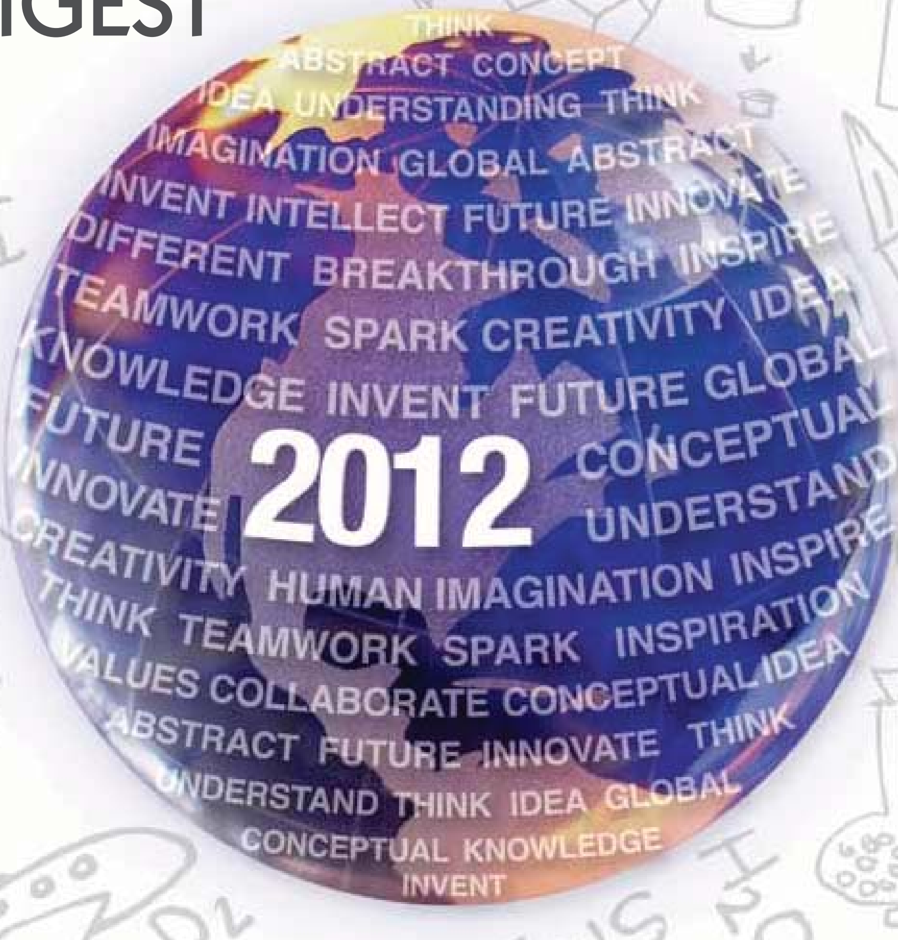
National Science Board

SCIENCE AND ENGINEERING INDICATORS DIGEST



National Science Foundation
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SCIENCE AND ENGINEERING INDICATORS

DIGEST 2012

January 2012

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Errata

Updated 16 February 2012

The following errors were discovered after publication of the print and PDF versions of *Science and Engineering Indicators 2012* and *Science and Engineering Indicators Digest 2012.* These errors have been corrected in the online version of the volume and in the interactive *Digest.*

Science and Engineering Indicators Digest 2012

Page 4. The Asia 10 economies are incorrectly identified in the section "B. Where?" The correct list is China, India, Indonesia, Japan, Malaysia, Philippines, Singapore, South Korea, Taiwan, and Thailand.

PREFACE

The National Science Board (Board) is required under the National Science Foundation (NSF) Act, 42 U.S.C. § 1863 (j) (1) to prepare and transmit the biennial *Science and Engineering Indicators (SEI)* report to the President and to the Congress by January 15 of every even-numbered year. The report is prepared by the NSF National Center for Science and Engineering Statistics (NCSES) under the guidance of the Board. It is subject to extensive review by Board members, outside experts, interested federal agencies, and NCSES internal reviewers for accuracy, coverage, and balance.

Indicators are quantitative representations—summaries—of factors relevant to the scope, quality, and vitality of the science and engineering (S&E) enterprise. *SEI* is the major authoritative source of these high-quality U.S. and international data. *SEI* is factual and policy-neutral; it neither offers policy options nor makes policy recommendations. The indicators included in the report are intended to contribute to the understanding of the current S&E environment.

This digest of major S&E indicators draws from the Board's *Science and Engineering Indicators 2012,* the 20th volume of this biennial series. The digest serves to draw attention to important trends and data points from across *SEI 2012* and to introduce readers to the data resources available in the report. Readers are invited to explore each of the major indicators presented here in more detail in the full report. To that end, each indicator presented in this digest is matched with the *SEI 2012* chapter or chapters from which it was drawn. The complete *SEI 2012* report and related resources are available on the Web at www.nsf.gov/statistics/indicators/.

Readers may also be interested in resources associated with *SEI 2012* which include the Board's companion pieces to *SEI 2012*. The section "*SEI 2012* Online Resources" at the end of this digest provides a complete list and descriptions of these products and tools. The Board hopes that readers will take advantage of these rich sources of information.

TABLE OF CONTENTS

INTRODUCTION

The United States holds a preeminent position in science and engineering (S&E) in the world, derived in large part from its long history of public and private investment in S&E research and development (R&D) and education. Investment in R&D, science, technology, and education correlate strongly with economic growth, as well the development of a safe, healthy, and well-educated society.

Many other nations, recognizing the economic and social benefits of such investment, have increased their R&D and education spending. These trends are by now well-established and will challenge the world leadership role of the United States.

MAJOR S&E INDICATORS

The National Science Board has selected 30 S&E indicators for inclusion in this digest. These indicators have been grouped into seven topical areas. Although each stands alone, collectively these seven themes are a snapshot of U.S. R&D capacity and outputs in the context of global trends affecting them. Exploration of areas that indicate capacity for innovation is a thread common to many of the themes presented here. As economies worldwide grow increasingly knowledge-intensive and interdependent, capacity for innovation becomes ever more critical.

Three themes provide a worldwide view, picturing R&D spending, research outputs, and science and technology capacities. Three others share a predominately domestic focus, providing indicators of U.S. R&D funding and performance, federal R&D support, STEM education, and the U.S. S&E workforce. Where possible, the Digest examines the effects of the recent global financial crisis and recession on strength and direction of the major trends that shape the global science, technology, and innovation system. These topical indicators may vary in successive volumes of the *Science and Engineering Indicators* series as different S&E policy issues emerge.

WHAT THESE INDICATORS TELL THE NATION

By selecting a set of indicators, the Board seeks to contribute to the assessment of the state of U.S. science and engineering and to highlight issues of current opportunity or concern. These measures address an emerging set of trends of particular interest to planners and policymakers at all levels whose decisions affect our national S&E enterprise.

GLOBAL R&D: MEASURING COMMITMENT TO INNOVATION

WHY IS THIS IMPORTANT?

Innovation in the form of new goods, services, or processes builds on new knowledge and technologies, contributes to national competitiveness, and furthers social welfare. Investment in research and development, a major driver of innovation, is vital in knowledge-intensive economies. R&D expenditures indicate the priority given to advancing science and technology relative to other national goals.

A. HOW MUCH?

R&D expenditures worldwide are estimated to have exceeded $1.25 trillion in 2009, up from $641 billion a decade earlier.

B. WHERE?

U.S. R&D expenditures accounted for about 31% of the worldwide total, down from 38% a decade earlier.

The combined R&D expenditures of 10 Asian economies (China, India, Indonesia, Japan, Malaysia, Singapore, South Korea, Taiwan, Thailand, Vietnam) rose steadily to reach U.S. levels in 2009, driven mostly by China, now the second largest R&D performing nation.

C. GROWTH

R&D growth of Western and other countries slowed markedly after 2008 in the face of adverse economic conditions. Singapore and Japan experienced especially sharp contractions, and, after accounting for inflation, R&D growth was negative for both the United States and the EU.

In contrast, China's R&D expenditures rose sharply in 2009, at 28% well above its trend-line (1996–2007) average annual growth of 22%. (Just-released data from China's National Bureau of Statistics indicate 2010 R&D growth of 22%).

Rapid R&D growth in Asia overall reflects private spending by domestic and foreign firms and increased public R&D spending that is often focused on sectors deemed to be of strategic importance.

D. INTENSITY

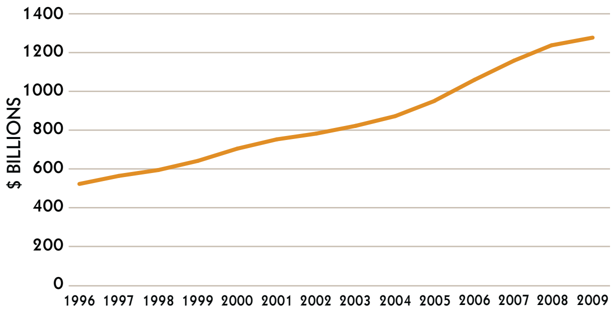
R&D intensity measures how much of a country's economic activity (gross domestic product) its R&D investment represents.

Japan committed a higher share of its GDP to R&D than most other large economies but is likely to be surpassed by South Korea. China's R&D intensity increased sharply, as growth in R&D outpaced a rapid expansion in GDP.

The slight 2009 U.S. and EU increases reflect essentially flat R&D expenditures in a year when GDP declined.

A

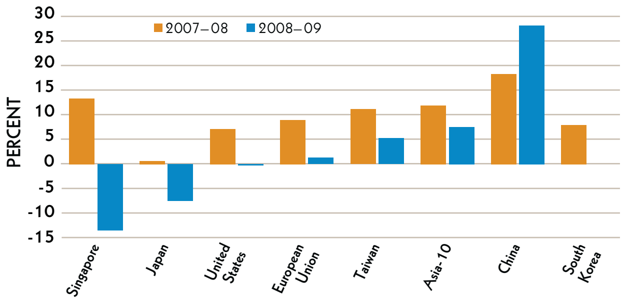
Estimated R&D expenditures worldwide: 1996–2009



SEI 2012: **Global Patterns of R&D Expenditures,** Chapter 4.

C

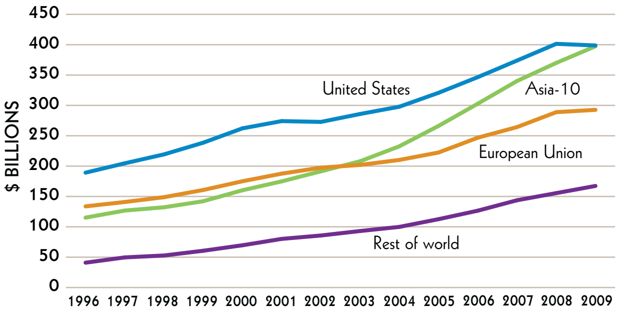
Average annual growth of R&D expenditures for United States, European Union, and Asia-10 economies: 2007–08 and 2008–09



NOTE: Asia-10=China, India, Indonesia, Japan, Malaysia, Philippines, Singapore, South Korea, Taiwan, and Thailand.
SEI 2012: **Global Patterns of R&D Expenditures,** Chapter 4.

B

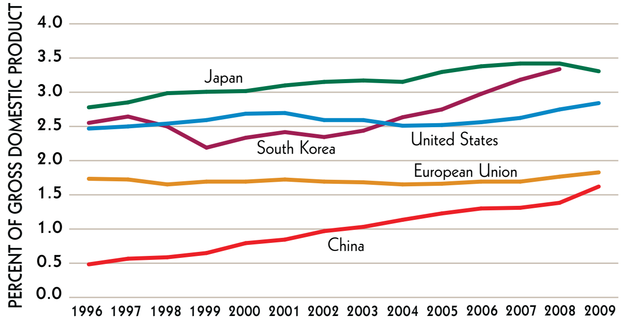
R&D expenditures for the United States, European Union, and Asia-10 economies: 1996–2009



NOTE: Asia-10=China, India, Indonesia, Japan, Malaysia, Philippines, Singapore, South Korea, Taiwan, and Thailand.
SEI 2012: **Global Patterns of R&D Expenditures,** Chapter 4.

D

R&D expenditures as share of economic output for selected countries: 1996–2009



SEI 2012: **Comparison of Country R&D Intensities,** Chapter 4.

U.S. R&D: FUNDING AND PERFORMANCE

WHY IS THIS IMPORTANT?

Outcomes and benefits of R&D depend not only on the total resources devoted to it but also on the types of R&D these resources support—basic research, applied research, development—and on who performs it.

A. FUNDING SOURCES

Overall, U.S. R&D support from 2008 to 2009 remained nearly level—a drop of about 1.7% in inflation-adjusted terms.

Industry, long the nation's largest supporter of R&D, reduced its 2009 funding in the face of unfavorable business conditions by nearly 4%. This drop was partially offset by a Recovery Act-enabled rise in federal R&D funding.

B. TYPES OF R&D

Resources for applied research and development—work that aims at practical application, new products, or novel processes—declined from 2008 to 2009. Propelled by a $7 billion drop in industry funding, the decline was partially countered by a $4 billion rise in federal government funds.

Basic research is directed primarily toward increasing knowledge or understanding and has long relied on federal government support. Support from industry remained below that from higher education and other nonprofit institutions, and federal support dropped from 62% of the total in 2004 to 56% in 2009.

C. ACADEMIC R&D SUPPORT

The bulk of academic R&D is basic research, amounting to more than half of the nation's total basic research. Sources of support for academic R&D have been relatively stable for nearly two decades: about 60% from the federal government, 20% from institutions' own funds. Industry funding has gradually declined from 7% to about 6%.

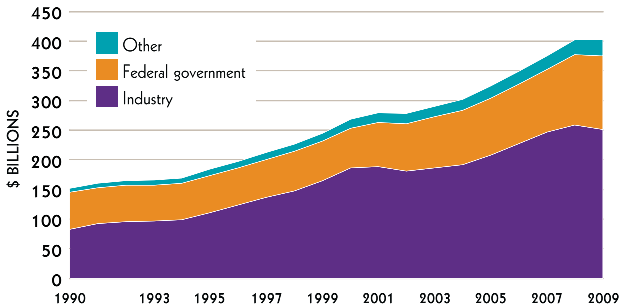
D. PERFORMERS

The nature of R&D varies by performer. Industry is the dominant performer of the nation's development and applied research; the federal government, academic institutions, and other nonprofit organizations combined perform less than 20% of that total.

Universities and colleges are the prime performers of the nation's basic research, a role they uniquely combine with the training of new researchers. Industry's share of basic research performance has recently risen after years of decline; the federal government share has gradually diminished.

A

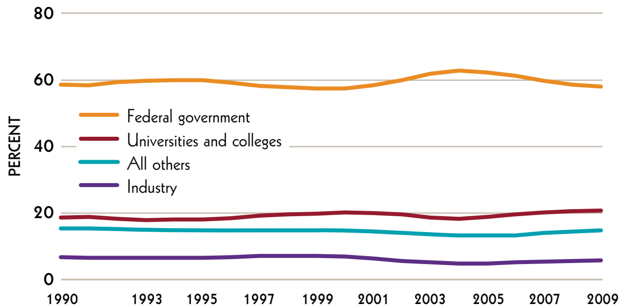
U.S. R&D expenditures, by source of funds: 1990–2009



SEI 2012: **Sources of R&D Funding,** Chapter 4.

C

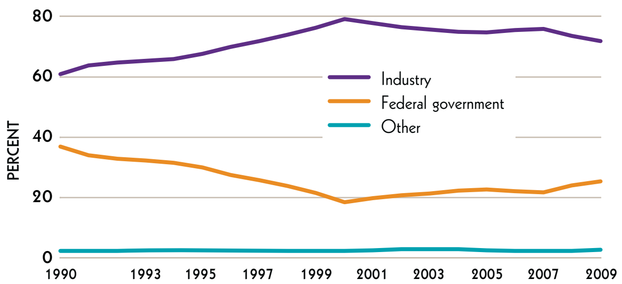
Funding sources for U.S. academic R&D: 1990–2009



SEI 2012: **Expenditures and Funding for Academic R&D,** Chapter 5.

B1

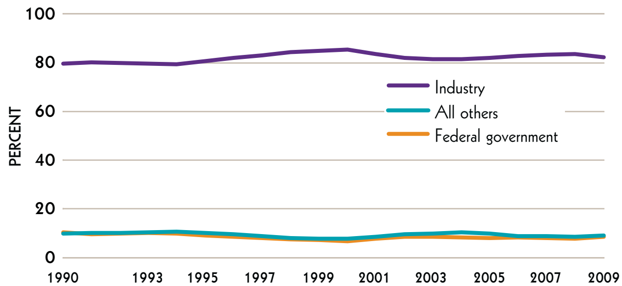
Funding sources for U.S. applied research and development: 1990–2009



SEI 2012: **Sources of R&D Funding** and **R&D by Character of Work,** Chapter 4.

D1

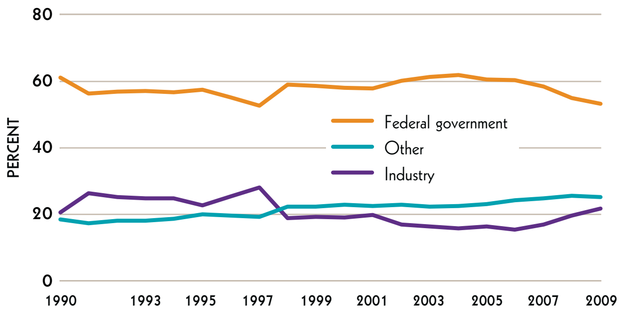
Performers of U.S. applied research and development: 1990–2009



NOTES: 2009 data are preliminary. Federal government is intramural only.
SEI 2012: **Performers of R&D** and **R&D by Character of Work,** Chapter 4.

B2

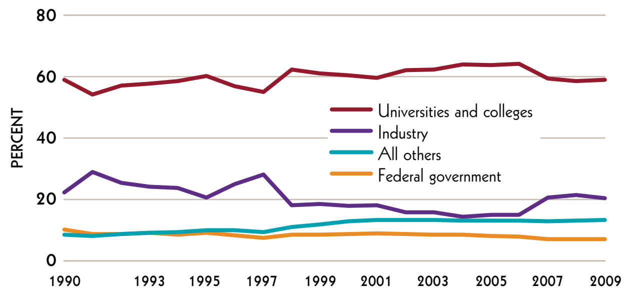
Funding sources for U.S. basic research: 1990–2009



SEI 2012: **Sources of R&D Funding** and **R&D by Character of Work,** Chapter 4.

D2

Performers of U.S. basic research: 1990–2009



NOTES: 2009 data are preliminary. Federal government is intramural only.
SEI 2012: **Performers of R&D** and **R&D by Character of Work,** Chapter 4.

U.S. R&D: FEDERAL PORTFOLIO

WHY IS THIS IMPORTANT?

The distribution of R&D funds by the U.S. federal government provides insight into the nation's broad mission priorities for public expenditures.

A. TYPE OF WORK

Federal funding of R&D has more than doubled over 20 years (not adjusting for inflation). For the past decade, basic and applied research funds have accounted for more than half of the total.

Federal stimulus funds for R&D have primarily boosted development activities.

B. SUPPORT FOR S&E FIELDS

The life sciences have accounted for half of the federal research portfolio (basic and applied research) since 2001.

Over the past decade, federal research funds for the life sciences and math/computer sciences have increased by more than one-third, after inflation; engineering funds rose by one quarter.

Inflation-adjusted federal funding over the decade was flat for the physical sciences and shrank for environmental sciences and for the social sciences and psychology.

C. FOCUS

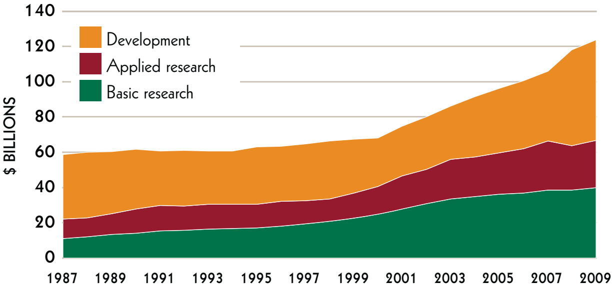
More than half of the federal government's R&D investment is devoted to defense. More than half of nondefense R&D is related to health, largely funded by the Department of Health and Human Services, primarily through the National Institutes of Health. Nondefense, health, and general science accounts show clearly the 1-year boost from federal stimulus funds.

D. PERFORMERS

Different institutions bring different perspectives and approaches to R&D. Academic and nonprofit institutions, which tend to concentrate on basic research, have received steadily increasing federal support. Industry, heavily focused on development and applied research, has recently seen rising federal funding after a decade of little growth.

A1

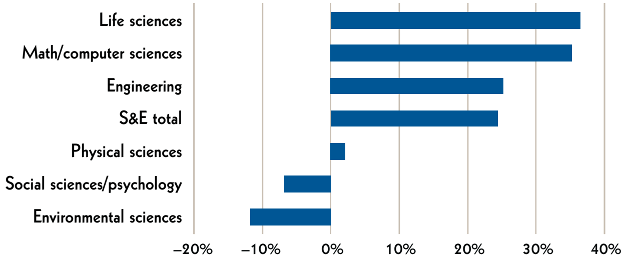
Federal R&D funds, by type of work: 1987–2009



NOTE: 2009 data are preliminary.
SEI 2012: **R&D by Character of Work,** Chapter 4.

B2

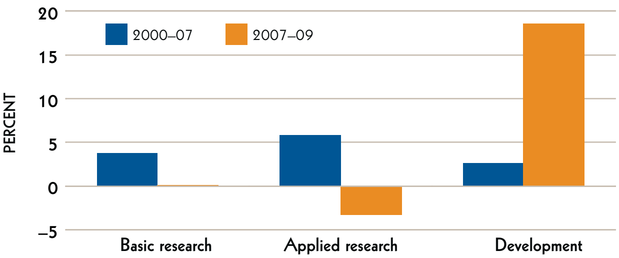
Inflation-adjusted increase in federal research funds, by S&E field: 2000–09



NOTE: 2009 data are preliminary.
SEI 2012: **Federal Spending on Research by Field,** Chapter 4.

A2

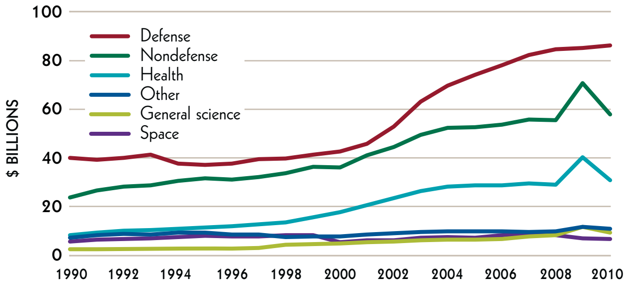
Average annual real growth of federal support for R&D, by type of work: 2000–07 and 2007–09



NOTE: 2009 data are preliminary.
SEI 2012: **R&D by Character of Work,** Chapter 4.

C

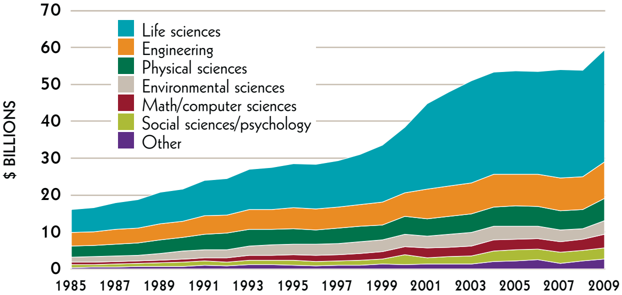
Federal R&D budget, by national objectives: 1990–2010



NOTE: 2010 data are preliminary Budget Authority figures.
SEI 2012: **Federal R&D Budget by National Objectives,** Chapter 4.

B1

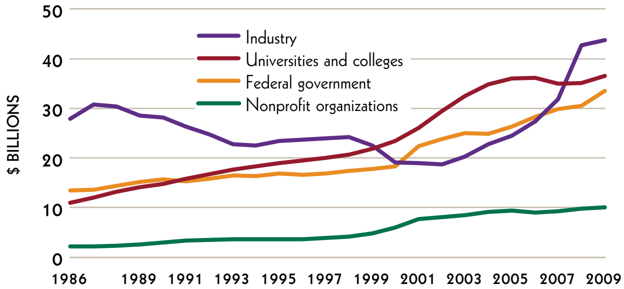
Federal basic and applied research funds, by S&E field: 1985–2009



NOTE: 2009 data are preliminary.
SEI 2012: **Federal Spending on Research by Field,** Chapter 4.

D

Federal spending on R&D, by performer: 1986–2009



NOTES: 2009 data are preliminary. Federal government is intramural only.
SEI 2012: **R&D Funding by the Federal Government,** Chapter 4.

STEM EDUCATION

WHY IS THIS IMPORTANT?

Education at all levels in science, technology, engineering, and mathematics—STEM—develops, preserves, and disseminates knowledge and skills that convey personal, economic, and social benefits. Higher education provides the advanced work skills needed in an increasingly knowledge-intensive, innovation-focused economy and society.

A. K–12 MATHEMATICS AND SCIENCE

In the past two decades, U.S. students' mathematics scores on national assessments have improved.

Nonetheless, U.S. 15-year-olds tend to score lower than the international average in mathematics, and about the same as the international average in science.

B. INTERNATIONAL BACHELOR'S DEGREES

China awarded 300,000 bachelor's degrees in the natural sciences and 700,000 in engineering—together representing 43% of its 2.3 million total in 2008.

China's engineering degrees were about 10 times the U.S. number and represented a much higher share of all bachelor's degrees (30%) than in the United States (5%).

C. U.S. BACHELOR'S DEGREES

U.S. output of total bachelor's degrees has increased by more than half over two decades, reflecting a rising trend in college attendance. STEM degrees have consistently constituted about one-third of the total.

However, degrees in the physical sciences and engineering—considered critical to innovation—have long reflected the size of the college age cohort rather than mirroring levels of college attendance.

Computer science degrees varied from this pattern, rising through the dot-com bubble and collapse as students finished their degrees and now trending towards pre-2000 levels.

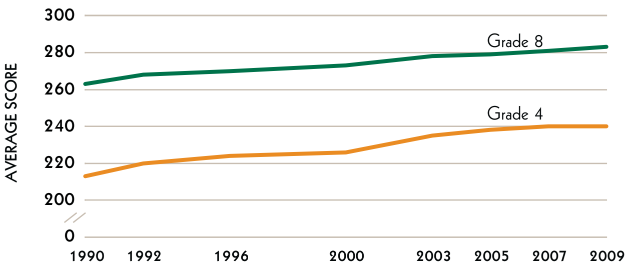
D. INTERNATIONAL DOCTORAL DEGREES

Advanced training towards the doctorate expanded over the decade 2000 to 2009. The EU graduated the most doctorate recipients in natural sciences and engineering (NS&E). The United States was a distant second, and nearly 40% of these doctorates were earned by temporary visa holders.

China now graduates more doctorate recipients in NS&E than does the United States, including temporary U.S. residents. China's doctoral degree output in NS&E is being driven by a steep rise in engineering doctorates, from 4,500 in 2000 to 15,300 in 2009.

A1

Average NAEP mathematics scores of students in grades 4 and 8: 1990–2009

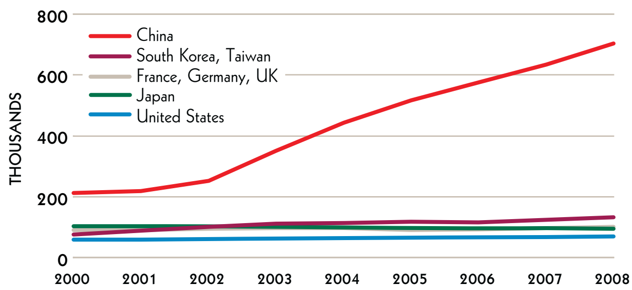


NAEP = National Assessment of Educational Progress

SEI 2012: **Mathematics and Science Performance in Grades 4, 8, and 12,** Chapter 1.

B2

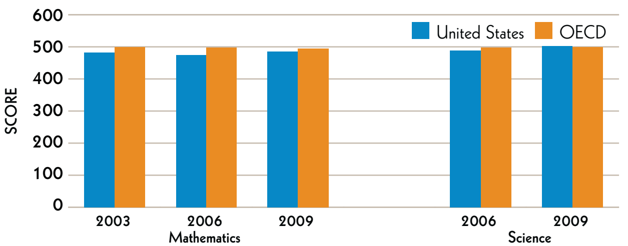
First university degrees in engineering, selected countries/ economies: 2000–08



SEI 2012: **First University Degrees in S&E Fields,** Chapter 2.

A2

Average mathematics and science PISA test scores of U.S. and OECD 15-year-olds: Selected years, 2003–09

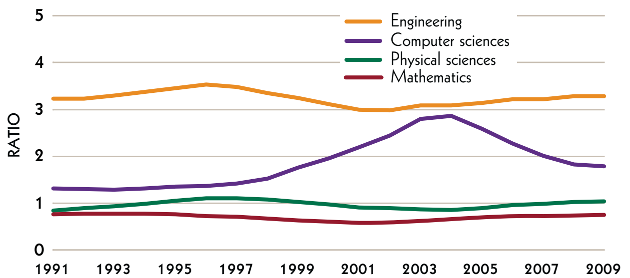


PISA = Program for International Student Assessment; OECD = Organisation for Economic Co-operation and Development

SEI 2012: **Mathematics and Science Performance in Grades 4, 8, and 12,** Chapter 1.

C

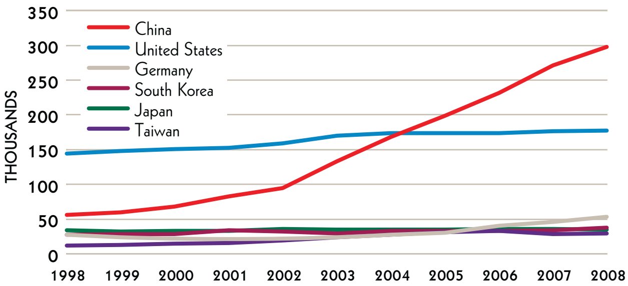
U.S. bachelor's degrees in selected S&E fields per 1,000 20–24-year-olds: 1991–2009



SEI 2012: **Undergraduate Degree Awards,** Chapter 2.

B1

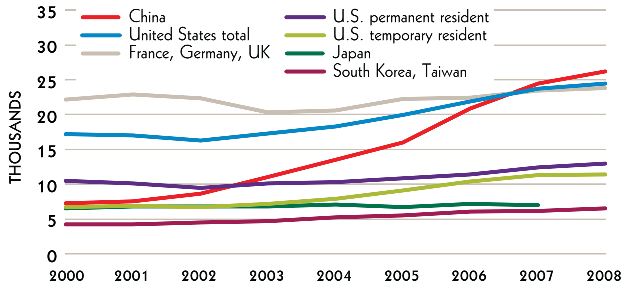
First university degrees in natural sciences, by selected country/ economy: 1998–2008



SEI 2012: **First University Degrees in S&E Fields,** Chapter 2.

D

Doctoral degrees in natural sciences and engineering, by selected country/economy: 2000–08



SEI 2012: **Global Comparison of S&E Doctoral Degrees,** Chapter 2.

U.S. S&E WORKFORCE: TRENDS AND COMPOSITION

WHY IS THIS IMPORTANT?

A growing science and engineering workforce contributes to an economy's capacity for innovation. As economies become more knowledge-intensive, S&E skills will be needed in jobs not traditionally considered part of the S&E workforce, such as managers, sales representatives, and financial analysts.

A. WORKFORCE GROWTH

The U.S. S&E workforce—made up of chemists, mathematicians, economists, engineers, and other such workers—has grown faster than the workforce overall. Over the past quarter century it has more than doubled in size and now represents about 4.3% of all U.S. jobs.

The job losses from the 2007–09 recession have been relatively less severe for those in S&E or S&E related jobs than for those in the U.S. workforce overall.

B. UNEMPLOYMENT

With few exceptions, workers in S&E occupations have for decades had lower unemployment than workers in other kinds of jobs. The unemployment rate for workers in S&E occupations is generally lower than it is for those with bachelor's degrees or higher who work in non-S&E occupations, and it is far lower than the overall unemployment rate.

Nevertheless, recession-induced job losses in sectors of the economy that employ large numbers of scientists and engineers have been severe. High-technology manufacturing has lost 28% of jobs since a 2000 employment high of 2.5 million.

C. WOMEN AND UNDERREPRESENTED MINORITIES

Women's representation in the S&E workforce has gradually risen from 23% in 1993 to 27% 15 years later.

Similarly, underrepresented minorities—blacks, Hispanics, and American Indians and Alaska Natives—have made substantial strides, but their representation in S&E jobs remains below their proportion in the population.

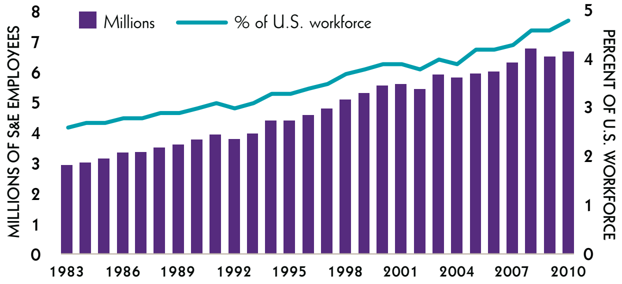
In both instances, participation has continued to rise over the last 5 years, but more slowly than in the 1990s.

D. FOREIGN-BORN SCIENTISTS AND ENGINEERS

Foreign-born scientists and engineers, whether educated in the United States or abroad, are a critical part of the U.S. S&E workforce: about one in four S&E master's degree holders and one in three S&E doctorate holders are foreign born. This reliance is greatest on those with engineering and math/computer science degrees. Among them, about 40% of master's degree holders and 50% of doctorate holders are foreign born.

A1

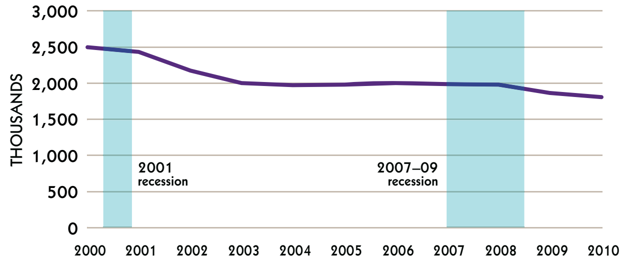
Individuals in S&E occupations and as a percentage of the U.S. workforce: 1983–2010



SEI 2012: **Size of the S&E Workforce,** Chapter 3.

B2

Employment in U.S. high-technology manufacturing sectors: 2000–10

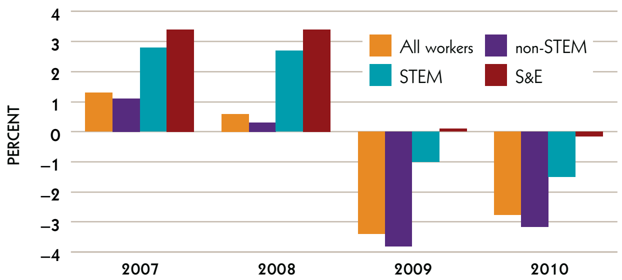


NOTE: Boxes mark approximate times of recession.

SEI 2012: **Employment in U.S. High-Technology Manufacturing,** Overview.

A2

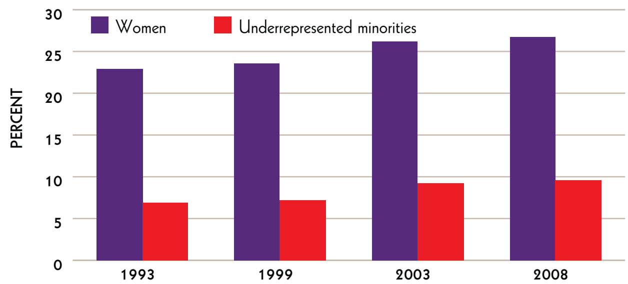
Change in employment from previous year, by type of job: 2007–10



SEI 2012: **Size of the S&E Workforce,** Chapter 3.

C

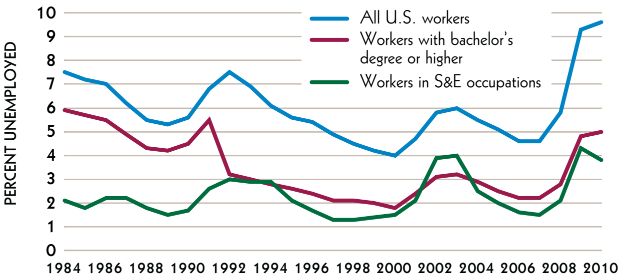
Women and underrepresented minorities in U.S. S&E occupations: selected years, 1993–2008



SEI 2012: **Demographics of the S&E Workforce,** Chapter 3.

B1

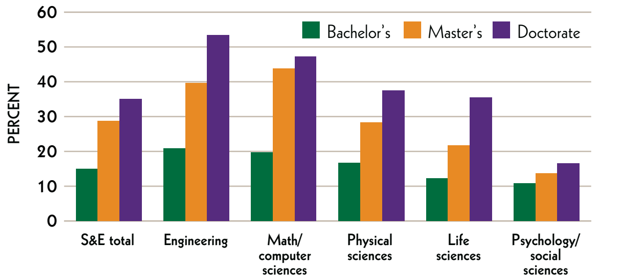
Unemployment rates for all workers, those with bachelor's degree or higher, and those in S&E occupations: 1984–2010



SEI 2012: **Unemployment in the S&E Labor Force,** Chapter 3.

D

Foreign-born percentage of S&E degree holders in the United States, by field and level of S&E degree: 2008



SEI 2012: **S&E Immigrants,** Chapter 3.

RESEARCH OUTPUTS: PUBLICATIONS AND PATENTS

WHY IS THIS IMPORTANT?

Research produces new knowledge, products, or processes. Research publications reflect contributions to knowledge, patents indicate useful inventions, and citations on patents to the scientific and technical literature indicate the linkage between research and practical application.

A. PUBLICATIONS

The EU leads the world in numbers of S&E articles published, but the United States continues to be the top country producer.

China produced 9% of the world's S&E articles in 2009. It ranked 14th in 1995 with a 2% world share and rose to become the second largest country producer in 2007, overtaking Japan. Asia's combined S&E research article volume is approaching parity with U.S. and EU output.

B. ENGINEERING ARTICLES

Engineering is vital to knowledge-intensive and technologically advanced economies, and many Asian economies are building their engineering capabilities. China publishes 15% of global engineering articles, and Asia as a whole publishes twice as many engineering articles as the United States and half again as many as the EU.

The output of engineering articles is increasing robustly in the EU, gradually rising in the United States, and declining in Japan.

C. CITATIONS TO THE LITERATURE

In the research literature, citations acknowledge intellectual debt to the work of others, and increasingly such citations cross borders. In an indication of the region's growing science base, Asian countries' citations to U.S. and EU articles have dropped or stayed level whereas intra-Asia citations have risen.

D. PATENTS

Patents protect the property rights of inventors. As knowledge-intensive economic activity expands worldwide, patent awards are rising. Inventors from around the globe seek patent protection in the United States because of its large and open market. Recently, more than half of U.S. patents have gone to non-U.S. awardees. Inventors in the EU and Japan produce most of these patents, but they have been joined by Asian inventors, chiefly in Taiwan and South Korea. Chinese and Indian patenting remains modest.

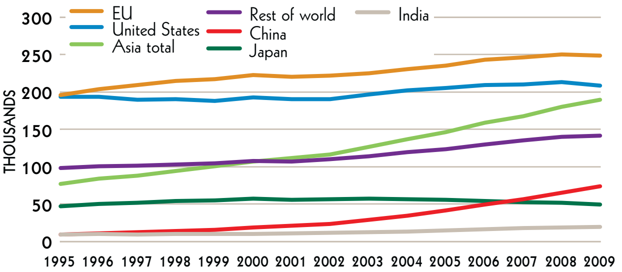
E. SCIENCE-PATENT LINKAGE

Patents list the prior scientific and technological knowledge on which they are built. Increasingly, U.S. patents have cited scientific articles as one such source.

The foreign share of such patent-to-article citations is rising, indicating growing utilization of published research in foreign inventions.

A

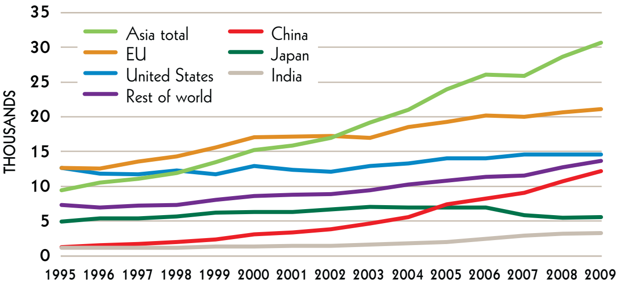
Science and engineering articles, by selected region/country: 1995–2009



NOTE: Asia total includes China, India, and Japan.
SEI 2012: **S&E Article Output,** Chapter 5.

B

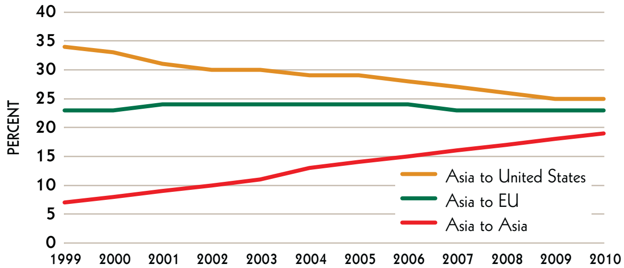
Engineering articles, by selected region/country: 1995–2009



NOTE: Asia total includes China, India, and Japan.
SEI 2012: **S&E Article Output,** Chapter 5.

C

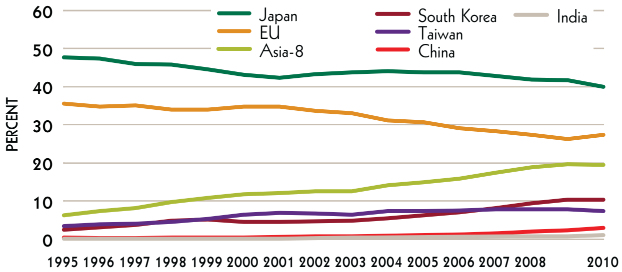
Citations in the Asian research literature to U.S., EU, and Asian research articles: 1999–2010



NOTE: Corrected for Asian self-citations.
SEI 2012: **Trends in Citation of S&E Articles,** Chapter 5.

D

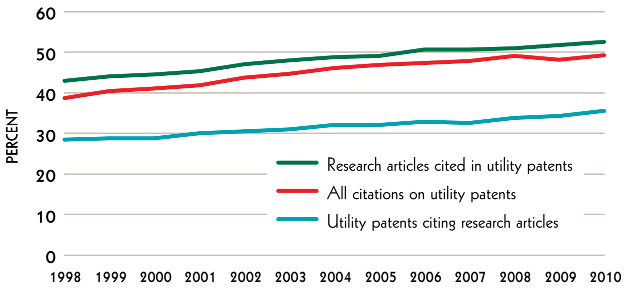
U.S. patents granted to non-U.S. inventors, by region/country/economy: 1995–2010



Asia-8 = India, Indonesia, Malaysia, Philippines, Singapore, South Korea, Taiwan, Thailand
SEI 2012: **Global Trends in Patenting and Trademarks,** Chapter 6.

E

Share of U.S. utility patents awarded to non-U.S. owners that cite S&E literature: 1998–2010



SEI 2012: **Patent-to-Literature Citations,** Chapter 5.

GEOGRAPHY OF S&T: GLOBALIZATION OF CAPABILITIES

WHY IS THIS IMPORTANT?

Today's interdependent economies rely on science, engineering, and technology for innovations that will keep them competitive. To that end, many governments have adopted policies to build or improve national science and technology capabilities.

A. LOCATION OF R&D

The geographic distribution of R&D expenditures shifted between 1996 and 2009. Asia's share rose to 35%, driven mostly by China's rapid R&D growth.

B. RESEARCHERS

The estimated number of researchers worldwide grew from about 4 million in 1995 to about 6 million in 2009, with indications of slowing growth from 2008 to 2009.

Annual growth was generally slower through the early part of the decade but since 2002 has averaged about 8% to over 10% for South Korea, Singapore, Taiwan, and China. Japan registered little or no growth over the 1995–2009 period, and Russia's researcher pool declined.

C. CROSS-BORDER R&D

R&D expenditures by overseas affiliates of U.S. multinational companies (MNCs) reached $37 billion in 2008. Europe's share of these overseas expenditures fell from 71% in 1998 to 65% in 2008, and Asia's share has increased from 11% to 20% since 1998.

U.S.-based affiliates of foreign MNCs spent $40.5 billion in the United States in 2008, three-quarters of it by European-owned companies. Canada, Latin America, and Africa had smaller or little-changed shares in 2008 compared with 1998; the Middle East had a larger share, driven by Israel.

D. HIGH-TECHNOLOGY MANUFACTURING

The United States, the EU, and China generate most of the value in the world's high-technology manufacturing output.

The worldwide recession changed trends in high-technology output growth around the world. U.S. growth nearly halted, and the EU, Japan, and Asia-8 experienced contraction in 2008 and 2009. Only China's output continued to grow rapidly, albeit at a somewhat slower pace than its previous double-digit growth.

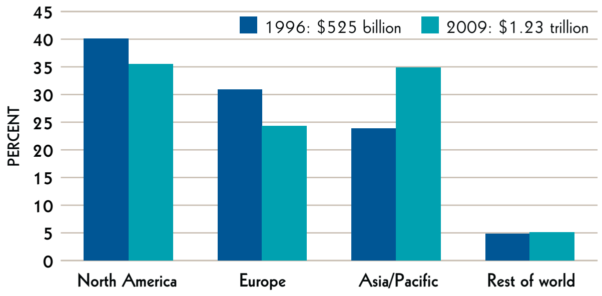
E. HIGH-TECHNOLOGY EXPORTS

Exports of high-technology manufactured goods (excluding intra-EU and China-Hong Kong trade) expanded from $761 billion in 1996 to $2.14 trillion in 2010, amid major shifts in countries' export positions, including a 10% recession-induced drop in 2009. The 2010 recovery was 6% above 2008 peak levels.

The combined China and Asia-8 exports amounted to half the world's total, with Asia-8 exports including substantial intermediate goods trade with China and other Asian economies. The United States and EU each accounted for about 15% of world high-technology exports.

A

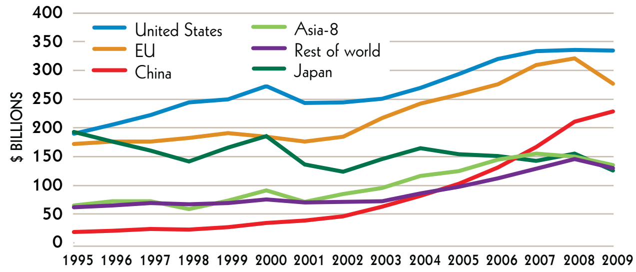
Location of estimated worldwide R&D expenditures: 1996 and 2009



SEI 2012: **Global Patterns of R&D Expenditures,** Chapter 4.

D

High-technology manufacturing value-added, by country/region: 1995–2009

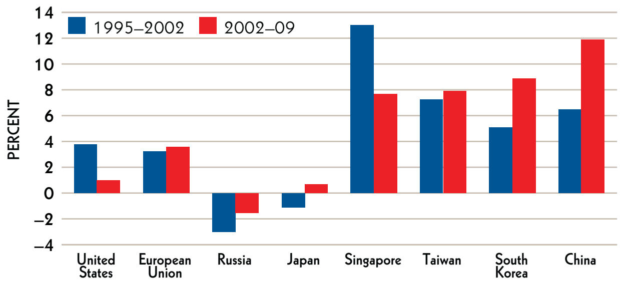


Asia-8 = India, Indonesia, Malaysia, Philippines, Singapore, South Korea, Taiwan, Thailand

SEI 2012: **High-Technology Manufacturing Industries,** Chapter 6.

B

Average annual growth rates in number of researchers, by country/economy: 1995–2002 and 2002–09

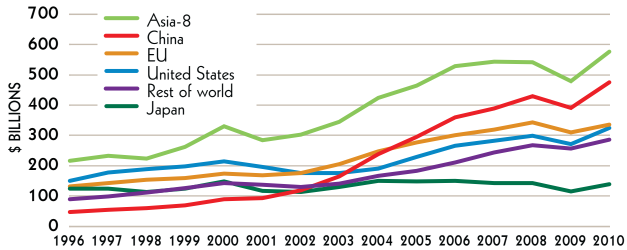


NOTE: Growth rates through last available year in range indicated.

SEI 2012: **Global S&E Labor Force,** Chapter 3.

E

Exports of high-technology manufactured goods, by region/country: 1996–2010



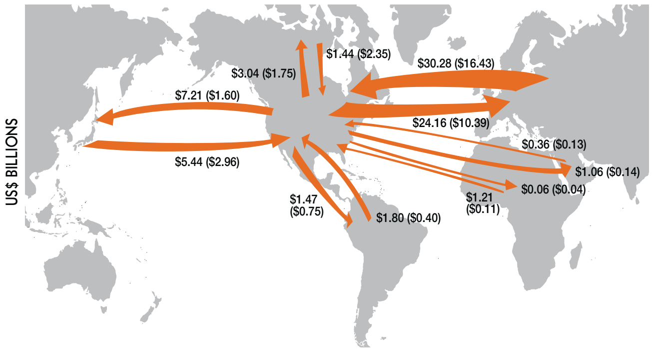
Asia-8 = India, Indonesia, Malaysia, Philippines, Singapore, South Korea, Taiwan, Thailand

NOTE: Excludes intra-EU and China-Hong Kong trade.

SEI 2012: **Global Trade in Commercial KTI Goods and Services,** Chapter 6.

C

Mapping cross-border R&D funds flows among affiliates



SEI 2012: **U.S. MNCs Parent Companies and Their Foreign Affiliates,** Chapter 4.

GLOSSARY AND KEY TO ACRONYMS

Applied research. Systematic study to gain knowledge or understanding to meet a specific, recognized need.

Asia-8. India, Indonesia, Malaysia, the Philippines, Singapore, South Korea, Taiwan, and Thailand.

Asia-10. China, India, Indonesia, Japan, Malaysia, the Philippines, Singapore, South Korea, Taiwan, and Thailand.

Basic research. Systematic study to gain more comprehensive knowledge or understanding of the subject under study without specific applications in mind.

Development. Systematic use of the knowledge or understanding gained from research directed toward the production of useful materials, devices, systems, or methods, including the design and development of prototypes and processes.

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

EU. The 27 member nations of the European Union: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxemburg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom.

High-technology manufacturing. Manufacturing in five industries, identified by the Organization for Economic Co-operation and Development, that have particularly strong linkages to science and technology: aerospace, communications and semiconductors, computers and office machinery, pharmaceuticals, and scientific instruments.

Knowledge-intensive economy. Economies in which research, its commercial exploitation, and intellectual work play a substantial role.

MNC. Multinational company.

NAEP. National Assessment of Educational Progress.

NCSES. National Center for Science and Engineering Statistics, National Science Foundation.

NSB. National Science Board.

NSF. National Science Foundation.

OECD. Organisation for Economic Co-operation and Development.

PISA. Program for International Student Assessment.

R&D. Research and development.

R&D intensity. R&D as a proportion of gross domestic product.

S&E. Science and engineering.

S&T. Science and technology.

STEM. Science, technology, engineering, and mathematics.

SEI. Science and Engineering Indicators.

Underrepresented minority. Members of racial and ethnic groups that have traditionally been underrepresented in science and engineering, including blacks, Hispanics, American Indians and Alaska Natives, and Native Hawaiians and other Pacific Islanders.

Value-added. Sales minus the cost of purchased domestic and foreign inputs and materials.

EXPLORE FURTHER

To read more about the themes presented in this digest, please see the Overview chapter as well as the more detailed analysis and fuller discussion of each of the major indicators presented in *SEI 2012*. Each digest theme is matched with its source *SEI 2012* chapter or chapters in the list below. *SEI 2012* also provides a wealth of detailed information on U.S. mathematics and science education at the elementary and secondary levels (Chapter 1), public attitudes and understanding of science and technology (Chapter 7), and state-level comparisons of selected science and engineering indicators (Chapter 8).

Global R&D: Measuring Commitment to Innovation

- Chapter 4. Research and Development: National Trends and International Comparisons

U.S. R&D: Funding and Performance

- Chapter 4. Research and Development: National Trends and International Comparisons
- Chapter 5. Academic Research and Development

U.S. R&D: Federal Portfolio

- Chapter 4. Research and Development: National Trends and International Comparisons
- Chapter 5. Academic Research and Development

U.S. and Global STEM Education

- Chapter 1. Elementary and Secondary Mathematics and Science Education
- Chapter 2. Higher Education in Science and Engineering

U.S. S&E Workforce: Trends and Composition

- Chapter 2. Higher Education in Science and Engineering
- Chapter 3. Science and Engineering Labor Force

Research Outputs: Publications and Patents

- Chapter 5. Academic Research and Development
- Chapter 6. Industry, Technology, and the Global Marketplace

Geography of S&T: Globalization of Capabilities

- Chapter 3. Science and Engineering Labor Force
- Chapter 4. Research and Development: National Trends and International Comparisons
- Chapter 6. Industry, Technology, and the Global Marketplace

SEI 2012 ONLINE RESOURCES

The complete *SEI 2012* report and its related resources, described below, are available on the Web at www.nsf.gov/statistics/indicators/. An interactive version of this digest is also available online at www.nsf.gov/statistics/digest/.

Companion piece. The Board's companion pieces are "companion" statements to *SEI 2012*. The Board focuses on trends that it believes raise important policy concerns and should be brought to the attention of the President, Congress, and the public.

State data tool. This state data tool allows interactive exploration of 58 indicators of state trends in science and technology education, workforce, finance, and R&D. Users have the ability to choose and explore a single indicator in-depth, compare multiple indicators for preselected groups, customize their own graphics, or download data tables.

Presentation graphics. Presentation graphics, in PowerPoint slide and image (JPEG) formats, accompanied by their supporting data (Excel), are based on figures in the Overview chapter of *SEI 2012*. These figures are modified to fit the presentation-slide format, and slides can be previewed using the thumbnail view.

Source data. Data supporting each figure, table, and appendix table in *SEI 2012* are available for download in Excel format. Links are provided on the *SEI 2012* main page to the lists of figures, tables, and appendix tables, each organized by chapter.

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www.nsf.gov/statistics/digest/

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