

## Historical Trends in Federal R&D

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Although high-priority investments in physical sciences research, weapons development, and human space exploration help to keep the federal R&D outlook brighter than the bleak outlook for domestic programs overall, the FY 2009 budget continues the recent trends of declining federal support for research. (See Table I-11 for historical data. More historical data are available on the AAAS R&D web site.)

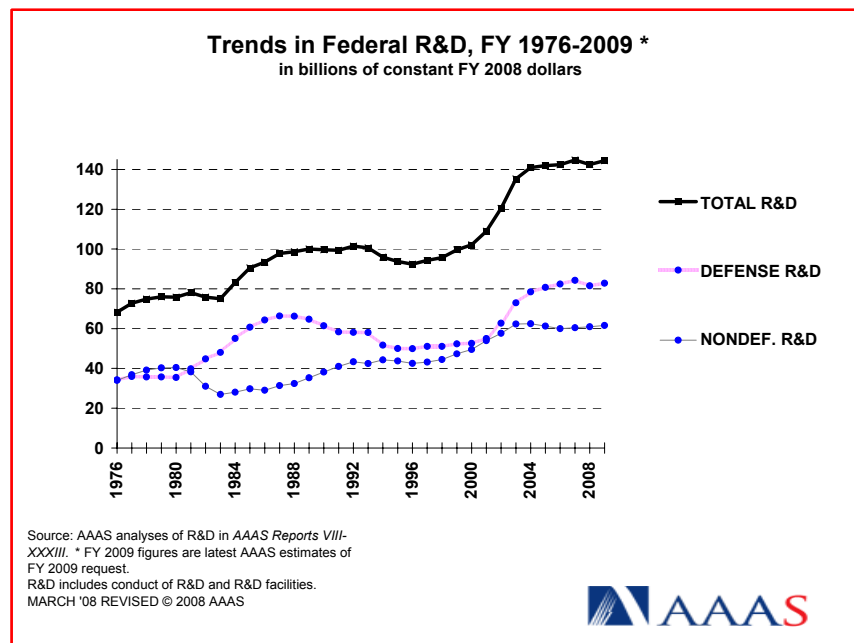


Figure 1.

The total federal R&D request of \$147.4 billion, a 3.4 percent increase, would be just ahead of expected inflation (see Figure 1) and would keep the federal R&D portfolio near the record high of FY 2007. Once supplemental appropriations are added, both the FY 2008 and FY 2009 R&D portfolios are likely to exceed the previous record. But the

potential gains would go mostly to development funding, and within development mostly for defense weapons.

For defense R&D, nearly all of the increases in the past few years have been in weapons systems development, “6.4” or higher in the Department of Defense (DOD) classification system (see Chapter 5 and Figure 1 in Chapter 5 for details). DOD’s S&T investments (“6.1” through “6.3”), comprising basic and applied research and technology development, barely hit a record high in 2005 after taking 16 years to return to Cold War funding levels and have declined since then. But the FY 2009 budget proposes to cut these S&T investments 12 percent, primarily through the proposed elimination of 2008 earmarks. 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. On the development side, large increases for weapons development, especially in the Air Force, and billions of dollars in requested development funding in wartime supplementals have pushed DOD’s non-S&T development funding to new highs in recent years.

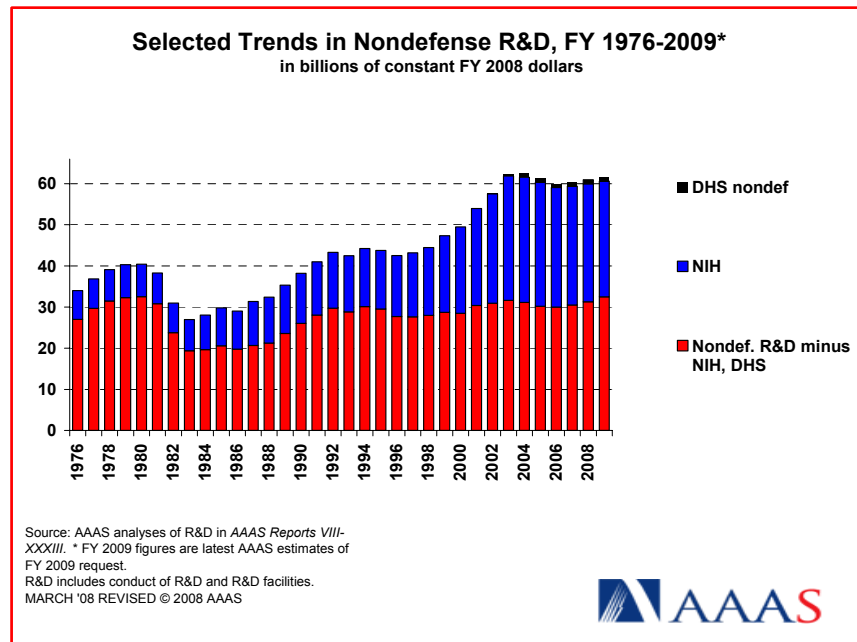


Figure 2.

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**Nondefense R&D peaked in FY 2004 and then declined, but would increase slightly in the 2009 budget.** 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 creation of the Department of Homeland Security (DHS) 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 (see the red bars in Figure 2), even as the U.S. economy, the federal budget, and the U.S. population have all boomed during that time. The 2009 proposed increases for the Department of Energy (DOE) Office of Science, the National Science Foundation (NSF), and the National Institute of Standards and Technology (NIST) as part of the American Competitiveness Initiative (ACI), plus development gains for the National Aeronautics and Space Administration (NASA) would recover the lost ground of the past few years, and could result in real gains if 2009 appropriations follow the request. These non-NIH agencies, combined with DOD's research investments (also flat or declining in recent years), 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 federal investment in basic and applied research would fall in real terms for the fifth year in a row (see Figure 3) if the FY 2009 budget is enacted.** Federal research did very well between 1998 and 2003 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 followed by restraints on domestic spending thereafter, 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, and NASA research fell even within a stable R&D budget as it shifted resources from research to development. Although the ACI agencies would do well in the 2009 budget and would therefore boost their support of research, declining DOD and NASA support of research combined with flat funding for NIH research would more than offset these potential gains.

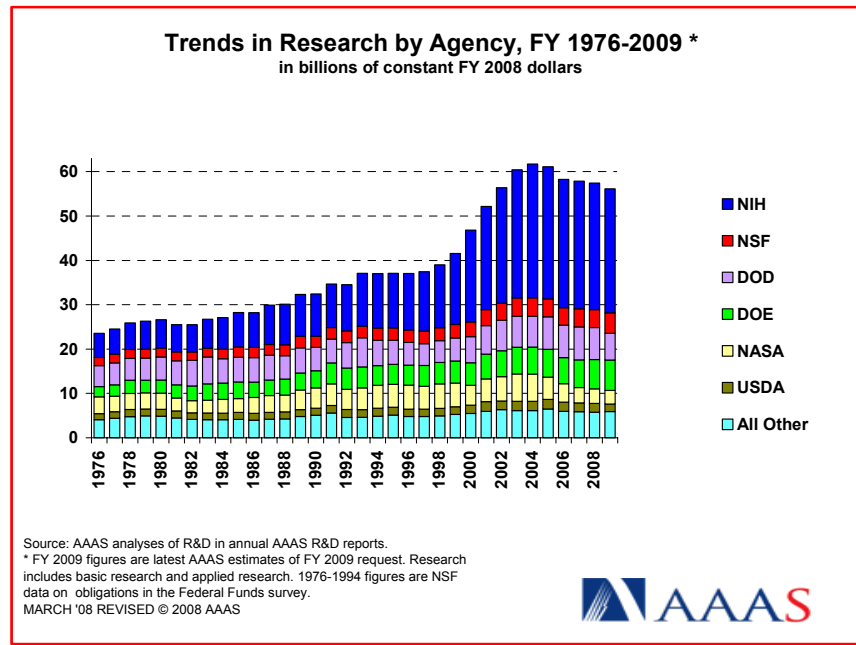


Figure 3.

**As a result, federal support for research in nearly all disciplines is now in decline**, with potential gains in the physical sciences more than offset by eroding support for biomedical research and other disciplines. The 2009 budget would continue the downward slide in federal research funding and leave the federal research portfolio 9.1 percent below the 2004 level in inflation-adjusted dollars. As shown in Figure 4, flat funding for research in most agencies going back decades has resulted in mostly flat funding for research by science and engineering discipline. Funding for the physical sciences, in particular, has just kept pace with inflation going back three decades, a trend that has prompted the ACI and other attempts to boost federal investments in the physical sciences. Similarly, environmental sciences research and social sciences research have seen stagnant funding for the past decade. Although funding for computer sciences research increased dramatically until 2001 because of the growing importance of computing in all facets of the economy, this funding has stagnated in recent years. The major growth in federal research support has been in biomedical research, particularly during the NIH doubling period 1998-2003, but even this support has declined since

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the NIH doubling period ended. Meanwhile, federal support for non-biomedical life sciences research has been slipping steadily in recent years. Once agencies' research investments in 2008 and 2009 are spent, the downward trends in these disciplines are almost certain to continue with the possible exception of the physical sciences and engineering.

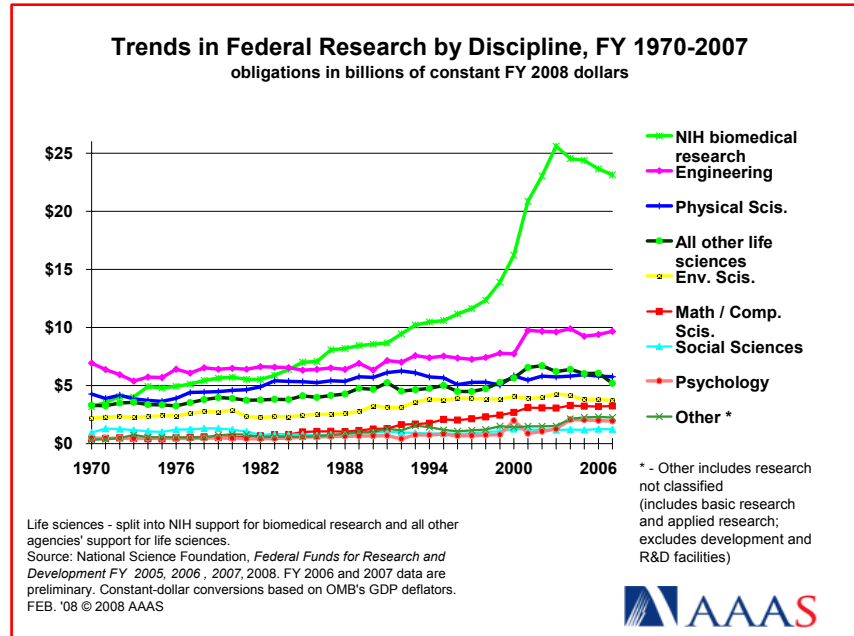


Figure 4.

**Federal research investments are shrinking as a share of the U.S. economy, just as other nations are increasing their investments.** As shown in Figure 5, the federal R&D investment exceeded 1 percent of U.S. Gross Domestic Product (GDP) until recently, buoyed by big increases in weapons development, but is now declining sharply. Federal investments in development, mostly in DOD, have held steady as a share of the economy, but the federal research/GDP ratio is in free fall down to a projected 0.38 percent in 2009, below the long-term historical average of 0.4 percent after gains in the late 1990s. Despite an increasingly technology-based economy and a growing recognition among policymakers that federal research investments are the seed corn for future technology-based innovations, the U.S. government research investment has so far failed to match the new realities despite the rallying points of innovation and the American Competitiveness Initiative, and

has also failed to match the competition. Asian nations are dramatically increasing their government research investments: both China and South Korea, for example, are boosting government research by 10 percent or more annually.

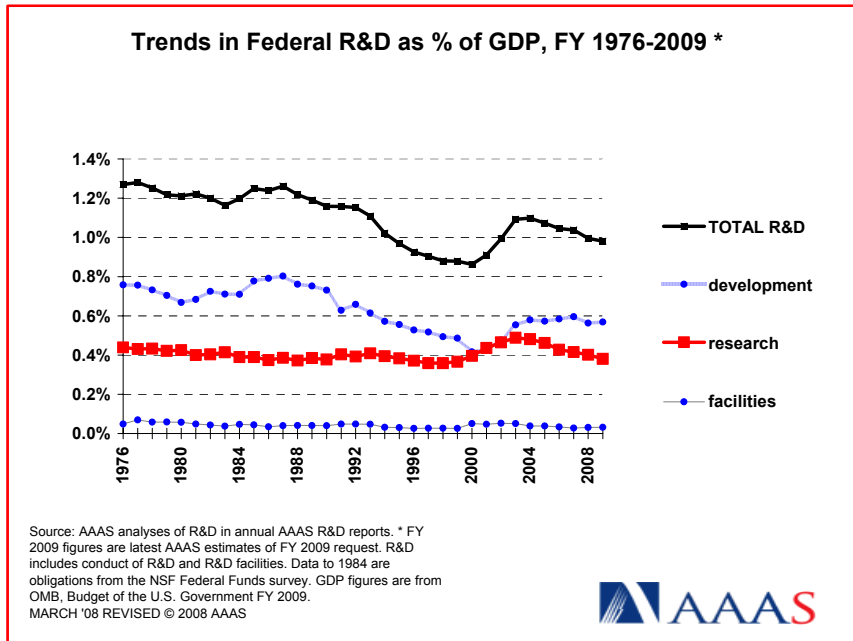


Figure 5.