UNITED STATES NATIONAL SCIENCE AND TECHNOLOGY EFFORT

As Figure 1 shows, US investments in R&D for the first time exceeded $200 billion dollars (in current dollars) in 1997. Total R&D spending in the US reached $205.7 billion in 1997.[i] In 1997, the total private sector investment in R&D was $133.3 billion, while the federal government's R&D investments in 1997 totaled $62.7 billion (in current dollars).[ii]

Figure 1: US National S&T Effort 1985-1997[iii]

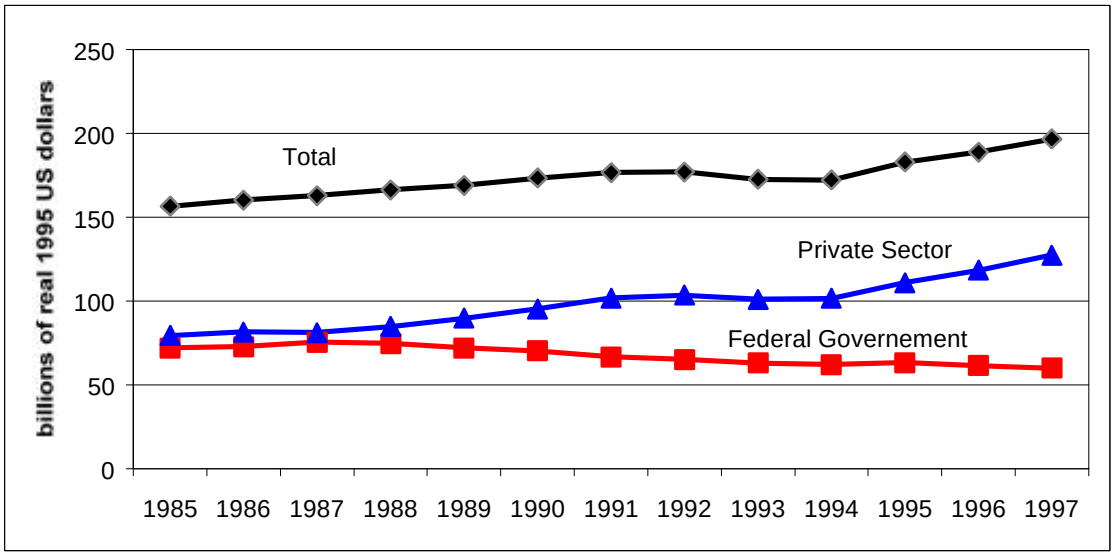


Figure 1 shows that industrial investments in R&D are responsible for the current expansion in US R&D spending. Federal investments in R&D have been declining at an average annual rate of 2.2% since 1987. Between 1987 and 1997, federal investments in R&D decreased by over 20% in real terms. On the other hand, industrial R&D in the US increased in real terms 57.1% over the same period. The average rate of real growth in industrial R&D over the past decade was 4.7%.[iv] While federal R&D investments actually declined in the 1990s (in both nominal and real terms), it is important to note that industrial R&D investments have increased (at least in nominal terms) every year since 1953.[v]

The strong growth in industrial R&D investments is in large measure attributable to the strength of the US economy in the 1990s. It is also likely attributable to the growing realization in firms that the structural and operational changes made in the 1980s and early 1990s (e.g., corporate mergers, downsizing, outsourcing) are unlikely to provide a basis for continuing growth by themselves. That is, firms see investments in R&D increasingly as the key to their long-term prosperity and survival.[vi] Increased industrial investments in R&D resulting from concerns for long-term growth do not signal a greater willingness on the part of US industry to fund longer term basic research. The US private sector continues to assign relatively little priority (5-7% of all R&D) to basic research.[vii]

A very important trend in industry's R&D effort has been the dramatic increase in the non-manufacturing (i.e., service) sector's R&D effort. Between 1983 and 1993, non-manufacturing firms have increased their R&D investments by more than 900%. It is now estimated that the non-manufacturing sector currently accounts for more than 25% of the industrially supported

R&D in the United States. Computer software, R&D and testing laboratories, and communication service firms are important R&D players in this sector.[viii]

These divergent trends of growth in private sector R&D investments while the public sector steadily loses ground in real terms is a further manifestation of a trend that began in 1978. Up until 1978, the federal government funded the majority of the US R&D effort; however, since 1978 the percent funded by the federal government has been in steady decline. The end of the Cold War with its decreasing public sector investments in defense R&D has only accelerated this general trend. The US government accounted for less than a third of all R&D investments in the United States in 1996.

In order to attempt to reverse the slide in the federal government's support for R&D, two pieces of legislation have been introduced in the US Senate to effectively double US federal investments in R&D within the next 10 to 12 years. To be more precise, the legislation intends to double US investments in civilian (i.e., non-defense) R&D. Given that the proposed legislation are authorization bills, the money needed to affect this doubling is still subject to annual appropriations bills and those bills will still be subject to the demand to reduce federal spending and to meet other national needs. If nothing else, the two bills signal an awareness that US federal investments in non-defense R&D have been in decline for more than a decade and that this decline could have a negative impact on the nation's continued prosperity.[ix]

On the other hand, projections of outyear federal budgets seem to indicate that the federal government will be investing less and not more in R&D for the foreseeable future. For example, the American Association for the Advancement of Science projects that from FY1999 to FY2004 the federal government will cut its overall investments in R&D by a further 10.4%. These reduced investment levels in R&D are believed to be driven in large measure by the government's desire to improve the financing of Medicare and Social Security, which are seen as higher priorities than R&D. [x]

As Figure 2 shows, the top six socioeconomic areas of R&D investment (national defense, health, space, general science, energy, and natural resources and the environment) for the US government accounted for 94% of all federal R&D outlays in 1996.[xi] Since 1986, the proportion of all federal R&D funds going to defense R&D has been in steady decline, dropping from its peak of 69% in 1986 to the 54% of all federal R&D outlays in 1998. Despite this decline in defense R&D and the rapid rise in health R&D since the early 1990s, defense R&D will still be funded at a level which is three times higher than health R&D.[xii] Defense R&D is expected to continue receiving a decreasing portion of all federal R&D outlays.[xiii]

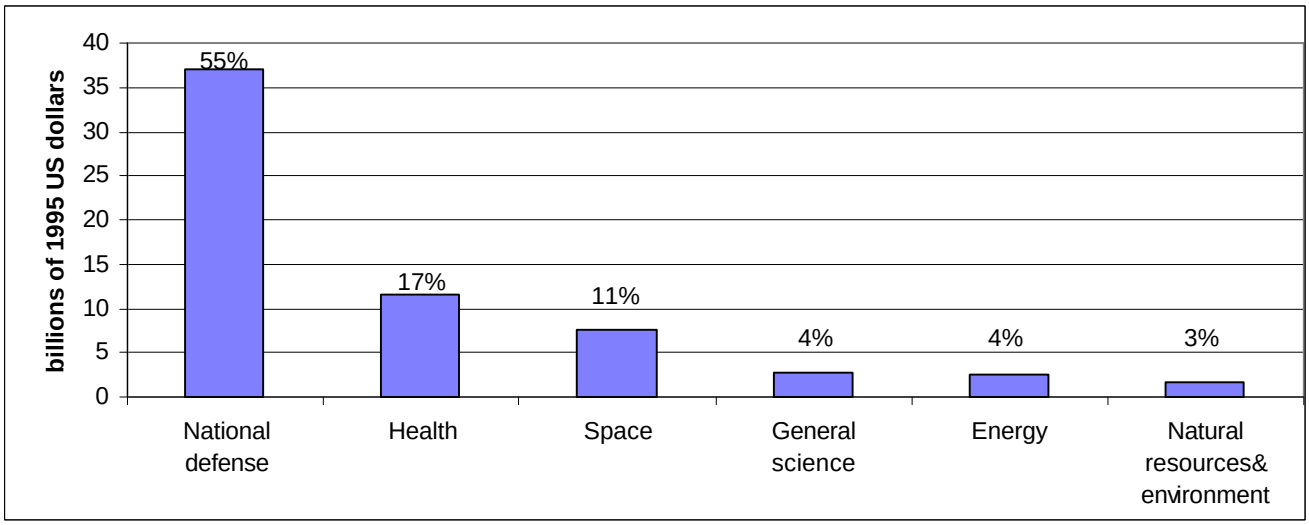
Health R&D (mainly carried out by the National Institutes of Health) has experienced the largest inflation-adjusted increases, up 21% in real terms since 1990, of any federal R&D program. AIDS-related research and cancer-related research now account for nearly 30% of all US health R&D investments.[xiv]

Space-related R&D has increased substantially in the early 1990s (+15%) although funding for this R&D objective leveled off in 1995 and has been in decline since that time. Most of the increase in space related R&D has been directed towards the development of the US-led International Space Station.

Funding for general science has remained flat during the 1990s even though these general science programs are looked upon very favorably by both the Congress and the Administration. The "general science" category of the US budget contains the research programs of the National

Science Foundation and of the high energy and nuclear physics programs of the Department of Energy.

Figure 2: Major Socioeconomic Areas of US Federal R&D Support 1996



Of the major socioeconomic areas of R&D supported by the US government, "energy R&D" has experienced the largest reductions in the 1990s. Federal support for energy R&D has declined 22% in real terms between 1990 and 1996. The Department of Energy accounts for 94% of the funding in this area with the Tennessee Valley Authority and the Nuclear Regulatory Commission's research programs accounting for the remainder.[xv]

The "natural resources and the environment" budget category contains the R&D programs of the Environmental Protection Agency, the National Oceanic and Atmospheric Administration, and the other related programs housed within Departments that oversee the management of natural resources, such as the Forestry Service. Funding for R&D in this area has increased 10% since 1990.

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[i] National Science Board, *Science & Engineering Indicators – 1998*.
[ii] Ibid.
[iii] Ibid.
[iv] Ibid.
[v] National Science Foundation, "Data Brief: 1995 US Industrial R&D Rises, NSF Survey Statistics Expanded to Emphasize Role of Nonmanufacturing Industries (NSF 97-332, December 16, 1997. http://www.nsf.gov/sbe/srs/databrf/sdb97332.htm).
[vi] T. Stundt J. and Duga, "Strong US Economy Drives Continued R&D Growth," *R&D Magazine* (1999).
[vii] National Science Foundation. "Research and Development in Industry: 1997 Early Release Tables" (1999) http://www.nsf.gov/sbe/srs/srs99411/start.htm
[viii] National Science Foundation, "Data Brief: 1995 US Industrial R&D Rises, NSF Survey Statistics Expanded to Emphasize Role of Nonmanufacturing Industries" (NSF 97-332, December 16, 1997 http://www.nsf.gov/sbe/srs/databrf/sdb97332.htm)
[ix] Mark Crawford, "First, Rockefeller Advance R&D Spending Bill." *New Technology Week* (June 22, 1998): 3.

[x] "AAAS Analysis of Outyear Projections for R&D in the FY 2000 Budget," American Association for the Advancement of Science's AAAS R&D Budget and Policy Project (March 9, 1999, http://www.aaas.org/spp/dspp/rd/fy00.htm)
[xi] National Science Board, *Science & Engineering Indicators – 1998*.
[xii] Ronald Meeks, *Federal R&D Funding by Budget Function: Fiscal Years 1996-98*.
[xiii] "AAAS Analysis of Outyear Projections for R&D in the FY 2000 Budget."
[xiv] National Science Board, *Science & Engineering Indicators – 1998*.
[xv] Ronald Meeks, *Federal R&D Funding by Budget Function: Fiscal Years 1996-98*.