Fractional Authorship & Publication Productivity

Highlights

Authors divide their research output across publications, contributing via research collaborations

The trend is for authors to produce more publications per year (increased fractionalization) but for the overall number of publications per author to decrease

We suggest that the effort required to participate in research collaborations is a factor in the decrease in publications per author

International Center for the Study of Research
Are authors collaborating more in response to the pressure to publish?

Growth in the number of scholarly publications each year has been well documented (e.g., Bornmann & Mutz, 2015, Figure 1). But how has that growth been achieved? Is it purely due to increasing investment in research, resulting in a greater number of active researchers? Or is each researcher producing more publications? To investigate these questions, we build on Plume & van Weijen’s (2014) previous work.

The “publish or perish” research culture provides incentives for researchers to have long publication lists on their CVs, especially where those publications appear in high-impact journals (Tregoning, 2018). By examining authorship trends, we aim to understand if researchers are responding to the pressure to publish by fractionalizing themselves across more papers and whether this leads to more publication outputs overall. Does increasing collaboration enable each researcher to be involved with, and produce more, research?

Researchers are motivated to enter into collaborations for many reasons; for instance, to gain access to samples, field sites, research facilities, or patient groups. Researchers wishing to study topics outside their own expertise require interdisciplinary collaborators or may simply look to find co-authors whose skills and knowledge complement their own. Evidence suggests that diverse research teams are more likely to be successful at problem solving (e.g., Phillips, Northcraft, & Neale, 2006) and that publications by collaborative teams benefit from a citation advantage (e.g., Glanzel, 2001). International collaboration has also been shown to drive publication growth (Adams, 2013).

Figure 1: Trends of publications, unique authors, and authorships per publication year 2008–17 (millions). Compound Annual Growth Rate (CAGR) is shown for the same period.
Growth in publications and authors is outstripped by growth in authorships

Using Scopus, we examined authors contributing to documents published between 2008 and 2017. Collaborative writing can be measured in terms of co-authorships—the number of authors listed as contributing to a document. This contrasts with the count of unique authors, where each author is only counted once per year in which they appear listed on any publication. Figure 1 shows that the number of authorships has grown at a much faster rate than both the growth of publications and of unique authors.

Perhaps the most straightforward measure of author behavior is the number of authors who contributed to each publication (authorships per publication). Over this decade, the average number of authors on each publication increased (see Figure 2), which is consistent with previous studies (Mallapaty 2018; Plume & van Weijen 2014). The rise in the number of authorships per publication over the past ten years means that, on average, a publication now has just under five authors, compared to just under four authors in 2008, suggesting that authors are writing more collaboratively. Some of this change is attributable to the rise of papers with very long author lists. In 2017, 1,249 papers had more than 100 authors, compared to 526 in 2008. Many papers with the longest lists of contributors are the result of large research collaborations, such as the Large Hadron Collider (e.g., Aad et al., 2015) or the Reduction of Atherothrombosis for Continued Health (REACH) Registry (Eisen et al., 2016).

Publications have more authors contributing on average, but how does that look for each researcher? Are individual researchers writing more articles every year, or are more authors just writing collaboratively? The number of authorships per author remained very stable from 2008-17, meaning that each author contributed to a similar number of papers per year; however, the number of publications per author (total publications divided by total unique authors) decreased from 0.57 in 2008 to 0.48 in 2017. Whilst collaboration (authorships per publication) rose, the number of publications per author declined. This indicates that, in terms of research efficiency (as measured by publication output), authors are collaborating more and increasing their personal productivity, but the net output per active researcher has decreased.

We see the same trend across all 27 subject areas studied (not shown, see supplementary data); therefore, we don’t believe that the trends can be attributed to any possible changes in the balance of content indexed in Scopus across different subject areas over time.

This interpretation assumes that authors are included on publications where they have made a genuine contribution and not as “gift” authorship (where authors are included despite little or no participation) or “ghost” authorship (where authors are not included despite making a significant contribution), and that the rates of gifting and ghosting have not substantially changed over time.

Publications have more authors contributing on average, but how does that look for each researcher? Are individual researchers writing more articles every year, or are more authors just writing collaboratively?
2017) and the least in Immunology and Microbiology publications (3% in 2017). The trend of decreasing publications per author while authorships per publication increases is seen across all fields.

Figure 3 shows that fields with more collaborative authors produce fewer publications per author. This is consistent with the trends observed across all publications, where authors collaborate more but contribute to slightly fewer publications in total.

This finding suggests that there is a productivity penalty to collaboration — while collaborating allows authors to appear on more articles, the time and energy required to work with a team (and the effort to get each document published) means that each researcher will produce fewer publications overall. So, while authors are responding to the pressure to publish by fractionalizing themselves across more publications, they become less productive (in terms of the number of publications), though this does not impact all fields equally. This may be of more concern to research institutions or funders who look at total research outputs counted across groups of researchers, rather than individual researchers who are successfully using this strategy to grow their own publication lists.

Our results imply that full and fractional counting approaches offer complementary perspectives on publication output, as they each expose different aspects of research practice. Furthermore, it highlights the need to employ both metrics to fully understand how publication output reflects productivity.

Given the trend of increasing author lists on publications, it has become more difficult to discern author contribution from that list alone. This emphasizes the need for improved credit assignment, particularly for the purposes of evaluating productivity and research leadership.

Figure 2: Trends of authorships per publication and per author and publications per author 2008–17.
Our results imply that full and fractional counting approaches offer complementary perspectives on publication output, as they each expose different aspects of research practice.
This report uses bibliometric data from Scopus. Scopus is Elsevier’s abstract and citation database of peer-reviewed literature covering 75 million documents published in over 23,500 journals, book series, and conference proceedings. Data for this report was accessed in April 2019.

Document types selected for the analysis were: journal articles, journal reviews, and conference proceedings. For each document in the analysis, the count of authorships is the total number of authors listed. Within Scopus, articles are assigned to author profiles which list all of the publications by a single author. Therefore, the count of unique authors is the total number of author profiles with at least one publication in a given year. Data are available here:


At the time of analysis, the most recent complete year of data was 2017. Subject analyses use the All Sciences Journal Classification (ASJC) top level 27 subject areas.


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