Historical Trends in Federal R&D

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Although priority investments in physical sciences research, energy, and space exploration help to keep the nondefense federal R&D outlook bright, the proposed fiscal year (FY) 2012 R&D investment of $148.9 billion, a 0.3 percent decrease, continues the recent trend of flat funding for federal R&D since 2004. (See Table I-10 for historical data. More historical data are available on the AAAS R&D web site.)¹

For defense R&D, nearly all of the increases between FY 2000 and FY 2007 have been in weapons systems development, “6.4” or higher in the Department of Defense (DOD) classification system (see Chapter 5 for details). DOD’s S&T investments (“6.1” through “6.3”), comprising basic and applied research and technology development, hit a record high in 2005 after taking 16 years to return to Cold War funding levels and have been on a downward trend since then. The S&T accounts fund all of DOD’s investments in research, including key federal contributions to the support of the physical sciences, engineering, and other research fields. The FY 2012 budget changes this trend somewhat with cuts throughout the defense R&D portfolio with the exception of Basic Research (“6.1”) which would see a record $2.1 billion investment, up 14.5 percent from FY 2010. This increase however, is not enough to counter decreases in Applied Research (“6.2”) and Advanced Technology Development (“6.3”), leaving defense S&T investments with a proposed 11.8 percent decrease to $13.0 billion in FY 2012. The recent trend of increases for weapons development, especially in the Air Force, would reverse in FY 2012 with DOD’s non-S&T development funding decreasing $2.7 billion, or 4.1 percent, to $62.8 billion.

¹ http://www.aaas.org/spp/rd
Figure 1. Trends in Federal R&D

Figure 2. Nondefense R&D
Nondefense R&D peaked in FY 2004 and then declined before increasing the past four years to set a new funding record in the FY 2012 budget request at $66.6 billion. Nondefense R&D did very well between 1998 and 2003 because of the campaign to double the National Institutes of Health (NIH) budget, as shown in Figure 2. The doubling of the NIH budget raised the NIH share of the total federal research investment from 37.1 percent in 1998 to 48.7 percent in 2004. This has greatly increased the role of NIH in the federal research portfolio. The creation of the Department of Homeland Security (DHS) in 2002 also helped to boost nondefense R&D investments by creating a new area for investment. But all the other nondefense R&D funding agencies collectively have seen their budgets remain flat for nearly two decades (the bottom part of the bar in Figure 2), even as the U.S. economy, the federal budget, and the U.S. population have all boomed during that time. The FY 2012 proposed increases for the National Science Foundation (NSF), the Department of Energy (DOE) Office of Science, and the National Institute of Standards and Technology (NIST) as part of the President’s Plan for Science and Innovation, plus gains for the Department of Energy’s energy programs and NASA, would recover some of the lost ground of the past few years, and more evenly distribute the research investment among the federal research agencies. These non-NIH agencies, combined with DOD’s research investments, fund nearly all of the federal investment in non-biomedical research, including the physical sciences, non-medical life sciences, environmental sciences, engineering, mathematics, computer sciences, and social sciences.
The overall federal investment in basic and applied research (including both defense and non-defense) reaches a new record in real terms if the FY 2012 budget is enacted (see Figure 3). As noted above, federal research did very well between 1998 and 2004 because of the campaign to double the budget of NIH, the largest federal supporter of research. Other agencies also increased their research investments in that time period because a string of budget surpluses freed up resources for domestic appropriations. But with the return of budget deficits in 2002, growth in research funding for NIH and other domestic agencies slowed in 2004 and then reversed. At the same time, DOD research support lagged as the Pentagon went to war in 2003 and shifted resources away from research toward near-term projects. NASA research also fell, even within a stable R&D budget, as it shifted resources from research to development. The signing of the America COMPETES Act in 2007 and the President’s Plan for Science and Innovation stopped these decreases, flattening out the federal research budget trend in recent years. However, large gains in clean energy research and the transition of the International Space Station to a research platform in the FY 2012 budget request would propel federal funding of research past the former record in FY 2004 by 1.2 percent.
Federal research investments are shrinking as a share of the U.S. economy while other nations are increasing their investments. As shown in Figure 4, the federal R&D investment exceeded 1 percent of U.S. Gross Domestic Product (GDP) until the 1990s when large gains in GDP were not accompanied by a significant increase in federal R&D investment. The doubling of the NIH budget and large gains in defense R&D increased the ratio of R&D investment to GDP to over 1 percent, but it has declined or remained flat in seven consecutive years since FY 2004. A modest estimated rise in GDP along with a decrease in R&D spending continues that trend in FY 2012 and the R&D investment to GDP ratio will dip below 1 percent for the first time since FY 2002. Large proposed cuts in the development-heavy DOD budget for FY 2012 reduce the federal development spending to GDP ratio by 0.06 percent to 0.50 percent after seven years of relative stability while a large gain in federal research investment in the FY 2012 budget request has raised the federal research investment to GDP ratio by 0.03 percent to 0.42 percent.
Despite an increasingly technology-based economy, a growing recognition among policymakers that federal research investments are the seed corn for future technology-based innovations, and the American Competitiveness Initiative and President’s Plan for Science and Innovation, the U.S. government research investment has so far failed to match the new realities of an increasingly global marketplace. However, clean energy and high-tech manufacturing investments along with new trade agreements proposed in the FY 2012 budget request could signal a new awareness of these global issues. Figure 5 shows the dramatic increases in Asian nations’ R&D investments: China, Taiwan, and South Korea, for example, have been increasing their R&D investments significantly each year while investment by the U.S. and the EU remains relatively flat. While there are many factors besides national R&D expenditures that drive innovation and economic growth such as education, intellectual property law, and corporate policy, these nations have already made changes or are beginning to make changes in these areas as well to try and develop a healthy innovation ecosystem that can rival the U.S. system.