

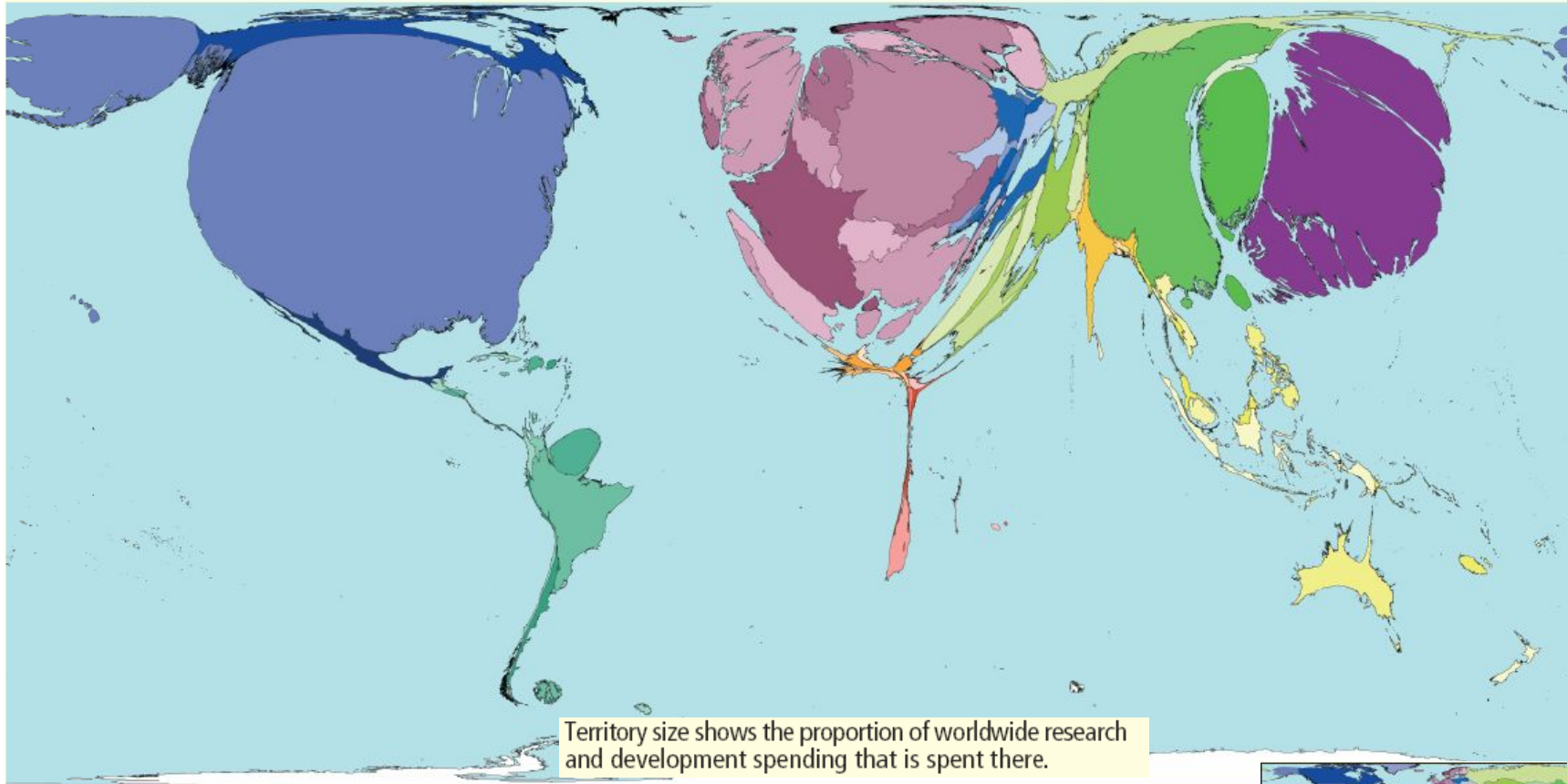
A broad overview of the U.S. innovation system

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U.S. R&D expenditure was \$292 billion in 2003

Research and Development Expenditure



The University Of Sheffield.

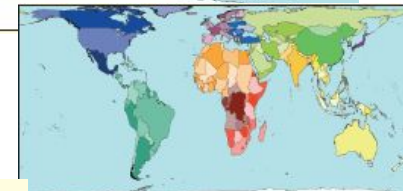


The Leverhulme Trust



Geographical Association

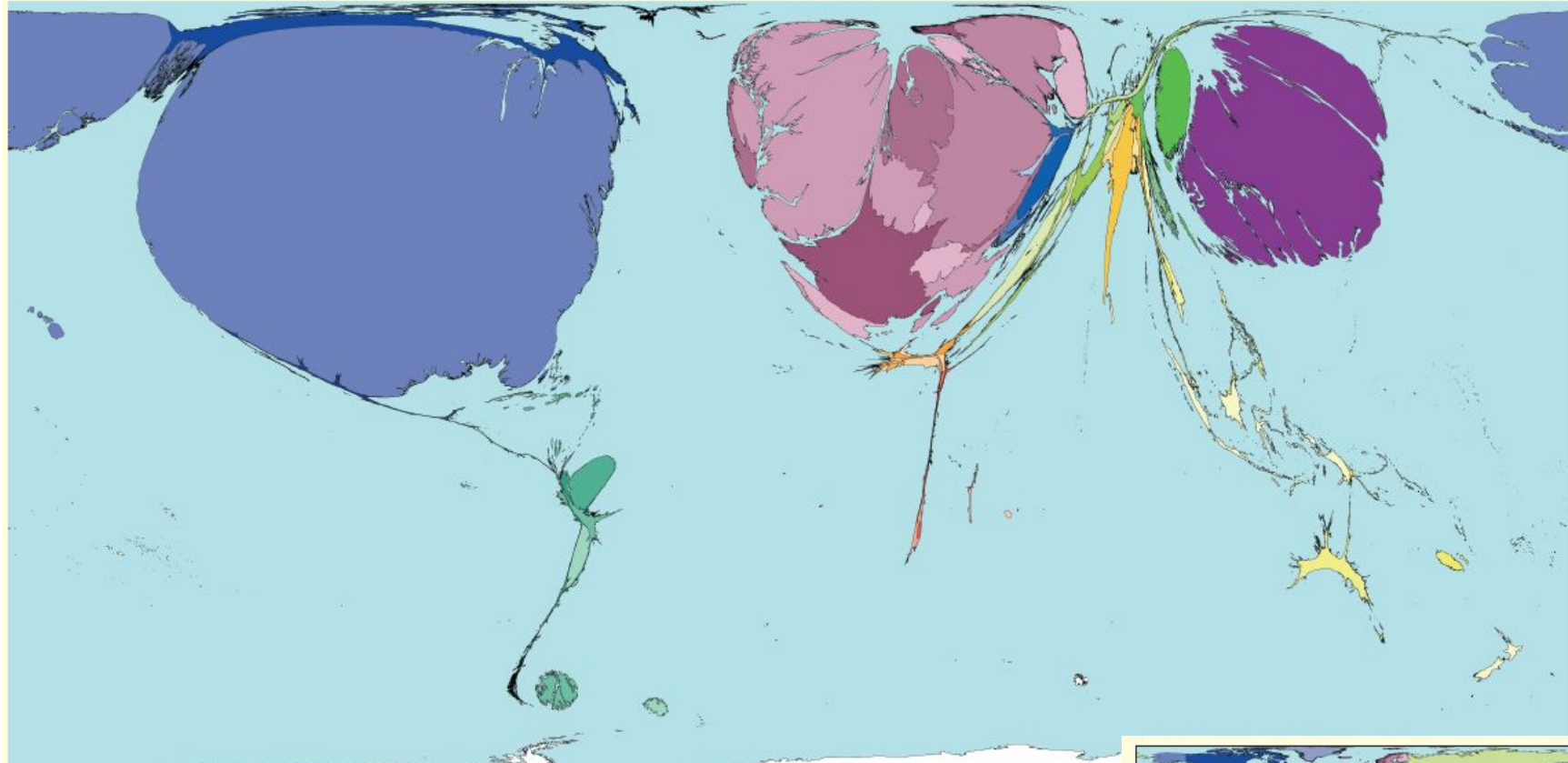
Produced by the SASI group (Sheffield) and Mark Newman (Michigan)



53% of all royalty and license fees paid in 2002 were received by the U.S.

Royalty Fees

Territory size shows the proportion of worldwide earnings (in purchasing power parity) from royalties and license fees that are earned there.



The University Of Sheffield.

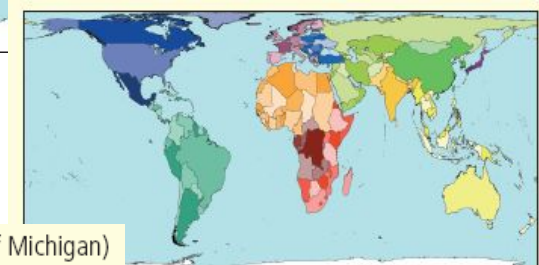


The Leverhulme Trust



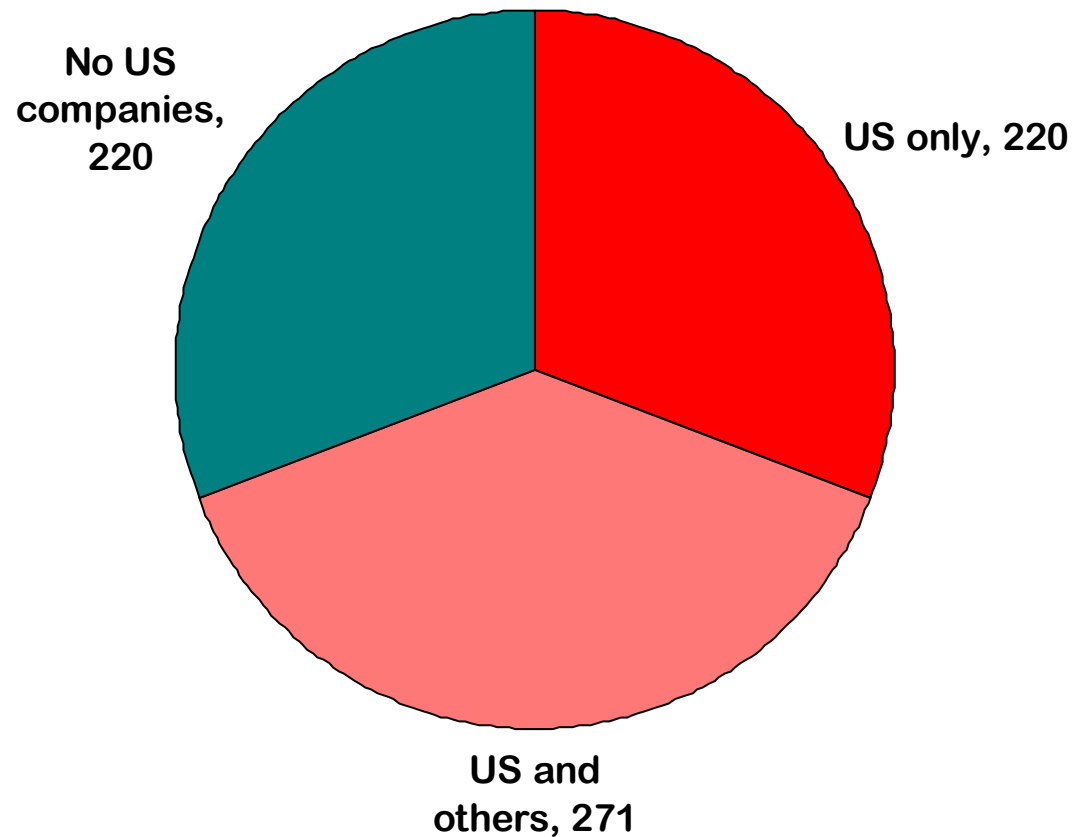
Geographical Association

Produced by the SASI group (Sheffield) and Mark Newman (Michigan)



Most technology alliances involve U.S. companies

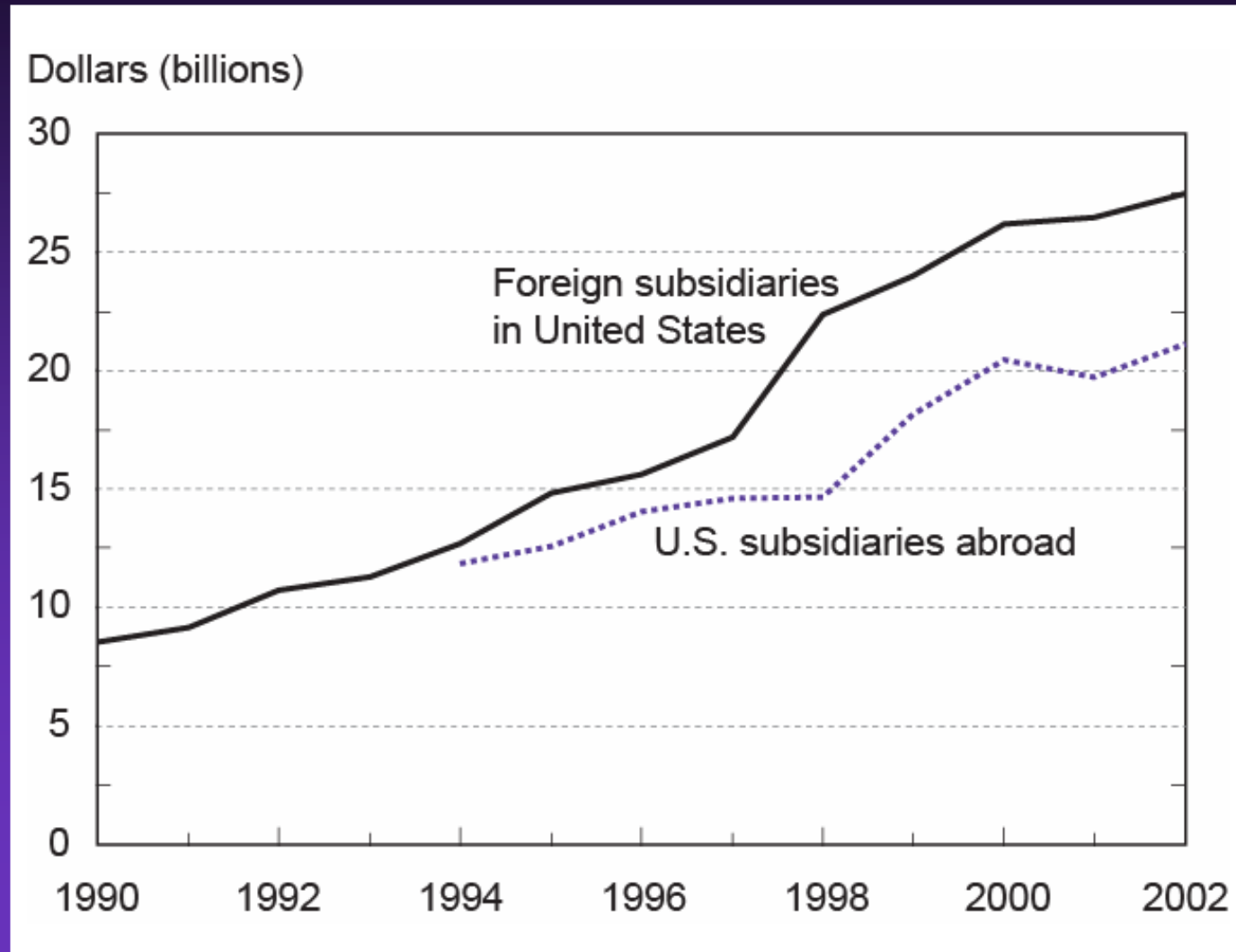
Count of new technology alliances in 2003



SOURCE: Maastricht Economic Research Institute on Innovation and Technology, Cooperative Agreements and Technology Indicators (CATI-MERIT) database, special tabulations.

Science and Engineering Indicators 2006, appendix table 04-37.

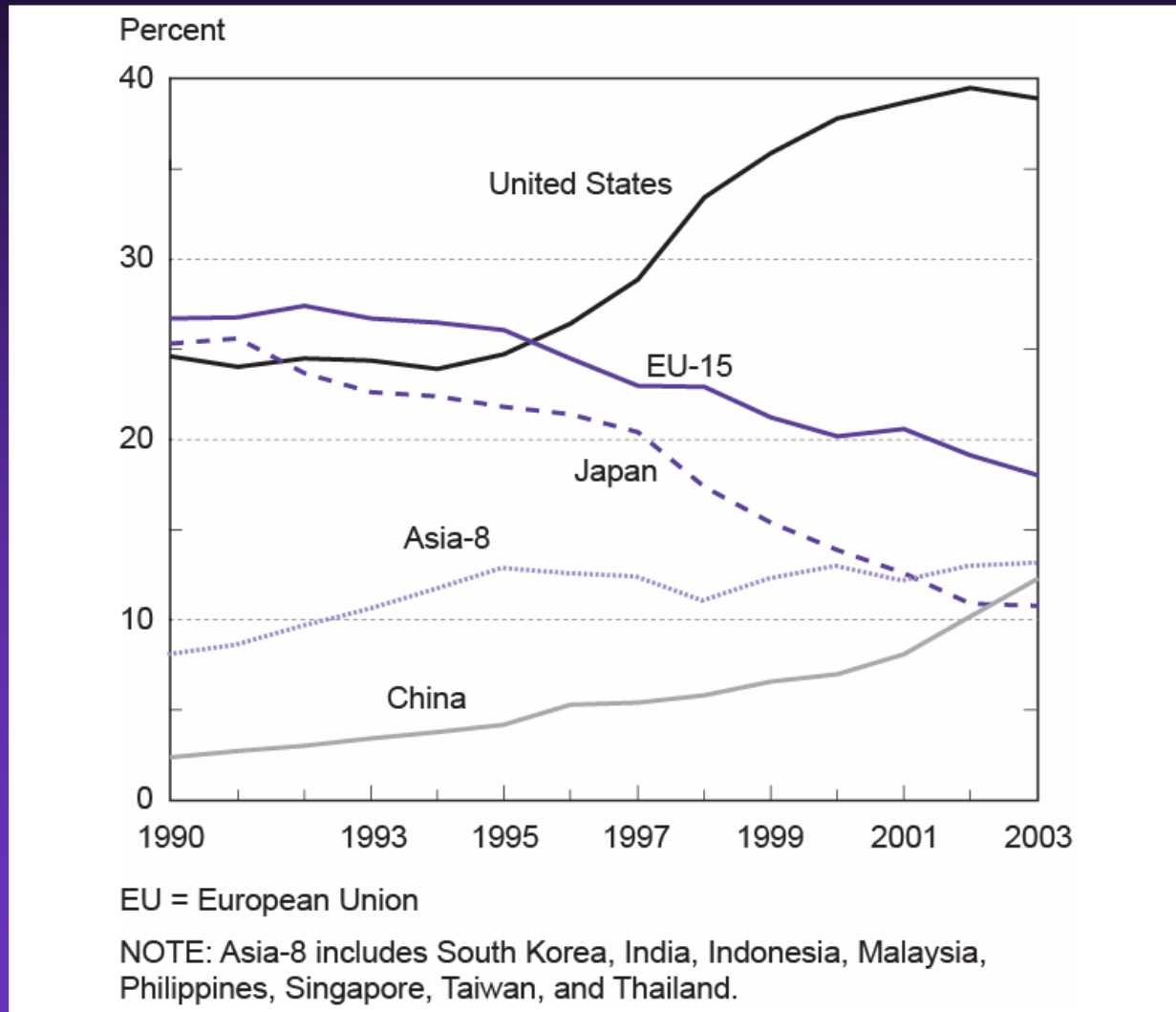
R&D expenditures of foreign-owned firms in United States and of U.S.-owned firms abroad: 1990–2002



SOURCE: National Science Board, *Science and Engineering Indicators 2006*



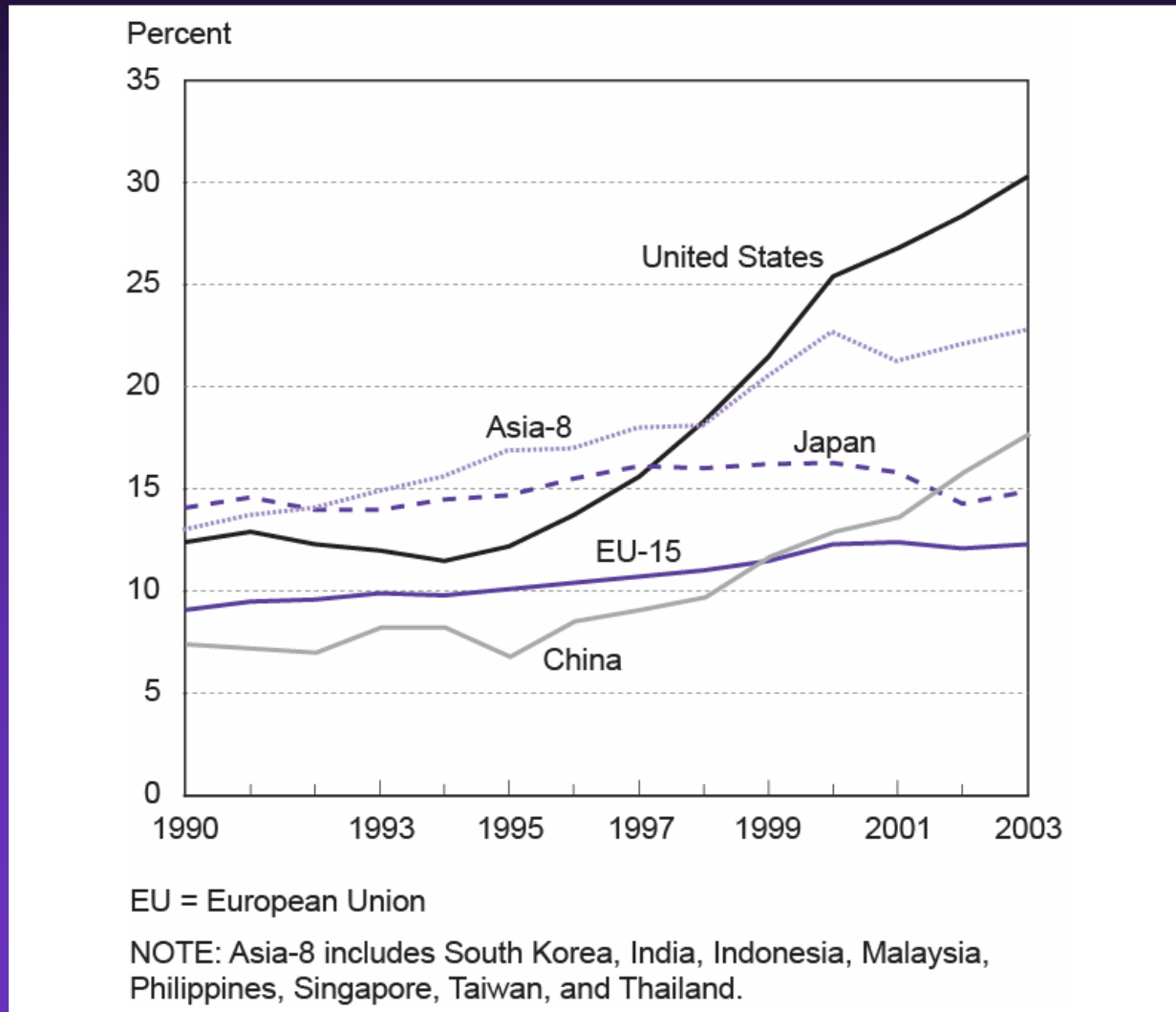
Location of world's high-technology manufacturing output: 1990–2003



SOURCE: National Science Board, *Science and Engineering Indicators 2006*



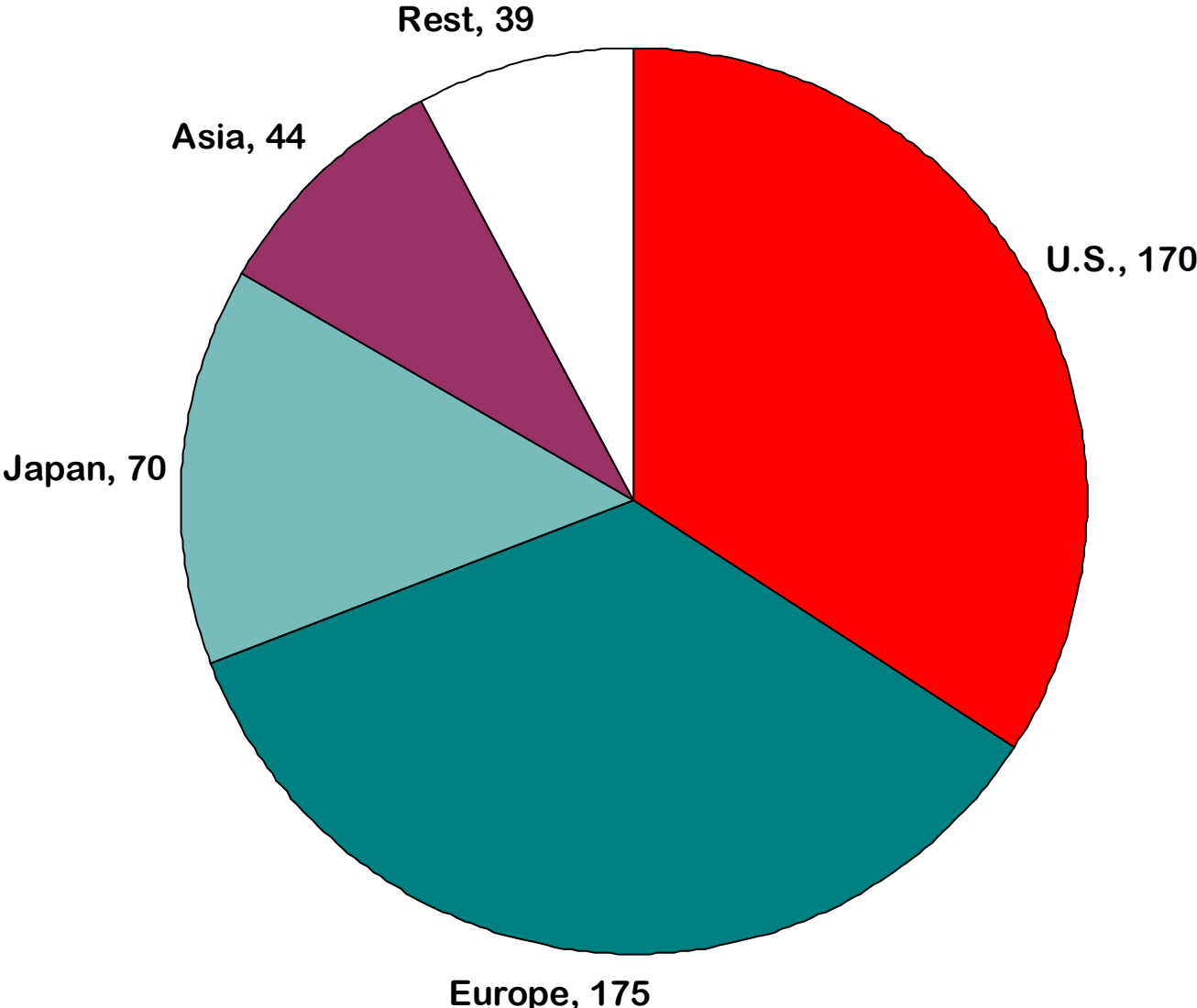
High-technology share of total manufacturing, by country/region: 1990–2003



SOURCE: National Science Board, *Science and Engineering Indicators 2006*



Fortune Global 500 largest firms counted by home country



Source: Fortune magazine, July 24, 2006

How important are small businesses to the U.S. economy?

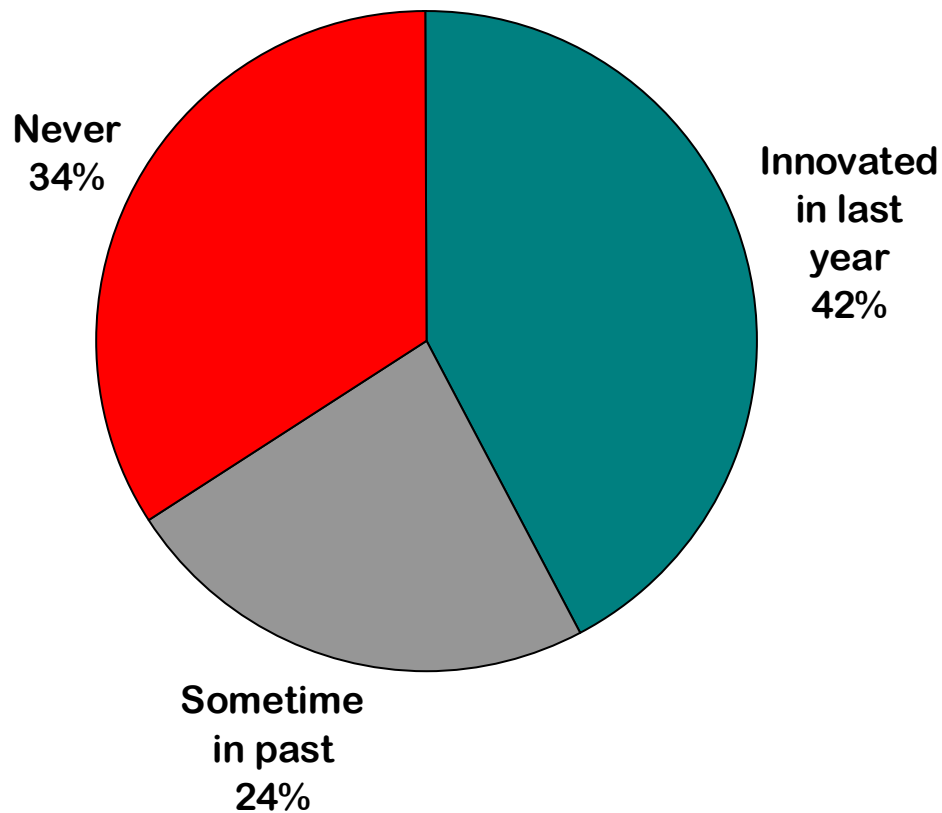
Small firms:

- Represent 99.7 percent of all employer firms.
- Employ half of all private sector employees.
- Pay more than 45 percent of total U.S. private payroll.
- Have generated 60 to 80 percent of net new jobs annually over the last decade.
- Create more than 50 percent of nonfarm private gross domestic product (GDP).
- Supplied more than 23 percent of the total value of federal prime contracts in FY 2005.
- Produce 13 to 14 times more patents per employee than large patenting firms. These patents are twice as likely as large firm patents to be among the one percent most cited.
- Are employers of 41 percent of high tech workers (such as scientists, engineers, and computer workers).
- Are 53 percent home-based and 3 percent franchises.
- Made up 97 percent of all identified exporters and produced 28.6 percent of the known export value in FY 2004.

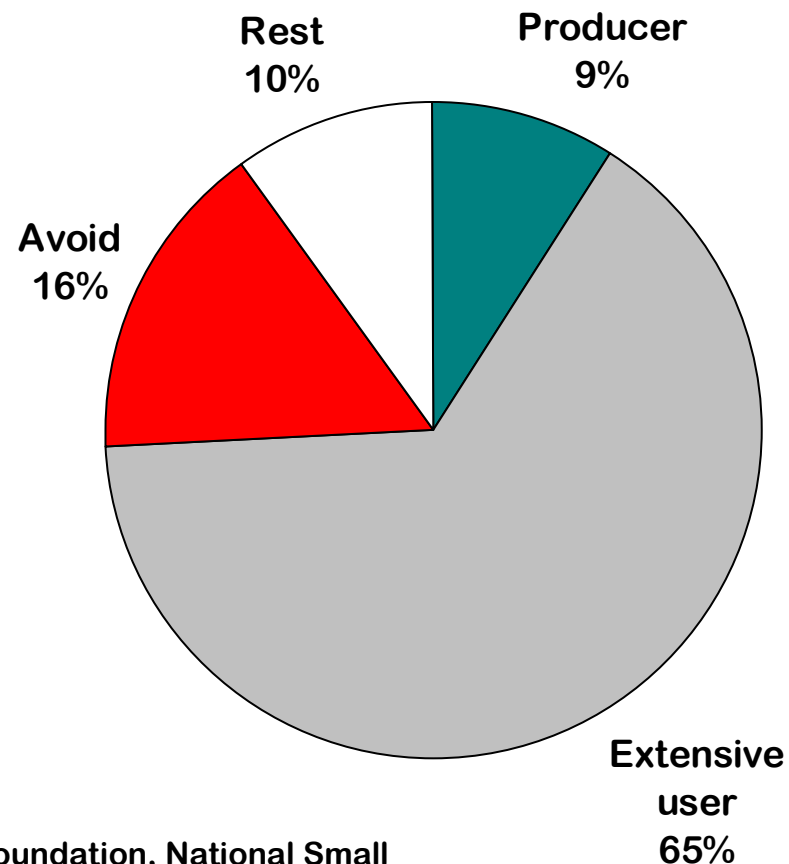
Sources: U.S. Bureau of the Census; Advocacy-funded research by Joel Popkin and Company, Jan. 2002 (see www.sba.gov/advo/research/rs211.pdf); Federal Procurement Data System; Advocacy-funded research by CHI Research, Inc., Feb. 2003 (see www.sba.gov/advo/research/rs225.pdf); Bureau of Labor Statistics, Current Population Survey; U.S. Department of Commerce, International Trade Administration.

How innovative are U.S. small firms (<250 employees)

Has the firm introduced a new product, process or service to the market?



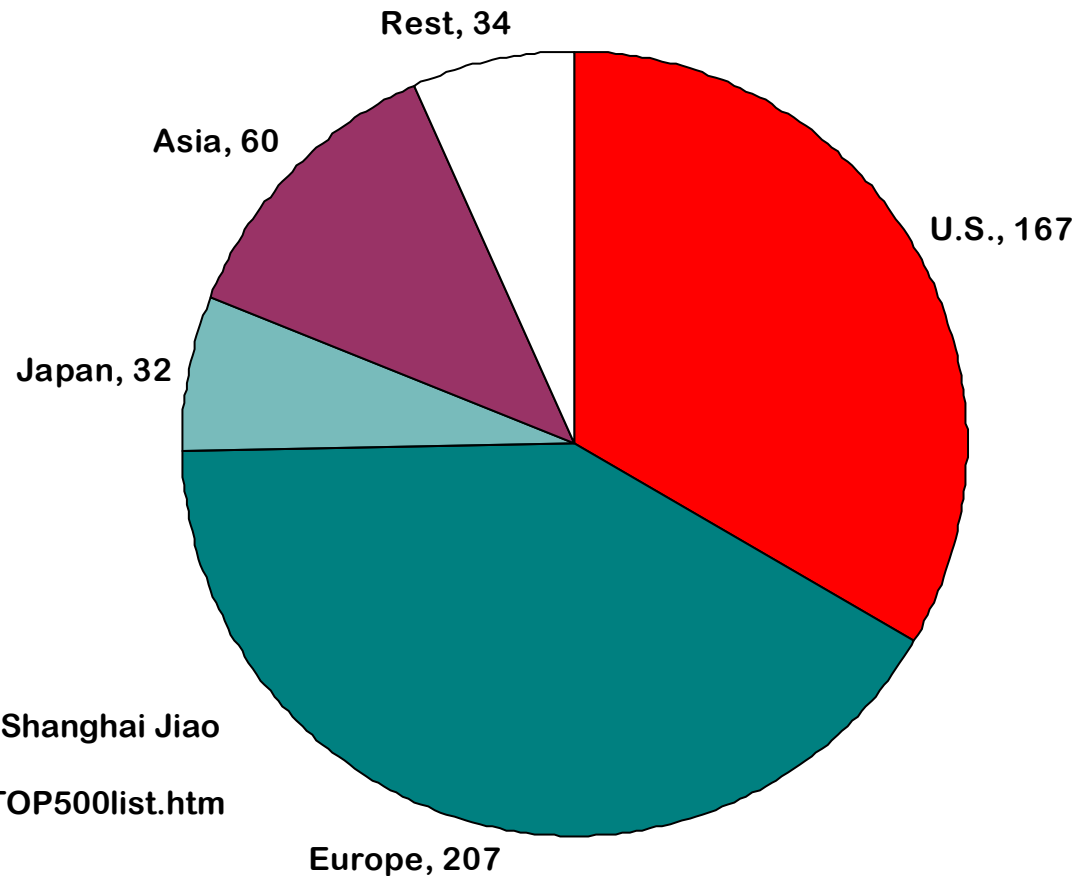
Does the firm produce, use or avoid technology?



Source: NFIB Research Foundation, National Small Business Poll: Innovation, vol. 5, issue 6, 2005

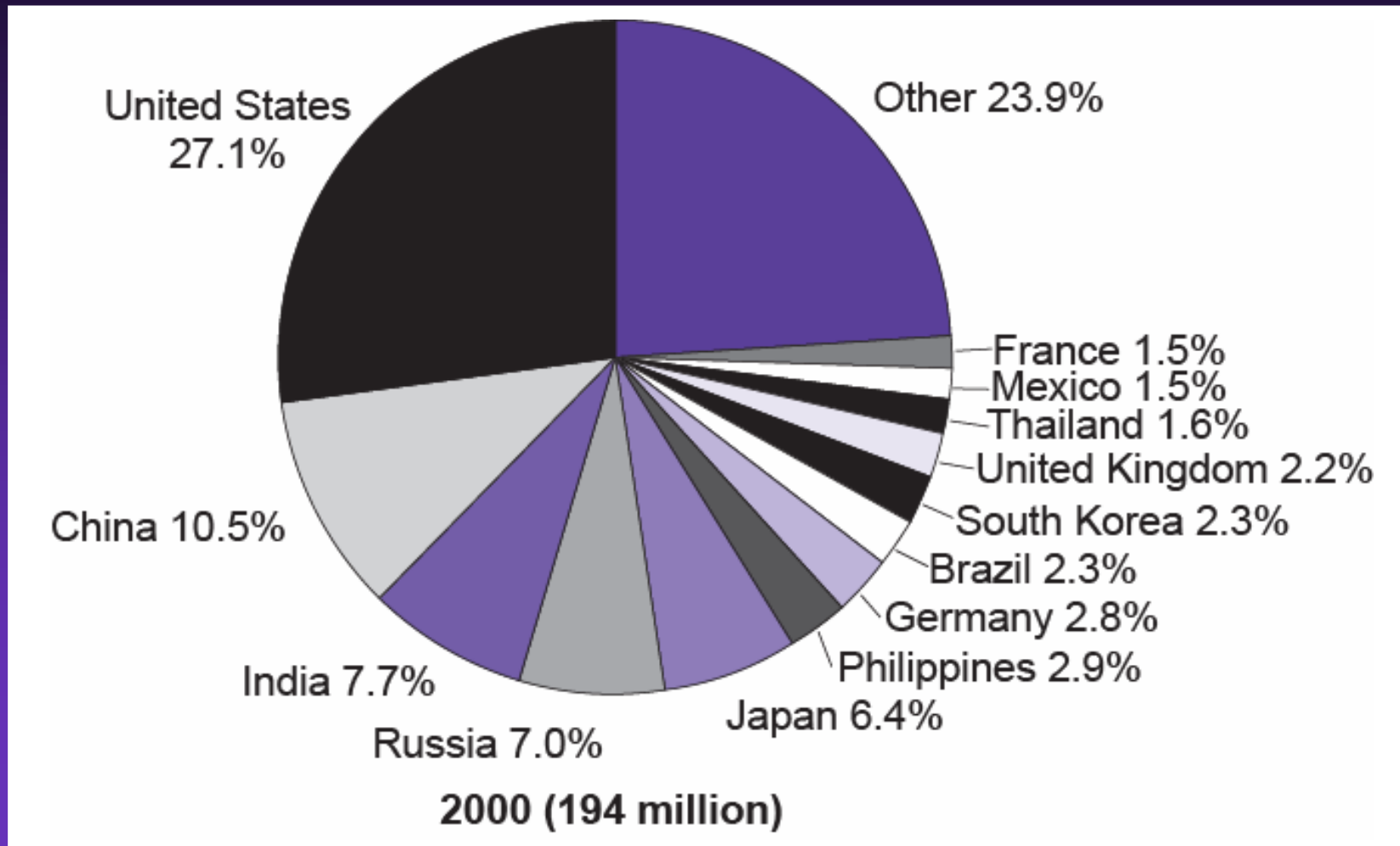
U.S. universities dominate the top of the Academic Ranking of World Universities from Shanghai Jiao Tong University

Top ranked:	Number of universities	U.S. universities	U.S. share
1%	5	4	80%
10%	50	37	74%
All	500	167	33%



Source: 2006 Institute of Higher Education, Shanghai Jiao Tong University,
<http://ed.sjtu.edu.cn/rank/2006/ARWU2006TOP500list.htm>

Population 15 years old or older with tertiary education by country/region: 2000



SOURCE: National Science Board, *Science and Engineering Indicators 2006*

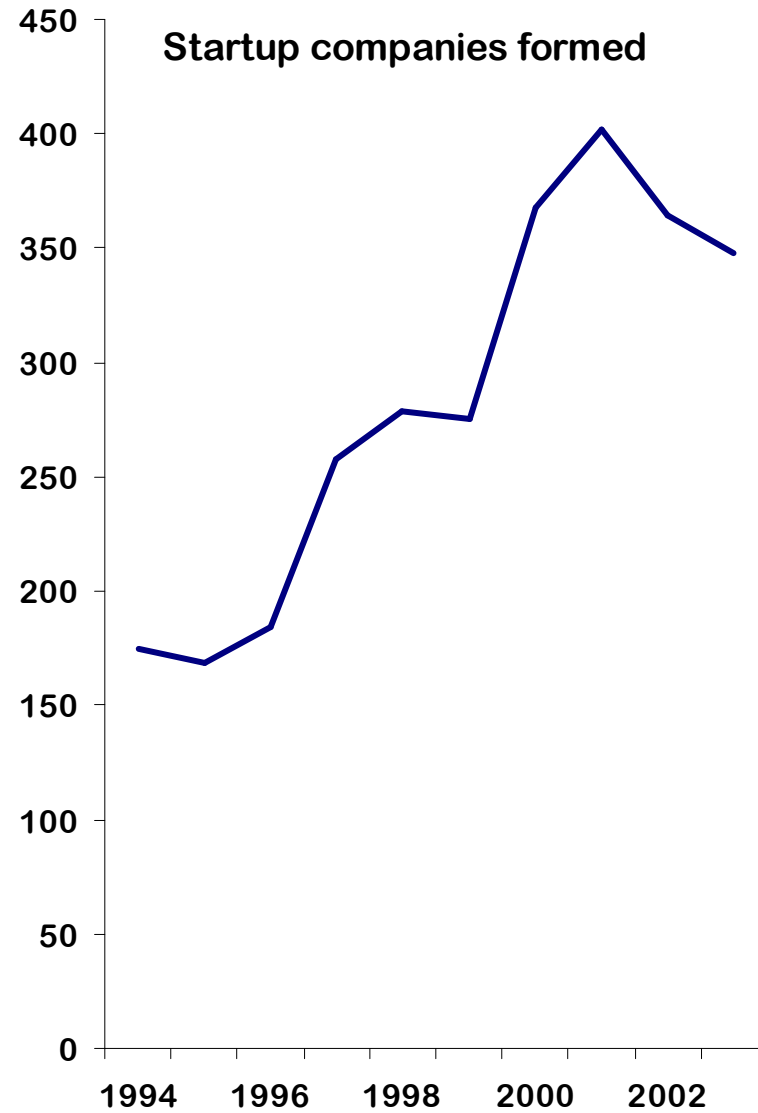
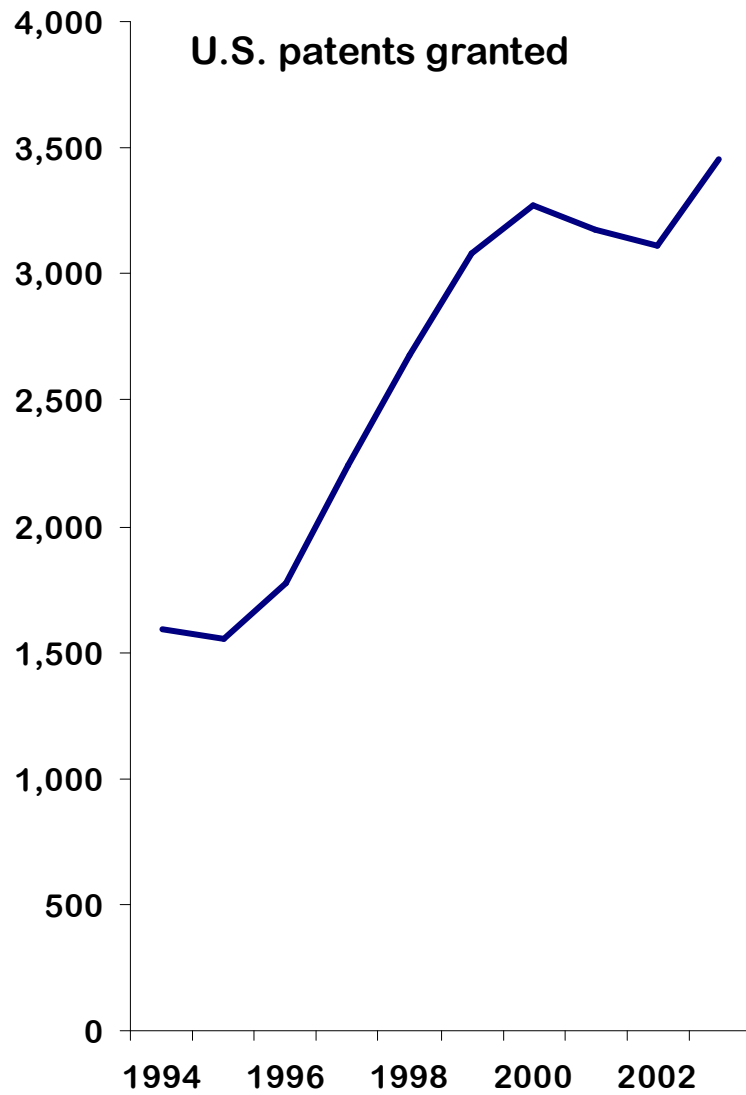


U.S. universities

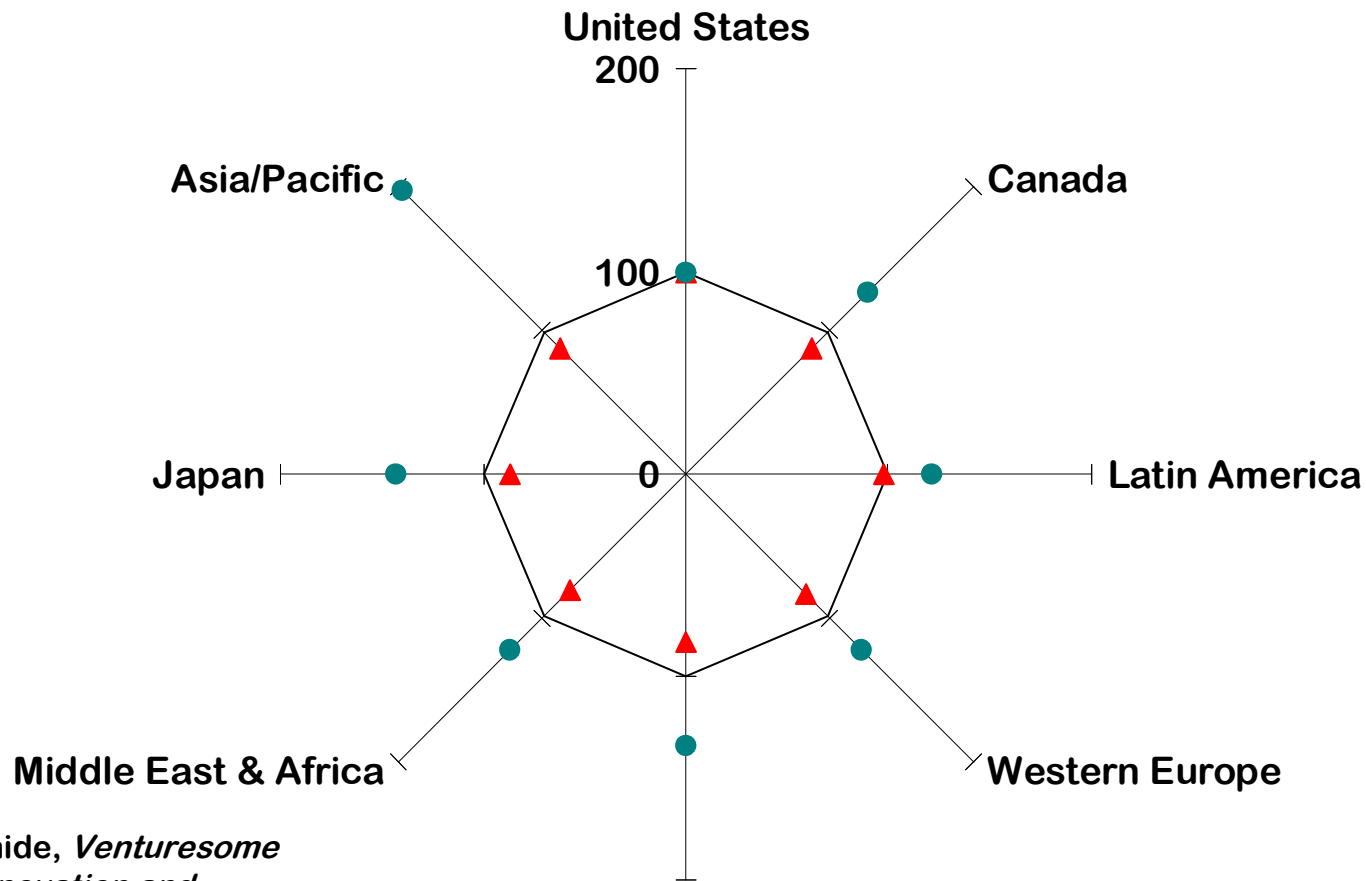
	Universities	Students (in millions)
Public 4-year institutions	631	6
Private 4-year institutions	1,835	3
Public 2-year institutions	1,081	6
Private 2-year institutions	621	0
Total	4,168	16

Chronicle of Higher Education, 2002-03 data

Growing technological entrepreneurship at US universities



U.S. lags in overall fixed investment but leads in IT spending

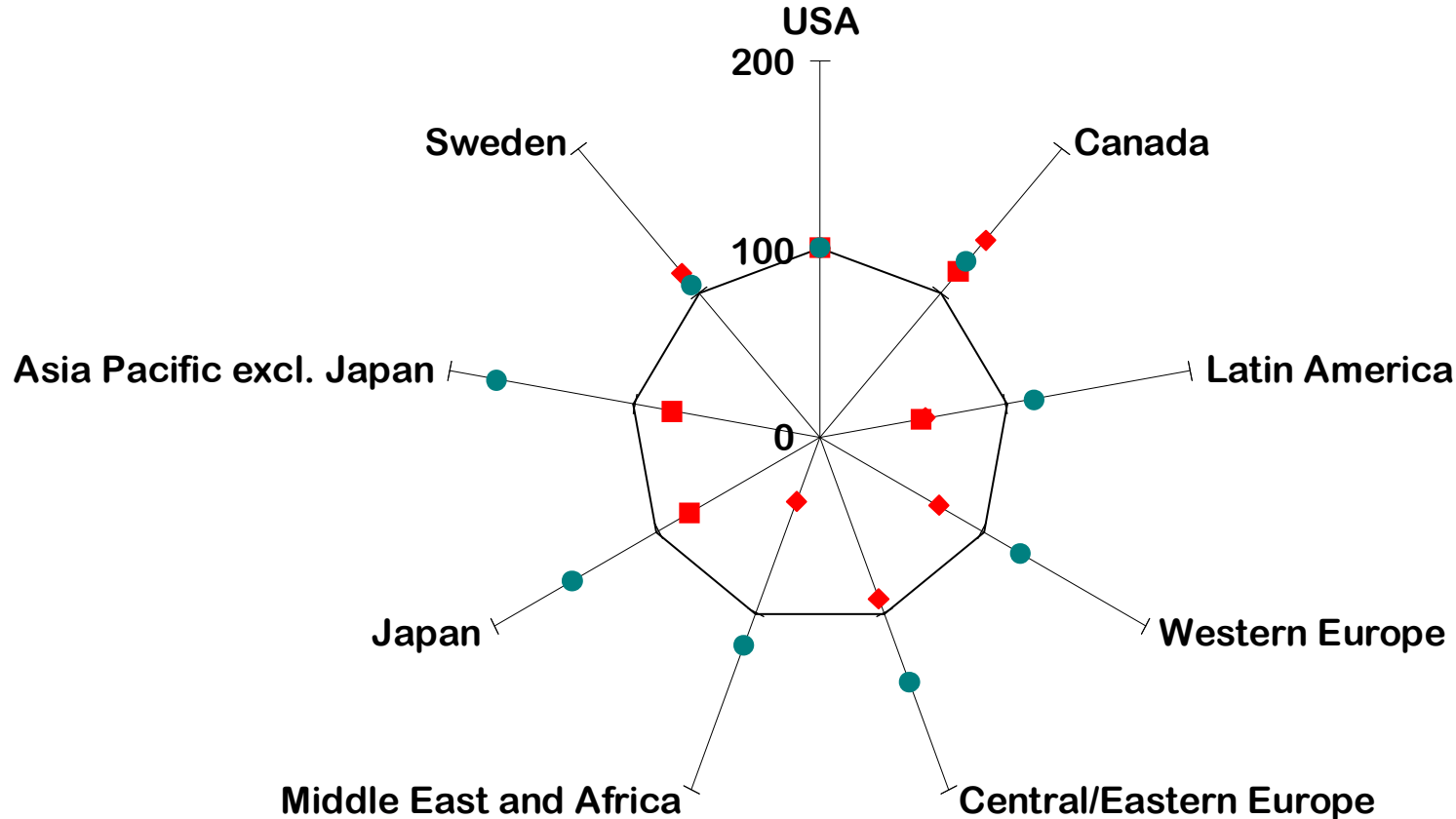


Source: Amar Bhide, *Venturesome Consumption, Innovation and Globalization*, Venice Summer Institute 2006, July 2006, data from Ghemawat & Casadesus-Masanell 2006, World Development Indicators Online, and EIU database

Central /Eastern Europe
 ▲ IT expenditure/GDP
 ● gross fixed investment/GDP
 — Ratio equals US ratio

U.S. lags in overall fixed investment but leads in operating system investment

Operating systems sales (Windows & Linux) divided by GDP compared to gross fixed investments GDP ratio



Operating systems
(Windows & Linux)



◆ Units sold/GDP

■ Revenues/GDP

● Gross Fixed investment/GDP

— Ratio equals US ratio

Source: Amar Bhide, *Venturesome Consumption, Innovation and Globalization*, Venice Summer

Institute 2006, July 2006, data from Ghemawat & Casadesus-Masanell 2006, World Development Indicators Online, and EIU database

Global private equity and venture capital investment in high-tech, 2004

Top 20 Countries (Based on High-Tech Investment)

US is 3.5 times UK, the 2nd ranked country

North America

- 1 USA (\$21.78)
- 8 Canada (\$0.97)

Western Europe

- 2 United Kingdom (\$6.22)
- 4 France (\$1.85)
- 5 Germany (\$1.45)
- 9 Spain (\$0.90)
- 10 Netherlands (\$0.81)
- 12 Sweden (\$0.55)
- 15 Denmark (\$0.32)
- 16 Italy (\$0.30)
- 18 Switzerland (\$0.14)
- 19 Belgium (\$0.12)
- 20 Finland (\$0.11)

Middle East & Africa

- 6 Israel (\$1.22)

Asia Pacific

- 3 Japan (\$4.31)
- 7 Korea (\$1.01)
- 11 India (\$0.71)
- 13 Malaysia (\$0.42)
- 14 China (\$0.36)
- 17 Singapore (\$0.23)

Central & South America

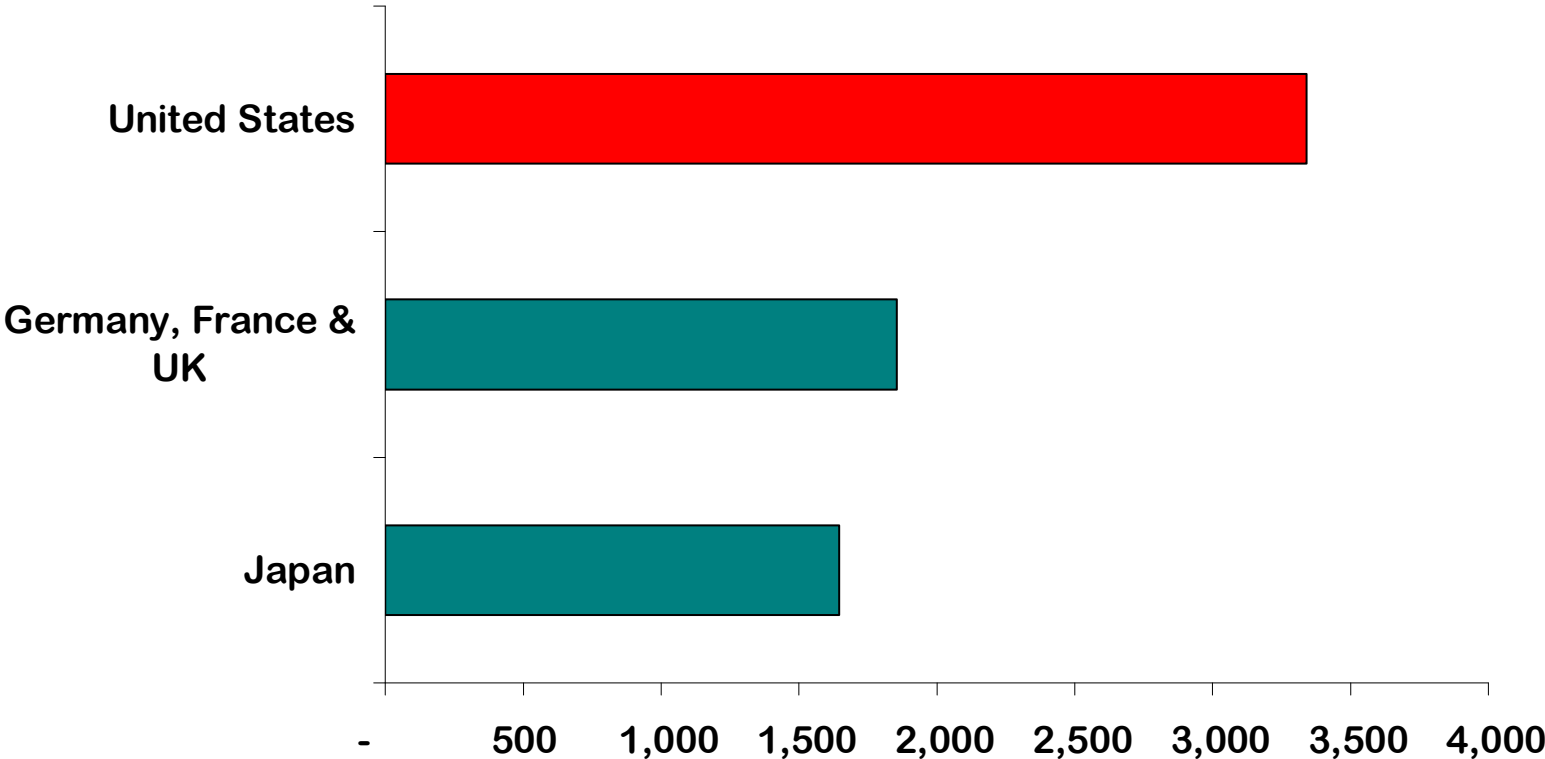
Note: Individual country data is not available for Central and South America.

Global Private Equity Report 2005

Source: The PricewaterhouseCoopers/Venture Economics/National Venture Capital Association MoneyTree™ Survey/Buyout Newsletter/Private Equity Analyst/CVCA Annual Statistical Review/EVCA Yearbook/AVCJ Guide to Venture Capital in Asia

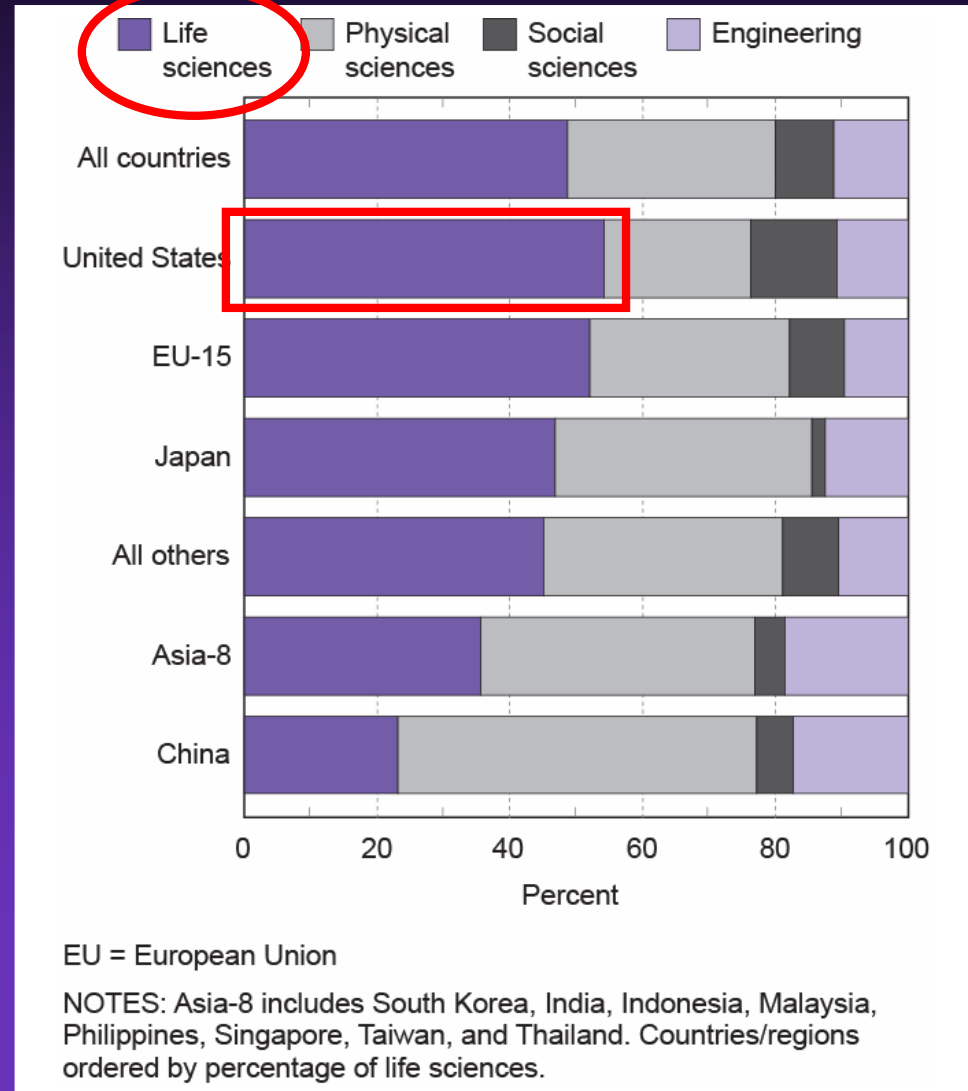
Cumulative non-defense R&D expenditure 1981-2002

Billions of constant 2000 US\$ converted using OECD PPP exchange rates



National Science Board. 2006. Science and Engineering Indicators 2006. Two volumes. Arlington, VA: National Science Foundation (volume 1, NSB 06-01; volume 2, NSB 06-01A), appendix table 4-43.

Portfolio of scientific and technical articles, by field and country/region: 2003

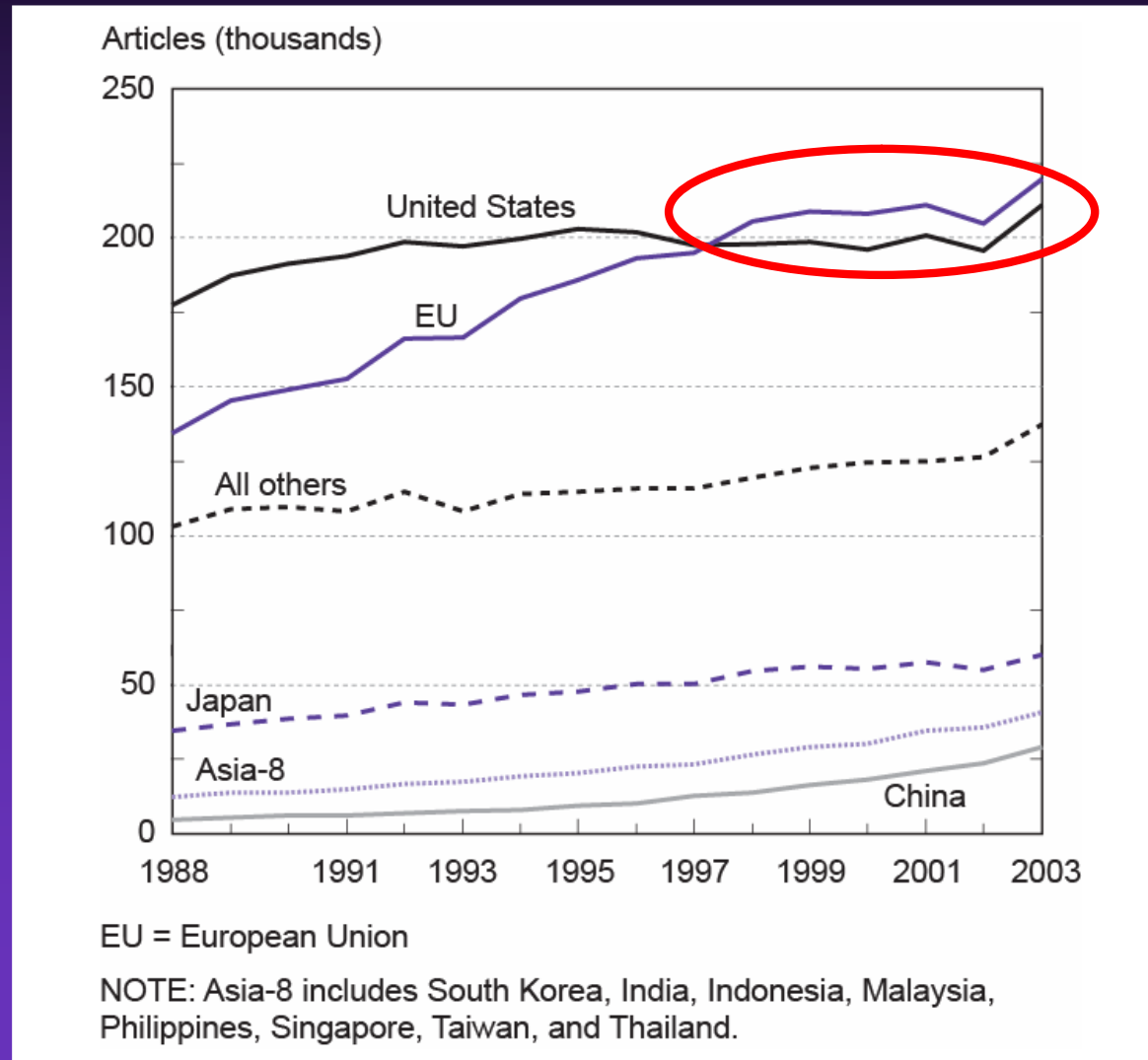


SOURCE: National Science Board, *Science and Engineering Indicators 2006*



Worries

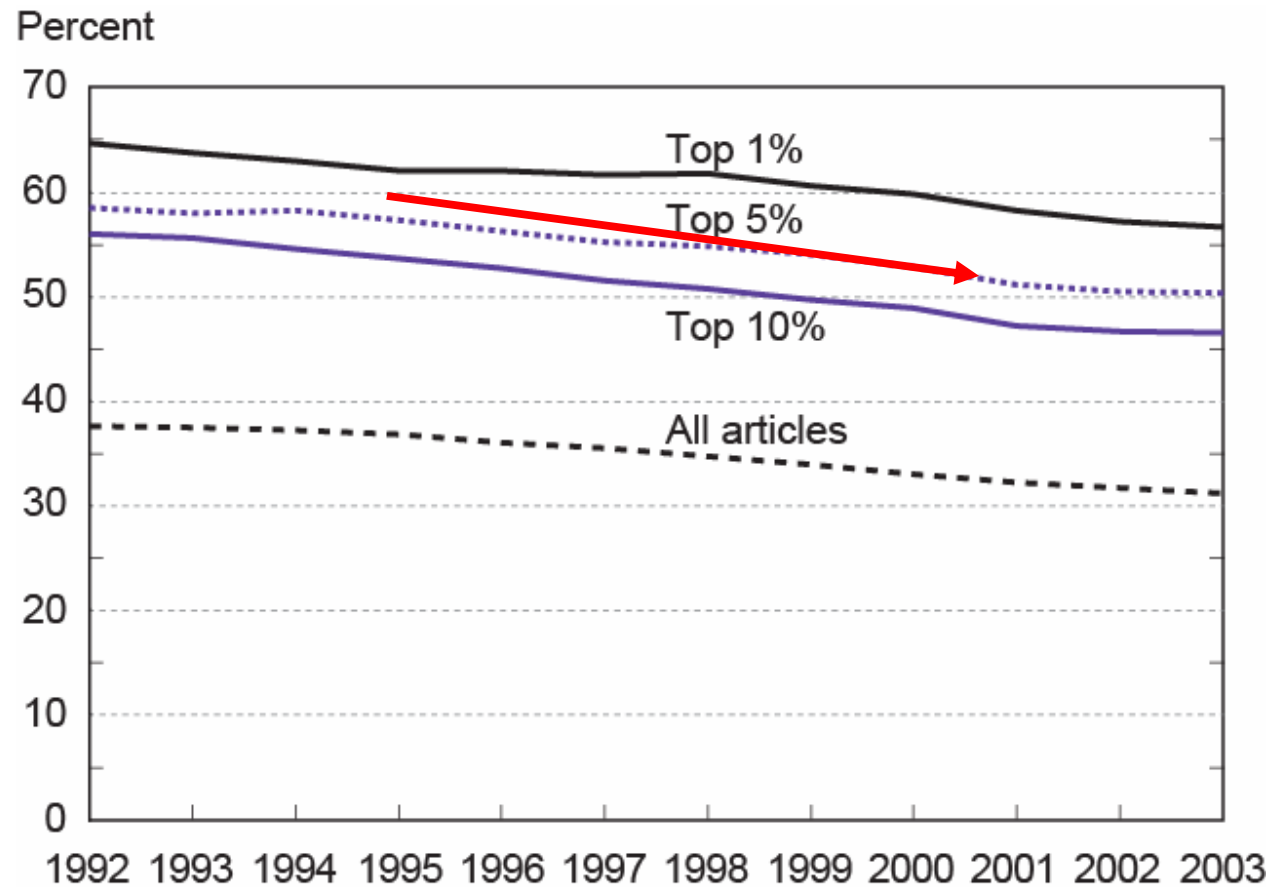
Scientific and technical articles, by country/region: 1988–2003



SOURCE: National Science Board, *Science and Engineering Indicators 2006*



Share of U.S. articles among most-cited articles, total S&E: 1992–2003

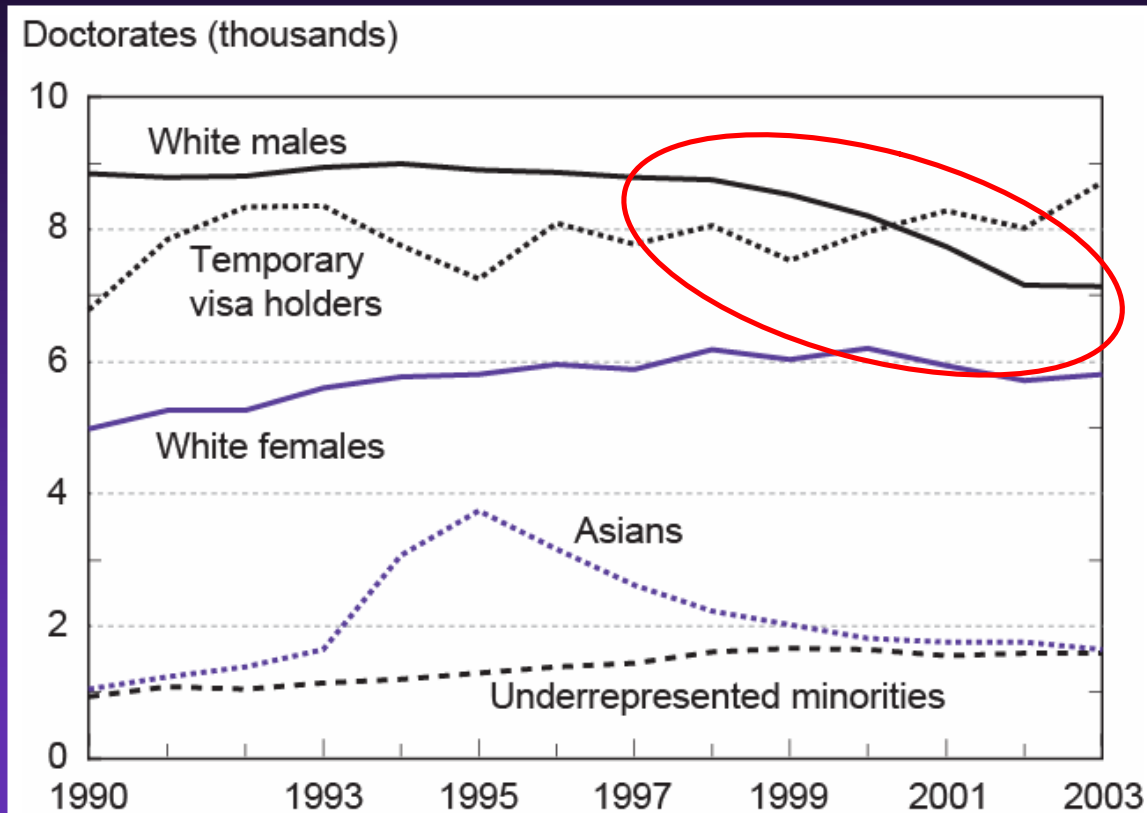


NOTE: Three years of article citations, lagged by 2 years.

SOURCE: National Science Board, *Science and Engineering Indicators 2006*



S&E doctorates conferred by citizenship status and race/ethnicity: 1990–2003

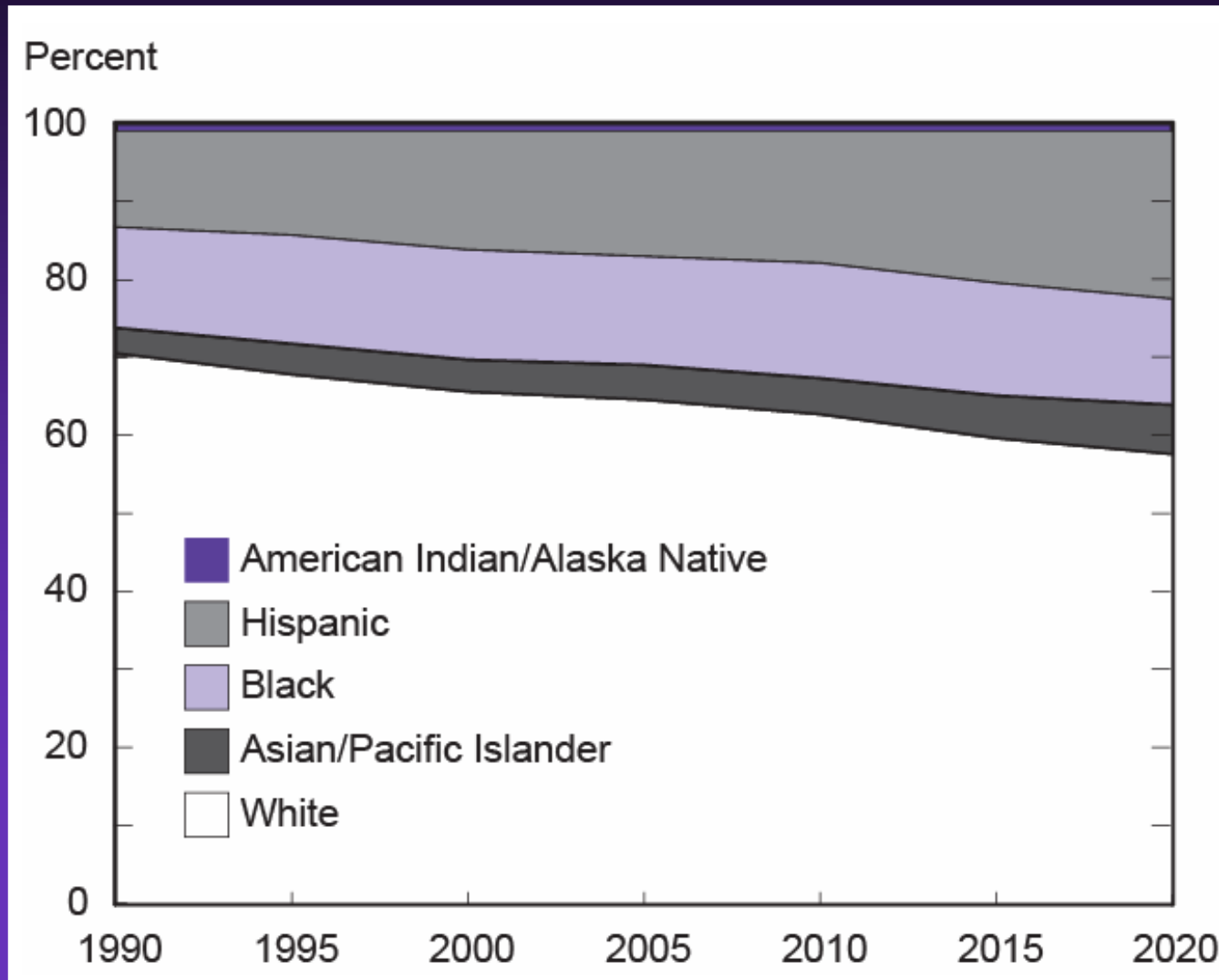


NOTES: Physical sciences include earth, ocean, and atmospheric sciences. Social sciences include psychology. Whites, underrepresented minorities, and Asians include U.S. citizens and permanent visa holders only. Excludes unknown citizenship or race/ethnicity.

SOURCE: National Science Board, *Science and Engineering Indicators 2006*



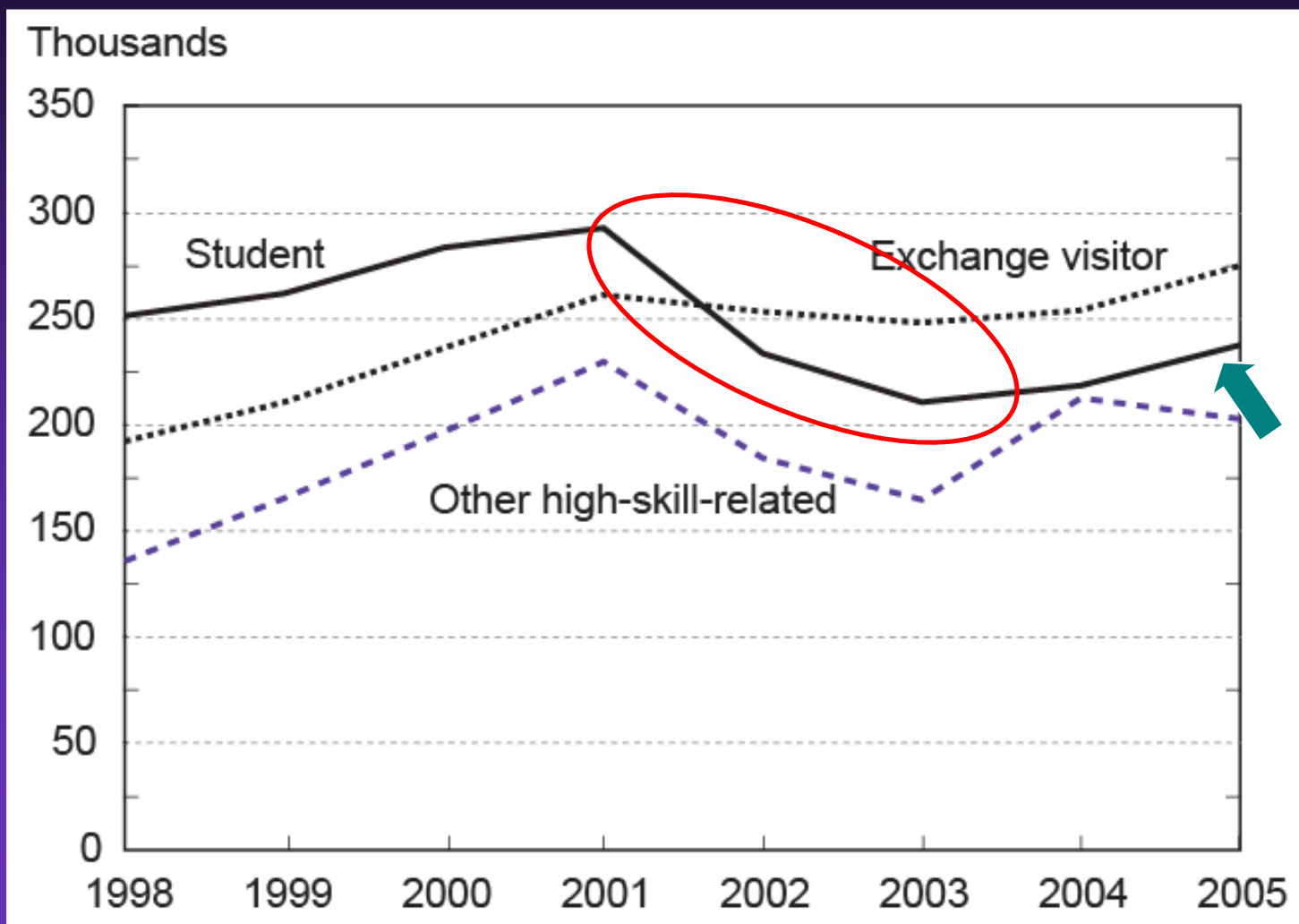
Composition of U.S. college-age cohort: 1990–2020



SOURCE: National Science Board, *Science and Engineering Indicators 2006*



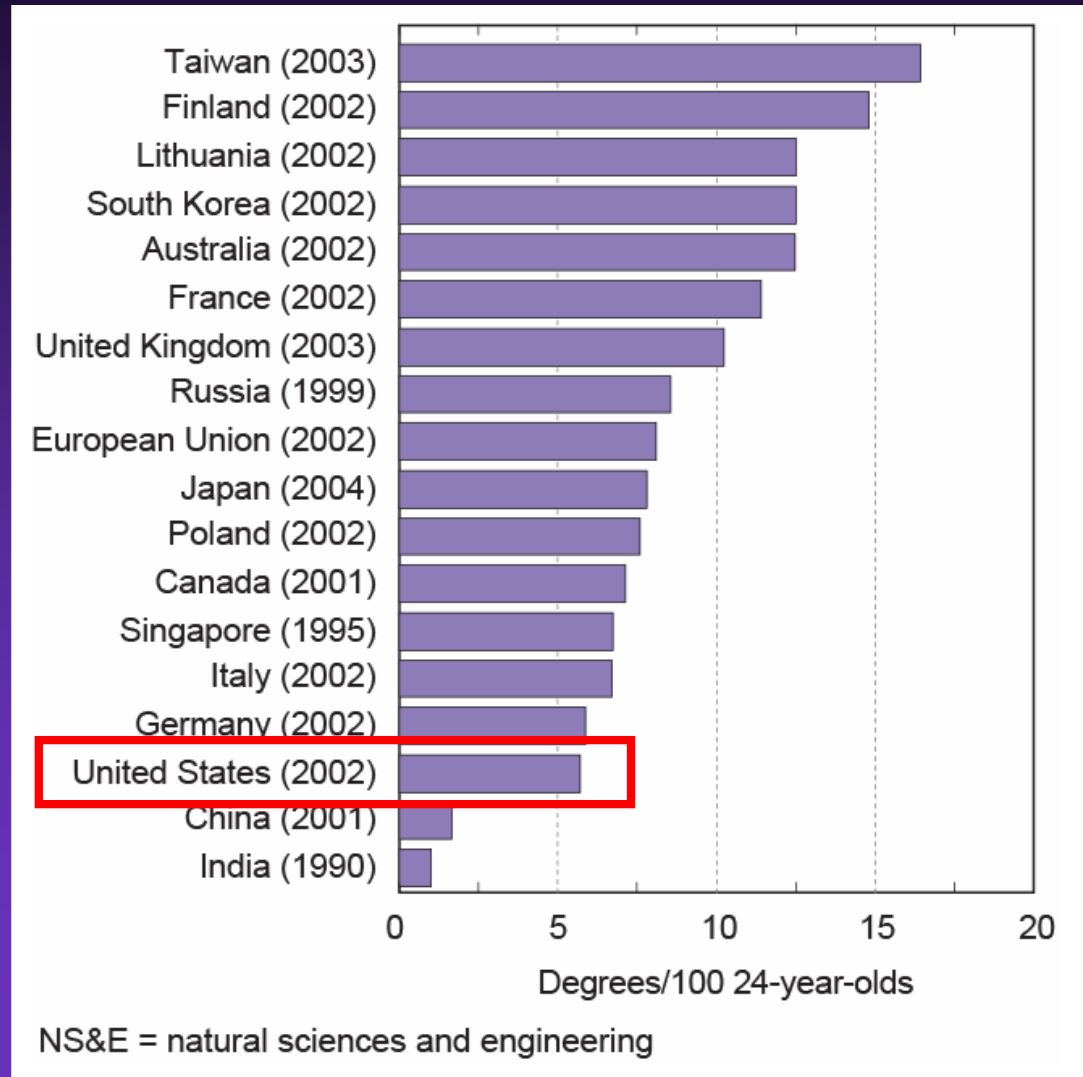
Student, exchange visitor, and other high-skill-related temporary visas issued: 1998–2005



SOURCE: National Science Board, *Science and Engineering Indicators 2006*



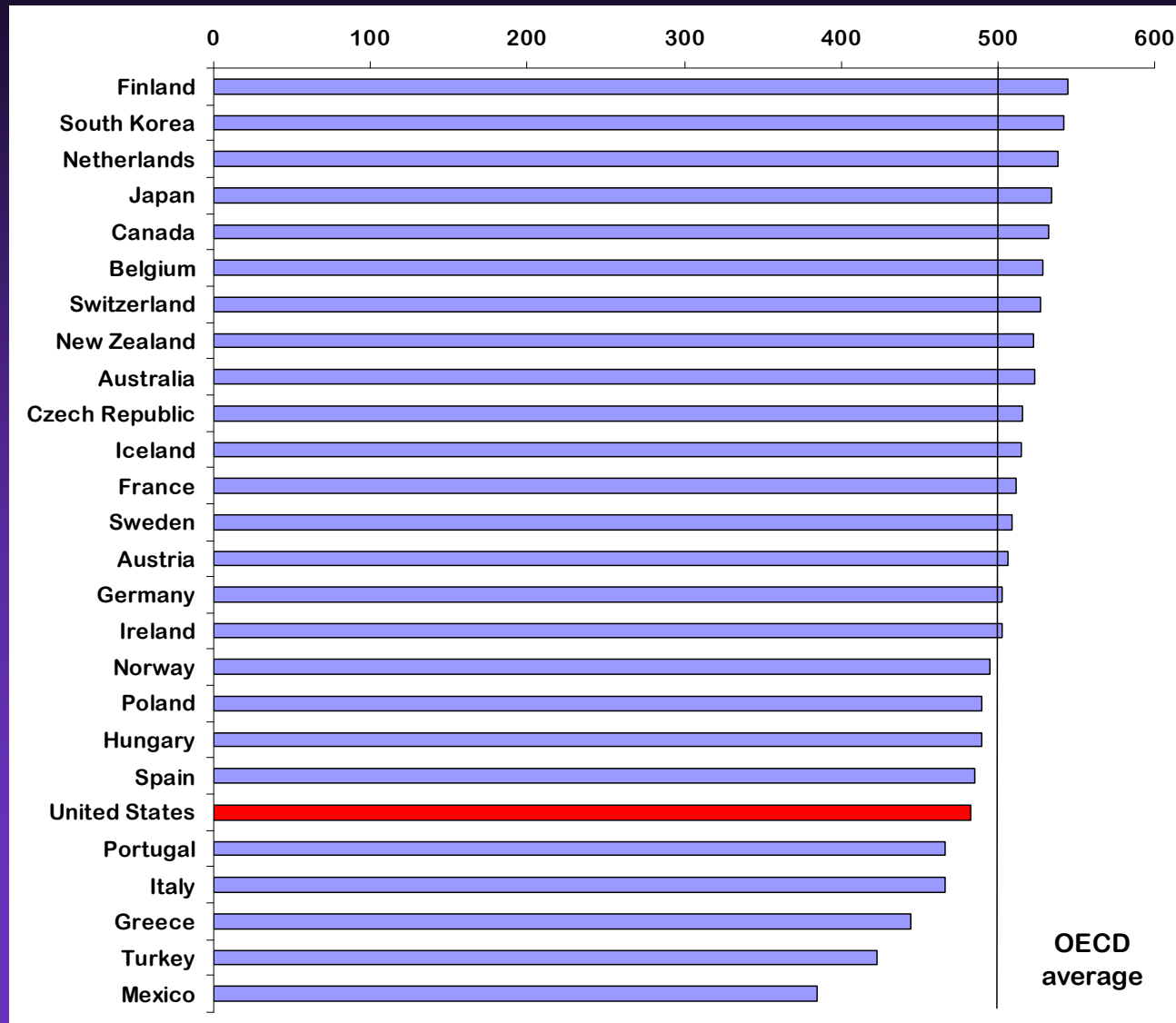
NS&E degrees per 100 24-year-olds, by country/economy: Most recent year



SOURCE: National Science Board, *Science and Engineering Indicators 2006*



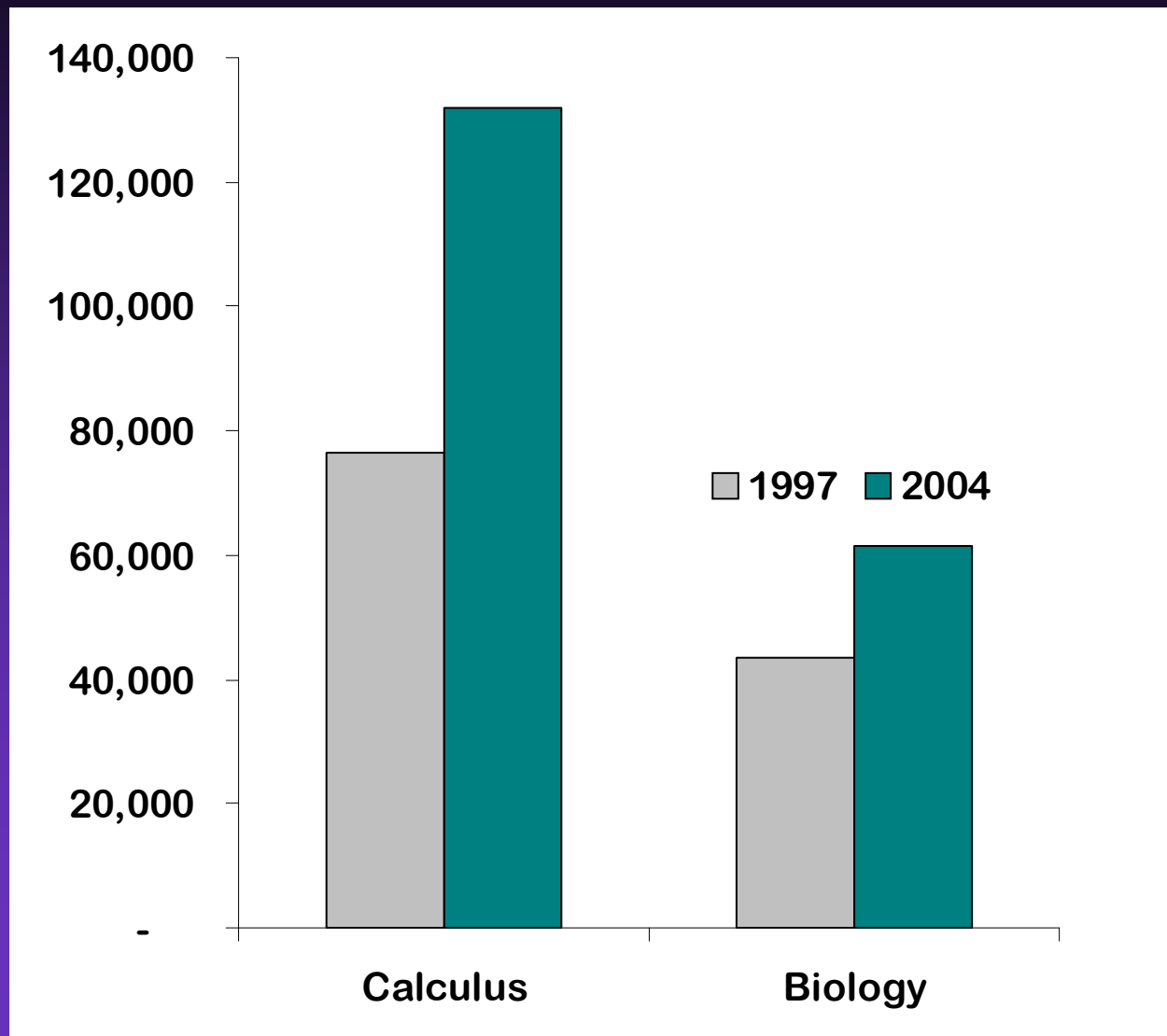
Average Mathematics Literacy Score of 15 year olds, 2003



SOURCE: National Science Board, *Science and Engineering Indicators 2006*



Number of students passing AP exams and gaining college credit



SOURCE: National Science Board, *Science and Engineering Indicators 2006*

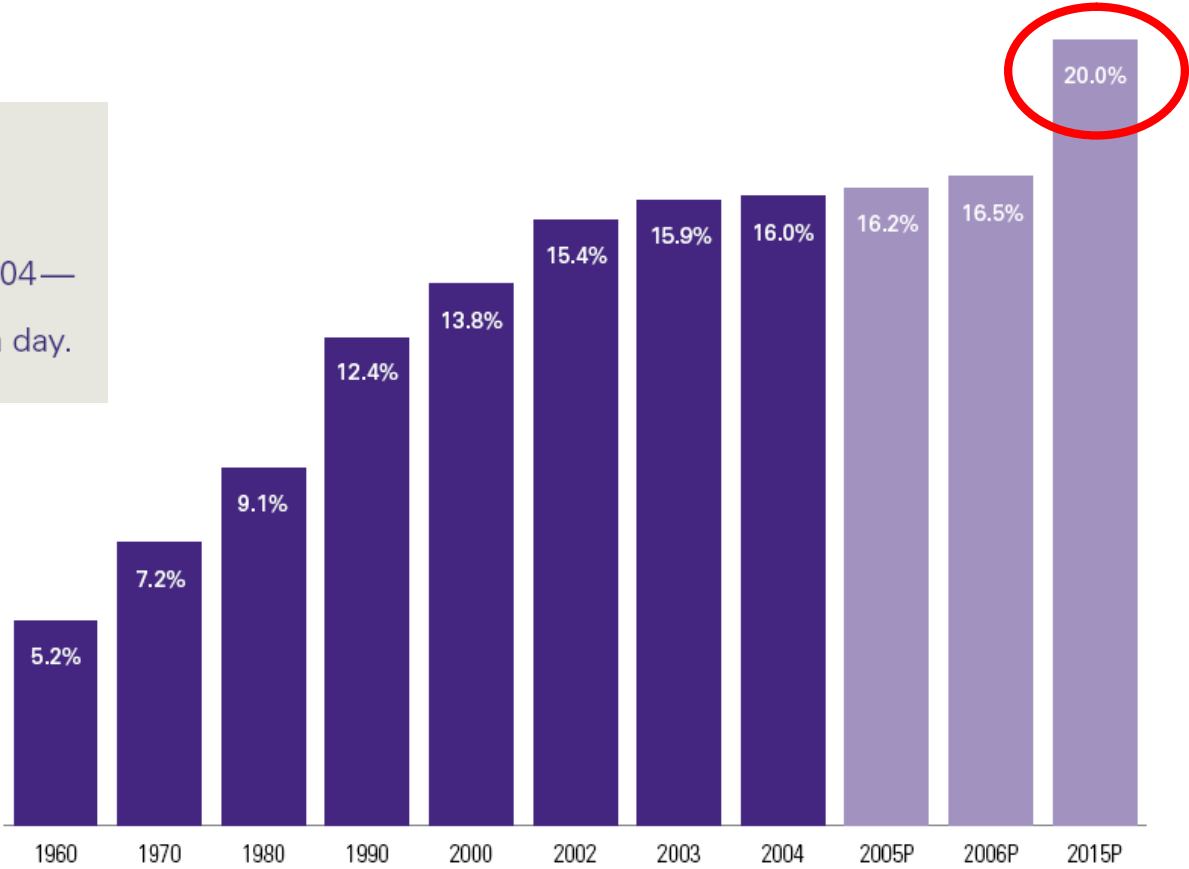


National Research Council review of the purposes and functioning of the IPR legal framework in the United States

- **Problems:**
 - Standards of patentability, in particular the nonobviousness standard, are eroding.
 - A proliferation of upstream patents on scientific discoveries, especially in biomedical science, could impede research.
 - Rising patent costs, longer patent pendency, and differences in national patent systems are contributing to unnecessary costs and delays.
 - The U.S. intellectual property system is struggling with the accelerating pace of technological developments in the knowledge economy.
- **Recommendations:**
 - Institute a relatively low-cost procedure for third parties to challenge issued patents.
 - Reinvigorate the nonobviousness standard.
 - Shield some research uses of patented inventions from liability for infringement.
 - Provide the PTO with additional budget resources to hire and train additional examiners and improve its electronic processing capabilities.
 - Harmonize U.S., European, and Japanese patent examination systems to reduce redundancy in search and examination.

National Health Spending as a Share of Gross Domestic Product

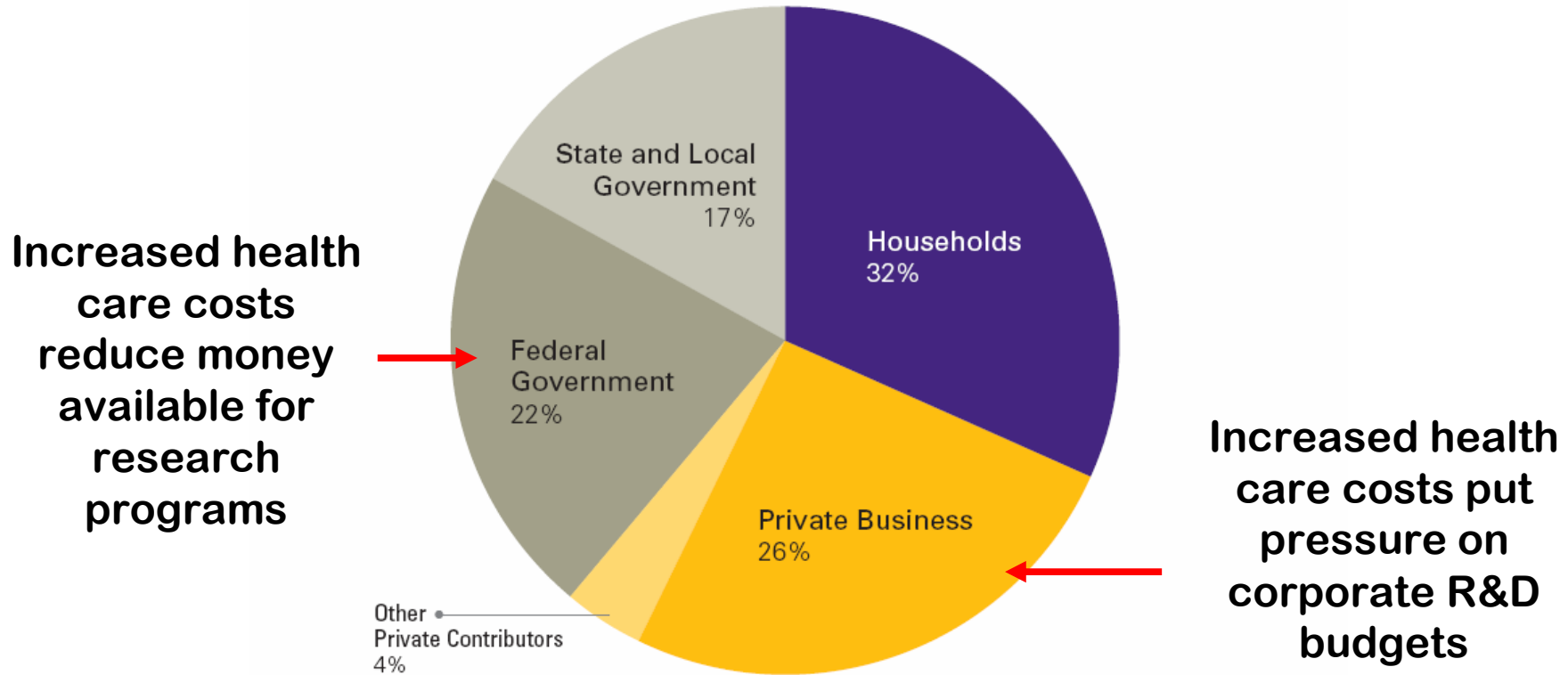
Health spending reached nearly \$1.9 trillion in 2004—that's \$5 billion a day.



Note: Selected rather than continuous years of data are shown prior to 2002. Years 2005 forward are CMS projections.
Source: Centers for Medicare and Medicaid Services (CMS), Office of the Actuary.

Spending Distribution by Contributors*

Total Health Services and Supplies: \$1.75 trillion

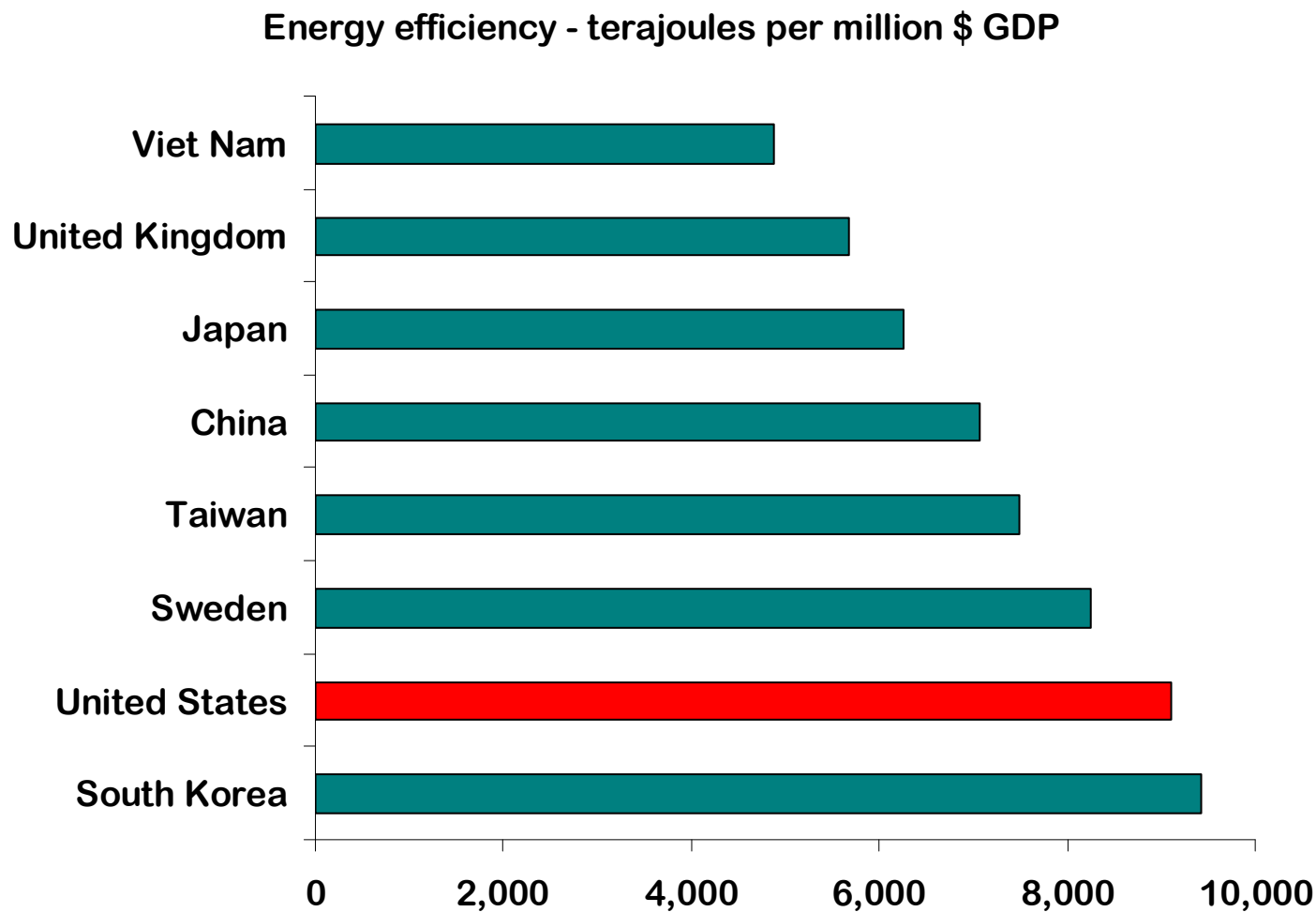


*Estimates of spending by contributor are organized according to the underlying entity (business, households, and government) financing the health care bill payer. CMS refers to these contributors as "sponsors."

Notes: Pie sections don't add to 100 percent due to rounding.

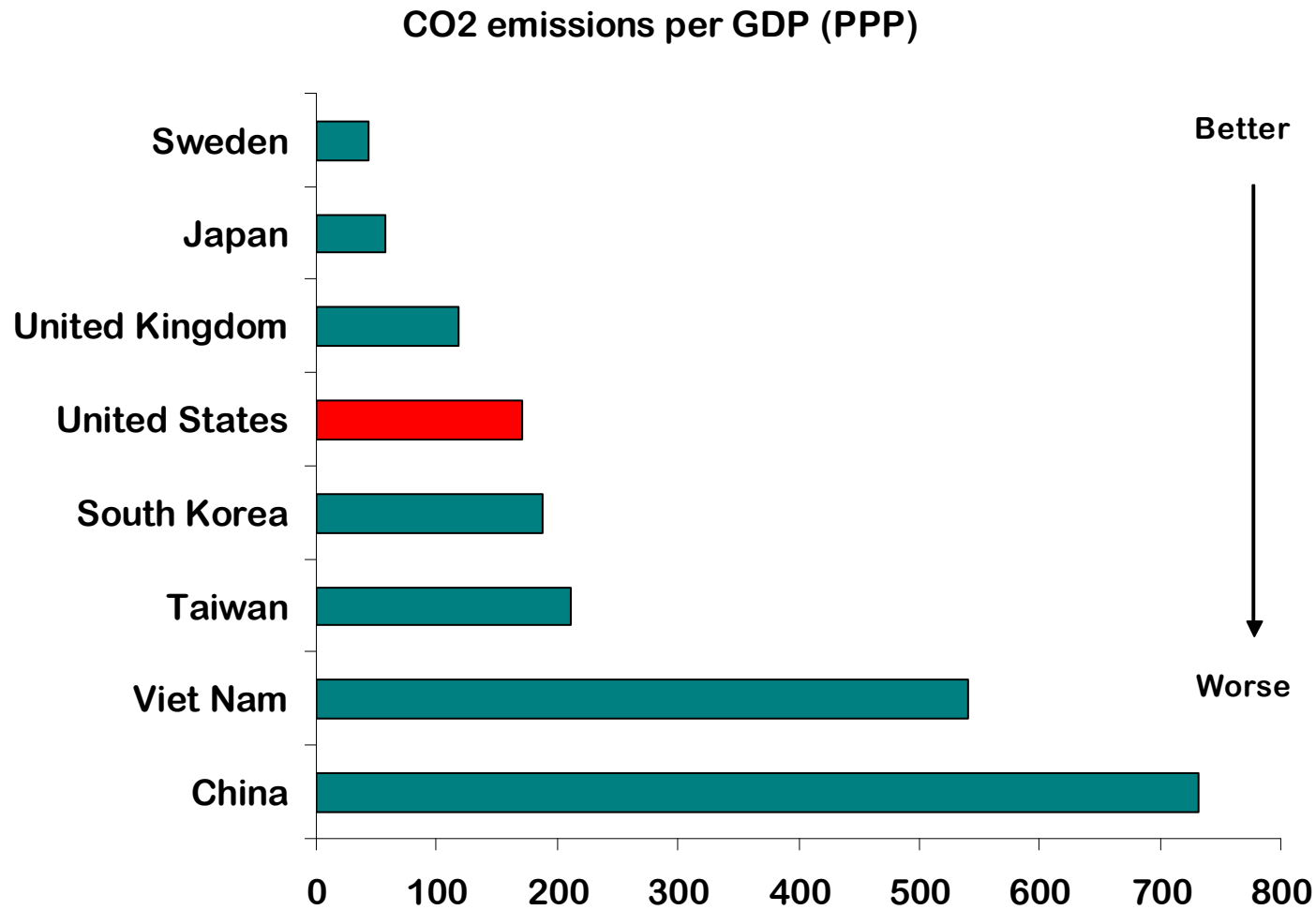
Source: Centers for Medicare and Medicaid Services (CMS), Office of the Actuary.

Sustainability – energy efficiency of economy



Yale Center for Environmental Law and Policy (YCELP) and Center for International Earth Science Information Network (CIESIN), Columbia University, with the World Economic Forum, and Joint Research Centre (JRC) of the European Commission (2006). *Pilot 2006 Environmental Performance Index*. Downloaded from <http://sedac.ciesin.columbia.edu/es/epi/> (last accessed 08/22/2006).

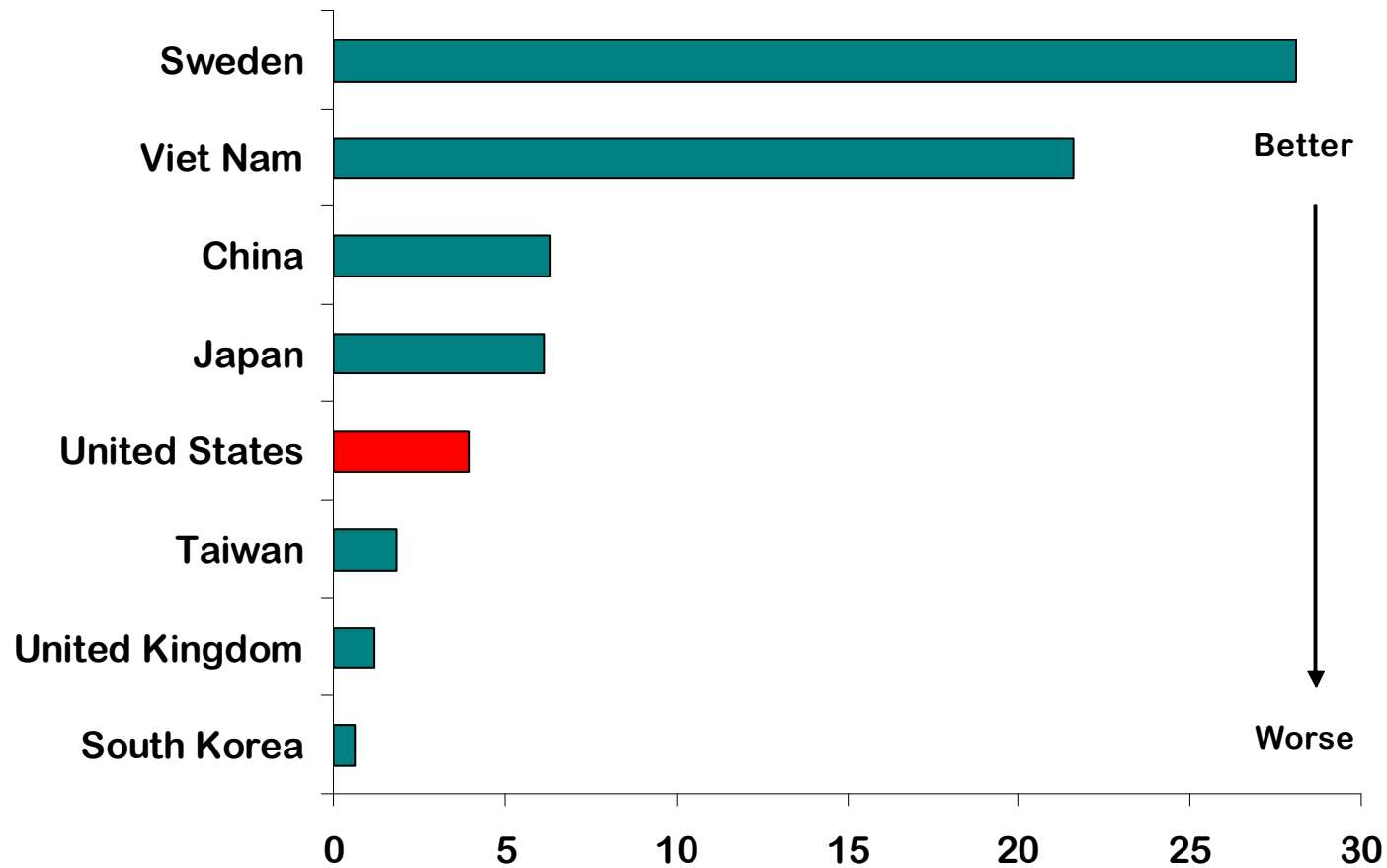
Sustainability – Carbon dioxide emissions



Yale Center for Environmental Law and Policy (YCELP) and Center for International Earth Science Information Network (CIESIN), Columbia University, with the World Economic Forum, and Joint Research Centre (JRC) of the European Commission (2006). *Pilot 2006 Environmental Performance Index*. Downloaded from <http://sedac.ciesin.columbia.edu/es/epi/> (last accessed 08/22/2006).

Sustainability – renewable energy

Renewable energy as % of total energy consumption



Yale Center for Environmental Law and Policy (YCELP) and Center for International Earth Science Information Network (CIESIN), Columbia University, with the World Economic Forum, and Joint Research Centre (JRC) of the European Commission (2006). *Pilot 2006 Environmental Performance Index*. Downloaded from <http://sedac.ciesin.columbia.edu/es/epi/> (last accessed 08/22/2006).

Summary

- **Strengths**
 - Large economy
 - Long history of investment in S&T
 - Dynamic institutions
 - Strong capital markets
 - Lots of human capital
- **Worries**
 - Declining indicators as others strengthen
 - Weakening interest in S&T among young people
 - Weaknesses in K-12 educational system
 - Problems in patent system
 - Rising health care costs
 - Sustainability not a focus