

1 Declining contribution of the United States federal government to global research corpus

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## Introduction

17 Departments and agencies of the United States federal government conduct research on  
18 topics ranging from nuclear technology to economic policy. This work directly benefits the  
19 nation and its citizens in four ways: by providing the information needed by agencies to  
20 advance their missions, via the broad advancement of knowledge, through the application of  
21 this knowledge in ways that benefit society, and by developing human capital with education  
22 and professional experience (1). Federal research is also a major driver of economic growth —  
23 in addition to the direct economic impacts of the research enterprise (e.g., employment,  
24 purchasing, tax revenue), the resulting knowledge is also used by the private sector to  
25 develop novel technologies and products (2–4). As such the outputs from federal research  
26 and development are considered vital not only for addressing domestic needs, but also for  
27 informing international policy, strengthening national security, and enhancing global  
28 economic competitiveness (5).

29 Here I show that a key indicator of federal research productivity — the number of  
30 peer-reviewed journal articles and book chapters by US federal government affiliates — has  
31 declined precipitously in the first seven months of 2025 relative to the same time period in  
32 any of the preceding six years (Figures 1–2). This conclusion is based on an analysis of ~1.20  
33 million articles in the Scopus bibliographic database (<https://www.scopus.com>), which  
34 indexes the content of over 200,000 books and 48,000 journals comprising all major fields of  
35 scholarship (6). While the scholarly productivity of twelve major research universities also  
36 declined during this time period (Figure 3), the relative drop in federal productivity was 50%  
37 greater.

38

## Results

39 I identified  $N = 457,421$  research articles (87%), reviews (7.4%), book chapters (3.6%),  
40 Notes (1.9%), and Data Papers (0.18%) in Scopus with at least one federally affiliated  
41 author and a publication date between January 1, 2019 and July 31, 2025 (hereafter,  
42 ‘publications’). The publications in this corpus had a total of  $N = 1,207,501$  unique authors,

43 of which  $N = 217,570$  (18%) had federal primary affiliations. Federal researchers were highly  
44 collaborative: the publications in the data set had on average  $9.3 \pm 12$  SD authors, of which  
45  $5.9 \pm 11$  SD had affiliations outside of the US federal government.

46 During the reference time period the focal universities produced  $N = 740,800$   
47 publications (Figures 3,5) with  $N = 6,332,969$  authors. There were  $N = 1,734,321$  unique  
48 authors in the data set, of which  $N = 404,446$  had one of the focal universities as their  
49 primary affiliation. Each article had an average of  $N = 8.9 \pm 12$  SD authors, of which  $2.7 \pm$   
50  $3.2$  SD were affiliated with the focal universities.

51 There were  $N = 15,589$  publications indexed in Scopus with a federally affiliated first  
52 author and a January 1-July 31, 2025 publication date (Table 1). This is a 14% decline  
53 relative to the same time period in 2024, and a 24% decline relative to the 2019-2024 average  
54 (Figure 1). Both this decline, and the 8.9% decline in first author publications observed for  
55 the focal universities (Figure 3), were highly significant ( $P < 0.0001$ , see the *Supporting*  
56 *Information* for a description of the bootstrapping procedure used to asses significance).  
57 Finally, from 2019-2025 there were  $N = 100,532$  publications whose authors were exclusively  
58 affiliated with the federal government; the number of January-July publications in 2025 was  
59 ~18% lower in 2024 (Figure 2).

## 60 Discussion

61 Scholarly publications such as peer-reviewed journal articles are the primary means of  
62 documenting, validating, and sharing research results; the data and conclusions they  
63 communicate are used to guide public policy and are the foundation on which future  
64 discoveries are built (7). I estimate that the US Federal Government — historically a leading  
65 global producer of knowledge across a vast array of disciplines — has accumulated a research  
66 publication deficit of 2,638-6,489 articles in only the first seven months of 2025. This deficit  
67 is primarily driven by declining research output at several of the largest and most-research  
68 intensive agencies of the federal government. For example, the number of publications by  
69 authors affiliated with the Departments of Defense, Commerce, Veterans Affairs, and NASA

70 all declined 15–20%, while the number of publications from the Smithsonian Institution and  
71 the Departments of Energy, Health & Human Services, and Agriculture decreased 9–15%  
72 (Table 1). However, the greatest proportional decline was at the Department of the Interior,  
73 whose 2025 research output to date has declined 21% relative to the same time period in  
74 2024 (Figure 4).

75 The proposed reductions to the budgets of federal agencies that support research and  
76 education, along with the ongoing efforts to strip universities of previously allocated research  
77 funds and limit the enrollment of international students (8), have led a broad array of  
78 stakeholders to warn of an imminent and potentially catastrophic decline in the scientific  
79 preeminence of the United States (e.g., 9, 10, 11). The results presented here suggest that  
80 executive orders dismissing research and support staff, suspending agency funding, and  
81 requiring federal scientists to withdraw manuscripts undergoing peer review (12–14) have  
82 already set this decline in motion — particularly at agencies conducting research on the  
83 economy, environment, public health, and national security. Given the disciplinary breadth  
84 and highly collaborative research conducted by the staff of these agencies (15, 16), in concert  
85 with their role in training early career scientists (17), it is likely the long-term consequences  
86 of these declines have already begun cascading through public and private-sector research  
87 institutions beyond the federal government.

## 88 Materials and Methods

89 Article records are uploaded daily to Scopus from over 25,000 currently active journals,  
90 with the metadata for each record including information such as the publication title,  
91 abstract, keywords, publication date. An article's record also includes the names and  
92 affiliations of all authors, both of which are assigned unique identification numbers. I used  
93 the Scopus Affiliation ID numbers assigned to Departments, Agencies, Commissions, and  
94 other units of the United States federal government (see *Supporting Information Table S2*)  
95 to search Scopus for all peer-reviewed journal articles, book chapters, and other scholarly  
96 publications produced between January 2019 and July 2025 by authors using these

97 affiliations. I began by identifying  $N = 5,360$  Scopus affiliation ID numbers nested under the  
98 Scopus Institution Codes of all US Cabinet-level Departments and independent federal  
99 agencies; these affiliation ID numbers included both the primary affiliation codes for the  
100 agencies (e.g., 60012471: US Department of Defense; 60000947: US Department of  
101 Commerce) and codes for author affiliations nested under them (e.g., 60032984: Naval  
102 Dental Center; 60027716: National Oceanic and Atmospheric Administration). I then used  
103 the Scopus API to download the metadata for all articles, data papers, reviews, notes, and  
104 book chapters published between 2019-2025 by authors using theses affiliation IDs. The  
105 author lists of the resulting publications were then searched for any federal affiliations not  
106 included in the initial query ( $N = 7,355$ ), and the search was repeated using complete list of  
107  $N = 12,715$  affiliations.

108 Queries of the Scopus API were conducted using the `rscopus` library (18) for the R  
109 statistical programming language (19). The resulting `.csv` files for each year and affiliation  
110 ID were initially processed using the `refsplitr` library (20), after which I combined all data  
111 for all years, identified all federal and non-federal author affiliations, and assigned all  
112 affiliations to their highest parent agency, department, or organization. I then visualized  
113 productivity within and across agencies using the `tidyverse` libraries (21) and used a  
114 bootstrapping procedure to assess whether productivity across all federal affiliations was  
115 significantly different in 2025 (see *Supporting Information: Statistical Analyses*).

116 It is possible that any changes in productivity at federal agencies reflect a broader  
117 national trend in research output. I therefore compared federal publication productivity with  
118 that at the  $N = 12$  research universities in the United States that were most productive  
119 during the focal time period: Harvard University, the University of Michigan, Ann Arbor,  
120 The University of Pennsylvania, Stanford University, the University of California, Los  
121 Angeles, the University of Washington, the University of Florida, The Ohio State University,  
122 the University of Minnesota, Twin Cities, the University of California, San Diego, the  
123 University of North Carolina, Chapel Hill, and the University of California, San Francisco.

124 As with the searches for federal agency productivity, the searches for university productivity  
125 were first conducted both with the primary Scopus affiliation codes for institutions (e.g.,  
126 60030612 for the University of California, San Diego) and any codes for nested affiliations  
127 (e.g., 60121501 for the UCSD School of Biological Sciences), then any additional codes found  
128 in the resulting publications. In total searches were conducted with  $N = 1,698$  Scopus  
129 affiliation IDs (*Supporting Information Table S3*).

130 I analyzed productivity in the first seven months of 2025 relative to the same time  
131 period in previous years using publications whose first author had a federal or focal  
132 university affiliation (49% and 50% of each group's publications, respectively). First-author  
133 position is typically interpreted as the person leading the research and the study's primary  
134 contributor. It is important to note, however, that authorship norms are used inconsistently  
135 within- and across disciplines (22–24), and in some fields (e.g., the biomedical sciences, 25)  
136 the last- or corresponding author position is used to indicate the person with primary project  
137 oversight. Moreover, the increasing complexity of research means that many publications  
138 written by non-federal first authors describe work that could not have been conducted  
139 without the intellectual contributions or other resources provided by their federal coauthors.  
140 As such, the estimates of changing productivity based on first-author position described here  
141 could be considered conservative. To address this possibility I also quantified changes in 2025  
142 productivity relative to previous years using the subset of publications whose authors were  
143 exclusively federal affiliates.

144 All data were collected from Scopus between September 1-4, 2025. However, the  
145 analyses were restricted to publications with cover dates from January 2019 through July  
146 2025 to avoid potential underestimates of productivity due to upload lags (*sensu* 26 and  
147 *Supporting Information*).

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<sup>152</sup> **Data Availability**

<sup>153</sup> The data used in this study are archived at Dryad [*url to be added*], while the version

<sup>154</sup> of the R code used for the analyses presented here is archived at Zenodo [*url to be added*].

<sup>155</sup> Post-publication updates to the code or data can be found at Github

<sup>156</sup> ([https://github.com/BrunaLab/fed\\_pubs](https://github.com/BrunaLab/fed_pubs)).

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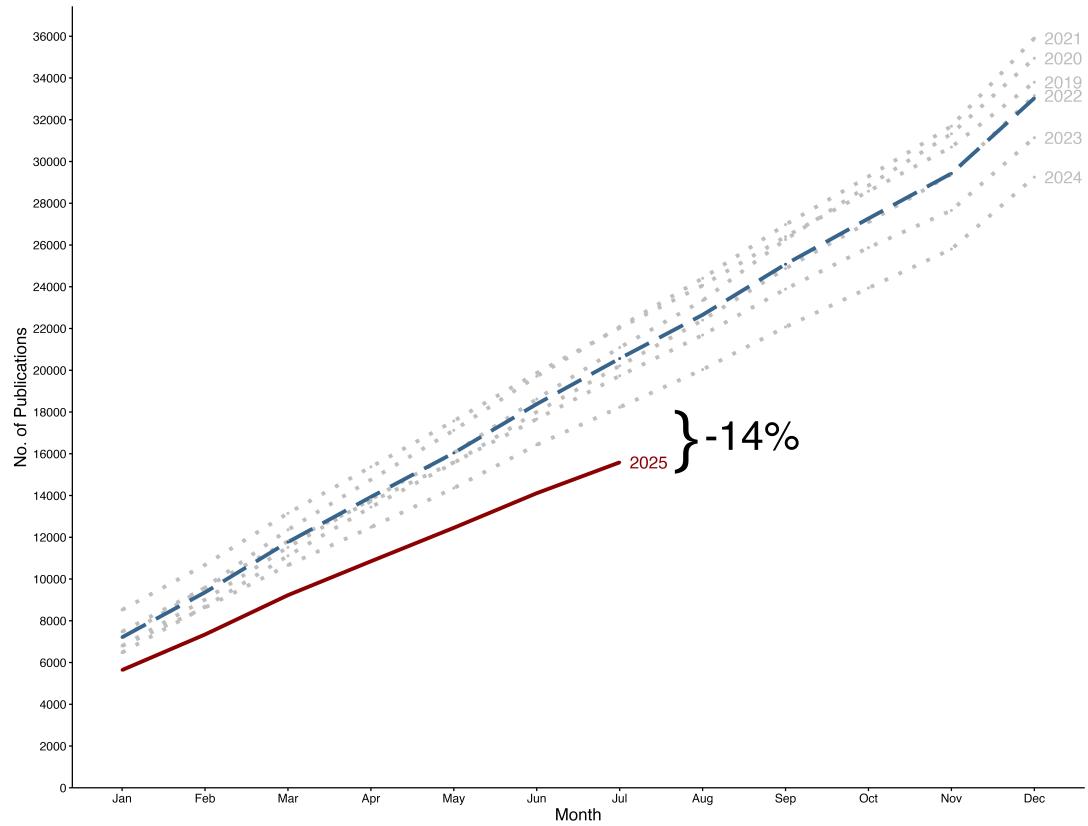
Table 1

*The number of publications in the data set with at least one author from an agency or department of the US federal government (any author position), the number of publications from 2019-2025 for which the first author's primary address is the federal department or agency, the number of 1st author publications from January-July 2025, and the percent change in productivity relative to the same time period in 2024.*

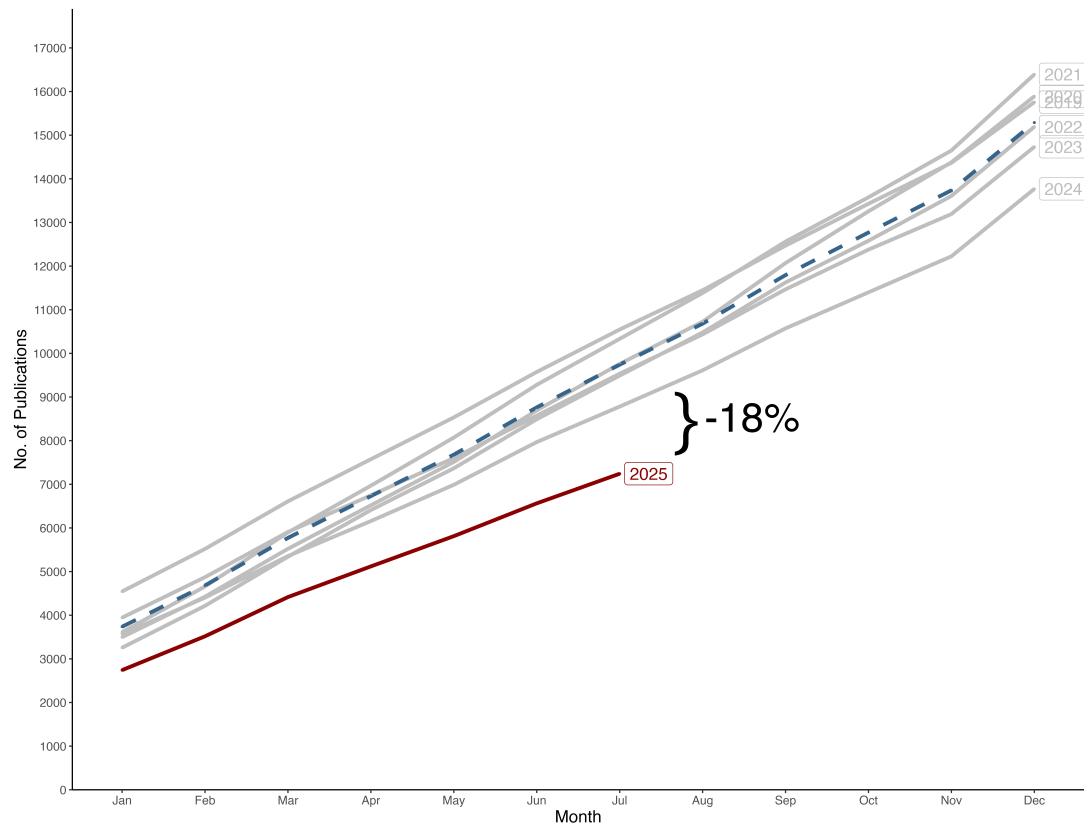
	Federal Author (any position)	Federal 1st Author	
	Jan 2019-July 2025 <sup>1</sup>	Jan 2019-July 2025 (%)	Jan-July 2025 (% change vs. 2024)
<b>Cabinet Departments</b>			
Energy	435,102	53,824 (23.77)	3,855 (-9.29)
Health & Human Services	401,943	51,510 (22.75)	3,258 (-14.38)
Veterans Affairs	235,455	33,620 (14.85)	2,282 (-16.16)
Defense	144,966	27,669 (12.22)	1,983 (-18.29)
Agriculture	102,050	17,209 (7.6)	1,230 (-13.26)
Commerce	66,593	10,290 (4.54)	680 (-19.24)
Interior	51,733	8,702 (3.84)	613 (-21.41)
Environmental Protection Agency	16,054	2,587 (1.14)	188 (-9.18)
State	5,050	561 (0.25)	32 (-15.79)
Transportation	1,026	222 (0.1)	14 (-33.33)
Homeland Security	949	182 (0.08)	16 (-15.79)
Justice	889	224 (0.1)	15 (-25)
Treasury	383	155 (0.07)	20 (53.85)
Education	231	74 (0.03)	6 (-50)
Labor	111	48 (0.02)	0 (-)
Housing & Urban Development	77	21 (0.01)	3 (-25)
<b>Agencies, Boards, &amp; Commissions</b>			
National Aeronautics & Space Administration	75,226	7,865 (3.47)	566 (-19.6)
Smithsonian Institution	41,978	5,440 (2.4)	392 (-11.91)
National Science Foundation	27,077	3,014 (1.33)	201 (-4.74)
Other federal units <sup>2</sup>	5,762	1,415 (0.62)	82 (-36.43)
Federal Reserve System	4,258	1,791 (0.79)	153 (-3.16)
<b>Total</b>		<b>226,423</b>	<b>15,589</b>

<sup>1</sup>The sum of publications in this column is greater than the total number of publications in the dataset because some publications include authors from multiple agencies (i.e., I did not attribute 'fractional authorship').

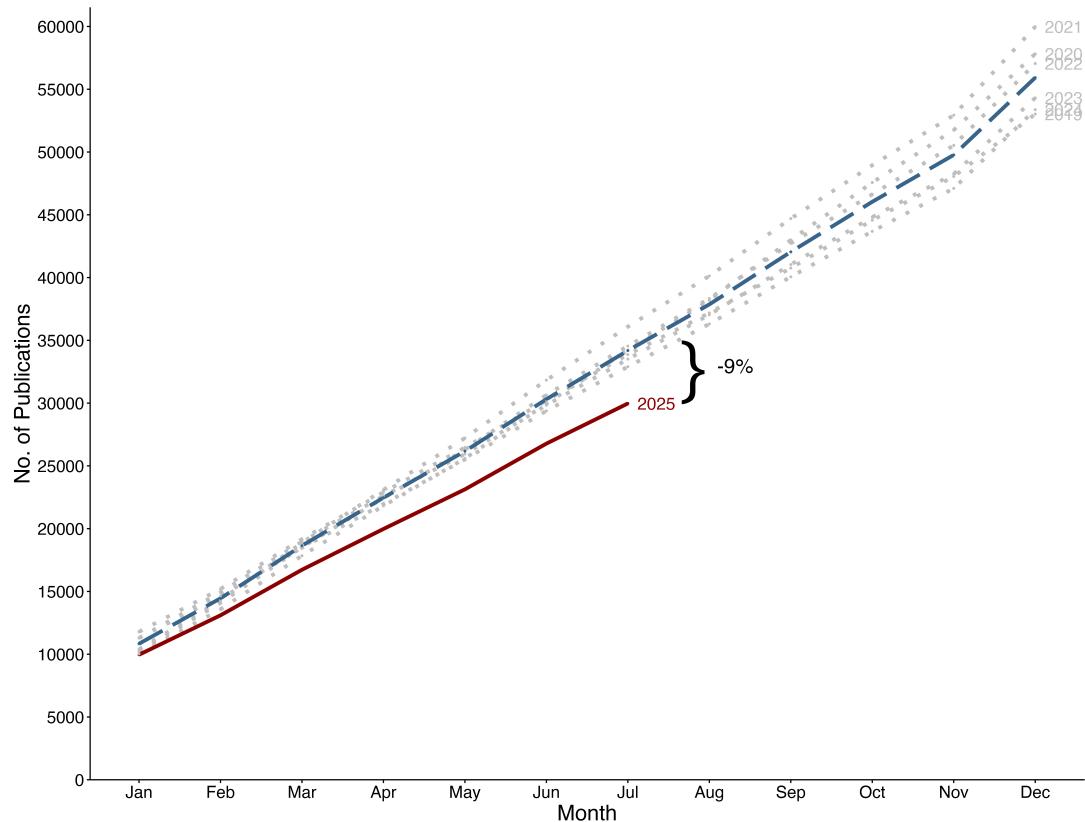
<sup>2</sup> Other federal author affiliations in the publications data set: Congressional Budget Office, Consumer Financial Protection Bureau, Central Intelligence Agency, Commodity Futures Trading Commission, US Congress, Consumer Product Safety Commission, Executive Office of the President, Equal Employment Opportunity Commission, Federal Communications Commission, Executive Office of the President, Federal Maritime Commission, Federal Housing Finance Agency, Financial Industry Regulatory Authority, Federal Maritime Commission, Federal Trade Commission, General Accounting Office, Government Publishing Office, General Services Administration, Institute of Museum and Library Services, Interagency Task Forces or Commissions, John F Kennedy Center for the Performing Arts, Federal Judiciary, Multiagency Task Forces or Commissions, National Academies of Sciences, Engineering, and Medicine, National Archives and Records Administration, National Center for Missing and Exploited Children, National Endowment for the Arts, Nuclear Regulatory Commission, National Security Council, National Transportation Safety Board, Office of the Director of National Intelligence, Office of Personnel Management, , Securities and Exchange Commission, Social Security Administration, Susquehanna River Basin Commission, Tennessee Valley Authority, US Global Change Research Program, US Holocaust Memorial Museum, US Institute Of Peace, USPS, Woodrow Wilson International Center for Scholars



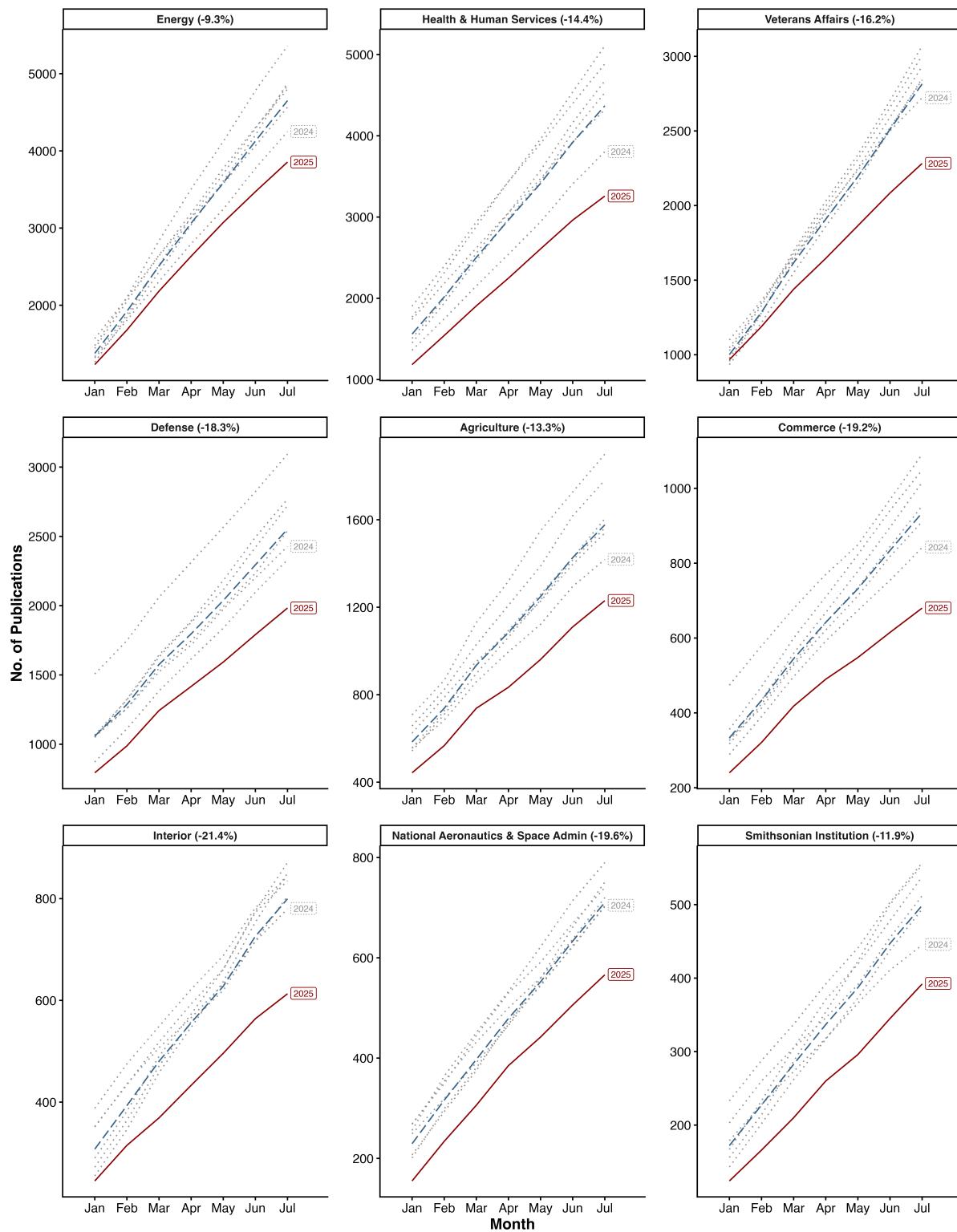
*Figure 1.* Cumulative number of articles published per month in 2019-2025 whose first-authors were affiliated with the US federal government. The dotted lines are the values cumulative counts for 2019-2024, the solid red line is the cumulative count through July 2025, and the dashed blue line is the 2019-2024 average. The percentage indicates the change in 2025 relative to the same time period in 2024.



*Figure 2.* Cumulative number of articles published per month in 2019-2025 for which all authors were affiliated with the US federal government. The dotted lines are the values cumulative counts for 2019-2024, the solid red line is the cumulative count through July 2025, and the dashed blue line is the 2019-2024 average.

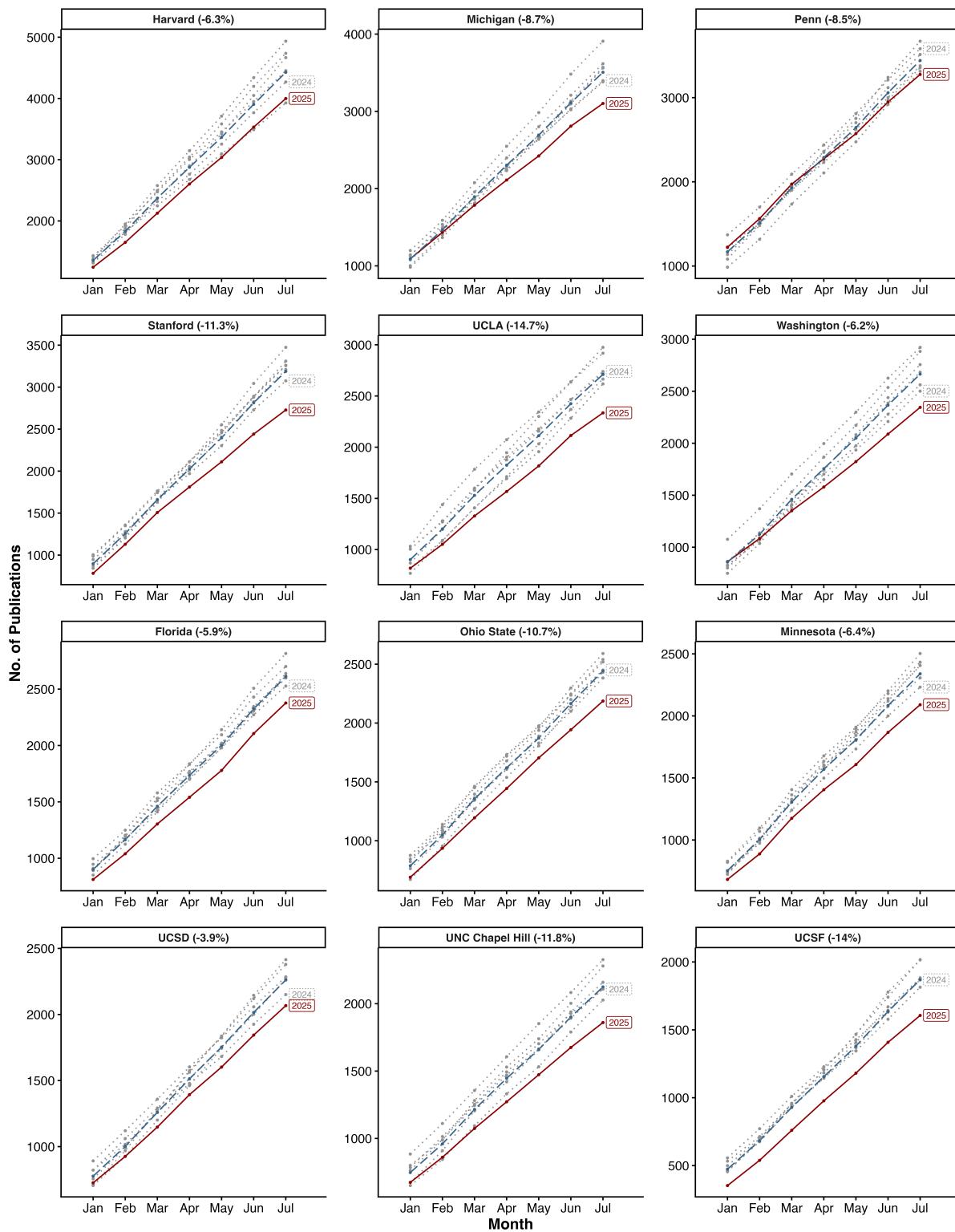


*Figure 3.* Cumulative number of articles published per month in 2019-2025 whose first-authors were affiliated with one of twelve focal universities. The dotted lines are the values cumulative counts for 2019-2024, the solid red line is the cumulative count through July 2025, and the dashed blue line is the 2019-2024 average. The percentage indicates the change in 2025 relative to the same time period in 2024.



*Figure 4.* Cumulative number of publications published Jan through July 2019-2025 whose 1st author was affiliated with one of the US federal government's 10 most productive agencies or departments. The dotted lines are the values cumulative counts for 2019-2024, the solid red line is the cumulative count through July 2025, and the dashed blue line is the 2019-2024 average.

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*Figure 5.* Cumulative number of publications published Jan through July 2019-2025 whose 1st author was affiliated with one of 12 focal universities. The dotted lines are the values cumulative counts for 2019-2024, the solid red line is the cumulative count through July 2025, and the dashed blue line is the 2019-2024 average