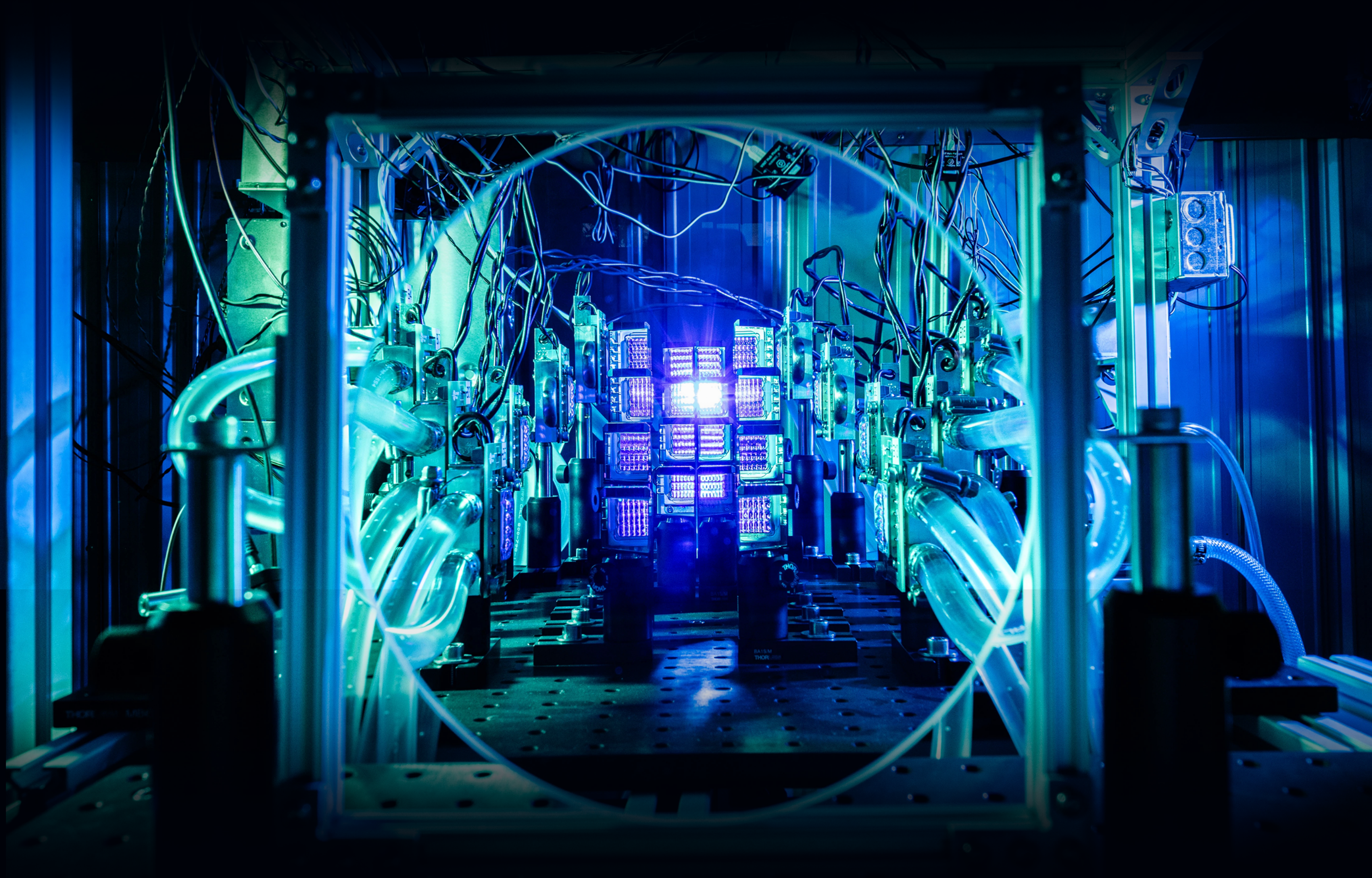
2026 The State of U.S. Science & Engineering



Science & Engineering Indicators
National Science Board

NATIONAL SCIENCE BOARD
Science & Engineering Indicators

2026

The State of U.S. Science and Engineering 2026

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Preface

The National Science Board (Board, NSB) is required under the National Science Foundation (NSF) Act, 42 U.S.C. § 1863 (j)(1) to prepare the biennial *Science and Engineering Indicators* (*Indicators*) report for and transmit it to the president and Congress every even-numbered year. The report is prepared by the National Center for Science and Engineering Statistics (NCSES) within NSF under the guidance of the Board.

Indicators provides information on the state of the U.S. science and engineering (S&E) enterprise over time and within a global context. The report is a policy-relevant, policy-neutral source of high-quality U.S. and international data. The indicators presented in the report are quantitative representations relevant to the scope, quality, and vitality of the S&E enterprise.

This report, *The State of U.S. Science and Engineering,* summarizes key findings from the thematic reports that make up *Indicators* and presents new findings, providing in-depth data and information on science, technology, engineering, and mathematics (STEM) education at all degree levels; the STEM workforce; U.S. and international research and development performance; technology transfer, invention and innovation, and business dynamics; and U.S. competitiveness in high-technology industries. *Indicators* also includes the State Indicators data tool that enables state comparisons on a variety of S&E indicators. This report, the thematic reports, and the online data tool together make up the full *Indicators* suite of products.

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Executive Summary

The U.S. Science and Engineering Enterprise in a Changing World

The past quarter century has fundamentally reshaped the U.S. science and engineering (S&E) enterprise through the business sector's dominant role in funding and performing research and development (R&D), the concentration of innovation activity in information technologies and critical and emerging technology (CET) areas, and the rise of China as a competitor. China performs strongly in several key science and technology (S&T) areas: in 2024, it is estimated to have surpassed the United States for the first time as the largest performer of R&D according to the latest data from the Organisation for Economic Co-operation and Development (OECD) when adjusted for international comparability, it awards the most S&E doctorates globally, produces the largest volume of research publications, and leads the global high-technology manufacturing trade. The United States is among the world's most R&D-intensive economies. The U.S. S&E enterprise is characterized by private-sector R&D funding and performance, especially of experimental development, with an emphasis on software, biotechnology, and artificial intelligence (AI). The United States maintains comparative advantages in highly cited research publications and patents, venture capital (VC)-backed innovation, and knowledge- and technology-intensive (KTI) services, where U.S. firms dominate global trade.

The U.S. science, technology, engineering, and mathematics (STEM) workforce grew at a faster rate than the non-STEM workforce from 2014 to 2024. STEM workers experienced lower unemployment rates and higher median annual earnings than their counterparts in non-STEM occupations. U.S. institutions have awarded increased numbers of S&E degrees at all levels between 2014 and 2024, and they awarded the second-highest number of S&E doctorates globally in 2022, the last year with internationally comparable data. In 2024, temporary visa holders accounted for more than half of doctoral degrees awarded by U.S. institutions of higher education in S&E fields such as computer and information sciences, engineering, and mathematics and statistics. In addition, longitudinal data confirm that most temporary visa S&E doctorate recipients remain in the United States after graduation, contributing to the U.S. STEM workforce and S&E enterprise. Average scores for U.S. elementary and secondary students on national mathematics and science assessments have declined from pre-COVID-19 pandemic levels, and in 2023, U.S. eighth graders performed at about or below the average among their peers on international science, mathematics, and computer and information literacy assessments.

STEM Talent: Education, Training, and Workforce

Between 2014 and 2024, U.S. institutions of higher education continued to expand S&E degree output, with particularly rapid growth in computer and information science degrees. The U.S. STEM workforce accounts for roughly a quarter (26%) of the total domestic workforce and enjoys employment and wage premiums. U.S. elementary and secondary student performance in national mathematics and science assessments has declined since 2019.

STEM Education

- U.S. elementary and secondary student performance on mathematics and science assessments has declined from pre-COVID-19 pandemic levels, with 4th and 8th grade average mathematics scores declining since 2019.
- In 2023, U.S. eighth graders performed at about or below the average among their peers on international science, mathematics, and computer and information literacy assessments.
- Between 2014 and 2024, the number of computer and information sciences degrees awarded by U.S. higher education institutions more than doubled at the bachelor's level and more than tripled at the master's level. They grew by 50% at the doctoral level over the same period.
- U.S. institutions of higher education awarded the second-highest number of S&E doctorates globally (45,000 in 2023), behind institutions in China (53,000 in 2022) but far above institutions in all other countries.

- The United States enrolled more international postsecondary students (across all fields of study) in 2023 than any other country. However, the number of these students in the United States decreased 3% from 2017 to 2023, while enrollment grew in Canada by 85%, in the United Kingdom by 72%, and in Germany by 63%.
- Total international S&E postsecondary degree student enrollment at U.S. institutions declined by 9% from 2024 to 2025, driven by a 24% decline in S&E master's degree students.
- Temporary visa holders earned 42% of S&E master's degrees and 38% of S&E doctoral degrees awarded by U.S. higher education institutions in 2024.
- In 2024, temporary visa holders accounted for 61% of the doctoral degrees awarded by U.S. higher education institutions in computer and information sciences, 54% in engineering, and 52% in mathematics and statistics.
- Longitudinal data collected in 2023 confirm that roughly three-quarters of temporary visa holders awarded S&E doctorates remained in the United States 5 years after graduation and about two-thirds remained after 10 years.

STEM Workforce

- The U.S. STEM workforce included 37 million workers in 2024, 26% of the total U.S. workforce.
- The STEM workforce grew at a faster rate than the non-STEM workforce from 2014 to 2024. In 2024, STEM workers experienced lower unemployment rates and higher median annual earnings ($80,000) than their non-STEM counterparts ($60,000).
- STEM workers accounted for 37% of employment in R&D-intensive industries in 2024, compared with 26% in all industries.
- In 2023, 46% of U.S. S&E workers with doctoral degrees were born abroad.
- Combined, over three-quarters of foreign-born S&E workers in the United States in 2023 were naturalized citizens (55%) or permanent residents (21%); temporary visa holders accounted for 24%.

Discovery: R&D Activity and Research Publications

The United States and China dominate global R&D, with U.S. R&D concentrated in business-led innovation. China is estimated to have surpassed the United States as the largest performer of R&D globally. China has the highest research publication volume globally, but U.S. researchers continue to generate a high share of highly cited articles (HCAs) across scientific fields.

R&D Activity

- In 2024, China is estimated to have surpassed the United States as the largest performer of R&D globally, with $1.028 trillion in gross domestic expenditures on R&D in 2024 when adjusted for international comparability, followed by the United States with $1.009 trillion. Together, China (30%) and the United States (29%) accounted for over half of global R&D performance.
- The United States is among the world's most R&D-intensive economies, with R&D expenditures equaling 3.4% of its gross domestic product (GDP) in 2024. China's R&D intensity (2.7%) is higher than the average across the European Union (EU-27, 2.1%).
- The business sector is the largest performer and funder of R&D in the United States, performing 77% and funding 75% of the nation's total R&D in 2024.

- Experimental development accounted for about two-thirds (67%) of U.S. R&D performance in 2024.
- In 2023, U.S. businesses across all industries invested heavily in R&D in areas that support CETs, including software products and embedded software ($302 billion), biotechnology ($136 billion), AI ($65 billion), and nanotechnology ($39 billion).
- The federal government obligated $194 billion for R&D in FY 2024. Across all fields of R&D, 24% of federal obligations were dedicated to basic research, 27% to applied research, and 49% to experimental development.
- The federal government was the largest funder of domestic basic research in 2024 (40% of total basic research), followed by the business sector (34% of total).
- Federal agencies supported 14% of the nation's nearly 600,000 full-time graduate students in science, engineering, and health fields in 2024. The National Institutes of Health and the National Science Foundation (NSF) together accounted for 54% of the federally supported graduate students in science, engineering, and health.

Publications

- Worldwide S&E research publication output totaled 3.5 million articles in 2024, with three countries together accounting for half of the global total: China (31%), the United States (12%), and India (7%).
- In 2024, authors in the United States had their highest share of publications in health sciences (36%) among all S&E research publications by U.S. authors. Authors from China had their highest share of their publications in engineering (27%) and authors from India had their highest share in computer and information sciences (30%).
- In 2022, U.S. authors generated a disproportionate share of HCAs. The U.S. HCA shares in several fields—materials science, computer and information sciences, physics, health sciences, and biological and biomedical sciences—were higher than those of China, the EU-27, Japan, and India.
- The share of all global S&E articles produced with international collaboration grew from 19% to 22% between 2012 and 2024. In 2024, U.S. authors contributed to 31% of all international coauthored articles, more than authors in any other country. U.S. authors coauthored S&E articles with authors in China more than with authors in any other country.

Translation to Impact: U.S. and Global Science, Technology, and Innovation Output

The United States maintains a strong global position translating R&D activities into economic value. While China leads global KTI manufacturing, the United States retained the largest share of value-added production in four KTI manufacturing industries in 2024: aerospace machinery, medical instruments, pharmaceuticals, and weapons. The United States maintains a dominant share of global production of KTI services. Globally, patents from U.S. inventors in CET areas are among the most highly cited.

Industry and Trade

- Between 2017 and 2024, total factor productivity in the United States, a measure of an economy's ability to generate outputs from inputs, increased faster for the information industry (13%) than for U.S. non-farm businesses overall (8%).
- In 2024, value added of U.S. KTI industries totaled $3.3 trillion and accounted for 11% of U.S. GDP. The information technology and other information services industry has been the largest U.S. KTI industry by value added since 2006, growing from 17% of total KTI value added in that year to 32% in 2024.
- KTI industries worldwide totaled $11.7 trillion in value added in 2024. The United States and China were the top two producers of KTI output globally, with 28% and 25% of the world total, respectively, followed by the EU-27 (18%).

- China is the world leader in KTI manufacturing, with $2.4 trillion in value added in 2024, double its 2012 level. It has been the largest global exporter of KTI manufactured goods since 2008. In 2024, China had $2.2 trillion in KTI manufactured goods exports, accounting for 19% of the world total. The United States and Germany had $1.2 trillion and $1.1 trillion in exports, respectively.
- The United States held a dominant share of KTI services production, with $1.7 trillion in value added in 2024, accounting for a larger share of the global total (43%) than the EU-27 (19%) and China (11%) combined.

Innovation

- Worldwide VC investment reached $354 billion in 2024, up from $327 billion in 2023 but roughly half of its peak value of $694 billion in 2021. Firms based in the United States accounted for 60% of global VC investment in 2024, followed by firms based in China (12%).
- VC investments in U.S. firms in CET areas accounted for two-thirds of total U.S. VC investment in 2024. Software firms received over 80% of funding for companies in CET areas and between 44% and 59% of total U.S. VC funding each year from 2013 to 2024.
- In 2024, the Patent and Trademark Office (USPTO) awarded 326,000 utility patents—which are issued for a new process, machine, manufacture, or composition of matter. Of these, 47% were awarded to U.S. applicants. Businesses received the largest share of patents awarded to U.S applicants (85%).
- The 326,000 USPTO patents issued in 2024 contained about 642,000 citations to S&E articles, indicative of scientific contributions to patented inventions. Citations to S&E articles by U.S. authors were most commonly in biological and biomedical sciences and in health sciences.
- In 2024, inventors in China were granted the most international patents (awarded in any jurisdiction globally and known as priority patent families) in AI, quantum information science and technology, biotechnology, semiconductors, and nuclear technologies.
- In many CET areas, a greater share of international patents (priority patent families) awarded to U.S. inventors in 2021 were in the top 1% of cited patents, a measure of patents' impact on subsequent invention, compared with those from China and the EU-27.

This report provides new data on the state of the U.S. S&E enterprise as well as data drawn from three *Science and Engineering Indicators 2026* thematic reports: STEM Talent: Education, Training, and Workforce; Discovery: R&D Activity and Research Publications; and Translation to Impact: U.S. and Global Science, Technology, and Innovation Output. The "Executive Summary" presents key takeaways about STEM education and the STEM workforce, R&D activity, and the outputs of R&D and innovative activities. The "Overview" section discusses the major trends shaping the contours of the U.S. S&E enterprise since the year 2000, including executive and legislative branch activities emphasizing CETs. It also provides a synthesis of the current state of the S&E enterprise drawn from the thematic sections that follow it. Those sections provide in-depth detail about the current state of STEM education and the STEM workforce, R&D activity, and the outputs of R&D and innovative activities in the United States and in an international context.

Overview

The U.S. Science and Engineering Enterprise in a Changing World

The first two and a half decades of the 21st century were a period of notable change for the United States and its science and engineering (S&E) enterprise. This period has been shaped by predicted developments—such as growing international competition and multipolarity and the dramatic growth in the development and use of computing and information and communication technologies—as well as by unforeseen events like the COVID-19 pandemic that altered the global science and technology (S&T) landscape.

The U.S. National Science Foundation (NSF) and National Science Board (NSB) celebrated their 75th anniversaries in 2025. To mark NSF's 50th anniversary in 2000, the NSB commissioned a special edition of *Science and Engineering Indicators* (*Indicators*), with a historical focus on "the conditions that characterized U.S. science and engineering 50 years ago compared to the current state of the Nation's S&E enterprise." Similarly, the 2026 edition looks at the trends and developments of the last two and a half decades that have shaped the U.S. and global S&T landscape.

The 2000 edition of *Indicators* identified "enduring themes" that shaped the U.S. S&E enterprise in the second half of the 20th century, focusing on, among others, research and development (R&D) funding and performance; the significance of private sector R&D; science, technology, engineering, and mathematics (STEM) education and the STEM workforce; and international competitiveness (NSB 2000). These themes have remained cornerstones of the biennial *Indicators* series. The 2000 *Indicators* also highlighted the impacts of information technologies at the end of 20th century on all aspects of society, including the S&E enterprise. That report presented emerging themes that the NSB identified as important for the first decade of the 21st century: globalization of R&D and education, information technologies, knowledge-based economies, the STEM workforce, and STEM education, among others.

The 2002 *Indicators* highlighted U.S. strength in the support and conduct of R&D at the start of the 21st century and reported that international governments "have initiated broad national and regional efforts to capture similar benefits," which "may foreshadow the eventual creation of new centers of scientific, technological, and engineering excellence" (NSB 2002). The report identified challenges facing the U.S. S&E enterprise due to increasing international competition for R&D investment, S&E talent, and trade. Since 2000, the global S&T landscape has been shaped, in part, by increased trade and R&D activity in Asia—East Asia notably, and China specifically. Total U.S. trade with China reached $660.7 billion in 2024, third among U.S. trading partners behind Mexico ($945.6 billion) and Canada ($917.4 billion) and up from $125.2 billion in 2000 (BEA 2025a). In constant 2017 dollars, U.S. trade of goods and services with China grew by 809% between 2000 and 2024, compared with 490% growth with Mexico and 245% growth with Canada.

The knowledge generated by R&D can have direct outcomes such as the development of new products and services as well as knowledge "spillover" effects in which "ideas generated by one inventor may lead other inventors to create other new ideas" (Myers and Lanahan 2022). There is interest in understanding the association and connections between R&D funding and performance and a diverse set of spillover effects. The Bureau of Labor Statistics routinely estimates the contribution of R&D spillovers to the domestic private nonfarm business sector's total factor productivity (TFP; see "Total Factor Productivity" section) and has done so since 1988 (BLS 2026).

In addition to evaluating the contributions of R&D spillovers to TFP, other policy relevant assessments related to R&D funding and performance and spillover effects include the following:

- The impact of the type of R&D and source of funds on the magnitude of R&D spillovers (Azoulay et al. 2019; Arora, Belenzon, and Sheer 2021; Arora et al. 2024)
- The contributions of international trade to knowledge spillovers and productivity (Coe and Helpman 1995; Coe, Helpman, and Hoffmaister 2009; CRS 2025a)

- The effects of large changes in federal nondefense R&D funding—changes unrelated to overall macroeconomic indicators—on overall productivity growth, the establishment of technology clusters and entrepreneurship, employment, manufacturing value added, and capital accumulation in specific industrial sectors (Fieldhouse and Mertens 2023; Gross and Sampat 2023; Kantor and Whalley 2025)
- The impact of federal defense R&D on private-sector R&D and productivity (Moretti, Steinwender, and Van Reenen 2019; Antolin-Diaz and Surico 2025)
- The impact of institutional factors—including patent protection, business climate, and tertiary education quality—on the magnitude of R&D spillover effects within an economy (Coe, Helpman, and Hoffmaister 2009; Foster-McGregor and Mohnen 2023; WIPO 2026)

The *Indicators* series and this report present data that characterize R&D contributions to innovative activity and productivity. These include R&D funding, source, and type; patents and publications as indicators of knowledge spillovers; and trade and productivity measures as indicators of output of innovative activity. The series highlights STEM education and workforce data, which are critical to understanding domestic employment patterns and the preparation of students to join the workforce and are critical to realizing the contributions of R&D funding and performance to innovative activity and productivity. Taken together, these indicators help characterize the state of the U.S. S&E enterprise in an international context.

U.S. Emphasis on Critical and Emerging Technologies

Since the 21st century, the U.S. government has emphasized critical and emerging technology (CET) areas through annual White House Office of Science and Technology Policy (OSTP)–Office of Management and Budget (OMB) memoranda on R&D budget priorities, executive orders, and formal legislative mandates. One of the first instances of a presidential administration prioritizing an emerging technology in the 21st century was the Clinton administration elevating nanotechnology to a national initiative in FY 2001. Congress codified this commitment through the 21st Century Nanotechnology Research and Development Act (P.L. 108-153) in 2003, with cumulative National Nanotechnology Initiative (NNI) funding since 2001 totaling over $45 billion through the 2025 request (NNCO 2024). Since then, Congress has supported research in select technology areas through the passage of the America COMPETES Act (P.L. 110-69) in 2007 and the America COMPETES Reauthorization Act of 2010 (P.L. 111-358). The 2007 law was passed "to invest in innovation through research and development, and to improve the competitiveness of the United States" and expressed the "sense of Congress that each Federal research agency should strive to support and promote innovation in the United States."

The first Trump administration advanced the institutionalization of emerging technology coordination, with the OSTP-OMB FY 2020 R&D budget priorities memorandum identifying artificial intelligence (AI), quantum information science and technology (QIST), and strategic computing as "critically important" to U.S. national security and economic competitiveness (Mulvaney and Kratsios 2018). Congress passed the National Quantum Initiative Act (P.L. 115-368), which was signed into law in December 2018 "to accelerate quantum research and development for the economic and national security of the United States," establishing the National Quantum Coordination Office within OSTP and authorizing new research centers at NSF and DOE. Agencies tasked with implementing the initiative have since expanded coordinated research activities across quantum computing, quantum networking, and quantum sensing (NQCO 2024). The National Science and Technology Council (NSTC) Select Committee on Artificial Intelligence was created in 2018 to advise the White House on interagency AI R&D budget priorities and improve interagency AI efforts "to ensure continued U.S. leadership in this field" (NSTC 2020b). Congress further institutionalized AI coordination through the National Artificial Intelligence Initiative Act of 2020 (as Division E of the William M. [Mac] Thornberry National Defense Authorization Act for Fiscal Year 2021 [P.L. 116-283]), which established the National AI Initiative Office, required development of a national AI strategy, and authorized expanded AI R&D across federal agencies. Congress enacted the CHIPS and Science Act of 2022 (P.L. 117-167), authorizing over $280 billion to increase domestic semiconductor manufacturing and expand R&D investment in critical technologies.

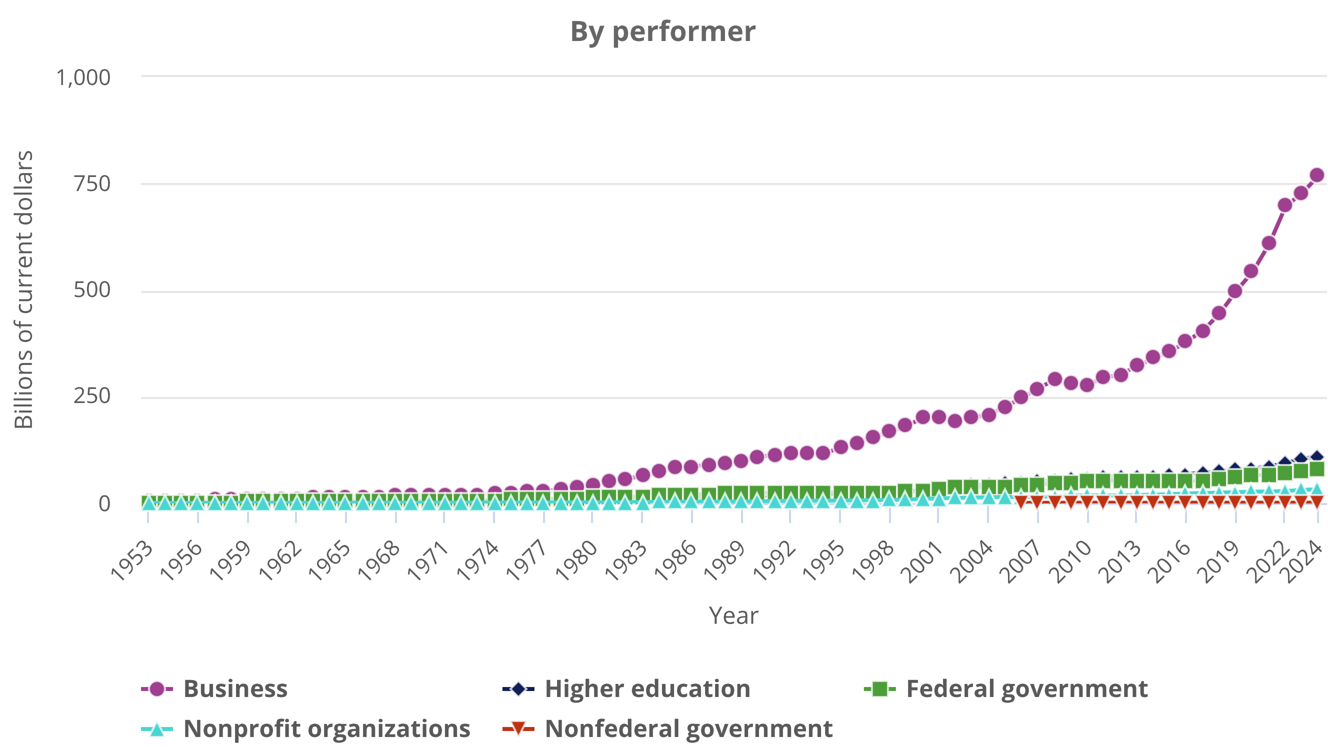
These policy and legislative frameworks have enabled technology priorities to persist across presidential administrations and changes in congressional majorities. The NSTC's Critical and Emerging Technologies List was established in 2020 by the first Trump administration to identify technologies that inform national security–related activities, building on the October 2020 *National Strategy for Critical and Emerging Technologies* (NSTC 2020a). The Biden administration continued this framework, with the OSTP-OMB FY 2025 R&D budget priorities memorandum directing agencies to "advance critical and emerging technology areas such as microelectronics, biotechnology, quantum information science, advanced materials, high performance computing, and nuclear" technologies (Young and Prabhakar 2023). OSTP updated the list in 2024 and identified 18 technology categories—including AI, QIST, biotechnologies, advanced manufacturing, and semiconductors—that are "potentially significant to U.S. national security" (OSTP 2024; NSTC 2024).

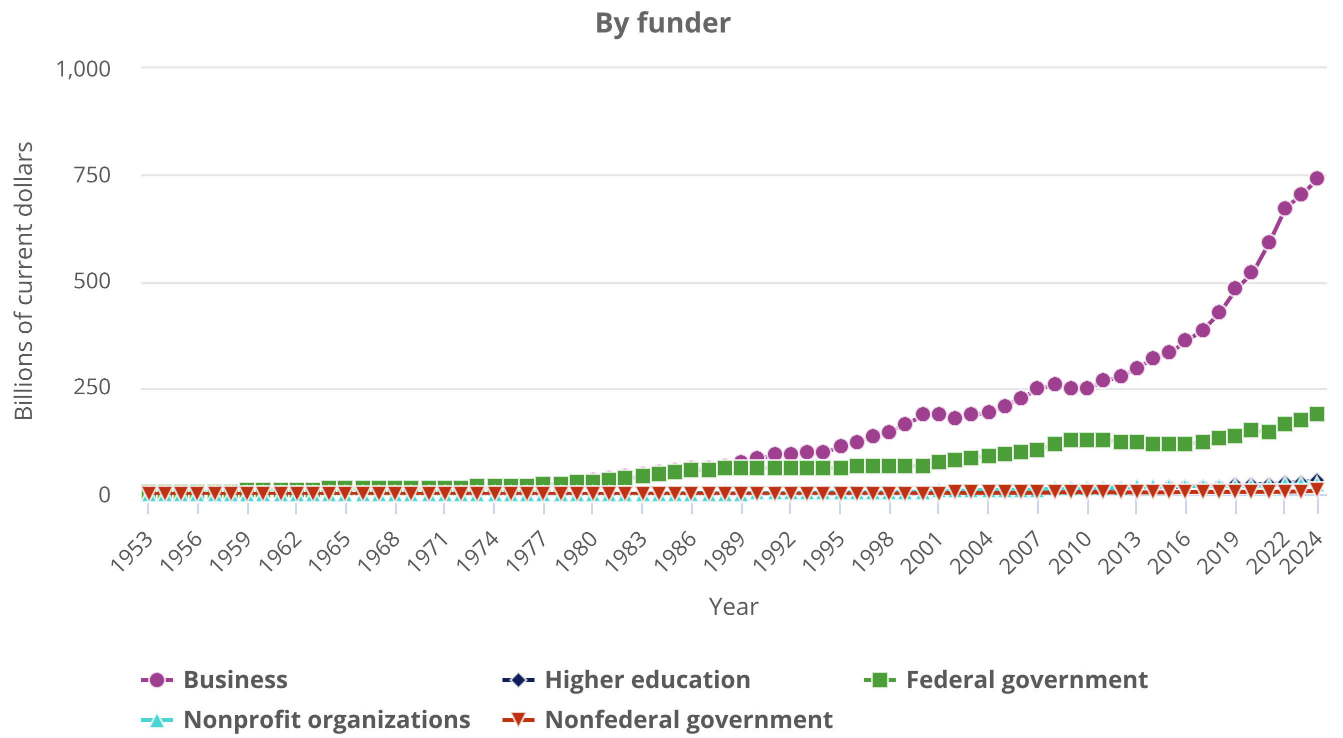
The second Trump administration has continued the emphasis on CETs. The OSTP-OMB FY 2027 R&D budget priorities memorandum identifies six priority CET areas: AI, QIST, semiconductors and microelectronics, advanced communications networks, future computing technologies, and advanced manufacturing (Vought and Kratsios 2025). The memorandum also identifies biotechnologies and biomanufacturing as critical to strengthening and safeguarding American health, building the STEM workforce through STEM education and workforce development, and investing in and expanding access to research infrastructure.

The U.S. Science and Engineering Enterprise

The U.S. S&E enterprise remains among the strongest globally, leading in a number of key indicators. This continued leadership, however, exists within a rapidly evolving global landscape characterized by intensifying international competition in the trade of high-technology goods and services, global investment in CETs, shifting domestic funding dynamics, and concerns about maintaining the nation's STEM workforce pipeline. In 2024, U.S. R&D expenditures were estimated to reach $993 billion in current U.S. dollars, up from $937 billion in 2023 (Figure 1) (NCSES 2026d).[1] In 2024, businesses performed 77% and funded 75% of all U.S. R&D, with compound annual growth rates higher than those of other sectors since 2010.

Figure 1. U.S. R&D expenditures, by performer or funder: 1953–2024





Note(s):
Some data for 2023 are preliminary and may be revised later. The data for 2024 include estimates and are likely to be revised later. Federal performers of R&D include federal agencies and federally funded R&D centers.

Source(s):
NCSES, National Patterns of R&D Resources (2023–24 edition).

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R&D activities are classified into three types of R&D: basic research, applied research, and experimental development (see the "Glossary" section for definitions). This private-sector expansion has fundamentally reshaped the funding of basic research. The share of business funding for basic research grew from 19% to 34% between 2000 and 2024, while the federal government's share declined from 58% to 40% (NCSES *National Patterns 2023–24*: Table 7). In 2024, experimental development accounted for about two-thirds (67%) of U.S. R&D performance, applied research accounted for 18%, and basic research accounted for 15% (NCSES 2026b). The predominance of experimental development is consistent with the business sector's role as the largest performer and funder of R&D, given its focus on closer-to-market applications. This pattern of domestic R&D has remained fairly consistent since 2000 (Table 1). Across all industries within the business sector—including manufacturing and services—R&D investment is heavily concentrated in software: 42% of U.S. business R&D in 2023 focused on software products and embedded software technologies.

Table 1. U.S. R&D expenditures, by type of R&D: Selected years, 2000–24

(Billions of current dollars, billions of constant 2017 dollars, and percent distribution)

Type of R&D	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023[a]	2024[b]
Billions of current dollars																	
All R&D	267.9	325.3	406.6	426.2	433.7	454.2	475.9	494.5	521.7	553.5	603.8	665.3	716.5	788.7	891.9	937.2	993.4
Basic research	42.0	59.9	76.4	73.7	74.0	79.2	82.8	84.4	87.4	90.1	97.7	104.8	111.6	118.6	130.2	138.1	144.8
Applied research	56.5	69.8	78.9	81.7	86.6	88.0	91.6	97.1	109.5	113.3	118.3	130.1	132.4	143.8	161.7	174.1	180.4
Experimental development	169.4	195.6	251.3	270.8	273.1	287.0	301.5	313.0	324.8	350.1	387.8	430.3	472.5	526.4	600.0	625.0	668.2

Table 1. U.S. R&D expenditures, by type of R&D: Selected years, 2000–24

(Billions of current dollars, billions of constant 2017 dollars, and percent distribution)

Type of R&D	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023[a]	2024[b]
Billions of constant 2017 dollars																	
All R&D	368.5	398.9	453.6	465.9	465.4	479.3	493.6	508.1	531.0	553.5	590.3	639.8	679.9	715.8	755.7	765.8	792.0
Basic research	57.8	73.4	85.3	80.5	79.4	83.6	85.9	86.7	89.0	90.1	95.5	100.8	105.9	107.6	110.3	112.9	115.5
Applied research	77.7	85.5	88.0	89.3	93.0	92.9	95.0	99.8	111.4	113.3	115.6	125.2	125.6	130.5	137.0	142.2	143.9
Experimental development	233.0	239.9	280.3	296.0	293.1	302.9	312.6	321.6	330.6	350.1	379.2	413.9	448.4	477.8	508.4	510.7	532.7
Percent distribution																	
All R&D	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Basic research	15.7	18.4	18.8	17.3	17.1	17.4	17.4	17.1	16.8	16.3	16.2	15.8	15.6	15.0	14.6	14.7	14.6
Applied research	21.1	21.4	19.4	19.2	20.0	19.4	19.3	19.6	21.0	20.5	19.6	19.6	18.5	18.2	18.1	18.6	18.2
Experimental development	63.2	60.1	61.8	63.5	63.0	63.2	63.3	63.3	62.3	63.3	64.2	64.7	66.0	66.7	67.3	66.7	67.3

[a] Some data for 2023 are preliminary and may be revised later.
[b] The data for 2024 are estimates and are likely to be revised later.

Note(s):
Data throughout the time series reported here are consistently based on the Organisation for Economic Co-operation and Development (OECD) *Frascati Manual 2015* (OECD 2015) definitions for basic research, applied research, and experimental development. Prior to 2010, however, some changes were introduced in the questionnaires of the sectoral expenditure surveys to improve the accuracy of respondents' classification of their R&D by type. Accordingly, small percentage changes in the historical data may not be meaningful.

Source(s):
NCSES, National Patterns of R&D Resources (2023–24 edition).

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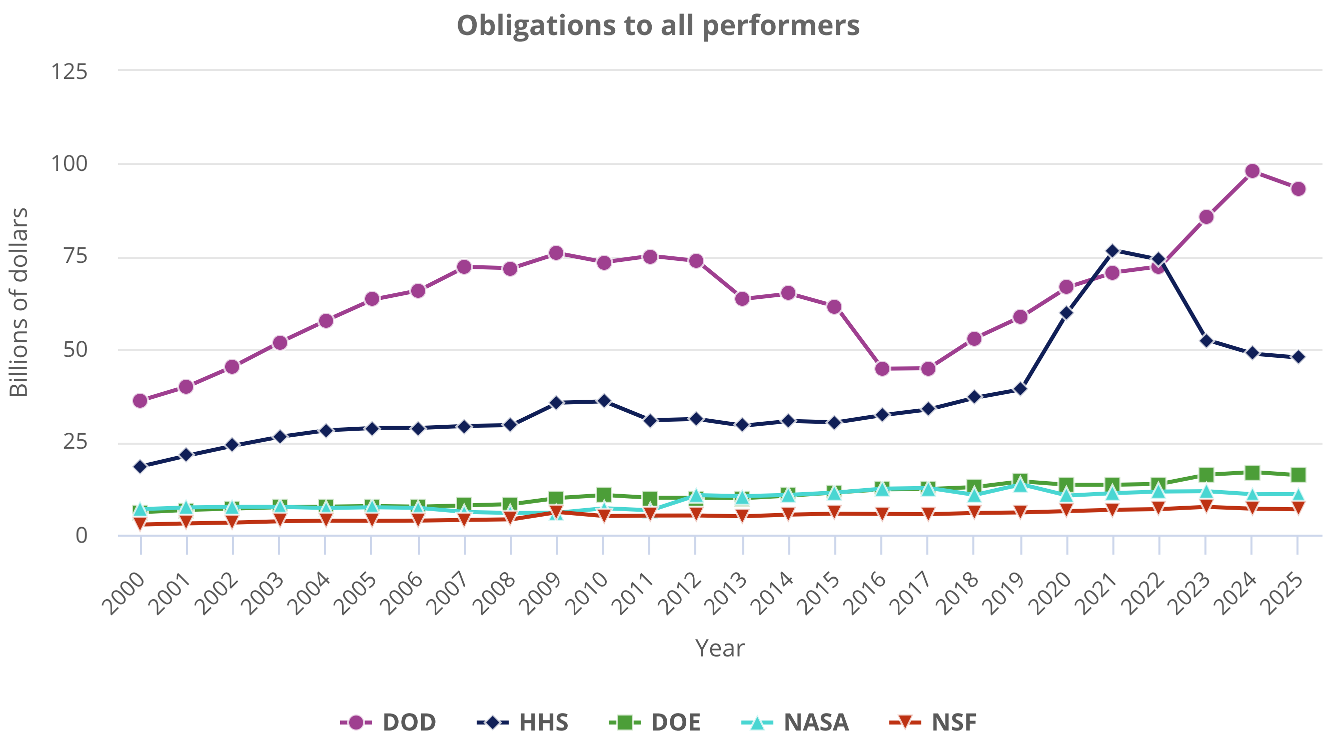
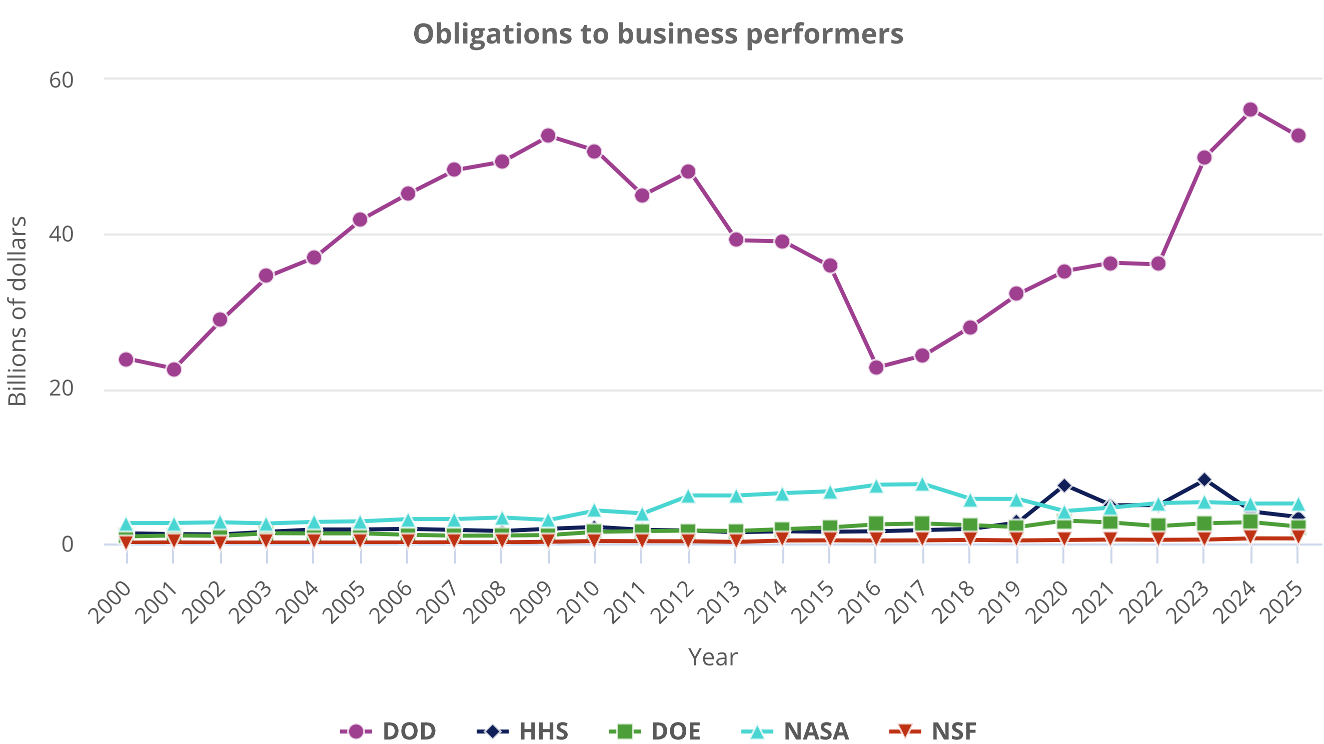
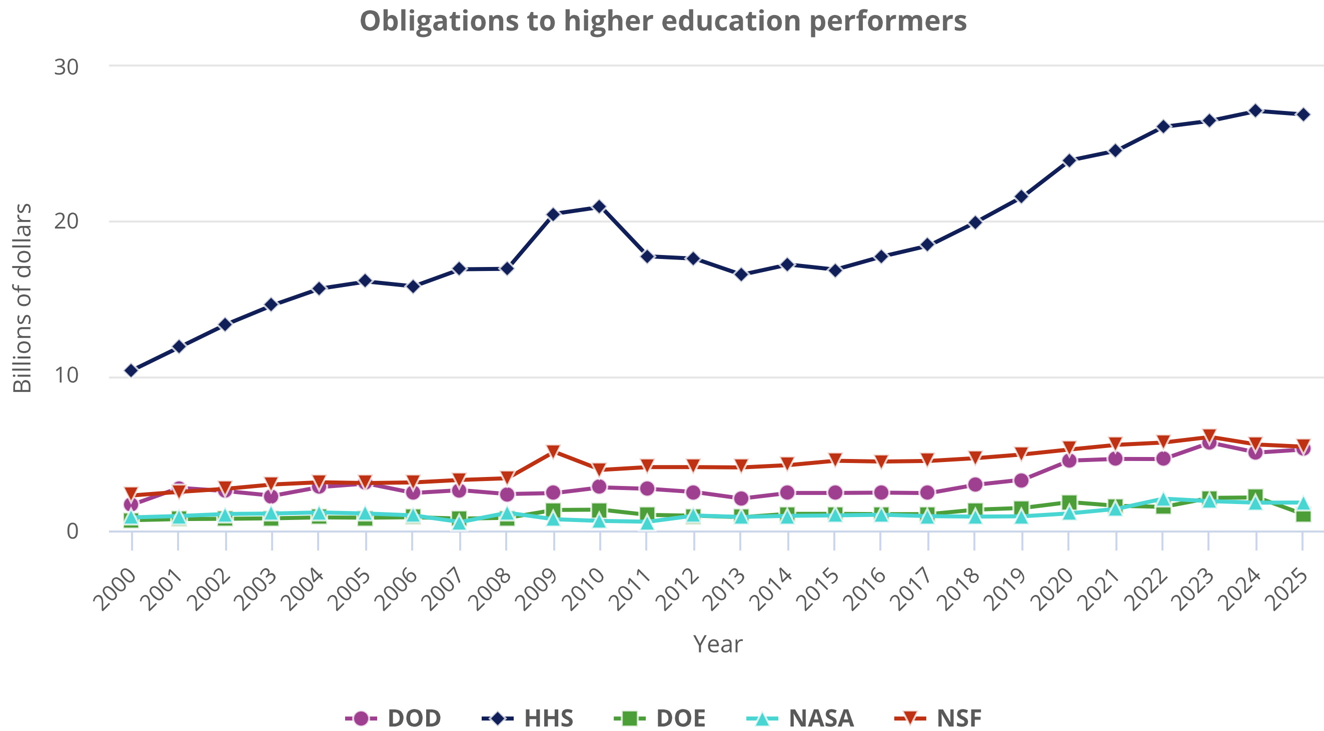
Since 2000, total federal obligations for R&D have been dominated by the Department of Defense (DOD) and the Department of Health and Human Services (HHS) (Figure 2). However, when looking at federal R&D obligations to business R&D performers (e.g., firms) and higher education R&D performers (e.g., principal investigators at academic institutions), a distinct pattern emerges: DOD has dominated funding for business performers since 2000, while HHS has dominated funding for higher education performers, with NSF being the second-largest agency funder for higher education performers over the same period except in 2001, when DOD was the second largest (Figure 2).

Figure 2. Federal obligations for research and development, top 5 agencies: FYs 2000–25







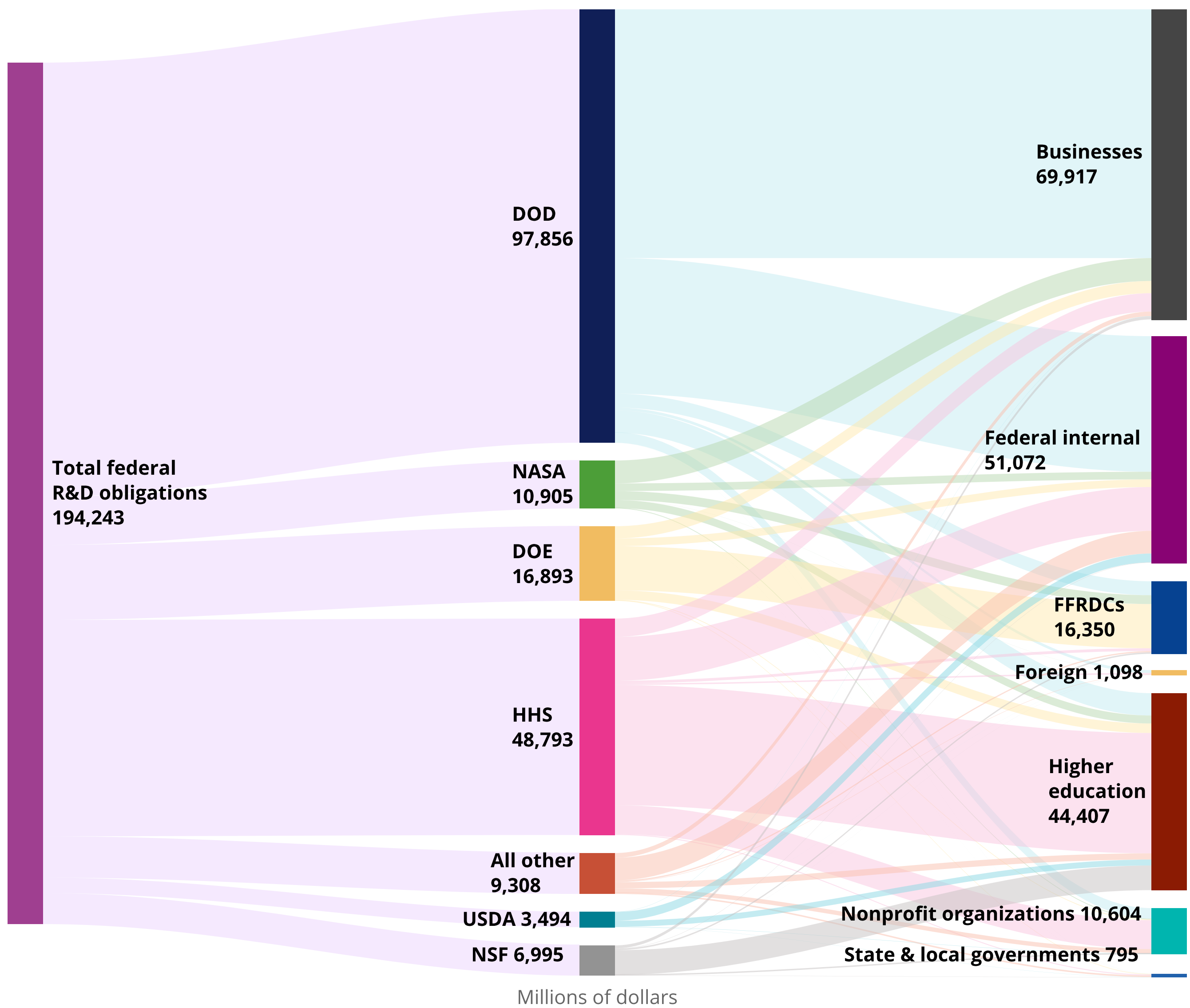
Note(s):
DOD is Department of Defense. DOE is Department of Energy. HHS is Department of Health and Human Services. NASA is National Aeronautics and Space Administration. NSF is National Science Foundation. Data for FY 2025 are preliminary and may be revised later. FYs 2020, 2021, and 2022 obligations include additional funding provided by supplemental COVID-19 related appropriations (e.g., Coronavirus Aid, Relief, and Economic Security [CARES] Act). Beginning with FY 2016, the totals reported for development obligations represent a refinement to this category by more narrowly defining it to be "experimental development." Most notably, totals for development do not include the DOD Budget Activity 7 (Operational System Development) nor Budget Activity 8 (Software and Digital Technology Pilot Programs) obligations. Those funds, previously included in DOD's development obligation totals, support the development efforts to upgrade systems that have been fielded or have received approval for full-rate production and anticipate production funding in the current or subsequent fiscal year. Therefore, the data are not directly comparable with totals reported in previous years. In the performer detail, data were not available for nonfederal government from 1953 to 2005.

Source(s):
NCSES, Survey of Federal Funds for Research and Development, Volume 74, FYs 2000–25.

Indicators 2026: State of U.S. S&E

In 2024, the federal agency R&D funding pattern that has persisted since 2000 held, with DOD providing the majority of federal funding to business R&D performers and HHS providing the majority of federal funding to higher education R&D performers. Federal agency R&D obligations in 2024 totaled over $194 billion from across 14 federal departments and 15 independent agencies (Figure 3). These funds were highly aggregated among the six largest agencies by total R&D obligations. For example, when combined, DOD, HHS, NSF, DOE, the National Aeronautics and Space Administration (NASA), and the Department of Agriculture (USDA) accounted for 95% of all federal R&D. In FY 2024, DOD accounted for 80% of all federal R&D obligations to the business sector, DOE was responsible for 61% of R&D obligations to the nation’s 41 federally funded research and development centers (such as the DOE National Laboratories and Technology Centers), and HHS accounted for 61% of R&D obligations to higher education.

Figure 3. Federal obligations for research and experimental development, by agency and performer: FY 2024



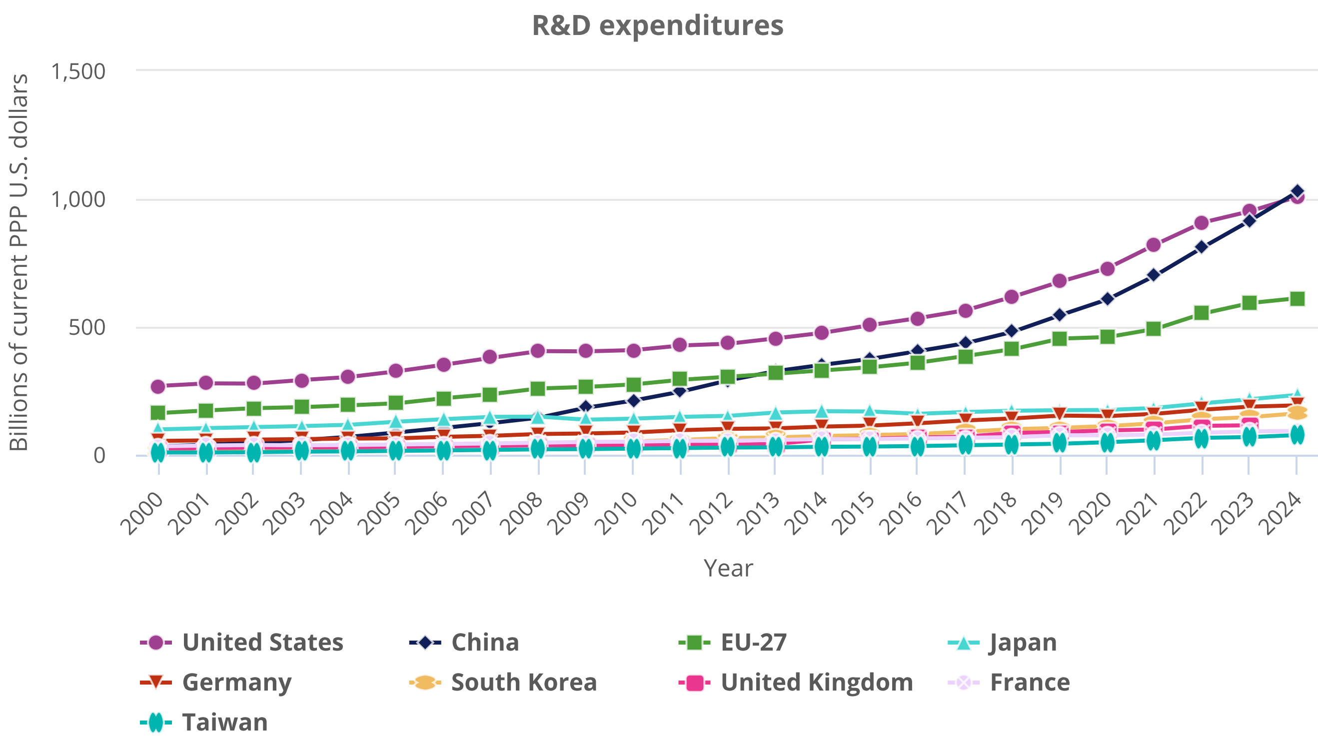
Note(s):
DOD is Department of Defense. DOE is Department of Energy. FFRDC is federally funded research and development center. HHS is Department of Health and Human Services. NASA is National Aeronautics and Space Administration. NSF is National Science Foundation. USDA is Department of Agriculture. Because of rounding, detail may not add to total. Federal agencies' activities cover costs associated with the administration of federal R&D performance and R&D procurements from nonfederal performers by federal personnel, transfers of funds to other federal agencies for purposes related to R&D, and actual federal performance. Higher education includes both public and private institutions as well as University Affiliated Research Centers.

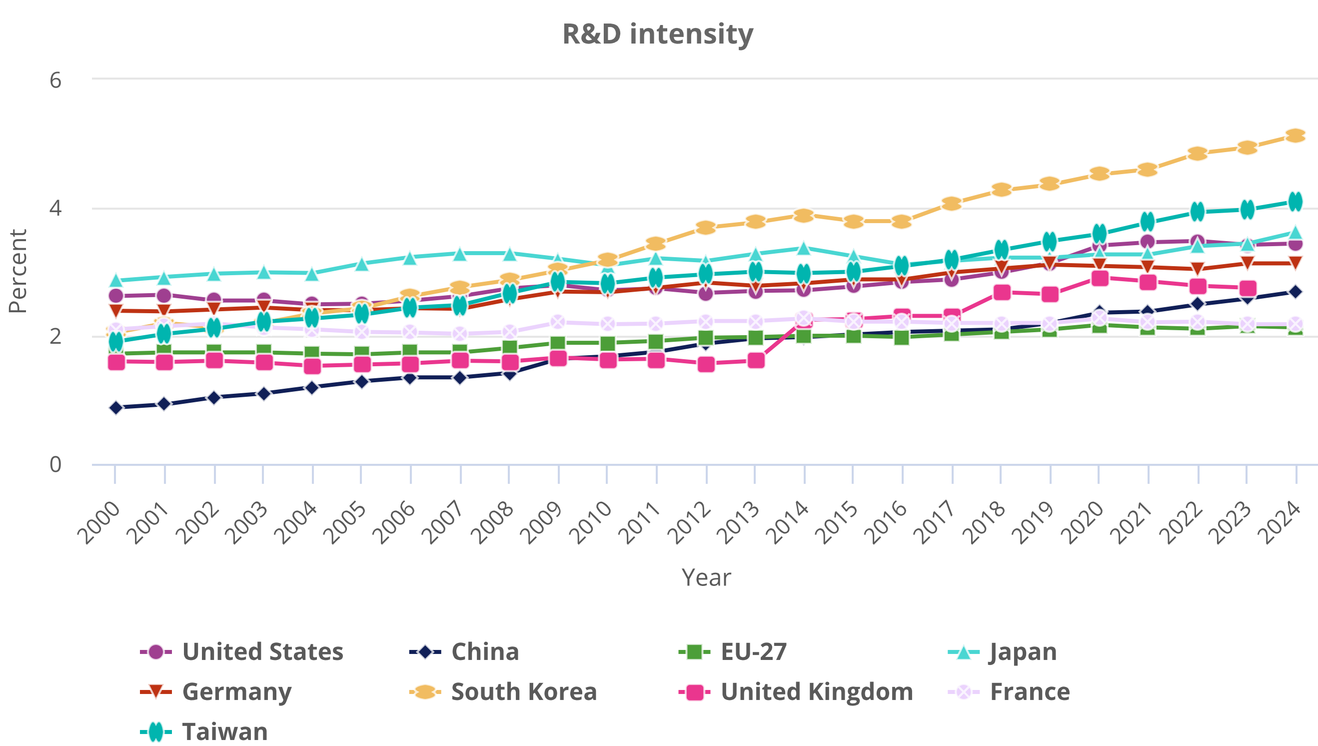
Source(s):
NCSES, Survey of Federal Funds for Research and Development, FYs 2024–25.

Indicators 2026: State of U.S. S&E

China's emergence as an S&T competitor represents one of the most significant shifts in the global R&D landscape of the 21st century (CRS 2024, 2025b). When adjusted for international comparability, China is estimated to have surpassed the United States for the first time in gross domestic expenditures on R&D (GERD) in 2024 with $1.028 trillion, followed by the United States with $1.009 trillion (Figure 4).[2] These totals may be revised as new national data are reported to OECD and purchasing power parity (PPP) benchmarks are updated.

Figure 4. Gross domestic expenditures on R&D and R&D intensity, by selected region, country, or economy: 2000–24





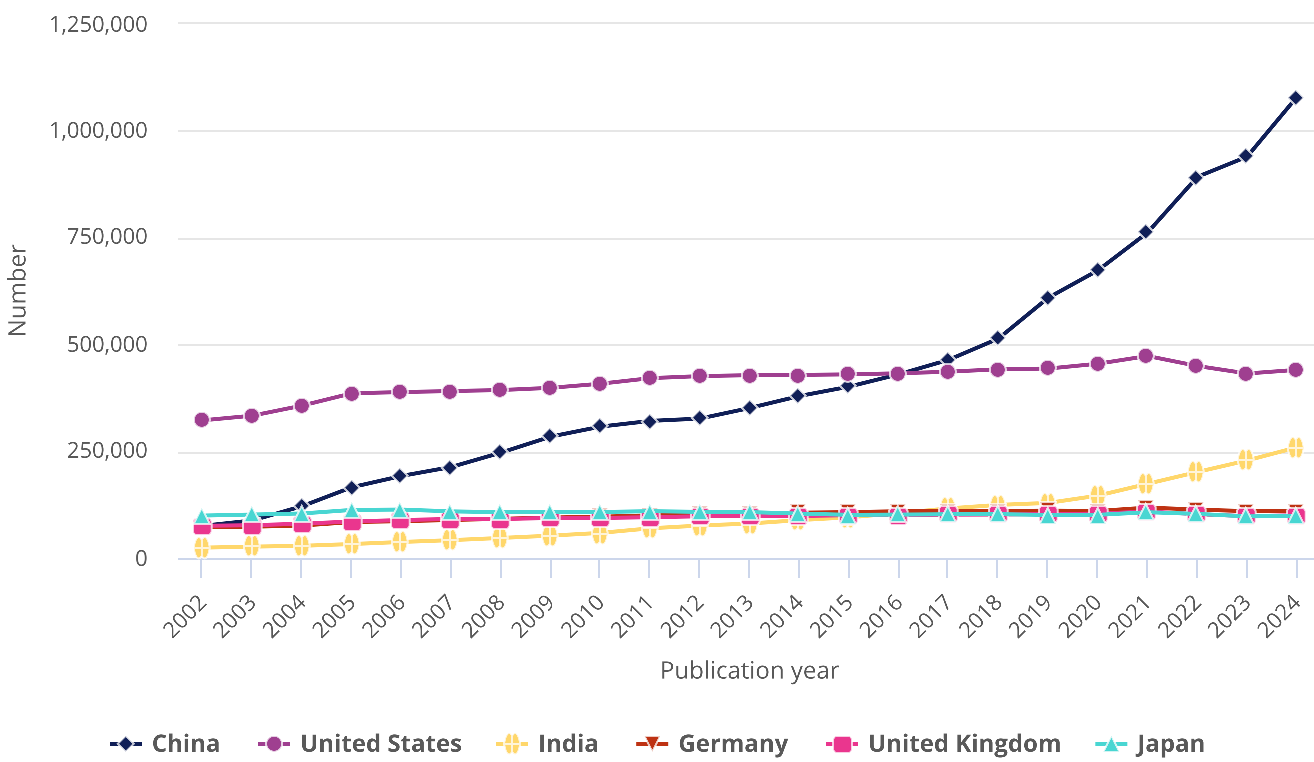
Note(s):
EU-27 is European Union. PPP is purchasing power parity. R&D intensity is gross domestic expenditures on R&D divided by gross domestic product. Some data are preliminary and may be revised later. U.S. data have been adjusted for international comparability. Data were not available for the United Kingdom in 2024.

Source(s):
NCSES, National Patterns of R&D Resources (2023–24 edition); OECD, MSTI, March 2026.

Indicators 2026: State of U.S. S&E

China has become the largest producer of peer-reviewed S&E publications, surpassing the United States in total output in 2017 and now producing more than double the U.S. output (Figure 5); see the "Global Output of Research Publications" section for additional discussion of the challenges using gross counts of publications and the use of highly cited articles (HCAs) to overcome those.

Figure 5. S&E publications, by selected country: 2002–24



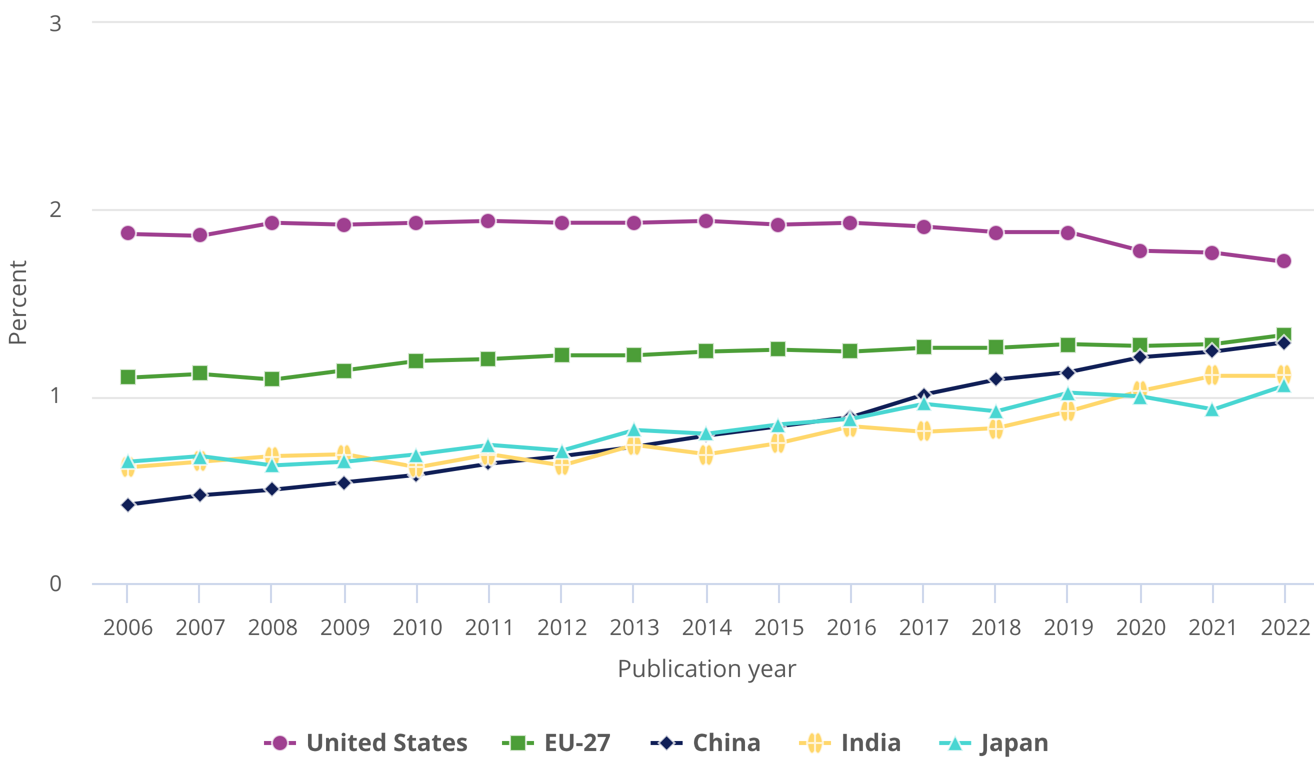
Note(s):
Articles are classified by their year of publication and are assigned to a region, country, or economy on the basis of the institutional address(es) of the author(s) listed in the article. Articles are credited on a fractional-count basis.

Source(s):
NCSES; Science-Metrix; Elsevier, Scopus abstract and citation database, accessed August 2025.

Indicators 2026: State of U.S. S&E

Since 2006, authors in the United States and the European Union (EU-27) have continued to publish large shares of highly cited S&E articles relative to their total output. During this period, the relative share of highly cited S&E articles published by authors in China has increased steadily, although it remains below those of authors in the United States and the EU-27 (Figure 6). In 2019, China surpassed the United States in the total number of S&E doctoral degrees awarded annually, a position it has held since then (Figure 7). Inventors from China received three-quarters of all AI international priority patents in 2024 (NSB 2026b: Figure TRN-8). In 2024, China led global semiconductor production, measured as value added, with a 30% share, followed by Taiwan (23%), the United States (19%), and South Korea (11%). Semiconductors are key enabling technologies in many CET areas such as AI, QIST, robotics, autonomous systems, and defense and aerospace technologies.

Figure 6. S&E publications in the top 1% most-cited journal articles as a share of all S&E journal articles, by selected region, country, or economy: 2006–22

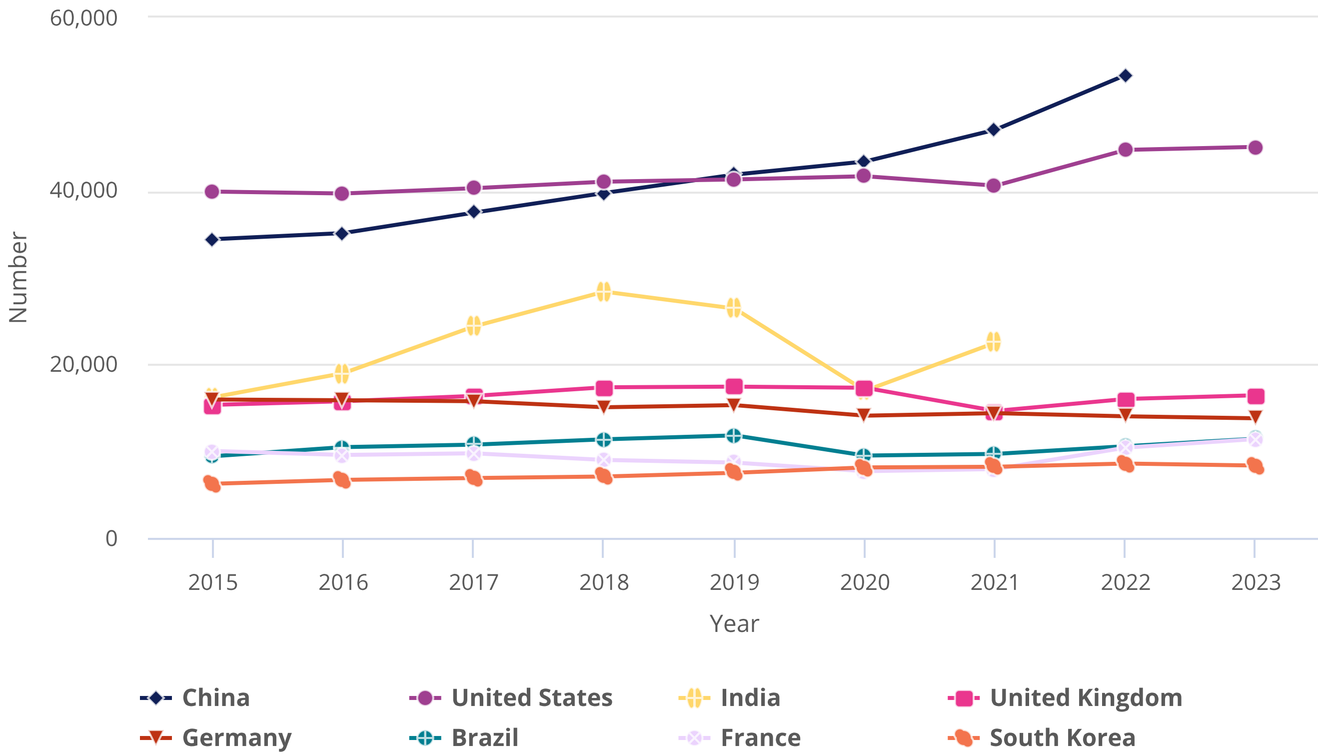


Note(s):
EU-27 is European Union. Articles are classified by their year of publication and are assigned to a region, country, or economy on a whole-count basis according to the institutional address(es) of the author(s) listed in the article. Citation data are based on all citations made to articles in their publication year and all following years and are normalized by subfield and publication year to allow for comparisons across subfields and over time, resulting in the world level standing at 1.00 for each subfield and year.

Source(s):
NCSES; Science-Metrix; Elsevier, Scopus abstract and citation database, accessed August 2025.

Indicators 2026: State of U.S. S&E

Figure 7. S&E doctoral degrees awarded, by selected country: 2015–23



Note(s):
To facilitate international comparison, data for the United States are those reported to the Organisation for Economic Co-operation and Development, which vary from the National Center for Science and Engineering Statistics classification of fields presented in other sections of the report. Data for China are not available for 2023; data for India are not available for 2022–23.

Source(s):
OECD, *Education at a Glance*; National Bureau of Statistics of China, *China Statistical Yearbook*; People's Republic of China, Ministry of Education data; Government of India, Ministry of Education, Department of Higher Education, *All India Survey on Higher Education*.

Indicators 2026: Talent

Despite international competition, the United States retains significant strengths and has one of the most R&D-intensive economies globally (3.4%), identified by R&D expenditures as a fraction of gross domestic product (GDP) (also known as GERD-to-GDP ratio) (Figure 4). U.S. researchers continue to produce disproportionately high shares of highly cited publications across most S&E fields. Articles from biological and biomedical sciences were cited in Patent and Trademark Office (USPTO) patents more frequently than any other S&E field between 2013 and 2024, accounting for 27% of all citations across the time period, with health sciences articles second at 25% (NSB 2026b: Figure TRN-6). Patents granted to U.S. inventors in critical technologies consistently demonstrate high impact, and they have the highest citation share globally in AI, biotechnology and related technologies, semiconductors, QIST, and advanced nuclear technologies (NSB 2026b: Figure TRN-10, Figure TRN-13, Figure TRN-16, Figure TRN-19, Figure TRN-22). While the share of highly cited patents in biotechnology and related technologies has risen for U.S. inventors between 2010 and 2021 (the last year that data are available),[3] the share has declined for patents in AI, semiconductor technology, quantum science, and advanced nuclear technology during the same period, signaling intensifying competition in CET domains.

China has been the largest total knowledge- and technology-intensive (KTI) manufacturing producer since 2012, with the United States remaining the second-largest producer. However, the United States has retained the largest share of value-added production in four KTI manufacturing industries in 2024: air and spacecraft and related machinery, medical and dental instruments, pharmaceuticals, and weapons and ammunitions. The United States dominates KTI services production, holding a 43% global share in 2024 compared with China's 11%. U.S. leadership is particularly pronounced in software publishing, where the United States holds 75% of global value added, followed by IT and information services at 44% (NSB 2026b: Figure TRN-35).

Between 2017 and 2024, TFP, an internationally comparable indicator of the impact of innovation and technological change on growth within an economy and its component industries, for the information sector grew faster (13%) than for the nonfarm business sector overall (8%). Within the information sector, TFP for publishing industries (including software) (23%) and for data processing, Internet publishing, and other information services (21%) have exhibited strong growth since 2017 (NSB 2026b: Figure TRN-1). These information sector industries are R&D-intensive, those industries where the ratio of R&D expenses to sales is higher than the average across all industries, and where STEM workers are highly represented. STEM workers accounted for 37% of employment in R&D-intensive industries in the United States in 2024, compared with 26% of all industries (see "STEM Workers in the Economy and R&D-Intensive Industries" section below).

The sectoral composition of the S&P 500, the large-cap (companies with high market capitalization, typically over $10 billion) segment of the U.S. equity market between 1995 and 2025, has shifted. According to S&P Dow Jones Indices, "index composition has evolved to reflect the increased importance of Information Technology companies and the reduction in Industrials and Energy companies." The S&P Dow Jones Indices also reports that the information technology (IT) sector represents roughly a third of the companies in the index in 2025. In 1995, the five largest companies in the S&P 500 were General Electric, Exxon Mobil, AT&T, Coca Cola, and Royal Dutch Petroleum; in 2025, the five largest companies were Nvidia, Microsoft, Apple, Amazon, and Meta Platforms (S&P Dow Jones Indices 2025).

The STEM workforce is integral to the United States' ability to meet persistent and emerging global challenges, including national security, health, economic development, and future research needs. It is sustained through the progression of individuals born in the United States as well as abroad and educated and trained at U.S. institutions, as well as individuals born abroad who enter directly into the domestic workforce. The 37 million STEM workers (Table 2) in the United States in 2024—representing 26% of all workers—have grown at nearly three times the rate of non-STEM workers since 2014, with foreign-born workers comprising 22% of this STEM workforce, over half (52%) of whom are naturalized U.S. citizens. While the overall STEM workforce in the United States has grown from 26 million workers in 2000 to 37 million in 2024 and has accounted for around a fifth to a quarter of the overall U.S. workforce during this period, its composition has changed (Figure 8). Workers employed in STEM middle-skill occupations declined from 12% to 9% of the total workforce between 2000 and 2024, while workers employed in S&E occupations grew from 4% to 7% and those employed in S&E-related occupations grew from 7% to 10% of the total workforce over the same period (see the "Glossary" section for definitions of S&E, S&E-related, and STEM middle-skill occupations).

Table 2. Workforce, occupational groups, and examples

(Workforce, occupational group, and example)

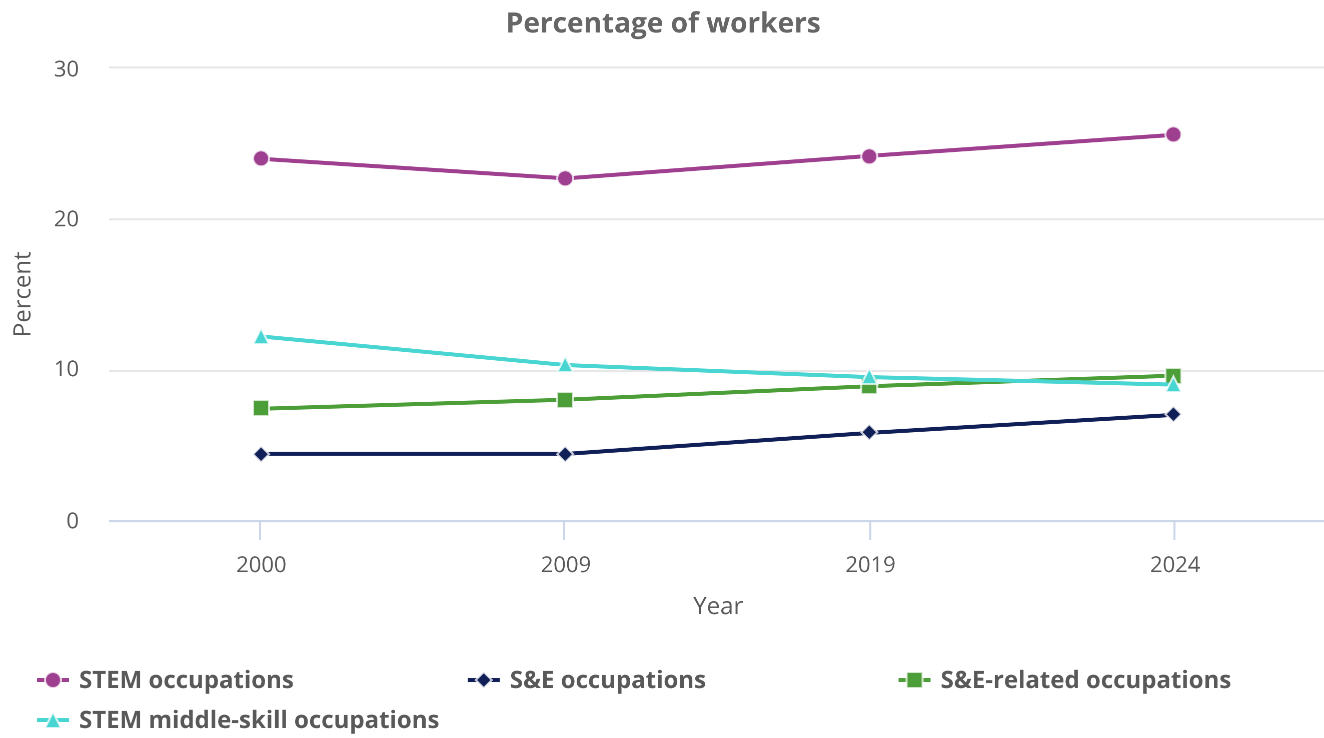
Workforce	Occupational groups	Examples of occupations
STEM	S&E	Computer support specialists, engineers, industrial engineers, including health and safety, software developers
	S&E-related	Licensed nurses, pharmacy technicians, physicians, registered nurses
	STEM middle skill	Carpenters, electricians, farmers, ranchers and other agricultural managers, industrial production managers
Non-STEM	Non-STEM	Counselors, food preparation workers, police officers, managers

Note(s):
STEM is science, technology, engineering, and mathematics. Please see https://ncses.nsf.gov/pubs/nsb20212/ for the expanded definition of STEM occupations; https://ncses.nsf.gov/pubs/nsb20212/table/SLBR-1 for the classification of STEM occupations; and https://ncses.nsf.gov/136/assets/0/files/ncses_workforcestatistics_onepager.pdf for an overview.

Source(s):
NSB, NSF, 2021, The STEM Labor Force of Today: Scientists, Engineers and Skilled Technical Workers, *Science and Engineering Indicators 2022*, NSB-2021-2, available at https://ncses.nsf.gov/pubs/nsb20212/; NCSES, 2022, *Workforce Statistics*, NCSES 2022-203, available at https://ncses.nsf.gov/136/assets/0/files/ncses_workforcestatistics_onepager.pdf.

Indicators 2026: State of U.S. S&E

Figure 8. Workers in STEM occupations: 2000, 2009, 2019, 2024



Note(s):
STEM is science, technology, engineering, and mathematics. Data represent the civilian, employed, noninstitutionalized populations ages 25–75. They exclude those who are currently enrolled in primary or secondary school. STEM classifications are based on the Integrated Public Use Microdata Series (IPUMS) occupation variable harmonized to 2010 Standard Occupational Classification codes (OCC2010). Information on this harmonized variable can be found at https://usa.ipums.org/usa-action/variables/OCC2010#description_section. STEM groupings represent National Center for Science and Engineering Statistics work and may not align with STEM classifications used by other data users. Percentages are of all workers. Non-STEM occupations are not shown.

Source(s):
Ruggles S, Flood S, Sobek M, Backman D, Cooper G, Rivera Drew JA, Richards S, Rodgers R, Schroeder J, Williams KCW, 2025, *IPUMS USA: Version 16.0* (Decennial 2000 1%, ACS 1-Year 2009, ACS 1-Year 2019, ACS 1-Year 2024), https://doi.org/10.18128/D010.V16.0.

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STEM employees enjoy an economic premium, with full-time, year-round workers (see "Glossary") in STEM occupations receiving higher median annual earnings ($80,000) in 2024 than workers in non-STEM occupations ($60,000). Between 2014 and 2024, the number of S&E degrees awarded by U.S. institutions increased at all levels. At the associate's, bachelor's, and master's degree levels, the growth in S&E degree completions during this period was higher than the growth in the college-age population, with computer and information sciences degrees at the bachelor's and master's levels exhibiting strong growth. The United States remained the most popular destination for internationally mobile postsecondary students in 2023, and temporary visa holders were highly represented among advanced degree awardees (master's and doctoral levels) in technologically important fields—computer and information sciences, engineering, and mathematics and statistics.

National and international elementary and secondary student assessments reveal limitations in the nation's preparation of future STEM workers. Pandemic-related learning losses in mathematics remain unrecovered for all but the highest-performing students, while mathematics scores have dropped across all student groups (4th, 8th, and 12th grades) since pre-pandemic levels. U.S. eighth graders scored in the middle third among 18 advanced economies in science and in the bottom third in mathematics in 2023. Given that high school mathematics achievement is associated with STEM degree completion (NSB 2026a: Table TAL-14), these educational challenges may have implications for the nation's future capacity to compete in an increasingly technology-driven global economy.

STEM Talent: Education, Training, and Workforce

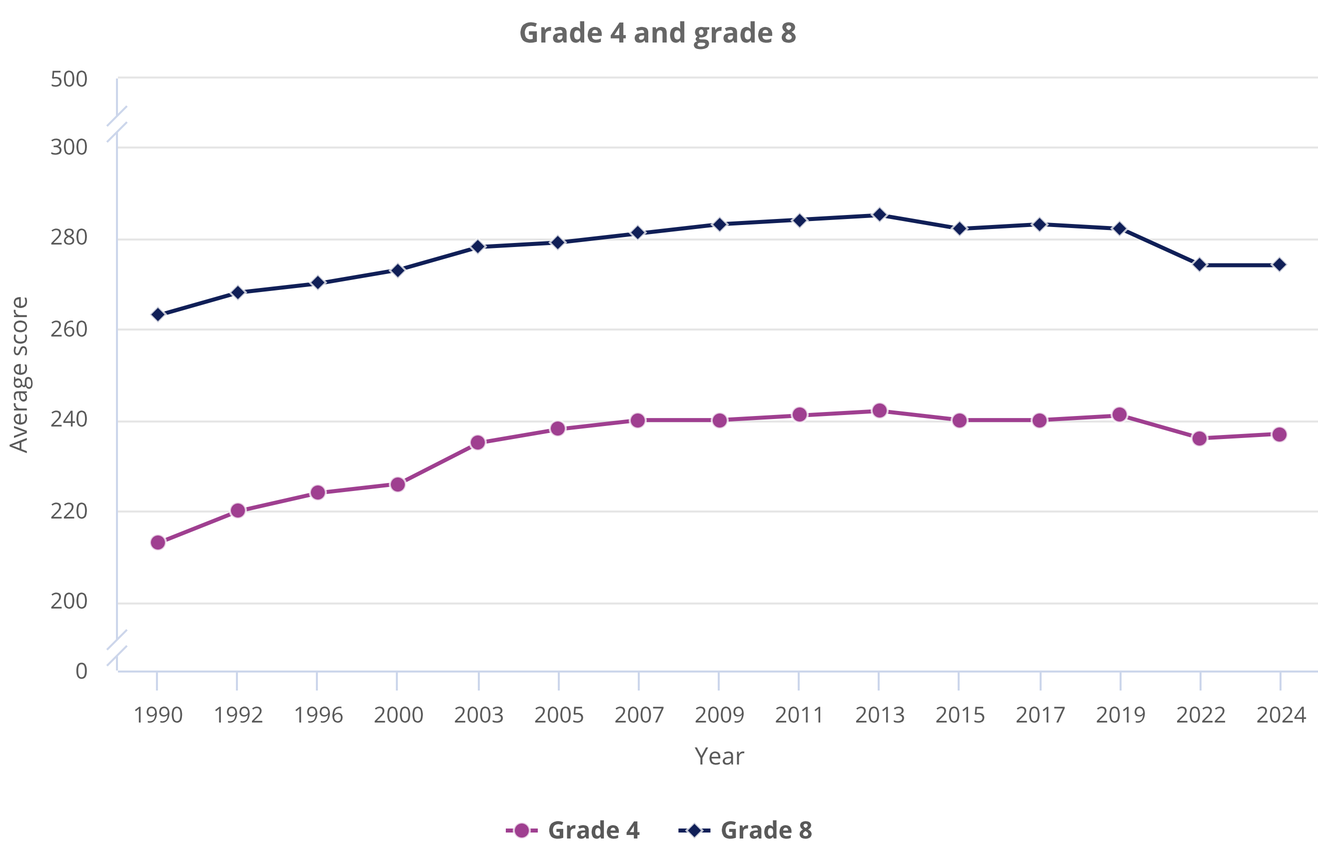
Talent is the bedrock of the nation's S&E enterprise and a key part of U.S. competitiveness.[4] The STEM workforce is integral to the United States' ability to meet persistent and emerging global challenges, including national security, health, economic development, and future research challenges. A globally competitive STEM education system equips Americans with the skills and knowledge needed to participate in the STEM workforce. Indicators of the performance of the domestic S&E enterprise—from STEM education and training to employment and attrition—highlight challenges.

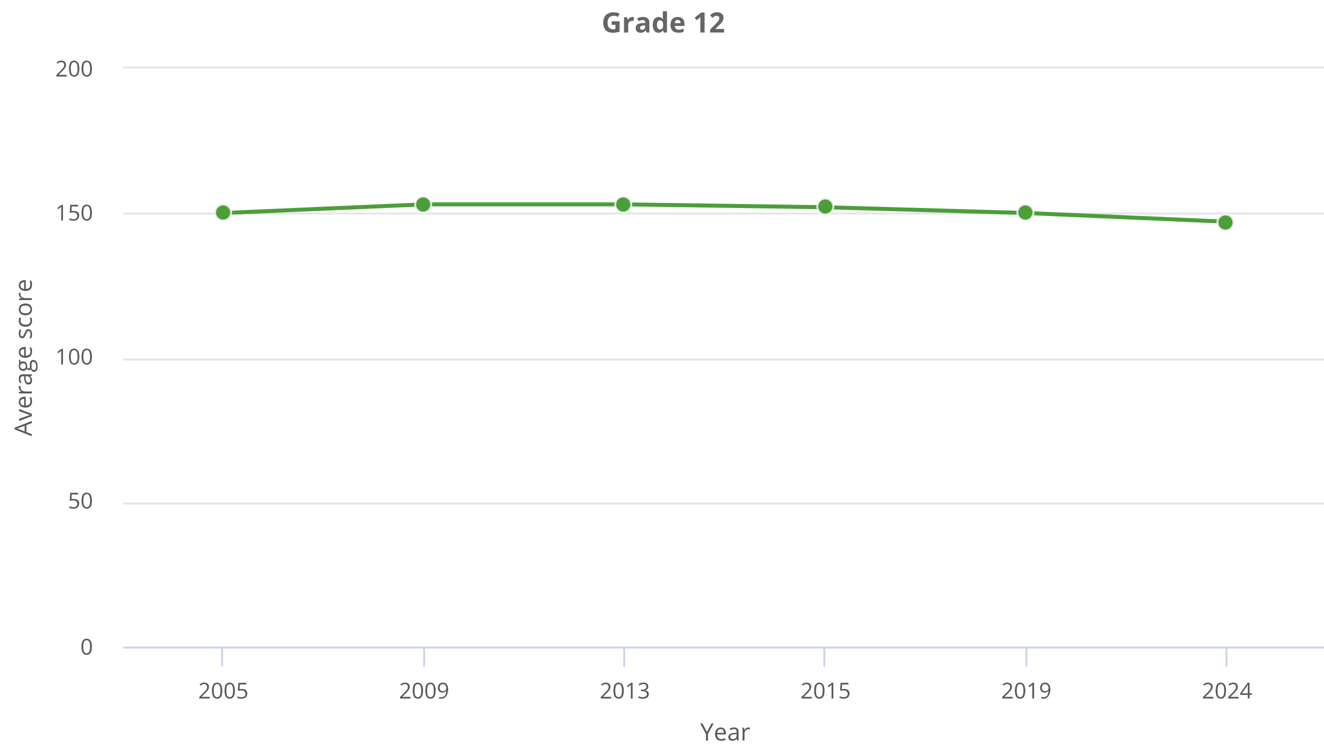
Elementary and Secondary STEM Education

Mathematics and Science Achievement

The results of the 2024 National Assessment of Educational Progress (NAEP) show overall significant declines in mathematics and science performance among U.S. elementary and secondary students since the COVID-19 pandemic. Average student scores on the main NAEP mathematics assessment for grades 4, 8, and 12 all declined significantly from 2019 to 2024 (Figure 9).[5] The 2024 data indicate a slight recovery in average mathematics performance among 4th graders when compared with the scores from 2022 and no recovery among 8th graders when compared with the scores from 2022 and the pre-pandemic benchmark of 2019. The average student score in 2024 on the grade 12 mathematics assessment—which is administered less frequently and uses a different score scale—declined to its lowest level among all assessments under the current mathematics framework, which was first administered in 2005.

Figure 9. Average student scores on the main NAEP mathematics assessment, by grade level: 1990–2024





Note(s):
NAEP is National Assessment of Educational Progress. The scale for NAEP mathematics assessment scores is 0–500 for grades 4 and 8 and 0–300 for grade 12. NAEP mathematics assessment schedules can differ between grade levels.

Source(s):
NCSES, special tabulations (2025) of the main NAEP mathematics assessments, NCES.

Indicators 2026: Talent

Trends in mathematics performance have differed for lower- and higher-performing students since the pandemic. Fourth- and 8th-grade student NAEP mathematics scores at the 10th and 25th percentiles in 2024 showed either a decline or no change from 2022, whereas scores at the 75th and 90th percentiles at both grade levels increased from 2022 to 2024. These results suggest some learning recovery for higher-performing students but no recovery for lower-performing students. For the grade 12 mathematics assessment, in addition to a decrease in the average score, scores at the 10th, 25th, and 75th percentiles each declined from 2019 to 2024. However, the score for high-performing students (90th percentile) held steady from 2019 to 2024.

The NAEP science assessment results show a significant decline in student performance from 2019 to 2024, the first assessment year since the pandemic. From 2019 to 2024, the average science score for 8th-grade students dropped to its level first observed in 2009, the initial assessment year under the current science framework (Table 3). Science scores declined across lower- and higher-performing students, as measured by the decrease in the 10th, 25th, 50th, 75th, and 90th percentile scores from 2019 to 2024.

Table 3. Average and percentile student scores on the grade 8 NAEP science assessment: 2009–24

(Score)

Year	10th percentile	25th percentile	Average score	75th percentile	90th percentile
2009	103	128	150	175	192
2011	106	131	152	176	193
2015	109	133	154	178	195
2019	106	132	154	179	196

Table 3. Average and percentile student scores on the grade 8 NAEP science assessment: 2009–24

(Score)

Year	10th percentile	25th percentile	Average score	75th percentile	90th percentile
2024	101	126	150	176	194

Note(s):
NAEP is National Assessment of Educational Progress. The scale for NAEP science assessment scores is 0–300.

Source(s):
NCES, NAEP, various years, 2009–24 science assessments.

Indicators 2026: State of U.S. S&E

Average student performance on the 2024 NAEP mathematics assessments differed by a variety of student and school factors. Male students scored higher than female students on the 4th-, 8th-, and 12th-grade mathematics assessments, as did high socioeconomic status (SES) students compared with low SES students.[6] Asian and White students posted the highest scores at all three grade levels. Students with more-experienced teachers scored higher than students with less-experienced teachers at both the 4th- and 8th-grade levels, as did students taught by teachers with traditional certifications rather than teachers with alternative certifications. Fourth- and 8th-grade students in suburban and rural areas scored higher than students in those grades in towns and urban areas. Average student performance on the 2024 NAEP science assessment showed similar patterns by student factors to the mathematics assessment. Male students scored higher than female students, high SES students scored higher than low SES students, and Asian and White students posted the highest scores.

STEM Course Access and Enrollment

Access to STEM courses in elementary and secondary education may be a factor in a student's future higher education or employment decisions, as these courses are often prerequisites for further education in STEM fields or training for STEM occupations. During the 2020–21 school year, more than 80% of U.S. public high schools offered algebra I, algebra II, geometry, and biology; 75% offered chemistry; 67% offered advanced mathematics; 61% offered physics; 49% offered computer science; and 48% offered calculus. Access to these courses varied by student and school characteristics. At the student level, 69% of Asian students, 55% of White students, 51% of Hispanic students, and 47% of Black students attended high schools that offered a full range of mathematics, science, and computer science courses.

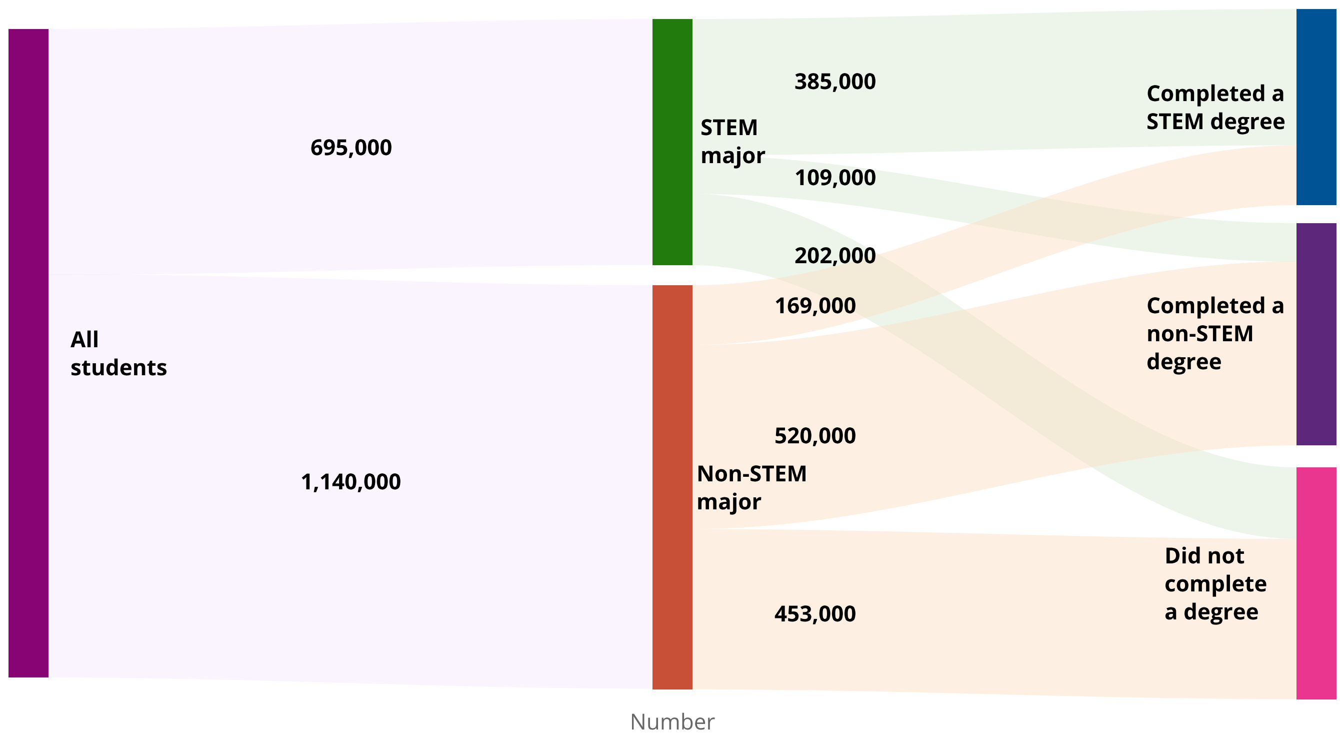
Public high school student enrollment in advanced STEM courses included approximately 2.9 million students in at least one Advanced Placement (AP) course in mathematics, science, or computer science. Student enrollment in AP STEM courses differed by race and ethnicity. For example, Asian students made up 5% of total high school student enrollment but accounted for 17% of students enrolled in AP science and AP mathematics courses. Black students made up 15% of enrollment but accounted for 8% of students enrolled in AP science and 6% of students enrolled in AP mathematics courses.

STEM Higher Education in the United States

Persistence and Attrition in STEM Education

The attrition of higher education students out of STEM—that is, students who begin studying STEM fields while enrolled in post-secondary education but switch to non-STEM fields or leave higher education altogether without completing any degree—may limit the development of the domestic STEM workforce. Approximately 1.8 million U.S. ninth graders in fall 2009 had enrolled in a postsecondary certificate or degree program by 2017; of these students, 695,000 (38%) first declared a STEM major (Figure 10).

Figure 10. Degree outcomes for fall 2009 ninth graders who had enrolled in postsecondary education by 2017, by first major: June 2021



Note(s):
STEM is science, technology, engineering, and mathematics. Estimates pertain to fall 2009 ninth graders who had known postsecondary enrollment through 2017 and degree completion status through June 2021. Completed a STEM degree includes any undergraduate certificate, associate's degree, and bachelor's degree earned in the fields of science technologies or technicians; psychology and other social sciences; and health and medicine.

Source(s):
NCES, High School Longitudinal Study of 2009 (HSLS:09).

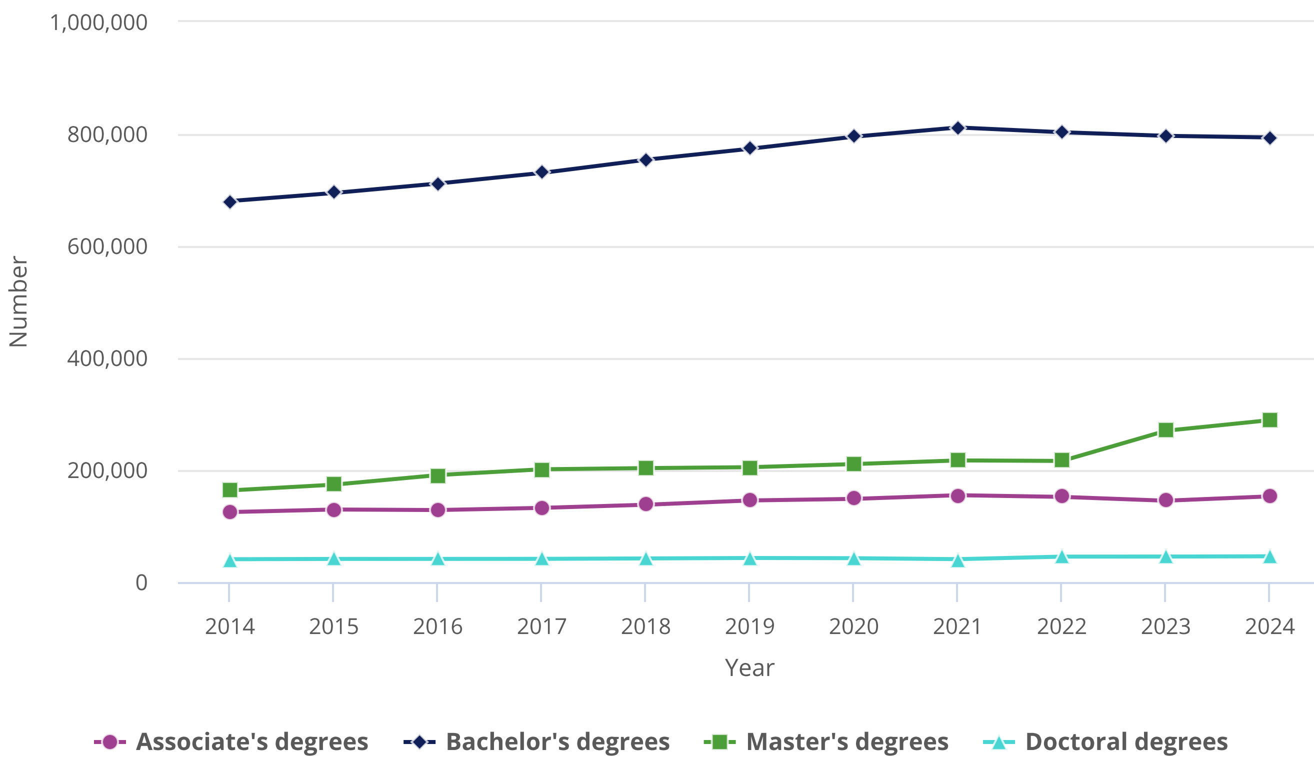
Indicators 2026: Talent

Among students who began STEM majors, 55% completed a STEM undergraduate certificate or degree (in any STEM field), 16% completed a non-STEM degree, and 29% did not complete a degree.[7] The share of STEM majors who completed a STEM degree (55%) was higher than the share of non-STEM majors who completed a non-STEM degree (46%). Due to the movement of non-STEM majors into STEM fields, 31% of students completing a STEM degree were not initially enrolled in STEM fields. Students' mathematics achievement in high school was associated with postsecondary STEM degree completion. STEM majors who had scored in the highest quintile in mathematics in grade 11 completed STEM degrees at a rate of 71%, significantly higher than the share of STEM majors who had scored in the lowest quintile (34%) (NCES 2024a; NSB 2026a: Table TAL-14).

S&E Degree Awards by Level and Field

The number of S&E degrees awarded by U.S. higher education institutions increased at all degree levels between 2014 and 2024 (Figure 11) (see the "Glossary" section for a list of S&E fields). S&E associate's and S&E bachelor's degree awards increased by 22% and 17%, respectively, during this period, and S&E doctoral degrees increased by 13%. By contrast, the number of S&E master's degrees awarded increased by 77%. During this time, the share of all degrees awarded in S&E fields increased at every degree level, most substantially for master's degrees, where the S&E share rose from 22% in 2014 to 31% in 2024 (Table S1). Doctoral degrees in S&E fields accounted for the vast majority (79%) of all doctoral degrees awarded in 2024, whereas S&E degrees did not account for the majority of degrees awarded at any other level.

Figure 11. S&E degrees awarded, by degree level: 2014–24



Note(s):
Data at the associate's, bachelor's, and master's levels are based on institutions eligible to participate in Title IV federal financial aid programs. Doctoral degree data correspond to research doctorates as collected in the Survey of Earned Doctorates (SED). The SED data collection for field of study changed in 2021, which may affect the data comparability across years.

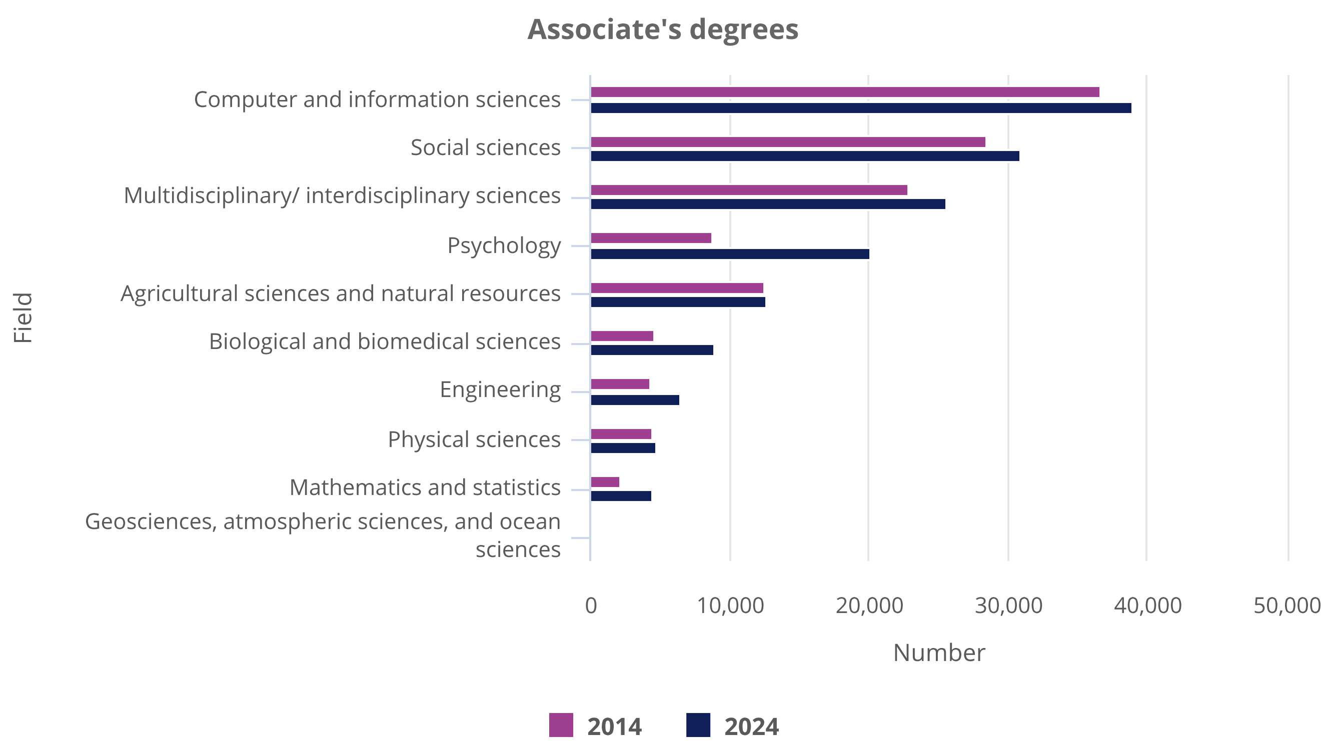
Source(s):
NCSES, special tabulations (2026) of NCES, IPEDS Completions Survey, provisional release data, and NCSES, SED, 2024.

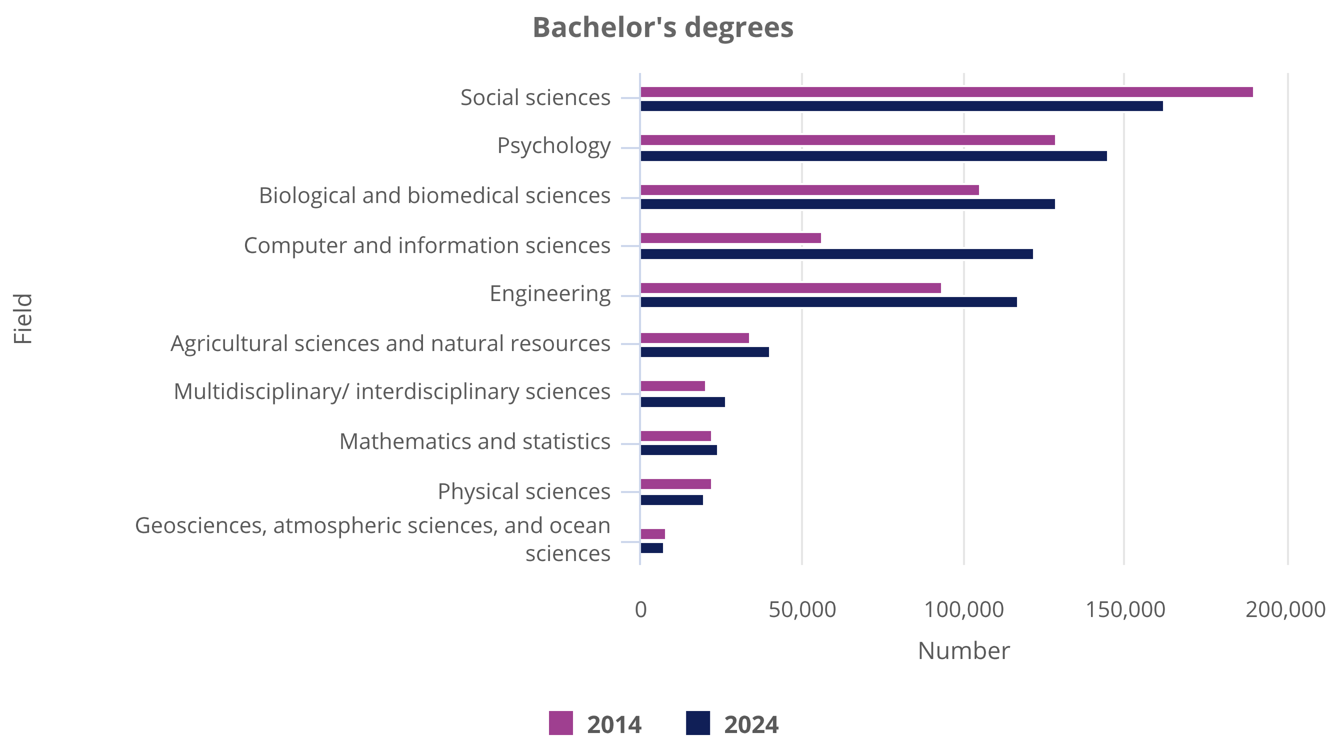
Indicators 2026: State of U.S. S&E

The distribution of S&E degrees among S&E fields varies according to degree level and has changed over time. In 2024, computer and information sciences, social sciences, and multidisciplinary and interdisciplinary sciences were the most common S&E fields for associate's degrees. At the bachelor's level, social sciences, psychology, and biological and biomedical sciences were the most common S&E fields (Figure 12). The number of degrees awarded in computer and information sciences—a field closely associated with CET areas such as AI and QIST—has increased rapidly over the last decade. From 2014 to 2024, computer and information sciences degrees more than doubled at the bachelor's level, increasing from about 56,000 degrees to about 122,000 degrees, and more than tripled at the master's level, from about

25,000 degrees to about 91,000 degrees (Figure 12; Table S2). Computer and information sciences was the most popular S&E degree field at the master's level in 2024, followed by engineering, psychology, and social sciences (Figure 13). At the doctoral level, degrees in computer and information sciences were comparatively less common, and engineering and biological and biomedical sciences were the most popular S&E degree fields in both 2014 and 2024.

Figure 12. S&E undergraduate degrees awarded, by field: 2014 and 2024



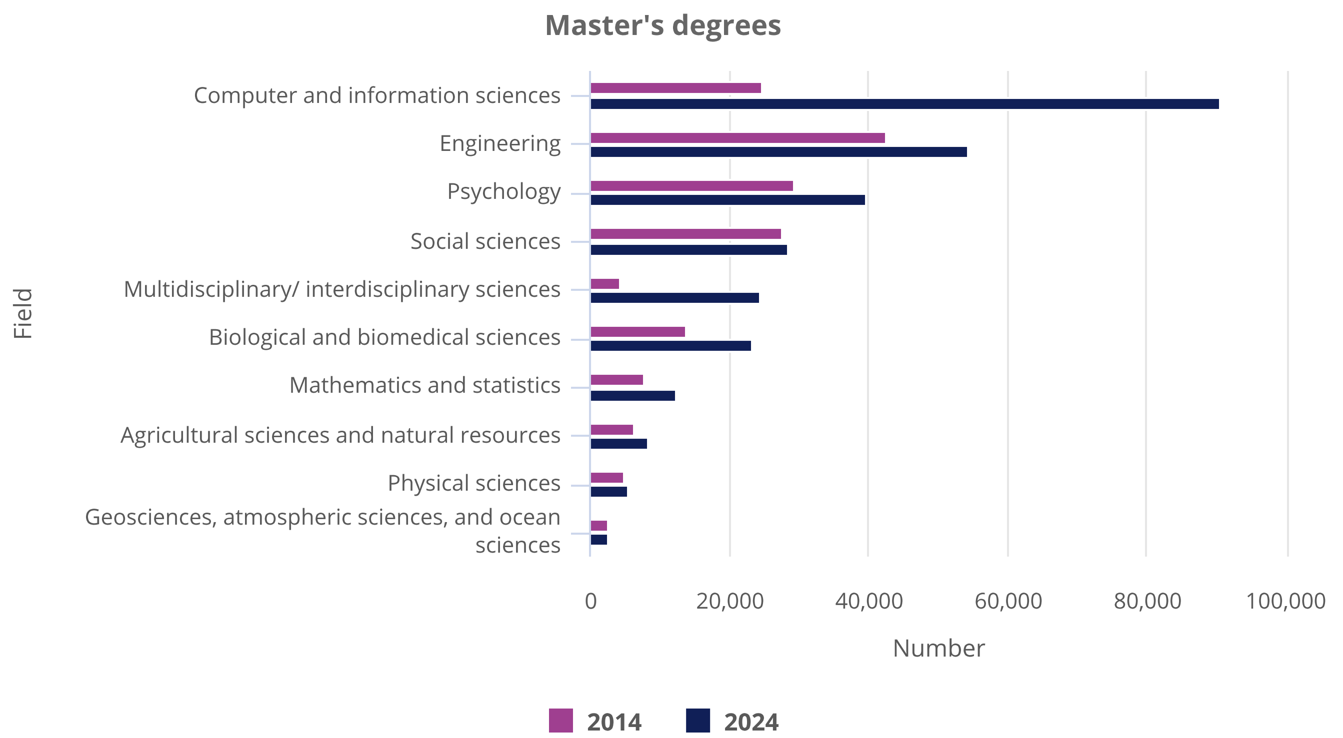


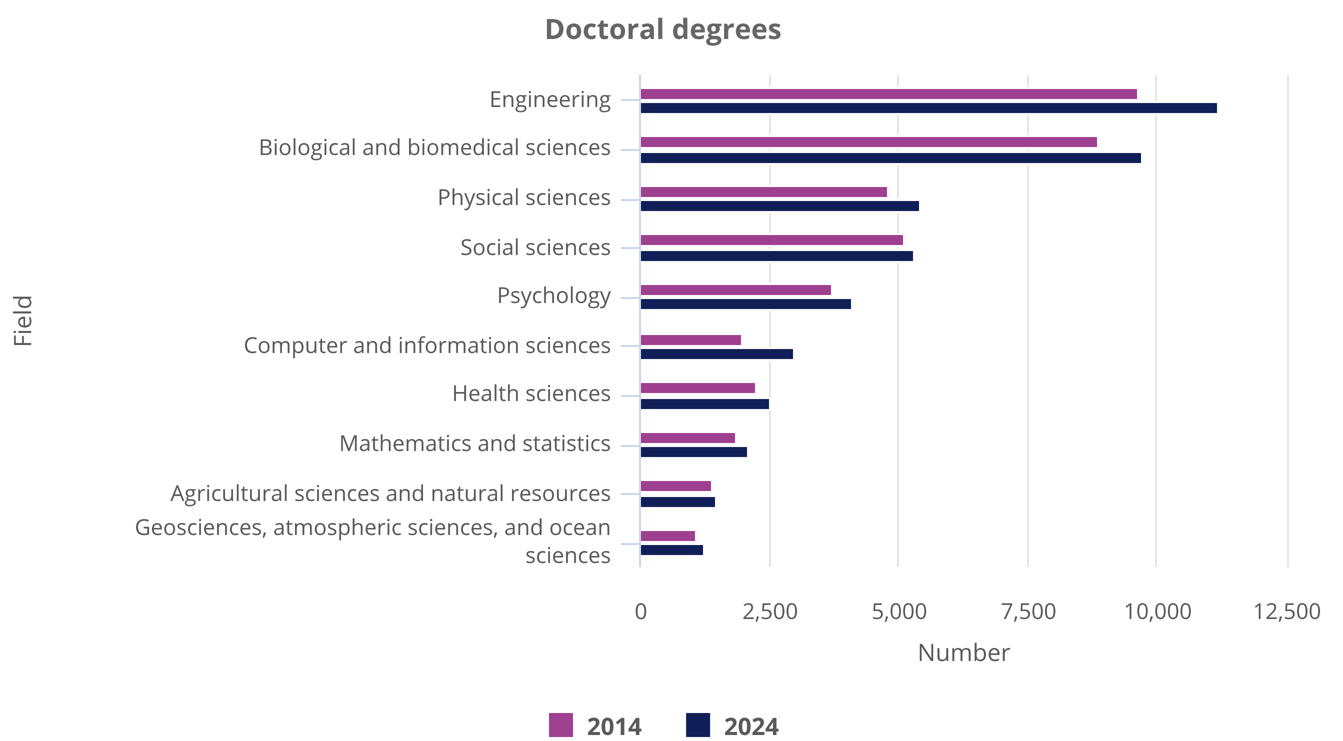
Note(s):
Associate's-level and bachelor's-level data are based on institutions eligible to participate in Title IV federal financial aid programs.

Source(s):
NCSES, special tabulations (2026) of NCES, IPEDS Completions Survey, provisional release data.

Indicators 2026: State of U.S. S&E

Figure 13. S&E graduate degrees awarded, by field: 2014 and 2024





Note(s):
Master's-level data are based on institutions eligible to participate in Title IV federal financial aid programs. Doctoral-level data correspond to research doctorates as collected in the Survey of Earned Doctorates (SED); the SED data collection for field of study changed in 2021, which may affect the data comparability across years.

Source(s):
NCSES, special tabulations (2026) of NCES, IPEDS Completions Survey, provisional release data, and NCSES, SED, 2024.

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S&E Degree Awards by Geography and Student Characteristics

The availability of S&E training and the relative concentration of higher education degrees awarded in S&E fields vary geographically throughout the United States.[8] The share of bachelor's degrees awarded in S&E fields in 2024 ranged from 27% for institutions in Arizona to 54% for institutions in Maryland. Generally, states awarded considerably larger shares of degrees in S&E fields at the doctoral level than at the bachelor's level. Vermont, Alaska, New Hampshire, Montana, and Delaware, had the highest share of doctoral degrees awarded in S&E fields of any state, 90% or higher. California, Texas, and New York, the most populous states in the United States, are also the top states for S&E doctorate awards (*SED 2024:* Table 7-6). In 2024, West Virginia and Mississippi awarded the lowest proportion of doctoral degrees in S&E fields (66% and 67%, respectively).

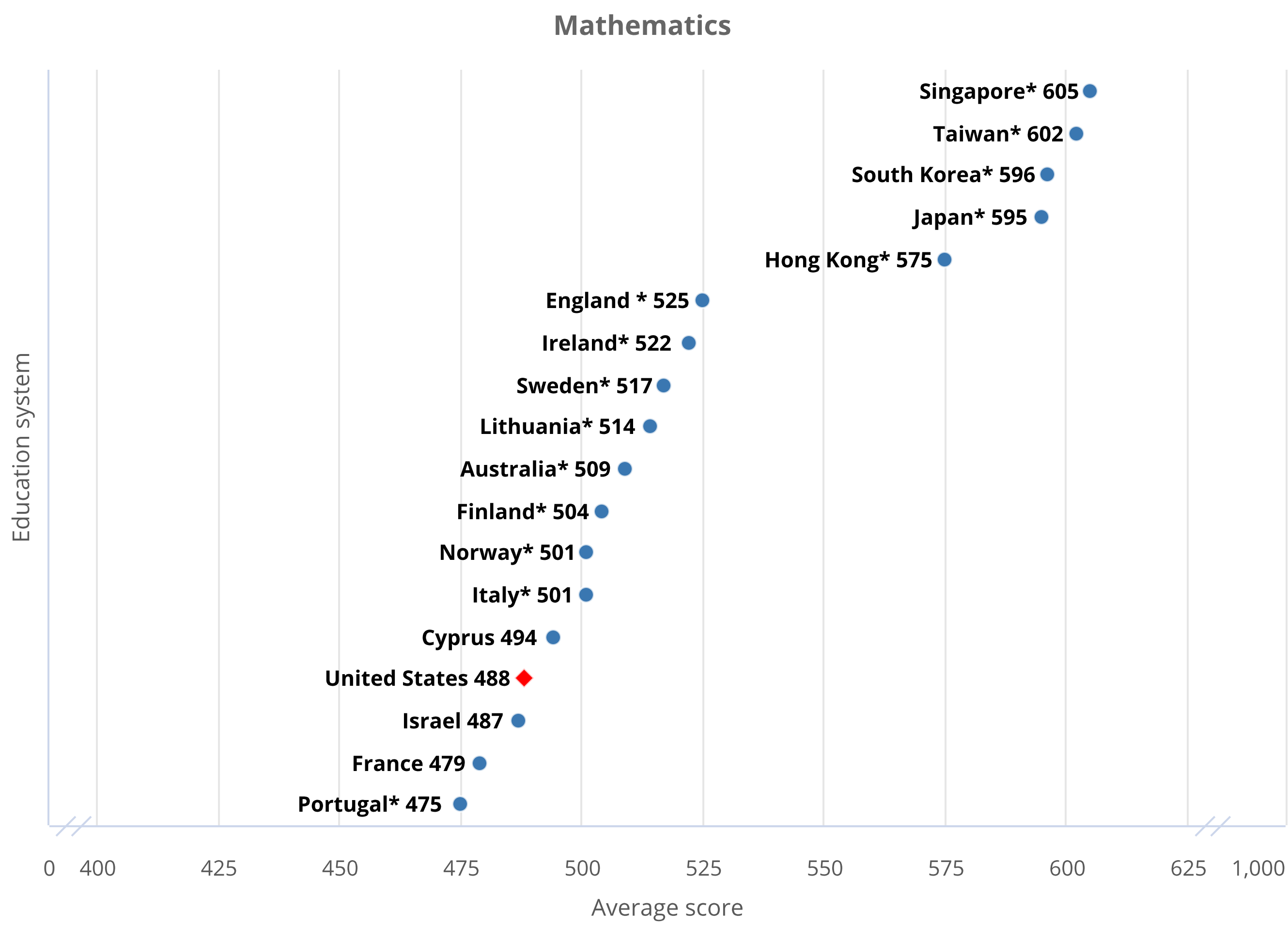
Male and female students account for different shares of S&E degree recipients, depending on the degree field and degree level (Table S3; Table S4). In 2024, across all degree levels—associate's, bachelor's, master's, and doctoral—male students earned a larger proportion of degrees than their female counterparts in engineering, computer and information sciences, mathematics and statistics, and physical sciences. In contrast, female students earned a majority of degrees in psychology, biological and biomedical sciences, agricultural sciences and natural resources, and social sciences at all degree levels. In terms of race and ethnicity, White students earned a lower proportion of S&E associate's degrees (40%) in 2024 than their share of the 20- to 34-year-old U.S. population (52%) (Table S5).[9] However, compared with their share of this population group, White students accounted for a similar share of S&E bachelor's degree recipients (53%), a proportionally slightly higher share (56%) of S&E master's degree recipients, and a much higher share of S&E doctoral degree (65%) recipients. Asian students earned larger proportions of S&E degrees at all levels than their share of the U.S. population ages 20–34 years. At the bachelor's degree level and higher, American Indian or Alaska Native, Black, and Hispanic students earned lower shares of S&E degrees than their respective shares of this population group.

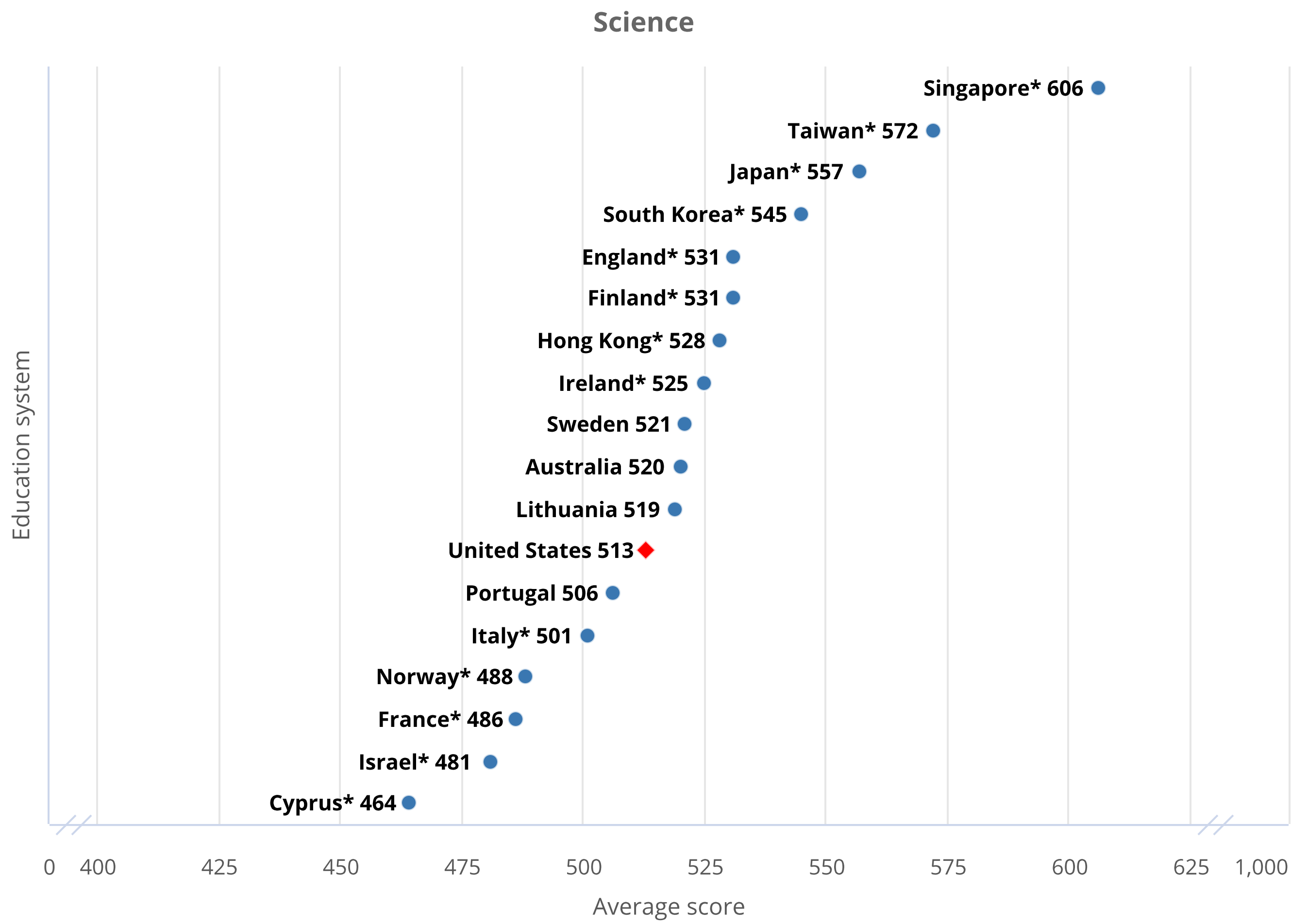
International Comparisons and Global Competitiveness

International Elementary and Secondary STEM Assessments

U.S. eighth graders perform better in science than they do in mathematics on international tests, according to the Trends in International Mathematics and Science Study (TIMSS) 2023 assessment. Among the advanced economies participating in the grade 8 TIMSS assessment, most (13 of 18) had statistically significantly higher average mathematics scores than the average U.S. score, and only one education system had a significantly lower average score (Figure 14).[10] U.S. students scored comparatively better in science, closer to the middle of advanced economies, where 8 of 18 education systems had statistically higher average scores.

Figure 14. Average scores of students in grade 8 on the TIMSS mathematics and science scales among participating advanced economies, by education system: 2023





* $p < 0.05$; significantly different from the U.S. estimate at the 0.05 level of statistical significance.

Note(s):
TIMSS is Trends in International Mathematics and Science Study. TIMSS participants include countries that are complete, independent political entities and non-national entities (e.g., Hong Kong). Advanced economies are based on the International Monetary Fund (IMF) designation of advanced economies (IMF 2022). Education systems are ordered by average mathematics score.

Source(s):
IEA, TIMSS, 2023.

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Similar to the NAEP, U.S. student mathematics performance on TIMSS has declined significantly since the COVID-19 pandemic. Average mathematics scores of eighth-grade U.S. students decreased by 27 points between the 2019 and 2023 TIMSS assessments. However, average U.S. student scores on the TIMSS science assessment did not change significantly from 2019 to 2023 (NSB 2026a: Figure TAL-40).

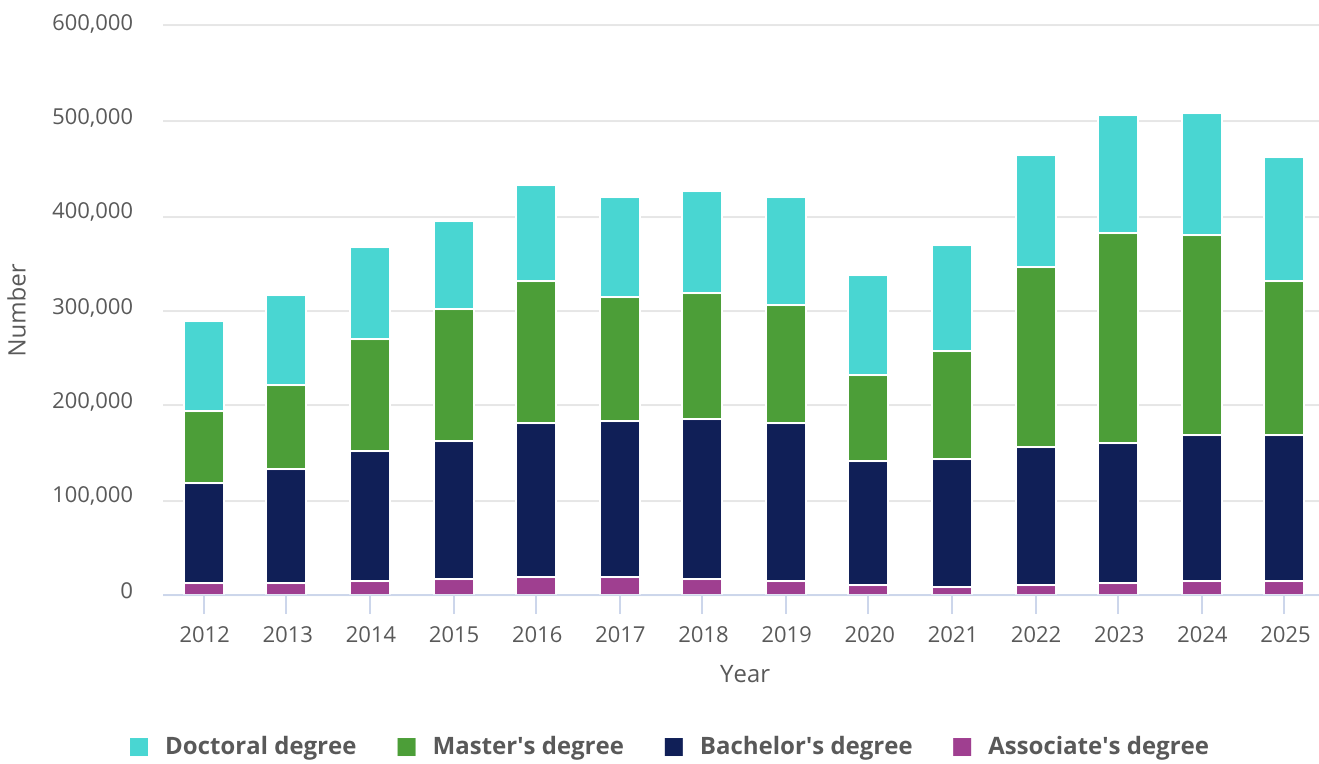
The International Computer and Information Literacy Study (ICILS) measures eighth-grade student performance in *computer and information literacy* (the ability to use computers effectively in everyday life at home, work, and school) and in *computational thinking* (the use of computers to solve problems; this includes such skills as programming) (NCES 2024b; NSB 2026a: Table STAL-23). In 2023, the average computer and information literacy score of U.S. students (482) was similar to the average across all education systems (476) participating in the ICILS. However, in computational thinking, U.S. students scored statistically lower (461) than the ICILS average (483). South Korea, Taiwan, and Czechia were among the highest-scoring countries and had significantly higher average student scores than the United States on both assessments.

International Student Enrollment in U.S. S&E Higher Education

International students play a significant role in U.S. higher education. U.S. services exports of education-related travel—expenditures of foreign students in the United States—were $49.3 billion in 2023 and $54.8 billion in 2024 (BEA 2025b).[11] According to internationally comparable definitions, the United States enrolled about 957,000 internationally mobile tertiary (postsecondary) students across all fields of study in 2023, more than any other country (OECD 2025a). Other popular destinations for internationally mobile students were the United Kingdom (748,000), Australia (467,000), Germany (423,000), and Canada (389,000). Between 2017 and 2023, the number of internationally mobile students in the United States decreased by 3%, while enrollment grew in Canada by 85%, in the United Kingdom by 72%, in Germany by 63%, and Australia by 23% during the same period (NSB 2026a: Table TAL-19).

Enrollment of international students traveling to the United States for postsecondary degrees in S&E fields totaled approximately 463,000 across all degree levels in fall 2025, a 9% decrease from its 2024 level.[12] Enrollment trends differ substantially depending on the degree level, with master's enrollment exhibiting the most variability (Figure 15). International S&E master's enrollment more than doubled from its COVID-era low in 2020 (89,000) to its peak in 2023 (224,000) before declining slightly in 2024 (211,000). Master's enrollment dropped by nearly a quarter (24%) from 2024 to 2025, driving the overall decline in total international S&E enrollment across all degree levels. In contrast, there was little change in enrollment at other degree levels from 2024 to 2025.

Figure 15. International S&E students on visas enrolled in U.S. higher education institutions, by level of enrollment: 2012–25



Note(s):
Data include active foreign national students on F-1 visas enrolled in person at U.S. higher education institutions. Individuals approved for optional practical training are excluded. Numbers are rounded to the nearest 10. Data reflect fall enrollment in a given year.

Source(s):
NCSES, special tabulations (2025) of the DHS, ICE, SEVIS database.

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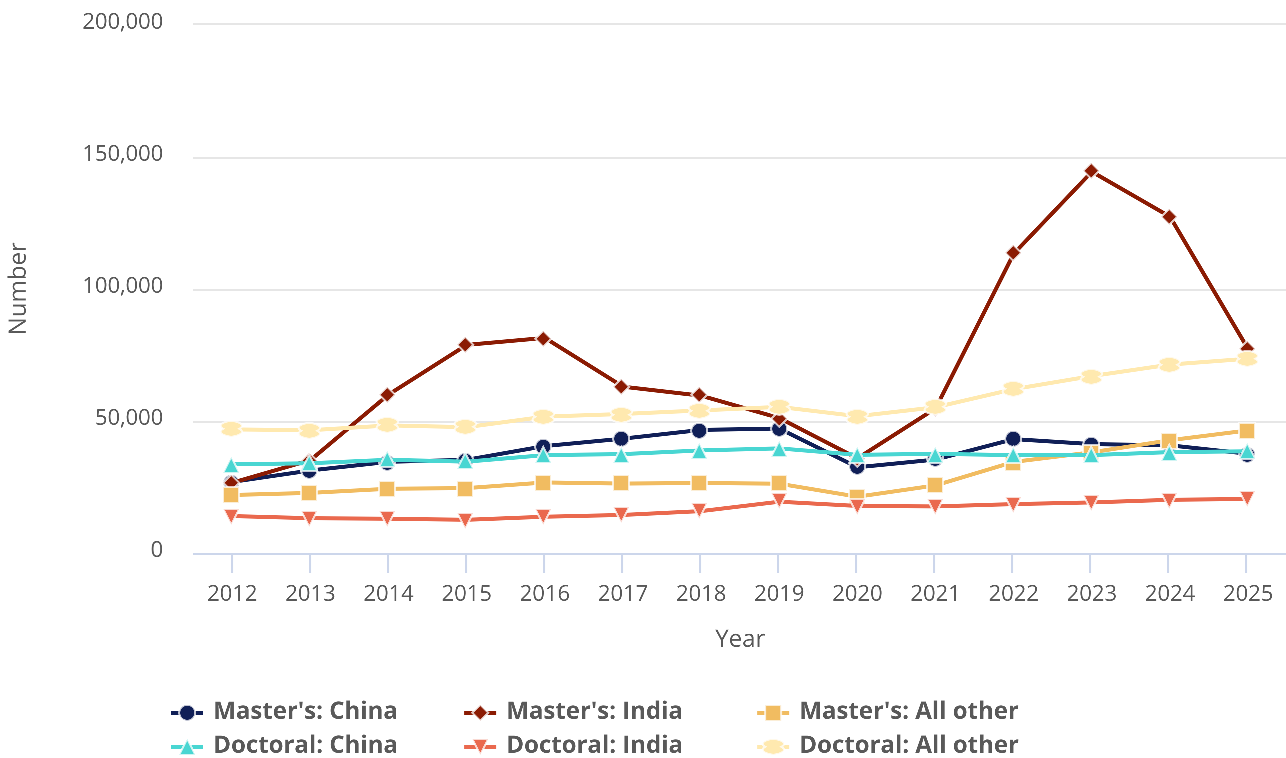
China and India are the most common countries of origin for international S&E graduate students on visas in the United States, and graduate students from these countries predominantly study computer and information sciences and engineering. In 2025, China and India combined accounted for 71% of international S&E master's enrollment and 44% of international S&E doctoral enrollment (Figure 16). China was the leading country of origin for international S&E doctoral students (about 38,000 in 2025), and India was by far the leading source for S&E master's students (77,000). The 24% decline in international S&E master's enrollment from 2024 to 2025 was driven by a 39% decrease in S&E master's students from India; enrollment of S&E master's students from China decreased by a comparatively small amount (8%) over this period, and enrollment from all other countries collectively increased by 9%.

Figure 16. International S&E graduate students on visas enrolled in U.S. higher education institutions, by level of enrollment and selected country of origin: 2012–25



Note(s):
Data include active foreign national students on F-1 visas enrolled in person at U.S. higher education institutions. Individuals approved for optional practical training are excluded. Numbers are rounded to the nearest 10. Data reflect fall enrollment in a given year.

Source(s):
NCSES, special tabulations (2025) of the DHS, ICE, SEVIS database.

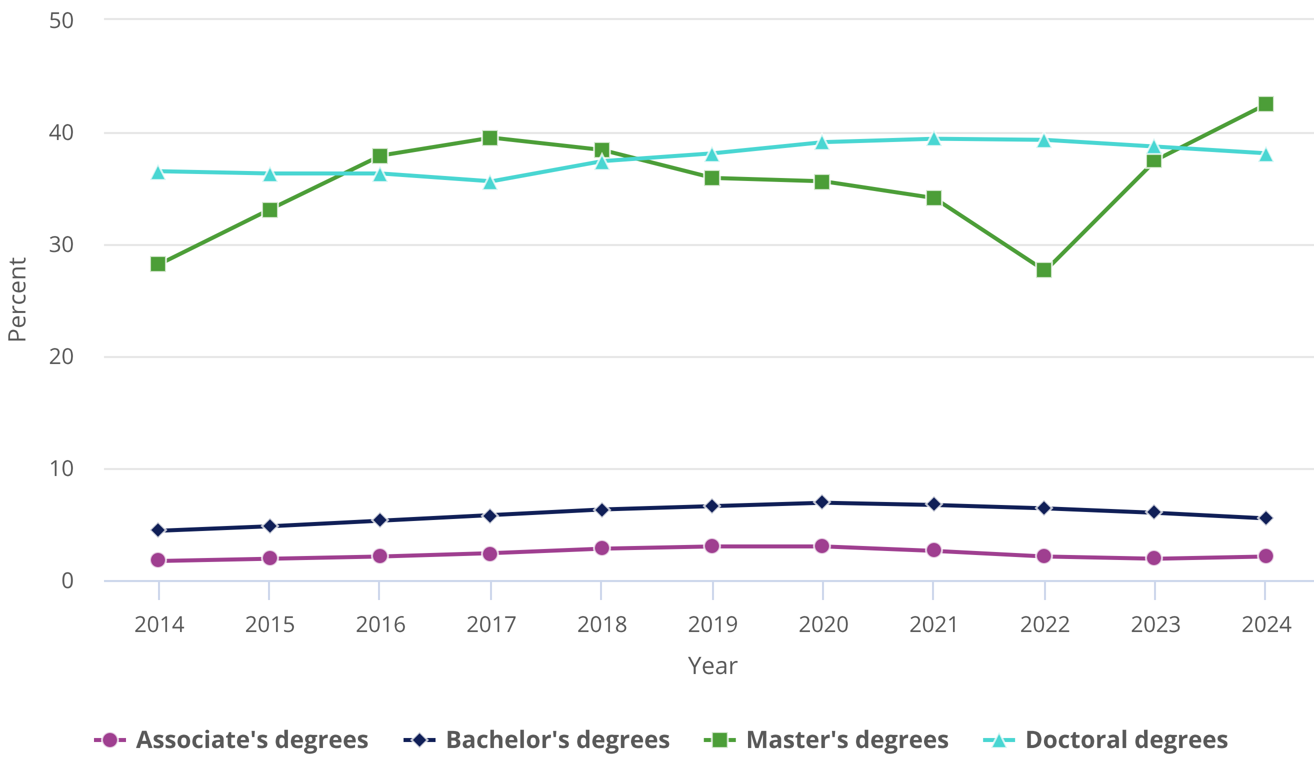
Indicators 2026: State of U.S. S&E

The majority of S&E master's students from India have been concentrated in computer and information sciences over the last decade, and enrollment in this field has been especially volatile in recent years. Enrollment of computer and information sciences master's students from India more than quadrupled from 2020 (about 21,000) to 2023 (94,000) and then dropped to less than half this peak by 2025 (43,000).[13]

U.S. S&E Degree Awards to International Students

International students earn low shares of S&E undergraduate degrees awarded by U.S. higher education institutions but much higher shares of S&E graduate degrees. In 2024, temporary visa holders earned 2% of S&E associate's degrees, 6% of S&E bachelor's degrees, 42% of S&E master's degrees, and 38% of S&E doctoral degrees (Figure 17). The share of S&E master's degrees awarded to temporary visa holders has been more variable than the relatively stable shares at other degree levels. Temporary visa holders' share of S&E master's degrees dropped sharply from 34% in 2021 to 28% in 2022 (2 years after the beginning of the COVID-19 pandemic) before climbing to 38% in 2023 and further to 42% in 2024.

Figure 17. Share of S&E degrees awarded to temporary visa holders, by degree level: 2014–24



Note(s):
Data at the associate's, bachelor's, and master's levels are based on institutions eligible to participate in Title IV federal financial aid programs. Doctoral degree data correspond to research doctorates as collected in the Survey of Earned Doctorates (SED). The SED data collection for field of study changed in 2021, which may affect the data comparability across years. At the doctoral level, percentages are based on the number of doctorate recipients who reported citizenship status.

Source(s):
NCSES, special tabulations (2026), of NCES, IPEDS Completions Survey, provisional release data, and NCSES, SED, 2024.

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The overall high presence of temporary visa holders among advanced S&E degree recipients varies greatly by S&E field (Table S6). In 2024, temporary visa holders earned 9% of doctoral degrees in psychology and 23% of those in health sciences but received more than half of doctoral degrees in computer and information sciences (61%), engineering (54%), and mathematics and statistics (52%). Temporary visa holders also accounted for more than half of the master's degrees awarded in each of these three fields.

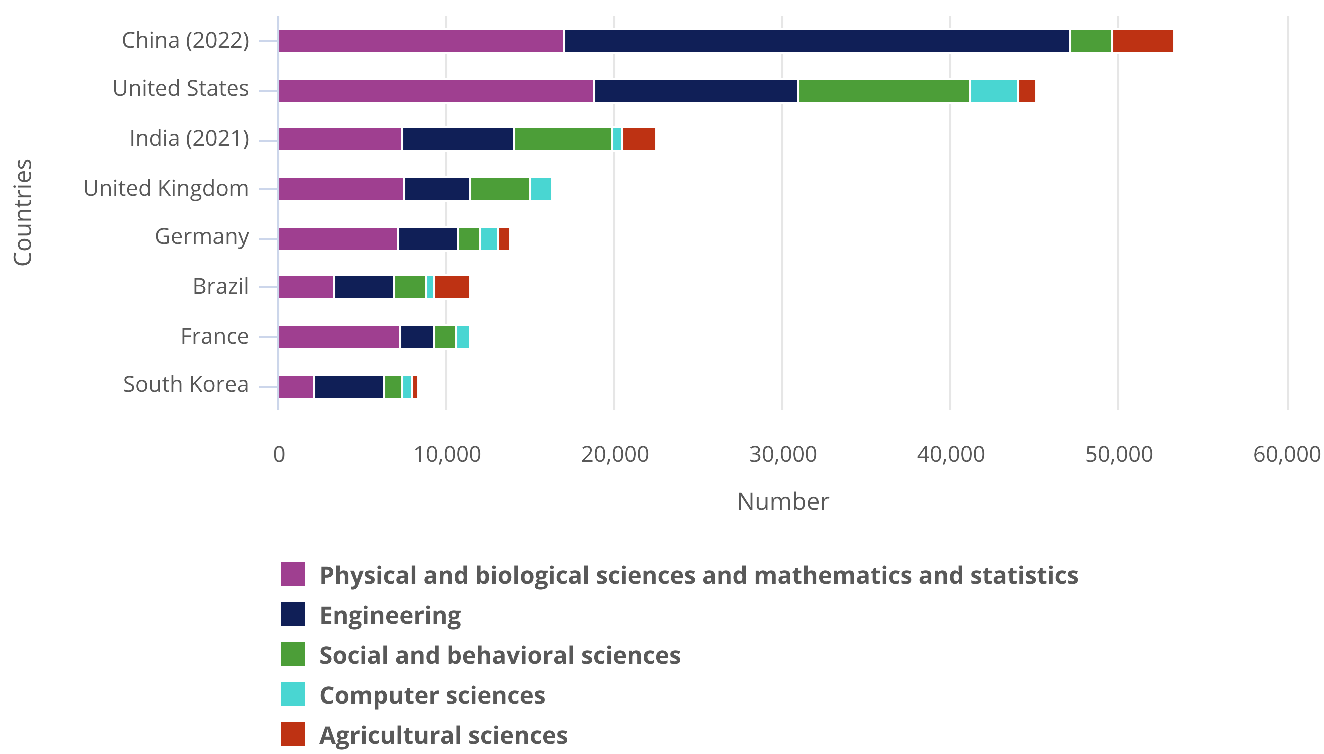
Stay Rates of U.S.-Trained Doctoral Scientists and Engineers

The share of S&E doctorate recipients on temporary visas intending to stay after graduation remained relatively stable at about three-fourths from 2012 to 2023 (NSB 2026a: Table TAL-17; Figure TAL-44). Longitudinal data confirm that most of these individuals do remain in the United States after earning their degrees. Among temporary visa holders earning S&E doctorates between 2017 and 2019, the short-term stay rate (approximately 5 years after graduation) was about 73% in 2023. Based on 2023 data, the long-term stay rate (approximately 10 years after graduating) for those earning degrees between 2012 and 2014 was about 68%. Short-term stay rates for S&E doctorate holders in biological, agricultural, and environmental life sciences and in health, computer and mathematical sciences, physical sciences, and engineering were roughly between 75% and 80%. Social sciences doctorate holders had a short-term stay rate of 49%. S&E doctorate holders from China, the most common country of origin, had similar short- and long-term stay rates (about 84%).[14] In contrast, S&E doctorate holders from India, the second most common country of origin, had higher short-term stay rates (86%) than long-term stay rates (75%).

International Comparisons of S&E Doctoral Degrees

China awarded approximately 53,000 S&E doctoral degrees in 2022 (the latest data available), more than any other country. The United States, which China surpassed in 2019, was the second-highest producer of S&E doctorates, with 45,000 degrees awarded in 2023 (Figure 7). According to 2021 data (the latest available), India awarded the next-largest number of S&E doctorates (23,000). In general, physical and biological sciences and mathematics and statistics collectively accounted for the largest share of S&E doctoral degrees among the top countries (Figure 18). A majority of the S&E doctorates awarded in China (56% in 2022) and South Korea (57% in 2023) were in computer sciences or engineering. In 2022, the last year that data are available for China, it awarded 30,000 doctorates in engineering, which includes computer sciences doctorates, compared with the 15,000 combined engineering and computer science doctorates awarded in the United States in 2023.

Figure 18. S&E doctoral degrees awarded, by field and selected country: 2023



Note(s):
Computer sciences is included under engineering for China. The latest year of data available is 2022 for China and 2021 for India. To facilitate international comparison, data for the United States are those reported to the Organisation for Economic Co-operation and Development, which vary from the National Center for Science and Engineering Statistics classification of fields presented in other sections of the report.

Source(s):
OECD, *Education at a Glance*; People's Republic of China, Ministry of Education data; Government of India, Ministry of Education, Department of Higher Education, *All India Survey on Higher Education*.

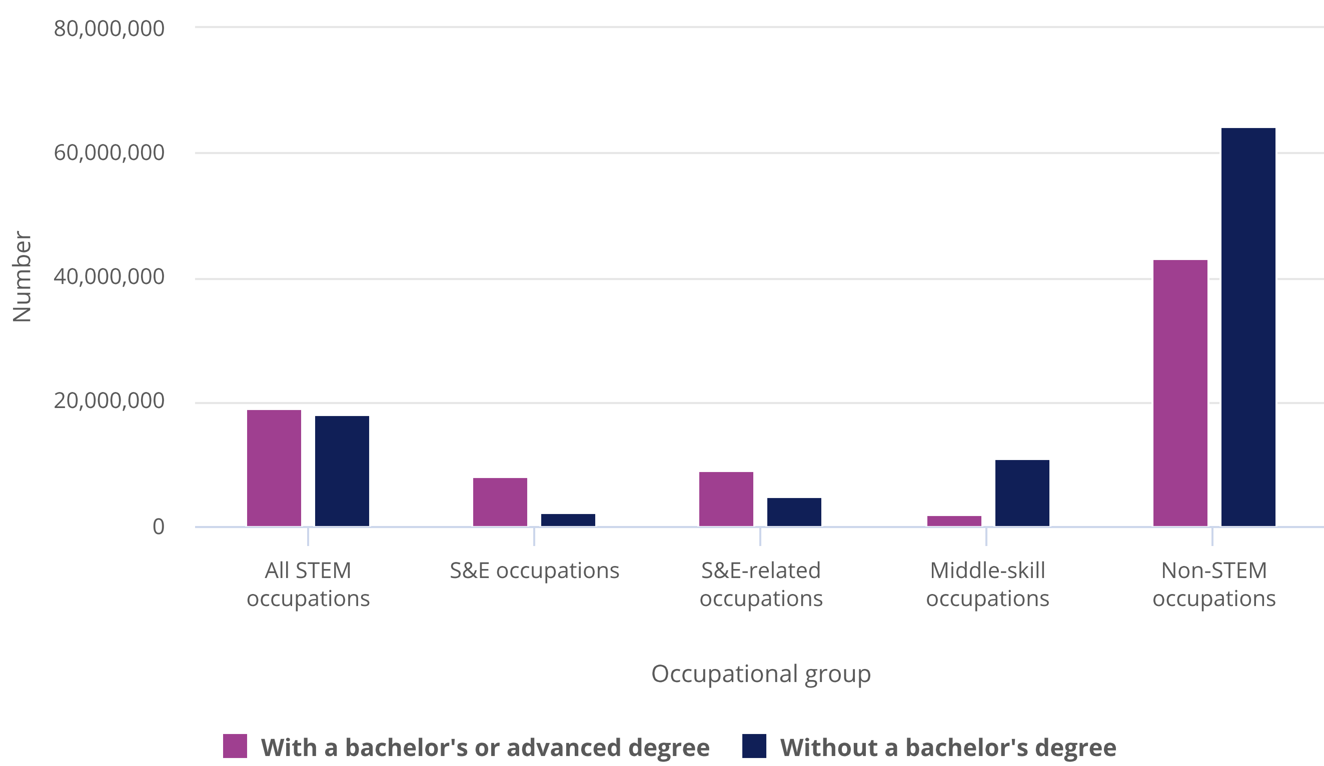
Indicators 2026: Talent

The STEM Workforce

Size and Composition of the U.S. STEM Workforce

The U.S. STEM workforce included 37 million workers in 2024, making up 26% of the total U.S. workforce (Figure 19).[15] The STEM workforce encompasses workers who use STEM skills in the primary function of their jobs, regardless of degree level. It includes S&E occupations and S&E-related occupations, as well as STEM middle-skill occupations that require STEM skills but typically do not require a bachelor's degree for entry (see the "Glossary" section for definitions of S&E, S&E-related, and STEM middle-skill occupations). Among STEM workers, 27% were employed in S&E occupations, 37% in S&E-related occupations, and 35% in STEM middle-skill occupations. In 2024, about half (49%) of the STEM workforce did not have a bachelor's or an advanced degree; of these workers, 62% were employed in STEM middle-skill occupations. A large majority of workers in S&E occupations had a bachelor's or an advanced degree (79%), higher than the shares of these degrees among workers in S&E-related (65%), STEM middle-skill (15%), and non-STEM (40%) occupations.

Figure 19. U.S. workforce, by occupational group and education level: 2024



Note(s):
STEM is science, technology, engineering, and mathematics. Data include the employed, civilian, noninstitutionalized population ages 25–75 not currently in primary or secondary school. Missing occupations and those who have not worked in the past 5 years or have never worked are not included in the data. STEM includes S&E, S&E-related, and STEM middle-skill occupations.

Source(s):
Census Bureau, ACS, 2024.

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Growth of the STEM Workforce

The STEM workforce grew from 29 million in 2014 to 37 million workers in 2024 (Table S7). Over this period, the STEM workforce increased at a faster rate than the non-STEM workforce; as a result, the STEM workforce's share of the total U.S. workforce increased from 23% in 2014 to 26% in 2024. Within STEM occupations, the number of workers employed in S&E occupations increased most (65%) during this period, followed by S&E-related occupations (26%) and STEM middle-skill occupations (5%). According to employment projections from BLS, general employment is projected to grow by 5.2 million jobs (3%) between 2024 and 2034, with employment in STEM occupations projected to grow by 6% (Table S8).[16] Employment in S&E occupations is expected to grow by 9% during this period, the fastest among STEM occupations, followed by S&E-related (8%) and STEM middle-skill occupations (3%).

The STEM Labor Market: Unemployment and Earnings

Labor market conditions are generally favorable for workers in STEM occupations (S&E, S&E-related, or STEM middle-skill occupations) compared with those in non-STEM occupations. In 2024, STEM workers overall had an unemployment rate of 2.4%, compared with 3.5% for non-STEM workers; the unemployment rate was lower for those in STEM occupations than for those in non-STEM occupations each year from 2014 to 2024 (Table S9). Within STEM occupation groups, S&E and S&E-related workers consistently had lower unemployment rates than workers in STEM middle-skill occupations over this period.

Full-time, year-round workers in STEM occupations had higher median annual earnings ($80,000) than workers in non-STEM occupations ($60,000) in 2024 (Table 4). Among STEM workers, those in STEM middle-skill occupations had the lowest earnings ($60,000). Workers in S&E occupations had the highest overall median earnings ($104,000) and, for the most part, had the highest earnings among all STEM occupational groups at each level of educational attainment.[17] For all occupational groups, median earnings generally increased with each degree level.[18]

Table 4. Median earnings of full-time, year-round workers, by educational attainment and occupational group: 2024

(Dollars)

Education level	All occupations	STEM occupations	S&E occupations	S&E-related occupations	Middle-skill occupations	Non-STEM occupations
All education levels	65,000	80,000	104,000	85,000	60,000	60,000
Without a bachelor's degree	50,000	60,000	80,000	64,000	60,000	48,000
Up to a high school diploma or an equivalent degree	45,000	55,000	77,000	55,000	54,000	43,400
Some college	55,000	65,000	82,000	60,000	63,600	51,000
Associate's degree	60,000	70,000	84,000	70,000	69,000	52,000
With a bachelor's or an advanced degree	90,000	100,000	110,000	100,000	72,000	80,000
Bachelor's degree	80,000	93,000	104,000	88,000	70,000	75,000
Master's or professional degree	100,000	120,000	120,000	120,000	80,000	90,000
Doctoral degree	119,100	130,000	131,000	125,000	92,000	103,000

Note(s):
STEM is science, technology, engineering, and mathematics. Data include the civilian, noninstitutionalized population ages 25–75 not currently in primary or secondary school. Missing occupations and those who have not worked in the past 5 years or have never worked are not included in the workforce data. STEM includes S&E, S&E-related, and middle-skill occupations.

Source(s):
Census Bureau, ACS, 2024.

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Geographic Patterns of the STEM Workforce

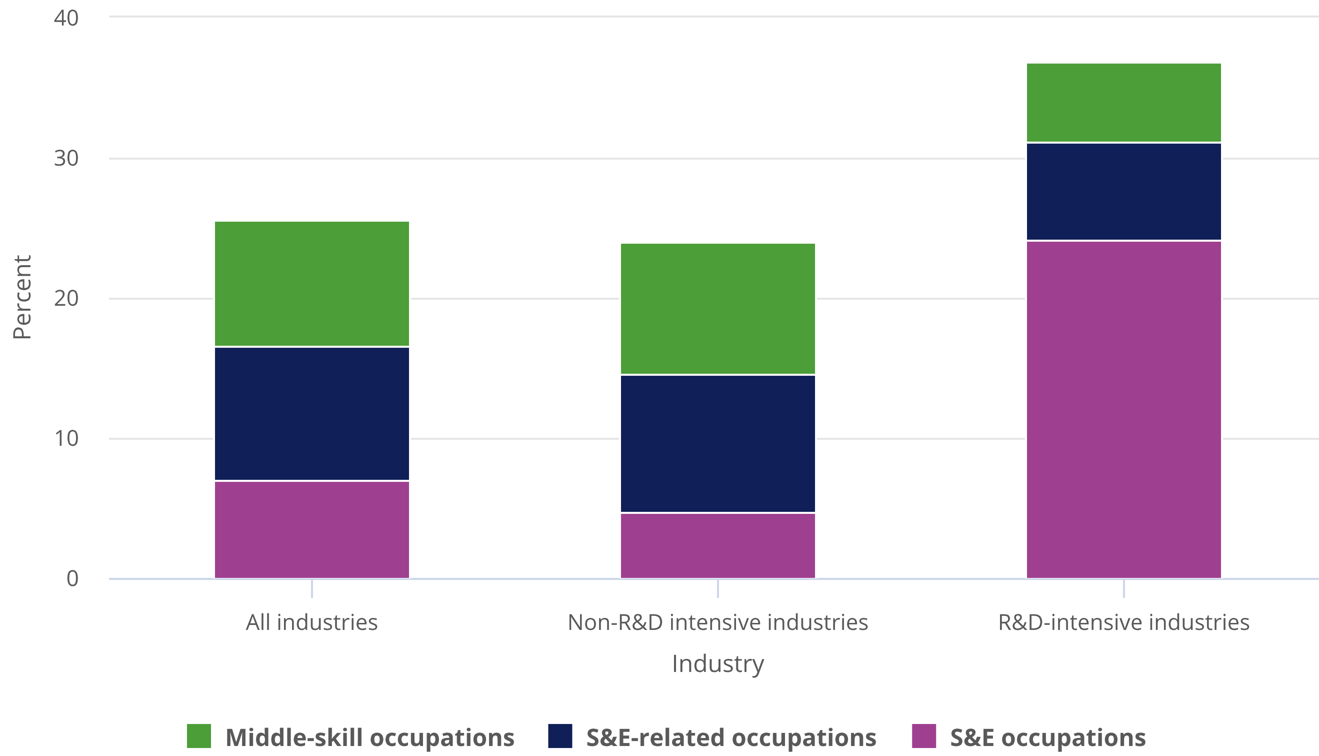
In 2024, the three states with the largest working-age populations—California, Texas, and Florida—were also the states with the largest numbers of STEM workers (Table S10). Together, these three states made up about a quarter (26%) of the nation's STEM workforce. Among the 50 states and the District of Columbia, Vermont and Washington had the highest shares of their workforce in STEM occupations (29% each),[19] and Nevada (21%) had the lowest share. West Virginia had the largest share of STEM workers without a bachelor's degree (65%).[20] The District of Columbia had the highest share of STEM workers with a bachelor's or an advanced degree (86%), followed by Massachusetts (63%). In 2023, equal proportions of rural and urban workers were employed in STEM occupations (25%), although the distribution of STEM occupational groups differed. STEM middle-skill occupations accounted for 13% of all workers in rural areas and for 9% in urban areas. S&E occupations were less common in rural areas: whereas 3% of rural workers were in S&E occupations, 7% of urban workers were in S&E occupations.

STEM Workers in the Economy and R&D-Intensive Industries

All major industries of the U.S. economy employ STEM workers, but they do so at differing rates. In 2024, the health care and social assistance sector (47%) and the utilities sector (45%) had the highest shares of workers in STEM occupations among major industrial sectors (Table S11). Within the STEM workforce, the professional, scientific, and technical services sector (26%) and the information sector (17%) employed the highest shares of workers in S&E occupations. The health care and social assistance sector, which accounted for over a quarter (27%) of the total STEM workforce, employed the highest share of S&E-related workers, accounting for 43% of its workforce. The construction sector (36%) and the agriculture, forestry, fishing, and hunting sector (35%) employed the highest share of workers in STEM middle-skill occupations.

R&D-intensive industries are an important component of the nation's innovation system (see the "Glossary" section for the definition of R&D intensity and Table S12 for a list of industries with higher than average R&D intensity). In 2024, 12% of the total workforce and 17% of the STEM workforce were employed in R&D-intensive industries (Table S13). The percentage of STEM workers employed in R&D-intensive industries varied by occupational group: 40% of workers in S&E occupations were employed in R&D-intensive industries, compared with 8% of workers in S&E-related occupations and 7% of workers in STEM middle-skill occupations. STEM workers are integral to R&D-intensive industries, where they accounted for 37% of employment in R&D-intensive industries in 2024, compared with 26% of all industries (Figure 20). Workers in S&E occupations have a particularly pronounced role in R&D-intensive industries, where they account for 24% of total employment in R&D-intensive industries, nearly five times their share of non-R&D intensive industry employment (5%).

Figure 20. STEM occupational group share of total employment, by R&D-intensive industry classification: 2024



Note(s):
STEM is science, technology, engineering, and mathematics. STEM employment includes workers in S&E, S&E-related, and middle-skill occupations. The classification of R&D-intensive industries is based on 2023 data from the National Center for Science and Engineering Statistics Business Enterprise Research and Development (BERD) Survey, which uses the 2017 version of the North American Industry Classification System (NAICS). The resulting 2017 NAICS industry codes were crosswalked to the NAICS-based codes used in the 2024 American Community Survey (ACS), which are based on the 2022 version of NAICS. In the 2022 version of NAICS the 2017 NAICS code 519130 was combined with multiple existing industries and recoded. Some of these industries are not classified as R&D intensive using 2023 BERD Survey data based on 2017 NAICS codes. These industries remained excluded from the identified R&D-intensive classification. As a result, use caution when comparing R&D intensity estimates across NAICS vintages.

Source(s):
Census Bureau, ACS, 2024.

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Demographics of the STEM Workforce

Participation in the STEM workforce varies by sex and by race and ethnicity. The STEM workforce overall is predominantly male: of the 37 million STEM workers in 2024, 64% were men (Table S14). Male workers accounted for about three-fourths (72%) of those employed in S&E occupations and the vast majority of those in STEM middle-skill occupations (89%), whereas most individuals employed in S&E-related occupations were female workers (65%). In 2024, 39% of all Asian workers were employed in STEM occupations, the highest share of any racial or ethnic group, followed by White workers at 27%. Between 20% and 22% of Black or African American, Hispanic or Latino, American Indian or Alaska Native, and Native Hawaiian or Other Pacific Islander workers were employed in STEM occupations.

Veterans in the STEM Workforce

A higher share of veterans than nonveterans were employed in the domestic STEM workforce. In 2024, the overall domestic workforce employed a lower share of military veterans (59%) than nonveterans (69%) among the civilian, noninstitutionalized, population ages 25–75. However, among those employed, a higher proportion of military veterans (33%) than nonveterans (25%) were employed in STEM occupations (Table 5). Among occupational groups, higher shares of veterans were employed in STEM middle-skill occupations (15%) and S&E occupations (10%), compared with their nonveteran counterparts (9% and 7%, respectively). Majorities of employed veterans (63%) and nonveterans (57%) in the workforce did not have a bachelor's degree, but among workers without a bachelor's degree, a higher proportion of veterans (32%) than nonveterans (21%) were employed in STEM occupations, particularly in STEM middle-skill occupations (20% and 13%, respectively).

Table 5. Select characteristics of veterans and nonveterans: 2024

(Number, percent, and years)

Select characteristics	Veteran	Nonveteran
Employment		
Number	11,286,201	198,171,439
Number of workers	6,623,800	137,480,448
Percent working in STEM occupations	32.6	25.2
Percent working in S&E occupations	9.7	6.9
Percent working in S&E-related occupations	8.4	9.6
Percent working in STEM middle-skill occupations	14.5	8.7
Educational attainment among the employed (%)		
Without a bachelor's degree	63.0	56.8
STEM occupations	32.0	21.3
S&E occupations	5.9	2.4
S&E-related occupations	6.1	5.8
STEM middle-skill occupations	20.0	13.1
With a bachelor's degree or an advanced degree	37.0	43.2
STEM occupations	33.7	30.3
S&E occupations	16.1	12.7
S&E-related occupations	12.4	14.6
STEM middle-skill occupations	5.2	3.0
Median age of the employed (years)		
All occupations	51	44
STEM occupations	50	42
S&E occupations	49	40
S&E-related occupations	50	42
STEM middle-skill occupations	50	44

Note(s):
STEM is science, technology, engineering, and mathematics. Data include the civilian, noninstitutionalized population ages 25–75 and exclude those with military occupations, those missing occupation data, and those currently enrolled in primary or secondary school. Workforce estimates include those who are currently employed.

Source(s):
Census Bureau, ACS, 2024, 1-Year Public Use Files.

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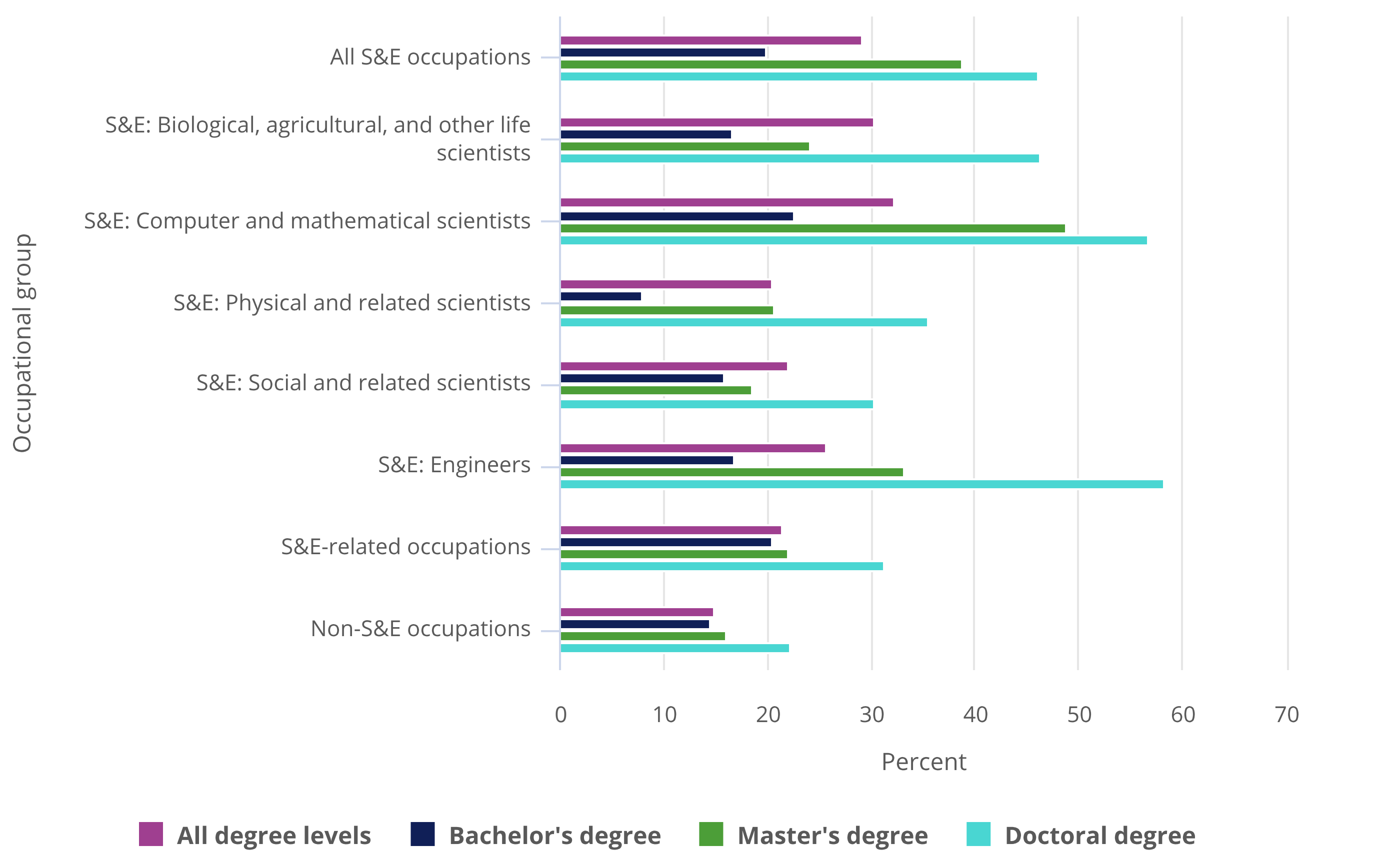
Foreign-Born STEM Workers

Foreign-born workers—individuals born outside of the United States and its territories, regardless of citizenship status—are more highly represented in the STEM workforce than in the general workforce. In 2024 foreign-born individuals accounted for 21% (30 million) of the 144 million workers in the United States, and 22% (8 million) of the 37 million STEM workers (Table S15). Within the STEM workforce, the foreign-born share of workers was 19% in S&E-related occupations, 22% in STEM middle-skill occupations, and 28% in S&E occupations. Mexico was the largest country of origin for foreign-born workers in STEM occupations overall (1.4 million), although only 10% of these workers were in S&E occupations. India and China were the top countries of origin for workers in S&E occupations, where they accounted for 29% and 12%, respectively, of all foreign-born workers in S&E occupations.

Foreign-born individuals make up an especially large share of U.S. S&E workers with higher levels of educational attainment. In 2023, they accounted for 20% of S&E workers with a bachelor's degree as their highest degree, 39% with a master's degree, and 46% with a doctoral degree (Figure 21). The majority of doctoral-level computer and mathematical scientists (57%) and engineers (58%) working in the United States in 2023 were born outside the country. About half (49%) of computer and mathematical scientists with master's degrees were foreign born.

Figure 21. Foreign-born share of workers with a bachelor's degree or higher, by highest degree level and occupational group: 2023



Note(s):
Data represent the civilian, employed, nonistitutionalized population ages 25–75. Percentages are of the indicated combination of occupation and educational attainment.

Source(s):
NCSES, NSCG, Public Use Files, 2023.

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Foreign-born individuals collectively account for 29% of the nation's college-educated S&E workforce, but a comparatively small share of individuals working in S&E occupations are non-U.S. citizens on temporary visas (Figure 21; Table S16). In 2023, temporary residents accounted for 3% of all S&E workers at the bachelor's level, 11% at the master's level, and 10% at the doctorate level (Table S16). Combined, over three-quarters of foreign-born S&E workers in the United States in 2023 were naturalized citizens (55%) or permanent residents (21%), temporary visa holders accounted for 24%. Additionally, across degree levels (bachelor's, master's, and doctoral) and broad S&E occupations, native-born and naturalized citizens combined account for most S&E workers. In 2023, 71% of computer and mathematical scientists and 73% of engineers at the doctorate level were either native-born or naturalized U.S. citizens.

Discovery: R&D Activity and Research Publications

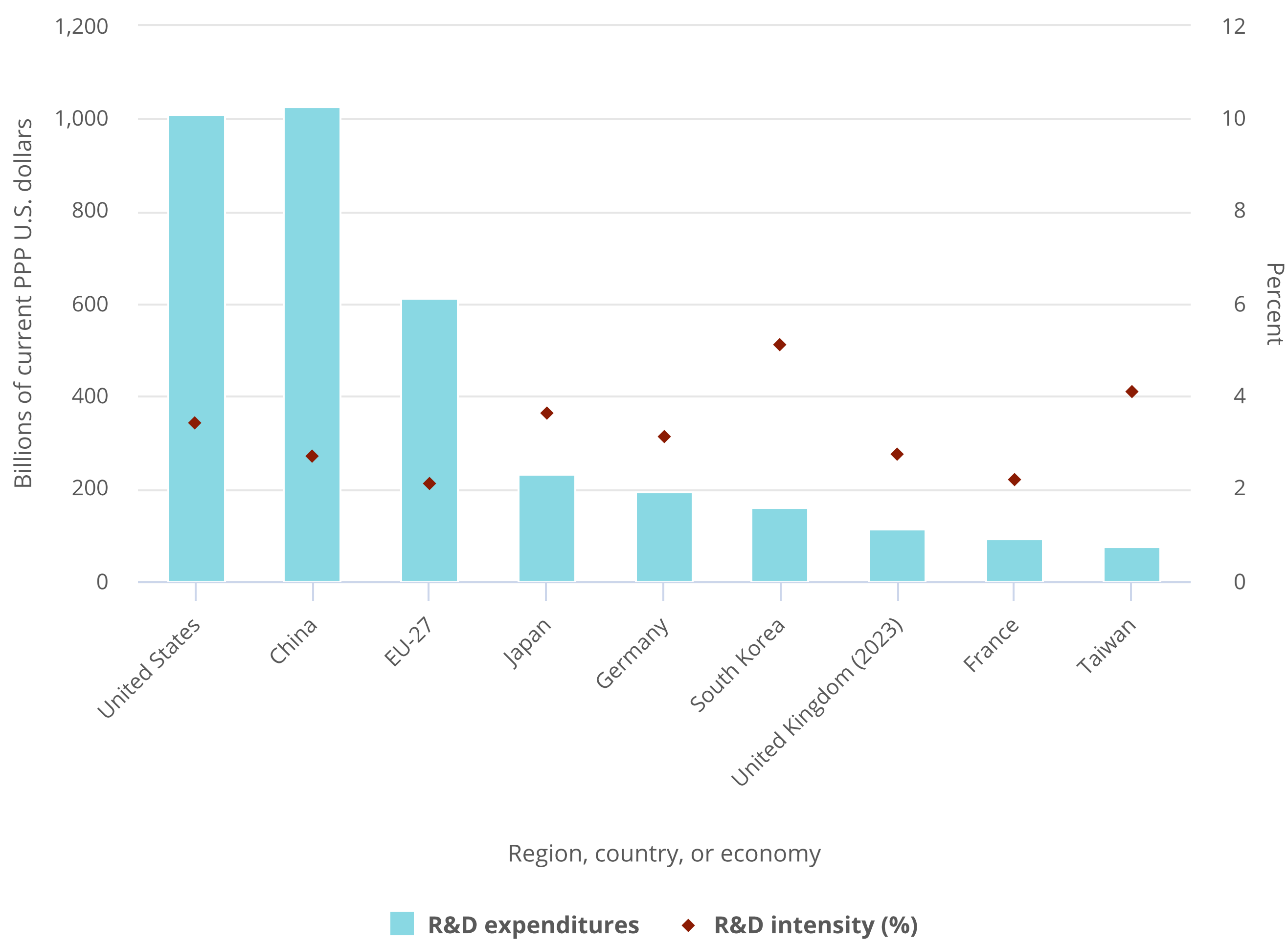
R&D and one of its early outputs, research publications, are important indicators of the performance of the U.S. S&E ecosystem in a global context.[21] R&D contributes to economic output and productivity growth and supports a range of national policy priorities. Research publications, in the form of peer-reviewed journal articles and conference proceedings, are important media for sharing scientific discoveries and contribute to a corpus of scientific knowledge that provides a foundation for future research and innovation.

Global R&D

Total R&D Expenditures

Worldwide R&D expenditures totaled $3.48 trillion in 2024, based on available data from OECD member countries and select non-OECD economies. Adjusted for international comparability, China had $1.028 trillion in gross domestic expenditures on R&D in 2024, followed by the United States with $1.009 trillion in R&D expenditures (Figure 22). China (30%) and the United States (29%) together accounted for over half of global R&D performance. Other top R&D-performing countries include Japan ($234 billion), Germany ($193 billion), and South Korea ($162 billion). As a group, the EU-27 collectively had $612 billion in total R&D expenditures in 2024, placing it third behind the United States and China.

Figure 22. R&D expenditures and R&D intensities, by selected region, country, or economy: 2024 or most recent year



Note(s):
EU-27 is European Union. PPP is purchasing power parity. R&D expenditures is measured as gross domestic expenditures on R&D; R&D intensity is gross domestic expenditures on R&D divided by gross domestic product. Some data are preliminary and may be revised later.

Source(s):
NCSES, National Patterns of R&D Resources (2023–24 edition); OECD, MSTI, March 2026.

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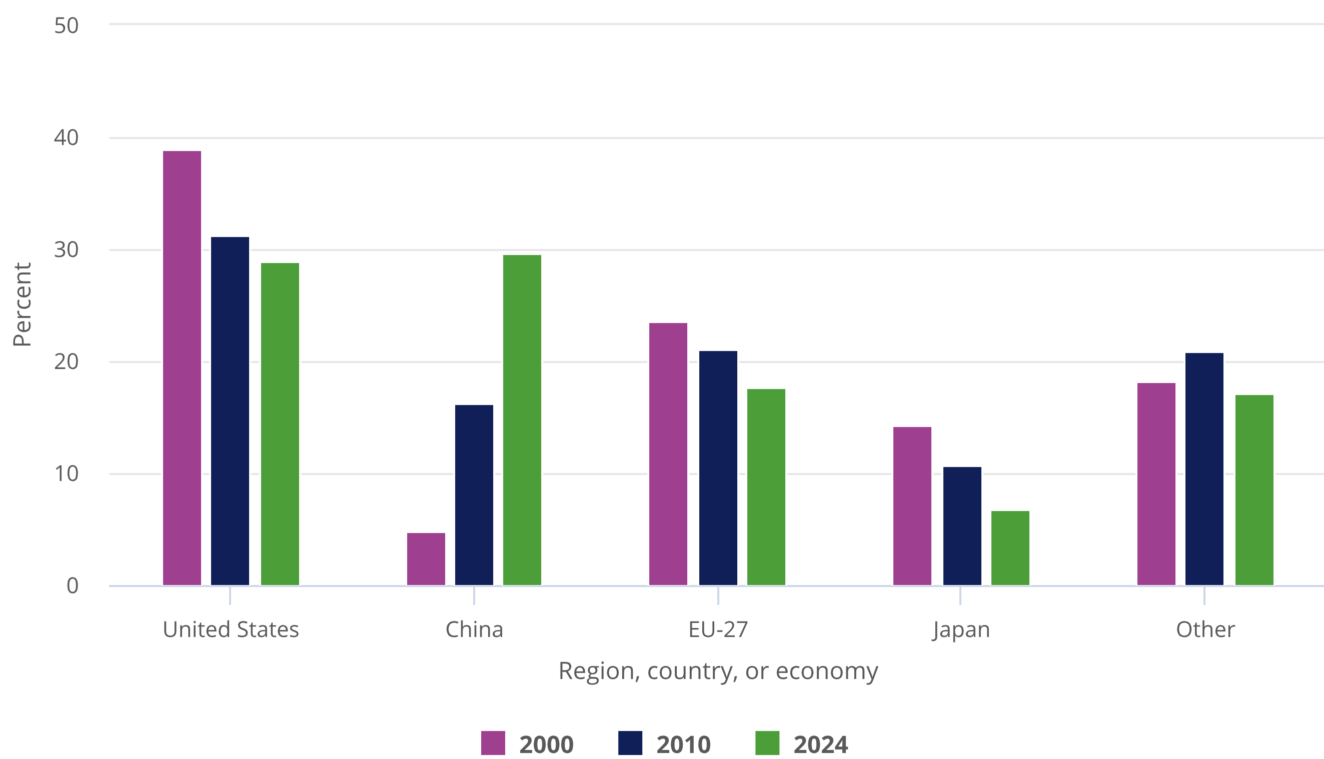
The United States has long been a leading performer of R&D, but its share of global R&D expenditures has declined over the last two decades (Figure 23). The U.S. share of global R&D decreased from 39% in 2000 to 31% in 2010, with little change to 29% in 2024. China's share of global R&D has increased significantly as global R&D shares of the EU-27 and Japan have correspondingly decreased. China accounted for 5% of global R&D in 2000, rising to 30% by 2024, surpassing the R&D shares of the EU-27 (18%) and Japan (7%).

Figure 23. Share of global R&D expenditures, by selected region, country, or economy: 2000, 2010, and 2024



Note(s):
EU-27 is European Union. Some data are preliminary and may be revised later. U.S. data have been adjusted for international comparable measurements of gross domestic expenditures on R&D.

Source(s):
NCSES, National Patterns of R&D Resources (2023–24 edition); OECD, MSTI, April 2026.

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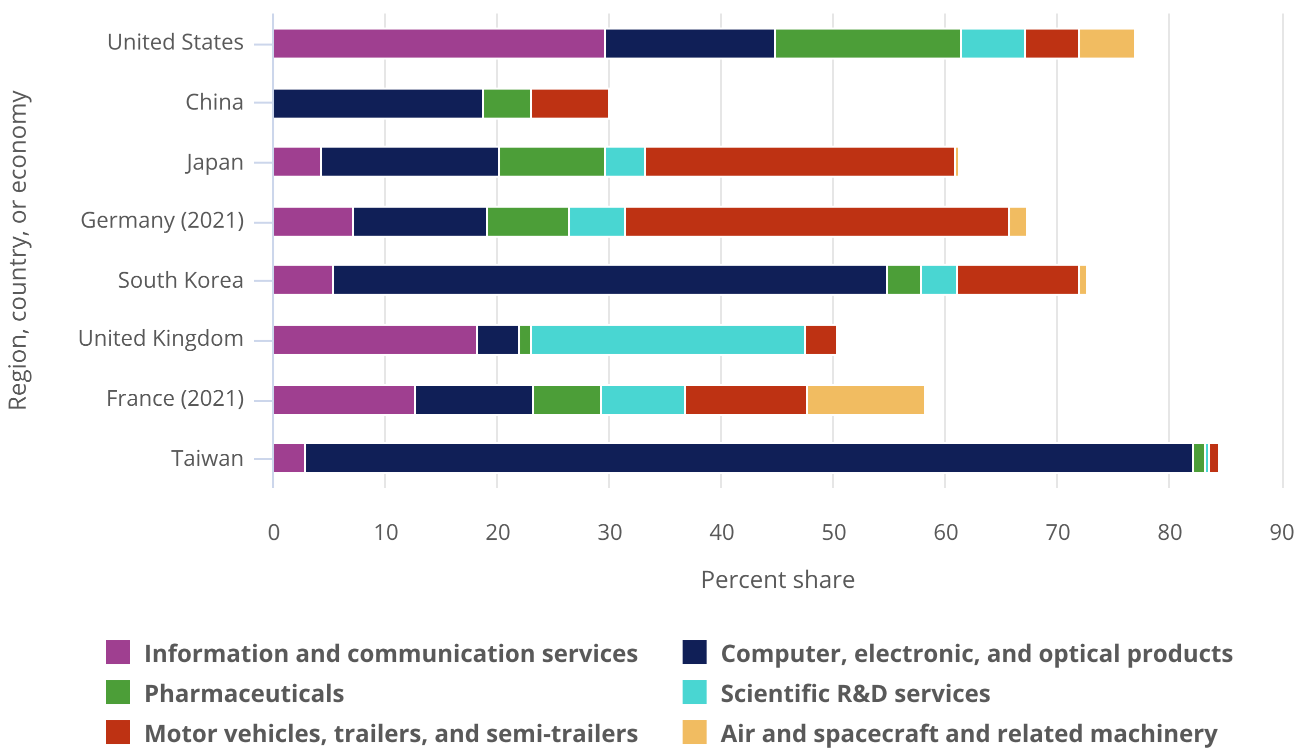
R&D Intensity

The major R&D-performing economies vary in their R&D-to-GDP ratios, known as *R&D intensities* (see the "Glossary" section for definition). The United States had an R&D intensity of 3.4% in 2024 (Figure 22). China's R&D intensity (2.7%) is higher than the average across the EU-27 (2.1%) but lower than the R&D intensities of other individual major R&D performers such as Japan (3.6%) and Germany (3.1%). Several smaller economies with lower total R&D expenditures had higher R&D intensities, most notably South Korea (5.1%) and Taiwan (4.1%).

International Business R&D

R&D performance and funding is distributed among the business, government, higher education, and private nonprofit sectors (see the "Glossary" section for definitions). The business sector is the largest performer and funder of R&D across many of the largest R&D-performing economies, but business R&D patterns vary considerably by industry. IT-related industries—information and communication services as well as computer, electronic, and optical products manufacturing—combined accounted for large shares of business R&D expenditures in several advanced economies in 2022 (82% in Taiwan, 55% in South Korea, and 45% in the United States) (Figure 24). In 2022, information and communication services had the largest share of business R&D expenditures in the United States (30%) and France (13%, as of 2021) and had the second-largest share in the United Kingdom (18%). Computer, electronic, and optical products manufacturing (including semiconductors) accounted for the largest share of business R&D expenditures in Taiwan (79%) and South Korea (49%). However, in absolute terms, China had the highest level of business R&D expenditures in this industry ($117 billion). The United States had a greater share of its business R&D in pharmaceuticals (17%) than other top R&D performers. Business R&D was much more concentrated in the motor vehicle industry in Germany (34% in 2021) and Japan (28% in 2022) than in other advanced economies.

Figure 24. Business R&D expenditures, by selected industry and selected region, country, or economy: 2022



Note(s):
Foreign currencies are converted by the Organisation for Economic Co-operation and Development (OECD) to U.S. dollars using purchasing power parity. U.S. R&D data have been adjusted for international comparability. Some data are preliminary and may be updated or revised later by OECD. Data for China were not available on information and communication services, scientific R&D services, and air and spacecraft and related machinery. Data for the United Kingdom and Taiwan were not available on air and spacecraft and related machinery.

Source(s):
OECD, ANBERD database, November 2024, accessed 13 November 2025.

Indicators 2026: Discovery

U.S. R&D Performance and Funding

Performers and Funders of R&D

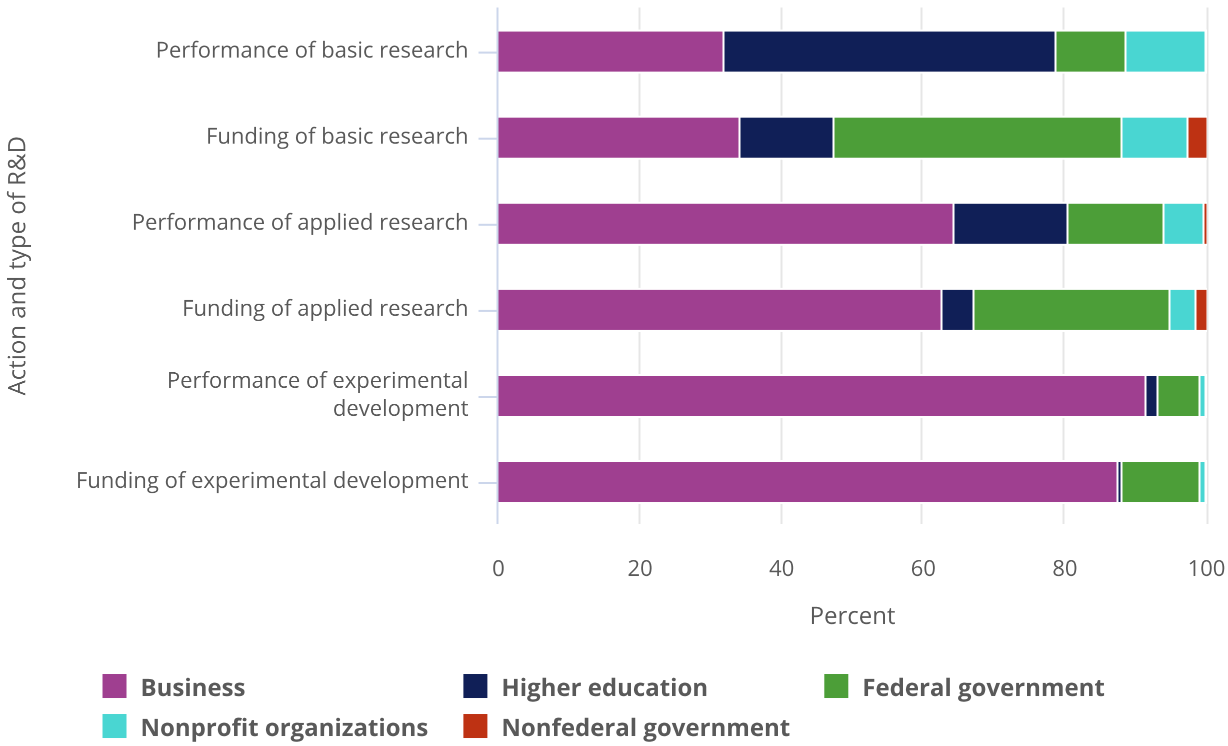
The U.S. R&D system consists of the activities of a diverse group of R&D performers and R&D funders, including the federal government, state and local governments, higher education institutions, businesses, and private nonprofit organizations. The United States performed $937 billion of R&D in 2023 and an estimated $993 billion in 2024 (NCSES 2026b).[22] National Patterns of R&D Resources 2024 data for the United States are estimates and are likely to be revised.[23] The business sector is by far the largest performer and funder of R&D, performing 77% ($769 billion) and funding 75% ($743 billion) of the nation's total R&D in 2024. Higher education institutions performed 11% of U.S. total R&D, followed by the federal government (8%), nonprofit organizations (3%), and nonfederal governments (less than 1%).

The composition of R&D funding in the United States differs from that of R&D performance. Virtually all (99%) of the business sector's R&D funding supported R&D performance within the business sector in 2024. In contrast, the federal government supported R&D performed across the U.S. R&D system, leading the federal government to account for a higher share of R&D funding (19%) than R&D performance (8%) in 2024. In addition to supporting intramural research at federal laboratories, the federal government funded 52% of R&D performed by higher education institutions, 42% by nonfederal governments, 40% by nonprofit organizations, and 5% by businesses. The higher education sector self-funds a portion (28%) of its own R&D performance, but its reliance on external sources of funding, particularly the federal government, means that it funds a substantially lower portion of U.S. total R&D (3%) than it performs (11%).

Type of R&D

Components of the nation's R&D system fulfill different roles in the performance and funding of basic research, applied research, and experimental development (Figure 25). Higher education institutions perform the greatest share (48%) of basic research, much of which is federally funded. The federal government performs comparatively low shares of all types of R&D but is the largest funder of basic research (40%) and the second-largest funder of applied research (26%). The business sector's share of basic research funding has expanded over time, reaching 34% by 2024 (NCSES *National Patterns 2023–24*: Table 7). Businesses account for an increasing share of U.S. R&D performance as the R&D process moves closer to market application: in 2024, business performed 32% of basic research, 6% of applied research, and 91% of experimental development. In contrast, nonprofit organizations concentrate on the performance and funding of basic research.

Figure 25. U.S. R&D expenditures, by type of R&D and performer or funder: 2024



Note(s):
Some data are preliminary and may be revised later.

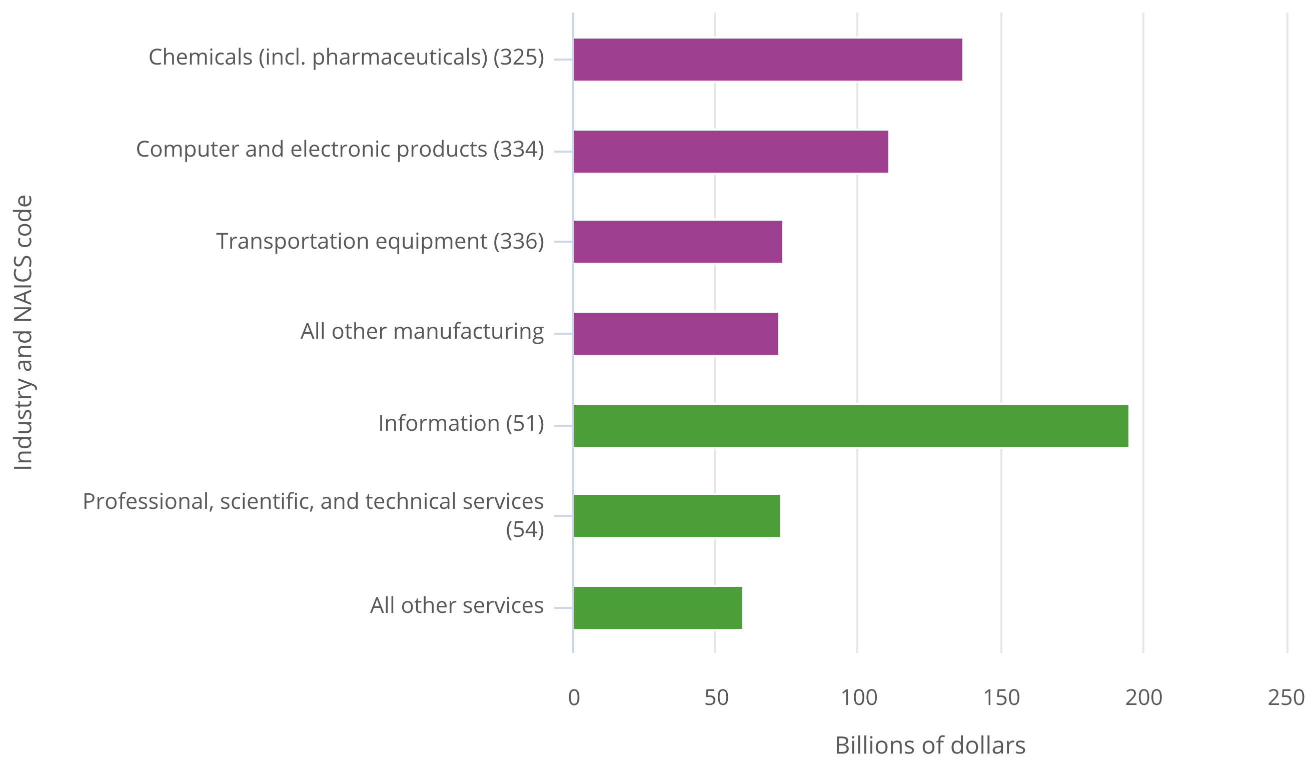
Source(s):
NCSES, National Patterns of R&D Resources (2023–24 edition).

Indicators 2026: State of U.S. S&E

Business R&D

A large portion of U.S. business R&D performance, which totaled $722 billion in 2023, is concentrated in several manufacturing and services industries (Figure 26).[24] Although the manufacturing sector overall was responsible for a greater share of business R&D (55%) than was services industries, the information industry in particular had more R&D expenditures ($195 billion) than any other industry. Around four-fifths of all business R&D was performed by five industries in 2023: information (including software publishing) accounted for 27% of the total, followed by chemicals manufacturing (primarily pharmaceuticals and medicines) at 19%, computer and electronic products manufacturing (including semiconductors) at 15%, transportation equipment manufacturing at 10%, and professional, scientific, and technical services (including R&D services) at 10%. Business R&D in the United States is also highly geographically concentrated, with about half of R&D performance occurring in three states in 2023: California, Washington, and Massachusetts (NCSES *BERD 2023*: Table 13).

Figure 26. U.S. business R&D expenditures, by selected manufacturing or services industry: 2023



Note(s):
NAICS is 2017 North American Industry Classification System. Data are for companies with 10 or more domestic employees. Detail may not add to total because of rounding. Industry classification was based on the dominant business code for domestic R&D performance, where available. For companies that did not report business codes, the classification used for sampling was assigned. Chemicals manufacturing includes pharmaceuticals and medicines.

Source(s):
NCSES and Census Bureau, BERD Survey, 2023.

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R&D in CETs and in advanced manufacturing processes contributes to economic competitiveness and national security. In 2023, U.S. businesses across all industries invested heavily in R&D in select technology focus areas—software products and embedded software ($302 billion), biotechnology ($136 billion), artificial intelligence ($65 billion), and nanotechnology ($39 billion) (NCSES *BERD 2023*: Table 18 through Table 21).[25] The information industry accounted for large shares of software (56%) and AI (60%) R&D; however, industries in the manufacturing sector collectively performed significant shares of total U.S. R&D in these areas (19% of software R&D and 26% of AI R&D). Biotechnology R&D was heavily concentrated in the pharmaceuticals and medicines industry (78% of the total) as well as in firms from the professional, scientific, and technical services industry (13%). Consistent with the role of nanotechnology tools and materials for performance of computer chips, the semiconductor manufacturing industry performed 70% of total nanotechnology R&D. Although nanotechnology R&D accounted for only 5% of all U.S. business R&D performed in 2023, it accounted for 54% of R&D performed in the semiconductor industry.

Academic R&D

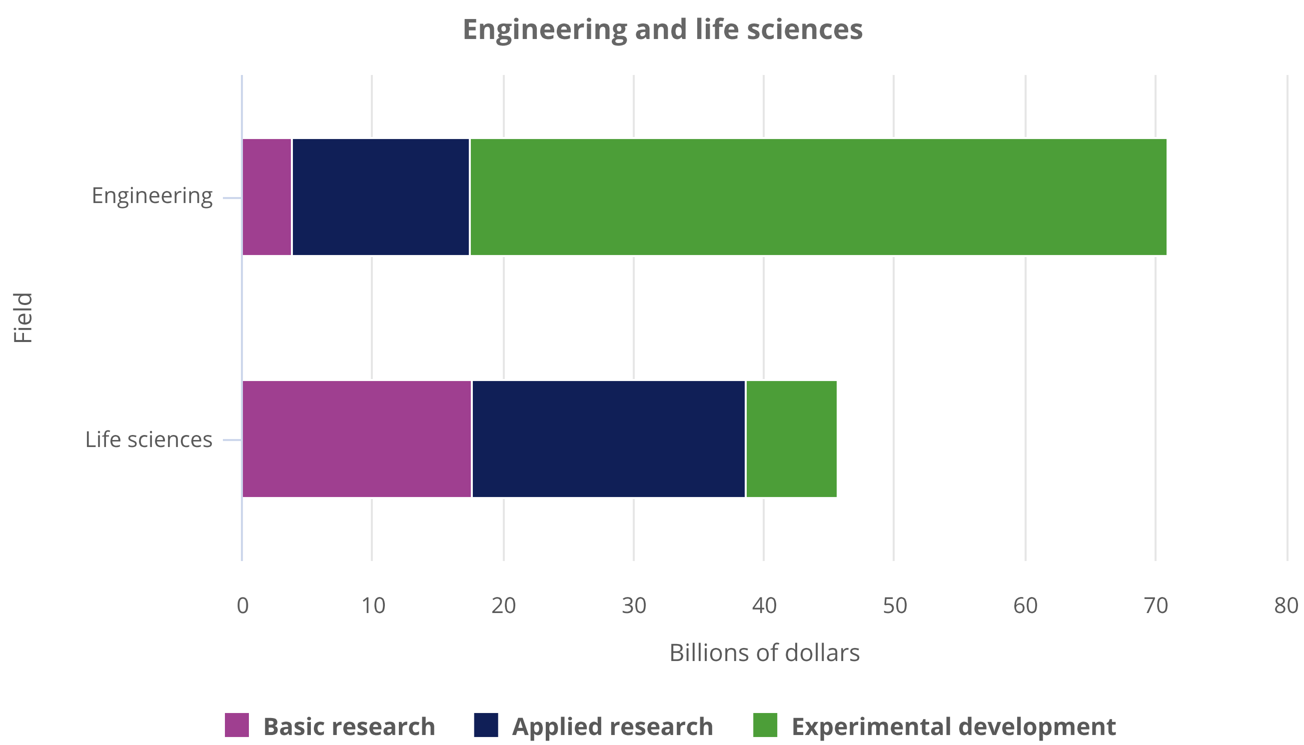
U.S. academic institutions had $118 billion of R&D expenditures in FY 2024. The federal government was the largest funder of total academic R&D, accounting for 55% of academic R&D expenditures, followed by academic institutions' own funding (26%), nonprofit organizations (6%), businesses (5%), and state and local governments (5%) (NCSES *HERD 2024*: Table 1). In contrast to the business sector, academic institutions focus heavily on basic research, which made up 63% of academic R&D

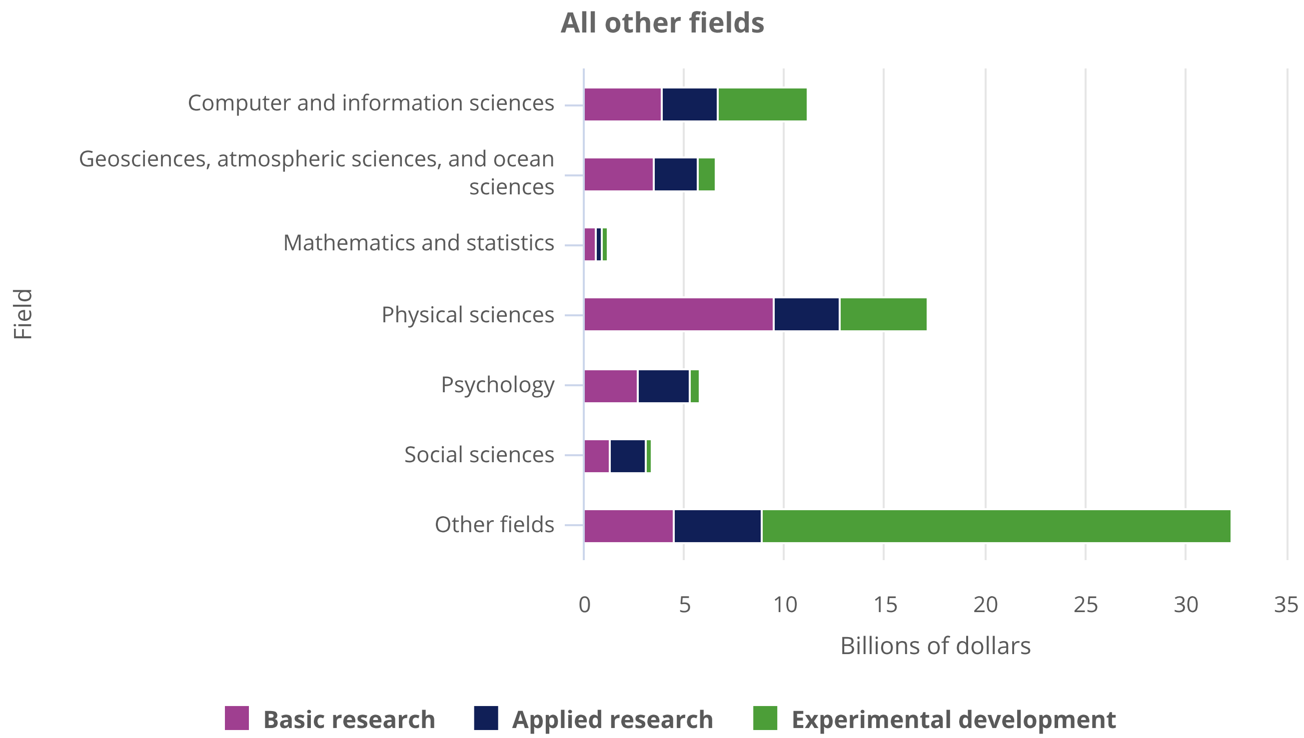
expenditures in FY 2024. Applied research (27%) and experimental development (10%) accounted for smaller shares of academic R&D. Although the federal government is the largest funder of basic research and applied research at higher education institutions, nonfederal sources collectively accounted for slightly more funding of academic experimental development ($6.2 billion) than the federal government ($5.6 billion) in FY 2024. The majority of academic R&D was in life sciences (57%), with little change in this share over the last decade. The predominance of life sciences in academic R&D aligns with the role of HHS as the largest federal funder of academic R&D—$35.5 billion in FY 2024—and is consistent with the high share of U.S. publications output in health sciences (see the "Research Publications" section).

Federal Support for U.S. R&D and Graduate Students

The federal government obligated $194 billion for R&D in FY 2024. DOD accounted for half (50%) of federal R&D obligations; other substantial agency funders of R&D included HHS (25%), DOE (9%), NASA (6%), and NSF (4%) (NCSES *Federal Funds 2024–25*: Table 5). The two largest fields of federally funded R&D were engineering ($71 billion) and life sciences ($46 billion) (Figure 27).

Figure 27. Federal obligations for R&D, by field and type of R&D: FY 2024





Source(s):
NCSES, Survey of Federal Funds for Research and Development, Volume 74, FYs 2024–25.

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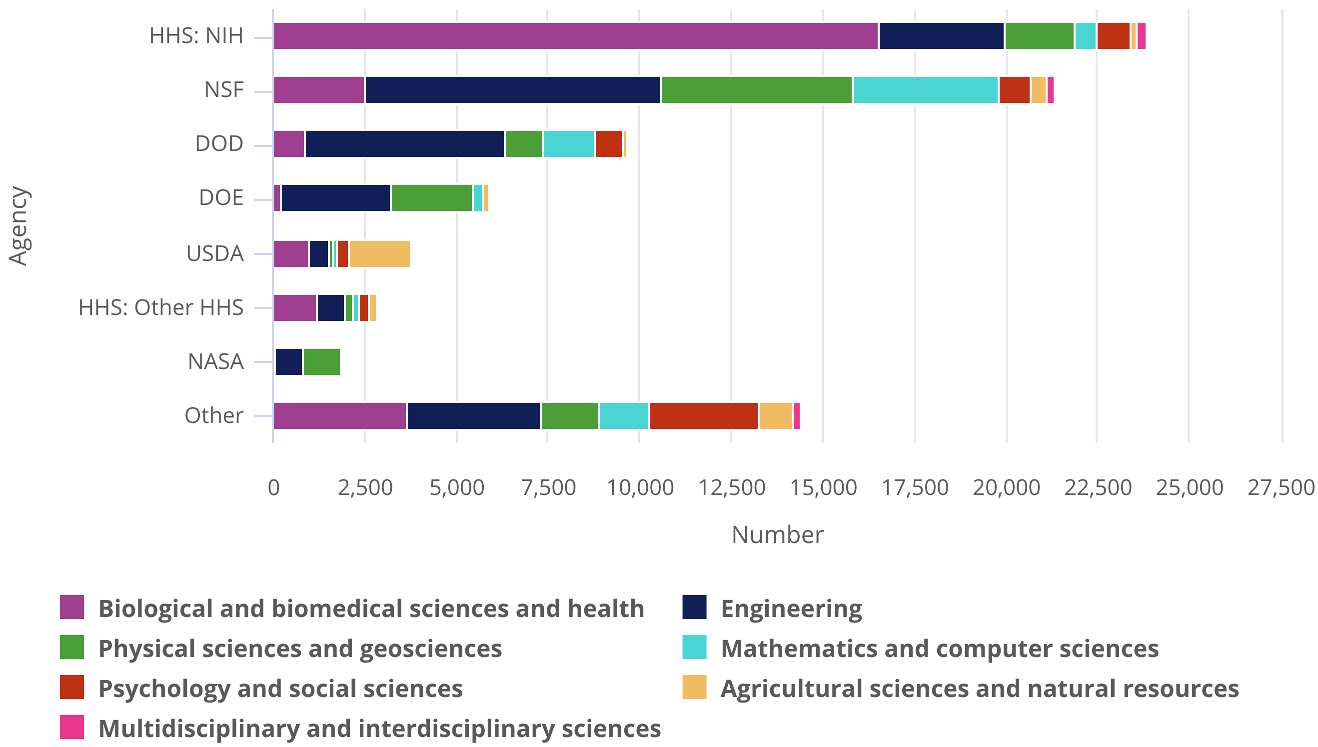
Across all fields of R&D, 24% of federal obligations were dedicated to basic research, 27% to applied research, and 49% to experimental development in FY 2024. Federal R&D obligations in engineering were heavily focused on experimental development (75%), whereas life sciences obligations were more focused on basic research (39%) and applied research (46%), as were federal obligations in most other fields. The federal government's relative emphasis on research over experimental development, and the distribution of that R&D across fields, distinguish its role in R&D funding from that of the business sector in the nation's R&D system. Basic research accounted for 6% of all U.S. business R&D in 2023, compared with 24% of federal R&D obligations in FY 2024 (NCSES *BERD 2023*: Table 12). More than half of federal R&D obligations in three fields were classified as basic research: mathematics and statistics (51%); geosciences, atmospheric sciences, and ocean sciences (53%); and physical sciences (55%) (Figure 27).

The federal government supported 14% of the nation's nearly 600,000 full-time graduate students in science, engineering, and health (SEH) fields in 2024 (NCSES *GSS 2024*: Table 3-1). The federal government supports a higher proportion of doctoral students (25%) than master's students (5%). This pattern is consistent across all broad SEH fields aside from social sciences, where a marginally higher share of master's (6%) than doctoral students (5%) received their primary financial support from the federal government in 2024.

Among federal agencies, the National Institutes of Health (NIH) and NSF supported the greatest number of SEH graduate students, followed by DOD, DOE, and USDA (Figure 28). In 2024, NIH supported nearly 24,000 SEH graduate students, and NSF supported over 21,000, together accounting for 54% of federally supported graduate students. The vast majority of graduate students supported by NIH study biological and biomedical sciences and health. In comparison to other agencies, NSF supports substantial numbers of students across a wider range of fields. In 2024, among graduate students primarily supported by the federal government, NSF funded 50% of students in mathematics and computer sciences, 39% in physical sciences and geosciences, and 31% in engineering.

Figure 28. Full-time graduate students in science, engineering, and health primarily supported by the federal government, by broad field and agency: 2024



Note(s):
DOD is Department of Defense. DOE is Department of Energy. HHS is Department of Health and Human Services. NASA is National Aeronautics and Space Administration. NIH is National Institutes of Health. NSF is National Science Foundation. USDA is Department of Agriculture. Physical sciences and geosciences includes geosciences, atmospheric sciences, and ocean sciences. Agricultural sciences includes veterinary sciences; natural resources includes conservation. Mathematics includes statistics; computer sciences includes information sciences.

Source(s):
NCSES, GSS, 2024.

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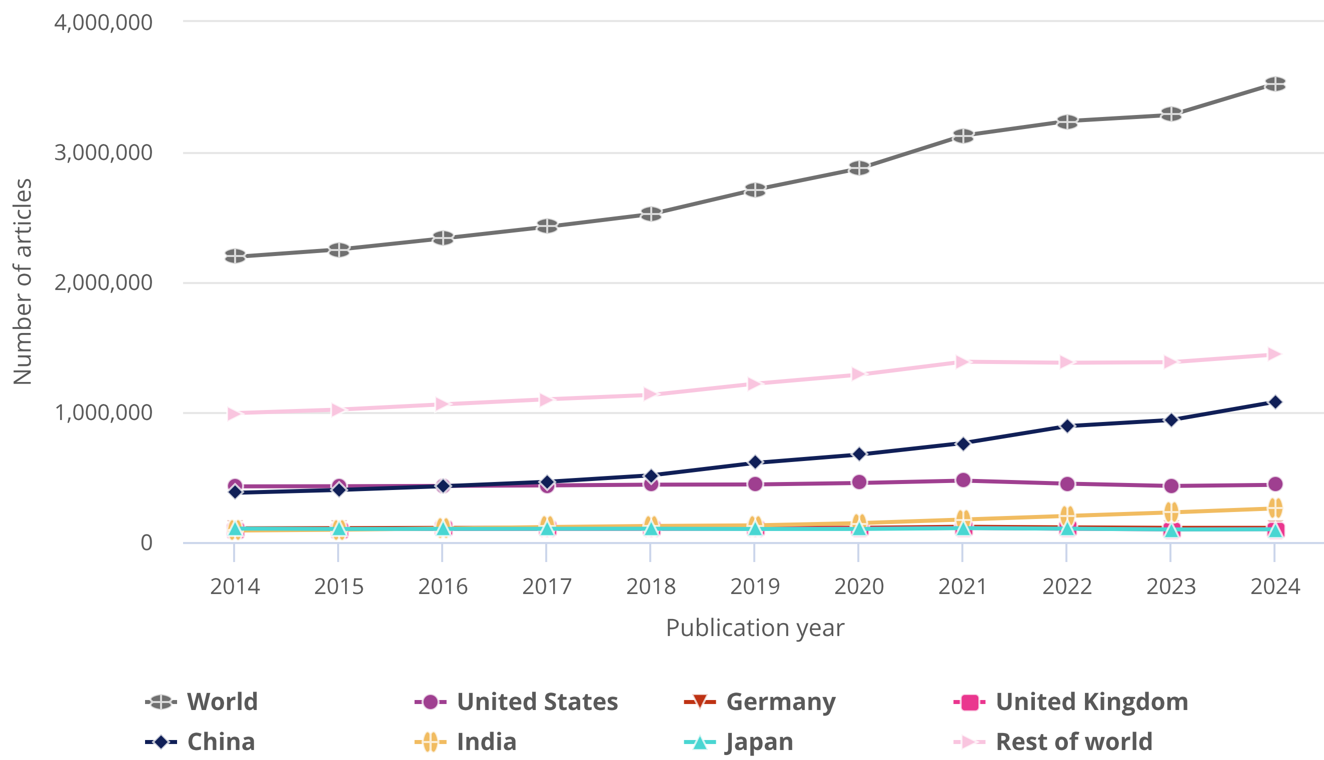
Research Publications

Global Output of Research Publications

Worldwide S&E publication output totaled 3.5 million articles in 2024, with three countries together accounting for half of the global total: China (31%), the United States (12%), and India (7%).[26] China was the second-largest producer of S&E publications in 2014 behind the United States, then expanded rapidly to become the largest producer, with over 1 million articles in 2024 (Figure 29). Authors from two countries, China and India, were responsible for most of the growth in annual publications since 2014. In contrast, publication output in many advanced economies since 2014 either increased by a small amount, as it did in Germany and United Kingdom, or decreased, as it did in Japan. Articles published by authors in the United States have grown modestly since 2014 but decreased from their peak in 2021.

Figure 29. S&E publications, by selected country and rest of world: 2014–24



Note(s):
Article counts refer to publications from a selection of conference proceedings and peer-reviewed journals in S&E fields from Scopus. 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. Articles are credited on a fractional-count basis (i.e., for articles produced by authors from different regions, countries, or economies, each region, country, or economy receives fractional credit on the basis of the proportion of its participating authors). Data by all regions, countries, and economies are available in Table SDISC-6.

Source(s):
NCSES; Science-Metrix; Elsevier, Scopus abstract and citation database, accessed August 2025.

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The distribution of publications by field of science may indicate national and regional research priorities and capabilities. Globally, health sciences represented 22% of all publications in 2024, the highest output of any field. Other fields with large numbers of publications included engineering (18%), computer and information sciences (14%), and biological and biomedical sciences (12%). Among the top producers, authors in the United States (36%), Japan (32%), and the EU-27 (26%) had their highest share of publications in health sciences in 2024. Meanwhile, authors from China had the greatest share of their publications in engineering (27%), and authors from India had their greatest share in computer and information sciences (30%).

Impact of Published Research

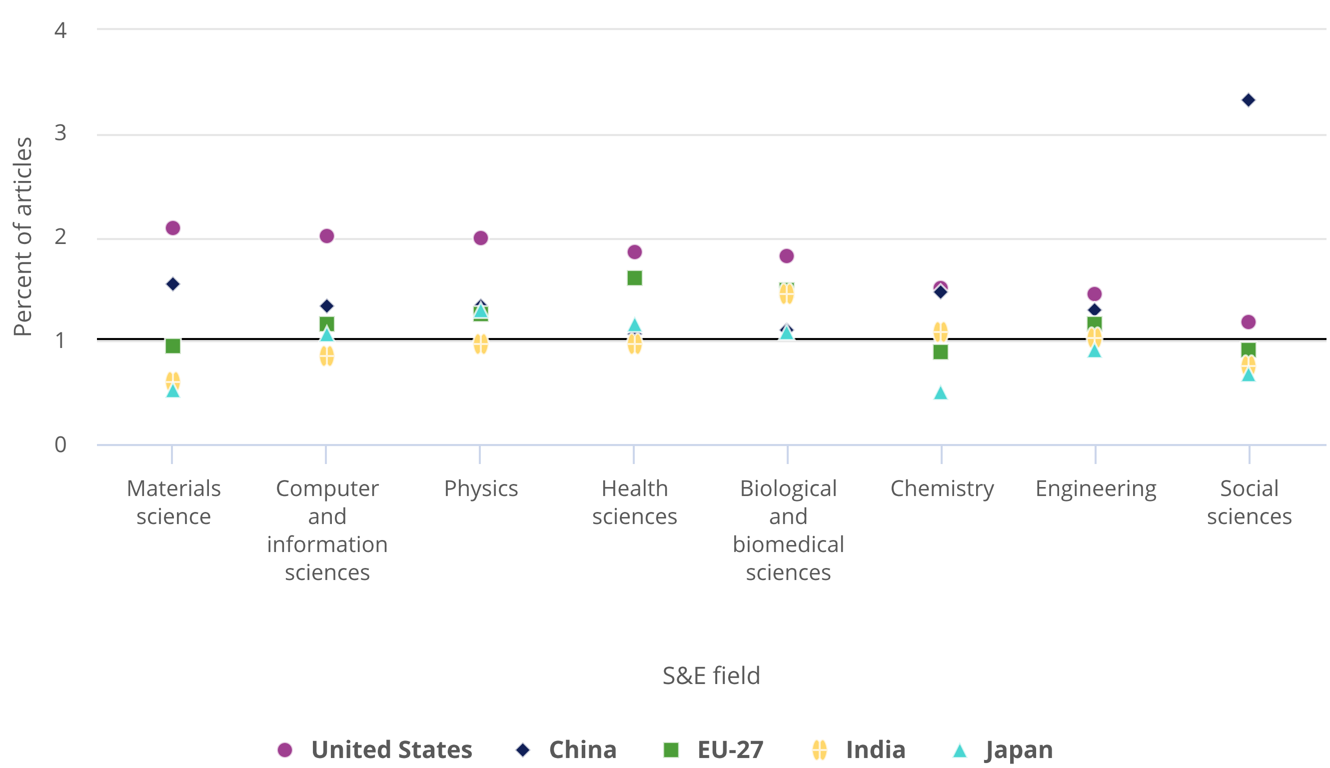
Gross counts of scientific publications by nation are one indicator of scientific productivity. However, taken alone they may be easy to misinterpret due to international differences in the allocation of R&D funding and performance across business, government, and academic sectors; toward research in specific S&E areas; and incentive structures for researchers to publish. Additionally, the reported proliferation of articles generated by paper mills—organizations that produce fraudulent publications and sell authorship to customers—and AI generated results may complicate the use gross counts alone

(Liverpool 2023; Van Noorden 2023). Published articles produced by paper mills are reported to be doubling every 1.5 years with signs of an "industrial scale of production" (Richardson et al. 2025). To address these challenges, *Indicators* also provides measures of HCAs, those in the top 1% of cited articles within a field, in addition to gross publication counts (NSB 2023; NSB 2025).

The level of citations received by scholarly articles is a method of gauging their scientific impact. Articles in the top 1% of all published articles by citations in a given year and field are designated as HCAs. In 2022, 1.7% of peer-reviewed publications with U.S. authors were HCAs, showing that authors from the United States generate a disproportionate share of influential articles. China's HCA share, which has increased each year since 2006, reached 1.3% in 2022. The collective HCA share for the EU-27 was 1.3%, and India's and Japan's shares were each 1.1% (NSB 2025: Figure DISC-26).

For S&E articles published in 2022, the HCA share of each country also varied between fields, reflecting research specializations or differences in the country's prominence in particular research fields or topics. In several fields—materials science (2.1%), computer and information sciences (2.0%), physics (2.0%), health sciences (1.9%), and biological and biomedical sciences (1.8%)—the U.S. HCA share was higher than its overall share. In addition, the U.S. HCA share in each of those fields was higher than those of China, the EU-27, Japan, and India (Figure 30). China and the United States had similar HCA shares in engineering and in chemistry. Within social sciences, China had an HCA share of 3.3%, far higher than the HCA shares of other top producers of publications.

Figure 30. S&E publications in the top 1% most-cited journal articles as a share of all journal articles for selected S&E fields, by selected region, country, or economy: 2022



Note(s):
EU-27 is European Union. Articles are classified by their year of publication and are assigned to a region, country, or economy on a whole-count basis according to the institutional address(es) of the author(s) listed in the article. Citation data are based on all citations made to articles in their publication year and all following years and are normalized by subfield and publication year to allow for comparisons across subfields and over time, resulting in the world level standing at 1.00 for each subfield and year.

Source(s):
NCSES; Science-Metrix; Elsevier, Scopus abstract and citation database, accessed August 2025.

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International Collaboration in Published Research

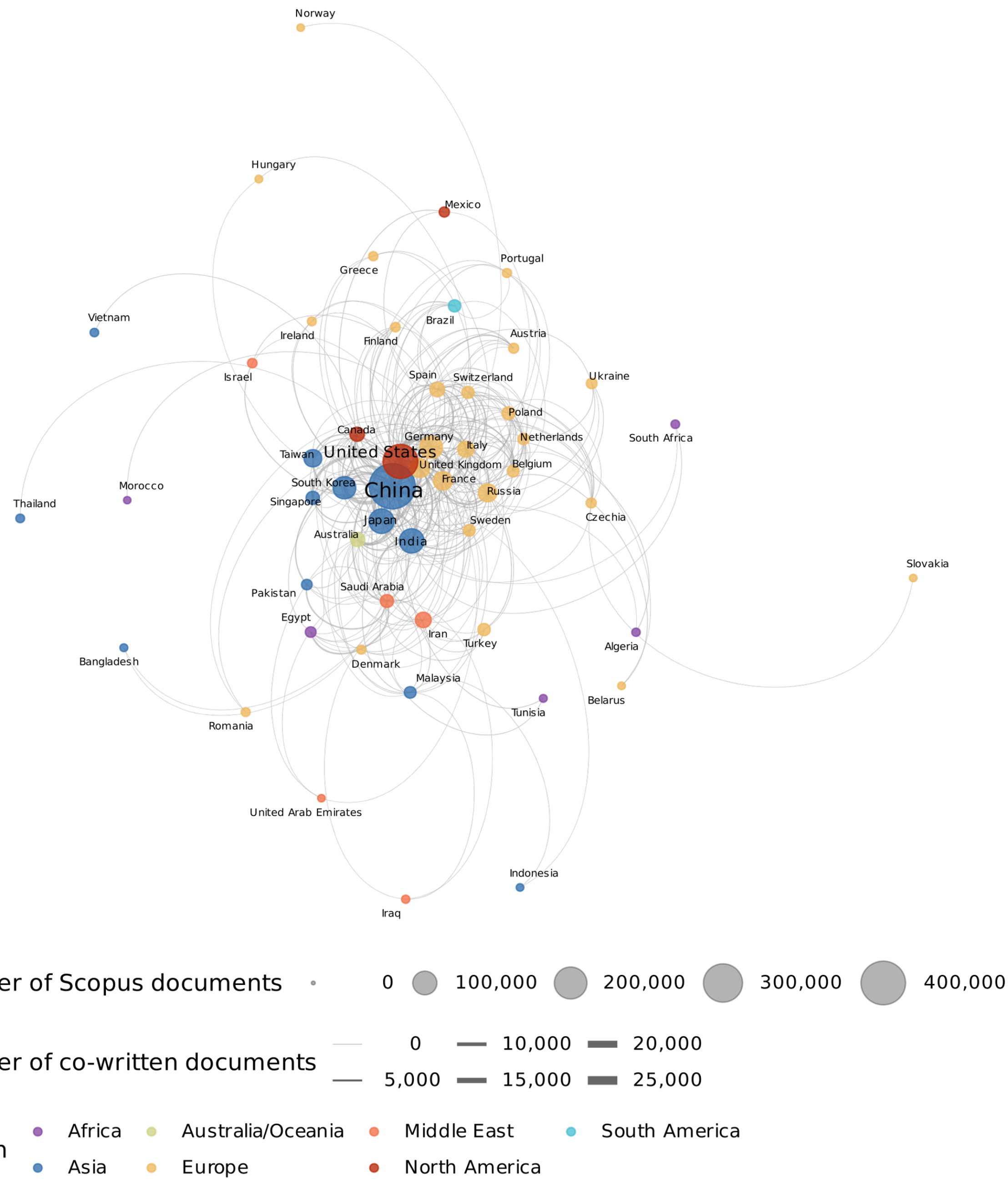
The share of global S&E articles produced with international collaboration has grown over time, increasing from 19% of all articles in 2012 to 22% in 2024 (Table S17). In that year, researchers in the United States contributed to nearly 240,000 articles involving international coauthorship, representing 31% of all internationally coauthored articles, more than any other country (for the U.S. role in semiconductor research collaboration, see sidebar International Collaboration in Semiconductor Research). Although the United States had the highest number of internationally coauthored articles in 2024, its share of published articles with international coauthors (41%) is lower than the shares for the United Kingdom (69%) and Germany (57%) (Table S17). China is the most frequent source for international collaboration with U.S. authors on S&E publications. In 2024, 23% of internationally coauthored U.S. articles had a Chinese coauthor, followed by coauthorship with the United Kingdom (15%), which had been the most common international collaborator with U.S. authors prior to 2010 (Table S18). However, compared with other top producers of published research, China has a low share of articles (16% in 2024) with international collaborators, and it is the only top producer that has decreased its international collaboration rate since its peak in 2018 (22%).

SIDEBAR

International Collaboration in Semiconductor Research

An international network of researchers and institutions supports the publication of research related to semiconductors, identified by the federal government as a critical and emerging technology (see section "Invention in Critical and Emerging Technologies: International Patenting"). Semiconductor research publications have tripled over the last 20 years, reaching more than 100,000 articles in 2024. By 2024, China accounted for the largest share of semiconductor publications (44%). China and the United States, central entities in global semiconductor research collaboration, were the largest contributors in terms of cumulative publications from 2002 to 2024 (Figure A). China and the United States were the top country coauthorship pair, coauthoring nearly 27,000 articles over this period. The next-largest coauthorship pairs were the United States and South Korea and then the United States and Germany, with each pair generating about 10,000 articles. Either the United States or China were part of each of the top 10 country coauthorship pairs. In 2024, 53% of semiconductor publications by U.S. authors were international collaborations, while 17% from China were international collaborations.

Figure A. Semiconductors collaboration network, by selected region, country, or economy pairs: 2002–24



Note(s):
This network diagram shows the number of coauthored articles by all pairs of regions, countries, or economies within the top 60 producers of semiconductor-related research based on whole counting for those pairs that cowrote 400 articles or more. Semiconductor article counts refer to publications algorithmically fingerprinted under semiconductors from conference proceedings and peer-reviewed journals in S&E fields in Scopus. 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. Links are only shown in a single direction, dictated by alphabetical order. The size of the nodes is proportional to the total number of semiconductor-related articles written by each region, country, or economy. The width of the links between nodes is proportional to the quantity of articles both regions, countries, or economies have coauthored. Positioning of nodes is defined using the Kamada-Kawai algorithm.

Source(s):
NCSES; Science-Metrix; Elsevier, Scopus abstract and citation database, accessed August 2025.

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Translation to Impact: U.S. and Global Science, Technology, and Innovation Output

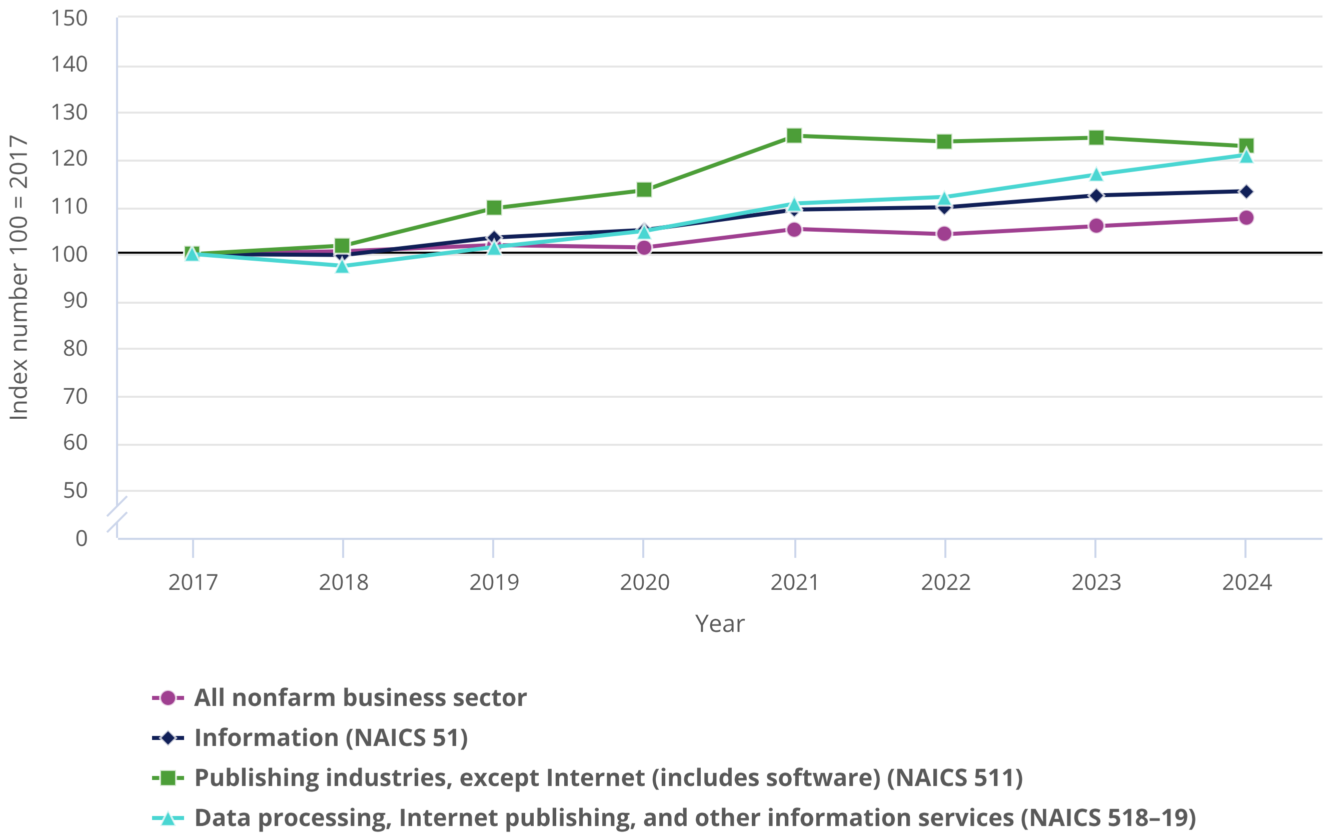
Science, technology, and innovation (STI) activities expand the frontiers of fundamental and technical knowledge and often lead to new outputs such as research publications, new products and services, licensed technologies, and companies, which in turn impact economic output, productivity, and global trade.[27] These outputs, along with the scientists, engineers, and skilled workers that enable them, contribute to the economic competitiveness and national security of the United States.

The impacts of S&E activities, particularly basic research, may not be realized for many years after they occur, thus making it challenging to assess the economic returns of investments in S&E. However, researchers have developed a variety of methods for estimating both short-term and long-term economic impacts of S&E activities. These approaches range from measuring the immediate economic impacts of S&E-related wages and procurement to calculating long-term effects on productivity from knowledge creation and diffusion (see *Indicators 2026* report "Translation to Impact: U.S. and Global Science, Technology, and Innovation Output" sidebar "Measuring Short- and Long-Term Impacts of S&E Activity").

Total Factor Productivity

Total factor productivity (TFP) is an internationally comparable indicator of the impact of innovation and technological change on growth within an economy and its component industries. TFP is calculated by dividing output measures by input measures, gauging how efficiently inputs such as labor and capital are used to produce goods and services. Compared with the overall nonfarm business sector, TFP for the information sector has grown faster: 13% from 2017 to 2024, compared with 8% overall (Figure 31). Within the information sector, TFP for publishing industries (including software) and for data processing, Internet publishing, and other information services have increased by 23% and 21%, respectively, since 2017.

Figure 31. Total factor productivity, U.S. nonfarm business sector and information industries: 2017–24



Note(s):
NAICS is 2017 North American Industry Classification System. The nonfarm business sector excludes general government, private households, nonprofit institutions, and the farm sector.

Source(s):
BLS, Office of Productivity and Technology, 2026.

Indicators 2026: Translation

AI has been identified as a rapidly growing general-purpose technology with broad-ranging implications for productivity and employment (see *Indicators 2026* report "Translation to Impact: U.S. and Global Science, Technology, and Innovation Output" section "Total Factor Productivity and General-Purpose Technologies"). Industries in the information sector experiencing comparatively faster TFP growth in recent years have also utilized AI more widely than the private sector overall. According to the most recent data available (2020–22), economy-wide use of AI as part of production processes was 4% but was 26% in the software industry (North American Industry Classification System [NAICS] 5112) (NCSES 2025a). AI use as part of processes and methods was 20% for data processing, hosting, and related services (NAICS 518). Firms with more than 10,000 employees used AI as a production technology at more than twice the rate of firms with 1,000–9,999 employees (37% vs. 16%) and at nearly 10 times the rate of microbusinesses (1–9 employees) and small businesses (10–49 employees) (4% and 3%, respectively).

Knowledge and Technology Transfer

Federal Technology Transfer Activities

U.S. federal agencies frequently engage in processes and activities that support the translation of knowledge arising from R&D for wider use. In addition to broad federal funding and performance of R&D, federal employees engage in activities such as patenting, publishing, and creating open-source software (OSS). Researchers at federal agencies report the development of new techniques and technologies in the form of invention disclosures and participate in cooperative R&D agreements (CRADAs). CRADAs involve the coordination of a federal agency or laboratory with one or more nonfederal organizations in which the nonfederal organization provides resources for research activities and in exchange receives the option of exclusive licensing of any newly produced technologies. For prior data on these topics, see the *Indicators 2024* report "[2024] Invention, Knowledge Transfer, and Innovation" (NSB 2024).

Federal agencies fund a significant share of the nation's R&D, and acknowledgements of federal support in peer-reviewed S&E research publications are evidence of the federal government's role in creating and diffusing knowledge. From 2002 to 2023, nine federal agencies each received more than 25,000 acknowledgements of funding in S&E articles (Table 6). The top agencies included HHS (including NIH) with nearly 2 million funding acknowledgements, and NSF with over 900,000 acknowledgments. HHS and NSF were also the most frequently acknowledged federal agencies within HCAs, those articles among the top 1% most-cited globally. Relative citation indices for all nine agencies listed were above 1.0, indicating significant scientific impact. Index scores were highest for DOD (3.6), DOE (2.9), and NSF (2.7).

Table 6. U.S. federal agencies cited in the funding acknowledgment section of S&E articles, by citation frequency: 2002–23

(Number and index)

Name	All publications (number)	Publications in the top 1% most-cited journal articles (number)	Relative citation index (index)
Department of Health and Human Services	1,983,820	46,601	2.53
National Science Foundation	918,900	18,995	2.66
Department of Energy	269,274	5,926	2.89
Department of Defense	197,830	4,929	3.62
National Aeronautics and Space Administration	99,959	1,842	2.46
Department of Agriculture	79,513	1,187	1.75
Department of Veterans Affairs	41,498	694	1.86
Department of Commerce	34,495	699	2.47
Department of the Interior	27,769	349	1.47

Note(s):

Articles are classified by their year of publication. 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. Because citation scores are not computed after 2022, the relative citation index is not simply the ratio of the count of publications in the top 1% over the total number of publications because publications without a citation score are excluded in the denominator.

Source(s):

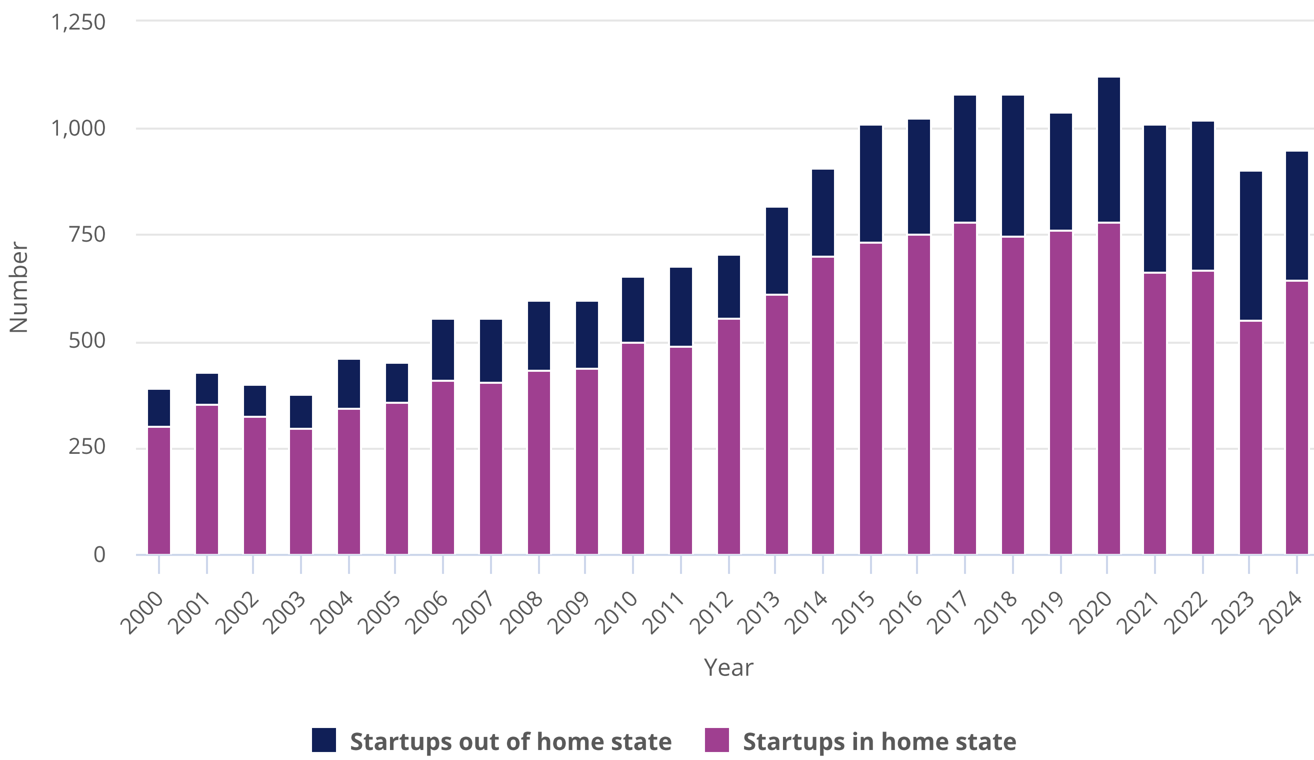
NCSES; Science-Metrix; Elsevier, Scopus abstract and citation database, accessed February 2025.

Indicators 2026: State of U.S. S&E

University Technology Transfer Activities

Universities may leverage the results of their research into private-sector innovations through licensing outside the university and forming startup companies. Patented inventions can be licensed directly to a preestablished external party or to a new startup; alternately, an exclusive option can be granted for licensing rights at a future date. U.S. universities issued 7,673 new licenses and 1,534 options in 2024. There were 951 university-related startups launched in 2024, a decline from the peak of 1,125 in 2020 (Figure 32). The majority of university-related startups since 2000 were launched in the home state of the research university from which the technology was transferred, ranging from 83% in 2001 to 61% in 2023. Startups formed specifically to develop and license university technology are a small subset of newly established businesses in the United States. However, these startups, often launched by university faculty and students, are one of the most direct means of translating findings and innovation from universities to the private sector.

Figure 32. Startup companies based on licensed university technology, by company location: 2000–24



Note(s):
Startup companies reported by universities in AUTM data refer only to those companies that were formed in the reporting year specifically to develop the technology being licensed.

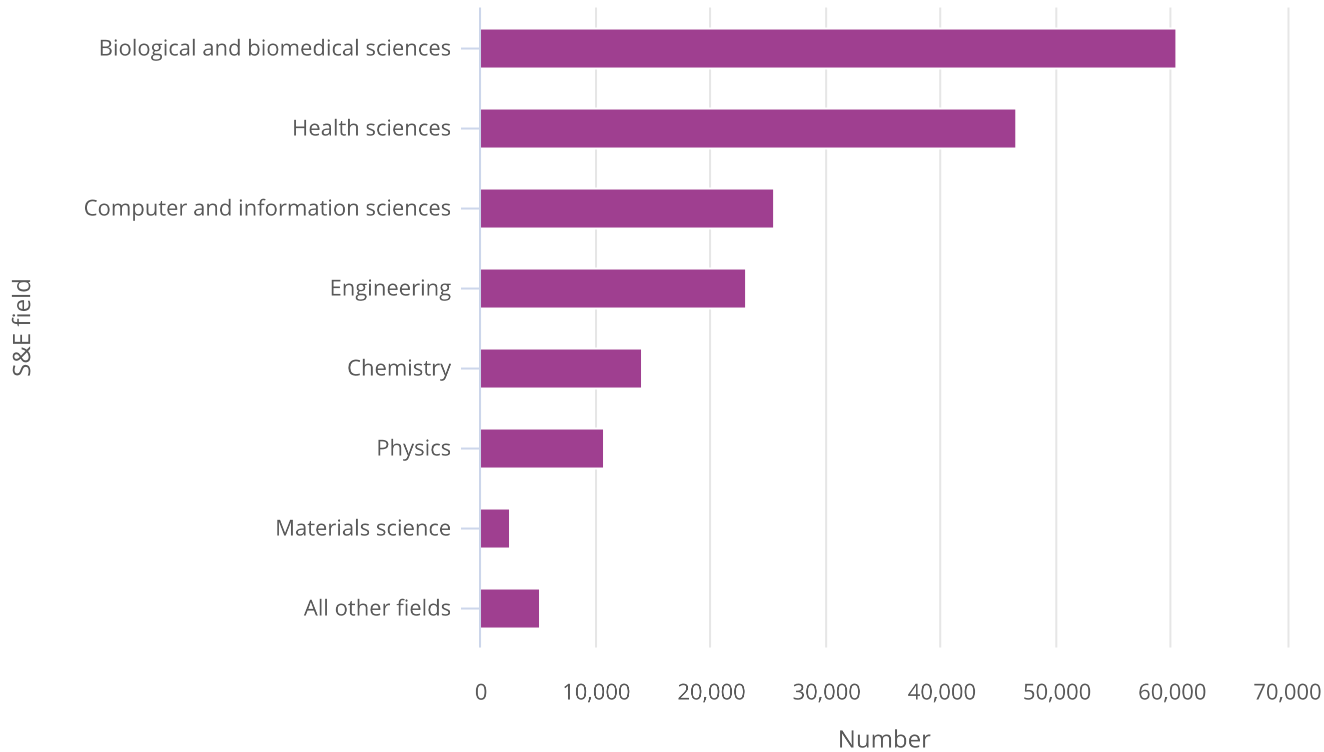
Source(s):
AUTM, STATT database, version 4.2, accessed July 2025.

Indicators 2026: Translation

Knowledge Flows: Patent Citations to Academic Research

Publicly funded knowledge also flows into the market through its contribution to patents for useful inventions. When peer-reviewed publications are cited in patent documents, the linkage suggests that scientific literature may have contributed knowledge to the patented invention. U.S. patents issued in 2024 contained about 642,000 citations to S&E articles, 56% of which were to foreign authors, 29% to U.S. academic authors, 7% to U.S. business authors, and the remainder to other or a combination of U.S. sectors. Patent citations to S&E articles by U.S. academic authors were most commonly made to articles in biological and biomedical sciences and in health sciences (Figure 33). Together, articles in these two fields accounted for 57% of all S&E articles from the U.S. academic sector that were cited by U.S. patents in 2024.

Figure 33. Citations of U.S. academic S&E articles in USPTO utility patents, by S&E field of the articles cited: 2024



Note(s):
USPTO is Patent and Trademark Office.

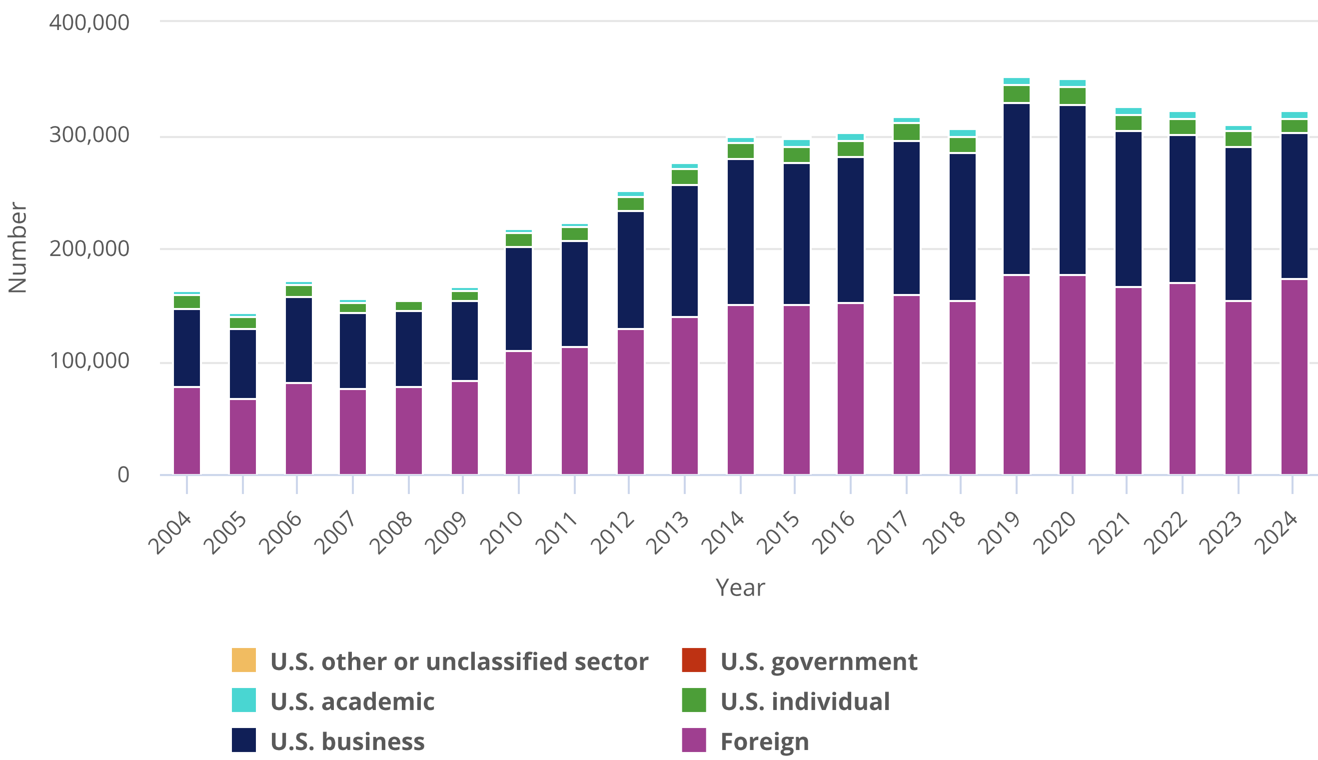
Source(s):
NCSES; Science-Metrix; PatentsView, USPTO, accessed March 2025; Elsevier, Scopus abstract and citation database, accessed August 2025.

Indicators 2026: Translation

Invention for the U.S. Market: U.S. Patent Trends

Invention is the creation of new and useful products and processes as well as their improvement (see the "Glossary" section for related definitions). The USPTO grants protection for inventions in the U.S. market, and patent documents provide detailed information that is widely used to understand invention activity. The USPTO awarded 326,000 utility patents in 2024, of which 152,000 (47%) were assigned to domestic U.S. owners (Figure 34).[28] Businesses received by far the largest share of patents awarded to U.S owners (85%), whereas individual filers and those in academia and government accounted for much smaller shares. Patents assigned to U.S. businesses declined 15% between 2019 and 2024, in contrast to a general upward trend from 2008 to 2019. The share of USPTO patents awarded to foreign owners has continued to increase, reaching 53% in 2024.

Figure 34. USPTO utility patents granted to owners, by nationality and U.S. sector: 2004–24



Note(s):
USPTO is Patent and Trademark Office. Patents are allocated by patent ownership information and are credited on a fractional-count basis according to the proportion of inventors from participating institutions. U.S. other includes private nonprofits, such as foundations, associations, nonacademic hospitals, and research-performing institutions. Patents with unknown owner location are not shown.

Source(s):
NCSES; Science-Metrix; PatentsView, USPTO, accessed July 2025.

Indicators 2026: Translation

The organizations with the highest level of USPTO patenting include both domestic and foreign businesses. The organizations with the largest number of USPTO patents granted in 2024 were Samsung (10,220), Taiwan Semiconductor Manufacturing Company (TSMC) (3,994), and Apple (3,505) (Table 7). The presence of these businesses among the top patenting organizations is an indication of the strategic value they see in intellectual property (IP) protection in the U.S. market. Many of the organizations with the greatest number of patents are also among the most highly valued companies in the world, with market capitalizations reaching into the trillions of dollars in recent years. For example, TSMC, Apple, Alphabet (Google), Microsoft, and Amazon were all among the top USPTO patenting organizations in 2024, and as of April 2026, these organizations were all in the top 10 companies globally by market capitalization, valued at more than $1 trillion each (Nasdaq 2026).

Table 7. Top patenting organizations at the USPTO: 2024

(Number)

Organization	USPTO patents
Samsung Electronics Co., Ltd.	10,220
Taiwan Semiconductor Manufacturing Company Ltd.	3,994
Apple Inc.	3,505
Qualcomm Incorporated	3,441
LG Electronics Inc.	3,182

Table 7. Top patenting organizations at the USPTO: 2024

(Number)

Organization	USPTO patents
Huawei Technologies Co., Ltd.	3,149
International Business Machines Corporation	2,466
Canon Kabushiki Kaisha	2,381
Google LLC	2,191
Intel Corporation	1,941
BOE Technology Group Co., Ltd.	1,883
Toyota Jidosha Kabushiki Kaisha	1,872
Micron Technology, Inc.	1,795
Microsoft Technology Licensing, LLC	1,717
Dell Products L.P.	1,552
Amazon Technologies, Inc.	1,543
Telefonaktiebolaget LM Ericsson	1,541
Sony Group Corporation	1,473
Hyundai Motor Company	1,431
Mitsubishi Electric Corporation	1,291
Ford Global Technologies, LLC	1,247
KIA Corporation	1,247
Capitol One Services, LLC	1,168
NEC Corporation	1,109
Nike, Inc.	1,109
Honda Motor Co., Ltd.	1,061
GM Global Technology Operations LLC	1,052
Nippon Telegraph and Telephone Corporation	1,046
Seiko Epson Corporation	1,029
Panasonic Intellectual Property Management Co., Ltd.	1,028
Murata Manufacturing Co., Ltd.	1,007

Note(s):
USPTO is Patent and Trademark Office. Patents are allocated according to patent ownership information. Patents are credited on a full-count basis (i.e., for patents with collaborating institutions, each institution receives full credit on the basis of the proportion of inventors from participating institutions). Organizations with more than 1,000 patents are shown. Curated profiles of organizations are based on the disambiguation information available in PatentsView. Subsidiaries are not merged under the profile of their parent organization.

Source(s):
NCSES; Science-Metrix (Elsevier); PatentsView, USPTO, accessed March 2025.

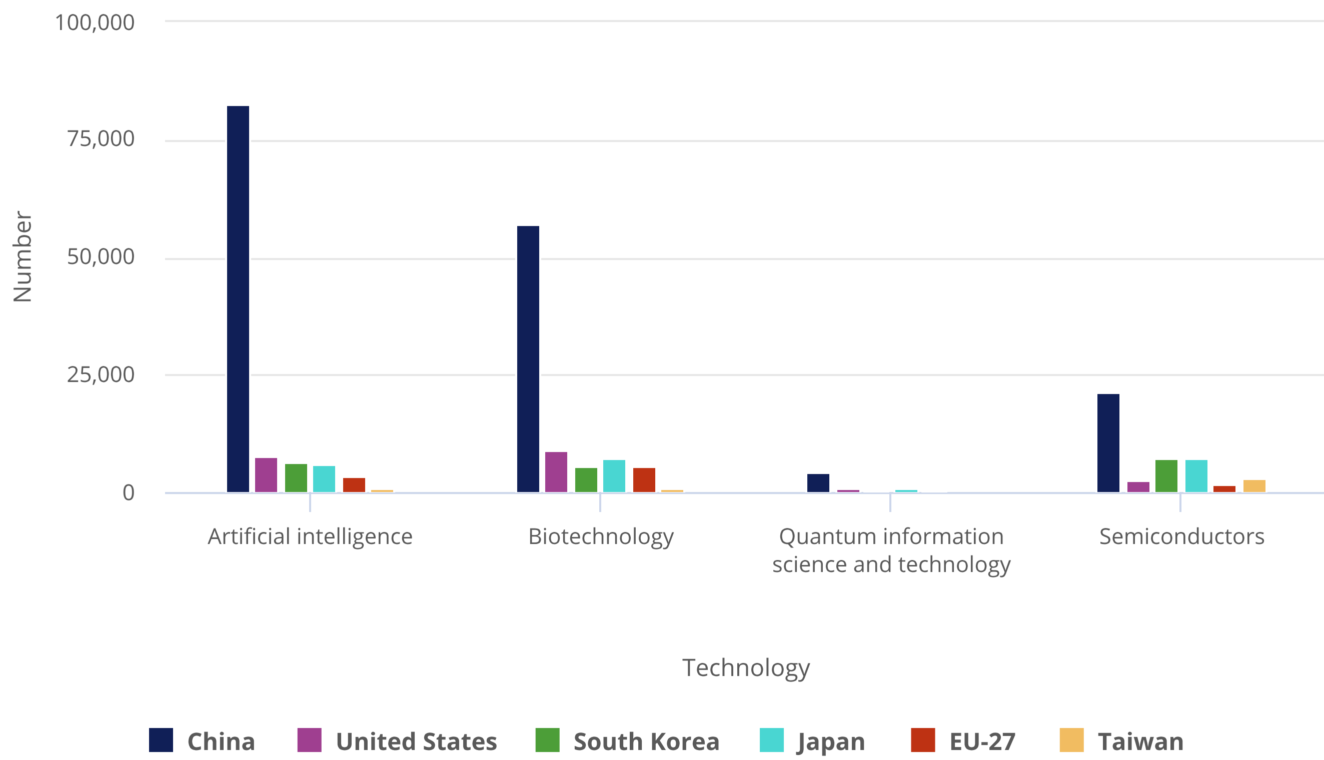
Indicators 2026: State of U.S. S&E

Invention in Critical and Emerging Technologies: International Patenting

International *priority patent families* provide a more globally representative picture of patenting of inventions compared with USPTO patents (see the "Glossary" section for definition). Inventors who apply for these patents are implicitly preparing to seek protection in more than one international market. This section focuses on international patenting trends for leading countries and economies in five CET areas identified by policymakers in recent years for their strategic importance: AI, QIST, biotechnology, semiconductors, and nuclear technologies (Biden 2022; Kratsios 2025; NSTC 2025; Trump 2025).

China accounts for large shares of priority patent families across all five CETs. Inventors in China were granted by far the most priority patent families in AI (about 83,000), biotechnology (57,000), and QIST (4,000) (Figure 35). In each of these technology areas, inventors in China accounted for nearly half or more than the global total. The United States, South Korea, Japan, and the EU-27 were consistently the other top patenting countries and economies across these three categories but collectively still had fewer priority patent families than China (NSB 2026b: Figure TRN-8, Figure TRN-11, Figure TRN-14, Figure TRN-17).

Figure 35. International priority patent families granted, by technology and selected country or economy: 2024



Note(s):
EU-27 is European Union. The technology class is based on the 2024 classification of key technology areas developed by the National Science Foundation's Directorate for Technology, Innovation and Partnerships. Patent families are assigned according to patent inventorship information found on the priority patent and are fractionally allocated among regions, countries, or economies based on the proportion of residences of all named inventors. India (not pictured) was granted 954 international patents in artificial intelligence in 2024 but was not among the top patenting countries in other technologies included in the figure. See *Indicators 2026* report "Translation to Impact: U.S. and Global Science, Technology, and Innovation Output" for complete details on methodology and technology categories.

Source(s):
NCSES; Science-Metrix (Elsevier); PATSTAT, accessed spring 2025.

Indicators 2026: Translation

China was the largest producer of international priority patent families in semiconductors and nuclear technologies in 2024 (NSB 2026b: Table STRN-21 and Table STRN-27). Compared with other CETs, priority patent families in semiconductors were more distributed throughout East Asia, where the top four countries and economies—China (about 21,000 patents), South Korea (7,000), Japan (7,000), and Taiwan (3,000)—collectively accounted for nearly 90% of total priority patent families (NSB 2026b: Table STRN-21). Taiwan was most prominent in semiconductors, where 7% of priority patent families were attributed to it, substantially higher than its share of the global total in other CETs. A much smaller number of priority patent families is granted in nuclear technologies relative to the other critical technologies, although inventors from China still accounted for the largest share (68%) of the global total in 2024. South Korea, Japan, and the United States were the next-largest sources of priority patent families in nuclear technologies; Taiwan ranked comparatively lower in this category.

The position of major patenting countries and economies changes substantially when focusing the analysis on highly cited patents, which provide a measure of patents' impact on subsequent invention. Across many CET areas, priority patent families awarded in 2021 to U.S. inventors were more likely to be in the top 1% of cited patents compared with those from China and the EU-27.[29] For example, the United States had a highly cited patent share of 1.73 in AI, machine learning, autonomy, and related advances compared with 1.36 for China and 0.84 for the EU-27 (NSB 2026b: Table STRN-17). The United States had a significantly higher patent citation share than China in other technologies in which China was by far the largest producer of international patents: QIST (1.84 vs. 1.27) and biotechnology, medical technology, genomics, and synthetic biology (3.07 vs. 1.18) (NSB 2026b: Table STRN-20 and Table STRN-26).

Innovation

Innovation is the translation of knowledge arising from R&D activities into new or improved products, processes, or services with real-world applications (see the "Glossary" section for internationally comparable definition). Innovation is measured through its incidence (survey measurement), activities (STEM education and workforce), outputs (products and processes), outcomes (economic growth and societal benefits), and the creation of intangible capital (Aizcorbe, Moylan, and Robbins 2009). Three indicators of innovation are discussed in this section: business registration of trademarks, OSS contributions, and the introduction of new products and processes in the business sector.

Trademarks

Trademark data complement patent data as indicators of innovation activity. In 2024, USPTO registered about 378,000 trademarks to owners across the world, including about 212,000 registered to U.S. owners. Trademarks are particularly valuable as innovation indicators for firms that produce services and firms that are knowledge or innovation intensive. Three service-industry categories—education, training, entertainment, and sporting and cultural activities (about 41,000); scientific research, information, and communication technology (35,000); and advertising, business management, business administration, and office functions (35,000)—had the highest number of U.S.-registered trademarks in 2024.[30]

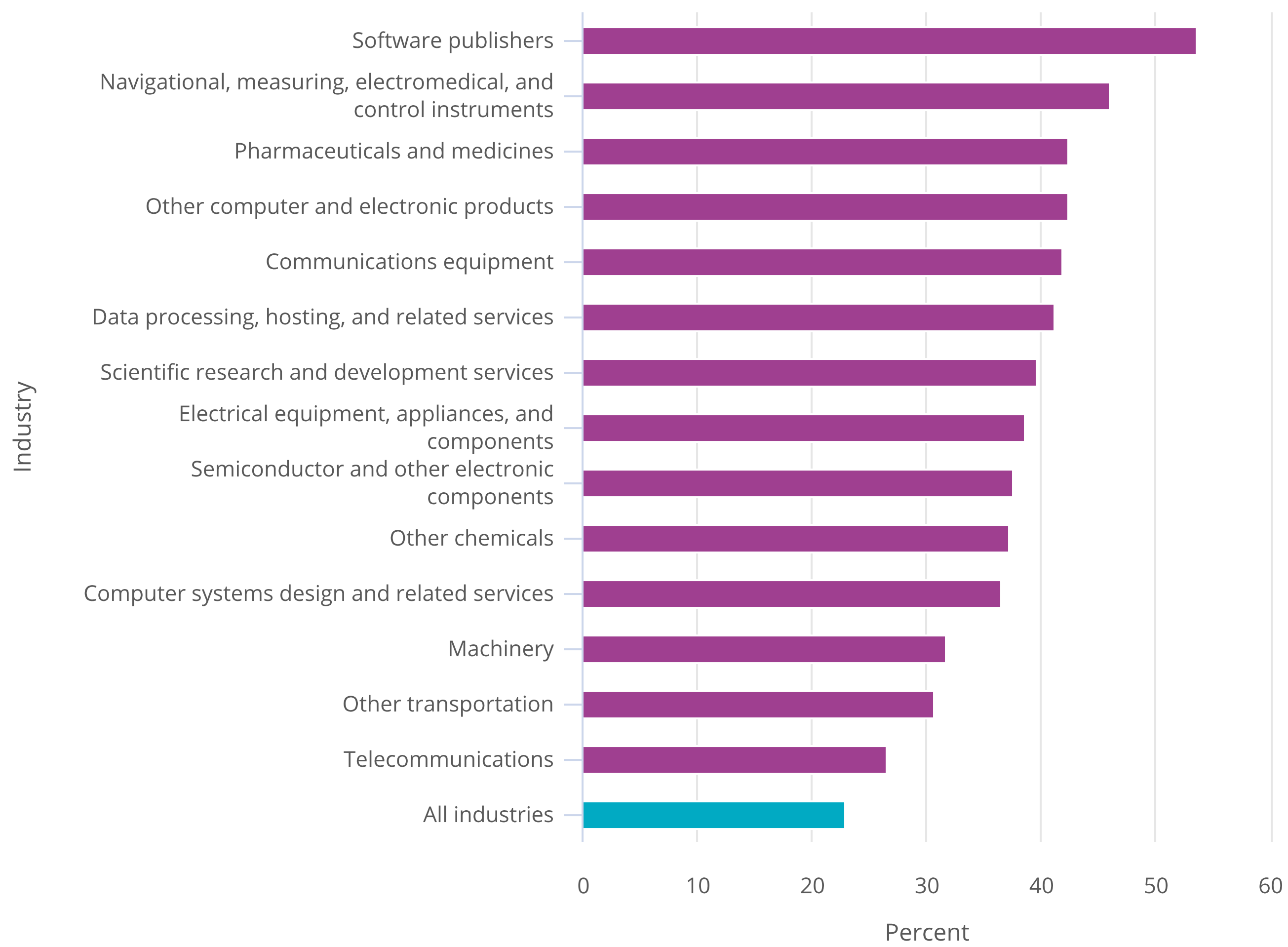
Open-Source Software

Some inventions and knowledge products are created with the intention of being widely shared. Broadly defined, OSS is any software that is accessed, modified, and distributed freely. Economists have estimated a value of $8.8 trillion for the OSS used by businesses (Layne 2024). Based on data from GitHub, the world's largest source code–hosting platform, the United States has the highest number of contributors to OSS repositories, although participation has become increasingly global. For new repositories created in 2010, 37% of GitHub contributors were from the United States; by 2023, U.S. contributors accounted for 15% of new repositories.[31] In 2023, seven countries accounted for over half of the contributors to repositories (regardless of the year of the repository's creation). Contributors from the United States accounted for the largest share of GitHub repository contributors (16.2%), followed by Brazil (7.5%) and India (7.5%).

Business-Reported Innovation Rates

A key indicator of business-sector innovation is the proportion of companies within an industry that introduce new or significantly improved products and processes. Slightly less than a quarter (23%) of U.S. companies introduced a product or process innovation during the 3-year period of 2020–22 (Figure 36). Many of the industries that invest heavily in R&D also have high innovation rates (see the "Business R&D" section). Software publishers had the highest rate of reported innovation; 54% of companies in this industry reported having introduced a product innovation within the 2020–22 period.

Figure 36. U.S. companies reporting product or business process innovation, by selected industry: 2020–22



Note(s):
Industry classification is based on dominant establishment payroll. Statistics are representative of companies located in the United States. Product-innovating companies are self-reporting, based on having introduced a new or improved product that differs significantly from the firm's previous products and that has also been introduced on the market or brought into use by the firm. These products may be goods or services.

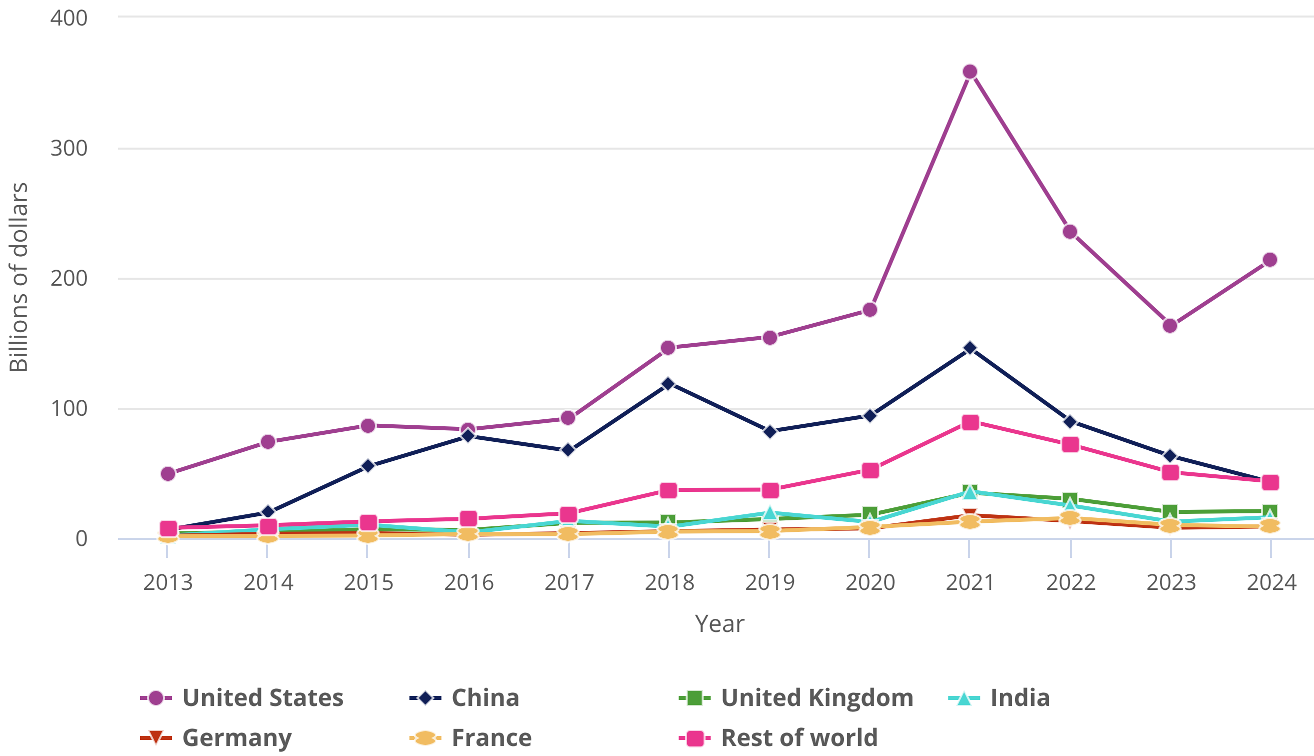
Source(s):
NCSES and Census Bureau, 2023 ABS: Data Year 2022.

Indicators 2026: Translation

Business Dynamics and Venture Capital

Startups (firms less than 1 year old) are major drivers of job growth and innovation in the United States. Firm creation in the United States peaked in 2006 at 542,000 and declined in subsequent years during the global financial crisis of 2007–09. Since 2010 and through the COVID-19 pandemic, firm creation has continued trending upward, reaching 520,000 in 2022, still short of the 2006 peak. Although venture capital (VC) funds only a small share of new private firms, it plays a substantial role in the innovation process through investment in startups with high growth potential, including those that engage in R&D. Worldwide VC investment was $354 billion in 2024, greater than its level in 2023 ($327 billion) but roughly half of its peak value in 2021 ($694 billion) (Figure 37). U.S. firms consistently received the most VC investment each year between 2013 and 2024. Firms based in the United States accounted for 60% of global VC investment in 2024, followed by firms based in China (12%).

Figure 37. Venture capital investment received by firms headquartered in selected regions, countries, or economies: 2013–24

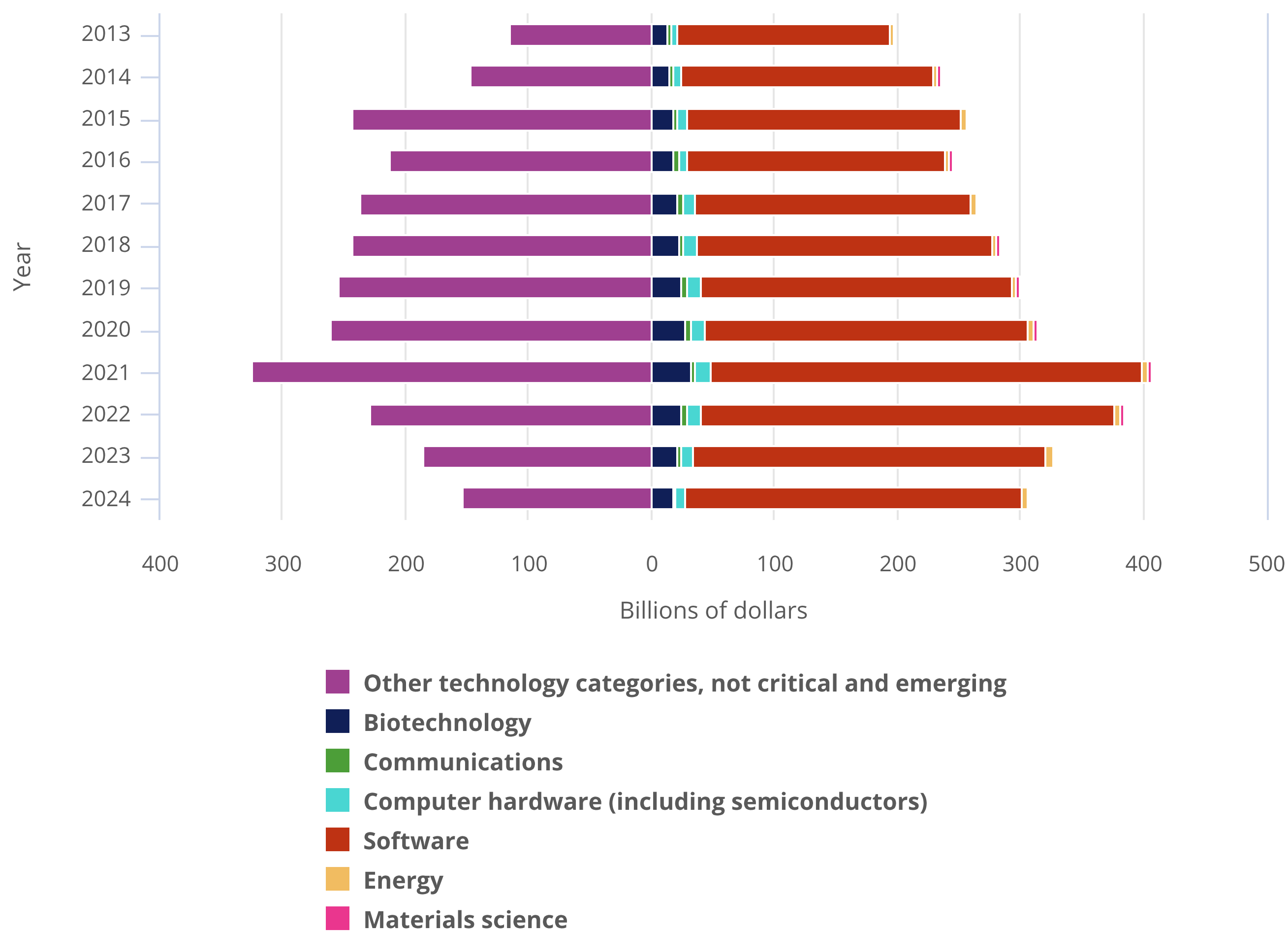


Source(s):
PitchBook, venture capital and private equity database, special tabulations, accessed March 2025.

Indicators 2026: Translation

VC investments can support firms developing CETs in the United States. VC investments in firms in CET areas accounted for over half of total U.S. VC investments each year from 2013 to 2024, and two-thirds of total VC investment in 2024 (Figure 38). Software firms received over 80% of VC funding allocated to CETs and between 44% and 59% of total U.S. VC funding, each year during this period. The share of CET VC funding going to software firms was comparatively higher than software publishing's share of value added by U.S. KTI services (see section "KTI Industries in the United States"). Biotechnology received the next-largest share of VC funding among CET areas, accounting for between 6% and 9% each year from 2013 to 2024. Computer hardware (including semiconductors) was the next-largest CET area in terms of VC funding. Investment in all CET areas was lower in 2024 than in 2021, the peak VC investment year for all CETs aside from energy.

Figure 38. Venture capital investment received by firms headquartered in the United States, by critical and emerging technology: 2013–24



Note(s):
Critical and emerging technology categories are derived from PitchBook Primary Industry Codes based on a classification developed by the National Science Foundation Directorate for Technology, Innovation and Partnerships.

Source(s):
PitchBook, venture capital and private equity database, special tabulations, accessed March 2025.

Indicators 2026: Translation

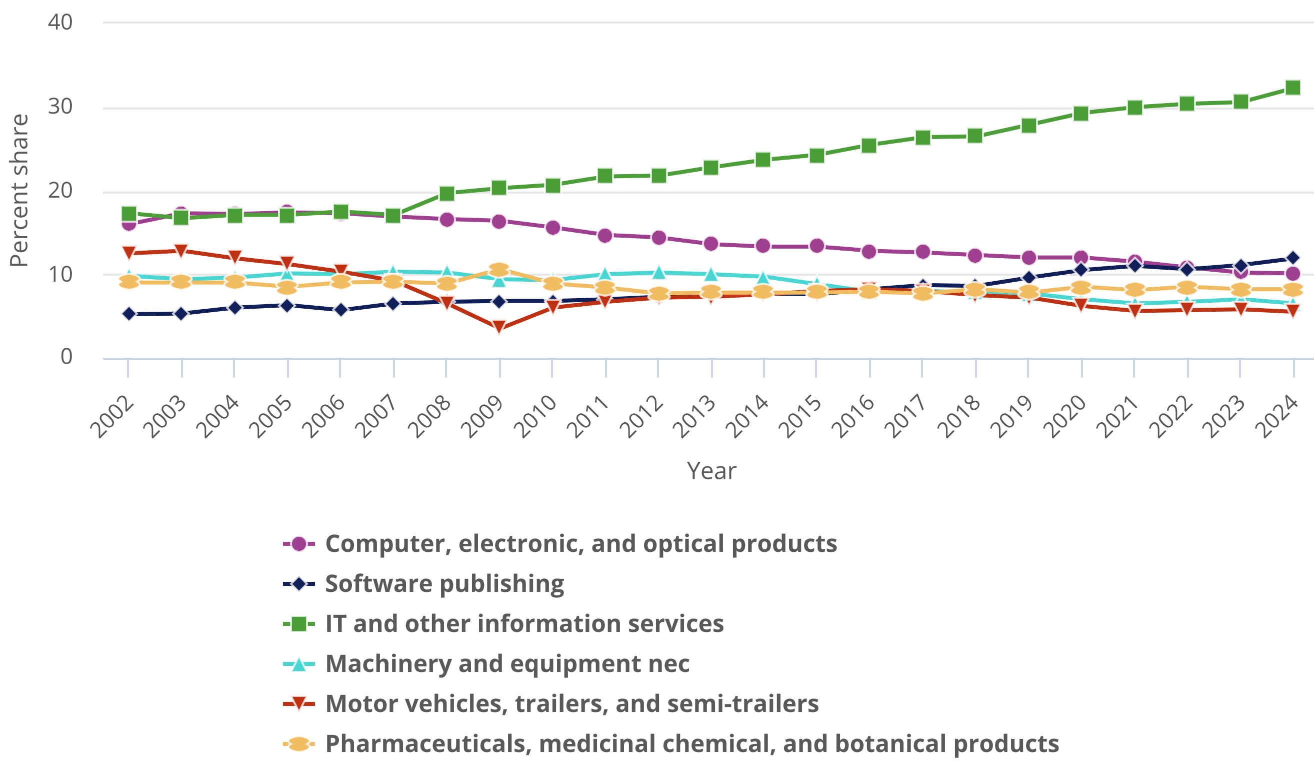
Production Patterns of Knowledge- and Technology-Intensive Industries

KTI industries are important funders and performers of R&D, produce high-value products and services and intangible assets, and contribute to national economic competitiveness in global markets. KTI industries are defined as those with high and medium-high R&D intensities based on an internationally comparable taxonomy and include 10 industries in manufacturing and 3 industries in services (see the "Glossary" section for list of KTI industries) (OECD 2016). KTI output is measured as the value of goods and services (gross output) minus the cost of intermediate inputs (energy, materials, and purchased services)—henceforth, *value added* (see the "Glossary" section for definition of value added).

KTI Industries in the United States

In 2024, value added of U.S. KTI industries totaled $3.3 trillion and accounted for 11% of U.S. GDP, a share little changed since 2002.[32] The share of total U.S. KTI value added contributed by manufacturing has decreased over the last two decades as the share attributable to KTI services has increased, from about a third in 2002 to just over half in 2024. This growth has been led by IT and other information services and by software publishing (Figure 39). The IT and other information services industry has been the largest KTI industry by value added since 2006, growing from 17% of total KTI value added in that year to 32% in 2024. The pharmaceuticals industry has accounted for between 8% and 11% of the KTI industry total during this period, whereas motor vehicles, trailers, and semi-trailers manufacturing has steadily decreased from 13% in 2002 to 5% in 2024.

Figure 39. Industry share of U.S. total KTI value added, by selected industries: 2002–24



Note(s):
IT is information technology; KTI is knowledge and technology intensive; nec is not elsewhere classified. *Value added* is the value of goods and services (gross output) minus the cost of intermediate inputs (energy, materials, and purchased services). *Industry value added* is a measure of an industry's contribution to overall gross domestic product. KTI industries include high R&D-intensive and medium-high R&D-intensive industries based on a classification by the Organisation for Economic Co-operation and Development. The data have been crosswalked to the International Standard Industrial Classification, Revision 4.

Source(s):
S&P Global Market Intelligence, Comparative Industry Service special tabulations, April 2025.

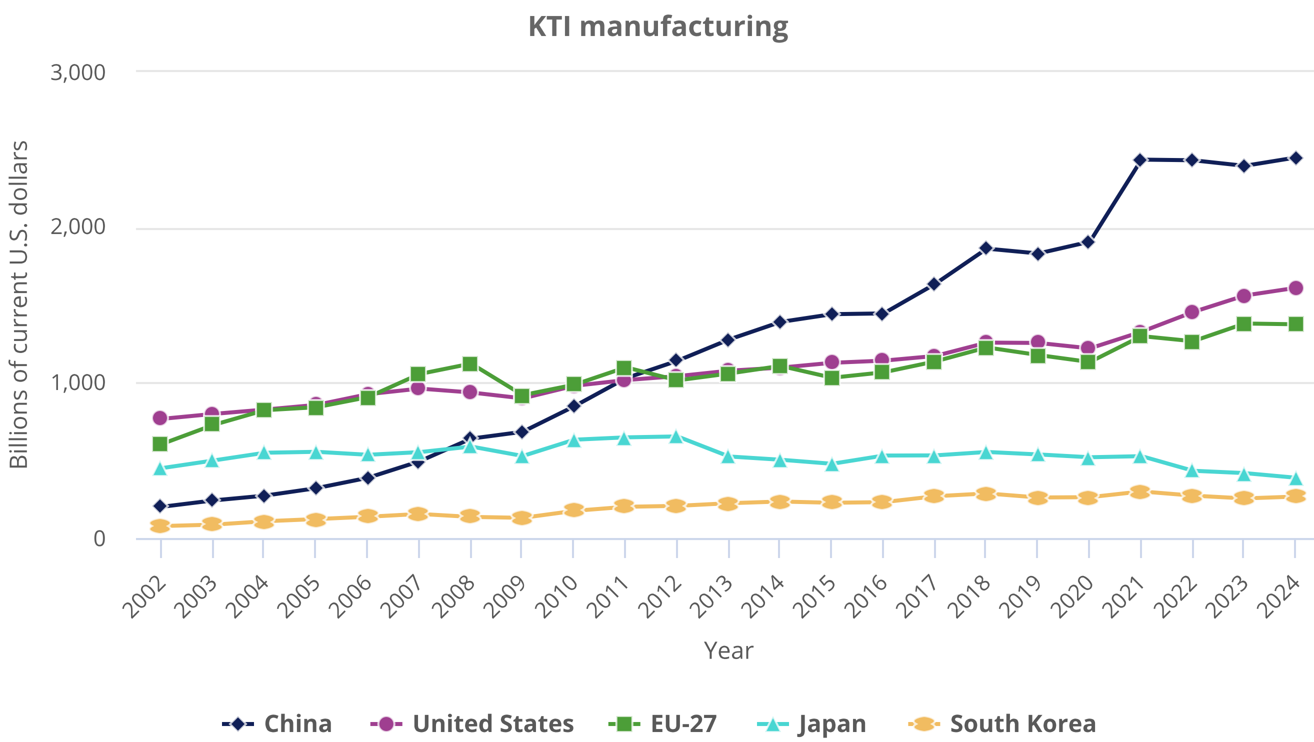
Indicators 2026: Translation

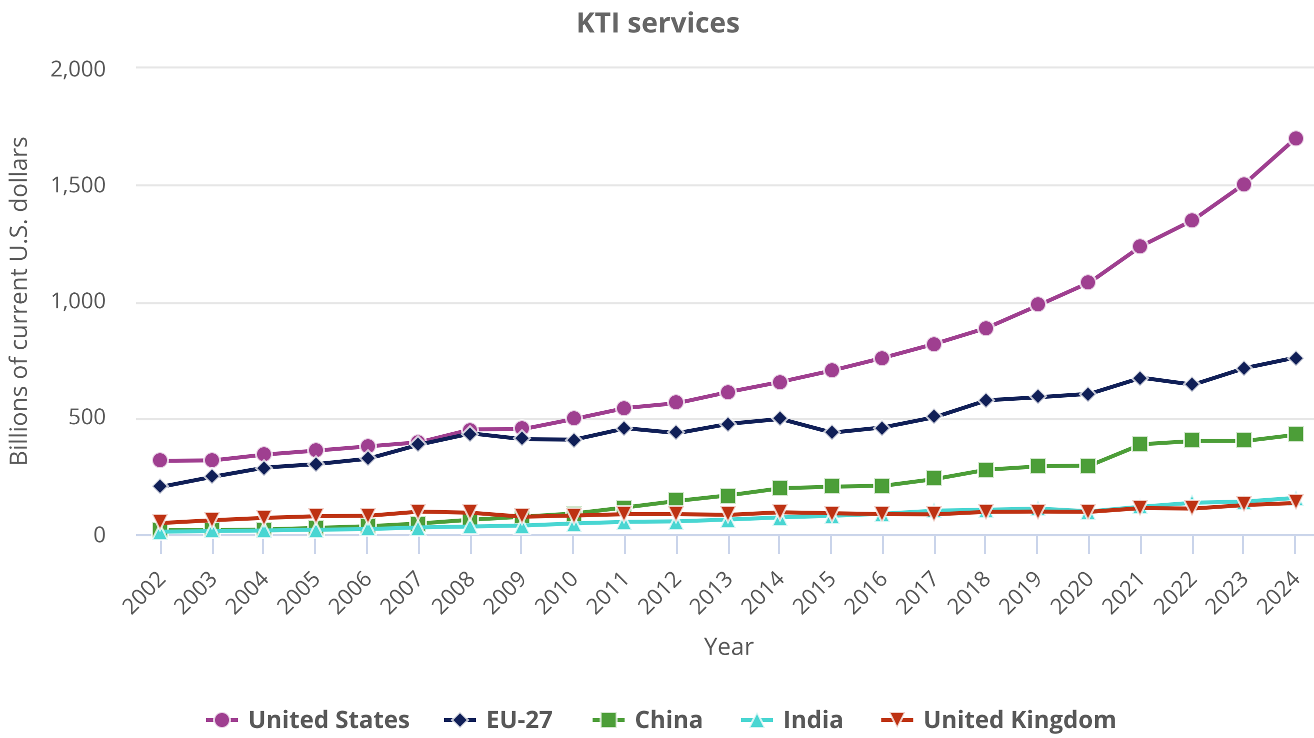
KTI Industries in the Global Economy

Value added of KTI industries worldwide totaled $11.7 trillion in 2024, a 4.2% increase from 2023. The United States, China, the EU-27, Japan, and South Korea together accounted for about 80% of global KTI value added in 2024. The United States and China were the top two producers of KTI output globally, with $3.3 trillion (28% of the world total) and $2.9 trillion (25%), respectively, followed by the EU-27, with $2.1 trillion (18%).

China is the world leader in KTI manufacturing, with $2.4 trillion in value added in 2024; by 2012, it had surpassed the United States and the EU-27 in KTI manufacturing and has since doubled its output (Figure 40). Even though China had the largest global share of overall KTI manufacturing value added in 2024, the United States had the largest share in four KTI industries: air and spacecraft and related machinery (51%), medical and dental instruments (35%), pharmaceuticals (including pharmaceutical biotechnology) (28%), and weapons and ammunitions (20%). For KTI services, the United States leads with $1.7 trillion in value added in 2024, accounting for a larger share of the global total (43%) than the EU-27 (19%) and China (11%) combined. India and the United Kingdom each had a comparatively larger global presence in KTI services—accounting for 4% and 3% of the world total, respectively—than they did in KTI manufacturing (2% each).

Figure 40. KTI industry value added for selected countries or economies: 2002–24





Note(s):
EU-27 is European Union. KTI is knowledge and technology intensive. *Value added* is the value of goods and services (gross output) minus the cost of intermediate inputs (energy, materials, and purchased services). KTI industries include high R&D-intensive and medium-high R&D-intensive industries based on a classification by the Organisation for Economic Co-operation and Development. KTI manufacturing industries include chemicals and chemical products; pharmaceuticals; weapons and ammunition; computer, electronic, and optical products; electrical equipment; machinery and equipment not elsewhere classified (nec); motor vehicles, trailers, and semi-trailers; air and spacecraft and related machinery; railroad, military vehicles, and transport nec; and medical and dental instruments. KTI services industries include information technology and other information services, software publishing, and scientific R&D.

Source(s):
S&P Global Market Intelligence, Comparative Industry Service special tabulations, April 2025.

Indicators 2026: Translation

Global Semiconductor Production

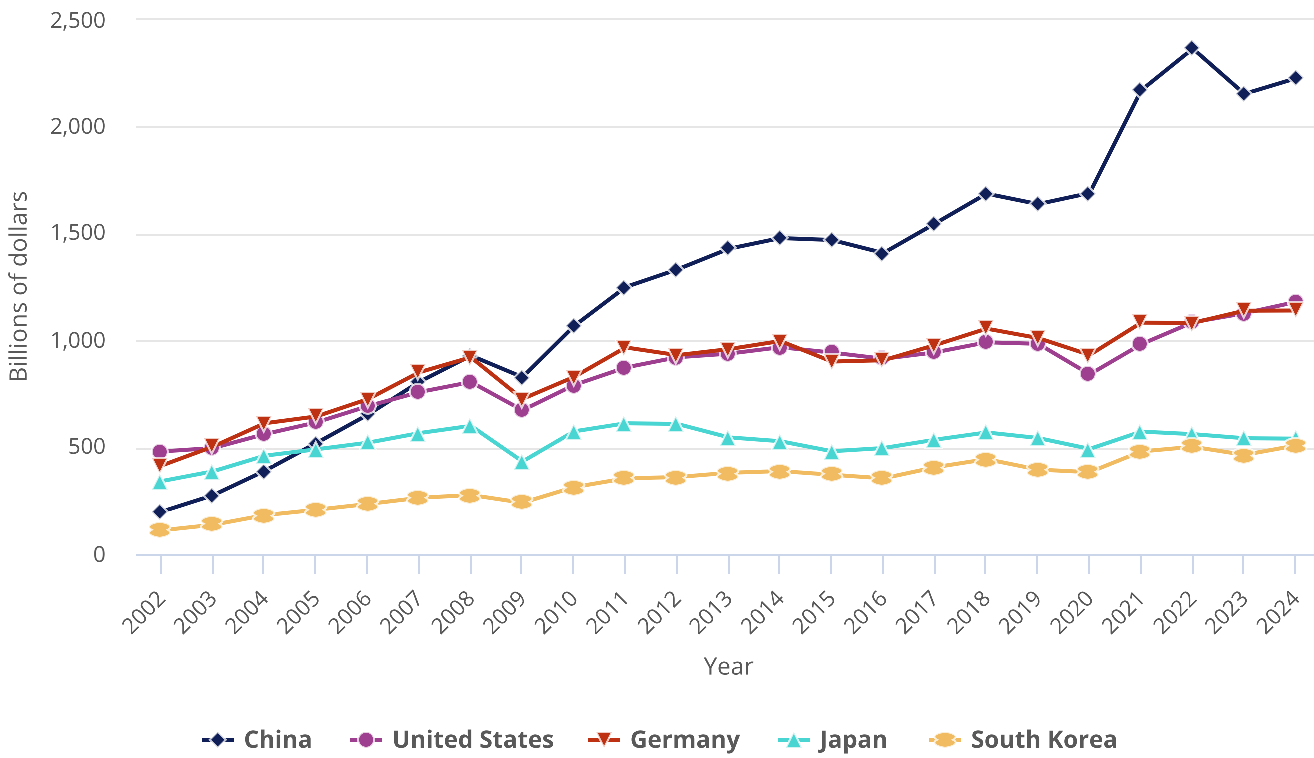
Semiconductors (also called computer chips or microchips) are key enabling components of many CETs. Semiconductor production occurs along global value chains that include R&D, engineering, and design; fabrication; and assembly, testing, and packing stages (CRS 2023). In 2002 and 2003, the United States and Japan together accounted for over half (53%) of value-added semiconductor production, with the EU-27 producing another 11%. Since 2002, China, Taiwan, and South Korea have substantially increased their shares of semiconductor production, while shares for the United States, Japan, and the EU-27 have significantly decreased. In 2024, just over half of global value-added semiconductor production occurred in China (30%) and Taiwan (22%), followed by the United States (19%) and South Korea (11%).

Trade in Knowledge- and Technology-Intensive Industries

KTI Manufacturing Exports

International trade is a key conduit for knowledge and technology spillovers, and exports are an indicator of an economy's competitiveness in the world market. Global KTI manufacturing goods exports reached $11.7 trillion in 2024, a 3% increase from 2023. China has been the largest exporter globally of KTI manufacturing goods since 2008 (Figure 41), with $2.2 trillion in exports in 2024, accounting for 19% of the world total. The United States and Germany were the next-largest KTI manufacturing exporters in 2024, with $1.2 trillion and $1.1 trillion in exports, respectively. By 2024, all major KTI manufacturing exporters except China and Japan exceeded their 2022 export levels.

Figure 41. Gross exports of KTI manufacturing industries for selected countries: 2002–24



Note(s):
KTI is knowledge and technology intensive. Data include trade for the following KTI industries: chemicals and chemical products; pharmaceuticals, medicinal chemical, and botanical products; computer, electronic, and optical products; electrical equipment; machinery and equipment not elsewhere classified (nec); motor vehicles, trailers, and semi-trailers; air and spacecraft and related machinery; weapons and ammunition; and other transport equipment (the latter comprises railway locomotives and rolling stock manufacturing and transport equipment nec and military equipment manufacturing).

Source(s):
S&P Global Market Intelligence, Comparative Industry Service special tabulations, April 2025.

Indicators 2026: Translation

The distribution of KTI manufacturing exports across industries differs substantially among the top KTI manufacturing exporters. Exporters from the computer, electronic, and optical products industry (which include computer chips or semiconductors) accounted for the largest shares of KTI manufacturing exports from China (47%), South Korea (42%), and the United States (26%) in 2024. Motor vehicles, trailers, and semi-trailers accounted for the largest share of KTI manufacturing exports from Japan (32%) and Germany (28%).

KTI Manufacturing Trade Balances

The U.S. trade deficit in KTI manufacturing goods has grown steadily over the last two decades, increasing from $155 billion in 2002 to $794 billion in 2024. Although the United States was the second-largest KTI manufacturing exporter in 2024, it was by far the largest importer; the difference between exports ($1.2 trillion) and imports ($2.0 trillion) resulted in the United States experiencing the largest trade deficit among the world's major economies. In contrast, Germany, which had a similar level of KTI manufacturing exports ($1.1 trillion) to the United States, had a trade surplus of $338 billion in 2024 due to its much lower level of imports. China, the world's largest KTI manufacturing exporter, has had a KTI manufacturing trade surplus above $1 trillion since 2021 and reached a high of $1.4 trillion in 2024.

Conclusion

Over the past 25 years, the U.S. science and engineering enterprise has been characterized by three trends: the business sector's dominant role in funding and performing R&D, the concentration of innovation in information technologies and CET areas, and China's emergence as a competitor. In 2024, China was estimated to have surpassed the United States for the first time as the world's largest performer of R&D, according to the latest data from the OECD after adjustment for international comparability. The United States remains among the most R&D-intensive economies in the world, and S&E research articles by U.S. authors and patents held by U.S. inventors are among the most highly cited globally, which is a measure of scientific impact.

The U.S. S&E enterprise is distinguished by private-sector funding and performance, particularly in experimental development. The United States enjoys comparative advantages globally in highly cited publications and patents, venture capital–backed innovation, and KTI services, where U.S. firms dominate global trade. U.S. inventors' patents in CET areas are among the most highly cited globally. The United States has the most robust venture capital investment globally. Although China leads KTI manufacturing trade overall, the United States retained the largest share of value-added production in 2024 in four industries: aerospace machinery, medical instruments, pharmaceuticals, and weapons.

The STEM workforce grew faster than the non-STEM workforce between 2014 and 2024 and now accounts for roughly 26% of total domestic employment. STEM workers experienced lower unemployment and higher median earnings than workers in other occupations. U.S. institutions expanded S&E degree output at all levels over the past decade, with especially rapid growth in computer and information sciences, and awarded the second-highest number of S&E doctorates globally in 2022. Temporary visa holders earned more than half of U.S. S&E doctorates in 2024 in computer and information sciences, engineering, and mathematics and statistics, and longitudinal data confirm that most remain in the country after graduation and contribute to the U.S. STEM workforce.

Average scores on national mathematics and science assessments for K–12 students have declined from their pre-pandemic levels, and U.S. eighth graders performed at or below the international average on science, mathematics, and computer and information literacy assessments in 2023. Because high school mathematics achievement is associated with STEM degree completion, these educational challenges may constrain the labor supply for R&D-intensive industries, including in CET areas, in which STEM workers are highly represented.

Glossary

Definitions

Applied research: Original investigation undertaken to acquire new knowledge. It is directed primarily toward a specific, practical aim or objective (OECD 2015).

Basic research: Experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without any particular application or use in view (OECD 2015).

Business sector: Consists of both private enterprises (regardless of whether they are publicly listed or traded) and government-controlled enterprises that are engaged in market production of goods or services at economically significant prices. Nonprofit entities, such as trade associations and industry-controlled research institutes, are also classified in the business sector (OECD 2015).

European Union (EU-27): The twenty-seven member nations of the European Union: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, and Sweden.

Experimental development: Systematic work, drawing on knowledge gained from research and practical experience and producing additional knowledge, which is directed to producing new products or processes or to improving existing products or processes (OECD 2015).

Foreign-born workers: Individuals born outside of the United States, regardless of citizenship. Foreign-born workers can be U.S. citizens or permanent residents.

Full-time, year-round workers: Workers who were employed at least 50 weeks in the preceding year (year-round workers) and worked at least 35 hours per week during that year (full-time workers).

General-purpose technology (GPT): Technologies that are widely used, are capable of ongoing technical improvement, and enable applications in other sectors (Bresnahan 2010).

Government sector: Consists of all federal, state, and local governments, except those that provide higher education services, and all nonmarket, nonprofit institutions controlled by government entities that are not part of the higher education sector. This sector excludes public corporations, even when all of the equity of such corporations is owned by government entities. Public enterprises are included in the business sector (see *Business sector*) (OECD 2015).

Gross domestic expenditures on R&D (GERD): Defined by OECD as the total expenditure (current and capital) on R&D carried out by all resident companies, research institutes, and university and government laboratories in a country. It includes R&D funded from abroad but excludes domestic funds for R&D performed outside the domestic economy (OECD 2015).

Gross domestic product (GDP): The market value of all final goods and services produced within a country in a given period.

Higher education sector: Consists of all universities, colleges of technology, and other institutions providing formal tertiary education programs, whatever their source of finance or legal status, as well as all research institutes, centers, experimental stations, and clinics that have their R&D activities under the direct control of, or that are administered by, tertiary education institutions (OECD 2015).

Highly cited article (HCA): An HCA ratio provides an indication of scientific impact (Waltman, van Eck, and Wouters 2013). The HCA ratio for a country or other geographic location is calculated as the share of all articles published in a given year by authors with institutional addresses within that location that fall within the top 1% by citation count of all articles published that year, measured for each research field. The HCA ratio is indexed to 1.00, so a location whose authors produce HCAs at the expected (i.e., global average) rate has an HCA ratio of 1.00—that is, 1% of the location's articles are among the top 1% of the world's highly cited articles. A location with an HCA ratio greater than 1.00 is producing a disproportionately high level of articles with exceptional scientific impact, whereas a location whose authors produce relatively fewer influential articles will have an HCA ratio below 1.00.

Highly cited patents: A ratio that represents the percentage of patents from inventors in a region, country, or economy that are in the top 1% of all cited patents, compared with the number of patents from that region, country, or economy. For example, if 1% of AI patents from the United States are in the top 1% of AI patents globally, then the highly cited patent index for the United States is 1.00. If the highly cited patent index for a location is 0.75, then 0.75% of that location's patents are in the top 1% globally.

Innovation: A new or improved product or process (or combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (*product*) or brought into use by the unit (*process*). The *unit* is a generic term to describe the actor responsible for innovations. It refers to any institutional unit in any sector, including households and their individual members, according to the *Oslo Manual 2018* (OECD, Eurostat 2018).

Intangibles or intellectual property products (IPPs): IPPs are the result of R&D or innovation leading to knowledge that the developers can market or use to their own benefit in production because use of the knowledge is restricted by means of legal or other protection. They include R&D; mineral exploration and evaluation; computer software and databases; entertainment, literary, and artistic originals; and other IPPs.

Intellectual property (IP): Creations of the mind including inventions; literary and artistic works; and symbols, names, images, and designs used in commerce. Industrial IP includes patents, utility models, trademarks, and industrial designs. IP covered by copyright includes literary, artistic, and musical works (WIPO 2020).

Internationally mobile students: Students who have physically crossed an international border to enroll with the objective of graduating with a degree in the country of destination. Students enrolled in short-term for-credit programs and exchange programs are excluded (UNESCO, UIS 2025).

Invention: Any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof (USPTO 2020).

Knowledge- and technology-intensive (KTI) industries: Industries classified by the OECD as high and medium-high R&D intensive industries. OECD defines industry R&D intensity as the ratio of an industry's business R&D expenditures to its value added (OECD 2016). KTI industries in this report include 10 manufacturing and 3 services industries from the International Standard Industrial Classification of All Economic Activities, Revision 4 (ISIC Rev.4). Manufacturing industries include air and spacecraft and related machinery (ISIC Rev.4 industry code 303); pharmaceuticals (21); computer, electronic, and optical products (26); weapons and ammunition (252); motor vehicles, trailers, and semi-trailers (29); medical and dental instruments (325); machinery and equipment not elsewhere classified (28); chemicals and chemical products (20); electrical equipment (27); and railroad, military vehicles, and transport not elsewhere classified (302, 304, 309). Services industries include scientific R&D (72), software publishing (582), and IT and other information services (62–63).

Patent and Trademark Office (USPTO) patent: As defined by the USPTO, a property right granted by the U.S. government to an inventor "to exclude others from making, using, offering for sale, or selling the invention throughout the United States or importing the invention into the United States" for a limited time in exchange for public disclosure of the invention when the patent is granted (USPTO 2025a).

Priority patent families: These are original patents that have been issued by any international jurisdiction, adjusted to count only the first issuance of a series or family of related patents. The unit of measurement is a patent family that shares a single original invention in common. All subsequent patents in a family refer to the first patent filed, or *priority patent*, and the indicator provides an unduplicated count of original or priority patents in any individual jurisdiction. The data used in this report are from the European Patent Office's PATSTAT database (EPO 2025).

Private nonprofit sector: Consists of nonmarket, private nonprofit institutions serving households. This sector excludes those nonprofit organizations mainly rendering services to enterprises, primarily serving government, entirely or mainly financed and controlled by the government, offering higher education services or controlled by institutes of higher education (OECD 2015).

Purchasing power parity (PPP): The price of a common basket of goods and services in each participating economy, measuring what an economy's local currency can buy in another economy (World Bank 2025). PPPs convert different currencies to a common currency while adjusting for differences in price levels between economies; thus, they enable direct comparisons of R&D expenditures across countries.

Research and (experimental) development (R&D): Creative and systematic work undertaken to increase the stock of knowledge—including knowledge of humankind, culture, and society—and its use to devise new applications of available knowledge (OECD 2015).

Research and development (R&D) funding (funders): Expenditures (or those that use expenditures) to pay the costs of R&D performance. For example, the federal government provides funding to laboratories at higher education institutions to perform R&D at the laboratories. R&D funders may differ from R&D performers (see *R&D performance*).

Research and development (R&D) intensity: A measure of R&D expenditures relative to size, production, financial, or other characteristics for a given R&D-performing unit (e.g., country, sector, or company). Examples include R&D-to–gross domestic product (GDP) ratio used in R&D cross-national comparisons and R&D-to–value-added output ratio used to classify industries as knowledge and technology intensive.

R&D-intensive industries: NCSES industry classification based on level of R&D intensity indicated in the 2023 Business Enterprise Research and Development (BERD) Survey. R&D-intensive industries include 7 manufacturing industries and 6 services industries. Manufacturing industries include Pharmaceuticals and medicines (NAICS 3254), Semiconductor machinery (NAICS 333242), Communications equipment (NAICS 3342), Semiconductor and other electronic components (NAICS 3344), Navigational, measuring, electromedical, and control instruments (NAICS 3345), Other computer and electronic products (NAICS 3341, 3343, 3346), and Aerospace products and parts (NAICS 3364). Services industries include Software publishers (NAICS 5132), Data processing, hosting, and related services (NAICS 518), Other information services (NAICS 5121, 5122, 5162, 51921, 51929), Computer system design and related services (NAICS 5415), Scientific research and development services (NAICS 5417), and Other professional, scientific, and technical services (NAICS 5411, 5412, 5414, 5416, 5418, 5419).

Research and development (R&D) performance (performers): Intramural expenditures (or those that use intramural expenditures) to conduct R&D. For example, laboratories at higher education institutions perform R&D with funding from the federal government. R&D performers may differ from R&D funders (see *R&D funding*).

Science and engineering (S&E) fields (degrees): Degrees awarded in the following fields: agricultural sciences and natural resources; biological and biomedical sciences; computer and information sciences; engineering; geosciences, atmospheric sciences, and ocean sciences; mathematics and statistics; multidisciplinary and interdisciplinary sciences; physical sciences; psychology; and social sciences. At the doctoral level only, health sciences are also included in S&E fields of study because at this level these fields are more likely to be research oriented rather than practitioner oriented.

Science and engineering (S&E) occupations: Occupations in the following five major categories: (1) computer and mathematical scientists; (2) biological, agricultural, and environmental life scientists; (3) physical scientists; (4) social scientists; and (5) engineers.

S&E-related occupations: These occupations require science and technology expertise but are not part of the five major categories of the S&E occupations. S&E-related occupations include these four minor occupations: (1) health, (2) S&E managers, (3) S&E precollege teachers, and (4) technologists and technicians.

Science, technology, engineering, and mathematics (STEM) occupations: A subset of the U.S. workforce made up of S&E, S&E-related, and STEM middle-skill occupations (see *S&E occupations*, *S&E-related occupations*, and *STEM middle-skill occupations*).

STEM middle-skill occupations: A range of occupations that require a high level of STEM expertise to perform their core duties, although these occupations do not require a bachelor's degree for entry. STEM middle-skill occupations are primarily in health care; construction; installation, maintenance, and repair; and production.

Trademark: A word, phrase, symbol, or design, or a combination thereof, that identifies and distinguishes the source of the goods of one party from those of others. In this report, trademark refers to both goods and services.

Utility patent: Intellectual property protection for a potentially useful, previously unknown, and nonobvious invention.

Value-added: Value added is a net measure of output; it is the difference between the value of goods and services (gross output) and the cost of intermediate inputs that were used in production, including energy, materials, and services. Industry value added is a measure of an industry's contribution to overall gross domestic product.

Key to Acronyms and Abbreviations

ABS: Annual Business Survey

ACS: American Community Survey

AI: artificial intelligence

Analytical Business Enterprise Research and Development: ANBERD

AP: Advanced Placement

BEA: Bureau of Economic Analysis

BLS: Bureau of Labor Statistics

CET: critical and emerging technology

CRADA: cooperative research and development agreement

DHS: Department of Homeland Security

DOD: Department of Defense

DOE: Department of Energy

EPO: European Patent Office

EU-27: European Union

GDP: gross domestic product

GPT: general-purpose technology

GSS: Survey of Graduate Students and Postdoctorates in Science and Engineering

HCA: highly cited article

HHS: Department of Health and Human Services

HSLS: High School Longitudinal Study

ICE: Immigration and Customs Enforcement

ICILS: International Computer and Information Literacy Study

IP: intellectual property

IPEDS: Integrated Postsecondary Education Data System

IPP: intellectual property product

ISIC: International Standard Industrial Classification of All Economic Activities

IT: information technology

KTI: knowledge and technology intensive

MSTI: Main Science and Technology Indicators

NAEP: National Assessment of Educational Progress

NAICS: North American Industry Classification System

NASA: National Aeronautics and Space Administration

NCES: National Center for Education Statistics

NCSES: National Center for Science and Engineering Statistics

NIH: National Institutes of Health

NSB: National Science Board

NSCG: National Survey of College Graduates

NSF: National Science Foundation

NSLP: National School Lunch Program

NSTC: National Science and Technology Council

OECD: Organisation for Economic Co-operation and Development

OPT: optional practical training

OSS: open-source software

PPP: purchasing power parity

QIST: quantum information science and technology

R&D: research and (experimental) development

S&E: science and engineering

SEH: science, engineering, and health

SES: socioeconomic status

SEVIS: Student and Exchange Visitor Information System

STATT: Statistics Access for Technology Transfer

STEM: science, technology, engineering, and mathematics

STI: science, technology, and innovation

TFP: total factor productivity

TIMSS: Trends in International Mathematics and Science Study

USDA: Department of Agriculture

USPTO: Patent and Trademark Office

VC: venture capital

WIPO: World Intellectual Property Organization

References

Aizcorbe AM, Moylan CE, Robbins CA. 2009. Toward Better Measurement of Innovation and Intangibles. Survey of Current Business. *BEA Briefing* June:10–23. Washington, DC: Bureau of Economic Analysis, Department of Commerce.

Antolin-Diaz J, Surico P. 2025. The Long-Run Effects of Government Spending. *American Economic Review* 115(7):2376–413. Available at https://www.aeaweb.org/articles?id=10.1257/aer.20231278. Accessed 16 April 2026.

Arora A, Belenzon S, Ferracuti E, Nagar J. 2024. *Revisiting the Private Value of Scientific Inventions*. Working Paper No. 33056. Cambridge, MA: National Bureau of Economic Research. Available at https://www.nber.org/system/files/working_papers/w33056/w33056.pdf. Accessed 16 April 2026.

Arora A, Belenzon S, Sheer L. 2021. Knowledge Spillovers and Corporate Investment in Scientific Research. *American Economic Review* 111(3):871–98. Available at https://www.aeaweb.org/articles/pdf/doi/10.1257/aer.20171742. Accessed 16 April 2026.

AUTM. Statistics Access for Technology Transfer (STATT) Database, Version 4.2. Accessed July 2025.

Azoulay P, Graff Zivin J, Li D, Sampat B. 2019. Public R&D Investments and Private-sector Patenting: Evidence from NIH Funding Rules. *Review of Economic Studies* 86:117–52. Available at https://doi.org/10.1093/restud/rdy034. Accessed 16 April 2026.

Biden J. 2022. Executive Order on Advancing Biotechnology and Biomanufacturing Innovation for a Sustainable, Safe, and Secure American Bioeconomy. September 12. Available at https://bidenwhitehouse.archives.gov/briefing-room/presidential-actions/2022/09/12/executive-order-on-advancing-biotechnology-and-biomanufacturing-innovation-for-a-sustainable-safe-and-secure-american-bioeconomy/. Accessed 27 August 2025.

Bresnahan T. 2010. General Purpose Technologies. *In* Hall BH, Rosenberg N, editors, *Economics of Innovation,* Vol. 2, pp. 761–91. Elsevier.

Bureau of Economic Analysis (BEA). 2024. *U.S. International Economic Accounts: Concepts and Methods*. Available at https://www.bea.gov/resources/methodologies/us-international-economic-accounts-concepts-methods. Accessed 29 September 2025.

Bureau of Economic Analysis (BEA). 2025a. *International Trade in Goods and Services: U.S. Trade in Goods and Services by Selected Countries and Areas, 1999–Present.* Washington, DC: Department of Commerce. Available at https://www.bea.gov/data/intl-trade-investment/international-trade-goods-and-services. Accessed 06 January 2026.

Bureau of Economic Analysis (BEA). 2025b. *International Data*. Table 2.1. U.S. Trade in Services, by Type of Service. Available at
https://apps.bea.gov/iTable/?reqid=62&step=9&isuri=1&6210=4#eyJhcHBpZCI6NjIsInN0Z
XBzIjpbMSw5LDZdLCJkYXRhIjpbWyJQcm9kdWN0IiwiNCJdL
FsiVGFibGVMaXN0IiwiMjQ1Il1dfQ==. Accessed 12 September 2025.

Bureau of Labor Statistics (BLS). 2025. *Occupational Employment Projections Data, Special Tabulations of 2024–34 Employment Projections.* Available at https://www.bls.gov/emp/data/occupational-data.htm. Accessed 25 November 2025.

Bureau of Labor Statistics (BLS). 2026. Office of Productivity and Technology. *Productivity.* Available at https://www.bls.gov/productivity/. Accessed 1 April 2026.

Census Bureau. 2014–24. *American Community Survey, 1-Year PUMS, 2013–19, 2021–23. Public Use Microdata Sample.* Available at https://www.census.gov/programs-surveys/acs/microdata/access.html. Accessed 5 November 2024.

Census Bureau. 2025. *Annual Estimates of the Resident Population by Sex, Age, Race, and Hispanic Origin for the United States: April 1, 2020 to July 1, 2024 (NC-EST2024-ASR6H)*. Available at https://www.census.gov/data/tables/time-series/demo/popest/2020s-national-detail.html. Accessed 1 February 2026.

Coe DT, Helpman E. 1995. International R&D Spillovers. *European Economic Review* 39(5):859–87. Available at https://doi.org/10.1016/0014-2921(94)00100-E. Accessed 16 December 2025.

Coe DT, Helpman E, Hoffmaister AW. 2009. International R&D Spillovers and Institutions. *European Economic Review* 53(7):723–41. Available at https://doi.org/10.1016/j.euroecorev.2009.02.005. Accessed 16 December 2025.

Congress. 2003. *21st Century Nanotechnology Research and Development Act*. Public Law 108-153. 108th Cong. Available at https://www.congress.gov/bill/108th-congress/senate-bill/189. Accessed 22 December 2025.

Congress. 2011. *America COMPETES Reauthorization Act of 2010*. Public Law 111-358. 111th Cong. Available at https://www.congress.gov/bill/111th-congress/house-bill/5116. Accessed 22 December 2025.

Congress. 2018. *National Quantum Initiative Act of 2018*. Public Law 115-368. 115th Cong. Available at https://www.congress.gov/bill/115th-congress/house-bill/6227. Accessed 22 December 2025.

Congress. 2021. *National Artificial Intelligence Initiative Act of 2020 (as Division E of the William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021).* Public Law 116-283, Division E. 116th Cong. Available at https://www.congress.gov/bill/116th-congress/house-bill/6216. Accessed 22 December 2025.

Congress. 2022. *CHIPS and Science Act of 2022*. Public Law 117-167. 117th Cong. Available at https://www.congress.gov/bill/117th-congress/house-bill/4346. Accessed 22 December 2025.

Congressional Research Service (CRS). 2023. *Semiconductors and the Semiconductor Industry.* Washington, DC: CRS.

Congressional Research Service (CRS). 2024. *Made in China 2025 and Industrial Policies: Issues for Congress.* IF10964. Washington, DC: Library of Congress. Available at https://www.congress.gov/crs-product/IF10964. Accessed 16 December 2025.

Congressional Research Service (CRS). 2025a. *Productivity Growth: Trends and Policy Issues.* R48695. Washington, DC: Library of Congress. Available at https://www.congress.gov/crs-product/R48695. Accessed 16 December 2025.

Congressional Research Service (CRS). 2025b. *U.S.-China Trade Relations.* IF11284. Washington, DC: Library of Congress. Available at https://www.congress.gov/crs-product/IF11284. Accessed 16 December 2025.

European Patent Office (EPO). 2025. *PATSTAT Database.* Available at https://data.epo.org/expert-services/. Accessed 30 September 2025.

Fieldhouse AJ, Mertens K. 2023. *The Returns to Government R&D: Evidence from U.S. Appropriations Shocks.* Working Paper 2305. Federal Reserve Bank of Dallas. Available at https://www.dallasfed.org/~/media/documents/research/papers/2023/wp2305r1.pdf. Accessed 16 December 2025.

Foster-McGregor N, Mohnen P. 2023. *The Factors That Shape a Country's Ability to Benefit from International R&D Spillovers*. ERC Insight Paper. Coventry and Birmingham, United Kingdom: Enterprise Research Center. Available at https://www.enterpriseresearch.ac.uk/wp-content/uploads/2023/09/ERC-Insight-The-factors-that-shape-a-countrys-ability-to-benefit-from-international-RD-spillovers-Foster-McGregor-Mohnen.pdf. Accessed 16 April 2026.

Gross DP, Sampat BN. 2023. America, Jump-Started: World War II R&D and the Takeoff of the US Innovation System. *American Economic Review* 113(12):3323–56. Available at https://www.aeaweb.org/articles?id=10.1257/aer.20221365. Accessed 16 April 2026.

Kantor S, Whalley A. 2025. Moonshot: Public R&D and Growth. *American Economic Review* 115(9):2891–25. Available at https://www.aeaweb.org/articles?id=10.1257/aer.20220540. Accessed 16 April 2026.

Kratsios M. 2025. *ICYMI: President Trump Outlines OSTP's Goals and Priorities*. Available at https://www.whitehouse.gov/articles/2025/03/icymi-president-trump-outlines-ostps-goals-and-priorities/. Accessed 27 August 2025.

Layne R. 2024. Open Source Software: The $9 Trillion Resource Companies Take for Granted. *Harvard Business School Working Knowledge* March 22. Available at https://www.library.hbs.edu/working-knowledge/open-source-software-the-nine-trillion-resource-companies-take-for-granted. Accessed 29 September 2025.

Liverpool L. 2023. AI Intensifies Fight Against Paper Mills. *Nature* 618(7964):222–23.

Ministry of Education, Government of India. *All India Survey on Higher Education* (various years). Available at https://aishe.gov.in/aishe-final-report/. Accessed 9 January 2026.

Ministry of Education, People's Republic of China. *Educational Statistics in 2022*. Available at http://en.moe.gov.cn/. Accessed 9 January 2026.

Moretti E, Steinwender C, Van Reenen J. 2019. *The Intellectual Spoils of War? Defense R&D, Productivity and International Spillovers.* NBER Working Paper No. 26483. Cambridge, MA: National Bureau of Economic Research. Available at https://www.nber.org/papers/w26483. Accessed 16 December 2025.

Mulvaney M, Kratsios M. 2018. *FY 2020 Administration Research and Development Budget Priorities.* Memorandum M-18-22. Washington, DC: Executive Office of the President. Available at https://trumpwhitehouse.archives.gov/wp-content/uploads/2018/07/M-18-22.pdf. Accessed 22 December 2025.

Myers K, Lanahan L. 2022. Estimating Spillovers from Publicly Funded R&D: Evidence from the U.S. Department of Energy. *American Economic Review* 112(7):2393–423.

Nasdaq, Inc. 2026. *Stock Screener.* Available at https://www.nasdaq.com/market-activity/stocks/screener. Accessed 20 April 2026.

National Bureau of Statistics of China. *China Statistical Yearbook* (various years). Available at https://www.stats.gov.cn/english/Statisticaldata/yearbook/. Accessed 29 September 2025.

National Center for Education Statistics (NCES). 2024a. *High School Longitudinal Study of 2009 (HSLS:09) Postsecondary Education Administrative Records Collection (PEAR).* Available at https://nces.ed.gov/surveys/hsls09/. Accessed 10 April 2026.

National Center for Education Statistics (NCES). 2024b. *International Computer and Information Literacy Study (ICILS): ICILS 2023 U.S. Results*. Available at https://nces.ed.gov/surveys/icils/icils2023/international.asp. Accessed 9 June 2025.

National Center for Education Statistics (NCES). 2024c. *TIMSS 2023 U.S. Highlights Web Report.* NCES 2024-184. Washington, DC. Available at https://nces.ed.gov/timss/results23/index.asp. Retrieved 17 January 2025.

National Center for Education Statistics (NCES). 2025. *Integrated Postsecondary Education Data System (IPEDS) Completions Survey: 2012–24.* Available at https://nces.ed.gov/ipeds/use-the-data. Accessed 1 December 2025.

National Center for Science and Engineering Statistics (NCSES). 2024a. *Business R&D Performance in the United States Nears $700 Billion in 2022*. NSF 24-334. Alexandria, VA: U.S. National Science Foundation. Available at https://ncses.nsf.gov/pubs/nsf24334.

National Center for Science and Engineering Statistics (NCSES). 2024b. *Microbusinesses Performed $5.7 Billion of R&D in the United States in 2022*. NSF 25-302. Alexandria, VA: U.S. National Science Foundation. Available at https://ncses.nsf.gov/pubs/nsf25302.

National Center for Science and Engineering Statistics (NCSES). 2025a. *Annual Business Survey: 2023* (*Data Year 2022*) (*2023 ABS: Date Year 2022*). NSF 25-303. Alexandria, VA: U.S. National Science Foundation. Available at https://ncses.nsf.gov/surveys/annual-business-survey/2023.

National Center for Science and Engineering Statistics (NCSES). 2025b. *Business Enterprise Research and Development: 2023* (*BERD 2023*). NSF 25-354. Alexandria, VA: U.S. National Science Foundation. Available at https://ncses.nsf.gov/surveys/business-enterprise-research-development/2023.

National Center for Science and Engineering Statistics (NCSES). 2025c. *Doctorate Recipients from U.S. Universities: 2024 Data Tables* (*SED 2024*). NSF 25-349. Alexandria, VA: U.S. National Science Foundation. Available at https://ncses.nsf.gov/pubs/nsf25349.

National Center for Science and Engineering Statistics (NCSES). 2025d. *Federal Funds for Research and Development: Fiscal Years 2023–24* (*Federal Funds 2023–24*). NSF 25-328. Alexandria, VA: U.S. National Science Foundation. Available at https://ncses.nsf.gov/surveys/federal-funds-research-development/2023-2024/.

National Center for Science and Engineering Statistics (NCSES). 2025e. *Higher Education Research and Development: Fiscal Year 2024* (*HERD 2024*). NSF 26-304. Alexandria, VA: U.S. National Science Foundation. Available at https://ncses.nsf.gov/surveys/higher-education-research-development/2024.

National Center for Science and Engineering Statistics (NCSES). 2025f. *National Survey of College Graduates: 2023* (*NSCG 2023*). NSF 25-322. Alexandria, VA: U.S. National Science Foundation. Available at https://ncses.nsf.gov/surveys/national-survey-college-graduates/2023.

National Center for Science and Engineering Statistics (NCSES). 2025g. Special tabulations by Science-Metrix of Elsevier's Scopus abstract and citation database. Alexandria, VA: U.S. National Science Foundation.

National Center for Science and Engineering Statistics (NCSES). 2025h. Special tabulations of the 1990–24 main National Assessment of Educational Progress (NAEP) mathematics assessments, National Center for Education Statistics (NCES). Alexandria, VA: U.S. National Science Foundation.

National Center for Science and Engineering Statistics (NCSES). 2025i. Special tabulations of the 1990–24 main National Assessment of Educational Progress (NAEP) science assessments, National Center for Education Statistics (NCES). Alexandria, VA: U.S. National Science Foundation.

National Center for Science and Engineering Statistics (NCSES). 2025j. Special tabulations of 2025 Student and Exchange Visitor System (SEVIS) database, Department of Homeland Security, Immigration and Customs Enforcement (DHS, ICE). Alexandria, VA: U.S. National Science Foundation.

National Center for Science and Engineering Statistics (NCSES). 2025k. Special tabulations by Science-Metrix of USPTO PatentsView. Alexandria, VA: U.S. National Science Foundation.

National Center for Science and Engineering Statistics (NCSES). 2025l. *Survey of Doctorate Recipients, 2023* (*SDR 2023*). NSF 25-321. Alexandria, VA: U.S. National Science Foundation. Available at https://ncses.nsf.gov/surveys/doctorate-recipients/2023.

National Center for Science and Engineering Statistics (NCSES). 2026a. *Federal Funds for Research and Development: Fiscal Years 2024–25* (*Federal Funds 2024–25*). NSF 26-316. Alexandria, VA: U.S. National Science Foundation. Available at https://ncses.nsf.gov/surveys/federal-funds-research-development/2024-2025/.

National Center for Science and Engineering Statistics (NCSES). 2026b. *National Patterns of R&D Resources: 2023–24 Data Update* (*National Patterns 2023–24*). NSF 26-313. Alexandria, VA: U.S. National Science Foundation. Available at https://ncses.nsf.gov/data-collections/national-patterns/2023-2024.

National Center for Science and Engineering Statistics (NCSES). 2026c. *Survey of Graduate Students and Postdoctorates in Science and Engineering: Fall 2024* (*GSS 2024*). NSF 26-307. Alexandria, VA: U.S. National Science Foundation. Available at https://ncses.nsf.gov/surveys/graduate-students-postdoctorates-s-e/2024.

National Center for Science and Engineering Statistics (NCSES). 2026d. *U.S. R&D Totaled $937 Billion in 2023; Estimate for 2024 Indicates Further Increase to $988 Billion.* NSF 26-314. Alexandria, VA: U.S. National Science Foundation. Available at https://ncses.nsf.gov/pubs/nsf26314.

National Nanotechnology Coordination Office (NNCO). 2024. *NNI Supplement to the President's 2025 Budget*. Washington, DC: National Science and Technology Council. Available at https://www.nano.gov/2025BudgetSupplement/. Accessed 22 December 2025.

National Quantum Coordination Office (NQCO). 2024. *National Quantum Initiative Supplement to the President's FY 2025 Budget*. Washington, DC: Executive Office of the President. Available at https://www.quantum.gov/wp-content/uploads/2024/12/NQI-Annual-Report-FY2025.pdf. Accessed 22 December 2025.

National Science and Technology Council (NSTC). 2020a. *National Strategy for Critical and Emerging Technologies*. Washington, DC: Executive Office of the President. Available at https://trumpwhitehouse.archives.gov/wp-content/uploads/2020/10/National-Strategy-for-CET.pdf. Accessed 22 December 2025.

National Science and Technology Council (NSTC). 2020b. *NSTC*. Washington, DC: Executive Office of the President. Available at https://trumpwhitehouse.archives.gov/ostp/nstc/. Accessed 22 December 2025.

National Science and Technology Council (NSTC). 2024. *Critical and Emerging Technologies List Update*. Washington, DC: Executive Office of the President. Available at https://bidenwhitehouse.archives.gov/wp-content/uploads/2024/02/Critical-and-Emerging-Technologies-List-2024-Update.pdf. Accessed 22 December 2025.

National Science and Technology Council (NSTC). 2025. *National Strategy on Microelectronics Research.* Washington, DC: NSTC, Office of Science and Technology Policy. Available at https://www.whitehouse.gov/wp-content/uploads/2025/03/Amended-National-Strategy-on-Microelectronics-Research.pdf. Accessed 25 September 2025.

National Science Board (NSB), National Science Foundation. 2000. *Science and Engineering Indicators 2000*. NSB-00-1. Arlington, VA: National Science Foundation.

National Science Board (NSB), National Science Foundation. 2002. *Science and Engineering Indicators 2002*. NSB-02-1. Arlington, VA: National Science Foundation.

National Science Board (NSB), National Science Foundation. 2021. The STEM Labor Force of Today: Scientists, Engineers and Skilled Technical Workers. *Science and Engineering Indicators 2022.* NSB-2021-2. Alexandria, VA. Available at https://ncses.nsf.gov/pubs/nsb20212/.

National Science Board (NSB), National Science Foundation. 2023. Publications Output: U.S. Trends and International Comparisons. *Science and Engineering Indicators 2024*. NSB-2023-33. Alexandria, VA. Available at https://ncses.nsf.gov/pubs/nsb202333/.

National Science Board (NSB), National Science Foundation. 2024. Invention, Knowledge Transfer, and Innovation. *Science and Engineering Indicators 2024*. NSB-2024-1. Alexandria, VA. Available at https://ncses.nsf.gov/pubs/nsb20241/.

National Science Board (NSB), National Science Foundation. 2025. Discovery: R&D Activity and Research Publications. *Science and Engineering Indicators 2026*. NSB-2025-7. Alexandria, VA. Available at https://ncses.nsf.gov/pubs/nsb20257/.

National Science Board (NSB), National Science Foundation. 2026a. STEM Talent: Education, Training, and Workforce. *Science and Engineering Indicators 2026.* NSB-2026-1. Alexandria, VA. Available at https://ncses.nsf.gov/pubs/nsb20261/.

National Science Board (NSB), National Science Foundation. 2026b. Translation to Impact: U.S. and Global Science, Technology, and Innovation Output. *Science and Engineering Indicators 2026.* NSB-2026-2. Alexandria, VA. Available at https://ncses.nsf.gov/pubs/nsb20262/.

Office of Science and Technology Policy (OSTP). 2024. *White House Office of Science and Technology Policy Releases Updated Critical and Emerging Technologies List* [press release], 12 February. Available at https://bidenwhitehouse.archives.gov/ostp/news-updates/2024/02/12/white-house-office-of-science-and-technology-policy-releases-updated-critical-and-emerging-technologies-list/. Accessed 22 December 2025.

Organisation for Economic Co-operation and Development (OECD). 2015. *Frascati Manual 2015: Guidelines for Collecting and Reporting Data on Research and Experimental Development,* The Measurement of Scientific, Technological and Innovation Activities. Paris: OECD Publishing.

Organisation for Economic Co-operation and Development (OECD). 2016. *OECD Taxonomy of Economic Activities Based on R&D Intensity.* Paris, France: OECD Publishing. Available at https://doi.org/10.1787/5jlv73sqqp8r-en. Accessed 29 September 2025.

Organisation for Economic Co-operation and Development (OECD). 2024. Analytical Business Enterprise Research and Development (ANBERD). Available at https://www.oecd.org/en/data/datasets/analytical-business-enterprise-research-and-development.html. Accessed 13 November 2025.

Organisation for Economic Co-operation and Development (OECD). 2025a. *Education at a Glance 2025: OECD Indicators*. Paris: OECD Publishing. Available at https://doi.org/10.1787/1c0d9c79-en. Accessed 13 November 2025.

Organisation for Economic Co-operation and Development (OECD). 2025b. Main Science and Technology Indicators (MSTI). September 2025 release. Available at https://www.oecd.org/science/msti.htm. Accessed 30 September 2025.

Organisation for Economic Co-operation and Development, Eurostat (OECD, Eurostat). 2018. *Oslo Manual 2018: Guidelines for Collecting, Reporting and Using Data on Innovation.* 4th ed. The Measurement of Scientific, Technological and Innovation Activities. Paris: OECD Publishing, Luxembourg: Eurostat.

Patent and Trademark Office (USPTO). 2020. *2104 Requirements of 35 U.S.C. 101 [R-10.2019]*. Available at https://www.uspto.gov/web/offices/pac/mpep/s2104.html. Accessed 29 September 2025.

Patent and Trademark Office (USPTO). 2025a. *Glossary*. Available at https://www.uspto.gov/learning-and-resources/glossary. Accessed 29 September 2025.

Patent and Trademark Office (USPTO). 2025b. *PatentsView* (tabulated by Science-Metrix). Available at https://patentsview.org/. Accessed September 2025.

PitchBook Data, Inc. 2025. Venture Capital and Private Equity Database. Available at https://pitchbook.com/. Accessed May 2025.

Richardson RA, Hong SS, Byrne JA, Stoeger T, Amaral LAN. 2025. The Entities Enabling Scientific Fraud at Scale Are Large, Resilient, and Growing Rapidly. *Proceedings of the National Academy of Sciences* 122(32):p.e2420092122.

Ruggles S, Flood S, Sobek M, Backman D, Cooper G, Rivera Drew JA, Richards S, Rodgers R, Schroeder J, Williams KCW. 2025. *IPUMS USA: Version 16.0* (Decennial 2000 1%, ACS 1-Year 2009, ACS 1-Year 2019, ACS 1-Year 2024). Available at https://doi.org/10.18128/D010.V16.0.

S&P Dow Jones Indices. 2025. *S&P 500: The Gauge of the U.S. Large-Cap Market*. Available at https://www.spglobal.com/spdji/en/documents/additional-material/sp-500-brochure.pdf. Accessed 10 April 2026.

S&P Global Market Intelligence. 2025. Comparative Industry Service, special tabulations. Accessed 2 April 2025.

Sandu S, Ciocanel B. 2014. Impact of R&D and Innovation on High-Tech Export. *Procedia Economics and Finance* 15:80–90. Available at https://doi.org/10.1016/S2212-5671(14)00450-X. Accessed 16 December 2025.

Trump D. 2025. A Letter to Michael Kratsios, Director of the White House Office of Science and Technology Policy. *Briefings & Statements.* 26 March. Available at https://www.whitehouse.gov/briefings-statements/2025/03/a-letter-to-michael-kratsios-director-of-the-white-house-office-of-science-and-technology-policy/. Accessed June 2025.

United Nations Educational, Scientific, and Cultural Organization, Institute for Statistics (UNESCO, UIS). 2025. *Glossary: Internationally Mobile Students*. Available at https://databrowser.uis.unesco.org/resources/glossary/3242. Accessed 27 April 2026.

Van Noorden R. 2023. How Big Is Science's Fake Paper Problem. *Nature* 623(7987):466–67.

Vought R, Kratsios M. 2025. *FY 2027 Administration Research and Development Budget Priorities and Cross-Cutting Actions* [memorandum], 23 September. Washington, DC: Executive Office of the President. Available at https://www.whitehouse.gov/wp-content/uploads/2025/09/FY27-OMB-OSTP-RD-Priorites-Memo-FINALSIGNED.pdf. Accessed 22 December 2025.

Waltman L, van Eck NJ, Wouters P. 2013. Counting Publications and Citations: Is More Always Better? *Journal of Informetrics* 7(3):635–41. Available at https://www.sciencedirect.com/science/article/abs/pii/S1751157713000357. Accessed 14 January 2026.

World Bank. 2025. *International Comparison Program.* Available at https://www.worldbank.org/en/programs/icp. Accessed 3 September 2025.

World Intellectual Property Organization (WIPO). 2020. *What Is Intellectual Property?* Geneva, Switzerland: WIPO. Available at https://www.wipo.int/en/web/about-ip. Accessed 14 January 2026.

World Intellectual Property Organization (WIPO). 2026. *World Intellectual Property Report 2026: Technology on the Move*. Geneva, Switzerland: WIPO. Available at https://tind.wipo.int/record/59025. Accessed 16 April 2026.

Young SD, Prabhakar A. 2023. *Multi-Agency Research and Development Priorities for the FY 2025 Budget* [memorandum], 17 August. Washington, DC: Executive Office of the President. Available at https://bidenwhitehouse.archives.gov/wp-content/uploads/2023/08/FY2025-OMB-OSTP-RD-Budget-Priorities-Memo.pdf. Accessed 22 December 2025.

Notes

1 Revisions in 2023 U.S. GERD reported here reflect the use of reported data rather than respondent reported projected data and partial year estimates for data reported to the National Center for Science and Engineering Statistics (NCSES) on a fiscal year basis that were used in the *Indicators 2026* report "Discovery: R&D Activity and Research Publications." Data for 2024 are estimates based mainly on findings from the 2023 sectoral R&D expenditure surveys, preliminary information from the 2024 sectoral R&D expenditure surveys, and evident recent trends. They are likely to be revised.

2 U.S. GERD as reported by the Organisation for Economic Co-operation and Development (OECD) differs slightly from the U.S. total domestic R&D performance tabulated earlier in this report. For consistency with international standards for the measurement of GERD, OECD includes U.S. domestic expenditures on capital for R&D, excludes depreciation on U.S. domestic R&D capital, and makes certain adjustments for foreign sources of funding of domestic R&D.

3 There is a minimum 3-year latency in the development of highly cited patent indicators because it takes time for enough patent citations to accumulate in specific fields to be a reliable measure of impact.

4 The section "STEM Talent: Education, Training, and Workforce" draws on data and sources in the *Indicators 2026* report "STEM Talent: Education, Training, and Workforce."

5 All comparative statements derived from sample surveys or assessments in this report have undergone statistical testing; unless otherwise noted, all comparisons are statistically significant at the 0.10 significance level.

6 SES is indicated by a student's SES index score, which ranges from 0 to 9. Scores are categorized as Low SES (0–2), Middle SES (3–6), and High SES (7–9). In 2024, NAEP introduced a measure of SES comprising four components: (1) the student's National School Lunch Program (NSLP) eligibility status, (2) the percentage of students eligible for NSLP at the school the student is attending, (3) the number of books at the student's home, and (4) the highest level of education of either parent.

7 Degree outcomes are based on data as of spring 2021.

8 S&E degrees discussed here are categorized by institution location and include postsecondary degrees awarded to all students, regardless of their residence or where they earned a high school diploma or equivalent degree.

9 Calculations of degree shares exclude students of unknown race and ethnicity and those on temporary visas.

10 Although a total of 42 countries or education systems participated in both TIMSS 2023 assessments, this analysis focuses on U.S. student performance compared with students from other advanced economies.

11 Dollar values are in current dollars. Unless otherwise stated, all dollar amounts in this section are provided in current dollars, unadjusted for inflation. Education-related travel includes all expenditures by travelers whose primary purpose for travel is education, including dependents and other travelers accompanying students. For more information on methodology, see BEA (2024).

12 Data reflect fall enrollment in a given year, include active foreign national students on F-1 visas enrolled in person at U.S. higher education institutions, and exclude individuals approved for optional practical training. An analysis of data on the enrollment of temporary visa holders in the Survey of Graduate Students and Postdoctorates in Science and Engineering shows similar trends.

13 NCSES, special tabulations (2025) of the Department of Homeland Security, Immigration and Customs Enforcement, Student and Exchange Visitor Information System database.

14 Country of origin is classified based on place of citizenship at birth.

15 The workforce includes the employed, civilian, noninstitutionalized population ages 25–75 not currently enrolled in primary or secondary school. Missing occupations and those who have not worked in the past 5 years or have never worked are not included in the data. STEM includes S&E, S&E-related, and STEM middle-skill occupations.

16 Designation of STEM occupations is based on NCSES STEM classification, which differs from the STEM classification used by the Bureau of Labor Statistics.

17 Among those with a master's degree or a professional degree, median earnings for full-time year-round S&E workers were not statistically different from the earnings for S&E-related workers.

18 Median earnings among S&E workers with some college were not statistically different from those among S&E workers with an associate's degree. Among STEM middle-skill workers, median earnings of those with an associate's degree were not statistically different from the earnings of those with a bachelor's degree.

19 The percentage of workers in STEM occupations was not statistically different between Washington and Vermont. The percentage of STEM workers in Washington was also not statistically different from the percentage in North Dakota.

20 The percentage of STEM workers without a bachelor's degree in Mississippi was not statistically different from the percentage in West Virginia.

21 The section "Discovery: R&D Activity and Research Publications" draws on data and sources in the *Indicators 2026* report "Discovery: R&D Activity and Research Publications."

22 Data for the United States in this section and its accompanying figures reflect NCSES standards for domestic reporting of U.S. total R&D. This results in marginal differences from the data on gross expenditures on R&D that NCSES provides to OECD for international comparisons. Unless otherwise stated, all measurements of U.S. R&D performance in this report are in current dollars, unadjusted for inflation.

23 National Patterns of R&D Resources 2024 data are estimates based mainly on findings from the 2023 sectoral R&D expenditure surveys, preliminary information from the 2024 sectoral R&D expenditure surveys, and evident recent trends. They are likely to be revised.

24 Excludes R&D performed by businesses with 9 or fewer domestic employees. Data in this section are representative of business with 10 or more domestic employees, which perform nearly all (99%) of business R&D in the United States (NCSES 2024a, 2024b).

25 Technology focus areas are not mutually exclusive; companies could report R&D in one, more than one, or no application area.

26 For details on methodology, see the *Indicators 2026* report "Discovery: R&D Activity and Research Publications" section "Technical Appendix."

27 The section "Translation to Impact: U.S. and Global Science, Technology, and Innovation Output" draws on data and sources in the *Indicators 2026* report "Translation to Impact: U.S. and Global Science, Technology, and Innovation Output."

28 Patent totals cited in text include unclassified patents, which are not pictured in the related figures.

29 Technology categories for highly cited patents approximate but do not exactly match those for international priority patent families. For additional details, see the *Indicators 2026* report "Translation to Impact: U.S. and Global Science, Technology, and Innovation Output."

30 Categories described are aggregations of Nice classes. Trademarks are classified under the 11th edition of the Nice Classification (NCL) of goods and services, which classifies trademarks under 34 categories of goods and 11 categories of services.

31 Reported values are among only repositories with location information.

32 Unless otherwise stated, all dollar values in this section are provided in current dollars, unadjusted for inflation.

Acknowledgments and Citation

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Cover Image Credit

The image shows the inside of Limelight Steel's laser furnace prototype, which uses laser light to heat up iron ore and convert it into iron metal for use in the steel industry. (Research supported by U.S. National Science Foundation SBIR/STTR.)

Credit: Limelight Steel

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