



# Bibliometric analysis of publications funded by the STFC

# Executive summary

---

## STFC funded publications result in excellent research.

The UK Science and Technology Facilities Council (STFC) funds the United Kingdom's "critical large-scale research infrastructures"<sup>1</sup> and funds research mainly in the areas of particle physics, nuclear physics, space science, and astronomy. It operates under UK Research and Innovation along with the other research councils, Innovate UK, and Research England.

The aim of this study is to provide a quantitative analysis of research publications arising from research funded by the STFC, as reported in Researchfish and to benchmark them against publications in the same research areas within the United Kingdom and the world.

For the publishing period 2006–2018, 37,981 publications funded by the STFC could be matched to the Scopus database. In this report, these are referred to as *STFC funded publications* or *the STFC corpus*.

On average, these publications had a Field-Weighted Citation Impact (FWCI) of 2.0. This means that their scholarly (citation) impact is twice the global average for their field. In the same period, over 4% of the STFC funded publications were among the top 1% most cited publications globally. Both indicators strongly suggest that STFC funding enables excellent research. The average scholarly impact for the STFC corpus has not only exceeded the world average (1.0), but also the UK average (1.6). The average scholarly impact as well as the share of top

cited publications remained stable for most of the analysis period.

The majority of the publications were in the fields of ASTROPHYSICS AND ASTRONOMY, NUCLEAR AND HIGH ENERGY PHYSICS, and SPACE AND PLANETARY SCIENCES.

On average, STFC funded publications accounted for 14%–15% of UK publications in their respective subjects and elevated the scholarly impact of the United Kingdom in those subjects. In particular, these publications accounted for 64% of all UK publications in ASTROPHYSICS AND ASTRONOMY.

Most of the publications were published as articles, followed by conference papers. The share of open access publications steadily increased throughout the analysis period.

STFC funded publications were highly international, mainly driven by the nature of the subject fields, which are focused on large experiments. More than 80% of the STFC corpus was co-authored with international collaborators. The United States, Germany, and France were some of the most represented countries alongside the United Kingdom.

While most of the publications were produced by academic and government institutions, the number of corporate entities publishing in the STFC corpus has been growing. In the analysis period, the share of publications with academic–corporate collaboration doubled, from 4% to over 8%.

---

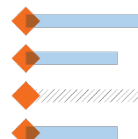
<sup>1</sup> <https://stfc.ukri.org/about-us/our-purpose-and-priorities/>

# Key findings



37,981

Number of publications in the STFC corpus (2006–2018)



2.0

FWCI of STFC funded publications (2006–2018)



4%

Share of STFC funded publications in top 1% most cited (2006–2018)



34%

Share of STFC funded publications in top 10% most cited (2006–2018)



80%

Share of STFC funded publications resulting from international collaboration (2006–2018)



2.3

Average FWCI of STFC funded publications resulting from international collaboration (2006–2018)



5.7%

Share of STFC funded publications with academic-corporate collaboration (2006–2018)



3.7

Average FWCI of STFC funded publications with academic-corporate collaboration (2006–2018)

# Contents

---

	Executive summary	2
	Key findings	3
	Methodology and scope	5
<b>1</b>	Scholarly output, impact, and excellence	8
<b>2</b>	Research collaboration	27
<b>3</b>	Topics of prominence	42
	Appendix A	49
	About	53
	Authors	54

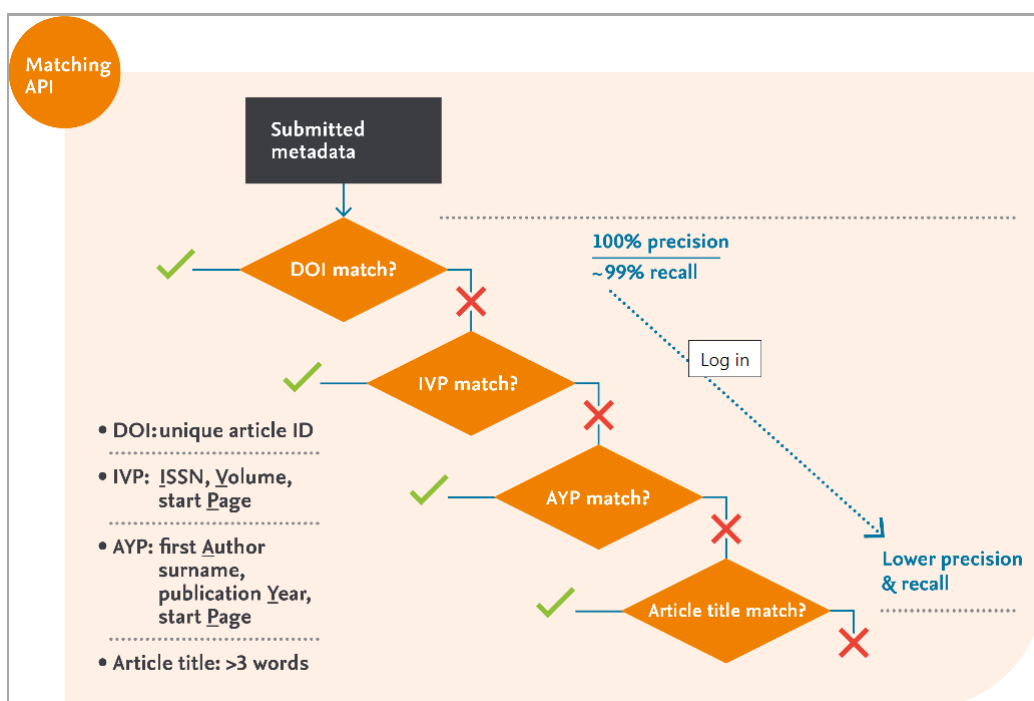
---

# Methodology and scope

## Defining the corpus

To analyse a research area through bibliometrics, the corpus—or set of publications—must first be defined. The corpus analysed in this report was defined through input provided by the STFC, as they were extracted from Researchfish.

The publication list provided by the STFC was matched against Scopus through a two-stage process. The first stage included using the Scopus matching API service, which is optimised for precise matches, even if the perfect metadata are entered. The service analyses provided metadata and uses matching combinations that provide accurate results first and that will cascade into other combinations. The graphic below shows a high-level workflow of the matching logic. Matching is based on metadata (e.g., DOI, IVP (ISSN, Volume, Issue, and first page), article title, publication year, and first author surname). The matching module is based on an advanced algorithm that leverages the metadata listed above by conducting distributed exact and 'fuzzy' matching lookups.



Any unmatched publications from the first stage were searched for in web search engines manually, to obtain a DOI, to be then matched against Scopus. This was necessary as, title field for publications with special characters made precise matching against Scopus difficult without a digital identifier. Also, the metadata for a large number of publications were insufficient or inconsistent, which meant it was not possible to identify a publication correctly via a manual search.

The matching exercise highlights the essential need to include a digital identifier with any publication data in repositories to ensure that publications are identified and attributed correctly.

#### Summary statistics for the corpus

- The original input file from the STFC included 52,607 rows of publication data.
- The first-stage matching resulted in ~85% matching to Scopus.
- Manual matching resulted in ~89% matching to Scopus. A total of 5,700 rows of publication data could not be matched to Scopus, either because the DOI did not match or because there were insufficient metadata to be able to identify a publication correctly. Publication in preprint servers, such as arXiv, is also an important outlet for STFC funded publications, and at the time of the data extraction these sources were not yet covered in Scopus.
- Of the 46,907 publications matched, 3,344 were duplicate records, resulting in a total of 43,563 unique publications that were matched to Scopus. Of these, 37,981 were for the period 2006–2018. These publications were used for the analyses presented in this report and are referred to throughout as *the STFC corpus* or *STFC funded publications*.

#### Description of indicators used in this report

- **Scholarly output** refers to the main types of peer-reviewed documents: articles, reviews, and conference papers that are indexed in Scopus.
- **Field-Weighted Citation Impact** is an indicator of the citation impact of a publication. It is calculated by comparing the number of citations received by a publication with the number of citations expected to be received by a publication of the same document type, publication year, and subject. The indicator is always defined with a world average baseline of 1.0. An FWCI of 1.0 indicates that the publications have been cited the same amount, on average, as the world average for similar publications. An FWCI of greater than 1.0 indicates that the publications have been cited more than would be expected based on the world average for similar publications—for example, a score of 1.4 means that the outputs have been cited 40% more than expected. An FWCI of less than 1.0 indicates that the publications have been cited less than would be expected based on the world average for similar publications—for example, a score of 0.9 means the publication is 10% less cited than the world average.
- **Collaboration** (i.e., research collaboration) is defined as a publication resulting from the efforts of two or more authors. An international collaboration is defined as a publication with co-authors affiliated to institutions from two or more countries.
- **Academic- Corporate Collaboration** is defined as a publication in which both corporate and academic entities are included in the author affiliation byline.
- **Outputs in Top Citation Percentiles** indicate the extent to which an entity's publications are present in the most cited percentiles of a data universe—that is, how many publications of an entity are among the top 1%, 5%, 10%, or 25% of the most cited publications worldwide. In this report, we focus on the top 1% as an indicator of excellence.

### Period of analysis

This study looks at the 2006–2018 period because at the time of data extraction 2018 was the last complete year of publications in Scopus.

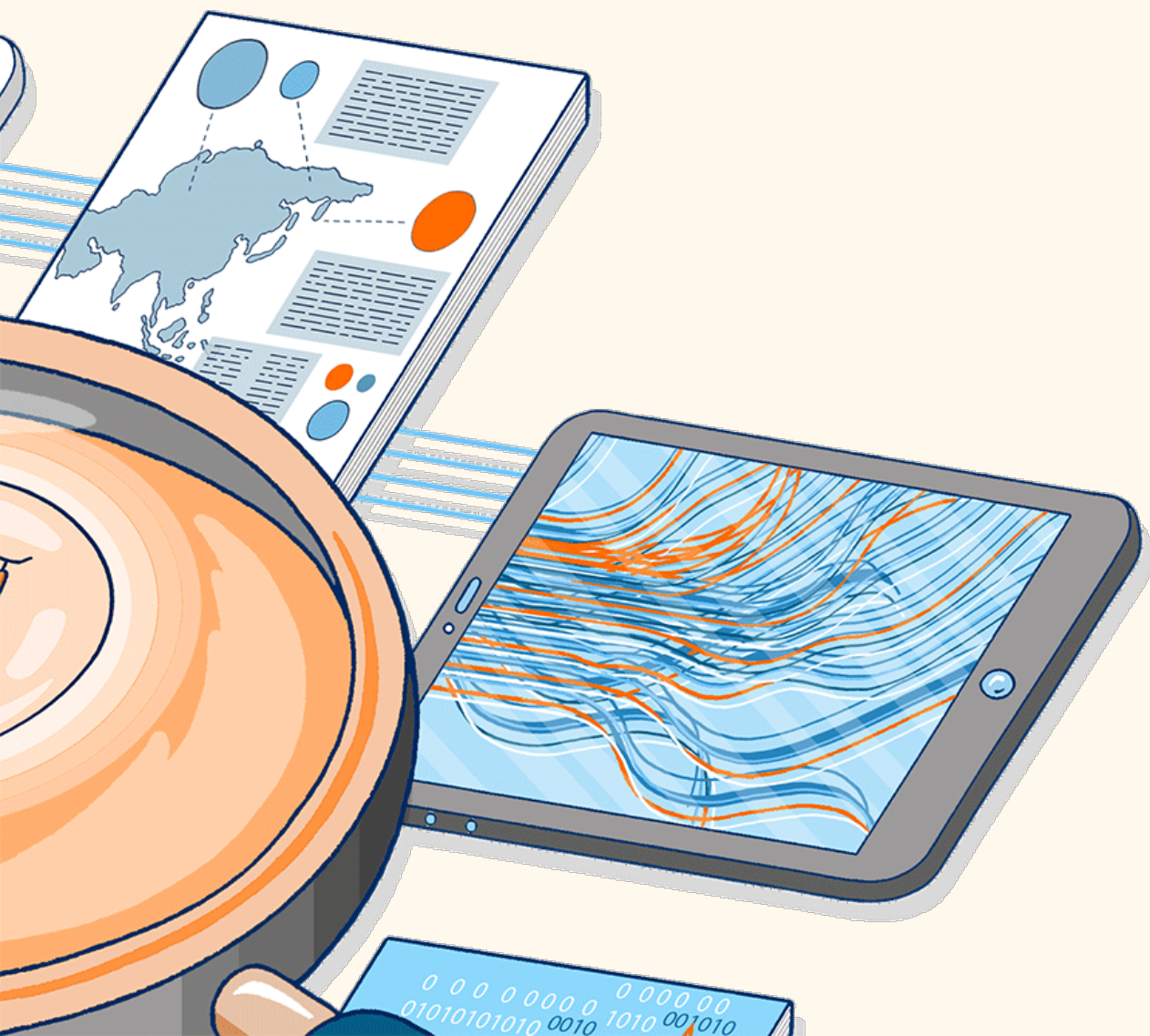
### Subject areas

Documents in Scopus are classified under four broad subject clusters: life sciences, physical sciences, health sciences and social sciences & humanities. These are further divided into 27 major subject areas and 300+ minor subject areas, which are referred to as the All Science Journal Classification (ASJC). A list of these can be found at Appendix A.

The subject distributions in Scopus are done at the journal level and each journal can be associated to more than one ASJC area. This is why subject distributions as a share of total publications can exceed 100%.

## Chapter 1

# Scholarly output, impact, and excellence





# 1.1 Research output trends

A total of 37,982 STFC funded publications were identified for 2006–2018, concentrated in ASTROPHYSICS AND ASTRONOMY, NUCLEAR AND HIGH ENERGY PHYSICS, and SPACE AND PLANETARY SCIENCES.

Between 2006 and 2018, a total of 37,982 publications were identified in Scopus as being linked to STFC funding. We see an increasing trend for publication output during the analysis period (FIGURE 1-1).

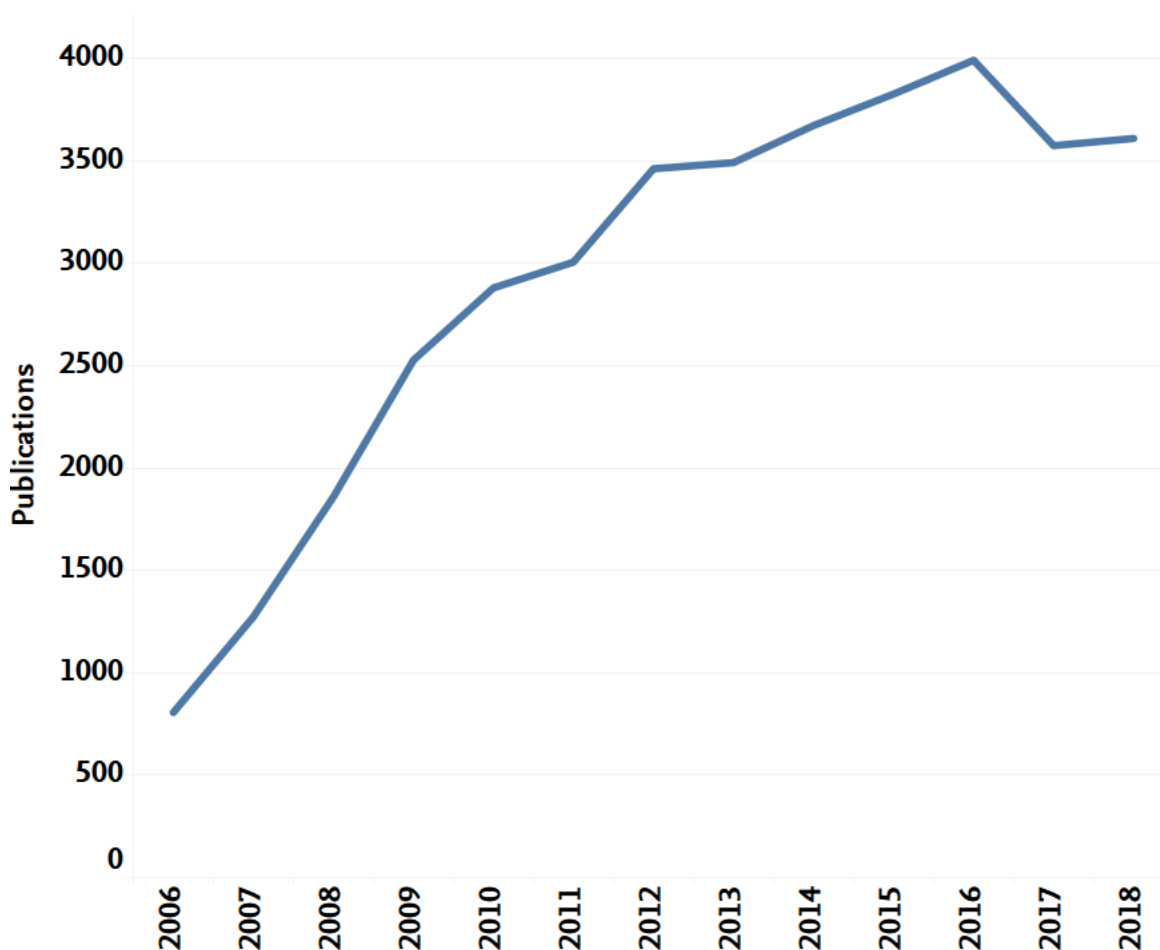


FIGURE 1-1  
Number of publications in the STFC corpus, 2006–2018.  
Source: Scopus

FIGURE 1-2 shows the subject distribution of the STFC funded publications across subject areas. Publications in Scopus can be associated with more than one subject area, so summing subject distributions indicated as share of total publications results in more than 100%. Therefore, the subject distributions are presented in absolute numbers rather than as a share of the total. For example, the largest outlet for the STFC funded publications was the *Monthly Notices of the Royal Astronomical Society*, which was associated with both PHYSICS AND ASTRONOMY and EARTH AND PLANETARY SCIENCES. The second and third largest outlets, *Astrophysical Journal* and *Astronomy and Astrophysics*, were also associated with both these subject areas.

Over the study period, the majority of STFC funded publications were associated mainly with the PHYSICS AND ASTRONOMY subject area (over 90%), followed by EARTH AND PLANETARY SCIENCES (over 50%) (FIGURE 1-2). This is not a surprising result as these are the focus subjects for STFC; however, there were also publications in non-core subjects such as AGRICULTURAL AND BIOLOGICAL SCIENCES, ENVIRONMENTAL SCIENCE, MEDICINE, and so on.

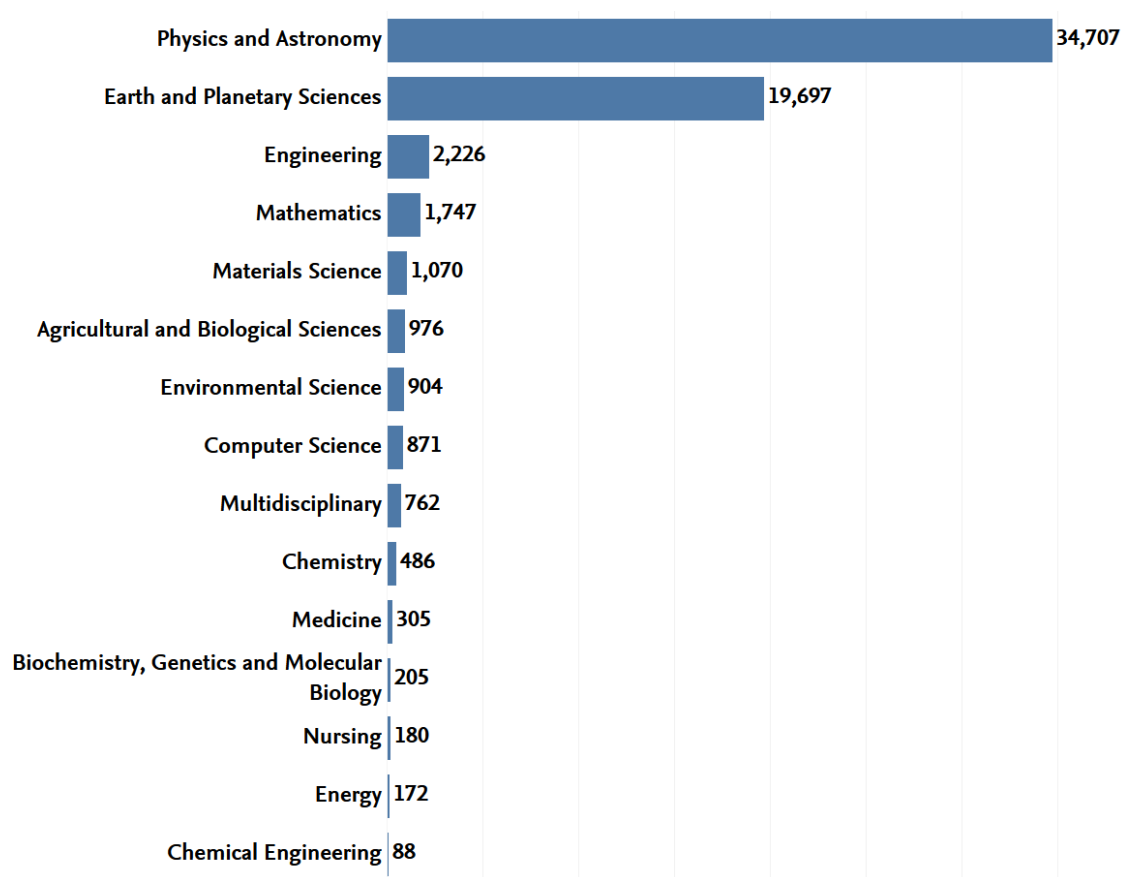


FIGURE 1-2 Subject distribution of the STFC corpus across subject areas, 2006–2018. A threshold of minimum 50 publications for the period was applied.

Source: Scopus

That the number of STFC funded publications associated with more than one ASJC subject area has been increasing over time (FIGURE 1-3) can partially be explained by the choice of journal and the journal's number of associated subject areas, as indicated earlier. However, it also indicates that STFC funded publications are interdisciplinary in nature.

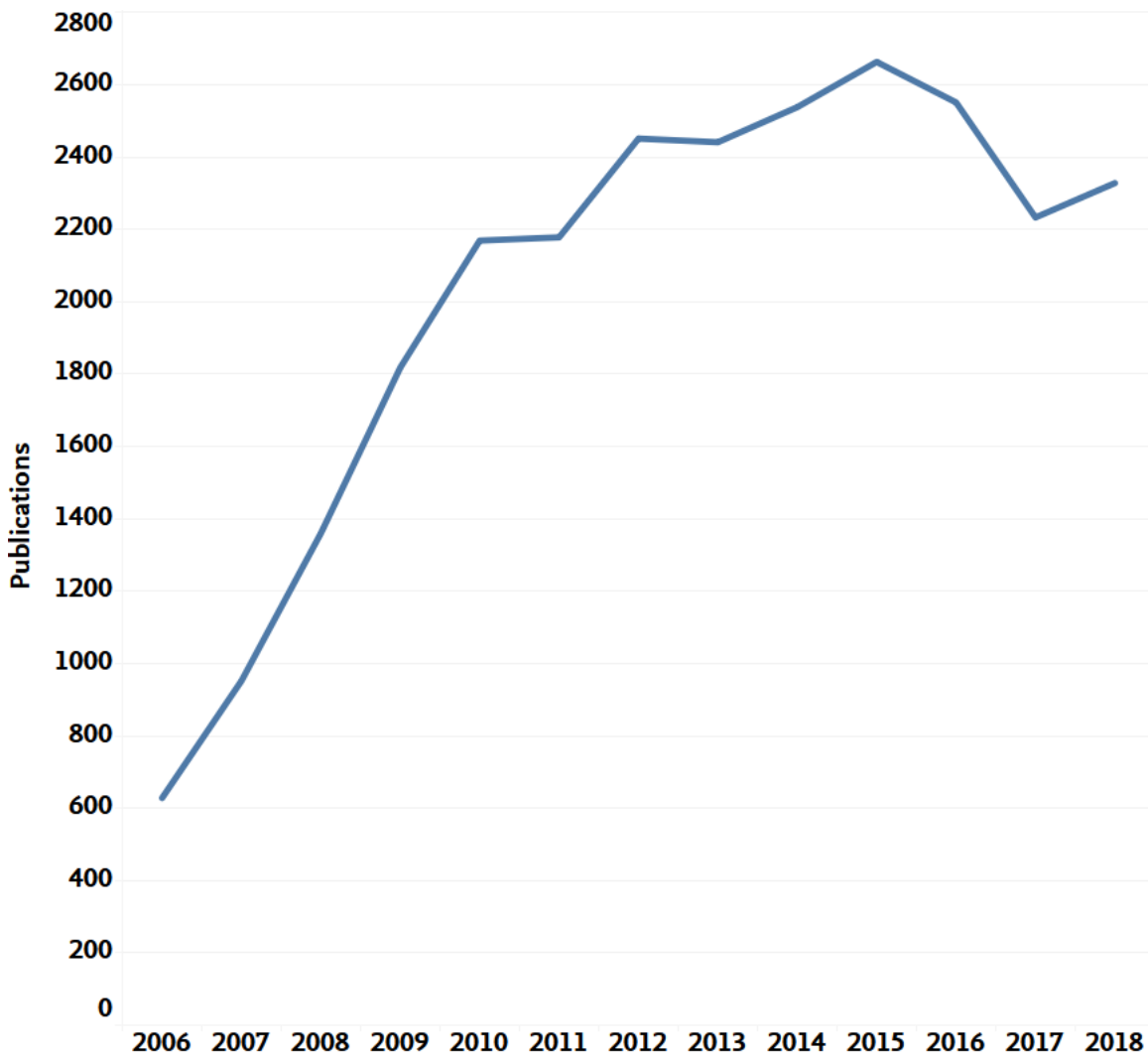


FIGURE 1-3  
Number of STFC funded publications that are associated with more than one ASJC subject area. 2006-2018.  
Source: Scopus

In terms of the two most published subject areas, PHYSICS AND ASTRONOMY and EARTH AND PLANETARY SCIENCES, the overall output trend is similar in both, with a flattening of the curve in the more recent years (FIGURE 1-4).

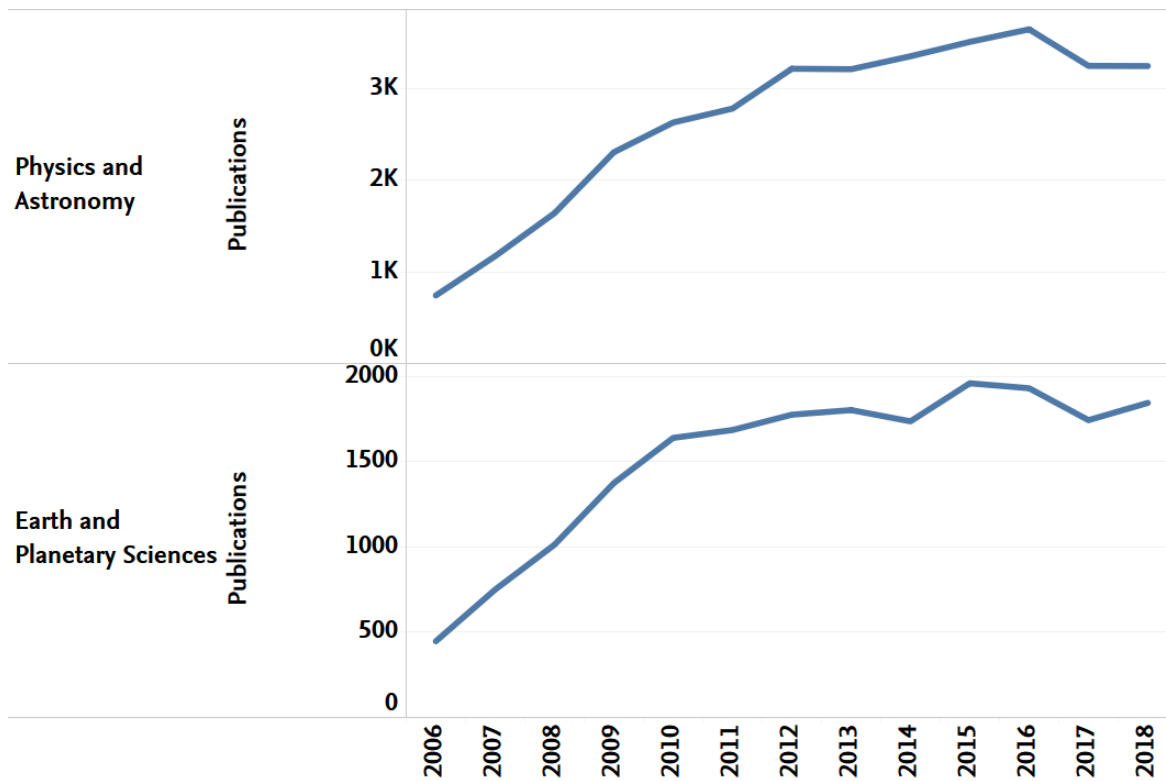


FIGURE 1-4  
Scholarly output trends for PHYSICS AND ASTRONOMY and EARTH AND PLANETARY SCIENCES, 2006–2018.  
Source: Scopus

Most of the publications in PHYSICS AND ASTRONOMY and EARTH AND PLANETARY SCIENCES are concentrated around a few subfields. For PHYSICS AND ASTRONOMY, nearly half of the publications are in the subfield of ASTRONOMY AND ASTROPHYSICS, followed by NUCLEAR AND HIGH ENERGY PHYSICS (FIGURE 1-5). In EARTH AND PLANETARY SCIENCES, the majority of the publications are in the subfield of SPACE AND PLANETARY SCIENCES (FIGURE 1-6).

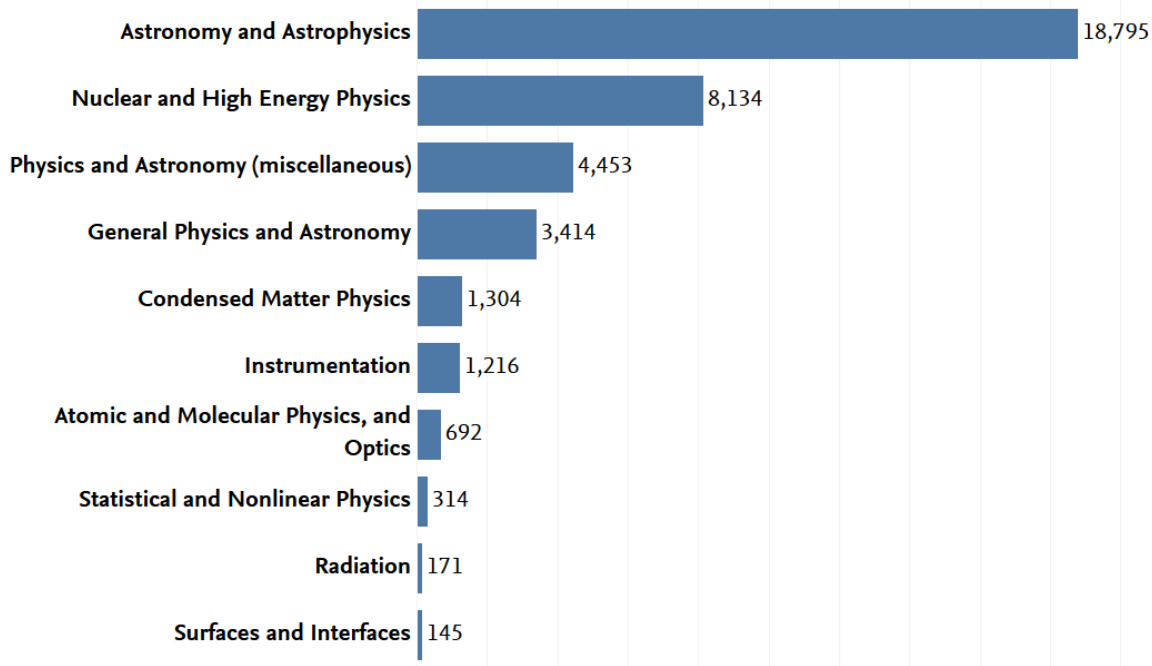


FIGURE 1-5  
 Subject breakdown of the STFC corpus in PHYSICS AND ASTRONOMY, 2006–2018. A threshold of minimum 50 publications was applied.  
 Source: Scopus

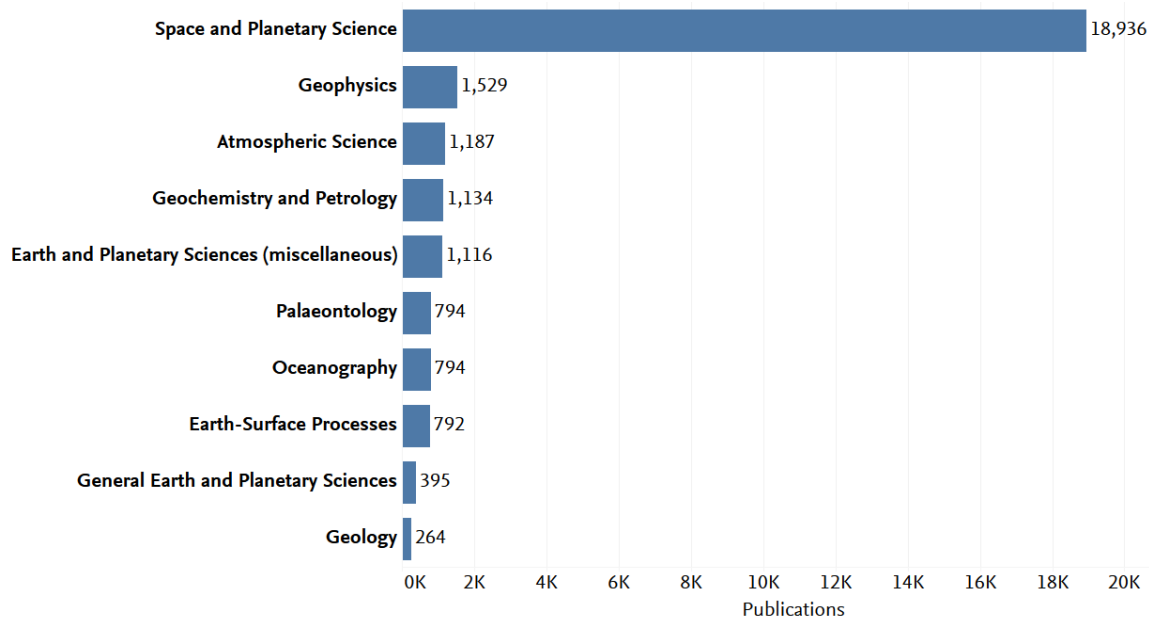


FIGURE 1-6  
 Subject breakdown of the STFC corpus in EARTH AND PLANETARY SCIENCES, 2006–2018. A threshold of minimum 50 publications was applied.  
 Source: Scopus

## 1.2 Scholarly impact

---

### On average, STFC funded publications have twice the scholarly impact of the global average.

The FWCI is a proxy indicator for measuring scholarly impact. The FWCI is a field-normalised indicator and measures the citation count of a publication relative to similar types of publications in the same subject area and publication year. An FWCI of more than 1.0 indicates that the entity's publications have been cited more than would be expected based on the global average for similar publications; for example, 2.1 means 110% more than the world average. An FWCI of less than 1.0 indicates that the entity's publications have been cited less than would be expected based on the global average for similar publications; for example, 0.8 means 20% less than the world average.

During the analysis period, the average FWCI of STFC funded publications remained stable at around 2.0 from 2009 onwards (FIGURE 1-7). This means that, on average, the citation impact of STFC funded publications was twice the global average. In the initial part of the analysis period, there was a declining trend; however, this could partially be explained by the lower numbers of publications in the earlier years, meaning outliers could have more effect on the average. This is particularly relevant in this analysis, as the fields of study are populated with hyper-collaborated papers—that is, publications with more than 100 authors. Hyper-collaborated publications received extraordinary number of citations in the study period and therefore have had a large effect on the average FWCI. To give an example, the publication with the highest number of citations in the STFC corpus has nearly 3,000 authors. It received over 5,500 citations in the study period and had an FWCI of 224.68. When hyper-collaborated publications are excluded, the publication with the highest number of citations received over 3,500 citations, with an FWCI of 51.18.

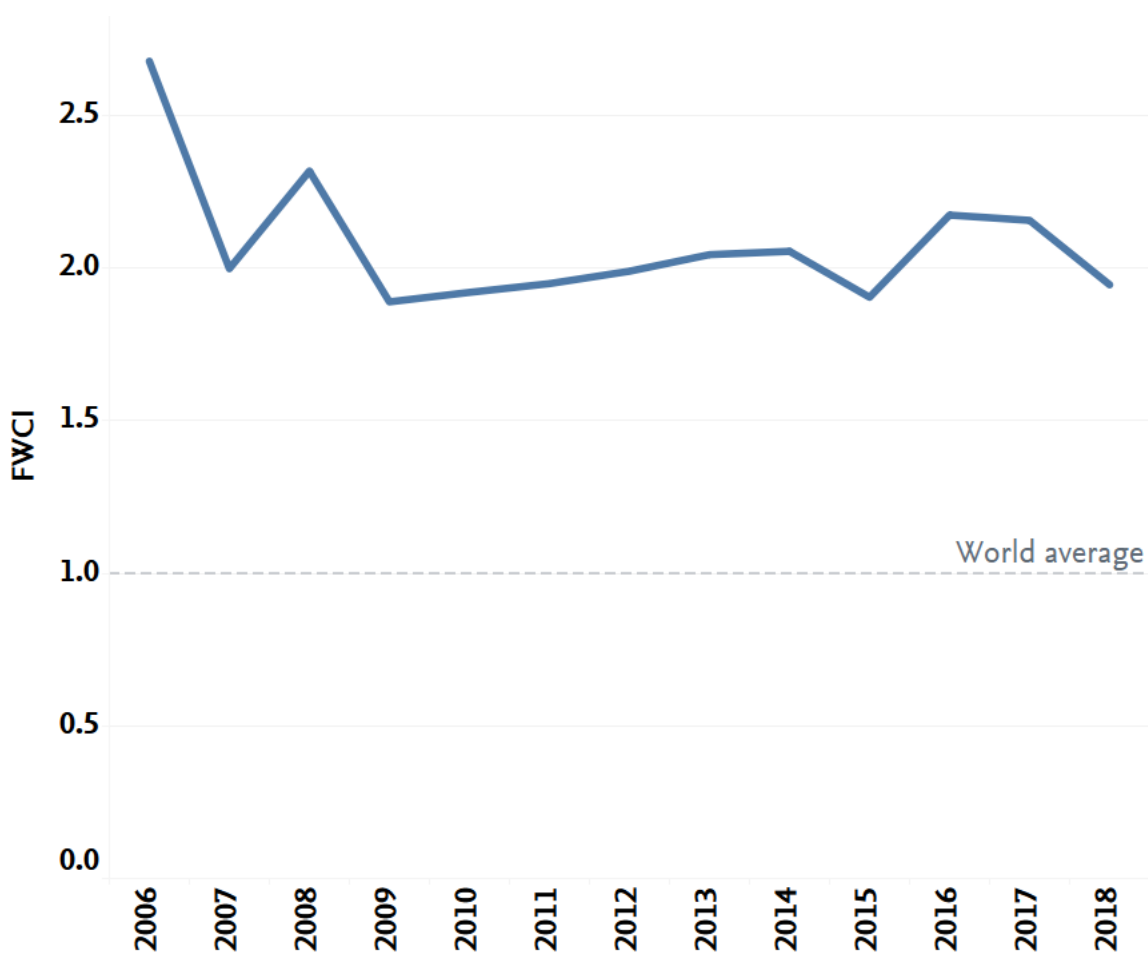


FIGURE 1-7  
Average FWCI for STFC funded publications, 2006–2018.  
Source: Scopus

At the subject level, publications in ENGINEERING and MULTIDISCIPLINARY journals had the largest average FWCI during 2006–2018 (FIGURE 1-8). In ENGINEERING, about 25% of the publications had more than 100 authors, which would have influenced their receiving more citations. The MULTIDISCIPLINARY subject includes large interdisciplinary journals such as *Proceedings of Science*, *Nature*, and *Science*, which usually receive large numbers of citations as well.

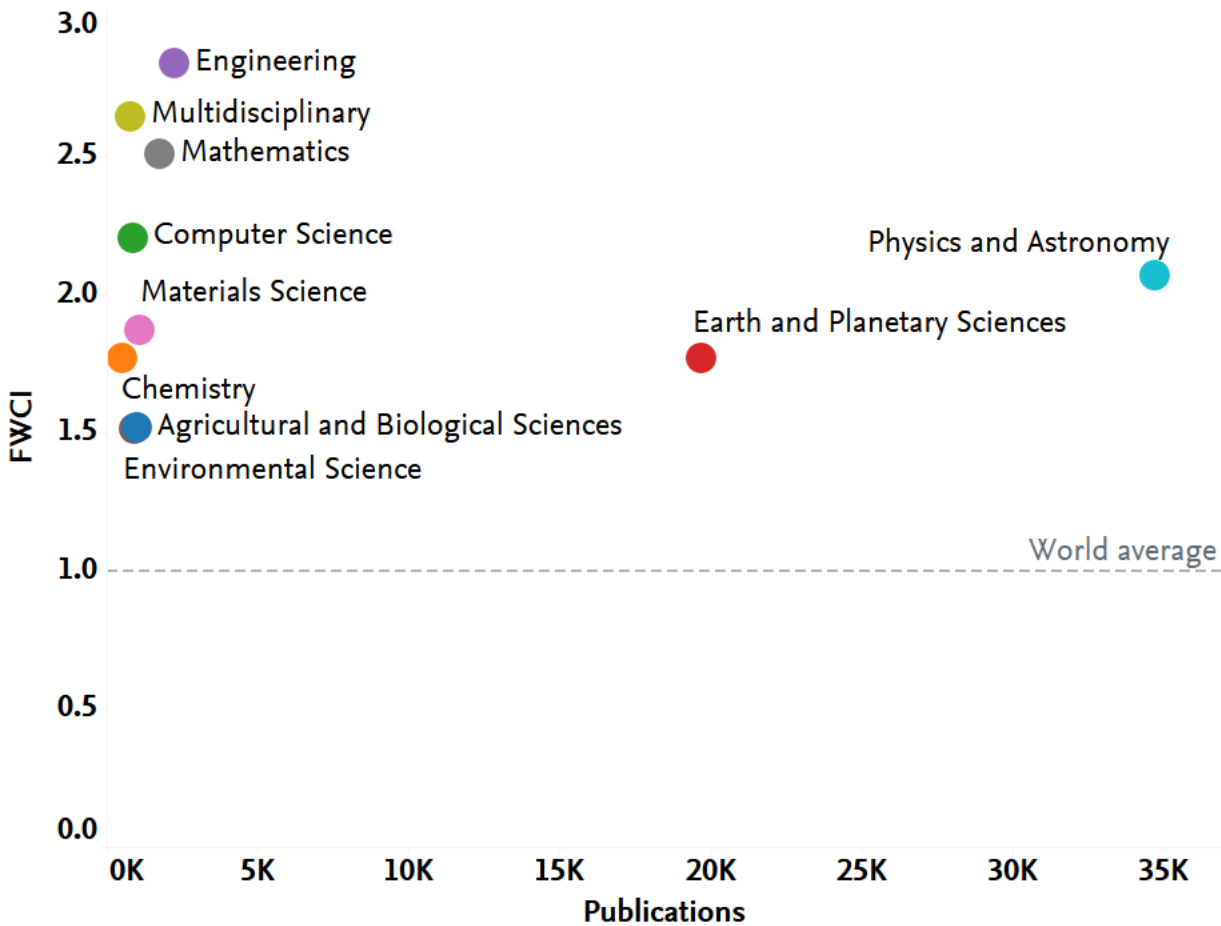
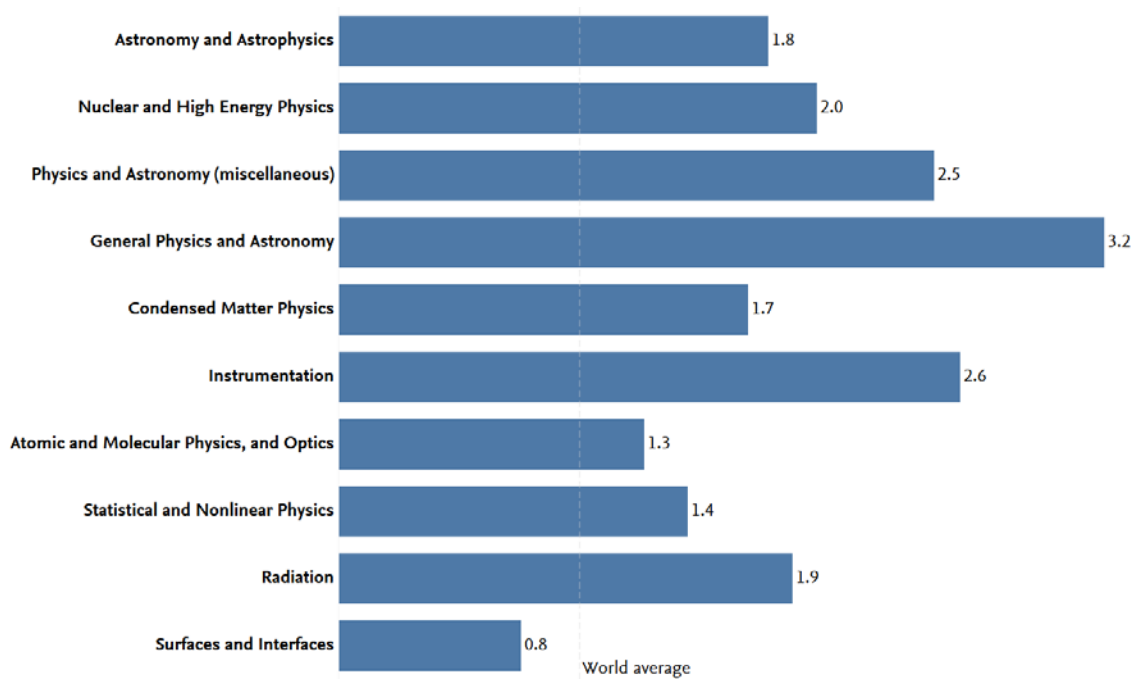


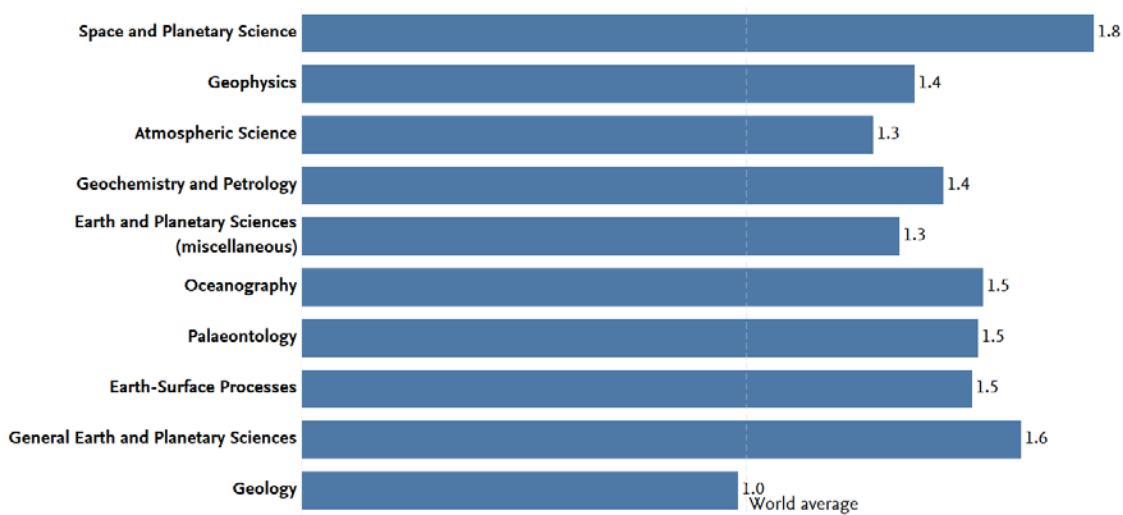
FIGURE 1-8 Average FWCI and scholarly output for STFC funded publications in the top 10 subjects with most output, for the period 2006–2018. Source: Scopus

Focusing on the subfields of PHYSICS AND ASTRONOMY and EARTH AND PLANETARY SCIENCES (FIGURE 1-9, FIGURE 1-10), it can be seen that the STFC funded publications were well above the FWCI global average with the exception of two subfields, SURFACES AND INTERFACES and GEOLOGY, which were the among the least published areas for the STFC corpus.





**FIGURE 1-9**  
 Average FWCI for STFC funded publications in the subfields of PHYSICS AND ASTRONOMY, 2006–2018. A threshold of minimum 50 publications for the period was applied.  
 Source: Scopus



**FIGURE 1-10**  
 Average FWCI for STFC funded publications in the subfields of EARTH AND PLANETARY SCIENCES, 2006–2018. A threshold of minimum 50 publications for the period was applied.  
 Source: Scopus

## 1.3 Research excellence

Between 2006 and 2018, on average 4% of STFC funded publications were among the top 1% most cited publications globally.

As citation distribution across articles is highly skewed, another way of looking at the quality of research is to examine the small proportion of the most highly cited articles. In this report, we focus on the top 1% most cited publications globally. During 2006–2018, on average more than 4% of STFC funded publications were among the top 1% most cited publications globally across all subjects, which indicates that the STFC corpus's share of excellent publications was considerably higher than the global average (FIGURE 1-11). The trend line is rather similar to the FWCI trend, with a declining phase between 2006 and 2009 and then a general increasing trend.

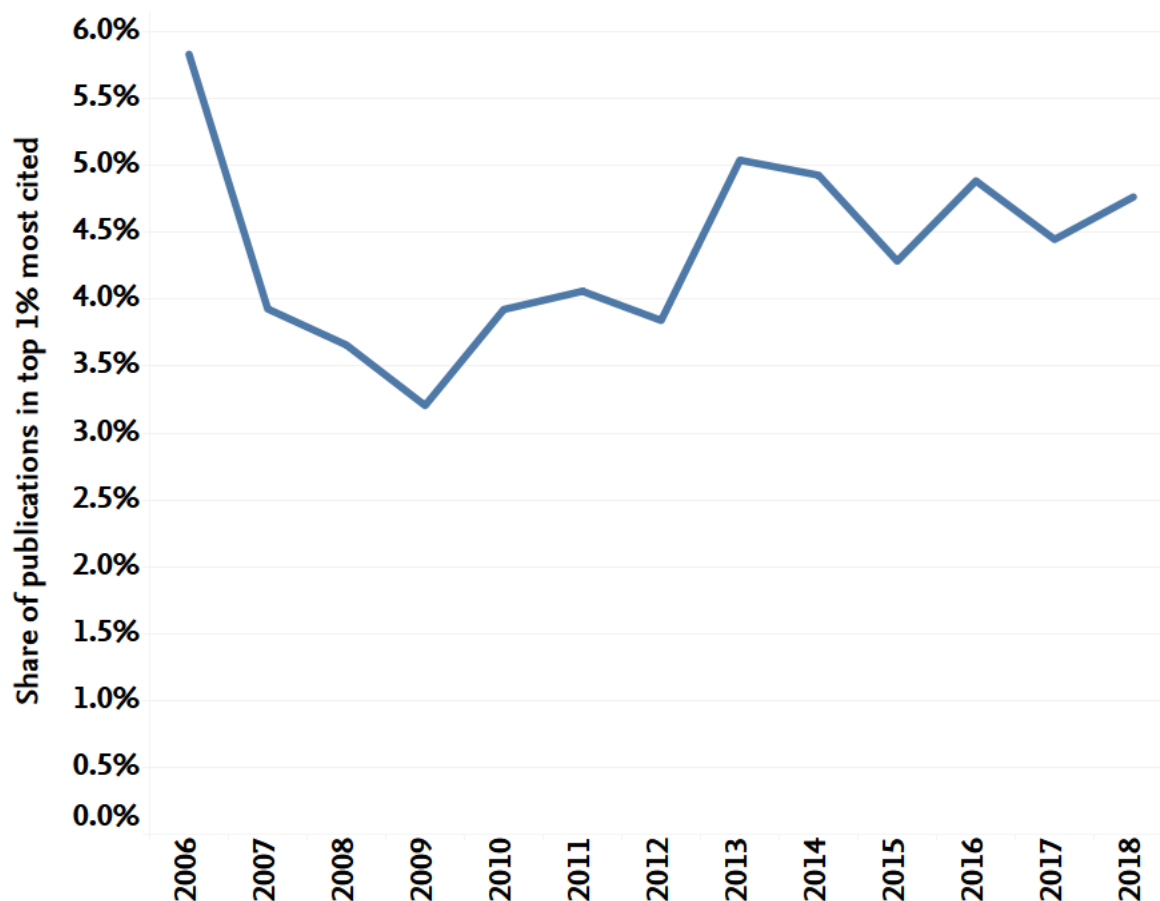


FIGURE 1-11

Share of STFC funded publications that are among the top 1% most cited publications globally, 2006–2018.

Source: Scopus

When we focus on the top two subject areas by output, PHYSICS AND ASTRONOMY and EARTH AND PLANETARY SCIENCES, we see slightly different trends: the trend for PHYSICS AND ASTRONOMY is more stable and that for EARTH AND PLANETARY SCIENCES shows a larger drop at the beginning followed by a larger recovery and increase from 2009 onwards (FIGURE 1-12).

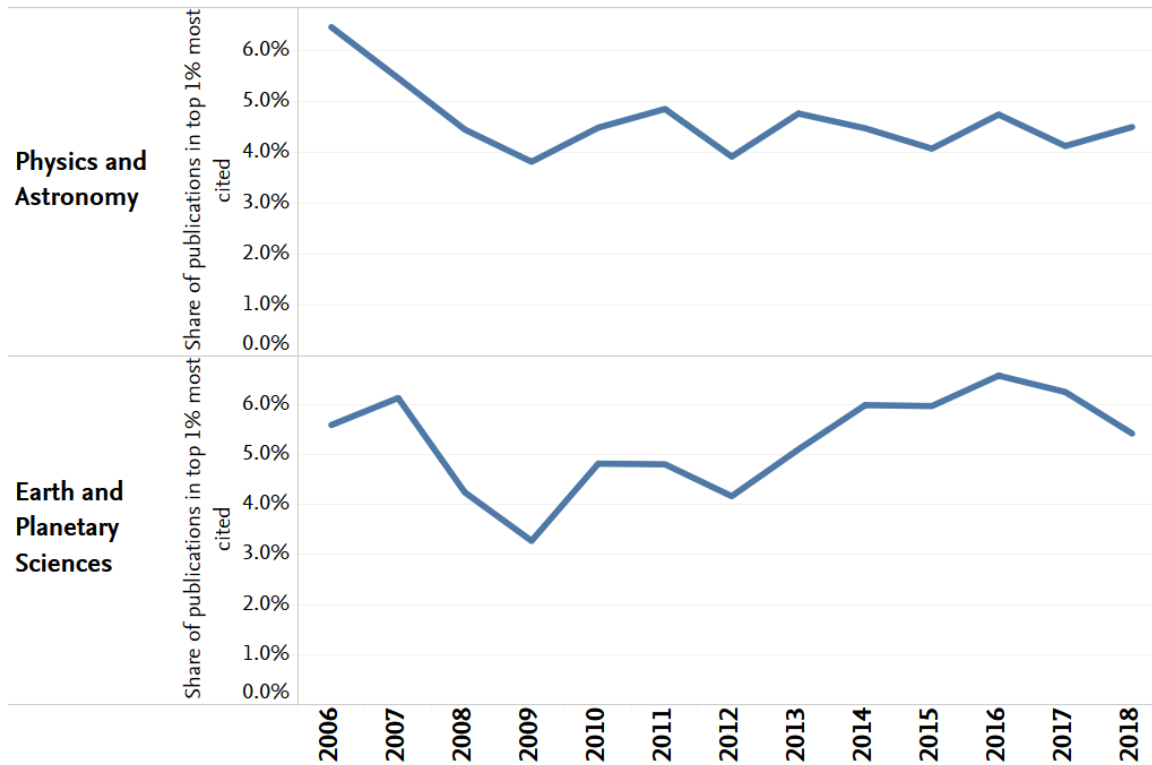


FIGURE 1-12  
Share of STFC funded publications that are among the top 1% most cited publications globally, 2006–2018. Focus on PHYSICS AND ASTRONOMY and EARTH AND PLANETARY SCIENCES.  
Source: Scopus

## 1.4 STFC funded publications in a UK context

---

On average, STFC funded publications accounted for 14%–15% of UK publications in their respective subjects and elevated the scholarly impact of the United Kingdom in those subjects.

In this section we compare the STFC funded publications with those of the rest of the United Kingdom exclusive of STFC funded publications. The sum of the two groups in the following bar charts indicates the UK total including the STFC funded publications. We particularly focus on PHYSICS AND ASTRONOMY and EARTH AND PLANETARY SCIENCES, which were the two subjects in which STFC funded publications were concentrated.

FIGURE 1-13 shows that, on average, STFC funded publications accounted for 14% of all publications in PHYSICS AND ASTRONOMY during 2006–2018. The increasing share in the initial period and decreasing shares in the latter period are to be expected as they are in line with the publications' output trends (FIGURE 1-1). The shares were even higher in the main subfields of PHYSICS AND ASTRONOMY in which the STFC corpus was published. On average, the STFC corpus accounted for 50% of ASTRONOMY AND ASTROPHYSICS publications in the United Kingdom, reaching as high as 64% in 2013. In NUCLEAR AND HIGH ENERGY PHYSICS, STFC funded publications accounted for 37% of all UK publications.

The findings are similar in EARTH AND PLANETARY SCIENCES, where STFC funded publications accounted for 15% of all UK publications, on average, and reached 55% in the SPACE AND PLANETARY SCIENCES subfield (FIGURE 1-14).

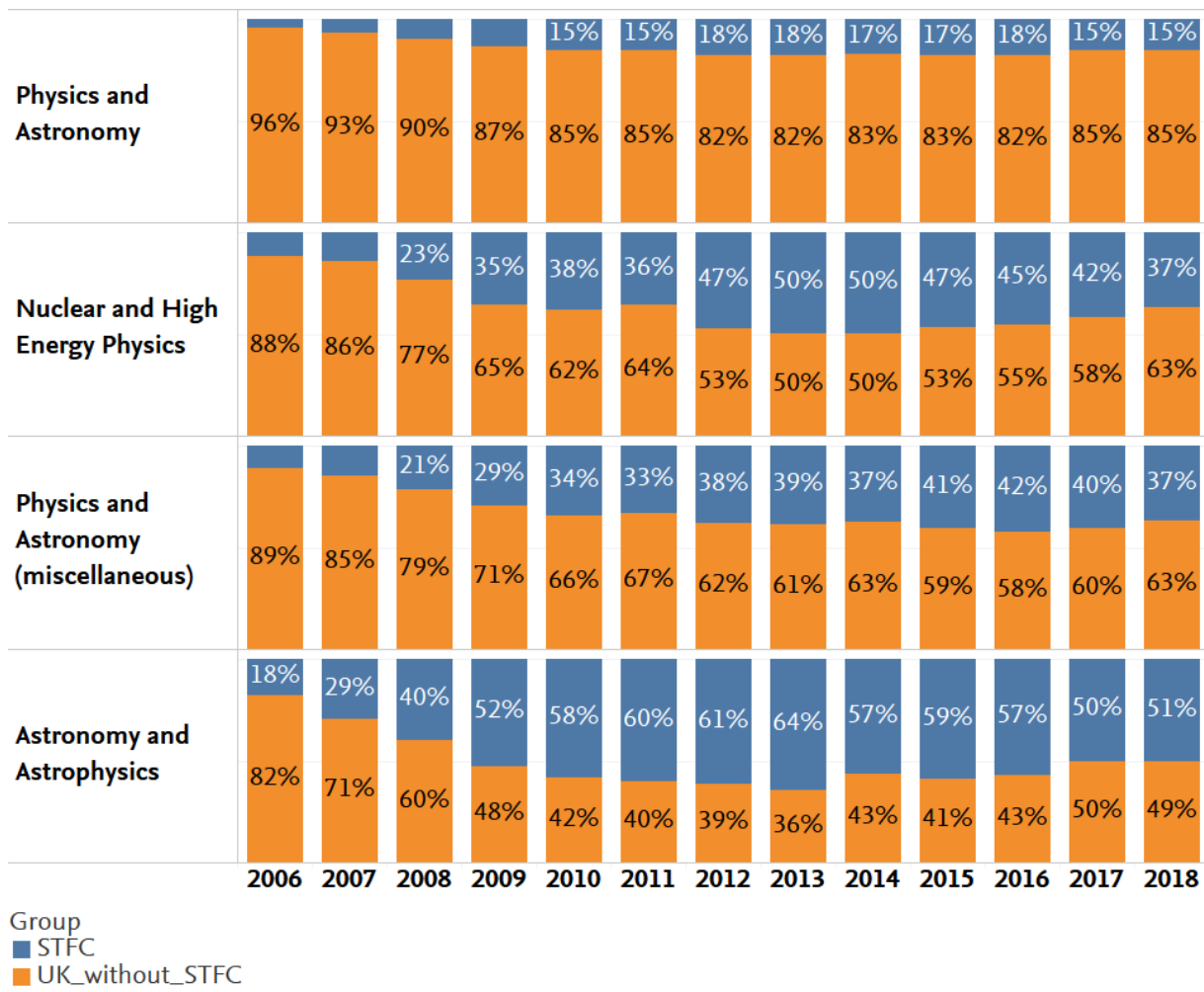


FIGURE 1-13  
 Share of STFC funded publications within the UK PHYSICS AND ASTRONOMY subject and selected subfields, 2006–2018.  
 Source: Scopus

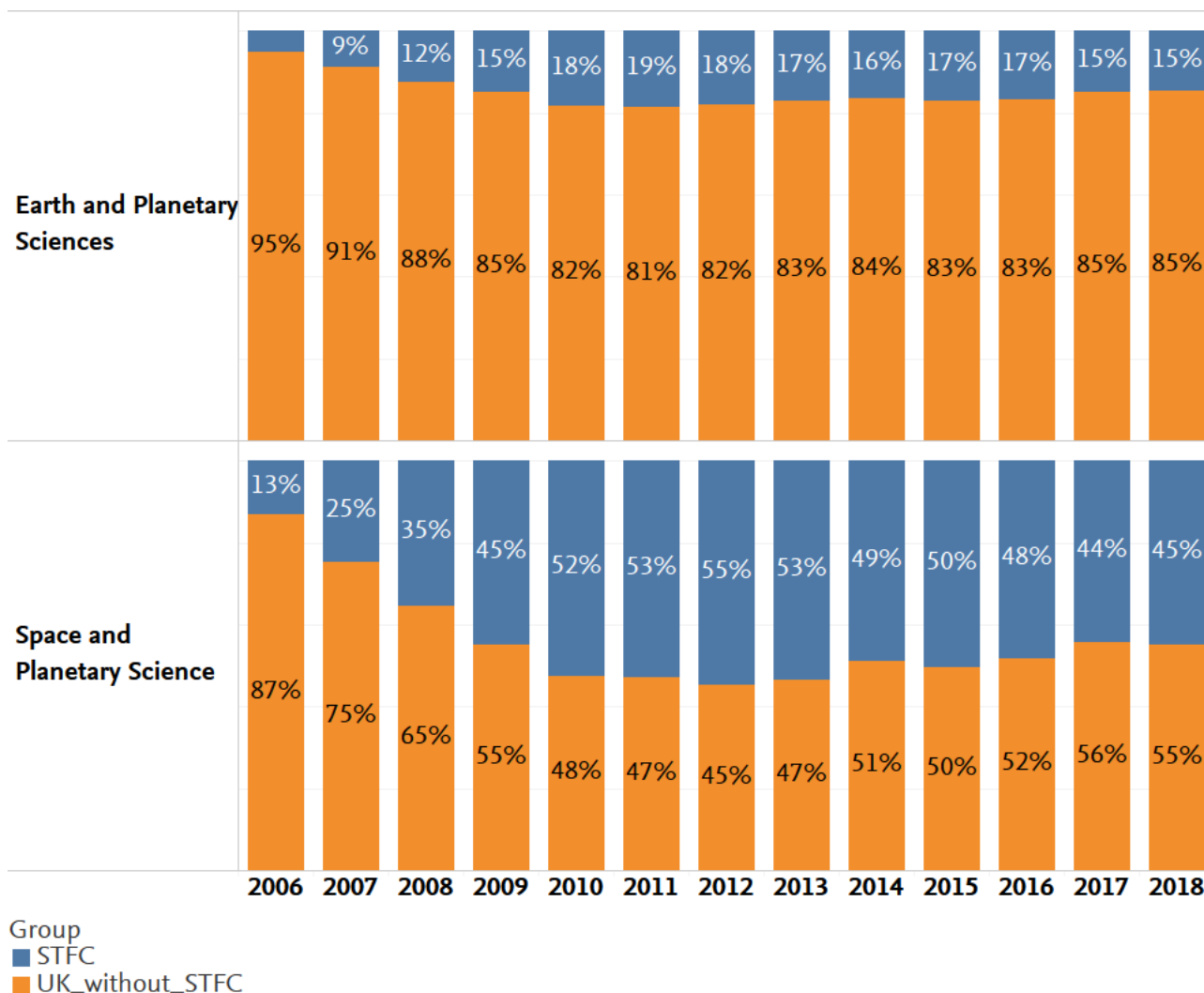


FIGURE 1-14  
 Share of STFC funded publications within the UK EARTH AND PLANETARY SCIENCES subject and the SPACE AND PLANETARY SCIENCES subfields, 2006–2018.  
 Source: Scopus

FIGURE 1-15 and FIGURE 1-17 show the average impact of STFC funded publications and UK publications in the top four subfields in which STFC funded publications were published. The charts show the average for the United Kingdom, both with and without the STFC funded publications included, to clearly highlight the role STFC funded publications played. In general, STFC funded publications had a higher average FWCI than other UK publications in the same subfields. At the broader subject level, the UK average was naturally more similar, both with and without the STFC funded publications, as the publication sets are much larger and in a broader range of areas. However, at the subfield level, it is clearly observed that the STFC funded publications elevated the average scholarly impact of the United Kingdom.

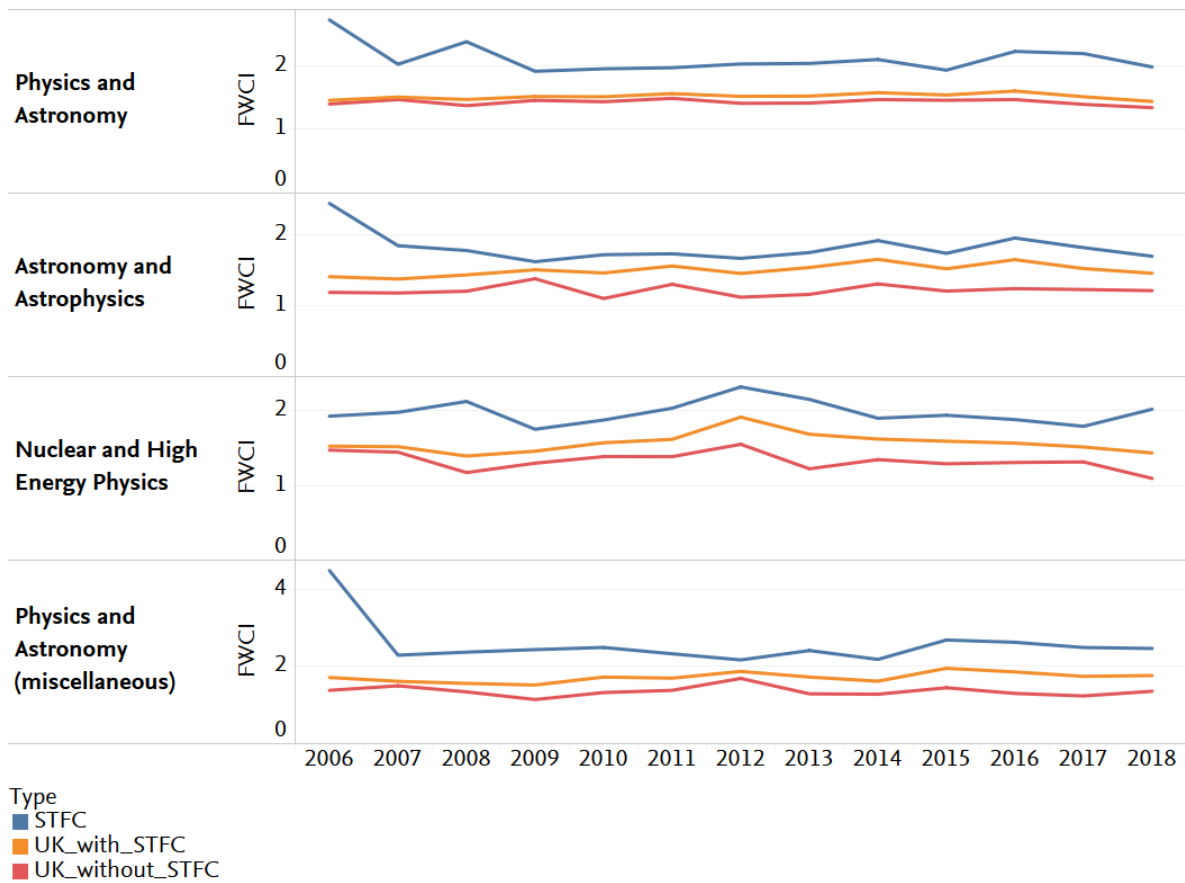


FIGURE 1-15 Average scholarly impact of STFC funded and UK publications (with and without STFC) in PHYSICS AND ASTRONOMY, 2006–2018. Source: Scopus

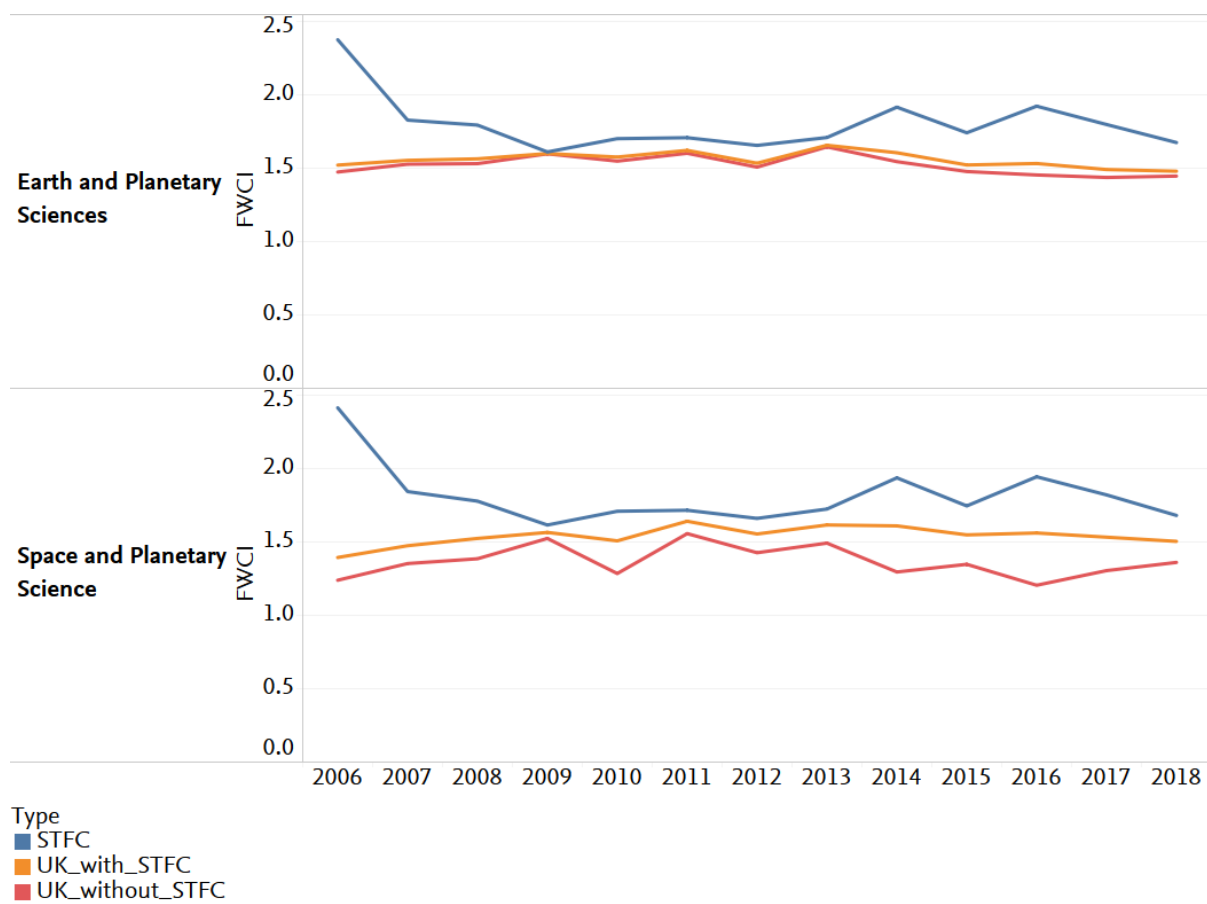


FIGURE 1-16  
 Average scholarly impact of STFC funded and UK publications (with and without STFC) in SPACE AND PLANETARY SCIENCES 2006–2018.  
 Source: Scopus



# 1.5 Publication types

## More STFC funded publications are being published as open access.

Most of the publications in the STFC corpus were articles, conference papers, and reviews. Despite some fluctuations, articles accounted for around 85% of the corpus, on average (FIGURE 1-17). In the same period, conference papers accounted for nearly 9% of the STFC funded publications. The largest change was for review articles, whose share declined sharply between 2006 and 2009 and started increasing thereafter, remaining steady at around 2.5% from 2013 onward.

The distribution of publication types was in line with global trends, with articles the most dominant form of publications for most subject areas. Conference papers are, in general, particularly prevalent in subjects such as ENGINEERING and COMPUTER SCIENCE, where conferences provide an important outlet for fast-changing areas.

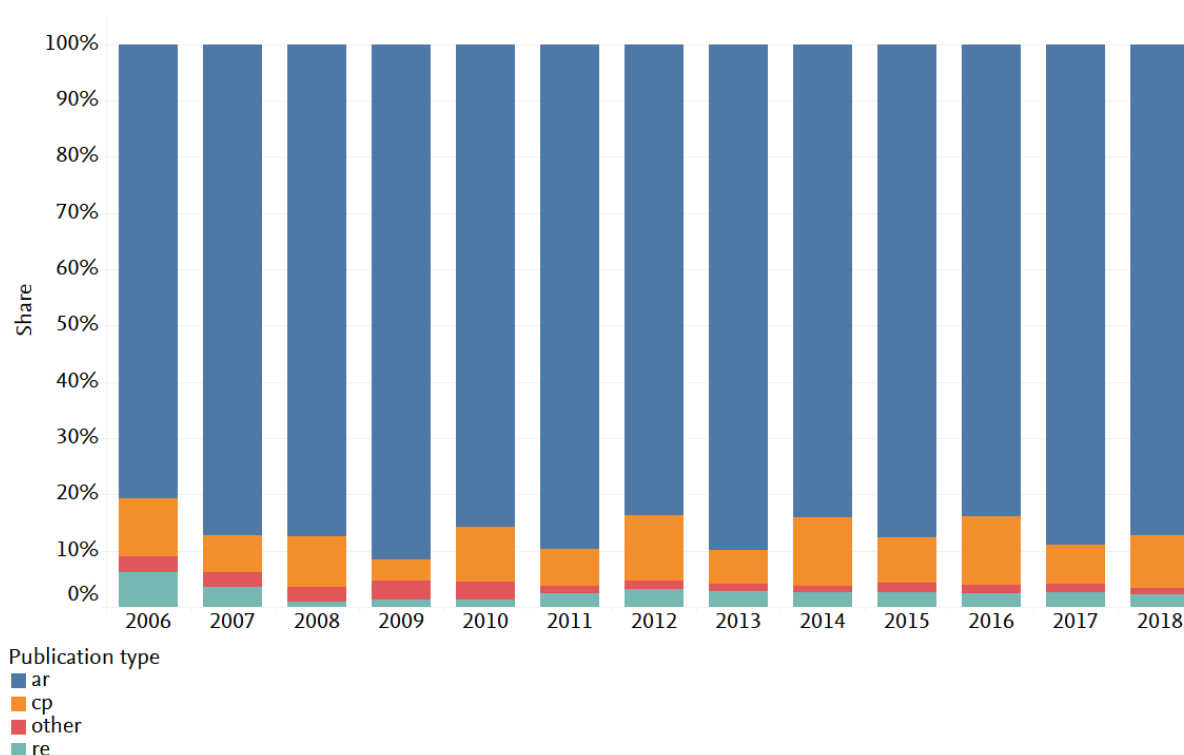


FIGURE 1-17  
Distribution of publication types for the STFC corpus, 2006–2018.  
Source: Scopus

FIGURE 1-18 shows the distribution of publications across different access types. *Null* indicates publications where access type could not be determined. *None* indicates publications that are not open in any form.

*Repository* indicates green open access (OA) publications and *Full* indicates gold OA publications that were published in gold and hybrid journals. We see that, over time, the share of fully OA journals increased, from nearly 40% in 2006 to nearly 50% in 2018, peaking around and above 60% in 2015 and 2016. This increase was mirrored by a declining share of green OA, and the peaks in gold OA correspond to a decline in green OA. However, there was also a persistent decline in the share of non-OA publications, which suggests that, overall, there was an increasing move toward publishing in OA formats.

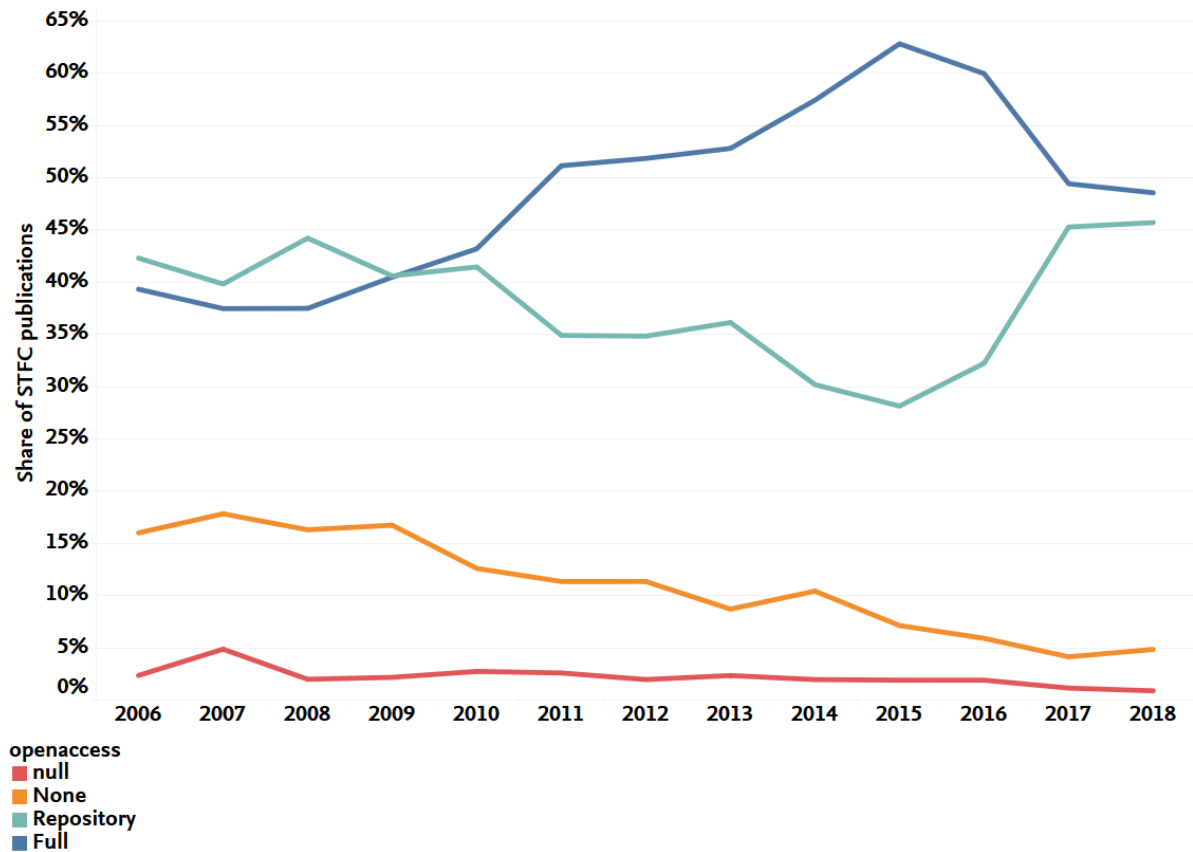


FIGURE 1-18  
Share of STFC funded publications across different access types, 2006–2018.  
Source: Scopus

## Chapter 2

# Research collaboration

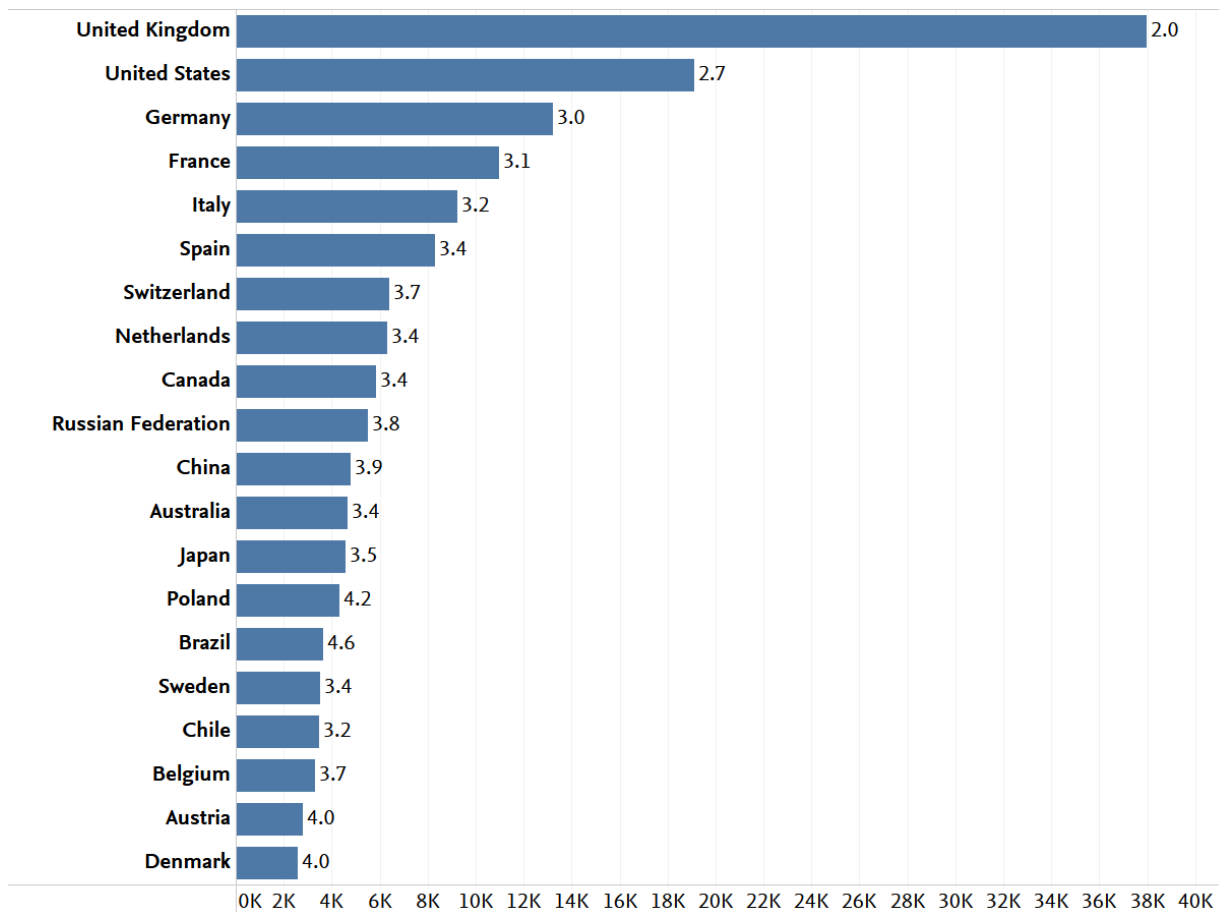


## 2.1 International nature of STFC funded publications

---

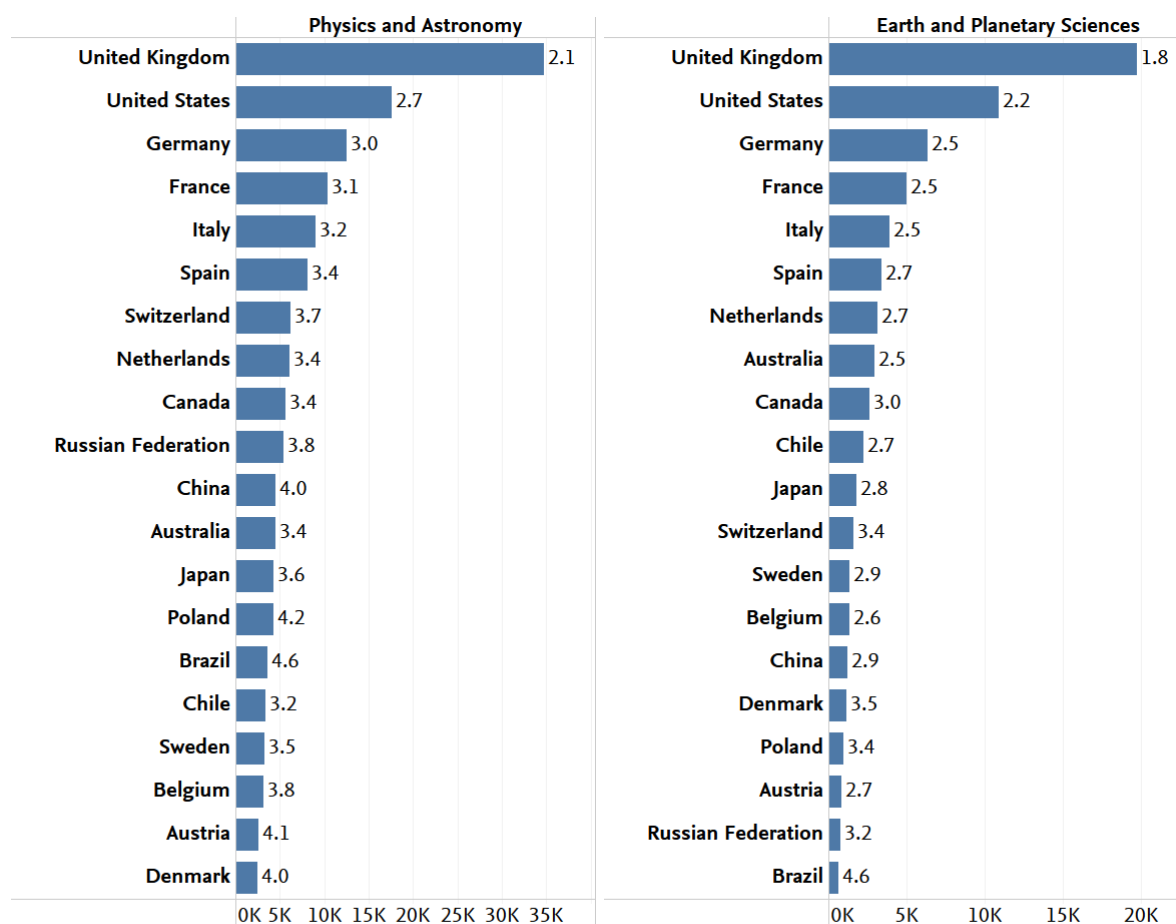
STFC funded publications are highly international, with the United States, Germany, and France being the most represented countries after the United Kingdom.

The subject fields in which STFC funded publications were concentrated are highly international. Over 12% of the corpus analysed in this study had more than 100 authors, and over 15% had more than 50 authors. After the United Kingdom, the United States, Germany, and France were the most published countries within the corpus (FIGURE 2-1). Austria, Brazil, and Chile had the largest growth of publications; however, they had relatively smaller numbers of publications to start with as well.



**FIGURE 2-1**  
 Top 20 countries published within the STFC corpus by scholarly output, 2006–2018. Numbers at the end of the bars indicate the average FWCI for the period.  
 Source: Scopus

When we look at the two dominant subjects we see that the top players were mainly the the same; however, there were some differences outside the top 10. To give an example, Russia and Switzerland had relatively more publications in this corpus within PHYSICS AND ASTRONOMY. We also observe that there was a trend for countries with fewer publications to have a larger average FWCI. This is likely to have been caused by the disproportionate affect of publications with a larger number of authors.



**FIGURE 2-2**  
 Top 20 countries published within the STFC corpus by scholarly output in PHYSICS AND ASTRONOMY (left panel) and in EARTH AND PLANETARY SCIENCES (right panel), 2006–2018.  
 Source: Scopus

In terms of the most published institutions, it is not surprising that the UK institutions led the way in terms of output, as STFC funding is focused on UK institutions. However, as FIGURE 2-3 shows, there were institutions from other countries as well, and these did not necessarily align with the most published countries. To give an example, while Germany was the third most published country in the corpus at an institutional level, only one German institution appeared among most published institutions. In contrast, many Russian institutions were among the most published institutions, whereas Russia itself ranked 10th in overall output. This suggests that in countries such as Russia research may be driven by a limited number of institutions that are very focused in certain areas, whereas in other countries, such as Germany and France, research activity may be more distributed.

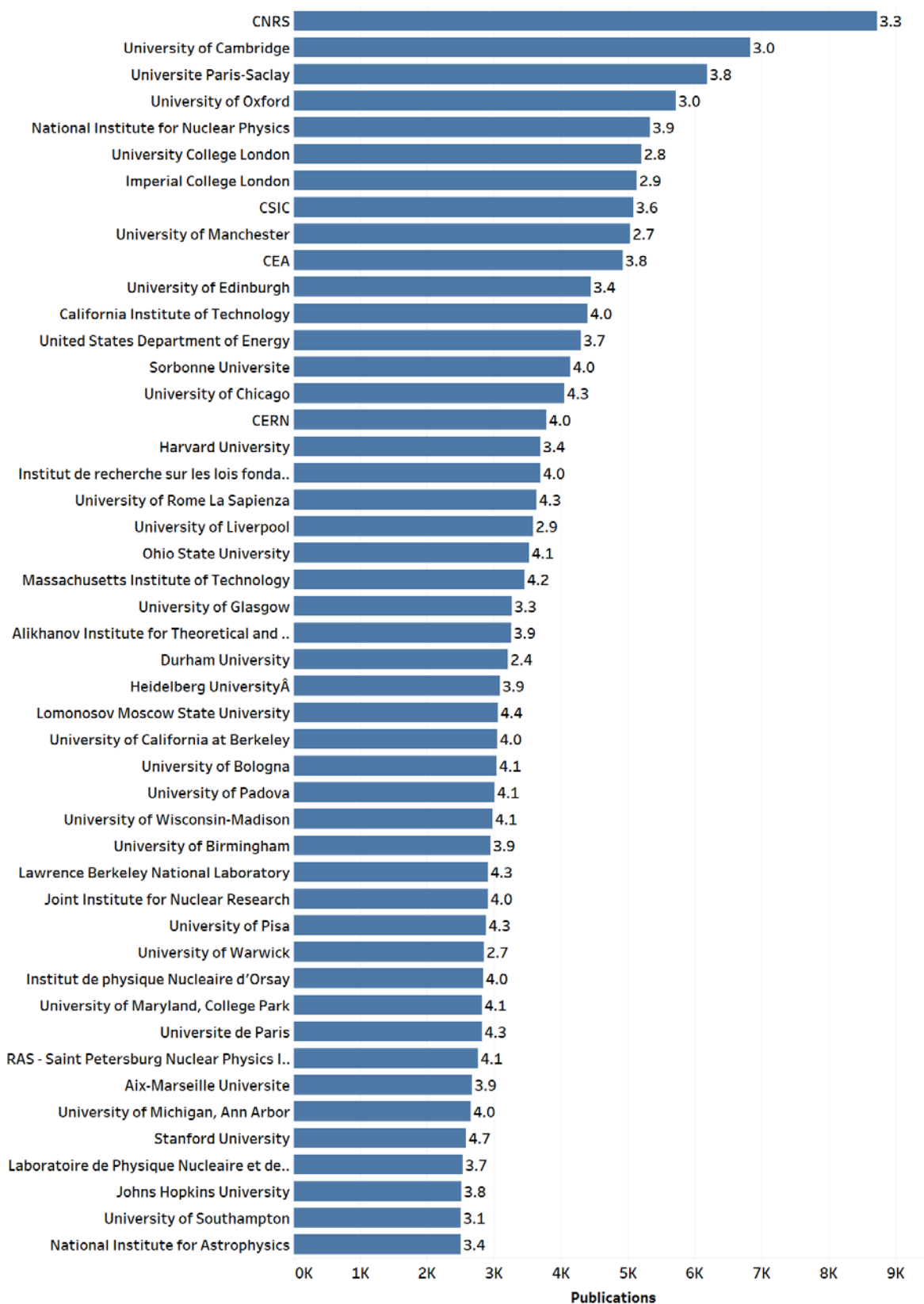


FIGURE 2-3  
 Top institutions published within the STFC corpus by scholarly output, 2006–2018. A cut-off of 2,500 publications was applied for visibility. The numbers at the end of the bars indicate the average FWCI.  
 Source: Scopus

## 2.2 International research collaboration

During 2006–2018, more than 80% of STFC funded publications were co-published with international authors.

The average share of STFC funded publications with international collaboration has been very high, at around 80%, which was much higher than the world average for the study period (FIGURE 2-4). The difference is to a large extent due to the nature of the field.

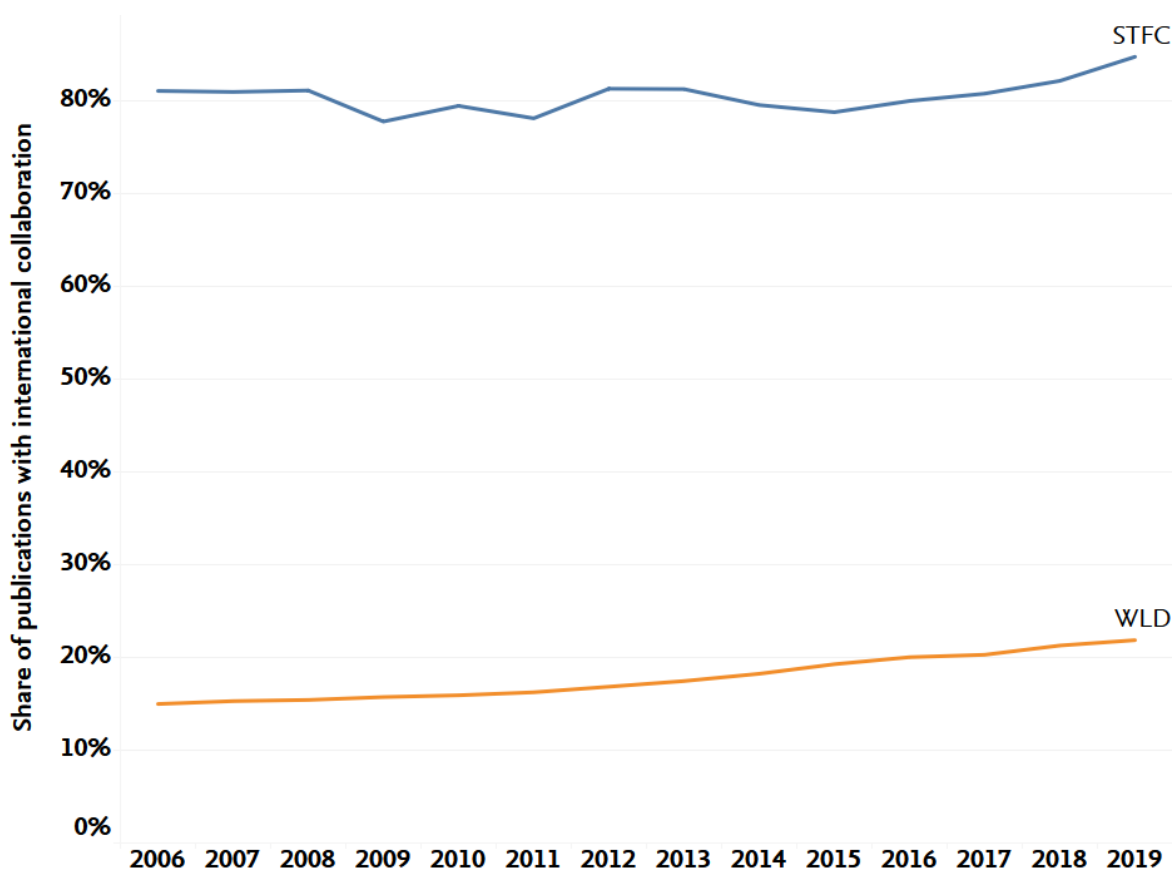


FIGURE 2-4  
Share of STFC funded publications with international collaboration, over time, 2006–2018.  
Source: Scopus



In terms of scholarly impact, we can see that the trend line of the FWCI is the same for STFC funded publications with international collaboration and overall (FIGURE 2-5), which is not surprising considering that the majority of the publications were produced in international collaboration. However, the publications with international collaboration had a higher average FWCI than the corpus average.

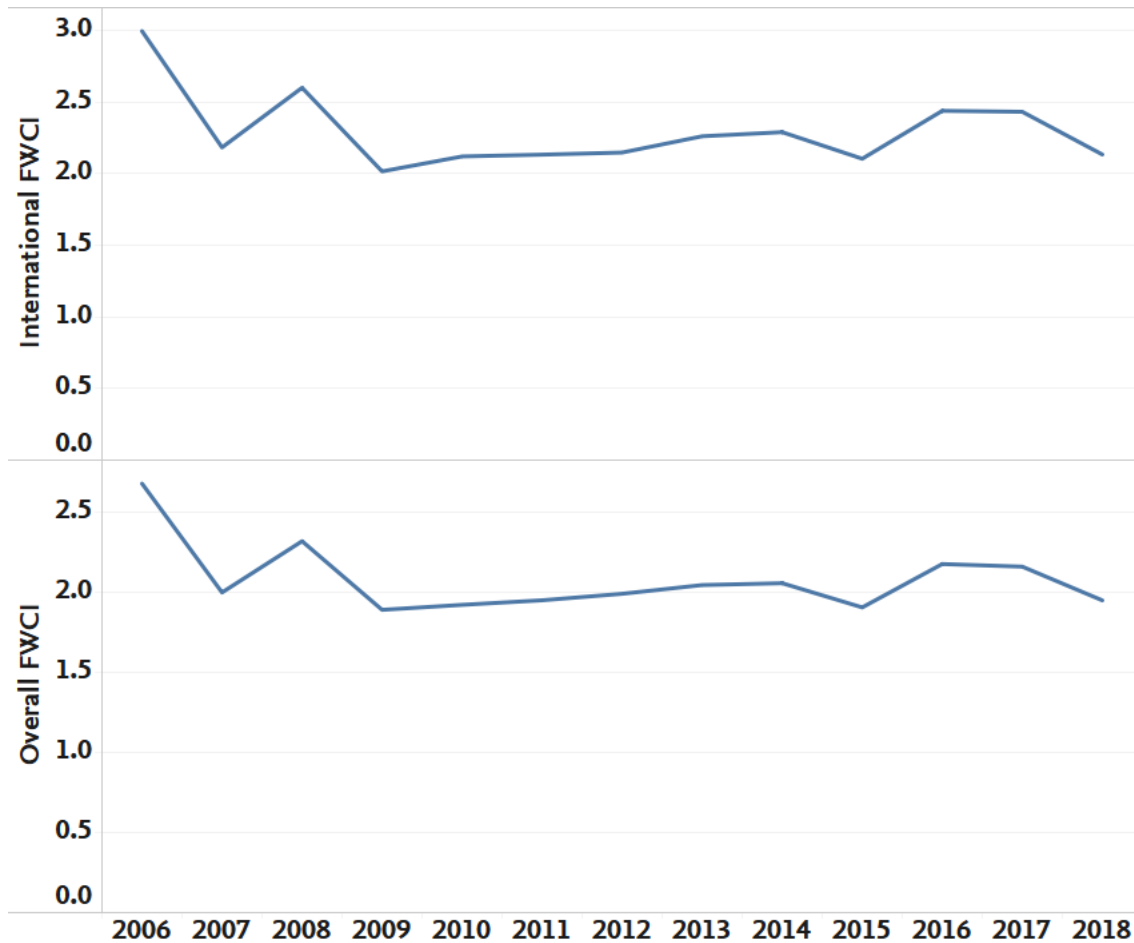


FIGURE 2-5 Annual average FWCI for STFC funded publications with international collaboration (top panel) and overall (bottom panel), 2006–2018.

Source: Scopus

## 2.3 International collaboration network map

---

FIGURE 2-6 indicates the collaboration map for the STFC funded publications during 2006–2018. The size of each node (circle) indicates the STFC funded publications at the country level. The colour of the nodes indicates the share of STFC funded publications within the total publications of that country in the same period. The thickness of the links (lines) indicates the absolute number of STFC co-publications between the countries.

The map depicts how close countries were to each other in terms of their collaboration. The distance between the countries is impacted by the relative share of their collaborations, so the closer the countries are, the higher the share of publications they had with each other. This can, of course, be affected by mutual relevancy or dependency: in the case of more advanced research nations, such as the United Kingdom, the United States, and Germany, we would expect to see more mutual relevancy. On the other hand, in the case of Peru, Cuba, Montenegro, and so on, we would expect closeness to be driven by dependency. The centrality of the biggest countries in terms of STFC funded scholarly output is also indicative of the fact that they were relevant collaborators (and thus central in the map) for many countries.

In the map below, we do not observe distinct communities but rather a cloud of collaboration. This is likely to be driven by the high share and associated effect of hyper-collaborated publications, which makes it difficult to observe more targeted collaborations between individual collaborations. It is also the reason we have not depicted impact in the links, as the whole community benefits from the high impact of hyper-collaborated publications.

A final observation on the map can be made about the colour of the nodes: countries such as Armenia and Georgia had the largest share of total publications represented by STFC funded collaborations, which shows the important effect of hyper-collaborated publications on the output and impact of smaller countries.

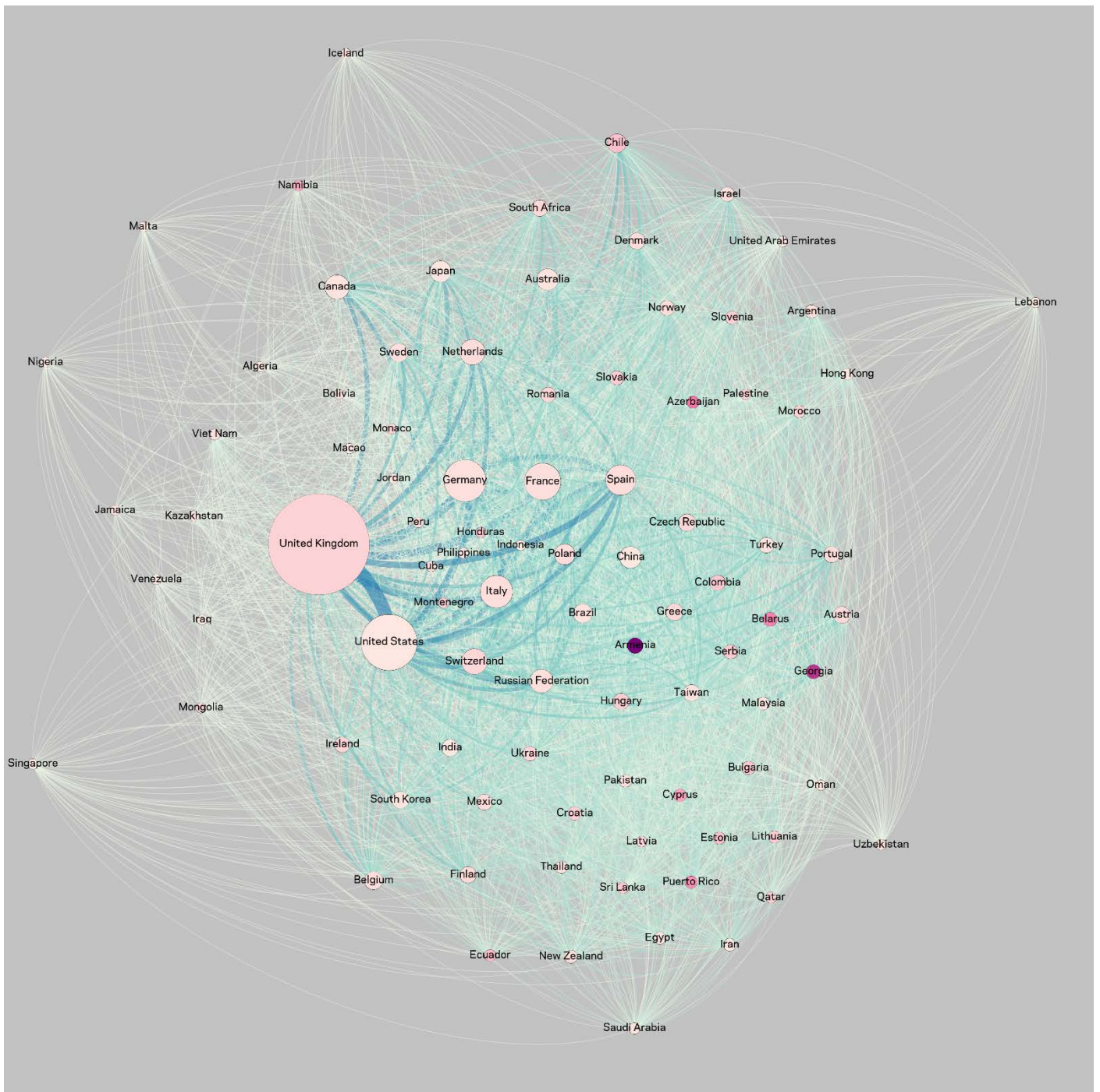


FIGURE 2-6  
Collaboration map for STFC funded publications, 2006–2018.  
Source: Scopus

## 2.4 Cross-sector collaboration

The share of publications with academic–corporate collaboration increased from 4% to over 8% between 2006 and 2018.

Most of the publications in the STFC corpus were published by academic institutions, followed by government entities (FIGURE 2-7). However, output from corporate entities grew the most, having a compound annual growth rate of 20%. Academic, government, and medical entity outputs grew by 12%–13% in the same period.

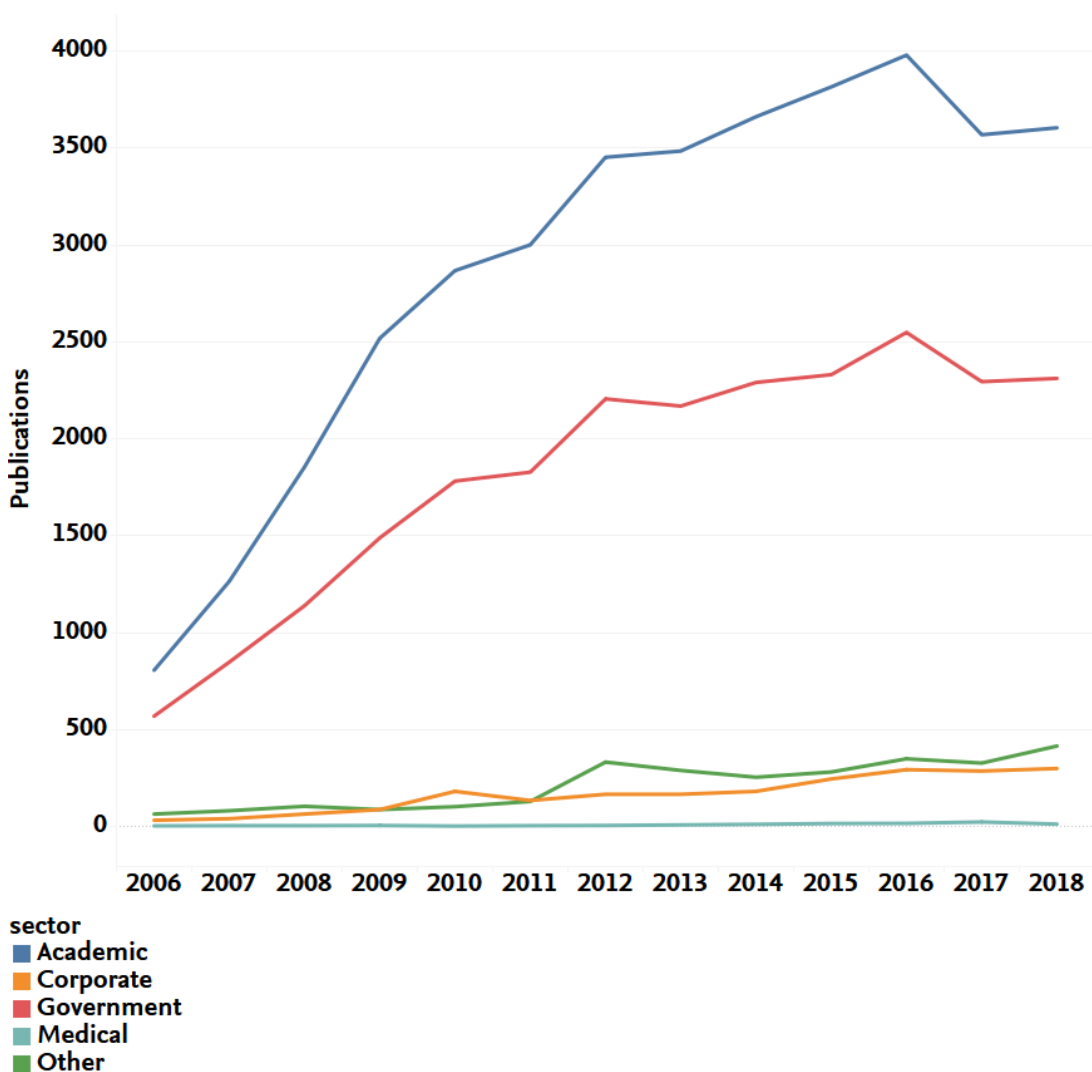


FIGURE 2-7  
Number of publications in the STFC corpus by entity sector type, 2006–2018.  
Source: Scopus

In terms of cross-sector collaboration, the largest type of collaboration was academic–government collaboration, which is not surprising considering the participation of large government research organisations such as CNRS from France and the National Institute for Nuclear Physics from Italy (FIGURE 2-8). The largest government sector entities publishing from the United Kingdom were Rutherford Appleton Laboratory (more than 4,200 publications during 2006–2018) and the Royal Observatory (nearly 1,600 publications).

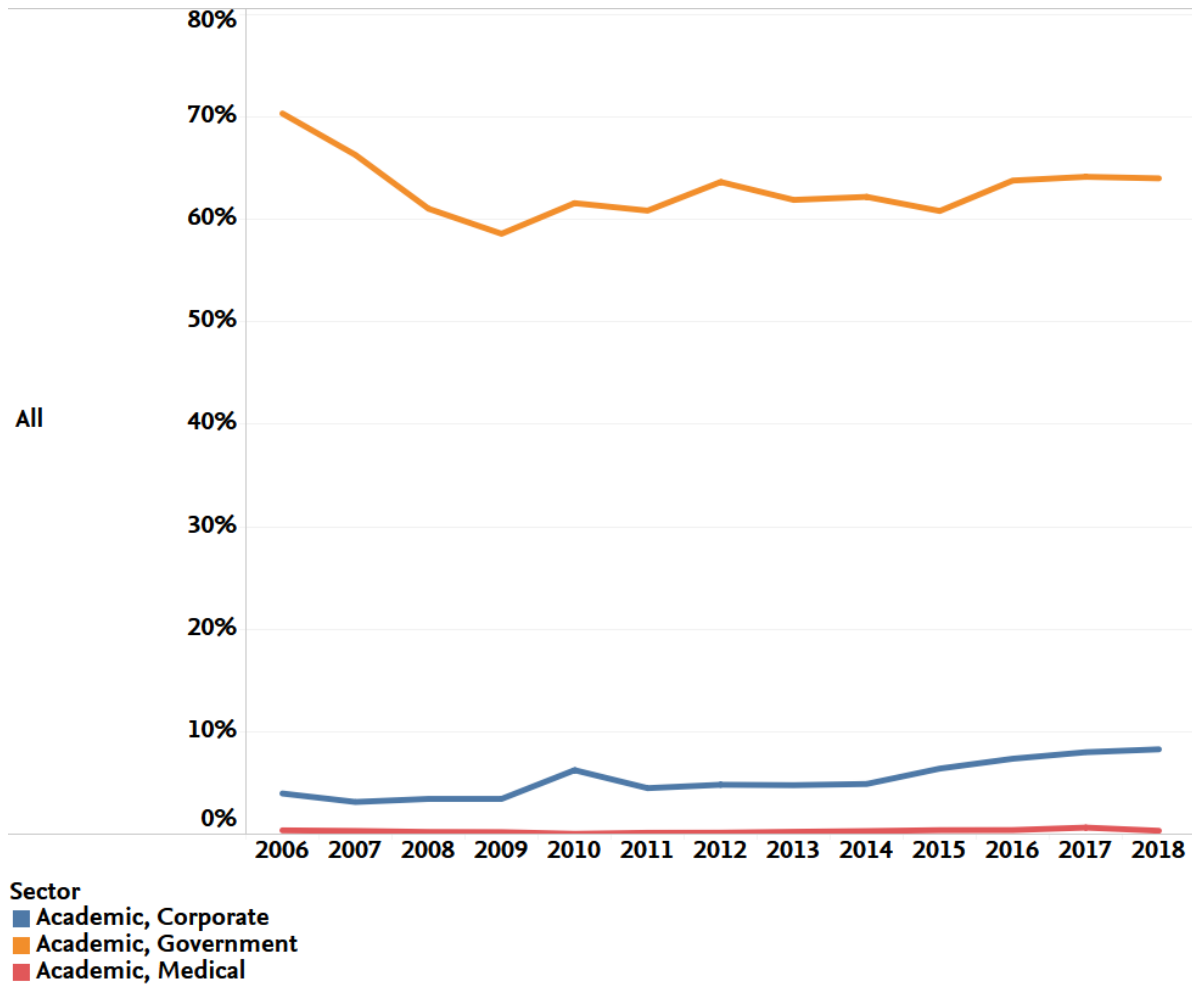


FIGURE 2-8  
Share of overall STFC funded publications with cross-sector collaboration, 2006–2018.  
Source: Scopus

In the same period, the share of academic–corporate collaborations grew considerably, doubling from 4% in 2008 to over 8% in 2018 overall. This increase was mainly driven by the publications in PHYSICS AND ASTRONOMY (FIGURE 2-9).

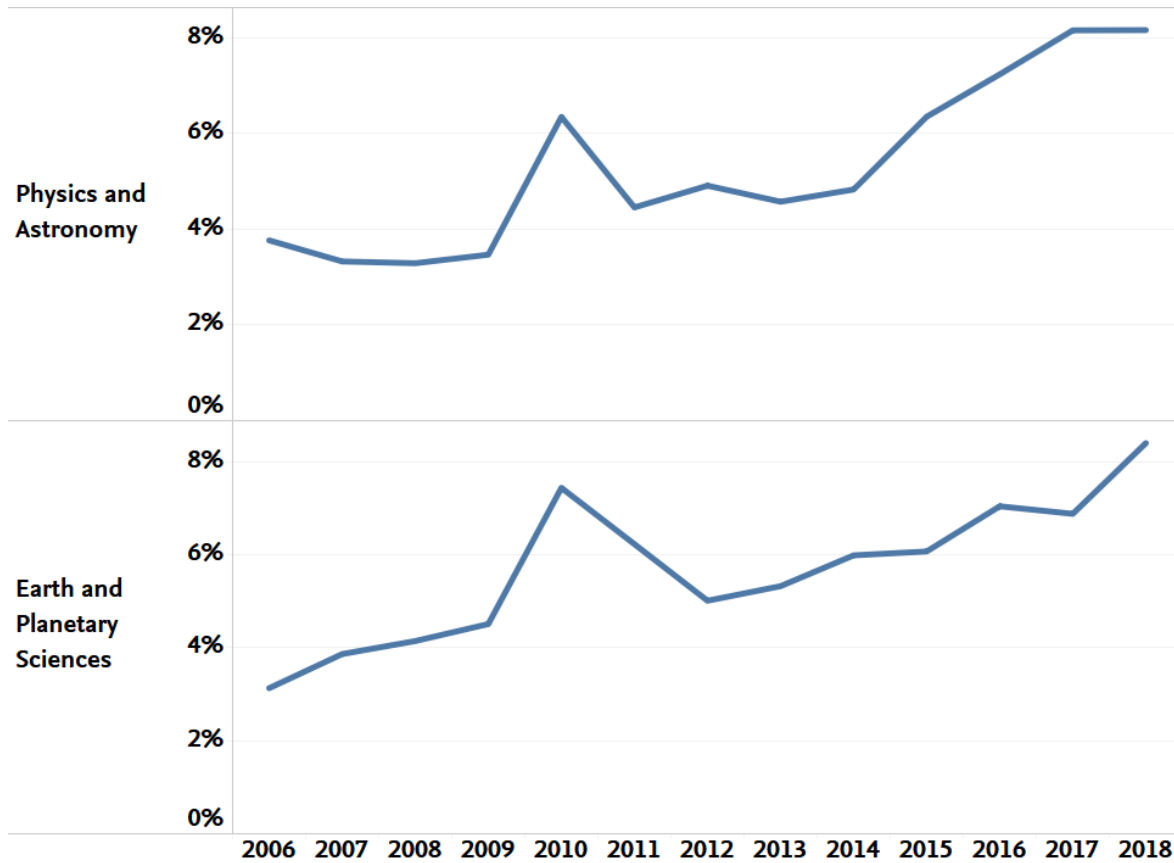


FIGURE 2-9  
Share of STFC funded publications within the two most published subjects, 2006–2018.  
Source: Scopus

In this period, the two most published corporate entities were from Russia: Yandex and the All-Russian Scientific Research Institute of Experimental Physics, which is part of Rosatom (FIGURE 2-10). The third most published institution was the Square Kilometre Array.

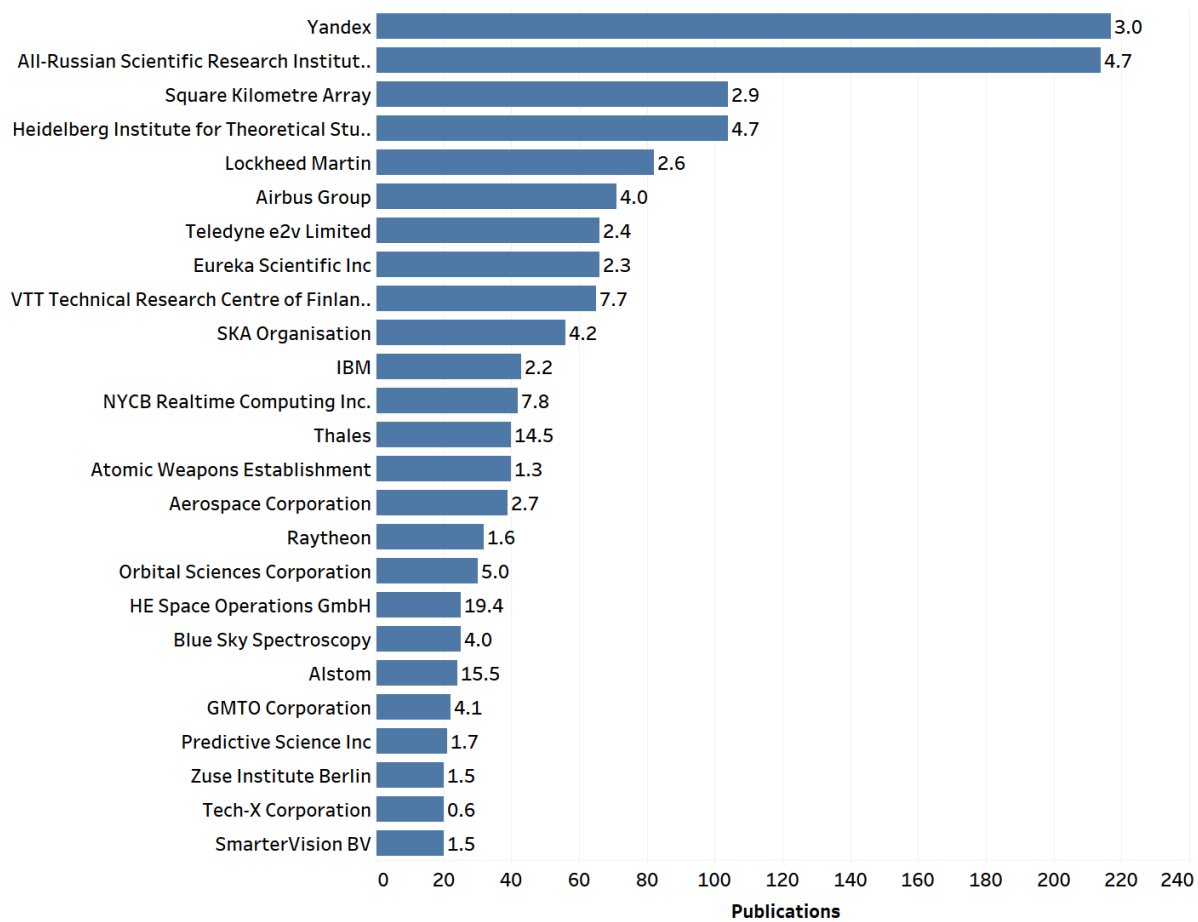


FIGURE 2-10  
 Top corporate institutions published within the STFC corpus by scholarly output, 2006–2018. A cut-off of 20 publications was applied for visibility. The numbers at the end of the bars indicate the average FWCI.  
 Source: Scopus

The most published corporate entities from the United Kingdom were Teledyne e2v Limited (66 publications in 2006–2018), SKA Organisation (56 publications), and Atomic Weapons Establishment (40 publications). FIGURE 2-11 shows the number of distinct corporate entities that published in the corporate sector (indicated by the bar chart) and the scholarly output from these entities (indicated by line chart), both of which increased until the last two years of the study period. The decline in the last two years was associated with the output from the three top corporate entities mentioned above.

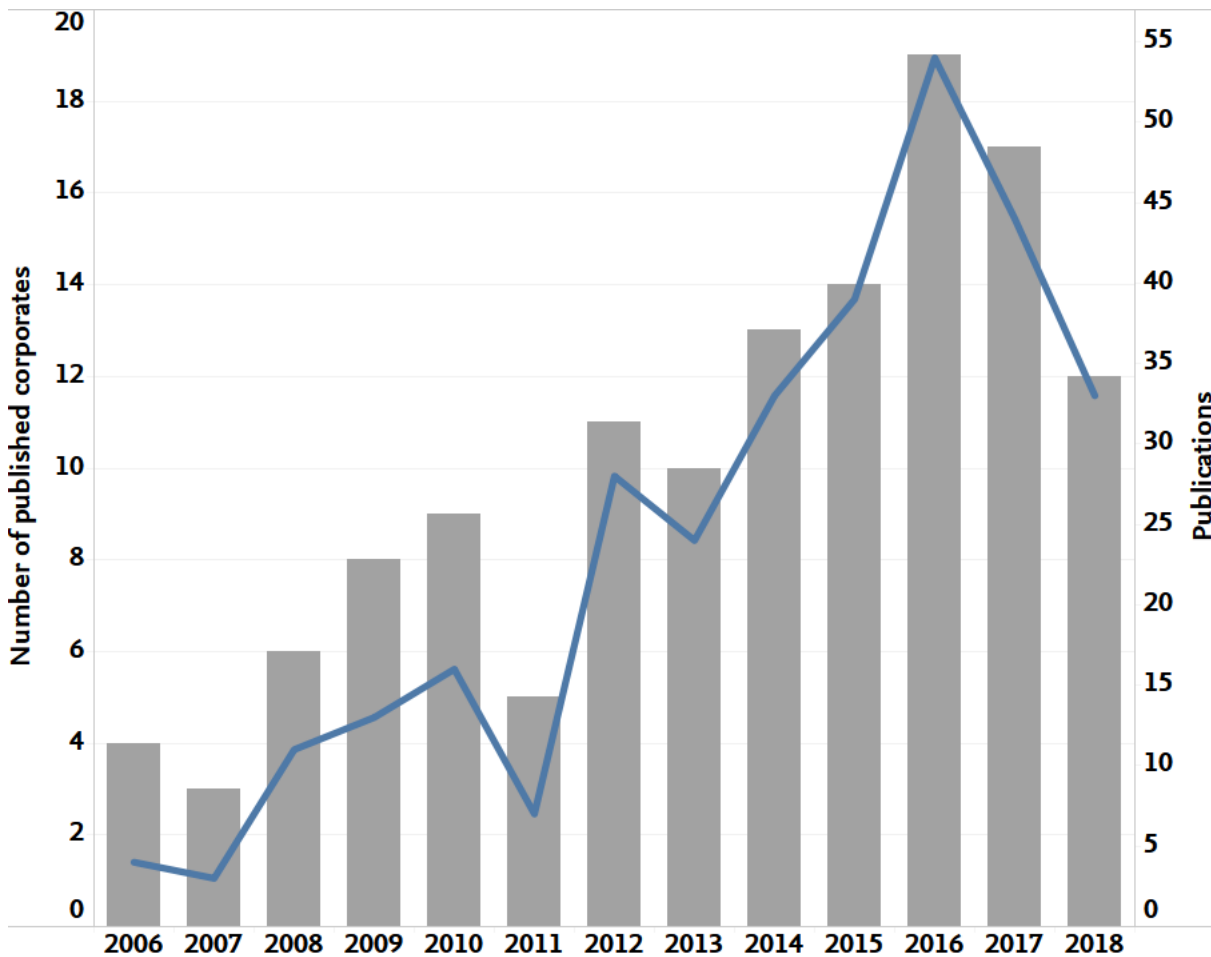


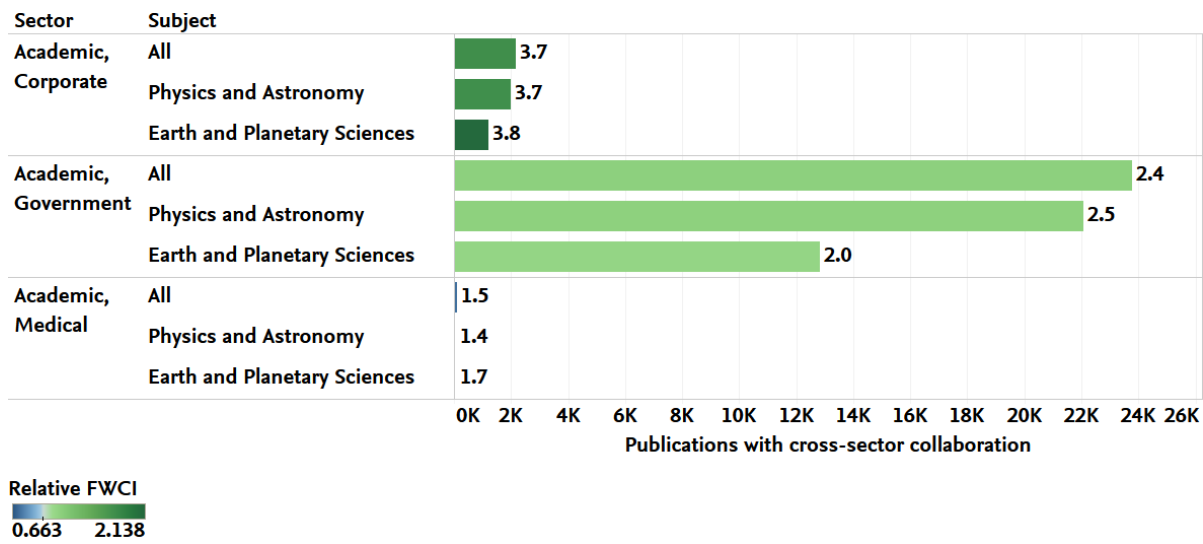
FIGURE 2-11

Number of UK corporate entities that published in the STFC corpus (left axis, indicated by bar chart) and number of publications from UK corporate entities in the STFC corpus (right axis, indicated by line chart), 2006–2018.

Source: Scopus

In terms of scholarly impact, SciVal data indicate that, on average, publications with academic–corporate collaboration have a higher average citation impact. This is also valid for the STFC funded publications: the average impact of STFC funded publications with academic–corporate collaboration was 3.7 for 2006–2018 (FIGURE 2-12), compared with 2.0 for the STFC average.





**FIGURE 2-12**  
 Output and FWCI per cross-sector collaboration type, overall and in PHYSICS AND ASTRONOMY and EARTH AND PLANETARY SCIENCES, 2006–2018. Numbers outside the bars indicate the average FWCI. Relative FWCI (collaboration FWCI/overall STFC corpus FWCI) is indicated by colour: any score above 1 (meaning a higher average FWCI for cross-sector collaboration) is indicated in green.  
 Source: Scopus

## Chapter 3

# Topics of prominence



# 3.1 Topics of prominence

---

## STFC funded publications are in globally prominent topics such as GALAXIES; DUST; INFRARED GALAXIES.

In this section we analyse the STFC corpus by taking a citations-based approach to defining topics and providing a better understanding of whether the main topics of focus in the STFC corpus align with global topics that are gaining momentum.

'Topics', as used in this report, refer to nearly 96,000 research topics created using the citation patterns of Scopus-indexed publications.<sup>2</sup> Topic-level analysis complements the subject-based analyses presented in the previous sections by going deeper and beyond subject disciplines; topic clusters are a higher-level aggregation of these research topics, based on the same direct citation algorithm that creates the topics.

When a topic or topic cluster is defined, a prominence score can be calculated, which indicates the momentum of that research area. A high prominence score suggests strong global momentum for that topic.

The prominence score is calculated by taking into account three metrics:

- Citation Count in year n to papers published in n and n-1
- Scopus Views Count in year n to papers published in n and n-1
- Average CiteScore of the journal the paper was published in, for year n

### The top 20 topics from the STFC corpus

Over 70% of the STFC funded publications were within the topic clusters of GALAXIES,STARS,PLANETS; DECAY,QUARKS,NEUTRINOS; and GRAVITATION,BLACK HOLES (ASTRONOMY),MODELS. GALAXIES,STARS,PLANETS was among the top 10 largest clusters globally, within the top 1% most prominent clusters. The United Kingdom was the second most published country globally, with STFC funded publications accounting for more than half of the UK publications for most topics. In terms of the global share, STFC funded publications accounted for over 30% of global publications within the topic of GALAXIES; DUST; INFRARED GALAXIES and had a larger scholarly impact (FWCI of 2.0) compared to the global average (FWCI of 1.6). The Royal Observatory and University of Edinburgh were among the top UK institutions that published in this topic, and authors from Imperial College, Cardiff University, and Durham University were among the top 10 most published authors globally. In the topic of GALAXIES; RADIO; RADIO GALAXY, STFC funded publications accounted for nearly 70% of UK publications and nearly 28% of global publications. Durham University, the Royal Observatory, and University of Nottingham were among the most published institutions globally. Within the cluster of DECAY,QUARKS,NEUTRINOS, the topic of COLLISIONS; JETS; PROTON-PROTON COLLISIONS was highly prominent, with STFC funded publications having twice the scholarly impact (FWCI of 4.0) of the global average (2.0). While

the United Kingdom was the third most published country globally, none of the UK institutions or authors were among the most published globally, suggesting the activity was distributed.

There were also certain topics where STFC funded publications increased their world output share considerably. GALAXIES; DUST; INFRARED GALAXIES was one of these topics; here the global share of the STFC corpus increased from nearly 12% in 2006 to nearly 27% in 2018. Similarly, the STFC corpus's share in COLLISIONS; JETS; PROTON–PROTON COLLISIONS increased from over 2% to over 36%. After a decline between 2006 and 2011, the share of STFC funded publications in DECAY; CP VIOLATION; ANGLE  $\Gamma$  increased steeply from over 6% in 2011 to over 25% in 2018. Despite a sharp decrease in 2018, STFC funded publications in GALAXIES; HALOS; ASSEMBLY BIAS increased from nearly 6% in 2006 to nearly 30% in 2017, and the average FWCI of STFC funded publications in this topic was nearly 3.0, considerably higher than the UK average of 2.4 and global average of 1.6. University of Portsmouth was one of the most published institutions globally. In terms of decreasing shares, the share of STFC funded publications in BOSONS; COUPLING; ANOMALOUS QUARTIC declined from 20% in 2006 to over 8% in 2018. However, output in this topic has been declining globally as well.

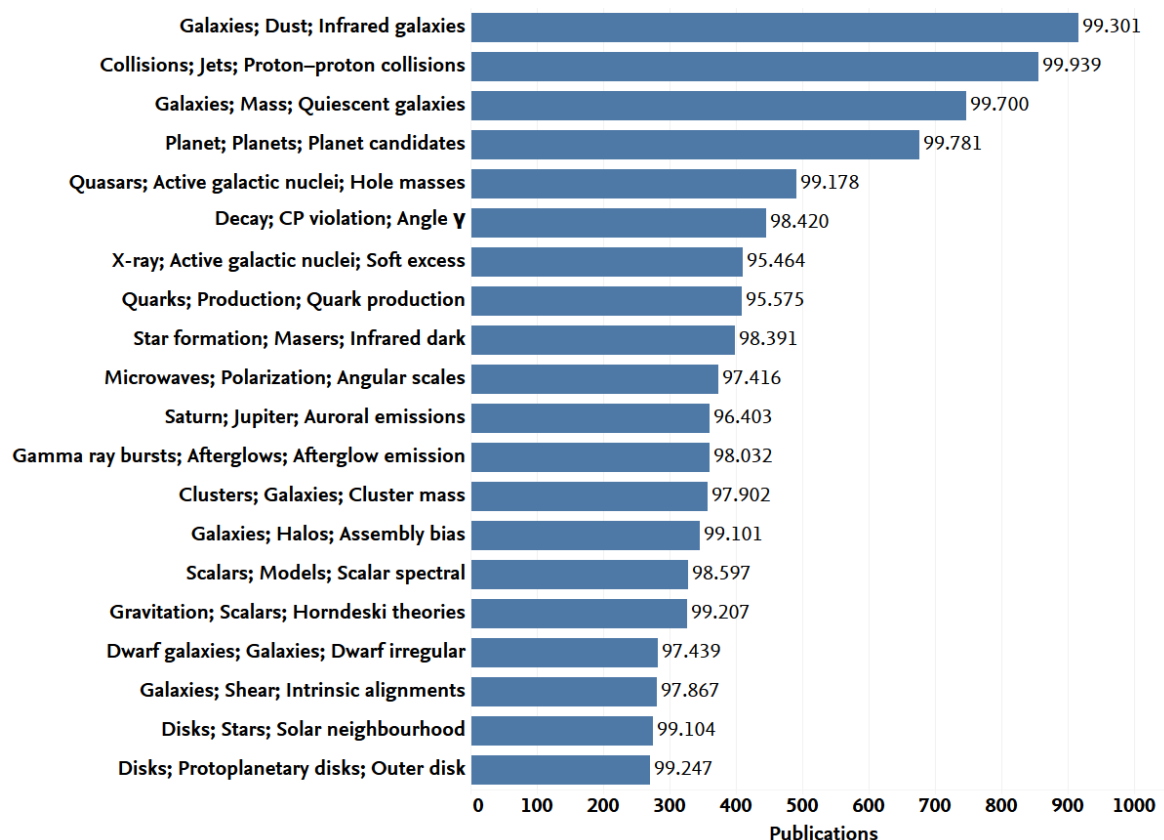


FIGURE 3-1  
Top 20 topics of the STFC corpus by output, 2006–2018.  
Source: Scopus

FIGURE 3-2 and FIGURE 3-3 indicate the top 50 topics where the STFC corpus's share was the highest for the world and the United Kingdom respectively. Some of the top topics in these charts differ from the top topics in which the STFC corpus was published. For example, NUCLEI; PROTONS; PROTON EMITTERS, GALAXIES; RADIO; RADIO GALAXY, and CURRENT SHEETS; MAGNETOHYDRODYNAMICS; FLUX ROPE were topics in which STFC funded publications accounted for a large global share, but they were not among the top 20 most published topics for the STFC. COLLISIONS; IONIC COLLISIONS; FLOW HARMONICS, DECAY; BARYONS; ABSOLUTE BRANCHING and NUCLEI; PROTONS; PROTON EMITTERS were some of the topics in which STFC funded publications accounted for 80% or more of all UK publications.

FIGURE 3-4 shows the compound annual growth rate of STFC funded publications per topic, for those topics where there were more than 100 publications during 2006–2018. TOP QUARK; PARTON; HIGGS BOSON was the topic that grew the most and the fastest, going from 2 publications in 2006 to 211 in 2018. Some of the other topics that had very high values for this indicator and consistent increasing trends were STAR FORMATION; GALAXY; GALACTIC EVOLUTION, STAR FORMATION; GALAXY; MOLECULAR GAS, EXOPLANET; KEPLER; JUPITER, ACTIVE GALACTIC NUCLEI; QUASAR; GALAXY; GAIUM; SOLAR NEIGHBORHOOD; LAMOST, SCATTERING AMPLITUDE; SUPERGRAVITY; YANG-MILL, NEUTRON STAR; LIGO (OBSERVATORY); GRAVITATIONAL WAVE.

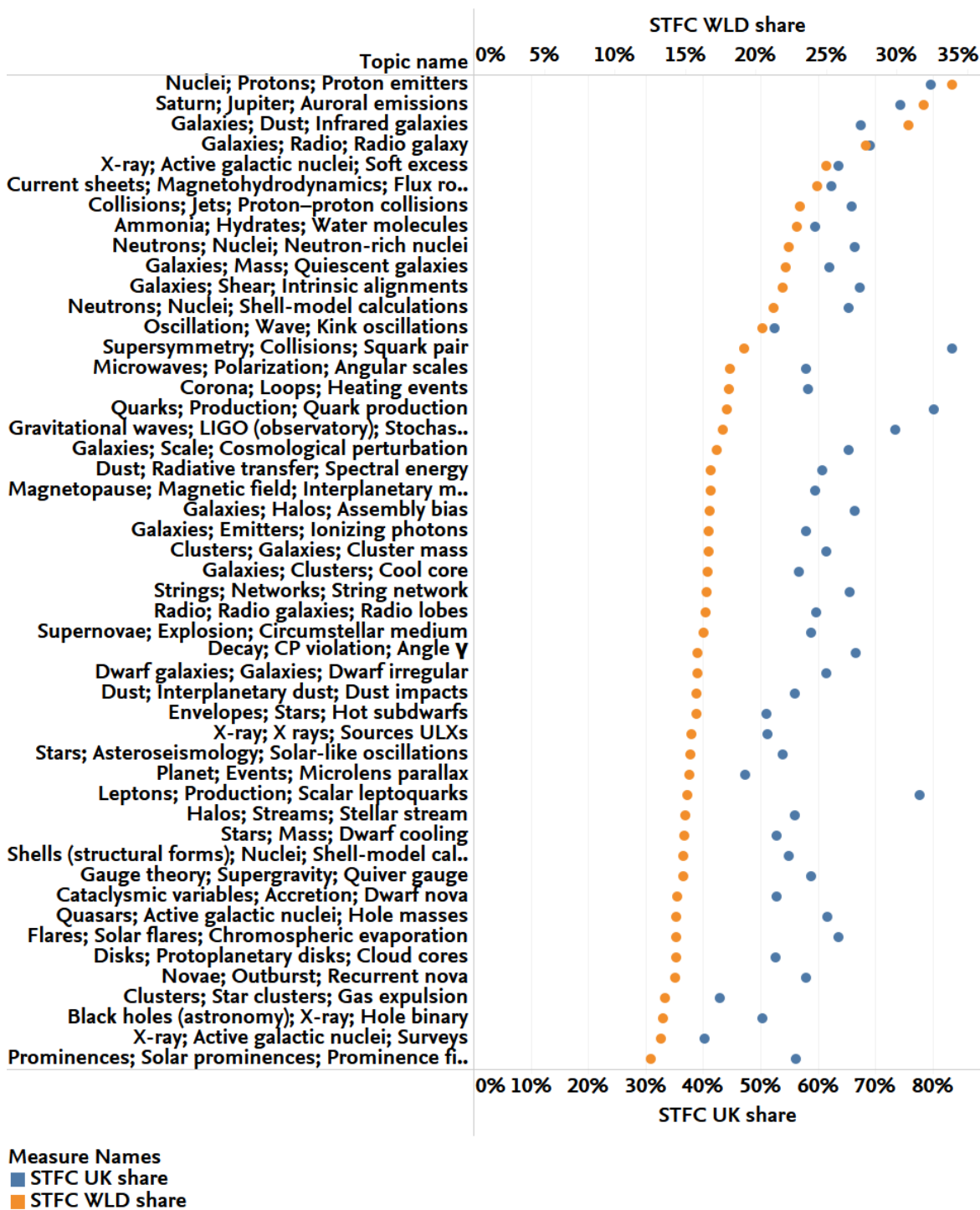


FIGURE 3-2  
 Top 50 topics in which the STFC corpus's global share of publications was the highest during the 2006–2018 period.  
 Orange dots indicate the global share of STFC funded publications in that period and blue dots indicate the UK share.  
 Source: Scopus

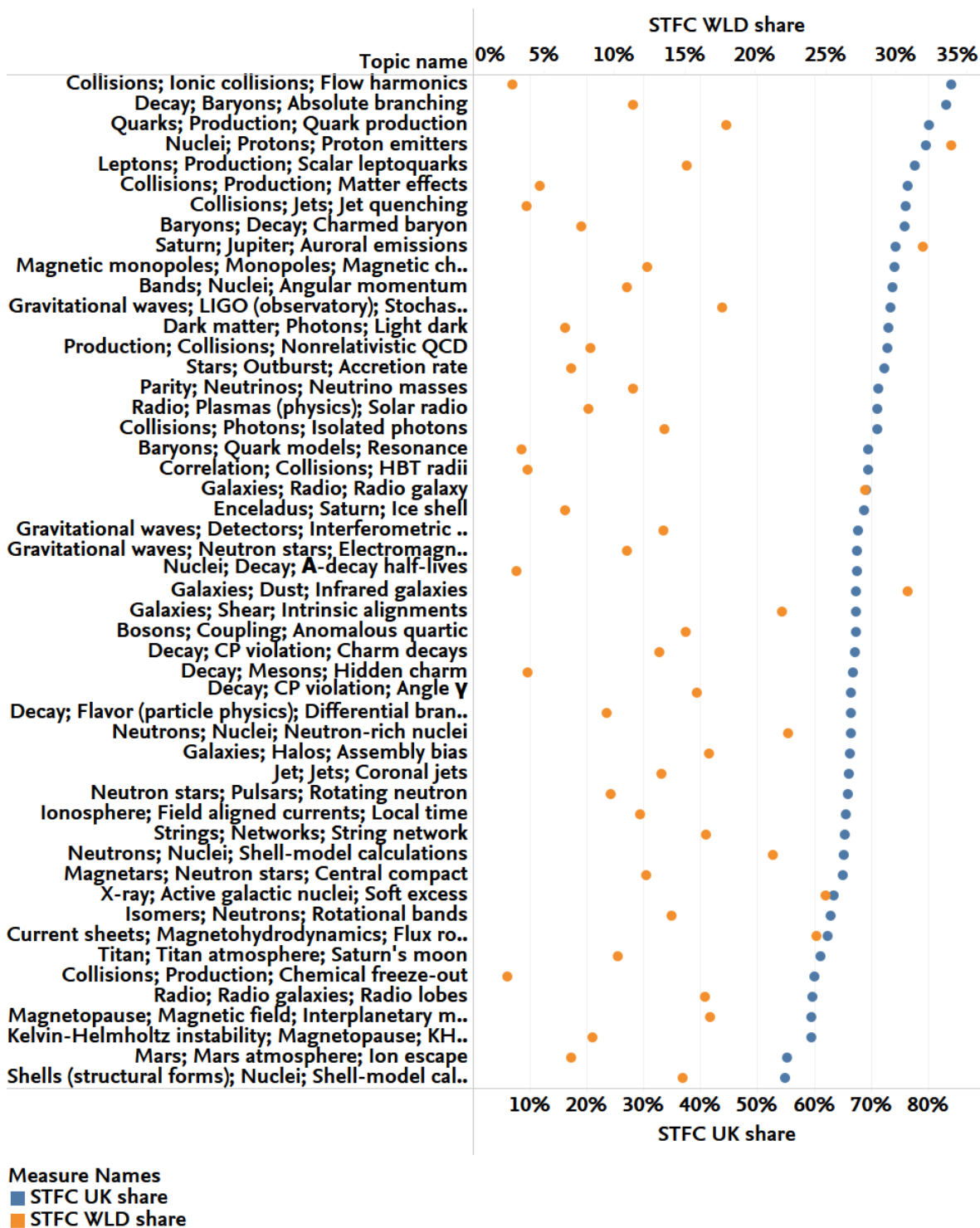


FIGURE 3-3 Top 50 topics in which the STFC corpus’s share of UK publications was the highest during the 2006–2018 period. Orange dots indicate the global share of STFC funded publications in that period and blue dots indicate the UK share. Source: Scopus

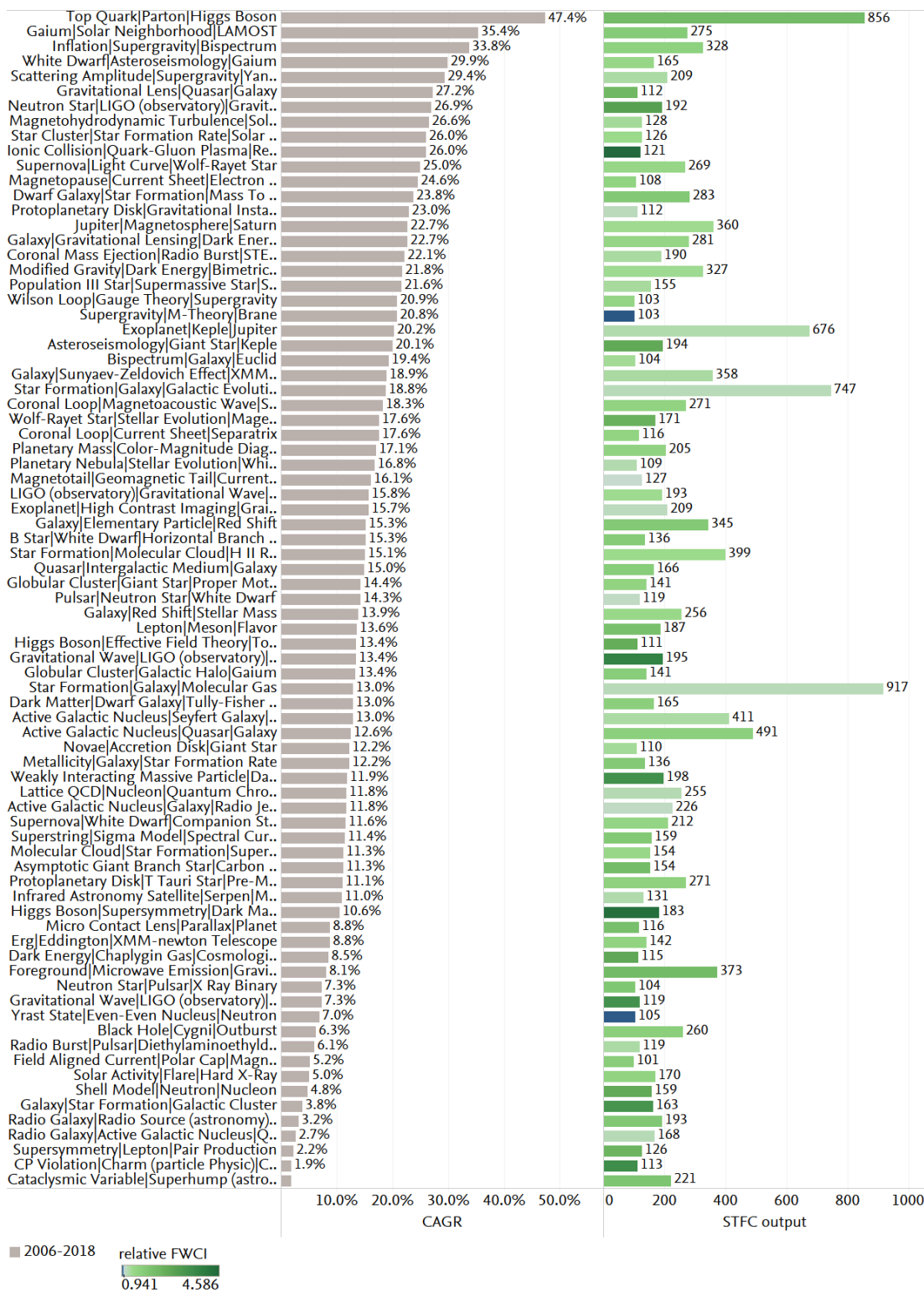


FIGURE 3-4

Compound annual growth rate (CAGR) and output of STFC funded publications for topics with more than 100 publications during the 2006–2018 period. Left panel shows the CAGR for 2006–2018, and right panel shows the number of publications in the same period. Colour on the right panel shows the relative average FWCI of STFC funded publications compared with the global average in that topic, where green indicates a higher STFC average FWCI than the global average FWCI.

Source: Scopus



# Appendix A

## List of Scopus ASJC 27/334 Subject Areas

---

### **Agricultural and Biological Sciences**

Agricultural & Biological Sciences (miscellaneous)  
Agronomy and Crop Science  
Animal Science and Zoology  
Aquatic Science  
Ecology, Evolution, Behavior and Systematics  
Food Science  
Forestry  
General Agricultural and Biological Sciences  
Horticulture  
Insect Science  
Plant Science  
Soil Science

### **Arts and Humanities**

General Arts and Humanities  
Arts and Humanities (miscellaneous)  
History  
Language and Linguistics  
Archeology (arts and humanities)  
Classics  
Conservation  
History and Philosophy of Science  
Literature and Literary Theory  
Museology  
Music  
Philosophy  
Religious Studies  
Visual Arts and Performing Arts

### **Biochemistry, Genetics and Molecular Biology**

General Biochemistry, Genetics & Molecular Biology  
Biochemistry, Genetics and Molecular Biology (miscellaneous)  
Aging  
Biochemistry  
Biophysics  
Biotechnology  
Cancer Research  
Cell Biology  
Clinical Biochemistry  
Developmental Biology  
Endocrinology  
Genetics

Molecular Biology

Molecular Medicine

Physiology

Structural Biology

### **Business, Management and Accounting**

General Business, Management and Accounting  
Business, Management and Accounting (miscellaneous)  
Accounting  
Business and International Management  
Management Information Systems  
Management of Technology and Innovation  
Marketing  
Organizational Behavior and Human Resource Management  
Strategy and Management  
Tourism, Leisure and Hospitality Management  
Industrial Relations

### **Chemical Engineering**

Bioengineering  
Catalysis  
Chemical Engineering (miscellaneous)  
Chemical Health and Safety  
Colloid and Surface Chemistry  
Filtration and Separation  
Fluid Flow and Transfer Processes  
General Chemical Engineering  
Process Chemistry and Technology

### **Chemistry**

Analytical Chemistry  
Chemistry (miscellaneous)  
Electrochemistry  
General Chemistry  
Inorganic Chemistry  
Organic Chemistry  
Physical and Theoretical Chemistry  
Spectroscopy

**Computer Science**

Artificial Intelligence  
 Computational Theory and Mathematics  
 Computer Graphics and Computer–Aided Design  
 Computer Networks and Communications  
 Computer Science (miscellaneous)  
 Computer Science Applications  
 Computer Vision and Pattern Recognition  
 General Computer Science  
 Hardware and Architecture  
 Human–Computer Interaction  
 Information Systems  
 Signal Processing  
 Software

**Decision Sciences**

Decision Sciences (miscellaneous)  
 General Decision Sciences  
 Information Systems and Management  
 Management Science and Operations Research  
 Statistics, Probability and Uncertainty

**Dentistry**

General Dentistry  
 Dentistry (miscellaneous)  
 Dental Assisting  
 Dental Hygiene  
 Oral Surgery  
 Orthodontics  
 Periodontics

**Earth and Planetary Sciences**

Atmospheric Science  
 Computers in Earth Sciences  
 Earth and Planetary Sciences (miscellaneous)  
 Earth–Surface Processes  
 Economic Geology  
 General Earth and Planetary Sciences  
 Geochemistry and Petrology  
 Geology  
 Geophysics  
 Geotechnical Engineering and Engineering Geology  
 Oceanography  
 Paleontology  
 Space and Planetary Science  
 Stratigraphy

**Economics, Econometrics and Finance**

General Economics, Econometrics and Finance  
 Economics, Econometrics and Finance  
 (miscellaneous)  
 Economics and Econometrics  
 Finance

**Energy**

Energy (miscellaneous)  
 Energy Engineering and Power Technology  
 Fuel Technology  
 General Energy  
 Nuclear Energy and Engineering  
 Renewable Energy, Sustainability and the  
 Environment

**Engineering**

Aerospace Engineering  
 Architecture  
 Automotive Engineering  
 Biomedical Engineering  
 Building and Construction  
 Civil and Structural Engineering  
 Computational Mechanics  
 Control and Systems Engineering  
 Electrical and Electronic Engineering  
 Engineering (miscellaneous)  
 General Engineering  
 Industrial and Manufacturing Engineering  
 Mechanical Engineering  
 Mechanics of Materials  
 Media Technology  
 Ocean Engineering  
 Safety, Risk, Reliability and Quality

**Environmental Science**

Ecological Modeling  
 Ecology  
 Environmental Chemistry  
 Environmental Engineering  
 Environmental Science (miscellaneous)  
 General Environmental Science  
 Global and Planetary Change  
 Health, Toxicology and Mutagenesis  
 Management, Monitoring, Policy and Law  
 Nature and Landscape Conservation  
 Pollution  
 Waste Management and Disposal  
 Water Science and Technology

---

**Health Professions**

- General Health Professions
- Health Professions (miscellaneous)
- Chiropractics
- Complementary and Manual Therapy
- Emergency Medical Services
- Health Information Management
- Medical Assisting and Transcription
- Medical Laboratory Technology
- Medical Terminology
- Occupational Therapy
- Optometry
- Pharmacy
- Physical Therapy, Sports Therapy and Rehabilitation
- Podiatry
- Radiological and Ultrasound Technology
- Respiratory Care
- Speech and Hearing

**Immunology and Microbiology**

- General Immunology and Microbiology
- Immunology and Microbiology (miscellaneous)
- Applied Microbiology and Biotechnology
- Immunology
- Microbiology
- Parasitology
- Virology

**Materials Science**

- General Materials Science
- Materials Science (miscellaneous)
- Biomaterials
- Ceramics and Composites
- Electronic, Optical and Magnetic Materials
- Materials Chemistry
- Metals and Alloys
- Polymers and Plastics
- Surfaces, Coatings and Films

**Mathematics**

- Algebra and Number Theory
- Analysis
- Applied Mathematics
- Computational Mathematics
- Control and Optimization
- Discrete Mathematics and Combinatorics
- General Mathematics
- Geometry and Topology
- Logic
- Mathematical Physics
- Mathematics (miscellaneous)
- Modeling and Simulation
- Numerical Analysis

- Statistics and Probability
- Theoretical Computer Science

**Medicine**

- Anatomy
- Anesthesiology and Pain Medicine
- Biochemistry (medical)
- Cardiology and Cardiovascular Medicine
- Complementary and Alternative Medicine
- Critical Care and Intensive Care Medicine
- Dermatology
- Drug Guides
- Embryology
- Emergency Medicine
- Endocrinology, Diabetes and Metabolism
- Epidemiology
- Family Practice
- Gastroenterology
- General Medicine
- Genetics (clinical)
- Geriatrics and Gerontology
- Health Informatics
- Health Policy
- Hematology
- Hepatology
- Histology
- Immunology and Allergy
- Infectious Diseases
- Internal Medicine
- Medicine (miscellaneous)
- Microbiology (medical)
- Nephrology
- Neurology (clinical)
- Obstetrics and Gynecology
- Oncology
- Ophthalmology
- Orthopedics and Sports Medicine
- Otorhinolaryngology
- Pathology and Forensic Medicine
- Pediatrics, Perinatology and Child Health
- Pharmacology (medical)
- Physiology (medical)
- Psychiatry and Mental Health
- Public Health, Environmental and Occupational Health
- Pulmonary and Respiratory Medicine
- Radiology, Nuclear Medicine and Imaging
- Rehabilitation
- Reproductive Medicine
- Reviews and References (medical)
- Rheumatology
- Surgery

---

Transplantation  
Urology

### **Multidisciplinary**

Multidisciplinary

### **Neuroscience**

General Neuroscience  
Neuroscience (miscellaneous)  
Behavioral Neuroscience  
Biological Psychiatry  
Cellular and Molecular Neuroscience  
Cognitive Neuroscience  
Developmental Neuroscience  
Endocrine and Autonomic Systems  
Neurology  
Sensory Systems

### **Nursing**

General Nursing  
Nursing (miscellaneous)  
Advanced and Specialized Nursing  
Assessment and Diagnosis  
Care Planning  
Community and Home Care  
Critical Care Nursing  
Emergency Nursing  
Fundamentals and Skills  
Gerontology  
Issues, Ethics and Legal Aspects  
Leadership and Management  
LPN and LVN  
Maternity and Midwifery  
Medical and Surgical Nursing  
Nurse Assisting  
Nutrition and Dietetics  
Oncology (nursing)  
Pathophysiology  
Pediatrics  
Pharmacology (nursing)  
Psychiatric Mental Health  
Research and Theory  
Review and Exam Preparation

### **Pharmacology, Toxicology and Pharmaceutics**

General Pharmacology, Toxicology and Pharmaceutics  
Pharmacology, Toxicology and Pharmaceutics (miscellaneous)  
Drug Discovery  
Pharmaceutical Science  
Pharmacology  
Toxicology

### **Physics and Astronomy**

Acoustics and Ultrasonics  
Astronomy and Astrophysics  
Atomic and Molecular Physics, and Optics  
Condensed Matter Physics  
General Physics and Astronomy  
Instrumentation  
Nuclear and High Energy Physics  
Physics and Astronomy (miscellaneous)  
Radiation  
Statistical and Nonlinear Physics  
Surfaces and Interfaces

### **Psychology**

General Psychology  
Psychology (miscellaneous)  
Applied Psychology  
Clinical Psychology  
Developmental and Educational Psychology  
Experimental and Cognitive Psychology  
Neuropsychology and Physiological Psychology  
Social Psychology

### **Social Sciences**

General Social Sciences  
Social Sciences (miscellaneous)  
Archeology  
Development  
Education  
Geography, Planning and Development  
Health (social science)  
Human Factors and Ergonomics  
Law  
Library and Information Sciences  
Linguistics and Language  
Safety Research  
Sociology and Political Science  
Transportation  
Anthropology  
Communication  
Cultural Studies  
Demography  
Gender Studies  
Life–span and Life–course Studies  
Political Science and International Relations  
Public Administration  
Urban Studies

### **Veterinary**

General Veterinary

Veterinary (miscellaneous)  
Equine

Food Animals  
Small Animals

# About

---

This is Appendix Text.

# Authors

---

This is Appendix Text.



Elsevier is a registered trademark of Elsevier B.V. | RELX Group and the RE symbol are trademarks of RELX Intellectual Properties SA, used under license. © 2019 Elsevier B.V.

**Analytical Services**