



Science and Engineering Indicators: Outputs and Outcomes Measures

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CENDI
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I. Overview of Science and Engineering Indicators (SEI)

Science & Engineering Indicators:

- **Authoritative data on status and trends of U.S. science & engineering enterprise**
- **Set in international context.**
- **Factual analysis; policy neutral.**



I. Overview of Science and Engineering Indicators (SEI)

- Coverage includes:

- K-12 and higher education
 - R&D and innovation
 - Employment
 - Production and trade of knowledge intensive and high technology industries
 - Public attitudes towards science
 - State level S&E indicators
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- Draws on a wide and diverse range of NCSES surveys and other data sources.



II. U.S. S&T global position

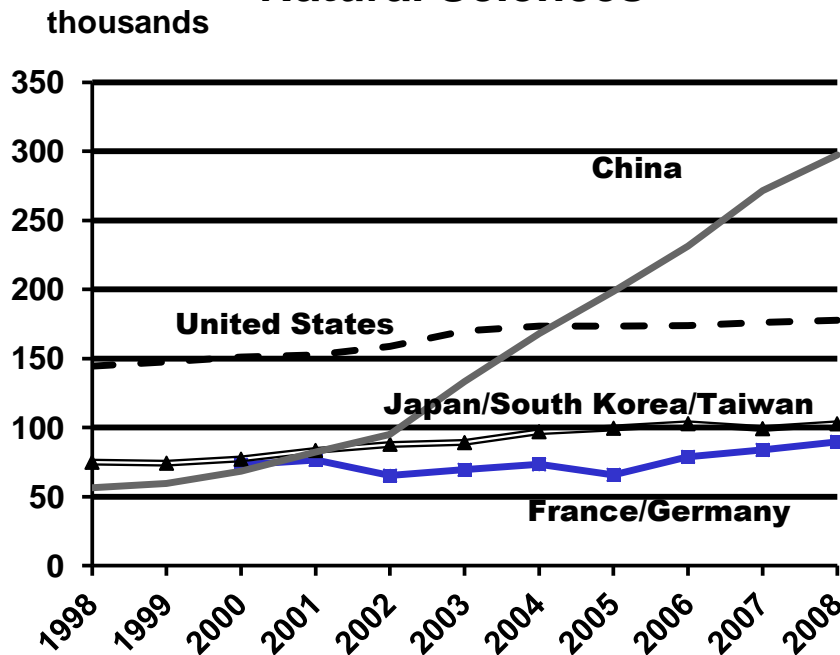
- **The United States maintains its S&T leadership but faces a gradual erosion of its position in specific areas.**
- **Many developing nations seek to develop the capacity to generate new knowledge and translate it into economic and social benefit.**



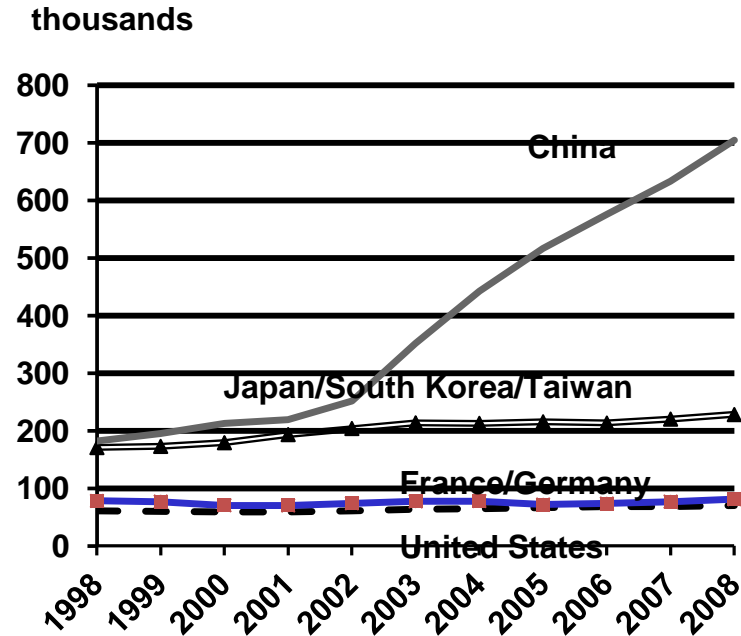
- **Asia's rapid ascent as a major world S&T region is chiefly driven by developments in China and other Asian economies with which it forms a supplier-based trade zone.**
- **Other developing countries share this heightened focus on S&T as a means of economic growth, e.g, Brazil and South Africa**
- **EU is striving to boost its relative competitiveness in R&D, innovation, and high technology.**

International trends in first S&E degree production

Natural Sciences



Engineering



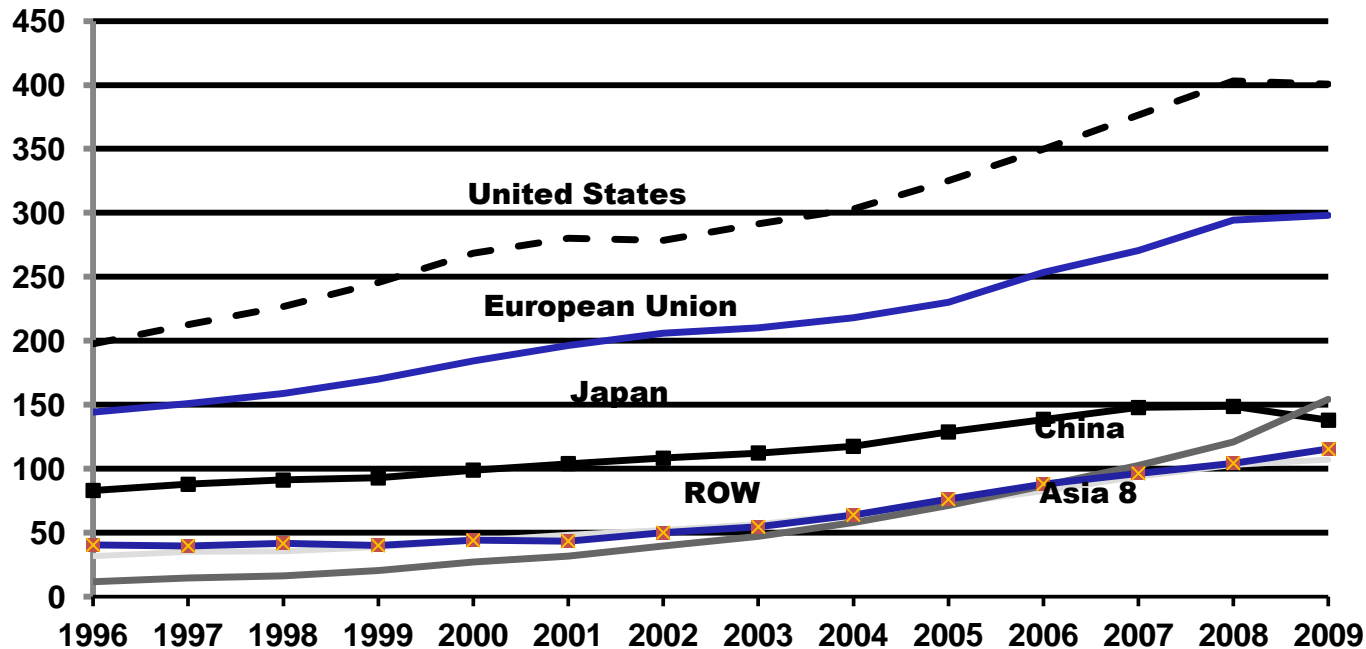
NOTES: Natural sciences include physical, biological, environmental, agricultural and computer sciences, and mathematics.

SOURCES: Organisation for Economic Co-operation and Development, Education On-line Database, <http://www.oecd.org/education>; and national statistical offices

Global trends in R&D

Global R&D expenditures for selected regions and countries:
1996-2009

\$ billions

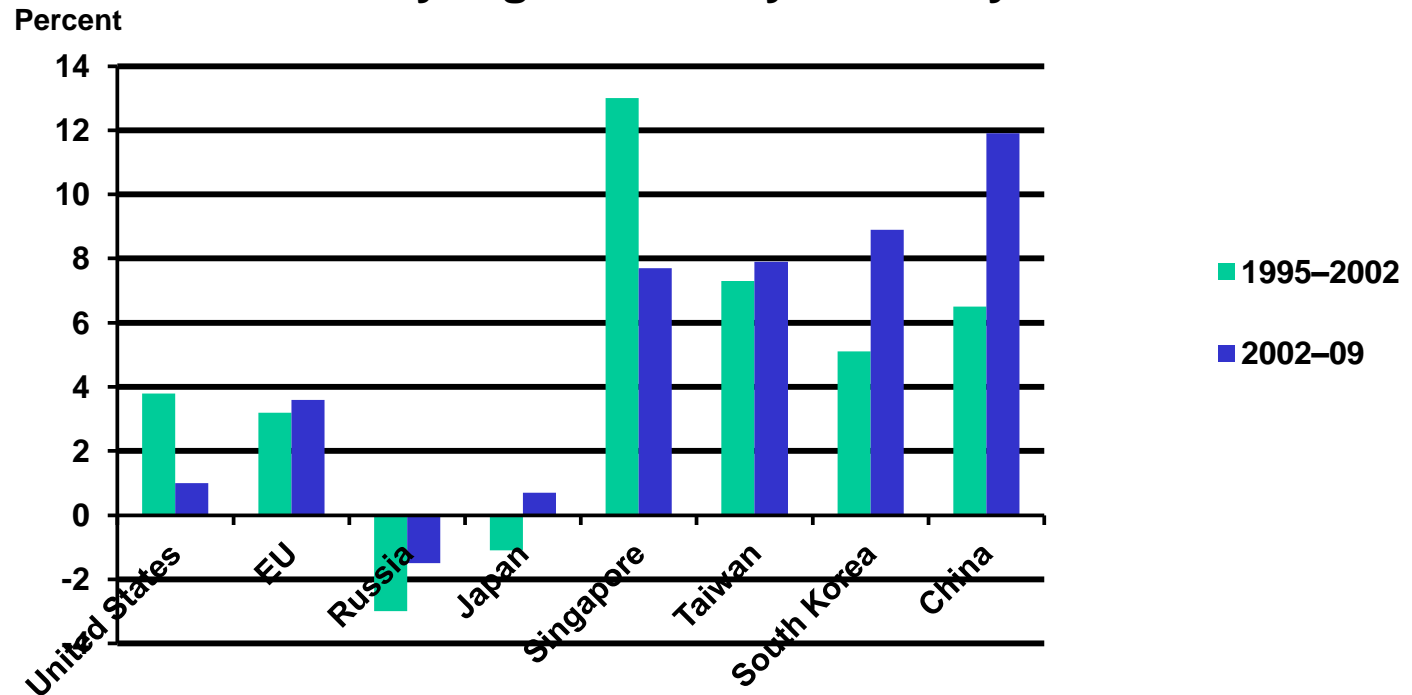


NOTE: Asia 8 consists of India, Indonesia, Malaysia, Philippines, Singapore, South Korea, Taiwan, and Thailand.

SOURCES: National Science Foundation, National Center for Science and Engineering Statistics, Organisation for Economic Cooperation and Development, and United Nations Educational, Scientific, and Cultural Organization Institute for Statistics.

International trends in researchers

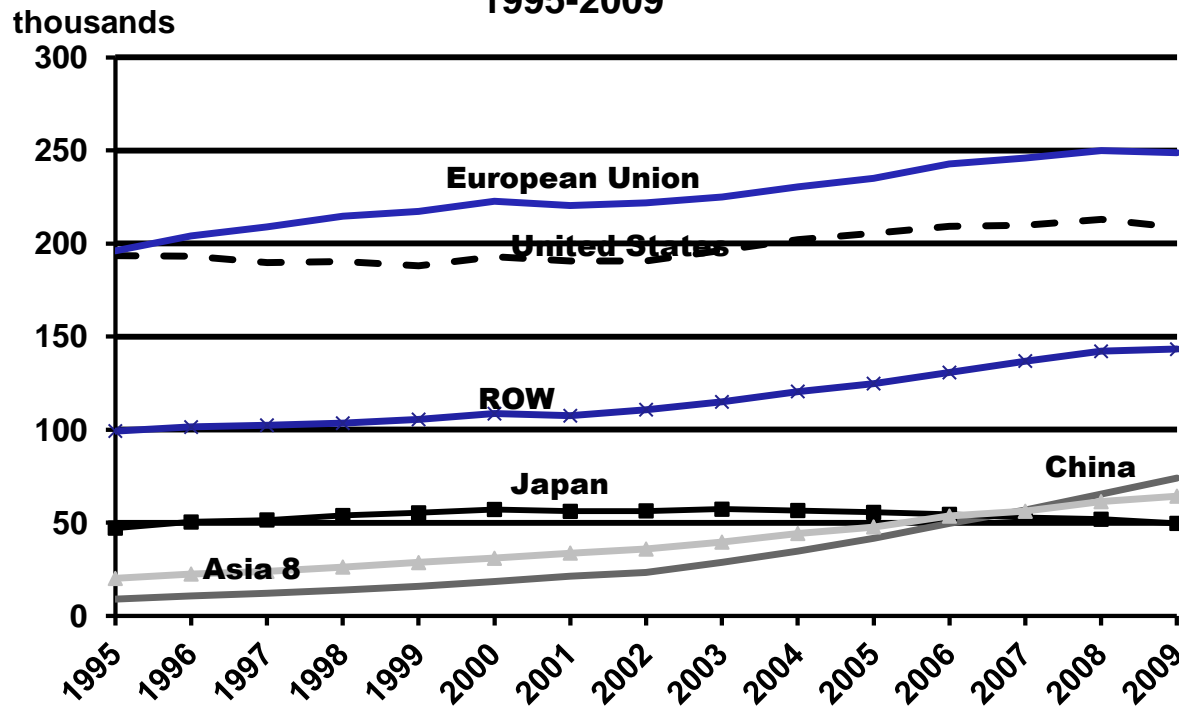
Average annual growth in number of researchers, by region/country/economy



SOURCE: Organisation for Economic Co-operation and Development, *Main Science and Technology Indicators*

Scientific publishing in major regions and countries

Global S&E publications, by selected region/country:
1995-2009

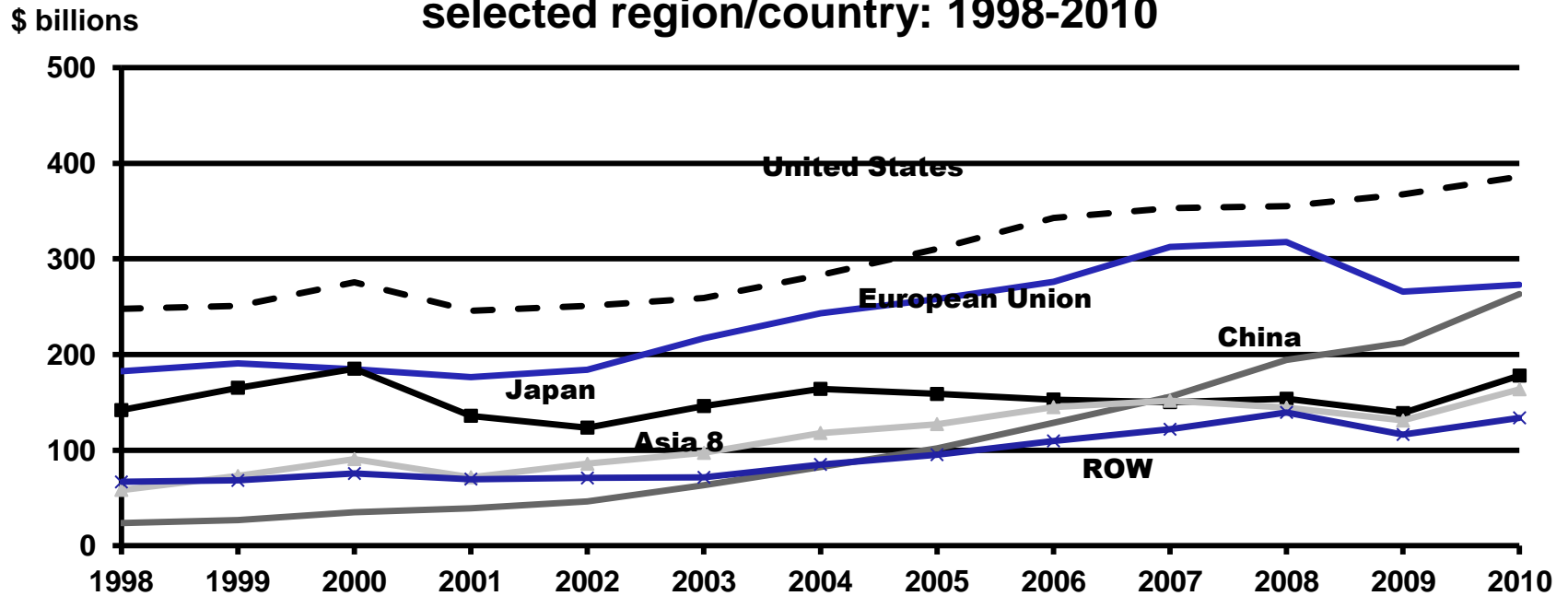


NOTE: Asia 8 consists of India, Indonesia, Malaysia, Philippines, Singapore, South Korea, Taiwan, and Thailand.

SOURCES: National Science Foundation, National Center for Science and Engineering Statistics, special tabulations of Thomson-Reuters, Science and Social Sciences Citation Indexes, and The Patent Board.

Major producers in high technology manufacturing

Value added for high technology manufacturing industries, by selected region/country: 1998-2010



NOTE: Asia 8 consists of India, Indonesia, Malaysia, Philippines, Singapore, South Korea, Taiwan, and Thailand.

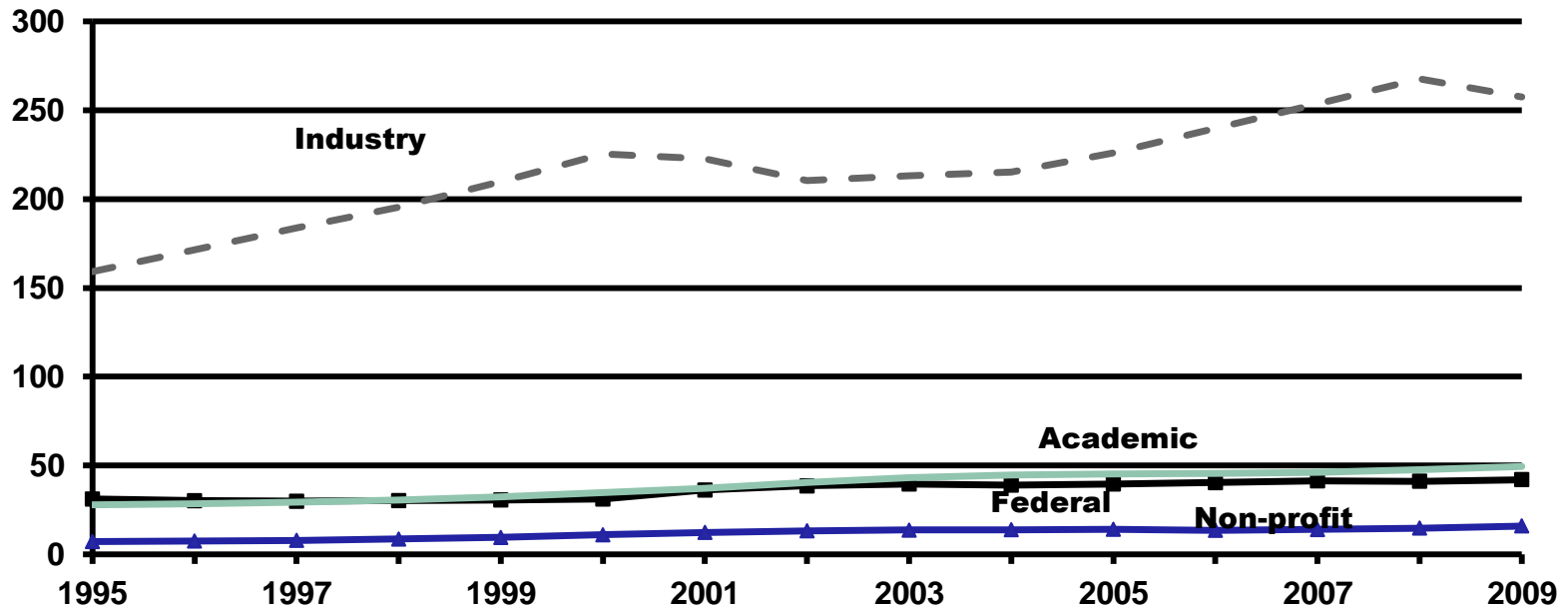
SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, special tabulation of IHS Global Insight, World Industry Service database.

III. U.S. Research Indicators

US R&D performance by sector

U.S. R&D expenditures by performing sector: 1995-2009

\$ constant billions



Note: Federal performers of R&D include federal agencies and federally funded research and development centers.

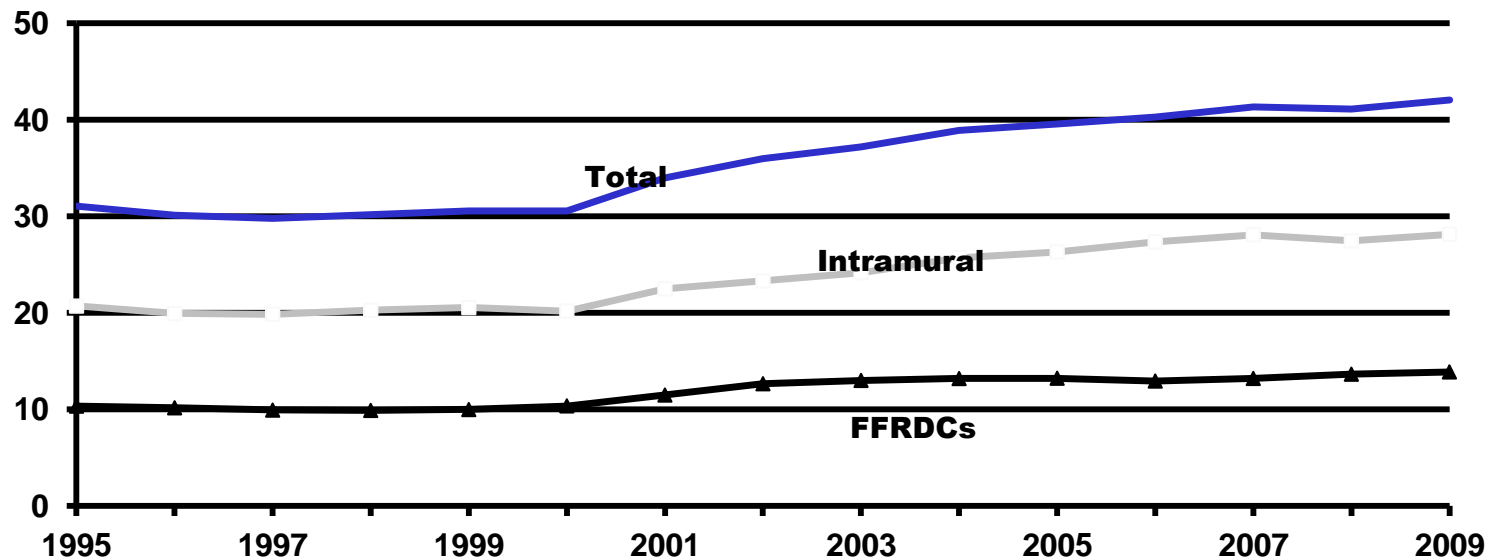
Source: National Science Foundation, National Center for Science and Engineering Statistics, National Patterns of R&D Resources.

III. U.S. Research Indicators

U.S. federal R&D performance

U.S. R&D performed by federal government : 1995-2009

\$ constant billions



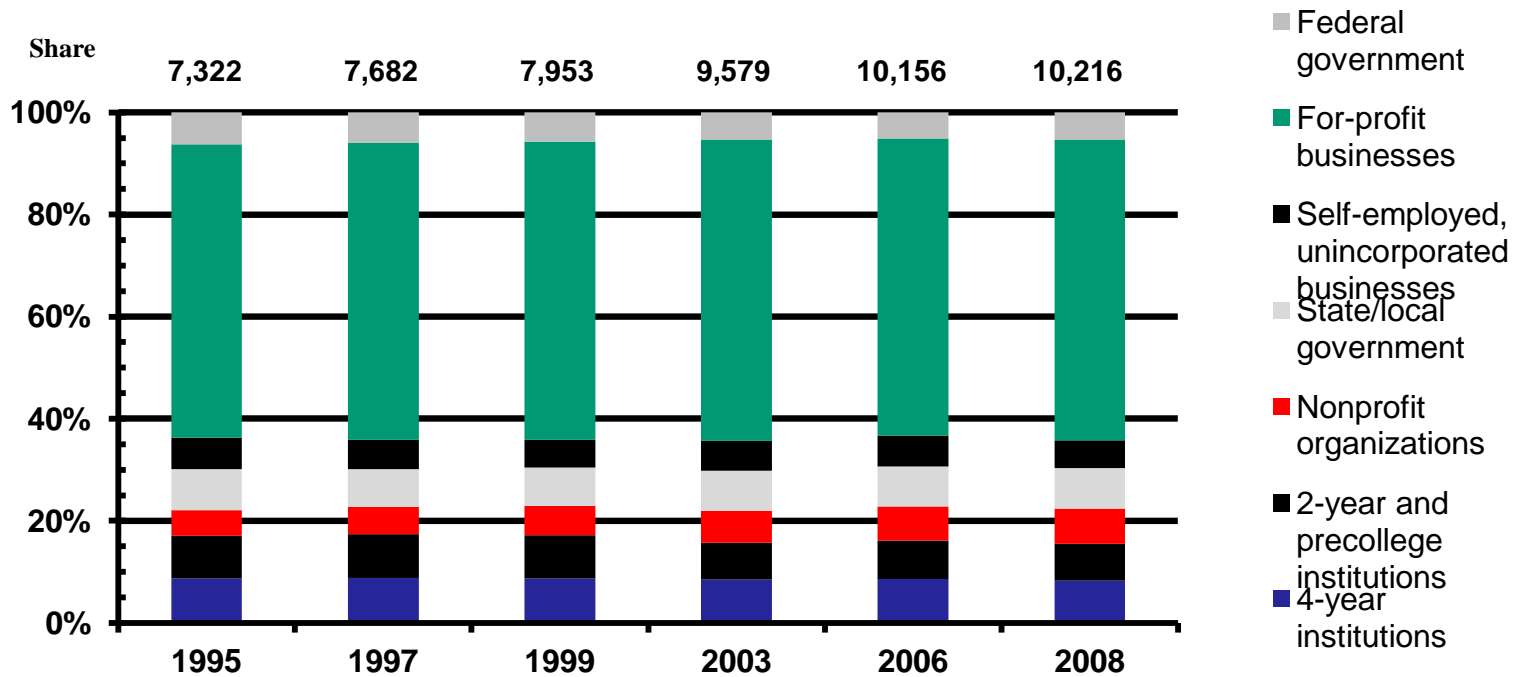
FFFRDC=Federally funded research and development center

Notes: Federal performers of R&D include federal agencies and federally funded research and development centers.

Source: National Science Foundation, National Center for Science and Engineering Statistics, National Patterns of R&D Resources.

Industry is largest employer of S&E degree holders

Employed S&E highest degree holders, by sector: 1995-2008



NOTE: NOTE: *Science and engineering highest degree holders* refers to individuals whose highest degrees are in computer/math sciences, biological/agricultural/environmental life sciences, physical sciences, social sciences and engineering. Number of employed S&E degree holders for each years is shown above bars in thousands.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT) (1993–2008), special tabulations, <http://sestat.nsf.gov>.



Employment sector of S&E highest degree holders: 2008

Percent

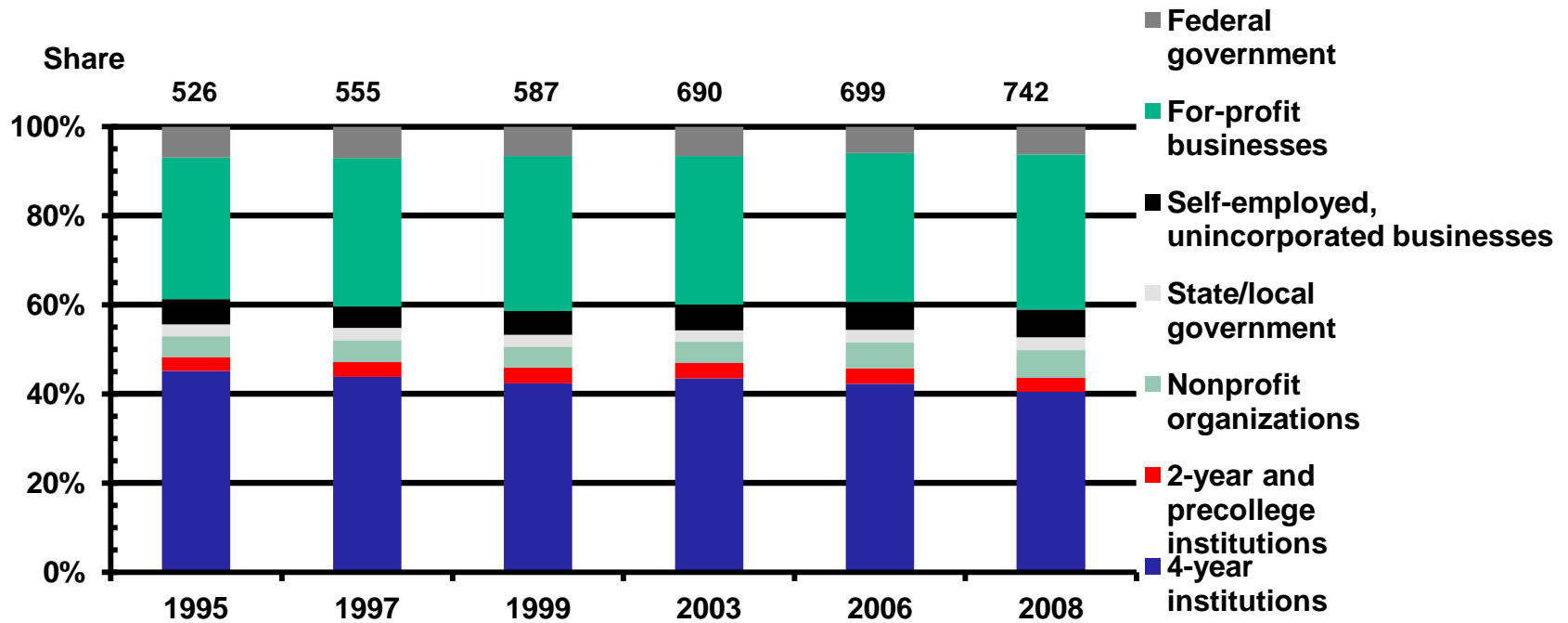
Highest degree field and level	Education		Government		Business/industry		
	4-year	2-year and precollege	Federal	State/local	Self-employed	Non-profit	For-profit
All S&E highest degree holders	8.3	7.2	5.3	7.9	5.5	6.9	58.9
Computer/mathematical sciences	7.2	6.3	4.2	4.1	3.3	4.7	70.3
Biological/agricultural/environmental life sciences	15.2	7.0	6.2	8.9	6.5	9.5	46.6
Physical sciences	14.9	6.3	6.4	6.7	5.7	5.3	54.8
Social sciences	7.4	11.7	5.1	10.9	7.4	10.2	47.3
Engineering	4.1	1.0	5.4	5.7	3.5	1.8	78.5

NOTE: Scientists and engineers refers to all persons who work in an S&E occupation or who received a bachelor's degree or higher in an S&E degree field in 1993–99 or an S&E or S&E-related field in 2003–08.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT) (1993–2008), <http://sestat.nsf.gov>.

Most S&E doctorate holders are employed in education and industry

Employed S&E doctorate holders, by U.S. employment sector: 1995-2008



NOTE: *Science and engineering doctorates* refers to individuals who have earned doctorates in computer/math sciences, biological/agricultural/environmental life sciences, physical sciences, social sciences and engineering. Number of total employed SE doctorates for each years is shown above bars in thousands.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT) (1993–2008), special tabulations, <http://sestat.nsf.gov>.



Employment Sector of S&E doctorate holders: 2008

Highest degree field and level	Education		Government		Business/industry		
	4-year	2-year and precollege	Federal	State /local	Self-employed	Non-profit	For-profit
S&E doctorate holders	40.5	3.1	6.3	2.9	6.2	6.2	34.8
Computer/mathematical sciences	49.0	2.6	3.7	0.8	3.4	3.3	37.3
Biological/agricultural/environmental life sciences	46.3	3.1	8.2	2.8	3.5	8.3	27.7
Physical sciences	34.7	3.2	6.8	2.3	3.7	4.9	44.3
Social sciences	46.5	4.8	5.3	4.7	12.9	8.2	17.7
Engineering	25.7	0.9	5.5	1.9	4.4	2.9	58.7

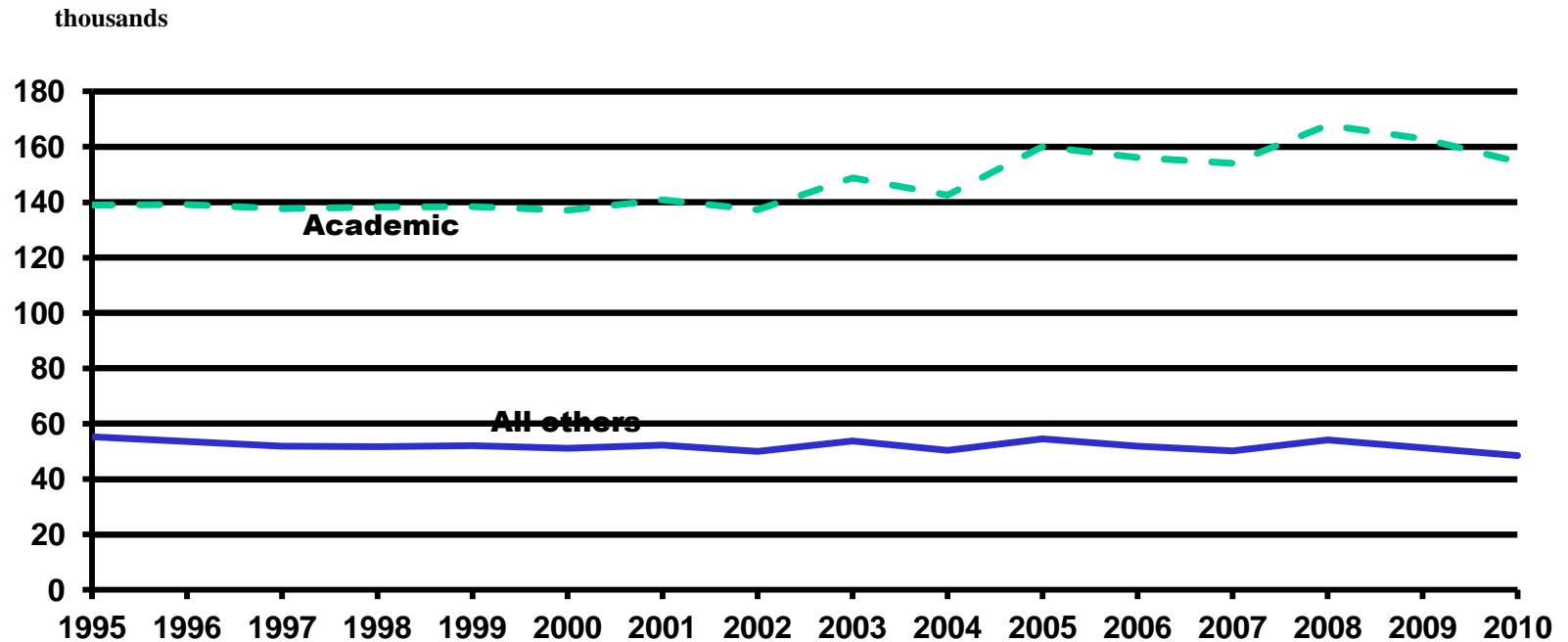
NOTE: Scientists and engineers refers to all persons who work in an S&E occupation or who received a bachelor's degree or higher in an S&E degree field in 1993–99 or an S&E or S&E-related field in 2003–08.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT) (1993–2008), <http://sestat.nsf.gov>.



US scientific publishing dominated by academic sector

U.S. S&E publications by sector: 1995-2010

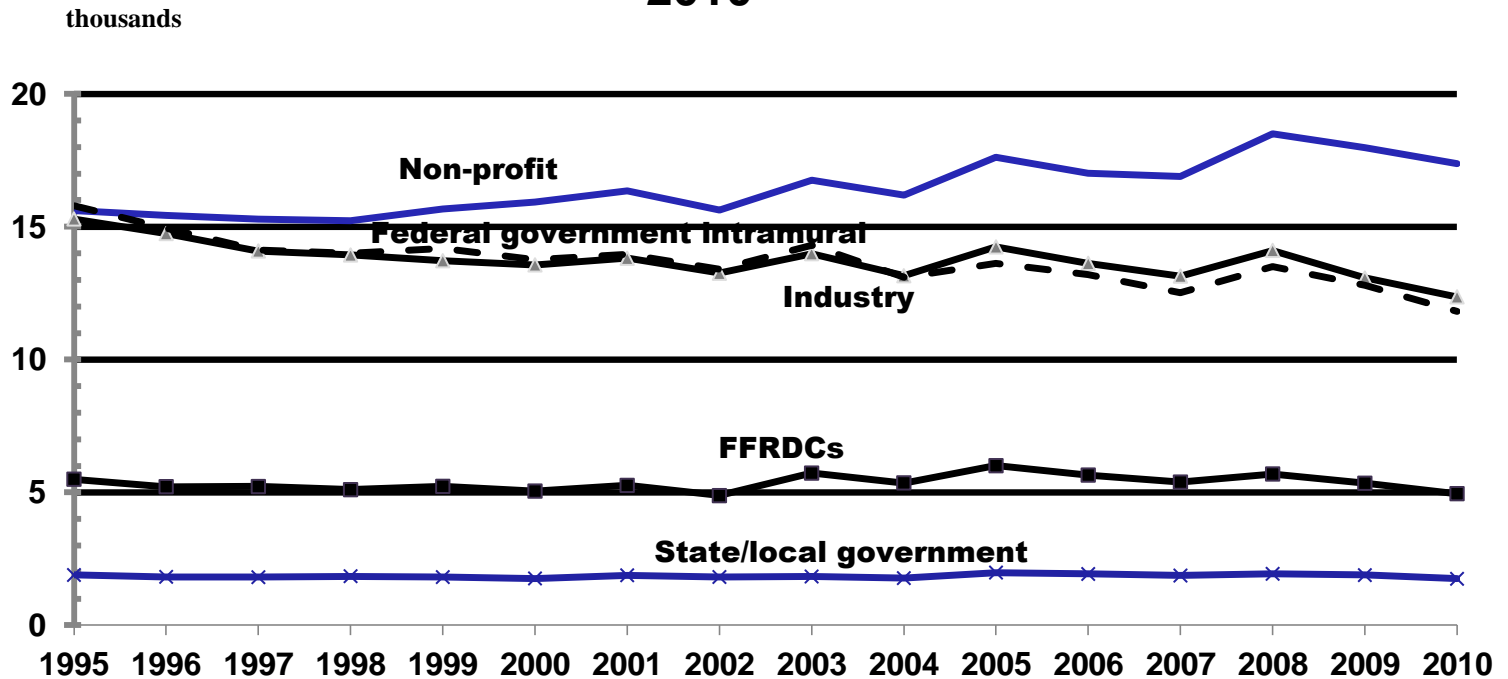


FFFRDC=Federally funded research and development center

SOURCES: National Science Foundation, National Center for Science and Engineering Statistics, special tabulations of Thomson-Reuters, Science and Social Sciences Citation Indexes, and The Patent Board.

Scientific publishing outside of academic sector

U.S. non-academic S&E publications, by sector: 1995-2010

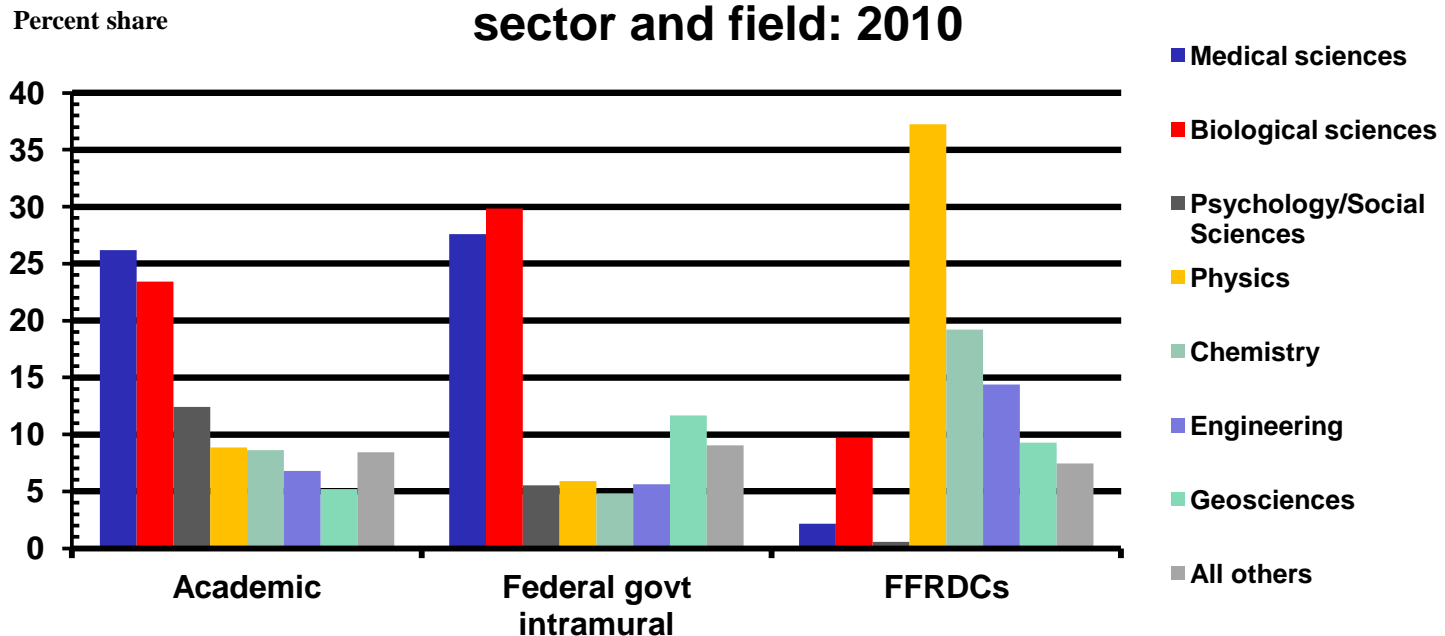


FFFRDC=Federally funded research and development center

SOURCES: National Science Foundation, National Center for Science and Engineering Statistics, special tabulations of Thomson-Reuters, Science and Social Sciences Citation Indexes, and The Patent Board.

U.S. academic and government authored publications by research field

Portfolio of U.S. S&E publications, by selected sector and field: 2010

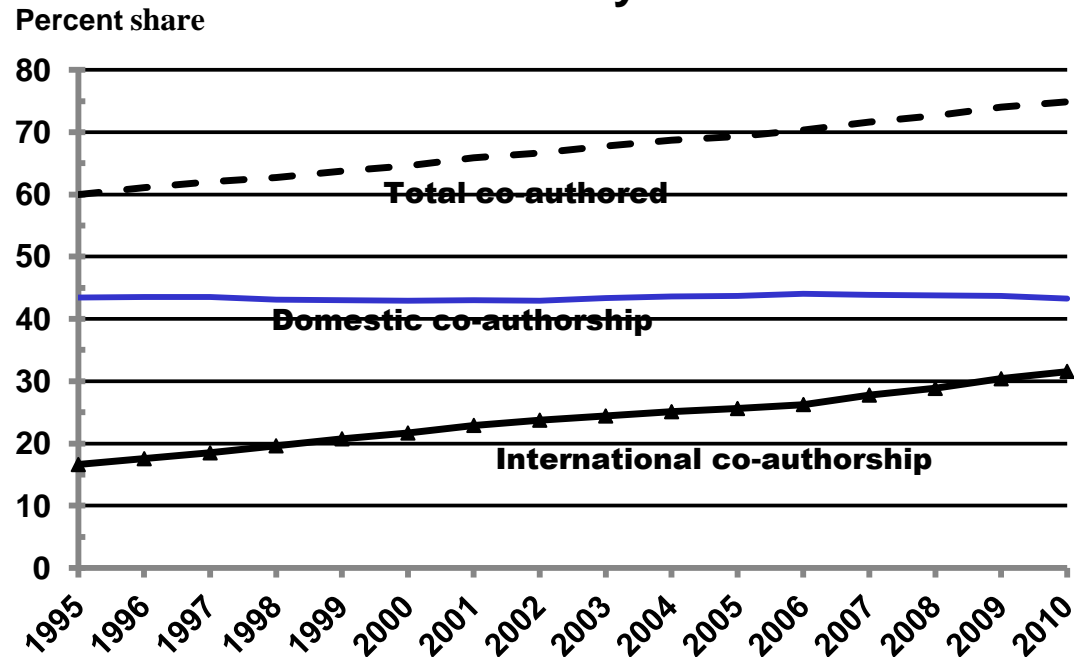


FFFRDC=Federally funded research and development center

SOURCES: National Science Foundation, National Center for Science and Engineering Statistics, special tabulations of Thomson-Reuters, Science and Social Sciences Citation Indexes, and The Patent Board.

Publication data shows increasing collaboration between US and foreign institutions.

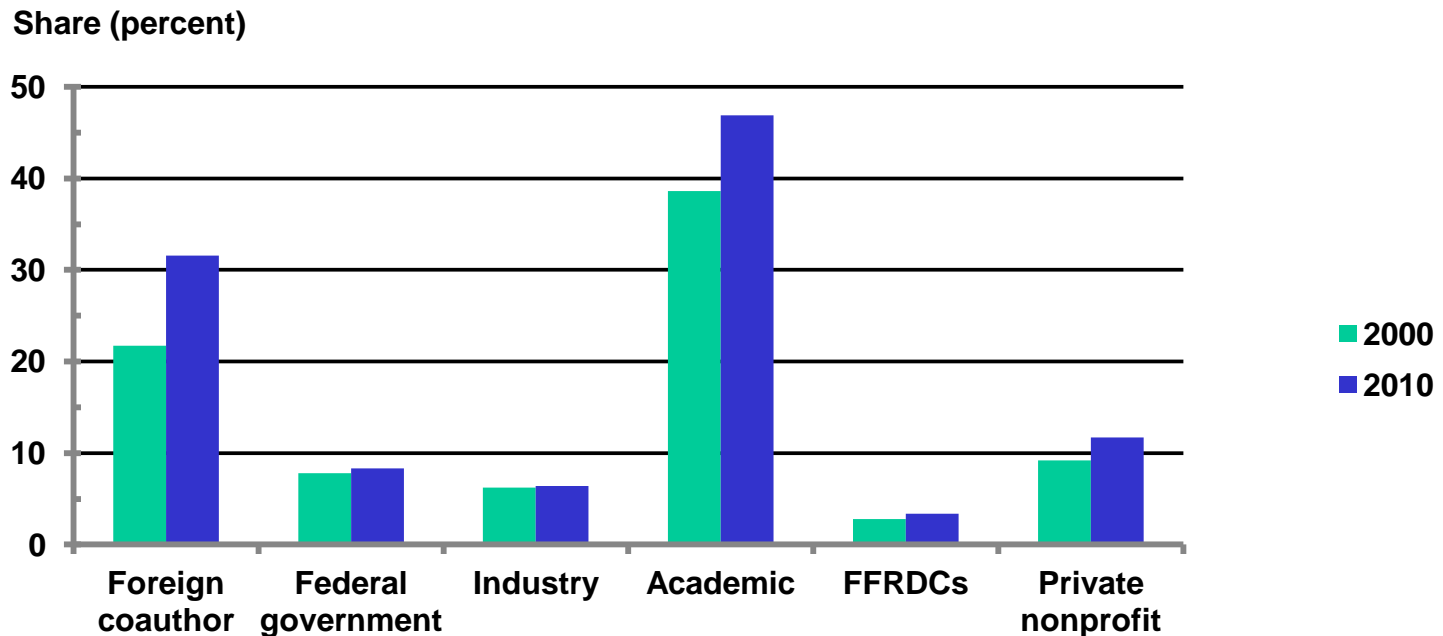
US S&E articles coauthored domestically and internationally: 1995-2010



SOURCES: National Science Foundation, National Center for Science and Engineering Statistics, special tabulations of Thomson-Reuters, Science and Social Sciences Citation Indexes, and The Patent Board.

U.S. sectors have increased their collaboration internationally and with other U.S. sectors

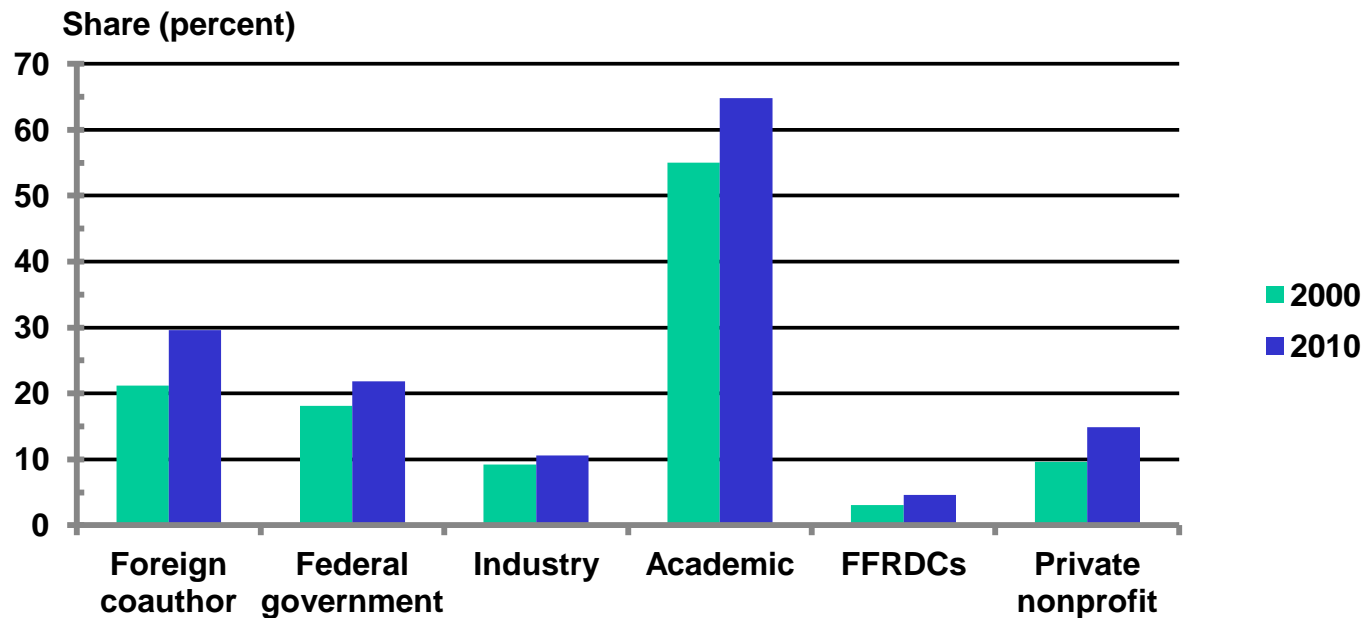
U.S. academic collaboration, by sector: 2000 and 2010



SOURCES: National Science Foundation, National Center for Science and Engineering Statistics, special tabulations of Thomson-Reuters, Science and Social Sciences Citation Indexes, and The Patent Board.



U.S. federal government collaboration, by sector: 2000 and 2010

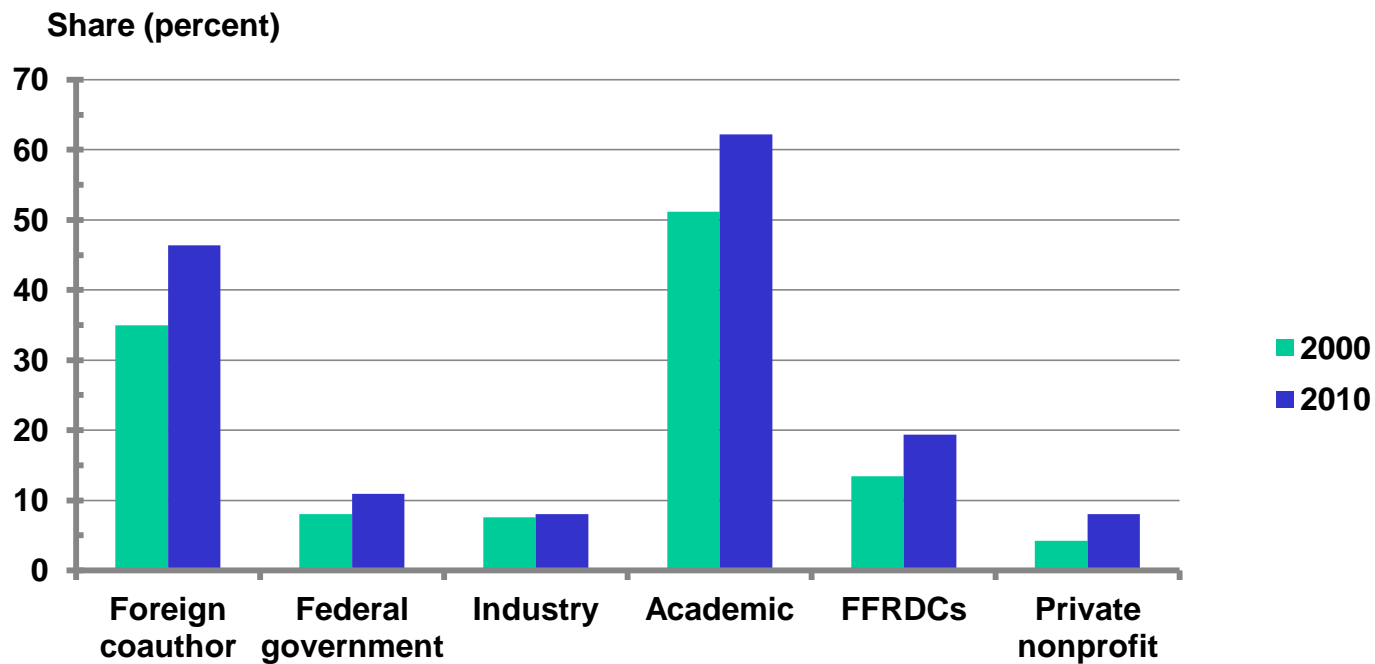


FFRDC=Federally funded research and development center

NOTE: U.S. federal government authored papers exclude those authored by FFRDCs

SOURCES: National Science Foundation, National Center for Science and Engineering Statistics, special tabulations of Thomson-Reuters Science and Social Sciences Citation Indexes, and The Patent Board

FFRDC collaboration with other sectors, by type: 2000 and 2010



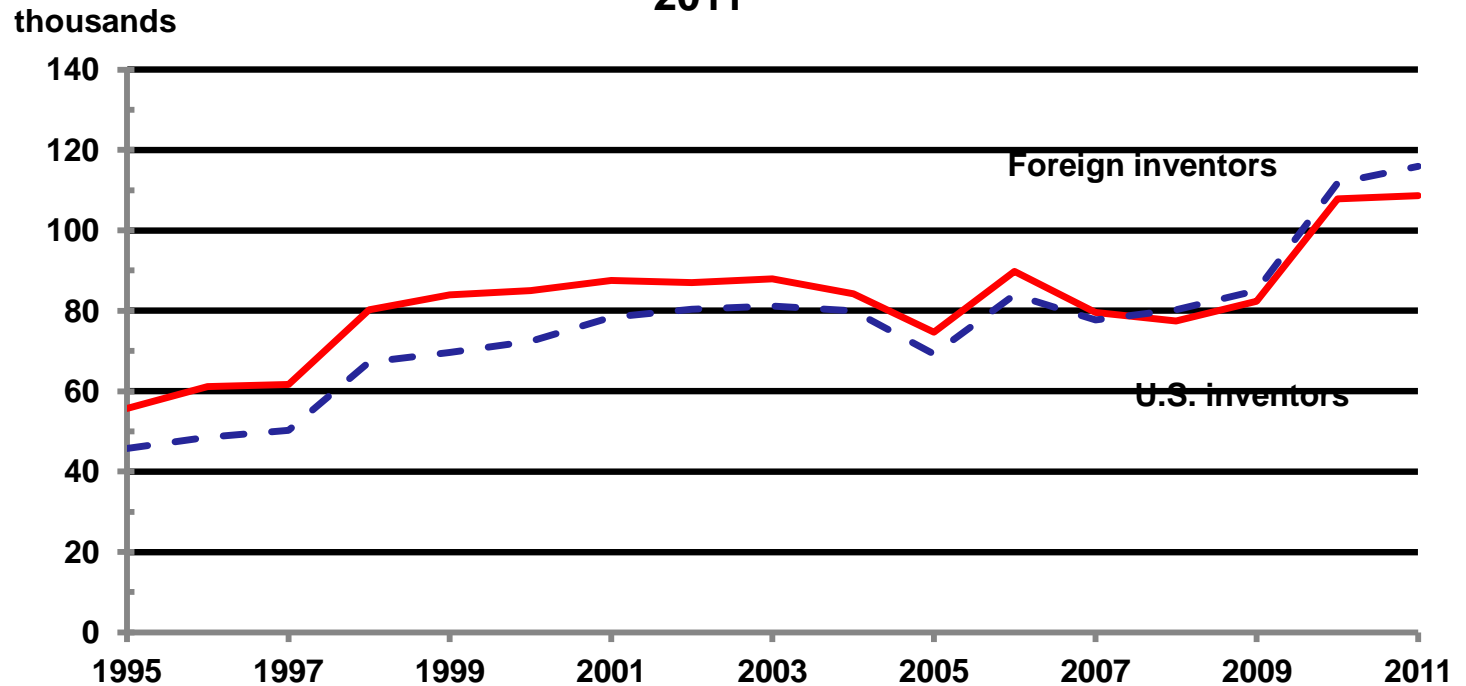
FFRDC=Federally funded research and development centers

SOURCES: National Science Foundation, National Center for Science and Engineering Statistics, special tabulations of Thomson-Reuters, Science and Social Sciences Citation Indexes, and The Patent Board.



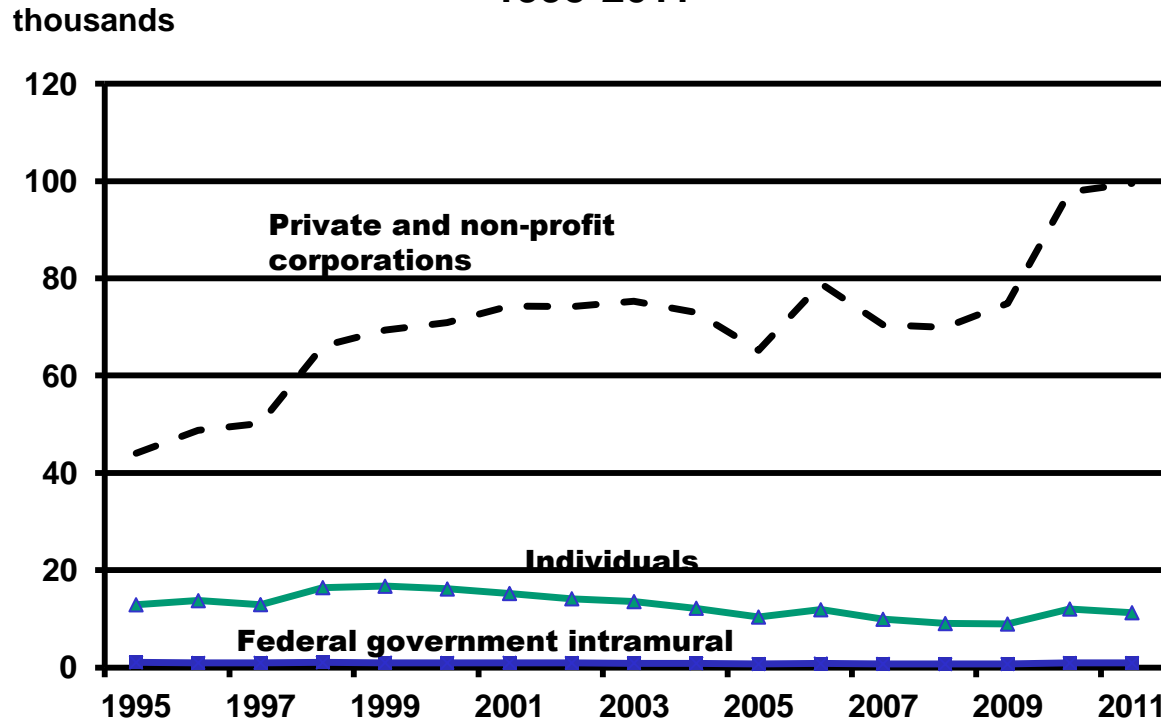
Trends for USPTO patents

USPTO patents granted to U.S. and foreign inventor: 1995-2011



USPTO patents credited to U.S. inventors

USPTO patents granted to U.S. inventors, by sector: 1995-2011

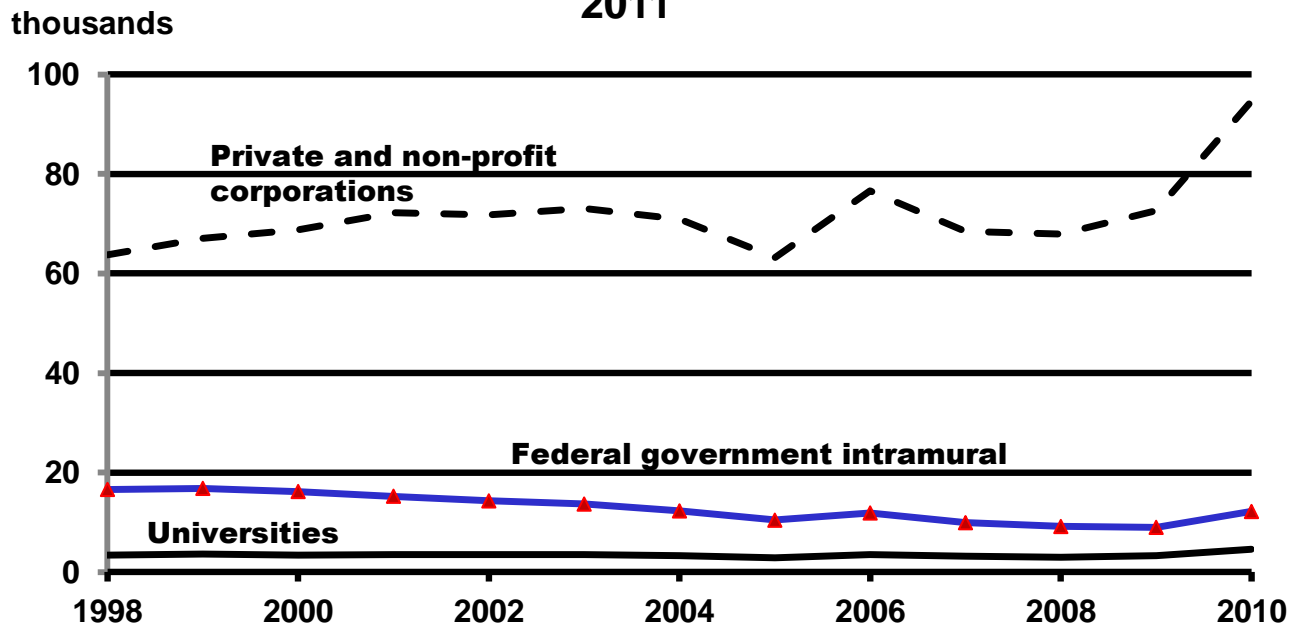


NOTE: USPTO patents granted to universities and federally funded research and development centers are classified as private and non-profit corporations.

SOURCE: U.S. Patent and Trademark Office, Patent Statistics, <http://www.uspto.gov/patents/stats/index.jsp>

U.S. ownership of USPTO patents

USPTO patents assigned to US owners, by type: 1995-2011



NOTES: Patents on whole-count basis, that is, each assignee on patent is credited one count. Patents assigned to federally funded research and development centers are classified as private and non-profit corporations.

SOURCES: National Science Foundation, National Center for Science and Engineering Statistics, and The Patent Board™, special tabulations (2011) from U.S. Patent and Trademark Office (USPTO), Patent Grant Bibliographic Data.



Thank you

Information and data available at <http://www.nsf.gov/statistics/>

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