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## Industrial Research and Development Rises 11 Percent Between 1976 and 1977

### Total R&D Funds, 1977

R&D expenditures by industry rose 11 percent between 1976 and 1977, to a total of \$29.9 billion. This represents a gain of 5 percent in constant dollars,<sup>1</sup> the second consecutive real increase in industrial R&D spending. During the last ten years, industrial R&D expenditures, when adjusted for inflation, have registered an average annual gain of 1 percent.

Federal R&D funds to industry also rose by 11 percent in 1977; in constant dollars, this amounted to 5 percent, the second largest real-dollar increase since 1968; in that year Federal R&D funds to industry first began to decline. This increase was attributable to larger R&D outlays for defense, energy, and the NASA space shuttle.

Companies' own funds rose by 11 percent between the two years, continuing a trend of real-dollar increases begun in 1972. The R&D increases approximate the pattern of industrial sales during the 1971-77 period. The increase between 1976 and 1977 can be partially attributed to a rise in spending for energy R&D projects, particularly in the petroleum industry, and research and development performed to meet government regulatory requirements, which have primarily affected two industries—motor vehicles and chemicals and drugs.

### R&D Expenditures by Character of Work

All three types of R&D activity—basic research, applied research, and development—increased by 11 percent between 1976 and 1977. Following a decade of declining expenditures in constant dollars, basic research has had two consecutive increases. This may be the start of a reversal of the ten-year trend of declining real industrial basic research expenditures.

The chemicals industry was the largest performer of applied research in 1977, spending nearly \$1.4 billion. Between 1976 and 1977, its applied research expenditures rose 10 percent, approximately the same as the all-industry average. Reflecting the scientific, as opposed to engineering, emphasis of chemical companies R&D programs, this industry devotes over 40 percent of its total R&D budget to applied

research. If the basic research component were added in, this figure would exceed 50 percent.

Industrial R&D activities have traditionally focused on the development end of the spectrum. In 1977 nearly four-fifths of total industrial R&D spending was directed toward this activity.

### Energy and Pollution Abatement Research and Development

Industrial spending for energy research and development totaled \$1.9 billion during 1977, an increase of 20 percent during the year. According to company spokesmen, expenditures were expected to rise an additional 11 percent during 1978, bringing the total outlay to \$2.1 billion.

Pollution abatement R&D expenditures totaled \$918 million in 1977, a 21-percent increase over 1976 outlays. This represented the largest one-year increase since this data series began in 1973. The high rate of growth in pollution abatement research and development is attributed to increases in company-funded projects to meet government regulatory requirements, primarily in the automotive and chemicals industries.

### R&D Funds/Net Sales

The ratio of total R&D spending to net sales for all R&D-performing manufacturing companies amounted to 3.1 percent in 1977, the same rate for the fourth year in a row. This ratio has not shown an increase since it reached its peak of 4.6 percent in 1964. The decline is basically a function of the decrease in Federal R&D funding over the period, since the company R&D/sales ratio has remained fairly constant during the period.

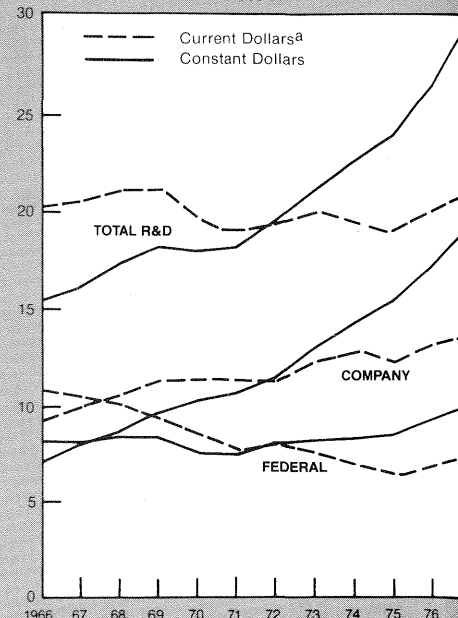
### Research and Development Performed Outside the United States by Domestic Companies

Research and development performed abroad by U.S. companies continued to increase at nearly the same rate as research and development performed in the United States. Between 1976 and 1977, research and development performed outside rose 9 percent, to a total of \$1.5 billion. As most foreign research and development is performed to develop products tailored to local markets, R&D performance abroad is expected to continue to increase in the short run.

### R&D Scientists and Engineers

Total industrial employment of R&D scientists and engineers (full-time-equivalent) reached an all-time high of 400,000 in January 1978, increasing by 17,800 over the January 1977 level. The number of R&D scientists and engineers employed by industry had increased steadily from January 1957, when this series began, to January 1969. Industry cut back its employment of R&D professionals during the economic decline in 1970-72. Since the economic upturn of 1972, the number of industrial R&D scientists and engineers has steadily increased, even during the nationwide slump in total employment during the 1974-75 recession. Since January 1976, the number of R&D scientists and engineers in industry has increased by 5 percent per year. This increase reflects the real increases in R&D spending during that period.

Industrial R&D Performance by Source of Funds  
1966-77



<sup>1</sup>1972 dollars  
Source: National Science Foundation

<sup>1</sup>The gross national product (GNP) implicit price deflator was used to convert from current to constant dollars.