



World of Research 2015

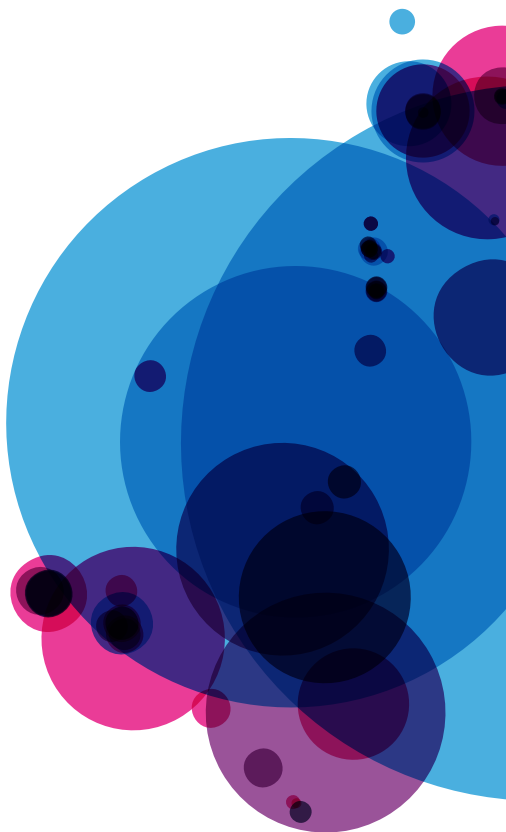
*Revealing patterns and archetypes
in scientific research*

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World of Research 2015

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Elsevier Analytical Services is proud to present *World of Research 2015* – a book that provides a snapshot of essential research indicators for the world's most prolific countries and regions in terms of scholarly output. This book is a great source of information for, among others, research managers, government officials, and those working for funding bodies. It will help you prepare for meetings with colleagues from other countries or regions, inform strategic choices in collaboration, learn from what other countries and regions are doing well, and be aware of your own country or region's challenges and strengths.

Each country or region is unique. It has its own language, culture, political system, and history. More specifically, in the context of this book, each country or region has its own scientific culture, its own expertise and specific areas in which it stands out. Over the coming pages you will find more than 70 profiles with key statistics, graphs, analyses, and insightful interpretations, each profile focusing on the country or region in question.

However, even though all countries or regions are unique, certain patterns recur in the data that we report on; in certain groupings or clusters of countries and regions, researchers seem to behave in similar ways. In this executive summary, we take a bird's eye view of the data, on the lookout for such patterns and clusters.

77

COUNTRY OR REGION PROFILES

Including:

- Investment in R&D
- Shares of world scholarly output
- Shares of world citations
- Shares of patents filed and granted
- Geographic distribution of citations
- Domestic and international collaboration
- Researcher mobility
- Disciplinary strengths and weaknesses
- Most prolific institutions and their output, growth, and citation impact

1 The Key Players

Research-intensive countries and regions, both large ones such as the United States (US), the United Kingdom (UK), Germany, and France, as well as smaller ones, such as the Netherlands, Switzerland, and Denmark, tend to:

- have relatively large research bases,
- be highly productive,
- have high field-weighted citation impact (FWCI),
- show a highly mobile researcher base with an average 70% of active researchers spending some time abroad to publish research,
- show a net loss of researchers (more outflow than inflow),
- have high levels of international collaboration.

2 The Up and Coming

This group of countries and regions overlaps greatly with the traditional view of emerging markets. It comprises developing scientific nations, such as Brazil, Russia, India, China (BRIC), but also Poland, South Korea, Iran, and Turkey, for instance. These countries typically:

- have research bases whose size is near the median of that of all countries,
- show lower productivity but strong growth,
- have their output associated with lower FWCI,
- consist of a highly sedentary researcher base, with an average of 60% of the researchers having never published with an affiliation outside the country,
- show low levels of international collaboration.

If we cluster countries based on the mobility level of their researchers, Japan is also classified in this group, although strong growth in output (arguably the most defining characteristic of this group) does not apply to Japan.

3 The Internationally Dependent

A seemingly heterogeneous group, these countries and regions are clustered together due to the following shared characteristics:

- smaller research bases,
- largest impact coming from connections abroad: either inflow researchers, visiting scholars, or international collaboration,
- average to high levels of international collaboration.

In this group, we find a large number of Eastern European countries (for instance Czech Republic, Bulgaria, Hungary), a number of Southern European countries (Spain, Portugal, Greece), a couple of Baltic countries (Finland, Norway), as well as South Africa, Argentina, and Chile.

Geographically speaking, this may seem like an odd mix, but what they all have in common is a strong dependency on their international connections. Researchers from abroad bring impactful work to these countries, and internationally co-authored publications yield the highest citation impact.

4 The Smallest Science Footprints

Related to the previous category, but nevertheless different, is a category in which the smallest research nations fall, such as Latin America's Cuba but also slightly larger Mexico, as well as Iraq, Egypt, Malaysia, and Kuwait, for example. The countries and regions in this category tend to show:

- a clear, often single-discipline focus in their research activity, as opposed to a more well-rounded spread across disciplines,
- moderate to high levels of international collaboration, and moderate levels of researcher mobility,
- limited networks of influence via citations (i.e. continental, such as Latin American, or linguistic, such as French connections for Algeria).
- the lowest level of FWCI for mobile researchers, compared to that of the other groups of countries.

This group's international connections do not bring them the same returns as we have seen in the previous category. Even though they are taking clear steps in this direction, benefits from international collaboration or mobility appear more limited.

5 The Attractive Destinations

The fifth and last category of smaller research countries and regions is characterized by its high mobility and attractiveness for foreign researchers.

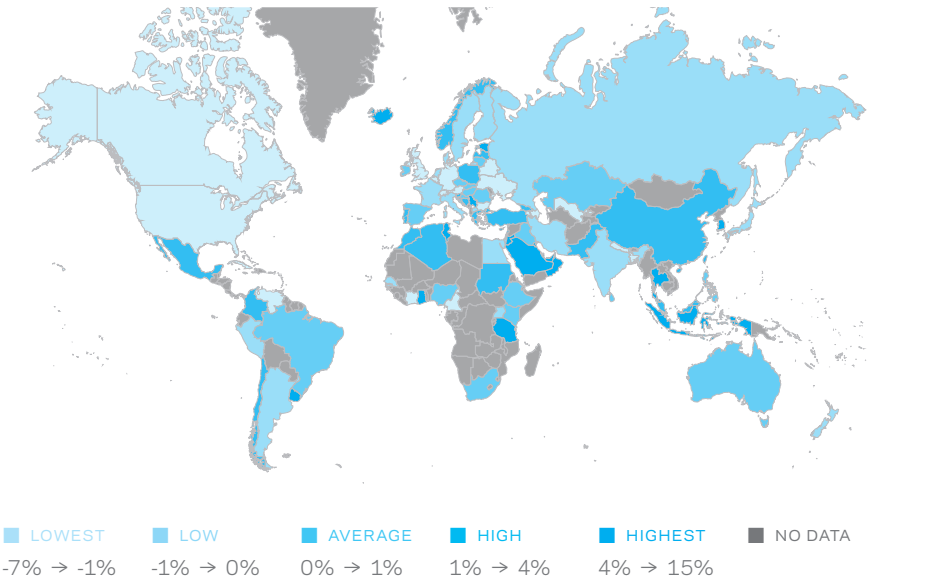
In this group, we find Asian territories such as Singapore, Hong Kong, as well as Middle Eastern territories such as Saudi Arabia, Qatar, and the United Arab Emirates. These countries and regions typically have:

- a high net researcher inflow, indicating that more researchers enter the country or region than those that leave,

- a highly mobile research population of on average 81%, even higher than the Key Players,
- around average FWCI in all mobility classes,
- the highest FWCI from sedentary researchers when compared to other clusters.

The net inflow, the key characteristic for this group of *Attractive Destinations* countries, is represented in Figure 1 below. It shows net gain in researchers per country: dark cyan countries have relatively high net inflow, and on the other end of the spectrum we find light cyan countries with relatively high net outflows.

Figure 1 – A map showing net gain in researchers, i.e. which countries have brain gain (where more researchers come in than leave), and which ones have brain drain (where more researchers leave than come in). Please note that we only show data for countries with more than 170 sedentary researchers, the median value, so that the smallest ones with lower reliability are excluded.



Other patterns and similarities

In addition to the grouping of countries and regions that we presented before, we have observed other patterns and similarities in the data used in preparation for this book.

For example, there seem to be preferences for certain regions to focus on specific subject areas:

- Northern European countries generally show strong foci in the Medical & Health Sciences,
- South America and Africa (mostly developing countries and regions) have high foci in the Agricultural Sciences,
- a combination of Asia Pacific and Eastern European countries (such as China, Korea, Singapore, Ukraine, and Russia), display strong foci in Engineering & Technology,
- mostly English speaking and/or former Commonwealth countries and regions show foci in the Humanities and the Social Sciences.

Another interesting pattern that has been observed previously, and is equally present throughout this book, is that countries and regions with smaller populations tend to have higher levels of international collaboration, at least after they have reached a certain level of research maturity. This size effect is to be expected, as smaller countries and regions simply have more necessity to collaborate across borders, whereas larger countries and regions will have most, if not all, expertise available within their borders.

Conclusion

We hope that this book offers you a pleasant journey through the countries and regions of the world today, looking for patterns and similarities in their research performance, while at the same time admiring what makes them unique.

Dr Judith Kamalski,
— *Head of Analytical Services,*
Research Management, Elsevier

Sarah Huggett, Elizabeth Kalinaki,
George Lan, Georgin Lau, Dr Lei Pan,
and Steven Scheerooren

Amsterdam / New York / Singapore
August 2015

Table of Contents

Revealing patterns and archetypes
in scientific research

3

Table of Contents

8

Country X: a profile example

11

Country or region analyses

17—322

APPENDIX A Methodology

328

APPENDIX B Data sources

336

APPENDIX C Glossary of terms

339

References

342

Authors

344

Acknowledgements

347

About

348

Country or region analyses

- A —**
- 18 Algeria
 - 22 Argentina
 - 26 Australia
 - 30 Austria
- B —**
- 34 Bangladesh
 - 38 Belarus
 - 42 Belgium
 - 46 Brazil
 - 50 Bulgaria
- C —**
- 54 Canada
 - 58 Chile
 - 62 China
 - 66 Colombia
 - 70 Croatia
 - 74 Cuba
 - 78 Cyprus
 - 82 Czech Republic
- D —**
- 86 Denmark
- E —**
- 90 Egypt
 - 94 Estonia
- F —**
- 98 Finland
 - 102 France
- G —**
- 106 Germany
 - 110 Greece
- H —**
- 114 Hong Kong
 - 118 Hungary
- I —**
- 122 Iceland
 - 126 India
 - 130 Indonesia
 - 134 Iran
 - 138 Iraq
 - 142 Ireland
 - 146 Israel
 - 150 Italy
- J —**
- 154 Japan
 - 158 Jordan
- K —**
- 162 Kenya
 - 166 Kuwait
- L —**
- 170 Latvia
 - 174 Lebanon
 - 178 Lithuania
 - 182 Luxembourg
- M —**
- 186 Malaysia
 - 190 Mexico
 - 194 Morocco
- N —**
- 198 Netherlands
 - 202 New Zealand
 - 206 Nigeria
 - 210 Norway
- P —**
- 214 Pakistan
 - 218 Peru
 - 222 Philippines
 - 226 Poland
 - 230 Portugal
- Q —**
- 234 Qatar
- R —**
- 238 Romania
 - 242 Russian Federation
- S —**
- 246 Saudi Arabia
 - 250 Serbia
 - 254 Singapore
 - 258 Slovakia
 - 262 Slovenia
 - 266 South Africa
 - 270 South Korea
 - 274 Spain
 - 278 Sweden
 - 282 Switzerland
- T —**
- 286 Taiwan
 - 290 Thailand
 - 294 Tunisia
 - 298 Turkey
- U —**
- 302 Ukraine
 - 306 United Arab Emirates
 - 310 United Kingdom
 - 314 United States
- V —**
- 318 Venezuela
 - 322 Vietnam

Country X

A profile example

COUNTRY X

The executive summary of findings outlines the main information for each country or region. It presents the key take-away points from each section.

We use the most recently available robust data points from a variety of sources such as Scopus for publications and citations, ScienceDirect for downloads, UNESCO or OECD for economic indicators, and WIPO for patents (see Appendix B for information on each data source).

ScienceDirect data are from 2014; Scopus data are from 2014 (2010-2014 for citations-based indicators: the longer window is for stability given the length of time citations take to accrue); UNESCO and OECD data when available are from 2012; WIPO data are from 2013.

Headline statistics

0.55%
OF WORLD CITATIONS

This section gives an intuitive and visual overview of the top insights, bringing out what is especially important for each country or region.

PROLIFIC IN THE
Agricultural Sciences

These four main points act as a summary of the most crucial research facts.

COLLABORATION
Highly international

It shows four main highlights that are particularly relevant to the country or region.

0.58%
OF GDP AS GERD

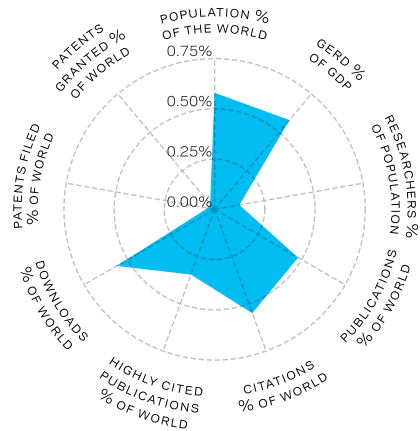
These figures may deal with the country or region's world share of main research indicators, including output and impact or innovation. They may also underline particularly striking points about geographical reach, collaboration, or mobility.

Overall country or region outlook

This section presents an overview of main research statistics for each country or region, including:

- Input such as population, Gross Domestic Expenditure on Research & Development (GERD), researchers.
- Output such as scholarly publications.
- Impact measured through the proxy of citations, highly cited articles, and downloads.
- Innovation assessed through patents filed and granted.

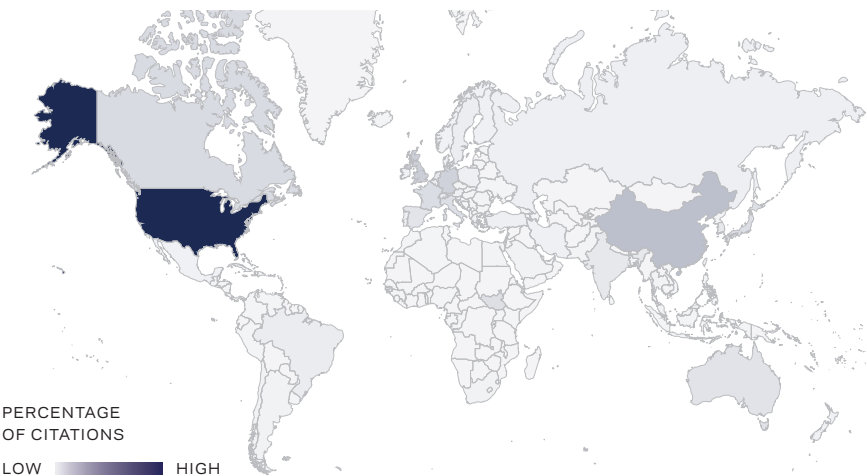
The number of indicators depends on the availability of data for a given country or region. (See Appendix C for definitions of each indicator)



Global distribution of citations

This world map of the global distribution of citations offers a visual display of the geographical impact and reach of Country X's research. Here, 2010-2014 citations are presented as shares of citations received by Country X, revealing in which specific regions and countries of the

world Country X's papers are read and referenced in the scholarly literature.



Collaboration patterns

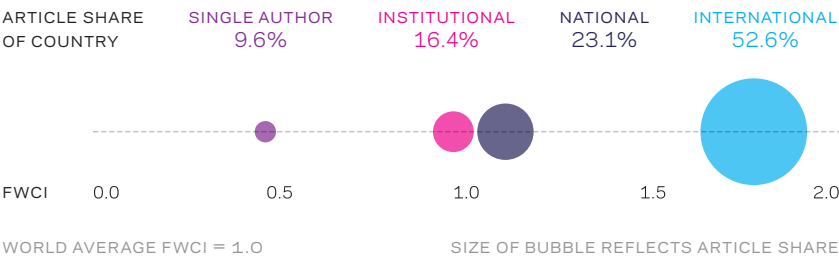
Collaboration can be analysed through the affiliations listed by authors on their papers, and classified in four mutually-exclusive types:

- International: with authors from at least two different countries.
- National: with authors from at least two different institutions within the same country.
- Institutional: with at least two authors

from the same institution.

→ Single author: non-collaborative papers with only one author.

The collaboration analysis reveals the country or region's proportion of each type of collaboration (2014 Scopus data) and their respective citation impact (2010-2014 Scopus data). (See Appendix A for full definitions of each collaboration type)



Researcher mobility

Researcher mobility can be estimated from the affiliation mentioned by authors on their published papers: if this changes, it is likely the researcher has moved. Four mobility classes and their proportions are identified using 1996-2014 Scopus data:

- Sedentary: no change in affiliation country of author.
- Inflow: author whose affiliation country has changed from another country

to Country X.

→ Outflow: author whose affiliation country has changed from Country X to another country.

→ Transitory: author whose affiliation country has changed from Country X to another country and/or vice-versa multiple times.

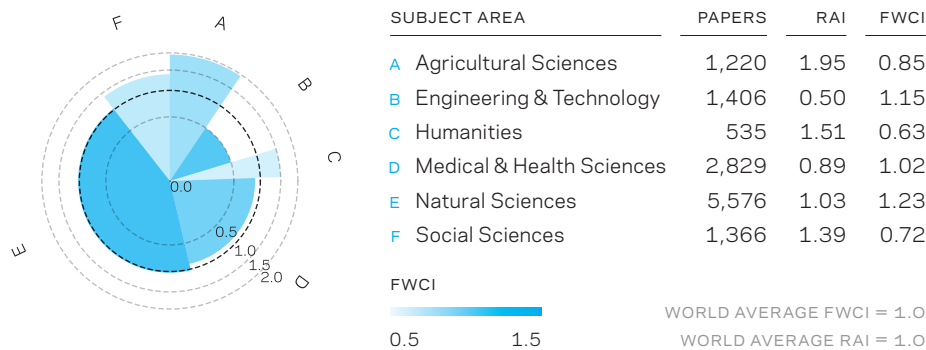
(See Appendix A for full definitions of each mobility class)



Subject breakdown

The output of each territory is broken down by OECD subject category. This section offers a view of each country's research focus in terms of absolute and relative output and impact. Absolute output is measured by number of publications. Relative output is calculated via an Activity Index that compares the proportion of

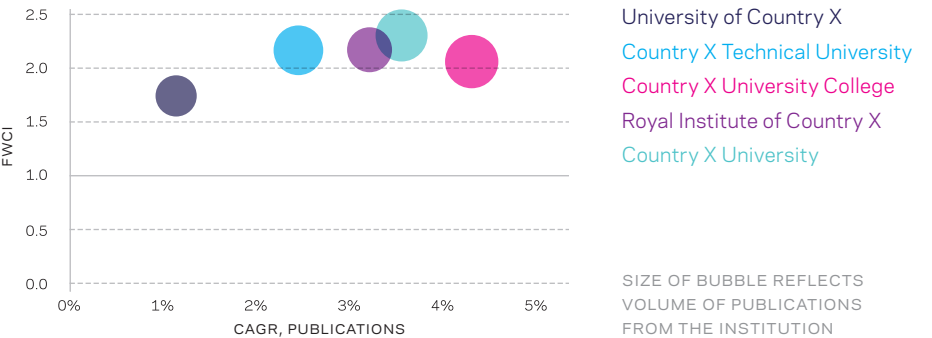
papers Country X publishes in each subject to that of the world. Relative impact is determined through Field-Weighted Citation Impact (FWCI), a sophisticated bibliometrics measure normalised against the world and accounting for differences in output type, age, and scope. (See Appendix C for full definitions of each indicator)



Most prolific institutions

This analysis provides details of the output (2014), impact (2010-2014), and growth (2010-2014) of each country's top five institutions in terms of volume of scholarly output, using Scopus data. Output is accounted for by publications, impact by Field-Weighted Citation Impact

(FWCI), and growth by Compound Annual Growth Rate (CAGR). (See Appendix C for full definitions of each indicator)



Country or region analyses

77 scientific research profiles



ALGERIA

Algeria has a small research footprint that focuses on Engineering & Technology. Given the size of its research output, Algeria produces nearly twice as much research in that area as the world average.

The most prolific institution in the country is the University of Sciences and Technology Houari Boumediene. Given the country's linguistic and geographic proximity, it is unsurprising that one in ten citations to Algerian research come from French researchers. Moreover, although the ma-

jority of Algerian researchers has stayed in the country since 1996, about half of Algeria's research are international collaborations.

Headline statistics

CONNECTIONS

Francophone

10% of citations to Algeria's research come from France.

High sedentary researcher base

The majority of Algeria's researcher base has never published with an affiliation to an institution outside of Algeria.

FOCUS AREA

Engineering & Tech

60% higher than expected based on the world average.

MOST PROLIFIC INSTITUTION

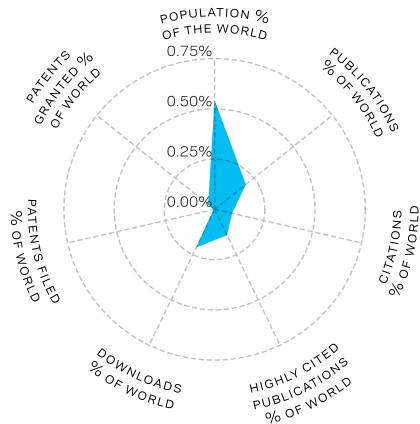
Houari Boumediene

The most prolific institution in Algeria is the University of Sciences and Technology Houari Boumediene, producing more than 400 publications in 2014.

Overall country or region outlook

Algeria accounts for only 0.54% of the world's population, but its research footprint is even smaller. Algeria publishes about 0.20% of the world's scholarly output, and its research receives about 0.09% of the world's citations.

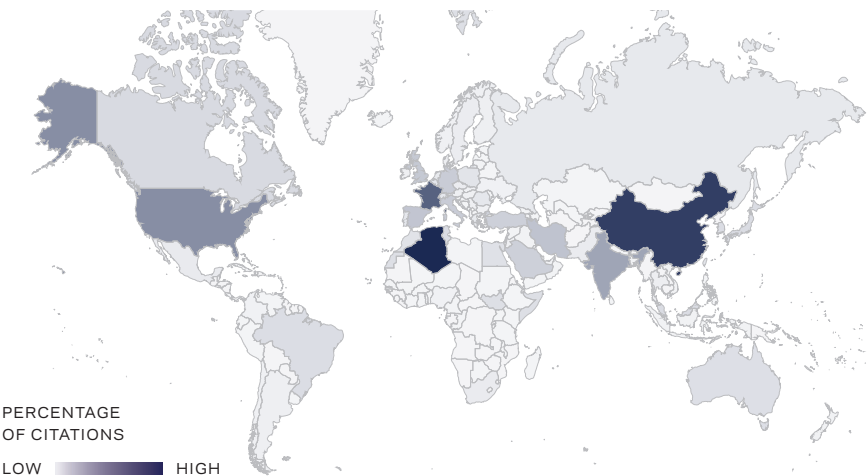
Relative to its output share, Algeria's research is downloaded at roughly the same rate, accounting for 0.21% of all world downloads.



Global distribution of citations

Citations to Algeria's research come from all over the world and expectedly skew toward Algeria (13%), prolific countries such as China (12%), the United States (7%), and those sharing the same language (France at 10%). Other countries whose citations form a sizeable share of Algeria's citations include India, whose

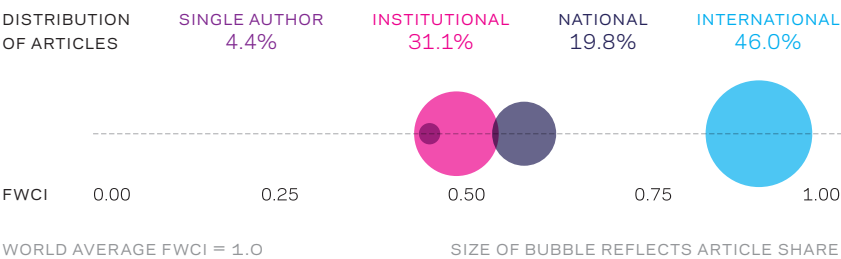
research contributes to 5% of Algeria's incoming citations, and Iran, Spain, the UK, Germany and Italy, each accounting for 3% of Algeria's incoming citations.



Collaboration patterns

International collaborations comprise nearly half of all publications from Algeria. Consistent with trends in other countries, Algeria's international collaborations tend to have a higher impact than that of other collaboration types. Algeria's national collaborations comprise a fifth of its total scholarly output, and its institutional collaborations make up a bit less than a third. Algeria's single-authored papers are the

least impactful, cited 55% less than the world average and account for only 4% of Algeria's scholarly output.



Researcher mobility

Algeria's researcher population is rather sedentary: 52% of Algerian researchers have published under only Algerian affiliations, suggesting that they have not held academic or research positions in institutions outside the country. Algeria's transitory researcher population comprises more than a third of the country's total research population. Algeria experiences

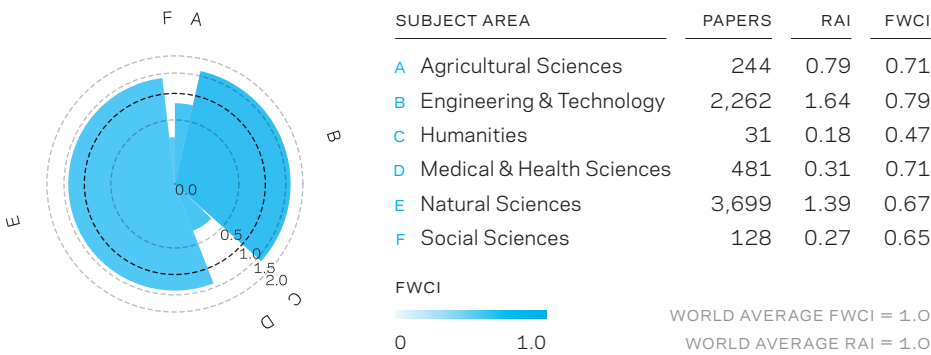
a net inflow of researchers (its researcher inflow is more than two percentage points higher than its researcher outflow). This suggests that the country as a whole benefits from global researcher mobility, as it attracts a higher number of researchers than it loses through migration.



Subject breakdown

Algeria's research is concentrated almost entirely in the Natural Sciences and Engineering & Technology. Relative to the world, Algeria publishes nearly 60% and 40% more, respectively, in those subject areas. However, across all subject areas, Algeria's research is cited much less than

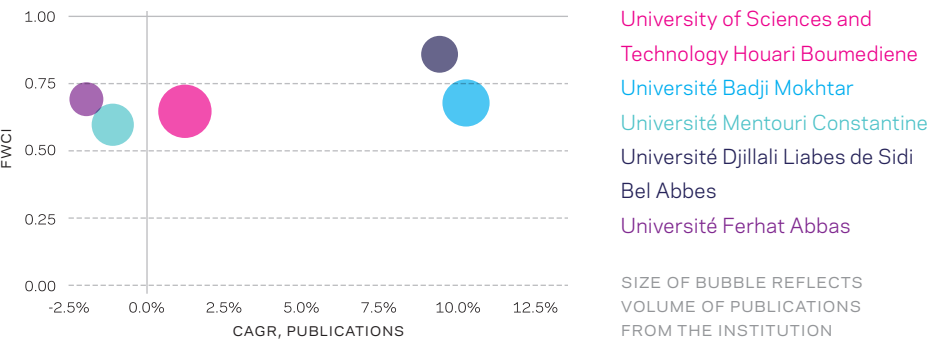
the world average. Algeria's research in the Agricultural Sciences and the Social Sciences received the highest relative level of citations, though the country publishes a lesser proportion of its output in those areas than the world does.



Most prolific institutions

Algeria's top five universities published between 171 and 423 publications in 2014. The Université Badji Mokhtar and the Université Djillali Liabès de Sidi Bel Abbes exhibited the highest levels of growth from 2010 to 2014, increasing their scholarly output annually by nearly

10%. All five institutions produced research that is cited below the world average. Research from the Université of Djillali Liabès de Sidi Bel Abbes achieved the highest FWCI at 0.86.





ARGENTINA

Argentina focuses strongly on the Agricultural Sciences, producing over 9,000 publications in the area from 2010 to 2014. The next step to further distinguishing the country's research is to improve the country's FWCI in the Agricultural Sciences.

Argentina has strong international connections, especially with other Iberian-Latin American countries; more than two-fifths of Argentina's research is through international collaborations. Consistent with other countries' trends, Argentina's

international collaborations are cited at rates well above the world average.

Headline statistics

CONNECTIONS

Latin

Countries with geographic and cultural proximity to Argentina, such as Brazil and Spain, cite Argentina's publications at higher rates.

High impact of international collaborations

Argentina's FWCI for international collaborations is 2.5 times higher than its national-only research.

FOCUS AREA

Agricultural Sciences

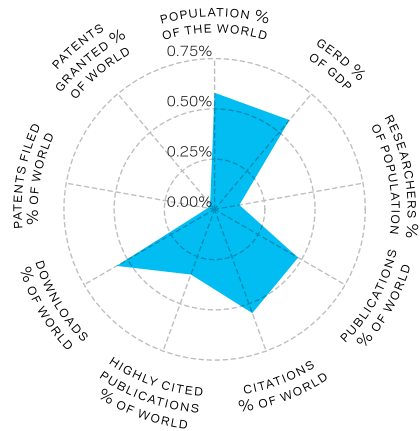
Relative to the world average, Argentina produces nearly 2.4 times as much research in the Agricultural Sciences.

Growth in output by CONICET

CONICET's research output has grown 5.1% per year from 2010 to 2014.

Overall country or region outlook

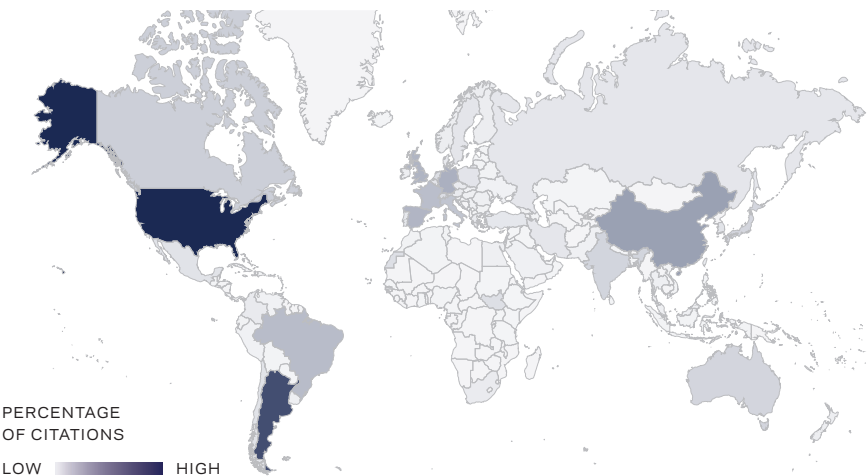
Argentina published more than 10,700 publications in 2014, representing a global publication share of 0.48%. As a point of reference, Argentina accounts for 0.58% of the global population. The country's global citation share, highly cited articles share, and download share are comparable, all ranging between 0.35% and 0.55%. There is relatively little patenting activity.



Global distribution of citations

After the United States (15.0% of all citations to Argentina's publications), Argentina itself accounts for 12.2% of all incoming citations. China is the third largest source of citations for Argentina with 6.2%. Countries with geographic and linguistic proximity to Argentina (such as Brazil and Spain) also cite Argentina's

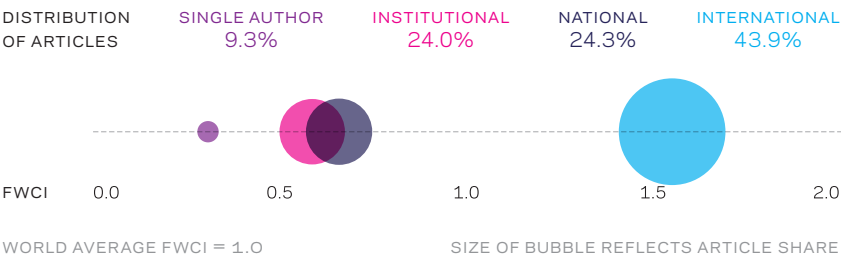
publications at higher rates. Citations from those countries comprise 4.2% and 4.6% of all citations to Argentina's publications.



Collaboration patterns

More than two-fifths of Argentina's publications were international collaborations. The FWCI associated with those collaborations is almost 2.5 times as high as that associated with national collaborations, underscoring the importance for Argentina of collaborating internationally. Less than one in ten of Argentina's publications are single-authored, and those publica-

tions achieve the lowest average FWCI, well below the world average.



Researcher mobility

A slight majority of Argentina's active researcher population has published at least once with an affiliation outside of the country. The majority of those who have tend to be transitory researchers. Similar to the trends in international collaboration, the FWCI associated with transitory, internationally mobile researchers' outputs is nearly double that

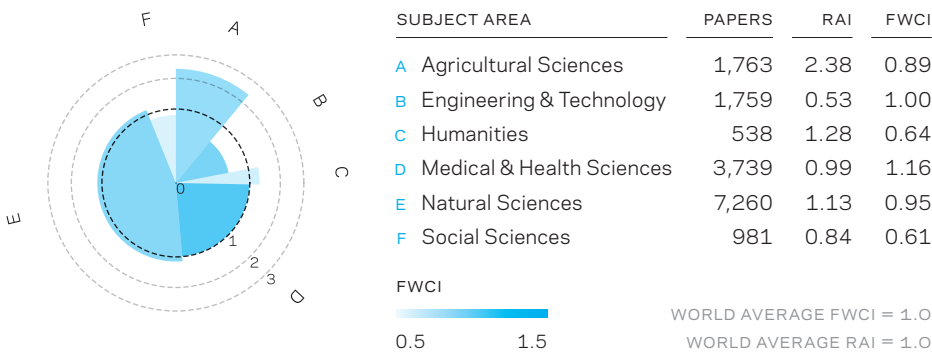
of the world average. On the other hand, researchers who have published with affiliations to only Argentinian institutions comprise 46% of the country's total active researcher base and achieve an FWCI about 20% below the world average.



Subject breakdown

Although Argentina produces the highest absolute amount of research in the Natural Sciences, the country focuses heavily on the Agricultural Sciences relative to the rest of the world. It produces nearly 2.4 times more research in that area than otherwise expected. In terms of FWCI, Ar-

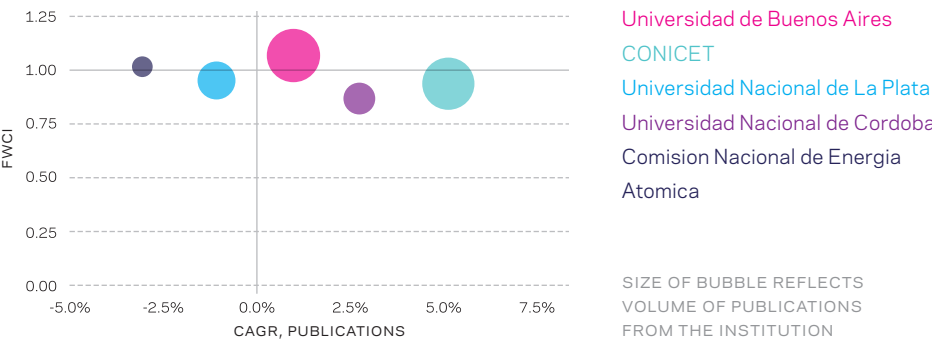
gentina's research in the Medical & Health Sciences is the most impactful across all subject areas, being cited 16% more than the world average.



Most prolific institutions

The two largest research-producing institutions in Argentina are the Universidad de Buenos Aires and Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), each producing over 2,000 publications in 2014 alone. CONICET has been steadily growing its annual output

by 5.1% from 2010 to 2014. Among the country's most prolific institutions, the Universidad de Buenos Aires achieves the highest FWCI at 1.07, or 7% above the world average.





AUSTRALIA

Led by highly prolific institutions such as the University of Sydney and the University of Melbourne, Australia publishes a high share of the world's research (and most impactful research) relative to its population size.

Australia's research base is very outward-looking and globally connected. More than half of its publications are international collaborations, and over two-thirds of its researchers have spent some time abroad doing and publishing research.

Headline statistics

Highly cited research

Nearly 1 out of every 4 publications from Australia are among the world's most highly cited.

Strong returns on international collaboration

Australia's international collaborations achieve an FWCI of 1.96, or nearly twice the world average.

Highly mobile research base

68% of Australia's researchers have moved abroad and published there.

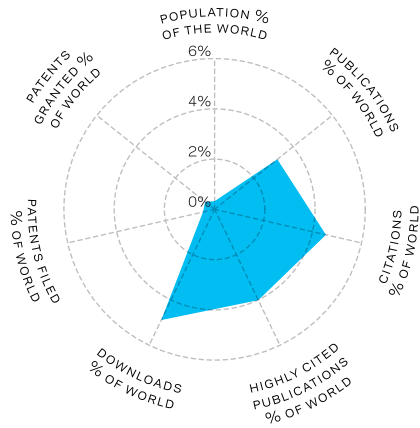
MOST PROLIFIC INSTITUTIONS

Universities of Sydney and Melbourne

The University of Sydney and the University of Melbourne are Australia's top institutions in terms of research output.

Overall country or region outlook

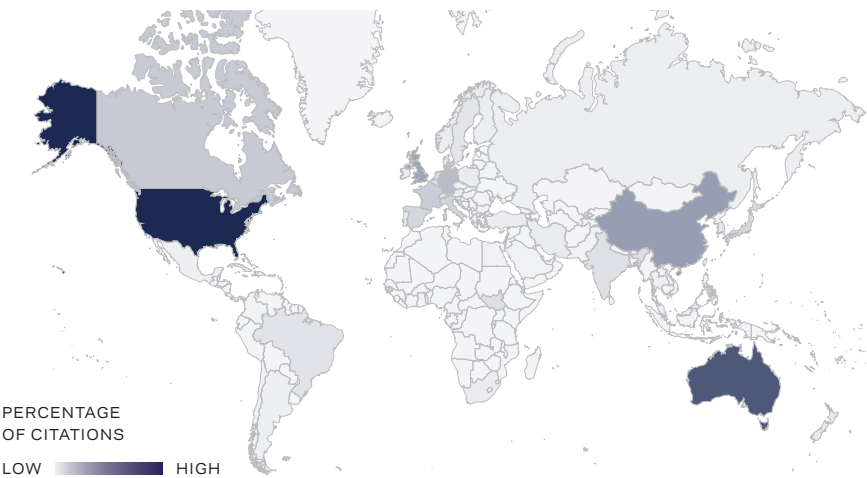
In terms of research performance, Australia punches well above its weight, relative to its population size. With only 0.33% of the world's population, Australia produces 3.20% of the world's publications and 4.01% of the world's most cited articles, and receives 4.55% of the world's citations and 4.89% of the world's downloads. Nearly one out of every four publications (23.5%) by Australia's researchers are among the world's most cited publications. However, the country's patenting activity levels are much lower, accounting for only 0.48% of all patents filed and granted worldwide.



Global distribution of citations

The top countries citing Australia's research are the United States (18.6% of all citations), Australia itself (14.2%), China (7.9%), and the UK (7.3%). Australia's research is generally cited at rates higher than expected in other Commonwealth countries - those sharing a history of being part of the former British Empire. Oth-

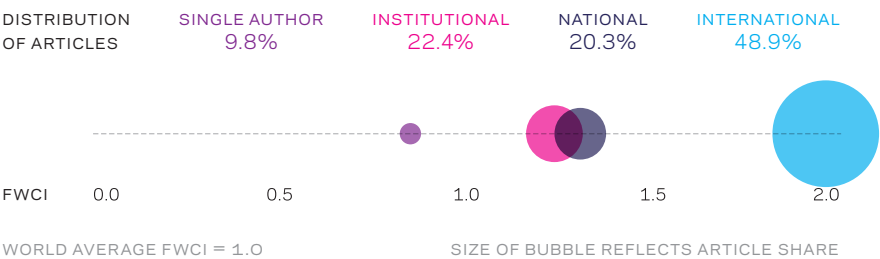
er countries that cite Australia's research at rates higher than expected, given their global share of citations, include Canada (3.8%), New Zealand (1.1%), South Africa (0.7%), and Hong Kong (0.2%).



Collaboration patterns

Nearly half of all publications from Australia are international collaborations, and they achieve an FWCI of 1.96, or nearly twice the world average. National and institutional collaborations for Australia each comprise about a fifth of Australia's total research output and are cited 23% to 30% more than the world average. Less than 10% articles from Australia are

single-authored, and those publications attain the lowest FWCI.



Researcher mobility

Similar to other advanced research nations, a high percentage of Australia's active research base is mobile. Only 32% have published only under an Australian affiliation. Of those that are mobile, the largest subset are transitory researchers (46.7%), those who have spent less than either two years abroad or two years in Australia, consecutively. Based on the

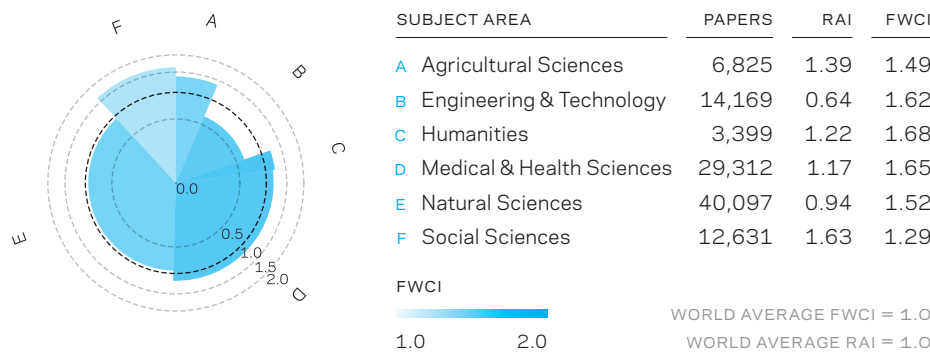
relative outflow and inflow of researchers, the country experiences a net inflow of 1.2%, suggesting that more researchers come and stay permanently in Australia than leave.



Subject breakdown

Compared to the world average, Australia produces relatively more research in the Social Sciences (69.3% above the world average) and to a lesser extent, in the Agricultural Sciences, the Humanities, and the Medical & Health Sciences. The country produces relatively less research

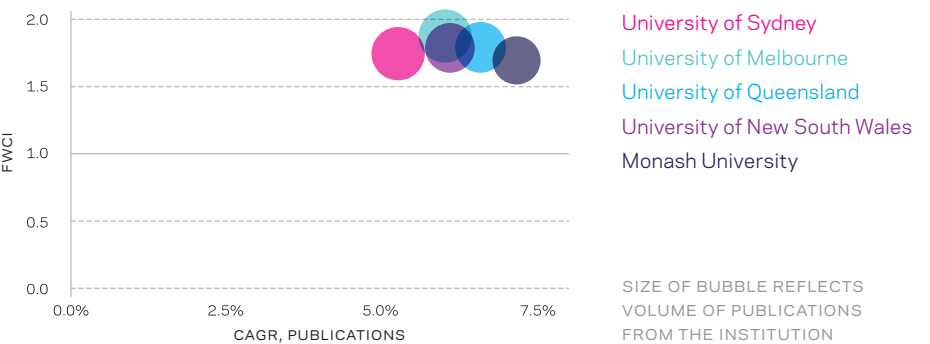
in Engineering & Technology. The FWCI of Australia's research is well above the world average across all subject areas, though it is comparatively the lowest in the Social Sciences (1.29).



Most prolific institutions

The top five research institutions in Australia all produce more than 5,000 publications per year and achieve an FWCI well above the world average. The University of Melbourne and the University of Sydney tend to produce the most publications per year. Monash University has experi-

enced the greatest growth in research output over the past five years (7.2% CAGR).





AUSTRIA

Austria shows a clear commitment to advancing research, with a relatively high percentage of GDP spent on research and development. Austria produces its most impactful research through international collaboration at 96% above the world average.

As a relatively small player, publishing less than 1% of the world's scientific output, it is unsurprising that the majority of Austrian research is published with an international co-author, and that Austria has a highly mobile researcher population, following the pattern of most smaller

European countries. Most of the citations that Austrian research receives come from US or German publications and, only in third place, from Austria itself.

Headline statistics

GERD almost 3% of GDP

Austria ranks 10th highest GERD out of all countries with available data for 2014.

INTERNATIONAL COLLABORATION

High citation impact

Austria's international collaboration results in citation impact 96% above the world average.

>70%

MOBILE RESEARCHERS

The Austrian researcher population is highly mobile, showing a preference for short stays abroad.

MOST PROLIFIC INSTITUTIONS

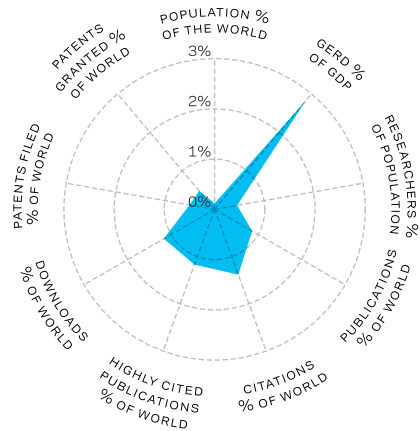
Vienna

The top 3 prolific institutions are all in Vienna, with more than 2,200 publications each in 2014.

Overall country or region outlook

Austria publishes less than 1% of the world's scientific publications. As a reference, Austria accounts for 0.1% of the global population. The 1% of publications produced by Austria receive 1.4% of the world's citations, and include 1.2% of the world's most highly cited articles.

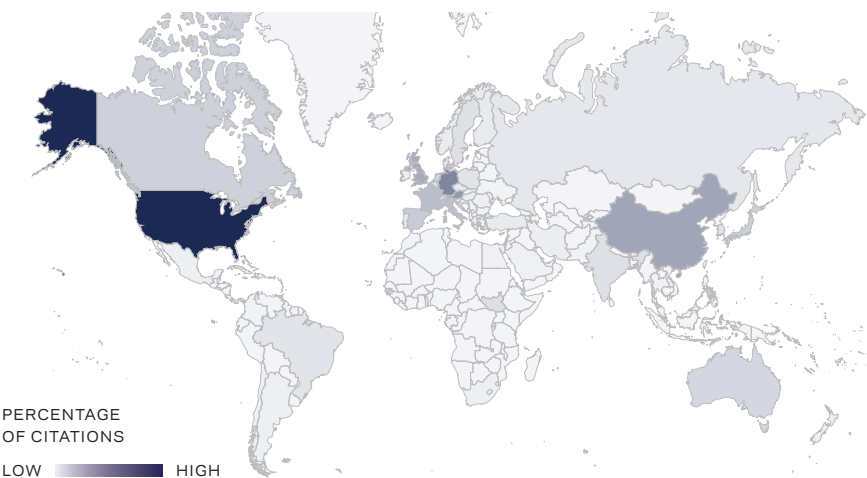
Most notably, Austria's GERD is relatively high: almost 3% of its GDP is spent on research & development.



Global distribution of citations

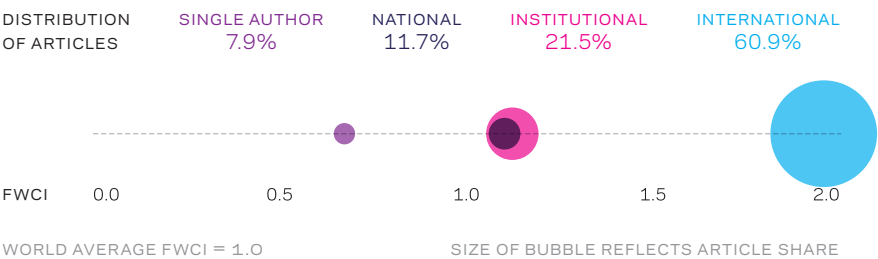
The highest proportion of citations that Austrian research receives comes from US research (17%), and after that, from German research (9%). Third place is reserved for Austrian research (8%), which is remarkable as for most nations, the country itself is the source of the lion's share of citations. China is ranked fourth

as a source of citations towards Austrian research, for the same reason as the US: both are prolific countries and therefore represent a large part of citations toward Austrian research.



Collaboration patterns

Austria produces a large percentage of its publications through international co-authorship (over 60%). The FWCI associated with international collaboration is nearly twice as high as that associated with national collaboration, underlining the importance for Austria to collaborate internationally. Single-author publications result in the lowest FWCI per collaboration type, even below the world average.



Researcher mobility

Austria has a highly mobile researcher population, with more than 70% of Austria's researchers having published articles abroad, while affiliated with non-Austrian institutions. The majority of Austria's researchers show a type of mobility that we label as transitory mobility, indicating short stays of less than two years either in Austria, or outside of Austria. Outflow

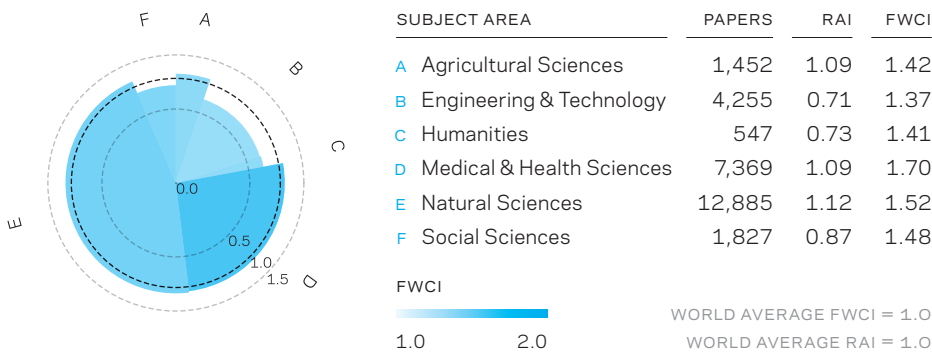
of researchers outweighs the inflow, meaning that more researchers leave the country than come in.



Subject breakdown

Austria shows a clear focus of activity in the Natural Sciences (11% higher than can be expected based on world share of articles in that discipline), in the Agricultural Sciences, and in the Medical & Health Sciences (both 9% above expected). In addition to a focus in activity,

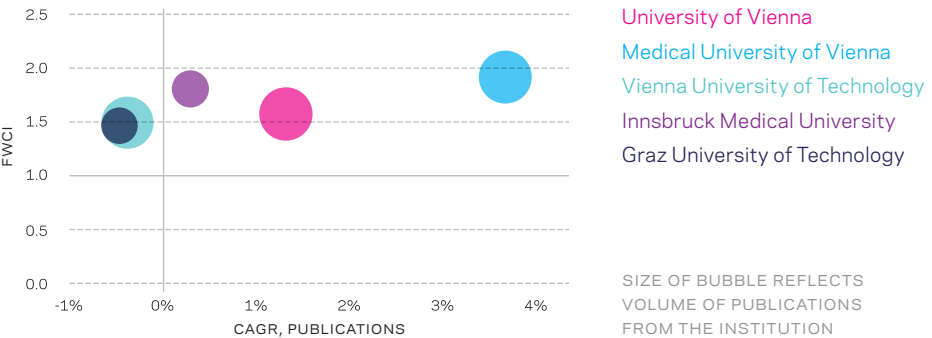
the Medical & Health Sciences also show a high FWCI. Austria shows relatively low levels of activity in the Humanities, Engineering & Technology, and the Social Sciences.



Most prolific institutions

The three most prolific institutions in Austria are all based in Vienna (University of Vienna, Vienna University of Technology, and Medical University of Vienna), and each of those published over 2,200 publications in 2014. The Medical University of Vienna has the highest annual growth

over the last five years, followed by University of Vienna. The top five Austrian institutions publish research with a citation impact that is higher than the world average.





BANGLADESH

Bangladesh's main strength seems to be its people: it holds 2.2% of the world's population, and its researchers are highly mobile and internationally collaborative, two characteristics that can help boost research impact.

The country has small shares of the world's research indicators, although its citation distribution reveals wide-ranging impact among both neighbouring and anglophone Commonwealth nations. It is most impactful in the Medical & Health Sciences and most comparatively prolific

in the Agricultural Sciences. Accordingly, one of its top institutions specialised in the Medical & Health Sciences shows particularly strong impact (International Centre for Diarrhoeal Disease Research).

Headline statistics

2.2%

OF THE WORLD'S POPULATION

higher than its shares of the world's papers (0.2%), highly cited papers, citations, downloads (all at 0.1%), and patents filed and granted.

51%

 INTERNATIONALLY-COLLABORATED PAPERS

Bangladesh is highly collaborative with over half its output resulting from international collaboration.

54%

 RESEARCHERS WITH TRANSITORY MOBILITY PATTERNS

More than half of Bangladesh's researchers belong to the transitory class, and more than 20% to either the inflow or outflow classes.

FOCUS AREA

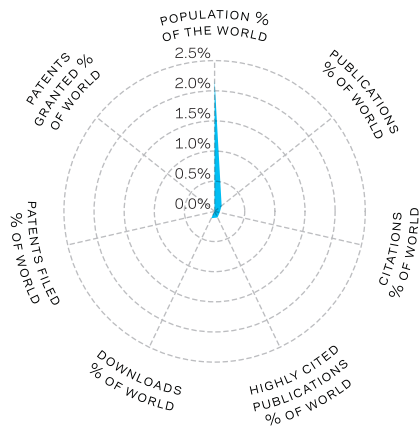
Agricultural Sciences

Bangladesh's proportion of its output in the Agricultural Sciences is more than twice that of the world.

Overall country or region outlook

Although Bangladesh represents 2.2% of the world's population, it has very small shares of the world's main research indicators. It publishes 0.14% of the world's scholarly output and 0.08% of the world's top 10% cited papers. It receives 0.09% of the world's citations and 0.12% of the world's downloads.

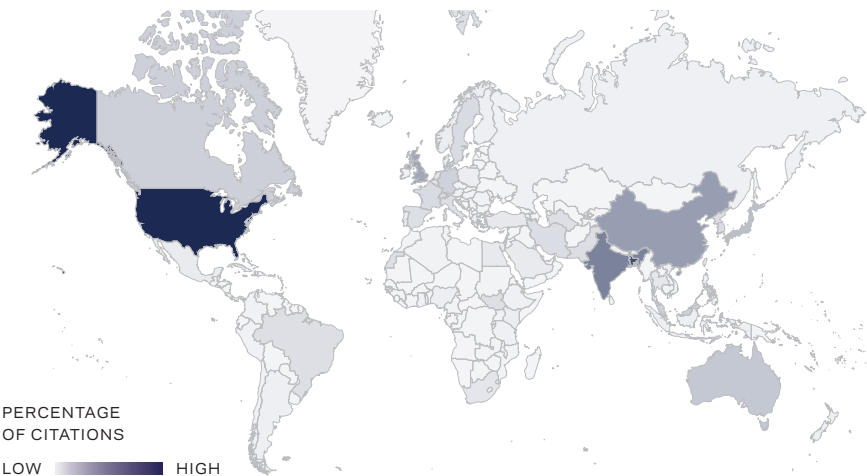
Bangladesh has few patents filed and granted, so that its global shares of these indicators are nearly null.



Global distribution of citations

Bangladesh's research is cited by researchers worldwide. Unsurprisingly, the prolific US shows by far the largest share of citations received by Bangladesh, at nearly 15%. The next highest shares of Bangladesh's citations are from itself, followed by neighbouring, and prolific, India and China. Anglophone countries such as

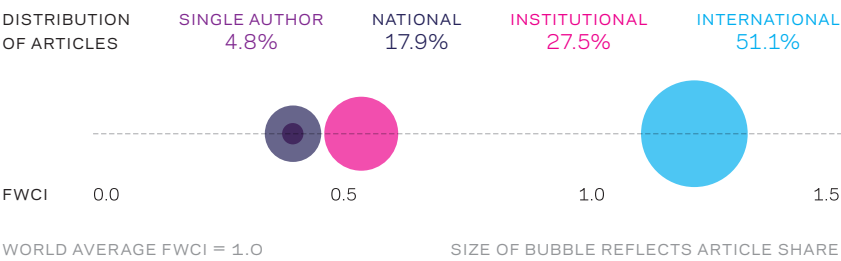
the UK, Australia, and Canada also represent a sizeable share of Bangladesh's citations, possibly because of the country's fluency in English and/or Commonwealth ties.



Collaboration patterns

Bangladesh is a highly collaborative country: more than half of its scholarly output results from international collaborations, and these have a much higher impact (receiving 21% more citations compared to the world average across all collaboration types) than all other collaboration types. The other half of Bangladesh's output is mostly the result of either national (18%) or institutional (28%) collaboration, with

less than 5% of Bangladesh's output authored by a single author. All of these have lower than average impact, being cited 46% to 60% less than the world average across all collaboration types.



Researcher mobility

Bangladesh's researchers are highly mobile; less than a quarter of them are sedentary and have only published with a Bangladeshi affiliation. The absolute majority (54%) of the country's researchers are transitory, meaning that they have had multiple Bangladeshi and non-Bangladeshi affiliations since 1996. Longer term mobility classes are of much smaller

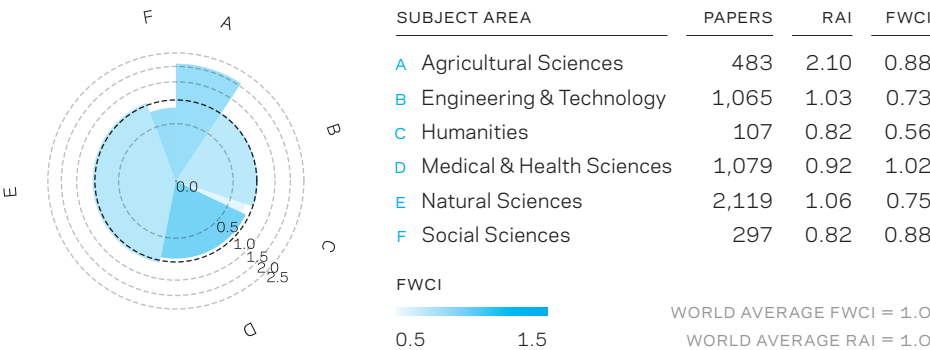
and similar sizes, with 13% of researchers having left Bangladesh since 1996, and 11% having joined it.



Subject breakdown

Bangladesh is most impactful in the Medical & Health Sciences, in which it is close to the world average impact and activity. In all other areas, Bangladesh research has lower impact than the world average. It is most prolific in the Natural Sciences and in Engineering & Technology.

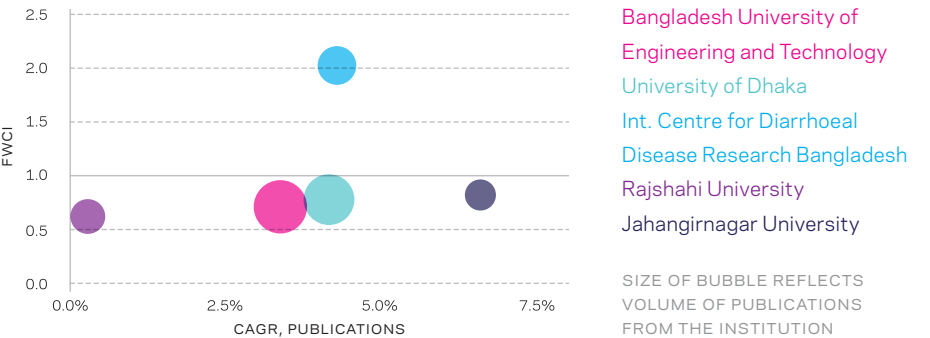
Compared to the world's distribution it is relatively most prolific in the Agricultural Sciences: its proportion of articles in this area is more than twice that of the world.



Most prolific institutions

In 2014, the most prolific Bangladeshi institutions each published between 418 papers (Bangladesh University of Engineering and Technology) and 142 papers (Jahangirnagar University, showing strong annual growth of over 6% CAGR 2010-2014). The most impactful insti-

tute in the country is the International Centre for Diarrhoeal Disease Research, with a citation impact of more than twice the world average, and positive growth in output of 4.3% per annum 2010-2014.





BELARUS

Belarus shows a strong dependence on international collaboration and mobility. Its citation network shows signs of economic and historic ties through links with Russia, Germany, and to a lesser extent, Poland.

Belarus' research performance follows the typical pattern that can be observed for nations with low scientific output volume: researchers from abroad bring high FWCI with them, and publications that result from international collaboration are the most impactful ones. Nevertheless,

Belarus' FWCI is below world average for all disciplines. What stands out is the fact that its global patent share is twice as high as its share of publications.

Headline statistics

Patents rather than publications

Belarus' global share of patents granted is twice as high as its share of publications.

CONNECTIONS

Germany & Russia

Connections with Germany and Russia are, after the usual role of the US and China, sources of citations towards Belarus' publications.

International dependence

As many other small nations, Belarus benefits greatly from its international collaboration.

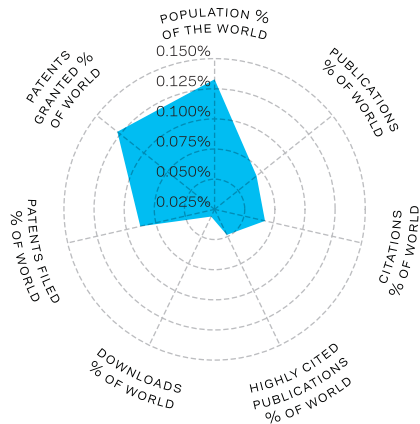
Importance of transitory stays from abroad

Out of all mobility categories, researchers with short stays in Belarus have the highest FWCI.

Overall country or region outlook

Belarus' global publication share and citation share are very small, but on par, at 0.07%. However, both these shares are below the share of population at 0.13%, suggesting a lesser focus on science. Data for GERD and researcher share are not available.

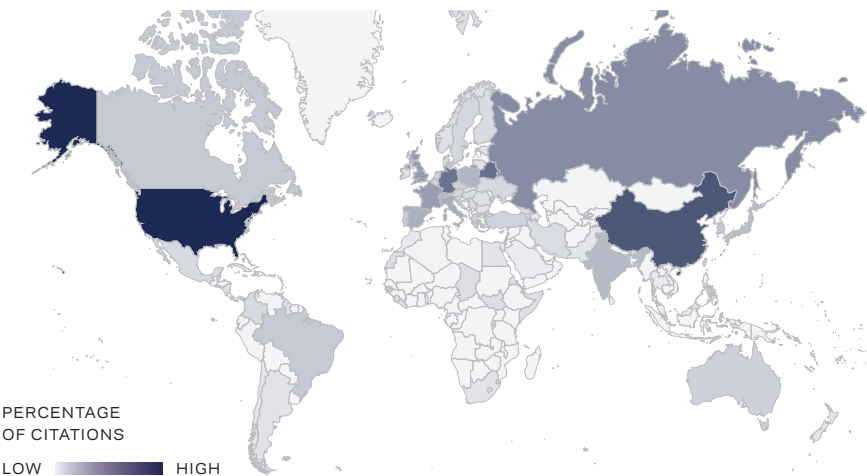
Belarus' focus seems to be more on patenting than on publishing in the scientific literature, as its share of patents granted is 0.13%, almost twice as high as its global share of scientific publications.



Global distribution of citations

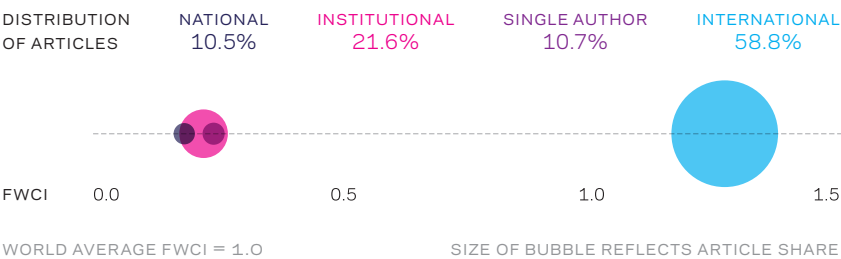
The two most prolific research nations, the US and China, are the two most important sources of citations towards Belarus' publications, at 9% and 7% respectively. Belarus' publications account for 6% of citations towards its own publications, followed by Germany and the Russian Federation at almost 6% and 4.5%.

These countries are known to be Belarus' main import and export partners, and this link is also visible in their citation network. Poland, historically closely tied to Belarus, ranks tenth.



Collaboration patterns

Following the pattern of other countries producing a relatively small volume of scientific output, the level of international collaboration is high for Belarus, at almost 60%. More interestingly, the internationally co-authored publications are the only collaboration type with an FWCI above average. All other collaboration types result in an FWCI of 70% to 80% below the world average.



Researcher mobility

The total number of active researchers who have at least once published with a Belarus affiliation is expectedly small. The pattern in researcher mobility, however, is remarkably similar to that of large research nations such as the UK, for example. The majority of Belarus' researcher population are mobile, almost 65%. The most frequent mobility type is transitory

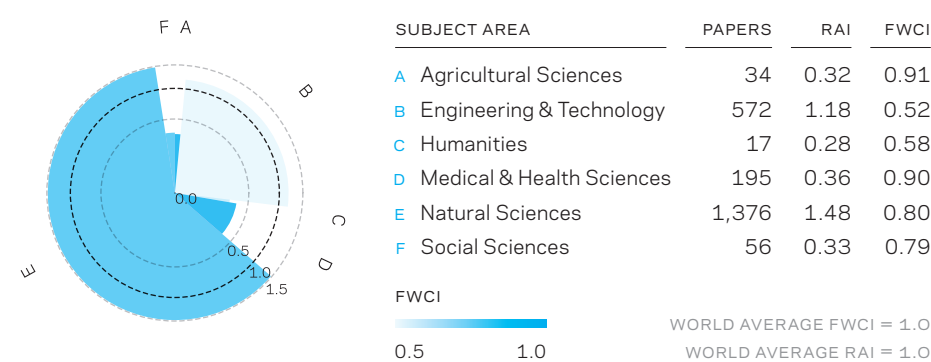
in nature. Especially researchers who are coming from abroad, for short stays in Belarus (34%), are having a positive effect on Belarus' FWCI, which is around twice as high as the world average. This is similar to what we observed regarding collaboration patterns: the international network and links are crucial for Belarus' research.



Subject breakdown

Belarus, instead of having a well-rounded profile, specialises in two subject areas: the Natural Sciences (at 48% more activity than expected based on the world average) and Engineering & Technology (at 18% more activity). The FWCI for Engineering is lowest among disciplines

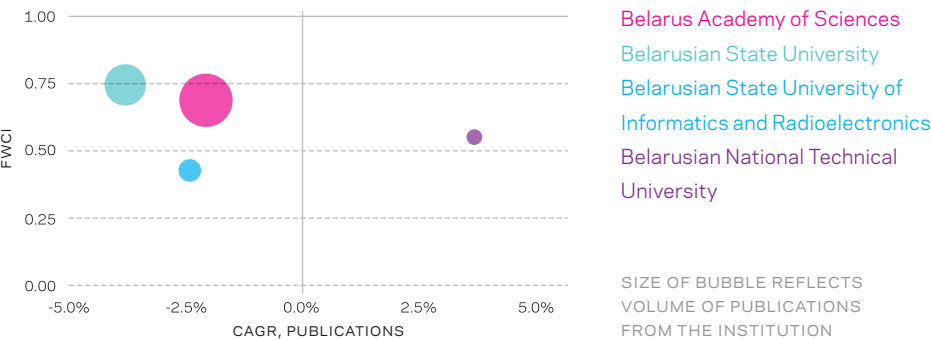
at 50% below the world average. FWCI values for the Social Sciences, the Agricultural Sciences, and the Humanities should be ignored as they are based on an extremely low volume of publications.



Most prolific institutions

Only two institutions in Belarus produce more than 300 publications per year: the Belarus Academy of Sciences (nearly 600 publications in 2014) and the Belarusian State University (358 publications in 2014). Output growth tends to be negative, except for the Belarusian National

Technical University, which produces a low volume of publications but is growing in terms of volume. For all institutions, the average FWCI is below the world average.





BELGIUM

Belgium accounts for around 1.2% of the world's publications. This share is well above its world population share. More impressively, these publications receive 2.1% of the world's citations and contribute to 1.7% of highly cited articles worldwide.

Belgium's researchers are highly mobile. one out of two active researchers belong to the transitory group. Belgian publications are also highly international, with about two-thirds resulting from international collaboration. Belgium's research

has close connections to the European research communities.

Headline statistics

High citation impact

Belgium accounts for only 1.2% of world's publications, but 2.1% of citations and 1.7% of highly cited articles.

CONNECTIONS

EU countries

The UK, France, Germany, Italy, Spain, and the Netherlands contribute to 26.7% of Belgium's citations.

Highly collaborative in research

Around 62.4% of Belgium's publications result from collaborations with international colleagues.

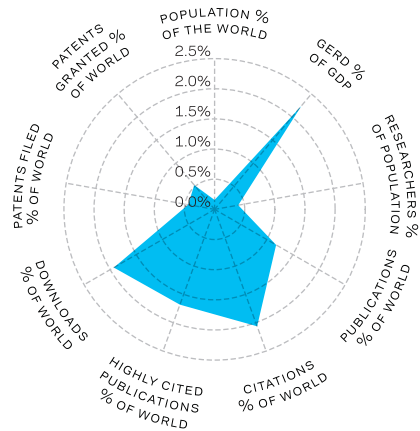
Highly mobile researchers

Around 70% of Belgium's researchers have at least one publication with a foreign affiliation.

Overall country or region outlook

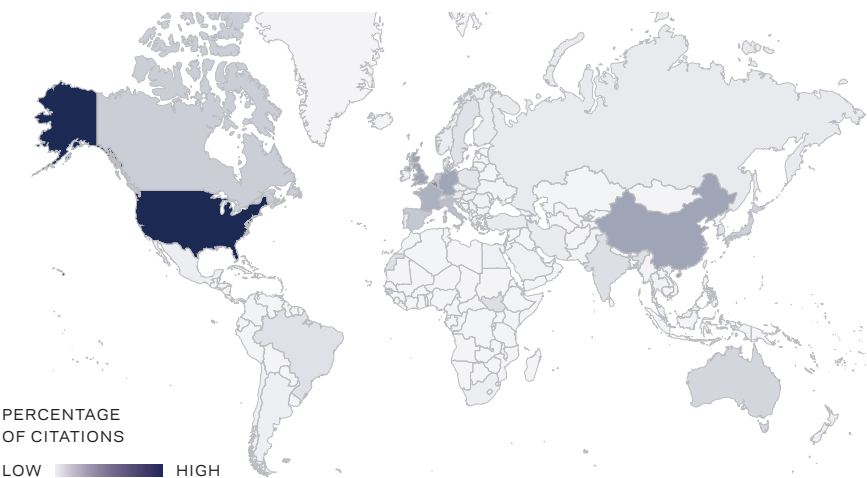
Belgium spends a good percentage of GDP on research and development (2.2%) but its researcher base is rather small (0.4% of the country's population). Belgium accounts for only 0.2% of the world's population, but its research output and citation impact are above its weight.

Belgium accounts for 1.2% of world's publications, 2.1% of citations and 1.7% of highly cited articles. Belgium's research output is also downloaded more frequently than the world average. There are relatively limited patenting activities.



Global distribution of citations

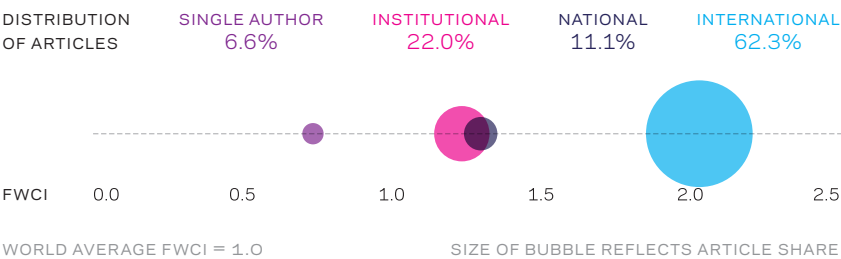
The top three citing countries of Belgium's publications are the US, Belgium, and the UK with 16.8%, 8.2% and 6.6% of citations respectively. They are followed by a group of European countries including France, Germany, Italy, Spain, and the Netherlands, with a combined share of 9.9% of citations.



Collaboration patterns

Belgium's research is highly internationally collaborative: just over 62% of Belgium's publications involve at least one author from outside of Belgium. These publications also have the highest FWCI among the four types of collaboration (2.03, or 103% higher than the world average). Institutional collaboration accounts for the second largest percentage

of Belgium's publications among the four collaboration types (22.0%).



Researcher mobility

Belgium's researchers are highly mobile. Only 30.3% of Belgium's active researchers have never published with a foreign affiliation. The majority of Belgium's active researchers belong to the transitory group: they are highly mobile and move in and out of the country frequently. This pattern is similar to many Western European countries. Belgium has similar per-

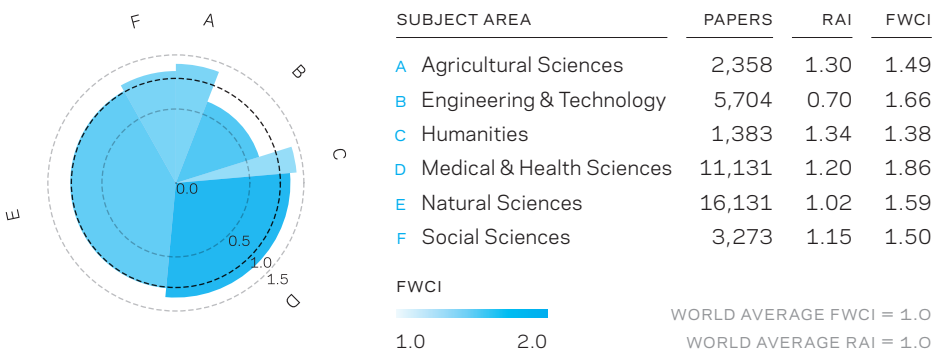
centages of outflow and inflow researchers.



Subject breakdown

Belgium produces the largest number of publications in the Natural Sciences, followed by the Medical & Health Sciences. Its publications in the Medical & Health Sciences have the highest field-weighted citation impact among the six subject areas (1.86, or 86% higher than the world

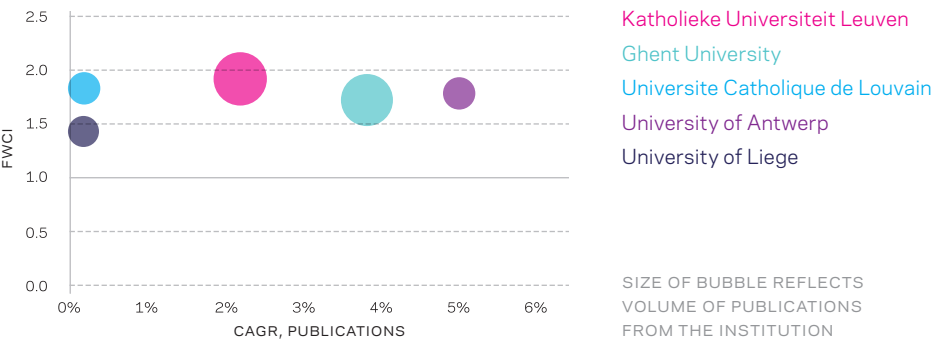
average). Relative to the world average, Belgium has the highest level of activity in the Humanities (34.4% higher than the world average) and the Agricultural Sciences (29.7% higher than the world average).



Most prolific institutions

Ghent University and Katholieke Universiteit Leuven are the two leading universities in Belgium, in terms of publication volume. They each produce more than 5,000 publications per year. Katholieke Universiteit Leuven also has the highest field-weighted citation impact among Bel-

gium's top five most prolific institutions (92% higher than the world average), followed by its sister university Université Catholique de Louvain's 1.83 and University of Antwerp's 1.78.





BRAZIL

Brazil has a sizeable research footprint, accounting for 2.55% of all publications worldwide. However, the country has room to improve, as its performance along measures of research impact (citations, highly cited articles) does not keep pace.

One way to do so is for the country to be more outward looking. Relative to other countries, international collaborations comprise a small share of Brazil's total publications (though the FWCI associated with those collaborations is quite high),

and the majority of Brazil's researcher base is sedentary.

Headline statistics

2.55%

OF ALL PUBLICATIONS WORLDWIDE

Brazilian researchers produced more than 270,000 publications from 2010 to 2014.

Sedentary researcher population

62.9% of Brazil's researcher base has never left the country to do research.

FOCUS AREA

Agricultural Sciences

Brazil has a strong relative focus on the Agricultural Sciences. Given the country's size, its 10,820 articles in 2014 was more than 3 times the world average.

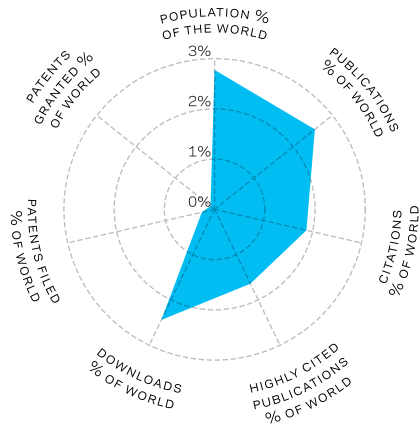
MOST PROLIFIC INSTITUTION

Univ. de São Paulo

One of the world's most prolific institutions, the Universidade de São Paulo produced 10,800 publications in 2014, the 5th most among all research institutions.

Overall country or region outlook

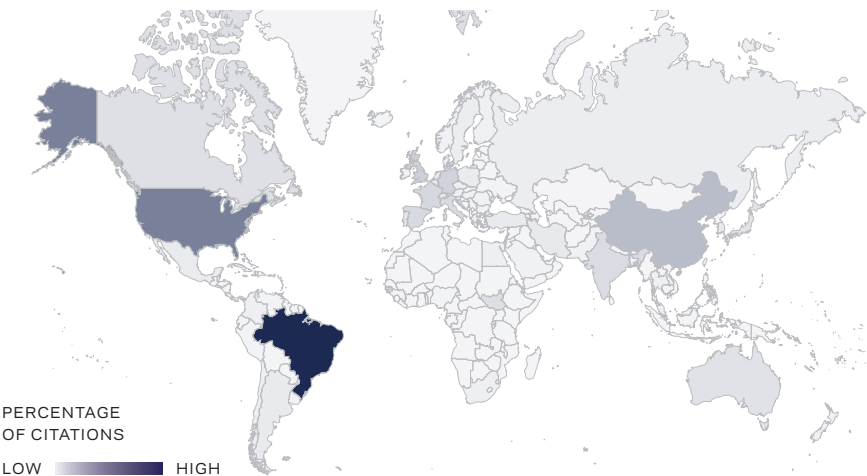
As one of the largest countries in the world (2.78% of the world's total population), it is unsurprising that Brazilian researchers produced more than 270,000 publications from 2010 to 2014, or about 2.55% of all publications in the world. However, citations to Brazil's research account for only 1.88% of citations worldwide, and only 1.64% of the world's most highly cited articles are from Brazil. Furthermore, there is relatively little patenting activity: Brazilian inventors account for 0.26% of the patents filed in the world, and only 0.10% of patents granted.



Global distribution of citations

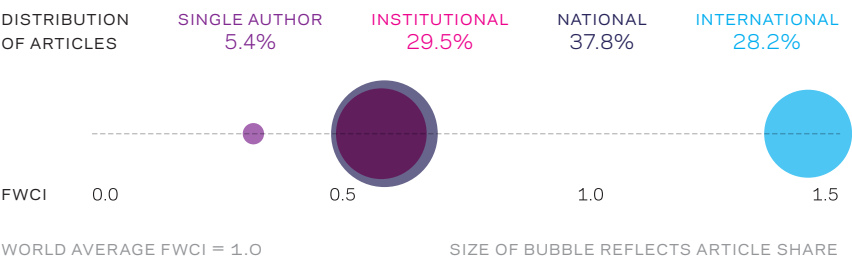
Nearly a quarter of all citations to Brazil's research comes from other Brazilian publications. After Brazil itself, the countries that cite Brazil's research the most closely follow the global distribution of citations: the United States (13.6%), China (6.5%), the UK (4.2%), and Germany (3.9%). Due

to geographic proximity and linguistic similarity, it is not surprising that countries such as Argentina (1.2%), Portugal (1.1%), Mexico (1.1%), Colombia (0.7%), and Chile (0.6%) cite Brazil's research at rates higher than expected, given global citation base rates.



Collaboration patterns

National collaboration comprises nearly two-fifths of all publications from Brazil, the highest of any collaboration category. However, they are cited at rates 40% less than the world average. International collaborations, on the other hand, comprises about 28% of Brazil's publications and achieve an FWCI of 1.44, or 44% above the world average.



Researcher mobility

Brazil's active researcher population is quite sedentary. 62.9% of Brazil's researchers have not published with an affiliation outside the country. This is similar to other BRIC countries. Sedentary researchers tend to produce research that is less impactful, achieving an FWCI of 0.76, or 24% below the world average. In contrast, transitory researchers, which

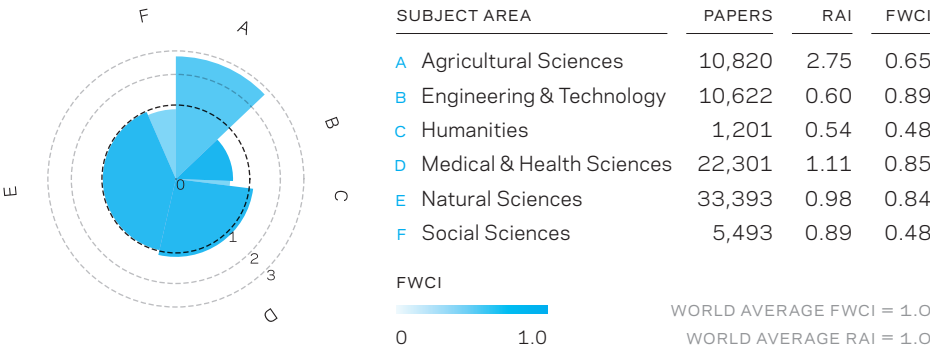
comprise only 28.6% of Brazil's total researcher base, achieve an FWCI of 2.13, or more than twice the world average.



Subject breakdown

Brazil focuses heavily on the Agricultural Sciences. In 2014, it produced more than 10,800 articles in the area, or nearly three times the world average, relative to the country's overall research output. The country has low levels of activity in Engineering & Technology and the Hu-

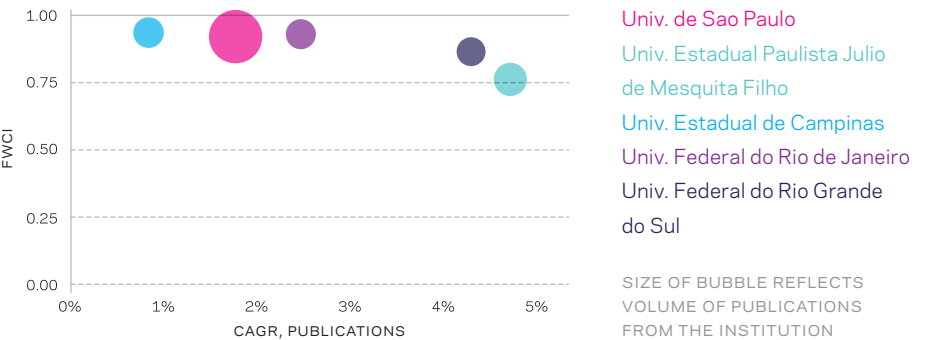
manities. The country's FWCI is below the world average in all subject areas, but it is comparatively the highest in Engineering & Technology (0.89).



Most prolific institutions

The Universidade de São Paulo leads all Brazilian research institutions in terms of research output, producing more than 10,800 publications in 2014 (fifth overall in the world). This is more than 2.5 times more than the next closest institution, the Universidade Estadual Paulista

Júlio de Mesquita Filho, which has experienced the highest growth rate (4.7% CAGR) over the past five years. In terms of FWCI, however, there is much more balance. Three of Brazil's top five institutions achieved an FWCI of between 0.92 and 0.94.





BULGARIA

Bulgaria appears to have a low focus on research: it spends less than 1% of its GDP on R&D, and its share of the world's scholarly output (0.15%) is not much higher than its share of the world's population (0.10%).

This can also be seen in Bulgaria's subject level performance: the highest FWCI – for the Natural Sciences – is still about 14% below the world average. Bulgaria certainly benefits from international collaboration: articles with an international co-author have an FWCI of 1.29, meaning

that these articles are cited 29% above the world average, whereas other collaboration types are cited over 60% less than the world average.

Headline statistics

0.15%

WORLD PUBLICATION SHARE

Bulgaria has a low total publication output in 2014, even when compared to countries within the region.

49%

INTERNATIONAL COLLABORATION

Just under half of Bulgaria's output consists of internationally collaborated articles and is highly impactful.

STRONG AREA

Natural Sciences

Bulgaria is relatively prolific in the Natural Sciences (publishing 19% more than the world average) and achieves its highest citation impact in this subject.

39%

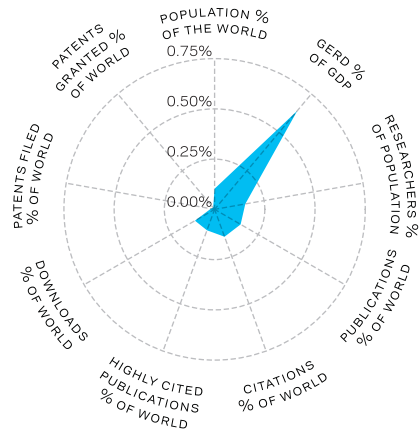
TRANSITORY RESEARCHERS

A reasonable share of Bulgarian researchers stays abroad for short periods, facilitating international knowledge exchange.

Overall country or region outlook

Bulgaria publishes 0.15% of the world's scholarly output, and 0.11% of the world's top 10% most cited articles. Its share of the world's citations is slightly lower than its output share (0.14%), as is its share of the world's downloads (0.11%).

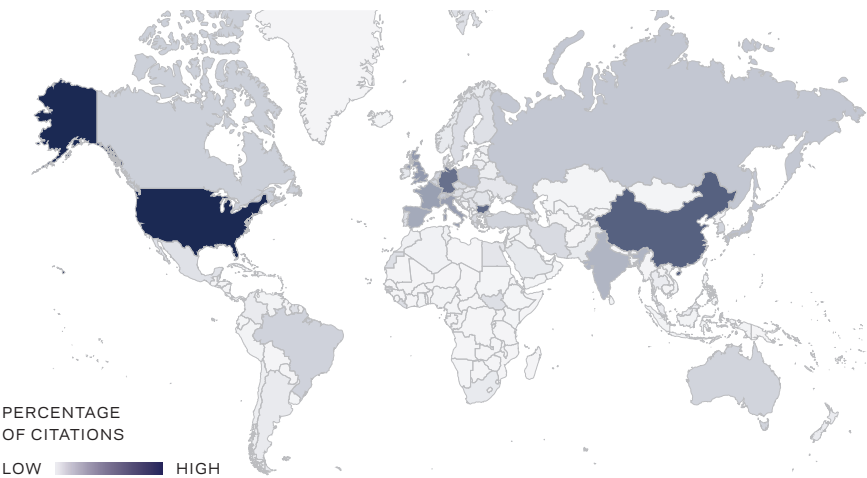
Bulgaria's share of the world's filed patents is 0.02%, and its share of granted patents, is just half of that. While Bulgaria's R&D spending may be low, at 0.64% of its GDP, this is a higher share than some of its neighbors.



Global distribution of citations

As is to be expected, prolific countries such as the US and China are the main source of citations to Bulgaria, accounting for 10.1% and 7.4%, respectively. Bulgaria itself also accounts for a large share of its received citations (7.0%), as researchers tend to be more aware of

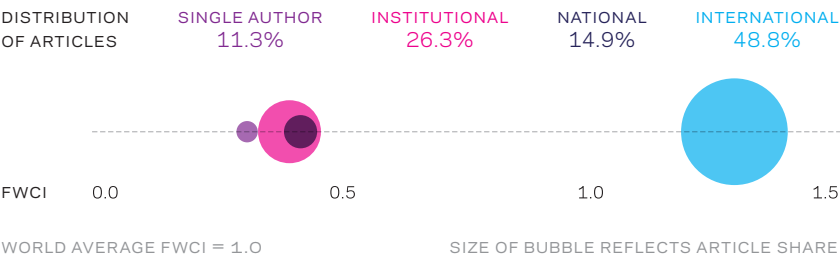
their own country's scholarly publications and cite these more frequently. While India (3.2%) and Japan (2.5%) do appear in the top ten of citing countries, other citations mainly come from European countries, with Germany (6.6%), the UK (4.5%), and Italy (4.3%) leading the list.



Collaboration patterns

Bulgaria is fairly collaborative internationally: just under half of its total publication output has an international co-author. These publications also have a high field-weighted citation impact: at 1.29, they are cited 29% more often than the world average. This is a sharp contrast with Bulgaria's nationally and institutionally co-authored articles, whose FWCI is about 60% below average. Single-author

publications account for the lowest share of Bulgaria's output (11.3%) and are also the least impactful, with an average FWCI of 0.31.



Researcher mobility

Bulgaria's researchers are somewhat sedentary: 46% of them have only published under a Bulgarian affiliation since 1996. Furthermore, the number of researchers that leave the country (not to return) is nearly 3% higher than the number of researchers settling in Bulgaria. However, 39% of its researchers stay abroad or in Bulgaria for a short period of

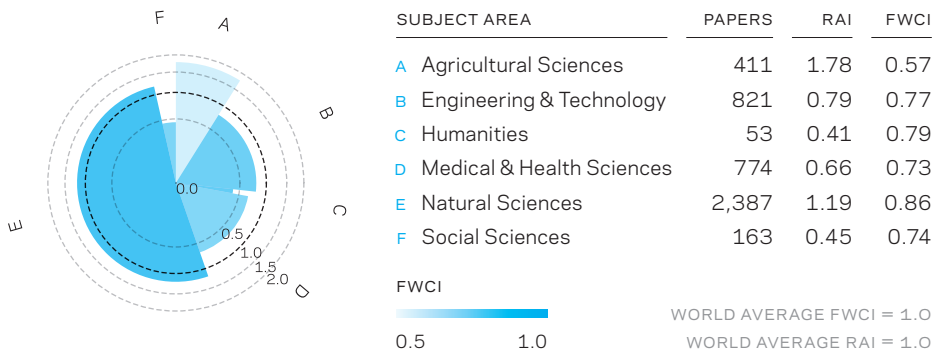
time before returning to Bulgaria, or moving on to other countries. This transitory mobility is likely to be beneficial to Bulgaria, as the researchers in this category have the highest average FWCI of all mobility types.



Subject breakdown

The most impactful subject for Bulgaria is the Natural Sciences, with an FWCI of 0.86. This also happens to be its largest subject in terms of overall publication output, and shows a relative activity of 1.19 (19% more than the world average). Bulgaria shows a very high relative activity

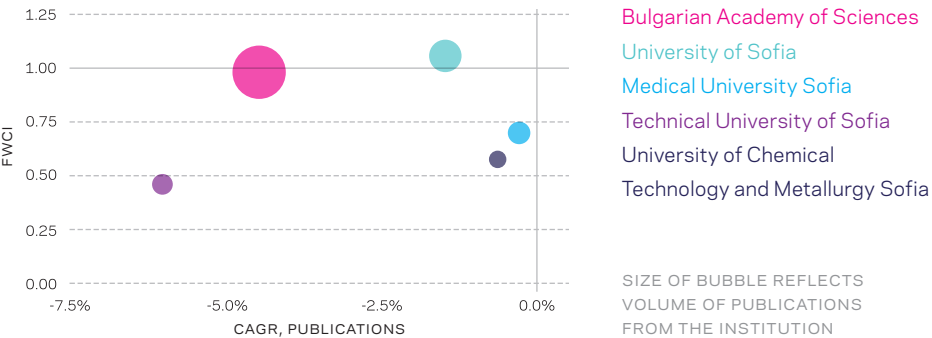
in the Agricultural Sciences; compared to the world average, it publishes nearly 1.8 times as many publications in this subject. However, the citation impact of those publications is quite low. In 2010-2014 the average FWCI of the Agricultural Sciences articles was just 0.57.



Most prolific institutions

By far the most prolific institution in Bulgaria is the Bulgarian Academy of Sciences. In 2014 it published more than 1,450 articles, and achieved the second highest citation impact amongst the top prolific institutions (0.98). The most impactful is the University of Sophia: at 1.06 it is the

only prolific institution to achieve an FWCI above the world average. All of Bulgaria's top five most prolific institutions show a negative growth rate, i.e. a decreasing output, with the Technical University of Sofia having the lowest CAGR of -6.0%.





CANADA

Canada is one of the world's leading research nations. It spends a high absolute amount of money on R&D, and that is reflected in its large and impactful research footprint. The University of Toronto is the country's most prolific institution (third most prolific in the world).

Canada's research base is very outward looking. Nearly half of Canada's publications are international collaborations, and those international collaborations achieve a high FWCI. Moreover, three quarters of Canada's active researchers have spent some time outside of Canada, and such

researchers tend to also produce more impactful research.

Headline statistics

Large research footprint

Canada accounts for 3.62% of all publications worldwide; 4.75% of all highly cited articles.

High level of international collaboration

Nearly half (49.3%) of Canada's publications are co-authored with at least one international collaborator.

STRONG AREA

Medicine & Health

Canada has a high research impact in the Medical & Health Sciences. Canada's research in this subject area achieves an FWCI of 1.67, or 67% above the world average.

MOST PROLIFIC INSTITUTION

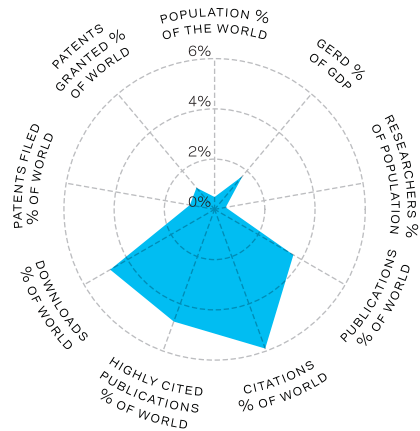
University of Toronto

The University of Toronto produced more than 12,000 publications in 2014, the 3rd most among all research institutions.

Overall country or region outlook

Canada spends about 1.73% of its GDP on gross R&D, projecting to be eleventh in terms of gross R&D at 30 billion US\$ PPP in 2014. Relative to its size (0.49% of the world's population), Canada has an outsized research footprint, accounting for 3.62% of all publications worldwide, 5.90% of all citations, 4.75% of all highly cited articles, and 4.80% of all downloads.

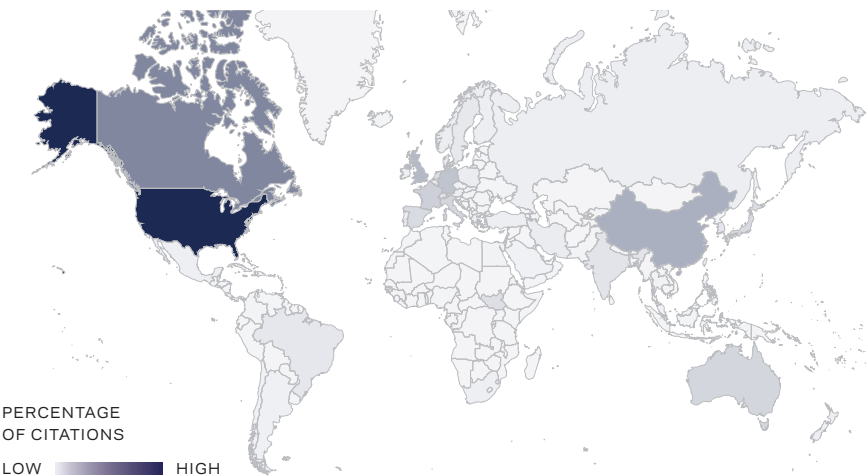
However, the country accounts for a slightly lower level of all patents filed and granted (1.00% and 1.12%, respectively) worldwide.



Global distribution of citations

More than one in every five citations to Canada's research comes from its neighbor to the south, the US. After the US, the country that cites Canada's research the most is itself, accounting for one out of every four citations. Other countries that account for a high percentage of

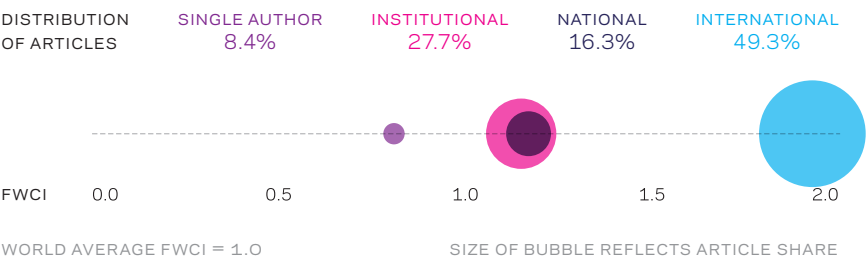
Canada's research include China (7.6%), the UK (6.6%), Germany (5.3%), France (4.0%), and Australia (3.3%).



Collaboration patterns

Similar to other advanced research nations, a very high percentage (49.3%) of Canada's total research output is through international collaborations, and the FWCI associated with those publications is 1.93, or nearly twice the world average. Institutional collaborations comprise the second most frequent type of collaboration for Canada at 27.7%. Both institutional and national collaborations attain

nearly the same level of FWCI, around 1.15. Only single-authored publications from Canada achieve an FWCI below the world average.



Researcher mobility

Canada's active researcher base is quite mobile. Nearly three quarters have spent at least some time outside of Canada, and almost half are categorized as transitory, which means they have spent less than two years outside of, or within Canada. The country benefits greatly from these highly mobile researchers. They achieve an FWCI of 2.00, or twice the world av-

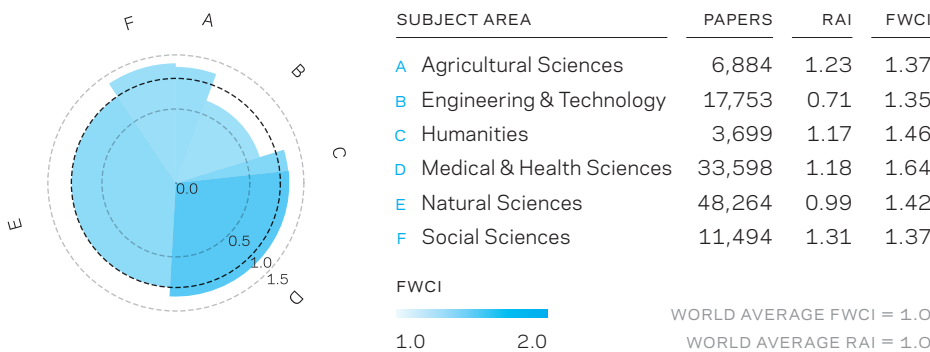
erage. Canada also experiences a net outflow (2%) of researchers, suggesting that more researchers leave Canada permanently than arrive and stay.



Subject breakdown

The distribution of Canada's research output across all subject areas is quite well rounded and proportionate to the world average, with slightly less focus than expected in Engineering & Technology, and slightly above average focus in the Social Sciences and the Humanities. Canada's

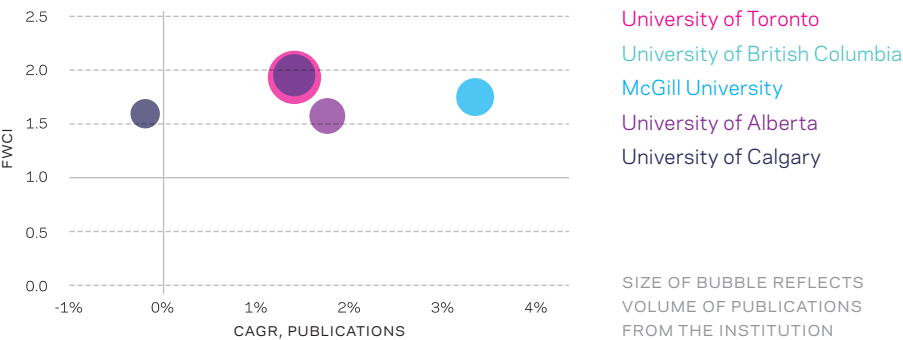
research in all subject areas is above the world average, and its research in the Medical & Health Sciences achieved the highest FWCI at 1.67, or 67% above the world average.



Most prolific institutions

In a country filled with world-class universities, the University of Toronto stands out. It produced more than 12,000 publications in 2014, the third most among all institutions in the world, after Harvard University and the Chinese Academy of Sciences, and nearly 60% more than the

next closest institution in Canada – the University of British Columbia. Both the University of Toronto and the University of British Columbia achieved an FWCI that was nearly twice the world average.





CHILE

Although Chile invests a small percentage of its GDP in R&D, the country has a growing, impactful research base. Compared to its world population share, Chile produces a proportionally higher amount of research overall, and especially highly cited articles.

Part of Chile's success can be traced to the outward-looking nature of its research base. The majority of Chile's research outputs are international collaborations, and those achieve a higher FWCI than all other types of collaborations.

Headline statistics

Growing, impactful research base

0.41% world publication share; 1 in every 6 publications are highly cited.

High level of international collaboration

Nearly 60% of Chile's research output is through international collaborations.

Highly mobile research base

More than 2/3 have published at least once with an affiliation outside of Chile; half are transitory researchers.

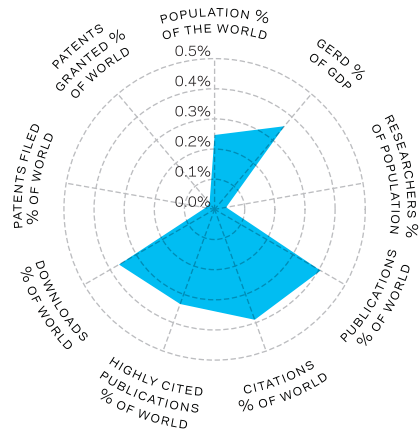
MOST PROLIFIC INSTITUTIONS

Pontificia Univ. Católica de Chile & Univ. de Chile

Pontificia Universidad Católica de Chile and Universidad de Chile are Chile's most prolific institutions (1,782 and 2,101 publications in 2014, respectively).

Overall country or region outlook

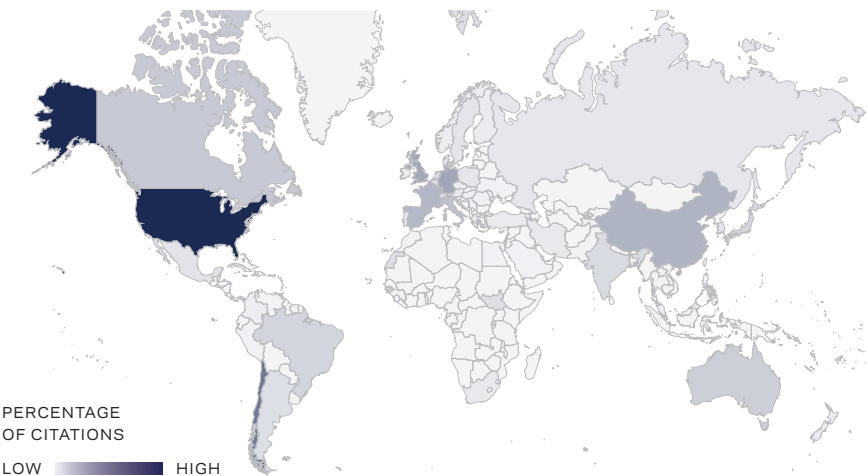
Chile invests a small percentage of its GDP (0.36% in 2012) on R&D, but the country has a growing research base. Compared to its world population share (0.25%), Chile produces a slightly higher-than-proportionate amount of research (0.41% of all publications worldwide, 0.39% of all citations, and 0.37% of all downloads of research). About 1 of every 6 publications by Chile is among the world's most highly cited. There is little patenting activity, with the country accounting for only 0.03% of all patents filed and granted in the world.



Global distribution of citations

The two countries that cite Chile's research the most are the US (comprising 16.0% of all citations to Chile's research) and Chile itself (9.7%). Germany (6.2%), the UK (6.1%), and China (5.1%) comprise the rest of the top five countries citing Chile's research. Due to linguistic similarity and geographic proximity, coun-

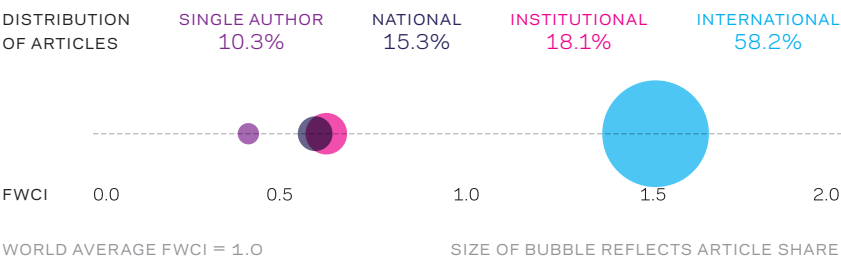
tries such as Spain (4.7%), Brazil (2.5%), Argentina (1.6%), Mexico (1.2%), and Colombia (0.6%) cite Chile's research more frequently than expected given global citation base rates.



Collaboration patterns

Nearly three fifths of all of Chile's research output consists of international collaborations, and they achieve an FWCI of 1.51, or 51% higher than the world average. The impact of international collaborations is much higher than all other types of collaboration by Chile. For reference, national and institutional collaborations (which comprise 15.3% and 18.1%

of the country's total output) have FWCI of 0.59 and 0.62, respectively.



Researcher mobility

The majority of Chile's active researcher base is quite mobile. Less than a third have published exclusively under affiliations with institutions in Chile, while more than 50% are transitory researchers - those who spend two years or less in Chile or outside of Chile in succession. The country experiences a net inflow of researchers (+2.5%), suggesting that

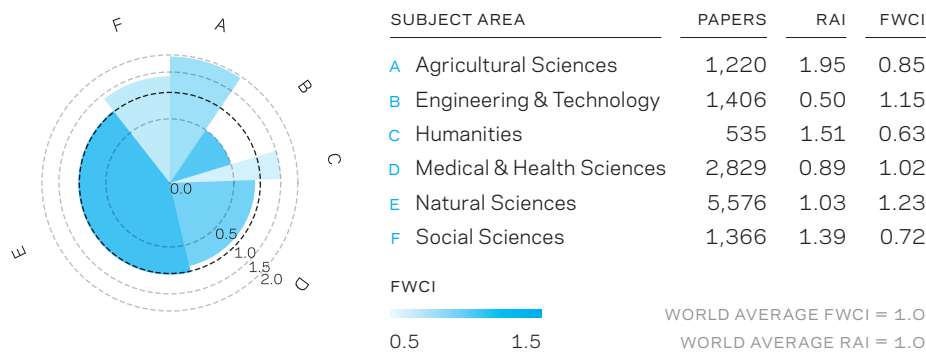
it attracts more researchers to permanently stay than losing researchers that permanently leave.



Subject breakdown

Chile focuses relatively more of its research output on the Agricultural Sciences (95% above the world average) and relatively less on Engineering & Technology (50% below the world average). Chile's research output across the other subject areas is quite balanced, and similar to the

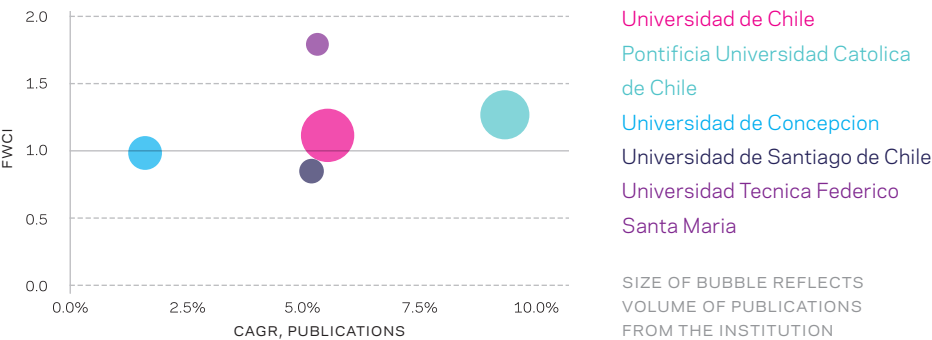
world baseline distributions. Chile's research in the Natural Sciences achieves the highest FWCI of all of its subjects (1.23, or 23% above the world average).



Most prolific institutions

In terms of research output, Chile's top two institutions are Pontificia Universidad Católica de Chile and Universidad de Chile. The former has experienced the highest growth rate over the past five years, increasing its publication output by 9.3% per year, while the latter is, and

continues to be, the country's most prolific institution. In terms of FWCI, however, the comparably smaller Universidad Tecnica Federico Santa María (349 publications in 2014, FWCI of 1.79) leads all other institutions in Chile.





CHINA

A growing research powerhouse, China has a large share of the world's scholarly output and is mainly focused on the Natural Sciences and Engineering & Technology. However, its papers are generally cited less than the world average, with relatively low levels of international collaboration.

China publishes about 20% of the world's scholarly output and 16% of the world's top 10% cited papers. It receives 13% of the world's citations and 17% of the world's downloads. Citations to China's research come mainly from China itself (43%), and the US (12%). Chinese Acad-

emy of Sciences, a national scientific think tank with branch institutes all over mainland China, is the leading Chinese institution in terms of both output and growth rate, with around 19,200 papers and more than 25% annual growth.

Headline statistics

20% OF THE WORLD'S
SCHOLARLY OUTPUT

China is highly prolific, producing 20% of the world's scholarly outputs.

26% ANNUAL GROWTH

China's research output is growing rapidly, growing at a rate of 26% yearly, on average, since 2010.

79% SEDENTARY
RESEARCHERS

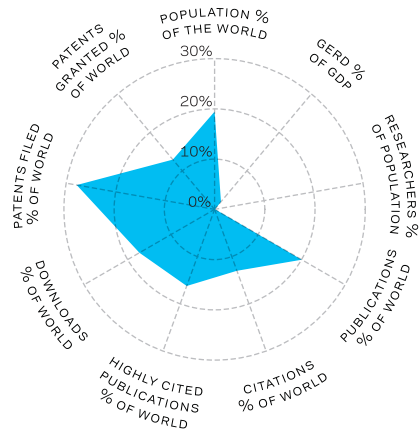
China's researchers are mainly sedentary with more researchers flowing into China (4.1%) than out of it (2.7%).

28% OF WORLD PATENTS
FILED

China is highly motivated in seeking innovation with a 28% share of world patents filed and 13% of world patents granted.

Overall country or region outlook

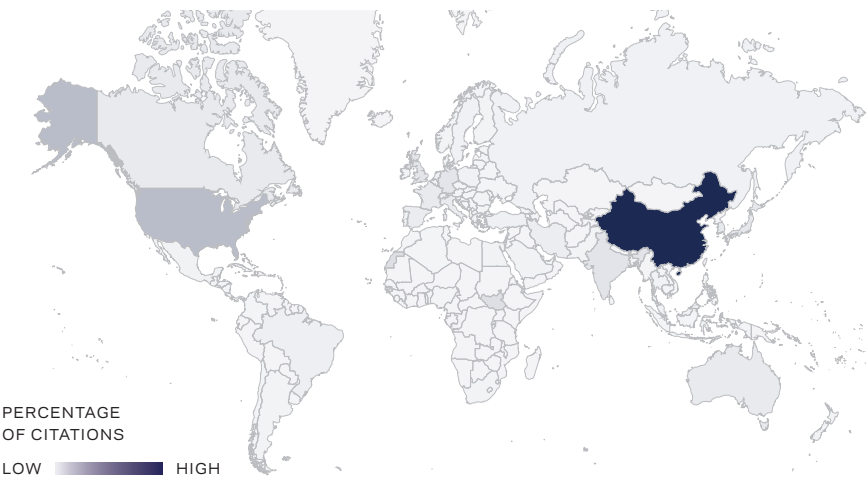
China makes up 20% of the world's population, and its pool of researchers publishes 20% of the world's scholarly output which includes almost 16% of the world's top 10% cited papers. It receives 13% of the world's citations and 17% of the world's downloads. China's growing focus in research and innovation is clear; although it holds 13% of the world patents granted, its share of world patents filed is higher at 28%. With a growing research output and continued focus in research and development, these indicators are likely to increase with time.



Global distribution of citations

Citations to China's research are mainly from its large volume of domestic publications (43% of all received citations), followed by the US (12%). This can be explained by researchers tending to be more aware of their own country's papers, compounded with China's large scholarly output and research base. The remaining

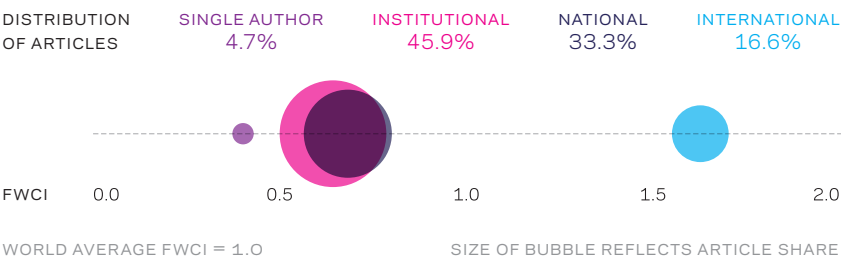
major countries that account for 2-3% of all received citations, namely in decreasing order, are India, the UK, Germany, Japan, South Korea, France, Australia, and Canada.



Collaboration patterns

Only about 17% of China's total scholarly outputs are internationally collaborated papers; these papers are cited about 63% more than the world average for all collaboration types. Most papers from China (around 46%) are collaborations within the same institution, and about 33% are collaborations with other institutions in China; these are cited, respectively, 36% and 32% less than the

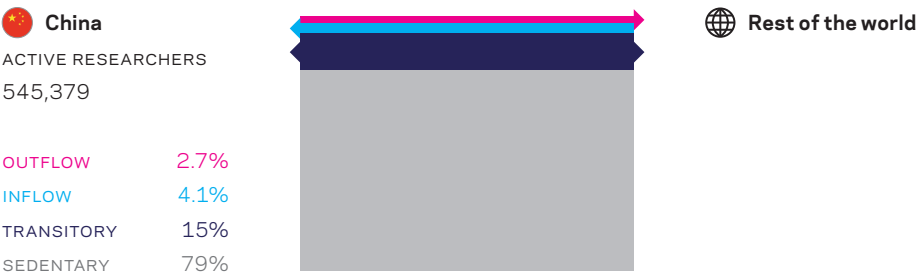
world average for all collaboration types. China's single-author papers are the least impactful, and only account for 5% of China's scholarly output.



Researcher mobility

China's researchers are mostly sedentary: 79% of them have only published under a Chinese affiliation. This lends support to the findings that the majority of the citations received by China's scholarly outputs are from within the country, and that research collaborations tend to be mainly within the same institutions or across institutions in China. Around 15%

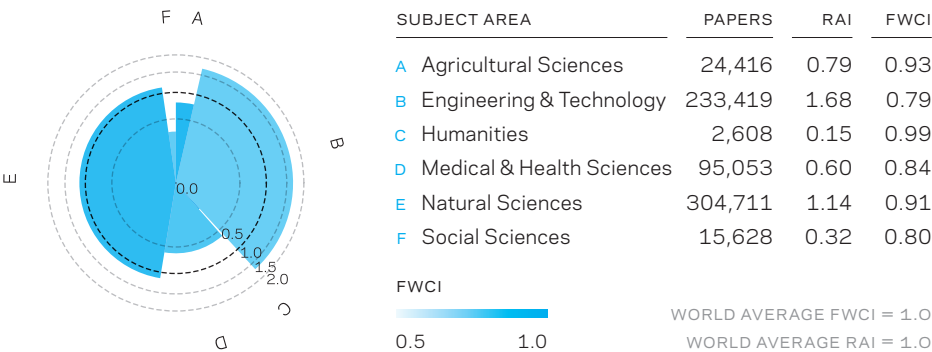
of China's total researcher population are transitory, meaning that short term assignments abroad are more frequent compared to permanent emigration. Interestingly, the percentage of inflow researchers to China is higher than that of outflow researchers, indicating a net brain gain for China's research population.



Subject breakdown

China is most prolific in the Natural Sciences, publishing nearly half of its output in this area. The second area in which China publishes the most in is Engineering & Technology (68% more than the world does). With the exception of papers in the Humanities, China's papers are cited 7%

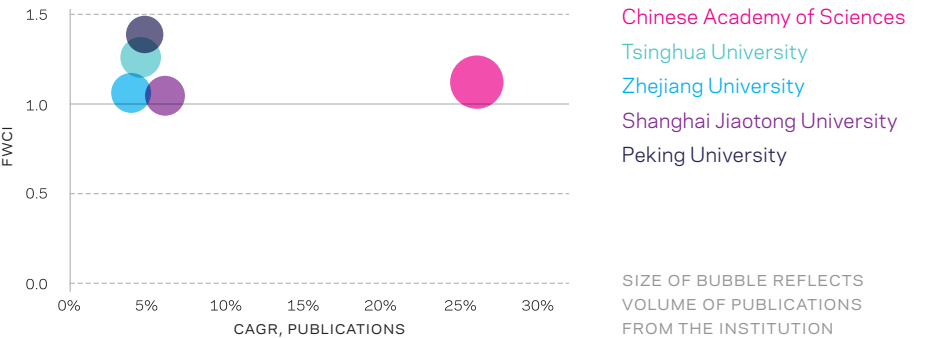
(in the area of the Agricultural Sciences) to 21% (in the area of Engineering and Technology) less than the world average.



Most prolific institutions

China's top five institutions published between 9,400 (Peking University) and 19,200 (Chinese Academy of Sciences) papers in 2014. The Chinese Academy of Sciences dwarfs the other top universities in China, in terms of 2010-2014 output growth rate, with a CAGR of more

than 25%. All top institutions have a positive FWCI, meaning that they are cited on average more than the world, from 5% (Shanghai Jiaotong University) to 39% (Peking University) more.





COLOMBIA

As a developing country, Colombia invests comparatively little in R&D, and this is reflected in the country's low world publication and citation shares (even when normalized to the country's population size).

However, despite Colombia's low investment in R&D, the country does maximize its larger research footprint through high levels of international collaboration and a highly mobile researcher base. Moreover, the country experiences a net inflow of researchers, which means that more re-

searchers arrive and stay in the country than permanently leave.

Headline statistics

High levels of international collaboration

Almost half of Colombia's research output is through international collaborations.

Highly mobile researchers

More than 3/4 have published at least once with an affiliation outside of Colombia; 58.6% are transitory.

FOCUS AREA

Agricultural Sciences

Colombia has a strong relative focus on the Agricultural Sciences, nearly twice the world average given the country's size.

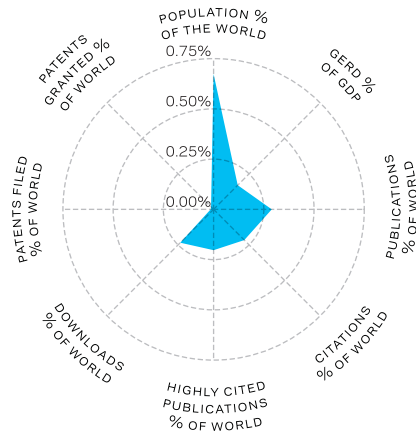
MOST PROLIFIC INSTITUTION

Universidad Nacional de Colombia

Universidad Nacional de Colombia is Colombia's most prolific institution, producing nearly double the amount of the next most prolific institution.

Overall country or region outlook

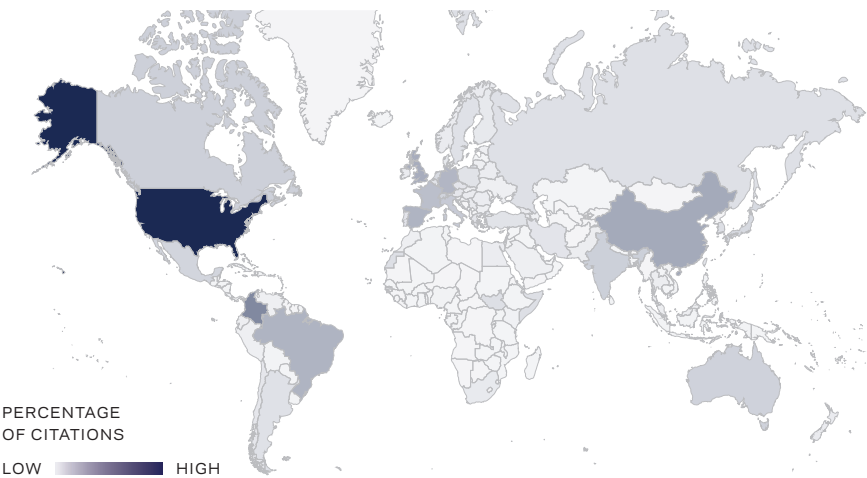
Relative to other countries, Colombia invests comparatively little in R&D, only 0.17% of its GDP, and this is reflected in the country's research performance. Although Colombia comprises 0.67% of the world's population, its research publications account for only 0.29% of the world's total, and citations to those publications account for 0.22% of all citations. There is little patent activity.



Global distribution of citations

After the US (which accounts for 13.6% of all citations to Colombia's research), Colombia itself accounts for the most citations to Colombia's research (7.2%). Similar to other countries, Colombia's research is cited disproportionately more (relative to global citation base rates) by its immediate neighbors and countries

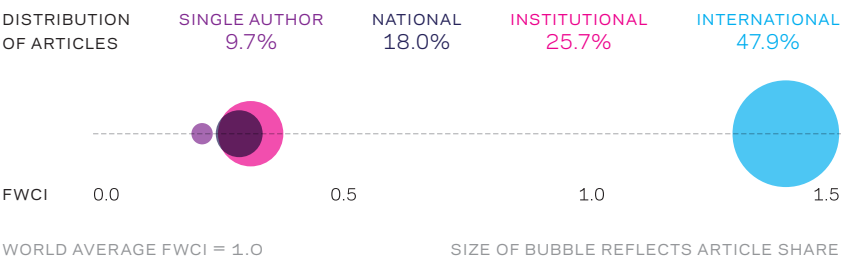
sharing a common language, such as Brazil (4.3%), Spain (4.3%), Mexico (2.1%), Argentina (1.3%), Chile (0.9%), and Venezuela (0.4%).



Collaboration patterns

International collaborations comprise nearly half of all of Colombia's research. Similar to trends in other countries, such collaborations have a much higher FWCI (1.39) than all other types of collaborations. After international collaboration, the next most frequent type of collaboration for Colombia is institutional collaboration, constituting 25.7% of the country's total output. Such collaborations,

however, achieve an FWCI of only 0.32, or 68% below the world average.



Researcher mobility

Similar to other countries with small but growing research infrastructures, Colombia's active researcher base is highly mobile. Less than a quarter has published only under affiliations with institutions in Colombia, and such researchers tend to be more junior (and hence have not received the opportunity to conduct research and publish abroad). On the other

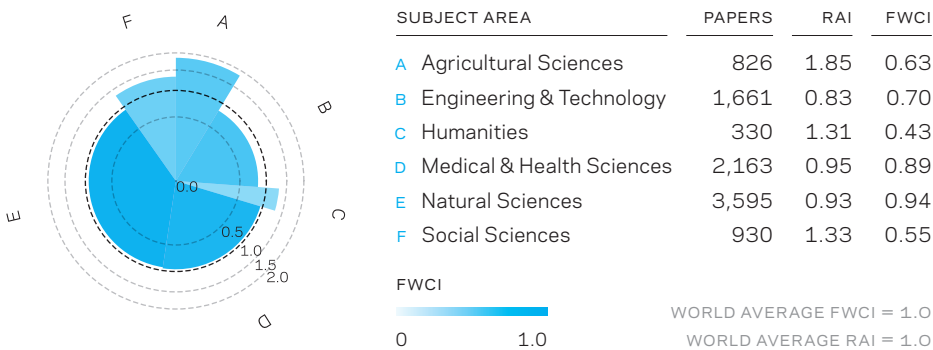
hand, 58.6% of all Colombian researchers are transitory. Colombia also experiences a net inflow of researchers (+2.4%).



Subject breakdown

Mirroring other Latin American countries (such as Argentina, Brazil, Cuba, Mexico, and Peru), Colombia has a strong focus of research activity in the Agricultural Sciences. The country produces nearly twice the global average given the size of its research output. The country also

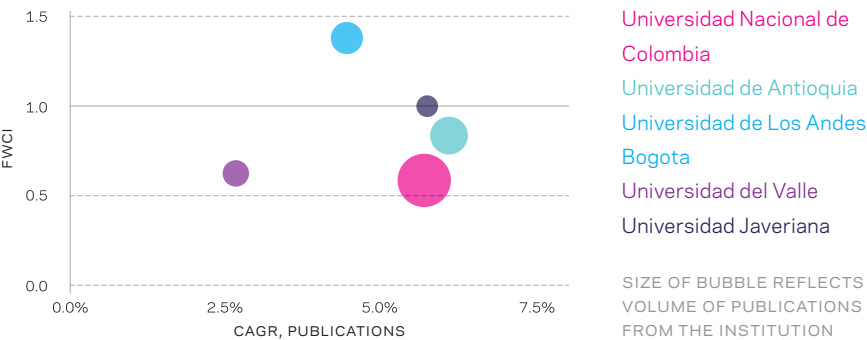
produces relatively more research in the Humanities and the Social Sciences than expected. Although the FWCI of Colombia's research is below the average in all subject areas, it is comparatively the highest in the Natural Sciences at 0.94.



Most prolific institutions

Colombia's most prolific institution, the Universidad Nacional de Colombia, produced 1,511 publications in 2014. This is nearly double the amount of the next closest institution, the Universidad de Antioquia, at 760 publications. Both institutions have experienced strong growth

(at 5.7% and 6.1%, respectively) over the past five years. While the Universidad de Los Andes produces considerably less research annually than the top two Colombian institutions, the FWCI of the university's research is much higher at 1.38.





CROATIA

Croatia's researchers are rather sedentary: the majority of them do not publish with any affiliation outside of the country. They also show a tendency to cite Croatian publications; the share of its citations coming from Croatia is nearly as high as that of the US.

Nevertheless, international collaboration is very important to Croatia for raising its overall field-weighted citation impact, as this is the only collaboration type with an above world average FWCI. Increasing international collaboration would be beneficial for Croatia's top prolific institutions

as well; only two out of five have an FWCI above the world average.

Headline statistics

Small share of patents

Croatia has a 0.01% share of the world's granted patents.

International collaboration is essential

Of all collaboration types, international collaboration is the only type that yields a positive citation impact.

Sedentary researchers

About 65% of Croatian researchers only publish with Croatian institutions.

STRONG AREA

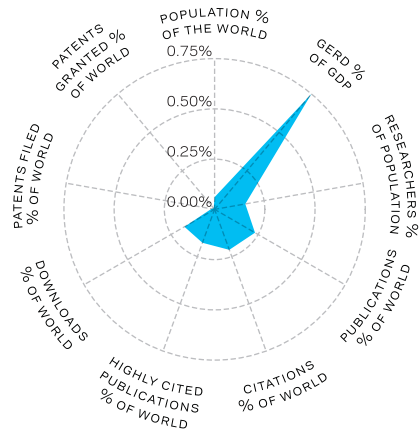
Natural Sciences

The Natural Sciences is the largest subject by total output, and has the highest FWCI, equal to the world average.

Overall country or region outlook

Compared to other indicators, Croatia seems to have a relatively high share of GERD as percentage of GDP. Croatia publishes about 0.23% of the world's scholarly output, and 0.18% of the world's top 10% most cited papers. It has a slightly smaller world citation share than output share, at around 0.21%, and receives 0.17% of the world's downloads.

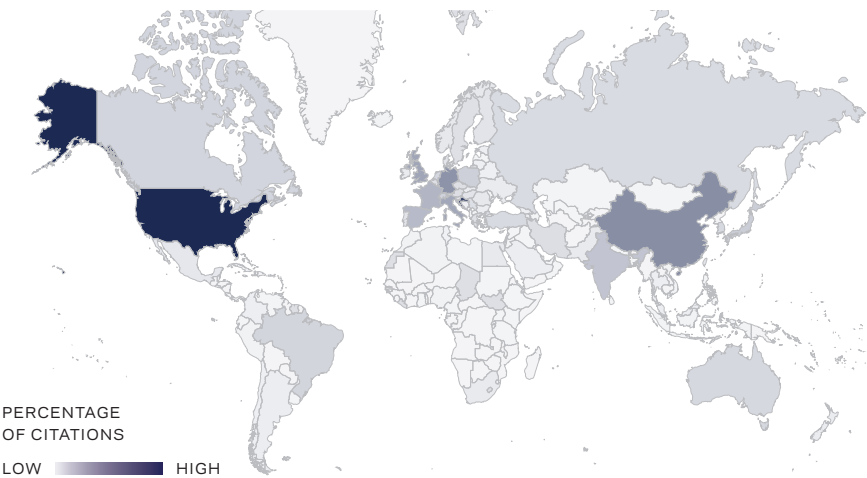
Croatia has little patenting activity: its share of the world's filed patents is a mere 0.02%, and its share of granted patents is 0.01%.



Global distribution of citations

In line with the general expectations, Croatia receives most citations from prolific research nations such as the US (11.9%), China (6.0%), and Germany (5.7%). After all, a large scholarly output also means a large number of references. However, as researchers tend to cite their own coun-

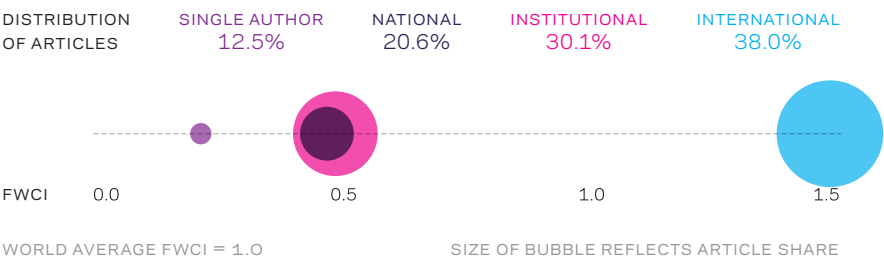
try's publications at a higher frequency than those of other countries, the second most citing country to Croatian publications is Croatia itself (10.3%). Other countries whose citations form a sizeable share of Croatia's citations include the UK (4.6%), Italy (4.5%), and France (3.7%).



Collaboration patterns

A decent share of Croatia's scholarly output results from international collaboration. This benefits Croatia's overall impact, as those publications have the highest field-weighted citation impact among the collaboration types. At 1.48, they are cited 48% more than the world average. At the opposite end of the spectrum we find the single-author publications: still accounting for 12.5% of Croatia's out-

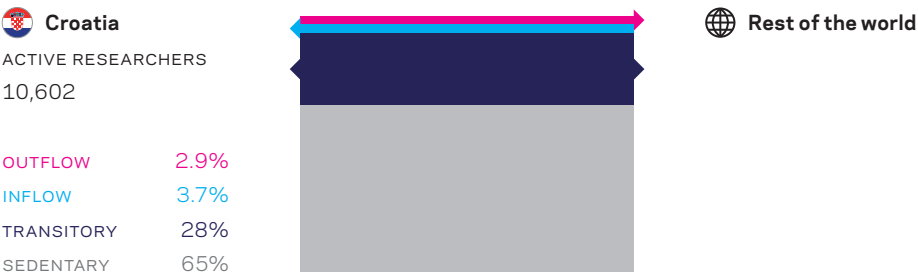
put, their citation impact is 78% below the world average. While institutional and national collaboration have higher shares, they fare not much better in terms of citation impact, being cited over 50% less than the world average.



Researcher mobility

Croatia's researchers are rather sedentary: 65% of them have only ever published under a Croatian affiliation, which may explain the high institutional collaboration rate in Croatia. Conversely, Croatia's researcher inflow and outflow are low, though the inflow (3.7%) is at least somewhat higher than the outflow (2.9%). Inflow researchers also have a

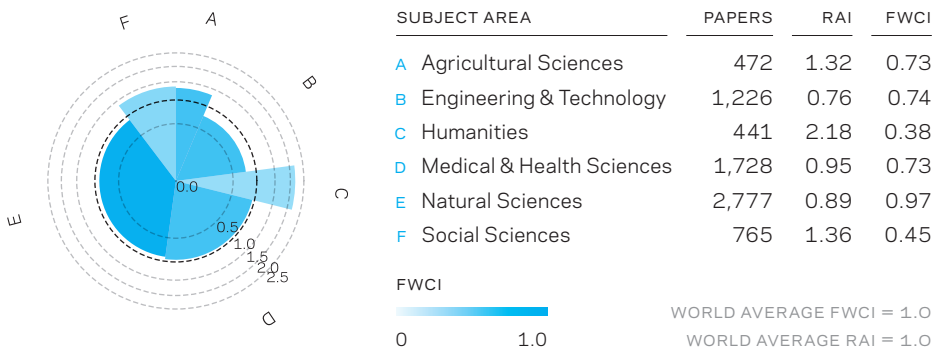
slightly higher FWCI than the outflow researchers. Interestingly, researchers showing transitory mobility represent over a quarter of Croatia's total researcher population. This means that although Croatia's researchers are unlikely to immigrate or emigrate permanently or long term, short term assignments abroad are more frequent.



Subject breakdown

Croatia's largest scholarly output comes from the Natural Sciences. It is in this subject that Croatia attains the highest citation impact; almost equal to the world average. Its research focus, in terms of relative activity, is on the Humanities. It is about 120% more prolific in this subject

than the world average. However, this is not reflected in its field-weighted citation impact, which is the lowest amongst all subjects (0.38). To be fair, in absolute numbers of publications, the Humanities is Croatia's smallest subject.



Most prolific institutions

Croatia's most prolific institution is the University of Zagreb, producing nearly 2,600 publications in 2014. Although it is several times more prolific than the other institutions in Croatia's top five, it has a negative 2010-2014 growth rate (-3.4%), and its citation impact is 21% be-

low the world average. The most impactful of these institutions is the University of Split, with an FWCI of 1.58. Its 2014 output was only the third largest, but it shows the second highest CAGR (1.5%) after the Ruđer Bošković Institute (2.4%).





CUBA

Cuba has a small research footprint, producing fewer publications over the past half-decade than some of the world's largest institutions have in 2014 alone.

Similar to other countries with small research footprints, especially in Latin America, Cuba engages in high levels of international collaboration and has a strong relative focus in the Agricultural Sciences. Moreover, a high percentage of its researchers are internationally mo-

bile, publishing at least once outside of the country. However, mirroring broader trends in migration, Cuba experiences a net outflow of researchers.

Headline statistics

High levels of international collaboration

Nearly half of Cuba's research output involves international collaborators.

Highly impactful transitory researchers

Nearly half of all active Cuban researchers are transitory, and they achieve an FWCi 91% above the world average.

Net outflow of researchers

Cuba experiences a net outflow (-6.4%), which means that far more researchers leave the country permanently than arrive and stay.

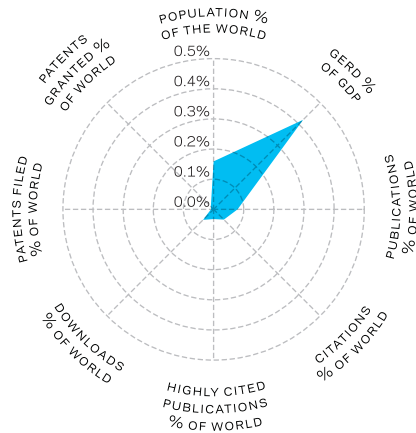
FOCUS AREA

Agricultural Sciences

Cuba has a strong relative focus on the Agricultural Sciences. It produces 60% more than the world average in this subject area given the country's size.

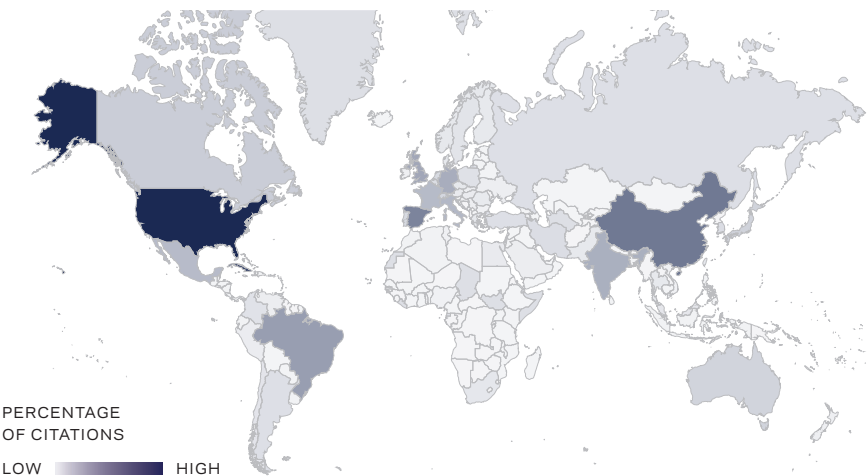
Overall country or region outlook

Cuba invests 0.42% of its GDP in gross expenditures on R&D. From 2010 to 2014, Cuba produced more than 10,000 research publications, which accounts for 0.08% of all publications worldwide. As reference, the country accounts for 0.16% of the world's population. The country has similarly low world shares of citations, highly cited articles, and downloads. There is little patenting activity.



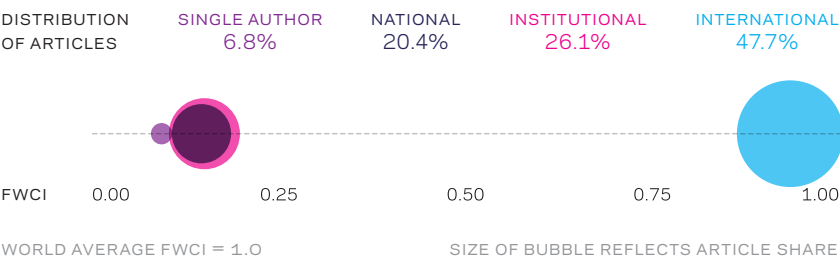
Global distribution of citations

The US accounts for 11.3% of all citations to Cuba's research. After the US, Cuba itself accounts for the next highest number of citations to Cuba's research, or nearly one of every 10 citations. China (6.8%), Spain (6.3%), and Brazil (4.8%) comprise the rest of the top five countries citing Cuba's research.



Collaboration patterns

Nearly half of Cuba's research are international collaborations. Similar to other countries, international collaborations achieve the highest FWCI (0.93) among all types of collaborations. Institutional and national collaborations comprise a little more than one fourth and one fifth, respectively, of Cuba's research.



Researcher mobility

Nearly half of all active researchers associated with Cuba are transitory, which means that they have spent less than two years in Cuba or outside of Cuba, in succession. They comprise the largest subgroup of all researcher mobility classes, and they achieve an FWCI of 1.91, or 91% above the world average. Given the country's geopolitical position, it is unsur-

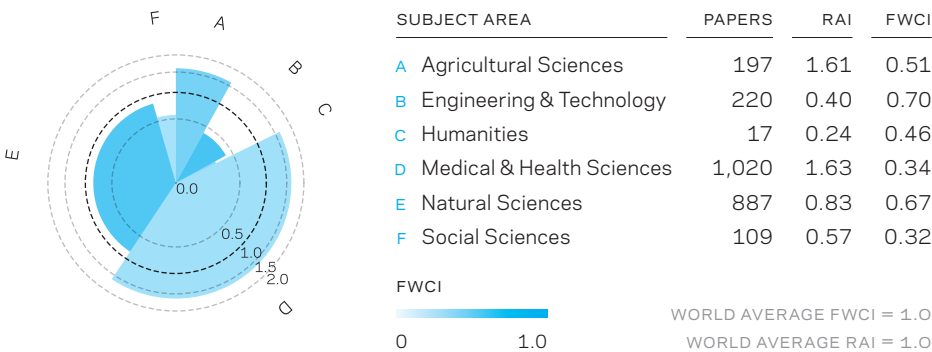
prising that it experiences a net outflow of researchers (-6.4%).



Subject breakdown

Cuba has a strong focus of research activity in the Agricultural Sciences and the Medical & Health Sciences. The country's activity in those subject areas is more than 60% higher than the global average. Although the FWCI of Cuba's research is below the world average in all subject

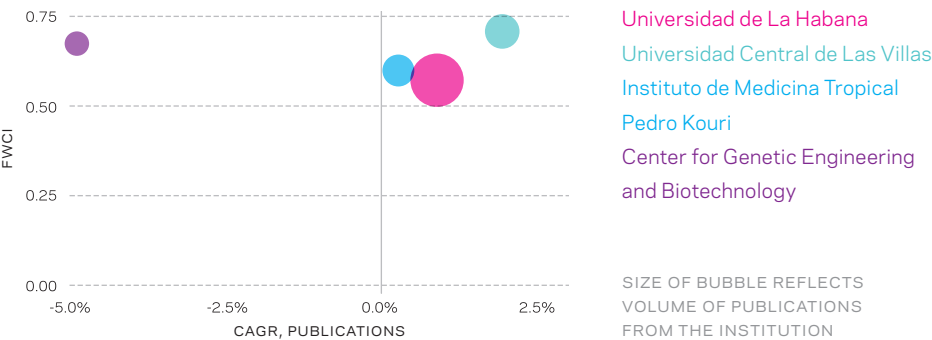
areas, it is comparatively the highest in Engineering & Technology (0.70) and the Natural Sciences (0.67).



Most prolific institutions

Cuba does not have many research-intensive institutions. Its most prolific is the Universidad de La Habana, which produced more than 250 publications in 2014. The second most prolific, the Universidad Central de Las Villas, has grown the most from 2010 to 2014 (1.9%

CAGR) and achieved the highest FWCI (0.71) among all of Cuba's research-intensive institutions.





CYPRUS

Cyprus' strength seems to be the collaborative and mobile nature of its researchers: nearly two-thirds of its output are the results of high impact international collaboration, and more than half its researcher population has had short-term assignments abroad.

Cyprus' small size and territorial division may explain its low proportion of nationally collaborated output, but these factors do not prevent Cyprus from being an attractive research destination with twice the proportion of inflow as outflow researchers. Although its world shares

of research indicators tend to be expectedly small, its output is highly impactful (in each field, Cyprus is cited more than the world average for all fields) particularly in the Natural and the Medical & Health Sciences.

Headline statistics

63% INTERNATIONALLY COLLABORATED PAPERS

cited 66% more than the world average. Low proportion (7%) of nationally collaborated output.

55% RESEARCHERS WITH TRANSITORY MOBILITY PATTERNS

and twice the amount of inflow (18%) as outflow (9%) researchers.

Low output but high impact

Cyprus publishes few papers, as expected from its small size, but these are highly impactful.

MOST PROLIFIC AREA

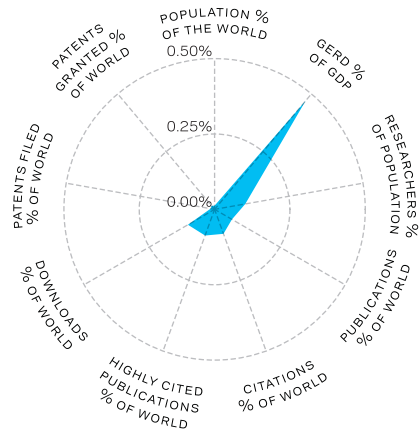
Natural Sciences

Cyprus is most prolific and impactful in the Natural Sciences, with nearly 1,000 papers in 2014, cited 41% more than the world average across all subject areas.

Overall country or region outlook

Cyprus represents 0.01% of the global population, and 0.10% of its residents are researchers; they benefit from a GERD of nearly 0.5% of Cyprus' GDP. Cyprus' shares of the world's research indicators hover around 0.1% as well, with 0.07% of the world's publications, 0.09% of highly cited papers and of citations, and 0.10% of downloads.

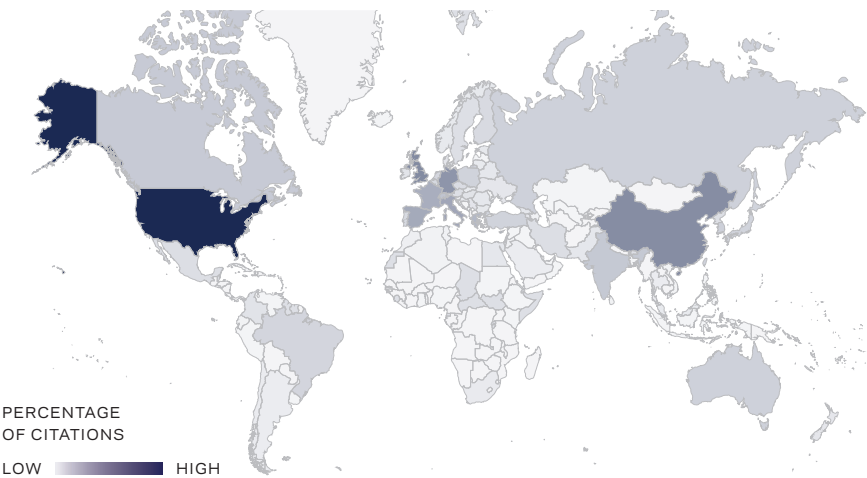
Cyprus has few patents, so that its shares of patents filed (0.01%) and granted (0.02%) are nearly null.



Global distribution of citations

The distribution of citations to Cyprus' research is skewed towards prolific countries, such as the US (accounting for over 10% of Cyprus' citations) and China. Cyprus also receives sizeable proportions of its citations from European countries, particular other European Union mem-

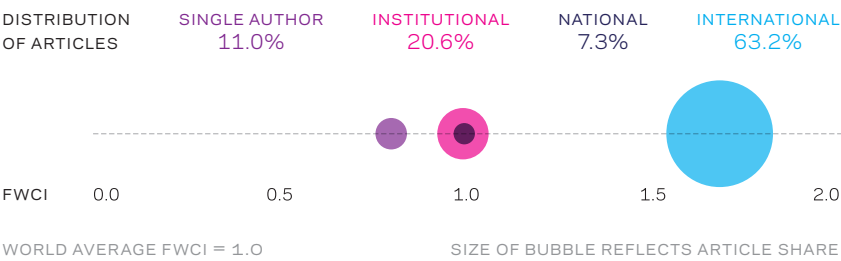
bers, such as the UK or Germany. The former could be in part explained by previous colonial ties.



Collaboration patterns

Cyprus' research is highly collaborative: internationally-collaborated papers account for over 60% of its output, and these are cited nearly two-thirds more than the world average across collaboration types. National and institutional collaborations are about as impactful as the world average and represent 7% and 21% of Cyprus' output, respectively. This low proportion of national collaboration

may, to some extent, be due to the small size of the Cypriot territory (few collaborators to partner with in one's specific area of expertise), and/or to the territory's current North-South division. 11% of Cyprus' papers have a single author, and these are cited 20% less than the world average.



Researcher mobility

The absolute majority (55%) of Cyprus' researchers display transitory mobility patterns, meaning that their publications have quickly successive Cypriot and foreign affiliations since 1996. Cyprus sees a net gain in researchers, with twice as many incoming (18%) as outgoing (9%). Only 18% of Cyprus' researchers are

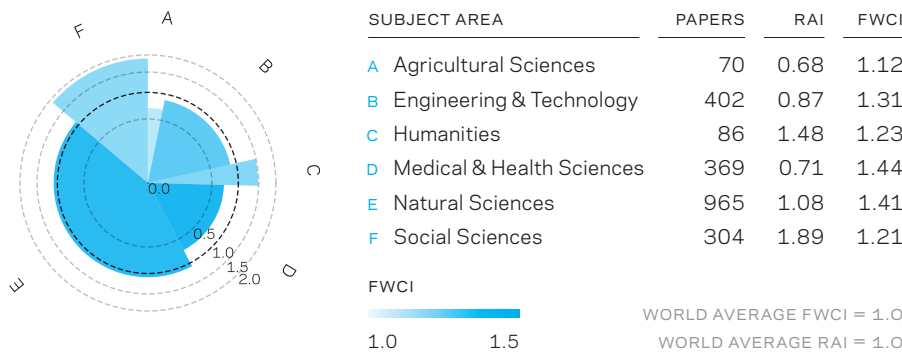
sedentary, having consistently and solely published under Cypriot affiliations since 1996.



Subject breakdown

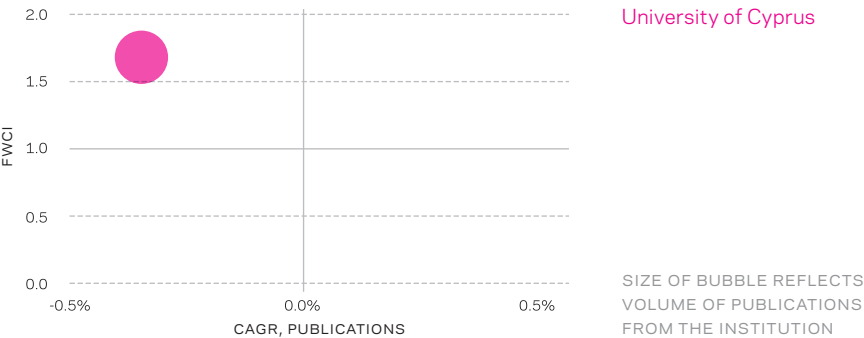
In all subject areas the impact of Cyprus' research is superior to the world average. In absolute terms, Cyprus is particularly prolific in the Natural Sciences, in which it reaches a citation impact of over 40% more than the world average across all subject areas. In relative terms, compared

to the world, Cyprus is more prolific in the Social Sciences and the Humanities, publishing significantly higher proportions of its output than the world in these two subject areas.



Most prolific institutions

The University of Cyprus has high impact: its research is cited 68% more than the world average. It published more than 3,700 scholarly papers between 2010 and 2014, although it displays neutral annual growth (CAGR) over that period.





CZECH REPUBLIC

The Czech Republic is a growing research nation that produces a relatively large volume of research output compared to its population size. It is close to, or exceeds, the world average on many measures of research performance such as citation impact and the usage of research output.

As a growing nation, the Czech Republic has both a large percentage of internationally collaborated publications and a large percentage of research output produced without international collaboration. Related to this, a large group of highly mobile researchers in the transitory

category exist side-by-side with a group of sedentary researchers.

Headline statistics

Relatively high publication share

With only 0.2% of the world's population, the Czech Republic contributes to around 0.8% of the world's publications.

Average relative citation share

The Czech Republic receives 0.8% of the world's citations, which matches its world publication share.

Co-existence of mobility types

Active researchers fall into two main groups: the sedentary (stay and publish in Czech) and the highly transitory (stay for a short period inside/ outside of the country, publish, and then move elsewhere).

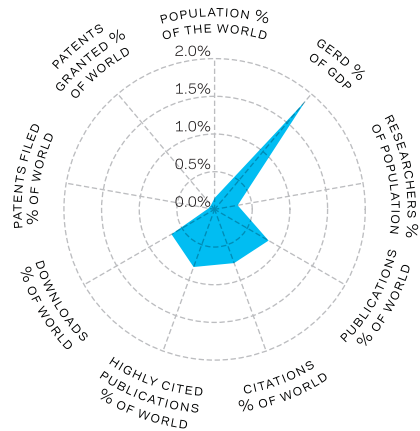
FOCUS AREA

Natural Sciences

The Czech Republic has a high focus on the Natural Sciences. The Natural Sciences are the country's most prolific subject with a high FWCI and a high level of research activity.

Overall country or region outlook

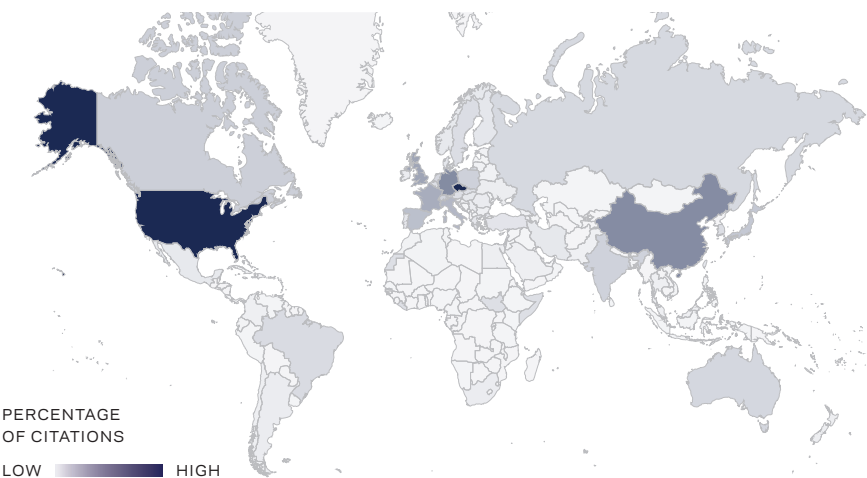
The Czech Republic spends a relatively high share of its GDP on research and development (1.9%). With only 0.2% of the world's population, it contributes to around 0.8% of the world's publications. It also receives and accounts for a similar share of the world's citations, highly cited articles, and downloads. This implies that the citation impact and the usage of its publications are around the world average. There is a limited level of patent activities in the Czech Republic.



Global distribution of citations

The Czech Republic receives the largest share of its citations from the US (12.7% of its citations), followed by the Czech Republic itself (12.7%), and Germany (6.5%). Other European countries such as the UK, France, and Spain are also among the top citing countries of the Czech Republic's publications. Among Eastern Eu-

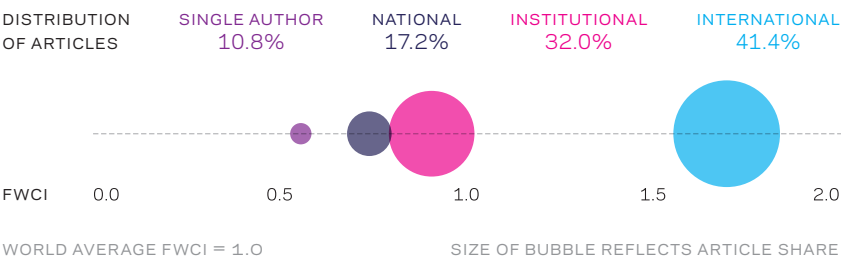
ropean countries, Poland contributes the largest number of citations (2.2% of the Czech Republic's received citations).



Collaboration patterns

International collaboration comprises the largest share of the Czech Republic's publications (41.4%). This number is lower than that of many Western European countries, such as the UK, Germany and France, but higher than that of the emerging countries, such as China and Brazil. The field-weighted citation impact of the internationally collaborated publications

(1.70) is the highest among the four collaboration types for the Czech Republic.



Researcher mobility

On the one hand, the Czech Republic's active researchers consist of a large group of sedentary researchers. More than half of the country's active researchers have no publication with a foreign affiliation. On the other hand, there is also a large group of researchers who belong to the highly mobile transitory category. The

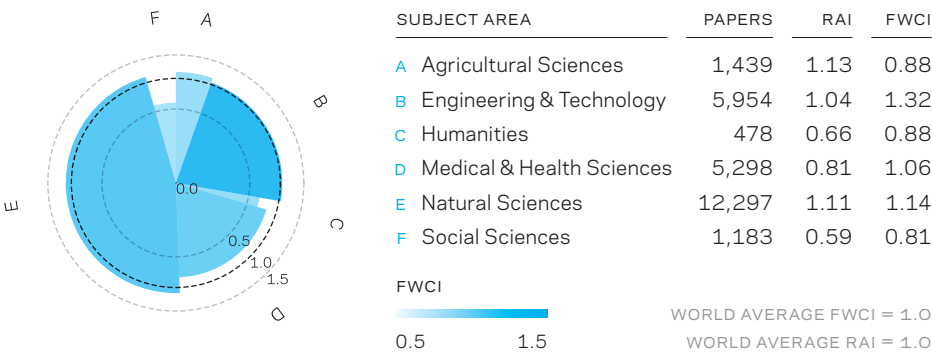
country has a very low percentage of out-flow and inflow researchers.



Subject breakdown

The Natural Sciences is obviously the focus of the Czech Republic's research. It comprises the largest number of publications among the six subject areas (12,297), the second highest field-weighted citation impact (1.14, or 14% higher than the world average) and a high-

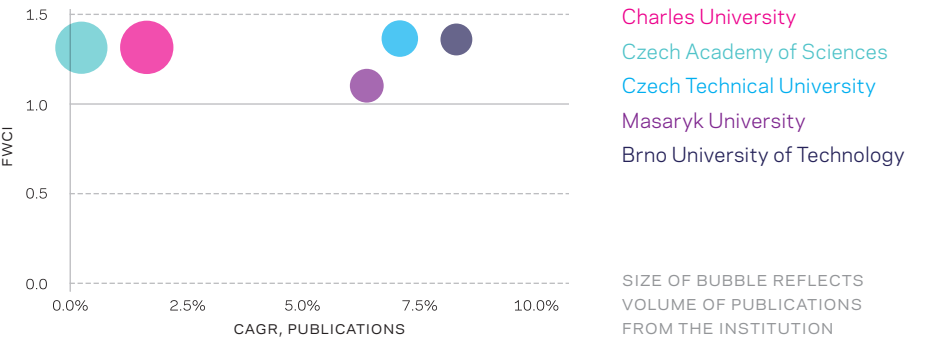
er than world average level of research activity (1.11). Based on relative activity and field-weighted cited impact, the Czech Republic's research is weak in the Social Sciences and the Humanities.



Most prolific institutions

The two institutions with the largest volume of publications are Charles University and the Czech Academy of Sciences. They each produce around 3,600 publications per year. However, their CAGR of publications is the lowest among the top five most prolific institutions during the

period 2010-2014. The five institutions have a field-weighted citation impact of between 10% and 37% higher than the world average.





DENMARK

With only 0.08% of the world's population, Denmark holds 1.3% of the world's most highly cited articles, indicating a high quality of its research. Denmark's high quality of research is consistent across disciplines: Denmark performs well above average in all subjects.

Denmark's relatively high performance is also reflected in its collaborative output: all collaboration types achieve a field-weighted citation impact that is above the world average, even single-author publications. One of the reasons for this may be Denmark's relatively high level

of researcher mobility. Over half of all of Denmark's researchers are 'transitory', meaning they spent short periods of time abroad, after which they return to Denmark, or vice versa.

Headline statistics

Highly mobile researchers

About 68% of Denmark's researchers also published with affiliations outside of Denmark between 1996 and 2014.

Highly impactful international collaboration

Denmark's internationally collaborated publications are cited 121% more than the world average.

STRONG AREA

Medical & Health

Denmark's second largest subject shows relative activity that is 32% above the world average, and an FWCI that is 86% above average.

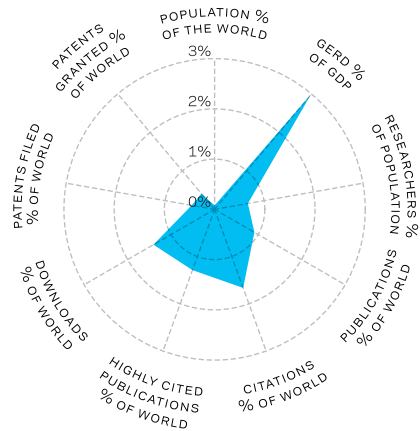
MOST PROLIFIC INSTITUTIONS

High growth rates

All top 5 most prolific institutions in Denmark show high growth rates. Aalborg University clearly leads in this respect, with an 18.5% CAGR.

Overall country or region outlook

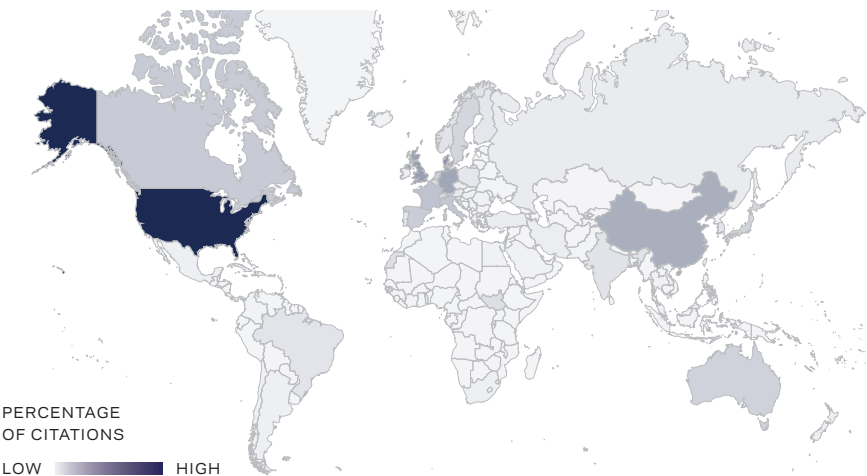
Denmark produces just 0.90% of the world's scholarly output, but receives 1.64% of the world's citations. The presence of high quality research is also reflected by Denmark's share of the world's top 10% most cited publications: 1.72%. It also receives 1.21% of the world's downloads; an indicator of (perceived) interest in, or usefulness of its research. Denmark spends almost 3% of its GDP on research and development. Denmark seems to focus less on patenting: its share of the world's filed patents is 0.16%, and its share of the world's granted patents is 0.41%.



Global distribution of citations

Denmark receives most citations from prolific research nations such as the US (17.8%), the UK (7.4%), and Germany (6.7%). The large scholarly output of these countries naturally means a large number of outgoing references. However, Denmark also receives a large share of its

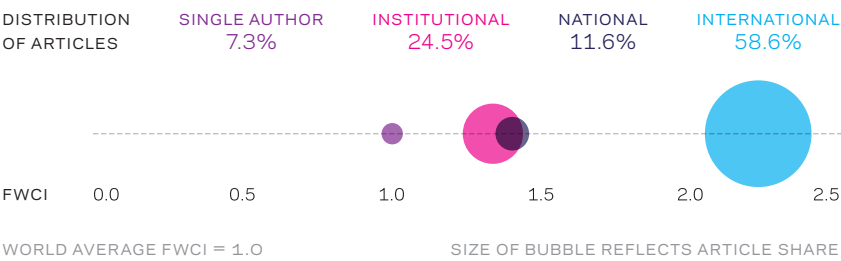
citations from within Denmark (8.6%), as researchers tend to cite their own country's research more than that of others. Other countries whose citations form a sizeable share of Denmark's citations include China (6.1%), France (4.3%), and Italy (3.9%).



Collaboration patterns

A considerable share of Denmark's publications are the result of international collaboration (nearly 59%). Since these publications result in the highest field-weighted citation impact of over twice the world average (2.21), this is beneficial to Denmark's overall citation impact. In fact, all of Denmark's collaboration results in above the world average FWCI. Even the single-author publications are cited just

above the world average, at 1.02. Institutional collaboration occurs more frequently than national collaboration, but achieves a slightly lower FWCI than the latter: 1.35 versus 1.40.



Researcher mobility

Denmark's researcher population is rather mobile. Only about a third of Denmark's researchers publish exclusively with an affiliation in Denmark, and they are cited less than researchers in other categories. Conversely, the highest cited researchers are those showing transitory mobility, meaning they stay abroad or in Denmark for short terms, before moving

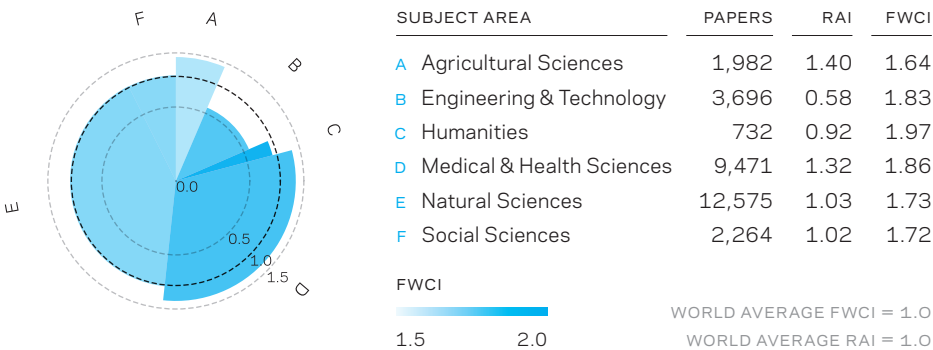
back. This group makes up more than half of Denmark's researchers. Denmark's inflow and outflow of researchers are both around 8.5%, with a minor difference in favor of inflow.



Subject breakdown

Denmark performs well across all subjects. It is relatively most prolific in the Medical & Health Sciences, in which it shows 32% more activity than can be expected based on the world average. The Medical & Health Sciences is also the subject with the second highest FWCI (1.86)

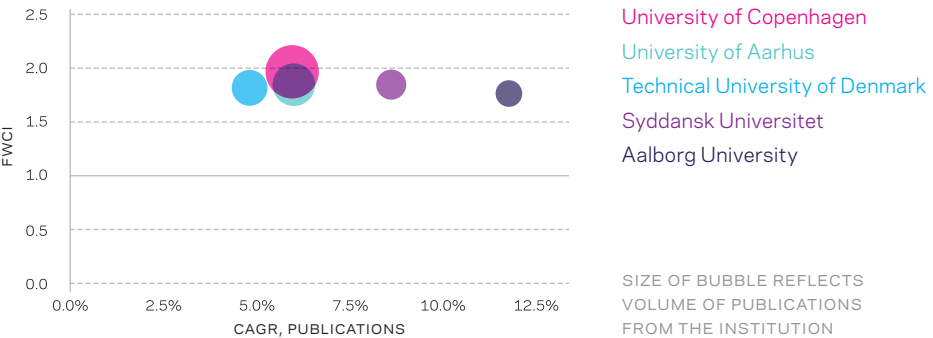
and the second largest output. Although it is the smallest subject in terms of total publications, the Humanities shows the highest FWCI; at 1.97 it is close to twice the world average.



Most prolific institutions

The most prolific institution in Denmark is the University of Copenhagen, with more than 7,500 publications in 2014. In addition to showing a high CAGR of 5.9%, it also shows the highest FWCI amongst these five institutions, at 1.97. Currently, Aalborg University is the smallest of the

most prolific institutions, but it shows the fastest annual growth by far: 11.7% CAGR. In terms of FWCI the second smallest, Syddansk Universitet, is equal to the second largest, the University of Aarhus. Both are cited 85% more than the world average.





EGYPT

Egypt is the second most research-intensive country in Africa, after South Africa. The country is home to several prolific research institutions, most notably Cairo University.

Egypt's research draws plenty of interest. The country's world download share outpaces its world citation share. Moreover, based on the global distribution of citations to Egypt's research, this interest comes from not only the major research countries (such as China and the US),

but also especially from Muslim-majority countries such as Saudi Arabia, Iran, and Turkey.

Headline statistics

High interest in Egypt's Research

Egypt accounts for 0.60% of all publications worldwide, but 0.84% of all downloads, suggesting high interest.

Highly mobile research base

Over 60% of Egypt's active researchers have published at least once outside the country.

CONNECTIONS

Muslim countries

Egypt is part of a Muslim country citation network. Saudi Arabia accounts for 5.1% of all citations to Egypt's research.

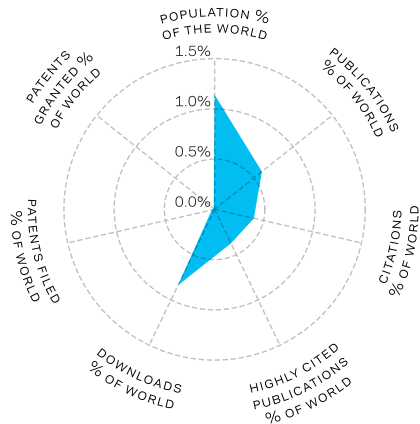
MOST PROLIFIC INSTITUTION

Cairo University

Cairo University is Egypt's most prolific research institution, producing 2,208 publications in 2014.

Overall country or region outlook

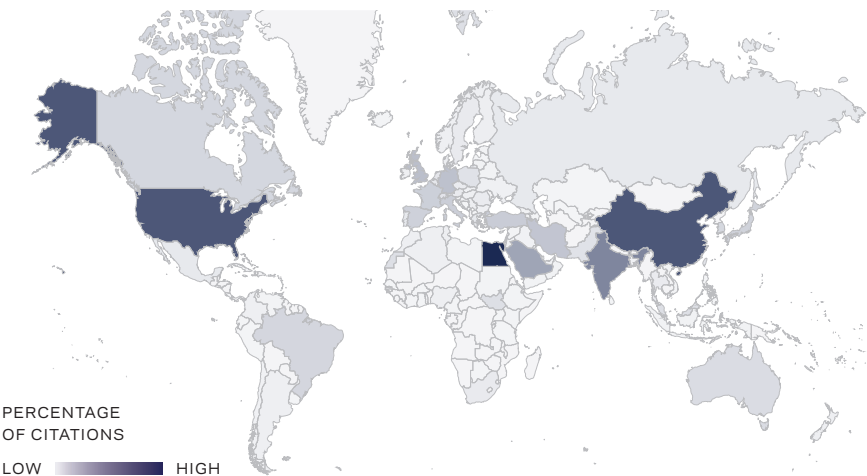
Egypt is the second most research-intensive country in Africa, after South Africa, in terms of output, producing nearly 59,500 publications from 2010 to 2014. In 2011, the country devoted 0.43% of its GDP to gross expenditures of R&D, which is a low level compared to more advanced research nations. The country accounts for 0.60% of all publications worldwide and 0.84% of all downloads of research worldwide. There is little patenting activity.



Global distribution of citations

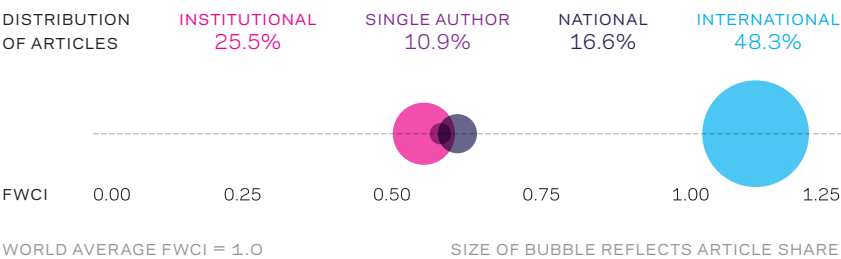
13.0% of all citations to Egypt's research come from Egypt itself. The next two countries that cite Egypt's research the most are China (10.1%) and the US (10.1%), which is mostly due to how prolific both countries are. Surprisingly, India and Saudi Arabia account for 7.0% and

5.1% of all citations to Egypt's research, a much higher rate than their global base-lines. Other Muslim-majority countries that cite Egypt's research at high rates include Iran (3.0%), Turkey (2.6%), Malaysia (1.4%), and Pakistan (1.2%).



Collaboration patterns

Nearly half of all publications from Egypt are from international collaborations, and they achieve an FWCI of 1.11, or 11% above the world average. All other types of collaborations achieve FWCI that are by 40% or more below the world average.



Researcher mobility

The majority of Egypt's active researcher base is quite mobile. Only 39.7% have published under only affiliations to Egyptian institutions, while 40.4% are categorized as transitory. This means that they have spent two years or less either outside of Egypt or in Egypt, in succession. The country as a whole experiences a

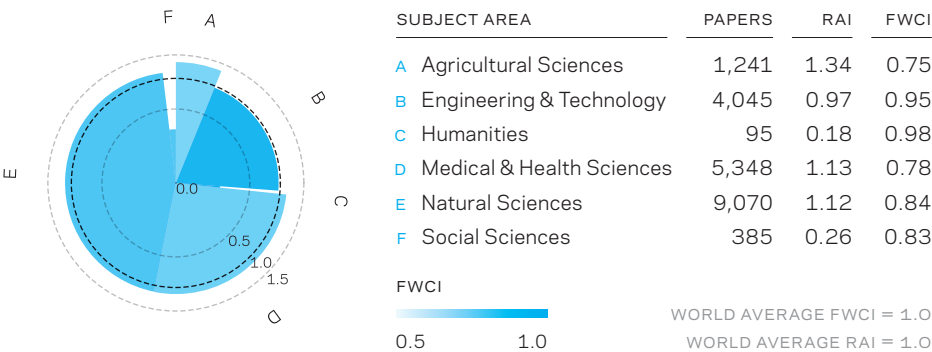
small net outflow of researchers (-1.1%), which means that more researchers leave the country than enter.



Subject breakdown

Relative to the world average, Egypt produces comparatively more research in the Agricultural Sciences (34% above the world average) and significantly less research in the Humanities and the Social Sciences (81% and 74% below the world average, respectively). Across all subject

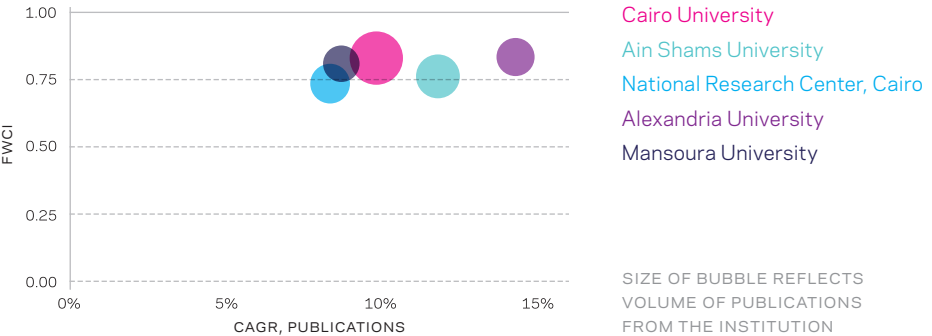
areas in which the country produces a substantial amount of research, Egypt achieves the highest FWCI in Engineering & Technology at 0.95.



Most prolific institutions

Relative to the world's overall growth rate, Egypt's most prolific institutions are all growing very quickly. Cairo University was by far the largest in terms of total output (2,208 publications in 2014, nearly 50% more than the next closest institution - Ain Shams University at 1,493

publications). Meanwhile, Alexandria University has grown its research output the fastest from 2010 to 2014 (14.3% CAGR).





ESTONIA

Estonia's higher inflow than outflow of researchers is a clear indication of its attractiveness to researchers from abroad. Estonia's international links are equally visible through its collaboration.

The majority of its papers are internationally collaborative and these result in the highest citation impact of over twice the world average. More specifically, Estonia's citation network shows close ties to its neighbors – Finland and Russia – and nearby countries such as Sweden and Po-

land. In terms of subject activity, Estonia shows a clear focus on the Natural Sciences.

Headline statistics

International collaboration is key

The FWCI of national collaborations is equal to the world average, but that of international collaboration is twice as high.

Rather sedentary researcher base

The majority of Estonian researchers have not published with affiliations outside of Estonia.

Net gain of researchers

The inflow of researchers to Estonia (8.2%) is almost twice as high as the outflow from Estonia (4.2%).

STRONG AREA

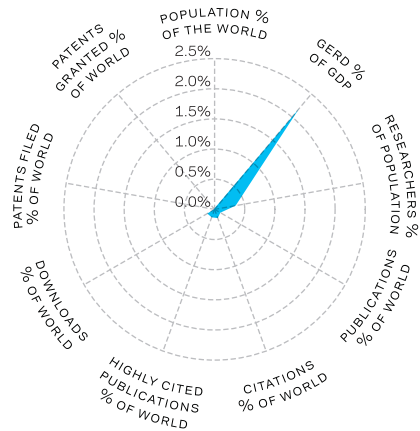
Natural Sciences

By far the largest subject for Estonia, in absolute terms, it is also relatively prolific as well as impactful.

Overall country or region outlook

Estonia produces 0.11% of the world's total scholarly output, and 0.14% of the world's top 10% most cited articles. It receives 0.15% of all citations and 0.14% of all downloads. While these shares are low, Estonia spent nearly 2.2% of its 2012 GDP on research and development, the effects of which may be seen in the coming years.

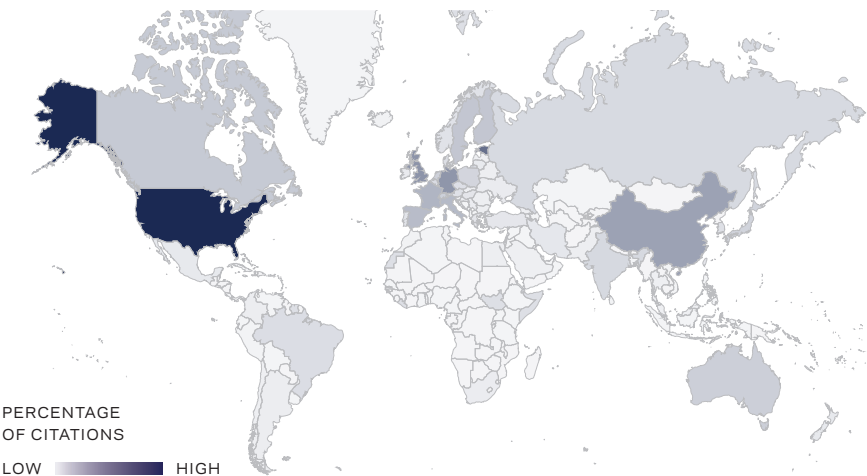
Estonia's share of the world's filed patents is very small (0.01%), though equal to its share of granted patents.



Global distribution of citations

In line with the general expectations, Estonia receives most citations from prolific research nations such as the US (12.6%), the UK (6.0%), and Germany (5.8%); a large scholarly output naturally means a large number of references. Since researchers are likely to make use of re-

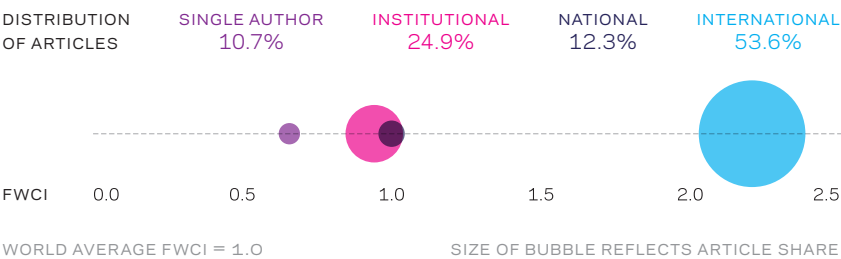
search in their own language, Estonia also receives a large share of its citations from within Estonia (8.2%). More interesting are the citation shares of Finland and Sweden (2.8% and 2.9%, resp.), indicating close ties to its northern neighbors.



Collaboration patterns

The majority of Estonia's publications result from international collaboration. These internationally co-authored publications have an FWCI of over twice the world average and definitely benefits Estonia's overall citation impact. Estonia's nationally and institutionally collaborated publications account for over a tenth and a fifth of its total output, and are both close to the world average FWCI at 1.0

and 0.94, respectively. Only the single-author publications are cited less than the world average, by about 34%.



Researcher mobility

Estonia has a rather large sedentary group of researchers: the majority of them have never published with an affiliation outside of the country. They also have a lower citation impact than researchers in other categories. Over one third of Estonian researchers are showing transitory mobility, meaning they stay abroad or in Estonia for a short period of time before

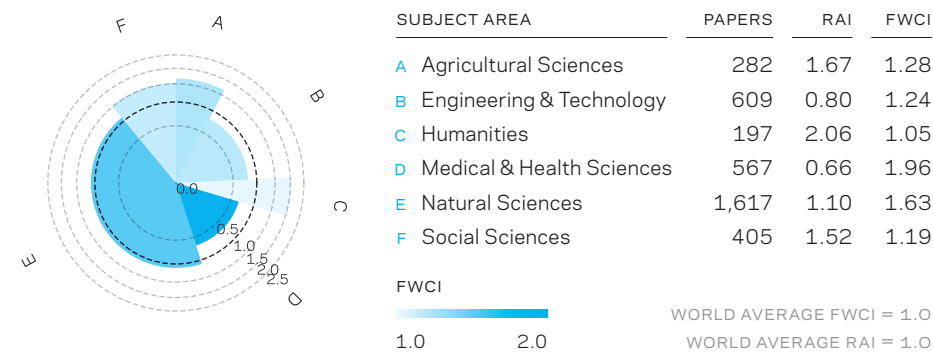
moving back to Estonia or elsewhere. Remarkably, Estonia's inflow of researchers is almost twice as high as its outflow, suggesting it is an attractive destination to international researchers.



Subject breakdown

The subject Estonia excels at is the Natural Sciences: it shows a relative activity of about 10% above the world average, has the largest total output, and produces publications that are cited 63% more often than the world average. Although Estonia is relatively highly active in the

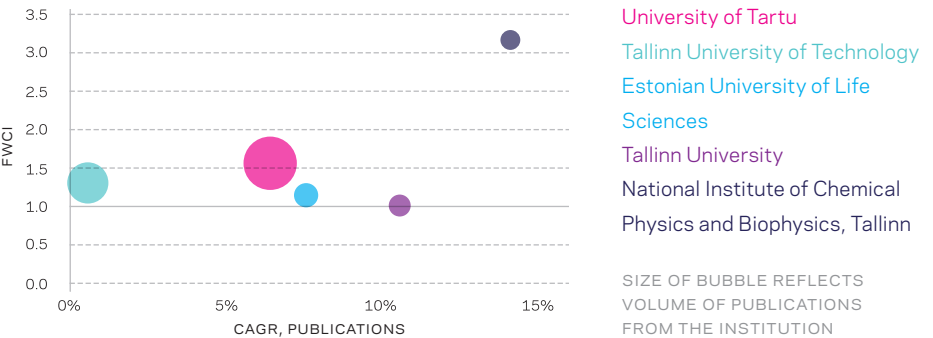
Humanities, producing more than twice as many publications in this subject compared to the world average, it is Estonia's smallest subject by absolute output, and has the lowest FWCI.



Most prolific institutions

All of Estonia's most prolific institutions have an above average FWCI. The highest FWCI is attained by the smallest of these five, namely the National Institute of Chemical Physics and Biophysics; its publications are cited more than three times as often as the world average. This

institution is also the fastest growing, with a CAGR of over 14%. While the University of Tartu already produces significantly more than the others, it still has a significant growth rate of 6.4%.





FINLAND

Even though Finland benefits from its international collaborations, with an FWCI twice as high as the world average, most researchers only publish from affiliations within Finland itself.

Finland shows great commitment to advancing research, with a relatively high percentage of GDP spent on research and development. In fact, there seems to be more focus on scientific publications than on patenting activity. University of Helsinki produces the largest volume of

publications, shows the highest growth percentage, and has the highest FWCI.

Headline statistics

GERD is 3.5% of GDP

Finland ranks 3rd highest GERD percentage of GDP out of all countries with available data for 2012.

Focus on publications rather than patents

Finland's global shares of patents filed and patents granted are lower than its share of publications.

Largest mobility class is sedentary

Out of all mobility classes, the largest proportion of Finland's active researchers show no mobility.

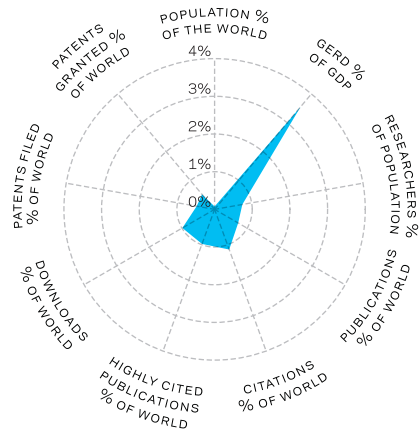
Well-rounded research activity

Finland's research activity is spread across different disciplines, all with above world average FWCI.

Overall country or region outlook

With only 0.08% of the global population, Finland produces 0.7% of the world's scientific output, and receives 1.1% of all citations. What stands out the most is Finland's relatively high GERD: with 3.5% of its GDP, Finland ranks third amongst all countries with available data.

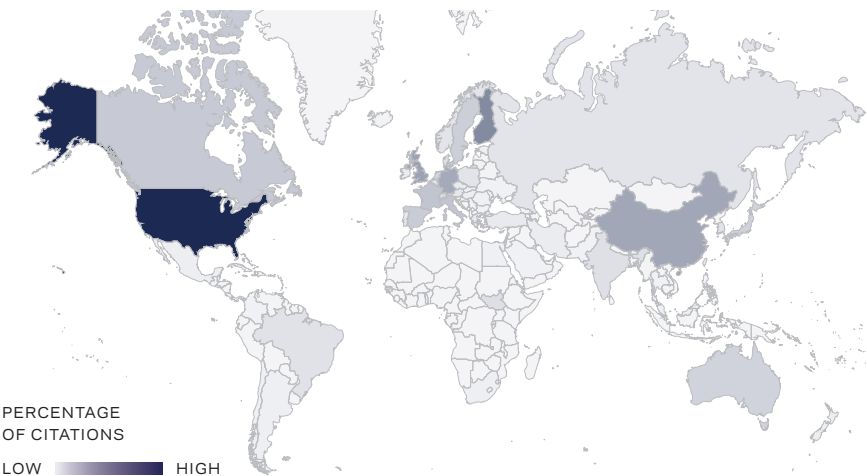
Finland's global shares of patents filed and patents granted are lower than shares of publications, citations, or downloads.



Global distribution of citations

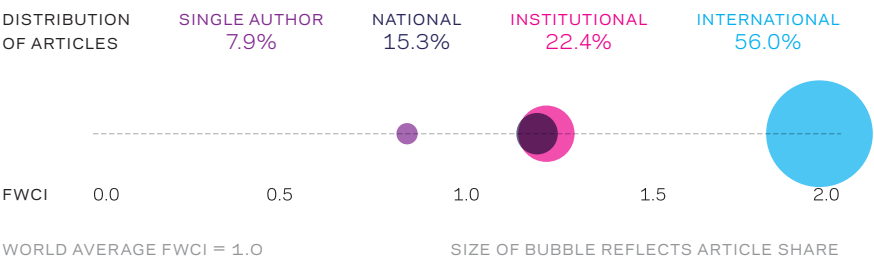
8.6% of all citations towards Finland's publications come from Finland itself, which is only surpassed by the US with 16.5%. From a different perspective, if we look at all outgoing citations given by Finland, 16% goes towards Finland's own research. The UK (with 6.6% of all cita-

tions received by Finland), China (6.2%), and Germany (6.0%) also contribute substantially to Finland's citations.



Collaboration patterns

Over half of all publications with a Finnish affiliation are published with an international co-author, leading to an average FWCI that is almost twice as high as the world average. As a reference, Finland's nationally co-authored publications have an average FWCI of only 16% above the world average.



Researcher mobility

A slight majority of Finland's active researchers are mobile (55.5%). What stands out, however, is that the category of sedentary researchers, the ones who have never published with an affiliation outside of Finland, is in fact the largest category. For most other countries in Europe this is the case for the transitory researchers. In general, sedentary re-

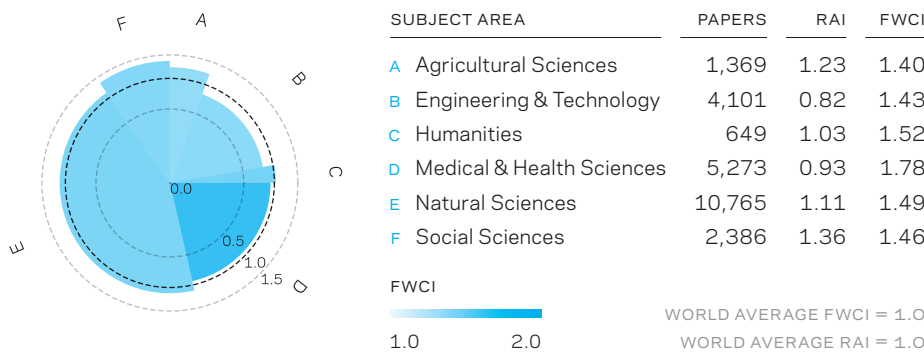
searchers typically publish publications with lower FWCI. In the case of Finland, even though FWCI for sedentary researchers is the lowest FWCI amongst the mobility categories, it is still 40% above the world average.



Subject breakdown

The subject-level breakdown shows well-rounded activity, with slightly less focus than expected based on the world average for Engineering & Technology and for the Medical & Health Sciences, and above average focus in the Agricultural Sciences, the Humanities, the Natural Sciences,

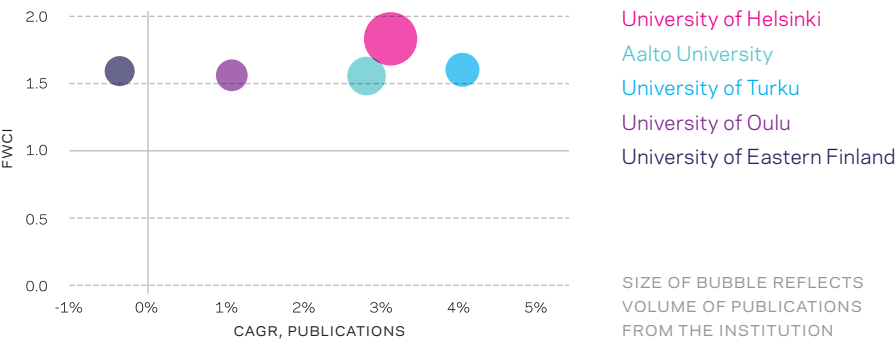
and the Social Sciences (highest at 36% above the world average). In addition, the FWCI for all disciplines is well above the world average, another indicator of well-rounded activity.



Most prolific institutions

The top five most prolific institutions in Finland all show FWCI well above the world average, with University of Helsinki as the front runner, in different ways: largest volume of articles (4,507 publications in 2014), the highest FWCI (83% above

world average) and second fastest annual growth, after Turku University.





FRANCE

France, home to world-renowned institutions such as CNRS and INSERM, receives a relatively high share of global citations. International collaboration is a crucial factor, as it is the only collaboration type with an FWCI well above the world average.

France shows a clear focus of their scientific activity on the Natural Sciences, the only discipline in which France is more active than expected based on the world's activity. France's active researchers show high levels of mobility, and their work receives citations from large nations

globally, as well as strong research nations within Europe.

Headline statistics

6.5%

CITATION SHARE

France's citation share of 6.5% is higher than its publication share of 4%.

CONNECTIONS

European countries

France has a strong European citation network. After the US and China, many European countries cite France's research frequently.

International collaboration increases FWCI

All other collaboration types show FWCI of either around the world average, or even below.

FOCUS AREA

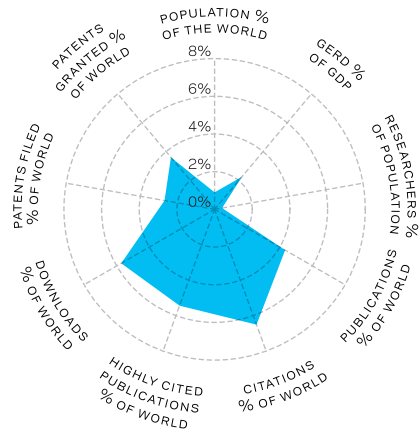
Natural Sciences

The Natural Sciences is the only discipline in which France shows above average activity focus.

Overall country or region outlook

France publishes 4.3% of all publications globally. These publications receive higher shares of citations and downloads: 6.5% of the world's citations, and over 5% of the world's downloads.

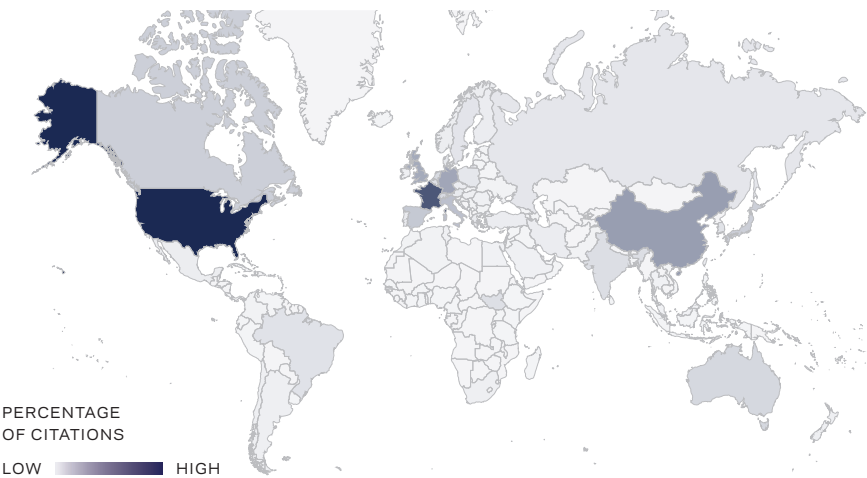
France's shares in patents filed and patents granted are lower than its publications share at 2.7% and 3.6%, respectively.



Global distribution of citations

French research is cited most by US researchers (17% of France's total citations are coming from the US), which is unsurprising because of the US' high levels of output. In second place is France itself (13%) and China is third (7%). Germany, the UK, Italy, and Spain are next on the

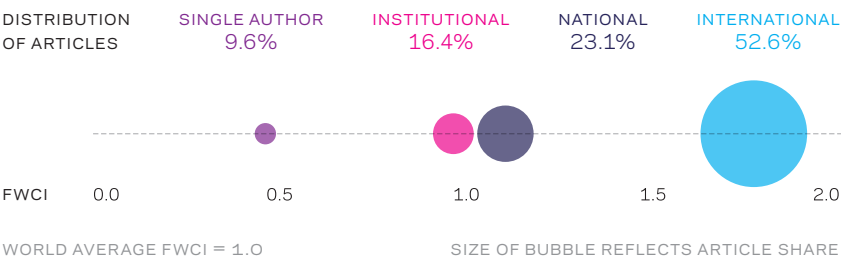
list, showing a strong European citation network of French publications.



Collaboration patterns

A little over half the publications that French researchers produce are co-authored with an international co-author. These publications are also the ones that have the highest FWCI at 77% above the world average. In comparison, national collaboration publications have an average FWCI of 1.1, only slightly above the world average. Institutional collaboration and single-author publications both have

FWCI below the world average, underlining the importance of international collaboration for France's overall FWCI.



Researcher mobility

France's researcher population is showing a relatively high level of mobility. Only 36.8% of all active researchers, who have at least once published with a French affiliation, are sedentary, and do not show international movement through their affiliations at all. The largest proportion of France's active researchers show transitory mobility, meaning that they spend

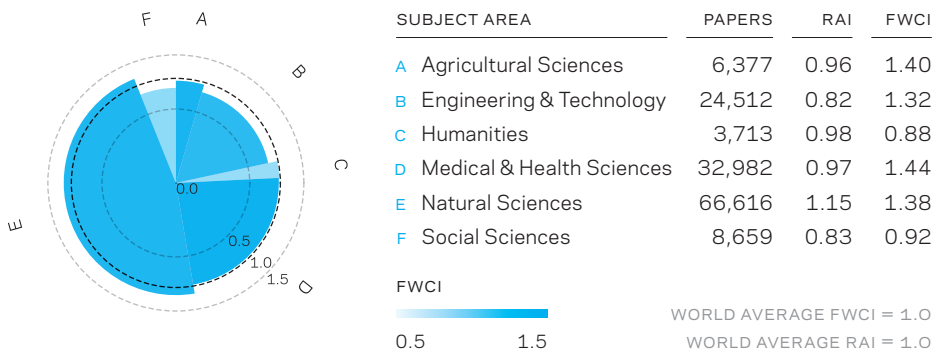
less than two years abroad. The outflow of active researchers (9.3%) is slightly larger than the inflow (8.4%).



Subject breakdown

There is only one discipline in which France is showing activity that is higher than expected based on world activity in that discipline: the Natural Sciences. For all other disciplines, activity is either very close to the world average (the Agricultural Sciences, the Humanities, the

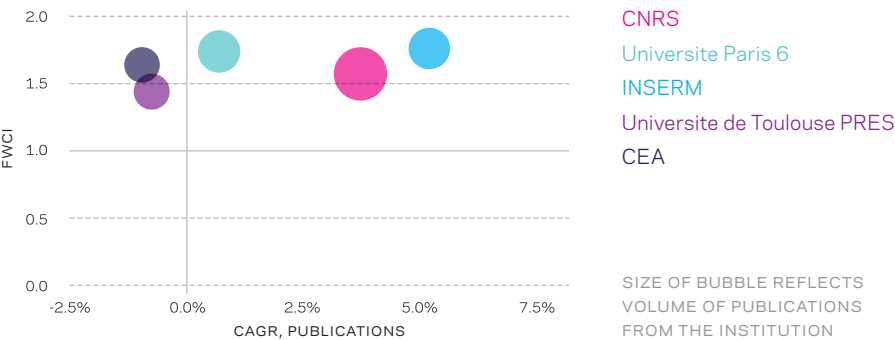
Medical & Health Sciences), or well below (Engineering & Technology and the Social Sciences). France's FWCI is lowest for the Humanities and the Social Sciences, and highest for the Medical & Health Sciences.



Most prolific institutions

Among France's most prolific institutions are well-renowned organisations such as CNRS (ranking most prolific with more than 9,000 publications in 2014) and INSERM (ranking third with almost 5,500 publications in 2014). Université Paris 6 is the second most prolific institution, but

the most prolific university (with around 5,700 publications). CNRS and INSERM show the highest annual growth. FWCI is well above the world average for all in the top five.





GERMANY

Germany, one of the most prolific countries in research, globally, shows a well rounded and high quality performance in research, with high top cited article shares, high patent shares, and high citation impact.

Although citations to German research come from all over the world, Germany collaborates less internationally than many other mature research countries. However, in line with the general trend, such publications do have a very high FWCI. More than 43% of Germany's

researchers show transitory mobility – spending short periods abroad – yet over a third still only ever published with a German affiliation.

Headline statistics

High share of top cited articles

Germany's global publication share is 6%, but its share of the world's most highly cited articles is 8%.

Importance of innovation

Germany holds a relatively high share of 7% of the world's filed patents, and close to the same share of granted patents.

STRONG AREA

Natural Sciences

Germany performs well consistently across all subjects, but is most prolific in this subject, both in absolute numbers and relative activity.

INTERNATIONAL COLLABORATION

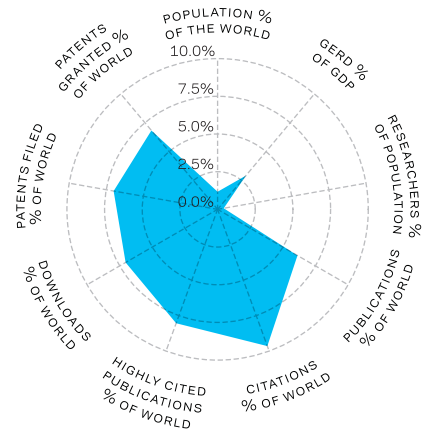
Relatively low

Contrary to most mature research nations, international collaboration accounts for less than 50% of Germany's output.

Overall country or region outlook

Germany is home to just about 1.2% of the world's population, of which 0.4% consists of researchers. Yet it publishes about 6.1% of the world's scholarly output, and 8% of the world's top 10% most cited articles, indicating a high quality of research. This is also indicated by its 9.7% share of the world's citations and 7% of the world's downloads.

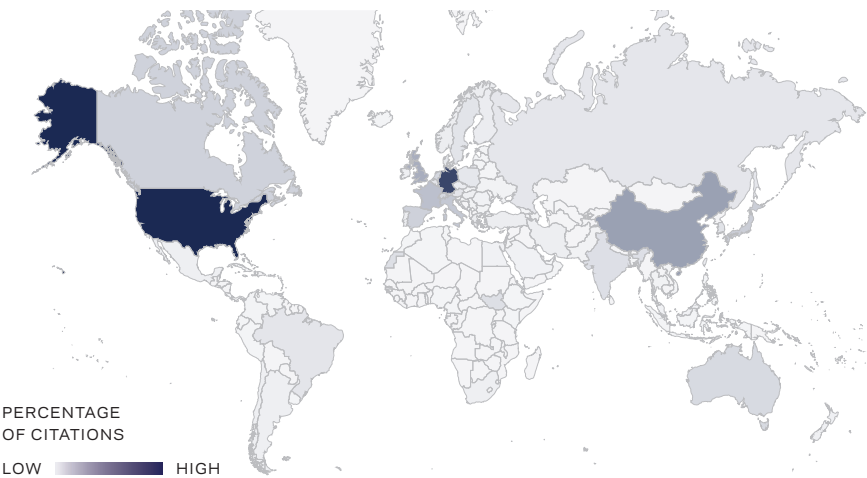
Germany has a 7% share of the world's filed patents, and almost an equal share (6.8%) of the world's granted patents.



Global distribution of citations

Germany's citations come from all over the world, and are expectedly skewed towards the US (over 18%), China (7.4%) and Germany itself (15.5%). This is mainly due to their large publication output, and a tendency to cite research of one's own country can be observed in nearly every

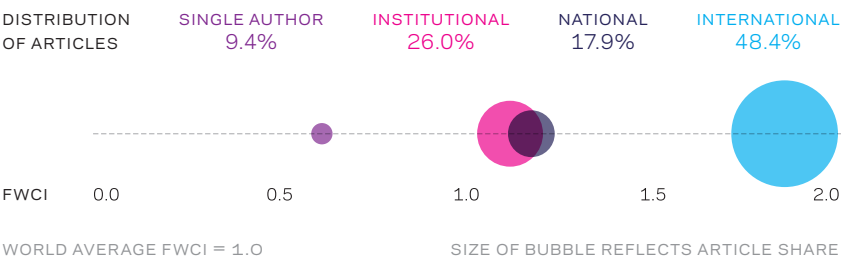
country or region. Likewise, prolific research nations such as the UK (6.3%) and France (4.6%) also contribute to sizable shares of Germany's citations. Other countries that frequently cite German publications include Italy (4%), Japan (3.4%), and Spain (3.1%).



Collaboration patterns

Just under half of Germany's scholarly output is the result of international collaboration. These publications are the most impactful, being cited 85% more than the world average. With an FWCI of 1.17, the second most cited type of collaboration is national collaboration. Although institutional collaboration is more frequent in Germany, such publications are cited slightly less, having an FWCI of 1.12. Ger-

many's single-author publications are the only ones to fall short of the world average: they are cited about 39% less.



Researcher mobility

Germany's research base is a fairly mobile one. The largest category is that of transitory mobility: those that move abroad – or to Germany – for a short period, after which they leave again. Germany's outflow is somewhat larger than its inflow, but the researchers coming to Germany have a slightly higher average citation impact than those leaving. Over a third of its

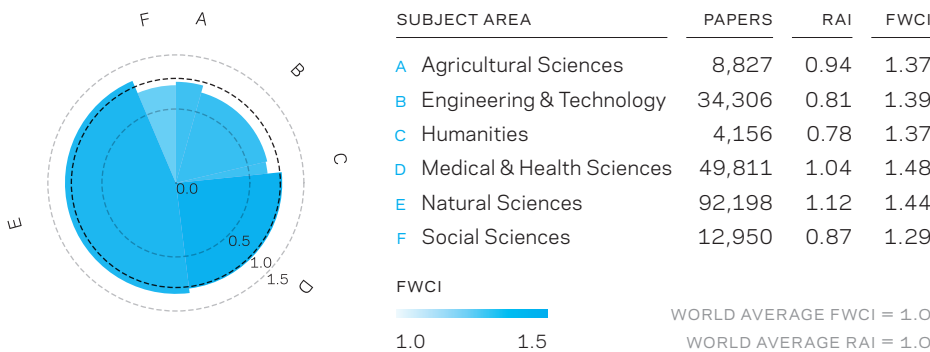
researchers – mainly the relatively junior ones – do not publish with institutions outside of Germany at all.



Subject breakdown

Germany shows an all-round strong performance in research. Its relative activity index is close to the world average in all subjects, ranging between 0.8 and 1.1. This means that Germany's profile in terms of publication activity is very similar to that of the world. In terms of FWCI, all subjects result in above world average

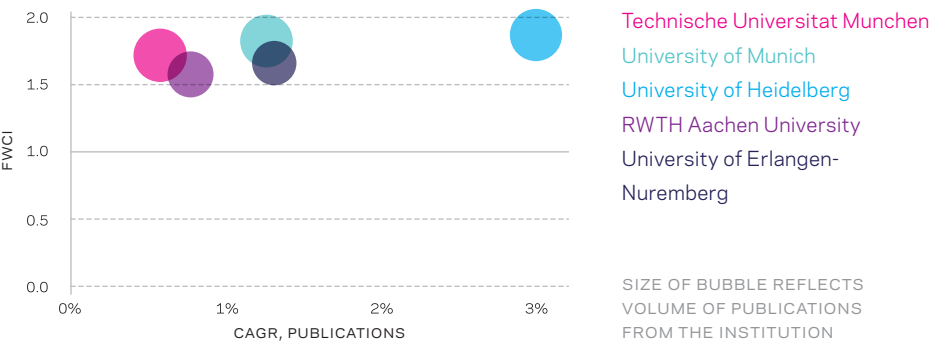
impact, being cited between 30-50% above average. Despite this, Germany does show a certain focus on the Natural Sciences, in which it publishes most of its output and has the highest relative activity index, as well as the second highest FWCI.



Most prolific institutions

Germany's top five most prolific institutions show very similar growth rates; four of them have a CAGR of either a little under or a little over 1%. Only the University of Heidelberg stands out in this, increasing its output at 3% per year. This institution also achieved the highest FWCI of the

top five, being cited 87% more often than the world average. It is therein closely followed by the University of Munich, which has an FWCI of 1.82. All of the top institutions produced between 3,800 and 5,000 publications in 2014.





GREECE

Greece is receiving a relatively high share of the world's downloads, compared to its share of publications, suggesting a growing interest in Greece's research. Greece's share of the world's scholarly output is small, but it performs well in all subjects, with above world average FWCI.

In terms of Greece's collaboration, only the internationally collaborated publications achieve a citation impact that is above the world average, though national and institutional collaboration are not too far below (0.90 and 0.95, respectively). A large share of Greece's researchers

(47%) are sedentary; they have not published with any affiliations outside of Greece.

Headline statistics

Frequently downloaded publications

Greece's share of the world's total downloads is close to 1%, indicating a relatively high interest in Greece's research.

Rather sedentary researcher base

Nearly 47% of Greece's research base has published exclusively with Greek affiliations.

All-round activity across subjects

Greece's relative activity approaches the world average in most subjects.

MOST PROLIFIC INSTITUTION

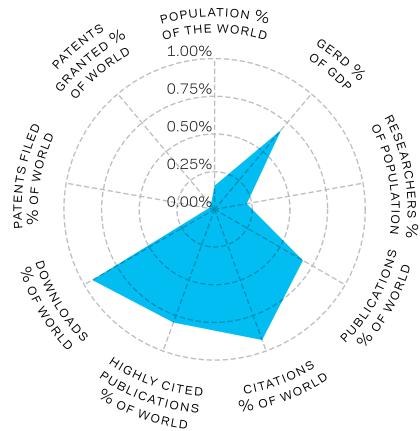
University of Athens

In publication volume and CAGR the University of Athens is ahead of other prolific institutions in Greece, and its FWCI is the 2nd highest.

Overall country or region outlook

Greece publishes 0.7% of the world's scholarly output, has a 0.8% share of the world's top cited articles, and receives 0.9% of the world's citations. Its spending on research and development (as measured by % of GDP) is lower than that of most other southern European countries. Greece's strength appears to lie in more immediate usage of its research articles: it receives 0.9% of the world's downloads.

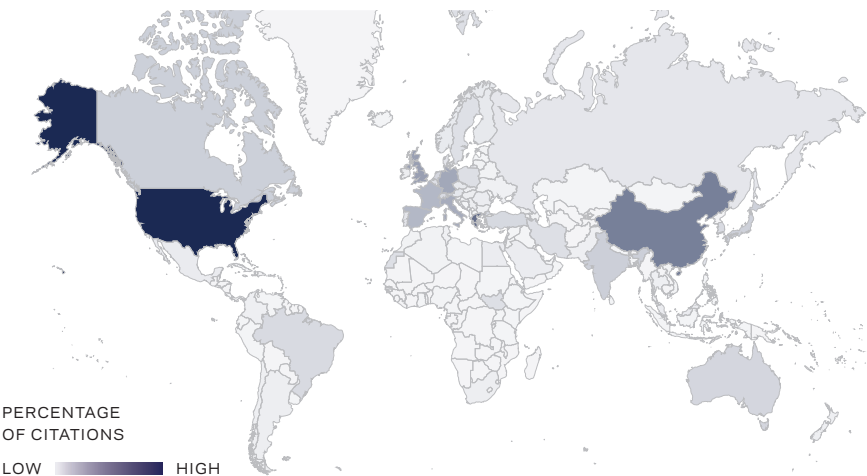
Greece's share of the world's filed patents is a mere 0.04% and so is its share of the world's granted patents.



Global distribution of citations

As the US and China publish a very large share of the world's output, any country is likely to receive a large share of its citations from these countries. Greece is no exception to this, with the US having a 13.8% share, and China 7.9%. Greece itself also accounts for a fair share of its

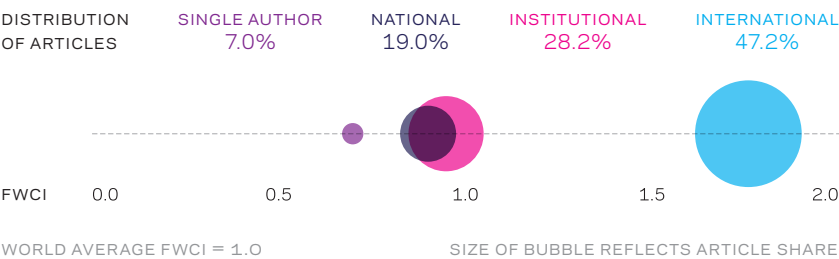
incoming citations (9.1%). A further quarter of Greece's citations is spread relatively equally between the larger European countries: the UK (5.8%), Germany (5.2%), Italy, (4.9%), Spain (4.1%), and France (4.1%). India and Canada are each responsible for about 2.5%.



Collaboration patterns

The largest share of Greece's scholarly output results from international collaboration. This is the only type of collaboration that achieves an above average FWCI: Greece's internationally co-authored publications are cited 76% more than the world average. Institutional collaboration holds both the second largest share of Greece's output and the second highest FWCI, at just below the world av-

erage (0.95). National collaboration is not far behind, with a 19% output share and an FWCI of 0.90. Greece's single-author publications are cited 30% less than the world average and only make up 7% of Greece's scholarly output.



Researcher mobility

Greece's researcher base is somewhat sedentary. Nearly 47% of Greece's active researchers have never published with a foreign affiliation. Greece's researcher inflow is higher than its outflow, suggesting Greece is attractive to international researchers. Furthermore, over a third of its researcher base is showing transitory mobility. This means that although

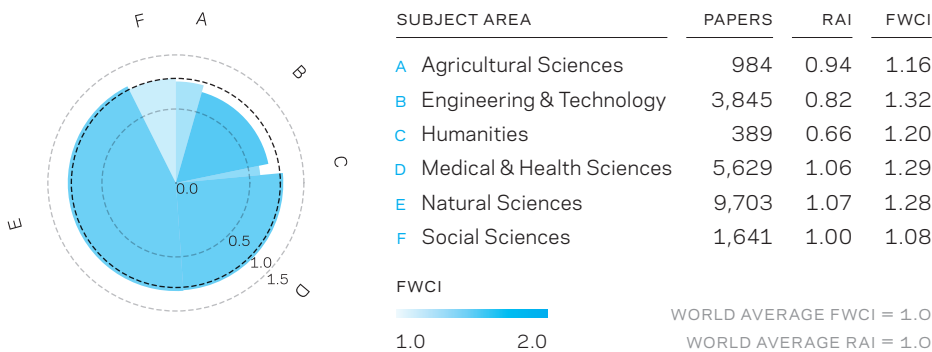
Greece's researchers are unlikely to immigrate or emigrate permanently or long term, short term assignments abroad are more frequent. This is beneficial to Greece's overall citation impact, as this group shows the highest average FWCI.



Subject breakdown

Greece performs well all-round: its field-weighted citation impact is above average in all subjects, ranging from about 10% to 30% above the world average. It also shows relative activity that is equal to, or just above, world average levels in most subjects. The Humanities is Greece's

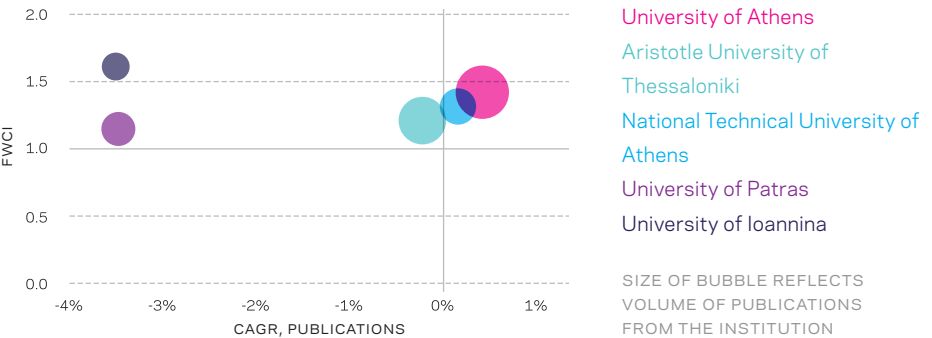
smallest subject - less than 400 publications - and the only subject showing a significantly low relative activity (0.66). Nevertheless, its FWCI of 1.20 is not far from that of Greece's largest and most active subject, the Natural Sciences.



Most prolific institutions

Although all five of Greece's most prolific institutions show an above average FWCI, the growth rates are rather low. The universities with the lowest and highest FWCI (1.15 for the University of Patras, and 1.61 for the University of Ioannina) happen to have the lowest, and even

negative CAGR of -3.5%. Somewhat surprisingly, the institution with the largest publication output - University of Athens - shows the highest growth rate: 0.4%.





HONG KONG

A small and vibrant city, Hong Kong shows exceptionally high levels of international collaboration and its researchers are highly mobile. The city produces relatively fewer but at the same time highly impactful papers that are highly cited in all subject areas.

Hong Kong publishes 0.2% of the world's scholarly output and 0.3% of the world's top 10% most cited papers. It receives around 0.3% of the world's citations and downloads. Citations to Hong Kong research come mainly from China and the US, and also from the UK with which it

has historical ties. With a relatively small number of institutions, papers from Hong Kong are least likely to be collaborations across Hong Kong institutions; over 70% of its papers are, however, internationally co-authored.

Headline statistics

Relatively large amount of patents filed and granted

Hong Kong has only 0.1% of the world's population but holds 0.7% of the world patents filed and granted.

72% OF PAPERS ARE INTERNATIONAL COLLABORATIONS

In contrast, only 1.2% of its papers are collaborations across Hong Kong institutions.

63% TRANSITORY RESEARCHERS

Hong Kong researchers tend to be highly mobile, favouring short time assignments abroad, with 63% of researchers showing transitory mobility.

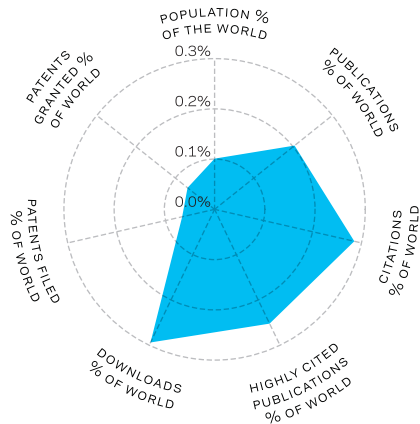
High FWCI in all subject areas

Hong Kong papers are impactful in all subject areas; and depending on their field, they are cited 33% to 70% more than the world average.

Overall country or region outlook

Hong Kong makes up 0.1% of the world's population and publishes about 0.2% of the world's scholarly output, which includes 0.3% of the world's top 10% cited papers. Hong Kong's papers receive around 0.3% of the world's citations and 0.3% of the world's downloads.

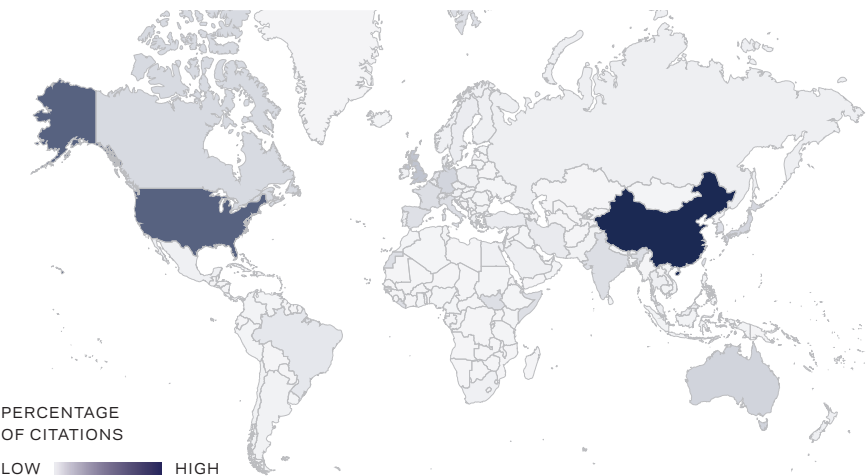
Relative to its population size, Hong Kong holds a relatively large proportion of the world patents filed and granted, at 0.7% each.



Global distribution of citations

Citations to Hong Kong research come from mainly China (23%) and the US (16%). This is expected since the USA and China are prolific countries, and since China and Hong Kong have a constitutional relationship. Other countries whose citations form a sizable share of Hong Kong's incoming citations (excluding

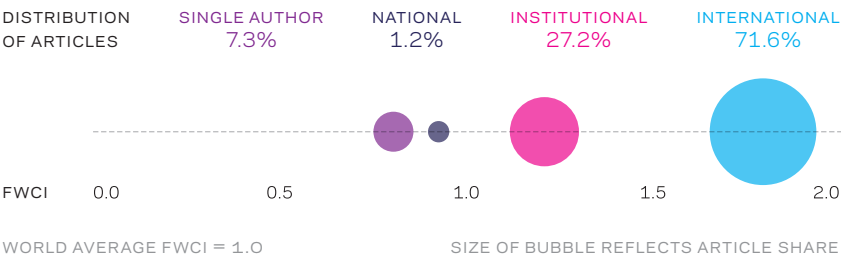
Hong Kong itself) include the UK (5.3%), Australia (3.6%), Germany (3.5%), Japan (3.3%), and Canada (2.9%).



Collaboration patterns

At 72%, an exceptionally high proportion of Hong Kong's total scholarly output results from international collaborations; these internationally collaborated papers are cited about 80% more than the world average for all collaboration types. Hong Kong's institutional collaborations make up about a fifth of its total scholarly output and are cited 21% more than the world average. Together, nationally col-

laborated and single-author papers each make up less than 10% of its total scholarly output and are respectively cited about 7.6% and 20% less than the world average.



Researcher mobility

The majority of Hong Kong's relatively small researcher population is transitory, meaning that movement of researchers abroad are mostly on a short term basis. Hong Kong's researcher outflow, where researchers emigrate abroad more permanently, is at 15% of its total researcher population. This is higher than its researcher inflow at about 12% of its

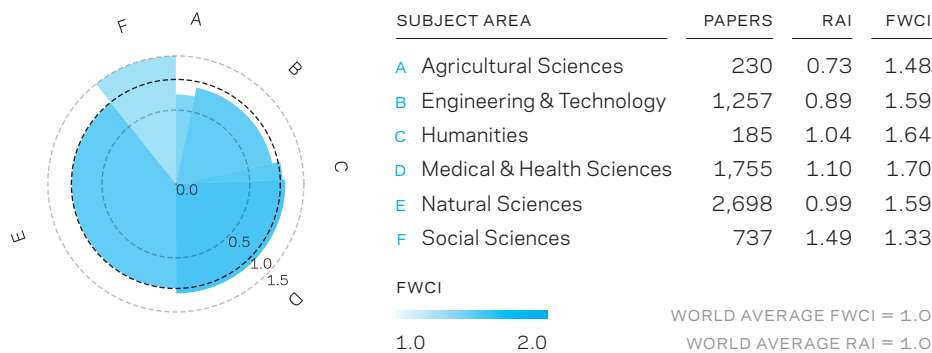
total researcher population. The smallest group of researchers are sedentary, having published only under a Hong Kong affiliation.



Subject breakdown

Hong Kong is the most prolific and impactful in the Natural Sciences with almost 40% of its total output in this area; these papers are cited almost 60% more than the world average. Hong Kong's papers are, in fact, well cited in all subject areas, ranging from being cited 33% more than world average for papers in the

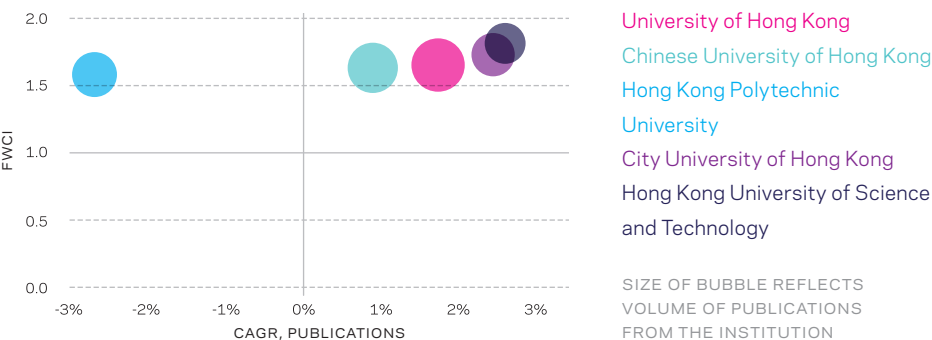
Social Sciences, to 70% more than the world average for papers in the Medical & Health Sciences. Compared to the world average, Hong Kong publishes a higher proportion of its output in the Social Sciences, and fewer in the Agricultural Sciences.



Most prolific institutions

Hong Kong's top five universities each published between 2,200 (Hong Kong University of Science and Technology) and 3,800 papers (University of Hong Kong) in 2014. All top five Universities have highly positive FWCI, meaning that they are cited, on average, more than the

world, from 58% more (Hong Kong Polytechnic University) to 81% more (Hong Kong University of Science and Technology). With the exception of Hong Kong University of Science and Technology, the remaining universities have moderate growth rates, between 0.9% and 2.6%.





HUNGARY

Though a relatively small country in terms of research output (0.4% of world publications), Hungary's world publication share is actually well above its world population share. Its publications are also cited and downloaded more often than the world average.

Hungary's research is highly international. Half of its publications involve at least one author from outside of the country. This number is comparable to that of the Western European countries. The Natural Sciences and the Medical & Health Sciences are the two largest subjects for

Hungary. Publications in these two subjects also have the highest FWCI among the subject areas.

Headline statistics

Relative high publication share

Hungary produces around 0.4% of the world's publications, well above its world population share at 0.1%.

High international collaboration

Around half of Hungary's publications result from international collaboration.

FOCUS AREA

Natural Sciences

Hungary has the largest number of research output and a high FWCI in the Natural Sciences.

MOST PROLIFIC INSTITUTION

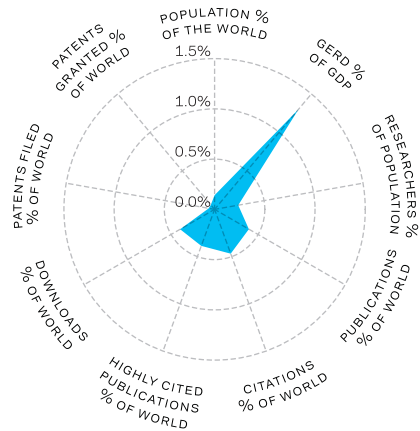
Hungarian Academy of Sciences

The Hungarian Academy of Sciences is the most prolific institution in Hungary.

Overall country or region outlook

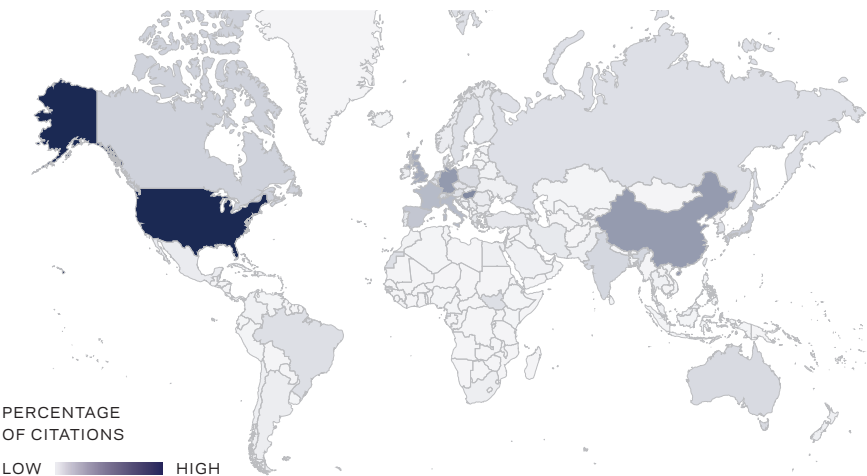
Hungary produces around 0.4% of the world's publications (8,827 in 2014), well above its world population share at 0.1%. It receives 0.5% of the world's citations and contributes to 0.4% of the highly cited articles worldwide. Both are slightly above its world publication share.

Hungary shows a relatively high GERD as percentage of GDP compared to its other research indicators.



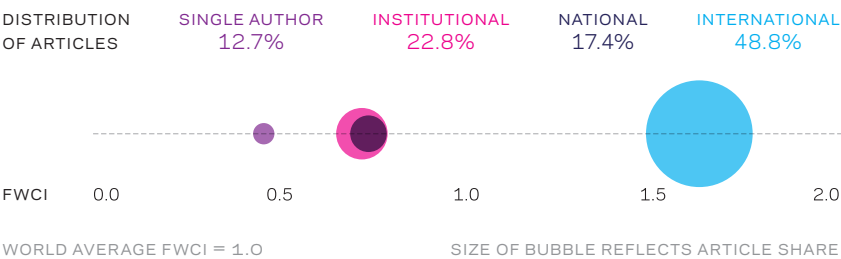
Global distribution of citations

Besides Hungary itself, the large countries in terms of research output contribute to most of Hungary's received citations. These countries include the US (15.2%), Germany (6.7%), China (6.5%), and the UK (5.5%). Among the Eastern European countries, Poland and Russia are among Hungary's top twenty citing countries.



Collaboration patterns

Hungary's research is highly internationally collaborative. Around half of its publications involve at least one researcher from outside of the country. These publications have the highest FWCI among the four collaboration types (62% higher than the world average). National and institutional collaboration each contributes to around 20% of Hungary's publications.



Researcher mobility

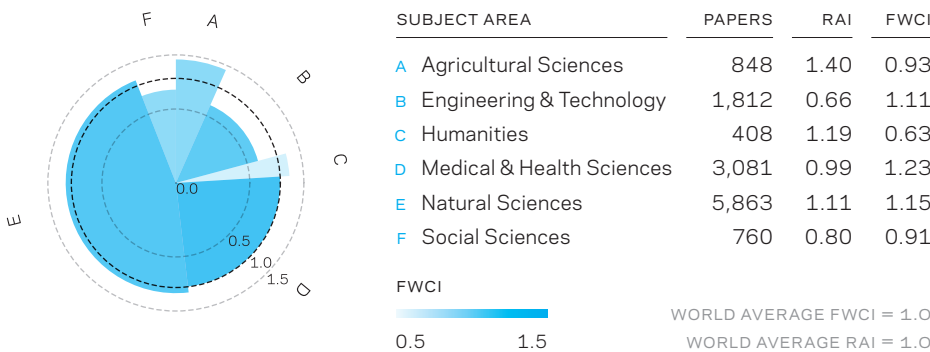
There co-exists a group of highly mobile researchers in the transitory category (41.0% of Hungary's active researchers) and a group of sedentary researchers (42.9% of Hungary's active researchers). Hungary has a slightly higher percentage of inflow researchers than outflow.



Subject breakdown

Hungary shows a research focus on the Natural Sciences. Across all subject areas, Hungary's output in the Natural Sciences has the largest number of publications (5,863), the second highest FWCI (15% higher than the world average), and a higher than world average level of

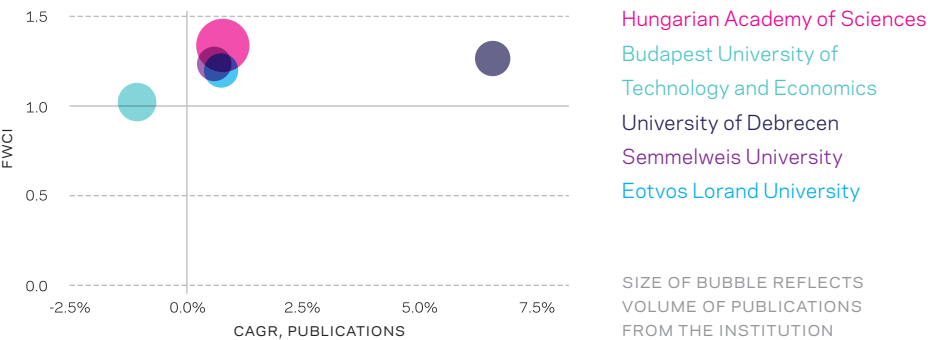
research activities (1.11). The Medical & Health Sciences are the second largest subject for the country, and it also has the highest FWCI (1.23).



Most prolific institutions

The Hungarian Academy of Sciences produces the largest amount of publications in Hungary (around 2,200 in 2014). It also has the highest FWCI among the top five most prolific institutions in Hungary (1.34). All five institutions have an FWCI higher than the world average of 1.0. Uni-

versity of Debrecen leads in the increase of publications with an annual growth rate of 6.6%.





ICELAND

Iceland publishes only around 1,100 publications per year. The citation impact of these publications is very high, more than twice the world average in 2014. The Medical & Health Sciences are the research strength and focus of Iceland.

Iceland's research is highly international. This is reflected by the high share of internationally collaborated publications out of all of Iceland's publications, and the high share of researchers in the transitory category out of all active researchers.

Headline statistics

FWCI more than 2× world average

The FWCI of Iceland's publications is more than 2 (twice the world average) in 2014.

High international collaboration

More than 75% of Iceland's publications involve at least one international colleague.

Highly mobile researchers

The majority of Iceland's active researchers belong to the transitory category, who move in and out of the country frequently.

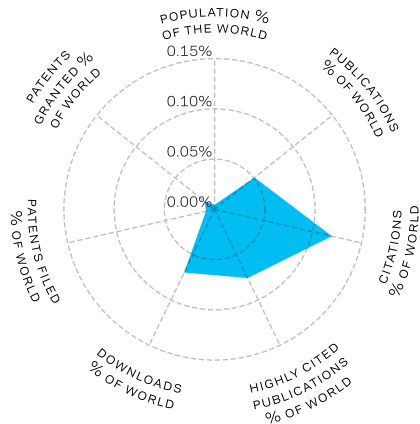
CONNECTIONS

Northern Europe

Northern European countries are among the top citing countries of Iceland's publications.

Overall country or region outlook

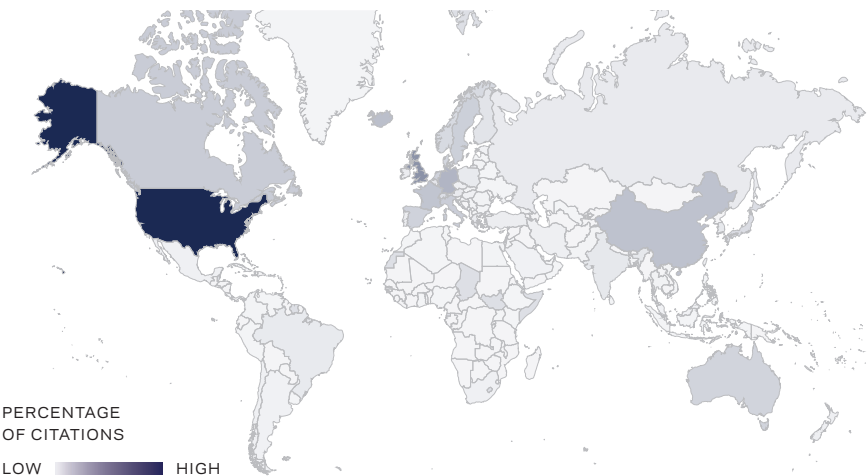
Iceland produced about 1,400 publications in 2014, accounting for 0.05% of the world's publications. These publications are highly cited and frequently downloaded. Iceland receives 0.12% of the world's citations, contributes to 0.08% of highly cited articles, and receives 0.07% of downloads. All of them are proportionally larger than Iceland's publication share.



Global distribution of citations

Iceland receives the largest amount of its citations from the US, the UK and Germany. Most of the top citing countries of Iceland are from Europe. There is a clear linkage between Iceland and the Northern European countries such as Sweden, Denmark, Norway, and Finland. These

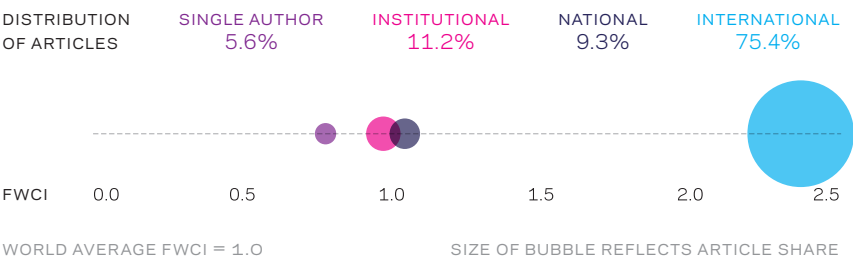
countries all appear among the top twenty citing countries of Iceland.



Collaboration patterns

More than three-quarters of Iceland's publications result from international collaboration. These publications have an impressive FWCI of 2.37, or 137% higher than the world average. Other types of collaboration contribute to less than a quarter of the country's publications. The FWCI of the publications from these collaboration types is much lower than that

of internationally collaborated publications.



Researcher mobility

Iceland has a small number of active researchers (2,074 from 1996 onwards). These researchers are, however, very mobile. Only 21.6% of Iceland's active researchers have never had any publication with a foreign affiliation, and 57.5% of the active researchers belong to the transitory category. There is a slightly higher

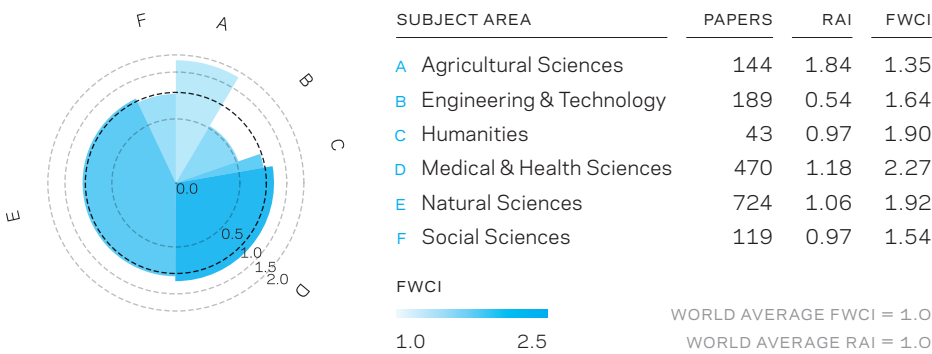
share of inflow researchers than outflow researchers.



Subject breakdown

The largest number share of publications from Iceland is in the Natural Sciences, followed by the Medical & Health Sciences. Iceland also has a high FWCI (2.27) and a high level of research activities (1.18) in the Medical & Health Sciences,

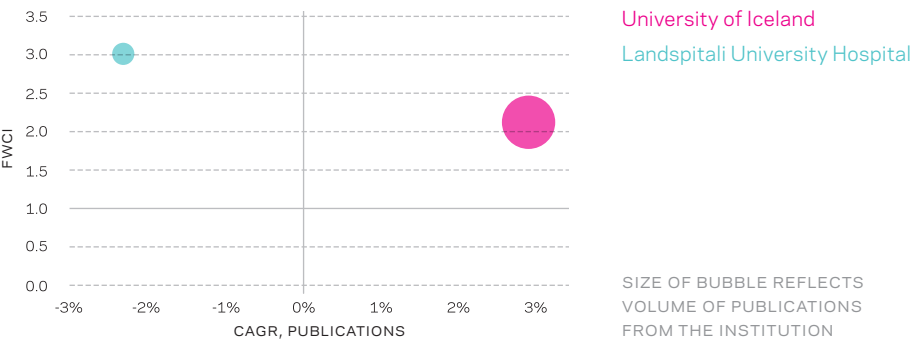
suggesting Iceland's research strength and focus in this area. In terms of relative activity, Iceland's research is particularly focused on the Agricultural Sciences, in which it publishes 84% more of its output than the world.



Most prolific institutions

Iceland has two major research-producing institutions: the University of Iceland and Landspítali University Hospital. The former produces around 700 publications per year, and the latter around 140. The University of Iceland shows fast growth in its publications in the period of 2010-

2014. Both institutions' publications have a high FWCI (more than double the world average).





INDIA

The vast Indian subcontinent is home to a large population, but it has comparatively lower world shares of main research indicators. India's researchers are mostly sedentary and most of their impact appears to be national.

Most collaborations in India seem to be institutional; only 16% of India's papers are internationally collaborative and reach citation impact levels higher than the world average across collaboration types. India is most prolific in the Natural Sciences and Engineering & Technology, in which

it reaches its highest impact, nevertheless still under the world average. India is home to prolific and fast growing institutes, some of which have higher impact than the world average.

Headline statistics

18%

OF THE WORLD'S POPULATION

India publishes nearly 5% of the world's output and over 3% of the world's highly cited output.

Over a quarter of self-citations

The impact and reach of India's research seems preponderantly national.

60%

SEDENTARY RESEARCHERS

Most researchers in India are sedentary; a quarter are transitory, and similarly low proportions have longer mobility patterns.

MOST IMPACTFUL INSTITUTION

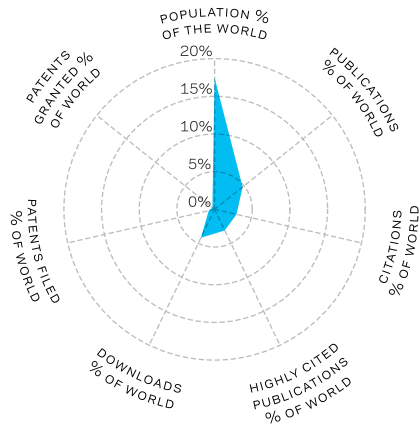
CSIR - Chemistry and Physics

The most impactful Indian institute also has high output and positive output growth.

Overall country or region outlook

The vast Indian subcontinent is home to 18% of the world's population. However, it publishes under 5% of the world's output and over 3% of the world's highly cited output. It also receives under 3% of the world's citations, and over 4% of the world's downloads.

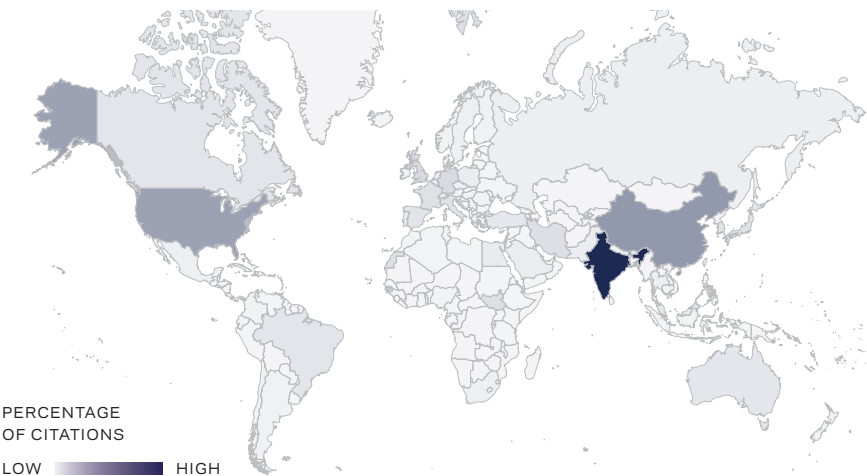
To an even greater extent, India's shares of world patents are much smaller in comparison to its world population share, at 0.8% for patents filed and 0.4% for patents granted.



Global distribution of citations

More than a quarter of India's citations come from India, and over 10% come from China and the US, respectively. The rest of citations to Indian research appear fairly equally distributed globally, with citations coming from American, European, Asian, and African countries. It

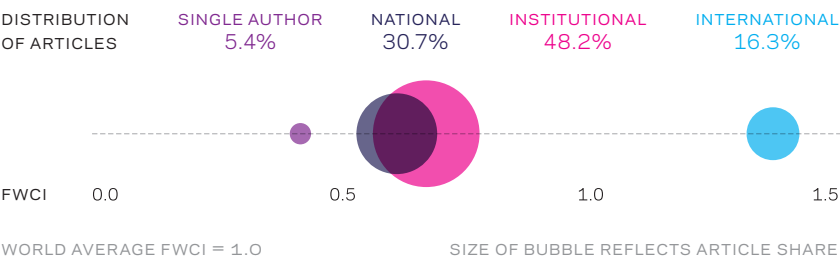
could therefore be argued that the reach of Indian research seems predominantly national.



Collaboration patterns

India's research is mostly institutionally collaborative, with nearly half of its output the result of such collaborations. National collaboration comes next, at over 30% of India's output. The impact of the latter is 39% less than that of the world average across all collaboration types, and that of the former 33% less. Only 16% of India's papers are internationally co-authored, but these yield the highest impact: they

tend to be cited 37% more than the world average across all collaboration types. Single-author papers are rare and 58% less impactful than the world average across all collaboration types.



Researcher mobility

The absolute majority of India's researchers (over 60%) are sedentary, meaning that they have only published under Indian affiliations since 1996; this might be explained, to some extent, by the scale of the country. More than a quarter of India's researchers are transitory, meaning that they display several Indian and non-Indian affiliations in succession, possibly as the

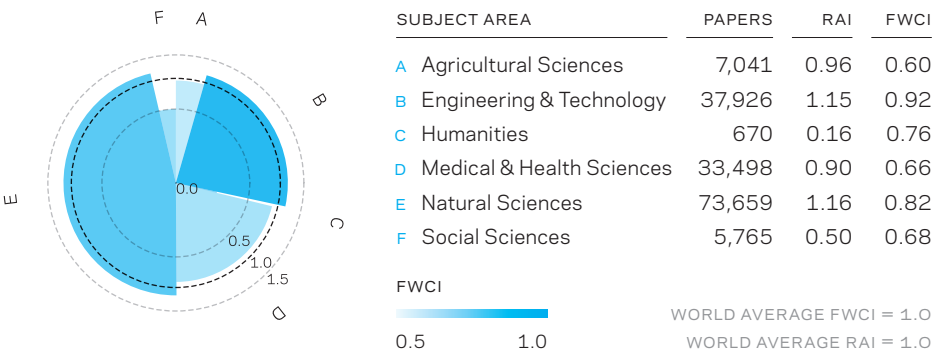
result of short term assignments. Inflow and outflow proportions are similarly low at about 7%, suggesting little long-term mobility.



Subject breakdown

In all subject areas, the impact of India's research is inferior to the world average. India publishes a sizeable proportion of its output in Engineering & Technology, in which it is most impactful and nearly reaches the world average. It is most prolific in the Natural Sciences, its second

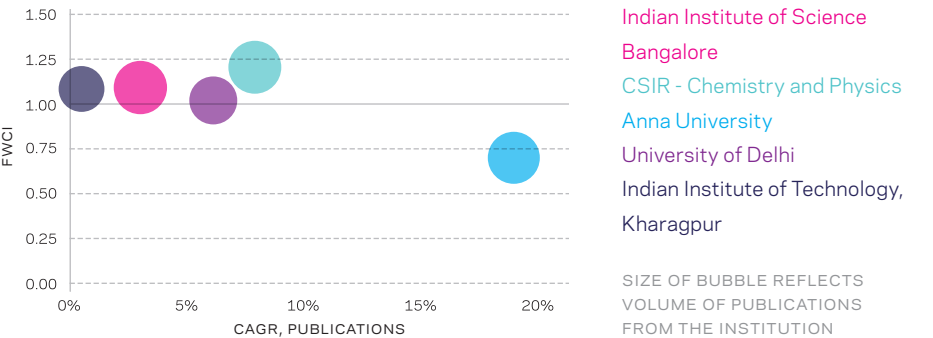
most impactful area. In both these areas, India publishes a relatively higher proportion of its output than the world. On the other end of the spectrum, India is least prolific (relatively and absolutely) in the Social Sciences and the Humanities.



Most prolific institutions

India's most prolific institutions published between 1,565 (Indian Institute of Technology, Kharagpur) and 2,121 (Indian Institute of Science Bangalore) papers each in 2014. All five show positive output growth. Anna University, in particular, has been growing in output at a high 19% per

annum 2010-2014 CAGR; this is, however, accompanied by the lowest impact (30% less than the world average) among the top five most prolific institutes. The most impactful institution, CSIR - Chemistry and Physics, is cited 20% above the world average.





INDONESIA

Indonesia's most prolific institutions all show positive and, in some cases, strong to very strong growth in output in recent years, albeit from a low base, and reaching under world average impact.

While over half of Indonesia's researchers display transitory mobility patterns, nearly a third are sedentary. Over 40% of Indonesia's output is the result of high impact collaboration. While Indonesia is most prolific in the Natural Sciences, it is in lower output subjects, such as the

Medical & Health Sciences and the Humanities, that it reaches above world average impact.

Headline statistics

Highly impactful international collaborations

Internationally collaborated papers comprise 43% of all of Indonesia's output, and they accrue 18% more citations than the world average.

53% TRANSITORY RESEARCHERS

and a higher amount of inflow (13%) than outflow (5%) researchers.

MOST IMPACTFUL AREA

Medical & Health

Indonesia is most impactful in the Medical & Health Sciences; its nearly 1,000 papers in 2014 were cited more than the world average across all subject areas.

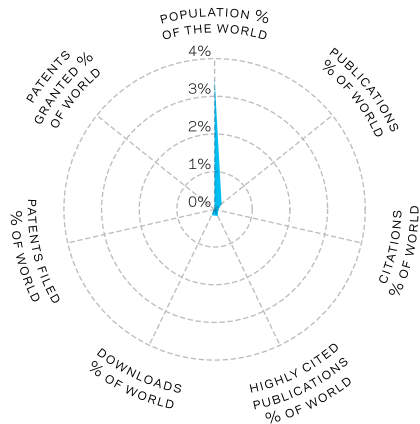
Strong output growth for prolific institutions

Especially Teknologi Sepuluh Nopember at over 30% annual growth CAGR.

Overall country or region outlook

While Indonesia's population accounts for 3.5% of the world's, it only publishes 0.2% of the world's publications and highly cited publications. These accrue an even smaller proportion of the world's citations (0.1%), but an expectedly small share of the world's downloads (0.2%).

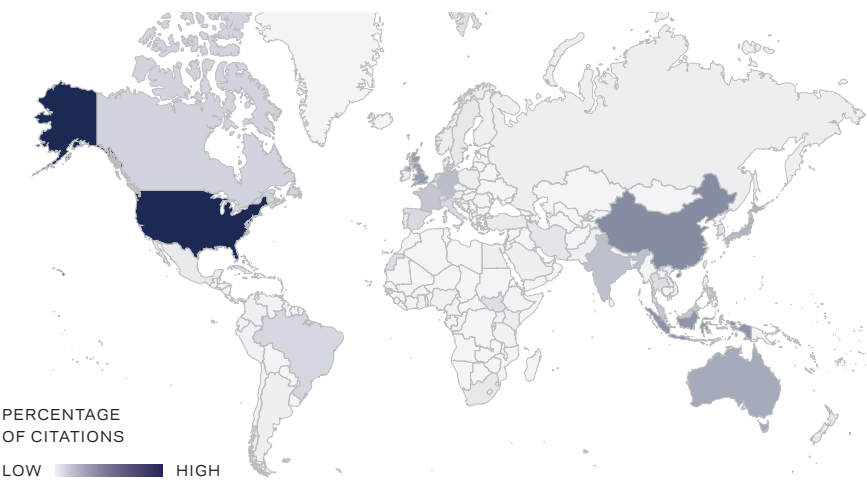
Indonesia files few patents (0.03% of the world), and only a fraction of these actually get granted, so the country's share of patents granted is nearly null.



Global distribution of citations

Indonesia's global citation distribution shows expected preponderance from prolific countries such as the US (nearly 15%) and China. It also presents an unsurprisingly significant share of self-citations. Indonesia also receives sizeable proportions of citations from regional neighbours, Australia, Japan, and India

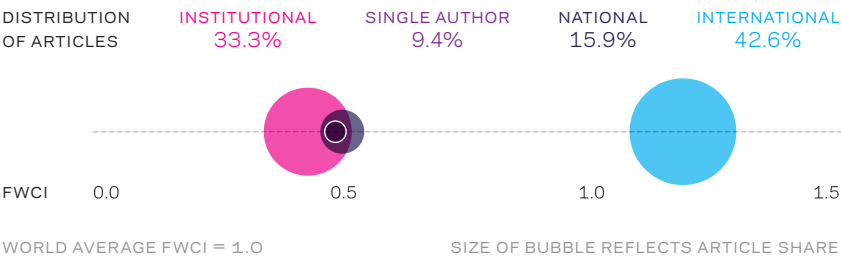
(3.8%), as well as from European countries such as the UK, Germany, and France.



Collaboration patterns

Over 42% of Indonesia's output is internationally collaborated, and these papers reach a citation impact of 18% above the world average across all collaboration types. Other collaboration types yield a smaller impact for Indonesia: while nearly 16% of its papers result from national collaboration, these attain half the impact of the world average across all collaboration types. Institutionally-collaborated

and single-author papers account for nearly one third and one tenth of Indonesia's output respectively, but receive about 51-57% less citations than the world average across collaboration types.



Researcher mobility

More than half of Indonesia's researchers (53%) display transitory mobility patterns, meaning that they have both Indonesian and non-Indonesian affiliation over shortly successive periods of time. Nearly 30% of Indonesia's researchers are sedentary, having only published under an Indonesian affiliation. Long-term mobility classes are proportionally smaller, with

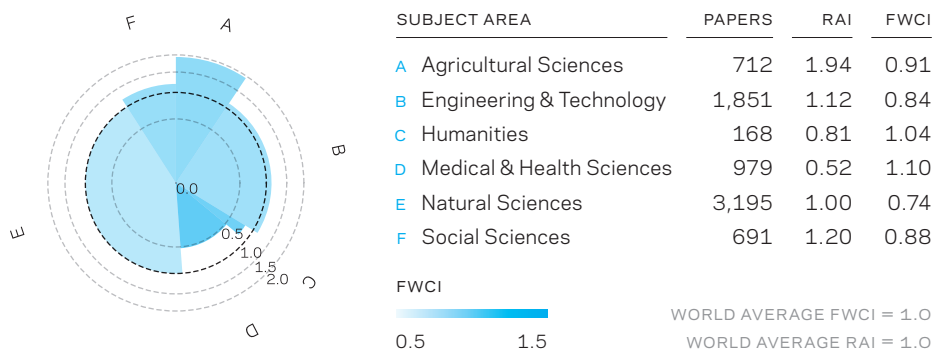
less than 5% of outflow and nearly 13% of inflow, showing a net gain for Indonesia as a more permanent location chosen by researchers.



Subject breakdown

The majority of Indonesia's output is in the Natural Sciences, but these papers have the lowest impact (less than 80% of the world average across fields) of all fields. The distribution of Indonesia's research by subject area is skewed towards the Agricultural Sciences, relative to the world, as Indonesia publishes nearly twice the

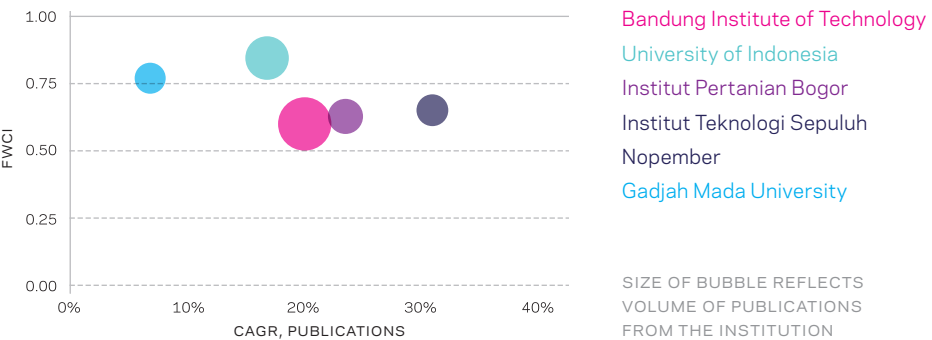
proportion of papers that the world publishes in this area. Again, these attain under world average impact. However, while Indonesia has relatively low shares of its output in the Medical & Health Sciences and the Humanities, these are cited more than the world average across all fields.



Most prolific institutions

All of the top five prolific institutions show positive annual growth, ranging from 6.9% for Gadjah Madah University, to very active at over 30% for Institut Teknologi Sepuluh Nopember. Institut Pertanian Bogor reaches over 23% annual growth, while the output of the most prolific insti-

tution, Bandung Institute of Technology, annually increases by over 20%. These growth patterns are on a relatively low base (fewer than 650 papers for each institute in 2014), and all five have below average impact.





IRAN

Two-thirds of Iran's researchers are sedentary and a quarter show transitory mobility patterns. Nearly 30% of citations to Iran come from the country itself. Iran's internationally collaborated output is low at 21%.

Turbulent international relations may foster this apparent national/local focus in Iranian research. Iran is most prolific in the Natural Sciences, and prolific and impactful in Engineering & Technology, in which it reaches above world average impact. Its most prolific institution is Islamic

Azad University, which shows strong positive annual output growth. Sharif University of Technology has high citation impact but negative annual output growth.

Headline statistics

21% OF INTERNATIONALLY COLLABORATED PAPERS

Cited nearly 30% more than the world average.

2/3 OF SEDENTARY RESEARCHERS

and 1/4 of transitory researchers make up the majority of Iran's researcher population.

MOST IMPACTFUL AREA

Engineering & Tech

Iran is prolific and most impactful in Engineering & Technology. Nearly 15,000 papers in 2014 cited, on average, more than the world average across all subject areas.

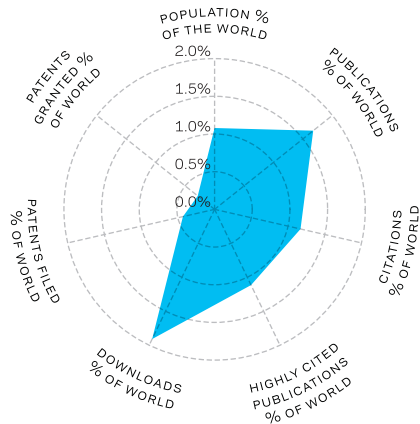
29%
SELF-CITATIONS

Over 1/4 of Iran's citations come from itself, suggesting a predominantly local reach.

Overall country or region outlook

Iran accounts for 1.1% of the world's population, and publishes 1.7% of the world's scholarly output and 1.1% of the world's highly cited papers. Iran's research receives 1.2% of the world's citations, and a slightly higher 1.9% of the world's downloads.

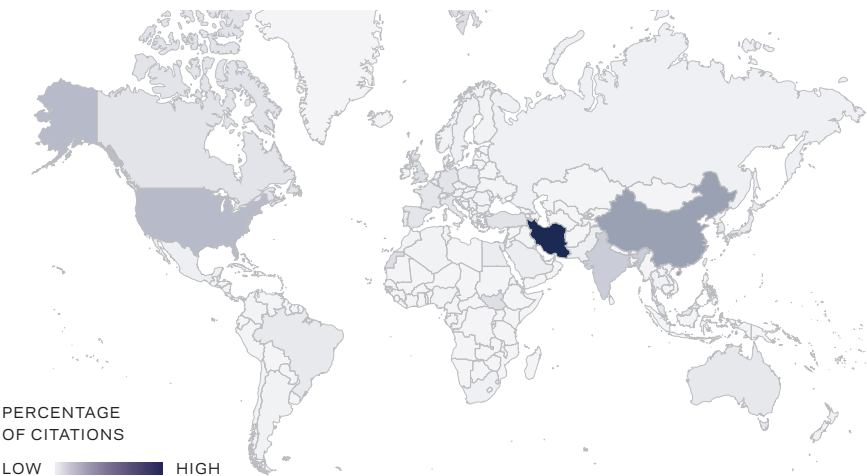
However, Iran is less active on the patent front, with 0.43% of world patents filed and 0.29% of world patents granted.



Global distribution of citations

The reach of Iran's research appears preponderantly national; by far the largest proportion of its citations (more than a quarter) are self-citations, or citations from other papers from Iran. The prolific US has a lower share of citations to Iran than its usual share of citations to other countries, most likely due to a strained

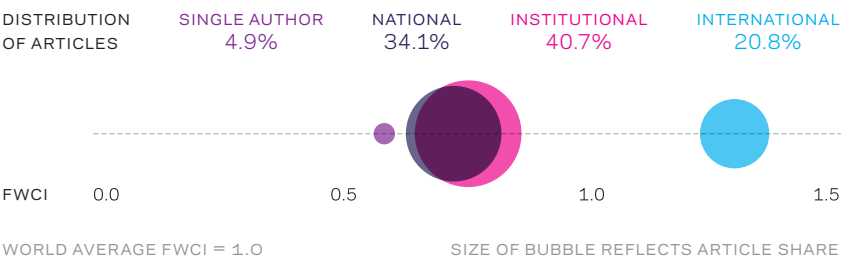
relationship between the two countries. China gives Iran its second largest share of citations, unsurprisingly, given that it publishes so many papers, followed by the US, and then India. The rest of Iran's citation distribution is fairly even across Eurasian, American, and African countries.



Collaboration patterns

Iran's collaboration is mostly local, with three quarters of its output the result of institutional (41%) or national (34%) collaboration. Its proportion of single-authored papers is about 5%. International collaboration accounts for only about 21% of its output, and this is the only collaboration type that reaches above the impact of the world average across collaboration types (cited 29% above the

world average across all collaboration types). International political sensitivities may be putting a strain on international collaboration for Iran, contributing to this low level of international collaboration. The impact of all other collaboration types is under the world average across collaboration types (being cited less by 25% to 42%).



Researcher mobility

Nearly two-thirds of Iran's researchers are sedentary, meaning that they have only published under Iranian affiliations since 1996. Researchers with short-term international mobility patterns account for just under a quarter of Iran's researchers, while Iran's proportions of outflow and inflow researchers are similarly low, but with a very slight net loss. While the

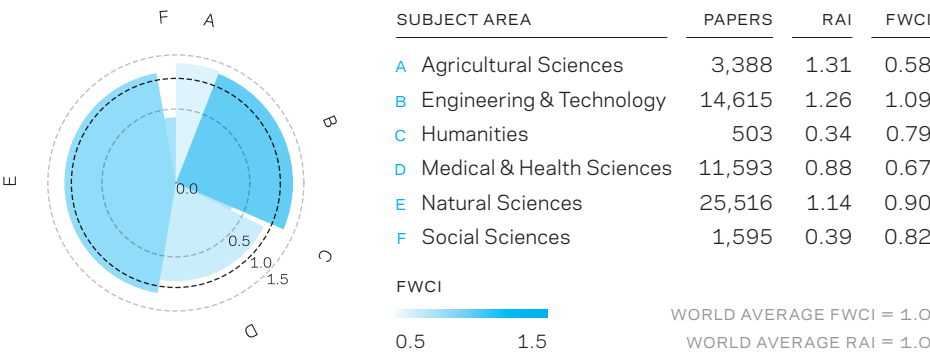
2013 Geneva Agreement has lifted some of the international sanctions against the country, it seems that there are still many barriers to the international mobility of researchers in and out of Iran, in particular when lasting assignments are concerned.



Subject breakdown

The Natural Sciences is the most prolific field for Iran while Engineering & Technology comes second. In relative terms, the Agricultural Sciences comes first, meaning that compared to the world's output distribution by subject, the share of Iran's output in this subject is 31% higher than

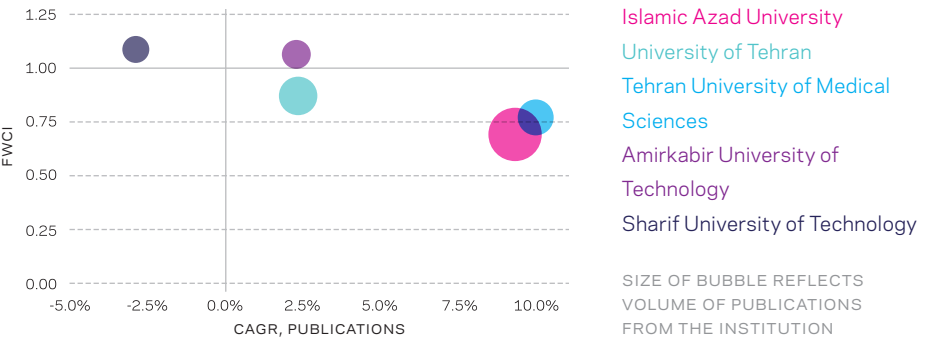
the world's. In Engineering & Technology Iran also achieves its highest citation impact, which is just above that of the world average across all fields, possibly attaining high expertise, in part, because of its vibrant oil industry.



Most prolific institutions

The most prolific Iranian institutions are all universities, the top being Islamic Azad University with nearly 6,500 papers in 2014, and a positive annual output growth of over 9% CAGR (similar to Tehran University of Medical Sciences). Sharif University of Technology has high

citation impact (nearly 10% more than the world average) but is the least prolific in the top five and shows a negative annual output growth of nearly -3% CAGR. Iran's other two most prolific institutions show low or negligible output growth since 2010.





IRAQ

Iraq's researchers are highly internationally collaborative and mobile in terms of short-term assignments. The country's recent troubles may be a factor in its very small shares of research indicators, such as output, citations, and patents.

Iraq is most prolific in the Natural Sciences and Engineering & Technology, but in all fields it shows under world average impact. Its most prolific institute is the University of Baghdad, with a strong output growth from a low base, but below average impact.

Headline statistics

62% OF INTERNATIONALLY COLLABORATED PAPERS

with a citation impact on a par with the world average across collaboration types.

65% TRANSITORY RESEARCHERS

Sedentary researchers make up the majority of Iraq's researcher population while 1/4 are sedentary.

MOST PROLIFIC AREAS

Natural Sciences and Engineering & Tech

Iraq is most prolific in the Natural Sciences and Engineering & Technology. In all fields, the impact of Iraq's research is below the world average.

MOST PROLIFIC INSTITUTION

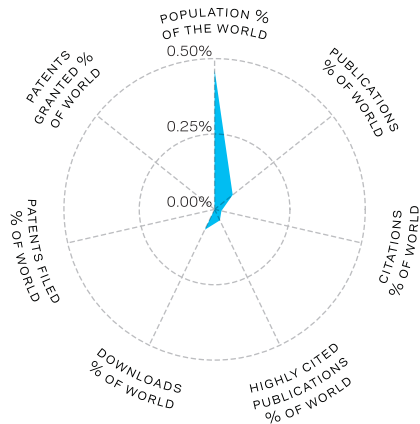
University of Baghdad

shows strong annual growth in output from a low base, but is below the world average in terms of citation impact.

Overall country or region outlook

Iraq has less than 0.5% of the world's population, and publishes 0.08% of the world's scholarly output. Its shares of the world's highly cited papers and citations are very low at 0.04% and 0.02%, respectively; its share of the world's downloads is more in line with its output share at 0.08%.

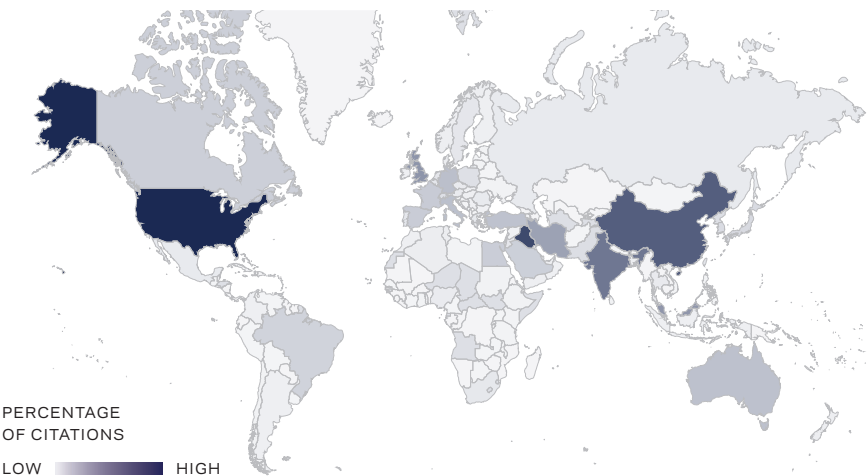
It files very few patents, and these are seldom granted, so that Iraq's shares of world patents filed and granted are infinitesimal.



Global distribution of citations

Iraq's research is referenced in the scholarly literature by researchers worldwide. The distribution of these citations is expectedly dominated by prolific countries such as the US and China, and by itself. Iraq's influence in Asian research is visible through the relatively large proportions of its citations coming from neighbouring

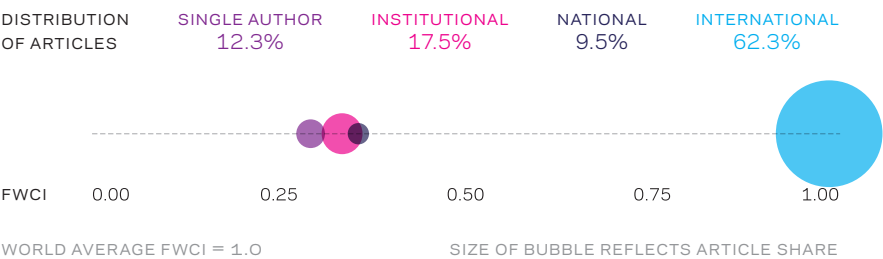
Iran, India, and Malaysia. The UK also contributes a sizeable proportion of citations received by Iraq.



Collaboration patterns

Iraq's collaboration pattern consists mostly of international collaboration, which account for 62% of its output and is cited to a level comparative to the world average across collaboration types. All of Iraq's other collaboration types are cited about 70% less than this average, and account for much lower proportions of Iraq's scholarly papers: 17% for institutionally-

collaborated, 12% for single-author, and 10% for nationally-collaborated papers.



Researcher mobility

Nearly two-thirds of Iraq's researchers display transitory mobility patterns, meaning that they have published under both Iraqi and non-Iraqi affiliations, in rapid succession, since 1996. Long-term international moves are, however, much less frequent for Iraq's researchers, with only about 5% of both researcher inflow and outflow. Sedentary researchers who

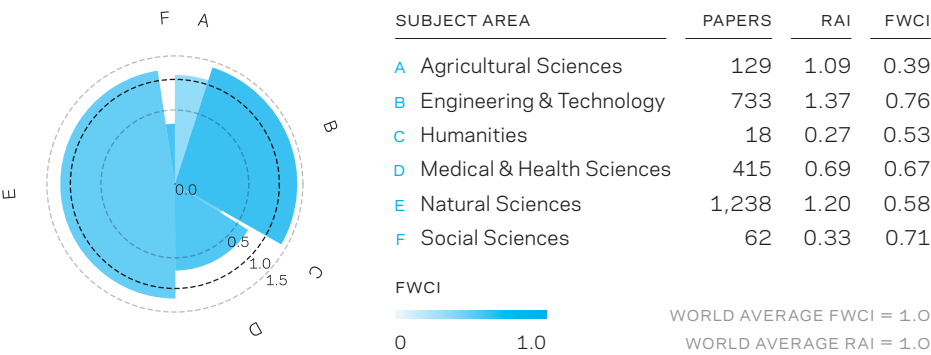
have consistently only published under Iraqi affiliations since 1996 account for more than a quarter of Iraq's researchers.



Subject breakdown

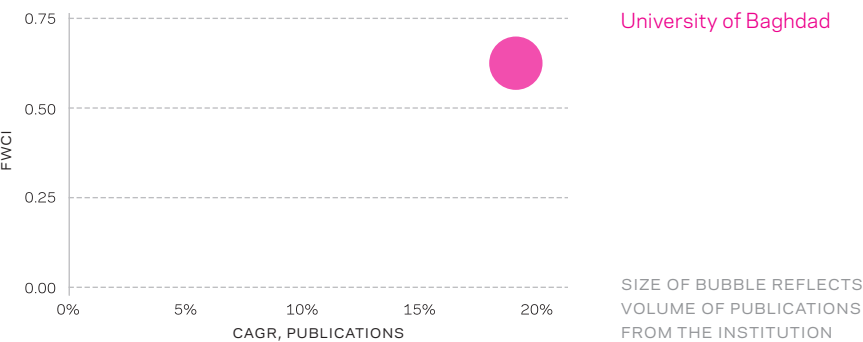
Iraq publishes most of its papers in the Natural Sciences and Engineering & Technology; in both fields, it is not only prolific in absolute, but also relative, terms (meaning that the proportions of its output in these fields exceed those of the world, respectively). Across all fields,

however, the impact of Iraq's research is inferior to the world average, and at its lowest in the Agricultural Sciences. Iraq publishes particularly few papers in the Social Sciences and the Humanities.



Most prolific institutions

University of Baghdad is the Iraqi institution with the largest share of Iraq's scholarly output, with more than 250 papers in 2014. Although its annual output growth is high, at 19% CAGR, its citation impact is 37% lower than the world average.





IRELAND

Ireland has a mobile researcher base, and collaborates internationally on the majority of its publications (56%). Irish research is relatively often cited by the UK, likely due to geographical proximity, historical ties, and the absence of a language barrier.

National collaboration, on the other hand, occurs relatively little: it accounts for less than 12% of Ireland's output. On a subject level, Ireland shows all-round activity and performance. With the exception of Engineering & Technology, its relative activity in each subject is nearly at, or above,

the world average. In terms of FWCI, all subjects are above average, and cited up to 63% more than the world average.

Headline statistics

CONNECTIONS

Close ties to the UK

Ireland receives a relatively large share of its citations from the UK.

Mobile researcher base

Ireland's inflow and outflow each make up around 13% of its researcher base, and 51% shows mobility for shorter periods of time.

High level of international collaboration

Nearly 56% of Ireland's scholarly output has an international co-author, and is cited 89% above the world average.

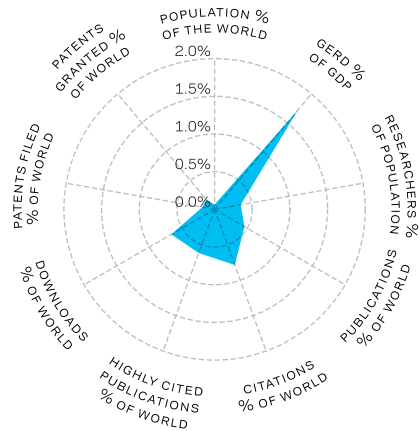
STRONG AREA

Medical & Health

Strength in the Medical & Health Sciences. The 2nd largest by output, Ireland publishes 21% more than the world average, and is cited 60% above average.

Overall country or region outlook

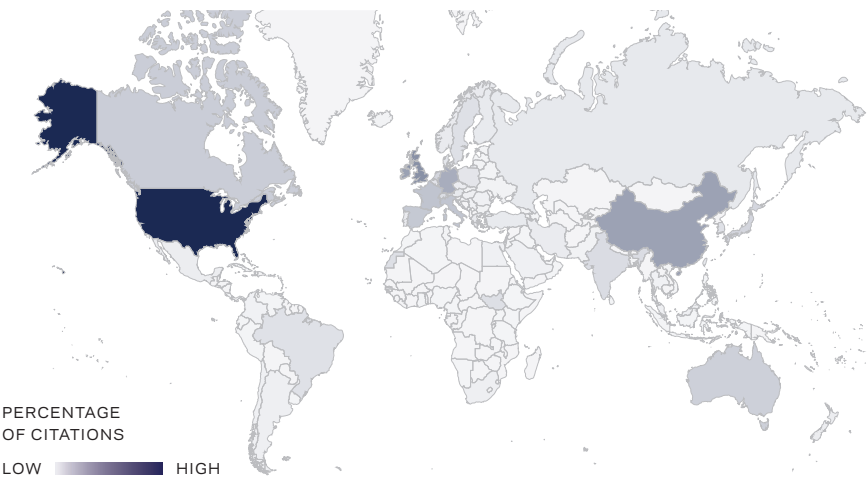
With just 0.06% of the world's population, Ireland publishes 0.46% of the world's scholarly output and receives 0.79% of the world's citations. It also holds 0.62% of the world's top 10% most cited articles. Ireland's publications also receive a fair amount of interest, as measured by downloads: it has a 0.66% share of the world's downloads. Ireland's share of the world's filed patents is just 0.17%, and holds an equal share of the world's granted patents. Compared to these research indicators, Ireland seems to devote a relatively percentage of its GDP to GERD.



Global distribution of citations

Unlike most countries, the second largest source of Ireland's citations (8.4%) is the UK. This is likely due to their closeness in terms of location, history, and language. However, as for most countries, the other countries in Ireland's top three citing countries are the US (17%) and China (6.9%). Since these are very prolific, it is

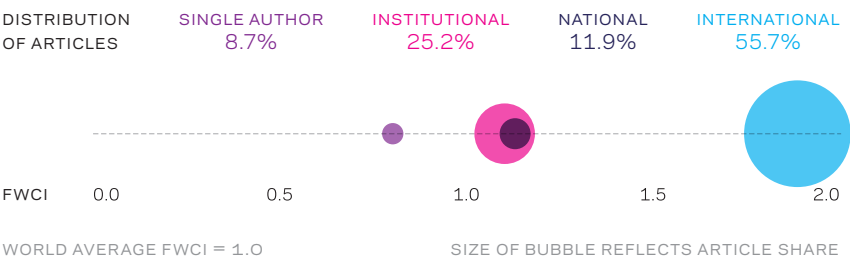
very likely for a country to receive citations from these countries. Ireland itself is responsible for about 7% of its own citations. Germany is another large source of citations to Ireland with a share of 6%, followed by France and Italy both having a 4% share.



Collaboration patterns

Ireland publishes the majority of its publications with an international co-author: 56% of its scholarly output is internationally collaborated. These publications are the most impactful, being cited 89% more than the world average. Ireland's nationally and institutionally collaborated publications also do well, with field-weighted citation impacts of 1.13 and 1.10, respectively. The only publications

that are cited less than the world average – by about 20% – are the single-author publications. These also make up the lowest share of Ireland's scholarly output.



Researcher mobility

Ireland's researcher base is highly mobile: only about a fifth of its researchers are sedentary, meaning they have not published with an institution outside of Ireland since 1996. The majority of the researchers (51%) show transitory mobility, spending less than two years abroad or in Ireland before moving back or elsewhere.

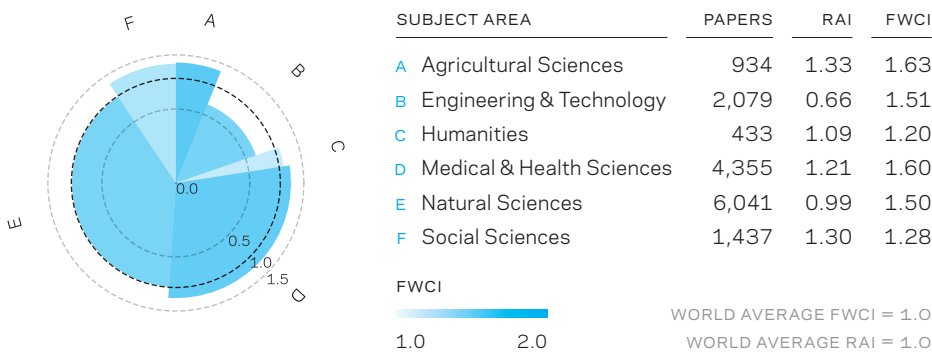
This is beneficial to Ireland's overall citation impact, as researchers in this category show a higher average FWCI than those in other categories. Ireland's outflow and inflow are both approximately 13%, with the inflow being slightly higher than the outflow.



Subject breakdown

Ireland shows all-round activity: with the exception of Engineering & Technology, all subjects show a relative activity that is near or above the world average. Its strength is in the Medical & Health Sciences, in which it publishes 21% more than expected, based on the world aver-

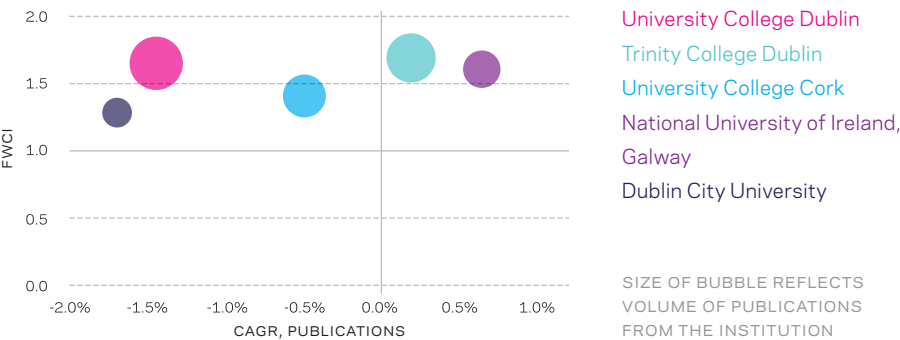
age, and has an FWCI of 1.60. Although it is the second smallest subject by total output, Ireland is relatively most active in the Agricultural Sciences (33% above the world average), and its publications in this subject are cited 63% above the world average.



Most prolific institutions

Trinity College Dublin, the second most prolific institution in Ireland, is the most impactful of the top five (FWCI of 1.69) and has the second highest CAGR(0.2%). University College Dublin produced over 2,300 publications in 2014, making it the most prolific. It also has the second high-

est FWCI at 1.65, but as is common with large output institutions, a low growth rate of -1.4%. The only institution to have a lower growth rate is Dublin City University (-1.7%); the smallest and least impactful of the top five prolific institutions.





ISRAEL

Israel's research is impactful, which can, to some extent, be attributed to a high national investment in Research & Development, as well as a large proportion of international collaboration, which attains more than twice the impact of the world across collaboration types.

Israel is most prolific and impactful in the Natural and the Medical & Health Sciences, and in all fields has above world average impact across subjects. Its researchers are not only highly collaborative, but also highly mobile, with 46% showing transitory mobility patterns, and a further

20% inflow or outflow mobility patterns in perfectly equal 10% proportions, leaving only a third sedentary.

Headline statistics

3.9% of GDP as GERD

Israel's sizeable national investment in research allows it to reach higher shares of output and citations than expected from its size.

47%

INTERNATIONAL COLLABORATION

reaching more than twice the impact of the world across collaboration types.

MOST PROLIFIC AREAS

Natural Sciences and Medical & Health

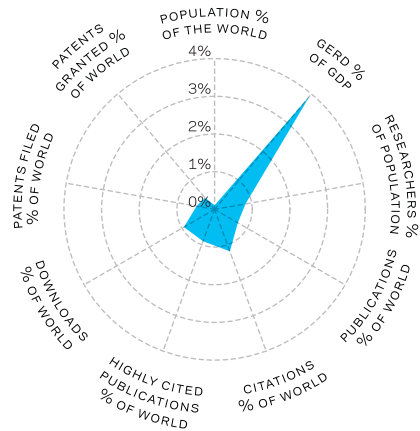
The Natural Sciences and the Medical & Health Sciences are Israel's most prolific and impactful fields.

46% RESEARCHERS WITH A TRANSITORY MOBILITY PATTERN

and over 1/3 are sedentary, leaving equally balanced 10% inflow and outflow proportions.

Overall country or region outlook

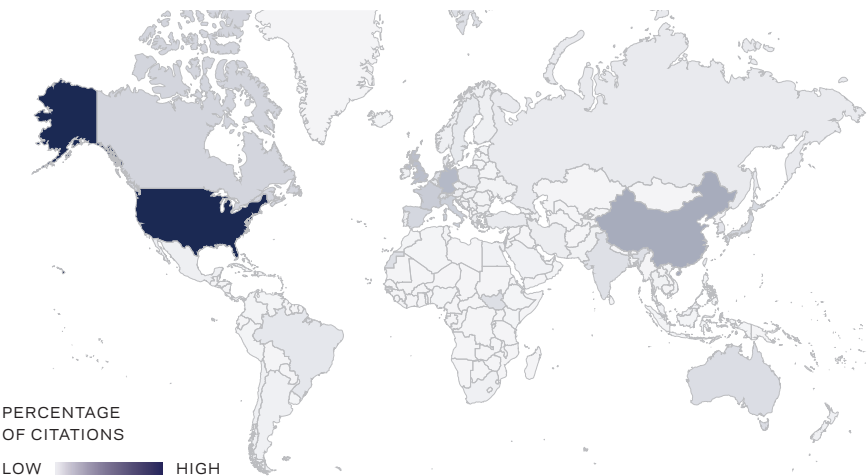
Although Israel holds only 0.1% of the world's population, it publishes 0.7% of the world's papers, and 0.9% of the world's highly cited papers. Israel's research receives 1.2% of the world's citations, and 0.9% of the world's downloads. It files 0.48% of the world's patents, and these are successful, amounting to 0.40% of world's patents granted. This good level of research performance, relative to Israel's size, is to some extent due to a high national investment in research, with nearly 4% of its GDP devoted to GERD.



Global distribution of citations

The distribution of Israel's citations is global and, unsurprisingly, comprises large proportions of incoming citations from prolific countries such as the US and China. In fact, the US is by far the largest contributor of citations to Israel's research, providing 22% of the total citations received by Israel. Amongst Euro-

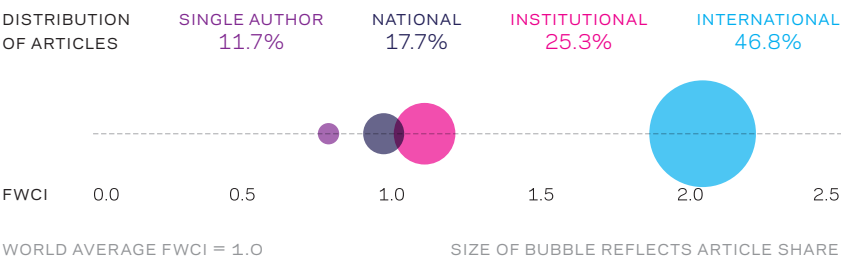
pean countries, Germany and the UK account for the larger proportion of Israel's citations, at 6.3% and 5.8%, respectively.



Collaboration patterns

Israel's research is fairly collaborative, with 47% of its scholarly output the result of international collaboration. These papers are highly impactful, reaching more than twice the impact of the world average across collaboration types. Institutional collaboration amounts to the second largest proportion of Israel's output at over a quarter of its output, and these are also of higher impact at 11% higher

than the world average. 18% of Israel's collaboration is national, and reaches just slightly under the world average impact. Single-author papers account for 12% of Israel's output, and tend to receive 21% fewer citations than the same world average.



Researcher mobility

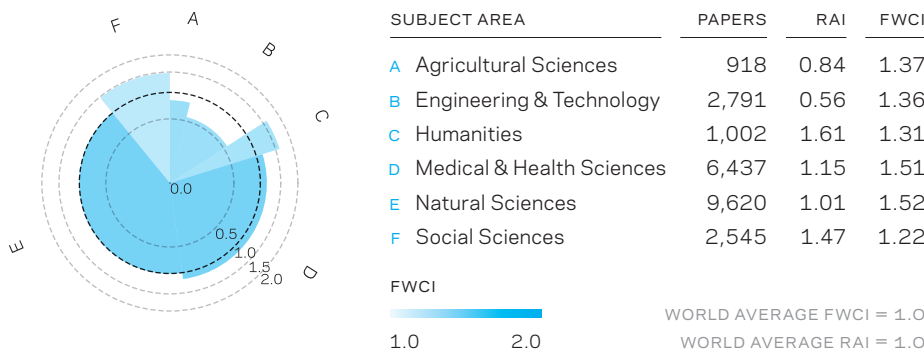
While under half of Israel's researchers show short-term international mobility patterns; over one third are sedentary and have consistently only published under Israeli affiliations since 1996. Researcher inflow and outflow proportions are smaller and perfectly balanced at 10%.



Subject breakdown

Israel's research is highly impactful across the board, and particularly so in its two most prolific areas: the Natural Sciences and the Medical & Health Sciences, in which it receives about 50% more citations than the world average across subjects. Comparing Israel's output dis-

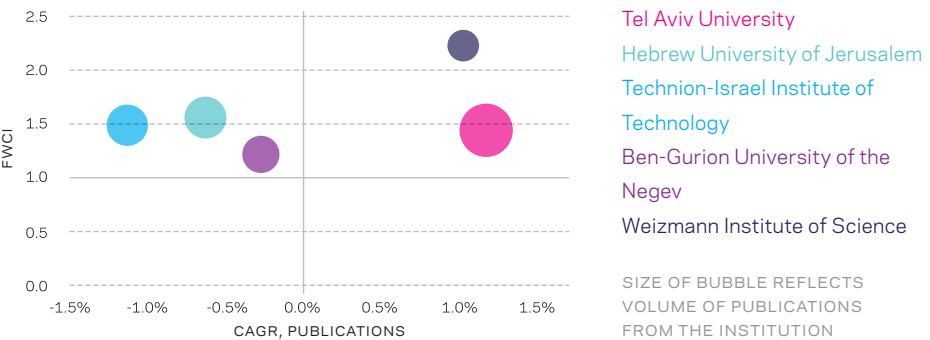
tribution by subject, to that of the world, reveals a greater focus in the Social Sciences and the Humanities, and to a lesser extent in the Medical & Health Sciences.



Most prolific institutions

Israel's top five prolific institutions each published between 1,370 (Weizmann Institute of Science) and 3,900 (Tel Aviv University) papers in 2014; however, all have negative or low annual output growth. All five prolific institutions have higher than the world average citation im-

pact, ranging from 22% above the world average (Ben-Gurion University of the Negev) to a very high 223% above the world average (Weizmann Institute of Science).





ITALY

Italy has a rather large share of researchers that do not show any mobility, which is reflected by its high rates of collaboration within Italy (25%) and within Italian institutions (26%).

Both these collaboration types result in citation impacts that are higher than the world average, at about 23% and 26%, respectively. Interestingly, the two most prolific institutions in Italy also have the highest compound annual growth rates (3.5-5.5%), increasing their output up to

twice as rapidly as the other top Italian institutions.

Headline statistics

High self-citation rate

Italian citations form 15% of Italy's incoming citations; almost as high as the US' share (17%).

Rather sedentary research base

Over half of Italy's researchers have not published with affiliations outside of Italy since 1996.

MOST PROLIFIC INSTITUTIONS

High CAGR

Italy's most prolific institutions show compound annual growth rates that are up to twice as high as the other top institutions.

STRONG AREA

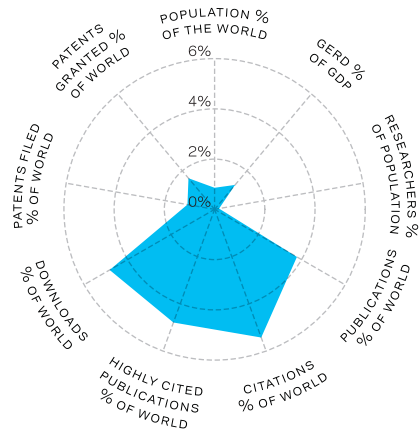
Medical & Health

The Medical & Health Sciences is Italy's 2nd largest subject by total output and it shows a high relative activity (15%), and achieves a high FWCI (1.45).

Overall country or region outlook

Italy publishes about 3.8% of the world's scholarly output, and these publications are well cited. Italy receives 5.4% of the world's citations, and has a share of 4.8% of the world's top 10% most cited papers. Aside from this, it receives 4.6% of the world's downloads.

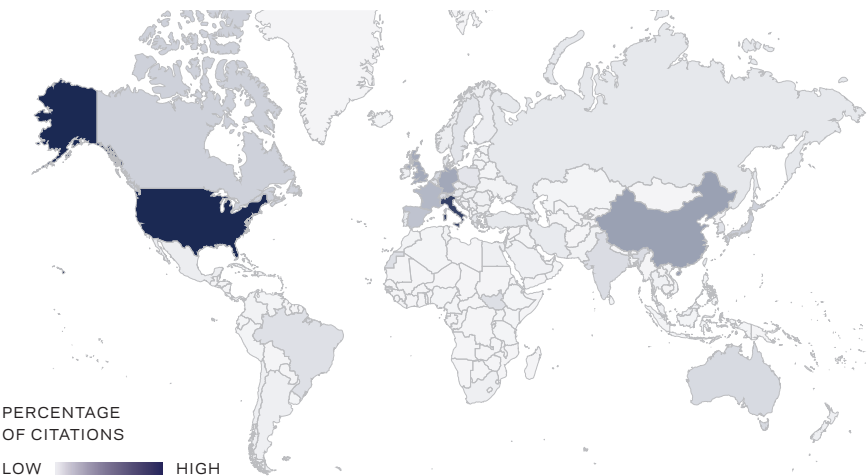
Italy also has a moderate share of the world's filed patents (1.1%) and the world's granted patents (1.6%). Its spending on research and development (by percentage of its GDP) is higher than most southern European countries.



Global distribution of citations

Although citing one's own country's research is a very common occurrence, Italy shows a particularly high rate of self-citation. Almost 15% of its incoming citations are from Italy itself. This share is nearly as high as that of the US (16%). Italy's third largest source of citations is China (7%), which is to be expected, as more publica-

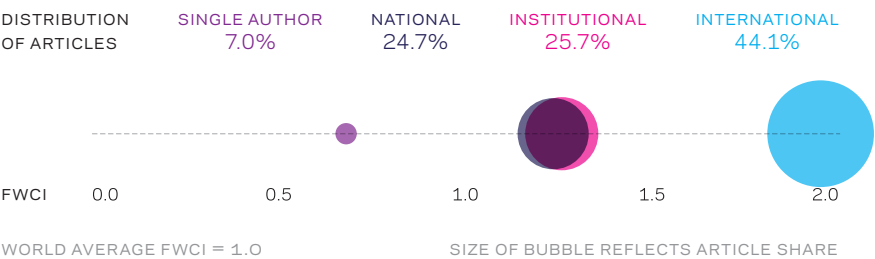
tions naturally means more references. Thus, a sizeable share of Italy's citations come from a small number of prolific European nations, such as Germany and the UK (each 6%), France (5%), and Spain (4%).



Collaboration patterns

International collaborations tend to have a higher impact than other collaboration types, and Italy is no exception: its internationally collaborated papers are cited almost twice as often as the world average for all collaboration types, and represent 44% of Italy's total scholarly output. National and institutional collaboration each take up about a quarter of Italy's output, and are cited 23% and 26% more

than the world average respectively. Italy's single-author publications form only a minor part of its output, and are also the only collaboration type that is cited less than the world average, with an FWCI of 0.73.



Researcher mobility

Italy's researchers are rather sedentary: 52% of them have only published under an Italian affiliation. The average FWCI of these researchers is considerably lower than that of researchers in other categories. Italy's outflow and inflow of researchers is fairly low. Though the outflow is somewhat higher than the inflow, the inflow researchers show a higher

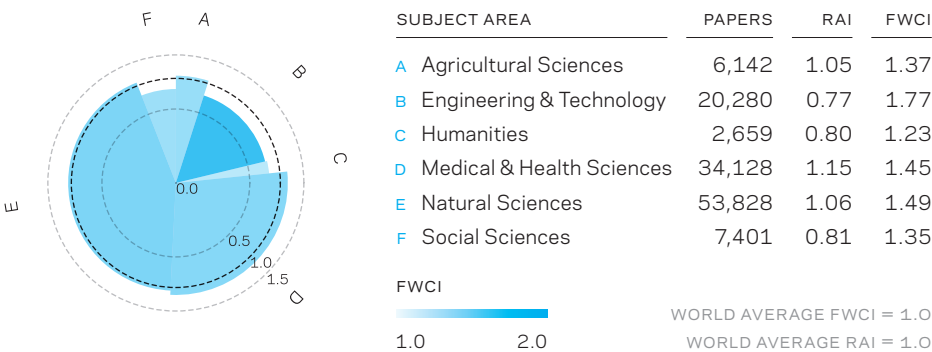
average FWCI. Over a third of Italy's researcher population is categorized as transitory, meaning they spend less than two years abroad or in Italy and then move back.



Subject breakdown

While the absolute number of publications differ substantially between subjects, the citation impact is above the world average for all subjects. Italy shows the highest relative activity (15% above the world average) in the Medical & Health Sciences. This is its second largest subject

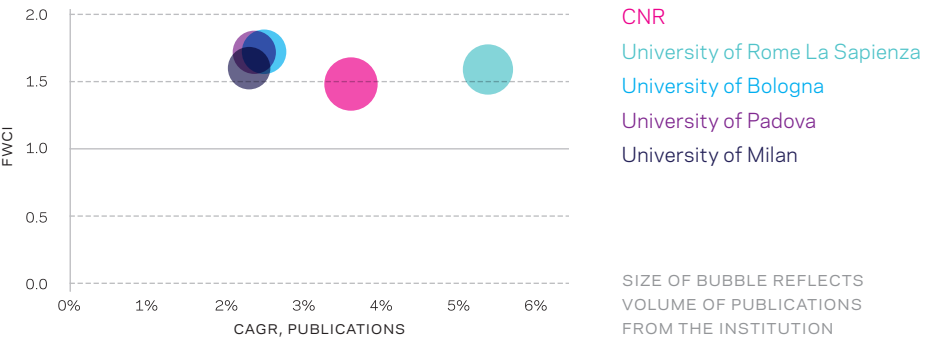
by output, and has the third highest FWCI (1.45). Italy achieves its highest citation impact of 1.77 in Engineering & Technology. Despite this, and its considerable output, Italy publishes proportionally less in this subject (by 13%).



Most prolific institutions

Italy's most prolific institutions each produced between 4,300 and 6,800 publications in 2014. All of them show high field-weighted citation impacts, ranging from 48% (Consiglio Nazionale delle Ricerche (CNR)) to 72% (University of Bologna and University of Padova) above the

world average. The greatest difference between the top five is in annual growth rates: whereas the 3 smaller ones show a CAGR of about 2.5%, the University of Rome La Sapienza is growing over twice as fast (a CAGR of 5.4%), followed by CNR at 3.6%.





JAPAN

As a highly innovative country, Japan has large shares of world patents filed and granted, and is both prolific and impactful in the Natural Sciences. However, it shows relatively low levels of international collaboration and long-term international mobility.

Japan publishes nearly 5% of both the world's scholarly output and the world's top 10% cited papers. It receives nearly 6% of the world's citations and 4% of the world's downloads. Japan itself, (18%) and prolific countries such as the US (18%) and China (12%) represent the

highest shares of citations to Japan's research. University of Tokyo is the leading Japanese institution in terms of both output and impact, with just under 10,000 papers cited, on average, 37% more than the world.

Headline statistics

29%

OF WORLD PATENTS GRANTED

Japan is highly innovative with an 18% share of world patents filed and a 29% share of world patents granted.

57%

HIGHER THAN THE WORLD
AVERAGE FOR ALL
COLLABORATION TYPES

Japan's international collaborations account for over 1/4 of its output and are highly impactful.

63%

SEDENTARY RESEARCHERS

Japan's researchers tend to favour short-term assignments abroad (27%) over long-term ones (10%).

STRONG AREA

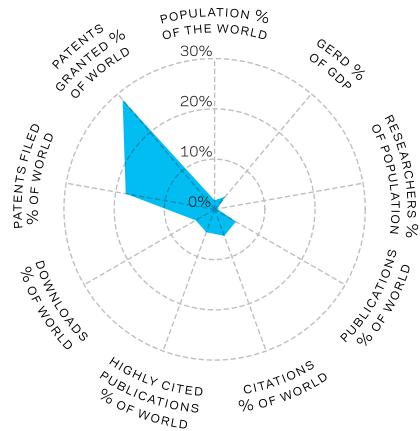
Natural Sciences

In the Natural Sciences, Japan is proportionally 13% more prolific than the world average.

Overall country or region outlook

Japan publishes about 5% of the world's scholarly output, and of the world's top cited papers. It receives around 6% of the world's citations and 4% of the world's downloads.

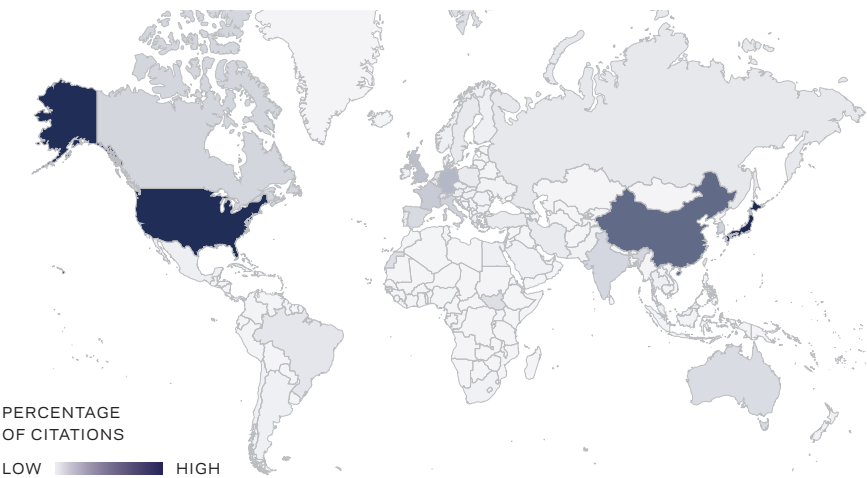
Japan's share of world's patents filed is 18%, and its share of patents granted is 29%. Both of these high shares, in themselves and relative to the other data shown here, clearly demonstrate Japan's impressive innovative capabilities.



Global distribution of citations

Citations to Japan's research come from all over the world and are expectedly skewed towards Japan (18%) and prolific countries such as the US (18%) or China (12%). Researchers tend to be more aware of their own country's papers and cite them preferentially, while a large output means a large number of references.

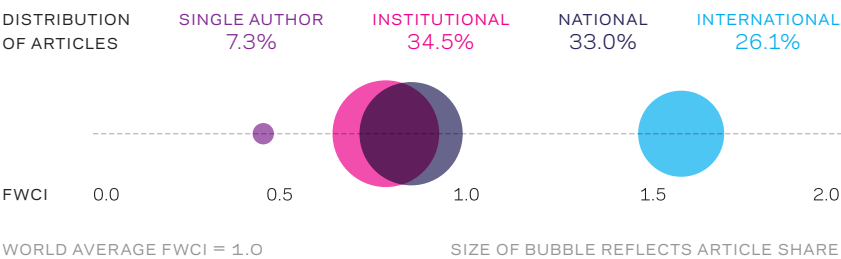
Other countries whose citations form a sizeable share of Japan's citations include Germany and the UK, each accounting for 5% of Japan's incoming citations, France with 4% of Japan's incoming citations, and South Korea, Italy, Canada, and India at 3% of Japan's incoming citations.



Collaboration patterns

International collaborations tend to have a higher impact than other collaboration types, and Japan is no exception: its internationally collaborated papers are cited about 57% more than the world average for all collaboration types, and represent more than a quarter of Japan's total scholarly output. Japan's national collaborations make up a third of Japan's total scholarly output, and its institutional col-

laborations are over a third; they are cited, respectively, 15% and 22% less than the world average for all collaboration types. Japan's single-authored papers are the least impactful, cited less than half the world average, and only account for 7% of Japan's scholarly output.



Researcher mobility

Japan's researchers are rather sedentary: 63% of them have only published under a Japanese affiliation. Japan's researcher inflow and outflow are similar, and conversely low, at around 5%; interestingly, Japan's transitory researcher population represents over a quarter of Japan's total researcher population. This means that although Japan's research-

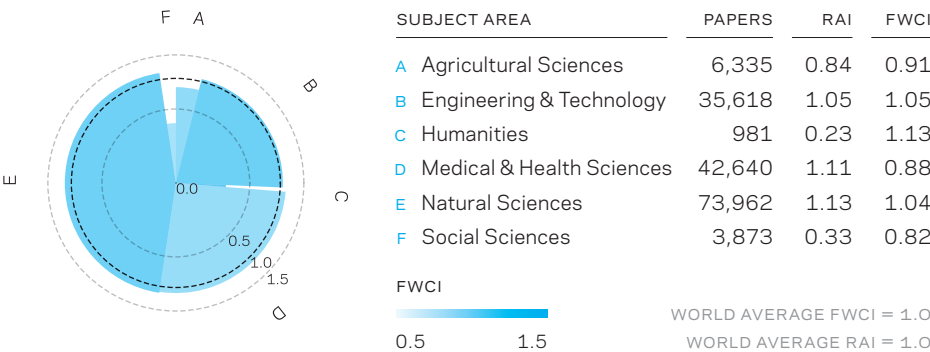
ers are unlikely to immigrate or emigrate permanently or long-term, short-term assignments abroad are more frequent. It can be argued that this level of short-term mobility is beneficial to Japan, facilitating exchanges of ideas across borders.



Subject breakdown

Japan is most prolific and impactful in the Natural Sciences; proportionally it publishes nearly half of its output in this area, which is 14% more than the world does, and these papers are cited slightly more than the world average. In the Medical & Health Sciences, Japan is also compara-

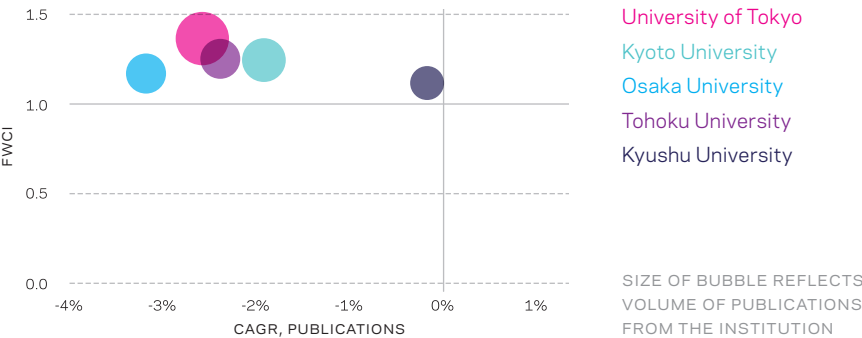
tively more prolific than the world (11% more), but less impactful. In other areas such as the Social Sciences and the Humanities, Japan tends to publish a lesser proportion of its output than the world.



Most prolific institutions

Japan's top five Universities each published between 3,950 (Kyushu University) and 10,000 papers (University of Tokyo) in 2014. However, all of them show negative growth in terms of 2010-2014 papers, from -3.2% (Osaka University) to -0.2% (Kyushu University) CAGR. Still, all

have positive FWCI, meaning that on average, they are cited more than the world, from 12% more (Kyushu University) to 37% more (University of Tokyo). University of Tokyo emerges as the most prolific and impactful Japanese institution.





JORDAN

Jordan's researchers are highly collaborative; in particular, international collaborations make up 47% of Jordan's output. They are also mobile, particularly on the short-term, with 45% of its researcher population displaying some transitory mobility patterns.

Despite its small shares of main research indicators and relatively low impact, Jordan seems to be an attractive research destination, as demonstrated by its 7 percentage point net gain in inflow compared to outflow researchers.

Headline statistics

0.1% WORLD POPULATION
AND PUBLICATIONS

Jordan's share of world output is in line with its share of world population.

47% INTERNATIONAL
COLLABORATION

cited just above the world average across collaboration types.

MOST PROLIFIC INSTITUTIONS

University of Jordan

Jordan's most prolific institution, with recent positive annual growth.

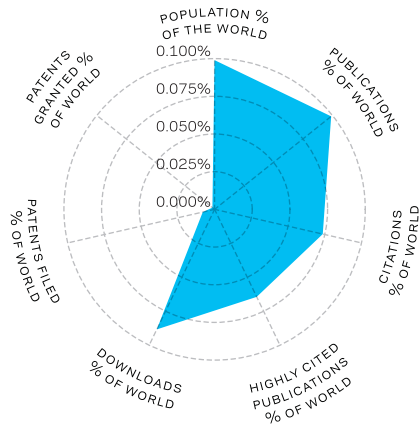
45% RESEARCHERS WITH
TRANSITORY MOBILITY
PATTERNS

and under 30% sedentary researchers, with a small net researcher gain (+7 percentage points) in the long term.

Overall country or region outlook

Jordan's world output and population shares are in line at 0.1%. It has slightly lower shares of highly cited papers (0.05%), citations (0.07%), and a nearly equal share of downloads (0.09%).

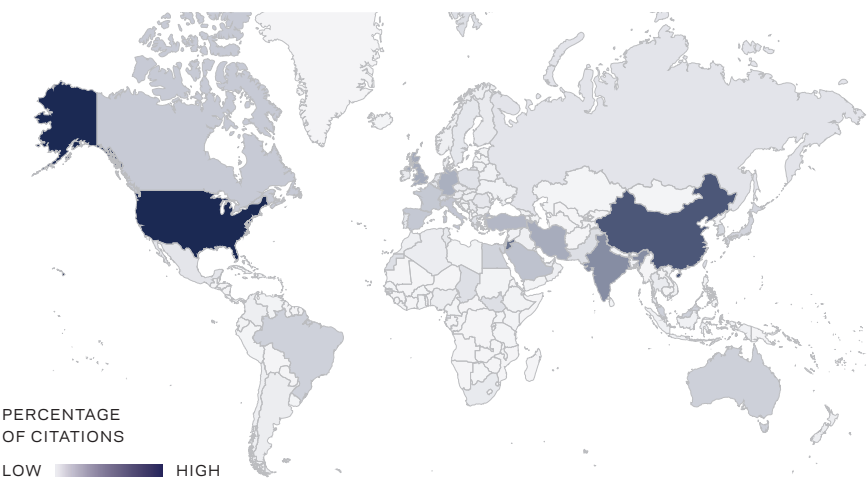
Jordan files few patents (0.01% of world patents filed) and these applications are rarely successful, resulting in a nearly null share of world patents granted.



Global distribution of citations

Jordan's research is cited globally, and in expectedly larger proportions by the prolific US (11%) and China (9%), and by itself (7%). Jordan's influence seems to preferentially extend to neighbouring countries such as Saudi Arabia, Iran, Turkey, or India, but it also receives signifi-

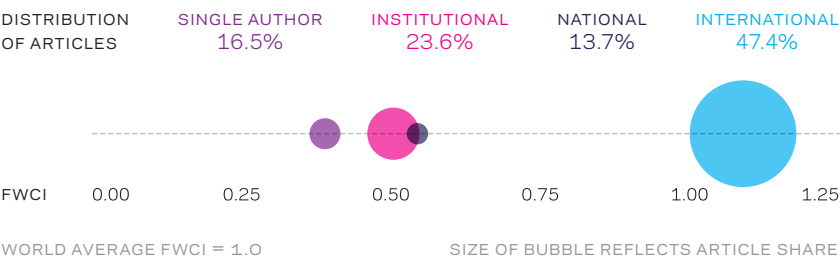
cant shares of its citations from European countries such as the UK and Germany.



Collaboration patterns

Nearly half of Jordan's papers are internationally collaborative, and these are cited at just above the world average citation impact level, across all collaboration types. Jordan's next most frequent collaboration type is institutional at 24% of its output; institutional and national collaborations (14%) tend to be of about half the world average citation impact. Single-authored papers account for 17% of Jor-

dan's output, and are cited 60% less than the world average citation impact level across all collaboration types.



Researcher mobility

Over 45% of Jordan's researchers show transitory mobility patterns with both Jordan and non-Jordan affiliations, in quick succession, since 1996. Under 30% of Jordan's researcher population are sedentary and have consistently solely published under Jordanian affiliations since 1996. Jordan's researcher inflow proportion (17%) is higher than its outflow

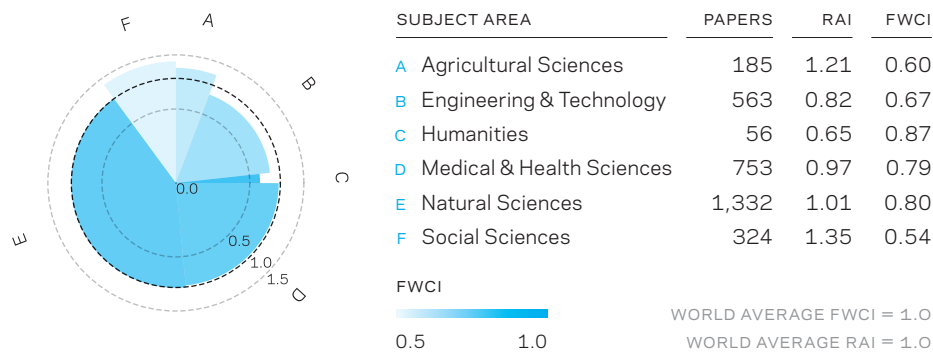
proportion (9%), so Jordan receives a net gain in researchers in the long run.



Subject breakdown

Jordan's research presents lower than the world average citation impact across all subject areas; its most impactful field is its least prolific, the Humanities, while its least impactful one is the Social Sciences. Jordan's output distribution is fairly close to that of the world, with the ex-

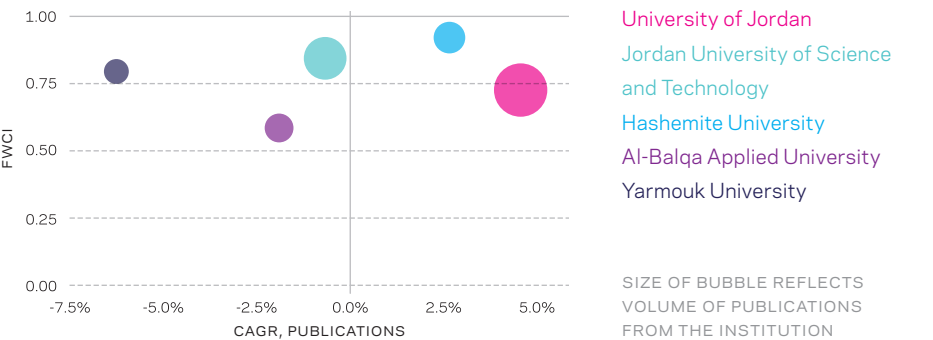
ception of a 20% higher proportion of its research in the Agricultural Sciences, and a 35% higher proportion of its research in the Social Sciences.



Most prolific institutions

Jordan's most prolific institution, the University of Jordan, published nearly 700 papers in 2014 and, with Hashemite University, are the only Jordanian prolific institutions to display positive output growth. All top five prolific Jordanian institutions have under average impact,

from -40% (Al-Balqa Applied University) to -8% (Hashemite University).





KENYA

Kenya has a very small, but internationally connected, research footprint. The country produced fewer publications over the past half-decade (8,964) than some of the world's largest institutions have in 2014 alone.

Similar to other countries with developing research infrastructures, a very high percentage of Kenya's publications are international collaborations. A similarly high percentage of Kenya's active researchers have spent some time abroad. The country benefits greatly from this infusion of

external research expertise. Furthermore, three of Kenya's five most prolific research institutions are research centers that collaborate with and host visiting researchers extensively.

Headline statistics

High interest in Kenya's research

Kenya accounts for 0.09% of all publications worldwide, but 0.13% and 0.15% of all downloads and citations.

Very high levels of international collaboration

More than 4 out of every 5 papers from Kenya are co-authored with an international collaborator.

Highly mobile research base

Nearly 80% of Kenya's active researchers have published at least once outside the country, and 57.1% are transitory.

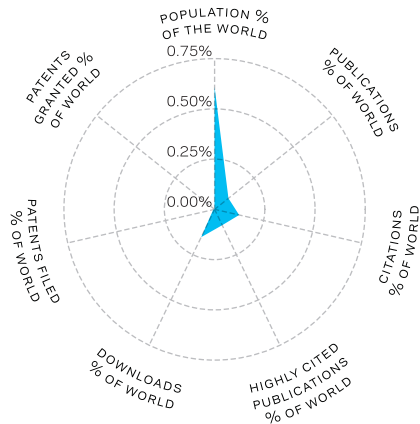
FOCUS AREA

Agricultural Sciences

Kenya produces nearly 4 times the world average in this subject area, relative to its total research output.

Overall country or region outlook

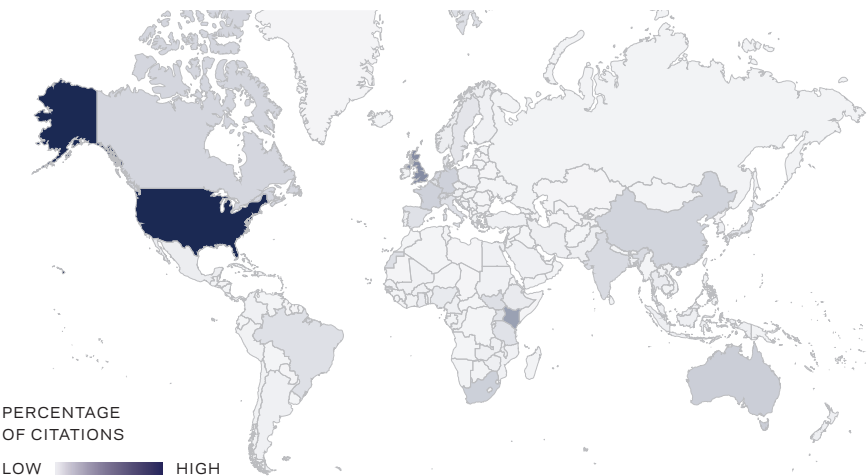
According to the latest figures from 2010, Kenya invests about 0.98% of its GDP on gross R&D expenditures. That comparatively low level of investment is reflected in the country's level of research output: 8,964 publications from 2010 to 2014, or 0.09% of the world's total publications in 2014. For reference, Kenya's world population share is 0.61%. Kenya's research, however, is cited and downloaded at higher rates, comprising 0.13% and 0.15% of all citations and downloads worldwide. Furthermore, nearly one of every five publications from Kenya is among the world's most highly cited articles.



Global distribution of citations

More than one out of every six citations to Kenya's research comes from the US, largely due to the fact that the US is the most prolific research country in the world. 7.7% of all citations to Kenya's research come from Kenya itself. The rest of the top five countries citing Kenya's research the most reflect the geopolitical

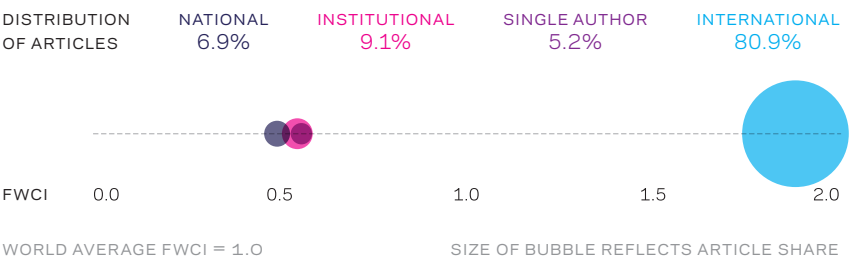
legacies of the British Commonwealth. The UK accounts for 9.6%, Australia for 3.5%, and South Africa for 3.4% of all citations to Kenya's research.



Collaboration patterns

More than 80%, or four out of every five, papers from Kenya are co-authored with an international collaborator. Such high trends in international collaboration are common for countries with developing research infrastructures, and the FWCI associated with such collaborations is 1.88, or 88% above the world average. However, the FWCI associated with all other types of collaborations are 44% or more

below the world average, suggesting that the country has much room to improve in developing its internal capacity to produce highly impactful research.



Researcher mobility

Similar to other countries with small but growing research footprints, the overwhelming majority of Kenya's research base is highly mobile and especially transitory in nature. 57.1% of Kenya's researchers have spent two years or less either in the country or outside of the country. Only 21.0% of the country's re-

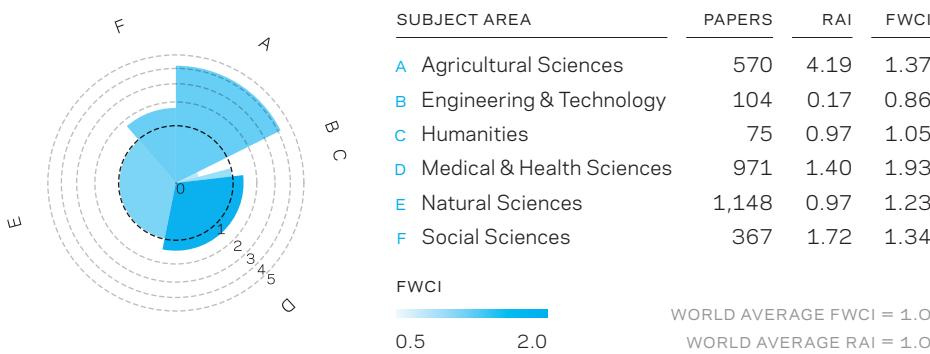
searchers have published under only affiliations in Kenya.



Subject breakdown

Kenya has a very high relative research focus in the Agricultural Sciences, producing nearly four times the world average. On the other hand, it focuses relatively less on Engineering & Technology, producing 80% less than the world average. The country's research in the Medi-

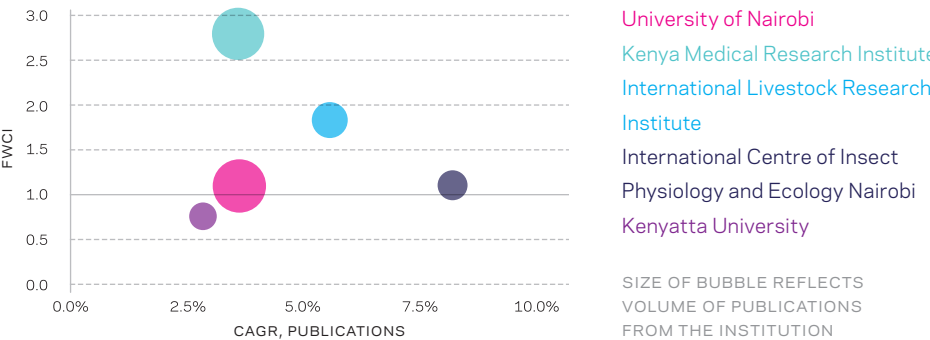
cal & Health Sciences achieves the highest FWCI of all subject areas at 1.93, or 93% above the world average.



Most prolific institutions

Three of Kenya's top five most prolific institutions are research institutes and centres, two of which focus on the Agricultural Sciences. Both the International Centre of Insect Physiology and Ecology Nairobi and International Livestock Research Institute have grown their research outputs

significantly from 2010 to 2014 (9.2% and 5.6% CAGR, respectively). The Kenya Medical Research Institute produces nearly 300 publications per year and, through its high international collaboration rate, achieves an FWCI of 2.79.





KUWAIT

Kuwait's small shares of main research indicators befit its size, which is also a likely contributing factor to the high transitory mobility of its researchers and international collaboration of its research.

Kuwait's research appears heavily concentrated in its most prolific institution, the University of Kuwait, which publishes the majority of its output. Despite small output levels, Kuwaiti research achieves a global reach demonstrated by its international citation distribution. Although in

all subject areas Kuwait lags behind the world average, it is relatively most prolific and impactful in the Social Sciences.

Headline statistics

0.05% OF WORLD SCHOLARLY OUTPUT

and similar shares of highly-cited output, citations, and downloads.

54% INTERNATIONALLY COLLABORATED PAPERS

which are cited 5% more than the world average.

MOST PROLIFIC AREA

Social Sciences

Kuwait's most relatively prolific field.

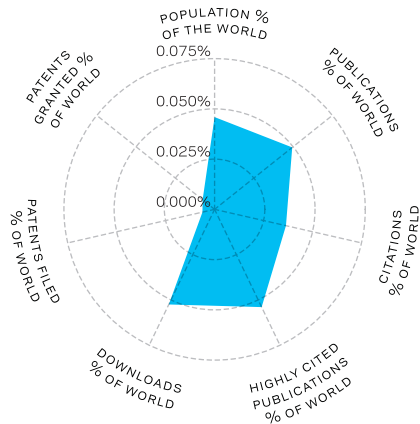
47% RESEARCHERS WITH A TRANSITORY MOBILITY PATTERN

and 29% sedentary researchers, with a small net researcher gain (+4 percentage points) in the long term.

Overall country or region outlook

Kuwait's share of the world's population is equivalent to its share of the world's scholarly output at 0.05% and similar to its shares of highly cited scholarly output and downloads. Kuwait's output receives a similar, slightly lower share of the world's citations at 0.04%.

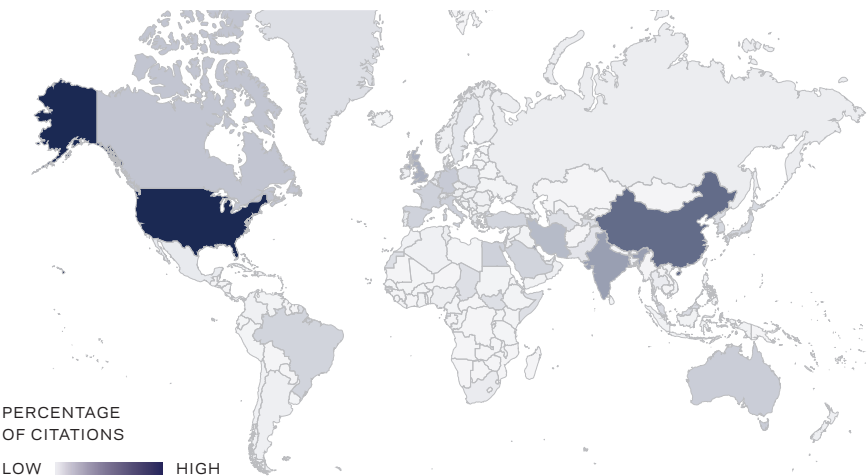
Kuwait has even lower shares of world patents, with patents filed and granted at 0.01% each.



Global distribution of citations

The largest share of Kuwait's citations comes without surprise from the prolific US (14%), followed by China, Kuwait itself, India, then the UK, followed by neighbouring Iran. Although Kuwait's output is small, it has a global citation distribution. Notably, other than the prolific countries, Kuwaiti research also receives citations

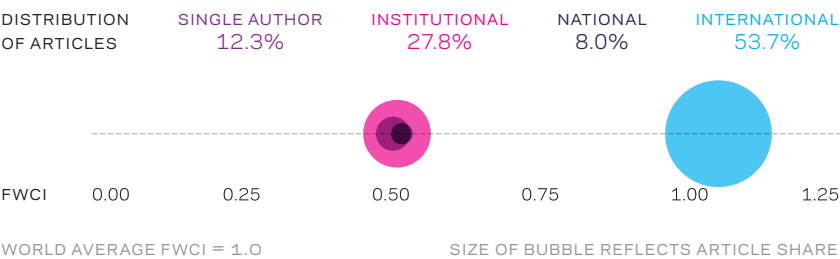
from Asian countries such as South Korea, Japan, Malaysia, and Taiwan, albeit at lower proportions.



Collaboration patterns

More than half of Kuwait's research is internationally collaborative, and cited about 5% more than the world average across collaboration types. Over a quarter of Kuwait's output is the result of institutional collaboration, while 12% are single-authored. National collaborations represent the lowest share of Kuwait's output at 8%, possibly a reflection of Kuwait's small size and output concentra-

tion at Kuwait University. The impact of these last 3 collaboration types is around half of the world average across collaboration types.



Researcher mobility

Nearly half of Kuwait's researchers belong to the transitory mobility class, meaning that they have published under both Kuwaiti and non-Kuwaiti affiliations, in rapid succession, since 1996. Under a third of Kuwait's researchers are sedentary, having consistently only published under Kuwaiti affiliations since 1996. In the long term, the country appears to re-

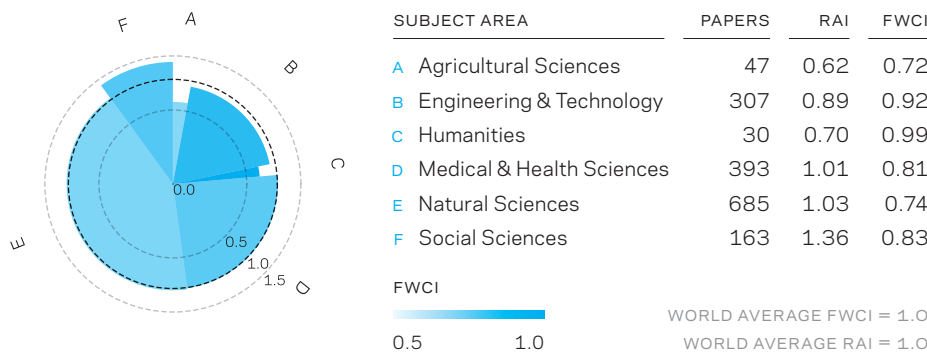
ceive a small (4 percentage points) gain in researchers, due to a 14% researcher inflow and a 10% researcher outflow.



Subject breakdown

As befits its size, Kuwait's output is small, and does not reach above the world average impact in any field. It is most prolific in the Natural Sciences, the Medical & Health Sciences and Engineering & Technology, and it publishes similar proportions of its output as the world in the first

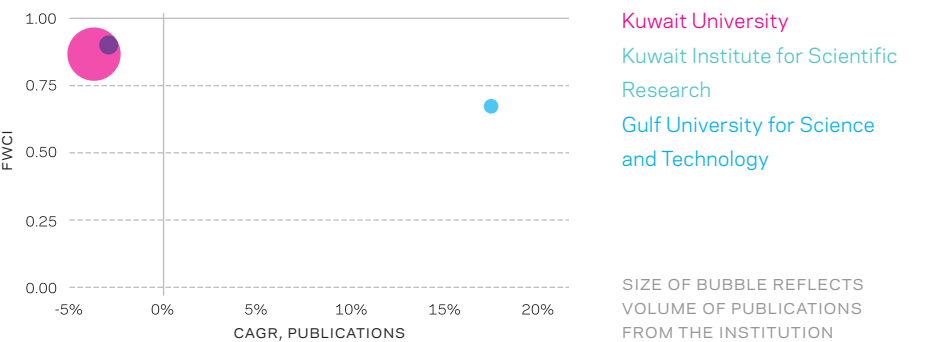
two aforementioned subject areas. However, it is comparatively more active in the Social Sciences.



Most prolific institutions

Kuwait University is by far the most prolific in the country, with more than 550 papers in 2014. However, it shows negative annual growth in output 2010-2014 CAGR, as does the less active Kuwait Institute for Scientific Research (71 papers). Gulf University for Science

and Technology's strong annual output growth (17% 2010-2014 CAGR) is from a very low base (42 papers in 2014).





Latvia focuses strongly on the Agricultural Sciences. The top prolific institutions all show impressive annual growth rates.

However, Latvia is not making use of international connections as much as it could. The international collaboration is relatively infrequent, at the same level as its institutional collaboration, and Latvia's researchers are rather sedentary. International collaboration shows a large

positive effect on Latvia's citation impact, providing evidence to increase this type of collaboration.

Headline statistics

International as frequent as institutional collaboration

International collaboration yields a large positive effect on Latvia's citation impact

Highly sedentary researcher base

The majority of Latvia's researcher base has never published with an affiliation outside of Latvia.

FOCUS AREA

Agricultural Sciences

Over 3 times as much activity as expected, based on the world average.

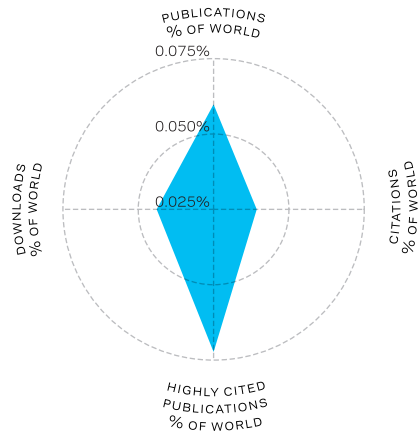
MOST PROLIFIC INSTITUTION

University of Latvia

University of Latvia is leading with the highest volume and highest FWCI. All prolific institutions show high annual growth rates.

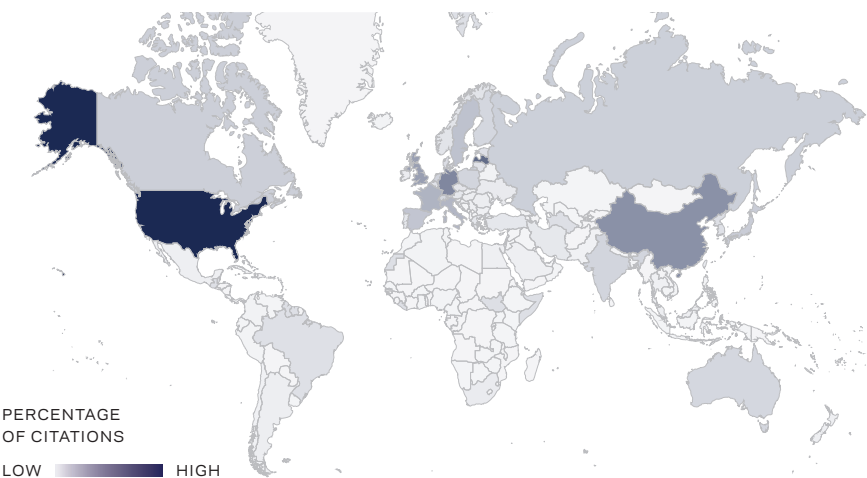
Overall country or region outlook

Latvia produces 0.06% of the world's scientific output, which equals 1,340 publications in 2014. Its global citation share and download share are comparable, yet slightly lower.



Global distribution of citations

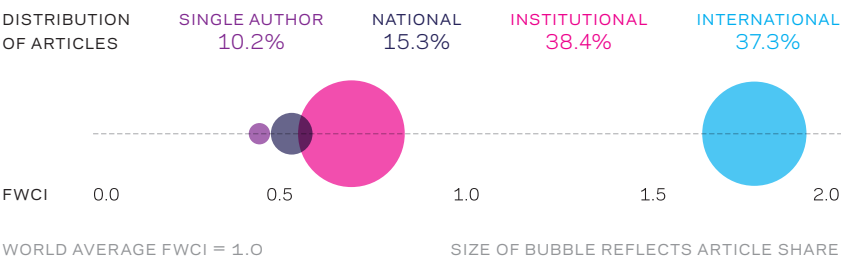
13% of all incoming citations for Latvia are from US publications, followed by Latvia itself (9%). Germany (7%), China (6%), and the UK (6%) also contribute a sizeable portion of the total citations towards Latvia's publications.



Collaboration patterns

Most nations that produce a low volume of publications tend to show relatively high percentages of international collaboration. Latvia produces 38.8% of its publications with an international co-author – a relatively low percentage, on a par with its institutional collaboration. However, Latvia's institutional collaboration results in an FWCI of 35% below the world average, whereas its international collabora-

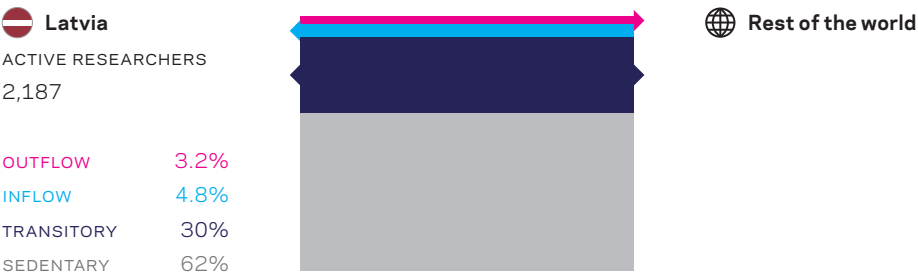
tion yields an FWCI of 63% above the world average.



Researcher mobility

Latvia's researcher population is highly sedentary, meaning that the majority of the active researchers have never published with an affiliation outside of Latvia. These researchers have an average FWCI of 22% below the world average, whereas all mobility types are associated with higher FWCI. This is a typical pattern that can be observed across nations: these

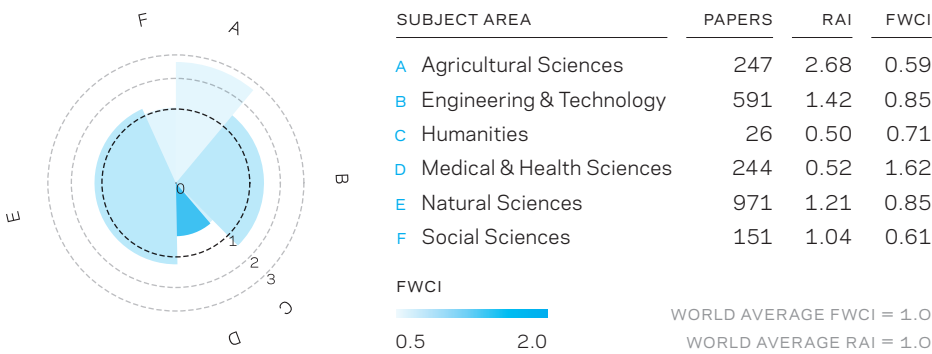
are typically more junior, less productive researchers, who have not had the opportunity for international experiences yet. For Latvia, the outflow researchers show the highest FWCI at 55% above the world average. The inflow of researchers is larger than the outflow.



Subject breakdown

Latvia's output is highly specialized in the Agricultural Sciences, more than 2.5 times as focused as would be expected, based on the world average activity in this area. Latvia also shows higher than average activity in Engineering & Technology, as well as the Natural Sciences, which

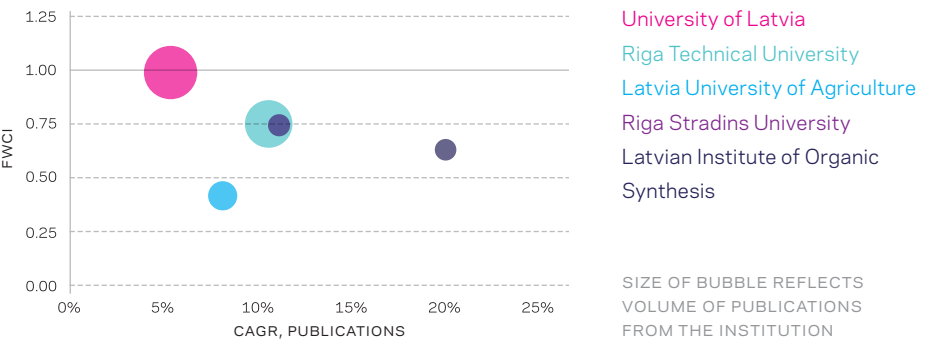
is, in absolute terms, the most dominant discipline for Latvia. FWCI scores for the Humanities are based on too low a volume of publications to be a reliable measure. Only the Medical & Health Sciences has an FWCI that is above the world average.



Most prolific institutions

Latvia's most prolific institutions are all showing impressive annual growth, which is caused in part by the small volume: for institutions with smaller annual numbers of publications it is more feasible to reach double digit growth rates than for institutions with thousands of publications per

year. The University of Latvia is leading, both in terms of volume and in FWCI. It is in fact the only institution among these five with an FWCI around the world average.





LEBANON

Lebanon has small shares of the world's main research indicators, as expected for a country of its size, but is nevertheless an attractive research country with nearly double the inflow of researchers compared to its out-flow.

Lebanon draws strength from the highly mobile nature of its researchers, whose absolute majority appears to have undertaken short-term foreign assignments. It also benefits from a high level of international collaboration (62% of its output), which yields high impact publications, cit-

ed nearly 30% more than the world average across collaboration types. Lebanon is particularly active, as well as impactful, in the Medical & Health Sciences.

Headline statistics

0.08% OF WORLD
SCHOLARLY
OUTPUT

and slightly lower shares of highly-cited output and citations.

62% INTERNATIONALLY
COLLABORATED
PAPERS

cited 29% more than the world average across collaboration types.

MOST PROLIFIC AREA

Medical & Health

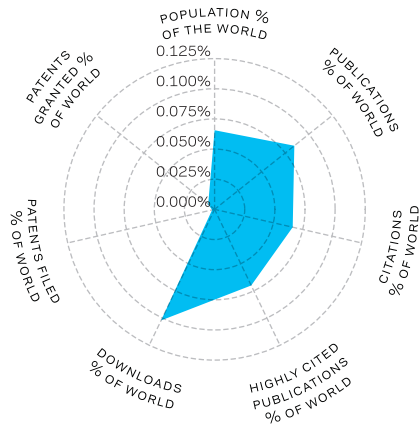
Lebanon's most relatively prolific field, showing higher than the world average impact.

57% RESEARCHERS WITH
TRANSITORY MOBILITY
PATTERNS

and 19% sedentary researchers, with a net researcher gain of nearly 8 percentage points in the long term.

Overall country or region outlook

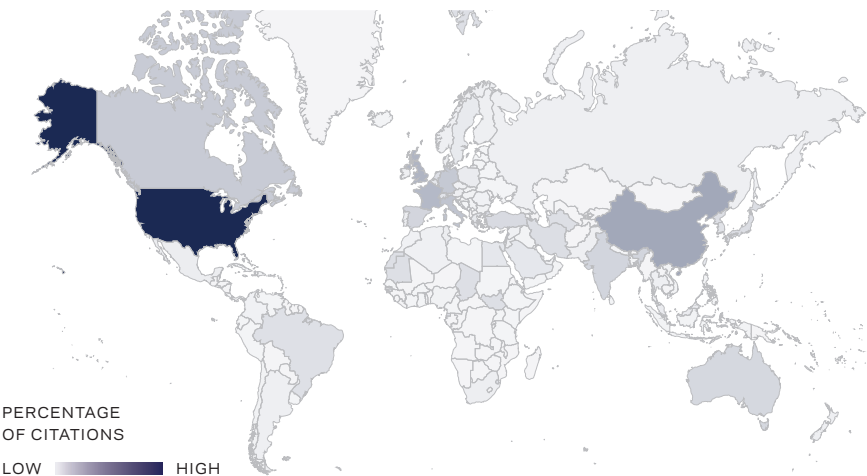
Compared to its population share of 0.07%, Lebanon publishes a slightly higher share of the world's scholarly output (0.08%) and highly-cited output (0.07%). Lebanon's papers are cited comparably, resulting in a 0.07% share of world citations, but viewed at a higher rate, leading to a 0.1% share of world downloads for the country. Lebanon files a very small number of patents so that its share of patents filed is practically null, but these tend to be rather successful, leading to an infinitesimally higher share of world patents granted (0.01%).



Global distribution of citations

Lebanon's citation distribution is expectedly skewed towards the more prolific countries, in particular, the US at over 18%, but also China at almost 7%. A sizeable proportion (6.5%) of citations to Lebanon's research comes from the country itself. The rest of Lebanon's citations come from all over the world, with slightly

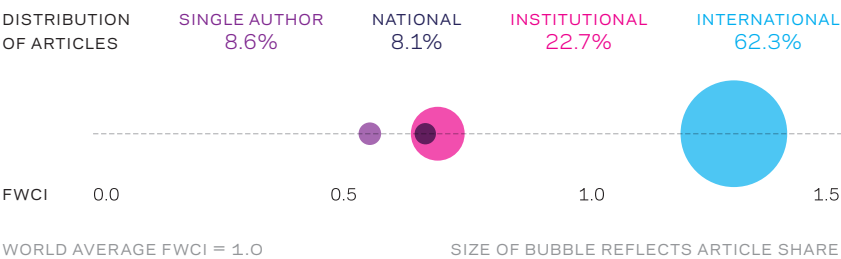
larger shares coming from the UK, France (possibly as a result of former colonial ties), and Italy.



Collaboration patterns

Nearly two-thirds of Lebanon's research is the product of international collaboration, and these papers are highly cited (29% more than the world average across all collaboration types). Nearly a quarter of Lebanon's scholarly output is institutionally collaborative, and yields 31% fewer citations than the above-mentioned world average. Nationally-collaborated and single-authored papers are rarer, accounting

for about 8% of Lebanon's output each, and are about 33% (national collaborations) to 45% (single-author papers) less impactful than the world average across collaboration types.



Researcher mobility

Lebanon's researchers are highly mobile, regarding short-term mobility in particular: 57% have published under both Lebanese and non-Lebanese affiliations, in rapid succession, since 1996. Less than a fifth of Lebanon's researchers are sedentary, having only published under Lebanese affiliations since 1996. As far as longer term mobility is concerned,

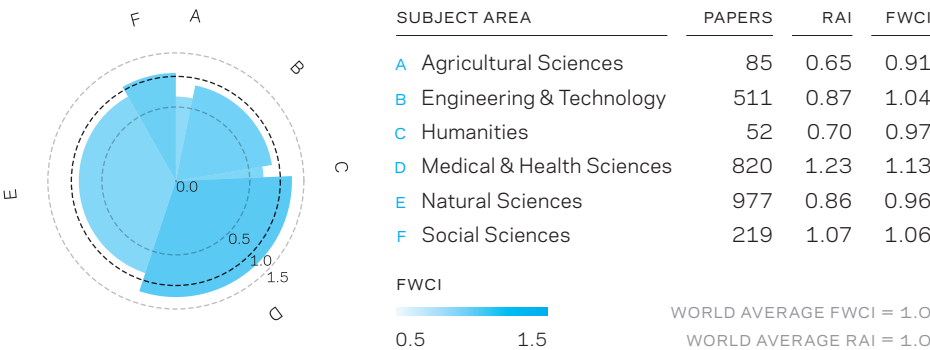
Lebanon appears to be an attractive destination for researchers, with an inflow proportion (15.8%) nearly double that of its outflow proportion (8.4%).



Subject breakdown

In absolute terms, Lebanon is most prolific in the Natural Sciences, but in relative terms in the Medical & Health Sciences, when compared to the output by subject distribution of the world. Lebanon's research reaches above the world average impact across all subjects in this field, as

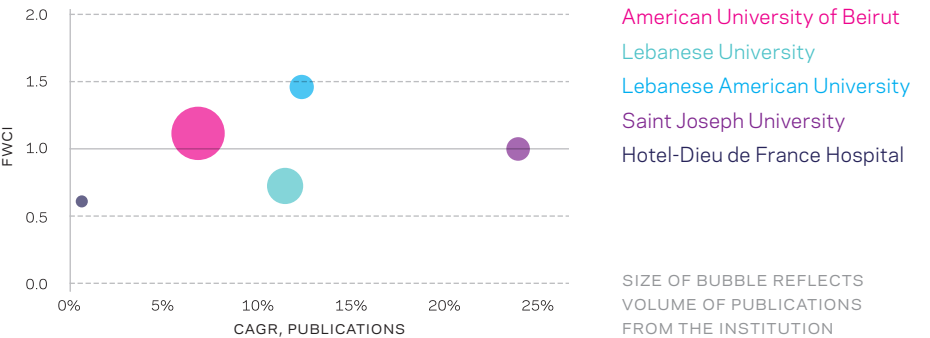
well as in the Social Sciences and in Engineering & Technology.



Most prolific institutions

Most of Lebanon's most prolific institutions appear to have some foreign ties, with either the US or France, and range in output size from nearly 800 papers in 2014 (American University of Beirut) to just over 40 papers in 2014 (Hôtel-Dieu de France Hospital), hinting to a highly

concentrated output distribution across few institutions. The two American-related universities have the highest impact above the world average (+46% for Lebanese American University and +11% for American University of Beirut).





LITHUANIA

Lithuania's research is rather insular. It produces around 2,700 publications per year, but most of the citations of these publications come from the country itself. The FWCI of Lithuania's publications is around the world average in recent years.

The large majority of Lithuania's active researchers have never moved across the country border. The country does start to collaborate more with the international research community, and the impact of the collaboration on citation impact of the research output is obvious.

Headline statistics

World average citation impact

The FWCI of Lithuania's publications is around the world average in recent years.

Low level of researcher mobility

Around 2/3 of Lithuania's researchers belong to the sedentary category in terms of mobility.

High citations from itself

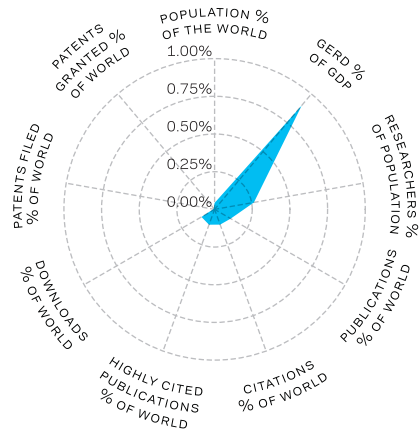
The largest share (11.9%) of Lithuania's citations comes from the country itself.

High FWCI for collaboration

The FWCI of Lithuania's internationally collaborated publications is 1.60, 60% higher than the world average.

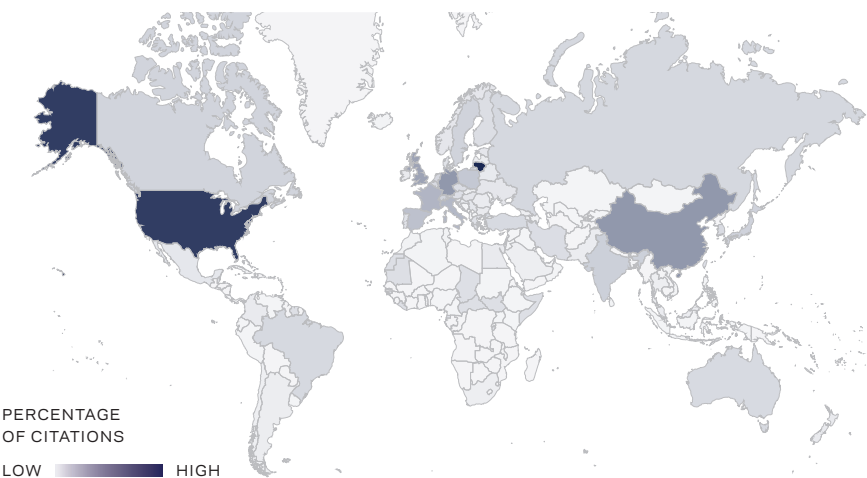
Overall country or region outlook

Lithuania produces around 2,700 publications per year (0.1% of the world's publications). It also receives around 0.1% of the world's citations, contributes to around 0.1% of highly cited publications and attracts 0.1% of downloads worldwide. Its FWCI is around the world average in the recent years.



Global distribution of citations

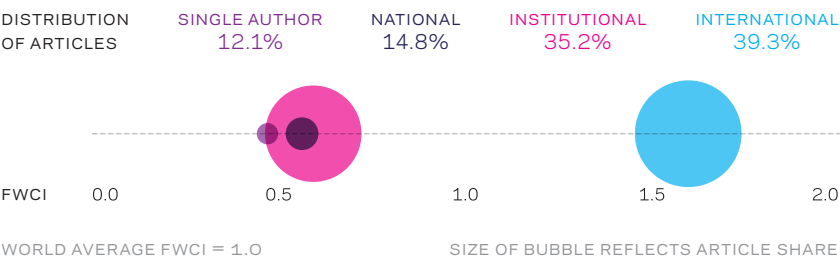
Lithuania's publications are most often cited by its own publications: 11.9% of Lithuania's citations come from the country itself. This is followed by the US (10.7%), China (5.4%), and Germany (5.4%). Lithuania's neighbouring countries, Poland and Russia, are also among its top twenty citing countries.



Collaboration patterns

Around 39.3% of Lithuania's publications involve at least one author from outside of the country. The number is lower than many of the Western European countries, but is similar to many Eastern European countries, such as Latvia and the Czech Republic. The FWCI of the international collaboration (1.60) is the highest among the four collaboration types and is also

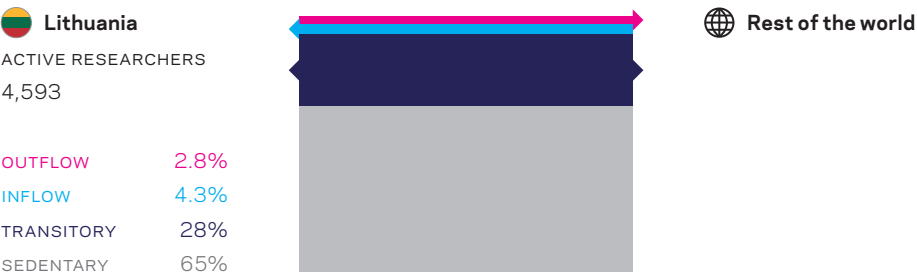
the only one that is above the world average.



Researcher mobility

Sedentary researchers are the largest group of researchers (65%) among the four mobility categories for Lithuania. This implies that Lithuania's research community is rather insular and the great majority of the researchers do not move across the country border. There is a second largest group of researchers who do move in and out of the country. This group

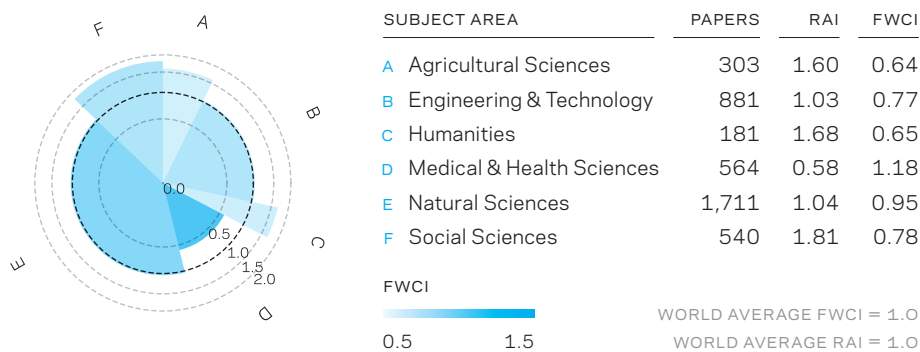
consists of 28% of the country's active researchers.



Subject breakdown

Lithuania only has a higher than world average FWCI in the Medical & Health Sciences (1.18). However, compared to the world average, Lithuania has a low level of research activity in this subject area (42% lower than the world average). Engineering & Technology is a large subject

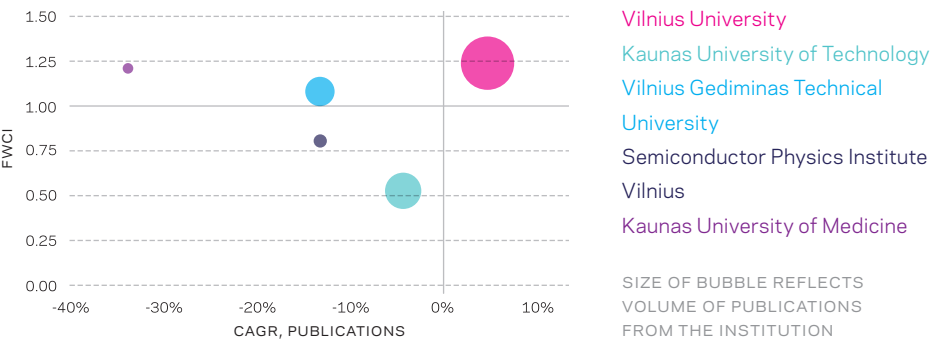
area for Lithuania. It also has a higher than world average level of research activities. However, the FWCI in Engineering and Technology is 23% lower than the world average.



Most prolific institutions

Lithuania's largest university is Vilnius University, as measured by the volume of research output. It produces around 1,000 publications per year and has the highest FWCI among the top five most prolific institutions of Lithuania (1.24).

The other four institutions all focus on Technology, Physics, or Medicine.





LUXEMBOURG

Being a very small country, Luxembourg collaborates little within its own borders. Instead, it looks abroad for its co-authors: three-quarters of its scholarly output is internationally collaborated.

Only about one in ten of Luxembourg's researchers have not published with an affiliation outside of Luxembourg since 1996. The majority (59%) prefers to move abroad, or to Luxembourg, for short periods of time. Luxembourg also shows relatively high patenting activity: its share

of the world's filed and granted patents is larger than that of many larger countries or regions, and larger than its share of the world's scholarly output.

Headline statistics

Net gain of researchers

Luxembourg's inflow of researchers is 3 times as high as its outflow (23% vs 7%).

75% INTERNATIONAL COLLABORATION SHARE

Luxembourg collaborates internationally on 75% of its scholarly output, more than most other countries.

90%

RESEARCHER MOBILITY

The vast majority of Luxembourg's researchers have published with an affiliation outside of Luxembourg.

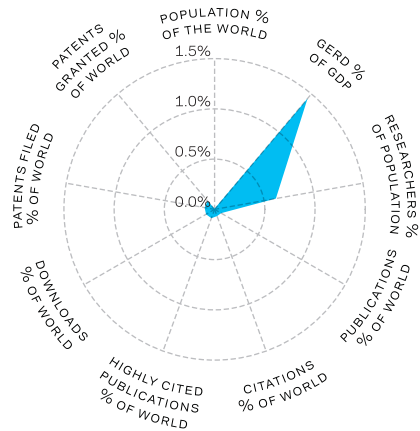
STRONG AREA

Natural Sciences

Half of all Luxembourg's publications come from the Natural Sciences, and these are cited 51% more than the world average.

Overall country or region outlook

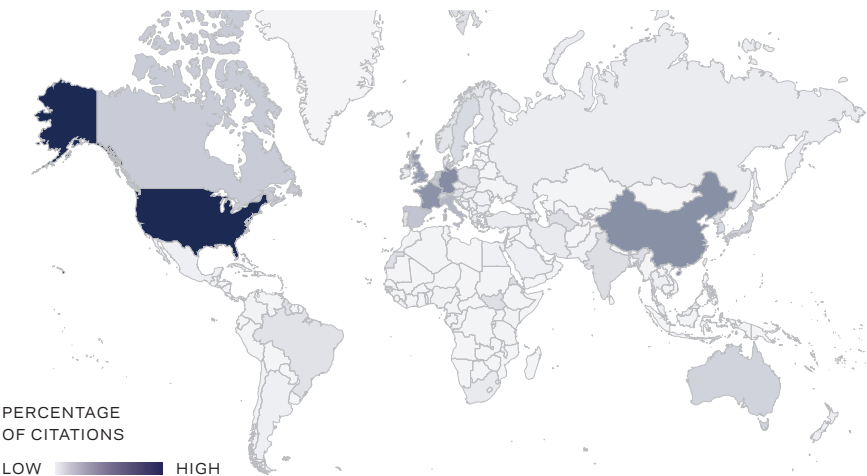
As one of the smallest countries in Europe, with just 0.01% of the world's population, it is to be expected that Luxembourg has low world shares: it produces about 0.08% of the world's scholarly output. Despite its share of the world's citations being slightly lower (0.07%), it holds 0.09% of the world's top 10% most cited articles. Its share of the world's downloads is slightly higher still, at 0.1%. Interestingly, Luxembourg also has a 0.1% share of the world's filed patents, as well as a similar share of the world's granted patents; higher than many larger countries.



Global distribution of citations

Although Luxembourg, like most other countries, is the source of a fair share of its incoming citations (7%), most citations naturally come from larger, more prolific research nations. US citations form by far the largest share, with almost 15%. After that come Germany, China,

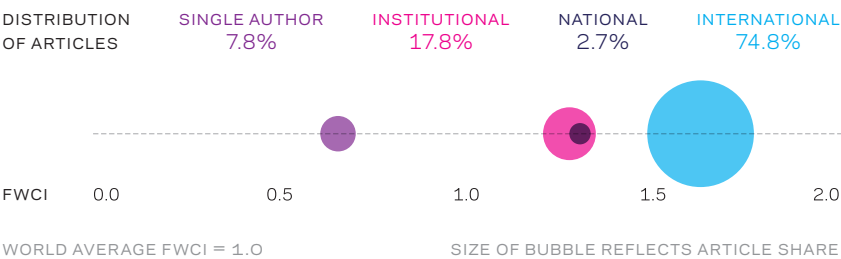
and France, each making up around 7%. Other countries whose citations form a sizeable share of Luxembourg's citations include the UK (6%), Italy (4.5%), and Spain (3.5%). Benelux partners, the Netherlands and Belgium, have a 3% and 2.7% share, respectively.



Collaboration patterns

Luxembourg collaborates internationally on a large majority of its output; 75% of all publications have an international co-author. These publications have the highest citation impact among the collaboration type, being cited 63% above the world average. In contrast to most other countries, Luxembourg's national collaboration makes up the smallest share of its output: just 2.7%. However, nation-

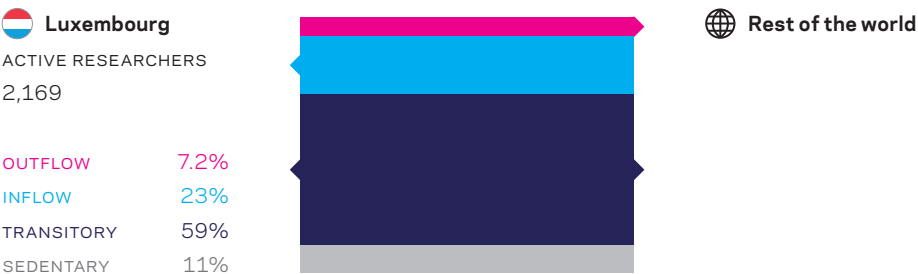
ally co-authored publications still have a higher citation impact than single-author publications (1.30 versus 0.65).



Researcher mobility

Luxembourg's researchers are highly mobile: less than 11% of the researchers in Luxembourg have not published with an affiliation outside of the country. Conversely, the share of researchers that show transitory mobility is just over 59%. These are researchers who move abroad or to Luxembourg for a short period, after which they move back. Furthermore, Lux-

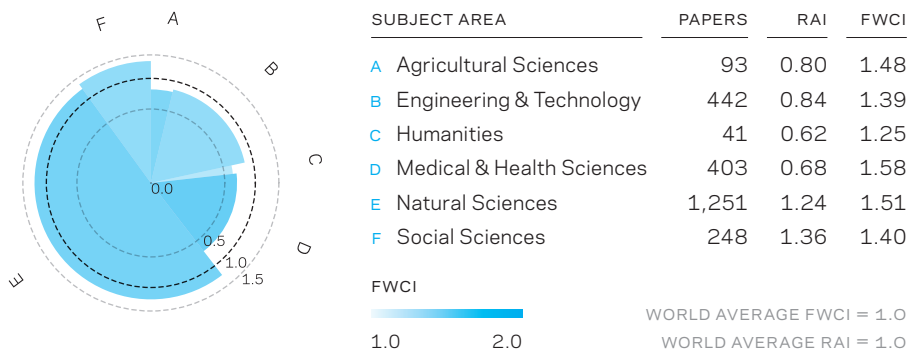
embourg's inflow of researchers is three times as high as its outflow, suggesting Luxembourg is very attractive to international researchers.



Subject breakdown

Half of Luxembourg's scholarly output is published in the Natural Sciences. Aside from being prolific in absolute numbers, this also makes Luxembourg 24% more active in this subject, relative to the world's average subject shares. The only other subject in which Luxembourg shows

an above average activity is the Social Sciences, proportionally publishing 36% more in this subject. All of Luxembourg's subjects achieve an FWCI above the world average of 1.0, ranging from 1.25 for the Humanities to 1.58 for the Medical & Health Sciences.

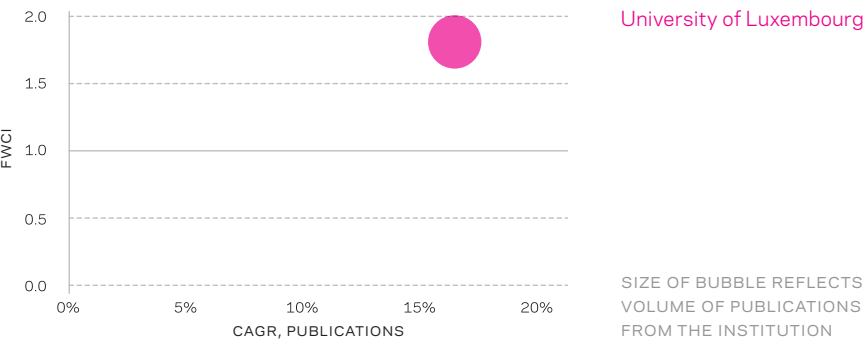


Most prolific institutions

Luxembourg's only research institution currently in SciVal* is the University of Luxembourg. While this makes it Luxembourg's largest, most impactful, and fastest growing research institution in this analysis by default, it is actually doing quite well. In 2014 it produced over 700

publications (about 42% of Luxembourg's total output that year), it has a compound annual growth rate of almost 17%, and its publications are cited 81% more than the world average.

**see Appendix A for more on this issue*





MALAYSIA

As a growing research country, Malaysia's share of the world's scholarly output is large for its population size, while its top institutions show high publication growth.

Malaysia publishes about 1.1% of the world's scholarly output and 1% of the world's top 10% cited papers. It receives around 0.6% of the world's citations and 1.1% of the world's downloads. Citations to Malaysia's research come from all over the world and their distribution is skewed

towards Malaysia (21%), and prolific countries such as China (10%) and the US (8%). Top institutions in Malaysia have positive growth in terms of scholarly output, and the Universiti Teknologi Malaysia has the highest FWCI at 1.20.

Headline statistics

1.1% OF THE WORLD'S
SCHOLARLY OUTPUT

Relative to its population, Malaysia's scholarly output is high and gets a higher share of the world's downloads than citations.

21% OF INCOMING CITATIONS
FROM MALAYSIA

Other than Malaysia, China, the US, India, and the UK each have a sizable share of citations to Malaysia's papers.

53%
SEDENTARY RESEARCHERS

The remaining researchers tend to favour short term assignments abroad (35%) over long term ones.

MOST PROLIFIC INSTITUTION

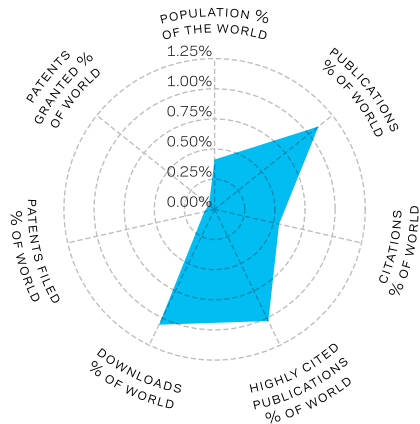
Univ. Teknologi Malaysia

Has the highest publication growth, the largest number of papers published in 2014, and the highest FWCI based on 2010-2014 papers.

Overall country or region outlook

Malaysia makes up 0.4% of the world's population, publishes around 1.1% of the world's scholarly output, and publishes 1.0% of the world's top 10% cited papers. It receives 0.6% of the world's citations and around 1.1% of the world's downloads.

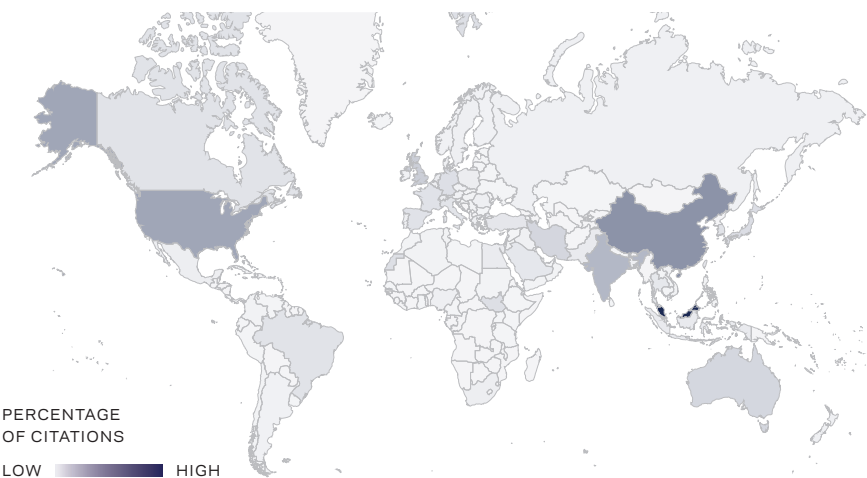
Malaysia's share of the world's patents filed and those granted are both less than 0.1%. Relative to its population, Malaysia's scholarly output is high, and currently getting more attention in the form of downloads, as compared to citations.



Global distribution of citations

Malaysia's largest source of citations is itself: 21% of its total received citations are references in Malaysia's papers. Other countries whose citations form a sizable share include prolific countries such as China (10%), the US (8.3%), India (6.3%), and the UK (4.1%). Citations to Malaysia's research is not limited to

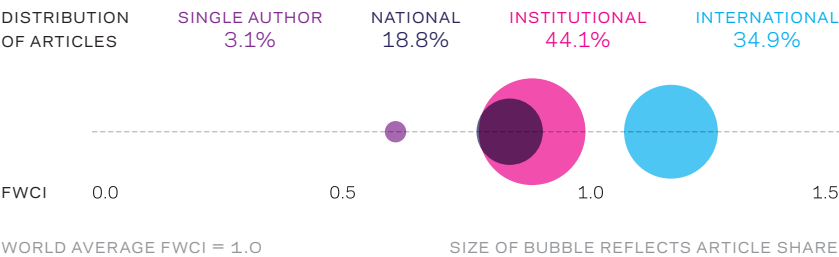
any particular geographic region, with citations from Iran, Australia, Japan, Germany, France, Spain, and South Korea, making up around 2% to 3% each of Malaysia's total received citations.



Collaboration patterns

International collaborations tend to have higher impact than other collaboration types; for Malaysia, however, this effect is less obvious: its internationally collaborated papers, which make up about 35% of its total scholarly output, are cited only about 16% more than the world average for all collaboration types. Malaysia has more institutional collaborations (44%) than international ones; they are cited

about 12% less than the world average for all collaboration types. About 19% of Malaysia's scholarly output are collaborations across institutions in Malaysia, and they are cited about 16% less than the world average for all collaboration types.



Researcher mobility

Malaysia's researchers are rather sedentary: 53% have only published under a Malaysian affiliation. Malaysia's researcher inflow is higher than its researcher outflow by 3%, indicating a slight overall net inflow of researchers into Malaysia in the long term. However, aside from the sedentary researchers, most researchers in Malaysia show transitory mobility

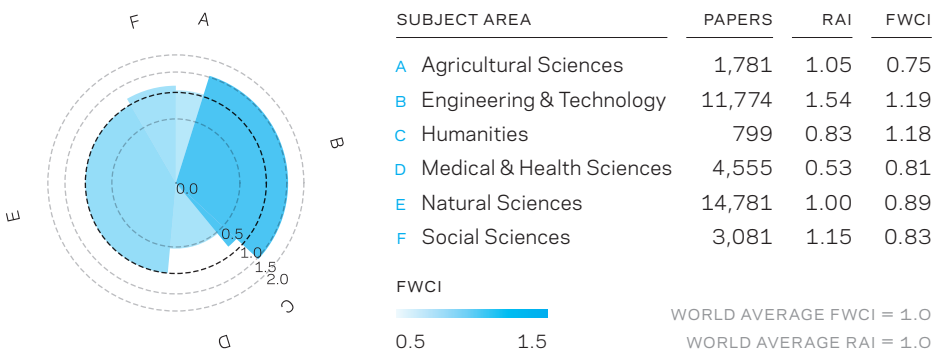
and this group represents almost 35% of Malaysia's total researcher population. This means that short term assignments abroad are more likely than long term immigration or emigration for Malaysia's researchers, and it can be argued that such transitory mobility can facilitate exchanges of ideas across borders, which would be beneficial to Malaysia.



Subject breakdown

Malaysia is most prolific in the Natural Sciences, with around 40% of its output in this area, but these papers are cited about 11% less than the world average. Around 32% of its output is in the area of Engineering & Technology, which is 54% more than the world, and these papers

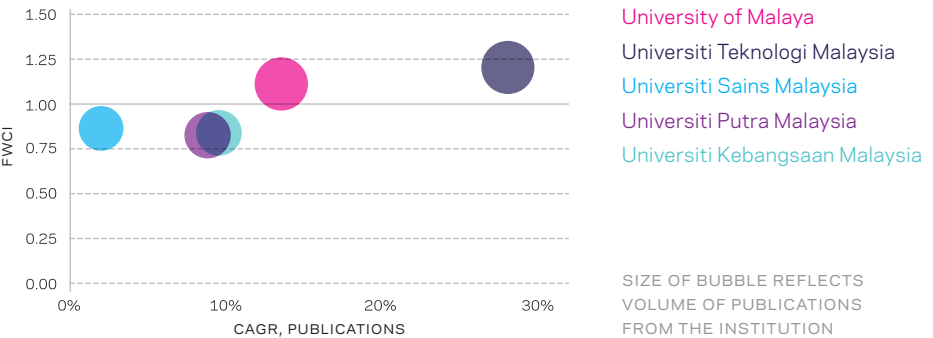
are cited 19% more than the world average. Malaysia tends to publish a lesser proportion of its output, than the world, in the Humanities and the Medical & Health Sciences, its small volume of papers in the Humanities is cited 18% more than world average.



Most prolific institutions

The top five Malaysian universities each published between 2,700 and 3,800 papers in 2014. All of them showed positive growth in terms of 2010-2014 papers, from 2.0% (Universiti Sains Malaysia) to 28.1% (Universiti Teknologi Malaysia). The two most prolific institutions, Univer-

siti Teknologi Malaysia and University of Malaya, are also the most impactful prolific Malaysian institutions with an FWCI of 1.20 and 1.11, respectively, meaning that they are cited on average 20% and 11% more than the world.





MEXICO

Mexico has strong connections to, and similarities with, other Latin American countries. Brazil and Argentina cite Mexico's research (and vice versa) at relatively high rates, and all of the countries have a strong relative focus in the Agricultural Sciences.

Mexico invests a comparatively low amount of its GDP on R&D, and that is reflected in the country's aggregate research performance. Its world share of citations and highly cited articles is lower than its world share of publications. The Universidad Nacional Autónoma de Mex-

ico stands out as Mexico's most prolific research institution, producing more publications than the next four combined.

Headline statistics

CONNECTIONS

Iberian-Latin American

Spain, Brazil, and Argentina cite Mexico's research at rates higher than expected.

Net inflow of researchers

Mexico experiences a net inflow (+2.2%), which means that more researchers enter the country than leave.

FOCUS AREA

Agricultural Sciences

Mexico has a strong relative focus in the Agricultural Sciences. It produces nearly twice the global average in this subject area, relative to its total research output.

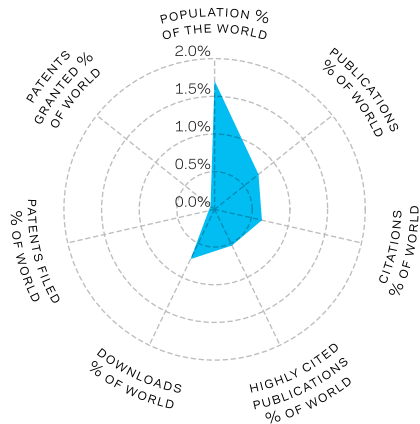
MOST PROLIFIC INSTITUTION

Universidad Nacional Autónoma de Mexico

is Mexico's most prolific research institution, producing more research than the next 4 combined.

Overall country or region outlook

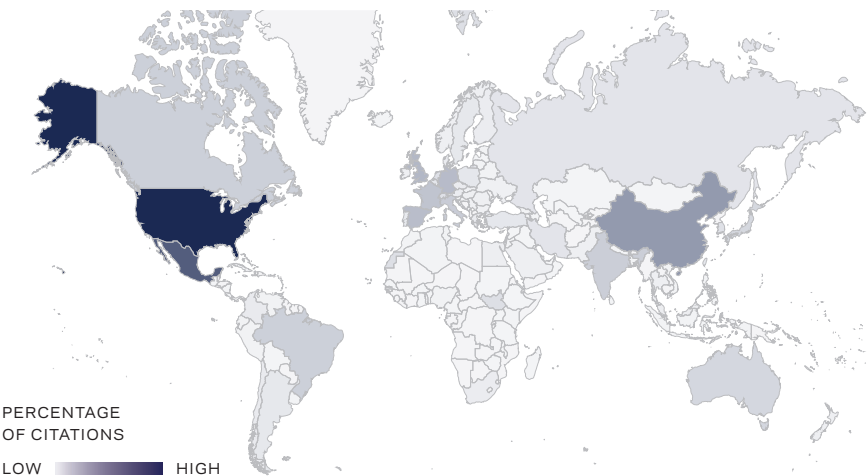
Mexico invests 0.43% of its GDP on gross R&D expenditures (according to the most recently available estimates in 2011). This is relatively low given the country's size, and that is reflected in its aggregate research performance. Although the country comprises 1.71% of the world's population, its research output accounts for only 0.75% of all publications worldwide in 2014, 0.64% of all citations from 2010 to 2014, and 0.53% of all highly cited articles from 2010 to 2014. Relative to its size, the country also exhibits low patenting activity, accounting for 0.08% of the world's patents filed.



Global distribution of citations

15.9% of all citations to Mexico's research come from the US. After the US, Mexico itself accounts for 11.8% or about one of every eight citations to its own research. The rest of the top five countries closely follow global base rates: China (7.1%), the UK (4.7%), and Germany (4.5%). There is evidence suggestive of an Iberian-Latin

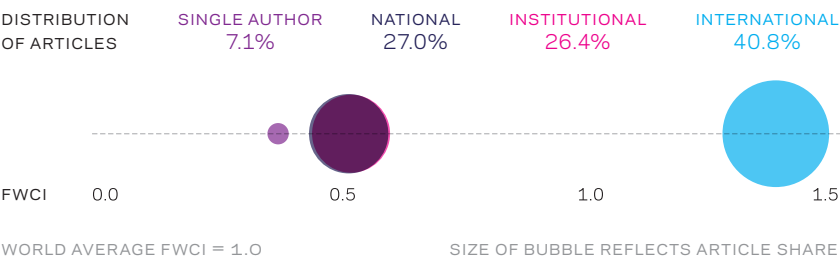
American citation network, in that Spain (4.3%), Brazil (2.9%), and Argentina (1.0%) cite Mexico's research at higher rates than otherwise expected.



Collaboration patterns

Nearly two-fifths of Mexico's research is the result of international collaboration. This is the only type of collaboration that achieves an FWCI (1.37) above the world average. National and institutional collaborations, which each comprise a little more than a quarter of all of Mexico's publications, attain FWCI that are nearly 50% less than the world average, and

single-authored publications achieve an even lower FWCI.



Researcher mobility

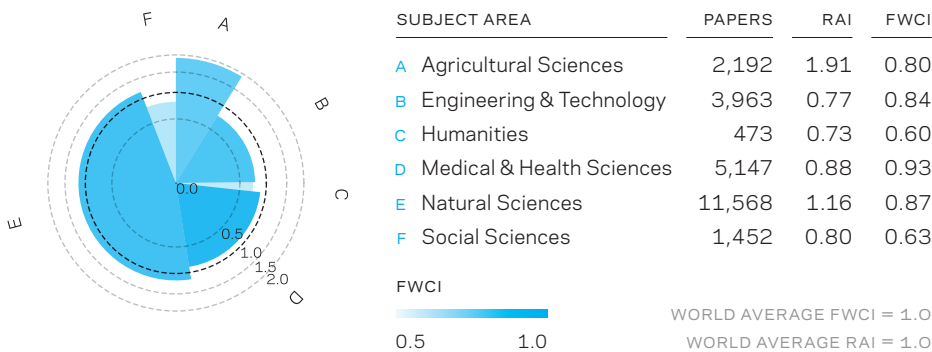
A slight majority (54.9%) of Mexico's active researcher base is mobile, having published at least once with an affiliation outside of the country. The country as a whole experiences a net inflow of researchers (+2.2%), which means that more researchers enter the country and stay permanently than leave.



Subject breakdown

Similar to other Latin American countries (such as Argentina, Brazil, Colombia, Cuba, and Peru), Mexico has a strong focus on research activity in the Agricultural Sciences. The country produces nearly twice the global average given the size of its research output. Across all subject

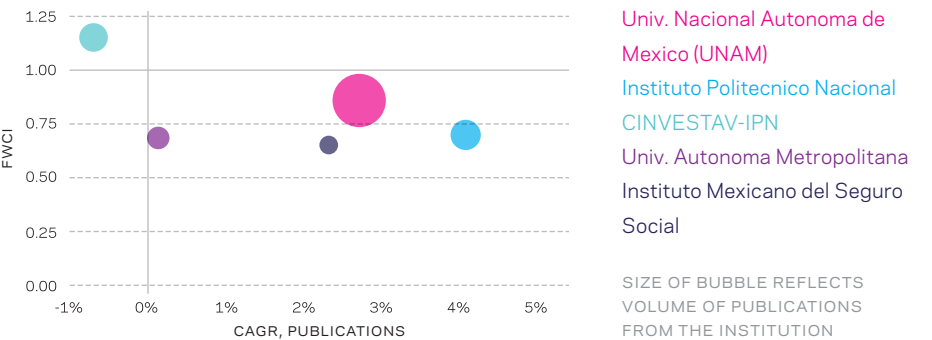
areas, in which the country produces a substantial amount of research, Mexico achieves the highest FWCI in the Medical & Health Sciences at 0.93, followed by the Natural Sciences at 0.87.



Most prolific institutions

Mexico's most prolific institution is the Universidad Nacional Autónoma de Mexico (UNAM), which produced more research publications in 2014 (4271) than the next four most prolific institutions combined. CINEVESTAV-IPN, a non-governmental scientific research institute,

achieves the highest FWCI at 1.15, or 15% above the world average.





MOROCCO

Morocco has a small but growing research base, buoyed by institutions such as the Université Mohammed Premier Oujda, which grew 24.8% per year over the past half-decade.

The majority of Morocco's active researcher base is transitory (researchers who spend two years or less inside the country or abroad). The country experiences a net inflow of researchers, which suggests that it is an attractive destination for international researchers. Moreo-

ver, based on citation networks, Morocco has strong connections to France and other North African countries.

Headline statistics

CONNECTIONS

Francophone

8.0% of all citations to Morocco's research come from France, while 1.3% and 1.1% come from Tunisia and Algeria, respectively.

Net inflow of researchers

Morocco experiences a net inflow (+3.7%) which means that more researchers enter the country than leave.

High research impact associated with international collaboration

FWCI of 1.11 for international collaborations.

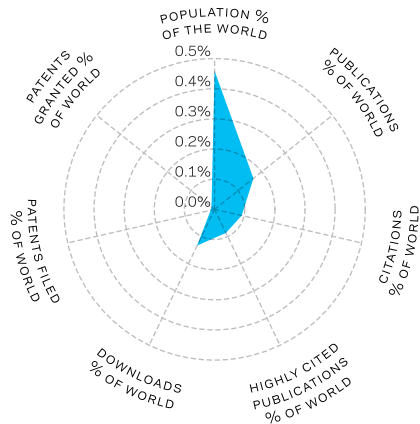
MOST PROLIFIC INSTITUTION

Université Mohammed Premier Oujda

is Morocco's top research institution, and it grew 24.8% per year over the past half-decade.

Overall country or region outlook

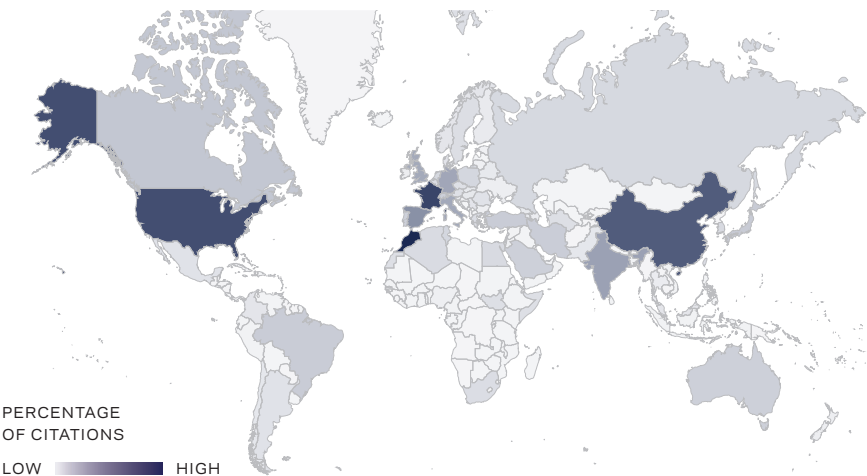
Compared to other African countries, Morocco invests a comparatively high level of its GDP in gross R&D expenditures (0.73% according to the most recently available estimates in 2010). The country comprises 0.46% of the world's population, and its research output accounts for 0.16% of the world's publications, 0.09% of the world's citations, and 0.09% of the world's most highly cited articles. There is little patenting activity.



Global distribution of citations

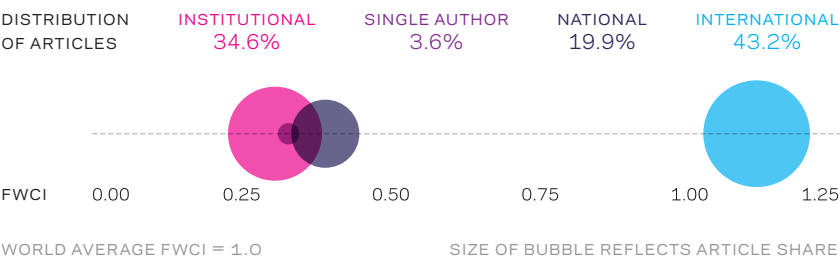
Nearly one out of every ten citations to Morocco's research comes from Morocco itself. Given their linguistic and colonial history, it is unsurprising that the country that cites Morocco the second most frequently is France, comprising 8.0% of all citations to Morocco. Relative to global citation base rates, Morocco has a

noticeable citation network, featuring the Maghreb (Tunisia at 1.3% and Algeria at 1.1%) and other Muslim countries in general (Iran and Turkey at 1.8% each).



Collaboration patterns

Similar to most countries, especially those with smaller levels of research outputs, international collaborations comprised the largest proportion of Morocco's total research output at 43.2%. Such collaborations achieved an FWCI of 1.11, or 11% above the world average. No other collaboration type for Morocco achieved an FWCI above 0.39, or 61% below the world average.



Researcher mobility

More than 50% of Morocco's active researcher base is transitory, which means their publication histories indicate that they have spent two years or less in Moroccan institutions, or at institutions outside of Morocco. Such researchers produce highly impactful research, achieving an FWCI of 3.09, or more than three times the world average. As a whole, the country

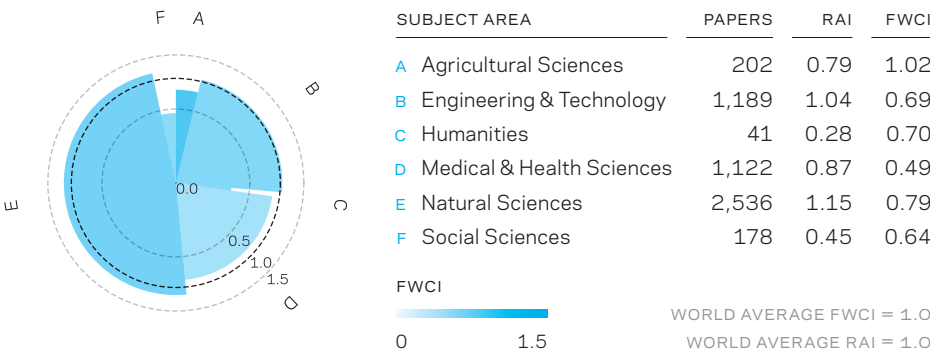
also experiences a moderate net inflow of researchers (+3.7%), which means that more researchers enter and stay in the country permanently than leave.



Subject breakdown

With the exception of the Humanities and the Social Sciences, the distribution of Morocco's research output across subject areas closely tracks the global distribution. The highest percentage of the country's research is concentrated in the Natural Sciences, and the FWCI of its re-

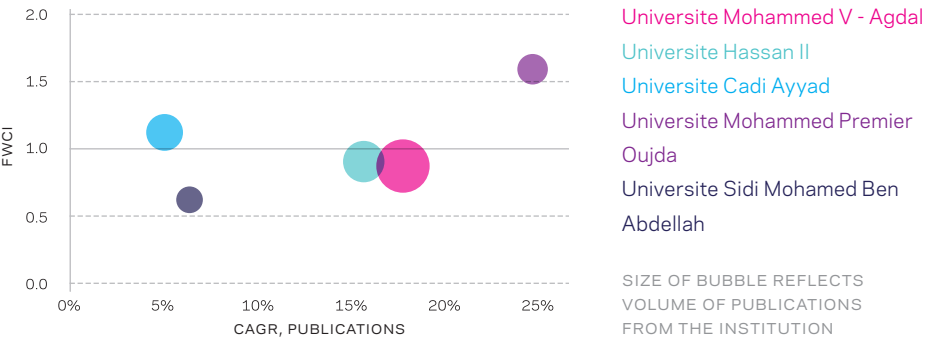
search in that area is 0.79, or 21% below the world average.



Most prolific institutions

Due to their low relative levels of output, several of Morocco's most prolific research institutions grew at very high rates over the past five years. The Université Mohammed V (Agdal) produced 821 publications in 2014, the highest among all of Morocco's institutions. In addition to its

high CAGR in publication output (24.8%), the Université Mohammed Premier Oujda also achieved a high FWCI (1.59), or 59% above the world average.





NETHERLANDS

While the Netherlands publishes a small share of the world's research output, it shows a clear contribution to excellence in research, and its international collaboration is highly impactful.

A typical pattern for smaller countries is a high degree of international collaboration and mobility. The Netherlands forms no exception to that rule. The most prolific university is Utrecht University, but the two universities based in Amsterdam show faster growth. The Netherlands is

relatively active in the Medical & Health Sciences, resulting in the highest FWCI amongst disciplines.

Headline statistics

3.2% OF MOST
HIGHLY CITED
PUBLICATIONS

The Netherlands shows a clear contribution to the world's excellence in research.

FWCI >2

INTERNATIONAL COLLABORATION

meaning that citation impact is twice as high as the world average.

STRONG AREA

Medical & Health

with higher activity than expected based on the world average, and the highest FWCI among disciplines.

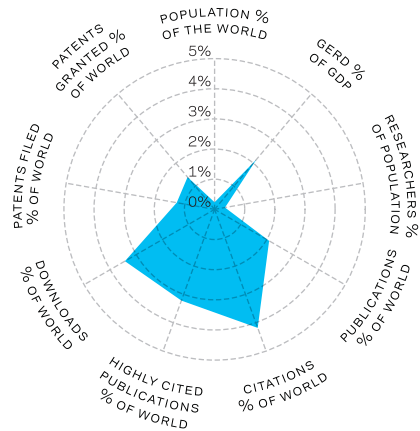
Internationally mobile

More than 64% of the Netherlands' active researcher population is internationally mobile .

Overall country or region outlook

The Netherlands, with only 0.2% of the global population, produces 2.1% of the world's scientific output, and receives 4.2% of the world's citations. The Netherlands contributes 3.2% of the world's most highly cited content. The level of downloads received is slightly higher, but patents filed or granted are much lower than that, at around 1%.

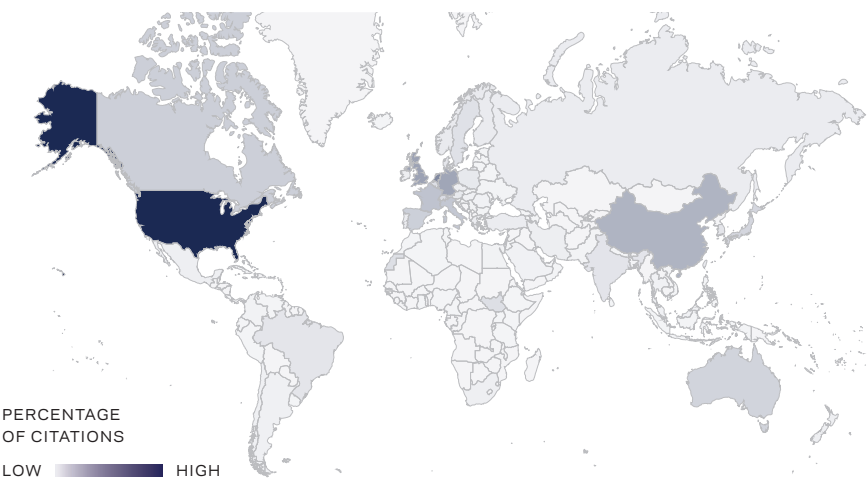
These are indications that even though the total volume of research from the Netherlands is low, it can be seen as being of relatively high quality and, in some cases, even excellence.



Global distribution of citations

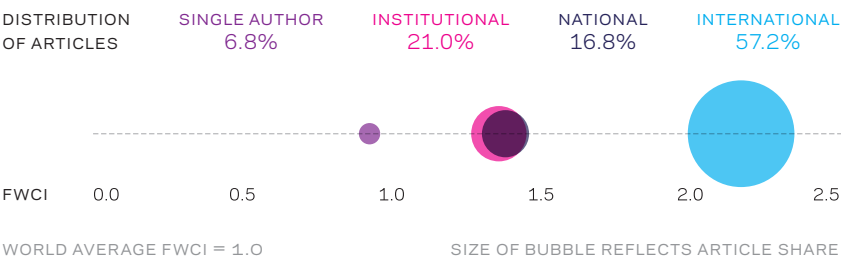
For research originating from the Netherlands, the US is responsible for the largest part of the citations received (19%). The pattern is even more skewed for other countries, in the sense that the difference between the US and the second nation on the list is relatively large. The Netherlands does cite work from its own

nation substantially, accounting for 10% of incoming citations. The UK and Germany are the next most frequent sources of citations (both with a little over 7%), followed by China (6%).



Collaboration patterns

The Netherlands publishes the majority of its research with an international co-author, which is often the case for relatively small countries. In addition, the Netherlands benefits greatly from its international collaboration, with an FWCI of over two. Institutional and national collaborations yield extremely similar results, both in volume and in FWCI, which is around 30% above the world average.



Researcher mobility

Similar to other European nations, such as France or the UK, the Netherlands' researcher population has a relatively high level of mobility. Only 35.4% of all active researchers are sedentary, showing no international movement through their affiliations. The most common type of mobility is transitory, indicating short stays abroad. The outflow of active researchers

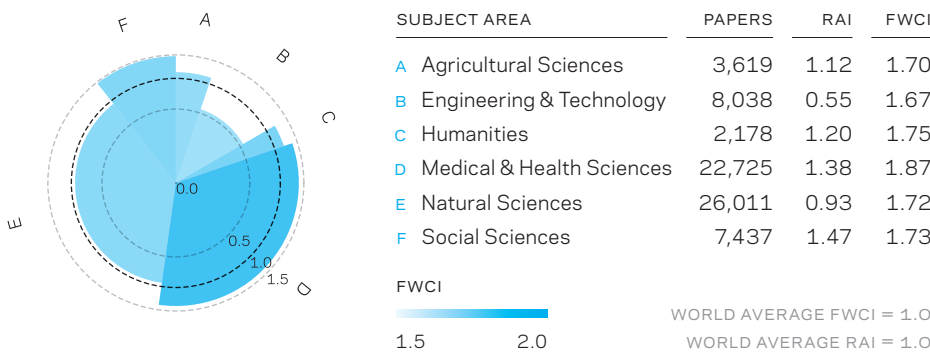
(9.6%) is slightly larger than the inflow (8.3%).



Subject breakdown

The Medical & Health Sciences, the Social Sciences, and the Humanities are clear areas of focus for the Netherlands, with a higher activity than expected based on the world average. Especially the Medical & Health Sciences can be seen as a strength, with the highest FWCI among

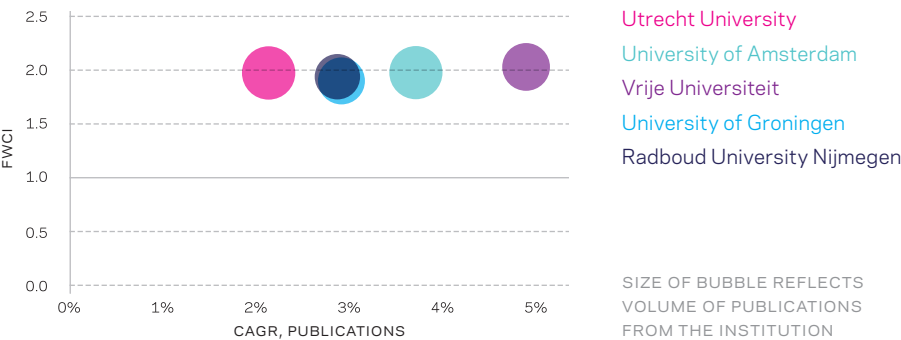
disciplines. The relative activity in Engineering & Technology is remarkably low, at more than 40% lower than expected based on world activity in that discipline.



Most prolific institutions

Among the most prolific institutions in the Netherlands are its two universities in Amsterdam (Vrije Universiteit with more than 4,500 publications in 2014, and University of Amsterdam with more 5,500 publications in 2014). Utrecht University is the most prolific institution

in the Netherlands (with more than 5,600 publications in 2014), while showing the slowest growth out of the top five institutions.





NEW ZEALAND

Similar to other small advanced research nations, New Zealand has an out-sized research footprint. Its world share of citations and highly cited articles outpace its world share of publications.

New Zealand researchers are very outward-looking and globally connected. More than half of all New Zealand's publications involve an international collaborator, and more than three-quarters of New Zealand's researchers have published at

least once with an affiliation outside of the country.

Headline statistics

Relatively large research footprint

New Zealand has a relatively large research footprint. 0.51% of the world's publications garner 0.73% of the world's citations.

High returns on international collaboration

Such collaborations (55.3% of the country's total output) achieve an FWCI of 1.80, or 80% above the world average.

FOCUS AREA

Agricultural Sciences

New Zealand publishes more than twice as much as the world average in this subject area.

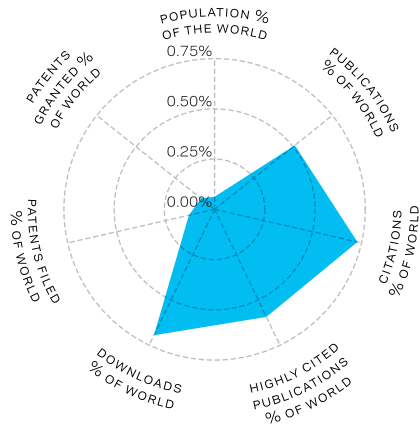
MOST PROLIFIC INSTITUTIONS

Universities of Auckland and Otago

are New Zealand's most prolific research institutions (3,169 and 2,047 publications, respectively, in 2014).

Overall country or region outlook

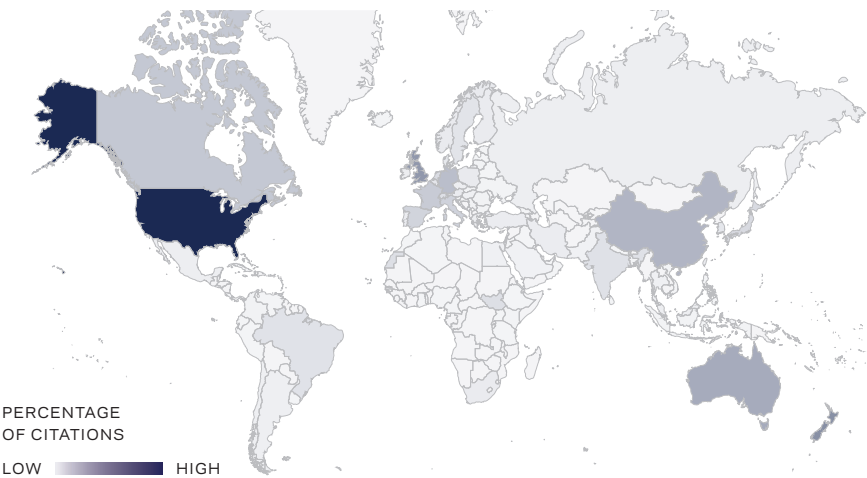
New Zealand is a small country with an out-sized research footprint, investing 1.27% of its GDP on gross R&D expenditures (estimates 2011). Although the country accounts for only 0.06% of the world's population, it produces 0.51% of the world's publications and garners 0.73% of the world's citations. Moreover, 0.59% of all highly cited articles in the world are from New Zealand (more than one out of every five articles from New Zealand). Proportionate to its size, the country also has a high level of patenting activity, accounting for 0.13% and 0.09% of patents filed and granted in the world.



Global distribution of citations

The top three countries that cite New Zealand's research are the US (18.2%), New Zealand itself (9.0%), and the UK (8.2%). Given their geographic proximity, and British colonial heritage, it is unsurprising that Australia accounts for 6.5% of all citations to New Zealand's research.

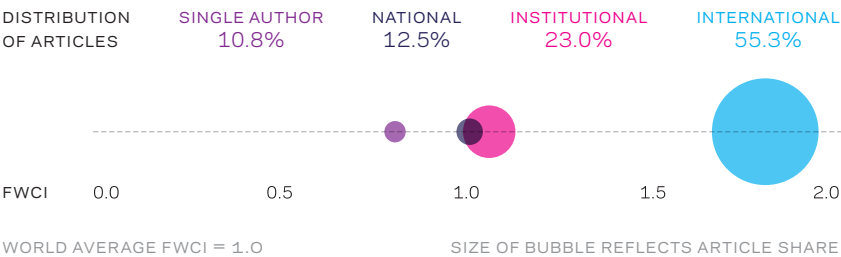
China completes the top five, accounting for 5.6% of all citations to New Zealand's research.



Collaboration patterns

More than half of New Zealand's publications are international collaborations, achieving an FWCI of 1.80, or 80% above the world average. Institutional collaborations are the next most frequent type of collaboration for New Zealand, but such collaborations attain an FWCI of 1.06, or only 6% above the world average. Among all the different types of publications,

only single-authored publications get an FWCI below the world average, at 0.81.



Researcher mobility

Similar to other small advanced research nations, New Zealand has a highly mobile research base. More than three-quarters of New Zealand researchers have published at least once with an affiliation outside of the country, and half are categorized as transitory. This means that, based on their publication histories, they have spent less than two years either at

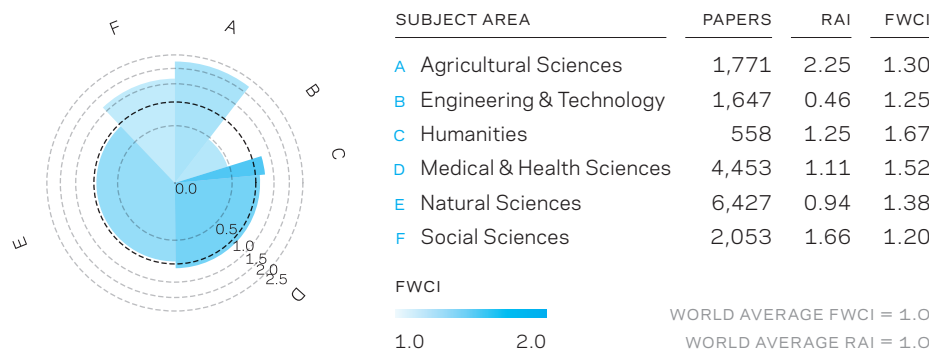
a New Zealand institution, or at an institution outside of New Zealand, in succession.



Subject breakdown

Given the importance of pastoral farming to the country's economy, it is not surprising that New Zealand has a strong research focus in the Agricultural Sciences. The country also has relatively higher levels of activity in the Social Sciences (66% above the world average) and lower

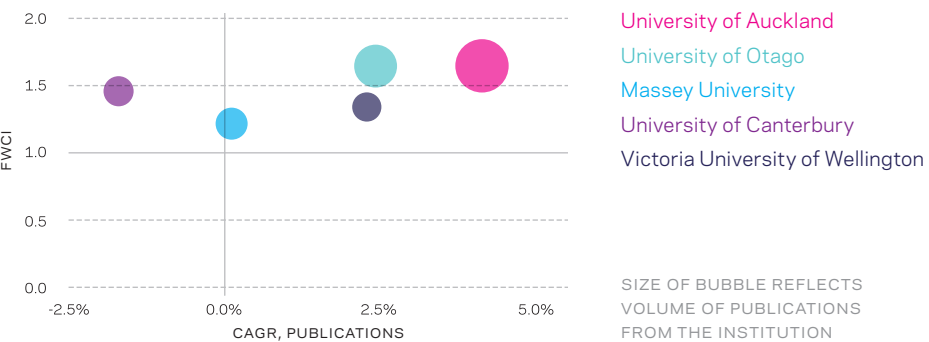
levels of activity in Engineering & Technology (54% below the world average). The relative citation impact of the country's research exceeds the world average in all subject areas and is highest in the Humanities (1.67).



Most prolific institutions

The University of Auckland leads all New Zealand institutions in terms of research output (3,169 publications in 2014) and growth (4.1% 2010-2014 annually). The next closest institution, on either metric, is the University of Otago (2,047 publications in 2014, 2.4% CAGR). Both institu-

tions' research achieves similarly high levels of FWCI (1.65 and 1.64, respectively).





NIGERIA

Despite the country's size and growing economic clout, Nigeria's research footprint is quite small. The country accounts for only 0.22% of the world's total publications, and even smaller shares of all citations and highly cited articles worldwide.

Nigeria's research base is quite insular. Similar to other countries with growing economies, developing research infrastructures, and (relatively) large populations (such as India, Brazil, Russia, and Turkey), Nigeria has a low international

collaboration rate and a highly sedentary active researcher population.

Headline statistics

CONNECTIONS

India

After the US and Nigeria itself, India accounts for the 3rd largest (7.1%) source of citations to Nigeria's research.

Low relative international collaboration rate

Only 34.0% of all Nigerian papers are co-authored with an international collaborator.

FOCUS AREA

Agricultural Sciences

Nigeria has a strong relative focus in the Agricultural Sciences. It produces more than twice as many articles in this subject area.

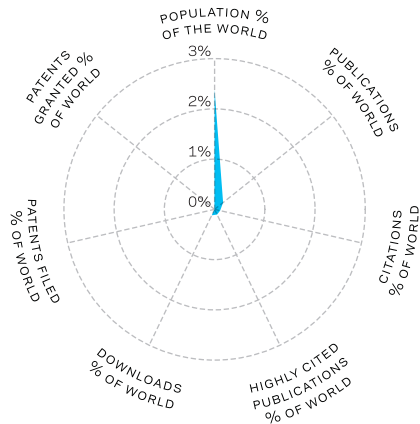
Highly sedentary research base

56.1% of the country's researchers have not published abroad.

Overall country or region outlook

Nigeria is the most populous country in Africa (and seventh most populous in the world), but its research footprint is quite small. Although the country accounts for 2.38% of the world's population, it accounts for only 0.22% of the world's total publications. The country has plenty of room to improve along measures of research usage and citation impact.

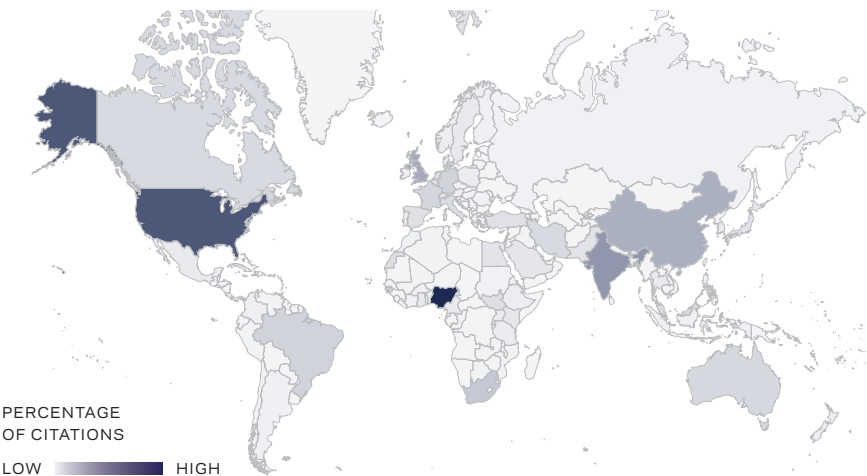
Downloads of and citations to Nigeria's research comprise 0.13% and 0.11% of all measures worldwide, respectively. There is very little patenting activity.



Global distribution of citations

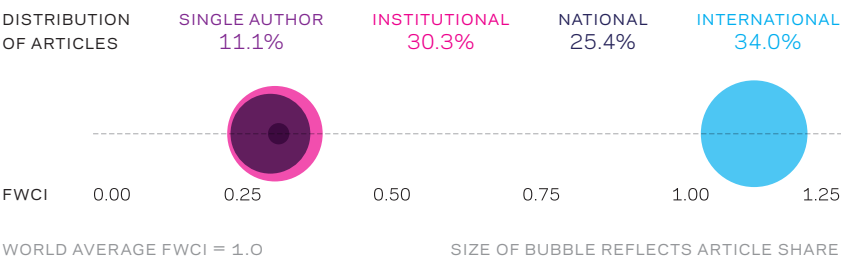
Nearly one out of every six citations to Nigeria's research comes from Nigeria itself. After Nigeria, the US and India constitute the largest sources of citations (11.7% and 7.1%, respectively). South Africa, the largest research-producing country in Africa, accounts for 3.2% of all citations to Nigeria's research. Relative

to global baselines, Nigeria also receives higher than expected levels of citations from Muslim-majority countries, such as Iran (2.0%), Malaysia (1.9%), Turkey (1.4%) and Pakistan (1.3%).



Collaboration patterns

Relative to many other countries in Africa, Nigeria has a low international collaboration rate. Such publications comprise only 34.0% of the country's total publications, though they achieve an FWCI of 1.11, or 11% above the world average. No other type of collaboration for Nigeria achieves an FWCI above 0.31.



Researcher mobility

Consistent with the country's relatively low international collaboration rate, Nigeria's active researcher base tends to not publish abroad. 56.1% of all the country's researchers have only published under affiliations with Nigerian institutions. This is quite high compared to many other African countries, though it is similar to those countries with growing economies, devel-

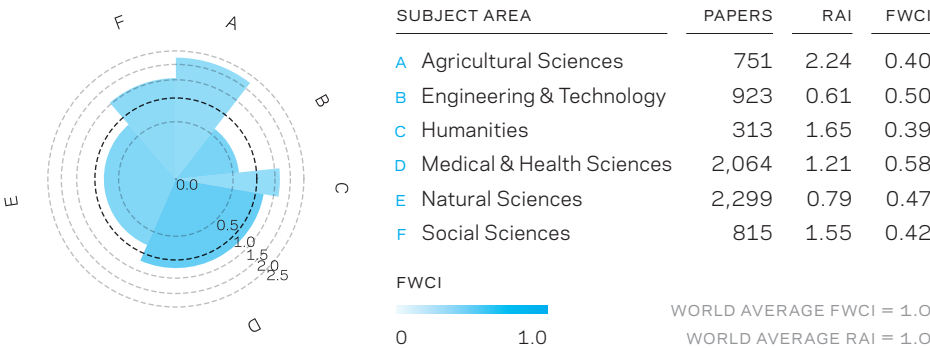
oping research infrastructures, and (relatively) large populations (such as India, Brazil, Russia, and Turkey).



Subject breakdown

Nigeria has a strong research focus in the Agricultural Sciences. Nigeria produces more than twice as many articles in that area than expected, relative to the world average (751 articles in 2014). The FWCI of the country's research is well below the world average in all subject areas, but it is

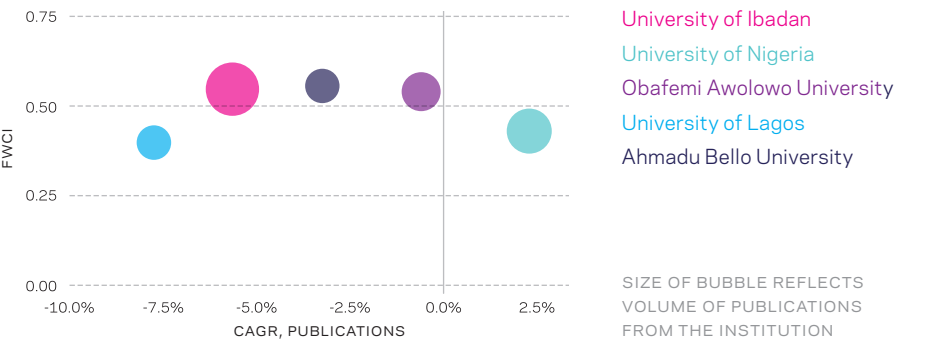
comparatively the highest in the Medical & Health Sciences (0.58).



Most prolific institutions

Mirroring the low overall research output and FWCI of the country, Nigeria's five most prolific institutions produced between 200 and 600 publications per year in 2014, and achieved FWCI between 0.40 and 0.56 (or between 44% and 60% below the world average). Only

one of the five institutions (the University of Nigeria at 2.3%) had non-negative growth rates in research output.





NORWAY

Norway's publications are highly impactful, measured by their citation impact. This applies to all subject areas. In recent years, on average, the FWCI of Norway's publications is about 60% higher than the world average.

Norway's research is highly international, with more than half of the publications from international collaboration. The country has a close link with the research communities in Northern European countries. Its researchers are, however, less mobile with 39.0% of the active re-

searchers never publishing with a foreign affiliation.

Headline statistics

High citation impact

The FWCI of Norway's publications is around 1.60, or 60% higher than the world average.

High international collaboration

More than half of Norway's publications are co-authored with a researcher from outside of the country.

Activities in the Social Sciences

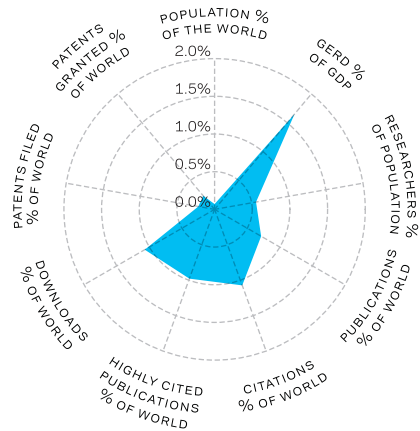
Norway has a high level of research activity in the Social Sciences (48% higher than the world average).

Co-existence of mobility types

There co-exists a group of sedentary researchers and a group of researchers in the transitory category.

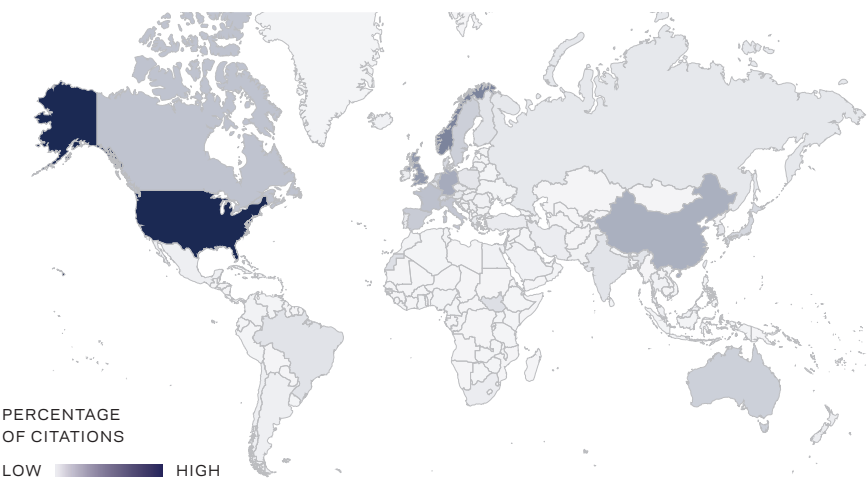
Overall country or region outlook

Norway produces around 15,000 publications per year. These publications have a high citation impact: with only 0.7% of the world's publications, Norway receives 1.1% of the citations worldwide and contributes to 1.0% of the world's highly cited publications. Norway's FWCI is around 1.60 in recent years, or 60% higher than the world average.



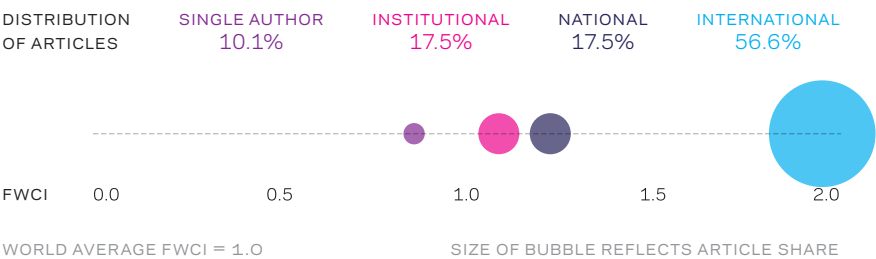
Global distribution of citations

The top citing countries of Norway's publications are the US (16.5%), Norway itself (9.1%), and the UK (7.5%). The Northern European countries, such as Sweden, Denmark, and Finland, are all among the top citing countries of Norway, implying close linkage between Norway and these countries.



Collaboration patterns

Norway's research is highly international: around 56.6% of the country's publications result from international collaboration. National and institutional collaboration each contribute to around a fifth of the country's publications. As most of the other countries, international collaboration leads to publications with the highest FWCI for Norway (1.95, or almost twice the world average).



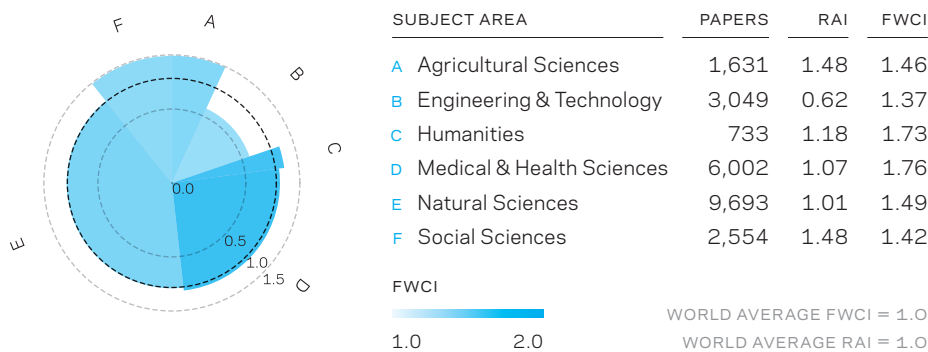
Researcher mobility

As a country with a high share of internationally collaborated publications, Norway has a high percentage of sedentary researchers (39.0%). They co-exist with a group of researchers in the transitory category, which consists of around 46.1% of Norway's active researchers. Norway has a slightly higher share of inflow researchers than outflow researchers.



Subject breakdown

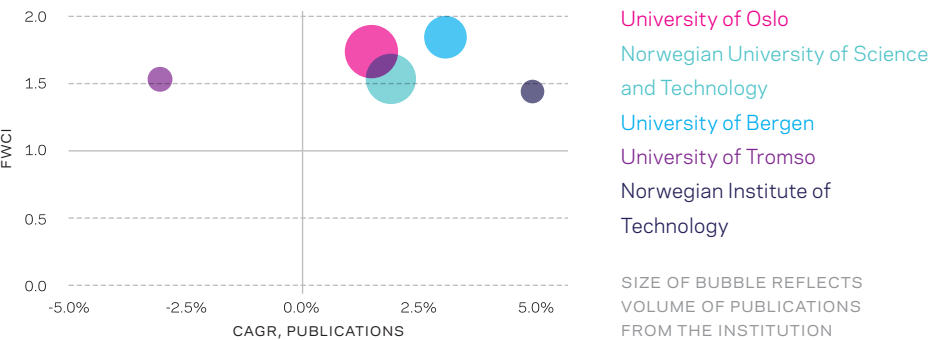
Norway has a high FWCI in all six subject areas. The publications in the Medical & Health Sciences have the highest FWCI among the six subject areas (1.76). Norway shows a relatively high level of activity in the Social Sciences and the Agricultural Sciences, and a relatively low level of activity in Engineering & Technology.



Most prolific institutions

Norway's top five most prolific institutions all have an FWCI much higher than the world average of 1.0, in line with the high citation impact of Norway's general publications. Norway's largest institutions are University of Oslo and Norwegian University of Science and Technol-

ogy. They each produce more than 3,000 publications per year.





PAKISTAN

Pakistan has a small but sizable research population. Almost 40% of them show transitory mobility, and are likely researchers who favour short-term assignments.

International collaborations make up 44% of Pakistan's total scholarly output, and these papers are cited 29% more than the world average for all collaboration types. 40% of Pakistan's research population show transitory mobility and these are likely researchers who favour

short-term assignments over long-term or permanent transfers. Although Pakistan publishes, proportionally, 102% more papers than the world does in the Agricultural Sciences, it is in the area of Engineering & Technology that its papers are most impactful.

Headline statistics

29% MORE THAN THE WORLD
AVERAGE FOR ALL
COLLABORATION TYPES

Cited 29% more than the world average for all collaboration types. Pakistan's international collaboration accounts for 44% of its output, and are highly impactful.

40% OF RESEARCHERS
SHOW TRANSITORY
MOBILITY

These researchers who favour short-term assignments can facilitate the cross border exchange of ideas and research collaboration.

RAI 2.02 in the Agricultural Sciences

Pakistan has a relative activity index of 2.02 in the area of the Agricultural Sciences. This means that, proportionally, Pakistan publishes 102% more than the world does in this area.

MOST PROLIFIC INSTITUTION

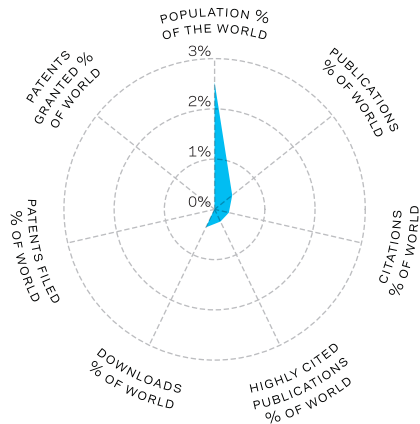
Quaid-i-Azam University

Quaid-i-Azam University is the most prolific institution of Pakistan, with an FWCI of 1.39. This means that this university's papers are cited 39% more than the world average.

Overall country or region outlook

Pakistan has 2.5% of the world's population, but publishes only 0.5% of the world's output. The papers published by Pakistan include 0.3% of the world's top 10% cited papers. Pakistan receives 0.3% of the world's citations and a slightly higher proportion of the world's downloads at 0.4%.

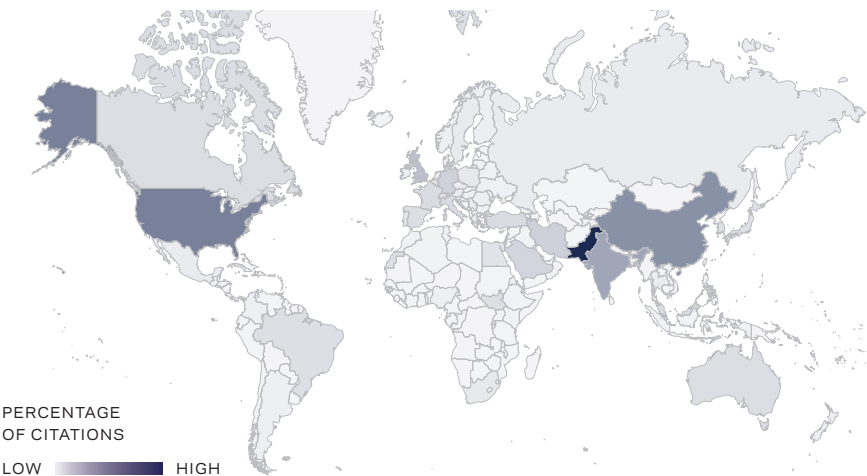
Patent applications do not appear to be of strong importance, it holds only 0.01% of the world's patents filed and, in turn, almost 0% of the world's patents granted.



Global distribution of citations

Citations to Pakistan's research come mostly from its own papers (17%); this is expected as researchers tend to be more aware of their own country's papers, and cite them preferentially. The remaining citations received by Pakistan's research comes mainly from prolific countries such as the US (9.4%), China (8.2%), and In-

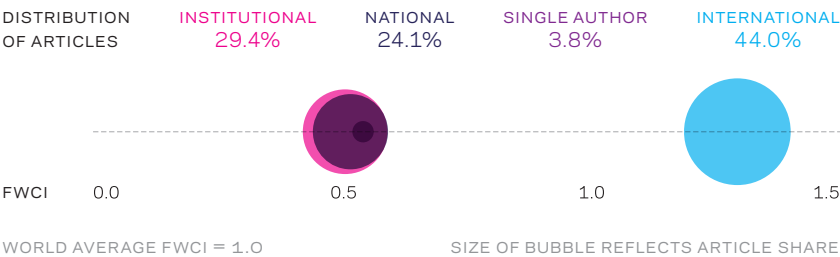
dia (6.5%). Countries such as the UK, Iran, Germany, Saudi Arabia, Italy, Turkey, France, and Malaysia also each form between 2% and 4% of the citations received by Pakistan.



Collaboration patterns

44% of Pakistan's research is through international collaborations, and they accrue 29% more citations than the world average. The remaining collaboration types are all cited about 46-50% less than the world average for all collaboration types, showing a clear example of internationally collaborated papers tending to be more impactful than other collaboration types. Papers in Pakistan are least

likely to be of single-authorship; for those that are not internationally collaborated, the remaining papers are almost equally likely to be collaborations within the same institution, or across institutions in Pakistan.



Researcher mobility

About 42% of Pakistan's research population tend to be sedentary researchers who have only published under Pakistani institutions. As a whole, Pakistan's researcher inflow is higher than its researcher outflow by about 2.7%, indicating a net inflow of researchers in the long term. However, this is a small proportion of researchers compared to the 40% of

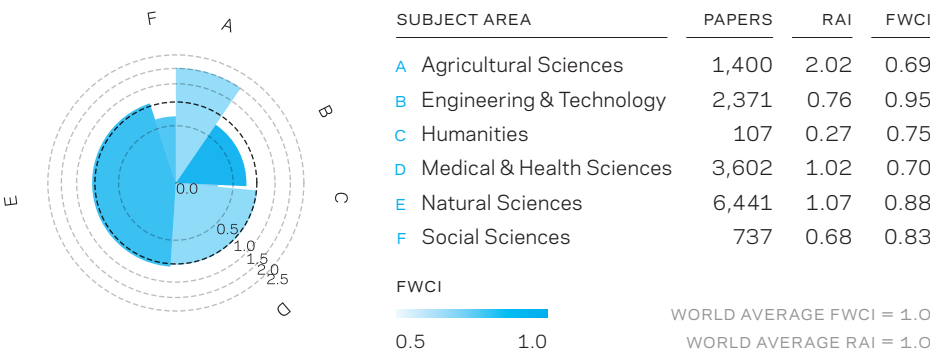
the same population who are researchers showing transitory mobility, publishing from institutions across borders for short time periods.



Subject breakdown

Pakistan is most prolific in the Natural Sciences: it publishes about 44% of its output in this area and these papers are cited about 12% less than the world average. In the Agricultural Sciences, Pakistan is comparatively much more prolific than the world, publishing 102% more

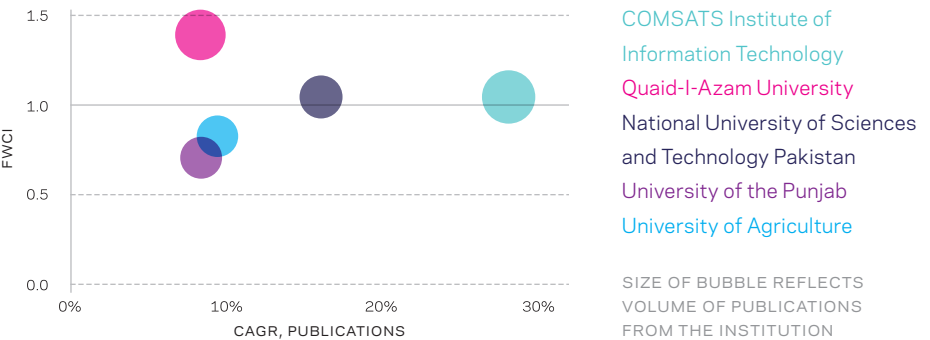
than the world does in this area; these papers are, however, cited about 31% less than the world average. Pakistan's papers in Engineering & Technology make up around 16% of its scholarly output, and are cited almost on a par with the world average.



Most prolific institutions

Pakistan's top five most prolific institutions published between 620 (University of Agriculture) and 1,000 papers (COMSATS Institute of Information Technology) in 2014. COMSATS Institute of Information Technology is also the fastest growing institution with an average yearly

growth of 28%, based on 2010-2014 papers. Quaid-i-Azam University has the highest FWCI of 1.39, meaning that its papers are cited 39% more than the world average.





PERU

Similar to other Latin American countries, Peru has a strong relative focus on the Agricultural Sciences.

Given the country's small research footprint, it is unsurprising that Peru has very high levels of international collaboration and mobility. Nearly three-quarters of all of Peru's research are international collaborations, and more than four-fifths of

Peru's active researcher base has published at least once with an affiliation outside of the country.

Headline statistics

CONNECTIONS

Latin America

Higher than expected levels of citations to Peru's research from other Latin American countries.

High levels of international collaboration

Nearly 3/4 of Peru's research is co-authored with an international collaborator.

FOCUS AREA

Agricultural Sciences

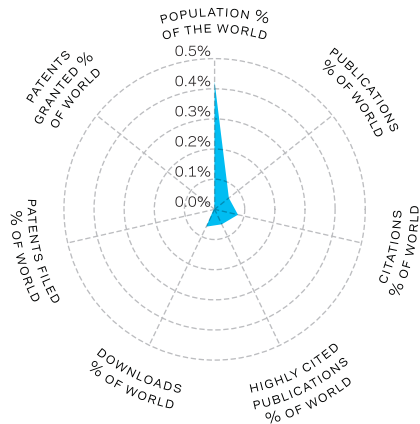
Peru has a strong relative focus on the Agricultural Sciences. It produces more than 3 times the world average in this subject area, relative to its total research output.

Highly mobile research base

More than 4/5 of Peru's active researchers have published at least once with an affiliation outside of the country.

Overall country or region outlook

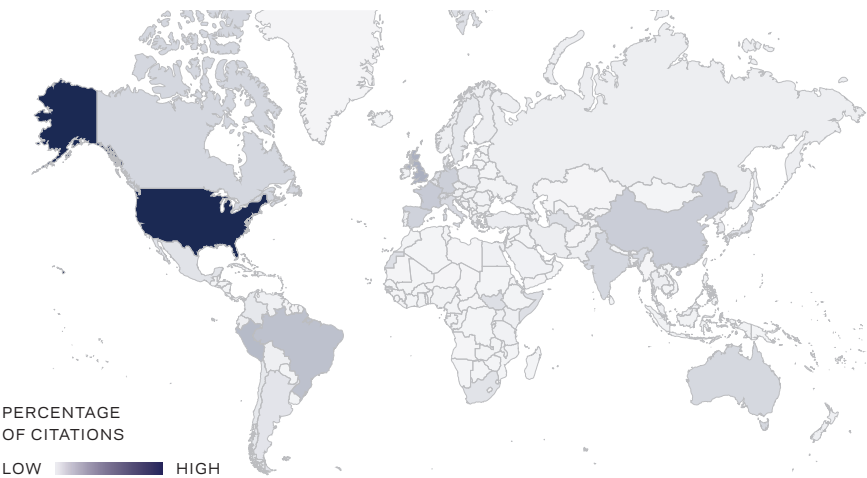
Peruvian researchers produced more than 1,300 publications in 2014, which account for 0.06% of all publications worldwide. As reference, Peru accounts 0.42% of the world's population. Although Peru does not produce a lot of research, the country's performance along measures of research usage and citation impact matches its output levels. Citations to, and downloads of, Peru's research comprise 0.08% and 0.06% of all citations and downloads worldwide, respectively. A little less than one out of every five articles from Peru are highly cited. There is very little patenting activity.



Global distribution of citations

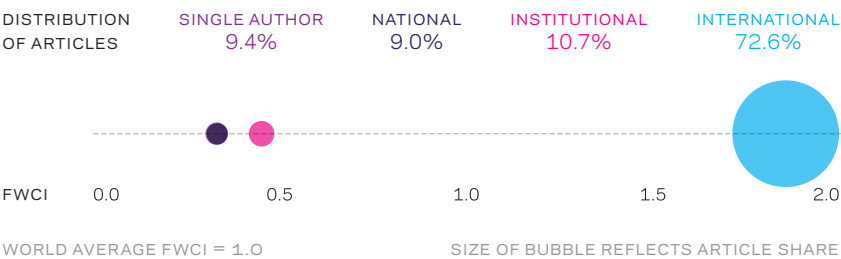
Nearly one of every five citations to Peru's research come from the US, consistent with global trends in citations. After the US, the countries that cite Peru's research most frequently are the UK (6.4%), Peru itself (5.5%), Brazil (4.8%), and France (4.0%). Although citations from Mexico (1.7%), Argentina (1.5%),

Chile (1.2%), and Colombia (1.2%) do not comprise a high absolute percentage of Peru's total citations, they represent higher than expected levels, given those countries' global citation baselines.



Collaboration patterns

Similar to other countries with low levels of research output, the bulk of Peru's publications are co-authored with international collaborators (72.6%). These publications achieve an FWCI of 1.85, or 85% above the world average. In contrast, no other type of collaboration achieves an FWCI above 0.45, or 55% below the world average.



Researcher mobility

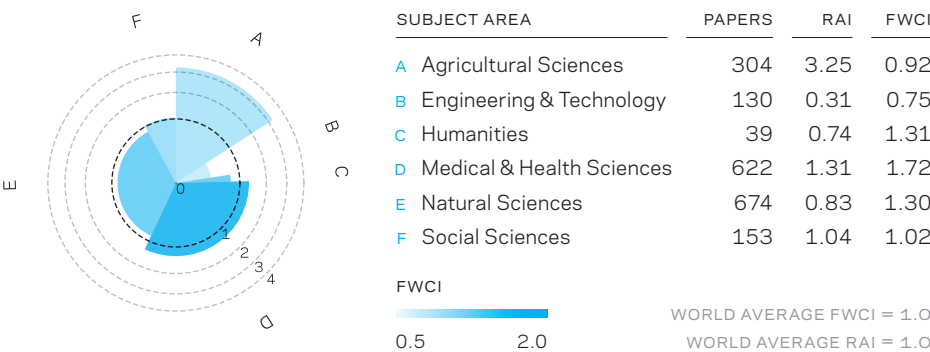
Peru has a highly mobile researcher base. More than three out of every five researchers are categorized as transitory (which means they have spent two years or less at either a Peruvian institution or an institution outside of Peru). On the other hand, less than a fifth of Peru's active researcher base has only published under affiliations in Peru.



Subject breakdown

Similar to other Latin American countries (such as Argentina, Brazil, Colombia, Cuba, and Mexico), Peru has a strong focus of research activity in the Agricultural Sciences. The country produces more than three times the global average, given the size of its research output. The

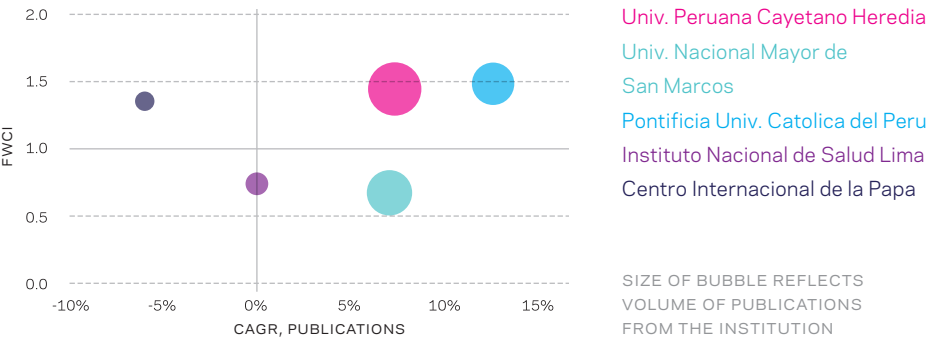
country also produces relatively more research in the Medical & Health Sciences than expected. Moreover, across all subject areas, Peru's research in the Medical & Health Sciences attains the highest FWCI at 1.72.



Most prolific institutions

The Universidad Peruana Cayetano Heredia is Peru's most prolific institution, producing 242 publications in 2014. Among Peru's most research-intensive institutions, the Pontificia Universidad Católica del Perú has grown its research output the fastest from 2010 to 2014 (12.7%

CAGR). Both institutions have achieved an FWCI of over 1.40 from 2010 to 2014, which is more than 40% above the world average.





PHILIPPINES

The Philippines has a relatively small researcher population, more than half of which is transitory. This may contribute partially to the high proportion of papers from the Philippines that are internationally collaborated and impactful.

The Philippines publishes less than 0.1% of the world's scholarly output. On the one hand, citations to the country's research are unexpectedly low from the Philippines itself (only 5.6%); on the other hand, the USA, China, the UK, and Australia each account for a sizable amount of citations

to its research. Top institutions have different strengths: the International Rice Research Institute has the highest FWCI, University of the Philippines is the most prolific, and De La Salle University - Manila has the highest publication growth.

Headline statistics

60%

INTERNATIONAL COLLABORATIONS

More than half of the Philippines' total scholarly output is through international collaborations with an FWCI of 1.76.

60%

TRANSITORY RESEARCHERS

More than half of the Philippines' researcher population are in the transitory group and publish with overseas affiliations on a short-term basis.

STRONG AREA

Medical & Health

Papers in this area have the highest impact and are cited 72% more than the world average.

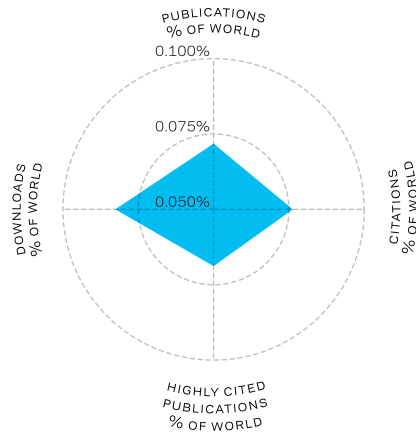
STRONG AREA

Agricultural Sciences

In the Agricultural Sciences, the Philippines is proportionally more prolific (185%) and more impactful than the world average.

Overall country or region outlook

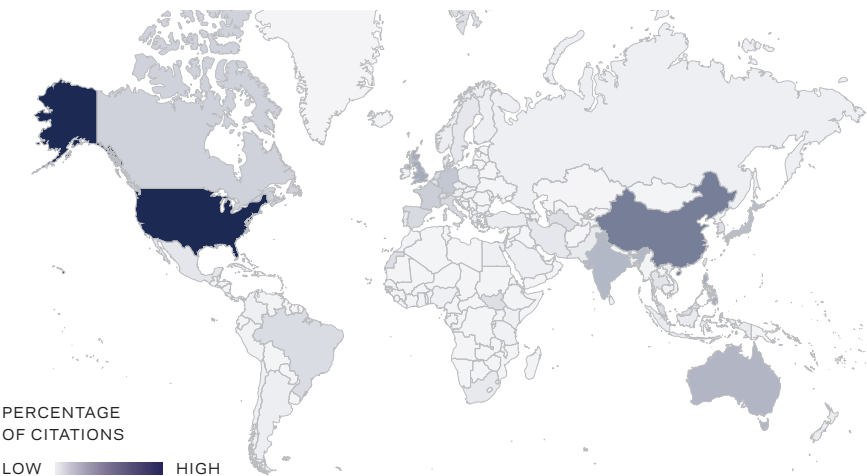
The Philippines publishes less than 0.1% of the world's total scholarly output: it published about 0.07% of the world's total scholarly output and of the world's top 10% cited papers. It receives a similar 0.08% of the world's citations and downloads. Patenting does not appear to be a highly prioritised process.



Global distribution of citations

Compared to other countries, citations to the Philippines' research are much less skewed towards citations from its own country's papers; only 5.6% of its citations come from itself. This is quite a unique situation as most countries' researchers tend to be more aware of, and cite, their own country's papers more. In

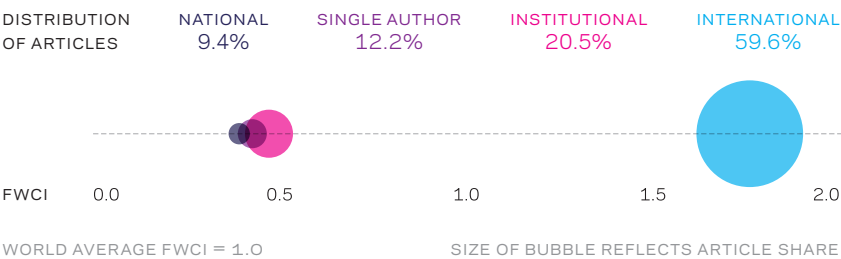
this case, the US (16%), China (9.1%), the UK (5.8%), and Australia (4.9%) account for sizable amounts of the Philippines' received citations.



Collaboration patterns

International collaborations make up 60% of the Philippines' total scholarly output. Internationally collaborated papers tend to have higher impact than other collaboration types, and the Philippines is no exception: these papers are cited about 76% more than the world average for all collaboration types. The Philippines' output of other collaboration types – institutional, national, and single

authorship – are less impactful, and are cited about 53-61% less than the world average. This reflects the importance of maintaining strong research partnerships with overseas collaborators. As for the Philippines, this results in the production of impactful scholarly output.



Researcher mobility

The Philippines has a small researcher population with about 2,500 active researchers. The majority of the Philippines' researchers show transitory mobility: 60% of them published with overseas affiliations on a short term basis. This supports the high proportion of international collaborations we see in the Philippines' scholarly output. Only 22% of the Philip-

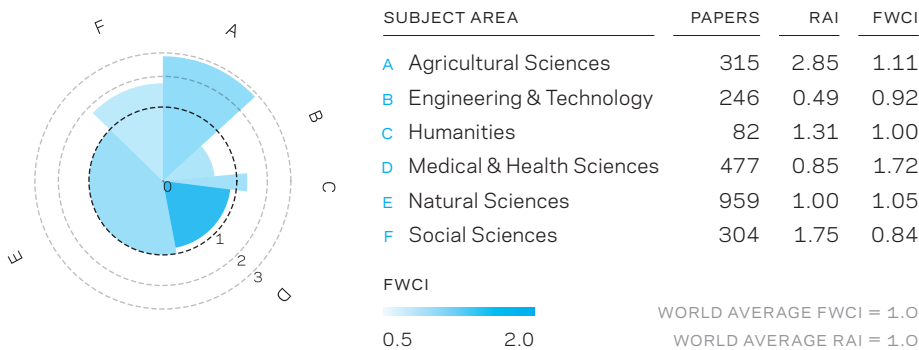
pines' researcher population is sedentary, having only published under a Filipino institution. The Philippines' researcher inflow is slightly higher than its researcher outflow, and this results in a net inflow of researchers (1.1%) in the long term.



Subject breakdown

The Philippines is most impactful in the Medical & Health Sciences; it publishes a fifth of its output in this area, and these papers are cited 72% more than the world average. However, it is in the Agricultural Sciences that the Philippines is comparatively most prolific compared to the world

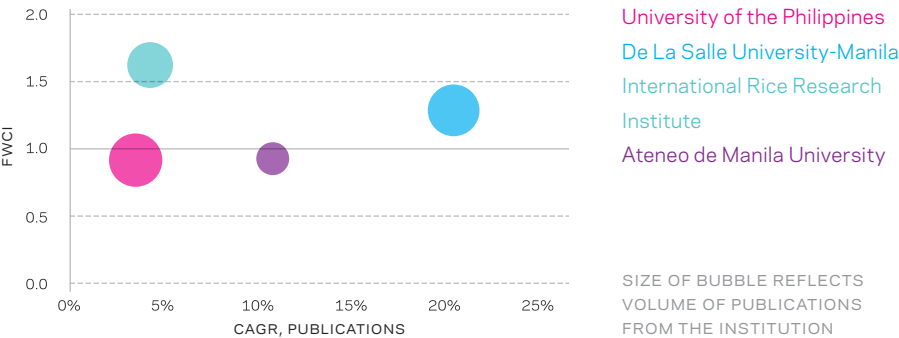
(185% more), and its papers in this area are cited about 11% more than the world average. Comparatively, the Philippines also publishes 75% more papers than the world in the Social Sciences, but is less impactful in this area.



Most prolific institutions

The Philippines' top institutions, based on papers published in 2014, are University of the Philippines (200), De La Salle University - Manila (190), International Rice Research Institute (150), and Ateneo de Manila University (80). All of them show positive growth (from a low base) in terms

of 2010-2014 papers, from 3.5% (University of the Philippines) to 21% (De La Salle University - Manila) CAGR. The International Rice Research Institute has the highest FWCI at 1.62, meaning that its papers are cited, on average, 62% more than the world average.





POLAND

Poland shows relatively little focus on international connections, although when it does make use of these, the returns are promising.

Poland collaborates relatively little internationally, and Poland's researchers are highly sedentary. The largest source of incoming citations for Polish research is Polish researchers themselves. However, the data shows great returns for when international collaboration does happen, or

when international researchers come for short stays in Poland.

Headline statistics

Institutional most frequent type of collaboration

whereas only international collaboration has a positive effect on Poland's FWCI.

Researcher base highly sedentary

Transitory mobility from abroad has the most positive effect on FWCI.

Central role for Natural Sciences

showing focus in relative activity, high absolute activity, and the highest FWCI among disciplines.

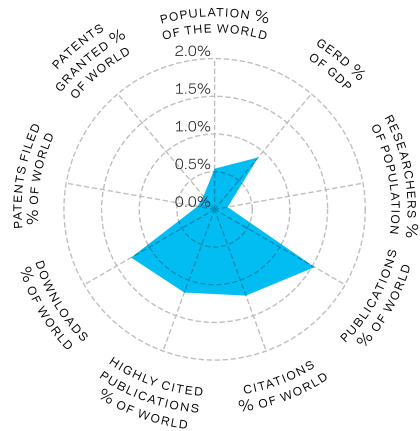
All prolific institutions show above world average FWCI

as well as, in some cases, impressive annual growth rates.

Overall country or region outlook

Poland published more than 35,000 publications in 2014. The resulting world publication share of 1.53% is higher than its citation share (1.22%), its share of highly cited articles (1.17%), and slightly higher than, but closer to, its download share (1.28%).

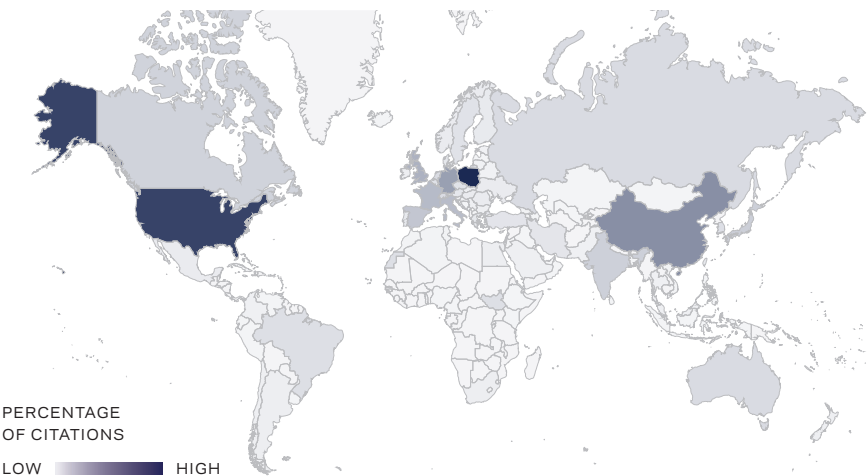
Patenting activity is relatively infrequent, with only 0.23% of the world's patents filed and granted.



Global distribution of citations

For most countries, the largest proportion of the citations that they receive come from the US, often followed closely by China, as these are the most prolific countries. In the case of Poland, the primary source of citations is Poland itself, with 15% of incoming citations origi-

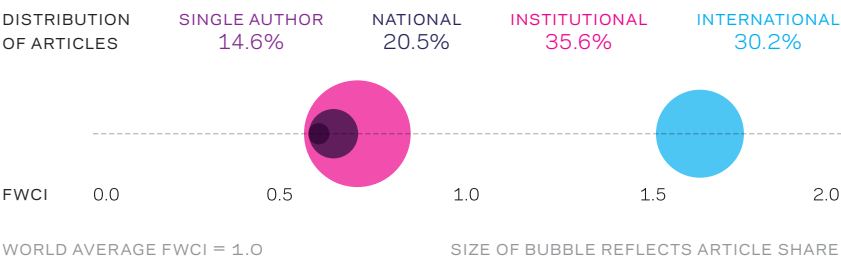
nating from Polish publications. The US ranks second with 13%, and China ranks third with 7%.



Collaboration patterns

Poland produces relatively few publications in collaboration with international partners: just 30.2%. In addition, Poland has the sixth largest percentage of single-author publications globally. Moreover, the most frequent collaboration type is institutional rather than international. International collaboration has a more beneficial effect on Poland's FWCI: it is the only collaboration type with an FWCI

above the world average, at 62% above average. This suggests that increasing the level of international collaboration could be fruitful in terms of citation impact.



Researcher mobility

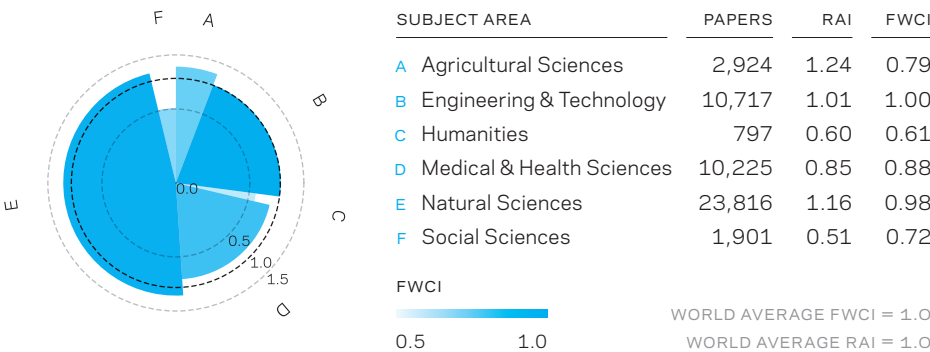
Poland's researcher base is highly sedentary: 64% of its active researchers show no signs of mobility. They have only published with an affiliation from within Poland. This group of researchers has an average FWCI of 34% below the world average. The researchers in the transitory group from abroad with short stays in Poland have the highest FWCI at over

twice the world average. This underlines the importance for Poland to continue to facilitate such connections with researchers from abroad. The percentage of researchers Poland attracts is higher than the percentage who leaves the country.



Subject breakdown

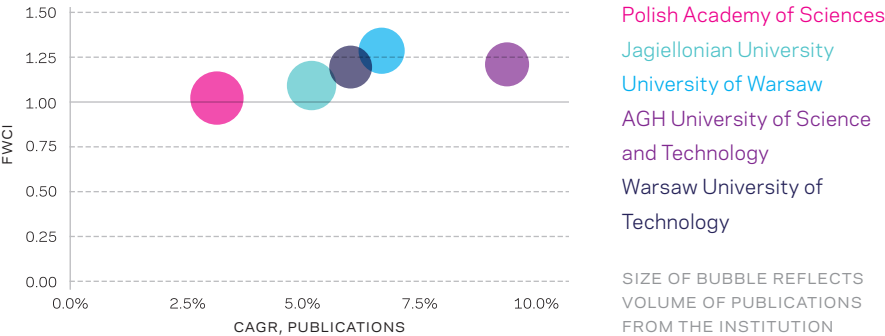
Poland is showing higher than average focus on the Agricultural Sciences and the Natural Sciences. In absolute terms, the lion's share of Poland's publications are in the Natural Sciences, and the Natural Sciences also has the highest FWCI amongst disciplines, at exactly the world average.



Most prolific institutions

Poland's most prolific institution is the Polish Academy of Sciences, with around 2,500 publications in 2014. All prolific institutions show positive annual growth, but these percentages are most impressive for AGH University of Science and Technology, University of Warsaw, and

Warsaw University of Technology. FWCI is around, or above, the world average for all 5 most prolific institutions.





PORTUGAL

Portugal's scientific publications are downloaded relatively often, a sign of emerging importance. One of its strengths clearly lies in the Natural Sciences, with high volume, high activity focus, and high citation impact.

International collaboration, as well as visiting scholars, are critical to Portugal's FWCI. In addition to links to the usual large research nations, its citation network reveals close ties with countries in close proximity (Spain) and with linguistic similarities (Brazil). Still, this focus on in-

ternationalisation is not as prominent as it could be, with a large group of sedentary researchers and a large proportion of institutionally, or nationally, co-authored publications.

Headline statistics

Relatively high download share

Portugal's 0.81% of the world's publications receive 1.24% of global downloads.

CONNECTIONS

Spain & Brazil

Among countries that cite Portugal's research, Spain and Brazil stand out, probably due to physical proximity and linguistic similarity.

STRONG AREA

Natural Sciences

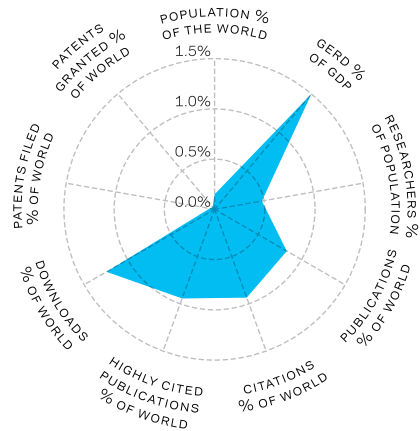
with high absolute volume, high relative focus, and high FWCI.

Importance of sedentary non-Portugal researchers

This group of active researchers brings the highest FWCI to Portugal.

Overall country or region outlook

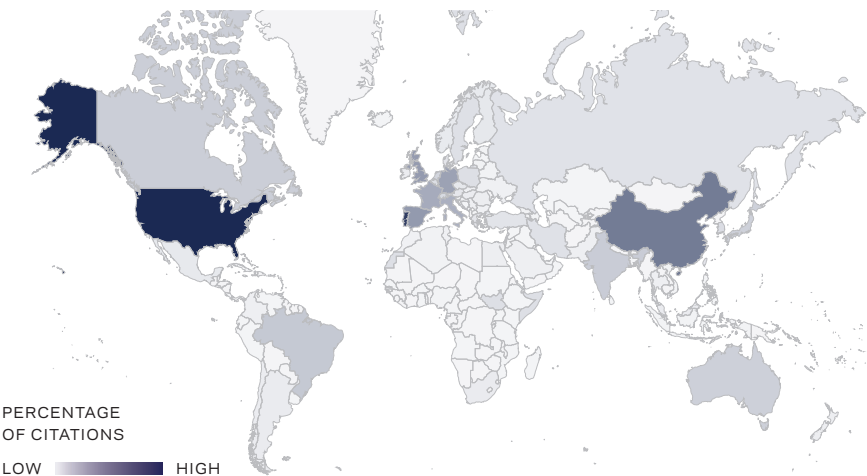
While Portugal's population accounts for 0.15% globally, it produces 0.83% of the world's scientific output. Portugal's publications receive 0.94% of the world's citations, and represent 0.94% of the world's most highly cited articles. Most notably, its publications are downloaded more often than expected, based on the publication share: with 0.83% of the world's publications, Portugal receives 1.24% of the world's downloads, which can be interpreted as a sign of early interest in, or emerging importance of, its research. Portugal shows very little patenting activity.



Global distribution of citations

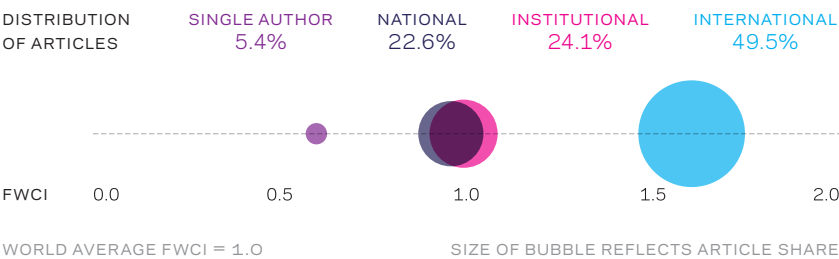
11% of all citations towards Portugal's research come from Portugal itself, a percentage that is only surpassed by the US (13%), and followed by another prolific research nation, China (8%). In fourth place is Spain, Portugal's closest neighbour (6%). Brazil, a country with which Portugal has a common language, ranks ninth

with 3%. As a reference, Brazil is the thirteenth largest source of citations for Spain, providing only 2% of all incoming citations.



Collaboration patterns

Just under half of all research from Portugal is published with an international co-author. This is the only collaboration type resulting in an FWCI that is above the world average, at 60%. National and institutional collaboration combined are just as frequent, but much less impactful, at just below the world average.



Researcher mobility

Portugal's researcher population most frequently shows a type of mobility that we refer to as transitory: short stays abroad of less than two years. In particular, researchers from abroad with a short stay in Portugal have a positive effect on FWCI (over twice the world average). Almost as large is the group of sedentary researchers, who do not show mobility.

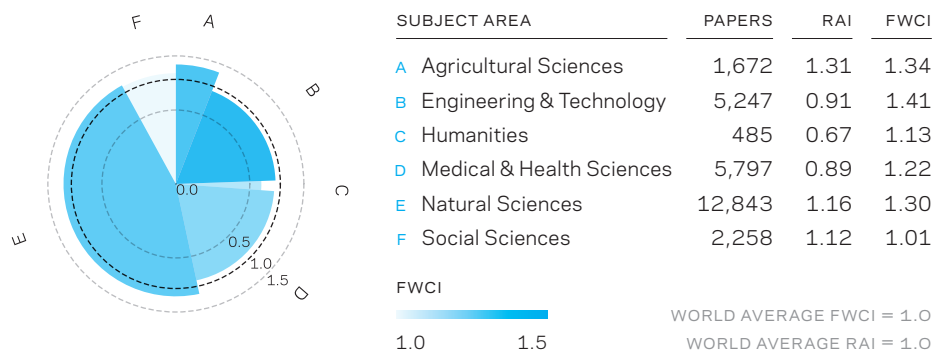
Their FWCI, as can generally be observed for most countries, is much lower, at only 11% above the world average. More researchers come into Portugal than leave (+2.7%).



Subject breakdown

Portugal shows the highest relative focus of activity in the Agricultural Sciences, at 31% above what would be expected based on the world average. In addition, this is an area in which Portugal is quite impactful, at 34% above the world average. It is not, however, the subject area

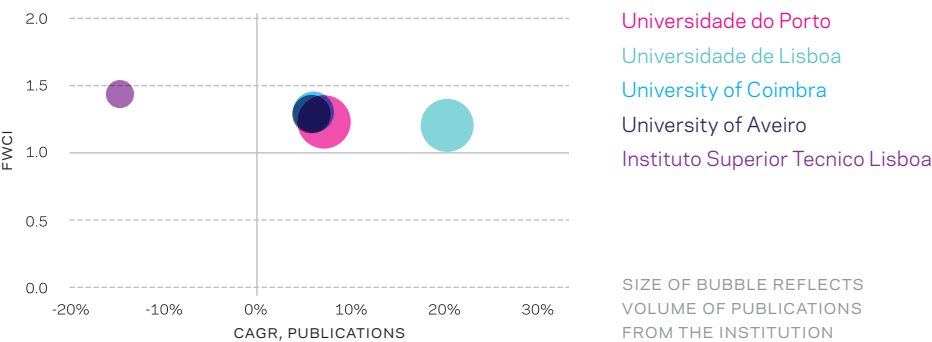
with the highest volume, in terms of output: it only had 1,672 publications in 2014. In absolute terms, the most prolific subject area for Portugal is the Natural Sciences (12,843 publications), where activity is also relatively high, as well as its FWCI.



Most prolific institutions

Universidade de Lisboa and Universidade do Porto are the two most prolific universities in Portugal. Universidade de Lisboa is also showing the fastest annual growth out of all five most prolific institutions, at an impressive level of 20.4%. In terms of highest FWCI, Instituto Superior Téc-

nico Lisboa's FWCI is the highest, at 44% above the world average.





Despite small world shares of research indicators, Qatar's research is highly impactful. Qatar seems to be an attractive destination for researchers, with more than twice the proportion of inflow as outflow of researchers.

A large proportion of Qatar's researchers also show transitory mobility patterns, and this high mobility is combined with a high propensity to collaborate internationally; both of these factors may, to some extent, explain the overall high impact of

Qatar's research, which is especially well cited in Engineering & Technology.

Headline statistics

0.1% OF WORLD SCHOLARLY OUTPUT

but slightly lower share of highly-cited output.

Highly collaborative and impactful research

80% internationally collaborated papers cited nearly 50% more than the world average across collaboration types.

Highly impactful in most fields

Qatar's research is cited more than the world average in all fields, except for the Social Sciences.

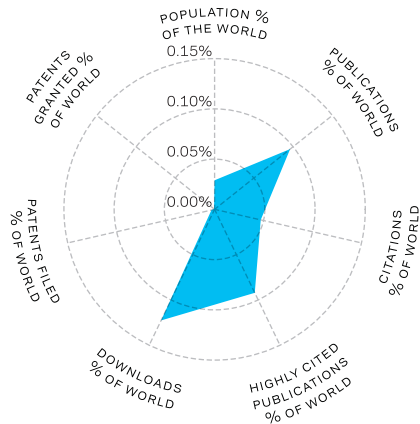
64% RESEARCHERS WITH TRANSITORY MOBILITY PATTERNS

and 11% sedentary researchers, with a net researcher gain (+10 percentage points) in the long term.

Overall country or region outlook

Although Qatar holds only 0.03% of the world's population, it publishes 0.10% of the world's scholarly output, with downloads accounting for 0.12% of the world's total. Qatar publishes 0.09% of the world's top cited papers, and receives 0.05% of the world's citations.

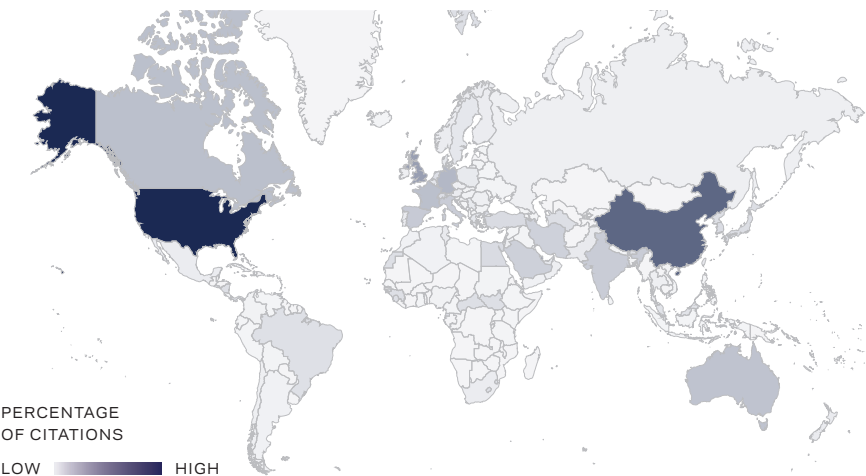
It files very few patents, and only a small proportion of these are granted, so that Qatar's world share of these two indicators is nearly null.



Global distribution of citations

As expected, most of Qatar's citations come from prolific countries like the US and China, each representing over 10% of Qatar's incoming citations. The next largest shares of Qatar's citations come from itself, and from the UK; it is possible that the two countries have retained a close relationship due to Qatar's formal

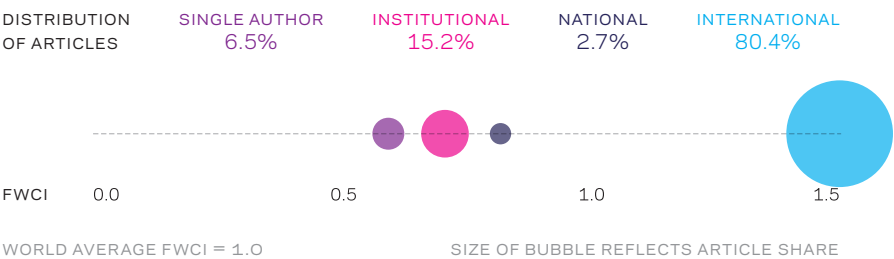
status as a British protectorate. The rest of Qatar's citations are fairly equally distributed worldwide, with a slightly higher share for Germany.



Collaboration patterns

Over 80% of Qatar's output is the result of international collaboration and these papers are cited nearly 50% more than the world average, across collaboration types. Nationally and institutionally collaborated papers reach between 70% and 80% of the impact of this same world average, and account for 2.7% and 15.2% of Qatar's scholarly output respectively. This low percentage of

nationally-collaborated papers may be a reflection of Qatar's small size and research concentration in a few institutes. Single-authored papers represent 6.5% of Qatar's total scholarly output, and are cited about 40% less than the above-mentioned world average.



Researcher mobility

Nearly two-thirds of Qatar's researchers show transitory mobility patterns, having published papers under Qatari and non-Qatari affiliations in quick succession since 1996. Less than 11% of Qatar's researchers are sedentary, and Qatar appears to be an attractive destination for researchers, with a researcher inflow proportion of nearly 18% compared to a

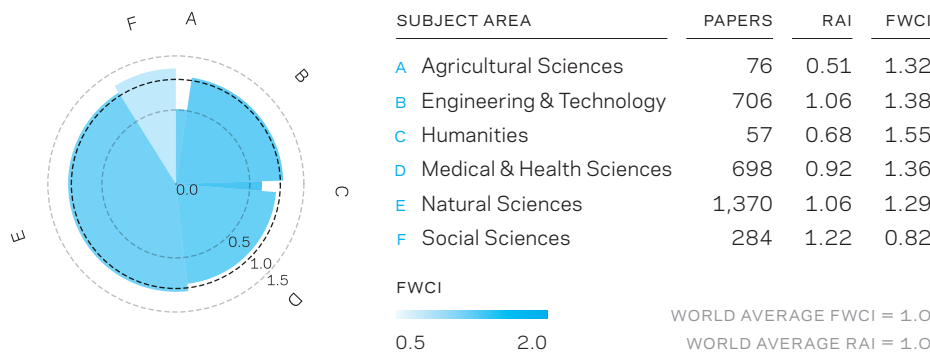
researcher outflow of 7%, representing a net gain of over 10 percentage points.



Subject breakdown

Qatar's research is highly impactful; its citation impact for different fields is significantly above the world average for all fields (29-55% higher) except in the Social Sciences (18% lower). It publishes lower proportions of its output in the Agricultural Sciences and the Humanities;

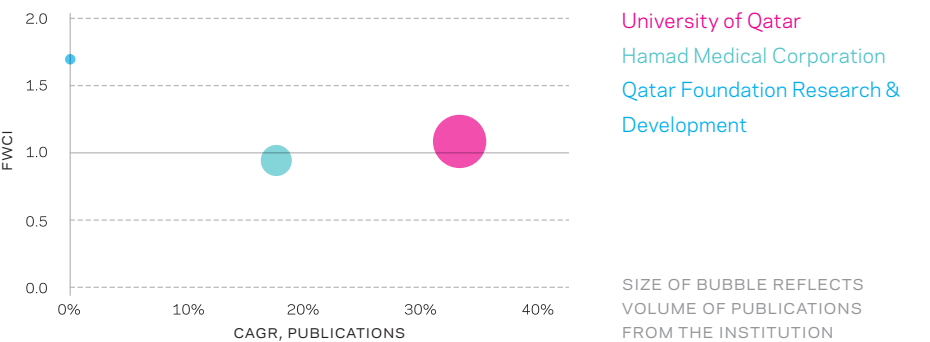
in the latter, it publishes few papers but reaches its highest impact of 55% above the world average.



Most prolific institutions

Qatar University is by far the most prolific institution in the country, with more than 670 publications in 2014, showing strong 2010-2014 annual output growth of over 33% CAGR, and with a citation impact around the world average. Hamad Medical Corporation also presents strong

growth at 18%, albeit from a much lower base and reaching over 200 papers in 2014, with a citation impact just under the world average.





ROMANIA

As a research nation, Romania is characterised, to some extent, as isolated: its researchers are rather immobile, and it produces a comparatively high degree of single-author publications. The data show that Romania would benefit from becoming more connected.

Romania's citation impact, as a proxy for quality, is below the world average for all subject areas. Its citation share is lower than its publication share. There is one university among the most prolific ones with an FWCI that is around the world average.

Headline statistics

High level of single-author publications

Romania collaborates relatively little internationally, and its large share of single-author publications has a low FWCI.

Strongly sedentary researcher base

Romania's researchers show little mobility and a tendency to stay within the country.

CONNECTIONS

Poland & Russia

In addition to large research nations, Romania's content is cited relatively frequently by Poland and Russia.

MOST PROLIFIC INSTITUTION

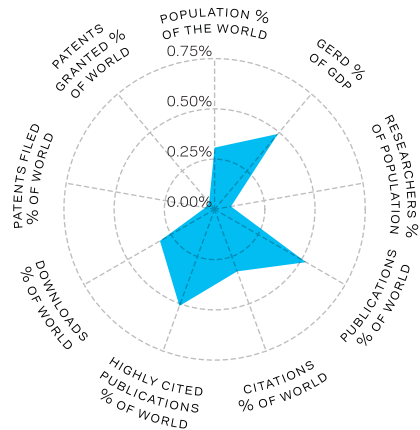
Babes-Bolyai University

Highest impact among the top 5 most prolific universities.

Overall country or region outlook

Romania published 11,765 publications in 2014, which is 0.53% of the world's scientific output. Its shares in citations and in downloads are all lower than expected, based on this article share, at around 0.3% each. In contrast, its share of highly cited articles is close to its publication share in general, at 0.51%.

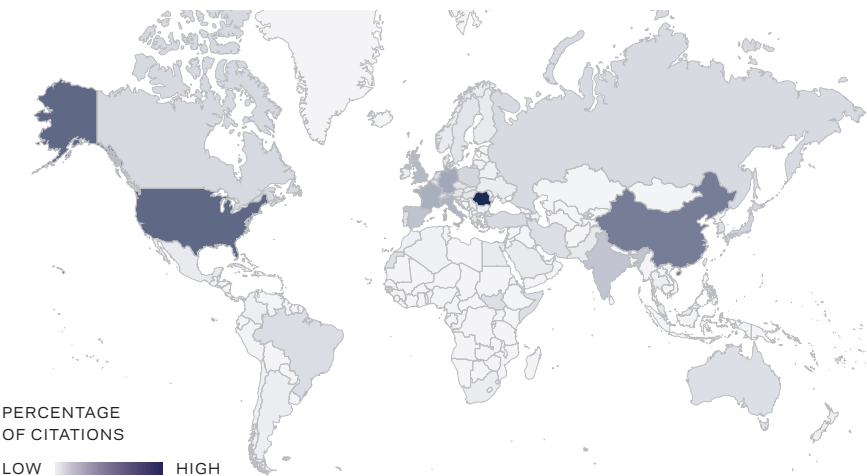
Romania's patenting activity is relatively infrequent, both in share of patents filed as well as in patents granted.



Global distribution of citations

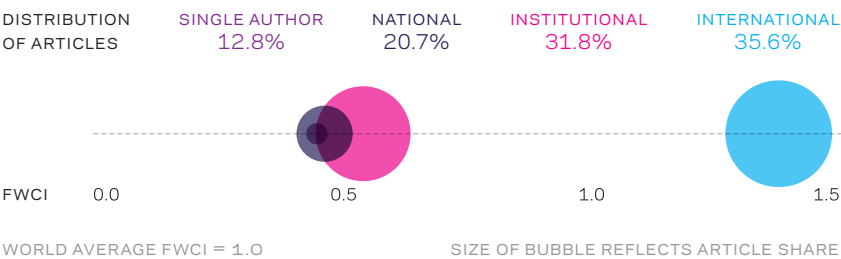
Romania is the main source of citations towards its own content, with 14% of all incoming citations being made in Romanian publications. The US and China are next in line, with 9% and 8%, respectively. Romania's neighbours, Poland (eleventh with 2%) and Russia (fourteenth with slightly under 2%), rank relatively

highly. As a reference, Russia and Poland rank nineteenth and twentieth for Germany's incoming citations, accounting for around 1%.



Collaboration patterns

Romania produces a high share of single-author publications, ranking eighth globally. The proportions of institutionally and internationally co-authored publications are similar, yet the yield in terms of FWCI is substantially different: 46% below, versus 38% above, the world average. This suggests that Romania would benefit from increasing its relatively low level of international collaboration further.



Researcher mobility

Romania's researcher population shows a tendency towards sedentary behaviour. Almost 60% of the active researchers have never published with an affiliation outside of Romania. This group of researchers has an FWCI of over 40% below the world average. Researchers in the transitory group are showing the highest FWCI, and more specifically,

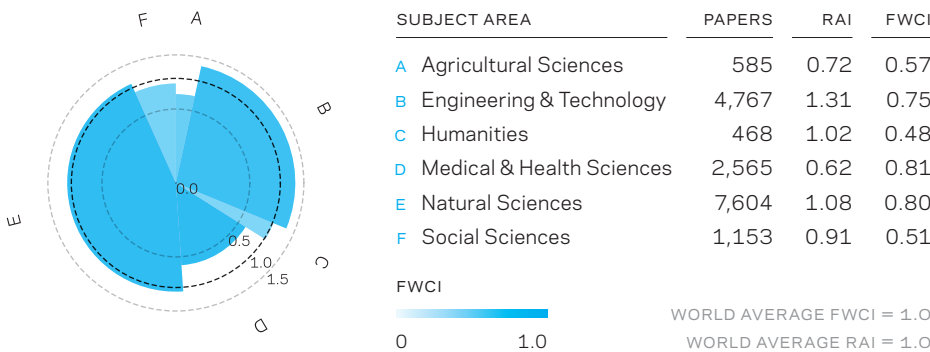
those researchers that come to Romania for a short stay. Romania has a slightly larger inflow of researchers than outflow (+1.0%).



Subject breakdown

In absolute volume, Romania is most active in the Natural Sciences. In relative activity, the focus is most pronounced in Engineering & Technology, at 31% above the world average. For all subject areas, Romania's performance in FWCI is below the world average, and lowest in the

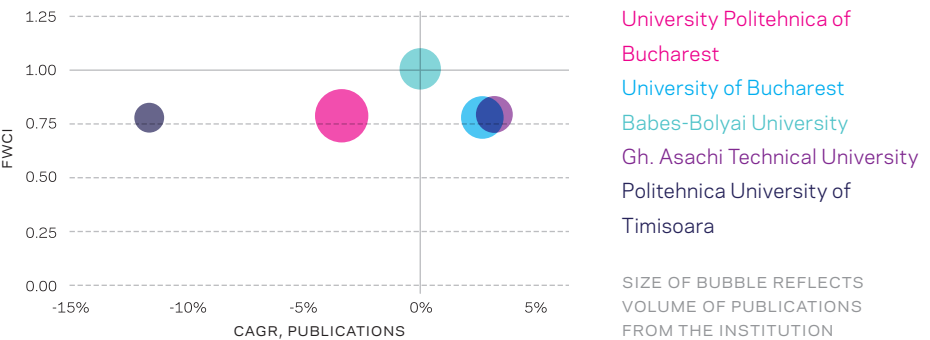
Humanities, the Social Sciences and the Agricultural Sciences. These are also Romania's subject areas with the lowest volume.



Most prolific institutions

University Politehnica of Bucharest is Romania's most prolific university, with almost 1,500 publications in 2014. It is, however, showing negative annual growth over the most recent five year period. Most of the other prolific institutions in Romania, except Politehnica University

of Timișoara, are showing positive growth rates, the highest being that of Gh. Asachi Technical University (3.2%). Babeș-Bolyai University is the only one out of these five that is reaching the world average FWCI, whereas all others perform below the world average.





RUSSIAN FEDERATION

Russia produces around 2% of the world's publications, which matches its world's population share. Russia's research has a strong focus on the Natural Sciences. Even though improving, the FWCI of Russia's research is still below the world average.

Russia's research is not very international: only 26.5% of its publications involve international collaboration. The benefit of international collaboration is, however, obvious. Among four collaboration types, only the FWCI of internationally collabo-

rative publications is above the world average of 1.0.

Headline statistics

High return to international collaboration

Only internationally collaborative publications have an FWCI (1.34) that is above the world average.

Below the world average FWCI

Russia's FWCI is below 1 in all 6 subject areas, except in the Humanities.

FOCUS AREA

Natural Sciences

Over 60% of Russia's publications belong to the Natural Sciences.

MOST PROLIFIC INSTITUTION

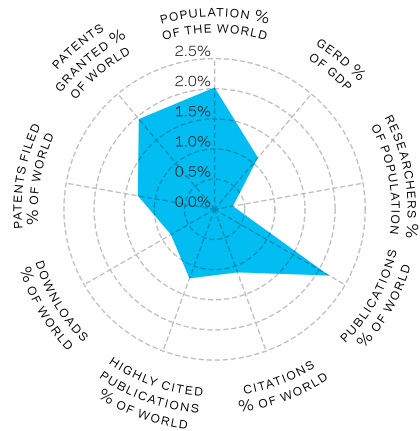
Russian Academy of Sciences

Russia's most prolific institution is the Russian Academy of Sciences, with around 10,000 publications per year.

Overall country or region outlook

Russia has around 2.0% of the world's population, and also produces a similar share of all publications worldwide. These publications are not very well cited or downloaded: Russia only receives around 1.1% of the world's citations, and 0.8% of downloads worldwide.

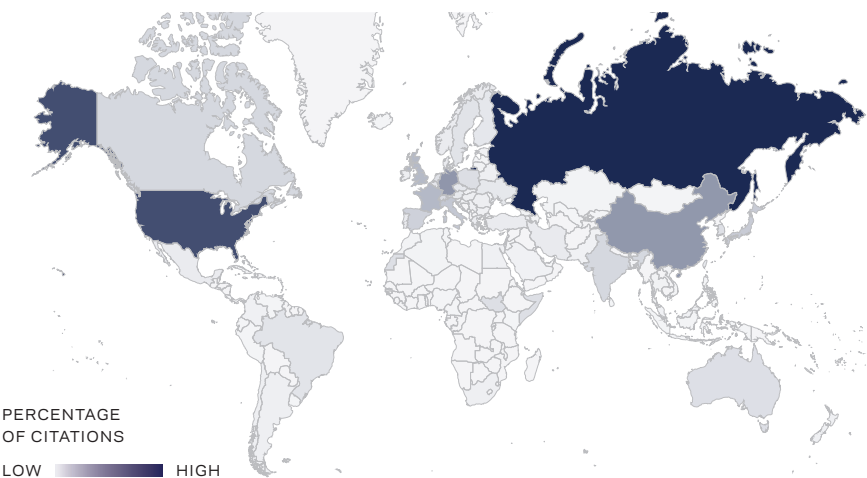
Russia's share of granted patents world-wide (2.0%), however, matches its population share, and exceeds its share of patents filed.



Global distribution of citations

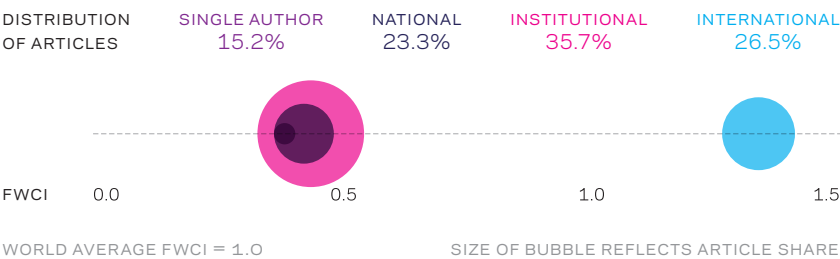
Russia receives more than 16% of its citations from itself. Unsurprisingly, many top citing countries of Russia are among the world's most prolific countries in publications. They include the US, Germany, China, France, and the UK. Eastern European countries, such as Poland, The

Czech Republic, and Ukraine, are also among Russia's top citing countries.



Collaboration patterns

Institutional collaboration is the most important type of collaboration for Russia, contributing to around a third of Russia's publications. Around 26.5% of Russia's publications are co-authored with at least one international collaborator. These publications achieve the highest FWCI (1.34) among the four collaboration types; the other three types have an FWCI of around 0.40.



Researcher mobility

Around 60% of Russia's active researchers belong to the sedentary group. This means that the majority of Russia's researchers have not had a foreign affiliation. Very small percentages of Russian researchers belong to the outflow or inflow category. There does exist a group of researchers (29.2%) who have either

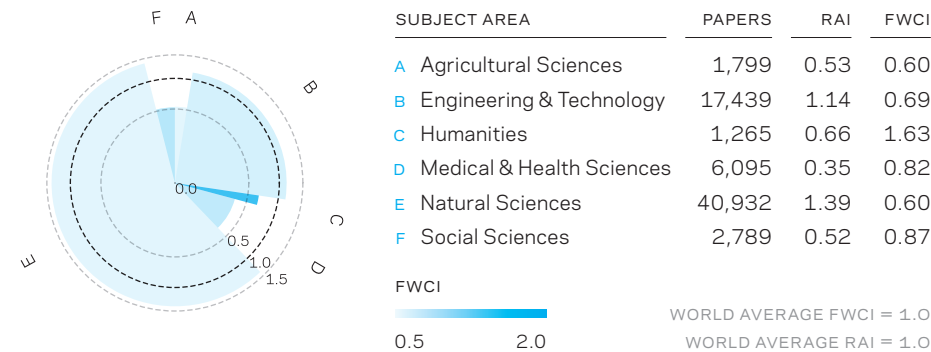
stayed in Russia or lived outside of Russia for less than two years.



Subject breakdown

The Natural Sciences is the focus of Russia's research. Over 60% of Russia's publications belong to the Natural Sciences. In relative terms, Russia produces 39% more research in this subject area compared to the world average. Russia has another quarter of publications in Engi-

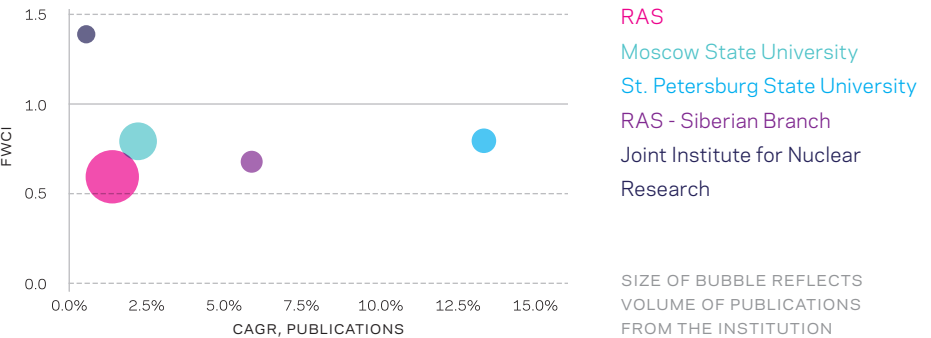
neering & Technology, and has very few publications in other subject areas. The FWCI is below 1.0 for all subject areas, except for the Humanities.



Most prolific institutions

Russia's most prolific institution is the Russian Academy of Sciences, which produces close to 10,000 publications per year. It is followed by Moscow State University with around 5,000 publications per year. Only the Joint Institute for Nuclear Research has an FWCI above the

world average of 1.0. Among Russia's most prolific institutions, St. Petersburg State University leads in the growth rate of publications with an impressive annual growth rate of 13.3%.





SAUDI ARABIA

Saudi Arabia shows signs of strong growth in research, with two of its top institutions showing publication growth of more than 40% CAGR. A large proportion of its scholarly output is the result of international collaborations, which are also more impactful than the world average.

Saudi Arabia publishes 0.69% of the world's scholarly output and 0.52% of the world's top 10% cited papers. It receives around 0.48% of the world's citations and 0.92% of the world's downloads. More citations to Saudi Arabia's research come from the USA (13%) than

Saudi Arabia itself (12%). Saudi Arabia publishes the most in the Natural Sciences, but its research output in Engineering & Technology is the most impactful, and cited more than the world average.

Headline statistics

44% HIGHER THAN WORLD AVERAGE

Saudi Arabia's international collaborations account for 70% of its output, and are impactful.

Mobile researcher population

Over half of Saudi Arabia's researchers show transitory mobility, favouring short-term assignments over long-term ones.

STRONG AREA

Engineering & Tech

Saudi Arabia's papers in Engineering & Technology are cited 37% more than the world average.

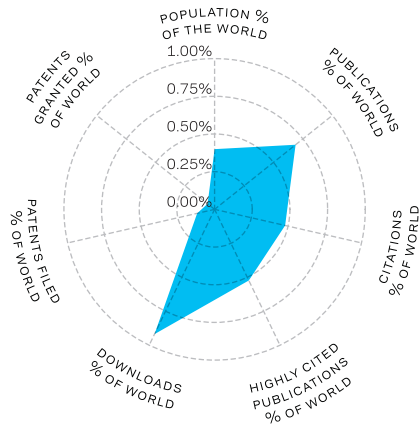
MOST PROLIFIC INSTITUTION

King Abdullah University

King Abdullah University of Science and Technology is a mid-sized university in Saudi Arabia with a high FWCI of 1.93.

Overall country or region outlook

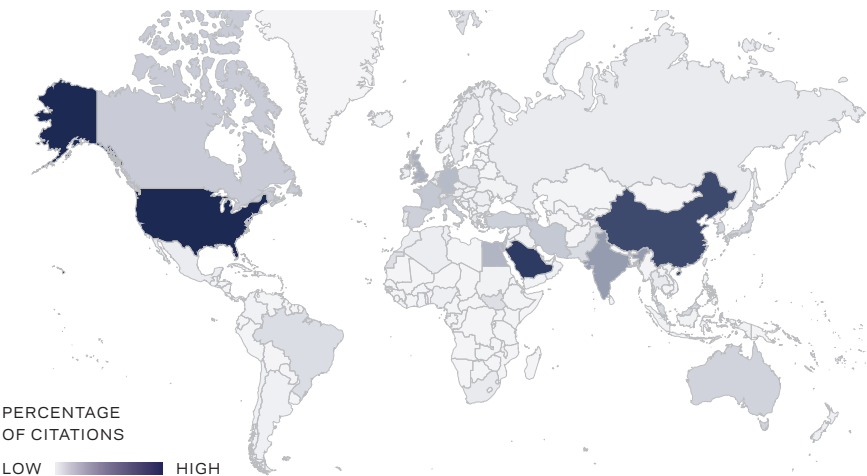
Saudi Arabia makes up 0.4% of the world's population; relative to this, it publishes a higher proportion of the world's scholarly output, at 0.69%. It publishes 0.52% of the world's top 10% cited papers and receives, in total, 0.48% of the world's citations. In terms of usage, Saudi Arabia's scholarly output appears to be downloaded more than cited since its papers receives 0.92% of the world's downloads. In the area of innovation, Saudi Arabia's share of world's patents filed is 0.12%, and its share of patents granted is 0.06%.



Global distribution of citations

Citations to Saudi Arabia's research come mainly from prolific countries such as the US (13%), China (11%), India (5.5%), and the UK (4.3%). In many countries, researchers tend to cite papers from their own countries preferentially; this appears to hold true for Saudi Arabia's research since citations from Saudi Arabia's pa-

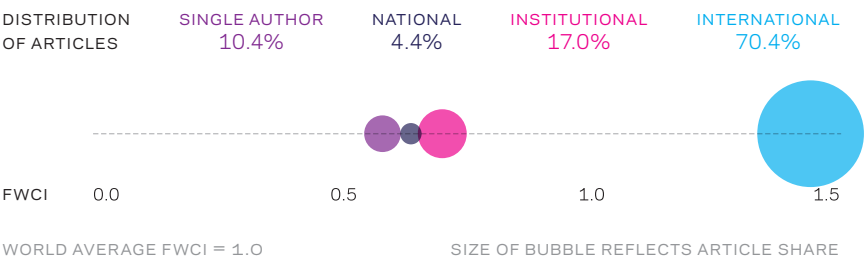
pers make up 12% of its received citations. Saudi Arabia is also cited by other European and Middle Eastern countries such as Egypt (3.9%), Germany (3.6%), Iran (2.7%), France (2.7%), and Italy (2.5%).



Collaboration patterns

Over 70% of Saudi Arabia's research results from international collaborations, and these papers are cited about 44% more than the world average for all collaboration types. Other research collaboration types make up less than 30% of its scholarly output and are less impactful: institutional collaborations make up 17% of its output and are cited 30% less than the world average; single-authored pa-

pers make up 10% of its output and are cited 42% less than the world average; national collaborations are cited 36% less than the world average and only account for 4.4% of Saudi Arabia's scholarly output.



Researcher mobility

Saudi Arabia's researchers are largely mobile: 57% of them have published under foreign affiliations on a short term basis; 17% of its researcher population are inflow researchers who take long term positions in Saudi Arabia, while only 7% are outflow researchers who take up long term assignments abroad. There is an overall net increase in researcher in-

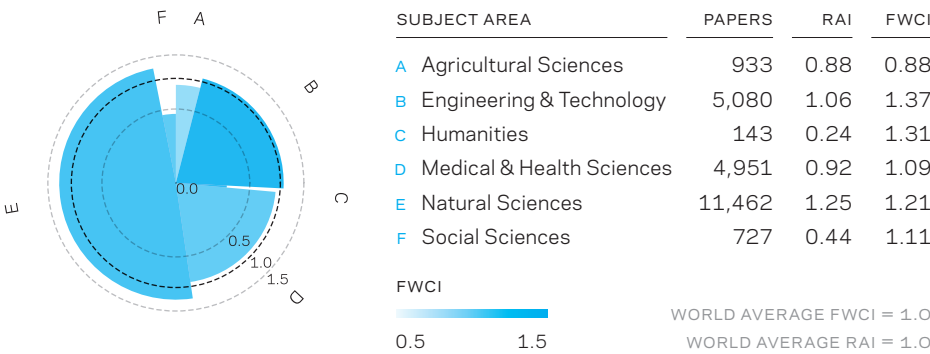
flow over outflow, suggesting that Saudi Arabia has a good ability to attract researchers. 19% of Saudi Arabia's total researcher population are sedentary and have never published under an affiliation outside of the country.



Subject breakdown

Saudi Arabia is most prolific in the Natural Sciences; proportionally, it publishes almost half of its output in this area, which is 25% more than the world does, and these papers are cited 21% more than the world average. In Engineering & Technology, Saudi Arabia publishes 6% more

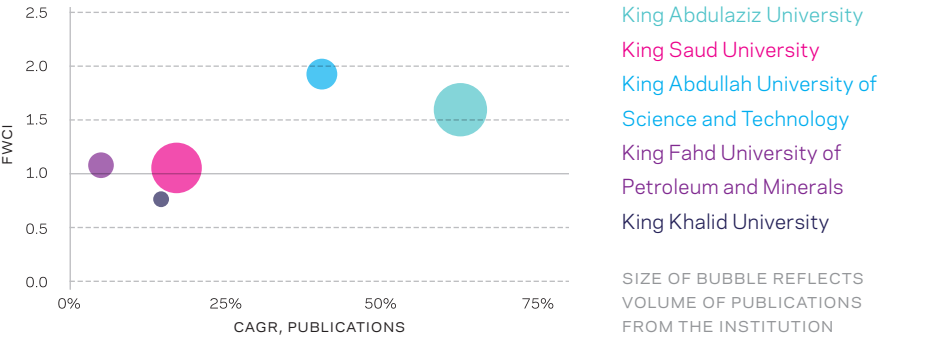
than the world does and its papers are more impactful (cited 37% more) than the world average. Saudi Arabia hardly publishes in the Humanities, and publishes proportionally less than the world does in the Agricultural and the Social Sciences.



Most prolific institutions

Saudi Arabia's top institutions published between 360 (King Khalid University) and 4,100 papers (King Abdulaziz University) in 2014. All of them show positive growth in terms of 2010-2014 papers, with King Abdulaziz University leading with the strongest growth at 63% CAGR. With the

exception of King Khalid University whose FWCI is lower than the world average at 0.76, the remaining top institutions have above average FWCI, including King Abdullah University of Science and Technology with a high FWCI of 1.93.





SERBIA

Serbia produces around 7,000 publications per year. These publications have an FWCI that is close to the world average. Serbia's research focuses on the Natural Sciences.

Serbia experiences a net inflow of researchers even though, in general, Serbia's researchers are not very mobile. Around half of Serbia's active researchers belong to the sedentary group who have never had a publication with a foreign affiliation.

Headline statistics

FWCI close to the world average

The FWCI of Serbia's publications is 0.91 in 2014, slightly below the world average.

Net inflow of researchers

Serbia benefits from international researcher migration with a 10% net inflow of researchers.

FOCUS AREA

Natural Sciences

Serbia produces the largest number of publications in the Natural Sciences, and its FWCI is also the highest in this subject area.

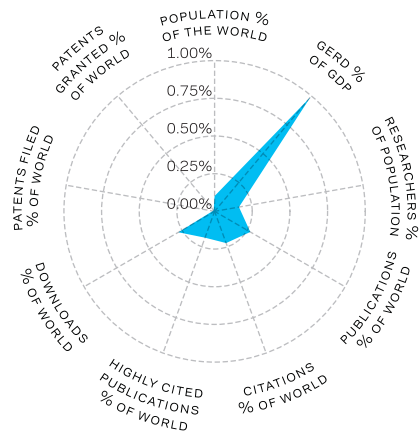
MOST PROLIFIC INSTITUTION

University of Belgrade

University of Belgrade is the most prolific institution in Serbia, producing around 3,500 publications per year.

Overall country or region outlook

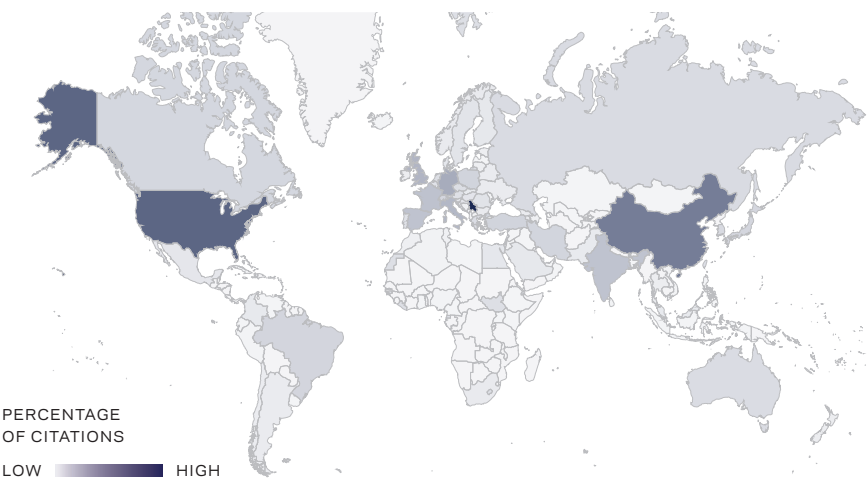
Serbia produces around 0.3% of the world's publications. They attract 0.2% of citations and 0.3% of downloads world-wide. Serbia's FWCI increased slightly in the last five years, reaching 0.91, or only 9% below the world average, in 2014.



Global distribution of citations

12.4% of citations to Serbia's research come from the country itself. The countries that next cite Serbia's research the most are a group of the most prolific countries in the world, including the US, China, Germany, the UK, Italy, France, and Spain. Among Serbia's top citing countries, there is also a group of emerg-

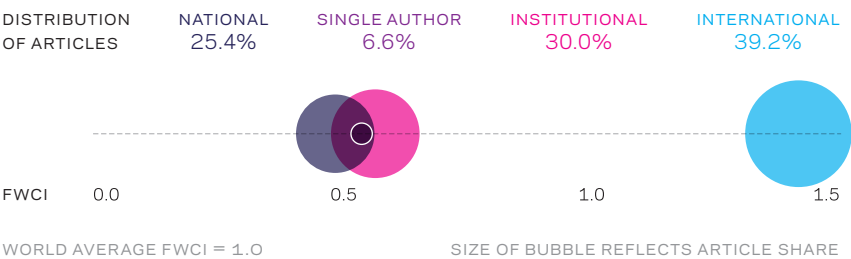
ing, or less research-intensive countries, such as India, Poland, Turkey, Iran, and Brazil.



Collaboration patterns

Around 40% of Serbia's publications involve international collaboration. This percentage is not as high as many Western European countries but is similar to some of the Eastern European countries. Institutional and national collaboration each comprises 25-30% of Serbia's publications. Among the four collaboration types, only international collaboration is

associated with an FWCI higher than the world average (1.42).



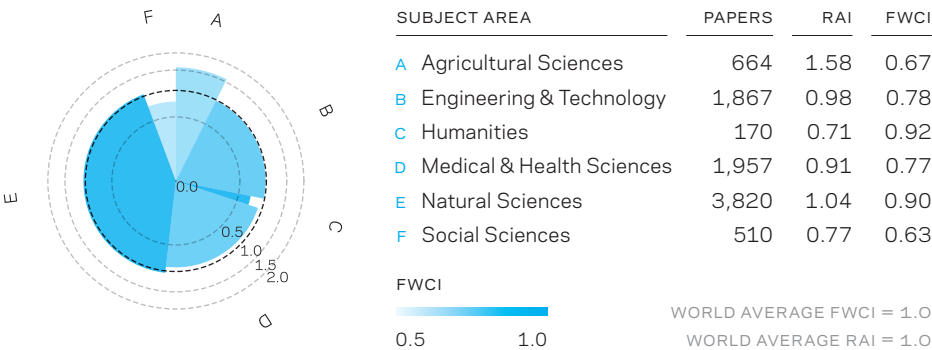
Researcher mobility

Serbia is a net inflow country (+10.2%) in terms of researcher mobility. This means that Serbia benefits from international researcher migration. Half of Serbia's active researchers are sedentary, but there is a sizeable group of researchers belonging to the transitory category (35.3%) who either stayed in Serbia or moved out of Serbia for less than two years.



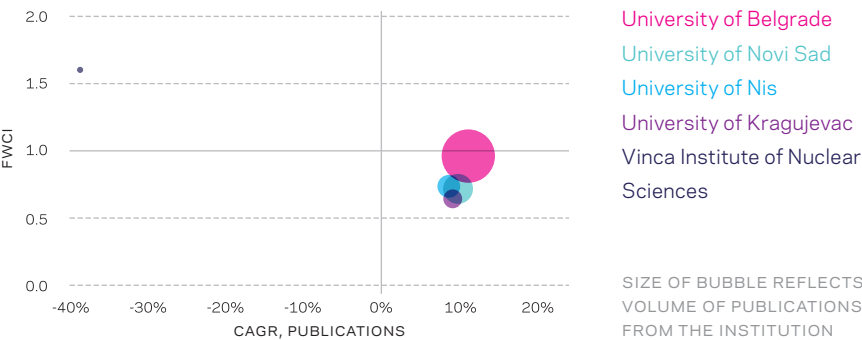
Subject breakdown

Serbia produces the largest volume of publications in the Natural Sciences among the six subject areas. It also has the highest FWCI in this subject area. The Agricultural Sciences has the highest level of research activity among the six subject areas (58% more than the world average).



Most prolific institutions

Serbia's most prolific institution is University of Belgrade, producing around 3,500 publications per year. This number is almost three times that of the second most prolific institution: University of Novi Sad. Except Vinča Institute of Nuclear Sciences, the other four prolific institutions have an FWCI below the world average.





SINGAPORE

Singapore is a small country with a sizable research base; its share of top 10% cited papers is large for its population size. Remarkably, its papers across all subject areas are highly impactful, as are the top institutions in the country.

Singapore publishes about 0.72% of the world's scholarly output and 1.1% of the the world's top 10% cited papers. It receives around 1.2% of the world's citations and 1.0% of the world's downloads. Citations to Singapore's research come largely from China (20%), the US

(16%), and other prolific countries such as the UK, Germany, and India. Its internationally collaborative papers are highly impactful: they are cited more than twice the world average and make up 60% of its total scholarly output.

Headline statistics

60%

INTERNATIONAL COLLABORATIONS

Singapore's internationally collaborative papers are highly impactful and are cited more than twice the world average.

Mobile researcher population

Only 28% of researchers in Singapore are sedentary. Almost half are transitory and publish with overseas affiliations on a short term basis.

Natural Sciences and Engineering & Tech

Singapore publishes nearly 3/4 of its output in these 2 areas, with FWCI of 1.9 and 2.0 respectively.

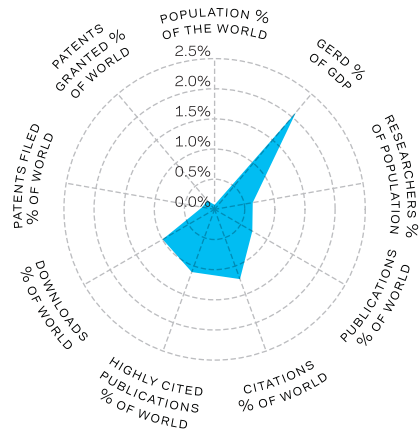
Highly impactful top institutions

4 out of the top prolific institutions in Singapore have FWCI of at least 1.8, meaning that they are cited over 80% more than the world average.

Overall country or region outlook

Singapore has a small population as a city-state and island country, its population makes up less than 0.1% of the world's population. Singapore invests about 2.1% of its GDP on GERD and its investment in research yields good results: it publishes 0.72% of the world's scholarly output and about 1.1% of the world's top 10% cited papers. Its papers receive about 1.2% of the world's citations and 1.0% of the world's downloads.

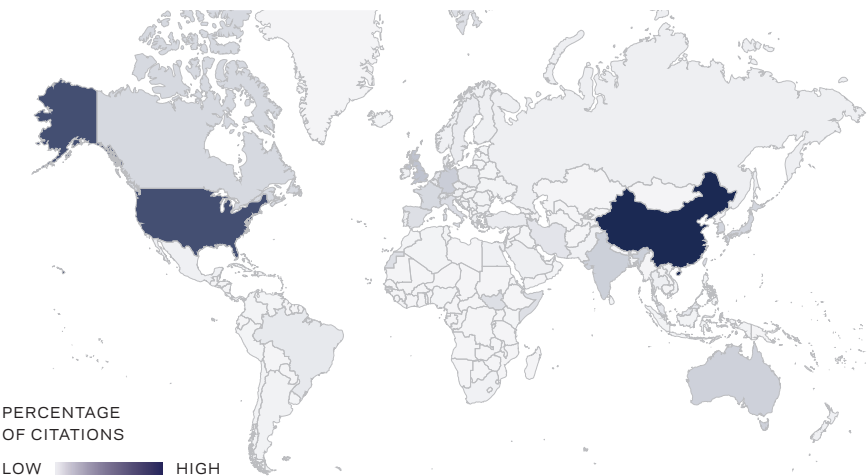
Singapore's share of world patents filed and granted, relative to other data shown here, are lower at 0.2% each.



Global distribution of citations

Unlike many countries in which researchers tend to cite their own country's papers preferentially, self-citations from Singapore account for only about 8.5% of its received citations. This can be attributed among others to the smaller publication volume from the country and a higher exposure to overseas research, as seen

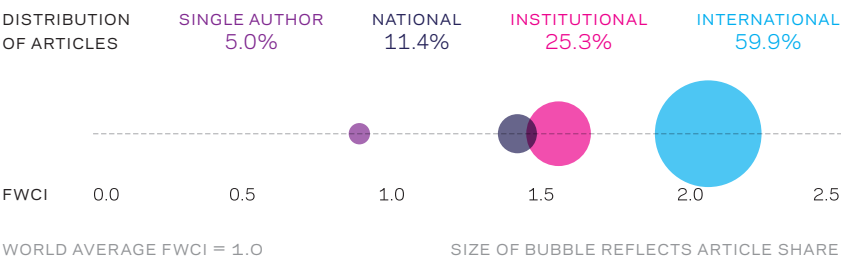
from the high international collaboration rate. Citations to Singapore's research come mainly from China (20%), the US (16%), the UK (4.8%), Germany (3.9%) and India (3.5%). Singapore is one of the countries that receive the highest proportion of its incoming citations from China.



Collaboration patterns

Almost 60% of Singapore's total scholarly output is internationally collaborated; these papers have a higher impact than all other collaboration types and are cited more than twice the world average for all collaboration types. Institutional collaborations make up 25% of Singapore's scholarly output and are cited about 56% more than the world average for all collaboration types. Only 11% of the total out-

put are collaborations across institutions in Singapore and they are still impactful, receiving 42% more citations than the world average. Singapore's single-authored papers are the least impactful, cited 11% less than the world average, and only account for 5% of Singapore's scholarly output.



Researcher mobility

Most of Singapore's researchers are rather mobile: 46% of them show transitory mobility and are researchers who have published under overseas affiliations on a short term basis. Researchers who move across borders on a longer-term basis make up a quarter of the researcher population; 13.2% are likely to take up permanent assignments abroad, while 12.7%

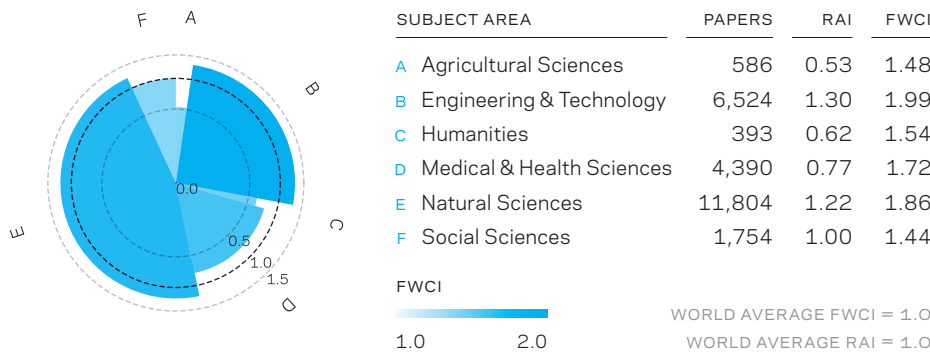
are inflow researchers who move to Singapore to take up long-term positions. Only 28% of the total researcher population have only published under a Singapore affiliation. The mobile researcher population can be arguably perceived as beneficial to Singapore as researchers expand their research network and facilitate the exchange of ideas with such movements.



Subject breakdown

Singapore's research is impactful in all areas in which it publishes. Singapore is most prolific in the area of the Natural Sciences; it publishes nearly half of its output in this area, which is 22% more than the world does, and these papers are cited 86% more than the world average.

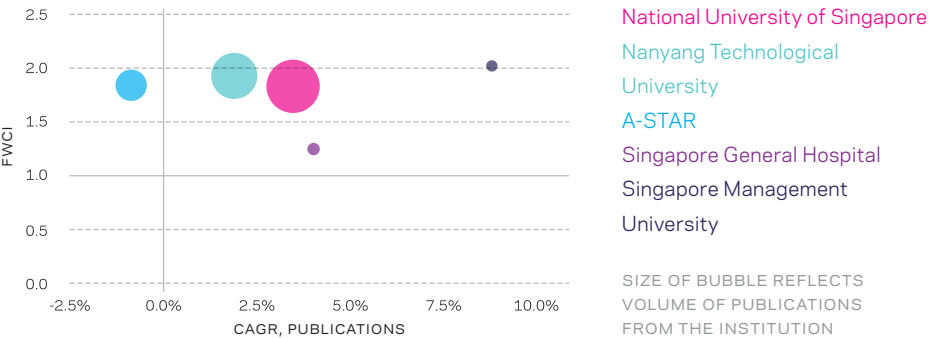
In Engineering & Technology, Singapore is also comparatively more prolific than the world (30% more) and highly impactful, as these papers are cited 99% more than the world average.



Most prolific institutions

Singapore's top institutions, based on papers published in 2014, are the National University of Singapore (7,100), National Technological University (5,300) and Agency for Science, Technology and Research (A-STAR) (2,500). Except for A-STAR, all of them show positive growth in terms of 2010-2014 papers, from 1.9%

(Nanyang Technological University) to 8.8% (Singapore Management University). With the exception of the Singapore General Hospital, all top institutions have an FWCI higher than 1.8, meaning that their papers are cited on average at least 80% more than the world average.





SLOVAKIA

Slovakia is a growing nation in research. The FWCI of its publications increased significantly in the recent five years, from below the world average to 1.20 in 2014.

International and institutional collaboration are the two most important types of collaboration for Slovakia. They also have a higher FWCI than the other two collaboration types. The number of Slovakia's active researchers belonging to the sed-

entary group is similar to the number of researchers that belong to the transitory group.

Headline statistics

Growing FWCI

Slovakia's FWCI increased significantly in the recent years, reaching 1.27 in 2014.

Crucial role of institutional collaboration

Institutional collaboration contributes to 37.6% of Slovakia's publications.

Highest FWCI in Natural Sciences

Among the 6 subject areas, Slovakia has the highest FWCI in Engineering & Technology.

MOST PROLIFIC INSTITUTION

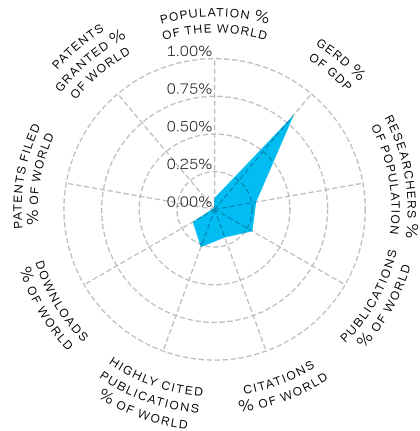
Slovak Academy of Sciences

The most prolific institution in Slovakia is the Slovak Academy of Sciences, producing 7,773 publications from 2010 to 2014.

Overall country or region outlook

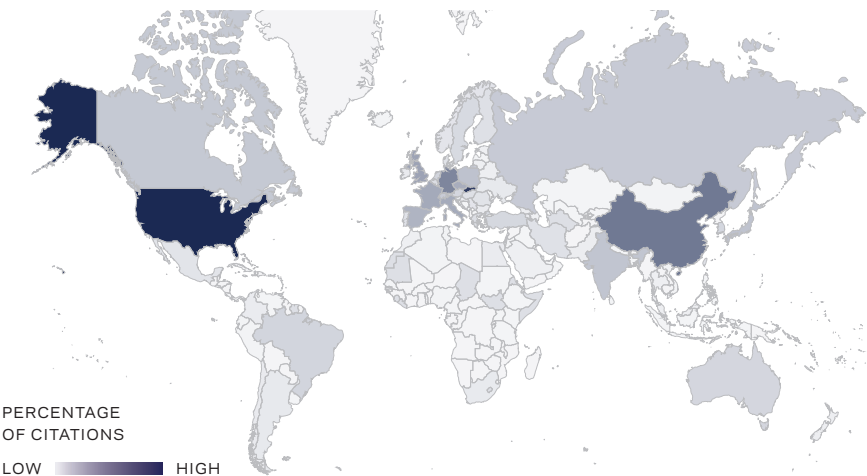
Slovakia has 0.1% of the world's population but produces 0.29% of the publications worldwide. The FWCI of Slovakia's publications has increased significantly in recent years, reaching 1.27 in 2014, or 27% higher than the world average.

Slovakia's publications are downloaded relatively less frequently than the world average, attracting only 0.17% of the world's downloads.



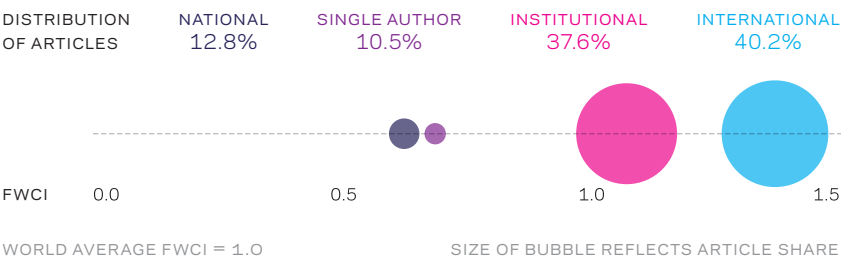
Global distribution of citations

Slovakia's top citing countries are the US (10.5%), itself (9.5%), and China (6.4%). Unsurprisingly, the Czech Republic is among the top ten citing counties of Slovakia. Poland and Russia also contribute to a significant amount of citations to Slovakia's publications.



Collaboration patterns

Similar to many of the Eastern European countries, Slovakia has a share of internationally collaborative publications that is between 40% and 50%. Institutional collaboration also plays a crucial role in Slovakia's research, contributing to 37.6% of the country's publications. These two types of collaboration are associated with a higher FWCI than the other types.



Researcher mobility

Very small percentages of Slovakia's active researchers belong to the outflow or inflow categories: those who leave or enter the country permanently. The majority of Slovakia's active researchers belong either to the sedentary category, who have not published with an affiliation outside of the country, or the transitory cat-

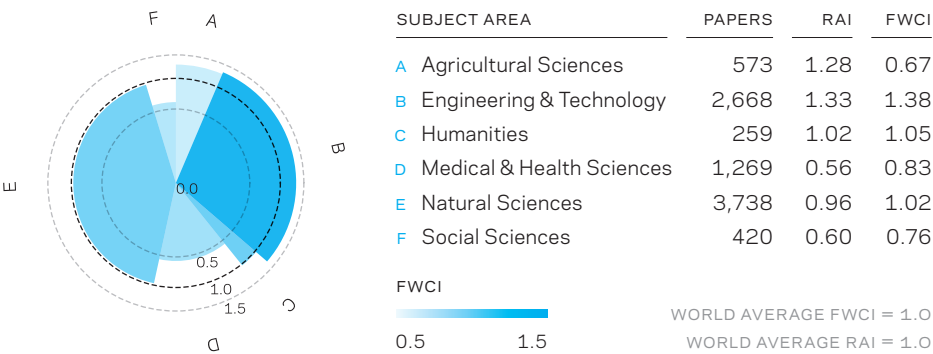
egory, who stayed in Slovakia or moved out of the country for less than two years.



Subject breakdown

The majority of Slovakia's publications belong to the Natural Sciences. It is also a subject area in which the country has an FWCI higher than the world average. Nevertheless, Slovakia's level of research activities in the Natural Sciences is close to the world average. Slovakia has the

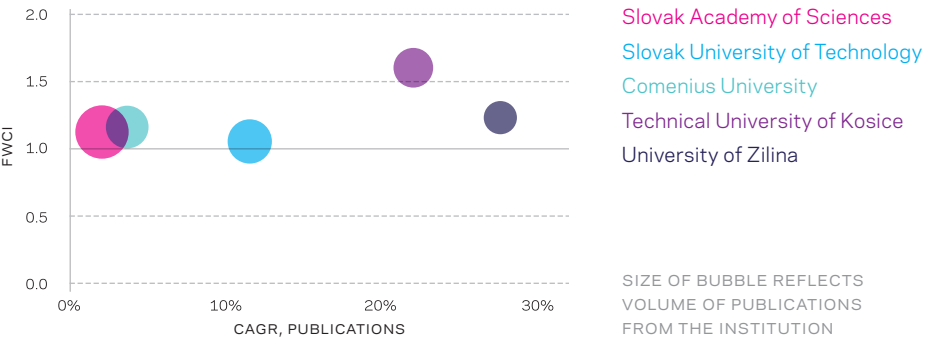
highest activity index in Engineering & Technology (33% higher than the world average) and also the highest FWCI in this subject area (1.38).



Most prolific institutions

Slovakia's most prolific institution is the Slovak Academy of Sciences. It produces around 1,500 publications per year. The top five most prolific institutions of Slovakia all have an FWCI higher than the world average of 1.0. The Technical University

of Žilina shows the highest growth in its research output among the top five institutions.





SLOVENIA

In some ways, Slovenia is similar to other Eastern European countries; a sedentary researcher base, and mostly cited within the Eastern European network of countries. In other ways, it is different: its level of international collaboration, for instance, is higher than that of others.

Slovenia's strongest subject area is the Natural Sciences. A key role is played by University of Ljubljana, which produces a larger volume of publications than the rest of the top five institutions in the country combined.

Headline statistics

GERD almost 3% of GDP

Slovenia ranks 11th highest GERD out of all countries with available data.

CONNECTIONS

Eastern Europe

Eastern European countries cite Slovenia most heavily.

Benefit from international collaboration

International collaboration is the only collaboration type with an FWCI above the world average.

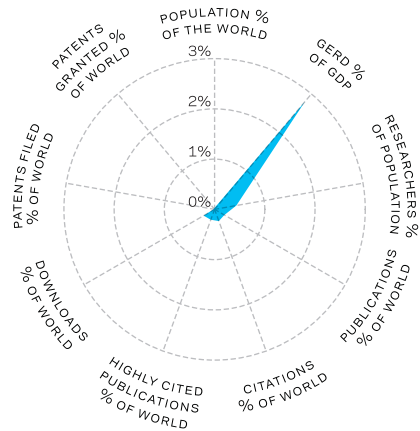
MOST PROLIFIC INSTITUTION

University of Ljubljana

University of Ljubljana produces a larger volume of publications than the rest of the top five institutions in the country combined.

Overall country or region outlook

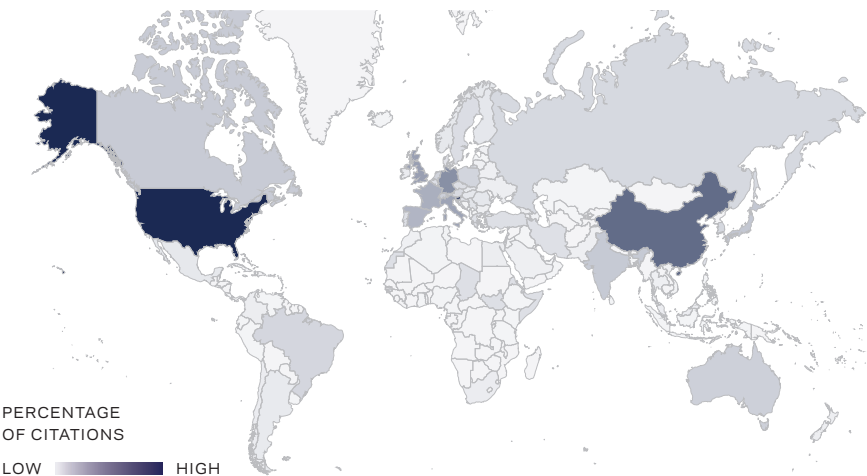
Slovenia shows a comparable share of around 0.2% of global publications, citations, highly cited articles, and downloads. Slovenia's GERD as a percentage of its GDP is relatively high, at 2.8%, ranking eleventh out of all countries with available data. There is relatively little patenting activity.



Global distribution of citations

After the US (11.5% of all citations towards Slovenian publications are coming from the US), Slovenia itself accounts for 9.4% of all incoming citations. China is the third largest source of citations for Slovenia, with 8%. If we look at the share of citations relative to all outgoing citations from each country, we see in the top

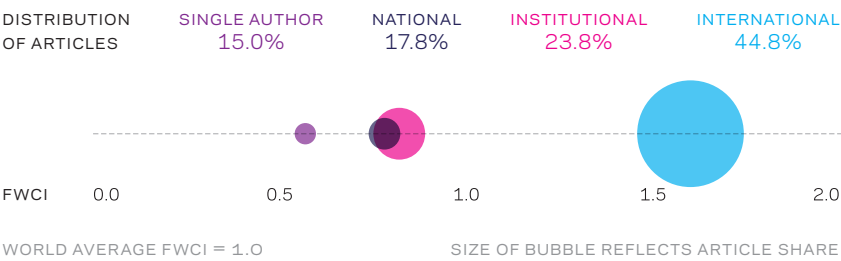
five a clear block of Eastern European countries: Slovenia, Belarus, Croatia, Serbia, and Slovakia, indicating a strong local citation network.



Collaboration patterns

The largest proportion of Slovenia's publications is produced through international collaboration, the only collaboration type with a resulting FWCI above the world average: 1.60, to be precise. All other collaboration types are associated with FWCI of well below the world average, emphasising the importance of international collaborations for Slovenia. Slove-

nia's percentage of single-author publications is relatively high, ranking fifth out of all countries.



Researcher mobility

Slightly over half of all active Slovenia researchers have not published with an affiliation outside of Slovenia. This is the mobility category which has the lowest FWCI, below the world average. For all other mobility types, FWCI is above the world average, and the highest can be found for visiting scholars with short

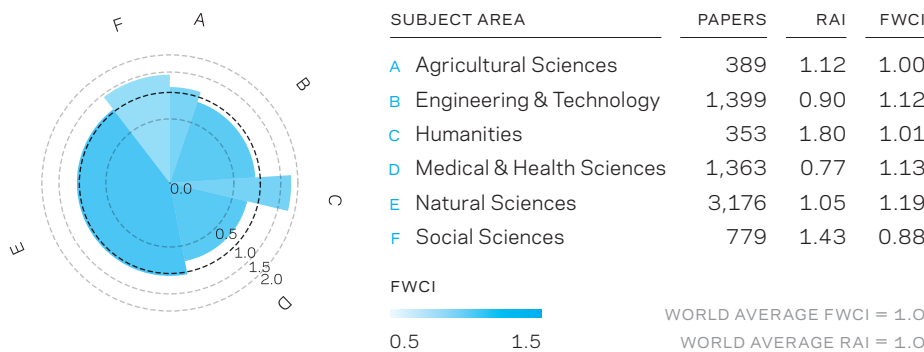
stays in Slovenia. Slovenia has a larger inflow of researchers than outflow.



Subject breakdown

In absolute terms, Slovenia is most prolific in the Natural Sciences (3,176 publications in 2014). This is also the subject area with the highest FWCI of 19% above the world average. In the relative sense, Slovenia's activity appears to be focused on the Humanities and the Social Sciences.

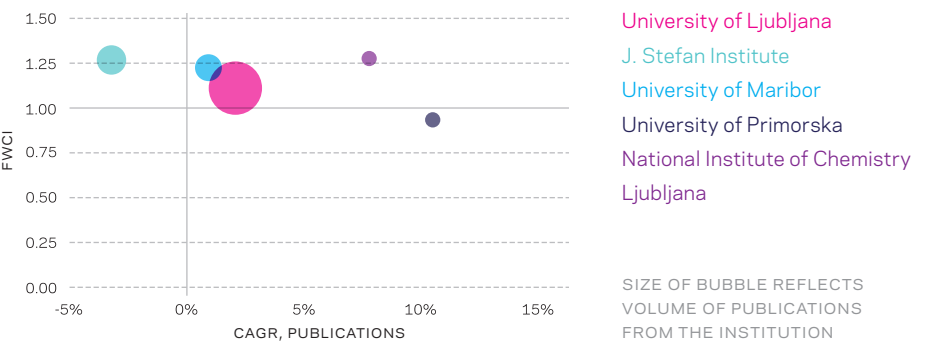
es. However, in absolute terms, the output in these subjects is rather low. Therefore, the Natural Sciences seems the subject area in which Slovenia is strongest.



Most prolific institutions

Slovenia's most prolific university, University of Ljubljana, produces a larger volume of publications than all other four institutions in the top five collectively. The highest growth rate can be observed for University of Primorska, showing an annual growth rate of over 10%. This is

easier for smaller universities than for larger ones, as a larger relative increase can be reached more easily from a small starting number. University of Primorska is the only one in the top five with an FWCI below the world average.





SOUTH AFRICA

As the most research-intensive country in Africa, South Africa generated more than 16,000 publications in 2014, or about 0.73% of the world's total publications.

In contrast to the rest of the BRICS (Brazil, Russia, India, China, and South Africa) countries, South Africa is very outward-looking and fosters strong global research connections. A high percentage of its total research output is international collaborations, and a super-majority of its

researchers have travelled and published abroad. The country is also unique in its strong relative focus in the Humanities and the Social Sciences.

Headline statistics

High levels of, and returns on, international collaboration

44.1% of all publications are international collaborations, achieving an FWCI of 1.79.

Highly mobile researcher base

More than 65% of active South African researchers have published at least once with an affiliation outside of the country.

FOCUS

Humanities

South Africa has a strong relative focus in the Humanities. It produces nearly four times as much research in the Humanities relative to the world.

MOST PROLIFIC INSTITUTION

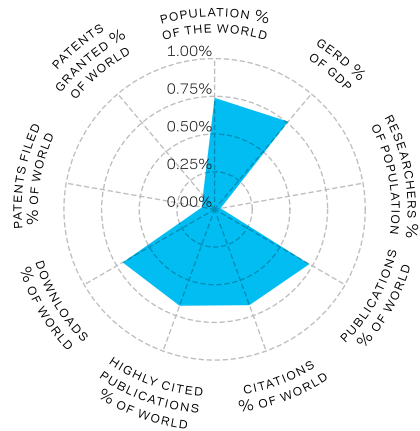
University of Cape Town

The University of Cape Town is South Africa's most prolific research institution, producing more than 2,400 publications in 2014.

Overall country or region outlook

As the most research-intensive country in Africa, South Africa invests about 0.8% of its GDP every year in gross R&D expenditures. The country generated over 16,000 publications in 2014, or about 0.73% of the world's total. South Africa accounts for proportionate shares of all citations worldwide (0.68%), highly cited articles (0.68%), and downloads (0.70%).

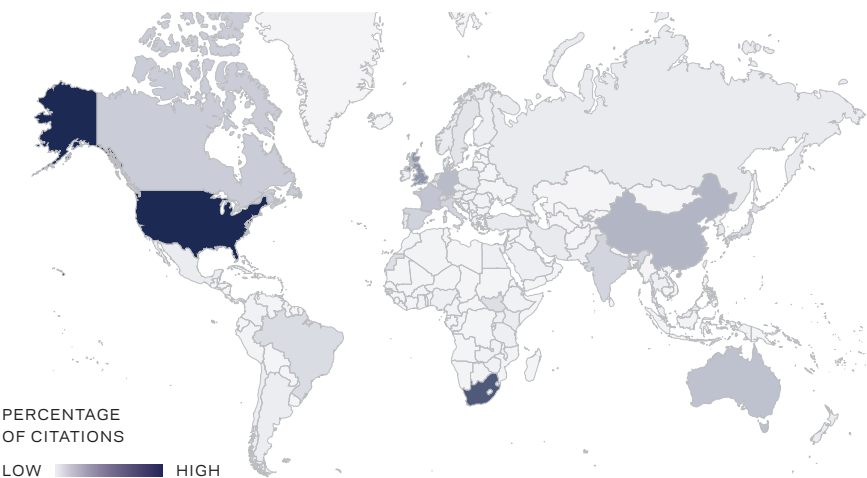
Furthermore, although the country does not file many patents (0.08% of all patents filed worldwide), a higher relative proportion of those patents are granted (0.12% of all patents granted worldwide).



Global distribution of citations

The US accounts for 16.3% or almost one out of every six citations to South Africa's research. South Africa itself accounts for 12.3%, followed by the UK at 7.6%, China at 5.0%, and Germany at 4.5%. Australia, another Commonwealth country, accounts for 4.0% of all citations to South Africa's research, which is much

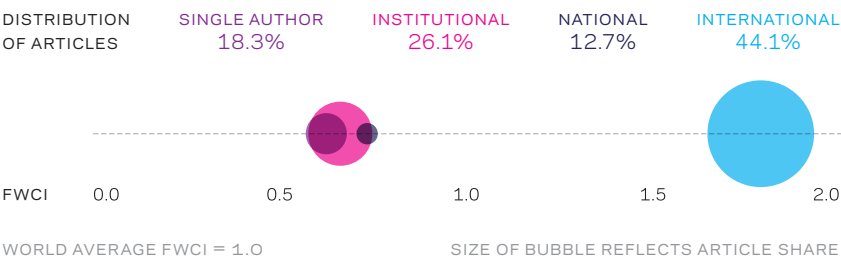
higher than expected, given Australia's global baseline of research output.



Collaboration patterns

International collaborations are the most popular type of collaborations for South Africa, constituting 44.1% of the country's total output. Similar to other countries, such collaborations achieve the highest FWCI at 1.79, or 79% above the world average. For reference, the next most frequent are institutional collaborations (26.1% of the country's total out-

put), which achieve an FWCI of 0.66 or 34% below the world average.



Researcher mobility

In contrast to the rest of the BRICS countries, South Africa has a highly mobile researcher base. More than 65% of all South African researchers have published at least once with an affiliation outside of the country. Moreover, 48.3% are categorized as transitory researchers, which means they have spent two years or less at either a South African institution or an

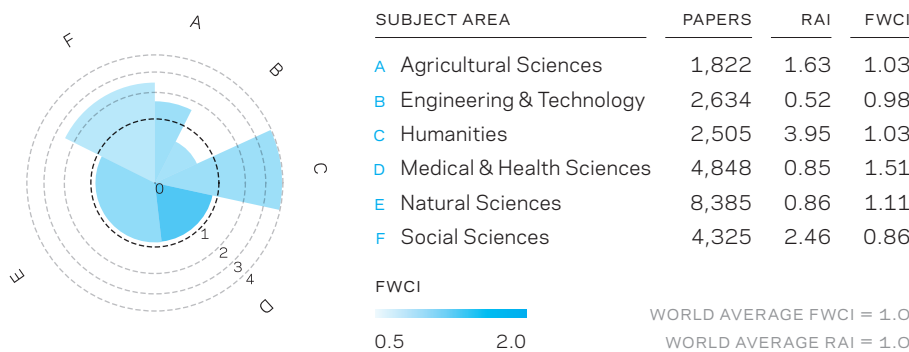
institution outside of South Africa. Such researchers have achieved an FWCI of 1.92, or nearly twice the world average.



Subject breakdown

Given the size of its research output, South Africa produces more than 2.5 times as much research in the Social Sciences than expected, and almost four times as much research in the Humanities. Similar to other Sub-Saharan African countries, South Africa has a higher level

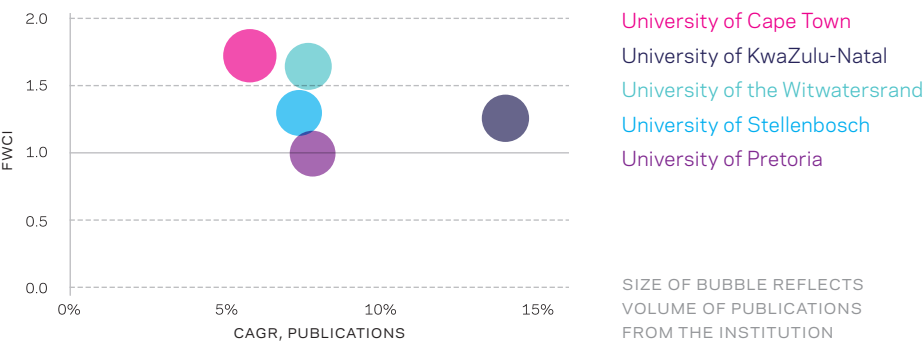
of activity in the Agricultural Sciences, relative to the world average. South Africa's research in the Medical & Health Sciences has the highest FWCI (1.51), more than 50% above the world average.



Most prolific institutions

The University of Cape Town is South Africa's most prolific research institution, producing nearly 2,400 publications in 2014. Each of the top five most prolific institutions from South Africa grew their output steadily from 2010 to 2014, outpacing the world growth rate. University

of KwaZulu-Natal increased its output at an especially high rate (14.0% CAGR).





SOUTH KOREA

Innovation is South Korea's strength: it makes 8.5% of the world's patent applications. These have a high success rate, resulting in South Korea holding over 10% of the world's patents granted.

Despite holding less than 1% of the world's population, South Korea publishes about 3% of the world's scholarly output and highly-cited output, receiving roughly equivalent shares of citations and downloads. Although most researchers in South Korea tend to be sedentary, over

a quarter show transitory mobility patterns, and South Korea presents a small net gain in terms of long term mobility. South Korea's strengths (prolificity and impact) are in the Natural Sciences and Engineering & Technology.

Headline statistics

3.1%

OF WORLD SCHOLARLY OUTPUT

and 2.8% of world highly-cited output.

10%

OF WORLD PATENT GRANTED

from a highly successful 8.5% share of world patents filed.

Natural Sciences and Engineering & Tech

South Korea's most prolific and impactful fields.

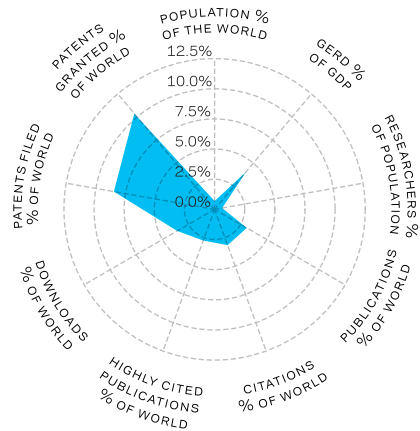
61%

SEDENTARY RESEARCHERS

and over 25% researchers displaying transitory mobility patterns, with a small net researcher gain (+4.5 percentage points) in the long term.

Overall country or region outlook

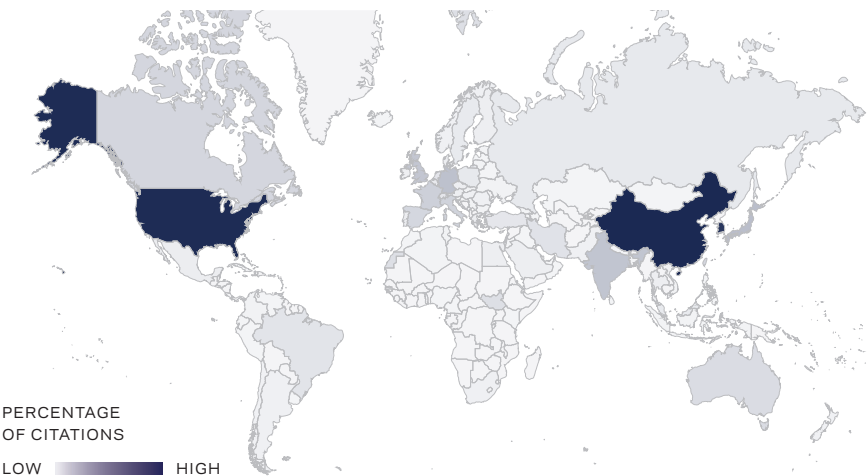
While South Korea holds less than 1% of the world's population (0.69%), it has comparatively larger shares of the world's main research indicators, at around 3% each. South Korea publishes 3.1% of the world's scholarly output and 2.8% of the world's highly cited output; it receives an equivalent 3.2% of the world's citations and an even higher share of the world's downloads, at 3.6%. It is in innovation, however, that South Korea is most impressive, filing 8.5% of world patent applications with a high success rate, resulting in a share of patents granted of more than 10%.



Global distribution of citations

Unsurprisingly, South Korea receives the largest shares (about 15% each) of its citations from prolific countries like the US and China, and from itself. The rest of its citation distribution is global and fairly equally distributed amongst citing countries, with slightly higher shares coming

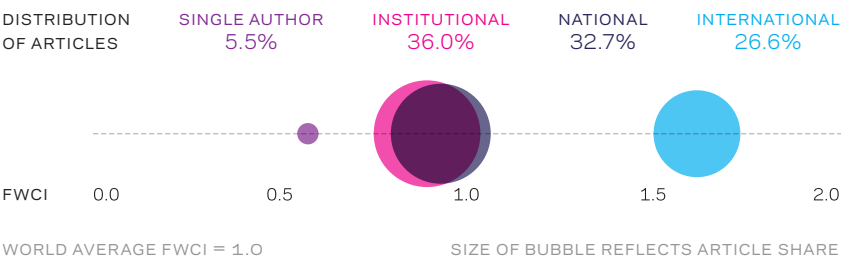
from Japan and India in Asia, and Germany and the UK in Europe.



Collaboration patterns

South Korea's institutional and international collaborations account for over two-thirds of the country's output, and are cited at about 90% of the world average across collaboration types. More than a quarter of the country's papers are the result of international collaboration, and they reach a high impact of over 60% of the world average across all collaboration types. South Korea has a small pro-

portion of single-authored papers, cited 43% less than the world average across collaboration types.



Researcher mobility

The absolute majority (more than 60%) of South Korea's researchers are sedentary, meaning that they have consistently only published under Korean affiliations since 1996. Over a quarter of South Korea's researchers belong to the transitory mobility class, which means that they have published under both South Korean and non-South Korean affiliations in rapid

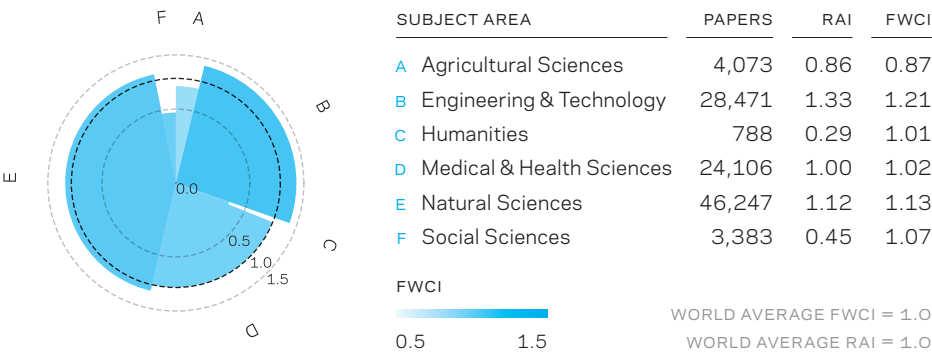
succession since 1996. Long term mobility in and out of South Korea is limited, with a small (4.5 percentage points) net gain in South Korea's proportion of inflow researchers (8.9%) compared to its outflow proportion (4.4%).



Subject breakdown

South Korea is most prolific and impactful, absolutely and relatively compared to the world, in the Natural Sciences, and Engineering & Technology. In these two fields South Korea's research is cited 13% and 21% more than the world average across all subject fields. In the Medi-

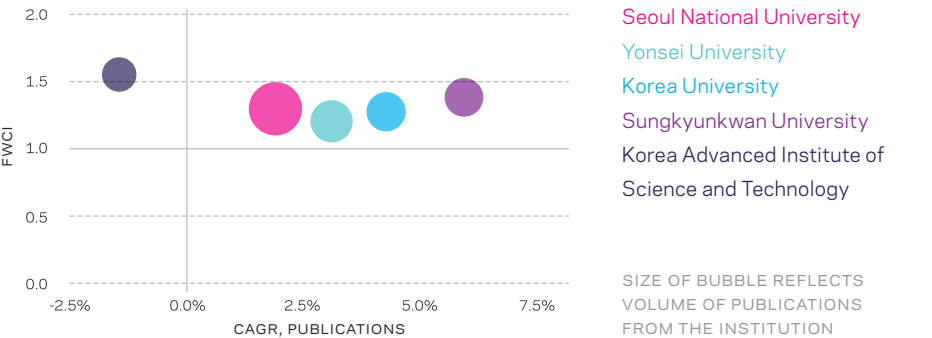
cal & Health Sciences, South Korea is relatively as prolific and impactful as the world.



Most prolific institutions

South Korea's top institutions, by output, published between 3,191 papers (Korea Advanced Institute of Science and Technology) and 7,639 papers (Seoul National University) in 2014. All of them show higher impact than the world average, with their output cited between

55% more (Korea Advanced Institute of Science and Technology) and 21% more (Yonsei University) than the world average. Sungkyunkwan University presents the highest annual output growth among these institutes, at 5.9% 2010-2014 CAGR.





SPAIN

Spain is a research-intensive nation. The country gets higher than proportionate attention to its research: its world citation share and highly cited article share are well above its world publication share.

Close to half of Spain's publications result from international collaboration. They have a high FWCI that is 79% above the world average. Spain's most prolific institution is the Spanish National Research Council (CSIC) that produces around 9,000 publications per year.

Headline statistics

High citation impact

Spain's publications have a high citation impact. Its FWCI is 33% higher than the world average in 2014.

Return to collaboration

The FWCI of Spain's internationally collaborative publications is 1.79, well above that of the other collaboration types.

High level of activity

Spain has a high level of research activities in the Agricultural Sciences (39% higher than the world average).

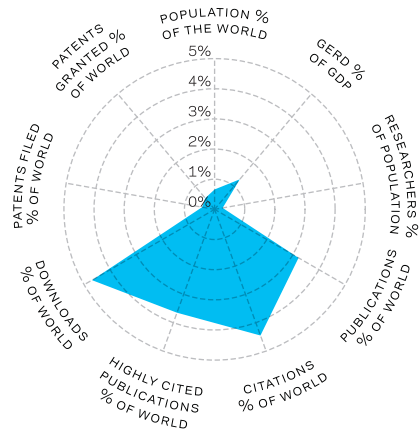
MOST PROLIFIC INSTITUTION

CSIC

Spain's most prolific institution is the Spanish National Research Council (CSIC).

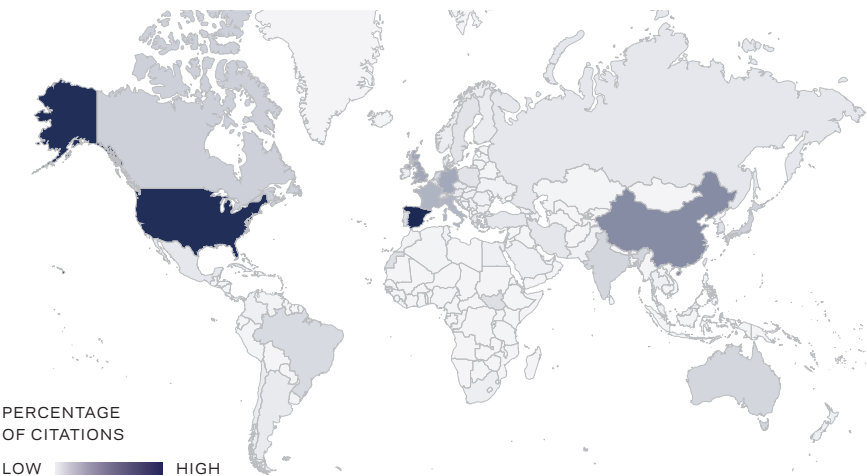
Overall country or region outlook

With 0.7% of the world's population, Spain produces 3.2% of the publications worldwide. These publications are cited often: Spain receives 4.5% of the world's citations, contributes to 3.7% of highly cited articles worldwide and attracts 4.7% of the world's downloads. In 2014, Spain's FWCI was 33% higher than the world average.



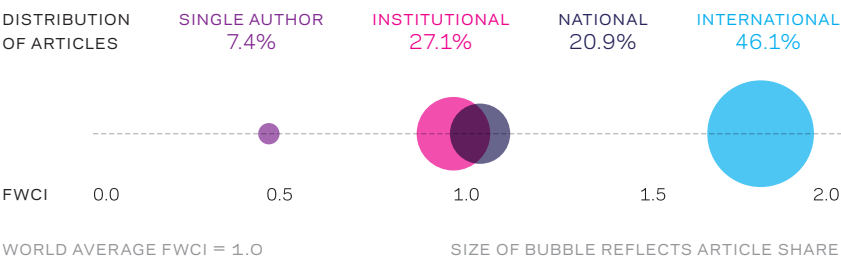
Global distribution of citations

Spain's top three citing countries are it-
self (14.9%), the US (14.5%), and China
(7.6%). Spain's publications are cited all
over the world. Among the other top cit-
ing countries are Japan, South Korea, and
India in Asia, Australia in Oceania, Canada
and Brazil in the Americas, and many Eu-
ropean countries.



Collaboration patterns

Close to half of Spain's publications are co-authored with at least one international collaborator. These publications are well cited, leading to an FWCI at 1.79 or 79% above the world average. National and institutional collaboration each contributes to 21%-27% of Spain's publications. The FWCI of these two types of collaboration is around 1.0. Single-authored publications have the lowest FWCI (0.50).



Researcher mobility

About half of Spain's active researchers are sedentary. That means that they have not published with a foreign affiliation. In this sense, Spain's researcher base is not very mobile. In the meantime, there is a group of researchers belonging to the transitory category, consisting of 36.6% of Spain's active researchers. These re-

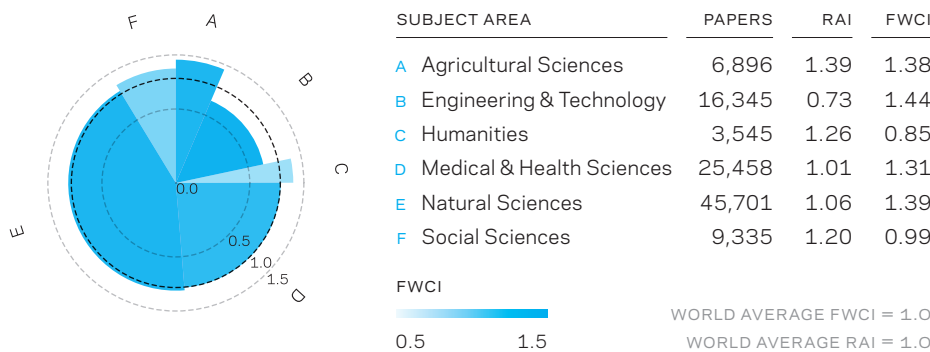
searchers either stayed in Spain or moved out of Spain for less than two years.



Subject breakdown

Spain publishes most of its publications in the Natural Sciences and the Medical & Health Sciences. In most of the subject areas, Spain has a level of research activity around the world average with exceptions for the Agricultural Sciences and the Humanities. Spain has the highest

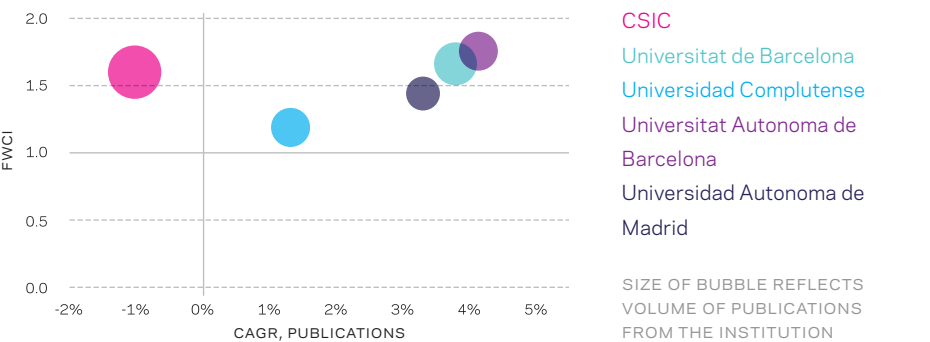
FWCI in Engineering & Technology (1.44) and has an FWCI higher than or equal to the world average in all subject areas except the Humanities.



Most prolific institutions

Spain's most prolific institution is the Spanish National Research Council (CSIC), the largest public institution dedicated to research in Spain. It produces around 9,000 publications per year. Spain's top five most prolific institutions all have an FWCI above the world average

of 1.0, in line with the high citation impact of Spain's general publications.





SWEDEN

Sweden collaborates internationally on over half of its scholarly output (58%) and has quite a mobile researcher base, with 68% of Sweden's researchers publishing with an affiliation outside of Sweden in 1996-2014. Its citation network reveals close ties to its neighbouring countries.

Sweden's best subject is arguably the Medical & Health Sciences. Publications in this subject have the second highest FWCI of 1.77, it is the second largest by output and Sweden is proportionally more active (21%) in this subject than the world average. While Sweden's most prolific in-

stitutions all show high citation impacts, Karolinska Institutet is the leading institute in terms of both output and impact, with around 4,600 papers in 2014, cited over twice as often as the world average.

Headline statistics

High spending on R&D

Sweden spent 3.4% of its 2012 GDP on research and development, ranking 4th among countries in this book.

CONNECTIONS

Northern Europe

Sweden is cited relatively often by its neighbouring countries; Denmark, Finland, and Norway.

STRONG AREA

Medical & Health

Sweden is both relatively more prolific in the Medical & Health Sciences (21%) and more impactful (77%) than the world average.

49%

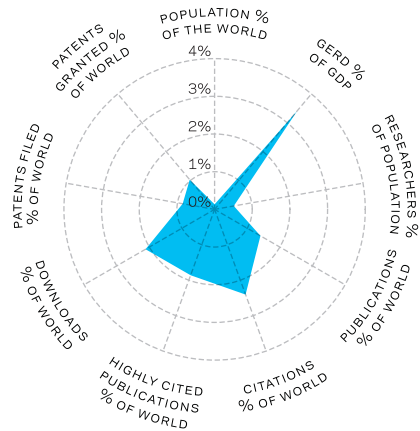
TRANSITORY MOBILITY

Sweden's researchers tend to favor short-term assignments abroad over long-term ones (20%) or staying in Sweden (32%).

Overall country or region outlook

Sweden has the fourth highest GERD among the most prolific research countries or regions, and produces 1.4% of the world's scholarly output. It receives 2.1% of the world's citations, 1.9% of the world's downloads, and holds a 2.4% share of the world's most highly cited articles.

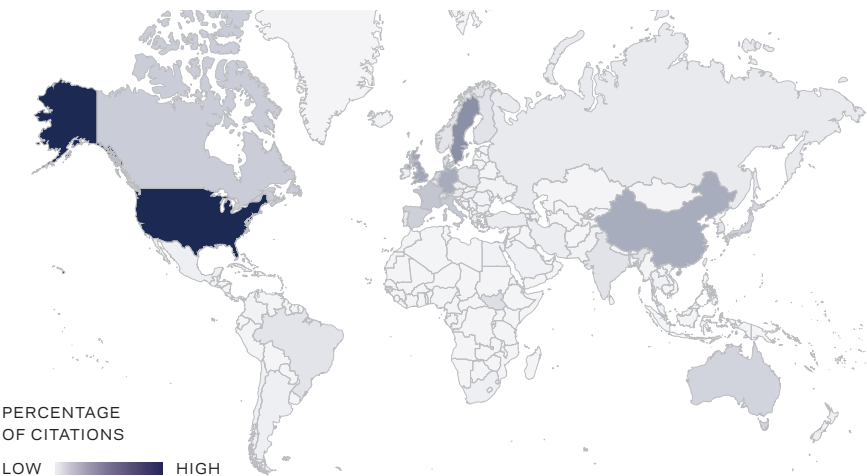
Furthermore, Sweden shows fairly strong patenting activity: its share of the world's filed patents is just under 0.9%, and its share of the world's granted patents is just over 1.0%.



Global distribution of citations

Citations to Sweden's research are heavily, though expectedly, skewed towards prolific countries such as the US (18.1%), the UK (7.0%) and Sweden itself (8.8%). The large publication outputs of the former make it likely for a country to be cited by them, and researchers tend to cite

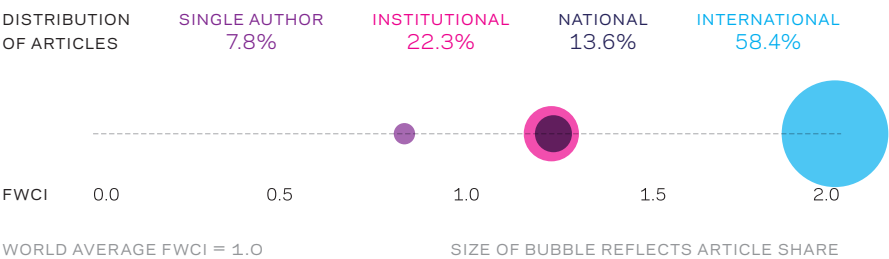
their own country's research preferentially. Similarly, China and Germany each account for 6.4% of Sweden's incoming citations. However, Sweden receives a higher share of its citations from neighbouring countries such as Denmark (1.8%), Finland (1.5%), and Norway (1.5%).



Collaboration patterns

Sweden's internationally collaborated papers account for over 58% of its scholarly output, and are cited about 99% more often than the world average publication. Single-author publications, on the other hand, form the smallest share of Sweden's output, and are cited 17% less than the world average. National and institutional collaborations in Sweden are more impactful than its single-author publica-

tions, though not nearly as much as its international collaborations. Both types have an average FWCI of 1.23.



Researcher mobility

More than two-thirds of Sweden's researchers show some type of mobility. For close to half of all researchers this is transitory mobility, meaning they move abroad or to Sweden for a short period of time before returning. Outflow and inflow of researchers each take up around 10% of Sweden's researcher population. While researchers from the latter category take

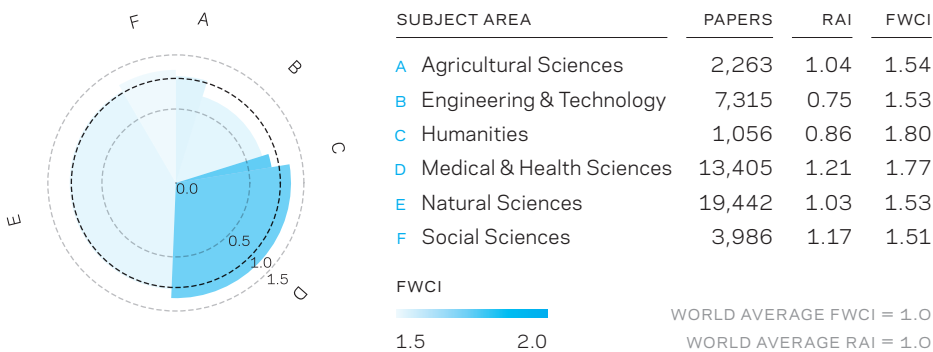
up a slightly lower share, they are more impactful. Still, just over 30% of Sweden's researchers have only published with a Swedish affiliation since 1996, and they are less impactful than the more mobile researchers.



Subject breakdown

In terms of FWCI, Sweden performs well in all subjects, including its smaller and relatively less active subjects. However, Sweden is particularly strong in the Medical & Health Sciences: it produces 22% more of its publications in this subject than the world average, and has an FWCI

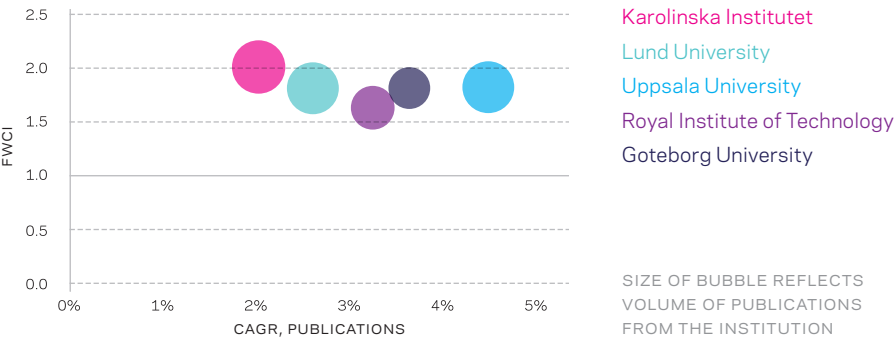
of 1.80. A close second is the Natural Sciences: Sweden does publish more in this subject in absolute numbers of publications, but its relative activity and FWCI are somewhat lower. Both are nevertheless above the world average, at 1.03 and 1.53, respectively.



Most prolific institutions

Karolinska Institutet is the most prolific of the top five institutions in Sweden (more than 4,600 publications in 2014) and has the highest citation impact; its publications are cited more than twice as much as the world average. However, it also has the lowest CAGR (2%). The highest

growth rate, on the other hand, is that of Uppsala University, at 4.5% CAGR. Goteborg University has the lowest 2014 output (around 2,800 publications), but achieves an FWCI of around 80% above the world average, equal to that of Lund University and Uppsala University.





SWITZERLAND

Switzerland has a strong international focus: it collaborates internationally on two-thirds of its total scholarly output, and has a very mobile researcher base. Only 15% of Switzerland's researchers publish exclusively with Swiss affiliations.

While international collaboration is generally more impactful than other types of collaboration, Switzerland's internationally co-authored publications have a field-weighted citation impact of 2.14; more than twice the world average. Switzerland is also very impactful on a subject

level, with nearly all subjects being cited 60% or more than the world average.

Headline statistics

Highly impactful international collaboration

Switzerland's publications with an international co-author have an FWCI of over twice the world average.

85%

RESEARCH MOBILITY

A large majority of Switzerland's researchers show some type of mobility, with a majority being transitory (58%).

MOST PROLIFIC AREA

Medical & Health

Switzerland is relatively more prolific in the Medical & Health Sciences, and its publications in this field are cited 86% more than the world average.

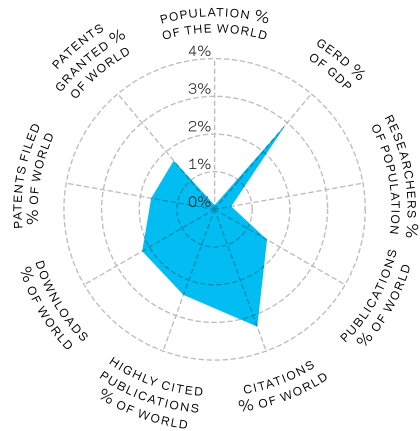
High investments in R&D

Switzerland spent nearly 3% of its 2012 GDP on research and development.

Overall country or region outlook

With 0.1% of the world's population, Switzerland manages to produce 1.6% of the world's scholarly output. This may be due in part to Switzerland's high GERD: almost 3% of its 2012 GDP was spent on research and development. Switzerland has a world citation share of 3.3%, and a 2.4% share of the world's top 10% most cited articles, indicating a high quality of research.

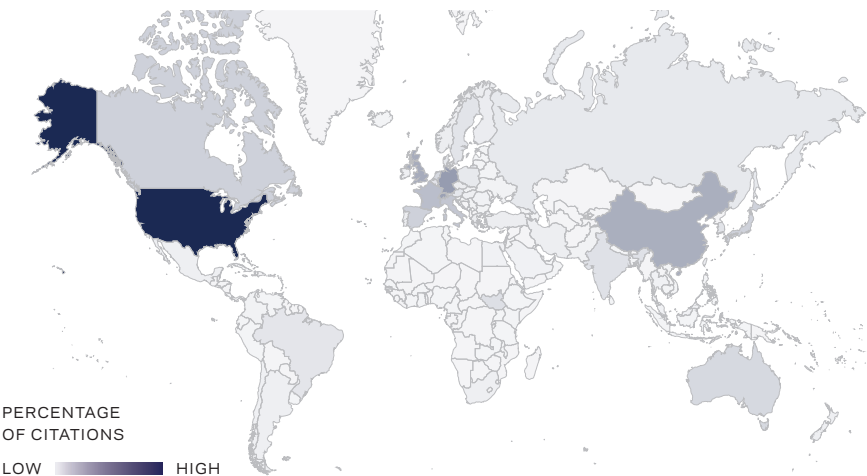
Switzerland's share of world patents filed is relatively high, and nearly equal to its share of world patents granted (both around 1.7%).



Global distribution of citations

Nearly a fifth of all citations Switzerland receives come from the US (18.7%). Other large shares come from Germany (8.1%), the UK (6.7%), and China (6.4%), but also from its own publications (7.6%). While prolific countries are often a large source of citations, the lack of a lan-

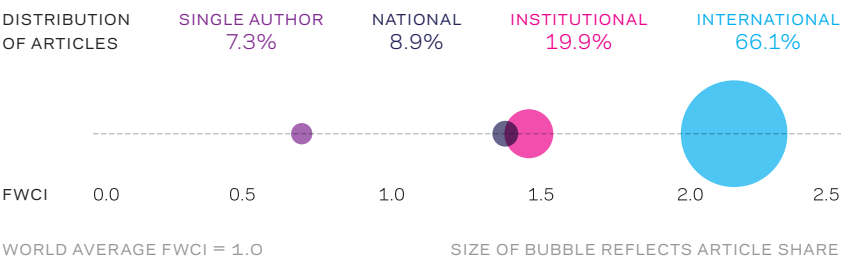
guage barrier between Germany and Switzerland likely facilitates knowledge exchange, thus making Germany the second largest source of incoming citations. Switzerland also receives a fair share of its citations from other neighbours such as France (5.0%) and Italy (4.2%).



Collaboration patterns

Switzerland collaborates, prolifically, internationally: the majority of its publications (66.4%) have an international co-author. This type of collaboration is also the most impactful: internationally collaborated publications have an FWCI of 2.14, more than twice the world average. Institutional collaboration and national collaboration are both less prevalent and less impactful. Nevertheless, these collabora-

tions are cited over 30% above the world average, with FWCI of 1.45 and 1.38, respectively. Switzerland's single-author publications are the only ones cited below the world average, by about 30%.



Researcher mobility

Switzerland's researchers are quite mobile: a mere 15% of the researchers have not published with an affiliation outside of Switzerland. While there is a reasonable outflow of 15%, there is also an inflow of researchers of over 12%, though the latter have a slightly lower average FWCI. The majority of Switzerland's researchers prefer short-term stays abroad or in

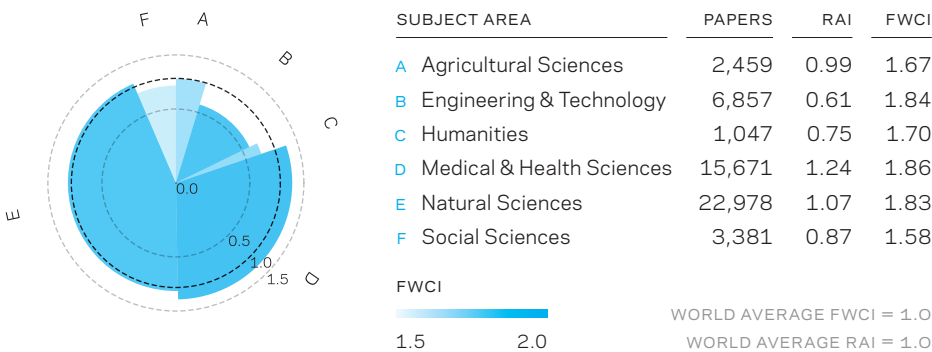
Switzerland before moving back, showing transitory mobility.



Subject breakdown

Switzerland's publications are highly impactful in all subjects. The lowest FWCI, attained in the Social Sciences, is still 58% above the world average. Switzerland's focus is on the Medical & Health Sciences, in which it publishes 24% more than one would expect based on the global

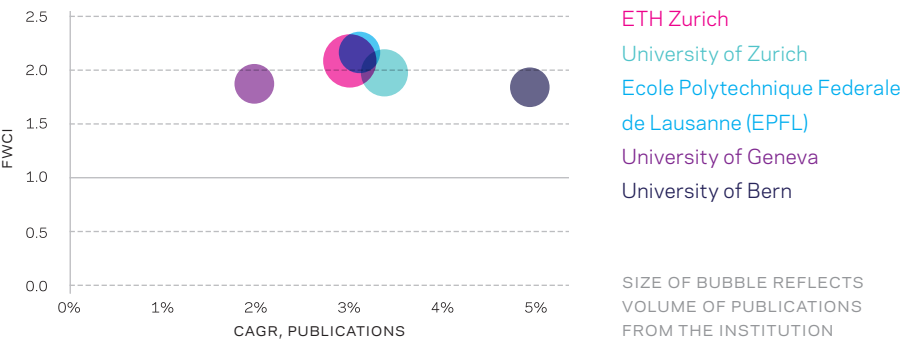
subject shares, and, to a lesser extent, on the Natural Sciences, where it produces about 7% more than the world average.



Most prolific institutions

Switzerland's top five most prolific institutions have a scholarly output between 3,200 and 5,900 publications in 2014, all of which also achieve very high FWCI. The highest citation impact is that of the EPFL; at 2.16 it is over twice the world average. The University of Bern has the

smallest output of the most prolific institutions, but it shows the highest CAGR, at 4.9%. While its average citation impact is the lowest among the most prolific institutions, it is still 84% above the world average.





TAIWAN

Taiwan's research foci are in two main subject areas: the Natural Sciences and Engineering & Technology, in which it is both prolific and impactful. Its internationally collaborated papers are impactful; however, they make up only a quarter of its scholarly output.

Taiwan publishes 1.6% of the world's scholarly output and 1.8% of the world's top 10% cited papers. Taiwan's research is cited by many prolific countries, expectedly a large proportion (15%) of its received citations come from Taiwan itself. The majority of Taiwan's researchers are

sedentary and this may be part of the reason for the low proportion of internationally collaborated papers in Taiwan (25% of its scholarly output), even though these papers are more impactful than other collaboration types.

Headline statistics

INTERNATIONAL COLLABORATION
55% ABOVE WORLD AVERAGE
IMPACT

Taiwan's international collaborations account for 1/4 of its output and are highly impactful.

63%
OF SEDENTARY RESEARCHERS

Taiwan's researchers tend to favour short-term assignments abroad (27%) over long-term ones (9.5%).

Natural Sciences and Engineering & Tech

Taiwan publishes 43% and 27% of its papers in these areas, respectively, and they are more impactful than the world average.

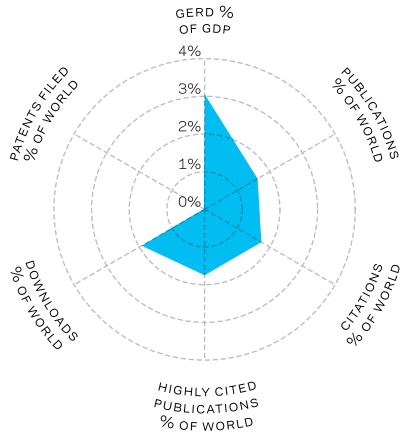
Positive FWCI for top institutions

Academia Sinica is the 3rd largest institution in Taiwan, based on papers published, and has the highest FWCI and output growth.

Overall country or region outlook

Taiwan spends approximately 3.1% of its GDP on GERD and publishes 1.6% of the world's scholarly outputs. It publishes a slightly higher proportion of the world's top 10% cited papers at about 1.8%. From its research output, Taiwan receives 1.7% of the world's citations and 1.9% of the world's downloads.

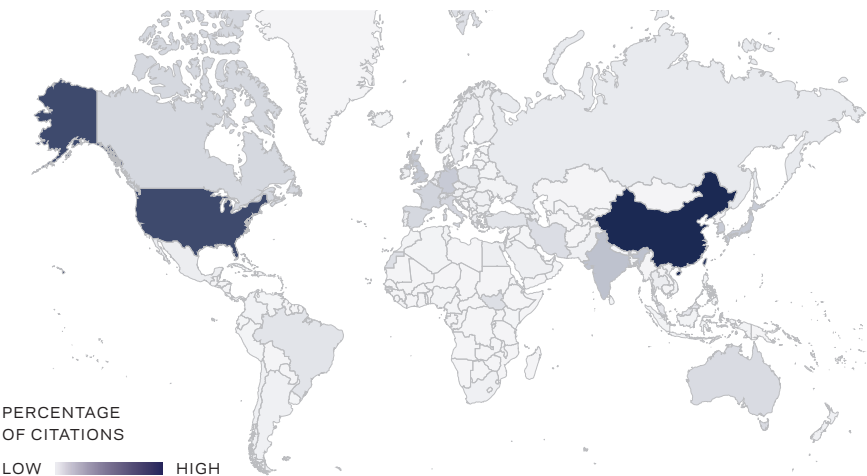
However, Taiwan does not appear to be too active in the area of patents: it holds only 0.02% of the world's patents filed.



Global distribution of citations

The citation distribution of Taiwan research is well balanced; citations to Taiwan's research come from all over the world and are expectedly skewed towards Taiwan. Specifically, citations to Taiwan research come mainly from China (16.4%), Taiwan itself (15.1%), and the US

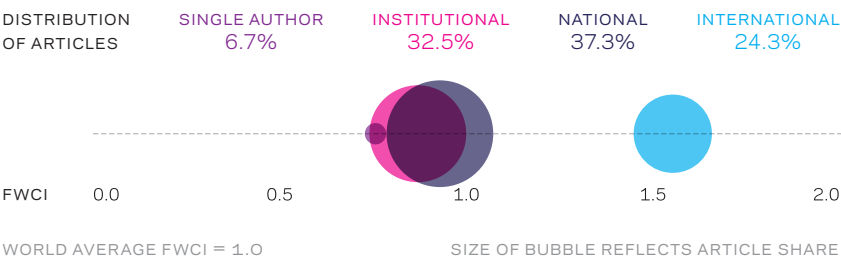
(13.7%). Other prolific countries account for another 30% of the citations received by Taiwan's research; these countries are, in decreasing order, India, the UK, Japan, South Korea, Germany, France, Italy, Spain, Canada, and Australia.



Collaboration patterns

Taiwan's scholarly output consists mainly of collaborations across institutions in Taiwan (37.3%) or papers co-authored within the same institution (32.5%). However, its internationally collaborated papers are the most impactful compared to other collaboration types; these papers are cited 55% more than the world average for all collaboration types, and make up almost a quarter of Taiwan's scholarly

output. Papers resulting from other collaboration types are cited less than the world average by 7% (national collaboration type), 13% (institutional collaboration type), and 25% (single-authored papers).



Researcher mobility

Taiwan's researchers are rather sedentary: 63% of them have only published under a Taiwanese affiliation. This aligns with the high proportion of nationally and institutionally collaborated papers seen in the previous section. Taiwan's researcher inflow is almost twice the size of its researcher outflow, indicating a likely overall brain gain, instead of brain drain, for

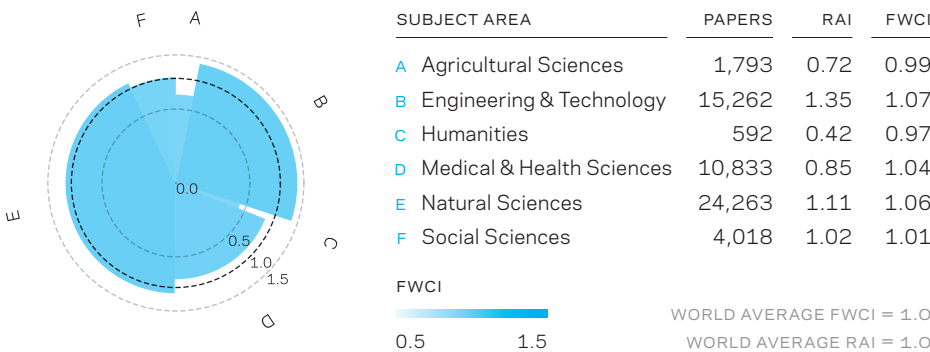
Taiwan. However, this percentage is small compared to the proportion of researchers with transitory mobility (27%) in Taiwan's researcher population. This means that short-term assignments are more frequent than long-term relocations for Taiwan's researchers.



Subject breakdown

Taiwan is most prolific and impactful in the Natural Sciences and in Engineering & Technology, publishing 43% and 27% of its papers in these areas, respectively, which represents proportionally 11% and 35% more than the world does. These papers are also respectively cited 6% and

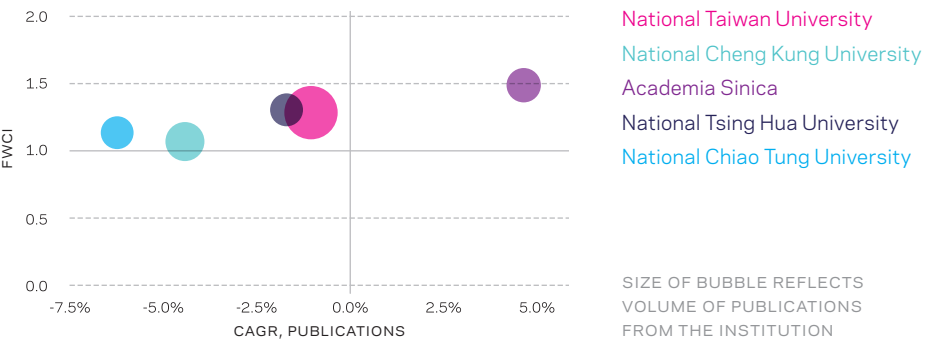
7% more than the world average. With the exception of the Humanities and the Agricultural Sciences, Taiwan's papers are generally impactful and are cited on a par with the world average.



Most prolific institutions

Taiwan's top five institutions each published between 2,200 (National Tsing Hua University and National Chiao Tung University) and 5,800 (National Taiwan University) in 2014. With the exception of Academia Sinica (4.6%), all of them show negative growth in terms of 2010-2014 papers, from -1.1% (Nation-

al Taiwan University) to -6.2% (National Chiao Tung University). All top institutions have positive FWCI, meaning that they are cited, on average, more than the world, from 7% more (National Cheng Kung University) to 49% more (Academia Sinica).





THAILAND

Thailand's research base is considered small to mid-sized, and is linked internationally; this, in turn, helps to spur its research and development. It has a high proportion of international collaborations that are impactful and cited above the world average.

Thailand publishes 0.51% of the world's scholarly output, including 0.47% of the world's top 10% cited papers. Citations to Thailand's research come from all over the world, including itself, and prolific countries such as the USA, China, the UK, and India. Its internationally collaborated

papers have the highest impact, compared to other collaboration types, and make up most of its total output. Thailand publishes proportionally 73% more than the world does in the area of the Agricultural Sciences.

Headline statistics

INTERNATIONAL COLLABORATION
37% ABOVE WORLD AVERAGE
 IMPACT

Thailand's international collaborations account for 38% of its output and are highly impactful.

Mobile researcher population

Thailand's researcher population shows largely transitory mobility, with a positive net researcher inflow, indicating an overall brain gain.

FOCUS AREA

Agricultural Sciences

In the the Agricultural Sciences, Thailand publishes proportionally 73% more than the world does.

STRONG AREA

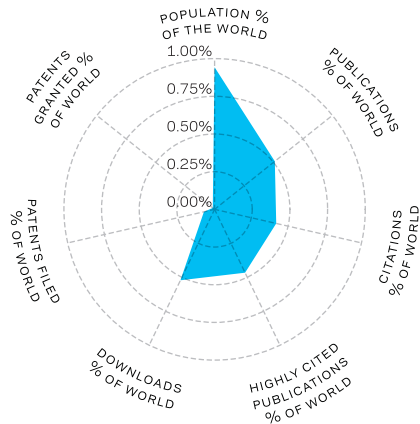
Medical & Health

Thailand publishes 23% of its papers in this area; these papers are slightly more impactful than the world average.

Overall country or region outlook

Thailand makes up 0.94% of the world's population, publishes about 0.51% of the world's scholarly output, and 0.47% of the world's top 10% cited papers. It receives 0.42% of the world's citations and 0.52% of the world's downloads.

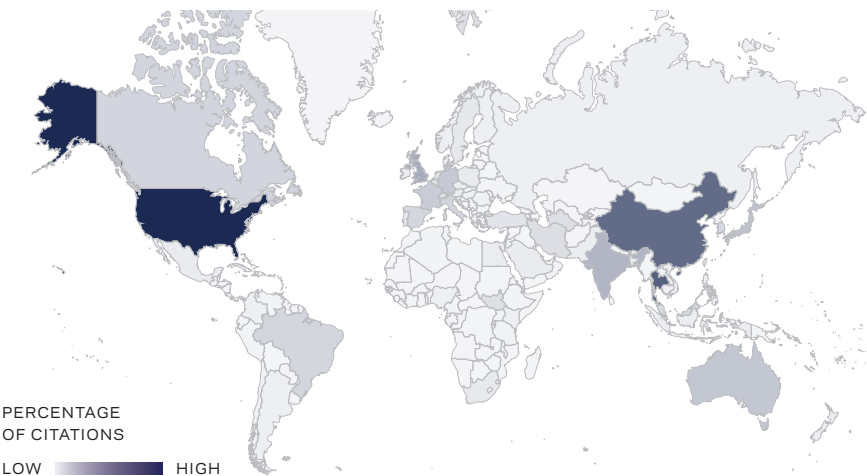
The shares of patents filed by, and granted to, Thailand, are relatively low at 0.07% and 0.02%, respectively, but this is not unexpected given its smaller research base.



Global distribution of citations

Thailand's research is cited by prolific countries, and all over the world; its citation distribution is expectedly skewed towards Thailand which accounts for 10.8% of its received citations. Countries whose sizable share of citations cumulatively form around a third of Thailand's received citations (excluding Thailand), are the US,

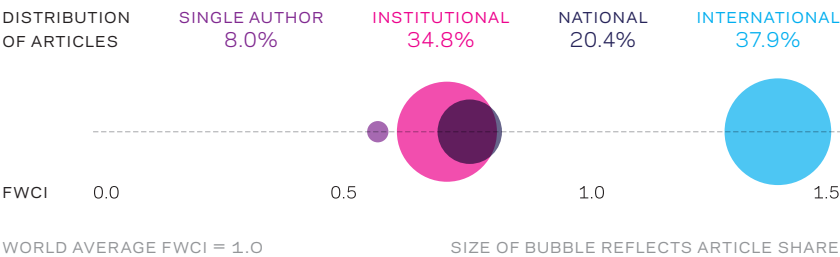
China, the UK, and India. Another third of Thailand's citations come from a range of countries including regional neighbours such as Japan, Australia, South Korea, Malaysia, and Taiwan.



Collaboration patterns

International collaborations tend to have higher impact than other collaboration types, and for Thailand, its internationally collaborated papers are the only collaboration type which are cited more than the world average across all collaboration types (by 37%); these internationally collaborated papers make up the largest proportion of Thailand's scholarly output. The remaining collaboration types are cit-

ed less than the world average from 43% (single-authored papers) to 24% (national collaborations).



Researcher mobility

44% of Thailand's researcher population are sedentary, which means that slightly less than half of Thailand's researchers have only published under a Thai affiliation. Most of the remaining researchers show transitory mobility and tend to publish under foreign affiliations on a short term basis. Interestingly, Thailand's researcher inflow represents 13% of its

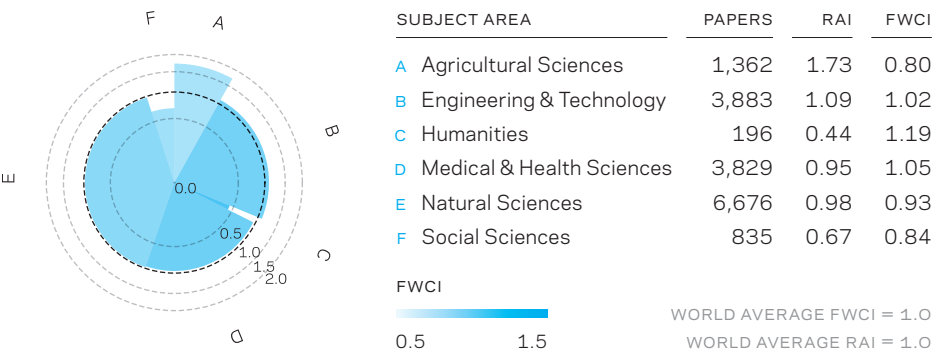
researcher population and far exceeds its researcher outflow by 9%; this indicates that Thailand experiences a significant brain gain in the long run.



Subject breakdown

Thailand publishes the most in the area of the Natural Sciences, but its papers in this area are less impactful than the world average. It publishes 23% of its output in the area of the Medical & Health Sciences, and these papers are cited slightly more than the world average. In the Ag-

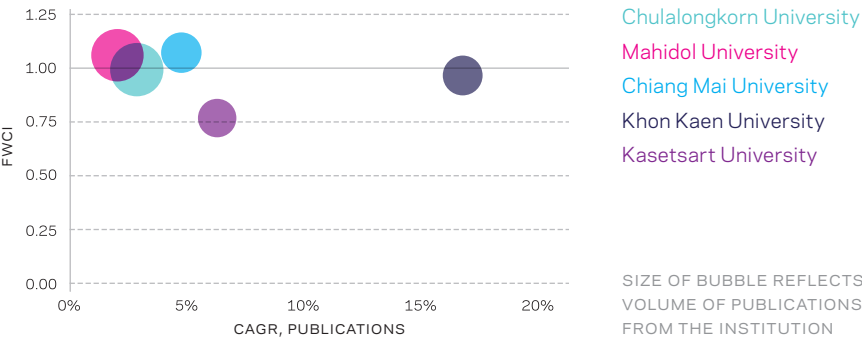
ricultural Sciences, Thailand is comparatively 73% more prolific than the world, but less impactful. In other areas such as the Social Sciences and the Humanities, Thailand tends to publish a lesser proportion of its output than the world.



Most prolific institutions

Thailand's top universities published between 900 (Kasetsart University) and 1,700 papers (Chulalongkorn University) in 2014. All of them show positive growth, in terms of 2010-2014 papers, but at a slower rate for the two larger universities. Except for Kasetsart University, the other

institutions generally have close to world average FWCI. Khon Kaen University, with a smaller publication base, is growing at the fastest rate of around 17% per year, and its FWCI of 0.97 is just slightly below the world average.





TUNISIA

Although Tunisia's researchers tend not to travel and publish abroad, the country is still quite globally connected. About half of all publications are co-authored with an international collaborator, and the country has a net inflow of researchers.

Similar to its neighbor Egypt, Tunisia has a low world publication share. However, its relatively higher world download share suggests that the country's research draws strong interest, primarily from countries across the Mediterranean, such as France and Spain.

Headline statistics

High interest in Tunisia's research

Tunisia accounts for 0.25% of all publications worldwide, and 0.29% of all downloads.

Relatively sedentary researcher base

More than half of Tunisia's active researchers have not published with an affiliation outside of the country.

Net inflow of researchers

Tunisia experiences a net inflow of researchers (+3.9%), which means that more researchers enter the country than leave it.

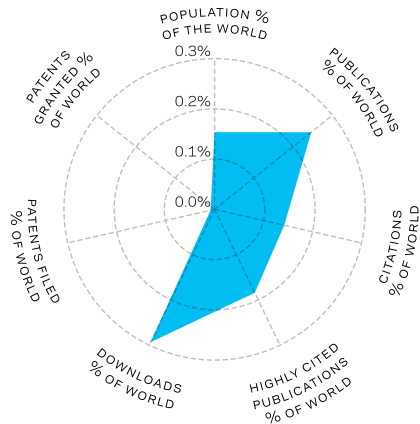
MOST PROLIFIC INSTITUTION

University of Sfax

The University of Sfax is Tunisia's most prolific and impactful research institution (1,052 publications in 2014 and an FWCI of 0.88 from 2010 to 2014).

Overall country or region outlook

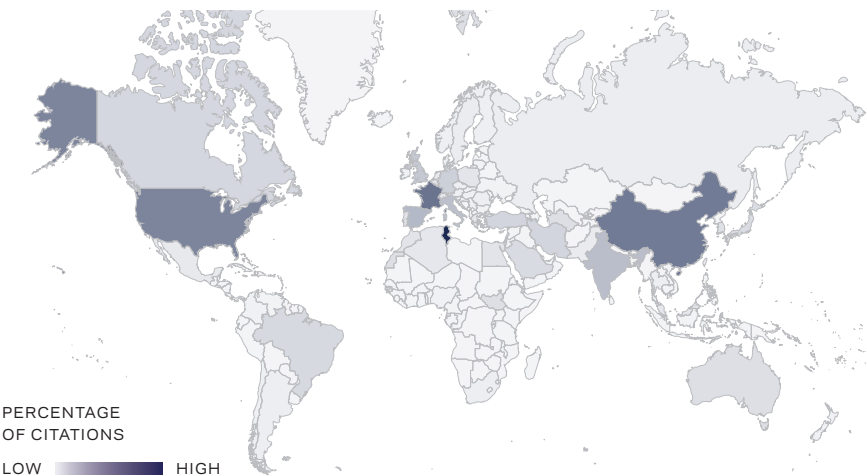
Tunisia has steadily increased the percentage of its GDP devoted to gross R&D expenditures over the past decade, and that investment is reflected in its comparative research footprint, which is proportionately larger than most other African countries. Although Tunisia comprises only 0.15% of the world population, the country produced more than 5,600 publications in 2014, accounting for 0.25% of the world's publications. Although Tunisia's research has not been cited as much (accounting for only 0.14% of all citations worldwide), it has attracted a lot of attention (0.29% of all downloads worldwide).



Global distribution of citations

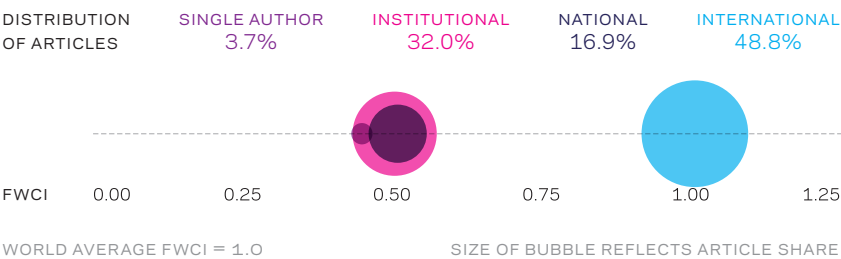
14.8% of all citations to Tunisia's research come from Tunisia itself. The countries that cite Tunisia next most frequently are France, China, and the US, comprising 9.3%, 8.8%, and 8.1% of all citations, respectively. Spain and India also cite Tunisia's research at rates higher

than expected, accounting for 4.3% and 4.0% of all citations to Tunisia's research.



Collaboration patterns

About half of all publications from Tunisia are co-authored with an international collaborator, and such collaborations achieve an FWCI reaching the world average. However, all other types of collaboration for Tunisia achieve an FWCI of 0.51 or lower, or more than 49% less than the world average.



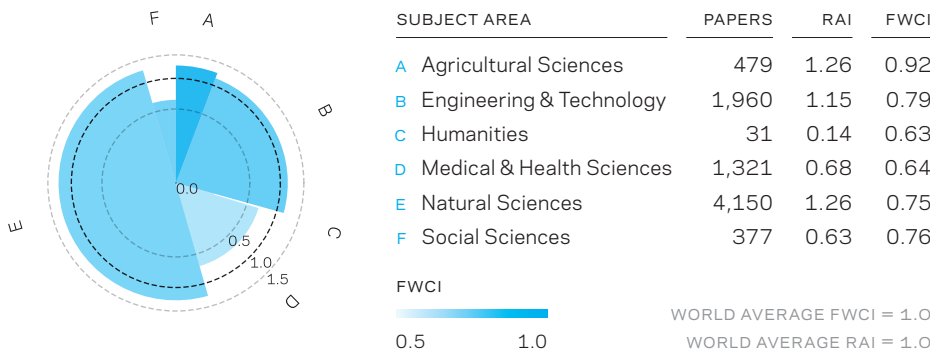
Researcher mobility

Relative to other countries in Northern Africa and the Maghreb, Tunisia has a somewhat sedentary active researcher base. More than half have not published with an affiliation outside of the country. However, Tunisia does experience a strong net inflow of researchers (+3.9%), which means that more researchers come and stay in the country than permanently leave it.



Subject breakdown

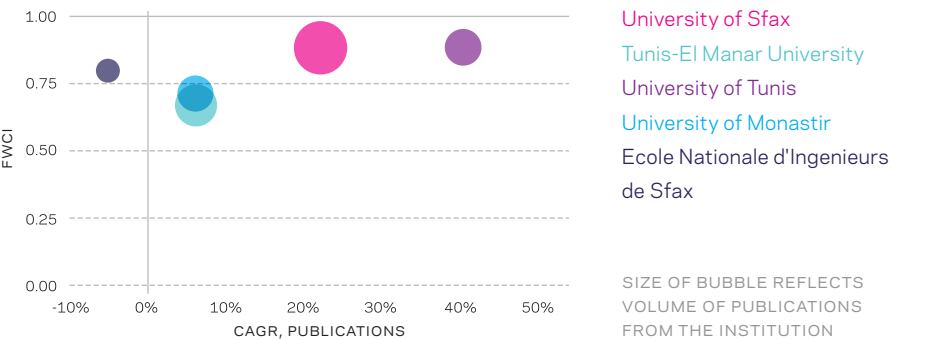
Relative to the world average, Tunisia exhibits higher levels of activity in the Agricultural Sciences (26% higher), the Natural Sciences (26% higher), and Engineering & Technology (15% higher). Moreover, across all subject areas, Tunisia achieves the highest FWCI in the Agricultural Sciences (0.92).



Most prolific institutions

Among Tunisia's most prolific research institutions, the University of Sfax leads in both the amount of research output (1,052 publications in 2014) and the impact of that output (FWCI of 0.88 from 2010 to 2014). The institution has also experienced a very high growth

rate (22.2% CAGR) over the past half-decade, more than doubling its annual research output. The University of Tunis has achieved an even higher growth rate (40.5%) and an equally strong FWCI (0.88) from 2010 to 2014.





TURKEY

Turkey is prolific in the Natural Sciences and the Medical & Health Sciences but most impactful in the area of Engineering & Technology. However, it shows relatively low proportions of international collaboration and long-term international mobility.

Turkey publishes 1.5% of the world's scholarly output and 0.97% of the world's top 10% cited papers. Turkey's research is largely rooted within the country: the largest proportion of citations to Turkey's research come from itself, 80% of Turkey's scholarly outputs are either single-

author papers or collaborations, within or across institutions in Turkey, and 71% of its researchers have published only under a Turkish affiliation.

Headline statistics

20%

INTERNATIONAL COLLABORATION

1/5 of Turkey's scholarly outputs are international collaborations, and are highly impactful.

Highly sedentary researcher population

71% of Turkey's researchers have only published under a Turkish affiliation.

Natural Sciences and Medical & Health

Almost 70% of Turkey's scholarly output are in either the Natural Sciences or the Medical & Health Sciences.

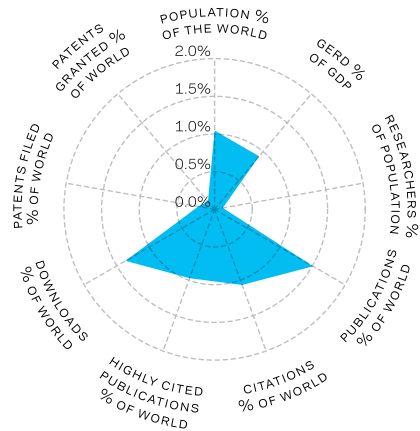
Balanced top institutions

The 5 most prolific institutions in Turkey published between 1,400 and 1,900 papers in 2014, with slow or negative output growth.

Overall country or region outlook

Turkey makes up 1.0% of the world's population, and its researchers make up 0.11% of that population. As a country, Turkey invests 0.92% of its GDP on GERD, resulting in publishing a total of 1.5% of the world's scholarly output, and 0.97% of the world's top 10% cited papers.

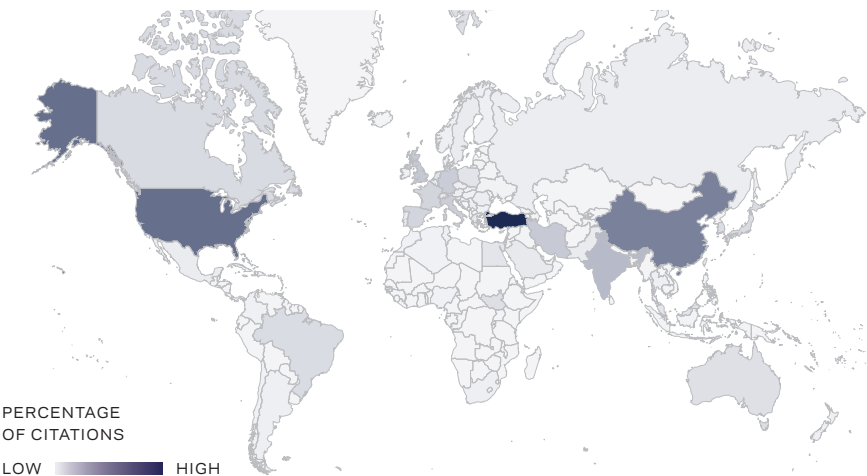
Turkey receives 1.1% of the world's citations and 1.4% of the world's downloads. In 2013, Turkey's share of world's patents filed is 0.22% and its share of patents granted is 0.14%.



Global distribution of citations

In many countries, researchers tend to be more aware of their own country's papers and cite them preferentially. This is the case for Turkey: 17% of its received citations come from papers published by Turkey itself. The US (11.4%), China (9.7%), and India (4.8%) together account for slightly more than a quarter of Turkey's

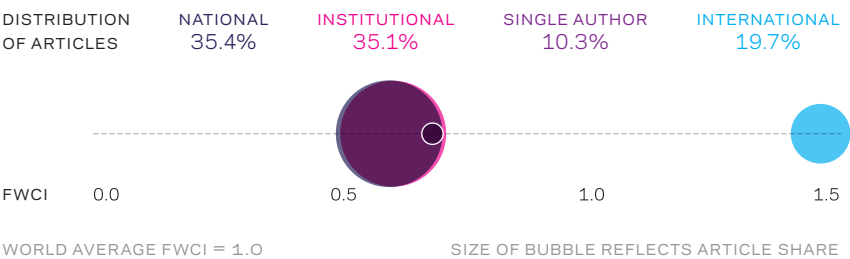
received citations, while the UK, Iran, Germany, Italy, Spain, France, Brazil and Canada provide another 25% of Turkey's received citations, at 2-3% per country.



Collaboration patterns

Compared to many countries, Turkey's proportion of international collaboration is low, at about a fifth of its scholarly output; internationally collaborated papers are the only collaboration type cited above the world average for all collaboration types (46% more). National and institutional collaborations are more common in Turkey, each accounting for 35% of its scholarly output; the papers from both

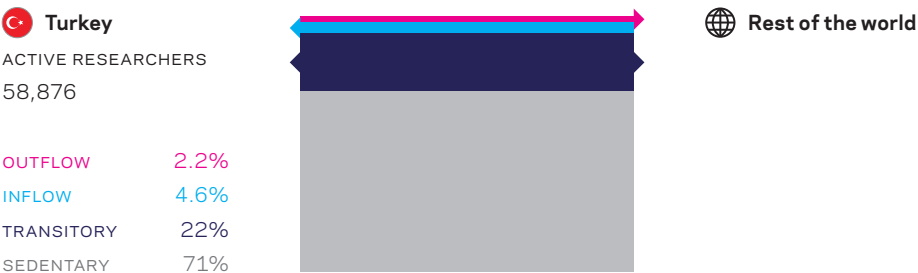
national and institutional collaborations are the least impactful compared to other collaboration types, and are cited 40% less than the world average. About 10% of Turkey's scholarly outputs are from a single-author and these papers are cited 32% less than the world average for all collaboration types.



Researcher mobility

Turkey's researcher population is predominantly sedentary: almost 71% of them have only published under a Turkish affiliation. Turkey's researcher inflow is about twice the size of its researcher outflow; however, these proportions are small compared to that of researchers who show transitory mobility, and represent 22% of Turkey's total researcher

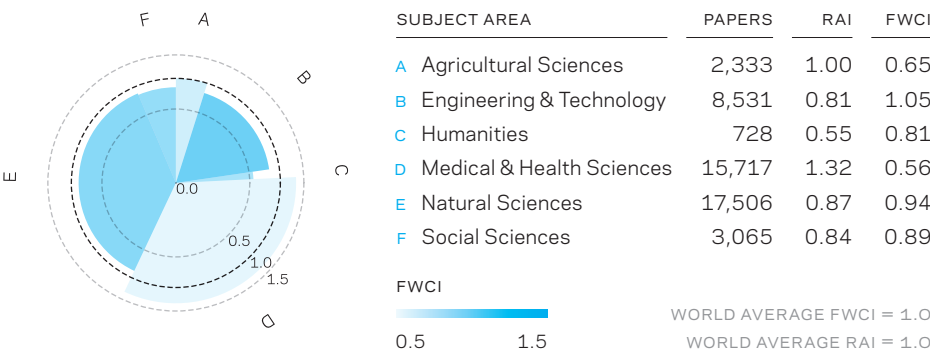
population. This means that short term assignments abroad are more frequent than long term relocation for Turkey's researchers. Combined with a high proportion of sedentary researchers, Turkey's researchers appear moderately mobile with a low likelihood of emigration.



Subject breakdown

Turkey publishes almost 70% of its scholarly output in either the Natural Sciences or the Medical & Health Sciences. Comparatively, Turkey is more prolific than the world in the Medical & Health Sciences (32% more); it is on par with the world in the Agricultural Sciences, but less im-

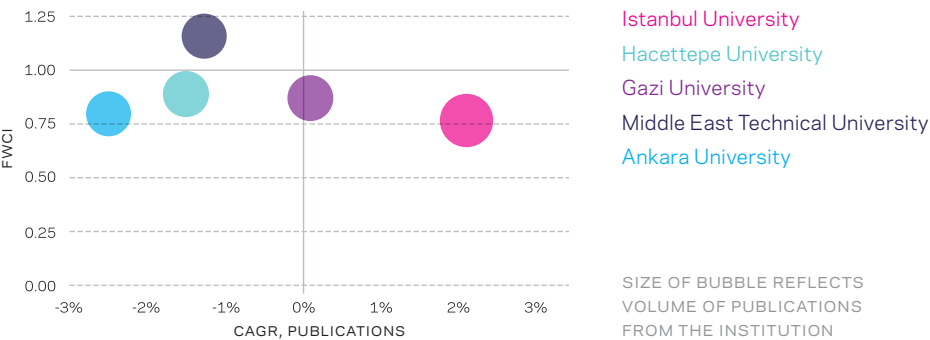
pactful, as these papers are respectively cited 44% and 35% less than the world average. In Engineering & Technology, Turkey publishes 18% of its output, and these papers are slightly more impactful than world average.



Most prolific institutions

Turkey's top universities are evenly sized; they each published between 1,400 (Ankara University, Middle East Technical University, Hacettepe University, and Gazi University) and 1,900 papers (Istanbul University). All of them show slow or negative growth, in terms of 2010-2014

papers, from -2.5% (Ankara University) to +2.1% (Istanbul University). Except for Middle East Technical University, the remaining top universities have FWCI lower than the world average, being cited 11% to 23% less.





UKRAINE

Ukraine's profile is similar to that of other Eastern European countries: a highly sedentary researcher base, mostly cited within a network of Eastern European countries, showing relatively meager levels of international collaboration.

The subject focus within Ukraine lies in the Natural Sciences and Engineering & Technology. Among the prolific institutions, the National National Science Center Kharkov Institute of Physics and Technology catches the eye: an impres-

sive annual growth rate of over 14%, and an FWCI above the world average.

Headline statistics

CONNECTIONS

Eastern Europe

Ukraine has strong ties to other Eastern European countries.

High percentage of single-author papers

which are associated with the lowest FWCI at 80% below world average.

FOCUS AREAS

Natural Sciences and Engineering & Tech

in both absolute and relative terms.

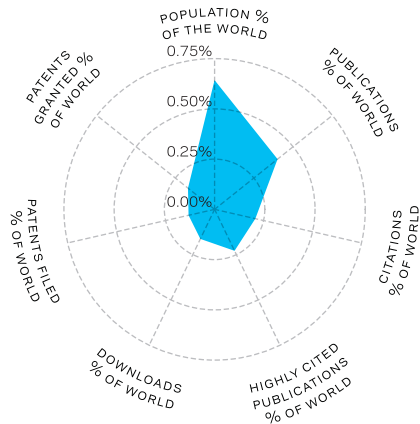
Researcher mobility mostly sedentary

which is associated with the lowest FWCI at 60% below the world average.

Overall country or region outlook

Ukraine published almost 9,000 publications in 2014, representing a global publication share of 0.40%. Its citation share, its highly cited article share, and its download share are all lower than its publications share.

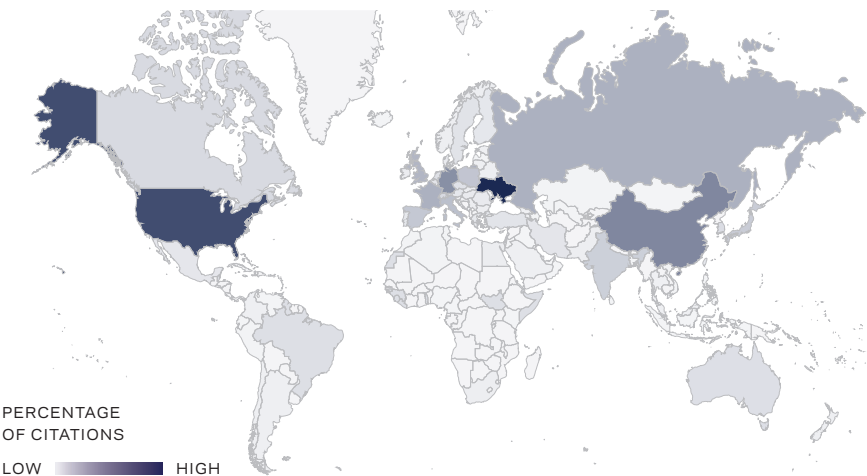
Ukraine's patenting activity is relatively infrequent, both in share of patents, as well as in citations in patents of the scientific literature produced by Ukraine.



Global distribution of citations

The most dominant share of citations towards Ukraine is coming from its own publications (13.6% of all incoming citations), followed by the US and China (11.2% and 7.2% respectively). Russia ranks remarkably high at fifth with 4.5%, as does Poland at ninth with 3.1%. Changing perspective to analyze the proportion of cita-

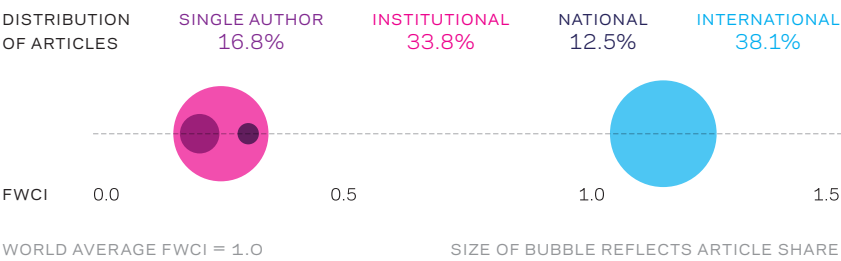
tions compared to the total of the country where the citation is coming from, we see a clear proximity effect: the top five countries with the highest percentage of outgoing citations to Ukraine are Ukraine itself, Belarus, the Russian Federation, Lithuania, and Bulgaria.



Collaboration patterns

Ukraine ranks second among countries with the highest percentage of single-author publications. It has less nationally collaborative publications than single-author publications, which is concerning because of the low FWCI associated with single-author publications (in Ukraine's case, 79% below world average). The most frequent type of collaboration is international, with a 14% above world aver-

age FWCI. However, the share of international collaboration is still relatively low, as is the return in terms of FWCI.



Researcher mobility

A majority of Ukraine's researchers show no signs of mobility, having only published with affiliations from within Ukraine. This group has an FWCI of 60% below the world average. Ukraine sees more researchers leave than come in. More importantly, the researchers that leave have a higher FWCI than the ones that come in. The highest FWCI, as for many other

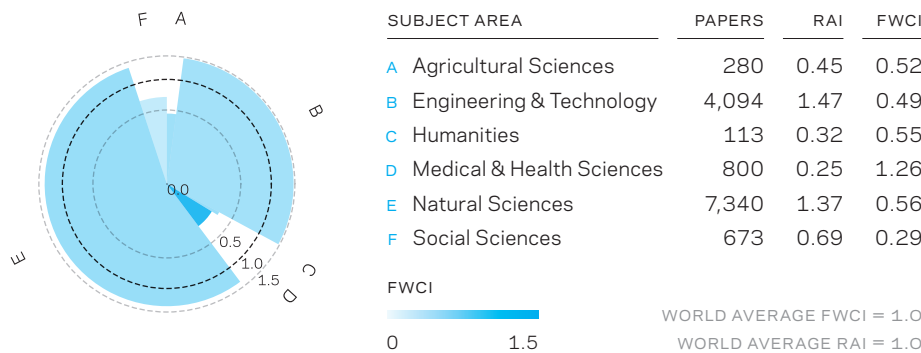
countries with similar profiles to that of Ukraine, come from the visiting scholars: over twice the world average.



Subject breakdown

Both in absolute terms and a relative sense, Ukraine focuses on the Natural Sciences and Engineering & Technology. The Natural Sciences is the most prolific subject area, with 7,340 publications in 2014, whereas Engineering & Technology shows the highest activity focus: 47%

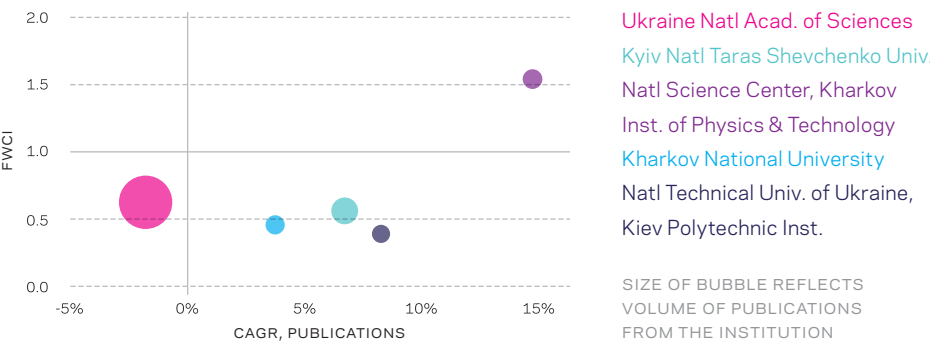
above the world average. The Medical & Health Sciences, albeit much smaller in absolute terms, and a subject area with 75% less activity, is shows the highest FWCI, of 26% above the world average.



Most prolific institutions

Among Ukraine's most prolific institutions, National Science Center Kharkov Institute of Physics and Technology clearly stands out. Not only does it show an impressive annual growth rate of over 14%, but it is the only institution in the top five with an FWCI above 1.0, at 54% above the world average. In terms of volume, it

clearly produces much less than, for instance, the Ukraine National Academy of Sciences, the most prolific institution in Ukraine.





UNITED ARAB EMIRATES

The UAE has a small, growing research base with two of its top five institutions showing more than 30% CAGR, based on 2010-2014 papers. A large proportion of its scholarly outputs are the result of international collaborations, which are also more impactful than the world average.

The United Arab Emirates publishes 0.13% of the world's scholarly output, and 0.14% of the world's top 10% cited papers. It receives around 0.09% of the world's citations and, relatively, double the amount of the world's downloads at 0.19%. More citations to the United

Arab Emirates' research come from the US (15%) and China (9.3%) than from the United Arab Emirates (6.6%).

Headline statistics

INTERNATIONAL COLLABORATIONS

23% ABOVE WORLD
AVERAGE IMPACT

The United Arab Emirates' international collaborations account for 65% of its output, and are impactful.

RESEARCHER MOBILITY

57% transitory

The United Arab Emirates' researchers tend to favour short-term assignments abroad and are generally mobile (only 13% are sedentary).

MOST PROLIFIC AREA

Natural Sciences

The United Arab Emirates is most prolific in the Natural Sciences with papers that are cited on a par with the world average.

MOST PROLIFIC INSTITUTION

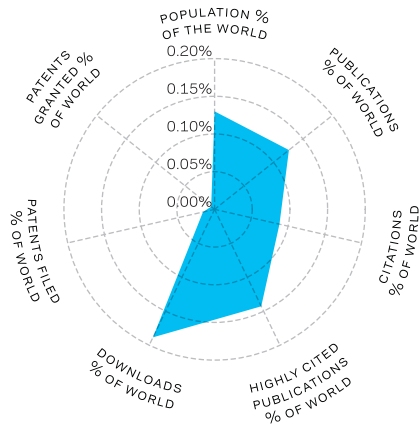
Masdar Institute

The fastest growing and most impactful institution in the United Arab Emirates is the Masdar Institute of Science and Technology with an FWCI of 1.78.

Overall country or region outlook

The United Arab Emirates makes up 0.13% of the world's population, and produces about the same proportions of the world's scholarly output and top 10% cited papers, at 0.13% and 0.14% respectively. The United Arab Emirates receives around 0.09% of the world's citations, and 0.19% of the world's downloads.

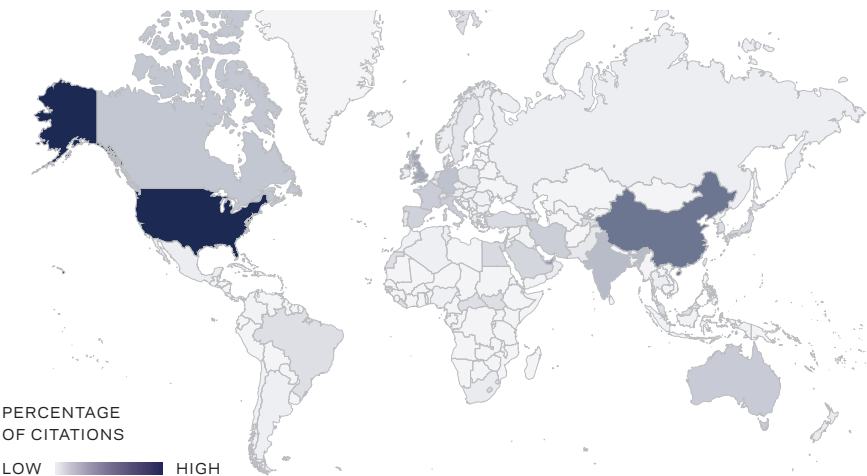
The United Arab Emirates' share of the world's patents filed is low at 0.02%, and its share of patents granted is even lower at 0.01%.



Global distribution of citations

With a relatively small research base, citations to the United Arab Emirates research come mainly from the US (14.9%) and China (9.3%), before the United Arab Emirates itself (6.6%). Other countries whose citations form a sizable share of the United Arab Emirates' received citations

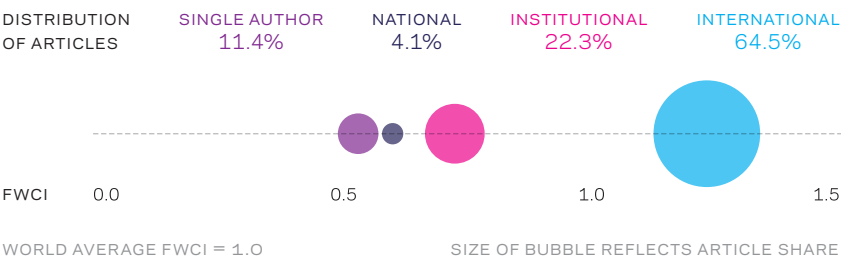
include the UK (accounting for 5.7% of the United Arab Emirates' citations), India (contributing about 4.1%), Germany, Canada, and Australia, each contributing between 3% and 3.7% of the total citations received by the United Arab Emirates.



Collaboration patterns

The United Arab Emirates' research is highly skewed towards international collaborations, with 65% of its scholarly output of this collaboration type. Only papers of this collaboration type are cited above the world average for all collaboration types, by about 23%. Other research collaboration types are less impactful: institutional collaborations make up 22% of the United Arab Emirates' output and are

cited 27% less than the world average; single-authored papers make up 11% of its output and are cited 47% less than the world average; national collaborations make up the smallest proportion at 4% of the United Arab Emirates' output and receive 40% fewer citations than the world average.



Researcher mobility

The United Arab Emirates' researchers are largely in the transitory group: 57% of them have published under overseas affiliations on a short term basis, mirroring the state of international collaboration in the country. The United Arab Emirates' researcher inflow exceeds its researcher outflow by 8%, suggesting an overall net research inflow into the United Arab

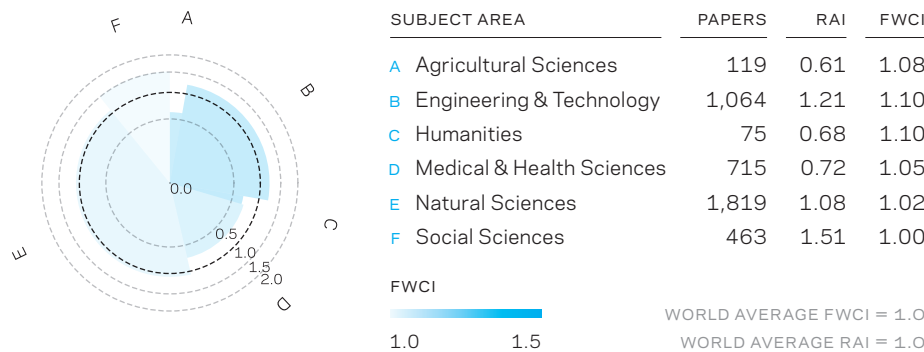
Emirates. Only 13% of the United Arab Emirates' total researcher population are sedentary and have never published under an affiliation outside of the country.



Subject breakdown

The United Arab Emirates are most prolific in the Natural Sciences and Engineering & Technology, publishing 43% and 25% of its total scholarly output in these areas, respectively. In Engineering & Technology, it publishes proportionally 21% more than the world does, and

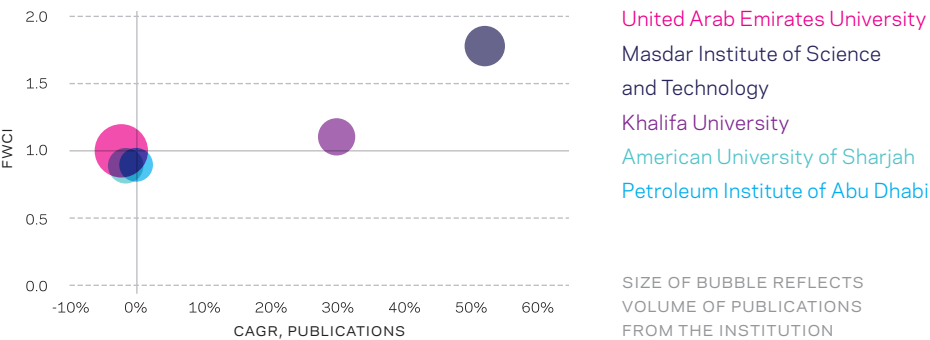
these papers are cited 10% more than the world average. The United Arab Emirates' outputs in most areas are cited on a par with, or slightly more than, the world average.



Most prolific institutions

The United Arab Emirates' top institutions published between 200 (Petroleum Institute of Abu Dhabi) and 500 papers (United Arab Emirates University) in 2014. Except for Khalifa University and Masdar Institute of Science and Technology which show the highest CAGR at 30%

and 52%, respectively, and the remaining three institutions show negative output growth. Masdar Institute of Science and Technology emerges as the fastest growing, and most impactful United Arab Emirates institution with an FWCI of 1.78.





UNITED KINGDOM

The United Kingdom (UK) has long held a leading position in the global research landscape. It is home to some of the most prestigious learned societies in the Sciences, the Social Sciences, and the Humanities, and has produced some of the greatest thinkers of the last millennium.

UK research is highly collaborative: more than half of its publications involve international collaboration. UK researchers are also very mobile: 71% of the country's active researchers have published with a foreign affiliation.

Headline statistics

8.9% OF THE WORLD'S
MOST HIGHLY-CITED ARTICLES

The UK's research is highly impactful; its share of highly cited papers is larger than its share of papers.

Global citation distribution

UK research is cited globally, and preferentially cited by African countries.

Collaboration & mobility

UK researchers are highly collaborative and mobile.

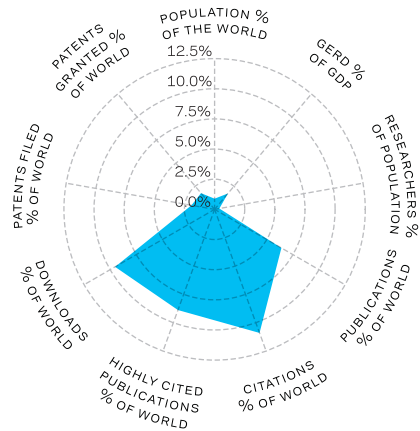
Prestigious institutions

The UK is home to many world-leading universities, such as the University of Cambridge and the University of Oxford.

Overall country or region outlook

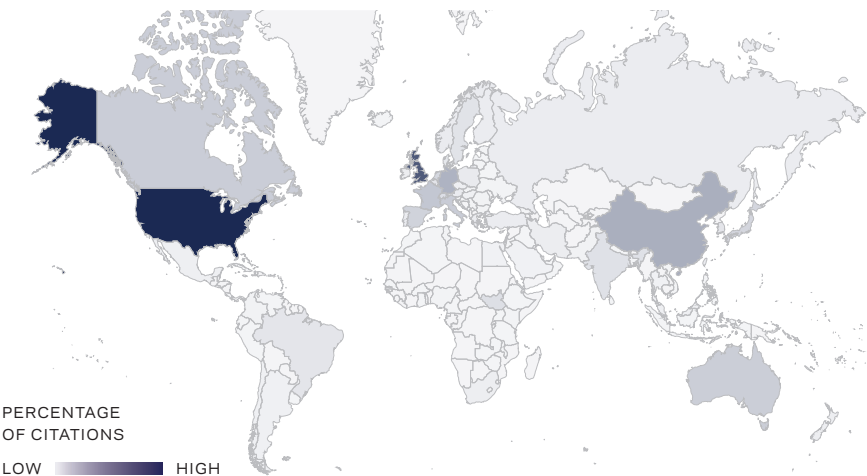
While the UK represents just 0.9% of global population, it accounts for 9.5% of downloads, 10.9% of citations, and 8.9% of the world's most highly-cited articles. The UK's field-weighted citation impact, a proxy for research quality, is 57% above world average and growing.

Taken together, these statistics illustrate how the UK punches above its weight as a research nation.



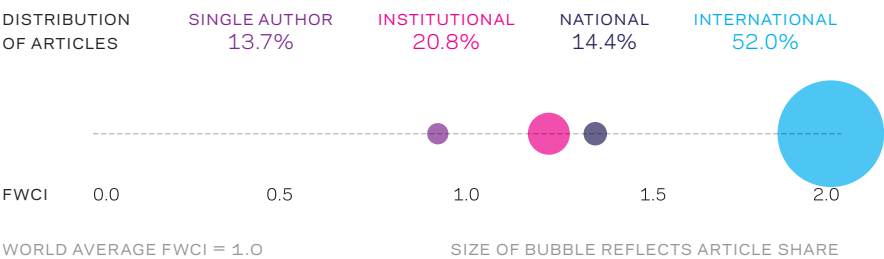
Global distribution of citations

UK research is cited globally. Top citing countries of the UK's research include the US, China, Germany, and France. Several African countries in particular seem to preferentially cite the UK, with more than 20% of their citations going to UK research.



Collaboration patterns

The UK's research is highly collaborative: 52% of the UK's publications involve international collaboration. This percentage is comparable to other Western European countries. UK international co-authorship is associated with 47% greater FWCI when compared to national collaboration, and 10% greater for national co-authorship over institutional co-authorship.



Researcher mobility

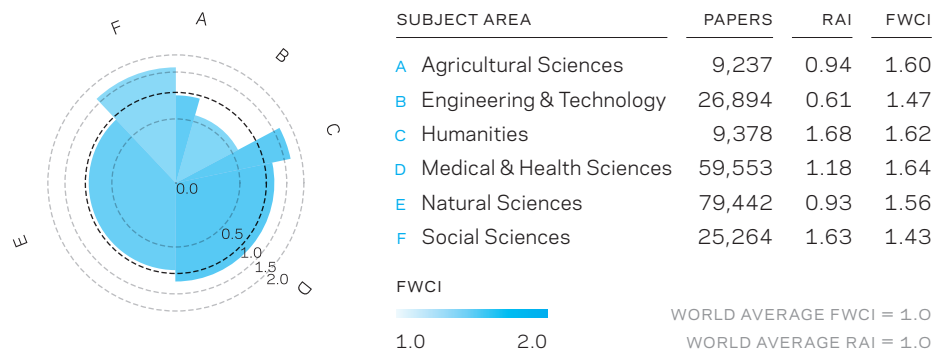
The UK has a highly mobile researcher population, with almost 71% of active UK researchers in the period 1996-2014 having published articles while affiliated with non-UK institutions. Around 13% of UK researchers moved out of the UK and have not returned to the UK as indicated by the countries listed in their published articles (the outflow group), while 9.3%

of UK researchers moved into the UK and showed no indication of having left the UK since (the inflow group). The UK is therefore a net outflow country in terms of researcher migration.



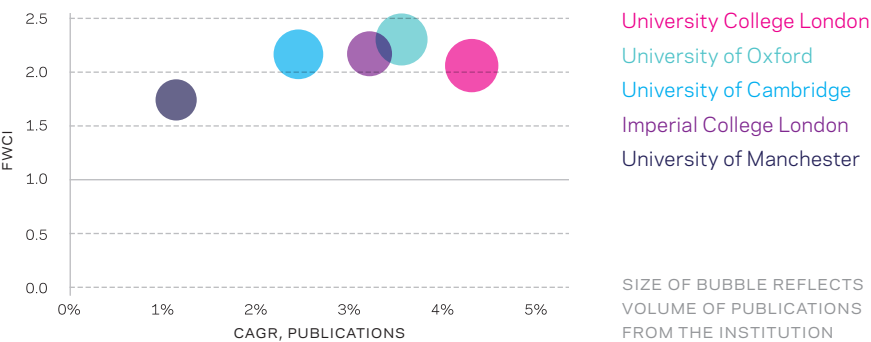
Subject breakdown

The UK shows above average activity patterns for fields such as the Social Sciences, the Humanities, and the Medical & Health Sciences. Its research is overall highly impactful: the FWCI is around 50% higher than the world average across the board.



Most prolific institutions

The UK is home to many of the oldest and most prestigious institutions in the world. University College London and University of Oxford each produce nearly 10,000 publications per year. All top five institutions have an FWCI higher than 1.7, confirming their positions as some of the world's leading universities.





UNITED STATES

The United States (US) is the most research intensive country in the world. It spends 2.8% of its GDP on R&D, and it accounts for more than a fifth of all publications and nearly two-fifths of all citations in the world.

The US produces relatively more research in the Humanities, the Social Sciences, and the Medical & Health Sciences than the world average. The country boasts some of the world's top research institutions, including Harvard University,

which produced more research in 2014 (20,830) than all but 24 countries.

Headline statistics

Outsized impact

The US publishes 22% of the world publications but accounts for 31% of the world's most highly cited articles.

Modest levels of international collaboration and mobility

The US has relatively modest levels of international collaboration and mobility compared to other major research nations, especially in Europe.

FOCUS AREA

Medical & Health

High relative focus in the Medical & Health Sciences. The US produces 25% more research than the world average.

MOST PROLIFIC INSTITUTION

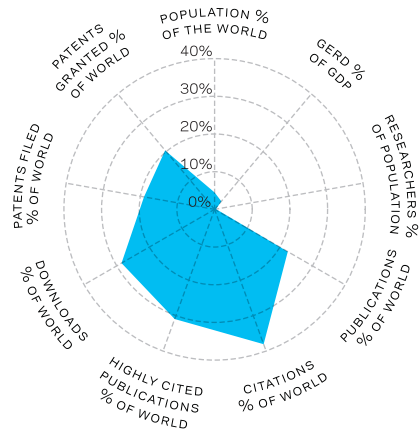
Harvard University

Harvard University is the most prolific institution in the world, publishing more in 2014 than entire countries did, such as Denmark, South Africa, or Israel.

Overall country or region outlook

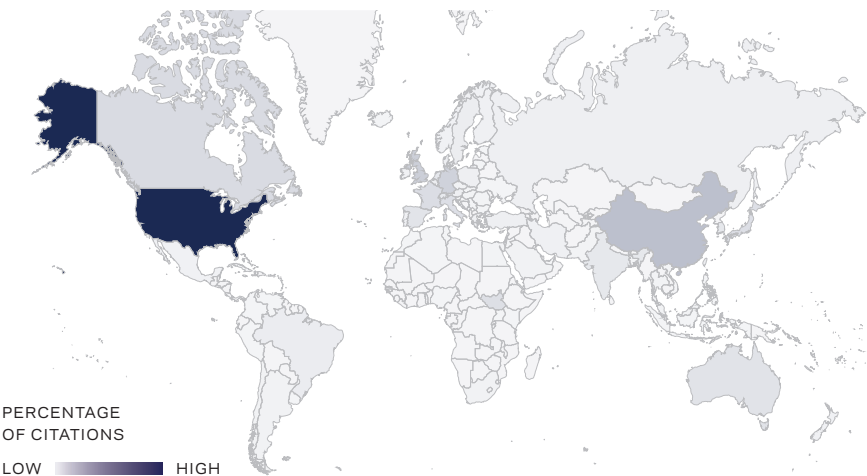
The US is the most research intensive country in the world. In 2014, it spent \$465 million, or 2.8% of its GDP, on research and development. Unsurprisingly, although the country accounts for 4.5% of the world's population, it produced 22% of the world's publications, amassed 38% of the world's citations and 29% of the world's downloads, and was responsible for 31% of the world's most highly cited articles.

Moreover, nearly one in every five patents filed or granted in the world came from a US inventor.



Global distribution of citations

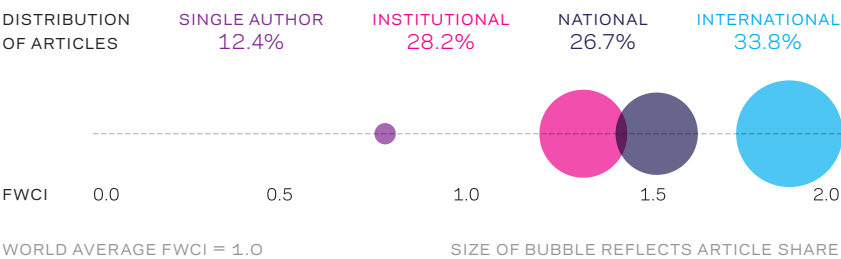
As the world's largest producer of research, it is unsurprising that nearly a third of all citations to the US' research come from the US itself. The next most frequent countries citing the US' research are China at 8.3%, the UK at 6.0%, Germany at 5.5%, and Canada at 3.9%.



Collaboration patterns

Compared to other top research countries in the world, the US has a relatively modest level of international collaboration, comprising 33.8% of its total output. This is partly due to the fact that the country has such an outsized research footprint, and researchers can find expertise and willing collaborators within the country's borders. Nevertheless, international collaborations achieve an FWCI

of 1.86, the highest of any collaboration type for the US.



Researcher mobility

For the same reasons that the US has relatively modest levels of international collaboration, the country's active researcher base is also more sedentary (48.7%) than most European countries. This means that those researchers have never published with an affiliation to an institution outside of the US. However, while the FWCI associated with most

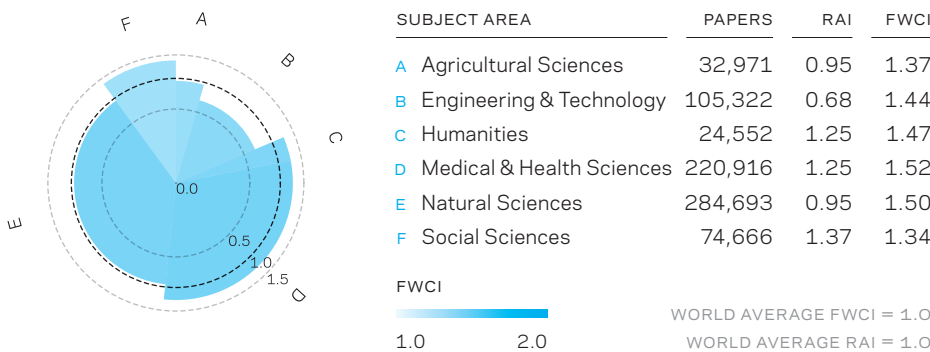
countries' sedentary researchers is comparatively lower than that of other mobility classes, the FWCI associated with the US' sedentary researchers is quite high at 1.87 (compared to an FWCI of 1.88 for the US' transitory researchers).



Subject breakdown

Relative to the world average, the US produces comparatively more research in the Humanities (25% more), the Social Sciences (37% more), and the Medical & Health Sciences (25% more). The FWCI of US' output in all subjects is well above the world average, and it is high-

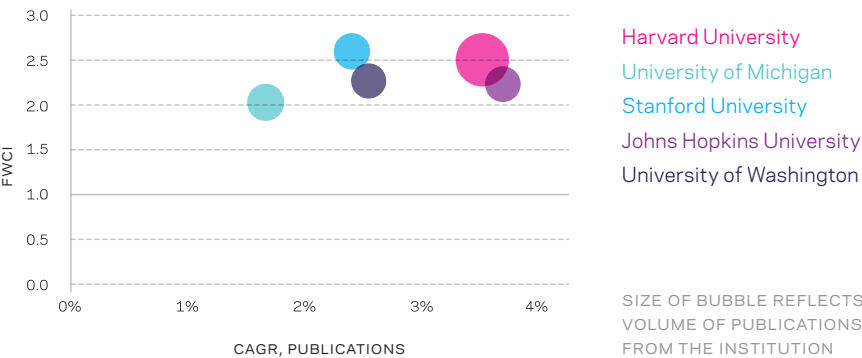
est in the Natural Sciences and the Medical & Health Sciences (at 1.50 and 1.52, respectively, or 50% and 52% above the world average).



Most prolific institutions

The US is home to some of the world's most renowned research institutions. Its top five most prolific institutions all achieved FWCI higher than 2.0, which means that the research they produce are cited twice as much as the world average. Among such a distinguished group, Har-

vard University (and its affiliated teaching hospitals) stands out for its high annual research output (20,830 publications in 2014, which is more than twice the level of the next most prolific institution in the US).





VENEZUELA

Venezuela has a small research footprint, producing a little over 1,500 publications in 2014, or 0.07% of all publications worldwide.

Similar to other countries with low levels of research output, Venezuela's researchers co-author frequently with international collaborators. A high percentage are also transitory, meaning that they spend two years or less abroad or in Venezuela. Based on researcher mobility trends, the

country experiences a net outflow of researchers, meaning that more researchers leave the country permanently than come and stay.

Headline statistics

CONNECTIONS

Latin America

Venezuela's research receives proportionately higher levels of citations from Brazil, Mexico, Argentina, and Colombia.

High level of international collaboration

Nearly half of Venezuela's publications co-authored with an international collaborator.

FOCUS AREA

Agricultural Sciences

Venezuela has a high relative focus in the Agricultural Sciences. It produces nearly 3 times as many articles in this subject as the world average.

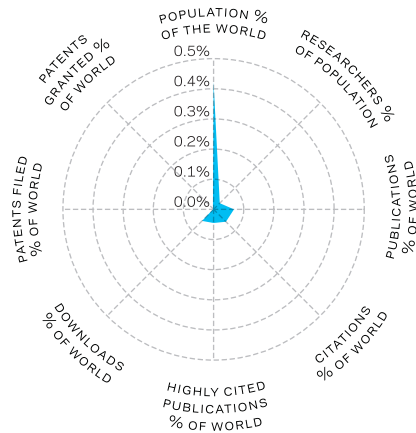
Highly mobile research base

About 3/4 of Venezuela's active researcher base has published at least once with an affiliation outside of the country.

Overall country or region outlook

Venezuela has a small research footprint, producing a little over 1,500 publications in 2014, or 0.07% of all publications worldwide. For reference, the country comprises 0.42% of the world's population.

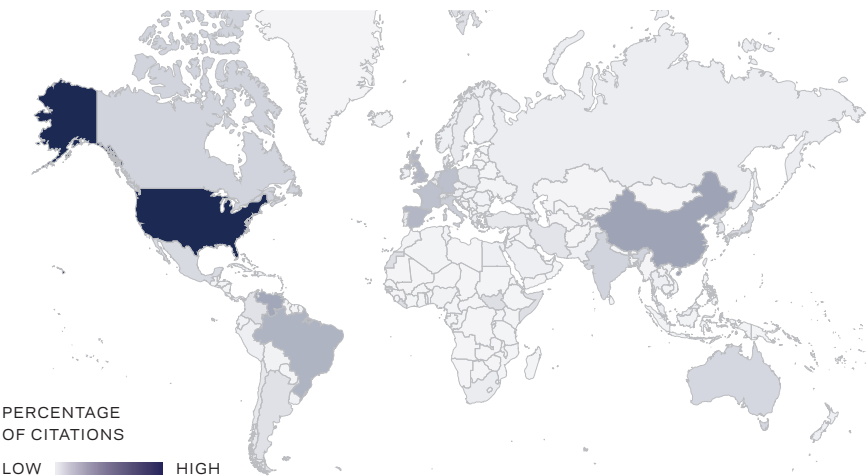
Similar to its publication output, the country accounts for a small percentage of all citations worldwide (0.06%), highly cited articles (0.05%) and downloads (0.05%). There is very little patenting activity.



Global distribution of citations

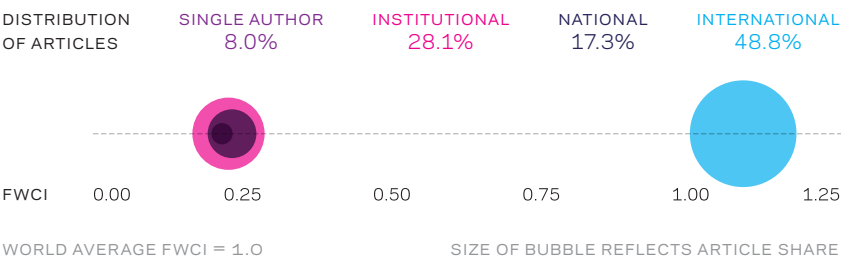
Similar to trends for most other countries, the country that accounts for the highest percentage of citations to Venezuela's research is the US. The countries that account for the next most citations to Venezuela's research are China at 6.6%, Venezuela itself at 6.4%, Brazil at 5.4%, the UK at 5.1%, and Spain at 5.1%. Ven-

ezuela's research is also cited at higher than expected rates by other Latin American countries such as Mexico (2.2%), Argentina (1.6%), and Colombia (1.6%).



Collaboration patterns

Nearly half of all publications by Venezuela are co-authored with an international collaborator, and such collaborations attain an FWCI of 1.09, or 9% above the world average. For reference, publications from every other collaboration type achieve FWCI of 0.23 or lower.



Researcher mobility

Nearly three-quarters of Venezuela's active researcher base is mobile, which means they have published at least once with an affiliation outside of the country. Over half (56%) are categorized as transitory, which means they have spent two years or less inside of, or outside of, Venezuela. The country as a whole, however, experiences a net outflow of research-

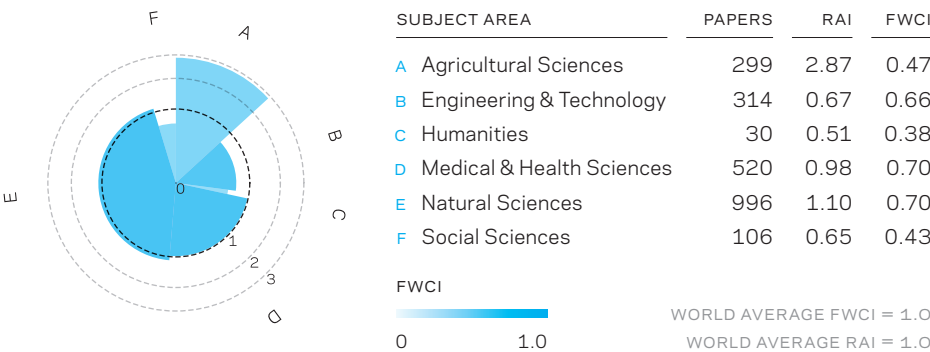
ers (-2.8%), which means that more researchers leave the country permanently than come and stay.



Subject breakdown

Venezuela produces the highest absolute amount of research and achieves the highest FWCI in the Natural Sciences and the Medical & Health Sciences. However, given the size of the country's research output, and similar to other South American countries, Venezuela's relative levels

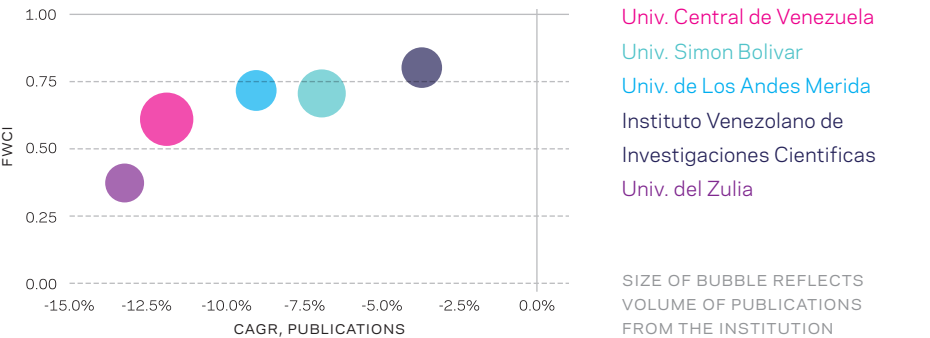
of activity in the Agricultural Sciences is nearly triple the world average.



Most prolific institutions

Among Venezuela's five most research-intensive institutions, the Universidad Central de Venezuela was the most prolific, producing 297 publications in 2014. All five have experienced declines in their annual level of research output, though their low levels of activity makes such

calculations more noisy and sensitive to change. The Instituto Venezolano de Investigaciones Cientificas achieved the highest FWCI at 0.80.





VIETNAM

Vietnam has a small and developing research base, having just three institutions with more than 50 papers published in 2014. A large proportion of its scholarly output is the result of international collaborations, which are also more impactful than the world average.

Vietnam publishes 0.15% of the world's scholarly output and 0.13% of the world's top 10% cited papers. It receives around 0.11% of the world's citations and 0.17% of the world's downloads. Citations to Vietnam research come more from the US (13%) and China (9.7%) than from

Vietnam itself (8.8%). Vietnam publishes mostly in the Natural Sciences but its research output in the Medical & Health Sciences and Engineering & Technology are impactful and cited more than the world average.

Headline statistics

Highly collaborative

Vietnam's international collaborations account for 70% of its output, and are cited 21% more than the world average.

MOST PROLIFIC AREA

Natural Sciences

Vietnam is most prolific in the Natural Sciences with more than half its output in this area, and a research impact on a par with the world average.

STRONG AREA

Medical & Health

Vietnam's papers in the Medical & Health Sciences are cited 30% more than the world average.

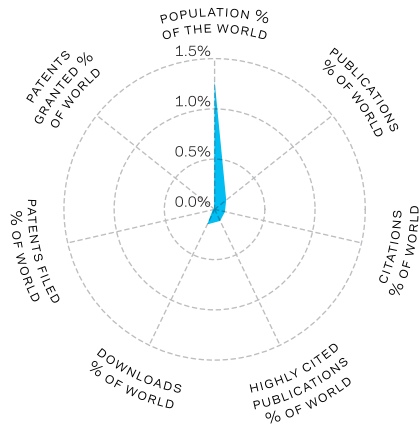
Small but growing institutions

Vietnam has 3 institutions that published more than 50 papers in 2014, with all 3 showing positive output growth.

Overall country or region outlook

Vietnam's population makes up 1.3% of the world's population; however, it publishes only 0.15% of the world's scholarly output, and 0.13% of the world's top 10% cited papers. It receives around 0.11% of the world's citations and 0.17% of the world's downloads.

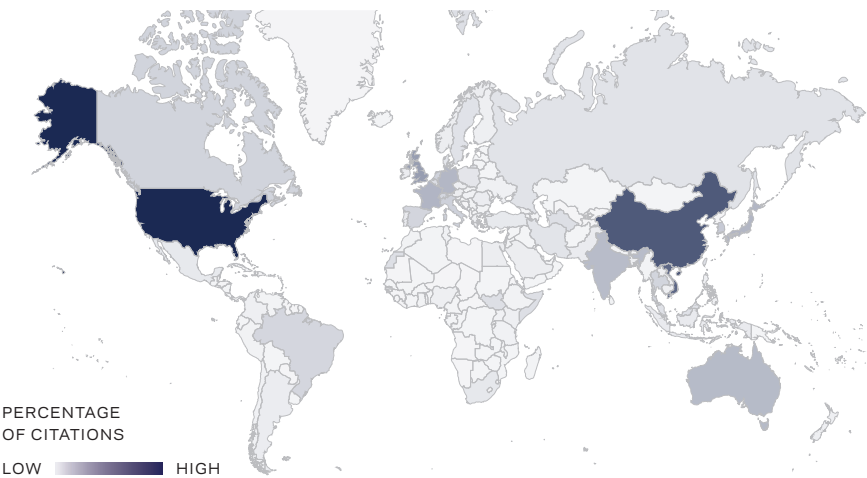
Vietnam's share of world's patents filed is lower at 0.02%, and its share of patents granted is 0.01%.



Global distribution of citations

Typically, researchers tend to be more aware of their own country's papers, and cite them preferentially. However, with a small research base, citations to Vietnam's research come mainly from the US (12.8%) and China (9.7%), before Vietnam itself (8.8%). Other countries whose citations form a sizable share of Viet-

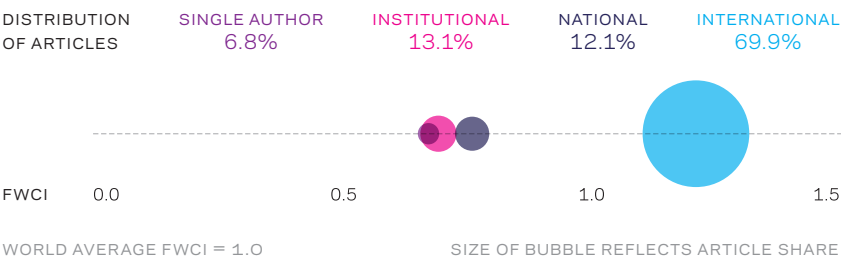
nam's received citations include the UK, accounting for 5.4% of Vietnam's citations, Japan, France, and Germany, each contributing almost 4% of Vietnam's citations, and Australia and India, each making up about 3.6% to 3.7% of Vietnam's citations.



Collaboration patterns

Vietnam's research is highly skewed towards international collaborations, with 70% of its scholarly output resulting from this collaboration type. These papers are cited about 21% more than the world average for all collaboration types. All other research collaboration types make up just 30% of its scholarly output and are less impactful: national collaborations make up 12% of its output and are cited 24%

less than the world average; institutional collaborations make up 13% of its output and are cited 31% less than the world average; single-authored papers are cited 33% less than the world average and only account for 6.9% of Vietnam's scholarly output.



Researcher mobility

Vietnam's researchers are largely in the transitory group: 59% of them have published under foreign affiliations on a short-term basis, mirroring the state of international collaboration in Vietnam. Long term assignments abroad, especially emigrations, are less likely; however, Vietnam's researcher inflow exceeds researcher outflow by 9%, suggesting an overall net

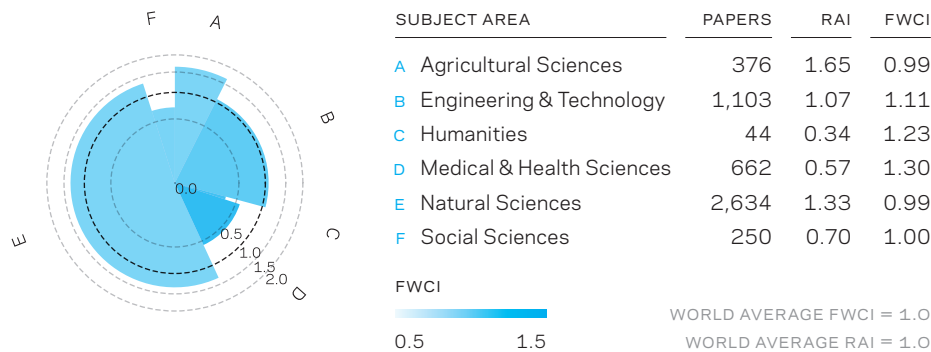
research inflow into Vietnam. Only 24% of Vietnam's total researcher population are sedentary and have never published under an affiliation outside of Vietnam.



Subject breakdown

Vietnam is most prolific in the Natural Sciences; proportionally, it publishes slightly more than half of its output in this area, which is 33% more than the world does, and these papers are cited on a par with the world average. In the Medical & Health Sciences, Vietnam tends to publish a

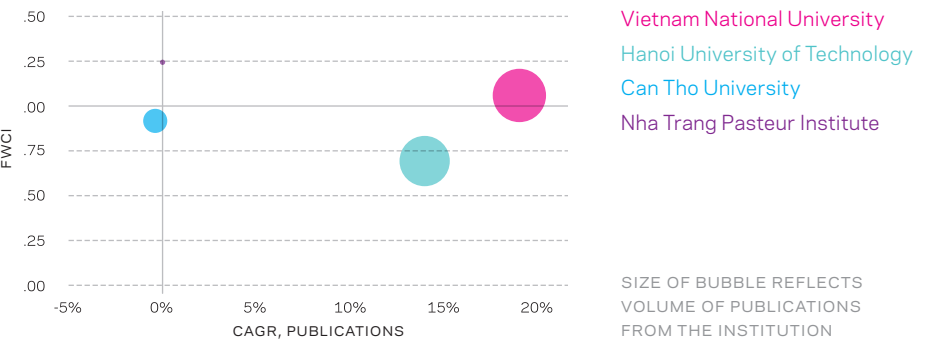
lesser proportion of its output than the world, but its papers are more impactful (cited 30% more) than the world average. Vietnam publishes 65% more than the world does in the Agricultural Sciences, and these papers are cited on a par with the world average.



Most prolific institutions

Vietnam's top institutions vary greatly in size: Nha Trang Pasteur Institute published only three papers in 2014 while the Vietnam National University published 300 papers in 2014. With the exception of Nha Trang Pasteur Institute and Can Tho University, the remaining larger insti-

tutions show positive growth in terms of 2010-2014 papers, at 14% (Hanoi University of Technology) and 19% (Vietnam National University). Vietnam National University emerges as the largest and most impactful institution, with an FWCI slightly higher than the world average.



Appendices

*Methodology,
Data sources, &
Glossary of terms*

Appendix A Methodology

Methodology and rationale

Our methodology is based on the theoretical principles and best practices developed in the field of quantitative science and technology studies, particularly in science and technology indicators research. *The Handbook of Quantitative Science and Technology Research: The Use of Publication and Patent Statistics in Studies of S&T Systems* (Moed, Glänzel, and Schmoch, 2004)¹ gives a good overview of this field and is based on the pioneering work of Derek de Solla Price (1978),² Eugene Garfield (1979),³ and Francis Narin (1976)⁴ in the USA, and John Irvine et al in the UK (1987),⁵ and in several European institutions including the Centre for Science and Technology Studies at Leiden University, the Netherlands, and the Library of the Academy of Sciences in Budapest, Hungary.

The analyses of bibliometric data in this book are based on recognised advanced indicators (e.g., the concept of relative citation impact). Our base assumption is that such indicators are useful and valid, though imperfect and partial measures. Their numerical values are determined by not only research performance and related concepts, but also other influencing factors that may cause systematic biases. In the past decade, the field of indicators research has developed best practices which state how indicator results should be interpreted and which influencing factors should be taken into account. Our methodology builds on these practices.

Year range

All analyses in this book are based on data that range from 2010 to 2014, using the most recent year consistently available to us for each indicator. For any exceptions, please refer to *Appendix B*, “Year and source of indicators per country”.

Article types

For all bibliometric analysis, only the following document types are considered:

- Article (AR)
- Review (RE)
- Conference Proceeding (CP)

In bibliometric studies, these article types are generally considered to be article types with scholarly content that has been peer-reviewed. That is, such article types have been scrutinized by experts in the same field and were determined by said experts to be suitable for publication. In contrast, our analyses exclude document types such as letters, notes, editorials, etc. that are also published in journals and other serials titles, but are not necessarily peer-reviewed.

Subject classification

All publications are divided into subjects according to the OECD's Field of Science and Technology (FOS) Classification, as described in the *Frascati Manual* – a “Proposed Standard Practice for Surveys on Research and Experimental Development”.⁶ In 2007 this classification was revised to better reflect changes in the science and technology area, such as newly emerging technology fields and the ‘interdisciplinarity’ of these and other research fields.⁷ As it is possible for an article to cover more than one subject, counts of publications per subject may add up to a

greater number than the total publication count of a country or region. See also: Appendix A, "counting publications".

OECD – Field of Science and Technology (FOS) Classification

Agricultural Sciences

Agriculture, forestry, and fisheries
Animal and dairy science
Veterinary science
Other agricultural science

Engineering & Technology

Chemical engineering
Civil engineering
Electrical and electronic engineering
Environmental biotechnology
Environmental engineering
Industrial biotechnology
Materials engineering
Mechanical engineering
Medical engineering
Other engineering and technologies

Humanities

Art
History and archaeology
Languages and literature
Philosophy, ethics, and religion
Other humanities

Medical & Health Sciences

Basic medical research
Clinical medicine
Health sciences

Natural Sciences

Biological sciences
Chemical sciences
Computer and information sciences
Earth and related environmental sciences
Mathematics
Physical sciences and astronomy
Other natural sciences

Social Sciences

Economics and business
Educational sciences
Law
Media and communications
Political science
Psychology
Social and economic geography
Sociology
Other social sciences

- 1 Moed, H. F., Glänzel, W., & Schmoch, U. (Eds.). (2005). *Handbook of Quantitative Science and Technology Research*. Dordrecht: Kluwer Academic Publishers. doi:10.1007/1-4020-2755-9
- 2 Price, D. J. de S. (1977). Foreword in *Essays of an Information Scientist* (pp. v-ix).
- 3 Garfield, E. (1979). "Is citation analysis a legitimate evaluation tool?" *Scientometrics*, 1(4), 359-375. doi:10.1007/BF02019306
- 4 Pinski, G., & Narin, F. (1976). "Citation influence for journal aggregates of scientific publications: Theory, with application to the literature of physics". *Information Processing & Management*, 12(5), 297-312. doi:10.1016/0306-4573(76)90048-0.
- 5 Irvine, J., Martin, B. R., Abraham, J., & Peacock, T. (1987). "Assessing basic research: Reappraisal and update of an evaluation of four radio astronomy observatories". *Research Policy*, 16(2-4), 213-227. doi:10.1016/0048-7333(87)90031-X
- 6 <http://www.oecd.org/innovation/inno/frascaticmanualproposedstandardpracticeforsurveysonresearchandexperimentaldevelopment6thedition.htm>
- 7 <http://www.oecd.org/science/inno/38235147.pdf>

Counting publications

All analyses make use of whole counting rather than fractional counting. For example, if a paper has been co-authored by one author from Algeria and one author from Vietnam, then that paper counts towards both the publication count of Algeria, as well as the publication count of Vietnam. Total counts for each country are the sum of unique publications.

We acknowledge that “there is no fair method to determine how much money, effort, equipment and expertise each researcher, institute or country contributes to a paper and the underlying research effort. Dividing up a paper between the participating units is therefore to some extent arbitrary. Our basic assumption is that each author, main institution and country listed in the affiliated addresses made a non-negligible contribution. Each paper is therefore assigned in full to all unique authors, institutions, and countries listed in the address heading.” (Tijssen & Van Leeuwen 2003)⁸

The same publication may be part of multiple smaller component entities, such as the calculation of counts of publications in multiple subject areas. However, this book de-duplicates all counts within an aggregate entity, so that a publication is counted only once even if it is included by several component entities. For example, a Kenyan publication on the impact of increased corn production on pricing may be counted once towards the totals of Kenya’s output in Agricultural & Biological Sciences and once towards Kenya’s output in Economics, Econometrics & Finance. However, this publication counts only once toward the aggregate entity of all Kenyan publications.

For this book we used a static version (‘snapshot’) of Scopus as of May 1, 2015. As articles of 2014 continue to be uploaded to Scopus until mid-2015, the publication counts for 2014 may not yet be 100% complete at the time this snapshot was taken. Further increases of absolute numbers of publications for countries or regions and their institutions are therefore possible, but expected to be small. Shares are not expected to be influenced by this.

Counting citations

All analyses of citation data (e.g. citation shares, citation distribution, highly cited articles, and field-weighted citation impact) make use of a 5-year citation window (i.e. citations accumulated in the period 2010-2014), unless otherwise indicated in *Appendix B*, “Year and source of indicators per country”.

Self-citations

Self-citations are those by which an entity refers to its previous work in new publications. Self-citing is normal and expected academic behaviour, and it is an author’s responsibility to make sure their readers are aware of related, relevant work. For this book, self-citations at author level as well as institution or country level are included in citation counts and the calculation of FWCI.

Citation distribution

For the calculation of citation distributions, the number of countries has not been limited to the 77 prolific countries or regions in this book. Available citation data from all countries or regions in the world has been used to compute citation distribution. As with publications, the analysis makes use of whole counting

rather than fractional counting. In other words, if an article co-authored by Brazil and China cites a US article, the US receives 1 citation from Brazil and 1 citation from China.

Highly cited articles

In this book 'highly cited articles' refers to articles in the top 10% most cited articles of all articles published and cited in 2010-2014.

Counting article downloads

Citation impact is by definition a lagging indicator: newly-published articles need to be read, after which they might influence studies that will be carried out, which are then written up in manuscript form, peer-reviewed, published, and finally included in a citation index such as Scopus. Only after these steps are completed can citations to the earlier article be systematically counted. For this reason, investigating downloads has become an appealing alternative, since it is possible to start counting downloads of full-text articles immediately upon online publication and to derive robust indicators over

windows of months rather than years. While there is a considerable body of literature on the meaning of citations and indicators derived from them,⁹ the relatively recent advent of download derived indicators means that there is no clear consensus on the nature of the phenomenon that is measured by download counts.¹⁰ A small body of research has concluded however that download counts may be a weak predictor of subsequent citation counts at the article level.¹¹ In this book, a download is defined as the event by which a user views the full-text HTML of an article or downloads the full-text PDF of an article from ScienceDirect, Elsevier's full-text journal article platform; views of an article abstract alone, and multiple full-text HTML views or PDF downloads of the same article during the same user session, are not included in accordance with the COUNTER Code of Practice.¹² ScienceDirect provides download data for approximately 16% of the articles indexed in Scopus; it is assumed that user downloading behaviour across countries does not systematically differ between online platforms.

8 Extended technical annex to chapter 5 of the 'Third European Report on S&T Indicators'; "Bibliometric Analyses of World Science" by Robert Tijssen and Thed van Leeuwen, CWTS, Leiden University. ftp://ftp.cordis.europa.eu/pub/indicators/docs/3rd_report_biblio_ext_methodology.pdf.

9 Cronin, B. (2005). A hundred million acts of whimsy? *Current Science*, 89(9), 1505-1509. Retrieved from http://www.currentscience.ac.in/Downloads/article_id_089_09_1505_1509_0.pdf; Bornmann, L., & Daniel, H.-D. (2008). "What do citation counts measure? A review of studies on citing behavior", *Journal of Documentation*, 64(1), 45-80. doi:10.1108/00220410810844150

10 Kurtz, M. J., & Bollen, J. (2010). "Usage bibliometrics". *Annual Review of Information Science and Technology*, 44(1), 1-64. doi:10.1002/aris.2010.1440440108

11 Moed, H. F. (2005). "Statistical relationships between downloads and citations at the level of individual documents within a single journal". *Journal of the American Society for Information Science and Technology*, 56(10), 1088-1097. doi:10.1002/asi.20200; Schloegl, C., & Gorraiz, J. (2010). "Comparison of citation and usage indicators: the case of oncology journals". *Scientometrics*, 82(3), 567-580. doi:10.1007/s11192-010-0172-1; Schloegl, C., & Gorraiz, J. (2011). "Global usage versus global citation metrics: The case of pharmacology journals". *Journal of the American Society for Information Science and Technology*, 62(1), 161-170. doi:10.1002/asi.21420

12 http://www.projectcounter.org/code_practice.html

Counting patent applications, and patents granted

The patenting process can be divided into three distinct phases: filing an application for a patent and its examination, the registration of a decision (granted or not), and the on-going payment of maintenance fees to keep the patent in force. Data indicating the volume of patenting activity in two of these phases are used in this book: patent applications and patents granted.

It is tempting to attempt to calculate the patenting "efficiency" of a given country by dividing the number of patents granted by the number of patent applications, for example. However, given the variable length of time taken for the examination of a patent application, phasing issues mean that any indicator derived in such a way could be somewhat misleading. Counts for patent applications and patents granted are totals, aggregated across all fields of research and all sectors of R&D performance. However, not all research fields and sectors have the same propensity to patent, so national patenting activities may reflect national research field specialisation and industry focus.¹³

Patent data in this book is taken from the World Intellectual Property Office (WIPO), and does not include United States Patent and Trademark Office (USPTO), European Patent Office (EPO), United Kingdom's Intellectual Property Office (IPO), or Japan Patent Office (JPO) data. Our measures of world patent shares for countries whose patenting activity relies heavily on these or other national patent offices may therefore be slightly biased downward.

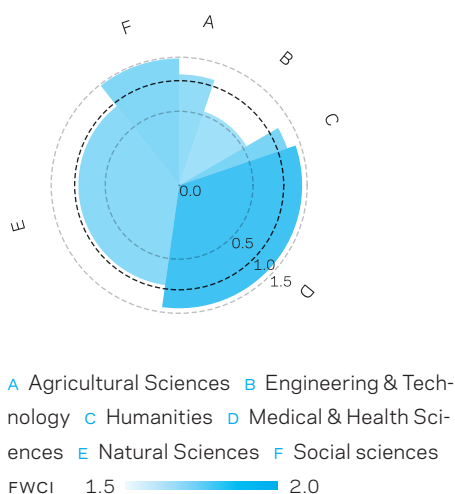
Spie charts

A spie chart¹⁴ is a combination of two pie

charts: one sets the angles of the slices, and the other sets their areas, by manipulating the radius of each slice individually. This enables a visual representation of two different indicators in a single pie chart. A third indicator may be added by using a colour scale for each of the slices. In this book the indicators are as follows:

- Angle represents a subject's share of a country's total publication output. The wider the angle, the larger the subject's share of the country's total output.
- Radius represents a country's relative activity in a subject. The longer the radius, the more a country publishes in this subject compared to the world average. See also: *Appendix C, 'Activity Index'*.
- Colour represents field-weighted citation impact (FWCI). A gradual colour scale is used, wherein the darkest hue represent higher FWCI values, and the lighter hue the lower FWCI values.

Figure 1 – Spie chart of subject focus of the Netherlands



Measuring international researcher mobility

The approach presented here uses Scopus author profile data to derive a history of active author affiliations recorded in their published articles and to assign them to mobility classes defined by the type and duration of observed moves.

How are individual researchers unambiguously identified in Scopus?

Scopus uses a sophisticated author-matching algorithm to precisely identify articles by the same author. The Scopus Author Identifier gives each author a unique ID and groups together all the documents published by that author, matching alternate spellings and variations of the author's last name and distinguishing between authors with the same surname by differentiating on data elements associated with the article (such as affiliation, subject area, co-authors, and so on). This is enriched with manual, author-supplied feedback, both directly through Scopus and also via Scopus' direct links with ORCID (Open Researcher & Contributor ID).

What is a researcher from (e.g.) Germany?

To define the initial population for the study, a country's authors were identified as those that had listed an affiliation in said country on at least one publication (articles, reviews and conference papers) published across the sources included in Scopus during the period 1996-2014.

What is an 'active researcher'?

The number of authors identified includes

a large proportion with relatively few articles over the entire period of analysis. As such, it was assumed that they are not likely to represent career researchers, but individuals who have left the research system. A productivity filter was therefore implemented to restrict the analysis to those authors with at least 1 article in the 5-year period 2010-2014 and at least 10 articles in the entire period 1996-2014, or those with fewer than 10 articles in 1996-2014, but at least 4 articles in 2010-2014. After applying the productivity filter, the remaining set of researchers was defined as active and formed the basis of the study.

How are mobility classes defined?

The measurement of international researcher mobility by co-authorship in the published literature is complicated by the difficulties involved in teasing out long-term mobility from short-term mobility (such as doctoral research visits, sabbaticals, secondments, etc.), which might be deemed instead to reflect a form of collaboration. In this study, stays abroad of two years or more were considered migratory. Stays abroad of less than two years were deemed transitory. Author nationality is not captured in article or author data. Instead, migration patterns are based on the country where an author first published (for migratory mobility) or the country where they published the majority of their articles (for transitory mobility). In individual cases, these criteria may result in authors being assigned migratory patterns that may not accurately reflect the real situation, but such errors may be as-

13 Pottelsberghe, B. Van. (2008). "Europe's R&D: missing the wrong targets?" Retrieved from <http://www.bruegel.org/publications/publication-detail/publication/7-europes-r-and-d-missing-the-wrong-targets/>

14 <http://www.cs.huji.ac.il/~feit/papers/Spie03TR.pdf>

sumed to be evenly distributed across the groups and so the overall pattern remains valid. Researchers without any apparent mobility based on their published affiliations were considered sedentary.

Migratory

→ Outflow

Researchers whose Scopus author data for the period 1996-2014 indicates that they first published with an affiliation in Country X and have subsequently migrated from Country X to another country (or countries) for at least two years without returning to Country X.

or

Researchers whose Scopus author profile data for the period 1996-2014 indicates that they migrated to Country X from another country (or countries) for at least two years, and then subsequently migrated to another country (or countries) for at least two years.

→ Inflow

Researchers whose Scopus author data for the period 1996-2014 indicates that they migrated to Country X from another country (or countries) for at least two years without leaving Country X.

or

Researchers whose Scopus author data for the period 1996-2014 indicates that they first published with an affiliation in Country X, migrated from Country X to another country (or countries) for at least two years, and subsequently migrated back to Country X for at least two years.

Transitory

→ Transitory

Researchers whose Scopus author data for the period 1996-2014 indicates that they are based in Country X for less than

two years at a time but are predominantly based in another country (or countries).

or

Researchers whose Scopus author data for the period 1996-2014 indicates that they are based in another country (or countries) for less than two years at a time but are predominantly based in Country X.

Sedentary

→ Sedentary

researchers whose Scopus author data for the period 1996-2014 indicates that they have not published with an affiliation outside of Country X.

Note that due to the rounding of numbers, the sum of each of these categories' share of a country or region's researcher base may not add up to 100% exactly.

Collaboration types

A publication is considered collaborative when there is more than one author in the authorship byline in Scopus. We distinguish between 4 collaboration types:

- **International collaboration**, whereby at least one co-author is affiliated with an institution from a different country or region.
- **National collaboration**, whereby at least one co-author is affiliated with a different institution, but all authors are affiliated with institutions from the same country or region.
- **Institutional collaboration**, whereby all authors are affiliated with the same institution.
- **Single author publications**. These are

technically not collaborations, and are used as a baseline for comparison of other collaboration types.

These collaboration types are mutually exclusive. For example, if nine out of ten authors are affiliated with the same institution and the same country, and one author is affiliated with an institution from a different country, their publication is considered internationally collaborative.

Note that due to the rounding of numbers, and to institutional collaboration across international campuses, the sum of each of these categories' share of a country or region's publication output may not add up to 100% exactly.

SciVal institutions

For the selection of the top five most prolific research institutions in a country, this book uses institution lists from SciVal. As these institution profiles were — and continue to be — created manually, starting with the most prolific ones, not all of the world's institutions have a profile in SciVal at this moment. A number of small countries and regions, with relatively smaller research institutions, may therefore appear to have fewer than 5 prolific institutions in this book.

Appendix B

Data sources

Data Sources

Scopus is Elsevier's abstract and citation database of peer-reviewed literature, covering 57 million documents published in over 22,000 journals, book series, and conference proceedings by some 5,000 international publishers. Reference lists are captured for 35+ million records published from 1996 onwards, and the additional 21+ million pre-1996 records reach as far back as the publication year 1823.

Scopus coverage is multi-lingual and global: approximately 15% of titles in Scopus are published in languages other than English (or published in both English and another language). The database contains titles from more than 120 different countries and over 50 languages in all geographic regions. Scopus covers approximately 18,000 titles from Europe, 10,500 from North-America, 3,300 from Asia-Pacific, 900 from Central and South America, and 400 titles from Africa.

Scopus coverage is also inclusive across all major research fields, with 11,500 titles in the Physical Sciences, 12,800 in the Health Sciences, 6,200 in the Life Sciences, and 9,500 in the Social Sciences. Titles which are covered are predominantly serial publications (journals, trade journals, book series, and conference material), but considerable numbers of conference papers are also covered from stand-alone proceedings volumes (a major dissemination mechanism, particularly in the computer sciences). Acknowledging that a great deal of important literature in all fields (but especially in the Social Sciences and the Arts & Humanities) is published in books, Scopus has begun to increase book coverage in 2013 (89,000 books in June 2015). Currently, Scopus already covers books published by Elsevier, Springer, Wiley, Brill, De Gruyter, Woodhead, Karger, Oxford University Press, Edward Elgar, Maney, Intellect, IOS Press, Pan Stanford, University of California Press, Princeton University Press, Edinburgh University Press, Delft University Press, Duke University Press, McGill Queens University Press, Project Muse (60+ UPs), OECD, and other publishers.

For this book, a static version of the Scopus database was aggregated by country or region. Subjects were defined by OECD subject areas (see Appendix A for more details).

A body of literature is available on the limitations and caveats in the use of such 'bibliometric' data, such as the accumulation of citations over time, the skewed distribution of citations across articles, and differences in publication and citation practices between fields of research, different languages, and applicability to social sciences and humanities research. In the social sciences and the humanities, the bibliometric indicators presented in this book for these fields must be interpreted with caution because a reasonable proportion of research outputs in such fields take the form of books, monographs, and non-textual media. As such, analyses of journal articles and their usage and citation, provide a less comprehensive view than in other fields, in which journal article comprise the vast majority

of research outputs. More information can be found on www.elsevier.com/solutions/scopus.

ScienceDirect is Elsevier's leading full-text journal articles platform. With an invaluable and incomparable customer base, the use of scientific research on ScienceDirect.com provides a different look at performance measurement. ScienceDirect.com is used by more than 12,000 institutes worldwide, with more than 15 million active users. The average click through to full-text per month is 67 million. ScienceDirect contains more than 13 million content pieces, 2,500 journals, and 33,000 books. More information can be found on www.elsevier.com/solutions/sciencedirect.

SciVal offers quick, easy access to the research performance of 4,600 research institutions and 220 countries worldwide. A ready-to-use solution with unparalleled power and flexibility, SciVal enables its users to navigate the world of research and devise an optimal plan to drive and analyze their performance. More info can be found on www.elsevier.com/solutions/scival.

Organisation for Economic Co-operation and Development (OECD) (www.oecd.org) is an international economic organisation founded in 1961 and representing 34 member countries. The OECD collects internationally comparable data on research and development and the data are available in the Main Science and Technology Indicators database (MSTI 2014/1;

www.oecd.org/sti/msti). A useful history of the development of the OECD's R&D statistics is available.¹⁵ Financial data are given in constant US\$ at current prices and corrected for Purchasing Power Parity (PPP), allowing comparability over time and between countries. Full-Time Equivalent (FTE) counts are used for all human capital data in this book. The OECD's Main Science and Technology Indicators is a biannual publication that provides a set of indicators that reflect the level and structure of the efforts undertaken by OECD Member countries and nine non-member economies in the field of science and technology. The indicators cover the resources devoted to research and development, patent families, technology balance of payments, and international trade in R&D-intensive industries.

United Nations Organization for Education, Science and Culture (UNESCO) is an international organization founded in 1945, which has 195 Members and eight Associate Members. UNESCO's mission is to contribute to the building of peace, the eradication of poverty, sustainable development, and intercultural dialogue through education, the sciences, culture, communication, and information. The UNESCO Institute for Statistics (UIS) in Canada is UNESCO's official statistical agency. It produces global and internationally comparable statistics on education, science, technology, culture and communication. In S&T, these cover national data on human resources and expenditure on research and development (GERD). The UIS is the official UN statisti-

15 Godin, B. (2008) "The Culture of Numbers: Origins and Development of Statistics on Science, Technology and Innovation" Project on the History and Sociology of S&T Statistics, Working Paper No. 40, Canadian Science and Innovation Indicators Consortium.

cal agency for the international collection of data in S&T and is the lead UN agency for elaborating statistical standards for developing countries, particularly in science, technology, and innovation.

World Intellectual Property Office (WIPO) is a specialized agency of the United Nations that administers the intellectual property and provides the world's largest database of 30 million patent documents, including 2.2 million published international patent applications. More info can be found on www.wipo.int.

Year and source of indicators

Population

Year: 2012

Sources: UNESCO, except: Brazil (OECD), Singapore (Singapore Department of Statistics)

No data available: Latvia, Philippines, Taiwan

GERD

Year: 2012

Sources: UNESCO, except: Argentina, Chile, Japan, South Africa, South Korea, Switzerland, Taiwan, Turkey (OECD)

No data available: Algeria, Australia, Bangladesh, Belarus, Brazil, Egypt, Hong Kong, Iceland, India, Indonesia, Iran, Iraq, Jordan, Kenya, Kuwait, Latvia, Lebanon, Malaysia, Mexico, Morocco, New Zealand, Nigeria, Pakistan, Peru, Philippines, Qatar, Saudi Arabia, Thailand, Tunisia, Ukraine, United Arab Emirates, Venezuela, Vietnam

Researchers

Years: 2012

Source: UNESCO, except: Argentina, Canada, Chile, Colombia, Cuba, France,

Israel, Japan, South Africa, South Korea, Switzerland, Taiwan, Turkey, United States (OECD)

No data available: Algeria, Australia, Bangladesh, Belarus, Brazil, Egypt, Hong Kong, Iceland, India, Indonesia, Iran, Iraq, Jordan, Kenya, Kuwait, Latvia, Lebanon, Malaysia, Mexico, Morocco, New Zealand, Nigeria, Pakistan, Peru, Philippines, Qatar, Saudi Arabia, Thailand, Tunisia, Ukraine, United Arab Emirates, Venezuela, Vietnam

Publications

Year: 2014

Source: Scopus

Citations

Years: 2010-2014

Source: Scopus

Highly cited articles

Years: 2010-2014

Source: Scopus

Downloads

Year: 2014

Source: ScienceDirect

Patents filed

Year: 2013, except: Taiwan (2012)

Source: WIPO, except: Taiwan (OECD)

No data available: Latvia, Philippines

Patents granted

Year: 2013

Source: WIPO

No data available: Latvia, Philippines, Taiwan

Researcher mobility

Years: 1996 - present

Source: Scopus

Appendix C

Glossary of terms

Article, Paper, or Publication (unless otherwise indicated) denotes the main types of peer reviewed documents published in journals: articles, reviews, and conference papers.

Article output for an institution or country is the count of articles with at least one author from that institution or country (according to the affiliation listed in the authorship byline). All analyses make use of 'whole' rather than 'fractional' counting: an article representing international collaboration (with at least two different countries listed in the authorship byline) is counted once each for every institution or country listed.

CAGR (Compound Annual Growth Rate) is defined as the year-over-year constant growth rate over a specified period of time. Starting with the first value in any series and applying this rate for each of the time intervals yields the amount in the final value of the series.

$$\text{CAGR}(t_0, t_n) = (V(t_n) / V(t_0))^{\frac{1}{t_n - t_0}} - 1$$

$V(t_0)$: start value

$V(t_n)$: finish value

$t_n - t_0$: number of years

Citation is a formal reference to earlier work made in an article or patent, frequently to other journal articles. A citation is used to credit the originator of an idea or finding and is usually used to indicate that the earlier work supports the

claims of the work citing it. The number of citations received by an article from subsequently-published articles is a proxy of the quality or importance of the reported research.

Downloads are defined as either downloading a PDF of an article on ScienceDirect, Elsevier's full-text platform, or looking at the full-text online on ScienceDirect without downloading the actual PDF. Views of abstracts are not included in the definition. Multiple views or downloads of the same article in the same format during a user session will be filtered out, in accordance with the COUNTER Code of Practice 4.¹⁶

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

¹⁶ <http://projectcounter.org/>, <http://usagereports.elsevier.com/asp/main.aspx>

GERD (Gross domestic expenditure on research and development) is total intramural expenditure on research and development performed on the national territory during a given period.

GDP (Gross domestic product) is an aggregate measure of production equal to the sum of the gross values added of all resident institutional units engaged in production (plus any taxes, and minus any subsidies, on products not included in the value of their outputs). The sum of the final uses of goods and services (all uses except intermediate consumption) measured in purchasers' prices, less the value of imports of goods and services, or the sum of primary incomes distributed by resident producer units.

Highly cited articles (unless otherwise indicated) are those in the top-cited 10% of all articles published and cited in a given period.

Institutional Collaboration in this book is defined as articles with at least two authors listed in the authorship byline, all of which are affiliated with the same institution.

International Collaboration in this book is defined as articles with at least two different countries listed in the authorship byline.

National Collaboration in this book is defined as articles with at least two different institutions listed in the authorship byline, all of which are from the same country.

Patents are sets of exclusive rights granted by a governing body that give the holder exclusive rights to a process, design

or invention, and the manufacture, use or sale thereof for a designated period of time. In this book we measure patents in two stages of the patenting process:

- Patents filed: the number of applications for a patent that have been filed by Country X with a patent office, in this case the World Intellectual Property Office (WIPO).
- Patents granted: the number of patents issued by WIPO to Country X.

Publication output is the number of publications per institution or country, which have at least one author affiliated to this institution or country. A publication which is co-authored by authors from different countries thus counts towards the publication output of each country.

Publication share is the global share of publications for a specific institution or country expressed as a percentage of the total world output. Using a global share in addition to absolute numbers of publications provides insight by normalizing for increases in world publication growth and expansion of the field in question or the whole Scopus database.

R&D (Research and Development) is "creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications."¹⁷ Per the *Frascati Manual*, this includes basic research, applied research and experimental development.

RAI (Relative Activity Index) is defined as a country's share of its total article output across subject field(s) relative to the global share of articles in the same sub-

ject field(s). For example, in 2014, France published 46.6% of its articles in the Natural Sciences, while globally this subject field represents 40.5% of all articles published. The Activity Index for France in the Social Sciences in 2014 is therefore $46.6 / 40.5 = 1.15$. A value of 1.0 indicates that a country's research activity in a field corresponds exactly with the global activity in that field; higher than 1.0 implies a greater emphasis while lower than 1.0 suggests a lesser focus.

Researchers are “professionals engaged in the conception or creation of new knowledge, products, processes, methods and systems and also in the management of the projects concerned.”¹⁷ This definition includes members of the armed forces who perform R&D, managers and administrators engaged in the planning and management of the scientific and technical aspects of a researcher's work, and PhD students engaged in R&D.

R&D Intensity (GERD as a percentage of GDP) is an indicator of an economy's relative degree of investment in generating new knowledge.

¹⁷ <http://www.oecd.org/innovation/inno/frascatimanualproposedstandardpracticeforsurveysonresearchandexperimentaldevelopment6thedition.htm>

¹⁸ idem

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Authors

Elsevier Analytical Services provides accurate, unbiased analysis on research performance by combining high quality data sources with technical and research metrics expertise accrued over Elsevier's 130 years in academic publishing.

Our analytics team is experienced in serving policy makers, funders, and academic and corporate research institutions around the world. Team members are located in Amsterdam, New York, and Singapore.



— **Dr Judith Kamalski** is Head of Analytical Services within Elsevier's research management division and has wide experience in bibliometrics and quantitative analysis. She has led multiple large-scale custom bibliometrics analyses for academic and government customers and worked previously as a bibliometric expert for publishing, editors, and learned societies. She currently heads up a global team of analytical product managers.

Judith has a PhD awarded by Utrecht Institute of Linguistics and also holds Master's degrees in Corporate Communications and French Linguistics & Literature.



— **Sarah Huggett** is Content & Analytics Product Manager with Elsevier, which involves preparing reports on research performance. Sarah's first job at Elsevier in Research & Academic Relations gave her an understanding of how bibliometrics can be used to inform strategic planning. She has a particular interest in new developments in research evaluation, such as measures of attention and engagement.

After completing a Bachelor's then Master's degrees at the University of Grenoble (France), Sarah moved to the UK to teach French at the University of Oxford prior to joining Elsevier in 2006, relocating to Singapore in 2014 to focus on the APAC region.



— **Elizabeth Kalinaki** is Data Scientist for Elsevier's research management. In her role, she works with different datasets, extracting and advising on this information in the form of content processing, analytics, and delivery.

Among other interests, Elizabeth is very enthusiastic about big data, the science of data, and visualization. She has a Master's degree in geospatial technologies atop her informatics background.



— **George Lan** is Content & Analytics Product Manager for Elsevier, providing analysis, reporting, and consulting on a variety of bibliometrics/scientometrics and research performance evaluation projects. George specializes in social network analysis, university rankings, knowledge-transfer and the intersection of academic and industry research, and the broader socio-economic impacts of research on cities and regions.

Prior to joining Elsevier, George was a research assistant at the MIT Sloan School of Management on policy topics related to higher education and the school-to-work transition. George has a Master's degree in Management Science from the MIT Sloan School of Management and a Bachelor's degree in Public Affairs and International Studies from Princeton University's Woodrow Wilson School.



— **Georgin Lau** is Content & Analytics Product Manager with Elsevier. Her focus is the APAC region where she is involved in analyzing research performance and trends for academic institutions, governments, and funding bodies. Georgin holds a Master's degree in Statistics from the National University of Singapore and is a visualization enthusiast who seeks to present data in the most understandable way.

Prior to joining Elsevier, she has worked on many Singapore and overseas government projects as a consultant, and she is attuned to recommending various analytical approaches based on the different analysis needs of institutions. A recent project she has worked on is the research assessment study on the current state of global brain research, *Brain Science: Mapping the Landscape of Brain and Neuroscience Research*.



— **Dr Lei Pan** is Content & Analytics Product Manager at Elsevier, focusing on analyzing the research performance and trends for public agencies and academic institutes. She focuses her work on European, African, and Middle East markets. She specializes in assessment reports for government, academic institutions and funding bodies and in combining publication and citation data with macroeconomic data to link research performance to policy and economic development.

Most recently she has worked for Ecorys, a European research and consultancy firm. Before that, she was an assistant professor at Wageningen University. She holds a PhD in Economics from VU Amsterdam and a Master's degree in Economics from Erasmus University Rotterdam and Tinbergen Institute.



— **Steven Scheerooren** is Content & Analytics Support Manager in Elsevier's Analytical Services team. Having graduated from the University of Leiden as a Japanologist (BA), Steven joined Analytics in 2013 to work on staff evaluation projects for Japanese universities, and has since supported national assessment exercises such as the UK's REF in 2013 and Australia's ERA in 2014.

In his current position he conducts comparative research performance analyses for academic and government institutions, wherein his focus is on the development of gender-based analyses.

Acknowledgements

The authors would like to express their sincere gratitude to the following people for their support of and contributions to this project:

- M'hamed Aisati
- Jeroen Baas
- Nick Fowler
- Thomas Gurney
- Chris James
- Sophia Katrenko
- Eleonora Palmaro
- Pablo Palmeiro
- Andrew Plume
- Keith Silver

We also thank the many other Elsevier colleagues who advised, helped, or championed the endeavour at various stages.

This book could never have been published without a tremendous team effort, and we are truly thankful to all who collaborated on the project.

This book was proofread by Tell Lucy, a communications company that specialises in science and sustainability, designed by CLEVER°FRANKE, an interactive design agency focused on information and data visualization, and printed and distributed by Peecho, a global cloud print platform.

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World of Research 2015 provides a snapshot of essential research indicators for the most prolific countries or regions in the world.

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ISBN 978-0-444-53513-9
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