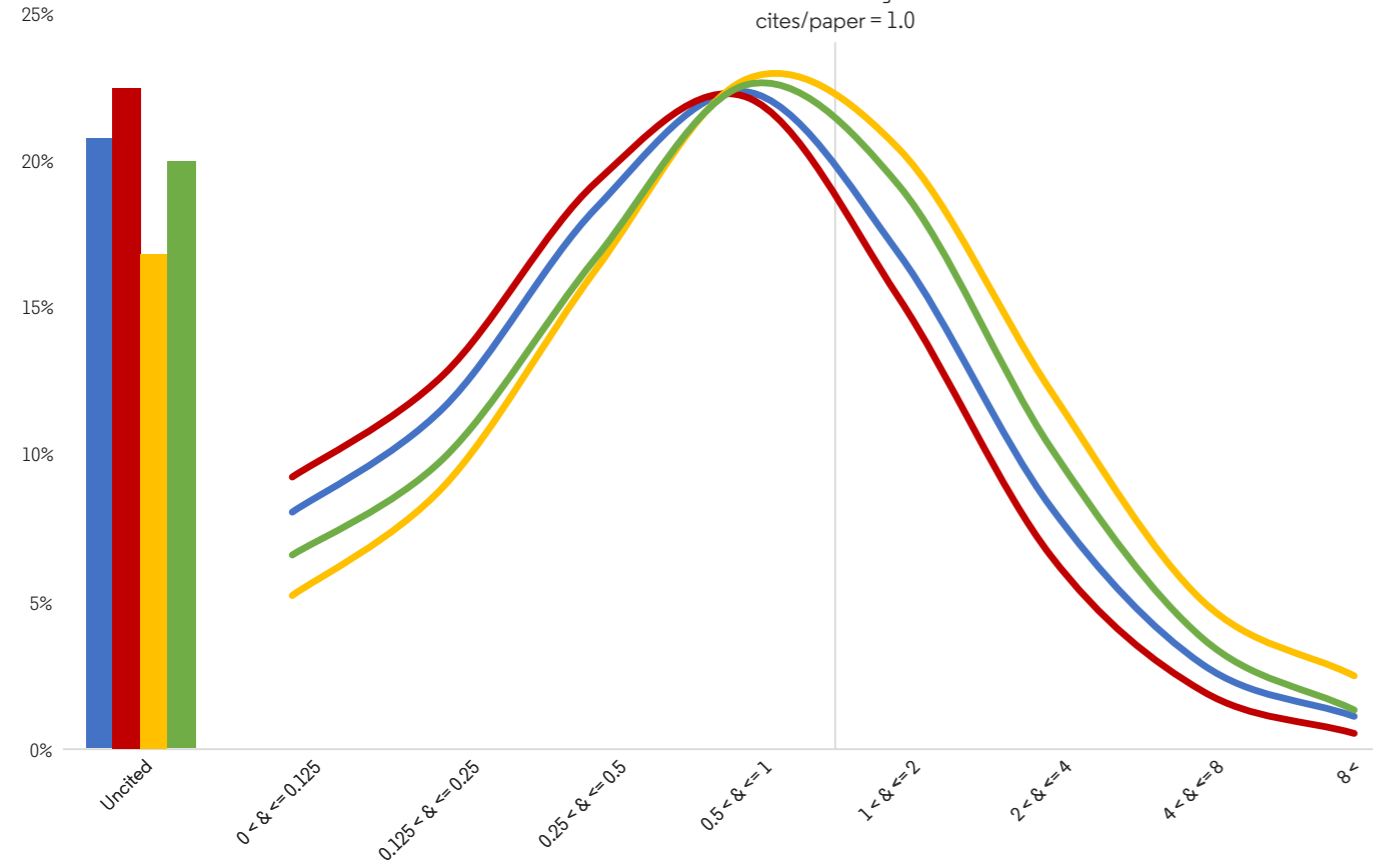
Women as % researchers  
**20.1**

Patents  
**226,568**

BERD (PPP US\$ billions)  
**72.2**

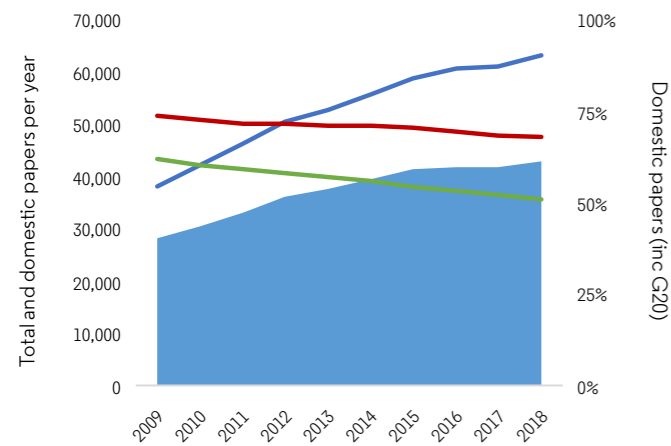
Patents/BERD  
**3136.2**

## Impact profile

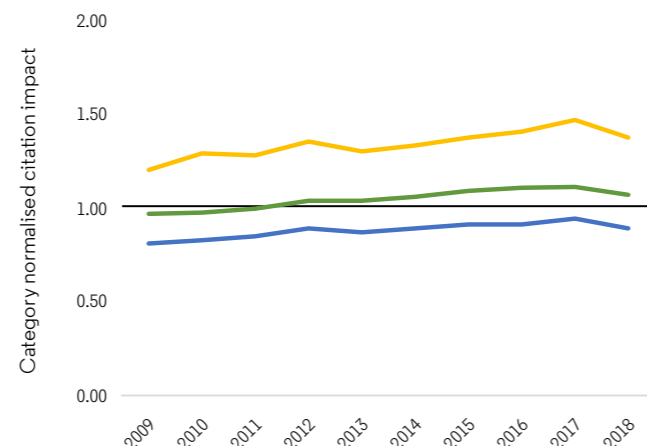


|                           | Papers     | CNCI | % > world average | % in top 10% |
|---------------------------|------------|------|-------------------|--------------|
| South Korea total         | 582,754    | 0.88 | 26.3%             | 7.6%         |
| South Korea domestic      | 410,239    | 0.68 | 22.1%             | 5.3%         |
| South Korea international | 172,515    | 1.34 | 36.4%             | 12.9%        |
| G20 total dataset         | 15,164,121 | 0.99 | 31.3%             | 9.5%         |

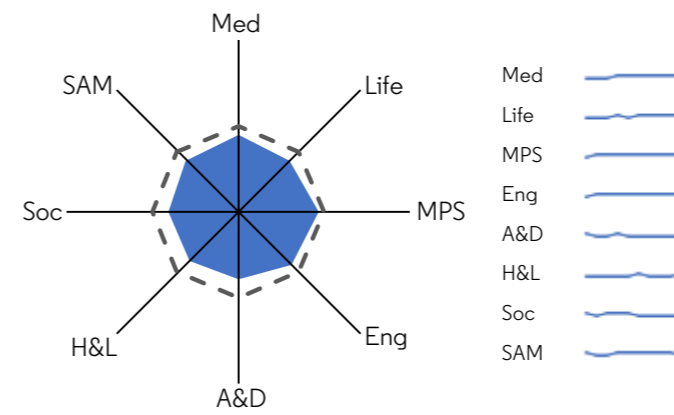
## Output and collaboration



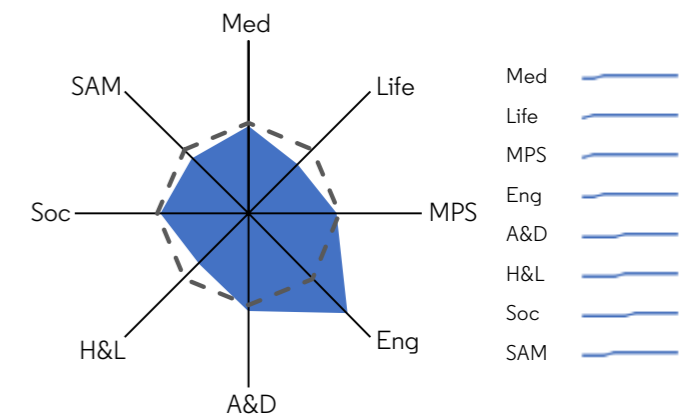
## Impact and collaboration



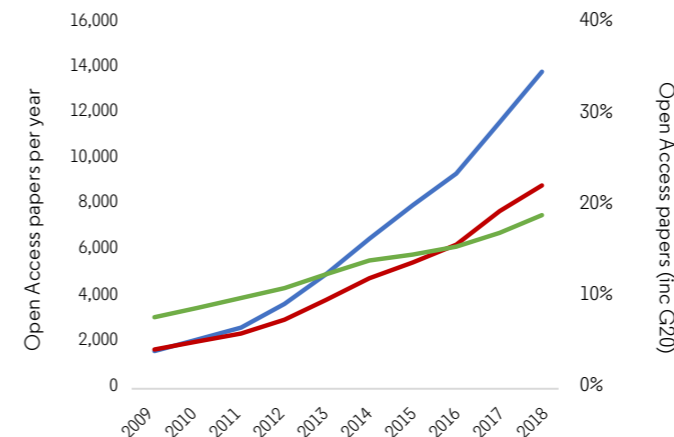
## Impact by discipline



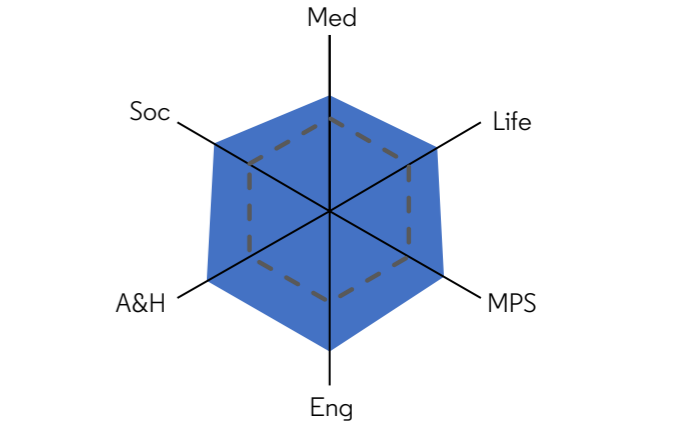
## Output by discipline



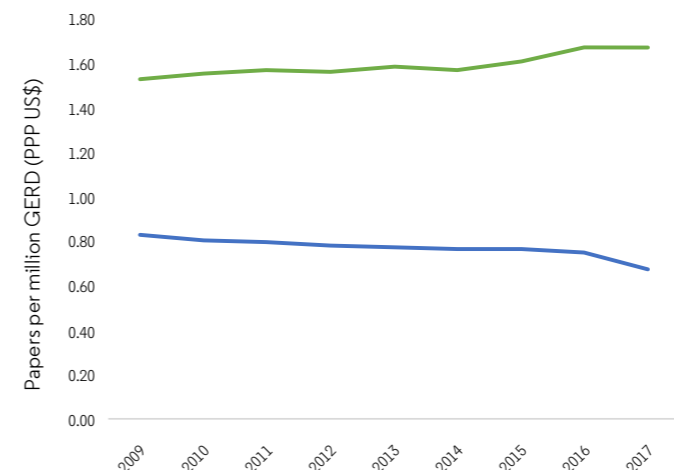
## Output and Open Access



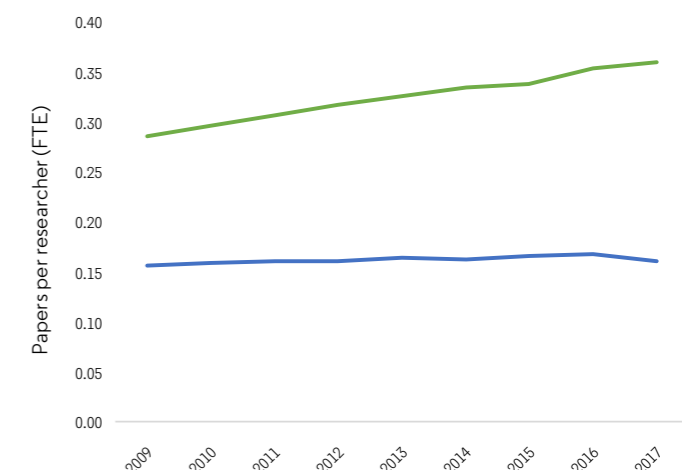
## Output and Open Access



## Output by GERD



## Output by researcher





# Turkey

Researchers  
**210,769**

Female researchers  
**78,056**

GDP (PPP US\$ billions)  
**2261.0**

GERD (PPP US\$ billions)  
**21.7**

GERD/GDP (%)  
**0.96**

Population  
**80,745,020**

Researchers / 1000 population  
**2.61**

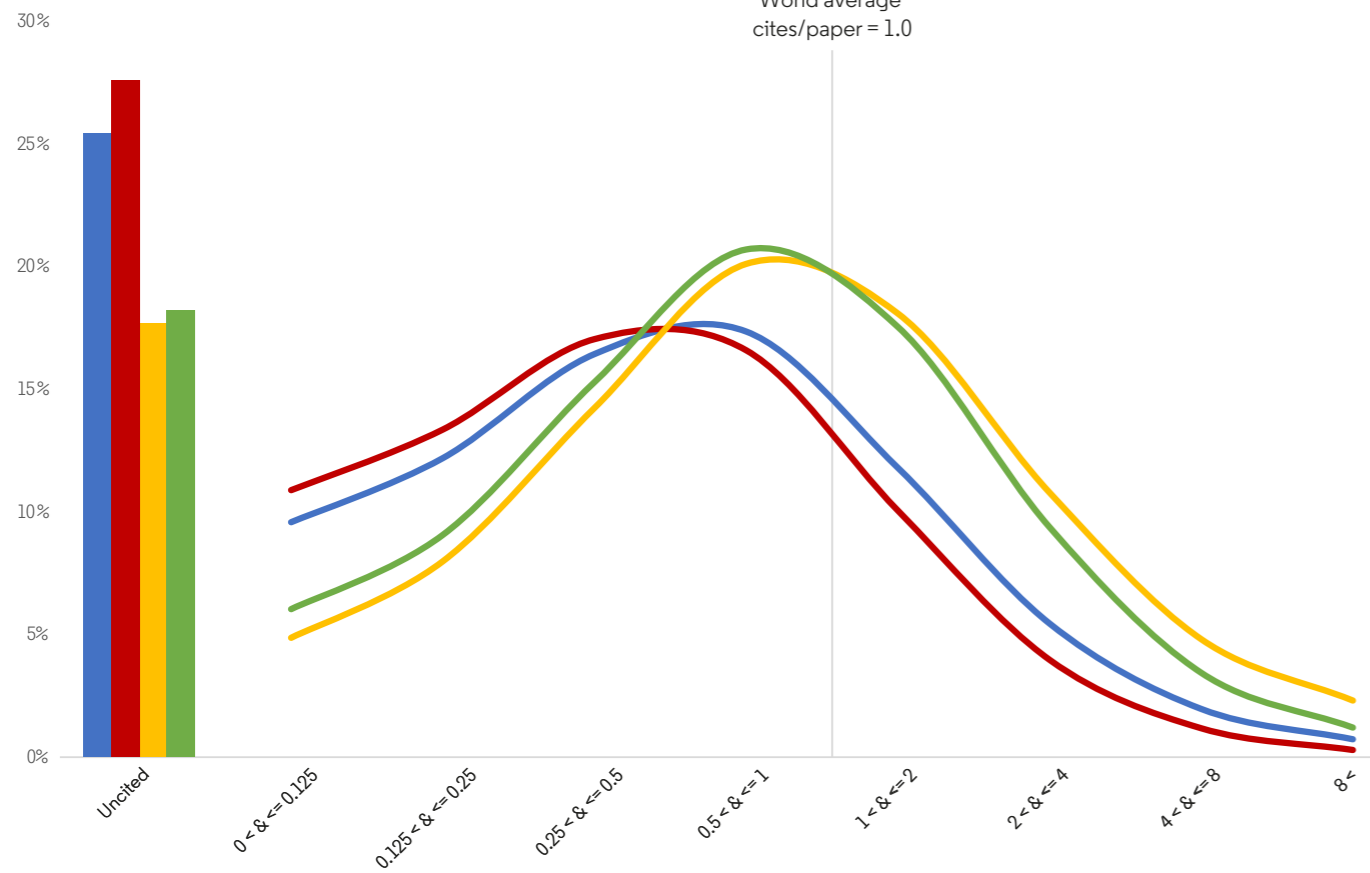
Women as % researchers  
**37.0**

Patents  
**11,144**

BERD (PPP US\$ billions)  
**12.4**

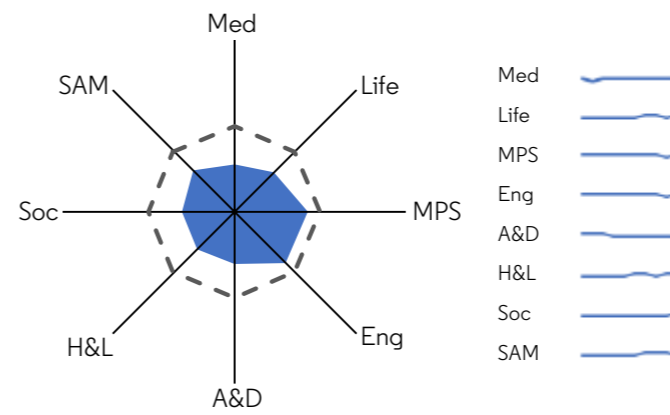
Patents/BERD  
**901.7**

## Impact profile

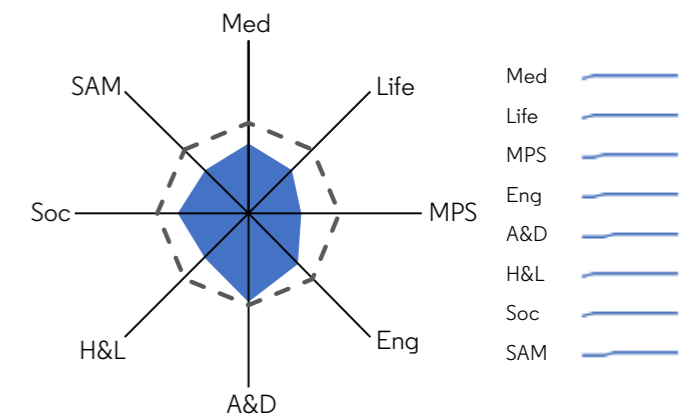


|                      | Papers     | CNCI | % > world average | % in top 10% |
|----------------------|------------|------|-------------------|--------------|
| Turkey total         | 300,883    | 0.67 | 19.7%             | 5.2%         |
| Turkey domestic      | 235,602    | 0.50 | 15.3%             | 3.2%         |
| Turkey international | 65,281     | 1.31 | 35.7%             | 12.6%        |
| G20 total dataset    | 15,164,121 | 0.99 | 31.3%             | 9.5%         |

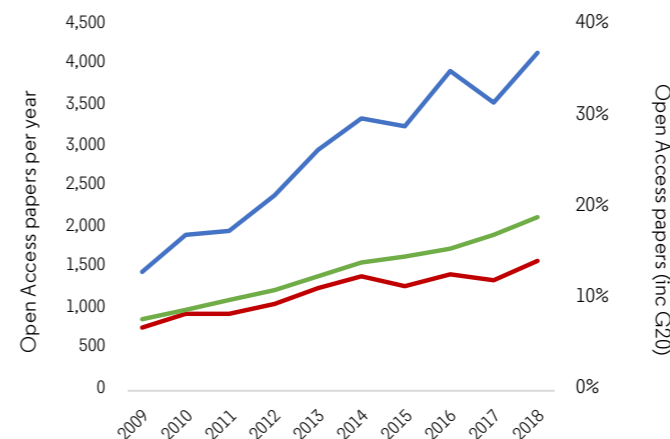
## Impact by discipline



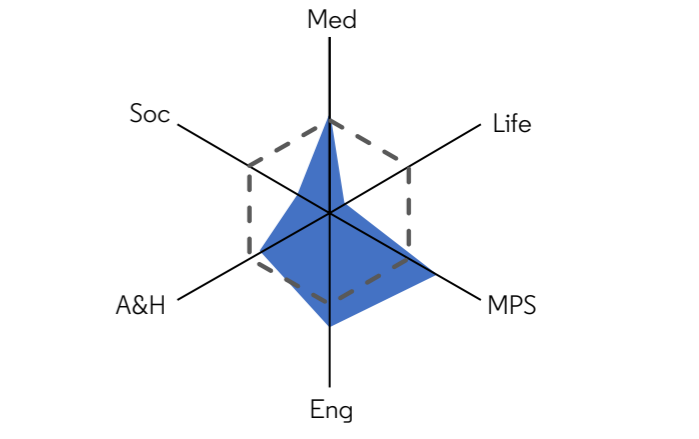
## Output by discipline



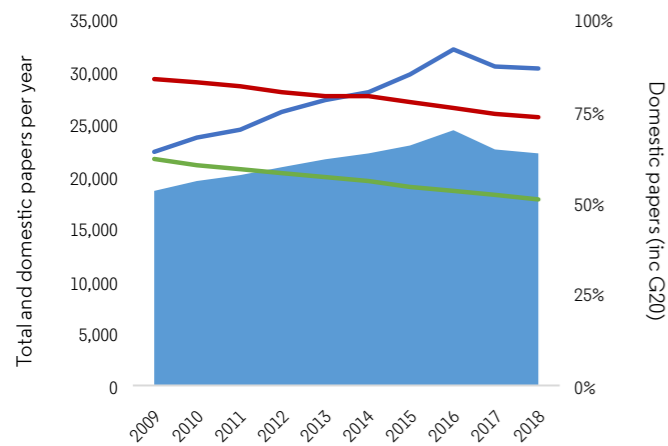
## Output and Open Access



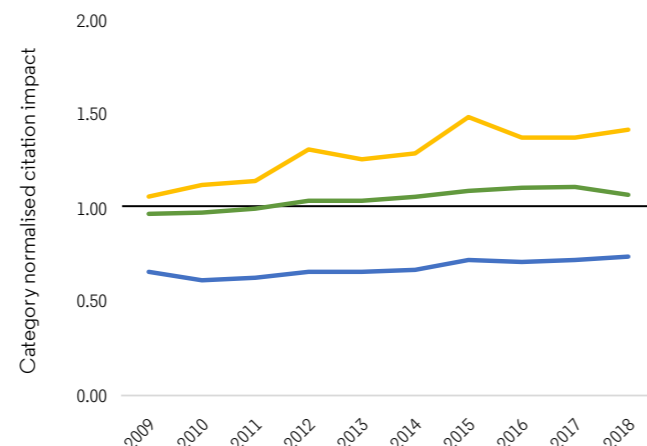
## Output and Open Access



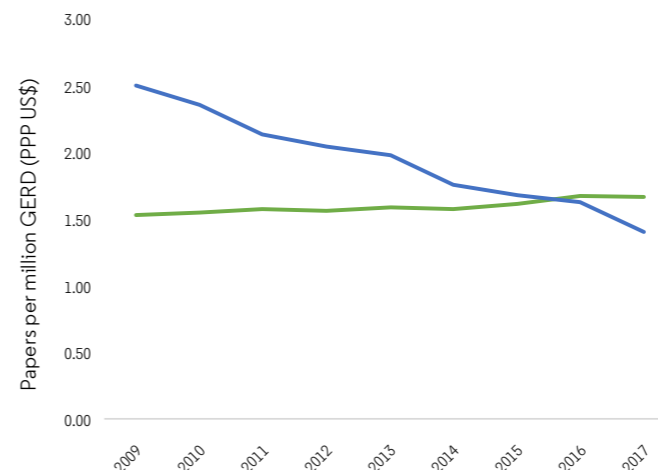
## Output and collaboration



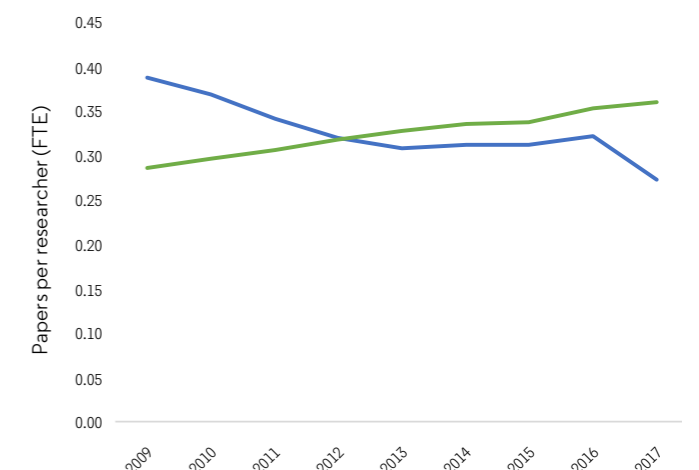
## Impact and collaboration



## Output by GERD



## Output by researcher



# United Kingdom

Researchers  
**510,980**

Female researchers  
**197,576**

GDP (PPP US\$ billions)  
**2965.8**

GERD (PPP US\$ billions)  
**49.3**

GERD/GDP (%)  
**1.66**

Population  
**65,595,565**

Researchers / 1000 population  
**7.79**

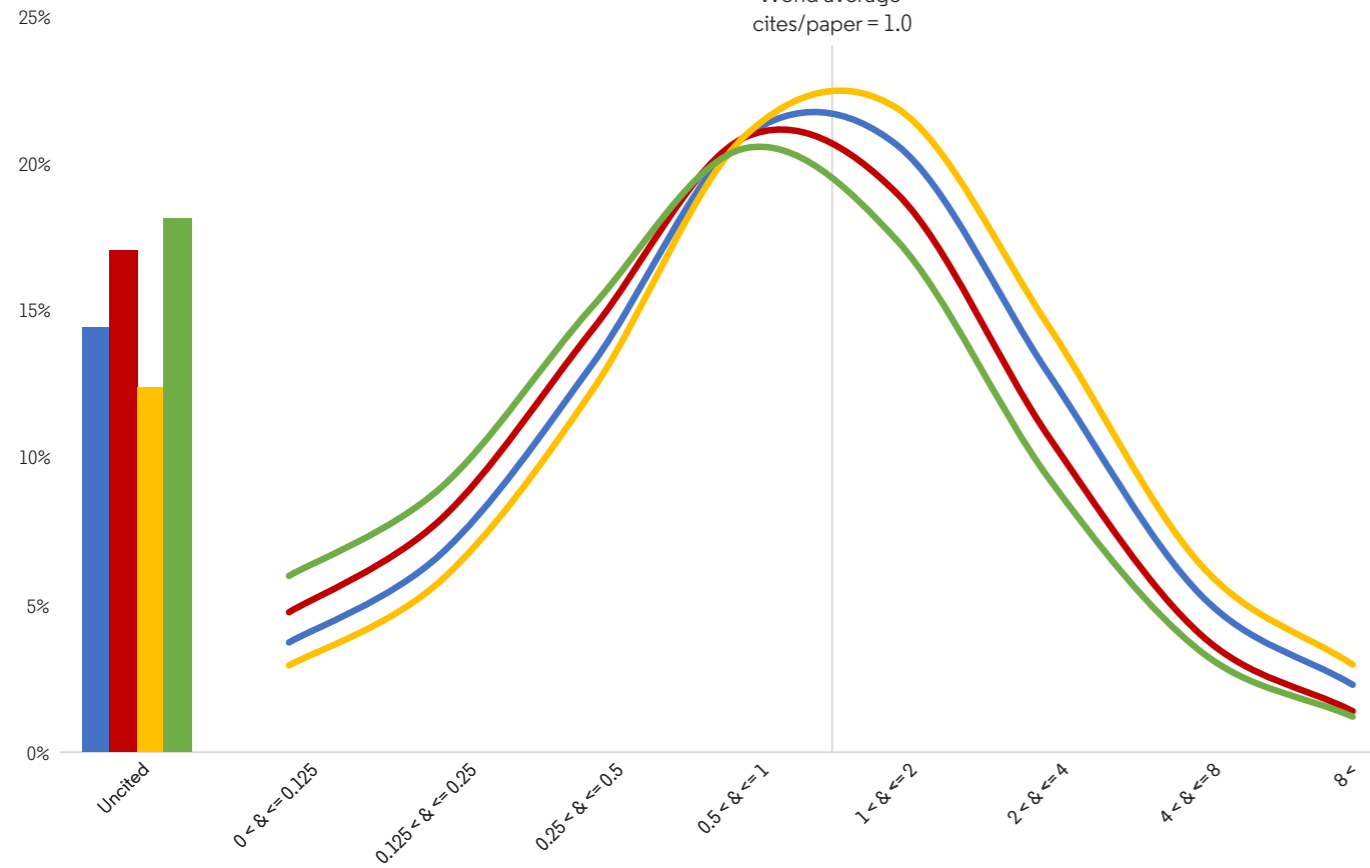
Women as % researchers  
**38.7**

Patents  
**53,746**

BERD (PPP US\$ billions)  
**33.3**

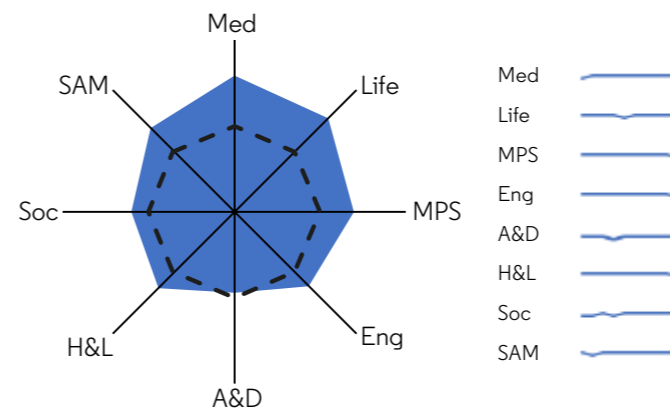
Patents/BERD  
**1611.8**

## Impact profile

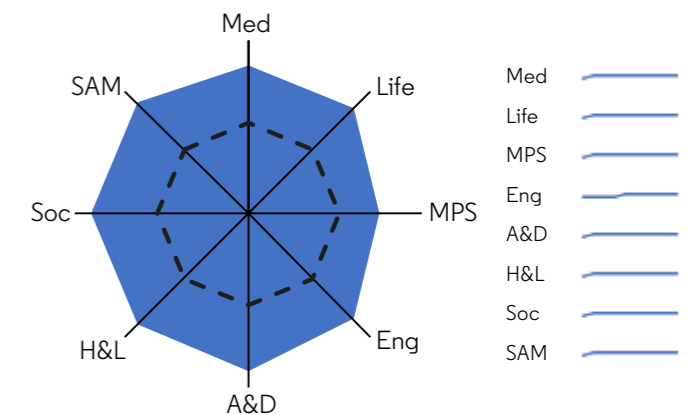


|                              | Papers     | CNCI | % > world average | % in top 10% |
|------------------------------|------------|------|-------------------|--------------|
| United Kingdom total         | 1,274,025  | 1.41 | 41.1%             | 14.5%        |
| United Kingdom domestic      | 550,634    | 1.10 | 35.0%             | 10.7%        |
| United Kingdom international | 723,391    | 1.65 | 45.6%             | 17.4%        |
| G20 total dataset            | 15,164,121 | 0.99 | 31.3%             | 9.5%         |

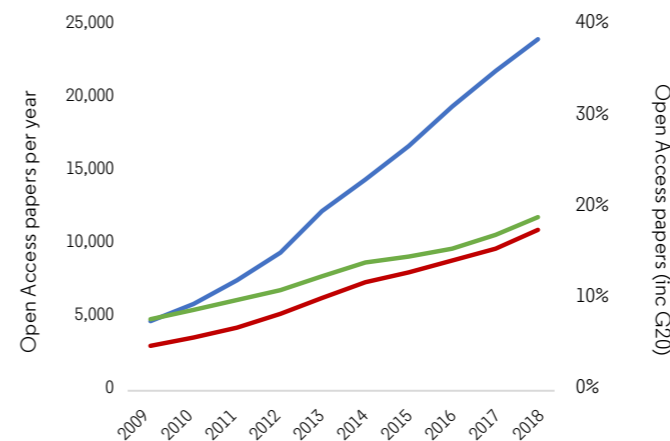
## Impact by discipline



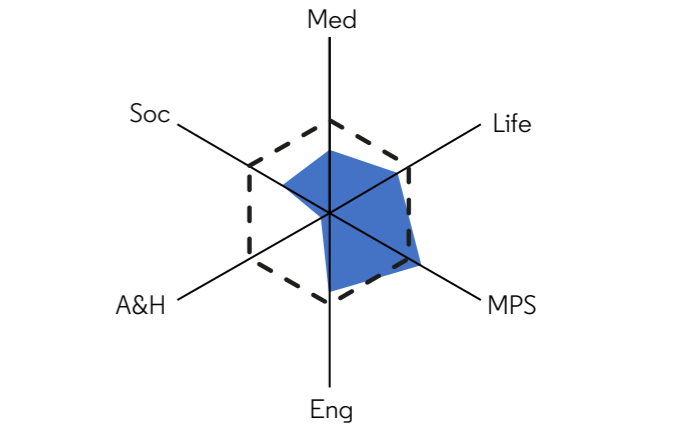
## Output by discipline



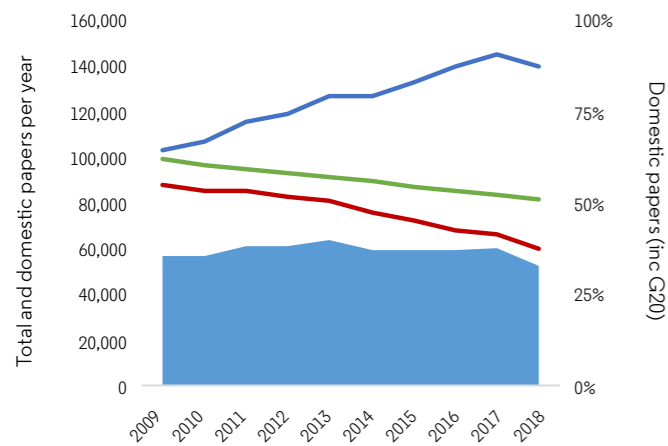
## Output and Open Access



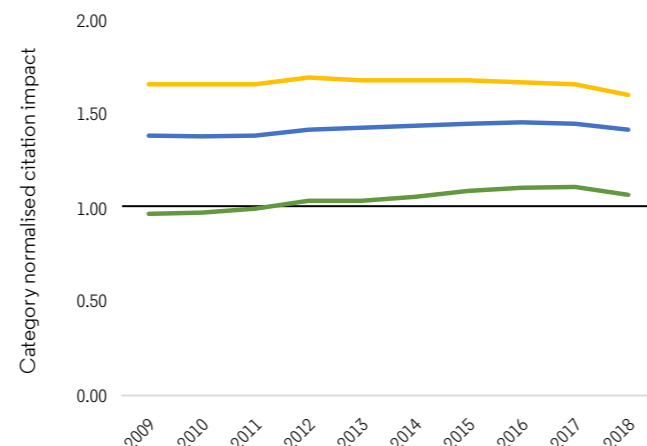
## Output and Open Access



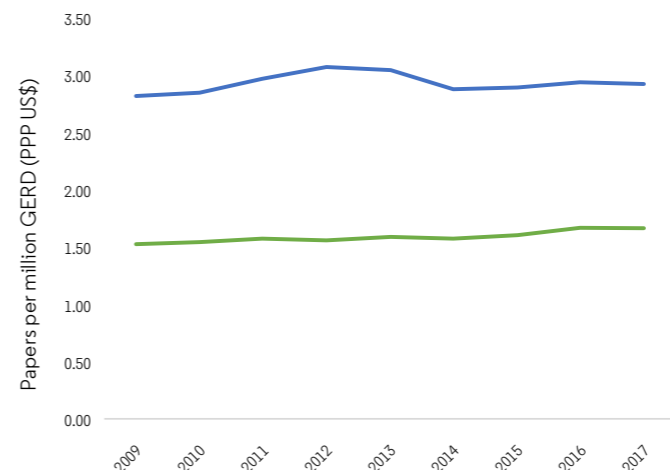
## Output and collaboration



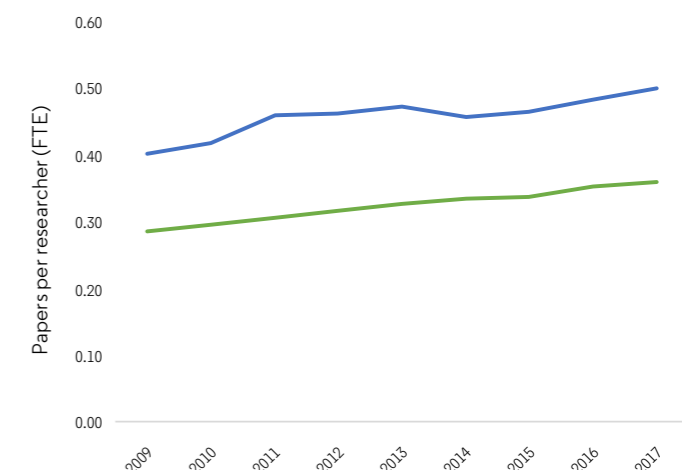
## Impact and collaboration



## Output by GERD



## Output by researcher



# United States

Researchers

-

Female researchers

-

Population  
**325,147,121**

Researchers / 1000 population

-

Women as % researchers

-

GDP (PPP US\$ billions)  
**19485.4**

GERD (PPP US\$ billions)  
**543.2**

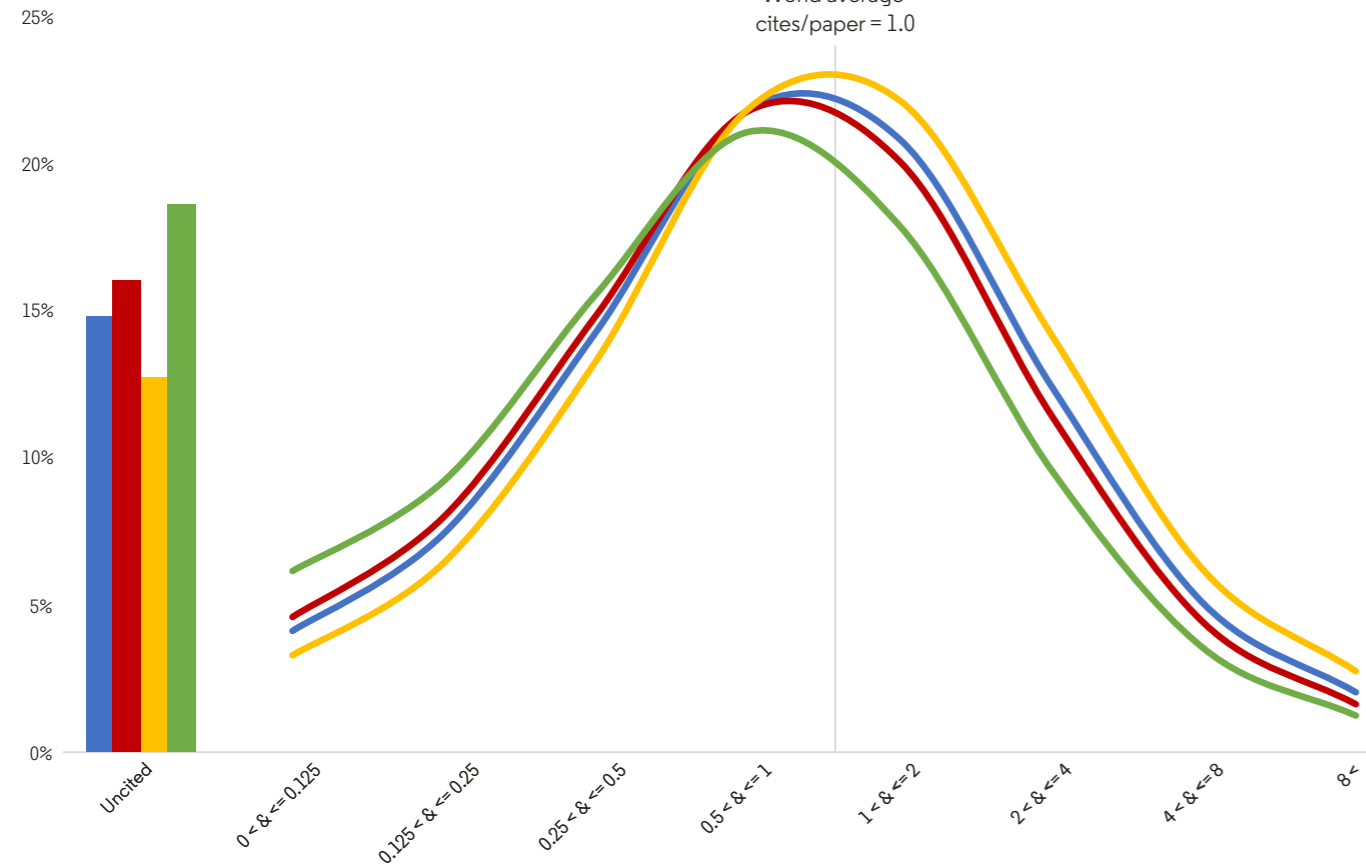
GERD/GDP (%)  
**2.79**

Patents  
**524,835**

BERD (PPP US\$ billions)  
**397.1**

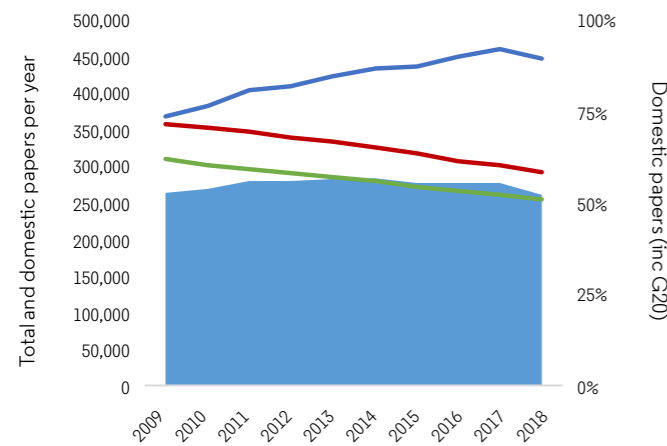
Patents/BERD  
**1321.8**

## Impact profile

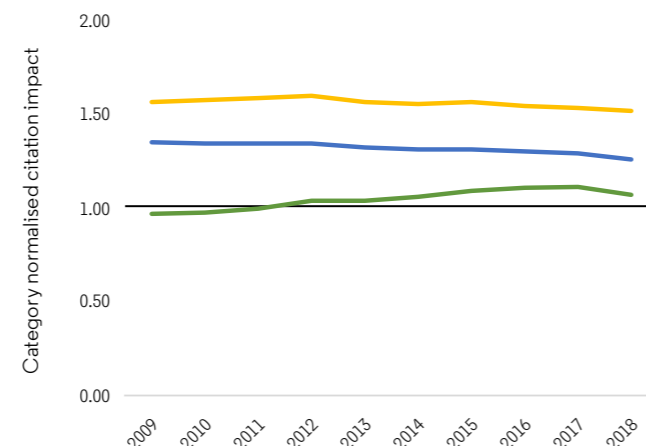


|                             | Papers     | CNCI | % > world average | % in top 10% |
|-----------------------------|------------|------|-------------------|--------------|
| United States total         | 4,427,597  | 1.31 | 39.2%             | 13.5%        |
| United States domestic      | 2,819,840  | 1.17 | 36.4%             | 11.7%        |
| United States international | 1,607,757  | 1.55 | 44.0%             | 16.5%        |
| G20 total dataset           | 15,164,121 | 0.99 | 31.3%             | 9.5%         |

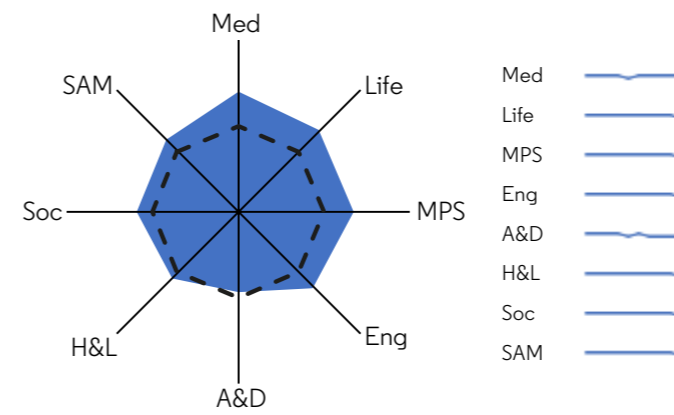
## Output and collaboration



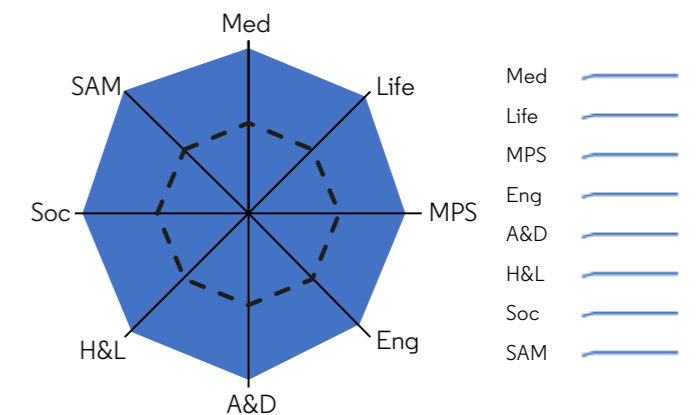
## Impact and collaboration



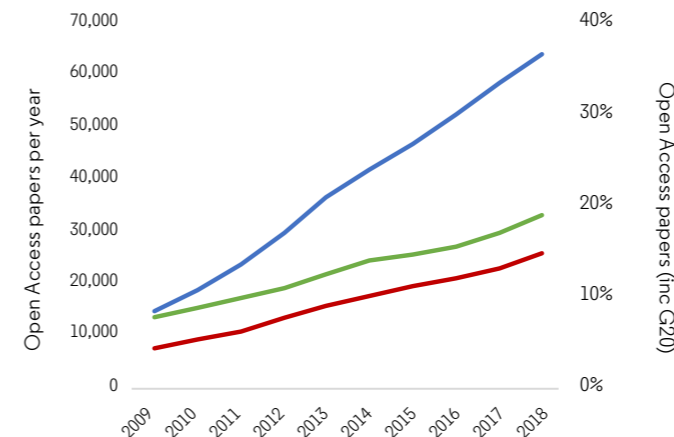
## Impact by discipline



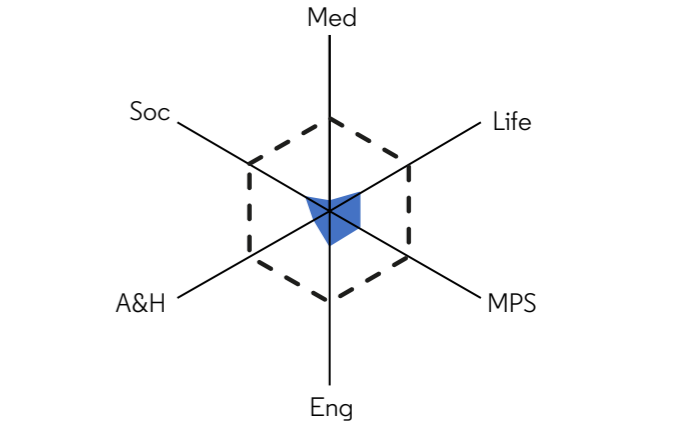
## Output by discipline



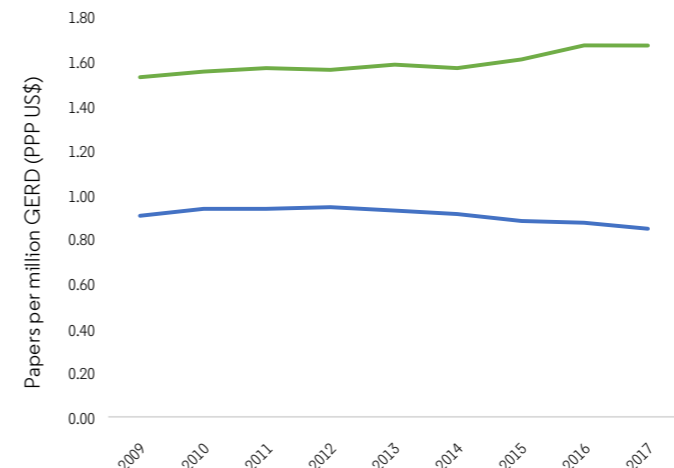
## Output and Open Access



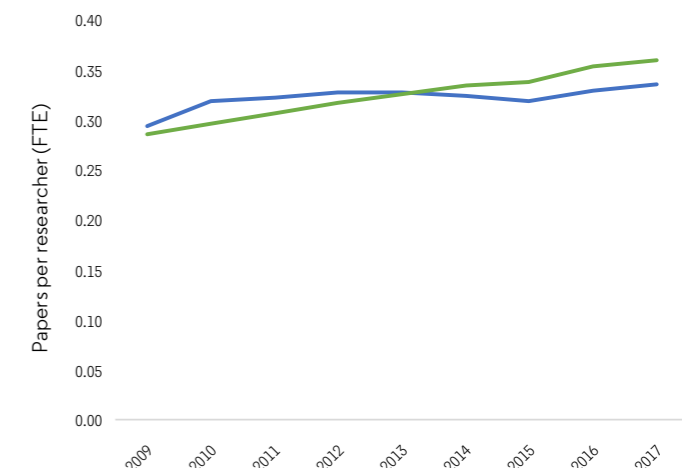
## Output and Open Access



## Output by GERD



## Output by researcher



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**2007. Adams J, Gurney K A and Marshall S.** Profiling citation impact: a new methodology. *Scientometrics*, 72 (2), 325-344.

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