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# STM Global Brief 2021 – Economics & Market Size

- An STM Report Supplement

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## Introduction

At STM, we promote the contribution that publishers make to innovation, openness and the sharing of knowledge and embrace change to support the growth and sustainability of the research ecosystem. As a common good, we provide data and analysis for all involved in the global activity of research.

For the past 15 years, we have produced the STM report which has explored the trends, issues and challenges facing scholarly publishing. This latest iteration sees the adoption of a new format for the report, with a wealth of industry-leading data and insights presented across an annual selection of ‘supplements’ – each providing compelling snapshots on specific aspects and characteristics of the industry. The next issue will cover Open Access and Open Research, which remain a key area of focus for STM and its members as a means to advance knowledge worldwide.

This first supplement in the new series - ‘STM Global Brief 2021 – Economics and Market Size’ shines a light on the scale and shape of scholarly publishing and provides updated figures covering 2018 onwards. We would like to thank all the contributors for their input, advice and insights. While every effort has been made to provide the most comprehensive outlook possible, there are sometimes variations in the data available. Please refer to the footnotes for details of data sources.

## About STM

STM is the leading trade association for academic and professional publishers worldwide. At STM we support our members in their mission to advance global research. We have over 140 members based in over 20 countries around the world who collectively publish 66% of all journal articles and tens of thousands of monographs and reference works. As academic and professional publishers, learned societies, university presses, start-ups and established players we work together to serve society by developing standards and technology to ensure research is of high quality, trustworthy and easy to access.

For more information about STM see [www.stm-assoc.org](http://www.stm-assoc.org).

For more information about this publication, please contact [info@stm-assoc.org](mailto:info@stm-assoc.org)

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## Executive summary

- 1** According to Outsell, Inc., the global scholarly publishing market continued to grow steadily in 2018, increasing from a value of \$27 billion to \$28 billion in 2019. In 2020, the year of the global pandemic, the global STM market contracted to \$26.5 billion.<sup>1</sup> Outsell, Inc. forecast that the global market will regain its pre-pandemic (2019) value of \$28 billion by 2023.<sup>2</sup>
- 2** The STM Report of 2018<sup>3</sup> observed a yearly growth in articles of 4% and 5% growth each year in journals. Current data shows that the growth rate in articles has continued to increase, indicating an average growth rate between 2015 and 2020 of between 5 and 6.5%. The average rate of growth in journals has meanwhile slowed to between 2 and 3% since 2015.
- 3** Social Science and Humanities (SSH) journals and online content continued to grow at compound annual growth rates of 1.7% and 3.8% respectively between 2018 and 2020<sup>4</sup> though certain areas, particularly books in print, have shown signs of being hit hard by the pandemic.<sup>5</sup>
- 4** Open Access publishing is growing much faster than the underlying market with revenues projected to increase at 11.5% and output at 12.5% (compound annual growth rates) from 2019-2022.<sup>6</sup>
- 5** The USA continues to retain the largest portion of global market revenues with 40% of global revenue overall throughout 2018 and 2019.<sup>7</sup> Within the global disciplinary segments, the USA held 39% of the Scientific and Technical Information and Solutions market in 2020 and 42% of the Medical Information and Solutions market in 2020, according to Outsell, Inc. North America, as a continent, held 40% of global social science and humanities revenues in 2020, according to Simba Information.
- 6** China remains the world's most prolific producer of publishable research output and has shown the strongest average growth rate in output<sup>8</sup> globally between 2018 and 2020. Russian Federation, India, Spain, Italy, Brazil and Australia have also shown strong rates of growth since 2018.
- 7** Digital continues to dominate the global market as a format, now accounting for as much as 89% of the scientific and technical segment in 2020, representing a 10% increase on 2019.<sup>9</sup> Digital accounted for 77% of the global STM market in 2019.<sup>10</sup>
- 8** 2020 will likely be a record year for number of submissions due to the increase in research and articles relating to COVID-19.<sup>11</sup>

<sup>1</sup> Outsell, Inc., "Segment View: Scientific, Technical & Medical," 2021, 7.

<sup>2</sup> Outsell, Inc., 7.

<sup>3</sup> Rob Johnson, Anthony Watkinson, and Michael Mabe, "The STM Report: 1968-2018" (International Association of Scientific, Technical and Medical Publishers, October 2018), 5, [https://www.stm-assoc.org/2018\\_10\\_04\\_STM\\_Report\\_2018.pdf](https://www.stm-assoc.org/2018_10_04_STM_Report_2018.pdf).

<sup>4</sup> Simba Information, *Global Scientific & Technical Publishing 2019-2023*, 2019, <https://www.youtube.com/watch?v=5SgWNGCpl5U>.

<sup>5</sup> Simba Information, *Global Social Sciences & Humanities Publishing 2021-2025: Market Research Report*. Accessed April 19, 2021. <https://www.simbainformation.com/Global-Social-Sciences-Humanities-Publishing-14240578/>.

<sup>6</sup> Ann Michael and Dan Pollock, "Open Access Market Sizing Update 2020," Delta Think, October 19, 2020, <https://deltathink.com/news-views-open-access-market-sizing-update-2020/>.

<sup>7</sup> Outsell, Inc., "Market View: Scientific, Technical & Medical," 2020, <https://www.outsellinc.com/product/market-view-scientific-technical-medical/>.

<sup>8</sup> In terms of papers such as articles, reviews, conference papers and short surveys produced by authors affiliated with Chinese institutions.

<sup>9</sup> Outsell, Inc., "Segment View: Scientific, Technical & Medical," 10.

<sup>10</sup> Outsell, Inc., "Market View: Scientific, Technical & Medical."

<sup>11</sup> Christos Petrou, "Guest Post – Scientific Output in the Year of COVID, An Update," The Scholarly Kitchen, February 23, 2021, <https://scholarlykitchen.sspnet.org/2021/02/23/guest-post-scientific-output-in-the-year-of-covid-an-update/>.

- 9** Over the last twenty years, university budgets in the USA have almost doubled in real-terms while the proportion spent on libraries has almost halved.<sup>12</sup> There are signs that the pandemic has further strained higher education budgets as well as library and research funding globally. It has also driven academic institutions to deliver courses and materials online, resulting in lowered sales for print publications.
- 10** Simba Information now predict that journals will overtake books as the largest social sciences and humanities publishing activity by 2025.<sup>13</sup>
- 11** Outsell, Inc. estimates that the Medical Information and Solutions segment will overtake the Scientific and Technical Information and Solutions segment in terms of market value in 2024.<sup>14</sup>
- 12** The longer-term impact of Brexit remains unclear, however it has already likely exacerbated a fall in UK university income from foreign students. Research funding in the UK will be challenged by the loss of EU funding streams. Brexit could also lead to reduced international collaboration for authors as well as an increase in subscription and acquisitions prices due to customs issues.<sup>15</sup>



<sup>12</sup> Ann Michael and Dan Pollock, "News & Views: Library Spending and the Serials Crisis," Delta Think, May 4, 2020, <https://deltathink.com/news-views-library-spending-and-the-serials-crisis/>.

<sup>13</sup> Simba Information, Global Social Sciences & Humanities Publishing 2021-2025.

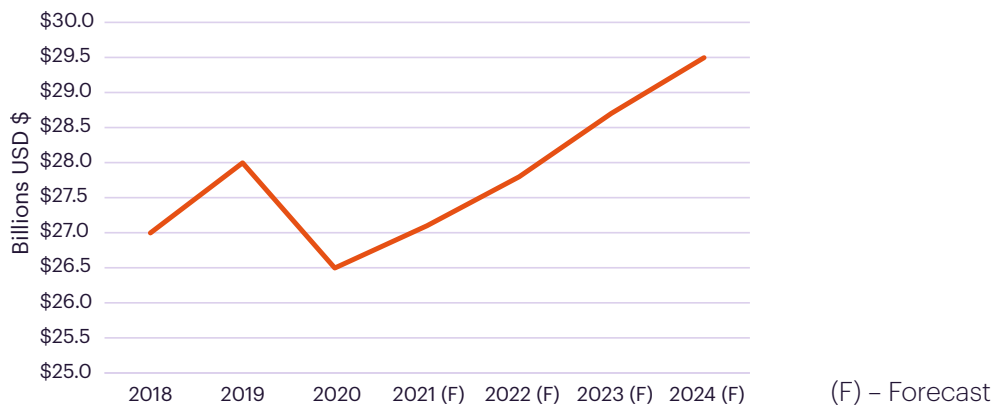
<sup>14</sup> Outsell, Inc., "Segment View: Scientific, Technical & Medical," 7.

<sup>15</sup> Christopher Kenneally, "Scholarly Publishing Through the Brexit Lens," March 27, 2019, <https://bookmachine.org/2019/03/27/scholarly-publishing-through-the-brexit-lens/>.

## Global Market Size

According to Outsell, Inc. the global scholarly publishing market in 2020 (including journals, books, technical information and standards, databases and tools, and medical communications and some related areas)<sup>16</sup> contracted to a value of \$26.5 billion (actual value for the cited year)<sup>17</sup> shrinking by -5% in the wake of the global pandemic.<sup>18</sup> Outsell, Inc. estimates that the market growth rate for the period 2018 to 2024 will be 1.3% (compound annual growth rate) which means that the market will regain its pre-pandemic (2019) value of \$28 billion by 2023.<sup>19</sup>

Fig.1 Total STM Market Value (Source: Outsell, Inc. 2021)



## Global Market Share Journals and Books

Outsell, Inc. measured 2019 revenues from journals, as a format, at \$10.81 billion, representing 39% of total market value, while books represented \$3.19 billion or 11% of total market value. In 2020, Outsell, Inc. found journals to have fallen to a value of \$9.51 billion or 36% of total market value and books to have increased marginally to \$3.21 billion, rising slightly to represent 12% of total market value. The remaining sources of revenue for the industry comprise of publishing platforms and tools, technical information, events, standards, databases and other services.

Fig.2 STM Global Market by Format, 2018 to 2021 (F) (Source: Outsell, Inc. 2021)



<sup>16</sup> The Outsell, Inc. definition of the STM market includes all scholarly disciplines.



<sup>17</sup> This and all other market size figures provided by Outsell, Inc. are at actual values for cited year, i.e. not updated to current values.

<sup>18</sup> Outsell, Inc., "Segment View: Scientific, Technical & Medical," 7.

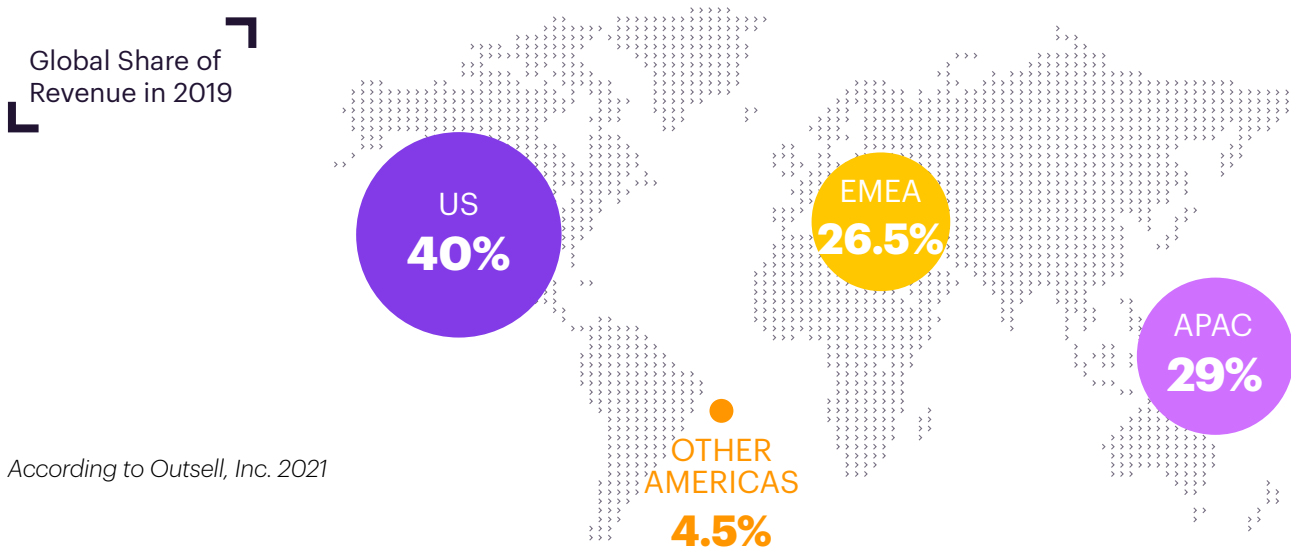
<sup>19</sup> Outsell, Inc., 7.

## Global Share of Revenue in 2020

Fig.3

Market Size in USD\$			Percentage Growth Rate	
2018	2019	2020	2019	2020
\$27bn	\$28bn	\$26.5bn	3.7% 	-5.3% 

(F) - Forecast





Regional share of revenues for the global STM market have remained stable since 2018.

In terms of dollar value, Outsell, Inc. analysis shows that, in 2020, the Other Americas (excepting the US) suffered a decline in revenue of 15%, EMEA revenue fell by 12%, the US by 7% and Asia Pacific by 4%.<sup>20</sup>

<sup>20</sup> Outsell, Inc., 10.

## Industry Segments

Table 1

Segment	Market Size in USD\$			Percentage Growth Rate	
	2018	2019	2020	2019	2020
SciTech	\$14.5	\$14.9	\$13.8	3.0%	-7.9%
Medical	\$12.5	\$13.0	\$12.8	4.5%	-2.4%
Total STM	\$27.0	\$28.0	\$26.5	3.7% 	-5.3% 

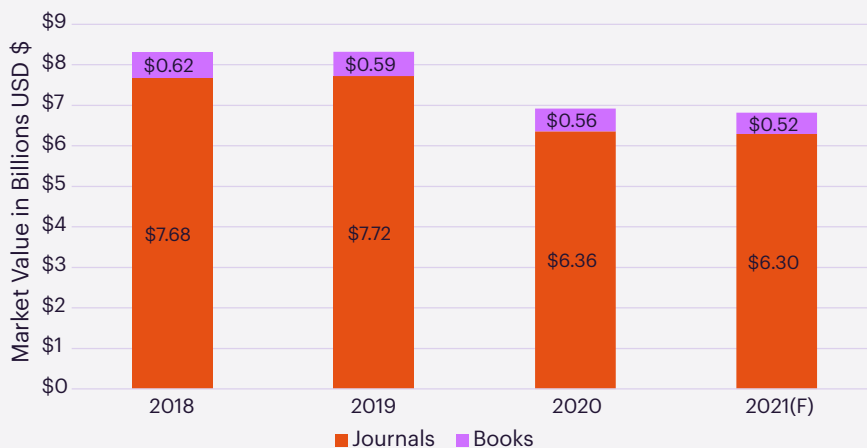
Source: Outsell, Inc. 2021

## Scientific and Technical Information and Solutions

Outsell, Inc. find the Scientific and Technical Information and Solutions segment to amount to \$13.8 billion in 2020 having fallen from \$14.9 billion in the previous year. Outsell, Inc. project a 1% growth rate for this segment in 2021 and a 0.1% compound annual growth rate overall from 2018 to 2024. Scientific and Technical Information and Solutions books experienced a negative growth rate of -5% in 2019 which continued over 2020 and is projected to reach -7% in 2021. Scientific and Technical Information and Solutions journal revenue grew by just 0.5% in 2019 then dropped by -17.7% in 2020. A much improved growth rate of -1% for 2021 is projected by Outsell, Inc.<sup>21</sup>



Fig.4 Scientific and Technical Journals and Books, 2018 to 2021 (F)  
(Source: Outsell, Inc. 2020)



(F) – Forecast

Table 2. Scientific and Technical Information – Global Market Share

Global Region	Value in billions USD, 2020	Percentage of Global Share, 2020	Percentage of Global Share, 2019	Change Points
1. USA	\$5.3	39%	38%	+1
2. EMEA	\$4.2	31%	32%	-1
3. Asia Pacific	\$3,5	25%	24%	+1
4. Other Americas	\$0.7	5%	6%	-1

Source: Outsell, Inc. 2021<sup>21</sup>

<sup>21</sup> Outsell, Inc. "Segment View: Scientific, Technical & Medical," 2021

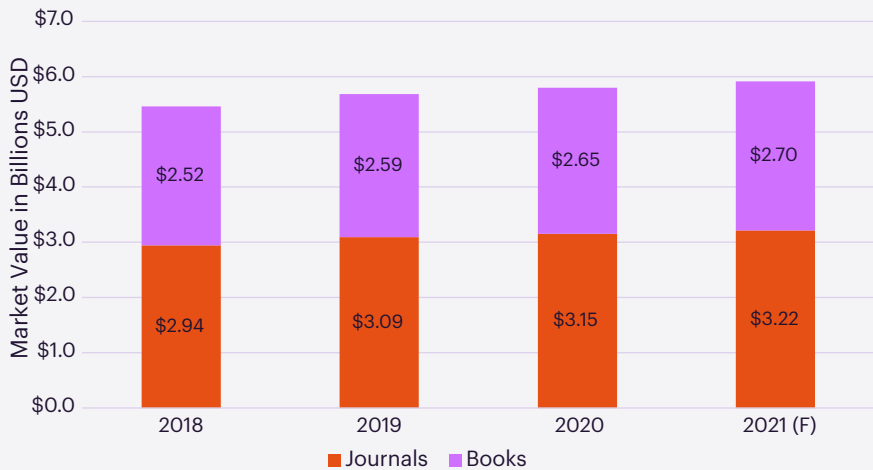


# Medical Information and Solutions



Outsell, Inc. values the Medical Information and Solutions segment at \$12.8 billion overall for 2020, having declined only -2.4% on the previous year. Outsell, Inc. forecasts a compound annual growth rate from 2018 to 2024 at 3.1% for this segment. In 2019, it was worth \$13.1 billion and within this, books and journals had shown strong growth, by 3% and 5% respectively<sup>22</sup>. In 2020, both formats grew at a rate of 2% and Outsell, Inc. forecast this to continue in 2021, see Fig. 5.

Fig.5 Medical Journals and Books, 2018 to 2021(F) (Source: Outsell, Inc. 2020)



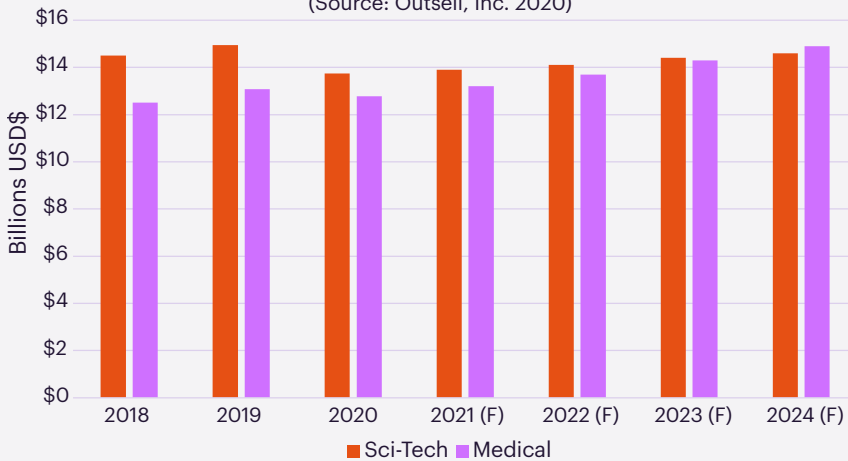
(F) – Forecast

Table 3. Medical Information and Solutions – Global Market Share

Global Region	Value in Billions USD\$, 2020	Percentage of Global Share, 2020
1. USA	\$5.4bn	42%
2. Asia Pacific	\$4.3bn	33.5%
3. EMEA	\$2.7bn	21%
4. Other Americas	\$0.4bn	3.5%

Source: Outsell, Inc. 2021

Fig.6 Sci-Tech and Medical Market Value 2018-2024(F) (Source: Outsell, Inc. 2020)



(F) – Forecast

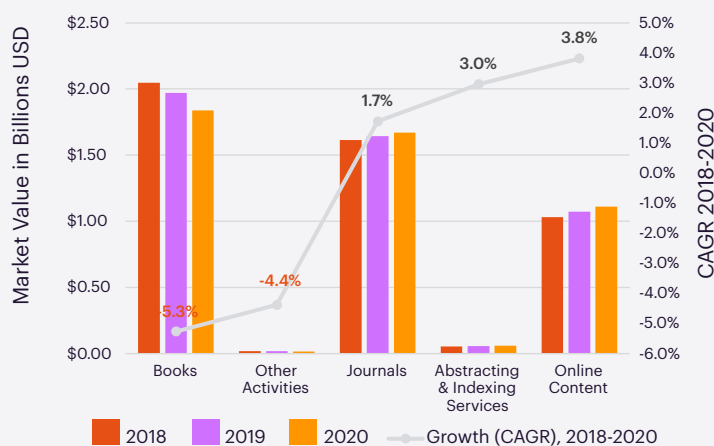
Further narrowing of the gap in value between Sci-Tech and Medical publishing is likely to continue. Outsell, Inc. predict that the Medical Information and Solutions segment will reach greater market value than Scientific and Technical Information and Solutions in 2024..

## Social Sciences and Humanities (SSH)

According to Simba Information, the total market value of the Social Sciences and Humanities (SSH) publishing market<sup>24</sup> in 2020 was \$4.5 billion, having receded by -1.5% since 2019 and with a compound annual growth rate between 2018-2020 of -0.08%.

Books accounted for half the market in 2017 but journals and online content have been taking an increasing share. Simba Information now estimate that journals will overtake books as the largest SSH publishing activity by 2025.<sup>25</sup> Most of the revenue for journals in this segment derives from multi-year licenses to consortia of university libraries that cover subscriptions.<sup>26</sup>

Fig.7 Social Sciences & Humanities 2018-2020  
(Source: Simba Information, 2021)



The COVID-19 pandemic, particularly in terms of closures of book shops and University Campuses, is thought to have had a huge impact on SSH which has traditionally relied on print book sales. Simba found that book publishers also had to reduce print publishing over 2020. The number of titles published globally fell by an estimated -10.9% in 2019 but in 2020 fell by -51.8%.<sup>27</sup> However, it is likely that these figures will significantly vary on a nation-by-nation basis due to differing levels of recovery relating to the pandemic.

Table 4

Publishing Activity in SSH	2018	2019	2020	Change, 2019-2020	CAGR, 2018-2020
Books	\$2,048.1	\$1,970.0	\$1,838.0	-6.7%	-5.3%
Journals	\$1,615.0	\$1,645.0	\$1,671.0	1.6%	1.7%
Online Content	\$1,030.0	\$1,072.0	\$1,110.0	3.5%	3.8%
Abstracting & Indexing Services	\$55.0	\$56.8	\$58.3	2.6%	3.0%
Other Activities	\$17.5	\$17.2	\$16.0	-6.8%	-4.4%
Elimination	(\$134.5)	(\$136.5)	(\$138.4)	1.4%	1.4%
<b>Total</b>	<b>\$4,631.1</b>	<b>\$4,624.5</b>	<b>\$4,554.9</b>	<b>-1.5%</b>	<b>-0.8%</b>

Published with permission of Simba Information. Values in millions USD

*Elimination:* To avoid the double counting created by trading between SSH publishers, particularly in the online content and A&I categories, Simba introduced an elimination line. This is equivalent to eliminating inter-company trading between divisions of a company. Tables will show the gross revenue of each category and the elimination line. This number has grown enormously over the decade as cooperation between rival players has increased, as have royalty rates (which often range from 40% to 70%). Pie charts and calculations that compare market share of publishing activities (i.e., journals, books and online content) are based on estimated revenue, net of elimination.

<sup>24</sup> Simba Information include the following subjects under the category of Social Sciences: anthropology, archaeology, area studies, communications, criminology, cultural studies, economics, education, ethnic and migration studies, gender studies, labour studies, political science, race and ethnicity, religion and sociology; and the following subjects are included in the category of Humanities: classics, history, information science, journalism, languages, linguistics, literature, music, philosophy and visual and performing arts. The overall market and each market segment are divided into four content delivery channels: books, journals, online services (including abstracting and indexing) and other activities. Books include revenue from print and electronic books. Electronic books includes e-books on e-readers, fees and sponsorship of Open Access books, mobile phone downloads as well as collections whether sold outright or through a subscription. Revenue can also come from Open Access business models including book publishing or chapter publishing charges, crowdsourcing or advertising. Graduate-level

textbooks used to train current and future social science and humanities scholars are also counted as books. Journals are defined as print and electronic periodicals and peer-reviewed journals, including newsletters and loose-leafs, that are published at least three times per year. Online content comes primarily from databases including archives but includes software tools and services that go beyond simply delivering e-versions of books or journals. Re-prints, author fees and advertising revenue is included under journals revenues. A&I services include subject-specific products that disseminate content from primary sources. The category of other activities includes; conferences, symposia, and media not included elsewhere such as audiotapes, video, microfilm, microfiche and CD-ROM and DVD content.

<sup>25</sup> Simba Information, Global Social Sciences & Humanities Publishing 2021-2025.

<sup>26</sup> Simba Information.

<sup>27</sup> Simba Information.

## Global Share of Social Sciences and Humanities Revenue

Fig.8

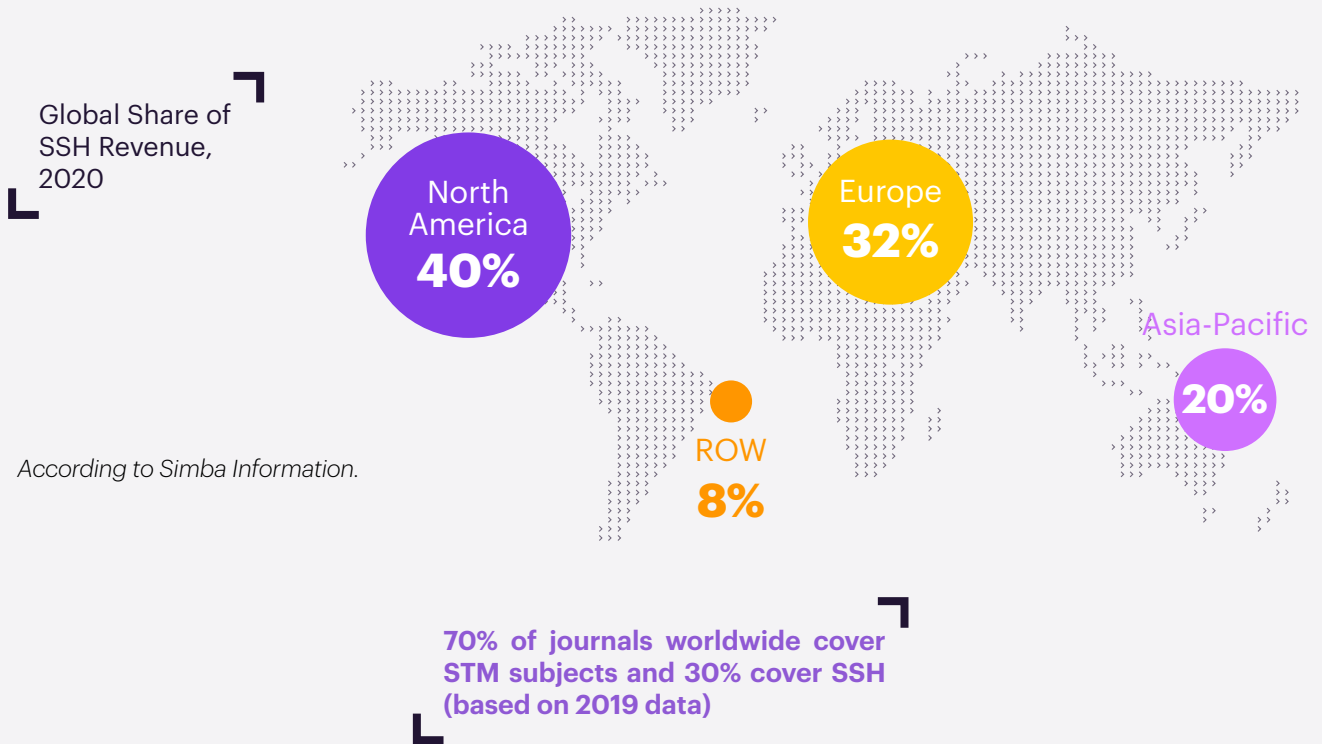
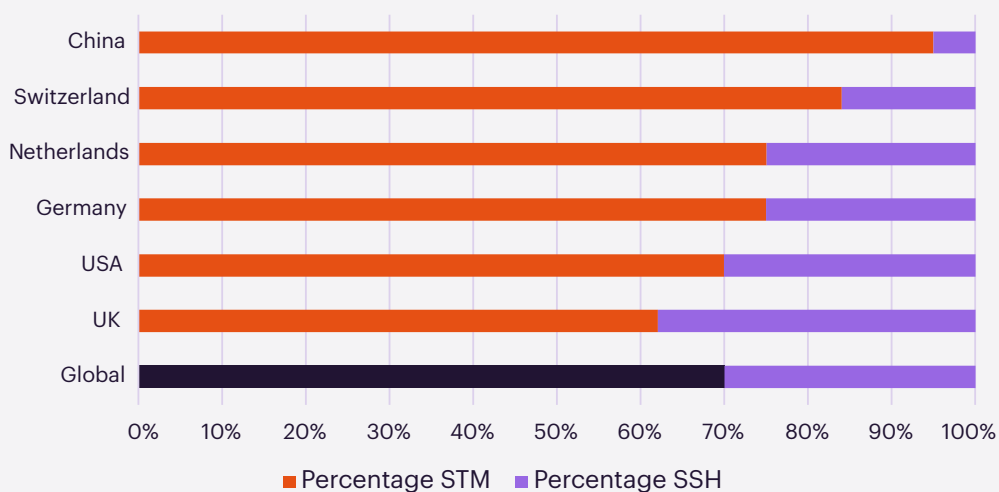


Fig.9

Percentage of STM and SSH Journals among the world's top six journal publishing countries in 2019  
(Source: Shape of Science, 2021)



According to the Shape of Science visualisation tool (based on 2019 data), 17,704 journals cover STM subjects, leaving a remaining 7,604 in SSH subjects and giving an almost exact split of 70% and 30%.<sup>28</sup>

<sup>28</sup> SCImago, n.d, "Shape of Science," accessed March 31, 2021, <https://www.scimagojr.com/shapeofscience/>. Filtering out Arts and Humanities, Business Management and Accounting, Decision Sciences, Economics, Econometrics and Finance, Multidisciplinary, Psychology and Social Sciences

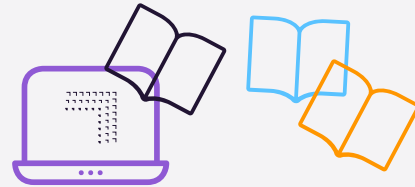
Fig.10



According to SCImago Journal and Country Rank, 2021.

## The Open Access Market

7% of total journal publishing market value is derived from paid-for Open Access.



**Open Access is growing more quickly than the underlying market in terms of both value and volume.**

Though it is increasing its share of the scholarly publishing business models, Open Access is not yet the dominant model.<sup>29</sup>

According to Delta Think, in 2019, the paid Open Access market was worth just over \$760m, up 13% from 2018. They also estimate that it grew to around \$850m in 2020. Just over 30% of all scholarly articles are published as paid-for Open Access, accounting for just over 7% of the total journal publishing market value. Delta Think anticipate a 2019-2022 CAGR of just over 12.5% in OA output and 11.5% in OA market value.<sup>30</sup>



## Library Spending



Scholarly publishers and academic libraries depend on each other to fulfil their missions. The spending capability of academic libraries is a keystone within the scholarly publishing ecosystem. Academic library spending increased by only 1.7% per year between 2015 and 2018.<sup>31</sup> Serials spending is growing, and is taking an increasing share of library budgets (from around 25% share in 1998 to just under 40% share in 2019, according to Delta Think analysis). Over the last twenty years, university budgets have almost doubled in real terms, while the proportion spent on libraries has almost halved.<sup>32</sup>

<sup>29</sup> Michael and Pollock, "News & Views: Open Access Market Sizing Update 2020."

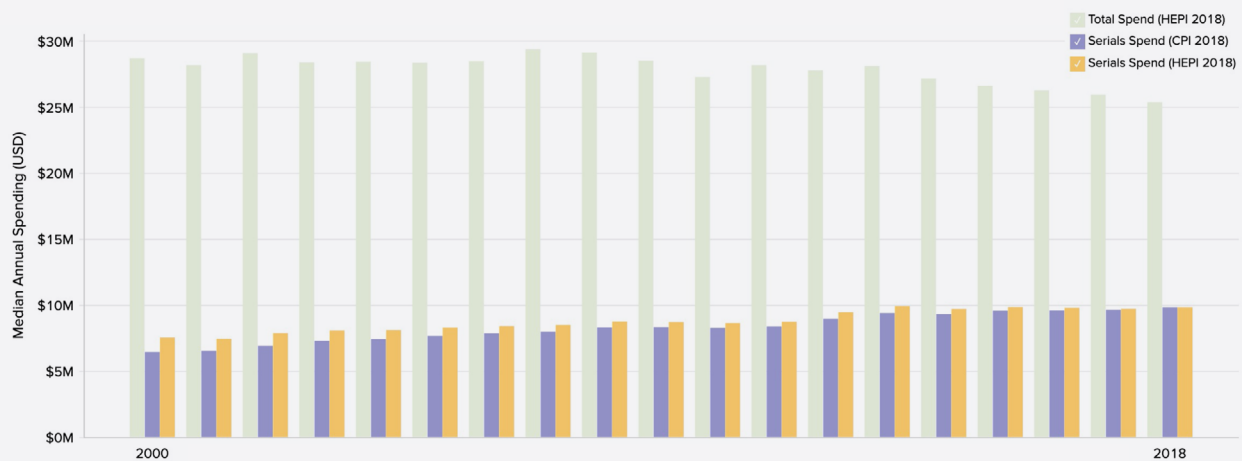
<sup>30</sup> Michael and Pollock.

<sup>31</sup> Simba Information, *Global Scientific & Technical Publishing 2019-2023*, 2019, <https://www.youtube.com/watch?v=5SgWNGCpl5U>.

<sup>32</sup> Michael and Pollock, "Library Spending and the Serials Crisis."

In the US, a survey by Ithaka S+R in 2020, found that 75 percent of academic libraries had received budget cuts. Directors reported that spending on e-books overtook print books for the first time and anticipated that by 2025 spending on e-books will be nearly double that of print books.<sup>33</sup> Streaming media is expected to be a growing area of investment — in fact, spending in this area is expected to rival that for print books in coming years. The impact of the COVID-19 pandemic and the resulting shift to remote work has served to reinforce a pre-existing acceleration toward digital resource acquisition.<sup>34</sup>

Fig.11 Median Annual North American Library Spending (USD, 2018 prices)



Sources: ARL, Commonfund Institute, Delta Think analysis. © 2020 Delta Think, Inc.

## Funding Outlook

Challenges for research funding bodies will also have an inevitable knock-on effect for global scholarly publishing revenues by impacting the supply of research papers.

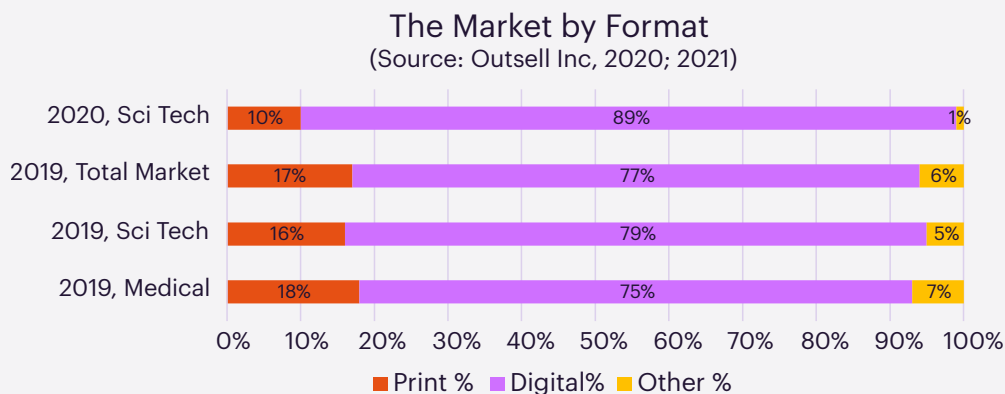
**Some funding bodies are announcing cutbacks due to the unprecedented effect of covid-19.** For example, Cancer Research UK, the charity that funds about half of all UK cancer research, due to the unprecedented financial effect of COVID-19, will cut its research budgets by up to 10%. Similarly, the Canadian Cancer Society forecasts a drop in donations of up to \$100 million in the year ahead, or about half of its budget.<sup>34</sup> Brexit will also deprive the United Kingdom’s research community of EU funding streams.

<sup>33</sup> Jennifer K. Frederick and Christine Wolff-Eisenberg, "Academic Library Strategy and Budgeting During the COVID-19 Pandemic," Ithaka S+R (blog), accessed March 31, 2021, <https://sr.ithaka.org/publications/academic-library-strategy-and-budgeting-during-the-covid-19-pandemic/>.

<sup>34</sup> Jennifer K. Frederick, Roger C Schonfeld, and Christine Wolff-Eisenberg, "The Impacts of COVID-19 on Academic Library Budgets: Fall 2020," The Scholarly Kitchen, December 9, 2020, <https://scholarlykitchen.sspnet.org/2020/12/09/academic-library-budgets-fall-2020/>.

## Formats

Fig.12



Digital formats continue to increase market share, accounting for 77% of the total market in 2019, according to Outsell, Inc. The pandemic served to exacerbate the decline of print by increasing the demand for digital resources that can be shared online. Outsell, Inc. data for the Sci Tech segment in 2020 shows an increase of 10% for digital formats while the category of ‘other’ (comprising of in-person events which were severely hit by the pandemic) lost 4% and print lost 6% of market share.<sup>36</sup>

## Online Services and Platforms



Online services are one of the largest areas of STM publishing products. Delivery is led by the US and Europe where medical data and information forms the largest topical component.<sup>37</sup> Online content also shows the strongest growth rate in SSH publishing with a compound annual growth rate between of 3.8% between 2018 and 2020, according to Simba Information.

A publishing platform is a technological means of delivering digital content, workflow tools, and added functionality to end users.

According to a 2020 report by Outsell, Inc.

**“The STM publishing platform is increasingly a critical piece of content infrastructure, supporting the strategic goals of STM information providers. Emphasis on a platform’s ability to provide added-value services beyond purely text-based content continues to grow and the definition of content now includes audio, video, learning solutions, and test data. Big Data and AI applications are influencing the expectations of the end user for personalization and efficiency of their experience while enticing publishers with opportunities for new revenue streams.”<sup>38</sup>**

<sup>36</sup> Outsell, Inc., “Segment View: Scientific, Technical & Medical.”

<sup>37</sup> Simba Information, STM Online Services 2019-2023, 2020, <https://www.youtube.com/watch?v=XzwlsgqCcrs>.

<sup>38</sup> Outsell, Inc., “STM Platform Providers,” April 9, 2020, <https://www.outsellinc.com/product/stm-platform-providers-2/>.

## Books



Simba Information estimates that the global professional eBook market will decline in 2020 due to the impact of the global pandemic.<sup>39</sup> The academic market however, has experienced an increased demand for digital resources due to the pivot to online learning. According to Simba Information, scientific and technical eBooks represent the biggest eBook segment globally, followed by medicine and law. The USA accounts for 52% of the global e-books market.<sup>40</sup>

The pandemic was also expected to exacerbate the pre-existing downward trend in revenue for academic print books, but this may not be universal. It is notable that the overall rate of decline in revenue for SSH books globally (digital and print) between 2018-19 was almost half that of 2019-20, according to Simba Information. However, recent data on the UK market, for example, indicates a fall of 13% in revenue for academic and professional print books from 2019 to 2020,<sup>41</sup> the same rate of decline (12.8%) observed between 2017 and 2018.<sup>42</sup> This suggests that the impact of the pandemic on the market will show some regional variation.

## Journals



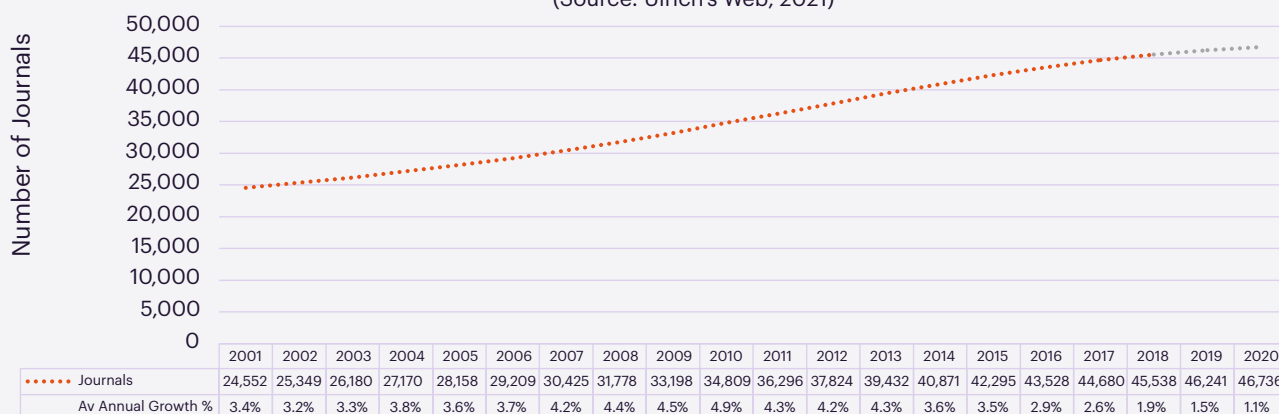
**The number of new scholarly journals is growing at a rate of around 2 to 3% each year.**<sup>43</sup>

The yearly number of peer-reviewed, active, scholarly journals within Ulrich's Web which show an average annual growth rate of 2.3% since 2015. English language journals show an average growth of 2.5% over the same period.

Fig.13

Growth in Number of Journals 2000-2020

(Source: Ulrich's Web, 2021)



In terms of numbers of active journals globally in 2020, Scopus listed 25,648 in October 2020.<sup>44</sup> Web of Science, lists the records of 24,974 journals in October 2021<sup>45</sup> and Ulrich's Web shows records for over forty-eight thousand active, scholarly peer-reviewed journals in all languages.<sup>46</sup> Over thirty-five thousand of these are in the English language. According to Simba Information, the number of new STM journals has fallen each year since 2015.<sup>47</sup>

<sup>39</sup> Simba Information, Scholarly & Professional E-Book Publishing 2020-2024, 2020, <https://www.youtube.com/watch?v=9ALrUtwNOvc>.

<sup>40</sup> Simba Information.

<sup>41</sup> Publishers Association, "Publishing in 2020," accessed May 10, 2021, <https://www.publishers.org.uk/publications/publishing-in-2020/>.

<sup>42</sup> Publishers Association, "The Publishers Association Yearbook 2019" (The Publishers Association, 2020), 75.

<sup>43</sup> According to STM analysis of Ulrich's Web data, September 2021.

<sup>44</sup> According to Scopus data of October 2020.

<sup>45</sup> Web of Science Group, Clarivate, "Web of Science Master Journal List," Database, Web of Science Group, a Clarivate company, accessed October 10, 2021, <https://mjl.clarivate.com/>.

<sup>46</sup> "Ulrich's Web," accessed September 19, 2021, <http://ulrichsweb.serialsolutions.com>.

<sup>47</sup> Simba Information, *Global Scientific & Technical Publishing 2019-2023*.

Fig.14

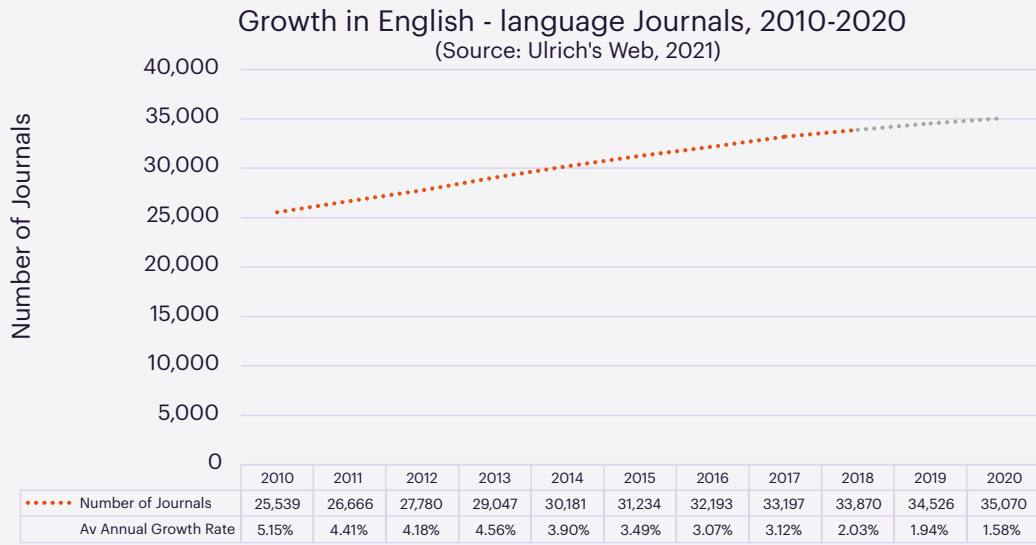
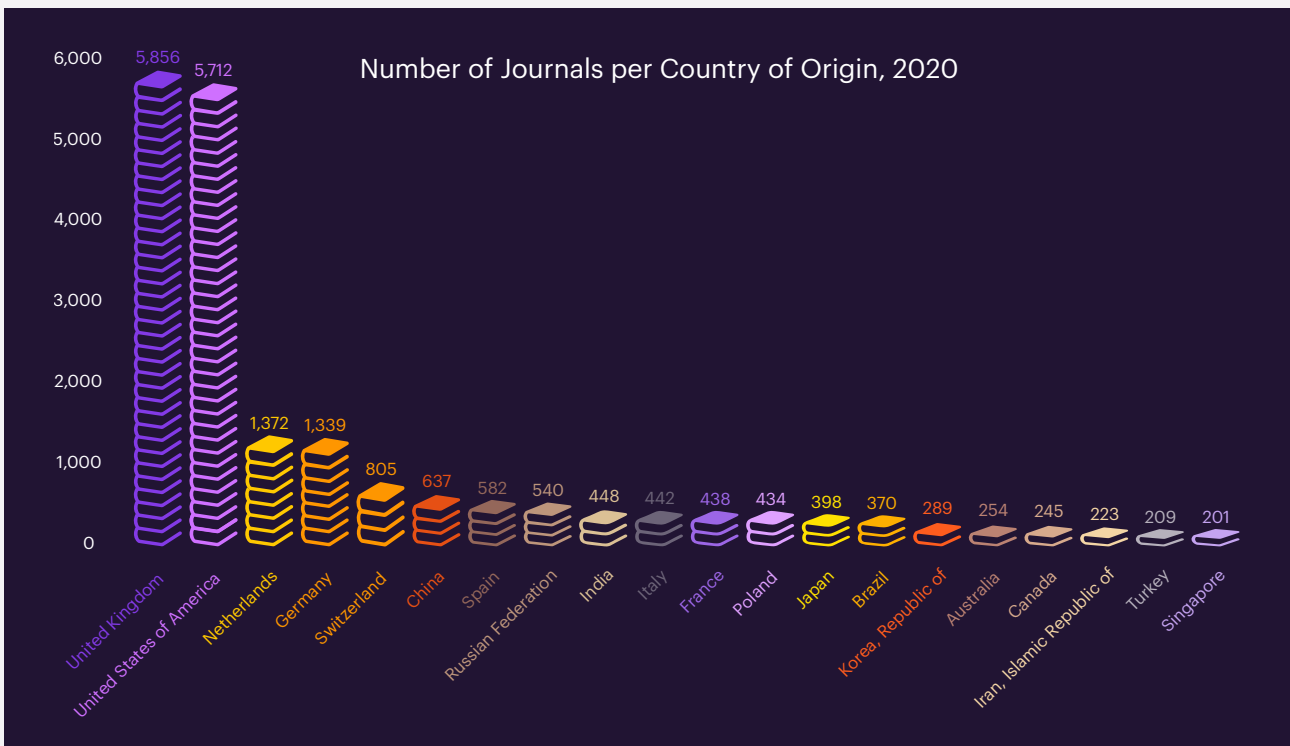


Chart shows active, peer-reviewed, academic / scholarly journals listed in Ulrich's Web. 2019 to 2020 are greyed to indicate these years may be subject to further updates.

Fig.15



According to Scopus data, March 1<sup>st</sup>, 2021. All journals counted published at least one article in 2020.

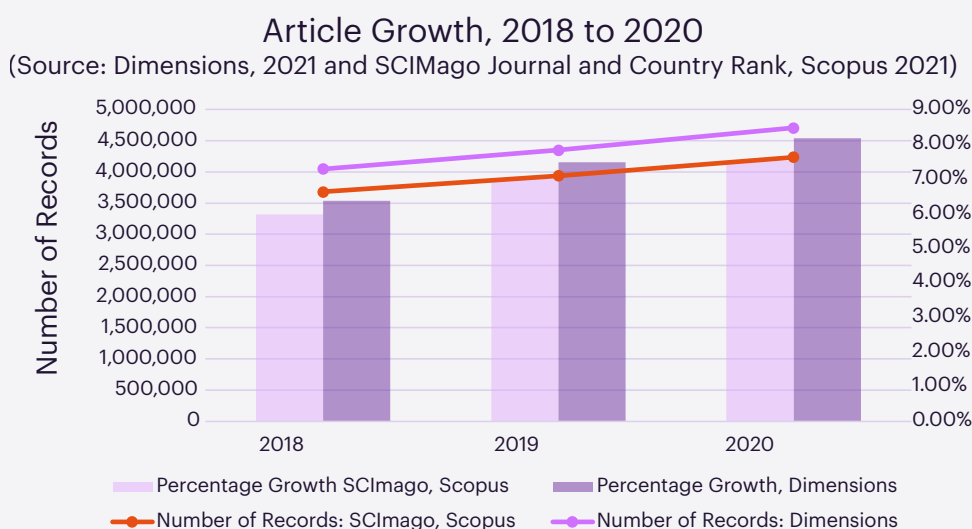


## Article Submissions

The 2018 STM Report observed a yearly growth in articles of 4% and a 5% growth in journals. In 2021, the growth rate in articles published has continued to increase to between 5 and 6.5%, on average, between 2015 and 2020 while the rate of growth in journals has slowed to an average of 2.3% over the same period.

In 2020, Scopus data available via SCImago showed 4.2 million records under the category ‘citable documents’ which includes articles, reviews, conference proceedings and short surveys. Within the Dimensions database, 2020 shows 4.7 million records under the category ‘articles’.

Fig.16



The number of STM articles submitted each year is thought to grow by 3% annually<sup>48</sup> but 2020 may have been a record year for article submissions. According to Christos Petrou’s analysis in *The Scholarly Kitchen*, the market grew by 200,000 papers or 8.1%. Were it not for COVID-related papers, the growth in 2020 would have been just below 5%, making for a strong but unremarkable performance.<sup>49</sup>

Copyright Clearance Center (CCC) reported, according to RightsLink data, total submissions had grown by 25% in aggregate in 2020 and, due to the sheer volume of submissions in many related fields, publishers were dealing with a double-digit growth in submissions - some publishers even reported their submission rates to be five times higher than the same period in the previous year.<sup>50</sup>

<sup>48</sup> Simba Information.

<sup>49</sup> Christos Petrou, “Guest Post – Scientific Output in the Year of COVID, An Update.”

<sup>50</sup> Kenneally, “Publishing in 2021.”

# Global Trends in Output

Fig.17 Growth in articles\* by authors affiliated with national research institutions, 2017 to 2020 (Source: SCImago Journal and Country Rank, 2021)

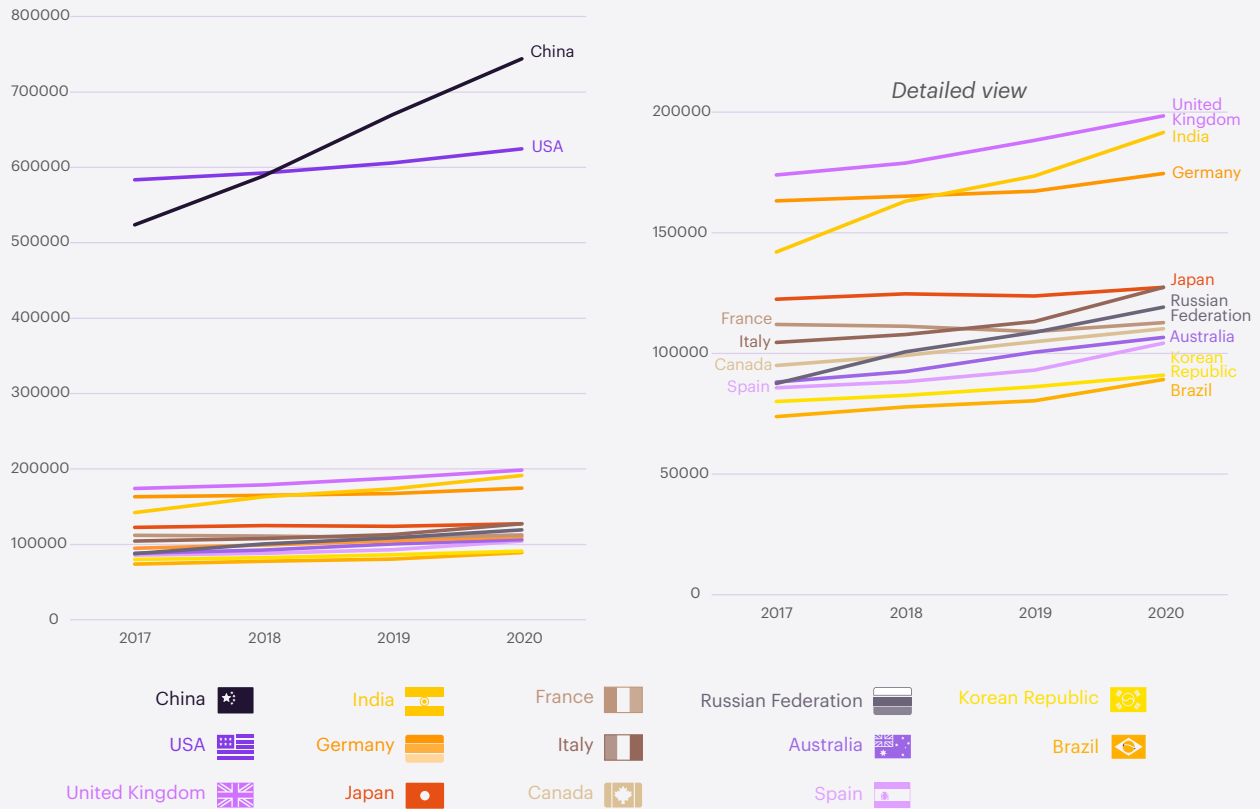


Fig. 17 displays the fourteen countries with the highest number of institutional affiliations with authors who published an article, conference paper, review or short survey between 2017 and 2020.

According to the Institute for Scientific Information, the global research landscape has changed seismically in recent decades, shifting from the dominance of a trans-Atlantic research axis as the strength of Asia-Pacific, Latin America and Middle-East, North Africa and Turkey (MENAT) have grown.<sup>51</sup> The growth in number of papers produced by authors affiliated with institutions in the US and Western Europe compared to those in China, India, Russian Federation, Italy, Spain, Australia and Brazil reflect this trend for change. However, preliminary data concerning the articles produced over 2020, the year of the global pandemic, indicate that this trend may have been disrupted.

<sup>51</sup> Jonathan Adams et al., "The Changing Research Landscape of the Middle East, North Africa and Turkey," Global Research Report (ISI), 1, accessed May 18, 2021, [https://clarivate.com/webofsciencegroup/wp-content/uploads/sites/2/dlm\\_uploads/2021/04/WS647760757-ISI-GRR-Changing-Research-Landscape-of-MENAT-DIGITAL.pdf](https://clarivate.com/webofsciencegroup/wp-content/uploads/sites/2/dlm_uploads/2021/04/WS647760757-ISI-GRR-Changing-Research-Landscape-of-MENAT-DIGITAL.pdf).

Fig.18

Global leaders according to number of articles\* produced by authors affiliated with national research institutions (Source: SCImago, 2021)

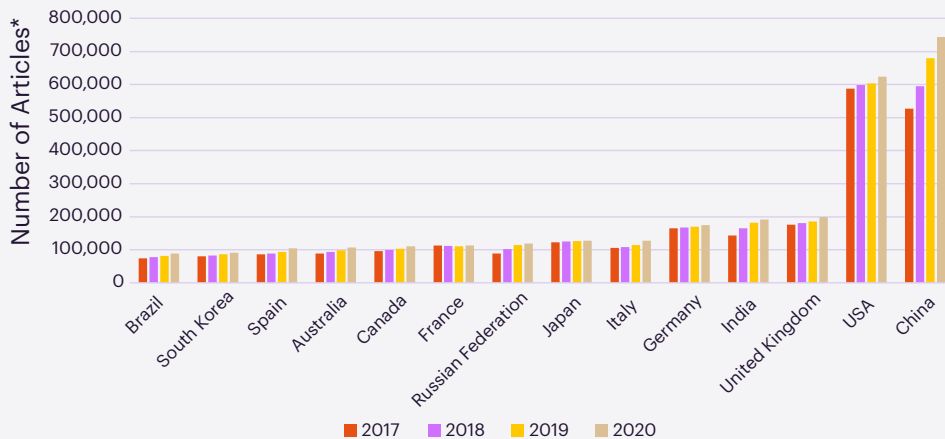
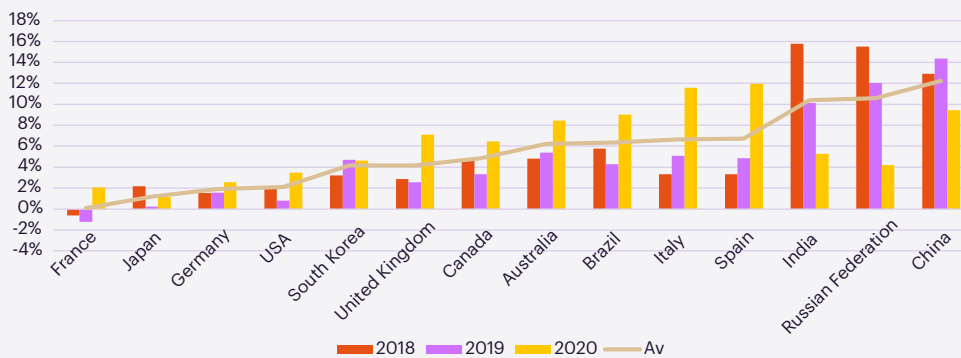


Fig.19

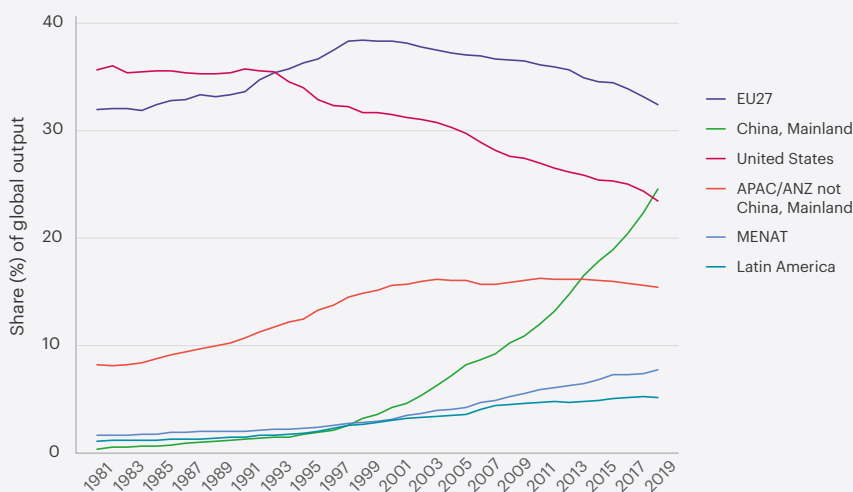
Percentage growth rates in articles\* produced by authors affiliated with national research institutions (Source: SCImago, 2021)



Articles\*: article, conference paper, review or short survey

Fig.20

Change in annual regional or national publication output as a percentage of all journal articles and reviews indexed globally in the Web of Science.<sup>52</sup>



<sup>52</sup>Web of Science data for Mainland China includes Hong Kong and Macau

Fig.21

Growth in Science and Engineering Articles 2008-18  
(Source: NSF, 2019)

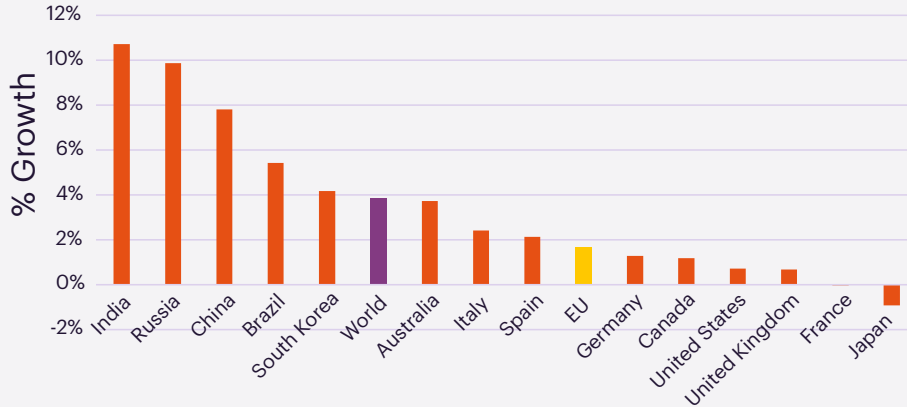
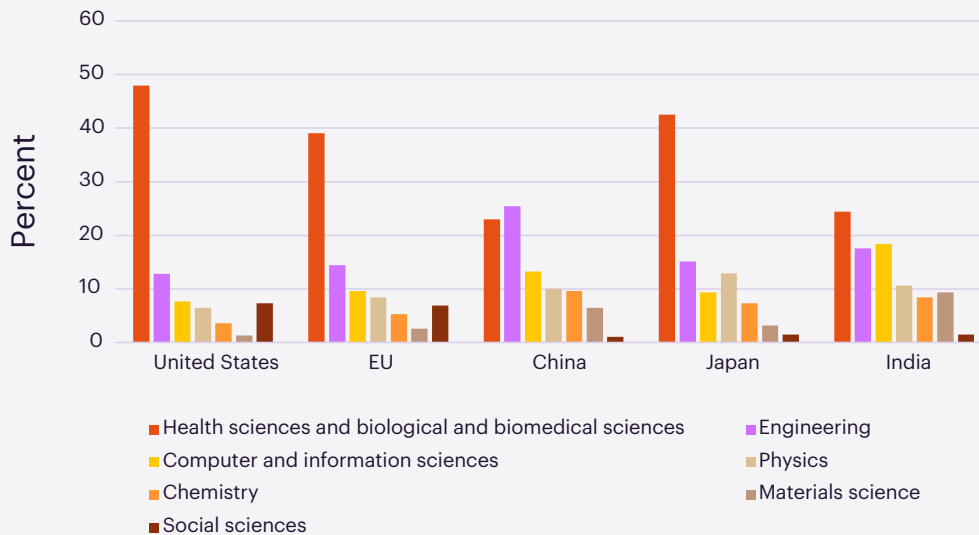


Fig.22

Growth in science and engineering research portfolios by seven largest fields of science by selected region, country, or economy: 2018  
(Source: NSF, 2019)



Sources (Fig 21 and 22): National Center for Science and Engineering Statistics, National Science Foundation; Science-Metrix; Elsevier, Scopus abstract and citation database, accessed June 2019.<sup>53</sup>

Specialization in scientific fields differs among countries, with the United States, the EU, and Japan more specialized in health sciences and China and India more specialized in engineering, as measured by journal articles and conference papers.

<sup>53</sup> White, Karen. "Publications Output: U.S. Trends and International Comparisons." Science and Engineering Indicators 2020. Alexandria, VA: National Science Foundation (NSF), 2019. <https://nces.nsf.gov/pubs/nsb20206/executive-summary>.

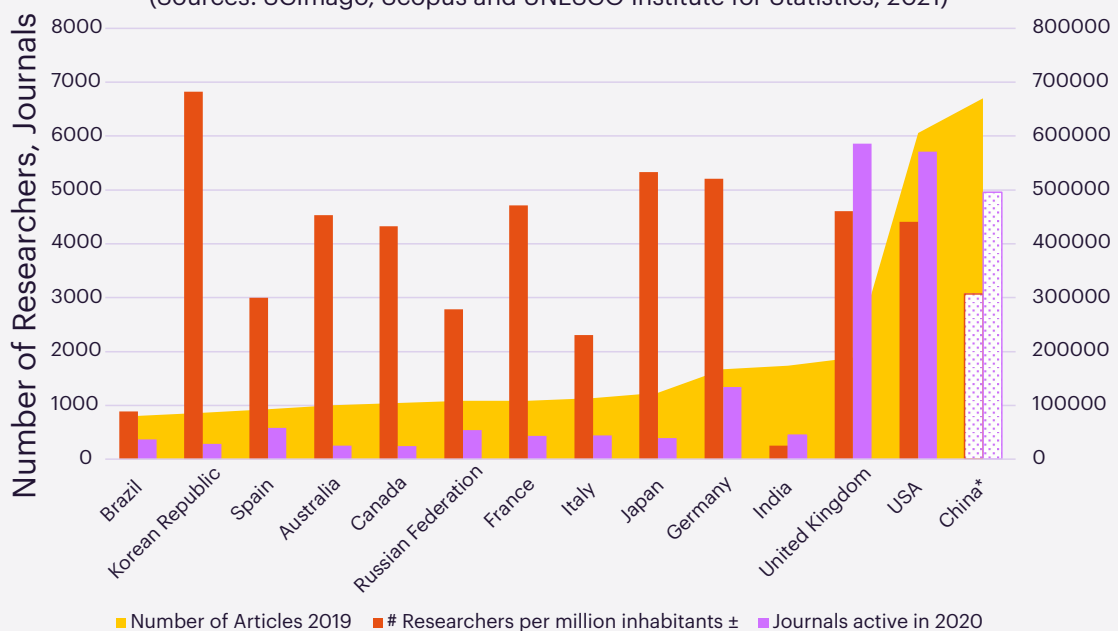
## Research and Development Expenditures

Before the global pandemic, China continued to stride forward in Research and Development spending; it surpassed the European Union in R&D expenditure in 2013, and continued to increase its spending in large increments bringing it very near to surpassing the level of spending in the USA, currently the world’s biggest R&D spender.<sup>54</sup> While China spent 84% of its research funds on experimental development, the US dedicated 62.5%.<sup>55</sup> According to a 2019 report by National Science Foundation, global science and engineering peer-reviewed journal articles and conference papers grew by roughly 4% each year for the past ten years<sup>56</sup> and China’s rate of research output has grown almost twice as fast as this over the same period, while the output of the United States and European Union (EU) has grown at less than half.<sup>57</sup>

In 2018, there were over 11M total personnel working in Research and Development worldwide<sup>58</sup>



Fig.23 Comparing numbers of researchers, journals and articles  
(Sources: SCImago, Scopus and UNESCO Institute for Statistics, 2021)



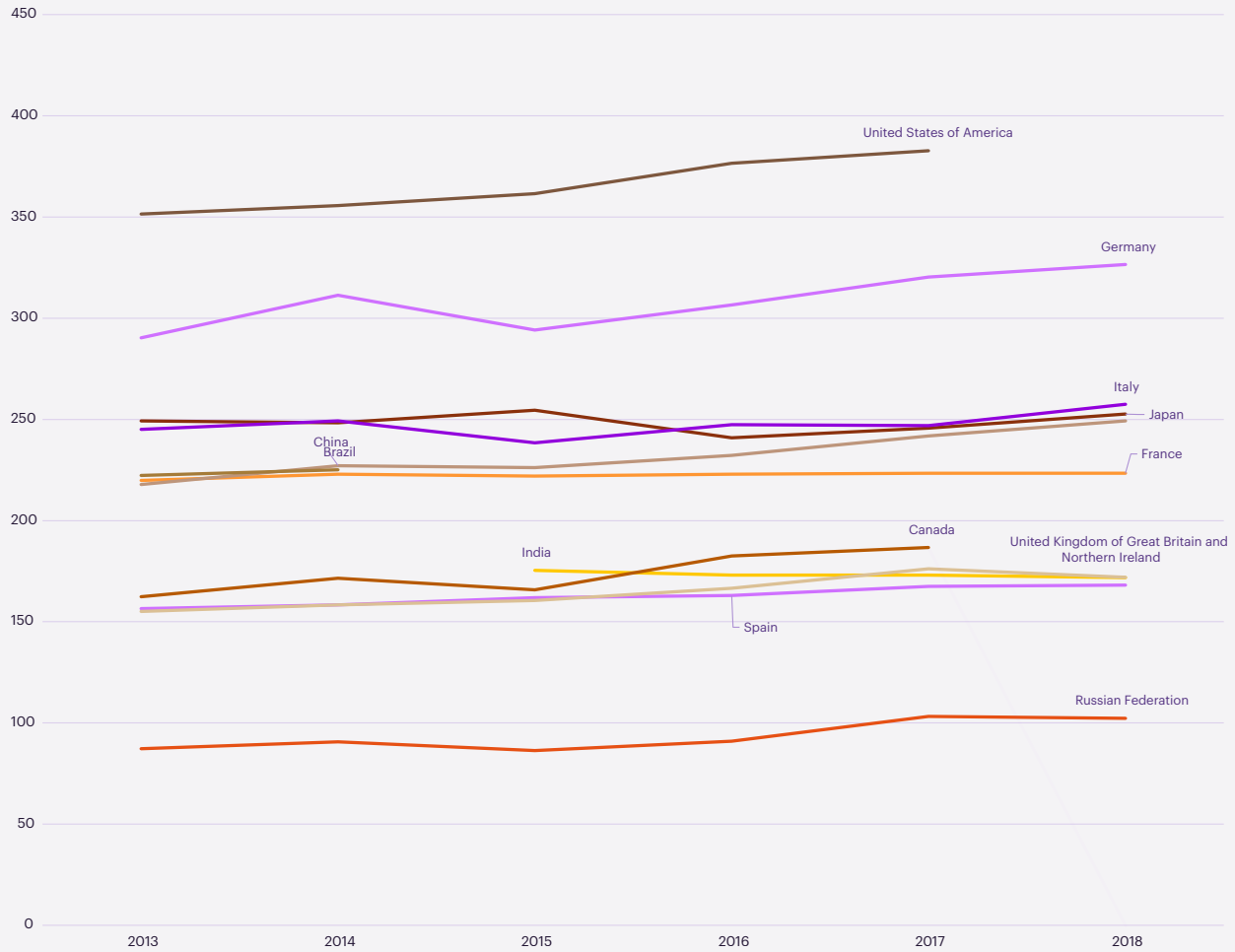
\*While Scopus lists 637 journals published in China, the Blue Book on China’s Scientific Journal Development 2020 gives China 4958 active STM journals alone (the majority are in Chinese and 358 in English). Also, while the UNESCO Institute for Statistics lists 1307 researchers per million inhabitants, the OECD give China a far higher number of researchers; 4 381 443.7 FTE in 2018<sup>59</sup> which, with a population of 1,427,647,786 in 2018<sup>60</sup> gives a researcher per million inhabitant density of 3070. ± to nearest year available. Korean Republic, Brazil, Australia; 2013. USA; 2017. All listed journals, according to Scopus data, published at least one article in 2020. For the purposes of this chart, ‘articles’ include reviews, conference papers and short surveys.

<sup>54</sup> National Science Board, National Science Foundation, “The State of U.S. Science and Engineering 2020 | NSF - National Science Foundation,” Science and Engineering Indicators 2020: The State of U.S. Science and Engineering (Alexandria, VA, 2020), <https://nces.nsf.gov/pubs/nsb20201/global-r-d>.  
<sup>55</sup> World Economic Forum, “Strategic Intelligence | World Economic Forum,” Strategic Intelligence, accessed March 31, 2021, <https://intelligence.weforum.org>.  
<sup>56</sup> Karen White, “Publications Output: U.S. Trends and International Comparisons.”

<sup>57</sup> Karen White.  
<sup>58</sup> UNESCO Institute for Statistics (UIS), “UIS Statistics,” Database, accessed March 31, 2021, <http://data.uis.unesco.org/>. Calculated according to FTE, Data extracted on 05 Mar 2021 04:55 UTC (GMT)  
<sup>59</sup> “OECD Statistics,” accessed April 19, 2021, <https://stats.oecd.org/>.  
<sup>60</sup> “China Population 1950-2021,” accessed April 19, 2021, <https://www.macrotrends.net/countries/CHN/china/population>.

Fig.24

GERD per Researcher (FTE), in '000' current PPP\$, 2013 to 2018 (Source: UNESCO Institute for Statistics)



Data for South Korea, Brazil and Australia unavailable.

GERD per researcher : Total intramural expenditure on R&D performed during a specific reference period per researcher.

Purchasing power parity (PPP): Currency exchange rate that equalises the purchasing power of different currencies.

Fig.25

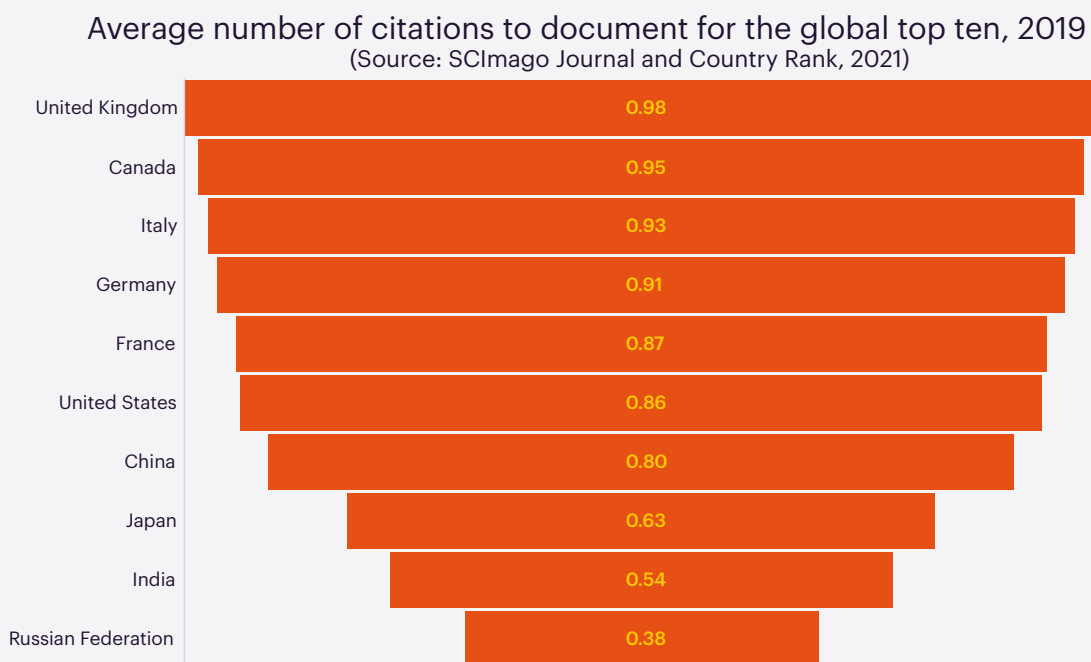
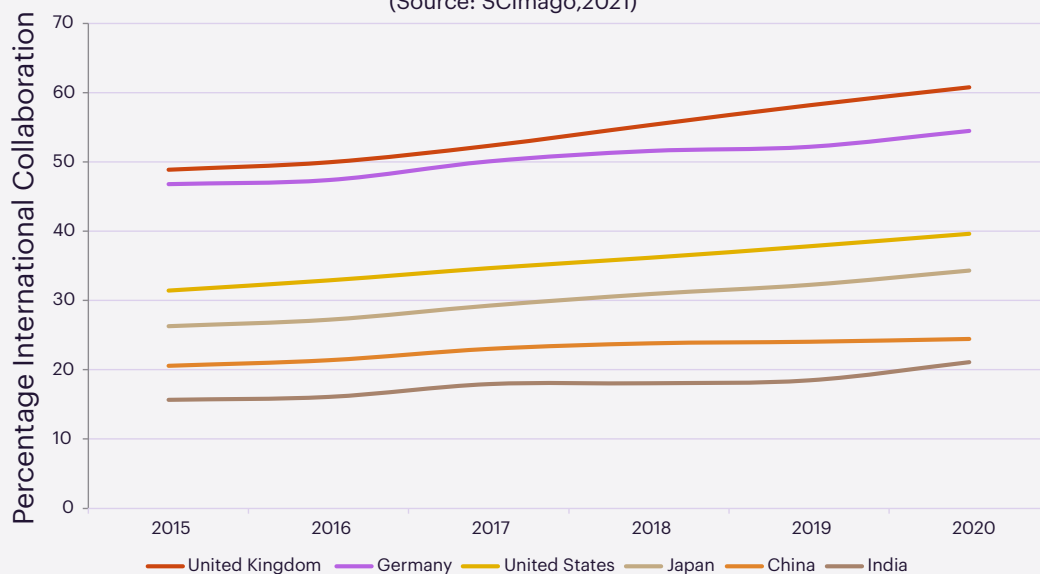


Fig.26

Percentage international collaboration among top six article producing countries, 2019  
 (Source: SCImago,2021)



## Global Regional Analysis

### Asia Pacific

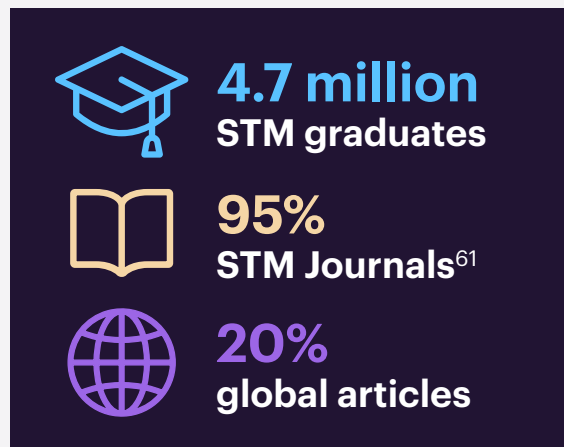
#### China



China holds first place among the upper-middle income economies within the World Intellectual Property Organisation's (WIPO) 2020 Global Innovation Index and is ranked 14<sup>th</sup> globally.<sup>62</sup> According to research by the National Science Foundation, in the field of Science and Engineering, China's rate of research output grew almost twice as fast as the world's annual average between 2009 and 2019, while the output of the United States and European Union (EU) increased at less than half the world's annual growth rate over the period.<sup>63</sup>

China is thought to have the world's greatest number of recent Science, Technology, Engineering and Mathematics (STEM) graduates, recorded at 4.7 million in 2016.<sup>64</sup> In 2020, China produced 8.74 million graduates overall.<sup>65</sup> In addition to this, papers published within China's English language journals are growing faster than those in Chinese language journals within STM disciplines.<sup>66</sup>

China's 14<sup>th</sup> Five Year Plan (covering 2021 to 2025) for National Economic and Social Development and the Outline of 2035 Long-Term Goals, aims to strengthen China's position. It will aim for scientific and technological self-reliance by increasing R&D expenditure and subsidising research through tax credits. During this period, the R&D expenditure of the whole society is proposed to increase by more than 7% annually, and the goal is that the number of high-value invention patents per 10,000 people will increase from 6.3 in 2020 to 12 per 10,000 people in 2025.<sup>67</sup>



According to Clarivate's Web of Science (WoS), **authors affiliated with Chinese organizations contributed to 20% of research articles** and review articles in 2018.<sup>68</sup>

It is important to note that while this growth in academic output is impressive, it is accompanied by a proliferation of fraudulent research papers. The online publication Quartz reported in 2017 that more than **50% of all articles retracted by scientific journals worldwide for fake peer reviews were submitted by Chinese authors**.<sup>69</sup>

In 2019, four organizations including China Association for Science and Technology (CAST) issued "Recommendations on Deepening Reform and Developing World's First-Class STM Journals". To implement the policy, CAST has undertaken the "Chinese Action Plan for Journal Excellence," and a series of measures to elevate China's publications to among the world's best.<sup>70</sup>

<sup>61</sup> According to Shape of Science, 2019 data.

<sup>62</sup> Cornell University, INSEAD, WIPO, Global Innovation Index 2020, xxii.

<sup>63</sup> "Publications Output: U.S. Trends and International Comparisons | NSF - National Science Foundation," accessed February 15, 2021, <https://ncses.nsf.gov/pubs/nsb20206/executive-summary>.

<sup>64</sup> World Economic Forum, "Human Capital Report 2016," accessed March 31, 2021, <http://wef.ch/25XlskM>.

<sup>65</sup> Sabrina Wang, "China's Postgraduate Boom Will Not Solve Underemployment Crisis," Times Higher Education (THE), February 2, 2021, <https://www.timeshighereducation.com/opinion/chinas-postgraduate-boom-will-not-solve-underemployment-crisis>.

<sup>66</sup> China Association for Science and Technology (Organized by), Blue Book on China's Scientific Journal Development (2020) (Science Press, EDP Sciences, 2021), 104.

<sup>67</sup> China Money AI, "China's 14th Five-Year Plan Aims To Increase R&D Spending, Tax Credit To Spur Basic Research," China Money Network (blog), March 9, 2021, <https://www.chinamoneynetwork.com/2021/03/09/chinas-14th-five-year-plan-aims-to-increase-rd-spending-tax-credit-to-spur-basic-research>.

<sup>68</sup> Christos Petrou, "Guest Post – Quantifying the Impact of the New Chinese Policy," The Scholarly Kitchen, March 16, 2020, <https://scholarlykitchen.sspnet.org/2020/03/16/guest-post-quantifying-the-impact-of-the-new-chinese-policy/>.

<sup>69</sup> Mini Gu, "The Economy of Fraud in Academic Publishing in China," World Education News + Reviews, April 3, 2018, <https://wenr.wes.org/2018/04/the-economy-of-fraud-in-academic-publishing-in-china>.

<sup>70</sup> China Association for Science and Technology (Organized by), Blue Book on China's Scientific Journal Development (2020), Foreword.



## Asia Pacific



### Japan

Japan's global share of articles declined by more than a third between 2005 and 2015<sup>71</sup> while its rate of publication remained stable. Between 2017 and 2019 this trend has continued, with article numbers only varying by a few thousand each year while countries such as China and India have increased their production by large increments<sup>72</sup>. The government's policy towards national universities, in particular cuts to funding for basic expenses, is thought to have weakened the foundations of scientific research. Another factor is the country's declining population, meaning fewer researchers, and flat research investment.<sup>73</sup> Japan's contribution to high-quality scientific research fell by 19.9% on the Nature Index between January 2012 and October 2018.<sup>74</sup> While global competition has increased, Japan continues to produce high quality research, particularly in the sciences and has received 19 Nobel Prizes in the sciences since the year 2000.



**19**  
Nobel Prizes in  
the Sciences



**1/3**  
Decrease in  
global share of  
article publishing



**5000+**  
Researchers per  
million inhabitants



### India

**India has the second highest number of STEM graduates, at 2.6m in 2016<sup>75</sup> and as of 2018, overtook the output of Germany in terms of articles produced by authors affiliated with national institutions.<sup>76</sup>**

The market is growing strongly and there is a high output of good quality scientific papers but the percentage of articles published in so-called "predatory" journals is also high. India is notable for a strong domestic research base but despite its volume it has yet to sustain high citation impact across the breadth of its research portfolio and its international collaborative output is visibly more highly cited than the domestic output.<sup>77</sup> Though within the top tier in terms of number of articles produced by authors affiliated with national institutions in 2019, India has the lowest density of researchers per million inhabitants which, though reflective of its sizable population, indicates strong potential. India's growth is close to that of the UK in both article output and GERD investments per researcher as shown in Fig 17 and 24.



**2.6 million**  
STEM graduates



**252**  
Researchers per  
million inhabitants

<sup>71</sup> Nicky Phillips, "The Slow Decline of Japanese Research in 5 Charts," Nature Index News, March 23, 2017, <https://www.natureindex.com/news-blog/the-slow-decline-of-japanese-research-in-five-charts>.

<sup>72</sup> SCImago, "SJR — SCImago Journal & Country Rank [Portal]," 2021, <http://www.scimagojr.com>.

<sup>73</sup> Nicky Phillips, "The Slow Decline of Japanese Research in 5 Charts."

<sup>74</sup> Springer Nature Group, "Press Release: Growing International Collaboration Not yet Enough to Halt Decline in Japan's Research Output | Corporate Affairs Homepage | Springer Nature" (March 20, 2019), <https://group.springernature.com/br/group/media/press-releases/growing-international-collaboration-not-yet-enough/16556176>.

<sup>75</sup> World Economic Forum, "Human Capital Report 2016."

<sup>76</sup> SCImago, "SCImago Journal and Country Rank."

<sup>77</sup> Adams, Jonathan, David Pendlebury, Gordon Rogers, and Martin Szomszor. "Global Research Report on South and Southeast Asia." Institute for Scientific Information, 2019. <https://clarivate.com/webofsciencegroup/campaigns/south-and-east-asia/>.

## North America USA



The scholarly publishing sector in the United States is continuing to provide value while facing multiple challenges. University presses need subsidies from their universities, learned societies depend on income from publications and libraries have seen their budgets squeezed for the past 25 years.<sup>78</sup>

Scientific impact, as measured by highly cited publications, shows the United States is among the leading countries with close to twice as many citations as would be expected given U.S. production levels.<sup>79</sup> The USA is ranked third among high income economies in the WIPO Global Innovation Index 2020.<sup>80</sup>



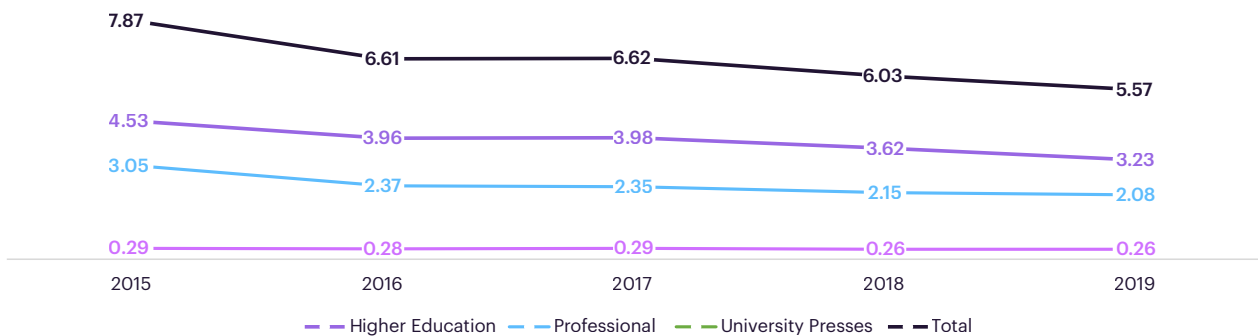
**40%**  
Global Share of  
Market Revenue

According to the Association for American Publishers, 2019 brought revenue decline for both professional and higher education publishing sectors. The higher education category fell by -10.9% to \$3.23 billion. Professional publishing revenue fell by -3.7% year-over-year to \$2.08 billion.<sup>81</sup> University Presses appear to have remained most stable in terms of revenue, growing by 1.1% from 2018 and 2019.<sup>82</sup>



**Ranked 1<sup>st</sup> in the  
Global Nature Index  
for high quality  
research output**

Fig.27 USA Scholarly Publishing Sector by Revenue (in Billions USD) 2015 - 2019



## Canada



38% of publications are above world average citation impact compared to 31% for the G20 as a whole and scholarly publishing efforts remain strongest in health and natural sciences.<sup>83</sup>



<sup>78</sup> Albert N. Greco, *The Business of Scholarly Publishing: Managing in Turbulent Times* (New York: Oxford University Press, 2020).

<sup>79</sup> Karen White, "Publications Output: U.S. Trends and International Comparisons."

<sup>80</sup> Cornell University, INSEAD, WIPO, *Global Innovation Index 2020*, 23.

<sup>81</sup> Association of American Publishers (AAP), "Annual Stat Shot Report 2019; Publishing Industry Revenue & Market Trends," July 31, 2020. Note: AAP's

statistical reports are based on data submitted by participating publishers and distributors by survey. Figures for non-participants are estimated.

<sup>82</sup> Association of American Publishers (AAP).

<sup>83</sup> Jonathan Adams, Gordon Rogers, and Martin Szomszor, "The Annual G20 Scorecard – Research Performance 2019" (Institute for Scientific Information), 4, accessed May 17, 2021, <https://clarivate.com/webofsciencegroup/campaigns/the-annual-g20-scorecard-research-performance-2019/>.

## Europe



**Research and development expenditure across the European Union 2017-19 as a percentage of GDP saw a slight increase rising from 2.08 in 2017 to 2.11 in 2018 and 2.14 in 2019.<sup>84</sup> According to Eurostat, more than three million researchers were identified across the European Union in 2019.<sup>85</sup>** The European Union also produced 24% of global Scientific and Engineering articles in 2018.<sup>86</sup>

In the World Intellectual Property Organisation's (WIPO) 2020 Global Innovation Index, Switzerland is ranked first globally, followed by Sweden in second place. The UK is ranked fourth, the Netherlands fifth, Denmark sixth, Finland seventh and Germany ninth. It is hardly surprising therefore, that in terms of global regions, both North America and Europe lead global innovation. Five of the countries in the top ten, and twelve in the top twenty five, are current European Union member-states.<sup>88</sup>

Germany is ranked third in the world by Nature Index for high quality research output (after the USA and China).<sup>89</sup> From 2015 to 2019, Germany accounted for 24% of output in Europe and 7.5% worldwide.<sup>90</sup>

The UK left the European Union on 31st January 2020. According to Scopus data, the UK was publishing the greatest number of active journals worldwide in 2020<sup>91</sup> and authors affiliated with UK institutions produced the most articles<sup>92</sup> both within the European Union and as geographical region from 2018 to 2020.<sup>93</sup> Journals published in the UK in 2020 outnumbered those published by all European Union member states combined by 50%.<sup>94</sup> Brexit has already likely exacerbated a fall in UK university income from foreign students and research funding in the UK will be challenged

by the loss of EU funding streams. According to The Publishers Association 2020 Yearbook, the UK's income from academic publishing grew by 3% to provide a total income of £3.3 billion while print revenues declined in double digits and digital revenues increased.<sup>95</sup>

In terms of articles produced by authors affiliated to national institutions, both Italy and the Russian Federation have now overtaken France (see Fig. 17) While international collaboration has boosted citation impact for the Russian Federation, domestic research is generally cited less than world average.<sup>96</sup>

Italy and Spain have shown impressive growth in article output since 2017, showing an average growth rate over the period of three times that of Germany (Fig.19).



**As a global block, the EU27 produced the most articles worldwide from 1993 to 2019**



**The UK publishes the greatest number of academic journals worldwide**



**3 million Researchers across the EU in 2018**

<sup>84</sup> "Research and Development Expenditure (% of GDP) - European Union | Data," accessed April 20, 2021, <https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS?locations=EU>.

<sup>85</sup> Eurostat, "Total Researchers by Sectors of Performance - Head Count," Database, accessed March 31, 2021, <https://ec.europa.eu/eurostat/databrowser/view/tsc00003/default/table?lang=en>.

<sup>86</sup> Karen White, "Publications Output: U.S. Trends and International Comparisons."

<sup>87</sup> Cornell University, INSEAD, WIPO, Global Innovation Index 2020, 33.

<sup>88</sup> Cornell University, INSEAD, WIPO, 11.

<sup>89</sup> Springer Nature Group, "2021 Tables: Countries/Territories | 2021 Tables | Countries/Territories | Nature Index," accessed September 27, 2021, <https://www.natureindex.com/annual-tables/2021/country/all>.

<sup>90</sup> Nature Index, 2020. "German science on the world stage: visualized", available at [German science on the world stage: visualized \(nature.com\)](https://www.nature.com/science-on-the-world-stage/visualized) accessed on 14/03/2020

<sup>91</sup> Elsevier, "Scopus," March 2, 2021.

<sup>92</sup> Articles, reviews, conference proceedings and short surveys

<sup>93</sup> SCImago, "SCImago Journal and Country Rank."

<sup>94</sup> Elsevier, "Search 'All Journals with at Least One Article Published in 2020 by Country,'" March 2, 2021.

<sup>95</sup> Publishers Association, "The Publishers Association Yearbook 2020" (The Publishers Association, n.d.), 65.

<sup>96</sup> Adams, Rogers, and Szomszor, "The Annual G20 Scorecard – Research Performance 2019," 4.



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## With thanks to...



## With special thanks to



The image features a dark blue background with a subtle, light-colored grid of small squares. The squares are arranged in a pattern that is slightly offset and fades out towards the bottom right. In the center of the image, the letters "STM" are displayed in a bold, white, sans-serif font. The letters are slightly shadowed, giving them a three-dimensional appearance as if they are floating above the grid. The "S" and "M" have small, light blue L-shaped accents at their top-right and bottom-left corners, respectively, which align with the grid lines.

**STM**