

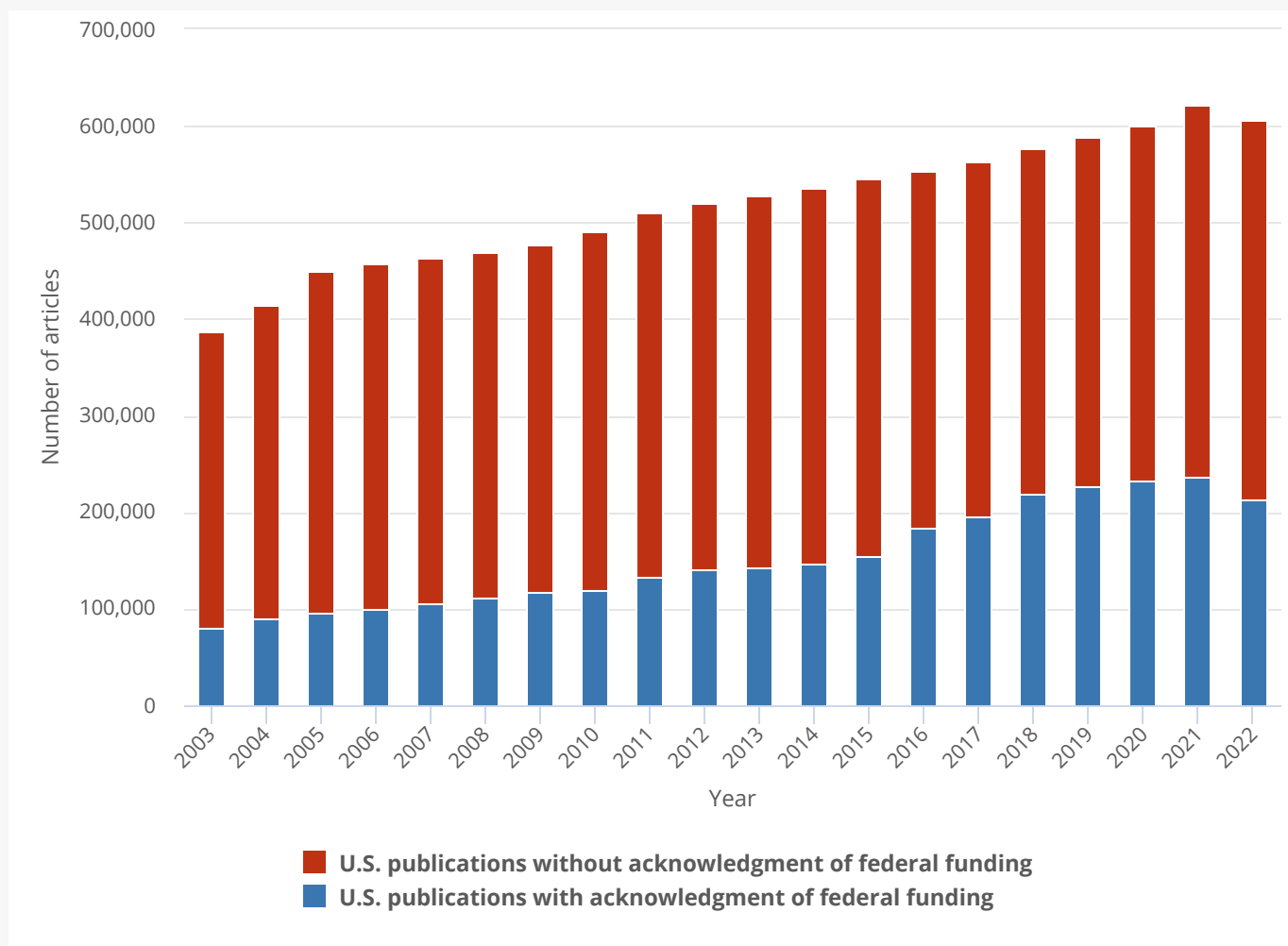
SIDEBAR

Using Funding Acknowledgments to Track Federally Funded Research Over Time

Federally funded research is an important component of the research ecosystem and is often envisioned as a means of supporting science performed for public benefit that may not otherwise be motivated by commercial interest (Bornmann 2013; Stephan 2012; Yin et al. 2022). Federal research funding supports applied and basic research (see *Indicators 2022* report “[2022] **Research and Development: U.S. Trends and International Comparisons**”) and has long been linked to successful expansions in scientific production—through the increased productivity and impact of individual researchers and laboratories (Ebadi and Schiffauerova 2016) and the national scale (Leydesdorff and Wagner 2009). This sidebar explores funding acknowledgments, as recorded in Scopus, as an emerging source to help illustrate the extent to which published research is supported by federal agencies and the trends in federally funded research. Specifically, the share of published research acknowledging support by federal funding was highest in chemistry and smaller in other fields, such as the social sciences (Table PBS-A). These differences may be driven by factors such as the resource costs to conduct research and by field differences, such as the overall frequency of publication, team size, and cultural differences among the disciplines. The time period analyzed in this sidebar is 2018–22, unless otherwise indicated.

Funding acknowledgments can shed light on the ability and priorities of federal funding to support discovery as measured by peer-reviewed journal articles and conference proceedings. However, some benefits and limitations of this emerging data source are important to highlight so as to accurately interpret these trends. Each peer-reviewed journal article and conference proceeding in the Scopus database includes a field for funding acknowledgments that are extracted by algorithmic (software) means. In some cases where the acknowledgments field is incomplete, funding information from agencies is also used to identify funded publications in Scopus. Using this field, it is possible to observe the conversion of federal funds to published research outputs, but a direct linkage between funding inputs and published discoveries remains challenging. First, extraction of this information into a structured field is a relatively new effort and is most complete for the most recent 4 years. Figure SPBS-1 shows how funding acknowledgment sections have grown in coverage since 2003 and that funding information was indexed for 68% of all publications in 2022.* Many factors may have contributed to this growth in addition to improved extraction, including increasing pressure and requirements from funders to include funding acknowledgments, standardization of acknowledgment language, and incentives to demonstrate high publication output—because future funding is tied to past conversion of funds into publications—while receiving funding.† Last, this inquiry helps explore research that acknowledges any federal funding but does not only account for publications that source all their funding from a single source. In practice, a publication may be generated using funding from multiple sources within the federal government, or from additional sources in state government, local government, or the private sector.

Figure PBS-A

U.S. S&E publications with and without acknowledgments of U.S. federal funding: 2003–22**Note(s):**

Articles are classified by their year of publication and are assigned to a region, country, or economy on the basis of the institutional address(es) of the author(s) listed in the article. Whole counting is used. An article is considered to be federally funded if the funding information tied with the publication record in Scopus links it with one of the U.S. federal agencies. Not all Scopus publications have funding information available, and coverage has evolved with time. For more information, see Figure SPBS-1. For a breakdown of federally funded papers by funding agency, see Table SPBS-90.

Source(s):

National Center for Science and Engineering Statistics; Science-Metrix; Elsevier, Scopus abstract and citation database, accessed April 2023.

Science and Engineering Indicators

Figure PBS-A tracks the growth of federally funded publications relative to the total research production in the United States. Other than a small downturn from 2021 to 2022, every year has seen an increase from the previous year in the number of publications that acknowledge funding support from federal agencies. The most comprehensive data from the past 4 years show variation among subject areas in the percentage of publications that acknowledge federal support. Table PBS-A shows number and share of publications appearing between 2018 and 2022 that acknowledged funding from federal sources and those acknowledging funding from other sources. During this time, more than 50% of publications in the following subject fields acknowledged federal funding support: chemistry (55% of publications),

biological and biomedical sciences (53%), astronomy and astrophysics (53%), and physics (52%). Only two subject areas have less than 30% of publications with federal funding acknowledged: agricultural sciences (28%), and social sciences (15%). Otherwise, all other fields had between 30% and 50% of their publications acknowledging federal funding.

Table PBS-A

U.S. S&E publications, by U.S. federal funding status and field: 2018–22

(Number and percent)

Field	U.S. publications (total)	U.S. publications (federally funded)	Percentage of federally funded publications	U.S. publications (other funding)	Percentage of publications acknowledging funding from another source
Health sciences	1,004,671	318,838	31.7	239,606	23.8
Biological and biomedical sciences	447,843	237,472	53.0	151,511	33.8
Engineering	356,520	128,106	35.9	67,692	19.0
Computer and information sciences	235,765	79,218	33.6	29,528	12.5
Social sciences	202,900	29,694	14.6	30,282	14.9
Physics	191,700	98,716	51.5	39,480	20.6
Geosciences, atmospheric sciences, and ocean sciences	109,183	49,647	45.5	31,728	29.1
Psychology	107,480	34,853	32.4	23,678	22.0
Chemistry	103,217	56,361	54.6	30,797	29.8
Mathematics and statistics	63,733	27,634	43.4	12,644	19.8
Natural resources and conservation	52,010	17,979	34.6	14,311	27.5
Materials science	42,610	19,859	46.6	10,046	23.6
Agricultural sciences	42,419	11,701	27.6	10,384	24.5
Astronomy and astrophysics	34,358	18,050	52.5	8,382	24.4

Note(s):

Articles are classified by their year of publication and are assigned to a region, country, or economy on the basis of the institutional address(es) of the author(s) listed in the article. Whole counting is used. An article is considered to be federally funded if the funding information tied with the publication record in Scopus links it with one of the U.S. federal agencies. Not all Scopus publications have funding information available, and coverage has evolved with time. For more information, see Figure SPBS-1. For a breakdown of federally funded papers by funding agency, see Table SPBS-90.

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Science and Engineering Indicators

In conclusion, federal funding plays an important role in the current research environment in the United States. Of the 606,144 articles published in journals and conference proceedings in 2022, 35% acknowledged support from federal agencies (Figure PBS-A). Ultimately, acknowledgment of federal funding can help show trends in the conversion of grants into published research over time and show variation at the subject or field level.

* Missing data in funding fields in a Scopus entry may mean that the research did not receive funding, the authors did not cite any funding despite receiving it, or the algorithm was unable to extract the acknowledgment. Of the articles from 2003 that had an entry for funding acknowledgment (27% had text in the funding field in Scopus), around 76% acknowledged a federal funding source. Comparatively, of the publications in 2022 with indexed funding information (68%), 52% acknowledged a federal source. The growth of coverage of funding not being tied to federal funding acknowledgments provides evidence that the data source has become more dependable over time. Data for the percentage of publications with indexed funding sources by year and field can be found in Figure SPBS-1.

† Table SPBS-90 displays the number of articles and conference proceedings acknowledging federal funding at the agency level and sub-agency level. These counts represent the number of supported articles as acknowledged and attributed in Scopus from 2003 to 2022.