More journal articles and fewer books: publication practices in the social sciences in the 2010's

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Abstract

Over the past few years, the rate of journal article publication has increased in most academic disciplines - in some cases more than doubling in the past decade. While journal articles are the *de facto* currency of knowledge production in many science disciplines, social science scholars routinely publish books as well as journal articles. The social sciences have also undergone a rapid transformation towards more quantitative methodologies, thus representing a unique opportunity to study the increased rate of journal article publication in an area where books are also an important mode of dissemination. We studied the publishing activity of social sciences faculty members in 12 disciplines at 290 Ph.D. granting institutions in the United States between 2011 and 2019. In all disciplines, journal articles per person increased between 2011 and 2019 by between 3% and 64%, while books per person decreased by at least 31% and as much as 54%. Overall, early career researchers show the largest increase in rates of journal article production, while senior scholars show the greatest increase in participation in journal article production. Younger scholars appear to have greater publication output, while growing numbers of older scholars turn towards journal articles as a means of disseminating their work in the social sciences. We observe growing uniformity in the disciplinary literatures of the social sciences, which increasingly resemble the physical and biological sciences in terms of publication practices.

Keywords

Social sciences; bibliometrics; publication rate; journal articles; scholarly books

Declarations

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Conflict of interest

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Data availability

Raw data tables (anonymized to conceal individual identities) are available via OSF:

<https://osf.io/2x4uf/>.

Code availability

R scripts for all analyses and figures are available via OSF: <https://osf.io/2x4uf/>.

Author's contributions

Both authors contributed to the study conception and design. Material preparation and data analysis was performed by AJO. The first draft of the manuscript was written by WES; all authors revised the manuscript. All authors read and approved the final manuscript.

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Introduction

The number of scholarly journal articles published each year is growing rapidly. Kyvik (2003) estimated there was, on average, a 30% increase in scientific and scholarly publishing between 1980 and 2000. In a later study, Kyvik and Aksnes (2015) noted that Web of Science records increased from 500,000 indexed articles in 1981 to 1.5 million indexed articles in 2013. More recently, Altbach and de Wit (2018) estimated that there are 30,000 scholarly journals with nearly two million articles published each year. The number of scholarly journals in which these articles are published has also increased; for example, Hermanowicz (2016) observed there were 256 journals in Sociology and cognate fields in 1970, but by 2015 there were 830 such journals. The social sciences are comprised of several disciplines in which scholars regularly publish both journal articles and books. Some academic departments in the same social science discipline may be characterized as “book departments” or “article departments” (Clemens et al. 1995). The social sciences thus represent a distinctive opportunity to explore the growth of journal article publications on overall publication practices in a sample of disciplines where journal articles are not the sole preferred mode of knowledge dissemination.

In this study, we examine how disciplinary publishing practices in the social sciences have changed over a recent nine year period at Ph.D. granting universities in the United States. We quantify changes in total and per capita journal article and book publication output of each discipline, as well as the rate of participation in both modes of dissemination (i.e., the percentage of scholars who have participated in journal article and book authorship over time). Both the rate of publication and the rate of participation are compared across academic age groups (early career, mid-career, and senior scholars). Specifically, we address the following questions using a large longitudinal database of scholarly activity spanning several social sciences disciplines and including tens of thousands of individual scholars:

1. Has the publication strategy of social science disciplines changed such that more or fewer books and journal articles are being written now than in the recent past (in total and in the context of faculty population changes in these disciplines over time)?
2. Has the percentage of scholars actively participating in a particular publishing type changed over time (e.g., are fewer scholars authoring books, or are fewer books being published per scholar, or both)?
3. Do different generations of researchers show different publication strategy patterns?

Changes in the social science research environment and performance-based measures

Kyvik and Aksnes (2015) take a generational approach to explain the growth of scientific and scholarly publishing. They posited several contributing factors. First, new generations of researchers receive better training and are more productive at the beginning of their careers than previous generations. Second, younger researchers enjoy better research environments with access to modern technology and external funding. Third, new generations of researchers are incentivized through the introduction of national evaluation and rewards systems. Unpacking the implications in these ideas will provide fertile background to our understanding of the increase in scholarly and scientific publishing.

Based on their analyses, they conclude that the growth in publishing is a general phenomenon across all age groups, not only a feature of new generations of well-trained scholars and that “younger staff may have affected the publishing behaviours of their older colleagues” (Kyvik and Aksnes 2015). Warren (2019) also observed increased publication rates among new generations of social science scholars, finding that publishing expectations are now twice as great as they were in the early 1990’s for graduates seeking an assistant professor position or assistant professors seeking promotion to associate professor. In an earlier study, Bauldry (2013) examined 403 new hires in sociology at 98 research universities and found assistant professors hired in either 2011 or 2012 had a median number of publications two to three times greater than new assistant professors hired in 2007. An important difference between the two groups was that 63% of the new hires in 2007 were graduate students who were “all but dissertation” (ABD), while in 2012 only 40% were ABD. The 2012 data also showed that 25% of new hires were post docs, 15% had been assistant professors elsewhere, and 10% had occupied other positions such as lecturer, visiting scholar or a term position. At least half of the new hires in 2012 had a year or more of additional work experience compared to 2007. In other words, the succeeding generations of new researchers who published more than their predecessors were not only better trained, they had more experience working in higher education.

In their discussion on the influence of research environments and external funding, Kyvik and Aksnes (2015) focused primarily on the impact of external funding. They simply note that there have been improvements in research environments with the introduction of personal computers, databases, and the internet. Much more could have been said about the profound changes in research methodologies, especially those brought about by the proliferation of massive databases for research.

Six years earlier, Lazer et al. (2009) announced an emergent field of computational social science “that leverages the capacity to collect and analyze data with an unprecedented breadth and depth and scale.” King (2014) describes the dramatic methodological changes in the social sciences as “from isolated scholars toiling away on their own to larger scale, collaborative, interdisciplinary, lab-style research teams; and from a purely academic pursuit to having a major impact on the world.” Data repositories such as the Inter-university Consortium for Political and Social Research (ICPSR) and the Harvard-MIT Data Center make large datasets and technical services available to social sciences researchers. On-campus resources for social science researchers at American universities are also widespread. For example, every member of the Association of American Universities (AAU) has at least one center, institute, or program exploring computational social science research. The availability of large research grants further demonstrates the growing importance of quantitative social sciences. The US National Science Foundation (NSF) Directorate of Social, Behavioral and Economic Science, for example, funds projects through a program called *Human Networks and Data Science* (National Science Foundation 2021). The program has two tracks; the first calls for the creation of national infrastructure which will include “user-friendly large-scale next-generation data resources and relevant analytic techniques and produce a finished product that will enable new types of data-intensive research.” The second track focuses on core research, stating an interest in “leveraging multi-scale, multi-level network data and techniques of network analysis to further theory development across the social sciences.” The social science research environment has developed towards increased collaborative investigation, frequent reporting, wider availability of data, and greater access to financial resources, and it seems the internal dynamic of the field of study is driving part of the growth in publication.

Kyvik and Aksnes (2015) also suggest that a growing connection between research success, career development and monetary rewards contributes to the growth of publishing. Performance-based research funding systems encourage greater publication rates to increase the prestige and ability to attract funding of individual researchers, academic departments, and universities. Hermanowicz (2016) also noted that the growth of academic publishing coincides with a transformation in the economy of universities. Universities and the faculty who work for them have become entrepreneurs. For both the university and the individual faculty member, “research and publication have become the main currency in which

prestige is traded.” Research evaluation and the conferral of prestige intersect in that they share the same currency: scholarly publication. The pressures driving the university also become the pressures driving the individual researcher. Hence, this alignment of university and faculty performance-based measures has likely been an influence on the increased the rate of scholarly publication.

The Research Excellence Framework (REF) determines a large proportion of national funding for institutional research in the United Kingdom (Al-Janabi et al. 2021). Fry et al. (2009) conducted a series of interviews in December 2008 into the factors influencing scholarly and scientific publication in the UK. Specifically, the surveyors wished to understand:

- What motivates or constrains researchers to publish and disseminate their work in different ways?
- How and why researchers cite other’s research?
- How do considerations arising from research assessment affect decisions on publication and citations?

Fry et al. report a near universal view that the publication of peer-reviewed journal articles was a fundamental disciplinary and institutional expectation, and that there was increasing institutional pressure to publish more frequently. In addition, they found increasing institutional emphasis on producing scholarly outputs that would positively contribute to their institution’s REF submissions. Regardless of the discipline involved, the greatest weight was placed on peer-reviewed journal articles as the preferred mode of dissemination. Additionally, emphasis was placed on collaborative research, suggesting that a preferred style of research (collaborative team research) was best suited to REF submissions. In his review of the evolution of UK economics under the Research Excellence Framework (REF), Lee et al. (2013) note that over the course of four research assessment exercises, 1992, 1996, 2001, and 2008, the proportion of all journal submissions appearing in Diamond’s (1989) 27 core prestigious economics journal went from 31 percent to 44 percent. Further, the percentage of journal titles in all economics departmental submissions went from 53 percent in 1992 to 91 percent in 2008 (Lee et al. 2013). The influence of the UK’s performance-based research assessment system clearly contributes to the growth of scholarly and scientific journal article publication by acting as an external stimulus for more collaborative research and more frequent journal publication.

Scholarly communities and publishing decisions: what, where, and for whom?

Individual scholars are members of various communities: academic departments, colleges, universities, and disciplines, among others. Placing the individual author or researcher in a complex social context of

competing demands at different levels of interaction, Nygaard (2017) used an academic literacies framework to analyze research and writing. In this model, research, writing, and publishing are a social practice embedded within community, and communities create expectations for individual behavior. The researcher must decide the genre of the artifact to be produced, whether to involve other researchers in a collaborative effort, the quality of the work, the appropriate audience, and the process of how the scholarship is done. The community (department, university, discipline, etc.) establishes the parameters for those individual decisions. For example, Moksony et al. (2014) posit that departmental research style is a major influence on the type of published artifact produced. Departments emphasizing quantitative research usually favor journal article publication rather than book publication. Several studies have observed institutional preferences for certain publishing types found throughout the disciplinary literature of Sociology. Wolfe (1990) and Clemens et al. (1995) both found that US public institutions preferred journal article publication for the dissemination of research results, while US private institutions preferred book publications. Noting that departments have specific cultures emphasizing book or article publication and that these preferences correlate with other demographic elements, Wolfe (1990) observed “We should recognize that the decision to publish is not a purely impersonal decision driven only by a scientific desire to announce the truth but also represents a socially constructed version of the self one wishes to present to significant others.”

Viewing research and publishing situated in the complex context of community membership and interaction, we may explore the different forces affecting individual publishing decisions at different career stages. Early career faculty face important decisions as they embark on a career in research and publishing. One of the most consequential decisions is deciding the venue for publishing their research. Early career faculty may recognize that book publication often relies on reputation and patronage. Clemens et al. (1995) observe that access to book publishers is through cumulative advantage which accrues to those who have established a record of successful publications, while journal article publication is more egalitarian, relying more on the author’s tenacity to submit their work multiple times until accepted. Early career faculty members might assume that the most advantageous strategy would be to first establish their research reputations through the publication of journal articles in prestigious journals.

In a study on future needs for scholarly communication in seven disciplines, Harley et al. (2010) remarked that in political science subfields “publication practices are governed by considerations of prestige, peer review, audience, and, increasingly, speed.” Likewise, a large survey sent to researchers in the United States asked what attributes were most important to authors when selecting a journal publishing outlet. Tenopir, et al. (2016) found that a journal’s reputation and its fit with the author’s work

are the two most important attributes, while the journal's audience or readership was also important. Researchers in the United Kingdom arrived at similar results in their own national survey of scholarly and scientific researchers: prestige or reputation was the primary factor for selecting a journal for submission of an article; the target audience or readership was the second contributing factor for selecting a journal title for article publication (Wakeling et al. 2019). Tenopir et al. (2016) ended their report with the following observation regarding entrepreneurial decisions researchers make when publishing their work: "it is evident that reputation building within a specific field is at the heart of what matters most to our respondents. A journal and all of its attributes is essentially a brand, with authors seeking to align themselves with top brands." In other words, when new generations of researchers begin their publishing career, they must navigate the requirements of their department, university, the research environment of the discipline, and research funders. The social sciences have historically emphasized both journal articles and books as important modes of dissemination. Given this unique publishing profile, we sought to explore and quantify whether the growing pressure to publish more and more frequently amidst the backdrop of community, reputation, and career stage requirements has altered the publication practices of social scientists.

Data and Methods

We mined the Academic Analytics commercial database for the names and departmental affiliation(s) of tenured and tenure-track scholars (Assistant Professor, Associate Professor, and Professor titles) in the following 12 social and behavioral science fields at Ph.D. granting universities in the United States:

1. Anthropology
2. Criminal Justice and Criminology
3. Economics
4. Educational Psychology
5. Geography
6. International Affairs and Development
7. Political Science
8. Psychology
9. Public Administration
10. Public Policy
11. Social Work/Social Welfare
12. Sociology

Data were extracted from two snapshots spanning nine years: the first snapshot documents the publication activity of faculty members employed during the 2010-2011 academic year (database version AAD2011-1816), and the second snapshot represents the publication activity of faculty members during the 2019-2020 academic year (database version AAD2019-1826). These snapshots represent the earliest and latest comprehensive datasets available from Academic Analytics at the time of our study (ca. June-August 2021). Each snapshot contains the name and year of terminal degree (typically the Ph.D. but sometimes M.F.A., M.B.A., etc.) for each faculty member, as well as the name of their employing university and the department(s) with which they are affiliated. Academic Analytics maps each department to a scholarly discipline based on the NCES CIP schema (NCES 2013). In each snapshot, faculty members were assigned an academic age cohort following Savage and Olejniczak (2021): early career researchers (ECR) earned their terminal degree 0-10 years before the snapshot was taken, mid-career researchers (MCR) earned their degree between 11 and 30 years before the snapshot was taken, and senior career researchers (SCR) earned their degree 31 or more years before the snapshot date.

Book and journal article publications linked to their authors were also extracted. For both publication types, a 5-year window of authored publications was extracted: for the 2011 snapshot, publications authored between 2007-2011 (inclusive) were extracted, and for the 2019 snapshot, publications authored between 2015 and 2019 (inclusive) were extracted. The focus of our study is the total publication output of a discipline, so the numbers reported in the tables and hereafter represent unique articles and books for each discipline. Each publication is counted only once, even if more than one of the scholars in that database shared authorship of that work. In cases where comparisons are made with disciplines among age cohorts, the unique number of books or articles (co)authored by that age cohort was used. We also extracted the total discipline population, total unique books published, and total unique articles published in each discipline for the years between 2011 and 2019 to visualize the growth or decline in disciplinary publications in Figures 1 and 2. Anonymized raw data, including faculty and department lists, journal titles, book presses, and the crosswalk of university departments to scholarly disciplines are publicly available at (<https://osf.io/2x4uf/>).

We quantified the percent of each discipline's population actively engaged in a particular publication type by calculating the percent of scholars in each discipline in each snapshot who published at least one book in the previous 5 years, and the percent who published at least one journal article in the previous 5 years. Significant differences in the proportion of scholars who have published at least one book (or journal article) between snapshots was tested using the Chi-squared test. We further tested differences in having published at least one book (or journal article) between age cohorts within a snapshot, also using Chi-

squared tests. All post-extract data handling, computations and statistical tests were performed in R (v4.1.0, R Core Team 2020).

Results

Population, academic department count, and publication count

The 2011 snapshot contains 27,447 unique faculty members affiliated with 1,476 social science departments at 267 universities; the 2019 snapshot contains 28,928 unique faculty members affiliated with 1,561 departments at 290 universities (<https://osf.io/2x4uf/>). The number of faculty members and academic departments in each discipline in both snapshots, as well as the percent change between 2011 and 2019, appears in Table 1. In total, scholars in the 2011 snapshot published 158,104 unique journal articles in 8,706 journals between 2007 and 2011. Over the same five-year period, the 2011 scholars published 17,101 unique books. Scholars in the 2019 snapshot published 215,540 unique journal articles in 11,480 journals between 2015 and 2019. Over the same five-year period, the 2019 scholars published 13,102 unique books. The counts of unique journal articles and books by authors in each discipline are presented in Table 2. While the overall number of social science scholars increased 5.4% between 2011 and 2019, the number of journal articles they produced increased at a much faster rate: 36.3%. The increase in articles published is associated with a 31.9% increase in the number of unique journal titles in which these works appear. Conversely, the overall number of books published decreased by 23.4% over the nine-year period.

Growth in the number of social science faculty members over the study period (5.4%) is not uniform across disciplines. Table 1 reveals that one discipline (Educational Psychology) evinced a slight decline in the number of faculty members and the number of academic departments (-1.2%), while large population increases were observed in International Affairs and Development (39.1%), Public Administration (22.3%), and Public Policy (10.1%). The number of academic departments classified as International Affairs and Development and Public Administration also increased substantially between 2011 and 2019 (Table 1). Growth in both the number of scholars and the number of departments in these disciplines suggests that American research universities strategically grew these areas of study both through investment in new faculty hires and by establishing new academic departments. A different pattern is observed among Criminal Justice and Criminology departments. The number of departments in this discipline increased by more than 10% over the study period, while the number of faculty members in this field increased by 5.4% on par with the overall social sciences population increase. This suggests that

growth in Criminal Justice over the previous decade reflects a reorganization of existing faculty appointments into novel departments rather than hiring large numbers of new faculty members in the area.

Changing publishing practices

In every discipline, the 5-year total of journal article publications increased more rapidly than the population of faculty members (Figure 1), and in all but one discipline the 5-year total of book publications decreased between 2011 and 2019 (in Public Administration, book publishing increased by 7.1%). Book publishing in International Affairs and Development also increased after 2011 but began to decrease again after 2014 and by 2019 the number of books published was identical to the 2011 number (Figure 1).

Table 2 shows the number of journal articles and books in each snapshot for each discipline, as well as the following ratios: articles per faculty, books per faculty, and books per article. In seven of the 12 disciplines we studied, journal articles per person increased by more than 30% from 2011 to 2019, including a more than 60% increase in both Educational Psychology and Social Work/Social Welfare. The increase in articles per person in Economics is notably lower than the other disciplines, with only a 3% increase over the study period. The next lowest increase is in International Affairs and Development (11%); unlike other fields, the year-by-year population growth in International Affairs and Development largely mirrors growth in the discipline's journal article output over time (Figure 1).

A decline in books per person over the study period characterizes all twelve disciplines (Table 2). Economics shows the greatest decline in books per person (-46%), while the lowest declines are in Public Administration and Educational Psychology (-12% and -14%, respectively). In all disciplines, the ratio of books per article declined by at least 31% from 2011 to 2019. In Sociology, for example, there was one book published for every 6.3 journal articles in the 2011 snapshot; in the 2019 snapshot, there was one book published for every 11.1 articles. The largest decline in books per article appears in Geography and Social Work/Social Welfare (-54% in both disciplines). We visualized the ratio "books per journal article" in each discipline throughout the study period (Figure 2); book publications constitute a steadily decreasing portion of the total publication output in each social science discipline over this timeframe.

Table 3 shows 2011 and 2019 articles per person and books per person by age cohort. In eight of twelve disciplines, the largest increase in articles per person from 2011 to 2019 is observed among the youngest age cohort (ECR). ECRs in Economics showed the smallest increase in journal articles per person among the ECR cohorts. Book publications per person declined among SCRs in all disciplines, and books per

person also declined among MCRs in all but one disciplines (Educational Psychology). Books per person among ECRs decreased slightly in all but one discipline, Geography.

Percent of faculty actively engaged in publishing books and articles

We quantified the rate of participation in each publishing type in both 2011 and 2019. These results appear in Table 4 along with significance values from Chi-squared tests for differences in proportions of faculty who participate in a particular publishing type in the 2011 and 2019 snapshots. The rate of participation was defined as the percent of all scholars in each discipline within a snapshot who (co)authored at least one of that type of publication over the previous 5-year period, divided by the total number of scholars in that discipline in that snapshot. In every discipline, the rate of participation in journal article publishing increased, while the rate of book publishing participation decreased. The changes in participation rate between 2011 and 2019 observed in Table 4 are generally less than the changes in books and articles per person (Table 2). For example, although Geography saw a 54% decline in the number of books published per person, the number of faculty who have published at least one book decreased by only 5.9%. Likewise, in Psychology the number of journal articles per person increased 34% over the study period, but the percent of the population engaged in the production of journal articles increased only 2.9%. Taken together, these results suggest that much of the increase in journal article publication and the decrease in book publication is due to individual authors publishing more articles and fewer books, rather than “book authors” becoming “article authors” *en masse* over the study period.

Table 5 shows the percent of scholars in each snapshot who published at least one book or journal article by age cohort. In all but one discipline (Economics) the youngest cohort (ECR) had the greatest rate of participation in journal article publication in both 2011 and 2019. Likewise, in every discipline except Educational Psychology, the oldest cohort (SCR) had the greatest participation in book publication. These findings are broadly consistent with our previous analysis of publishing behavior among age cohorts (Savage and Olejniczak 2021: Fig. 6), where senior scholars were observed to publish more books than their younger colleagues. Table 5 also shows that rates of participation in journal article publication have increased in all age cohorts in all disciplines, with three exceptions: SCRs in International Affairs and Development, Public Administration, and Public Policy all showed non-significant decreases in journal article publication participation. In six disciplines SCRs showed the greatest increase in journal article publication participation, in four disciplines the greatest increase was among ECRs, and in the remaining two disciplines MCRs showed the greatest increase in journal article publication participation.

Thirty-five of the 36 comparisons of book publication participation by age cohort revealed a decrease in participation rate between 2011 and 2019 (among MCRs in Educational Psychology the increase was not statistically significant; Table 5). In six disciplines MCRs showed the greatest decrease in journal article publication participation, in four disciplines the greatest decrease was among ECRs, and in the remaining two disciplines SCRs showed the greatest increase in journal article publication participation. ECRs universally show the lowest rate of book publication participation. This is most extreme in Economics where only 3.7% of ECRs published at least one book in the 5-year period leading to 2011, and only 2.0% of Economics ECRs published a book in the 5-year period leading to 2019.

Discussion and conclusions

Overall, the literatures of social science disciplines are evolving toward more journal article publications and fewer book publications, both per person and in total. Journal articles are already the *de facto* “currency” of research in many physical, mathematical, biological, biomedical, and engineering fields (e.g., Olejniczak et al. 2021), and our data show that the social sciences are becoming more like those STEM disciplines in terms of publication practices. In their study on the future requirements of scholarly publishing, Harley et al., (2010) note: “As in economics, political science has seen a trend toward publishing journal articles and away from publishing books. The degree to which final publication is both book- and article based depends largely on the work’s qualitative or quantitative orientation and the argument length.” The growing importance of quantitative social science research has had a clear effect on researchers’ decisions on how to conduct research and which venues should be pursued when publishing results. King (2014) likewise prefaced his comments on how computational research is restructuring the social sciences by noting “The social sciences are in the midst of an historic change, with large parts moving from the humanities to the sciences in terms of research style, infrastructural needs, data availability, empirical methods, substantive understanding, and the ability to make swift and dramatic progress.” Thus, the internal dynamics of large parts of research in the social sciences are contributing to more collaborative research and an increased emphasis on journal article publication. Our analyses suggest that the emphasis on journal article publication may come at the expense of book publication (e.g., Figure 1), and may be driven by increasing article publishing expectations on the youngest age cohort. While increased rates of journal article publication are not limited to the ECR cohort, in all but one discipline, the youngest cohort (ECR) had the greatest rate of participation in journal article publication in both 2011 and 2019.

The influence of performance-based research assessment systems on faculty publishing and research decisions are also likely related to the increase in journal article production and the de-emphasis on book publication. Hicks (2012) noted "...it is the form of social science scholarly publication that is evolving in response to the imposition of national research evaluation. At the same time, governments have accepted the argument that a one size fits all research evaluation system is unfair, and research evaluation protocols have been revised to better suit social science and humanities scholarship. Research evaluation and publishing in the social sciences and humanities are co-evolving." Our data indicate that the co-evolution of research evaluation systems and publishing practices in the social sciences likely results in greater emphasis on large research programs conducted by teams and increased frequency of journal article publication. In every discipline we examined, the rate of participation in journal article publishing increased, while the rate of book publishing participation decreased. In general, books take more time to produce than journal articles and their impact on the community is difficult to ascertain in the short term due in part to a dearth of comprehensive book citation databases. We posit that the increased need for rapidly produced research artifacts, the growth of quantitatively-focused modes of inquiry in social science disciplines, and the increasingly greater number of journal articles produced by the youngest age cohort will continue to favor journal article publication in the social sciences over book publications.

Future directions and study limitations

Kyvik and Aksnes (2015) also studied the role of increased research collaboration in the growth of scholarly publishing, concluding that increased collaboration contributes to increased journal article publications. Collaborative research and publication have become commonplace in most disciplines in the social sciences, and further studies of scholarly collaboration are likely to provide further context and depth to understanding the behaviors involved in this phenomenon. The relatively greater increase in journal articles per person among ECRs in our study (Table 3), for example, may be due in part to a greater propensity to collaborate among peers among the youngest age cohort.

Our study sample was limited to research universities that offer the Ph.D. degree in the United States. Faculty employed by many non-Ph.D. granting universities also routinely publish research results, and are likely also influenced by community practices, prestige, external evaluation, and the increasing use of quantitative research methods. Future research may seek to expand the sample of universities to include those institutions. Further, we did not consider non-traditional forms of scientific and scholarly communication such as blog authorship, zine authorship, newsletters, op-ed pieces, listserv posts, performances, musical compositions, choreography, etc., nor did we consider conference proceedings and

book chapters. It is possible that the decline we observed in books published (and the increase in journal articles published) does not completely capture the fullness of the shift in social science research dissemination strategies. Bibliometric data aggregation would benefit from the inclusion of more of the diversity of dissemination strategies now available to scholars.

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Figures

Fig 1. Change in discipline population (blue dotted line), books published (green line with triangles), and journal articles published (red dashed line with circles), from 2011 to 2019. Each data point is expressed as a percentage of the 2011 value. Population is the actual number of scholars in the Academic Analytics database each year. Books and journal articles represent 5-year time windows, such that the 2011 data point represents the total published between 2007 and 2011, the 2012 data point represents the total published between 2008 and 2012, and so on.

Fig 2. Books per journal article between 2011 and 2019 in each of the twelve disciplines studied. Both books and journal articles represent five-year sums, such that the 2011 data point represents the total books published between 2007 and 2011 divided by the total articles published between 2007 and 2011, the 2012 data point represents the total books published between 2008 and 2012 divided by the total articles published between 2008 and 2012, and so on.

525 **Tables**

Table 1. Faculty member population and number of academic departments in the 2011 and 2019 database snapshots.

Discipline	Faculty 2011	Faculty 2019	% Change Faculty	Departments 2011	Departments 2019	% Change Depts
Anthropology	2,788	2,886	3.5%	180	189	5.0%
Criminal Justice and Criminology	1,081	1,139	5.4%	78	86	10.3%
Economics	4,318	4,492	4.0%	213	223	4.7%
Educational Psychology	1,148	1,134	-1.2%	63	61	-3.2%
Geography	1,502	1,558	3.7%	103	102	-1.0%
International Affairs and Development	1,030	1,433	39.1%	40	52	30.0%
Political Science	4,233	4,295	1.5%	201	210	4.5%
Psychology	6,087	6,537	7.4%	248	267	7.7%
Public Administration	1,006	1,230	22.3%	59	68	15.3%
Public Policy	1,650	1,816	10.1%	80	81	1.2%
Social Work/Social Welfare	2,104	2,269	7.8%	127	138	8.7%
Sociology	3,300	3,398	3.0%	195	207	6.2%

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Table 2. Faculty, article (5-year count), and book (5 year count) totals and ratios in the 2011 and 2019 snapshots.

Discipline	Snapshot Year	Faculty Count	Article Count (5yr)	Articles (5yr) per Person	Articles per person % change	Book Count (5yr)	Books (5yr) per Person	Books per person % change	Books per Article (5yr)	Books per article % change
Anthropology	2011	2,788	11,486	4.12		2,108	0.76		0.18	
	2019	2,886	15,939	5.52	34%	1,721	0.60	-21%	0.11	-41%
Criminal Justice and Criminology	2011	1,081	5,095	4.71		901	0.83		0.18	
	2019	1,139	7,427	6.52	38%	684	0.60	-28%	0.09	-48%
Economics	2011	4,318	22,715	5.26		1,982	0.46		0.09	
	2019	4,492	24,310	5.41	3%	1,117	0.25	-46%	0.05	-47%
Educational Psychology	2011	1,148	6,098	5.31		540	0.47		0.09	
	2019	1,134	9,852	8.69	64%	460	0.41	-14%	0.05	-47%
Geography	2011	1,502	10,277	6.84		767	0.51		0.07	
	2019	1,558	16,395	10.52	54%	560	0.36	-30%	0.03	-54%
International Affairs and Development	2011	1,030	4,797	4.66		1,266	1.23		0.26	
	2019	1,433	7,403	5.17	11%	1,266	0.88	-28%	0.17	-35%
Political Science	2011	4,233	15,918	3.76		4,128	0.98		0.26	
	2019	4,295	19,861	4.62	23%	3,221	0.75	-23%	0.16	-37%
Psychology	2011	6,087	59,739	9.81		2,541	0.42		0.04	
	2019	6,537	85,755	13.12	34%	1,894	0.29	-31%	0.02	-48%
Public Administration	2011	1,006	5,238	5.21		686	0.68		0.13	
	2019	1,230	8,084	6.57	26%	735	0.60	-12%	0.09	-31%
Public Policy	2011	1,650	11,644	7.06		1,236	0.75		0.11	
	2019	1,816	15,760	8.68	23%	1,066	0.59	-22%	0.07	-36%
Social Work/Social Welfare	2011	2,104	9,827	4.67		830	0.39		0.08	
	2019	2,269	17,012	7.50	61%	655	0.29	-27%	0.04	-54%
Sociology	2011	3,300	14,767	4.47		2,428	0.74		0.16	
	2019	3,398	20,544	6.05	35%	1,930	0.57	-23%	0.09	-43%

Table 3. Article (5-year count), and book (5-year count) per person ratios in the 2011 and 2019 snapshots for each age cohort.

Discipline	Age cohort	2011 articles per person (5yr)	2019 articles per person (5yr)	Articles per person % change	2011 books per person (5yr)	2019 books per person (5yr)	Books per person % change
Anthropology	ECR	4.40	6.49	47.4%	0.41	0.38	-9.0%
	MCR	4.52	5.98	32.4%	0.85	0.57	-32.6%
	SCR	3.95	5.32	34.9%	1.01	0.93	-7.7%
Criminal Justice and Criminology	ECR	5.49	8.72	58.7%	0.48	0.25	-48.2%
	MCR	5.33	6.85	28.6%	0.87	0.73	-15.8%
	SCR	4.29	6.94	61.6%	1.15	1.03	-10.8%
Economics	ECR	4.64	4.65	0.3%	0.04	0.03	-32.0%
	MCR	6.47	6.56	1.5%	0.43	0.21	-50.2%
	SCR	5.49	6.53	19.0%	0.99	0.58	-42.0%
Educational Psychology	ECR	5.78	10.31	78.4%	0.17	0.15	-12.6%
	MCR	5.99	9.03	50.7%	0.48	0.55	15.8%
	SCR	5.48	8.07	47.3%	1.01	0.50	-51.0%
Geography	ECR	6.75	9.97	47.7%	0.17	0.20	16.1%
	MCR	8.20	12.45	51.7%	0.62	0.38	-39.3%
	SCR	6.22	10.88	74.8%	0.87	0.65	-25.6%
International Affairs and Development	ECR	4.35	5.64	29.6%	0.53	0.46	-13.8%
	MCR	4.84	5.20	7.5%	1.19	0.88	-26.0%
	SCR	4.96	5.14	3.6%	2.07	1.35	-34.8%
Political Science	ECR	4.04	5.51	36.5%	0.47	0.41	-12.8%
	MCR	4.15	4.89	17.8%	1.01	0.76	-24.8%
	SCR	3.77	4.51	19.8%	1.63	1.25	-23.4%
Psychology	ECR	10.38	14.26	37.3%	0.11	0.06	-45.3%
	MCR	11.94	15.65	31.1%	0.41	0.29	-29.1%
	SCR	11.13	15.34	37.8%	0.75	0.52	-30.5%
Public Administration	ECR	5.48	7.42	35.5%	0.26	0.21	-18.4%
	MCR	5.24	6.54	24.8%	0.68	0.63	-6.8%
	SCR	5.89	7.23	22.7%	1.29	1.14	-11.7%
Public Policy	ECR	6.27	8.33	32.8%	0.27	0.19	-29.1%
	MCR	7.87	9.69	23.1%	0.75	0.55	-26.7%
	SCR	7.97	9.02	13.2%	1.22	1.10	-9.9%
Social Work/Social Welfare	ECR	5.58	9.76	74.8%	0.14	0.09	-33.6%
	MCR	5.15	8.31	61.4%	0.45	0.35	-23.0%
	SCR	4.88	7.86	60.9%	0.81	0.66	-18.9%
Sociology	ECR	4.79	7.01	46.4%	0.35	0.32	-8.8%
	MCR	5.02	6.50	29.4%	0.80	0.58	-26.9%
	SCR	4.70	6.26	33.4%	1.18	0.93	-20.8%

Table 4. Percent of the population of scholars who have published at least one journal article or book in the 5-year period preceding each data snapshot. P-value is from Chi-squared test for difference in proportions who have published in the two snapshots.

Discipline	2011 % of scholars with an article	2019 % of scholars with an article	2011-2019 change in article participation	<i>p</i> < 0.05	2011 % of scholars with a book	2019 % of scholars with a book	2011-2019 change in book participation	<i>p</i> < 0.05
Anthropology	83.1%	87.9%	4.8%	*	42.3%	37.5%	-4.8%	*
Criminal Justice and Criminology	79.3%	86.7%	7.5%	*	38.6%	29.7%	-8.9%	*
Economics	83.0%	87.5%	4.6%	*	19.4%	12.5%	-6.9%	*
Educational Psychology	84.9%	90.7%	5.8%	*	26.7%	24.3%	-2.5%	
Geography	88.5%	92.7%	4.2%	*	27.7%	21.8%	-5.9%	*
International Affairs and Development	81.0%	83.7%	2.8%		51.2%	44.8%	-6.4%	*
Political Science	81.3%	86.0%	4.8%	*	47.6%	42.6%	-5.0%	*
Psychology	90.4%	93.3%	2.9%	*	22.0%	17.0%	-4.9%	*
Public Administration	79.1%	85.3%	6.2%	*	32.5%	29.5%	-3.0%	
Public Policy	83.5%	87.0%	3.5%	*	34.0%	29.6%	-4.4%	*
Social Work/Social Welfare	79.3%	87.7%	8.3%	*	22.3%	17.5%	-4.8%	*
Sociology	84.8%	88.3%	3.5%	*	36.8%	32.9%	-3.8%	*

Table 5. Percent of the population of scholars by age cohort who have published at least one journal article or book in the 5-year period preceding each data snapshot. P-value is from Chi-squared test for difference in proportions who have published in the two snapshots.

Discipline	Age cohort	2011 % of	2019 % of	2011-2019	<i>p</i> < 0.05	2011 % of	2019 % of	2011-2019	<i>p</i> < 0.05
		scholars with an article	scholars with an article	change in article participation		scholars with a book	scholars with a book	change in book participation	
Anthropology	ECR	88.8%	94.5%	5.7%	*	31.7%	29.6%	-2.0%	
	MCR	84.0%	87.5%	3.5%	*	46.5%	37.2%	-9.4%	*
	SCR	72.6%	80.4%	7.8%	*	48.5%	48.1%	-0.4%	
Criminal Justice and Criminology	ECR	88.3%	95.7%	7.5%	*	28.2%	17.3%	-11.0%	*
	MCR	80.2%	84.8%	4.6%		43.5%	35.4%	-8.1%	*
	SCR	64.2%	71.2%	7.0%		44.0%	41.8%	-2.2%	
Economics	ECR	83.6%	87.5%	3.9%	*	3.7%	2.0%	-1.7%	*
	MCR	87.3%	91.8%	4.5%	*	21.6%	11.5%	-10.1%	*
	SCR	74.6%	80.7%	6.1%	*	35.6%	27.5%	-8.1%	*
Educational Psychology	ECR	88.4%	93.8%	5.4%	*	13.9%	10.6%	-3.4%	
	MCR	84.4%	89.5%	5.1%	*	29.7%	31.8%	2.1%	
	SCR	79.8%	87.9%	8.1%	*	42.4%	29.7%	-12.7%	*
Geography	ECR	92.9%	96.3%	3.3%	*	12.1%	11.8%	-0.3%	
	MCR	90.4%	91.9%	1.5%		33.4%	24.5%	-8.9%	*
	SCR	73.8%	88.5%	14.7%	*	41.4%	32.3%	-9.1%	*
International Affairs and Development	ECR	87.1%	91.7%	4.7%	*	33.0%	32.8%	-0.2%	
	MCR	81.7%	86.2%	4.5%	*	57.6%	47.9%	-9.7%	*
	SCR	73.0%	70.5%	-2.6%		59.9%	51.8%	-8.1%	*
Political Science	ECR	88.0%	93.8%	5.7%	*	34.7%	31.2%	-3.5%	
	MCR	82.7%	85.8%	3.1%	*	52.7%	44.6%	-8.2%	*
	SCR	68.3%	74.5%	6.2%	*	57.0%	55.5%	-1.6%	
Psychology	ECR	95.4%	97.7%	2.3%	*	9.3%	4.8%	-4.5%	*
	MCR	92.1%	93.8%	1.8%	*	23.3%	17.6%	-5.7%	*
	SCR	81.7%	87.5%	5.8%	*	33.0%	28.4%	-4.6%	*
Public Administration	ECR	87.1%	94.2%	7.1%	*	19.4%	14.2%	-5.1%	
	MCR	76.5%	85.0%	8.4%	*	37.0%	34.1%	-2.8%	
	SCR	72.4%	72.0%	-0.4%		43.2%	42.8%	-0.4%	
Public Policy	ECR	89.1%	93.9%	4.8%	*	20.0%	13.7%	-6.3%	*
	MCR	84.3%	88.5%	4.2%	*	35.9%	31.9%	-4.0%	
	SCR	76.6%	76.4%	-0.2%		45.5%	44.1%	-1.3%	
Social Work/Social Welfare	ECR	87.4%	93.7%	6.4%	*	11.5%	6.7%	-4.7%	*
	MCR	77.0%	85.7%	8.7%	*	26.3%	21.6%	-4.7%	*
	SCR	66.8%	77.4%	10.6%	*	36.0%	34.1%	-1.9%	
Sociology	ECR	91.1%	95.6%	4.5%	*	25.7%	23.2%	-2.5%	
	MCR	85.2%	88.4%	3.1%	*	40.2%	34.1%	-6.1%	*
	SCR	74.9%	76.4%	1.5%		46.4%	45.6%	-0.8%	

ECR = early career researcher, 0-10 years since terminal degree. *MCR* = mid-career researcher, 11-30 years since terminal degree. *SCR* = senior career researcher, 31 or more years since terminal degree.