The State of U.S. Science & Engineering

Science & Engineering Indicators **2024**

Thursday, April 11, 2024

Speakers:

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The National Science Board

Science and Engineering Indicators

➢ *The State of U.S. Science and Engineering*: Talent, Discovery, and Translation

➢ **Thematic reports** on key topics

➢ **State Indicators** tool

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https://ncses.nsf.gov/indicators

Science & Engineering State Indicators

U.S. State trends in science and engineering education, workforce, research and development, patents and publications, and knowledge-intensive industries.

Indicators

Explore data for over 50 state-level S&E indicators in education, workforce, R&D, patents and publications, and knowledge-intensive industries.

EXPLORE INDICATORS

State Data

See how your state compares to other states and the nation on S&E performance using preset comparisons and custom selections.

COMPARE STATES

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The State of U.S. Science & Engineering

THE STATE OF U.S.
SCIENCE & ENGINEERING
2024
Science & Engineering Indicators
NATIONAL SCIENCE BOARD
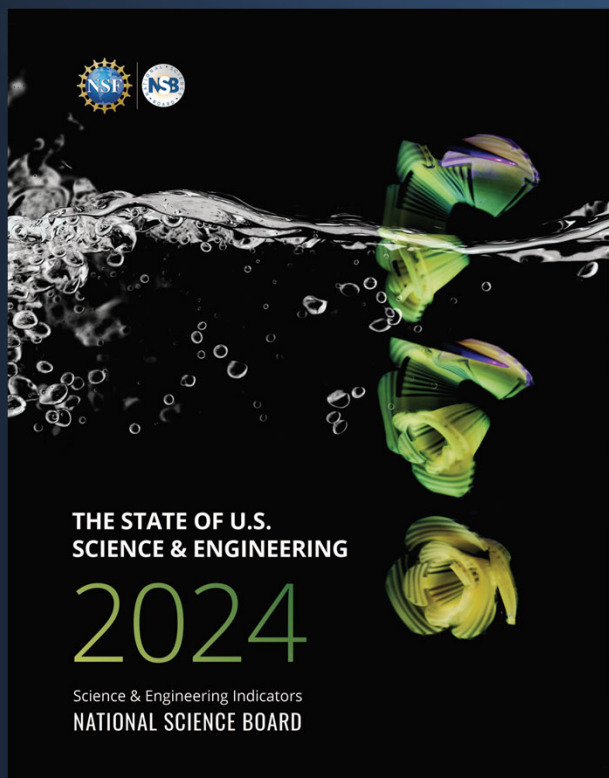
➢ The U.S. <u>performs more total R&D than any other country</u>

➢ But <u>the nation's global position is slipping</u>, as countries in East and Southeast Asia, particularly China, increase their activities.

➢ The nation's ability to compete in S&E <u>depends on robust and sustained national investments</u> in STEM talent, R&D-driven discovery, knowledge translation, and innovation.

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NCSES: Trusted Source of Objective Data on the S&E Enterprise

A Variety of Data Sources

- NCSES official government statistics
  - University
  - Government
  - Business
  - Individuals
- Census, BLS, NCES, etc.
- International, OECD data
- Bibliometric data
- Patent data information

THE STATE OF U.S. SCIENCE & ENGINEERING

2024

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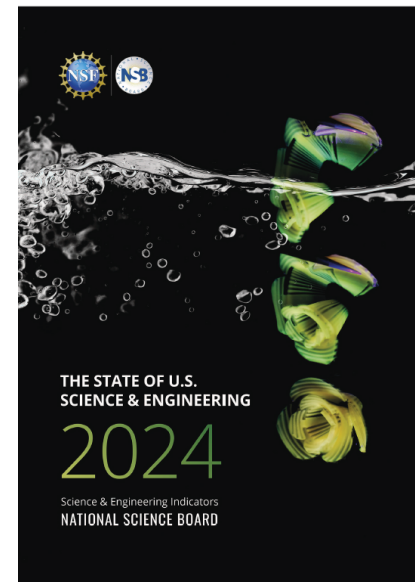
Data From Across the Globe

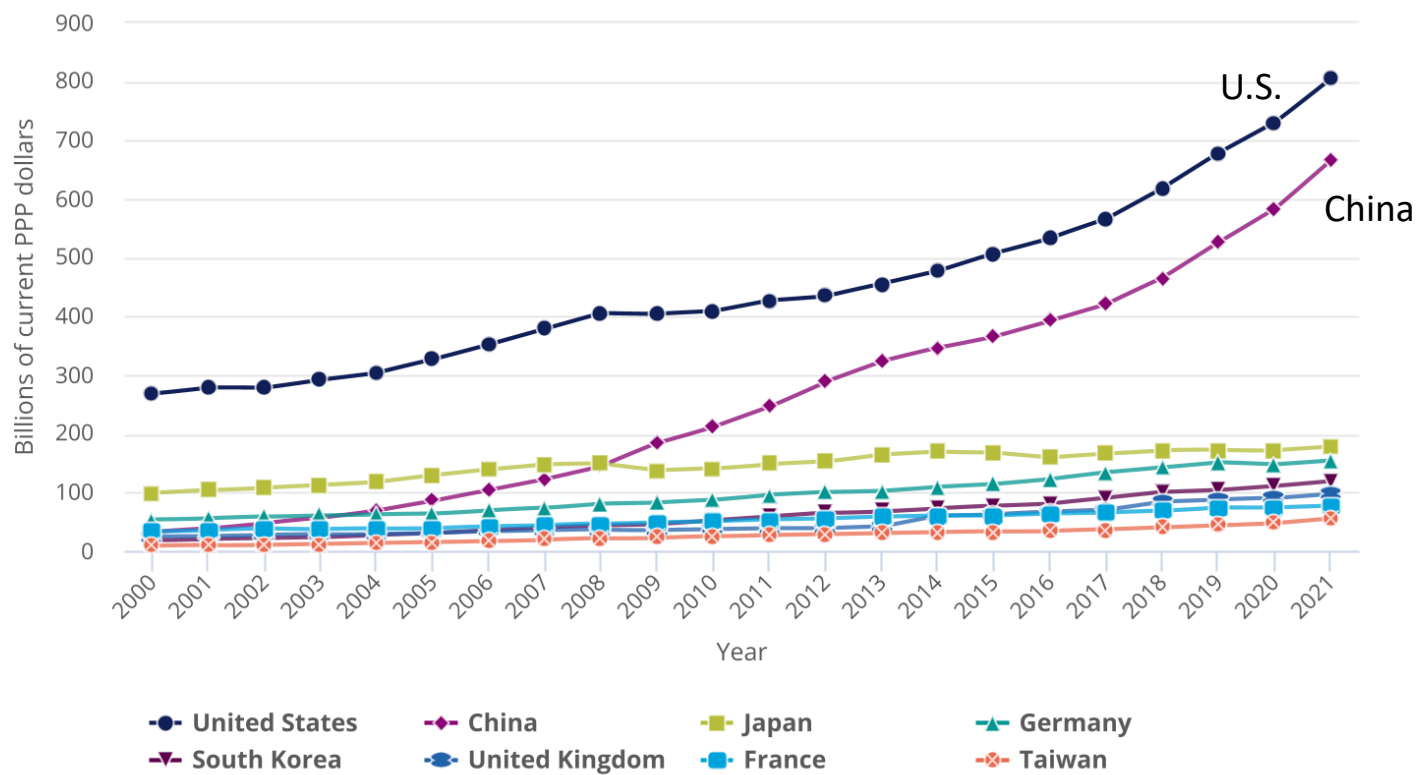# Securely Liberating Data for You

Standard
Application
Process

National Secure
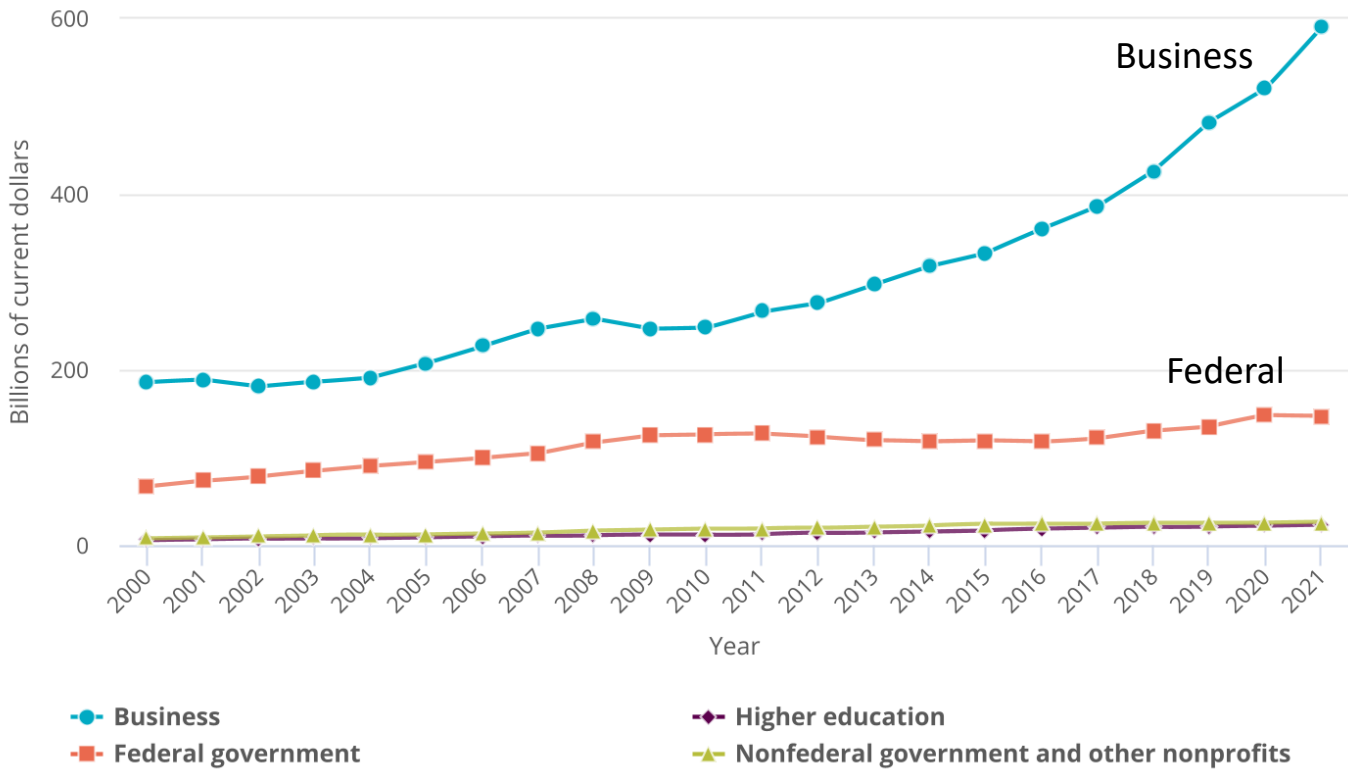Data Service

Discovery: Gross Domestic Expenditures on R&D

Gross domestic expenditures on R&D, by selected country or economy: 2000−21

Discovery: U.S. R&D Expenditures

U.S. R&D expenditures, by source of funds: 2000–21

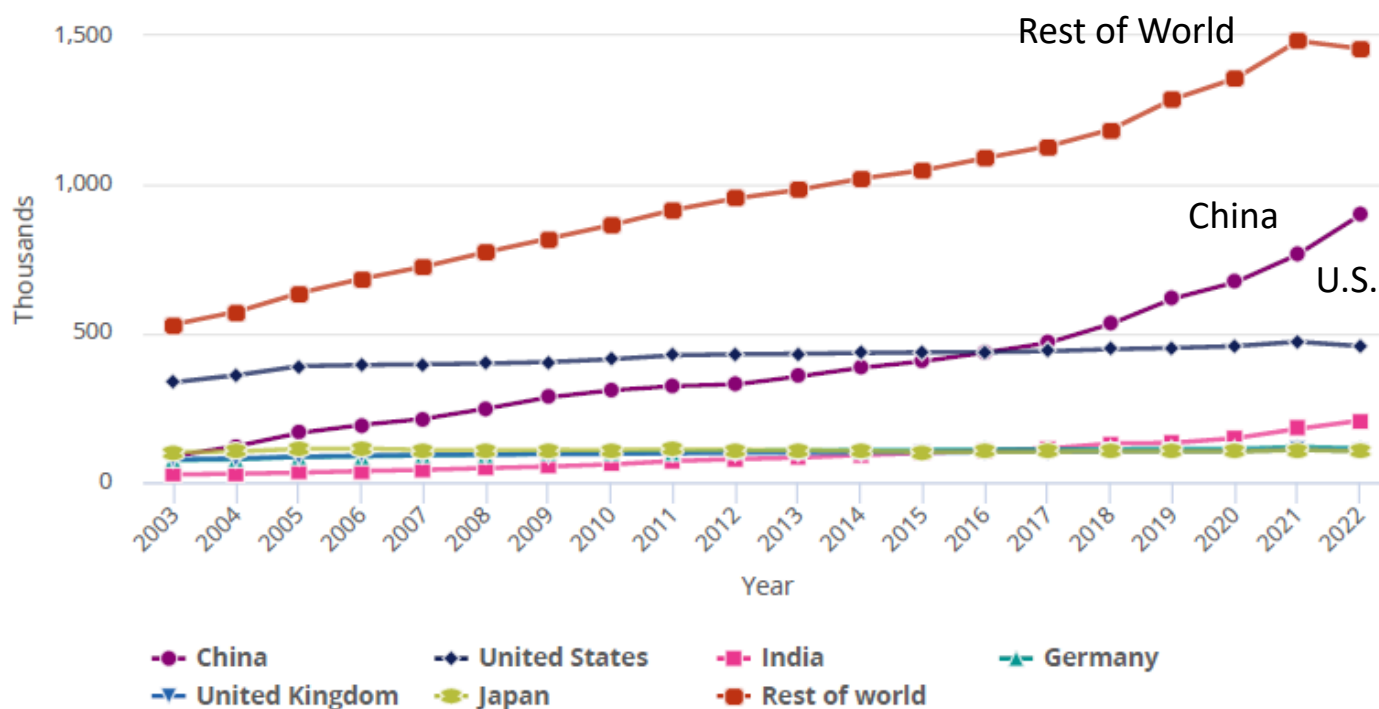# Translation: Publications, Patents, and Industry

S&E research publications, patents, and knowledge- and technology-intensive industry output are concentrated in the United States, East and Southeast Asia, and Europe.

China has significantly increased its share of global science, technology, and innovation capabilities over the last decade.
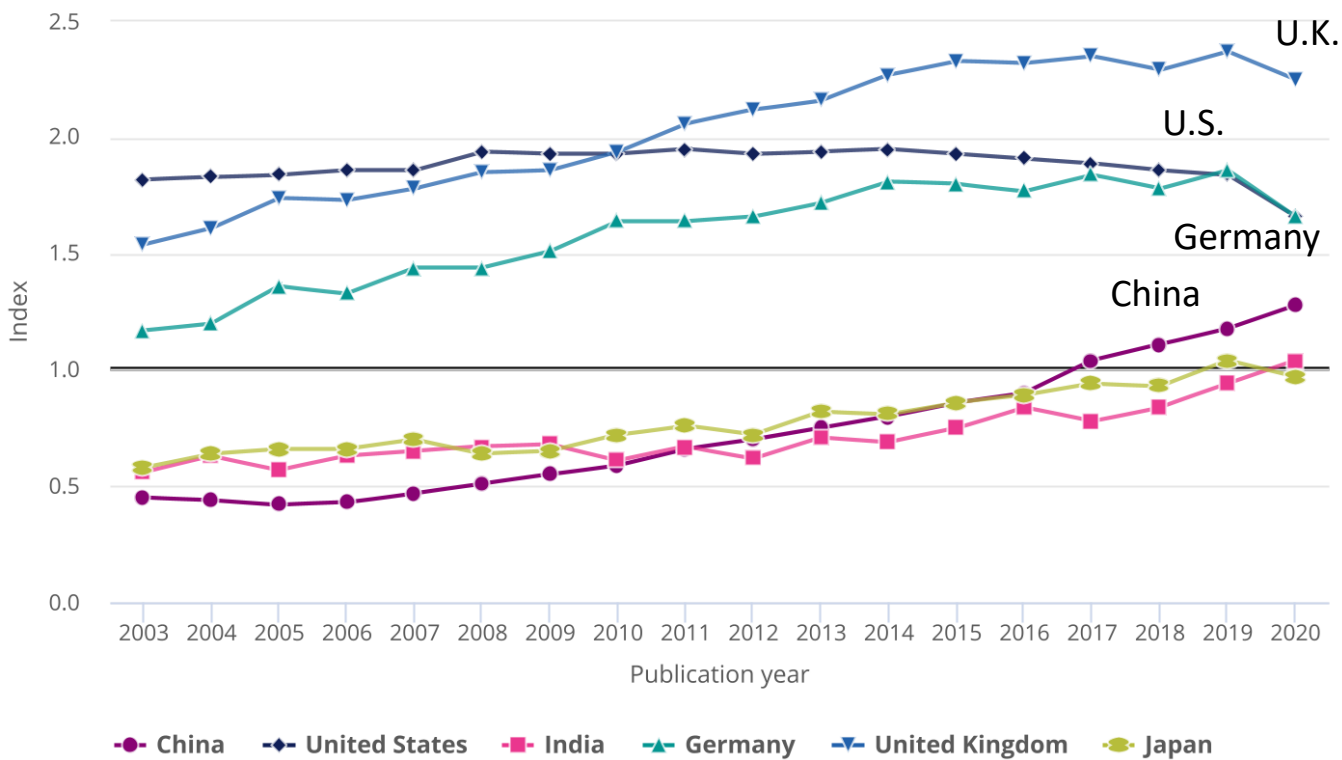
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Translation: Publications

Figure 18. S&E articles, by selected region, country, or economy: 2003–22
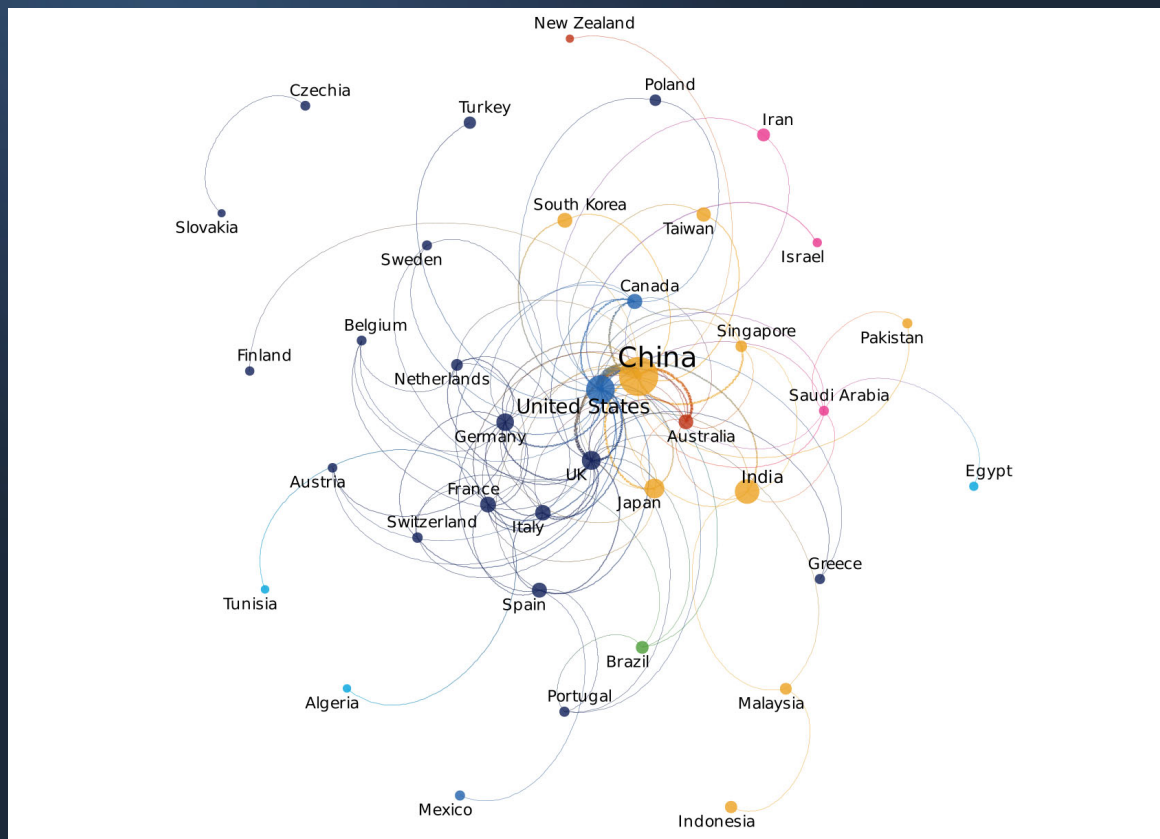
Translation: Highly Cited Publications

Highly cited article index, by selected country: 2003–20

Translation: Global Network of AI Research Publishing

Translation: Patents

Patent Cooperation Treaty applications, by selected region, country, or economy: 2000–22
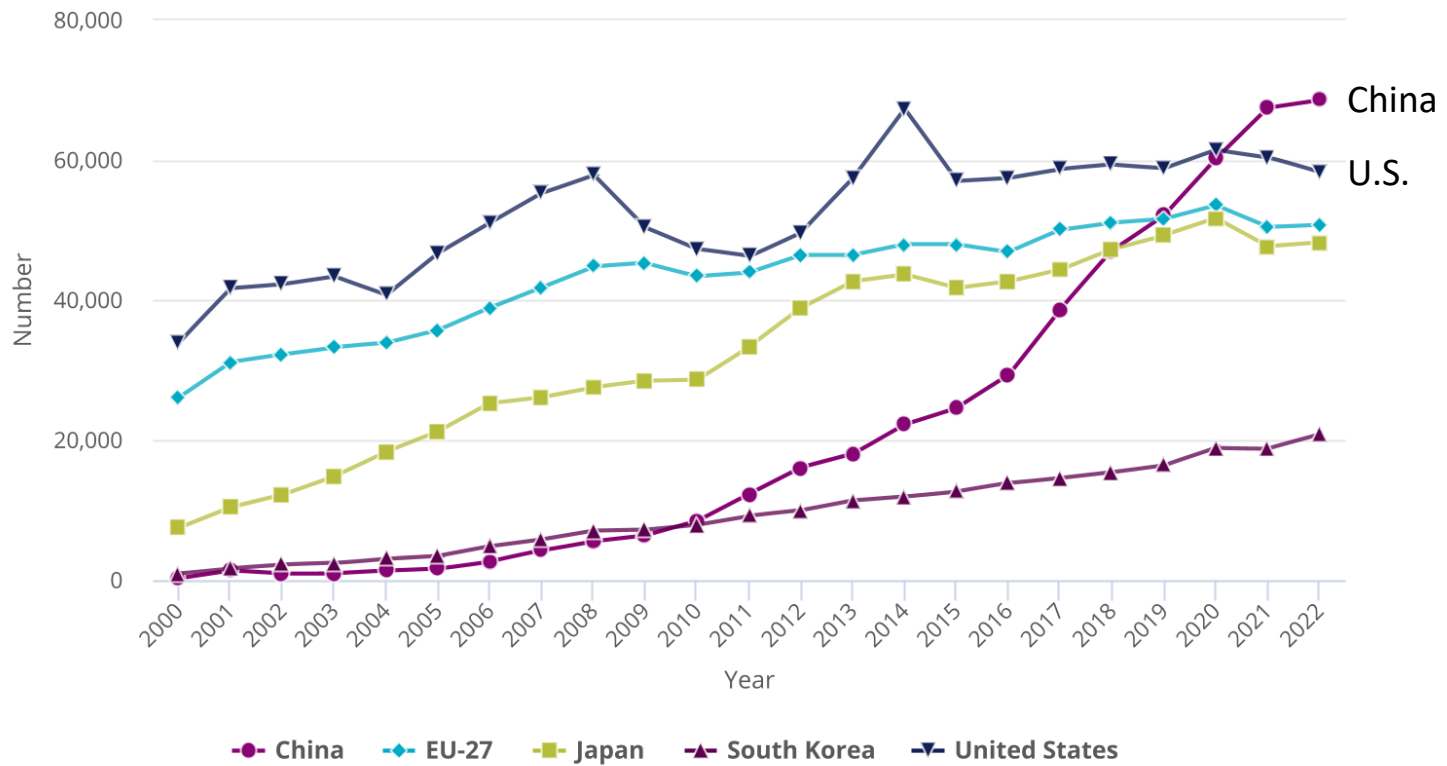
Translation: Knowledge- and Technology-Intensive Industries

Value-added output of KTI industries, by selected region, county, or economy and by sector: 2012 and 2021

China: 33% ($2.4T) of global Knowledge and Technology Intensive manufacturing

U.S.: 39% ($1.3T) of global KTI services

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The State of U.S. S&E: **STEM Talent**

Figure 8. Employment in the STEM workforce, by state: 2021

< 25th percentile:
20.2–23.7

25th–50th percentile:
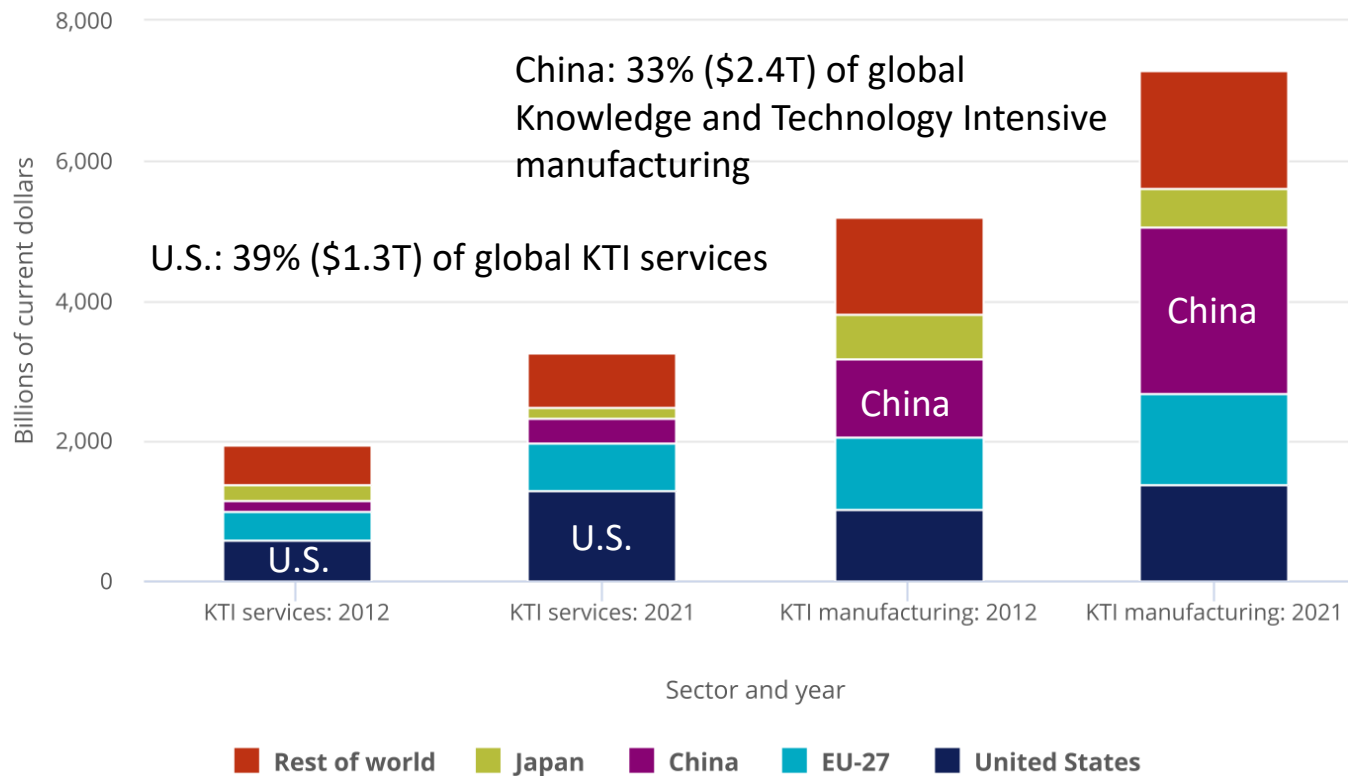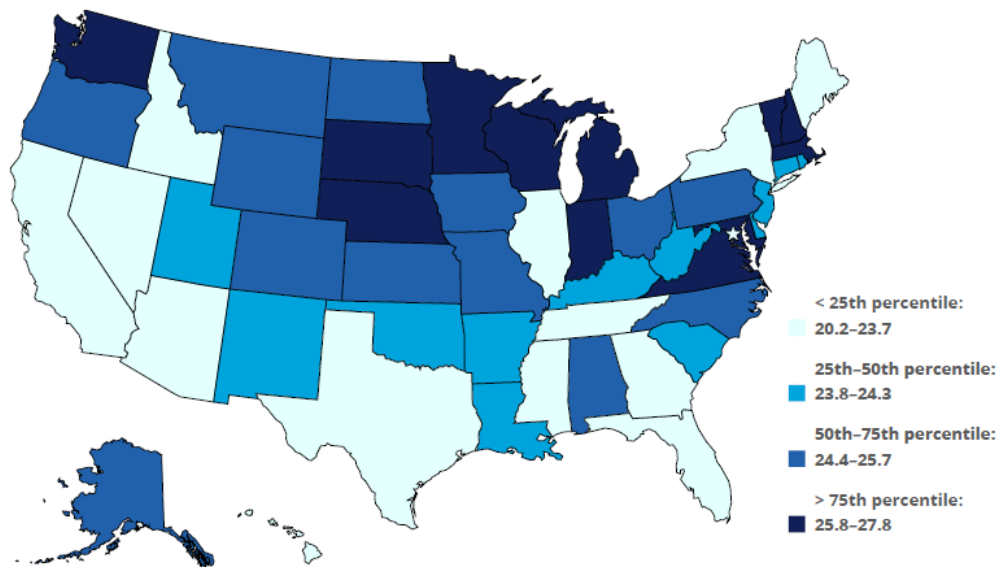23.8–24.3

50th–75th percentile:
24.4–25.7

> 75th percentile:
25.8–27.8

Note(s): STEM is science, technology, engineering, and mathematics. Quartiles are based on point estimates and do not account for sampling variability.
Source(s): Census Bureau, ACS, 2021. *Indicators 2024: Labor Force*

➢ *A globally competitive STEM education system equips Americans with the skills and knowledge needed to participate in the STEM workforce.*

➢ *STEM workers with a broad range of educational credentials sustain the U.S. research enterprise and drive innovation in critical and emerging technologies, supporting the nation's competitiveness in the global economy.*

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National Science Board: **Vision for the Future**

- ➢ **Deliver Benefits From Research**

- ➢ **Expand the Geography of Innovation**

- ➢ **Foster a Global S&E Community**

- ➢ **Develop STEM Talent for America**

https://www.nsf.gov/nsb/NSBActivities/vision-2030.jsp

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NSB Policy Messages: Talent is the Treasure

- The U.S. needs a robust, resilient STEM workforce for a strong economy and national security

- But the nation is facing a STEM talent crisis

- Strategic action is sorely needed across educational and workforce levels

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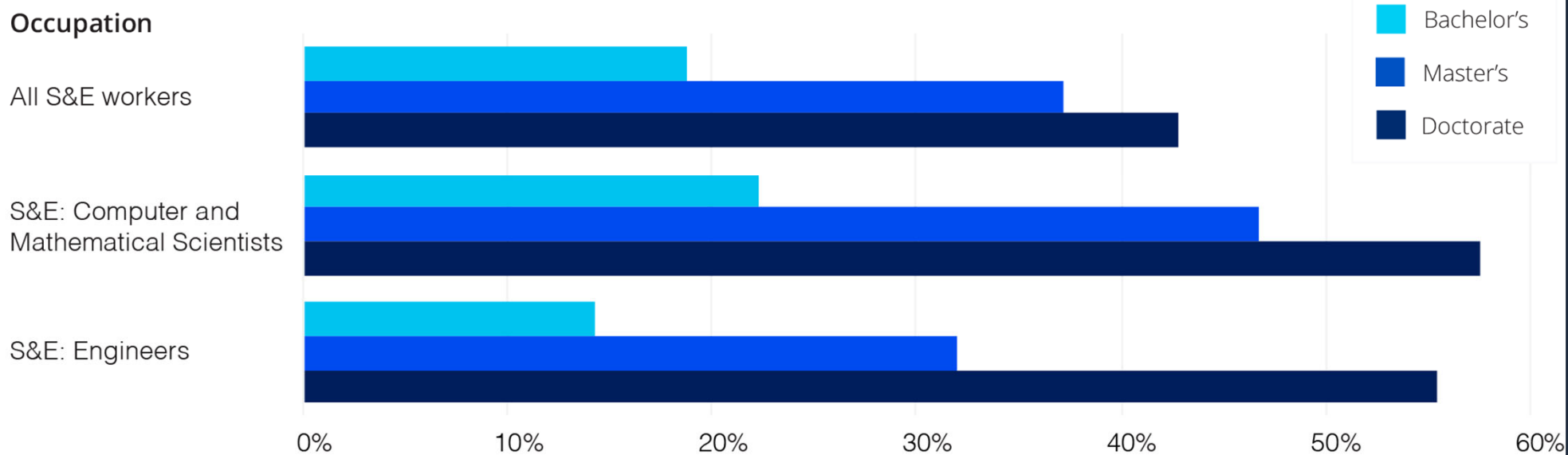# Need for Robust, Resilient STEM Workforce

- STEM workforce: <u>37 million people</u>

- With bachelor's degree: <u>18 million</u>

- Without bachelor's degree (Skilled Technical Workforce): <u>19 million</u>
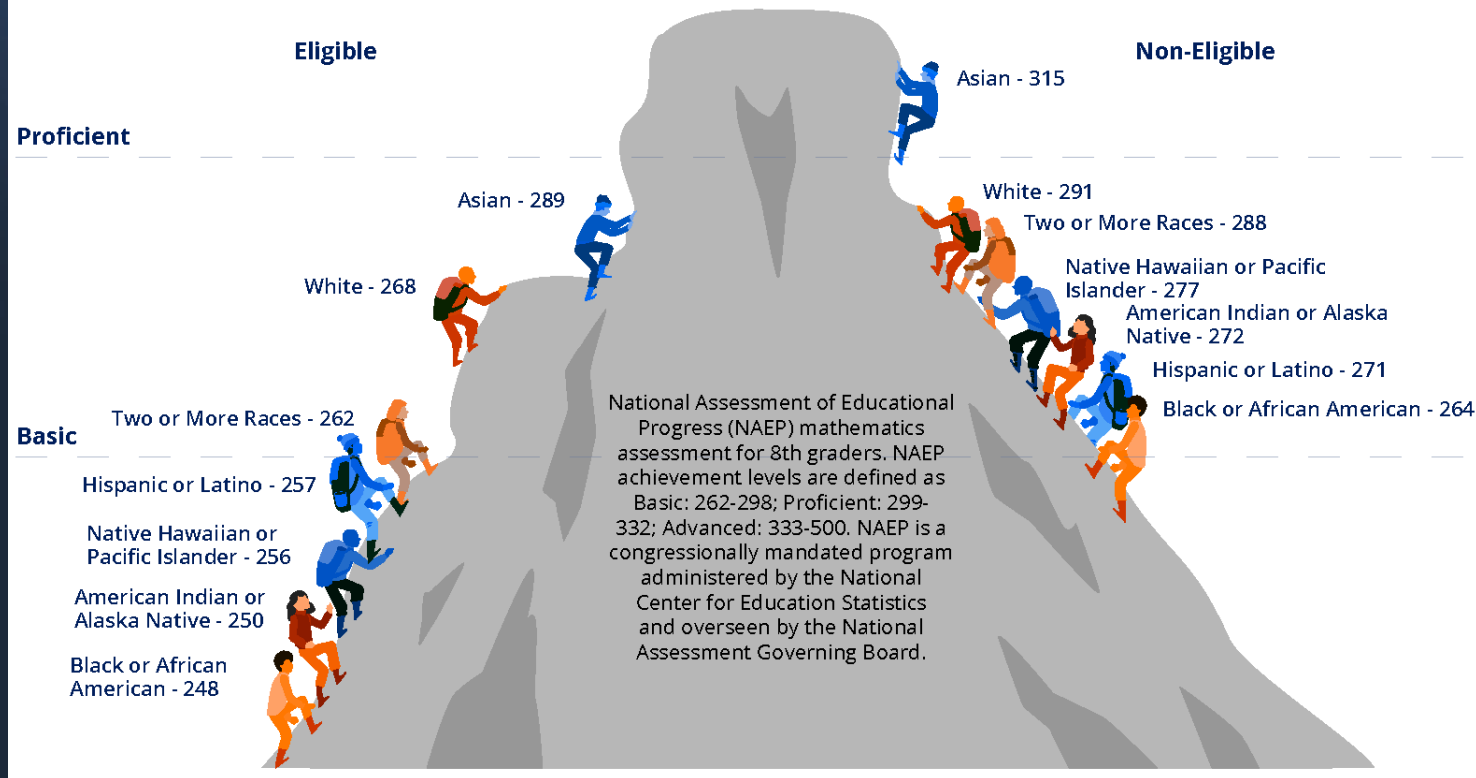
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Leadership Risk: Talent Supply Chain

Foreign-born Share of Workers with a Bachelor's Degree or Higher, by Highest Degree Level and Major Occupation: 2021
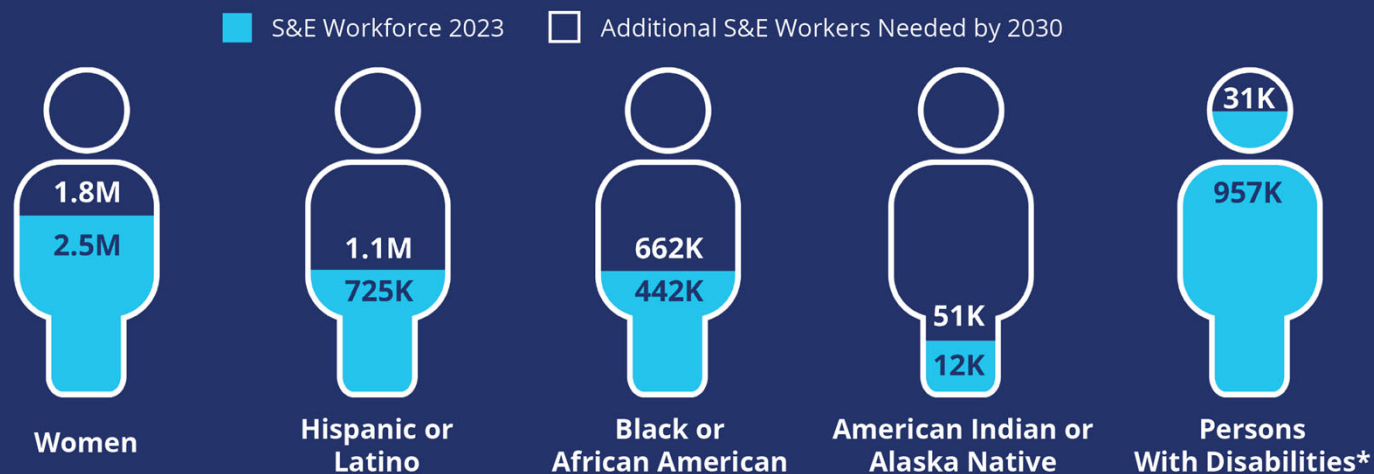
Leadership Risk: PreK-12 STEM Education

Average Scores of 8th Grade Students on the Main NAEP Mathematics Assessment, by Race, Ethnicity, and Eligibility for Free or Reduced School Lunch: 2022

Eligible

Non-Eligible

Asian - 315

Proficient

Asian - 289

White - 291

Two or More Races - 288

White - 268

Native Hawaiian or Pacific Islander - 277

American Indian or Alaska Native - 272

Two or More Races - 262

Hispanic or Latino - 271

Basic

Hispanic or Latino - 257

Black or African American - 264

Native Hawaiian or Pacific Islander - 256

American Indian or Alaska Native - 250

Black or African American - 248

National Assessment of Educational Progress (NAEP) mathematics assessment for 8th graders. NAEP achievement levels are defined as Basic: 262-298; Proficient: 299-332; Advanced: 333-500. NAEP is a congressionally mandated program administered by the National Center for Education Statistics and overseen by the National Assessment Governing Board.

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Leadership Risk: the Missing Millions

Missing Millions: Closing the Diversity Gap in the S&E Workforce by 2030

Over the past decade, the United States has seen significant growth in underrepresented groups in the science & engineering (S&E) workforce. However, the National Science Board is urging an even swifter expansion to create a more diverse workforce that mirrors the U.S. population and meets the demands of 2030.

■ S&E Workforce 2023   ☐ Additional S&E Workers Needed by 2030

Women	Hispanic or Latino	Black or African American	American Indian or Alaska Native	Persons With Disabilities*
1.8M	1.1M	662K	51K	31K
2.5M	725K	442K	12K	957K

*Visual (30%), Cognitive (29%), Hearing (26%), Lifting (8%), and Walking (7%) disabilities

Source: Estimates are based on projections from the U.S. Census and Bureau of Labor Statistics, together with data from the National Center for Science and Engineering Statistics, and assume that participation of these groups in the S&E workforce increases at current rates.

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Opportunities for Action

Strategic Action: Access to Higher Education

Increase scholarships for low-income individuals (e.g. S-STEM)

Initiate national service programs (e.g. Defense Civilian Training Corps)

Increase Pell grant amounts to reflect the current cost of education

Build out capacity at community colleges, Minority Serving Institutions (MSIs), and Emerging Research Institutions (ERIs)

For STEM Doctoral Students

- Expand graduate fellowship programs, with an emphasis on critical and emerging technologies

- Increase doctoral stipends & annually adjust for inflation

- Provide doctoral students with benefits
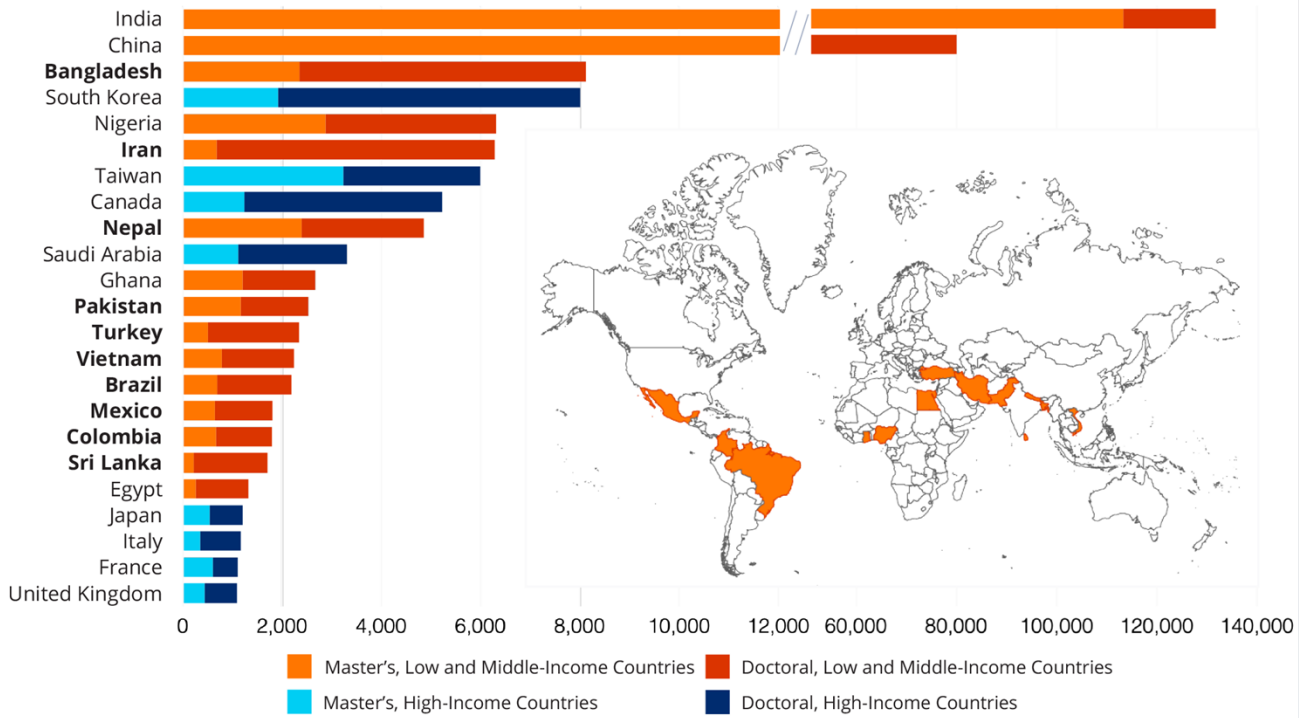
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Strategic Action: Emerging Science Partners

International S&E Students on Visas Enrolled in U.S. Higher Education Institutions, by Level of Enrollment: 2012–22

Legend: Associate's, Bachelor's, Master's, Doctorate
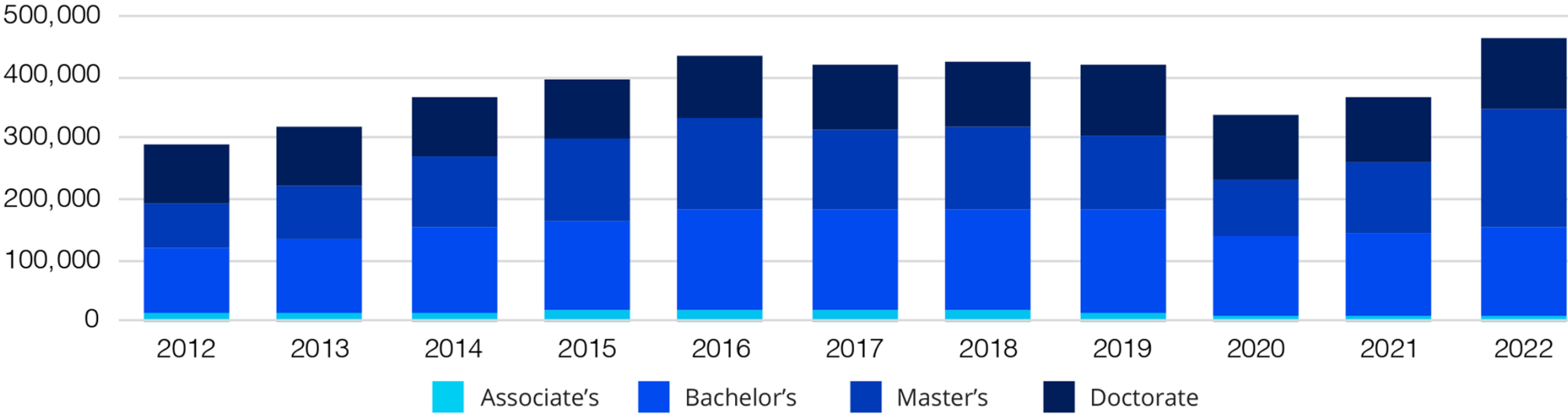
Strategic Action: Emerging Science Partners

Number of S&E Master's & Doctorate Students (Top Countries)

Legend:
- Master's, Low and Middle-Income Countries
- Doctoral, Low and Middle-Income Countries
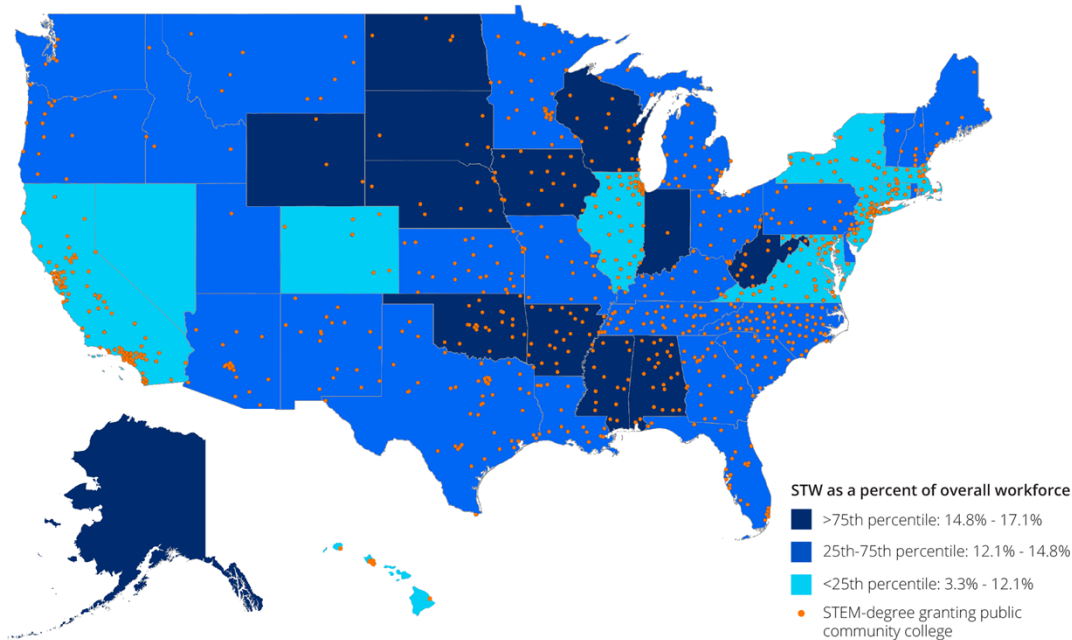- Master's, High-Income Countries
- Doctoral, High-Income Countries

Strategic Action: Skilled Technical Workforce

THE SKILLED TECHNICAL WORKFORCE:

Crafting America's Science & Engineering Enterprise

STEM-Degree Granting Community Colleges and STW Employment by State

STW as a percent of overall workforce

- >75th percentile: 14.8% - 17.1%
- 25th-75th percentile: 12.1% - 14.8%
- <25th percentile: 3.3% - 12.1%
- STEM-degree granting public community college

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A Bedrock for the Nation's R&D Enterprise

With a robust and concerted effort to close the STEM talent gap - preK-12, higher education, the Skilled Technical Workforce, international talent - the U.S. can fully lean into longstanding, strategic approaches to ensure it remains a global S&E discovery powerhouse
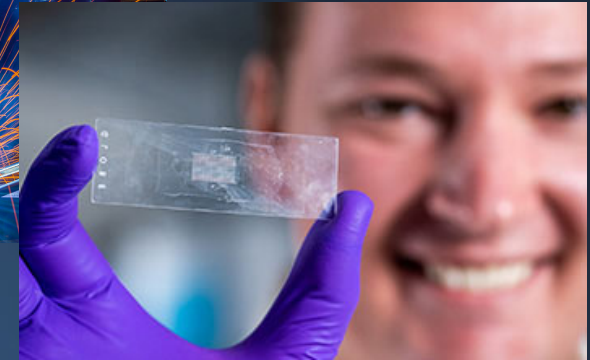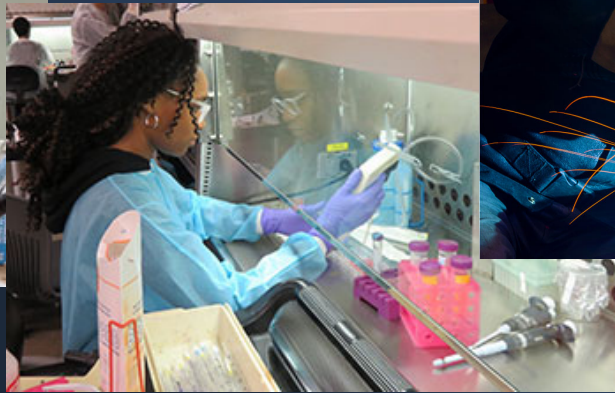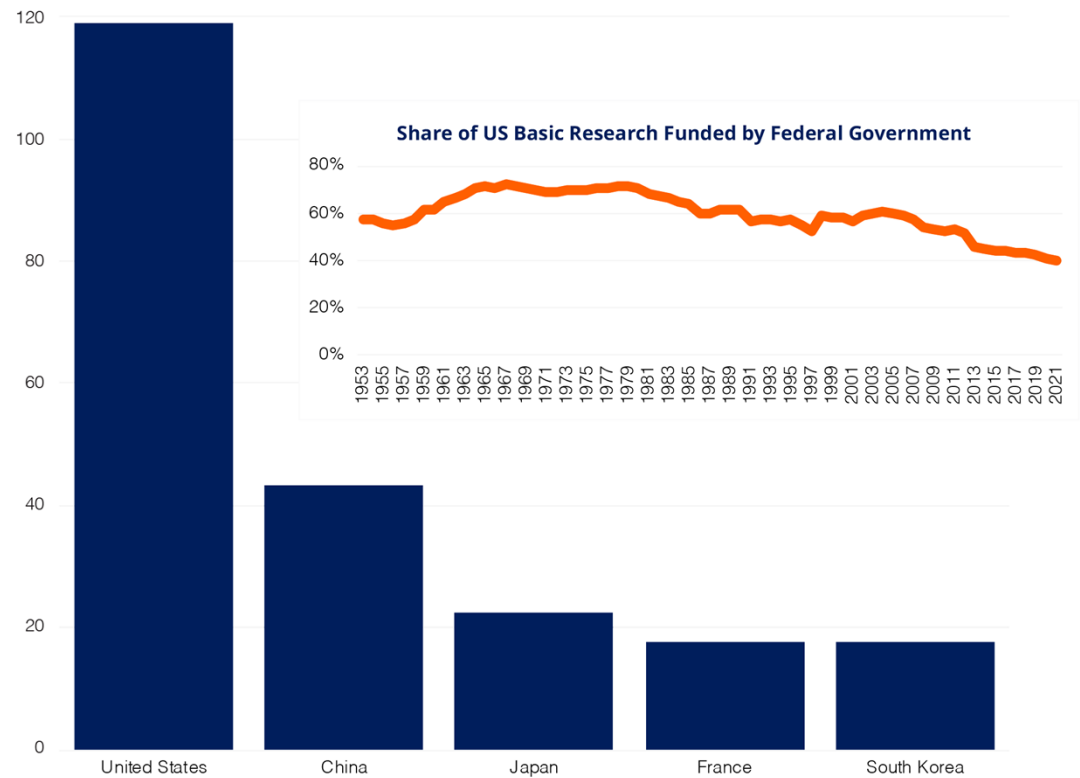
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A Bedrock for the Nation's R&D Enterprise

➢ Invest in basic research

➢ Identify "under the radar" discoveries and opportunities

➢ Invest in critical and emerging technologies

Gross Domestic Expenditure on Basic Research (in Billions)

Share of US Basic Research Funded by Federal Government

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Talent is the Treasure

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