National Science Board

Introduction

Universities and colleges are key societal institutions that shape our Nation. Among their many contributions to the public and private good, they serve our country by:

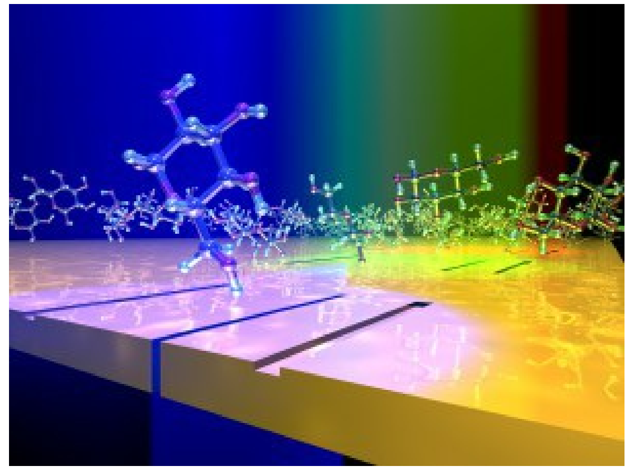
- Discovering and disseminating new knowledge through science and technology research
- Developing an educated citizenry with science, technology, engineering, and mathematics (STEM) capabilities

Over a century ago, the United States forged a modern system of higher education. It combined the idea of the research university – dedicated to creating new knowledge in all fields – with commitments to engage students in both classical and practical studies and make higher education available to a much wider portion of the nation. In the past 154 years, legislation ranging from the Morrill Acts of 1862 and 1890 to the GI Bill of 1944 has made widespread access to higher education a reality. Since the 1940s, the federal government, through the Public Health Service Act of 1944, the NSF Act of 1950, and the National Foundation on the Arts and Humanities Act of 1965, has reinforced that the research mission of our colleges and universities is a public good. Our colleges' and universities' innovative combination of research, practical education, and accessibility, coupled with the commitment of public resources to achieve these ends, have made the U.S. system of higher education a model for the world.

Today, the pursuit of new knowledge and access to higher education matter as much as ever to individual and national prosperity. Yet data indicate that U.S. higher education institutions' ability to support research and provide access to a high quality education is at risk, in part because our Nation's commitment to public investment in higher education is wavering. Federal support for R&D conducted at colleges and universities has declined, and long term federal budget challenges loom. Likewise, tuition costs have increased for both private and public higher education institutions. This trend is particularly acute for public colleges and universities, which face significant declines in state support while experiencing increased enrollment and expenditures. These developments are eroding our research enterprise and putting the education needed to thrive in a knowledge-intensive global economy out of reach for many Americans.

As these and other pressures mount, policy discussions about higher education have become increasingly limited, focusing on its near-term, individual, and private benefits. This approach fails to recognize the full range of near- and long-term public and private benefits of higher education, and that these benefits are deeply intertwined and mutually reinforcing. At the same time that our higher education system prepares individuals for gainful employment, it also positions the United States to compete in a global knowledge economy and meet domestic and international challenges. Our higher education ecosystem simultaneously serves public and private purposes – contributing to our collective economic prosperity, a well-functioning public sector, a globally competitive private sector, and the creation of a STEM-literate populace that can navigate a data- and technology-intensive world. It also plays a vital role in shaping a thriving, democratic society, as highlighted in the "Sense of the National Science Board Regarding the Broad Value to the Nation of Higher Education."

Innovation through University-based Discovery Research



Why is Discovery Research Important?

"Discovery" research (also called basic, early-stage, or fundamental research) expands our understanding of the natural world and the human experience. By tackling broad research questions without particular applications in mind, scientists create new knowledge and seed the Nation's science and technology enterprise. Over time, the pursuit of fundamental knowledge in all scientific fields and its integration in different and often unanticipated ways, paves the way for applied research and development, and ultimately scientific advances and technological innovations. By laying the foundation for the Nation's S&T enterprise, discovery research enhances U.S. economic competitiveness and improves the health, prosperity, and security of all Americans.

What is the Role of Colleges and Universities?

U.S. colleges and universities play an essential and unique role in the Nation's research enterprise. Researchers at U.S. colleges and universities conduct the majority of discovery research, performing just over half ($41.3 billion) of the Nation's $80.5 billion[1] investment in basic research. They also conduct about 21% ($18.6 billion) of the Nation's $90.6 billion investment in applied research. [**Figure 1A**]

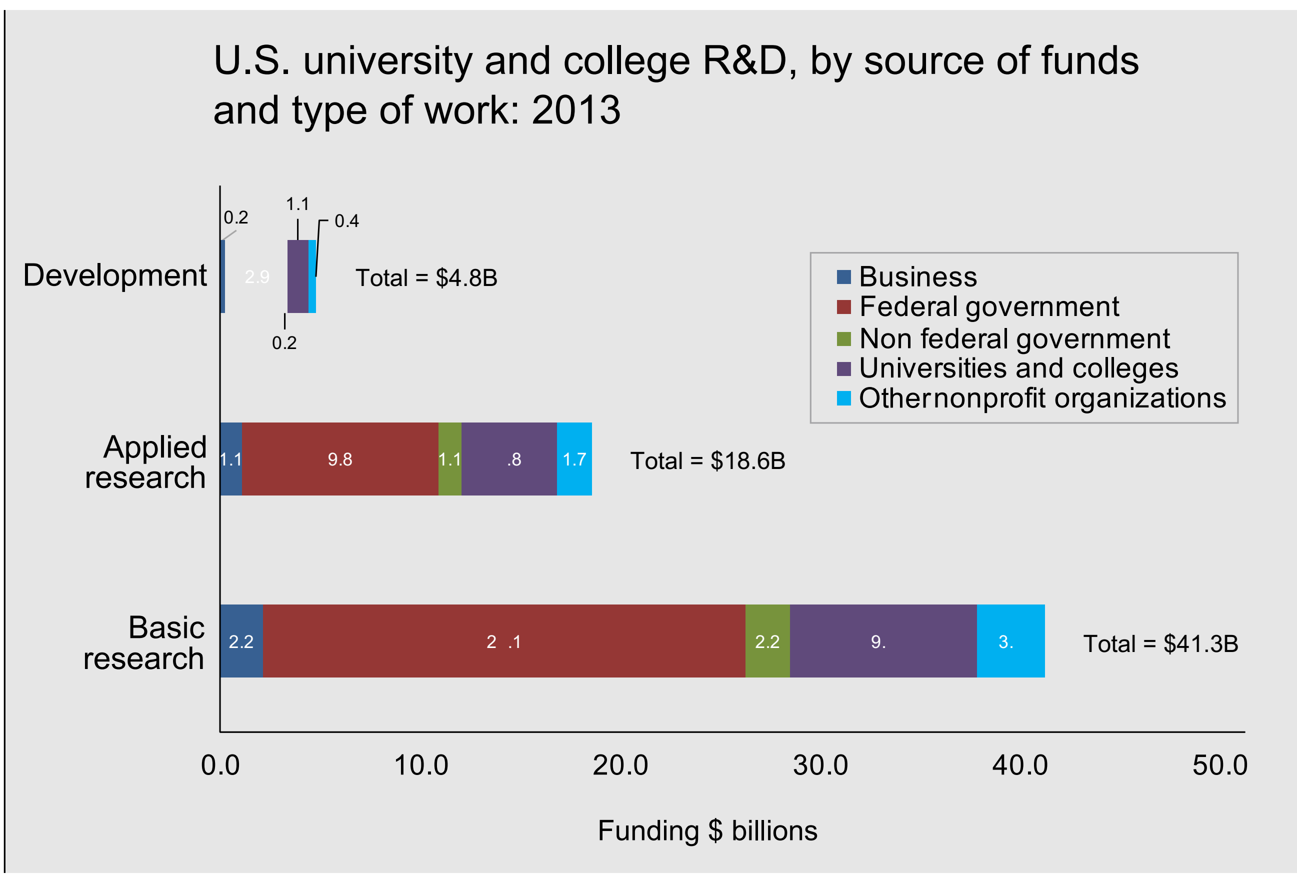


Figure 1A

Discovery Research at Colleges and Universities – A Public Investment

The Federal government is the primary source of support for research conducted at U.S. colleges and universities, funding 59% ($24.1 billion) of the basic and 53% ($9.8 billion) of the applied research. [Figure 1A] Federal investment in the research conducted at our colleges and universities is vital since investment in discovery research is a classic example of "market failure." [2] Developed nations worldwide recognize this and invest in basic research because of its intangible and public good characteristics. In 2013, the Federal government directed 31% of its $121.8 billion in R&D support to basic research [**Figure 1B**], with two-thirds of that going to colleges and universities.

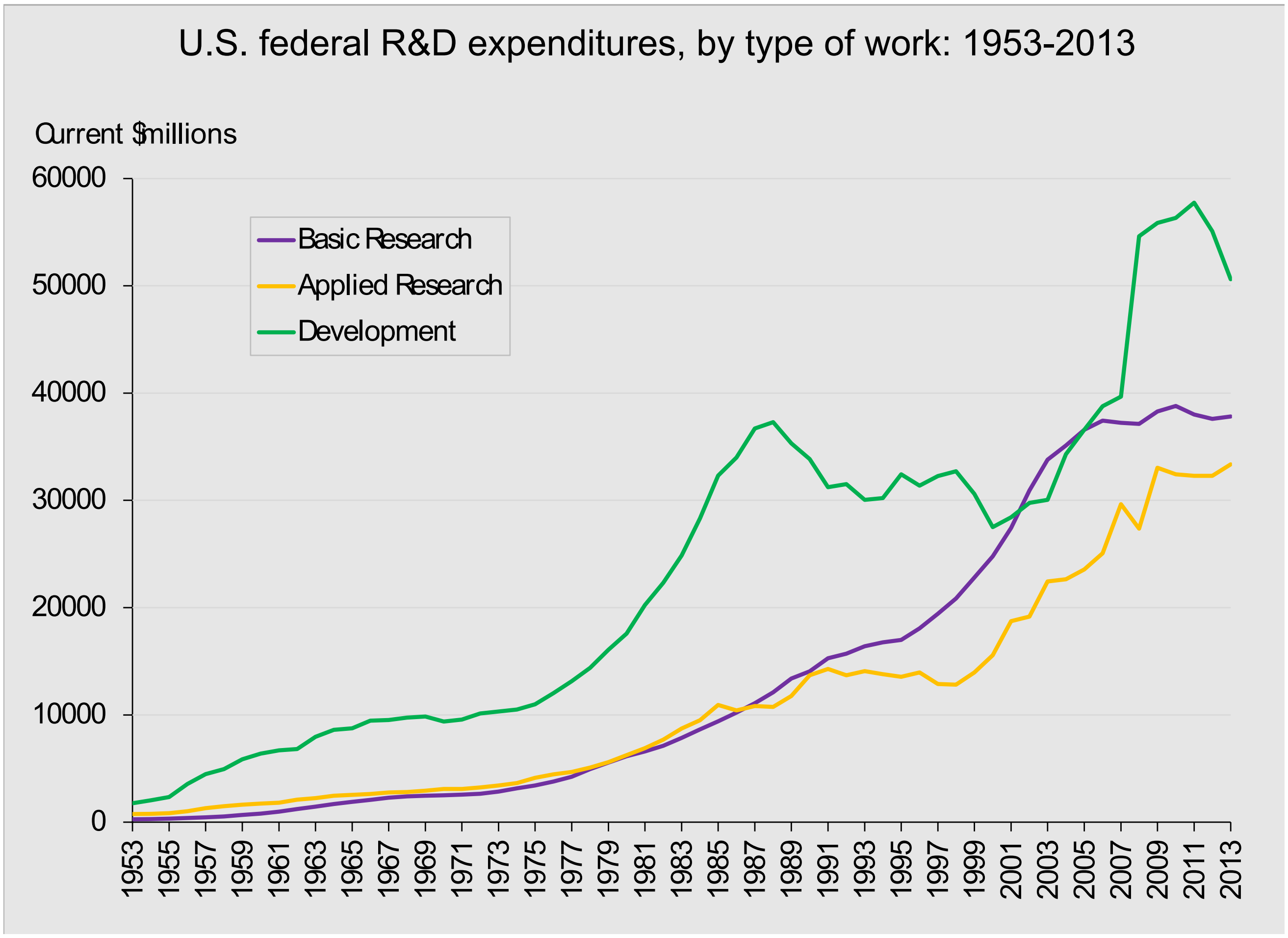


Figure 1B

By contrast, in 2013, businesses allocated 7.1% of their $297.8 billion in R&D funding toward basic research [**Figure 1C**], with about 10% of those funds supporting research at colleges and universities. Although total business R&D is much greater than federal R&D, data since 1953 (the earliest data available in Indicators) show that the private sector has consistently directed the vast majority of its R&D dollars to development. **[Figure 1C**]

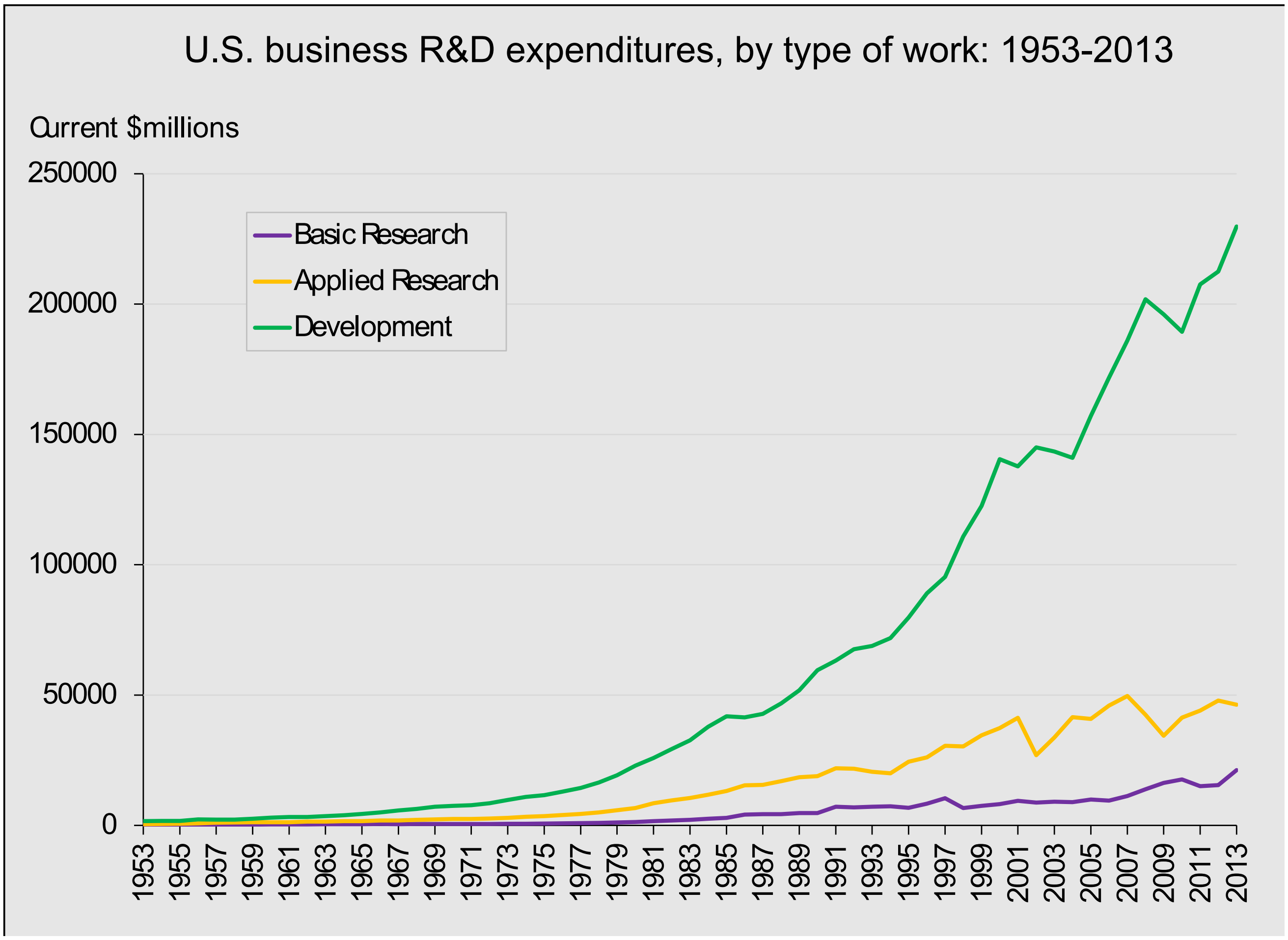


Figure 1C

University-based Research – Yielding Private and Public Benefits

Research carried out at U.S. colleges and universities yields tremendous public and private benefits at the local, state, regional, and national levels. Initial studies highlight that university research contributes to short-term economic activity both regionally and nationally.[3] Additionally university-based research catalyzes long-term economic activity through inventions, patenting activities, the formation of new startups, and other technology transfer activities. [**Figure 1D**] The products of university-based research – both those that can be monetized and those that cannot – ultimately contribute to our prosperity.

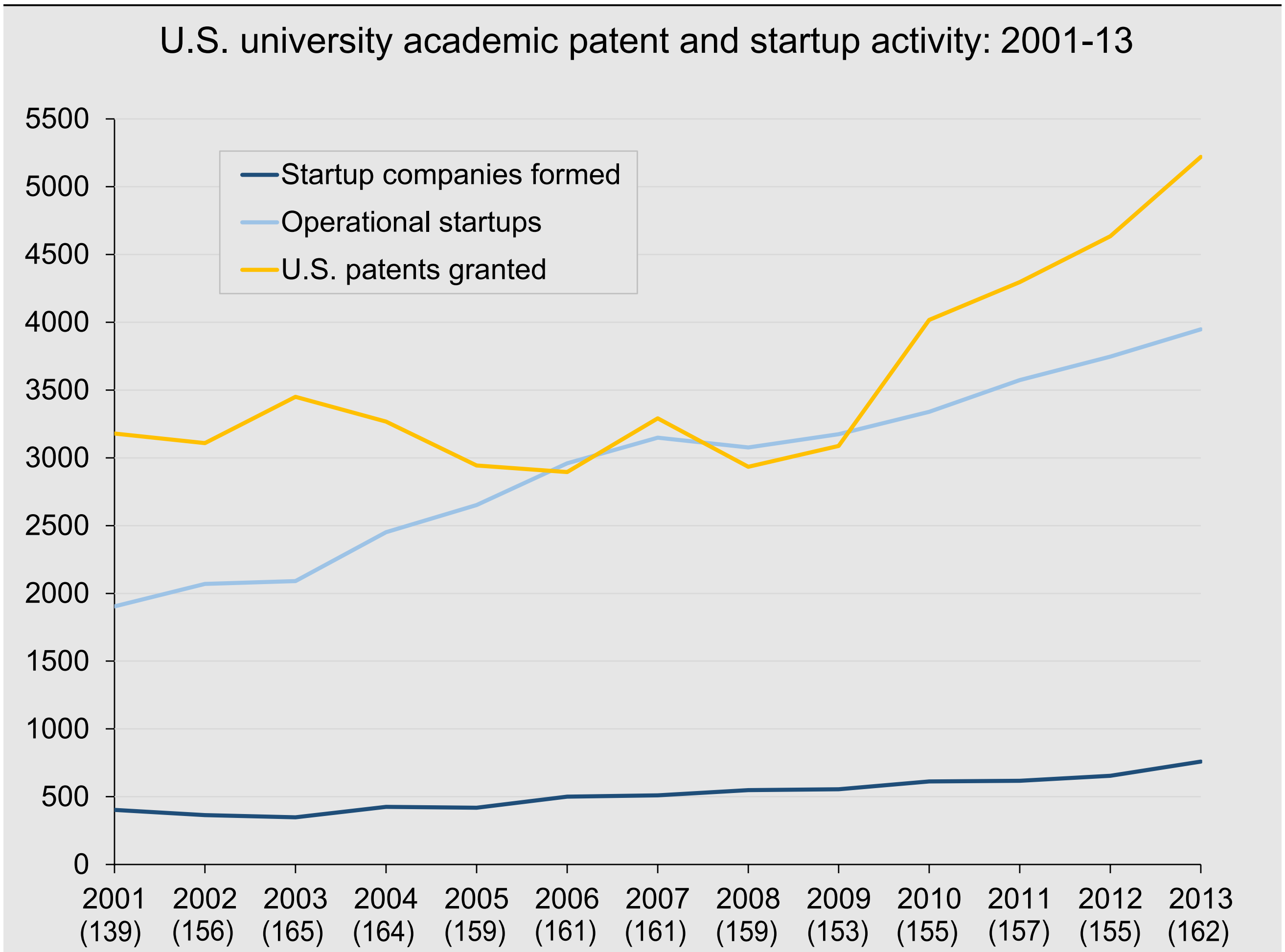


Figure 1D

The following stories highlight just a few examples of NSF-funded discovery research at colleges and universities that have led to important innovations that benefit society:

Preventing Freezer Burn with Help from Antarctic Fish

In the early 1970s, NSF-funded research discovered that Antarctic fish have developed proteins that act as antifreeze, allowing them to survive in their harsh environment.
These compounds inhibit the growth of ice crystals, preventing them from damaging cells and tissues. Since this discovery, researchers have found similar compounds in other cold-water fish, insects, plants, fungi and bacteria. These compounds are about 300 times more effective in preventing freezing than conventional chemical antifreezes. The effectiveness of the fish antifreeze proteins in inhibiting ice growth suggests that they could be used to prevent unwanted freezing of food and freezing injury.

Protecting organic material from damage caused by freezing offers many potential benefits and commercial applications. For example, they could be used in the preservation of foods, such as ice cream, whose taste and texture is altered due to “freezer burn” (ice crystal damage). The proteins could be used to engineer cold resistance in living plants, to preserve tissues and organs for transplant, or to create non-polluting de-icing agents.

Beyond its cold-related applications, study of the mechanism of how antifreezes bind to ice and inhibit its growth also provides insights into how other biomolecules affect growth of harmful bio-crystals such as those associated with gout, kidney, and gallstones.

While most of these applications are still in the experimental phase, it’s possible that in a few more years, we will be enjoying smooth, freezer-burn-free ice cream courtesy of Antarctic fish!

Medical Match.com: Streamlining Kidney Donations

Harvard economist Alvin Roth is a matchmaker but he’s not finding love – he’s finding kidneys! With support from NSF, he and his team developed a suite of computer programs that match living kidney donors with recipients. It starts when the person who needs a kidney brings someone to the table who is willing to donate a kidney. If those two are not a match, the donor will match someone else on the waiting list, while a different match is found from the donor database for the person in need of a kidney. Think of it as a medical version of match.com, linking donors and recipients, making chains of transplants possible across the country.

Roth’s team includes market designer Itai Ashlagi and operations researcher David Gamarnik at MIT and economists Utku Unver and Tayfun Sonmez at Boston College. So, what are economists doing organizing kidney transplants? It turns out that an understanding of game theory and market dynamics is key to optimizing pairings. It’s all about streamlining complicated matches using the science of the marketplace. Their matching software is the engine that has helped transplant centers in 30 states so far.

Provided by the National Science Foundation Runtime: 2:32

Touch Screen Technology: How Accessibility for Some Became Essential Technology for All

Double-tap, swipe, type – we do all of this on our flat screen phones and tablets without thinking about it. But who invented this technology that seemingly arrived overnight and is now a part of our everyday life?

Far from arriving overnight, the seeds of our handheld devices were sown in the 1960s, when touchscreens were first invented in the United Kingdom. This invention was improved over the next three decades, with new touchscreen technologies developed and incorporated into computer monitors and, in the 1990s, early personal digital assistants (PDAs). However, these first PDAs required a stylus and could only process single-touch input, e.g. from the tip of the stylus.

In 1995, Wayne Westerman, a University of Delaware graduate student in the College of Engineering, started thinking about people whose medical conditions made it difficult for them to push the keys and buttons on conventional keyboards. Westerman, who had tendonitis, noticed that he had less trouble using touchscreens. This led him to imagine a “no-pressure keyboard” that would only require a “soft touch” to operate. However, Westerman realized that no existing devices could process “multi-finger input.”

Westerman, together with his faculty advisor, Professor John Elias, set to work on this puzzle. For his doctoral dissertation, Westerman developed algorithms and interface technology capable of handling multi-touch input such as scrolling, swiping, and other gestures. His work also focused on improving the functionality and user-friendliness of “surface typing” on a flat screen. To fund this work, they applied for and received a grant from the National Science Foundation’s Experimental Program to Stimulate Competitive Research (EPSCoR).

Based on these innovations, Westerman and Elias launched the startup company FingerWorks in 1998 and began producing a line of tablets and keyboards that had 10-finger capacity. FingerWorks was the first company to commercialize multi-touch technology for consumer devices. In 2005, Apple bought FingerWorks and incorporated the technology into the first iPhone, which was released in 2007. The rest, as they say, is history!

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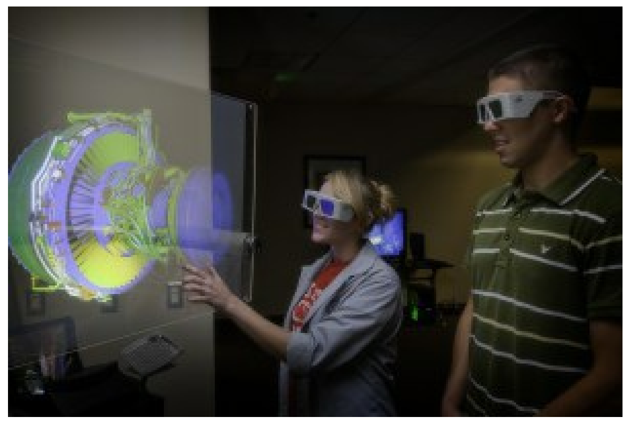
[1]These totals reflect investment from all sources.

[2]“The fundamental justification for government support of research is the classical market failure argument: the market does not provide sufficient incentives for private investment in research owing to the non-appropriable, public good, intangible character of knowledge and the risky nature of research.”http://www.oecd.org/sti/outlook/e-outlook/stipolicyprofiles/competencestoinnovate/publicresearchpolicy.htm

[3]Weinberg et. al., “Science Funding and Short-Term Economic Activity,” *Science*, Vol. 344, 4 April 2014, pp. 41- 43.

Human Capital Development through Higher Education



Why is Human Capital Important?
Since our Nation’s founding, Americans have understood that education is important not only to improving one’s station in life or generating wealth, but also to creating a strong, democratic society (See “Sense of the National Science Board Regarding the Broad Value to the Nation of Higher Education”). Today, we talk about education as the way that an individual or nation produces “human capital.” The Organization for Economic Cooperation and Development (OECD) defines human capital as “the knowledge, skills, competencies, and attributes embodied in individuals that facilitate the creation of personal, social, and economic well-being.” Human capital is our Nation’s most vital resource; increasingly it will influence – if not determine – individual and national well-being in a knowledge- and technology-intensive global economy.

What is the Role of Colleges and Universities?
Through their education mission, institutions of higher education, including research universities, 4-year bachelor’s degree granting institutions, and community colleges, equip individuals and our Nation with the human capital needed to thrive now and in the future. In 2013, these institutions enrolled over 20 million people in the United States [**Figure 2A**]

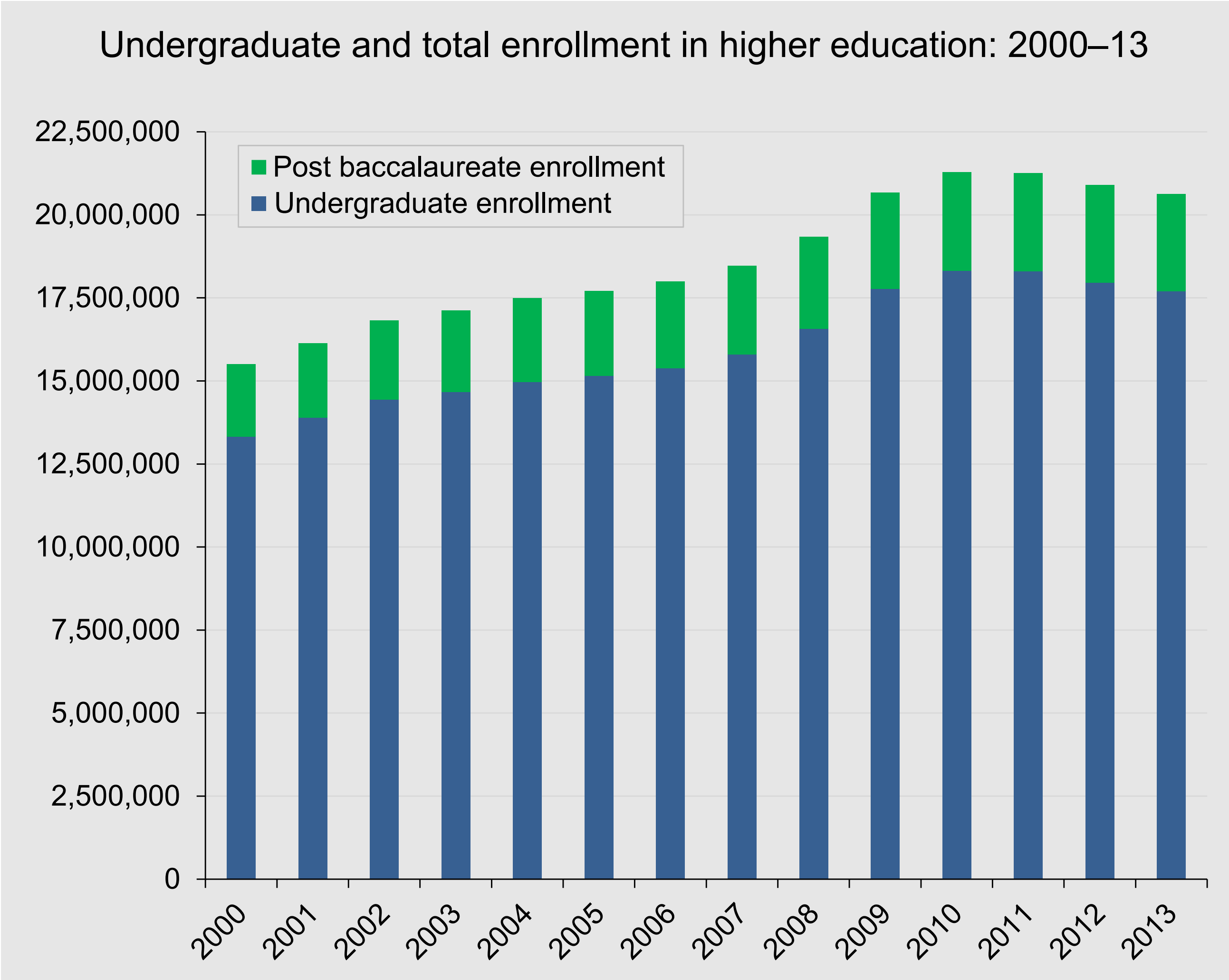


Figure 2A

and awarded over 3.5 million associate, bachelor's, master's, and doctoral degrees. [**Figure 2B**]

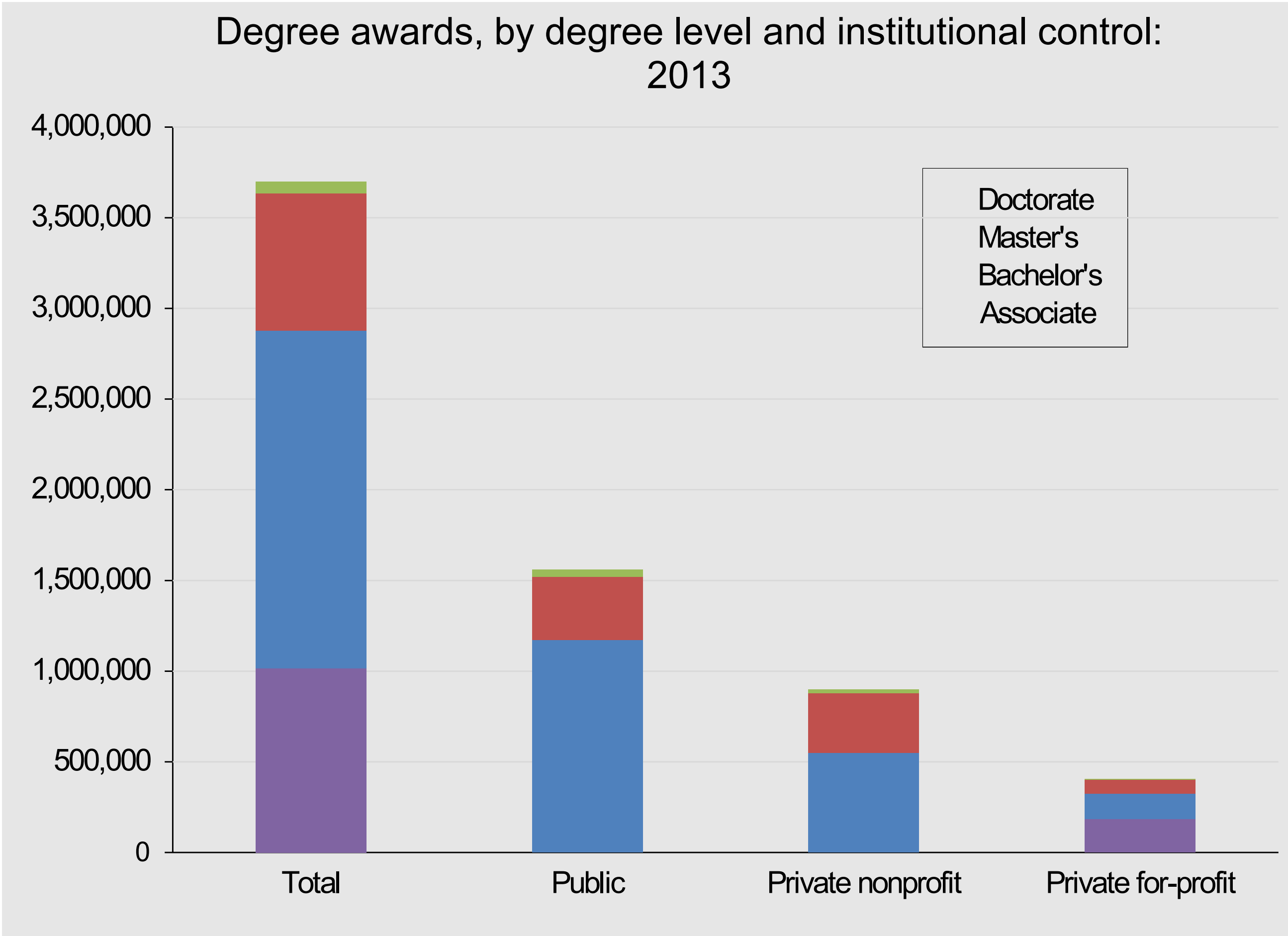


Figure 2B

Although both public and private universities and colleges are important, public institutions play a special role in providing access to high quality education at a lower net tuition cost. [**Figure 2C**]

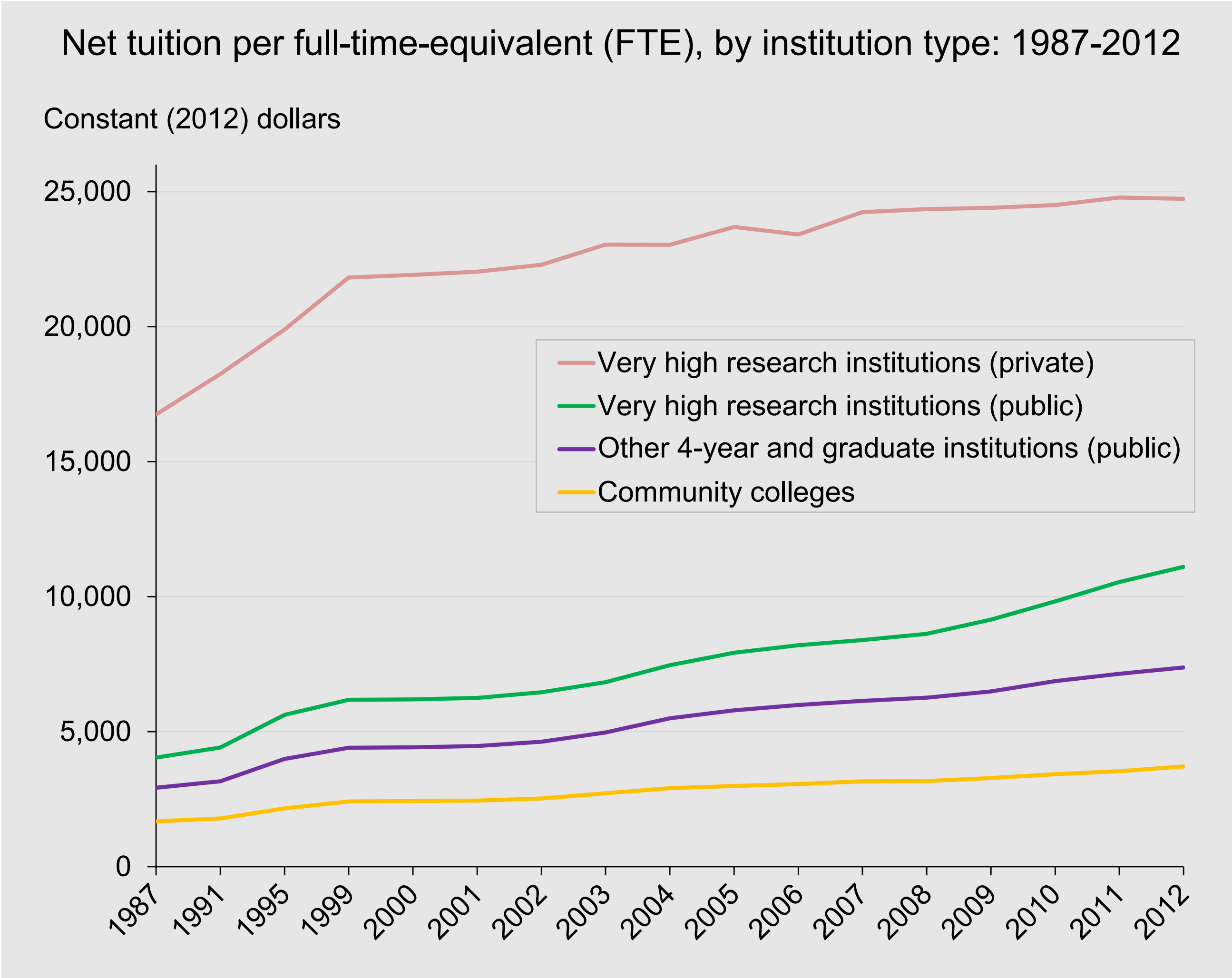


Figure 2C

Higher Education – Value for the Workforce

More and more jobs require post-secondary education. This is especially true in science, technology, engineering, and mathematics (STEM) occupations. About 75% of individuals employed in jobs classified as science and engineering (S&E) have earned a bachelor's degree or higher versus 31% of individuals in other occupations. [**Figure 2D**]

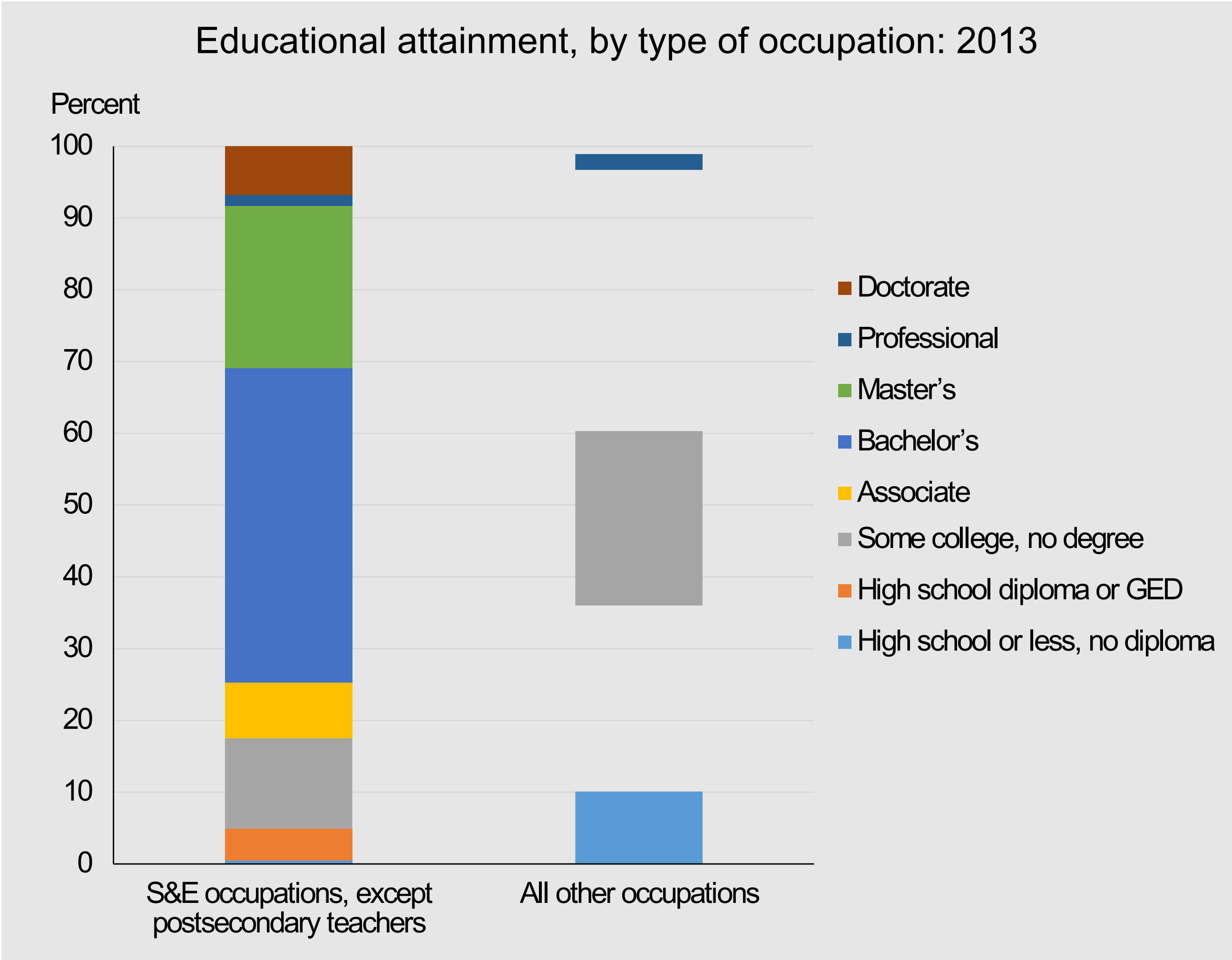


Figure 2D

But it is not just STEM jobs that require highly skilled workers. In today's "knowledge economy," as the size of the workforce increases, the number of jobs requiring a bachelor's level of S&E expertise is increasing in S&E and non-S&E jobs alike. [**Figure 2E**]

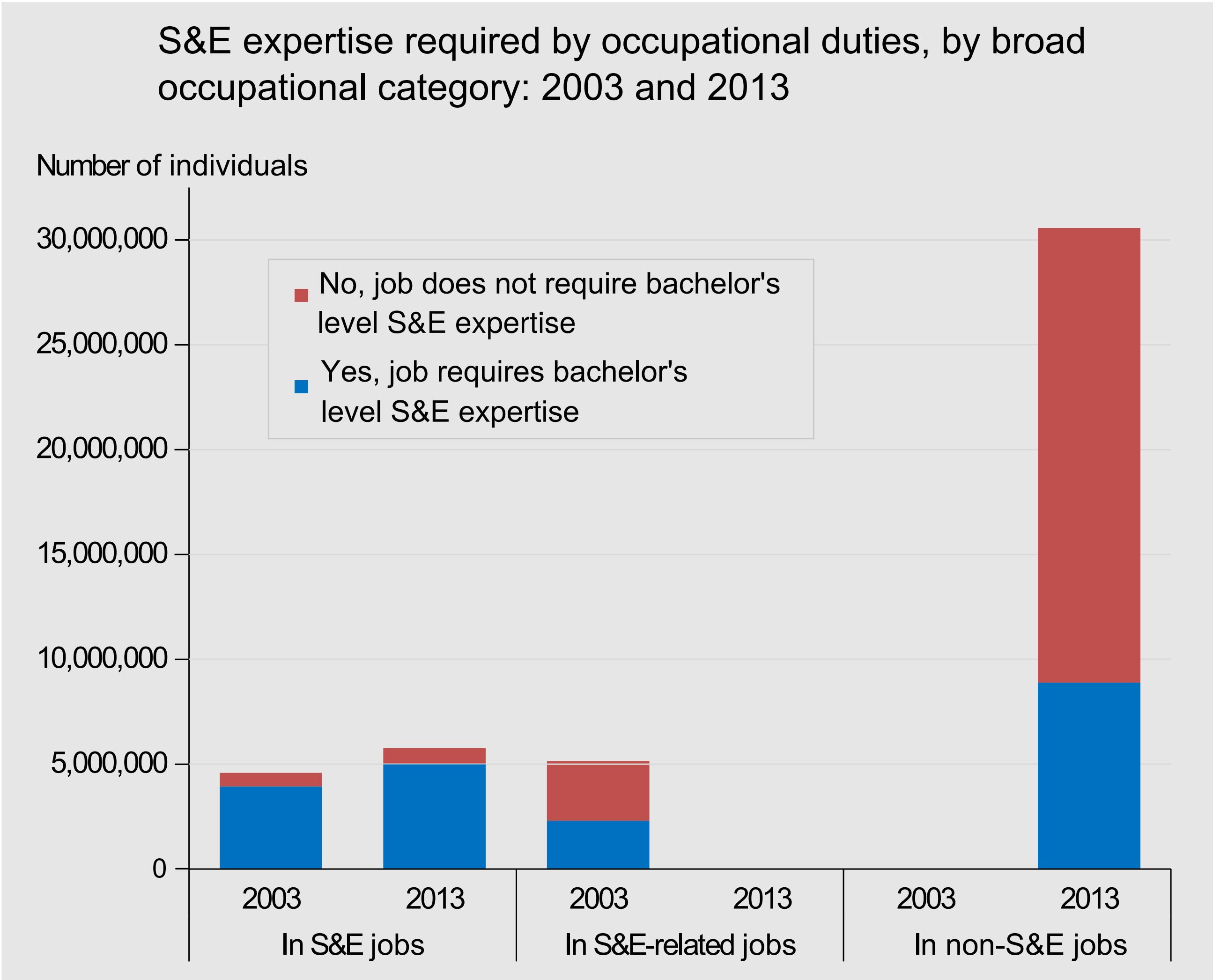


Figure 2E

In fact, there are now more non-STEM jobs that require S&E expertise (8.9 million) than there are STEM jobs that require S&E expertise (8.8 million). In a rapidly changing world, higher education institutions will continue to play a key role in creating the diverse, STEM-capable U.S. workforce our Nation needs.

Higher Education – Value for the American Dream

For individuals, higher education offers the potential for social mobility. The Brookings Institution's Hamilton Project highlights the value of a college degree, showing that the "median earnings of bachelor's degree graduates were higher than median earnings of high school graduates in all 80 majors studied" and that this was demonstrated at all career stages.[4] Over a career, the earnings premium associated with a college degree adds up; "over the entire career a typical bachelor's degree graduate earns $1.19 million, which is twice what the typical high school graduate earns, and $335,000 more than what the typical associate degree graduate earns."[5] Beyond income, individuals with post-secondary education have lower unemployment and under-employment. Additionally, higher education provides foundational cognitive and non-cognitive knowledge and skills that allow workers to reinvent themselves over the course of a career.

Higher Education – Value to Society

Current discussions about higher education often emphasize its immediate individual and private benefits. But higher education is about more than preparation for a first job, salary, or other market indicators. Among its many benefits, higher education serves the long-term public good by creating a scientifically-literate society. STEM literacy helps all of our citizens to use technology in daily life, evaluate evidence critically, make public policy choices that entail science and technology, and navigate a data-intensive world. Higher education is associated with higher levels of interest in science, technology, and medicine, and certain other important contemporary issues as well as with scientific knowledge. [**Figure 2F**]

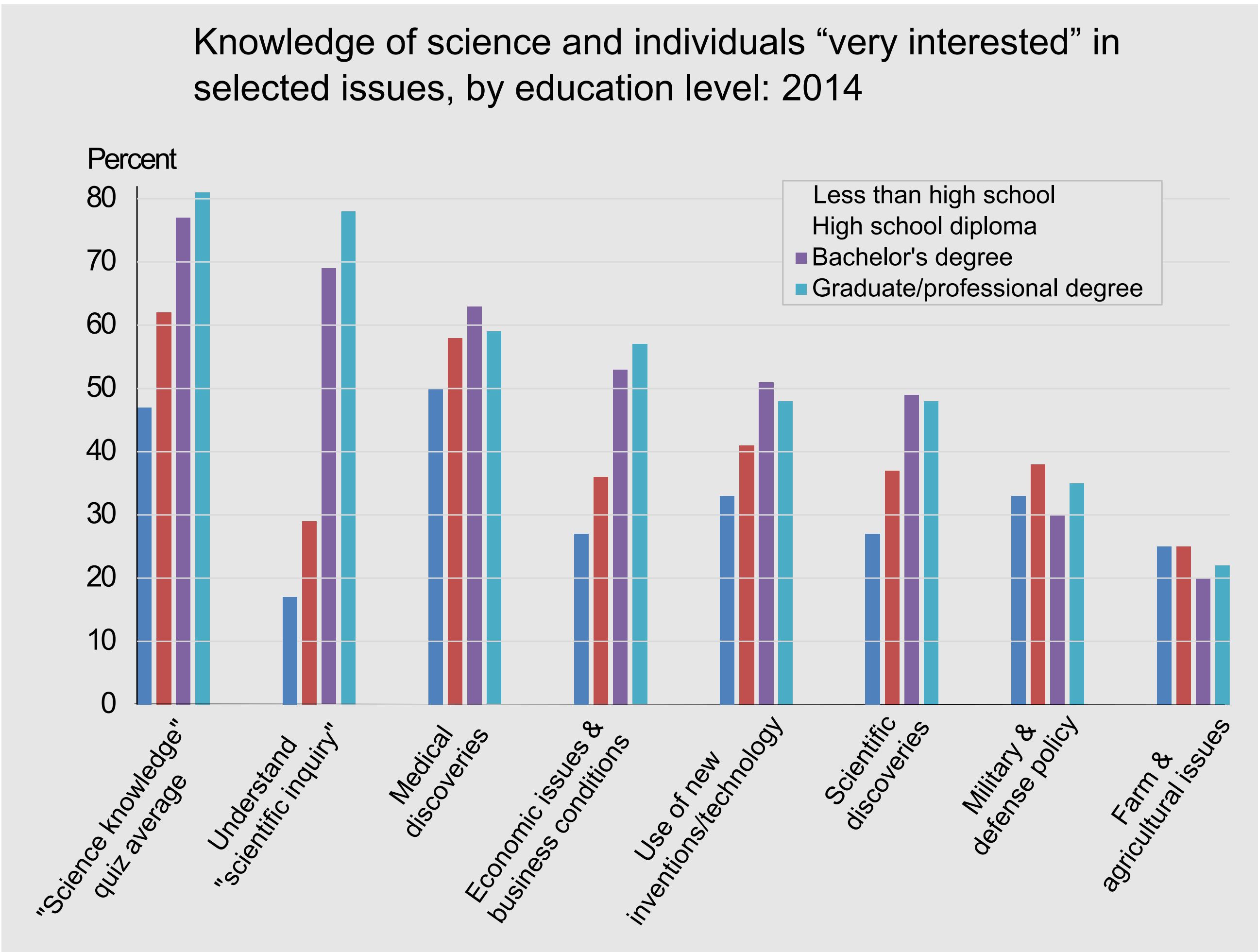


Figure 2F

The following stories represent just a few examples of how NSF-funded human capital development is creating a STEM-capable U.S. workforce:

Crime-Solving Students

Preparing for careers in real life "CSI," undergraduate students learn crime-solving techniques in the science labs at the University of Alabama, Birmingham (UAB). Instead of taking the summer off, college students from all over the southern United States participate in UAB's NSF-supported Research Experiences for Undergraduates program to build their knowledge of forensic science. Criminal justice is naturally interdisciplinary – students use techniques from the natural sciences, mathematics, and social science in the course of their research, gaining the hands-on experience with STEM disciplines that is often highly sought-after by employers.

Provided by the University of Alabama, Birmingham
Runtime: 2:32

Community College Students Train for a Cybersecurity Career

The stakes are high at Collegiate Cyber Defense Competitions (CCDC), where top-notch security professionals pose as computer hackers, who try to break into simulated business computer networks — the kinds you'd find on Wall Street, in banks, hospitals, or even your home. As the "bad guys" try to compromise computer systems, teams of students have to think like hackers, and compete against each other to keep the attackers out. It's a way for students to be noticed by potential employers, and apply what students are learning in class at the Center for Systems Security and Information Assurance (CSSIA) at Moraine Valley Community College, outside Chicago.

"Cybersecurity provides a great career path. There are thousands of different types of jobs out there," says Erich Spengler, CSSIA director. With support from the NSF, CSSIA has become a national leader in cybersecurity education. The Center provides hands-on complex laboratory exercises and real-world learning experiences. In fact, some of the students are actually educators themselves. Since 2004, CSSIA has instructed more than 2,000 teachers and college faculty in cybersecurity-related areas.

Provided by the National Science Foundation
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Tackling the Need for a Technical Workforce

"If we're going to have the technical workforce that this country needs, we're going to need to look really closely at science and engineering in college, and look at how can we teach more effectively … and also more inclusively," says Lisa Hunter, founder and director of the Akamai Workforce Initiative (AWI) at the University of Hawaii Institute for Astronomy. With help from the NSF, Hunter and her team at AWI are working on the training and retention of a diverse student population in electro-optics through a curriculum that is designed to meet workforce needs in astronomy, remote sensing, and other technology industries in the state of Hawaii. According to Hunter, several AWI alumni have either entered the science, technology, engineering and mathematics (STEM) workforce or are continuing their education in a STEM-related field.

Provided by the National Science Foundation

Runtime: 2:32

[4] Brad Hershbein and Melissa Kearney, “Major Decisions: What Graduates Earn Over Their Lifetimes,” Brookings Institution, Hamilton Project, September 2014.
[5] Hershbein and Kearney, “Major Decisions.”

Challenges and Pressures

The United States owes its status as a world leader in innovation to public support of R&D and human capital development. In the post-World War II era, our Nation had the foresight to make higher education a ladder for individual opportunity and an engine of our Nation’s economic and scientific competitiveness.[6] Through a historic set of public investments at the local, state, and federal levels, we committed to catalyzing the U.S. research enterprise through federal funding of civilian basic research and fulfilling the promise of the Morrill Acts by making higher education accessible to all Americans.

A variety of indicators suggest that this public commitment to R&D and higher education is wavering. Tight federal budgets have led to declines in federal investment in academic R&D. Simultaneously, net tuition has increased at both our public and private universities, making the cost of higher education borne by individuals and families even greater. Decreased state funding for public higher education has exacerbated matters, increasing financial pressure on the institutions and students.

Amid current debates about the allocation of limited public funds and higher education reform, our Nation must reaffirm the important public and private benefits that our higher education institutions provide. In whatever form higher education takes in the future, we must sustain our higher educational institutions’ essential research, education, and service missions through public investment.

Challenges to Creating New Knowledge
Given the disincentives for the private sector to fund the early phase discovery research that is typically conducted at our colleges and universities, continued public sector support will be necessary to catalyze our research enterprise. However, current and future federal budget trends, including increasing mandatory spending commitments and an accompanying squeeze of non-defense discretionary budgets [**Figure 3A**], cast doubt on whether the United States will be able sustain its prior level of federal investment in academic R&D.

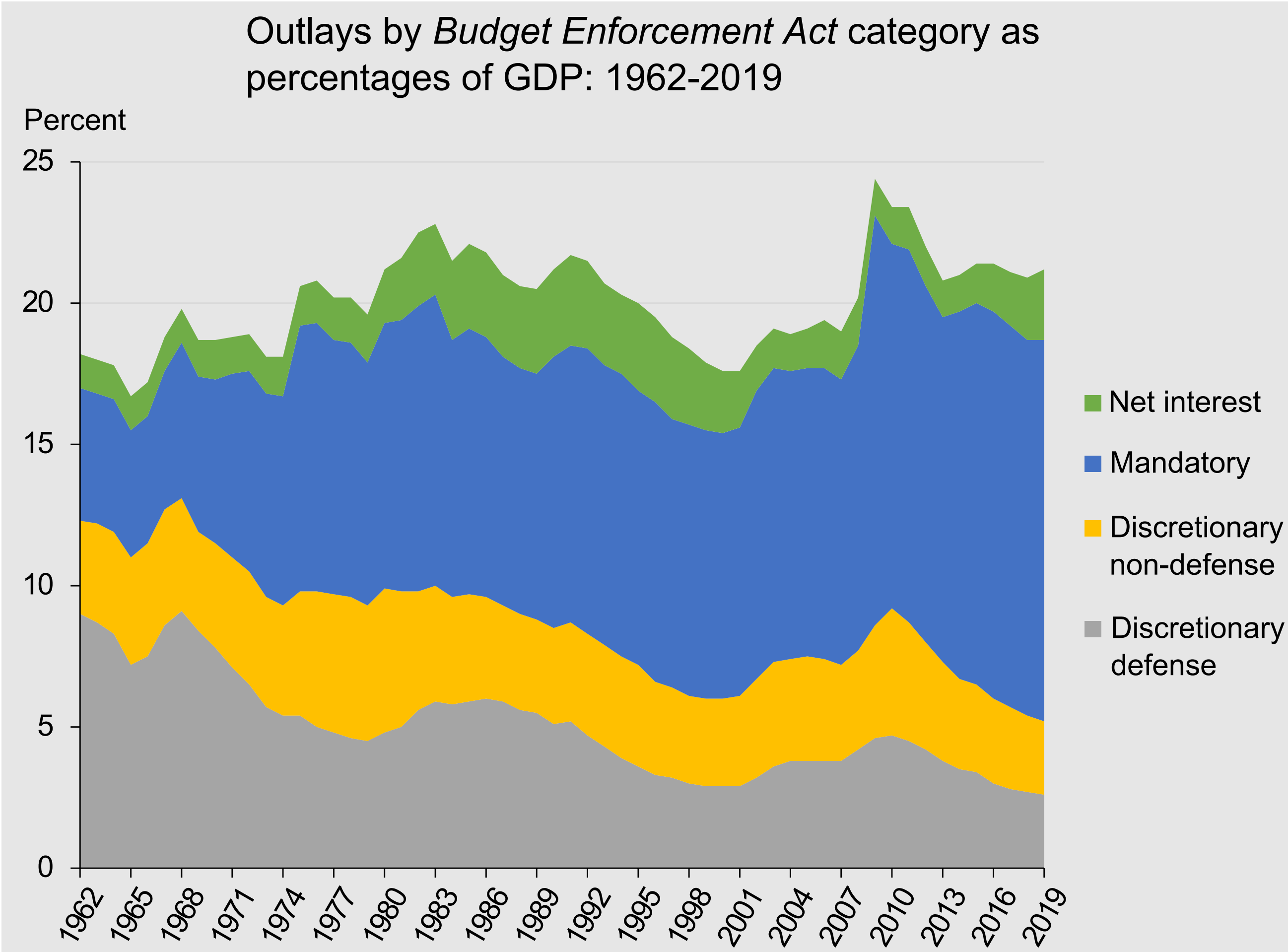

Figure 3A

Decline in Federal Support for Academic R&D

In Fiscal Year (FY) 2014, federal funding of higher education research & development failed to outpace inflation for the third straight year. When adjusted for inflation, federal funding of R&D at institutions of higher education declined by 5.1% between FY 2013 and FY 2014 and fell over 11% since its peak in FY 2011.[7] [**Figure 3B**]

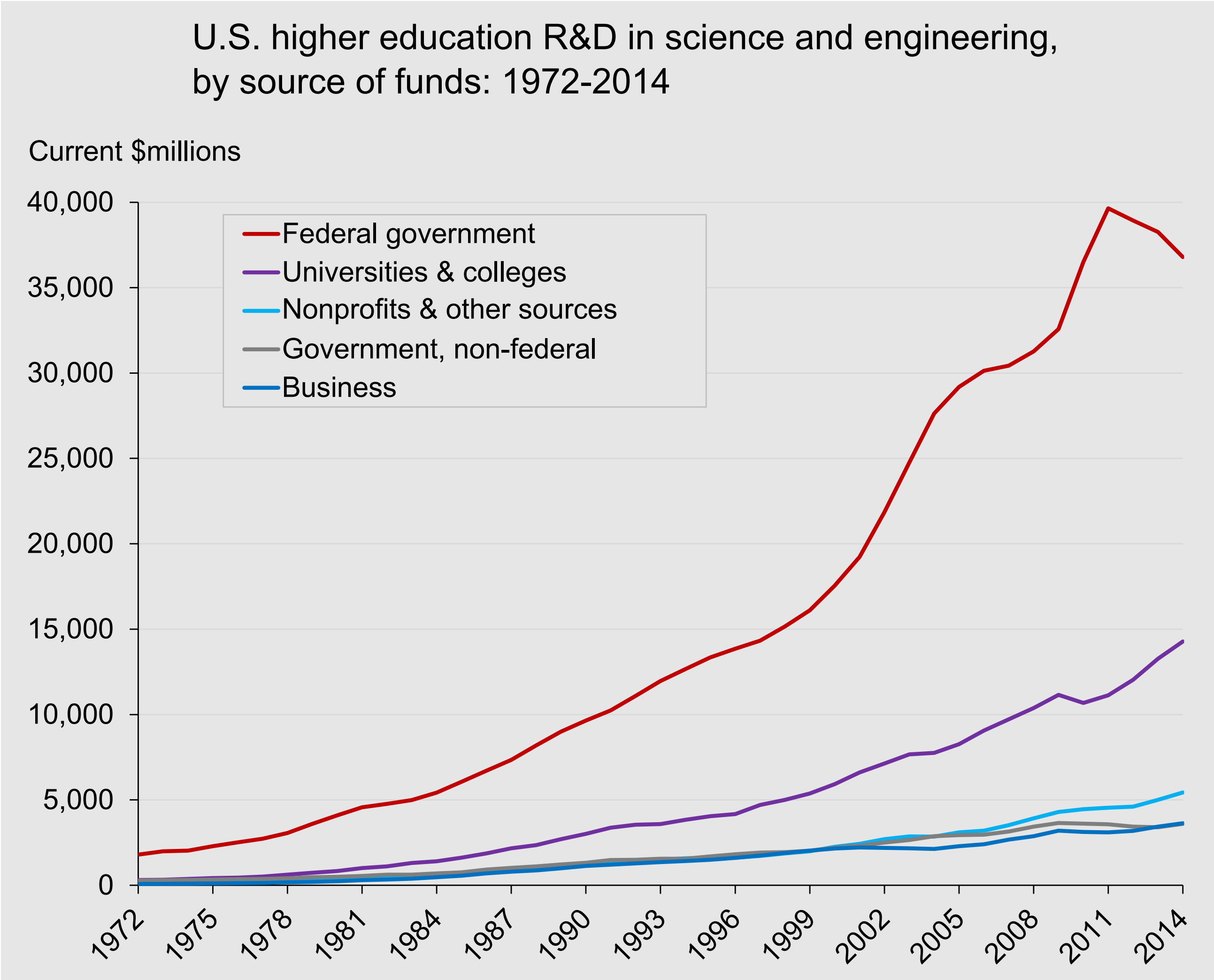

Figure 3B

This marks the longest multi-year decline in federal funding in the history of this data series that goes back to FY 1972. Declining support means that federal science agencies will be unable to fund an ever-larger amount of promising university-based research. Interestingly, the share and amount of academic R&D supported by the institutions themselves has increased markedly over the past few decades.[8]

Federal support for scientists and engineers employed at higher education institutions

Federal support – in the form of fellowships, traineeships, and research grants – plays an essential role in ensuring the future of the basic research enterprise. In addition to funding basic research, federal support helps develop the next generation of scientists and engineers. Yet these grants are becoming harder to obtain. Data on National Institutes of Health (NIH) and National Science Foundation (NSF) grant funding rates suggest that success rates at both agencies are hovering at or near 15-year lows. [**Figure 3C**]

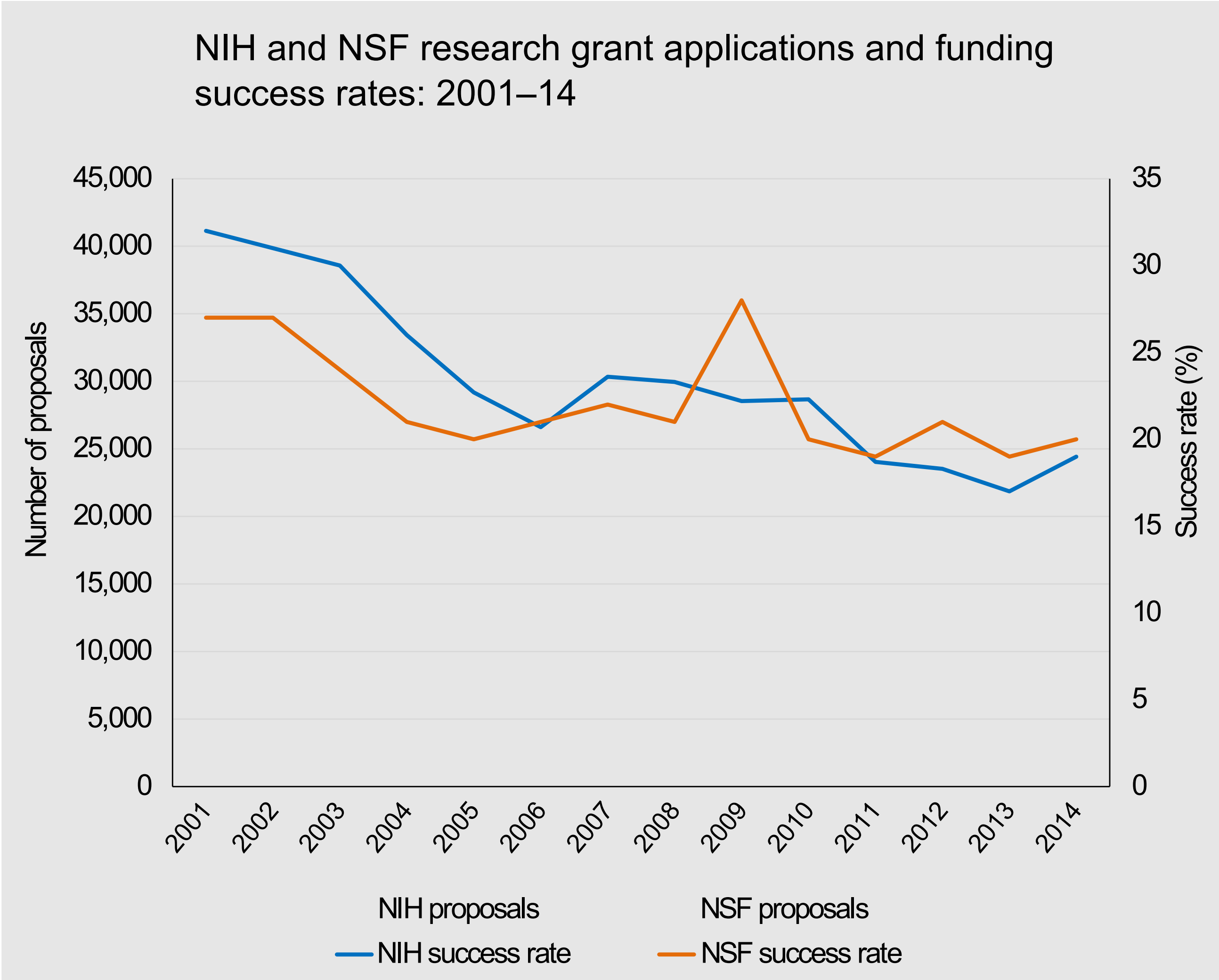

Figure 3C

In recent years, S&E doctorate holders 1- to 3-years post PhD have received relatively less federal support than in past decades. This holds true for those in full-time faculty positions (22% in 2013 versus 38% in 1991) and for postdocs (77% in 2013 versus 84% in 1991).[9]

Employment of scientists and engineers at higher education institutions

Academic employment opportunities for STEM doctorate holders have changed markedly over the past few decades. The academically-employed doctorate workforce grew by about 45% from 1993 to 2013, increasing from just over 200,000 in 1993 to about 300,000 in 2013. During this period, this workforce aged considerably. In 1993, 19% of the U.S.-trained S&E doctorate workforce (an estimated 40,100 individuals) were between 55 and 75 years of age. In 2013, 35% (107,200) were between 55 and 75 years of age. [**Figure 3D**]

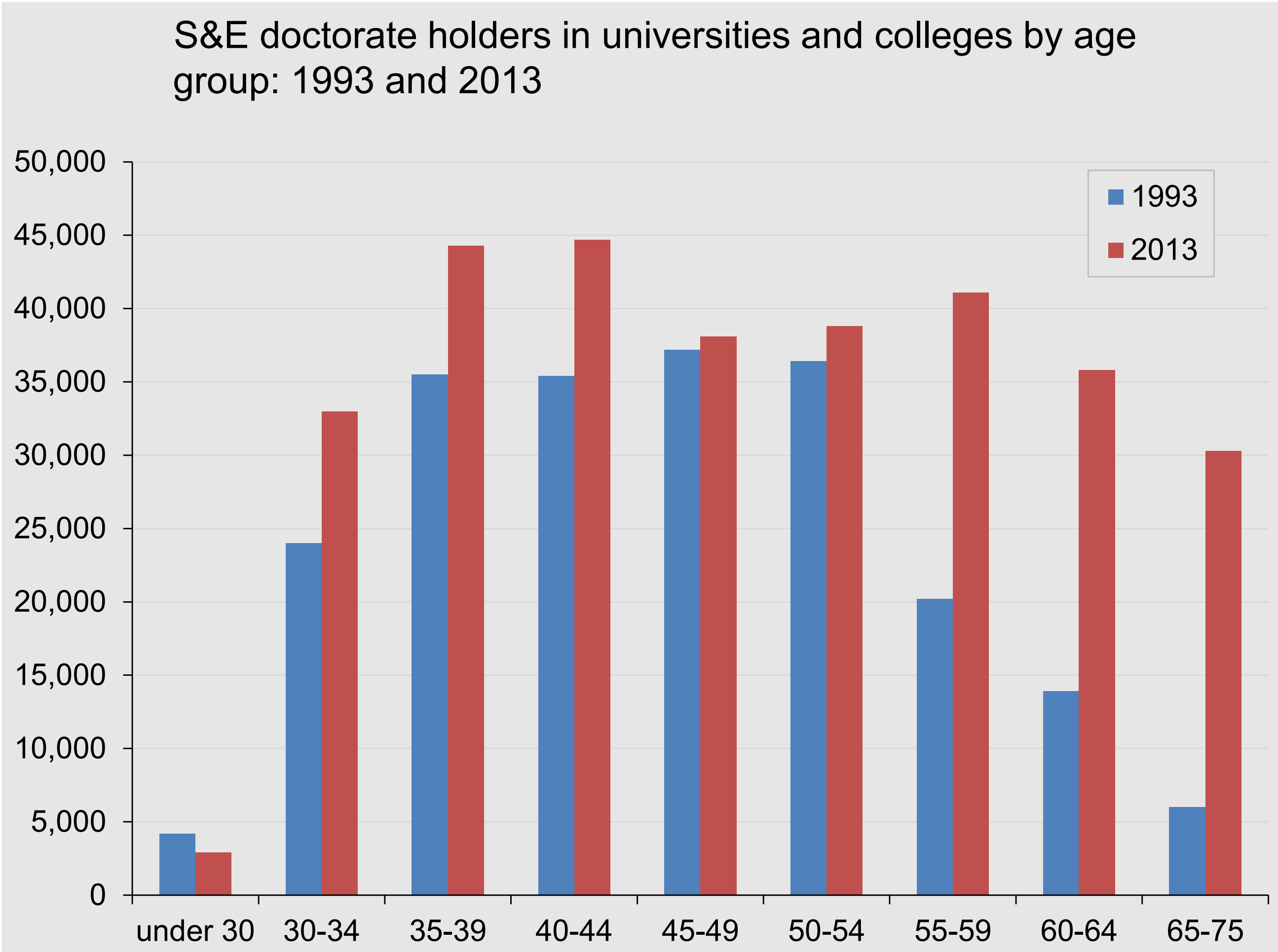

Figure 3D

There have also been changes in tenure patterns for doctorate degree holders employed in the higher education sector. In 1993, 54% (114,200) of STEM PhDs in academia were tenured; in 2013, 47% (144,600) were tenured. While the overall numbers of tenured positions has increased, the share of those tenured has decreased due to an increase in the number and share of positions for which tenure is not an option (e.g., postdoctoral researchers, contingent faculty). [**Figure 3E**]

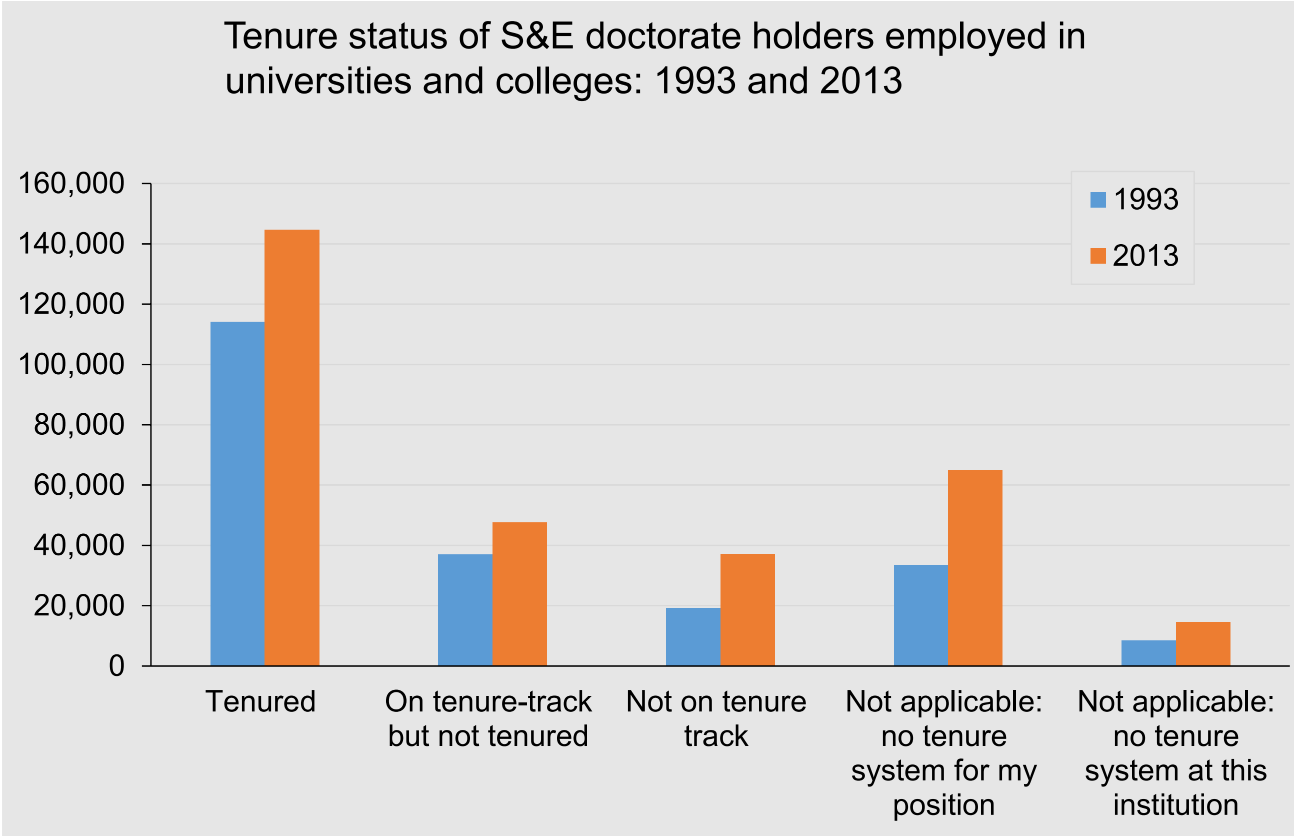

Figure 3E

Administrative Challenges in Academic Science

Scientists and engineers employed in universities and colleges face challenges that go beyond obtaining federal support for research and the training of the next generation of students and the changing landscape of employment in academic science. A 2013 National Science Board report highlighted the substantial administrative burden associated with faculty members' federal grants.[10] Federal Demonstration Partnership surveys in 2005 and 2012 showed that administrative requirements occupied on average 42% of principal investigators' time, some of which could be spent doing science.[11]

Challenges to Developing Human Capital

In a world that demands an increasingly educated workforce and populace, access to affordable, high-quality post-secondary education is an issue of critical national importance. Current trends raise questions about whether our decades-long commitment to expanding post-secondary educational opportunities will continue.

Tuition cost/growth

Affordability and access to higher education institutions are areas of significant concern. After adjustment for inflation, between 1987 and 2012 net tuition per full time student rose by 121% at community colleges, by 152% at 4-year public and graduate institutions, by 175% at public very high research institutions, and by 48% at private very high research institutions. [**Figure 3F**]

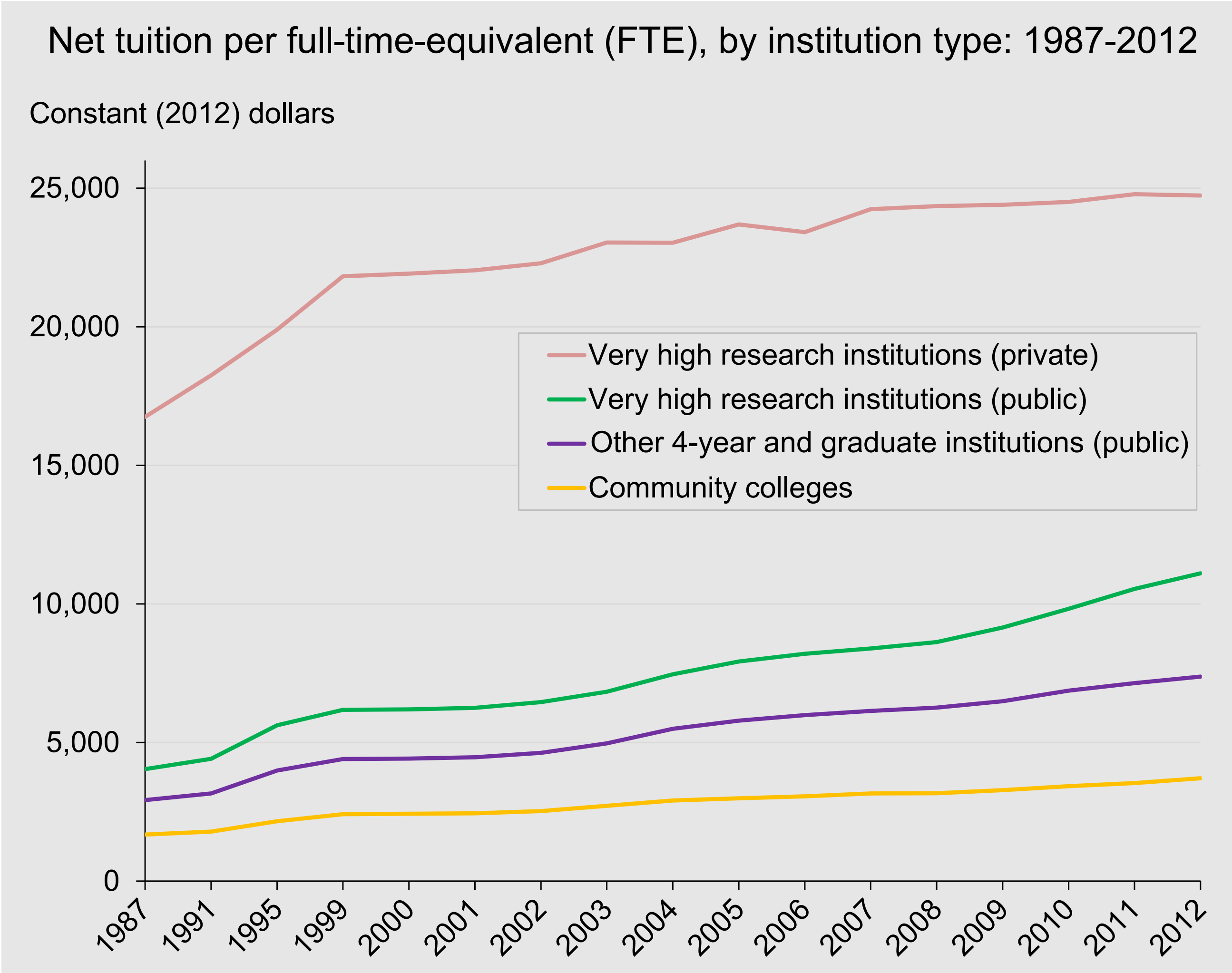

Figure 3F

Not only is the cost of obtaining higher education increasing, but tuition also absorbs an increasing share of an individual's income. In 2014, a year of undergraduate education at a state institution would have consumed, on average, 44.5% of an individual's disposable income, an increase from the 34.7% it consumed in 2004.[12]

State and local appropriations

Unlike private institutions, public institutions rely on state and local appropriations as important sources of revenue. State and local appropriations for public "very high research" universities have declined since 1987, with a particularly steep drop between 2008-2012 in per student funds. [**Figure 3G**]

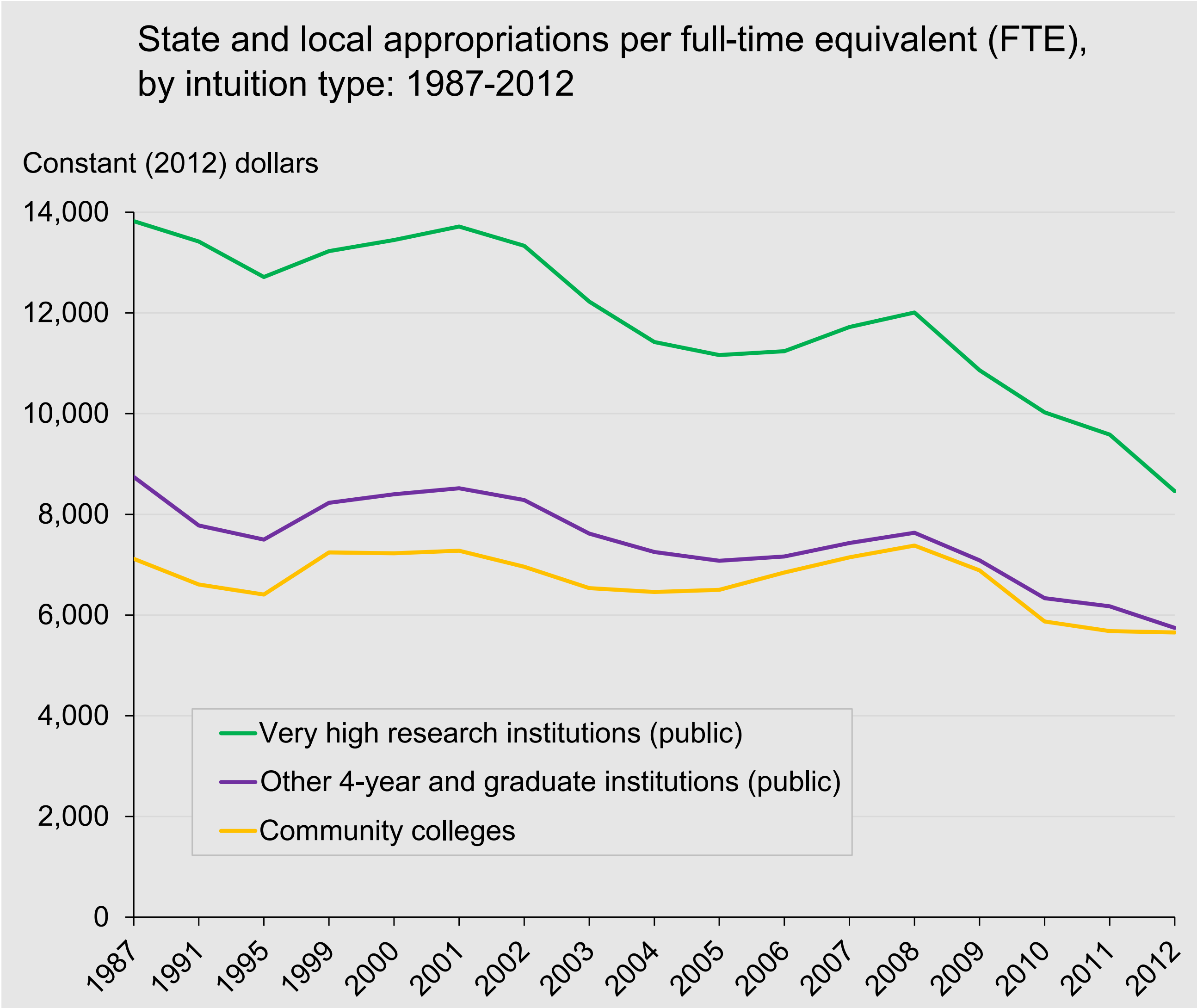

Figure 3G

In 1987, average state appropriations per FTE at public very high research institutions was $13,800; by 2012 this had dropped to $8500 per FTE. Over the same time period, net tuition increased from $4000 to $11,100 FTE. A similar pattern can also be found at other public institutions offering 4-year and graduate degrees, suggesting a significant shift in tuition burden from state and local governments to individual students across all 4-year public institutions. [**Figure 3G**] Community colleges have also seen decreases in state and local appropriations. [**Figure 3G**] Finally, state and local appropriations as a share of total revenue for public institutions of higher education declined markedly between 1987 and 2012. [**Figure 3H**]

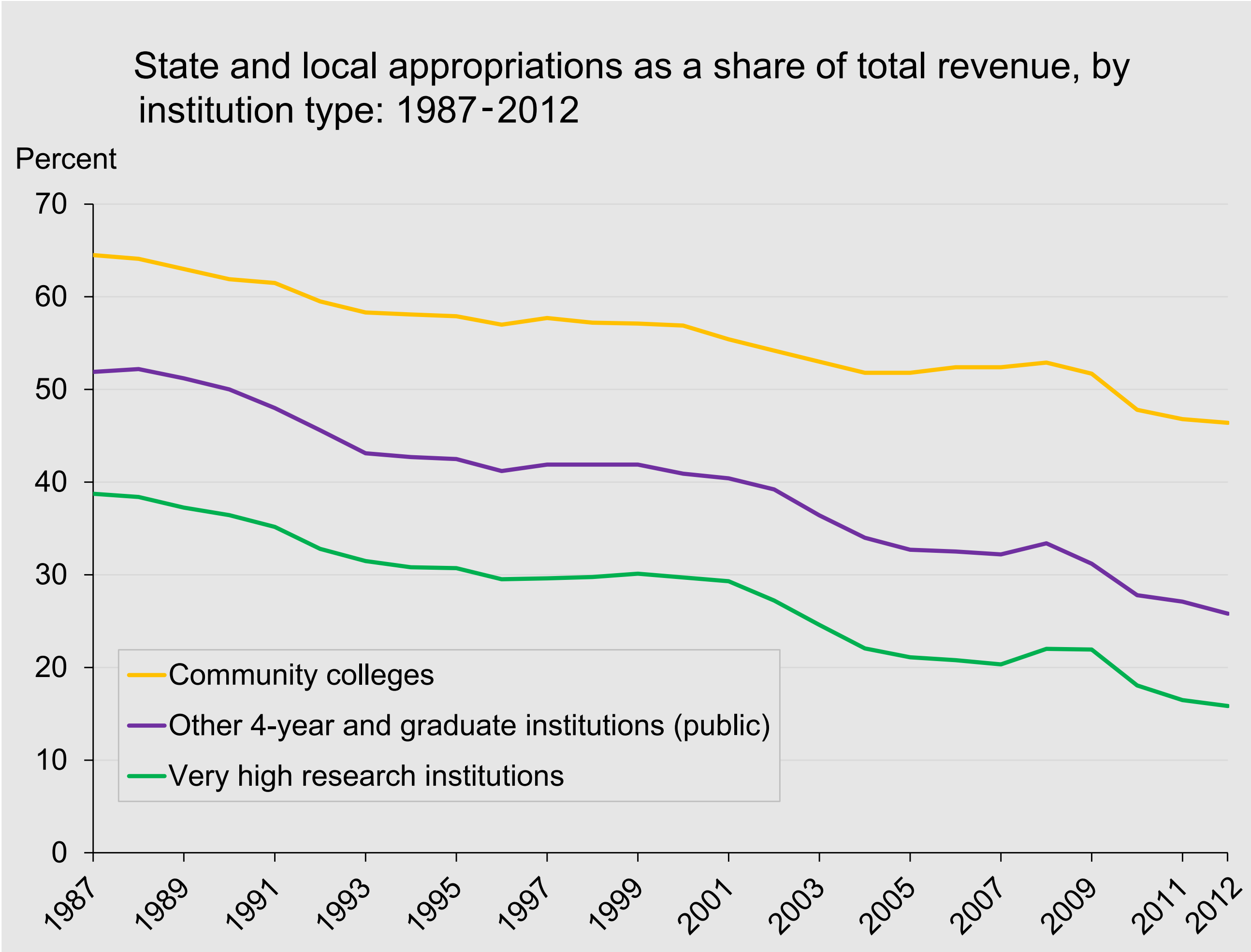

Figure 3H

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[6]The GI Bill is often credited with catalyzing the massive post-war expansion in higher education enrollment. The National Defense Education Act played an important role in encouraging graduate study in math, science, and area studies/foreign languages. Pell Grants, another federal program, play an important role in helping individuals fund their educations.

[7] Ronda Britt, "Universities Report Continuing Decline in Federal R&D Funding in FY 2014," National Center for Science and Engineering Statistics Info Brief, November 2015.

[8]Institution funds comprise direct funding for R&D , cost sharing on externally sponsored projects, and indirect costs on external projects that are not reimbursed by the sponsor. Most of the increase since 2010 has been within the category of direct funding for R&D.

[9]*Indicators* 2016, 5-49. http://nsf.gov/statistics/2016/nsb20161/#/table/at05-23.

[10]National Science Board, *Reducing Investigators' Administrative Workload for Federally Funded Research* , Arlington, VA: National Science Foundation (NSB-14-18). This report described policy actions aimed at streamlining inefficient requirements while maintaining necessary oversight of federally funded research.

[11] http://sites.nationalacademies.org/PGA/fdp/PGA_055749.

[12]*Indicators* 2016, State Data Tool.

Sense of the National Science Board Regarding the Broad Value to the Nation of Higher Education[1]

The extraordinary value to our Nation of higher education is pervasive and undeniable. As this companion brief highlights, our colleges and universities not only are the envy of the world, but they also remain more important than ever to the future health, safety, security, and economic competitiveness of our Nation.

Yet, understanding of the value of higher education among policymakers, the media, and the general public varies widely and in some cases has become alarmingly limited. The narrative most commonly emphasizes individual gainful employment in the area of the degree received, personal lifelong earnings at levels notably above those associated with a high school diploma, and the provision of a workforce that helps the United States to remain the world leader in research, technology, defense, and innovation. These attributes of the higher education system are extraordinarily important, readily measurable, and undeniably essential to our future, as this companion brief highlights. However, such indicators represent an incomplete accounting of the full value of higher education. The National Science Board believes that higher education plays a broader, intangible, and crucial role in supporting the past, current, and future success of our democratic society. This role must be highlighted and better appreciated.

Our Nation's founders recognized that a representative democracy would require more than just the consent of the governed; specifically, it would rely on the active and informed participation of an educated electorate. Consistent with this understanding of the inseparable link between education and democracy, our Nation has repeatedly expanded educational access for its citizens – first at the primary and secondary levels and, from the mid-nineteenth century onward, in higher education. This expansive, inclusive view of higher education was stated in the seminal report of President Truman's Commission on Higher Education for Democracy (1947):

Education is by far the biggest and the most hopeful of the Nation's enterprises. Long ago our people recognized that education for all is not only democracy's obligation but its necessity. Education is the foundation of democratic liberties. Without an educated citizenry alert to preserve and extend freedom, it would not long endure.

How does higher education support American democracy? Our higher education institutions strive to create a consciously communal environment where students and faculty have opportunities to acquire and use skills critical to a democratic society. These include learning how to function effectively within a close community comprising individuals from dozens of countries, cultures, backgrounds, and points of view; learning how to debate difficult issues thoughtfully with a view toward positive outcomes and recognition of the impact on those affected; participating formally in institutional governance; taking part in the development of and understanding how to comply with complex policies; developing new ways of thinking and exploring new ideas and approaches to solving problems – and pursuing creative activities – within a structured framework; making decisions as an individual, but with a recognition of the consequences they might have on others; serving the needs of others; and pursing interests and activities that are bigger than oneself.

This combination of learning and experiences, in addition to the important disciplinary-focused benefits that accrue to the student, is paramount for an educated and civically engaged citizenry. The National Science Board firmly believes that to ensure the continued success of our democracy all forms of higher education should strive to achieve these ideals and that all Americans should have access to high-quality higher education.

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[1]Approved by SEI and the NSB at the February 3, 2016 NSB Meeting.