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ABSTRACT

This report, the 18th in a series extending back to 1953, presents the results of a 1972 survey of industrial research and development. Data obtained are designed to provide information useful to government officials, legislators, and other individuals concerned with evaluating the role of research and development in furthering the national welfare and in allocation of scientific resources. Data in the report were obtained from the Bureau of Census survey of industrial research and development and cover the periods 1956-72 and January 1957 - January 1973, respectively. This survey does not cover trade associations. (Author/EB)

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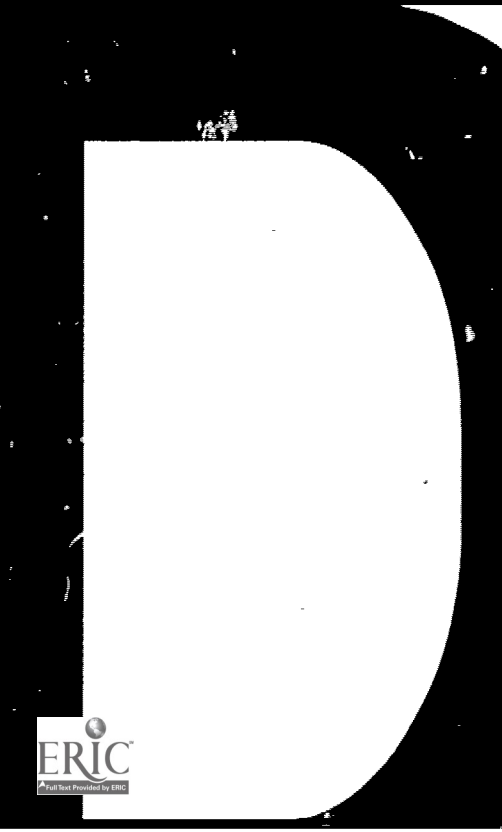
JANUARY 1973



Related Publications

REPORTS	NSF No.	Price
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Federal Funds for Research, Development and Other Scientific Activities, Fiscal Years 1972, 1973, and 1974, Vol. XXII	74-300	$1.45
Research and Development in Industry, 1971 Funds, 1971; Scientists & Engineers, Jan. 1972	73-305	$1.65
HIGHLIGHTS		
"R&D Expenditures of Independent Nonprofit Institutions Approach $1 Billion in 1973"	74-309	———
"Academic R&D Expenditures Up 9 Percent in 1973"	74-306	———
"Industrial Research and Development Approaches $20 Billion in 1972"	73-317	———
"NSF Forecasts Rise in Company-Funded Research and Development and R&D Employment"	73-301	———
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FOREWORD

The National Science Foundation both conducts and sponsors surveys in the various sectors of the economy—Federal Government, industry, universities and colleges, and other nonprofit institutes—to improve our understanding of changes in R&D emphasis, as well as to measure the growth, magnitude, and other characteristics of research and development. The data obtained from these surveys are designed to provide information useful to government officials, legislators, and other individuals concerned with evaluating the role of research and development, in furthering the national welfare, and in the allocation of scientific resources.

This report presents the results of the 1972 survey of industrial research and development and is the 18th in a series extending back to 1953. The report was prepared in the Division of Science Resources Studies, Charles E. Falk, Director. Data contained in the survey were collected and compiled by the Bureau of the Census, U.S. Department of Commerce, under the general direction of Elmer Biles, Chief, Industry Division.

The National Science Foundation and the Bureau of the Census gratefully acknowledge the cooperation of the numerous organizations that provided data for this study.

July 1974

H. Guyford Stever
Director
National Science Foundation

acknowledgments

Within the National Science Foundation, this report was prepared by Rita K. Bricksin, Robert O. Santos, and John R. Chirichiello under the supervision of Thomas J. Hogan, Study Director, Industry Studies Group. Patricia L. Kirkpatrick assisted in the preparation of the statistical material.

Within the Bureau of the Census, U.S. Department of Commerce, the 1972 survey of industrial research and development was supervised by Edward A. Robinson, Assistant Division Chief for Industrial Activities, Industry Division, assisted by Wayne M. McCaughey and Paul Beasley. Jack L. Ogus, Assistant Chief, Statistical Research and Methodology, assisted by Donald F. Clark, served as statistical consultant for the project.

CONTENTS

SUMMARY

- Total industrial R&D spending amounted to $19.4 billion in 1972, 6 percent more than was spent on these activities in 1971. In constant dollars, the growth between the two years was 3 percent.

- Company R&D funds increased by 7 percent between 1971 and 1972 to a level of $11.3 billion. After three consecutive years of decreases, Federal R&D support to industry registered a 6-percent gain between 1971 and 1972 to $8.1 billion. In 1972, 58 percent of industry's R&D effort was financed with its own funds.

- The full-time-equivalent (FTE) number of R&D scientists and engineers employed in industry increased 3 percent between January 1972 and January 1973 to nearly 360,000. This was the first increase in this series since January 1969 when R&D professional employment in industry totaled about 386,000.

- DOD and NASA provided 87 percent of the Federal R&D funds to industry in 1972. These two agencies supported 88 percent of the industrial R&D scientists and engineers working on Federal programs at an average annual cost of $67,300 per R&D professional.

- The industrial basic research total of $611 million in 1972 was the same as 1971. Almost one-half of this amount was spent on the physical sciences. Applied research and development spending amounted to $18.8 billion in 1972, 6 percent above the 1971 amount.

- In 1972, R&D-performing manufacturing companies spent an average of 3.4 percent of their net sales on R&D activities, down from 3.5 percent in 1971.

INTRODUCTION

Data on R&D expenditures and R&D scientists and engineers presented in this report have been obtained from the Bureau of Census surveys of industrial research and development and cover the periods 1956-72 and January 1957—January 1973, respectively. The data on scientific manpower are not directly comparable with data in surveys formerly conducted by the Bureau of Labor Statistics. For example, the reporting unit used in the Census surveys of industrial research and development is the company, which is defined to include all establishments under common ownership or control. Surveys of scientific and technical personnel conducted by the Bureau of Labor Statistics were on an establishment-reporting-unit basis. Further, the Census surveys obtain data on the number of R&D scientists and engineers on a full-time-equivalent (FTE) basis, unlike the surveys of the Bureau of Labor Statistics in which data were provided in terms of scientists and engineers primarily employed in research and development. Other variations in the two sets of data may be the result of different offices in the same company preparing the estimates, or the varying response rate of the two surveys.

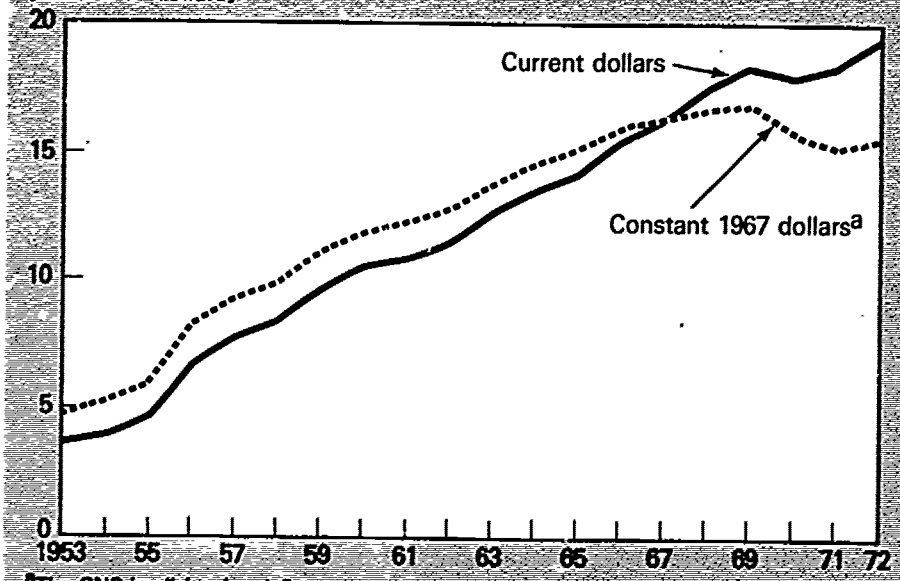
This report presents industrial R&D data on two different bases. First, total R&D data are furnished on the traditional industry basis for the years 1953 to 1972 (appendix tables B-1 to B-49). The second approach presents the applied research and development data on a product basis for 1959 to 1972 (appendix tables B-50 to B-55). Because of its generalized nature, basic research cannot readily be classified by product field; instead, these data are classified by field of science.

This survey does not cover trade associations, which are estimated to account for less than 1 percent of the industrial R&D performance total. Although trade associations are nonprofit organizations, their primary mission is to serve industry.

GENERAL

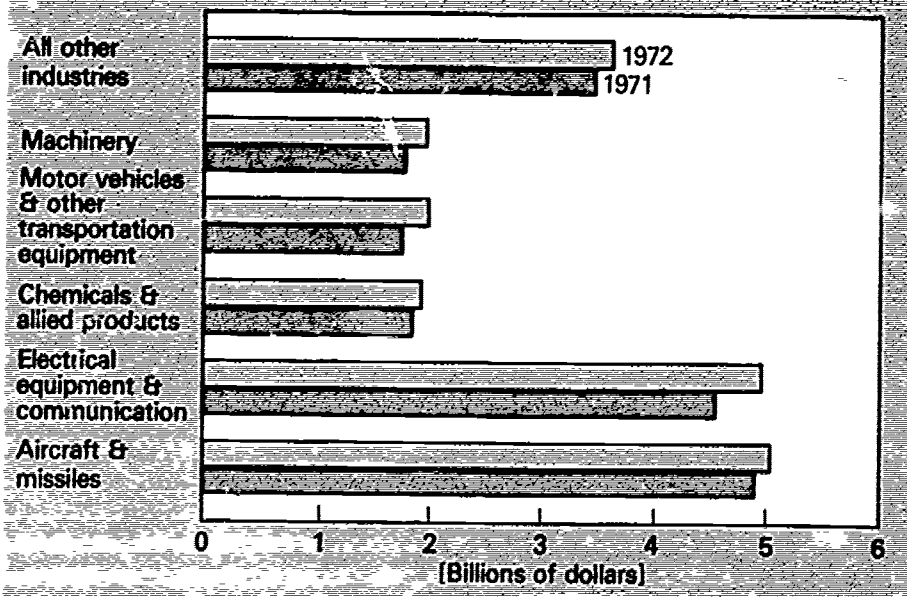
CHARACTERISTICS

Funds for industrial R&D performance: 1953-72



[a]The GNP implicit price deflator was used to convert from current to constant dollars.
SOURCE: National Science Foundation

R&D performance by the five leading industries in 1971 and 1972



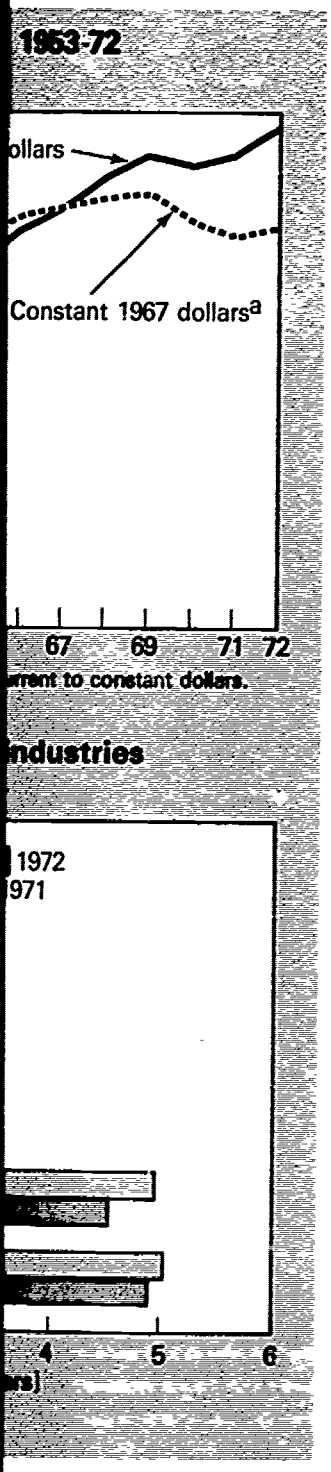
SOURCE: National Science Foundation

R&D Funds

Total industrial R&D spending reach
1972, an increase of 6 percent above the
stant dollars, the growth in industrial
between 1971 and 1972.

LEADING INDU

In 1972, five leading R&D-performi
siles, electrical equipment and comm
vehicles and other transportation equipm
80 percent of the total industrial R&D fu
industries accounted for over one-half of
the five industries recorded gains over t
percent in motor vehicles to 2 percent i



R&D Funds

Total industrial R&D spending reached a level of $19.4 billion during 1972, an increase of 6 percent above the 1971 level of $18.3 billion. In constant dollars, the growth in industrial R&D spending was 3 percent between 1971 and 1972.

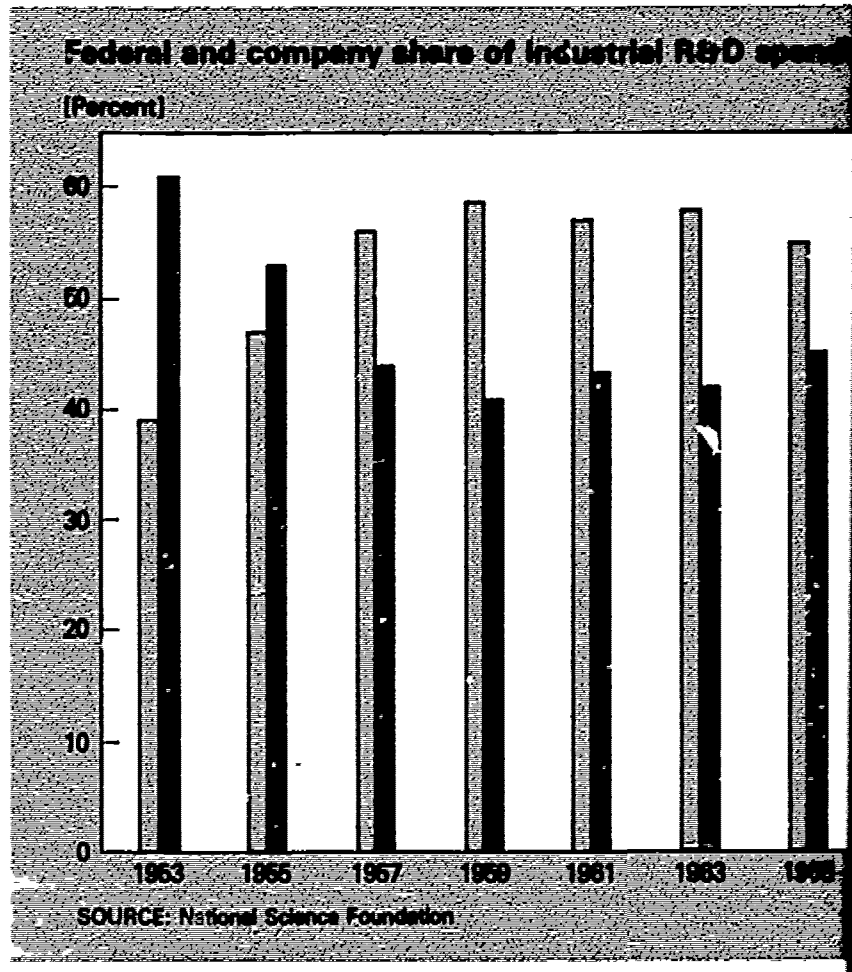
LEADING INDUSTRIES

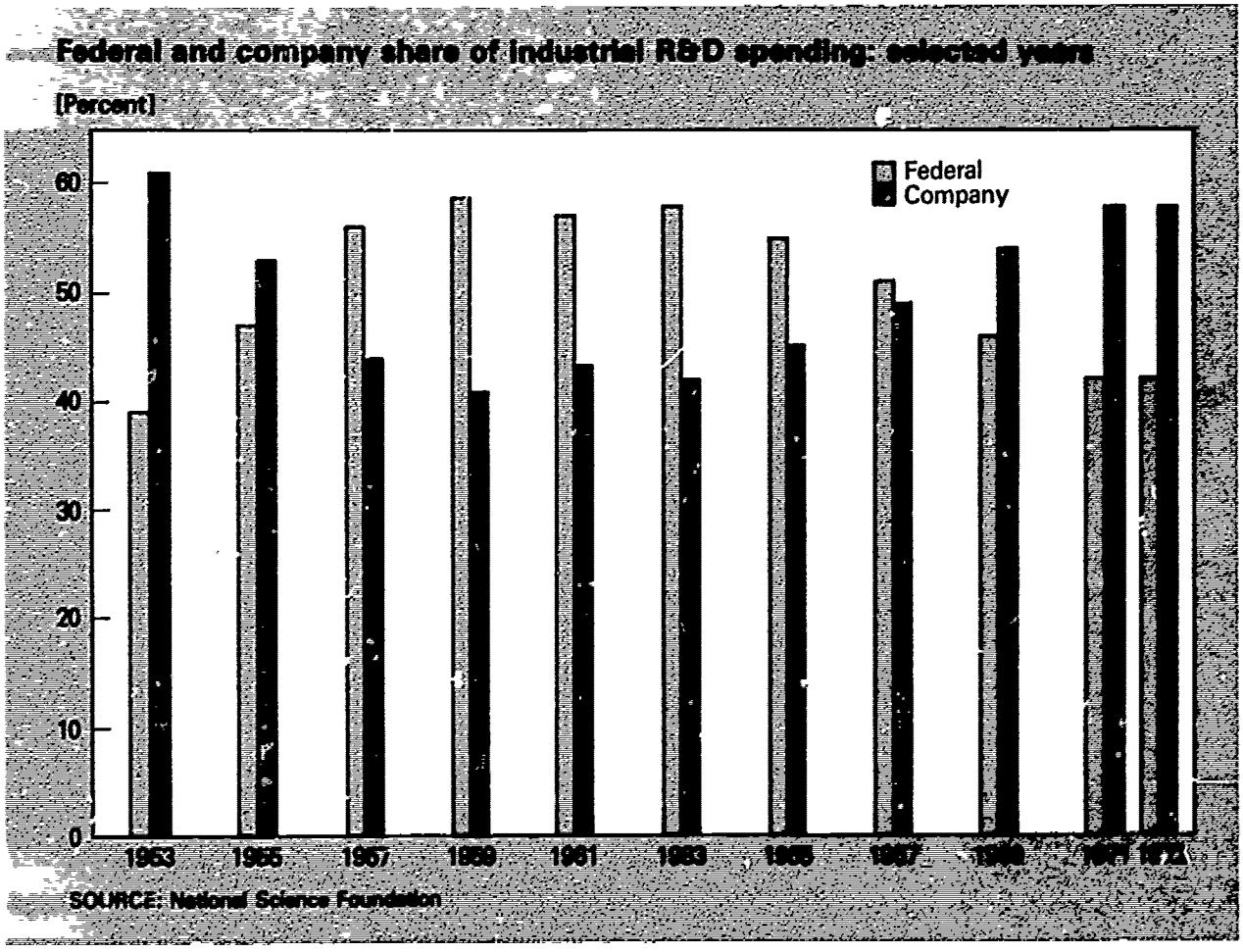
In 1972, five leading R&D-performing industries—aircraft and missiles, electrical equipment and communication, machinery, motor vehicles and other transportation equipment, and chemicals—spent over 80 percent of the total industrial R&D funds. Companies in the first two industries accounted for over one-half of the industrial R&D total. Each of the five industries recorded gains over the 1971 levels, ranging from 13 percent in motor vehicles to 2 percent in aircraft and missiles.

FEDERAL SHARE

The Federal Government supported 42 percent of the research and development performed by industry in 1972. This ratio was the same as in 1971, but down from a high of 59 percent in 1959. As a percent of total, federally financed industrial research and development has been decreasing since 1964, while that financed by company has been increasing, with the result that company replaced the Federal Government in 1968 as the principal source of funding for industrial research and development.

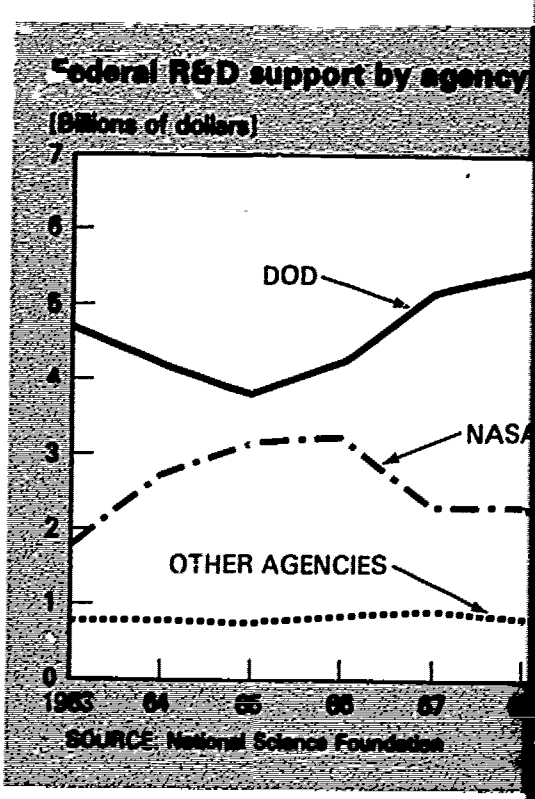
In 1972, Federal funds were directed to a small number of industries with more than 90 percent of funds going to five leading R&D-performing industries. About 80 percent of all Federal R&D funds in industry went to companies in two industries—aircraft and missiles and electrical equipment and communication. Firms in these two industries financed 81 percent and 51 percent, respectively, of their R&D effort with Federal funds.




Federal and company share of industrial R&D spending: selected years
[Percent]
Federal
Company
60
50
40
30
20
10
0
1953
1955
1957
1959
1961
1963
1965
1967
1969
1971
1973
SOURCE: National Science Foundation

Almost three-fourths of Federal R&D funds in industry ($5.9 billion) were provided by the Department of Defense (DOD) in 1972, an increase of 10 percent over the 1971 level of $5.3 billion. The National Aeronautics and Space Administration (NASA) accounted for an additional 15 percent, while other Federal agencies provided 13 percent. The downward trend in NASA's R&D spending in industry can be traced to 1966, when it provided almost 40 percent of Federal R&D funds in industry. This drop in industrial R&D spending was due to a decrease in Federal support for various space programs.

The aircraft and missiles industry received $3.2 billion (54 percent) of DOD's total allocation to industrial R&D activities followed by the electrical equipment industry with $1.7 billion (30 percent). With the cutback in NASA's R&D activities, the support to aircraft and missiles industry in 1972 was significantly lower than reported in 1965, from $2,340 million in 1965 to $725 million in 1972.



FEDERALLY FUNDED RESEARCH AND DEVELOPMENT CENTERS

Federally Funded Research and Development Centers (FFRDC's) are organizations administered by industrial firms, universities and colleges, or other nonprofit institutions. These organizations perform R&D work almost exclusively for Federal agencies. R&D activities undertaken by FFRDC's administered by industrial organizations are classified with those of the administering firm.

Total R&D effort in industry-administered FFRDC's amounted to $513 million in 1972, 4.5 percent above the 1971 level. R&D expenditures increased for both basic and applied research by 10 percent, and development by 3 percent between 1971 and 1972.

In January 1973 there were 6,600 FTE
these centers—up 2 percent over the Ja
employment remained level between th

Total R&D funds ....
Basic research .....
Applied research .....
Development .....

Scientists and engineers .....
Total employment .....

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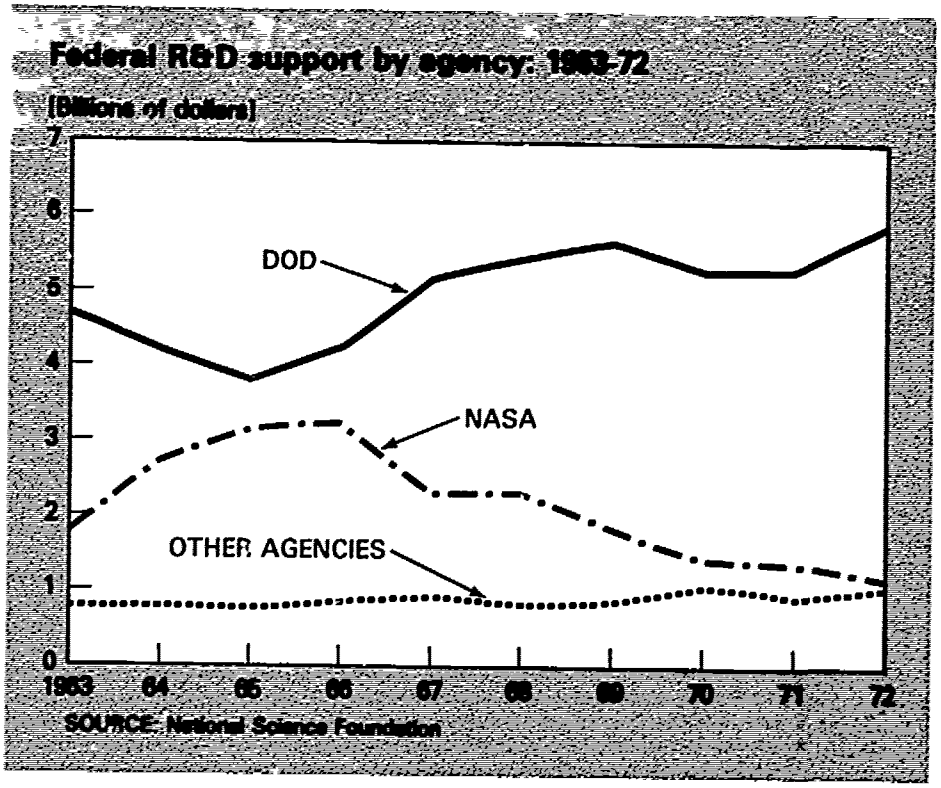

ELOPMENT CENTERS

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activities undertaken by
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In January 1973 there were 6,600 FTE R&D scientists and engineers in these centers—up 2 percent over the January 1972 figure of 6,500. Total employment remained level between the two years.

	1971	1972
	(Millions of dollars)	
Total R&D funds	$491	$513
Basic research	33	37
Applied research	67	73
Development	391	402

	January 1972	January 1973
Scientists and engineers	6,500	6,600
Total employment	23,000	23,000

COMPANY-FINANCED RESEARCH AND DEVELOPMENT

Company-financed research and development increased 7 percent between 1971 and 1972, climbing from $10.6 billion to $11.3 billion. Federal support for industrial R&D performance increased by 6 percent between 1971 and 1972 after recording a 1-percent decline between 1970 and 1971.

Examination of the indexes below shows that since 1958, in each of the five leading industries, company-financed research and development has been increasing at a much faster rate than federally financed. The most dramatic changes in company R&D spending occurred in the electrical equipment and machinery industries, with average annual growth rates of 10.1 percent and 9.8 percent, respectively, during the 1958-72 period. More recently, between 1968 and 1972, these same industries recorded average annual growth rates of 8.5 percent and 9.3 percent, respectively.

Since 1963 the electrical equipment industry has continued to claim the largest dollar amount of company funds. Although this amounted to $2.4 billion in 1972, this represented only one-half—49 percent—of its total R&D resources. Chemicals, on the other hand, reported a total of $1.9 billion, of which 90 percent, or $1.7 billion, was company funds. The machinery and motor vehicles industries also reported significant shares of their own funds allocated to their R&D activities, 83 percent and 85 percent, respectively.

In 1972 industrial firms also reported that $221 million in company-financed R&D projects went to outside organizations—universities and colleges, nonprofit institutes, and other companies—16 percent above the 1971 level.

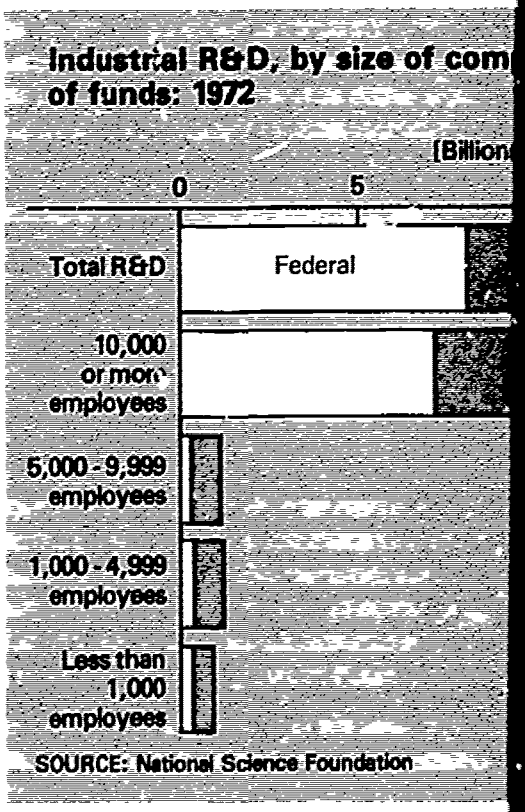
SIZE OF COMPANY

Companies with 10,000 or more employees performed over 80 percent of all industrial research and development in 1972; companies with fewer than 1,000 employees performed about 5 percent. Of the $8.1 billion Federal R&D total, nearly 90 percent, or $7.2 billion, was located in companies with employment exceeding 10,000. These same firms spent about 80 percent, or $8.9 billion, of the total company R&D effort.

Although the largest firms typically tend to dominate an industry's R&D activity, in some industries these companies reported shares ranging down to 9 percent.

Indexes of five industries leading by source: selecte

Industry by source of funds	1958	1963
Total Federal	100.0	152.8
Aircraft and missiles	100.0	187.2
Electrical equipment	100.0	138.3
Chemicals	100.0	185.7
Machinery	100.0	72.9
Motor vehicles	100.0	98.3
Total company	100.0	147.7
Aircraft and missiles	100.0	135.7
Electrical equipment	100.0	160.9
Chemicals	100.0	150.8
Machinery	100.0	161.9
Motor vehicles	100.0	142.7



ND DEVELOPMENT

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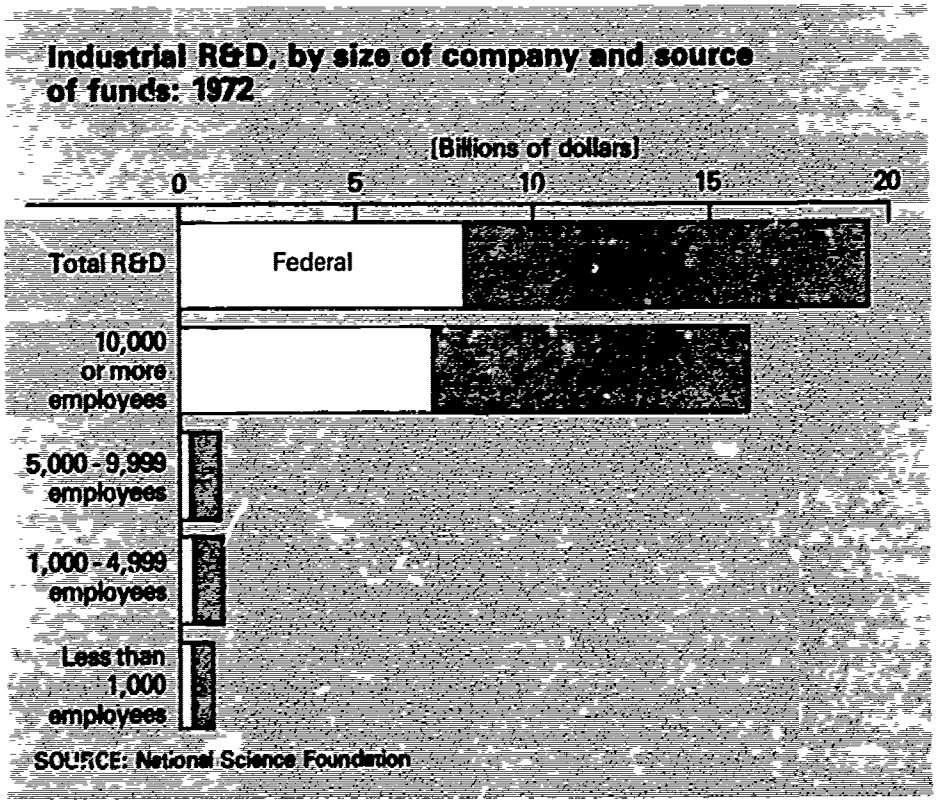
nies reported shares ranging

Indexes of five industries leading in R&D performance, by source: selected years

Industry by source of funds	1958	1963	1968	1969	1970	1971	1972
Total Federal	100.0	152.8	179.9	177.6	163.5	161.1	170.0
Aircraft and missiles	100.0	187.2	199.6	200.1	177.2	171.4	178.7
Electrical equipment	100.0	138.3	175.4	180.4	169.1	172.2	187.3
Chemicals	100.0	185.7	157.9	152.4	142.9	146.0	155.6
Machinery	100.0	72.9	98.3	75.5	69.7	84.8	98.8
Motor vehicles	100.0	98.3	125.7	95.9	104.1	101.7	102.4
Total company	100.0	147.7	244.3	271.8	283.3	293.3	312.6
Aircraft and missiles	100.0	135.7	370.0	406.9	364.3	303.9	283.8
Electrical equipment	100.0	160.9	278.5	314.7	330.9	353.2	386.4
Chemicals	100.0	150.8	208.6	220.3	238.1	245.5	257.2
Machinery	100.0	161.9	260.3	291.6	321.9	338.4	371.0
Motor vehicles	100.0	142.7	199.8	227.5	227.5	259.8	299.8



Employment of R&D Scientists and Engineers

Between January 1972 and January 1973 the FTE number of R&D scientists and engineers increased 3 percent from 349,900 to 359,900. Manpower counts in January 1973, although increasing for the first time since 1969 were still 8 percent below the level for that year. Only two industries recorded decreases between January 1972 and January 1973—petroleum, 1 percent; and primary metals, 5 percent. Four industries recorded increases between January 1972 and January 1973 in excess of the all-industry average: electrical equipment and lumber, 6 percent; and instruments and machinery, 4 percent.

Overall totals show that the actual number of FTE R&D scientists and engineers increased by 10,000 between January 1972 and January 1973. Companies with total employment of 10,000 or more reported increases of such personnel equaling 7,900. Companies with total employment of 5,000 to 9,900 increased slightly from 28,400 in January 1972 to 29,100 in January 1973.

SOURCE OF SUPPORT

Both federally and company-financed R&D projects reflected increases in the number of FTE R&D scientists and engineers between January 1972 and January 1973, Federal projects recorded a 3.5-percent increase, while company-funded activities showed a 2.5-percent increase. The largest increases in scientific and engineering manpower employed on Federal R&D projects occurred in the electrical equipment and aircraft and missiles industries—2,800 and 2,400, respectively. Together these two industries accounted for over three-quarters of the total number of FTE R&D scientists and engineers engaged on Federal projects. The motor vehicles industry, although engaging a smaller number of federally financed R&D scientists and engineers, reported a significant decrease of over 25 percent while increasing their company financed R&D scientists and engineers by 7 percent.

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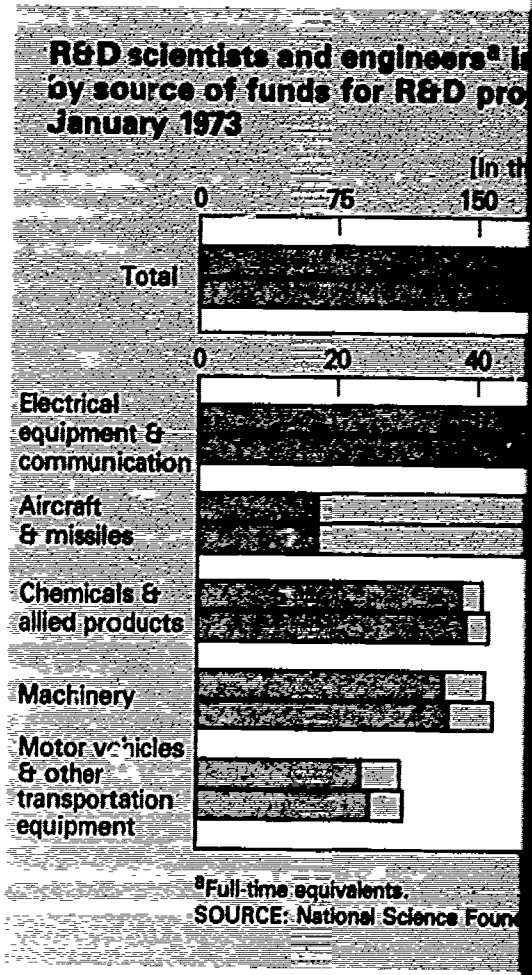
These were electrical equipment, 2,800;



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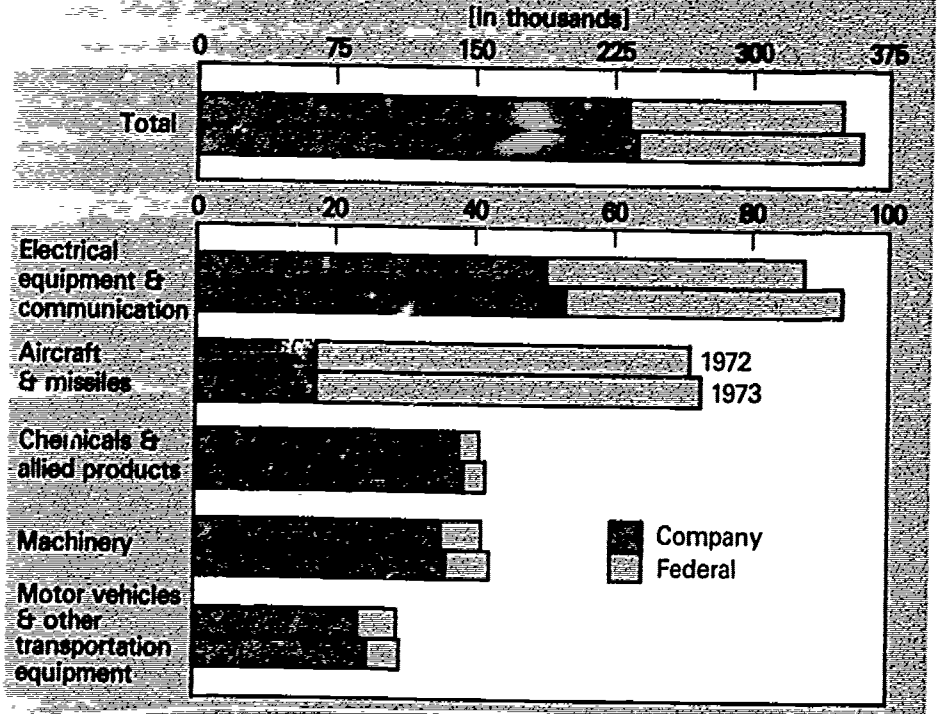
Two industries reflected the largest increase in actual counts of R&D scientists and engineers engaged in company-financed R&D activities. These were electrical equipment, 2,800; and motor vehicles, 1,700.

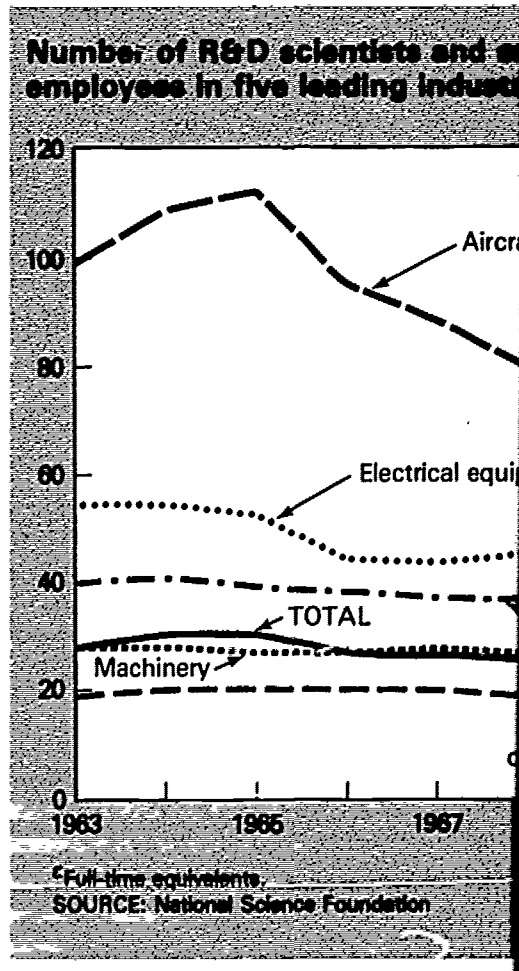
R&D scientists and engineers[a] in five leading industries, by source of funds for R&D projects: January 1972 and January 1973



[a]Full-time equivalents.
SOURCE: National Science Foundation

SCIENTIFIC VERSUS OTHER EMPLOYMENT

The relationship between R&D scientists and engineers and total employment in each industry is of particular interest. For all industries combined this ratio has been a constant 26 scientists and engineers per 1,000 employees between 1968 and 1971. For 1972 however, the ratio declined slightly to 25. Examination of this measure for the leading R&D-performing industries, however, reflects a considerable variation. The aircraft and missiles industry has been in a continuous state of change for the last decade or more, with its ratio ranging from a high of 113 in 1965 to a low of 72 in 1958—the first year for which these data are available. In 1972 this industry continued to increase slightly from the 1970 total of 73 R&D scientists and engineers per 1,000 employees to 75. The electrical equipment and chemicals industries were the only two among the five leading industries to reflect a 1971-72 decrease in this ratio. Two other R&D-performing industries reporting decreases between 1971 and 1972 were fabricated metal products and scientific instruments.



Number of R&D scientists and e
employees in five leading indust

[c]Full-time equivalents.
SOURCE: National Science Foundation

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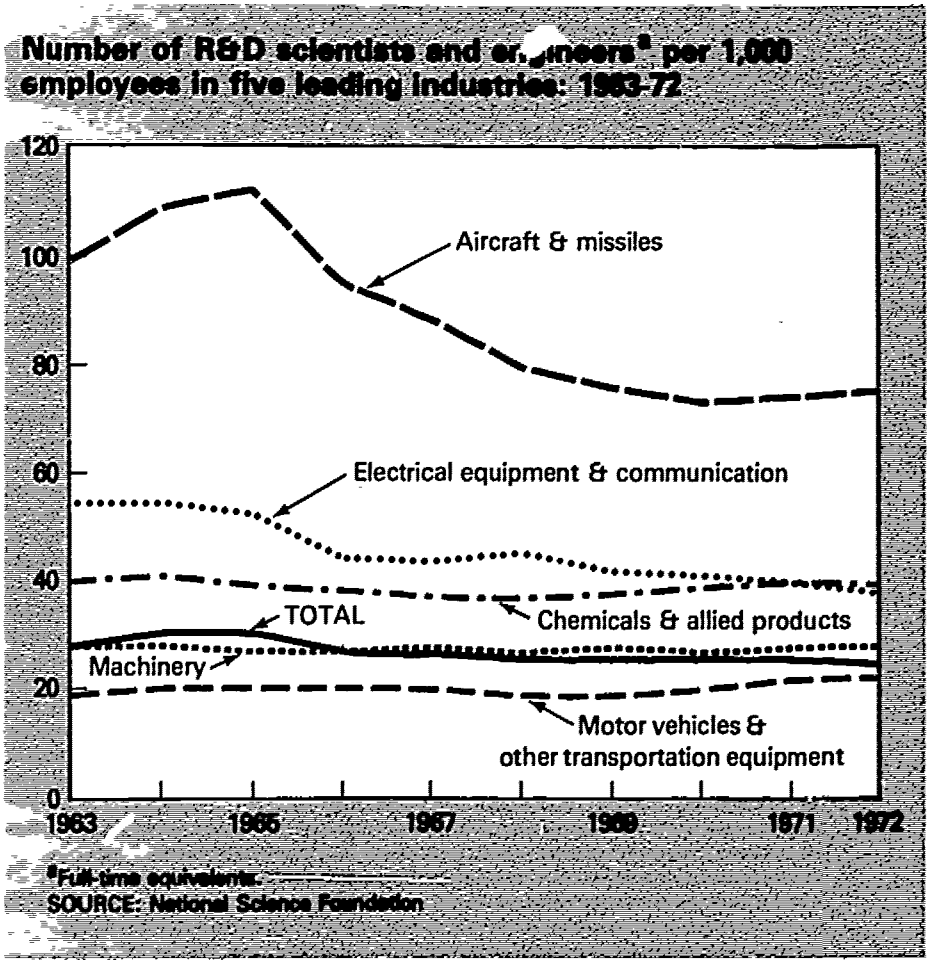
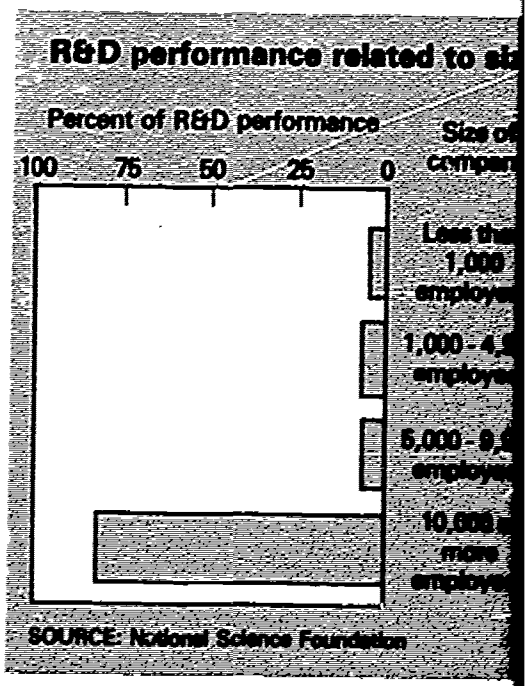


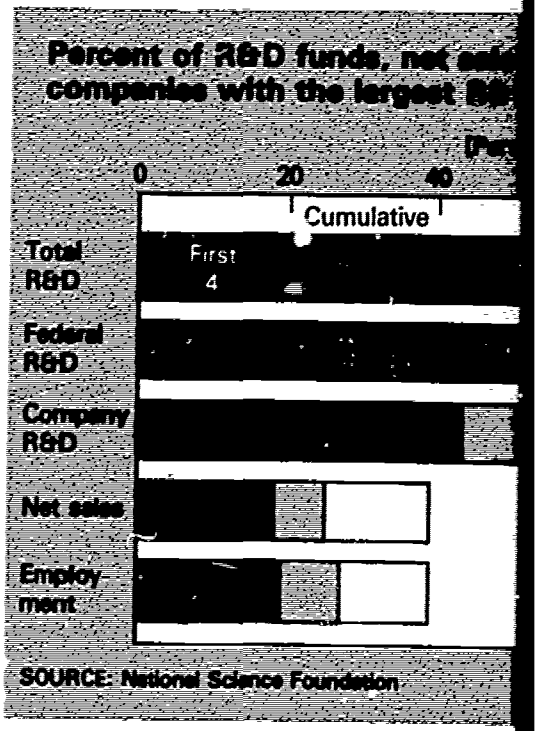
Distribution of R&D Funds



SIZE OF COMPANY AND R&D PROGRAM

Of the 301 R&D-performing companies with 10,000 or more employees, 36 reported 1972 R&D expenditures totaling less than $1 million. Thirty-one companies, however, reported R&D programs costing more than $100 million, and accounting for almost $12 billion, or more than 60 percent of all industrial research and development performed.

The four companies with the largest R&D programs in 1972 accounted for 19 percent of all industrial research and development. These firms accounted for 18 percent of the Federal R&D money contracted to industry and 20 percent of the company R&D funds.



Over three-fourths of all industrial research and development in 1972 was performed by the 100 companies with the largest R&D programs. These same companies accounted for 91 percent of Federal support and 68 percent of company-financed R&D activity.

The 100 largest R&D-performing companies also were responsible for 39 percent of net sales and employment during 1972.

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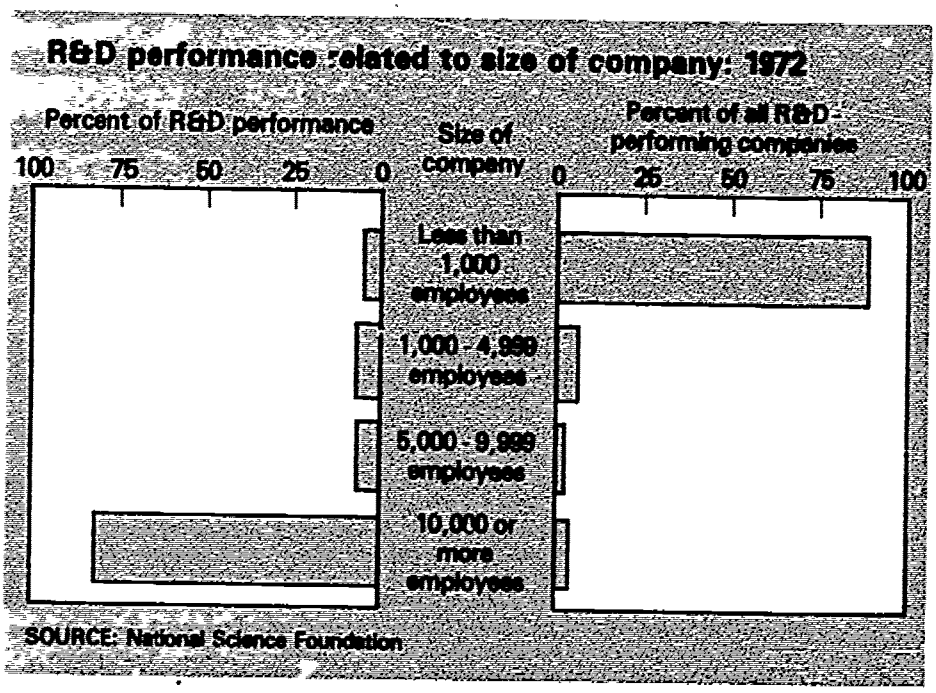
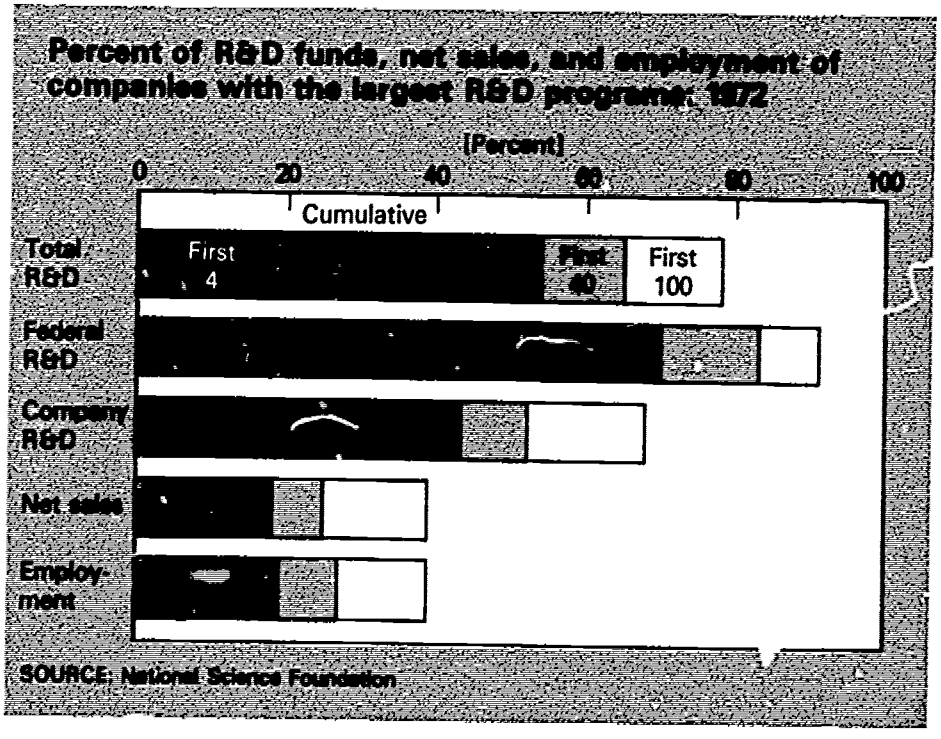




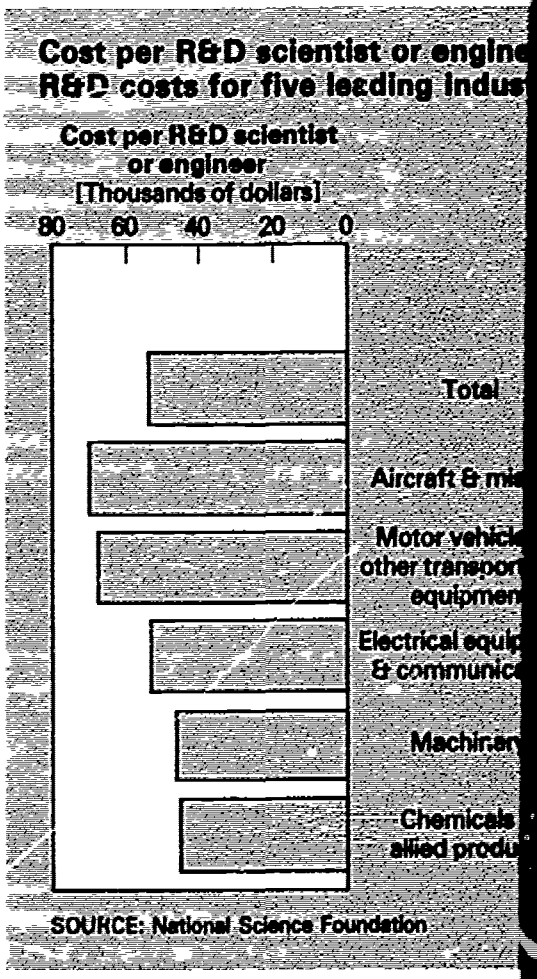
MAJOR TYPE OF COST

Forty-nine percent of all 1972 industrial R&D dollars was expended on wages and salaries of R&D scientists and engineers and supporting personnel. The remainder was divided between materials and supplies—18 percent; and other costs—33 percent. These ratios were derived from the responses of companies accounting for 84 percent of all industrial R&D performance. The responses reflected little change over 1971.

Of the five leading R&D-performing industries, the chemicals industry reported the highest allocation to professional salaries—36 percent.

The largest share of R&D funds devoted to supporting personnel costs, 31 percent, was reported by the motor vehicles industry—a sharp contrast to the 19-percent all-industry average.

The aircraft industry was the only one of the five leading R&D-performing industries to spend more than the all-industry average on materials and supplies in 1972—23 percent versus 18 percent.



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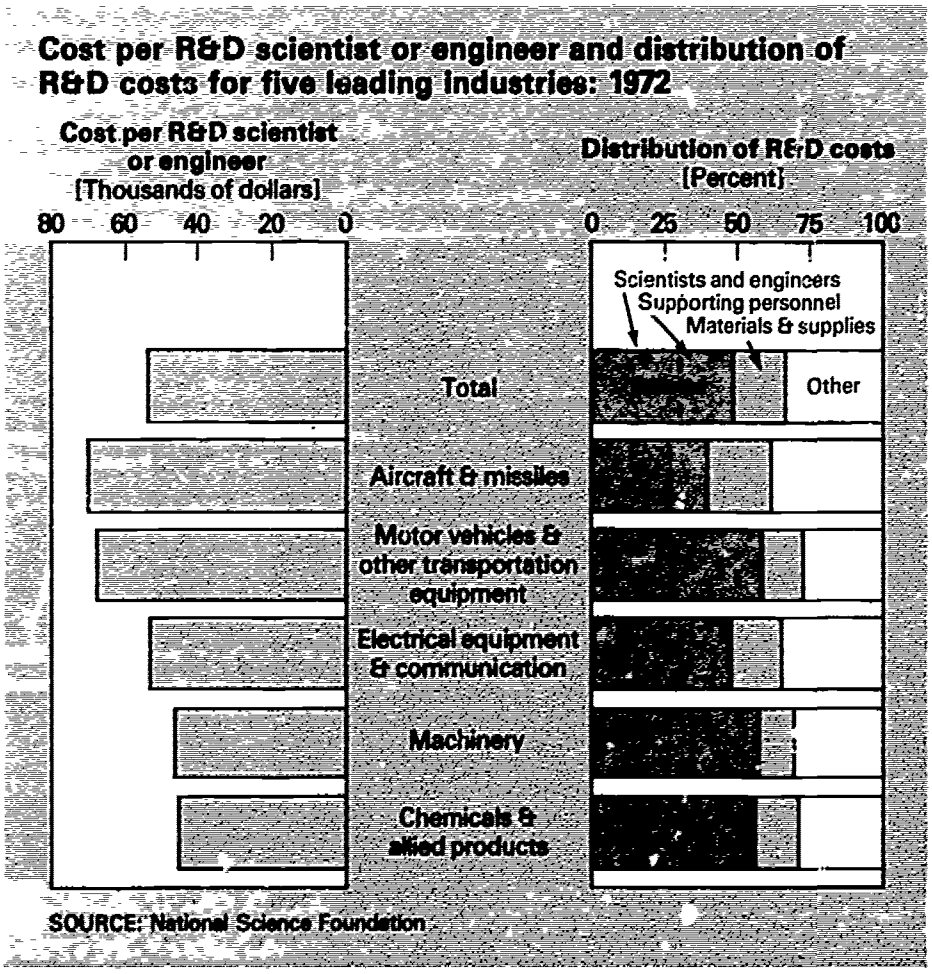
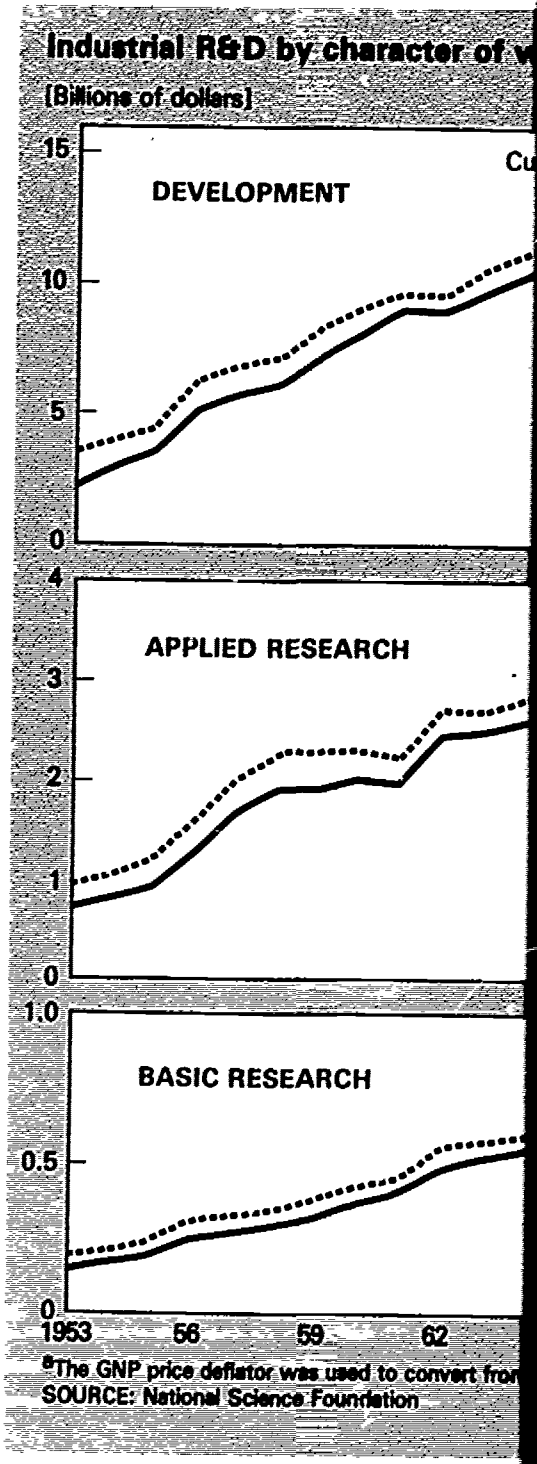


Basic Research, Applied Research, and Development

Total basic research expenditures by industrial firms amounted to $611 million in 1972, which represented 14 percent of all basic research performed in the United States. Companies spent $3.5 billion for applied research and $15.3 billion for development performance. These funds accounted for 54 percent and 83 percent, respectively, of the national totals.



BASIC RESEARCH, BY INDUSTRY

Basic research performance in industry remained almost level at $611 million for 1971 and 1972, however, in constant dollars, basic research spending decreased by 3 percent. As in other years, the chemicals industry led in basic research performance, with an expenditure of $246 million in 1972. Chemical companies accounted for 40 percent of all industrial basic research. Electrical equipment and aircraft companies accounted for an additional 24 percent and 9 percent, respectively, with all other industries making up 27 percent.

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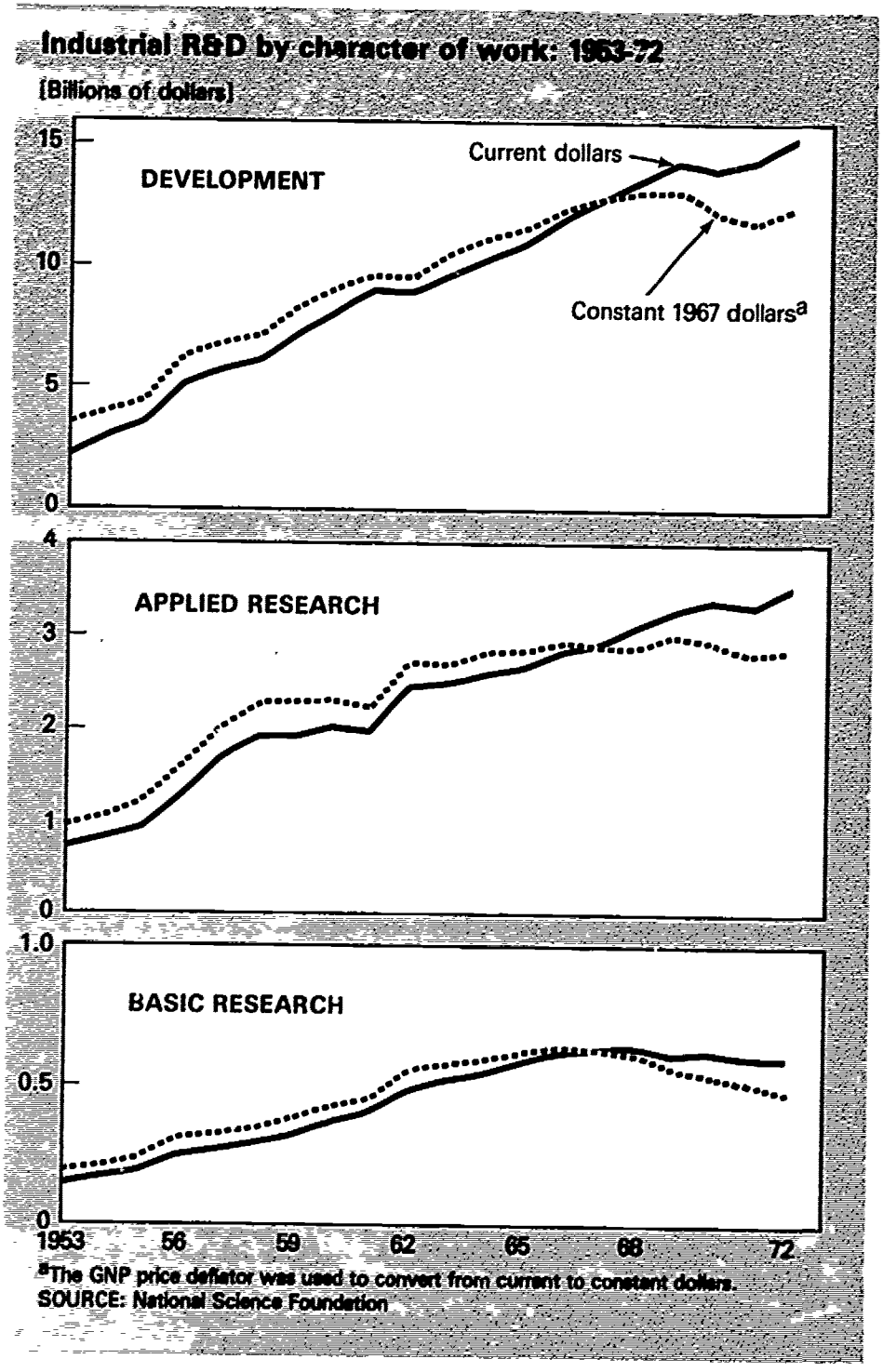
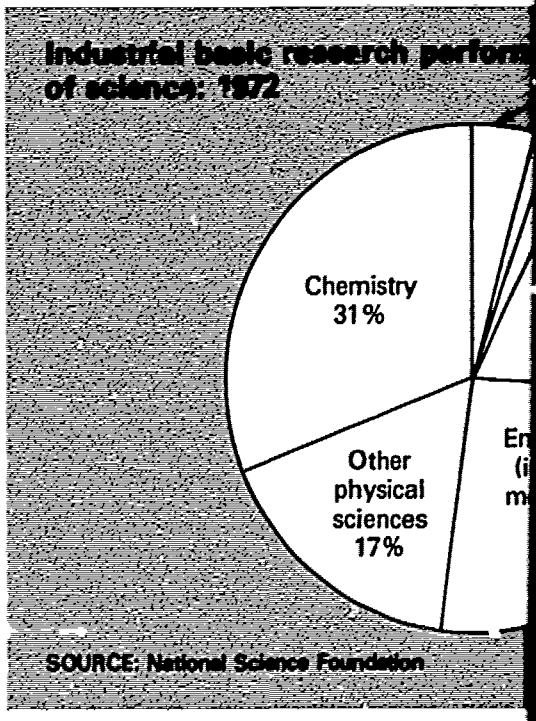


BASIC RESEARCH, BY SOURCE

In 1972, almost 80 percent of industry's basic research was financed by companies' own R&D funds, amounting to $480 million. Chemical companies were the leading performers of company-sponsored basic research, allocating $201 million or 12 percent of their own R&D funds to basic research. This relatively large allocation of their R&D funds to basic research reflects an intensive commitment to basic research by pharmaceutical companies. Electrical equipment firms were the second largest performers of company-sponsored basic research, devoting $98 million or 4 percent of their own R&D funds on basic research in 1972.

The Federal Government allocated less than 2 percent of its R&D support in industry to basic research. This amounted to $131 million, or 5 percent of all Federal basic research spending in the economy. About 82 percent of Federal basic research support to industry went to companies in the electrical equipment industry ($47 million), chemical industry ($45 million), and aircraft and missiles industry ($15 million). An additional 14 percent ($18 million) was contracted to nonmanufacturing industries.



BASIC RESEARCH, BY FIELD OF SCIENCE

Funds for basic research in all fields of science remained almost level between 1971 and 1972. Almost one-half of all industrial basic research in 1972 was in the physical sciences—$289 million; chemistry alone accounted for $188 million of this. Engineering and the life sciences accounted for an additional 45 percent of all industrial basic research.

In 1972, the chemicals industry accounted for almost 50 percent and 71 percent of all basic research in the physical and life sciences, respectively. Basic research in engineering amounted to $159 million; about 65 percent of this work was financed by companies in the electrical equipment and aircraft and missiles industries.

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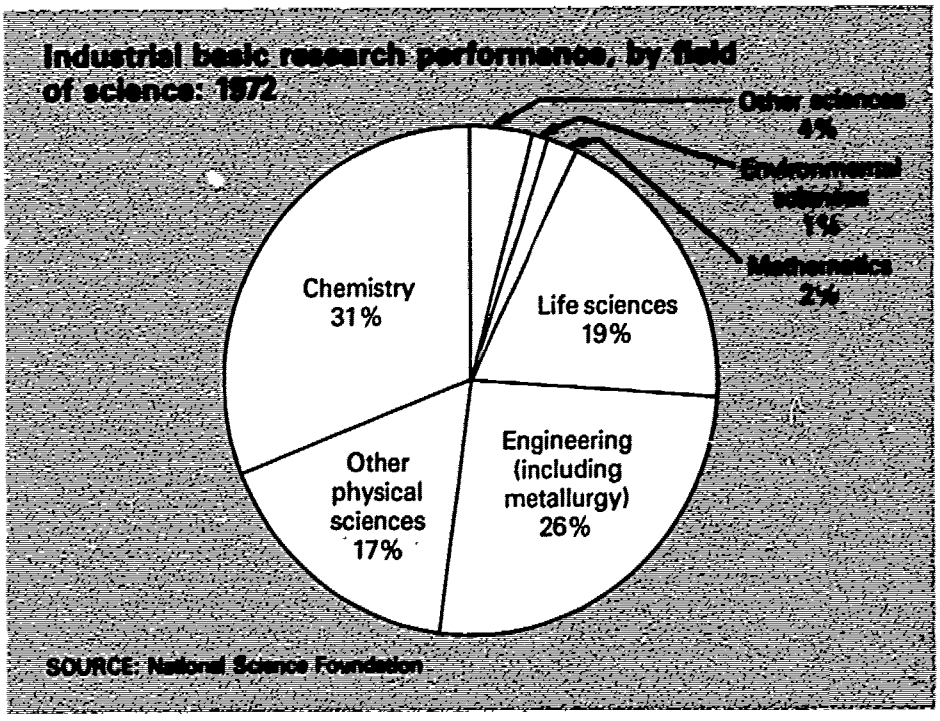


APPLIED RESEARCH AND DEVELOPMENT, BY INDUSTRY

Applied research and development spending by industry amounted to $18.8 billion in 1972, 6 percent above the 1971 figure. Over one-half of this was spent by the companies in the aircraft and missiles (almost $5.0 billion), and electrical equipment ($4.8 billion) industries.

The aircraft industry financed 82 percent of its applied research and development performance with Federal funds in 1972, and electrical equipment companies reported 51 percent Federal support. These industries, with their heavy involvement in Federal R&D contracts, spent $6.5 billion of Federal funds on applied research and development in 1972.

The electrical equipment industry was the leading performer of company-sponsored applied research and development, spending $2.3 billion in 1972. Other industries spending relatively large amounts of company R&D funds on applied research and development were motor vehicles, chemicals, and machinery.

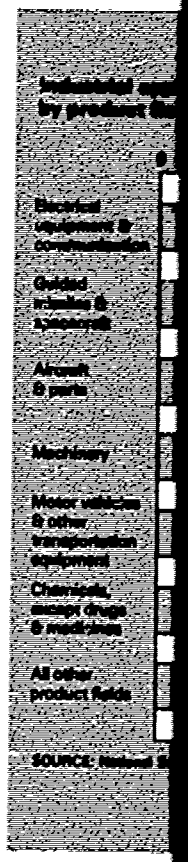
APPLIED RESEARCH AND DEVELOPMENT, BY PRODUCT FIELD

Applied research and development spending by product field shows the allocation of R&D funds by companies in different product areas. Three-fourths of the industrial applied research and development funds ($18.8 billion) were spent in six product fields in 1972—electrical equipment and communication, 21 percent; guided missiles and spacecraft, 15 percent; aircraft and parts, 13 percent; machinery, 10 percent; motor vehicles and other transportation equipment, 9 percent; and chemicals, except drugs and medicines, 7 percent.

The Federal Government supported 42 percent of industrial applied research and development in 1972. About one-third of this Federal support was to sponsor work on guided missiles and spacecraft, $2.7 billion. An additional 47 percent went to two other product fields—electrical equipment and communication, $2.2 billion; and aircraft and parts, $1.6 billion.

Since many companies are active in a number of diverse areas, it is helpful to know what percent of applied research and development dollars are directed towards the companies' major products. The following table shows the specialization ratios for selected industries. These ratios were derived by calculating the percent of total applied research and development directed to each industry's primary products.

Industry	1972 Specialization Ratios
Aircraft and missiles	82.1
Chemicals and allied products	78.8
Professional and scientific instruments	73.9
Motor vehicles and other transportation equipment	68.9
Primary metals	62.7
Machinery	61.7
Petroleum refining and extraction	58.8
Electrical equipment and communication	51.6
Fabricated metal products	36.2



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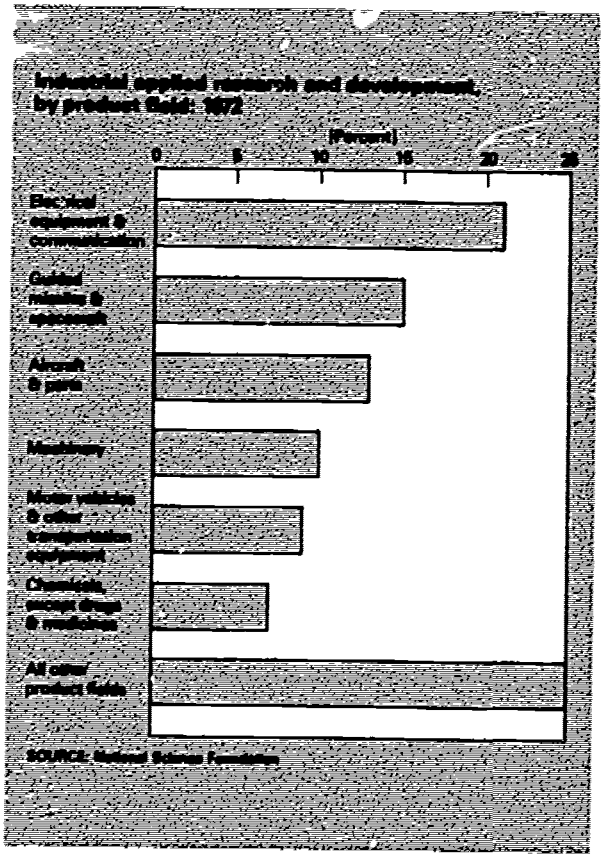


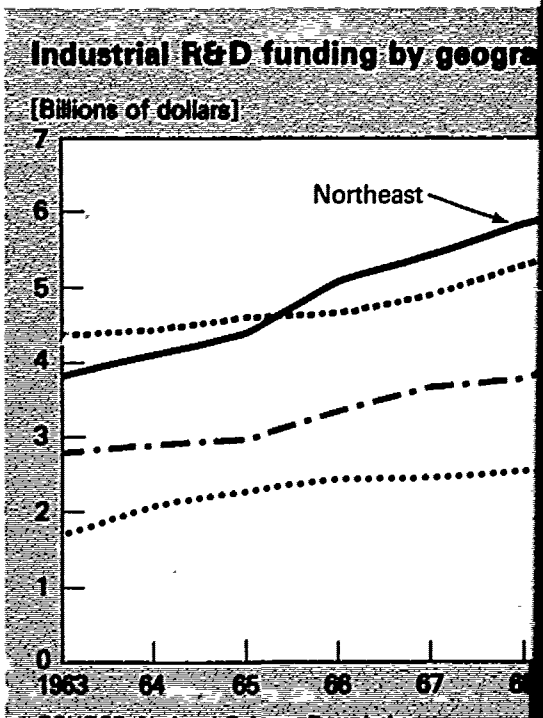
Geographic Distribution of R&D Funds

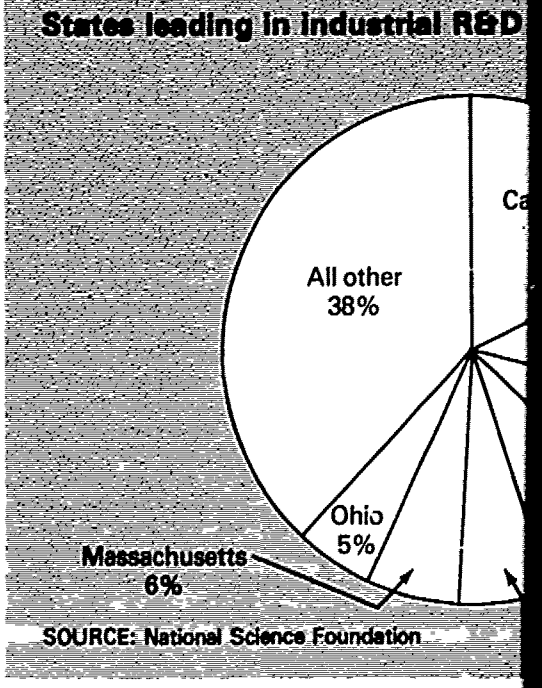
The seven States leading in industrial R&D performance—California, New York, Michigan, New Jersey, Pennsylvania, Massachusetts, and Ohio—accounted for 62 percent of the national industrial total in 1972.

California, with $3.5 billion in 1972, led in industrial R&D performance, but its share in industrial R&D total decreased from a high of 28 percent in 1964 to 18 percent in 1972. This decrease in industrial R&D expenditure resulted primarily from substantial cutbacks on the part of NASA and DOD which brought about retrenchment in the R&D effort of defense and space industries.

Industrial R&D dollars increased between 1971 and 1972 in all geographic divisions, ranging from 11 percent in the South Atlantic division to 3 percent in the Pacific. Florida was the leading gainer during this period, where R&D funds showed a 30-percent increase. Of the nine geographic divisions, five—West North Central, South Atlantic, East South Central, Mountain, and Pacific—had more than one-half of their R&D activities supported by the Federal Government. Pacific States financed 71 percent of their R&D activities with Federal funds.

Among the States, California received the largest Federal support in 1972, accounting for $2.6 billion or 32 percent of all the Federal funds. New York followed with $752 million. Michigan led in company-funded R&D work, with $1.5 billion in 1972: this was 95 percent of its total. About one-third of all company-funded R&D was conducted in Michigan, New York, New Jersey, and California.





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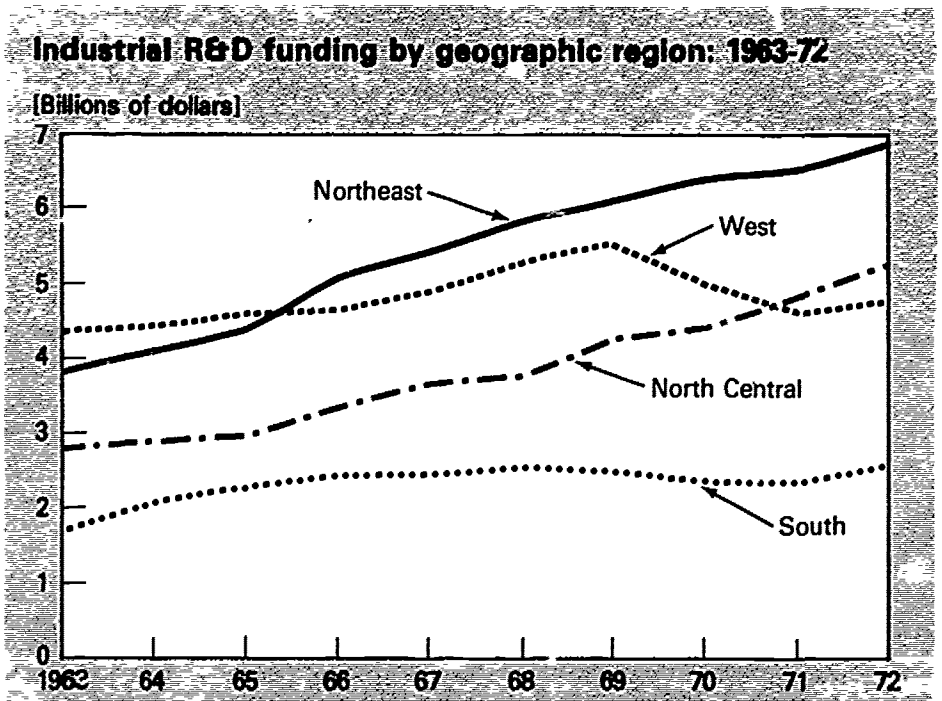
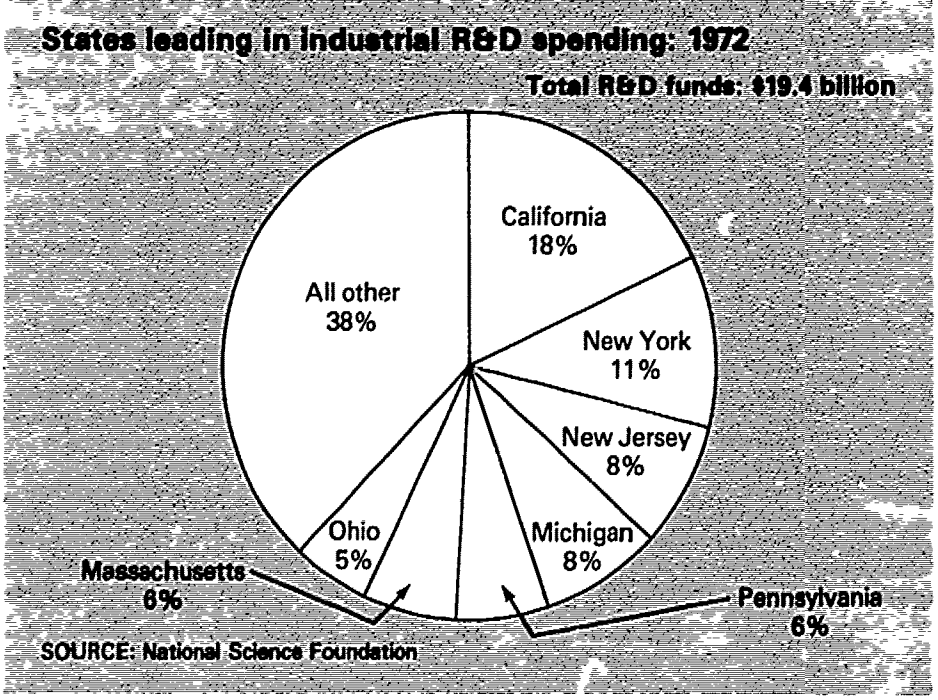


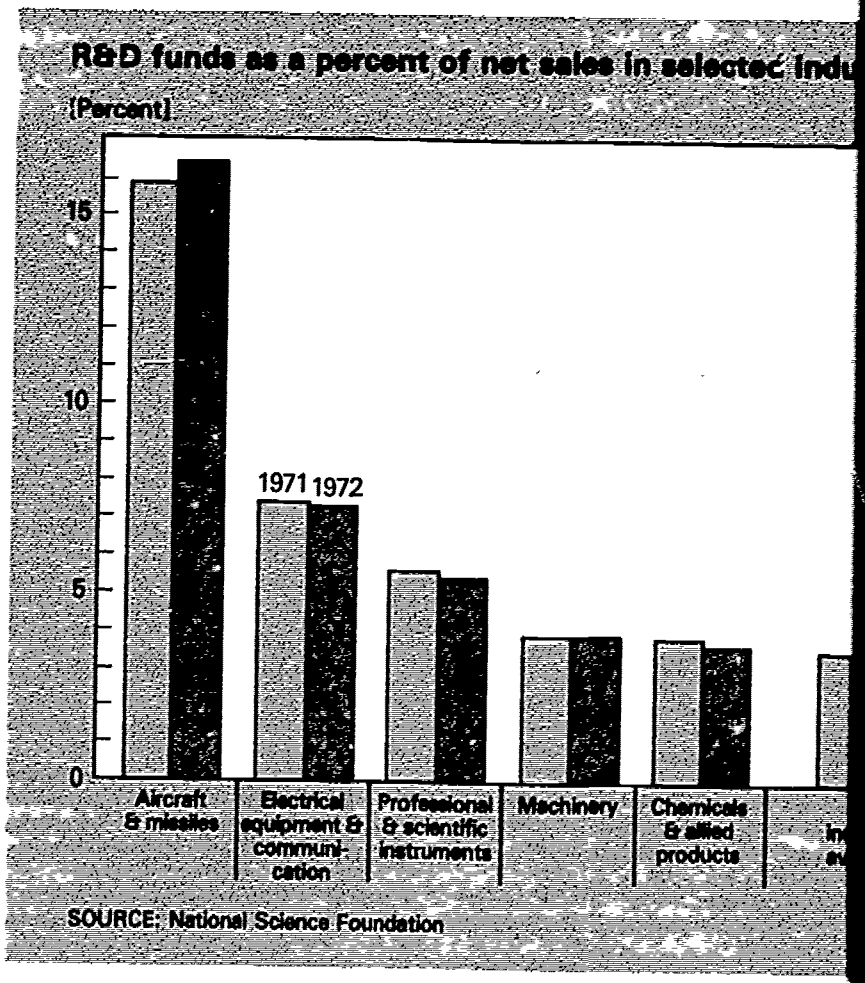


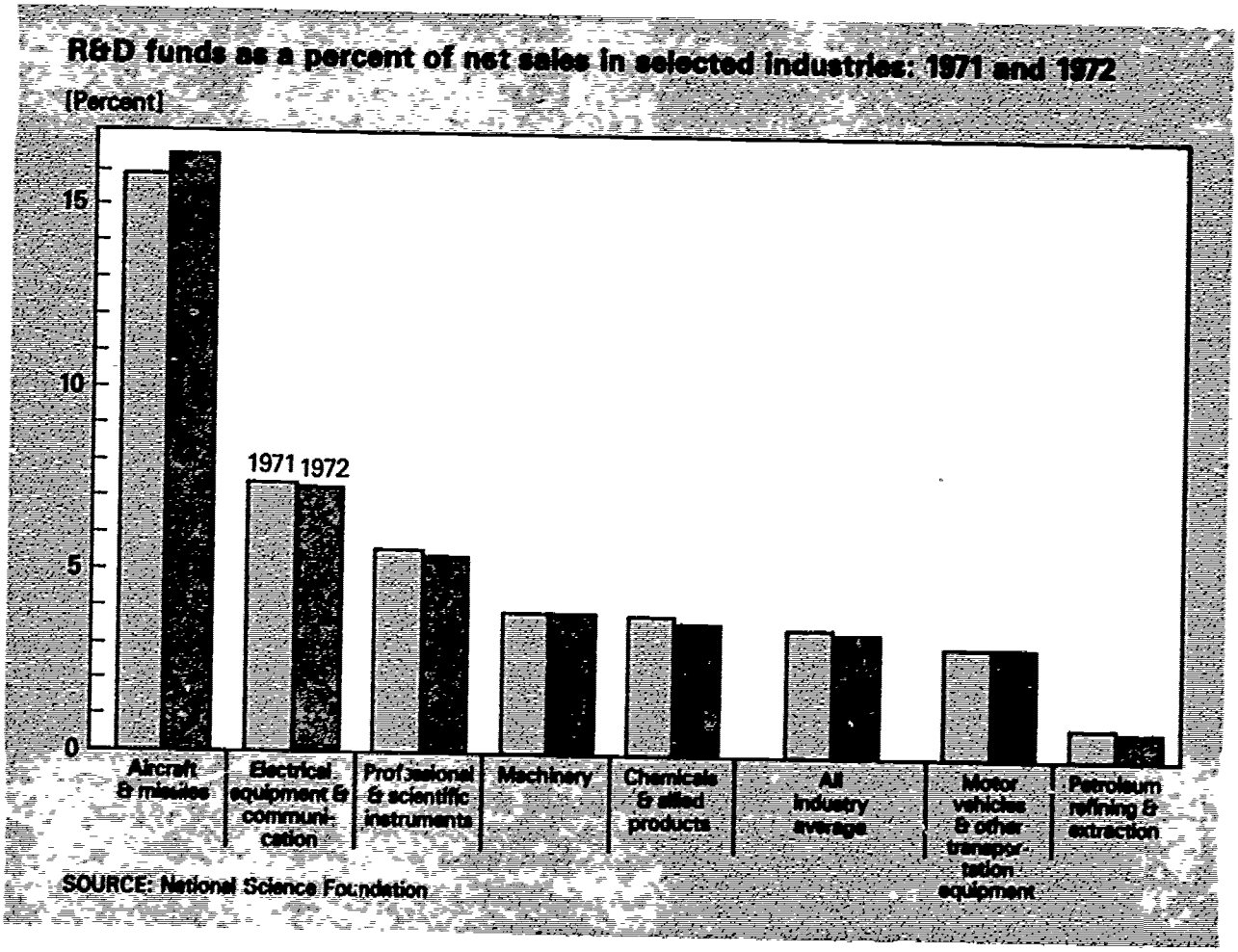
R&D Funds Related to Net Sales and Employment

Total R&D/net sales ratio of R&D-performing manufacturing companies continued to decline to 3.4 percent in 1972 from a high of 4.6 percent in 1964.

The aircraft industry had the highest R&D/net sales ratio in 1972—16.3 percent. This is up from 15.9 percent in 1971 but down from the 1964 high of 28.9 percent. All of this decrease was due to the leveling in Federal R&D support to this industry. All other industries' R&D/net sales ratios remained at their 1971 levels or showed decreases.

The all-industry ratio of company R&D funds to net sales declined slightly from 2.1 percent in 1971 to 2.0 percent in 1972. The machinery industry was the only one in which this ratio showed a slight increase between 1971 and 1972 from 3.2 percent to 3.3 percent. An additional five industries registered decreases in company R&D funds/net sales ratios during this period—aircraft and missiles, 3.3 to 3.1 percent; chemicals, 3.4 to 3.3 percent; petroleum refining and extraction, 0.8 to 0.7 percent; primary metals, 0.8 to 0.7 percent; and textiles and apparel, 0.5 to 0.4 percent.




R&D funds as a percent of net sales in selected industries: 1971 and 1972
(Percent)
15
10
5
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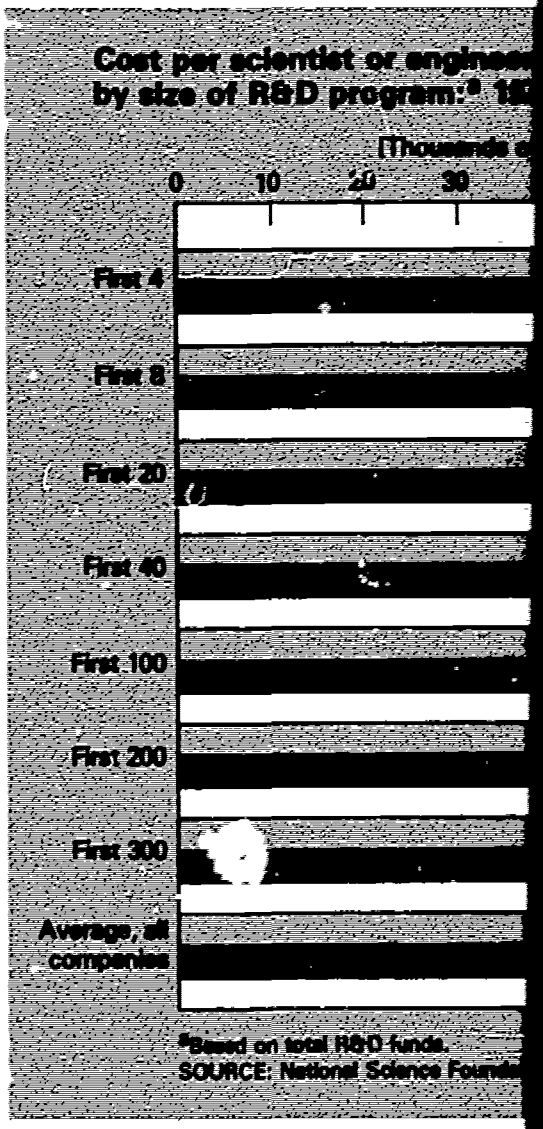
1971
1972
Aircraft & missiles
Electrical equipment & communication
Professional & scientific instruments
Machinery
Chemicals & allied products
All industry average
Motor vehicles & other transportation equipment
Petroleum refining & extraction
SOURCE: National Science Foundation

Total R&D funds per employee amounted to $1,380 in 1972, an increase of 6 percent over the 1971 ratio of $1,304. Company R&D funds per employee increased 7 percent between 1971 and 1972 to a level of $810. Federal R&D funds per employee reached $574 in 1972, 5 percent higher than the $546 reached in 1971.

The cost per R&D scientist or engineer in all industries, continuing to climb in 1972, reached $54,800 or 7 percent more than the previous year. Above-average cost ratios were reported by three industries—aircraft, $69,600; motor vehicles, $67,500; and petroleum, $57,300—whereas the lumber, wood products, and furniture industry reported the lowest ratio, $29,100.

The four companies with the largest R&D programs had an average cost of $70,900 in 1972, while the first 300 companies reported $59,100 or 29 percent and 8 percent, respectively, above the 1972 average for all R&D-performing manufacturing companies.

Companies with a total employment of 5,000 to 9,999 reported an average cost of $43,100 per scientist or engineer in 1972, while larger companies with a total employment of 10,000 or more had $60,200 as their average cost. In the motor vehicles industry, medium-sized companies spent an average of $39,000 per R&D scientist or engineer, while the larger companies spent $69,500. In the chemicals industry, the comparable costs were $39,300 and $55,100.



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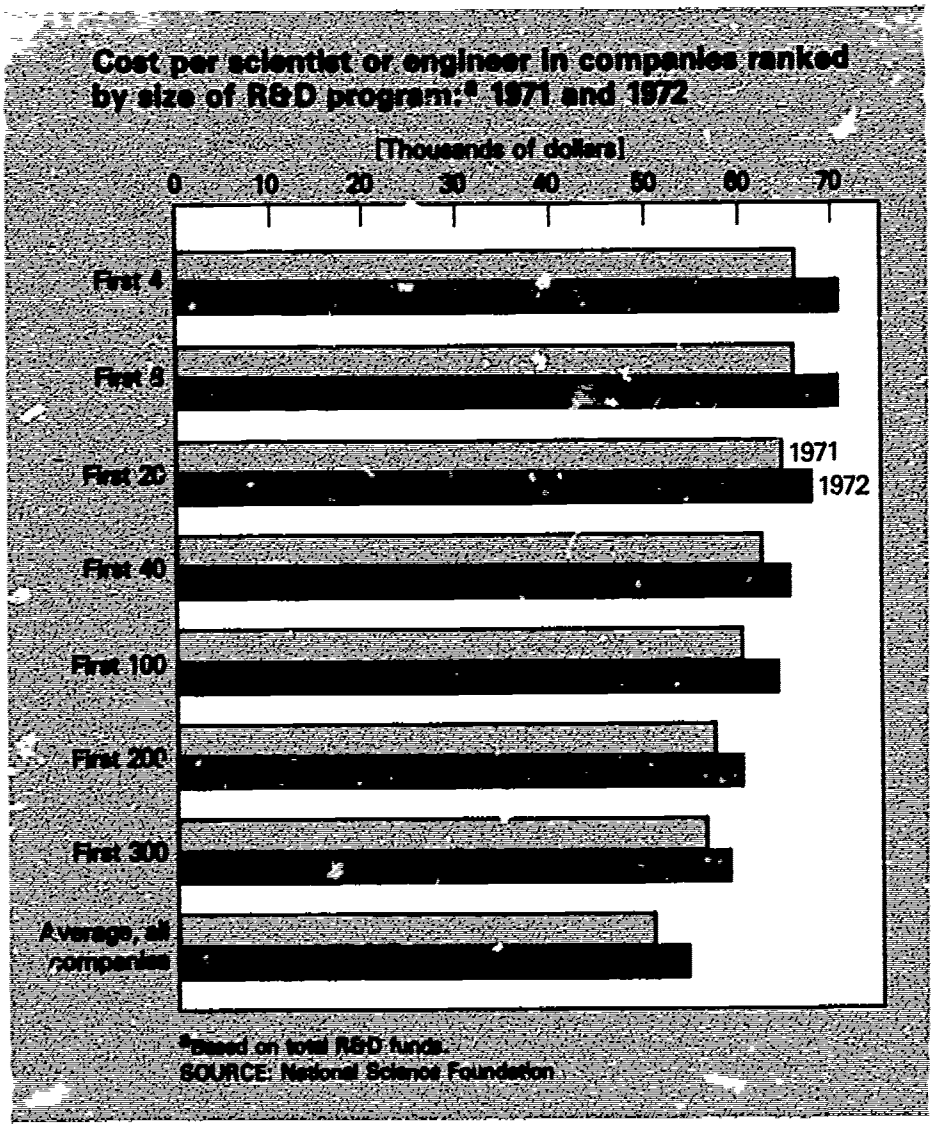

APPENDIXES

A. Technical Notes

B. Statistical Tables

C. Reproduction of Covering Letters, Questionnaire, and Instructions

APPENDIX A

Technical Notes

Scope of Study

The National Science Foundation sponsored its first survey of industrial research and development in 1953. Since then, the scope of the survey has gradually been expanded and refined in response to an increasing need for more detailed information on the Nation's R&D effort.

The 1972 industry survey is the 16th in the annual series sponsored by the Foundation and conducted by the Bureau of the Census, U.S. Department of Commerce. The Foundation also sponsored two industry surveys covering the 1953-56 period, which were conducted by the Bureau of Labor Statistics (BLS), U.S. Department of Labor.[1] Data obtained in the BLS surveys are not directly comparable with the Census figures for 1957-71 because of methodological and other differences in the surveys conducted by the two agencies. In addition, the Census surveys, beginning in 1957, have collected data on the R&D activities of Federally Funded Research and Development Centers (FFRDC's) operated by business firms, whereas the earlier BLS surveys did not. To account for the R&D performance of these research centers in 1956, Census adjusted data for that year (collected in the 1957 survey) to provide comparable trend data for 1956 and earlier years.

The statistics presented in this report are subject to response and concept errors caused by differences between survey and industry concepts and definitions of R&D activities and by variations in company accounting procedures. Consequently, the accuracy of the data provided by respondents is subject to some variation.

Since the first industry survey in 1953, the quality of the data has improved substantially. This results mainly from more accurate and sophisticated accounting procedures adopted by respondents. In addition, the Foundation and the Bureau of the Census have continued their efforts to reduce response and concept errors arising from difficulties in interpreting or applying survey definitions.

Survey Definitions

Research and development—Basic and applied research in the sciences and engineering and the design and development of prototypes and processes. This definition excludes quality control, routine product testing, market research, sales promotion, sales service, research in the social sciences or psychology, and other nontechnological activities or technical services.

Basic research—Original investigations for the advancement of scientific knowledge not having specific commercial objectives, although such investigations may be in fields of present or potential interest to the reporting company.

Applied research—Investigations directed to the discovery of new scientific knowledge having specific commercial objectives with respect to products or processes. This definition differs from that of basic research chiefly in terms of the objectives of the reporting company.

Development—Technical activities of a nonroutine nature concerned with translating research findings or other scientific knowledge into products or processes. Does not include routine technical services to customers or other activities excluded from the above definition of research and development.

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[1] National Science Foundation, *Science and Engineering in American Industry Final Report on a 1953-54 Survey* (NSF 56-16) and *Science and Engineering in America's Industry, 1956* (NSF 59-50) (Washington, D.C. 20402: Supt. of Documents, U.S. Government Printing Office).

[2] For more detailed information on definitions, as well as the instructions for individual items covered in the survey questionnaire, see appendix C.

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Development—Technical activities of a nonroutine nature concerned with translating research findings or other scientific knowledge into products or processes. Does not include routine technical services to customers or other activities excluded from the above definition of research and development.

Funds for research and development—Operating expenses incurred by a company in the conduct of research and development in its own laboratories or other company-owned or-operated facilities. Includes wages and salaries, materials and supplies consumed, property and other taxes, maintenance and repairs, depreciation, and an appropriate share of overhead, but excludes capital expenditures. Funds for R&D performance are expressed in current dollars rather than in constant dollars.

Federally financed research and development—Receipts for work done by the company on R&D contracts or subcontracts and R&D portions of procurement contracts and subcontracts.

Company-financed research and development—Cost of the company-sponsored research and development performed within the company. Does not include company-financed research and development contracted to outside organizations, such as research institutions, universities and colleges, or other nonprofit organizations.

R&D scientists and engineers—The January number of those engaged full time in research and development and the full-time equivalent (FTE) of those working part time. Scientists and engineers are defined as persons engaged in scientific or engineering work at a level which requires a knowledge of physical, life, engineering, or mathematical sciences equivalent at least to that acquired through completion of a 4-year college course with a major in one of those fields.

Total employment—Total number of persons employed by the company in all activities during the pay period which includes the 12th of March. These data are not completely comparable with employment of R&D scientists and engineers data which are collected (1) as of January and (2) on a man-year basis.

Net sales and receipts—Recorded dollar values for goods sold or services rendered by a company to customers outside the company, including the Federal Government, less such items as returns, allowances, freight charges, and excise taxes. Excludes domestic intracompany transfers as well as sales by foreign subsidiaries, but includes transfers to foreign subsidiaries. Net sales and receipts figures are expressed in current dollars rather than constant dollars.

Geographic area covered—Includes only those operations located in the 50 States and the District of Columbia.

[2] For more detailed information on definitions, as well as the instructions for individual items covered in the survey questionnaire, see appendix C.

Explanation of Tabular Data

Industry classification—Industries and industry groups shown separately in statistical tables are classified according to their *Standard Industrial Classification Manual*[3] codes as follows:

Food and kindred products (20)
Textiles and apparel (22,23)
Lumber, wood products, and furniture (24,25)
Paper and allied products (26)

Chemicals and allied products (28)
- Industrial chemicals (281-82)
- Drugs and medicines (283)
- Other chemicals (284-89)

Petroleum refining and extraction (29, 13)[4]
Rubber products (30)
Stone, clay, and glass products (32)
Primary metals (33)
- Ferrous metals and products (331-32,3391,3399)
- Nonferrous metals and products (333-36, 3392)

Fabricated metal products (34)
Machinery (35)
Electrical equipment and communication (36, 48)[4]
- Radio and TV receiving equipment (365)
- Communication equipment and electronic components (366-67, 48)
- Other electrical equipment (361-64 and 369)

Motor vehicles and other transportation equipment 8(371,7 373-75, 379)
Aircraft and missiles (372, 19)[5]

- Professional and scientific instruments (38)
- Scientific and mechanical measuring instruments (381-82)
- Optical, surgical, photographic, and other instruments (383-87)

Other manufacturing industries—tobacco manufacturers (21), printing and publishing (27), leather products (31), and miscellaneous manufacturing industries (39)

Nonmanufacturing industries—agriculture, forestry, and fisheries (07-09); mining (10-12,14); contract construction (15-17); transportation and other public utilities (41-47, 49); wholesale and retail trade (50-59); finance, insurance, and real estate (60-67); and selected service industries (739, 807, 891).

Company size-class—The size of a company as determined by the total number of its employees. The four company size-classes used in this report are less than 1,000 employees; 1,000 to 4,999 employees; 5,000 to 9,999 employees; and 10,000 or more employees.

Classification of reporting units—The company or corporate family which includes all establishments under common ownership or control. Similarly, each company was classified in a single size-category on the basis of its total employment.

Cost per R&D scientist or engineer—The number of R&D scientists and engineers used to estimate the cost per R&D scientist or engineer for 1957-72 is the arithmetic mean of the numbers of R&D scientists and engineers reported in each industry for January in 2 consecutive years.

Nonavailability of certain statistics—Estimates withheld for not meeting publication standards for reasons such as excessively high associated sampling error of estimate; high rate of imputation because of failure of companies to report; possible disclosure of data of an individual company; or cases where data were inconsistent for inclusion in a time series. In tables, the term "not separately available but included in total" indicates statistics could not be published for any of these reasons.

Method of computation—Detailed statistics in the tables may not add to totals or subtotals because of rounding. Also, percentages were calculated on the basis of thousands of dollars and may differ from those based on the rounded figures shown.

Methodology of Survey[6]

The sample used for the 1972 Survey of Industrial Research and Development represented all manufacturing industries and those nonmanufacturing industries,

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[3] Executive Office of the President, Bureau of the Budget, *Standard Industrial Classification Manual, 1967* (Washington, D.C. 20402: Supt. of Documents, U.S. Government Printing Office). Industry group code numbers are shown in parentheses.

[4] For the purposes of this study, crude petroleum and extraction (13) is grouped with petroleum refining (29), and communication (48) is grouped with electrical equipment (36), in the manufacturing group of industries.

[5] Companies primarily engaged in the manufacture of ordnance and accessories, including complete guided missiles, are grouped with companies primarily engaged in the manufacture of aircraft and parts because of close similarity of R&D activities carried out by major companies in the two industries.

[6] This section was prepared in the Industry Division of the Bureau of the Census, Social and Economic Statistics Administration, the collecting and compiling agent for the National Science Foundation in this survey.

[7] U. S. Bureau of the
Supt. of Documents, U.

Nonmanufacturing industries—agriculture, forestry, and fisheries (07-09); mining (10-12,14); contract construction (15-17); transportation and other public utilities (41-47, 49); wholesale and retail trade (50-59); finance, insurance, and real estate (60-67); and selected service industries (739, 807, 891).

Company size-class—The size of a company as determined by the total number of its employees. The four company size-classes used in this report are less than 1,000 employees; 1,000 to 4,999 employees; 5,000 to 9,999 employees; and 10,000 or more employees.

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Cost per R&D scientist or engineer—The number of R&D scientists and engineers used to estimate the cost per R&D scientist or engineer for 1957-72 is the arithmetic mean of the numbers of R&D scientists and engineers reported in each industry for January in 2 consecutive years.

Nonavailability of certain statistics—Estimates withheld for not meeting publication standards for reasons such as excessively high associated sampling error of estimate; high rate of imputation because of failure of companies to report; possible disclosure of data of an individual company; or cases where data were inconsistent for inclusion in a time series. In tables, the term "not separately available but included in total" indicates statistics could not be published for any of these reasons.

Method of computation—Detailed statistics in the tables may not add to totals or subtotals because of rounding. Also, percentages were calculated on the basis of thousands of dollars and may differ from those based on the rounded figures shown.

Methodology of Survey[6]

The sample used for the 1972 Survey of Industrial Research and Development represented all manufacturing industries and those nonmanufacturing industries, known on the basis of earlier, more detailed samples to conduct or to finance research and development. The sampling unit for the survey was the company, defined as a business organization consisting of one or more establishments under common ownership or control. All manufacturing companies with 1,000 or more employees in 1967, as determined from the 1967 Economic Censuses Enterprise Statistics[7] multi-unit file, were included in the sample with certainty. Manufacturing companies with fewer than 1,000 employees were sampled at rates depending upon their industry and employment size, based upon the 1967 Economic Censuses Enterprise Statistics multi-unit file and the 1967 Census of Manufactures universe file. For selected nonmanufacturing industries (SIC 7391, 7392, 7397, and 8911) the sample was drawn from the 1967 Economic Censuses Enterprise Statistics file. For all other nonmanufacturing industries, the sample was based on the 1966 records of the Social Security Administration.

Approximately 8,000 manufacturing and nonmanufacturing companies are represented in the 1972 sample. Questionnaires were mailed to approximately 1,400 of these. About 1,200 of the companies included are certainty companies which accounted for over 90 percent of the total R&D performance funds. Appendix table A-1 shows the probabilities of selection applied for each industry-size stratum. The probabilities of being selected in the survey range from one chance in 200 (.005) to certainty (1.000).

Each year the annual Department of Defense (DOD) and National Aeronautics and Space Administration (NASA) lists of R&D contractors are reviewed to ensure the inclusion of large contractors in the sample. For the 1972 survey, the 80 largest companies from DOD list and the 50 largest NASA contractors were included in the sample with certainty regardless of their industry class and employment size. The 80 largest companies from the DOD list accounted for 92 percent of the total contract awards of all companies included on the DOD list. The 50 largest companies from the NASA list accounted for 84 percent of the total contract awards of all companies included on the NASA list.

The particular sample selected is one of a large number of samples of the same type and size that, by chance,

[6] This section was prepared in the Industry Division of the Bureau of the Census, Social and Economic Statistics Administration, the collecting and compiling agent for the National Science Foundation in this survey.

[7] U. S. Bureau of the Census, *Enterprise Statistics, 1967* (Washington, D.C. 20404: Supt. of Documents, U.S. Government Printing Office).

might have been selected. Estimates from each of the different samples would differ somewhat from each other, and from the results of a complete canvass conducted under essentially the same conditions as the survey. This variation among the possible estimates is defined by the sampling error, measured in standard error units. The complete canvass total would be included in the range—

1. From one standard error below to one standard error above the derived estimate for about two-thirds of all possible samples.

2. From two standard errors below to two standard errors above the derived estimate for about 95 percent of all possible samples.

3. From three standard errors below to three standard errors above the derived estimate, almost always.

These values may be interpreted as defining approximate probabilities that the estimate shown would differ from a complete canvass total by as much as one, two, or three standard errors, respectively. For example, if an estimate is shown as 400, with an associated relative standard error of 2 percent, the chances are roughly two out of three that the complete canvass total would lie between 392 and 408; the chances are roughly 19 out of 20 that the complete canvass total would lie between 384 and 416; and it is almost certain that the complete canvass total would lie between 376 and 424.

As stated, the standard error refers only to sampling variations. In addition to the sampling errors as measured by the standard error, the estimates are subject to errors in response, coding, processing, and imputation for nonresponse. These nonsampling errors would also occur if a complete canvass were to be conducted under the same conditions as the survey. The 1972 standard errors of estimates for each industry, for all companies and for those with fewer than 1,000 employees, are shown in appendix table A-2. The forms for the survey were mailed in March 1973, and nonrespondents were followed up by mail. The basic forms used were Form RD-1 and RD-11, but since total R&D performance funds and total Federal funds expended by industry for research and development are included in the Census Bureau's mandatory statistical program, the few large companies that did not reply were mailed the Census Form MA-121, which collects total R&D and Federal R&D funds. Less than 1 percent of total R&D funds were obtained in this way and included in this report.

Appendix table A-3 shows the percent of total R&D funds for which a distribution by basic research, applied research, and development was estimated by the Bureau of the Census in the absence of respondent distributed data for 1972.

Comparability of Data Over A Period of Several Years

In the surveys of industrial research and development, there has been substantial comparability over any 2-year period. This is because the respondent has had before him, on the same report form used in filing current data, the figures for the previous year as reported by the respondent and as entered on the form by the Census Bureau before mailing; the respondent has been asked to adjust the data for the previous year as necessary to make it comparable to those of the current year. Such adjustments have been made to reflect, for example, changes in reporting concepts or company structure such as mergers or acquisitions. To maintain some measure of consistency, the employment-size classification of any company affected by such changes has been adjusted so that the company is tabulated in the same employment-size category for two consecutive years.

Some measure of the degree of change reflecting these adjustments in contrast to an actual change in R&D activity, can be gained by comparing figures for the same year reported for two succeeding reporting periods; e.g., 1971 R&D statistics in the final report of the 1971 survey and the revised 1971 R&D statistics in the final report of the 1972 survey. The totals for broad classification are likely to be very close in the two reports, but in the finer detail, larger differences are noticable. The results underscore the point that the measures are approximate and indicative rather than precise.

When tables covering more than two years were prepared for this report, it was not considered feasible to carry most revisions back more than one year.

Industry Codes For 1963—72[a]

The industry codes appearing in the tables are based on the 1967 Standard Industrial Classification (SIC) Manual. The SIC classifications for individual companies for 1963-67 were originally determined by data reported in the 1963 Economic Censuses. Between 1963 and 1967, the SIC code for a company generally remained fixed and reflected that company's principal activity in 1963. However, under certain circumstances—such as the merger of two or more c
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research, and development was estimated by the Bureau of the Census in the absence of respondent distributed data for 1972.

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Some measure of the degree of change reflecting these adjustments in contrast to an actual change in R&D activity, can be gained by comparing figures for the same year reported for two succeeding reporting periods; e.g., 1971 R&D statistics in the final report of the 1971 survey and the revised 1971 R&D statistics in the final report of the 1972 survey. The totals for broad classification are likely to be very close in the two reports, but in the finer detail, larger differences are noticable. The results underscore the point that the measures are approximate and indicative rather than precise.

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The industry codes appearing in the tables are based on the 1967 Standard Industrial Classification (SIC) Manual. The SIC classifications for individual companies for 1963-67 were originally determined by data reported in the 1963 Economic Censuses. Between 1963 and 1967, the SIC code for a company generally remained fixed and reflected that company's principal activity in 1963. However, under certain circumstances—such as the merger of two or more companies; the acquisition of one company by another; or the formation of "conglomerates"—the 1963 SIC code for a company could have changed.

Most industry groups were characterized by relatively minor changes in the SIC codes for companies classified in those groups, and the tabulated data for such groups remained substantially comparable between 1963 and 1967. However, some industry groups were characterized by significant changes in the SIC codes for companies originally classified in those groups in 1963. The effect of these changes became most noticeable toward the end of the 4-year intercensal period, with the result that revisions to industry totals resulting from these code changes tended to reflect disproportionately large fluctuations between the data for 1967 and the year immediately preceding.

To remedy these apparent discrepancies, the data for affected industries were adjusted in the following manner. For companies changing industry codes between 1963 and 1967, the industry data for each of the four years affected (1964 through 1967) were estimated to have changed at the constant rate of 25 percent per year. Accordingly, the data for the industry in which such a company had been classified in 1963 were deflated by 25 percent per year for each of the years 1964-67. Similarly, the data for the industry in which such a company was classified in 1967 were inflated by 25 percent per year for each of the years 1964-67. The industry code assigned to a company for 1967 is also used to classify that company's activities for the years 1968-72.

The following measures were adjusted in this manner: Number of scientists and engineers; funds for research and development—total, Federal, and company; net sales; cost per R&D scientist and engineer; and basic research expenditures. These historical data appear, for example, in selected tables of the 1972 NSF publication on research and development in industry. (See appendix tables B-3, B-7, B-10, B-25, B-31, B-38, B-39, and B-45.) No adjustments were made in data for other measures, nor have similar adjustments been made for any data or for any company industry code subsequent to 1967.

[8] For a discussion of industry codes for 1962 and earlier years, see National Science Foundation, *Research and Development in Industry, 1970* (NSF 72-309) (Washington, D.C. 20402. Supt. of Documents, U.S. Government Printing Office), 1972.

Table A-1.—Sampling ratios used in the selection of manufacturing and nonmanufacturing companies included in the survey of industrial research and development, by industry and size of company, 1972

Industry	SIC code[1]	Companies with total employment of—				
		1-49	50-99	100-499	500-999	1,000 or more
Agriculture, forestry, and fisheries	07-09	[2]	0.010	0.020	0.200	1.000
Mining, except petroleum extraction	10-12,14	[2]	.050	050	.100	1.000
Contract construction	15-17	[2]	.050	.100	.500	1.000
Food and kindred products	20	.005	.005	.033	.500	1.000
Textiles and apparel	22,23	.005	.005	.025	1.000	1.000
Lumber, wood products, and furniture	24,25	.005	.005	.050	.500	1.000
Paper and allied products	26	.005	.005	.050	1.000	1.000
Industrial chemicals	281-82	.033	.083	1.000	1.000	1.000
Drugs and medicines	283	.250	.250	1.000	1.000	1.000
Other chemicals	284-89	.007	.007	.333	1.000	1.000
Petroleum refining and extraction	29,13	.050	.050	1.000	1.000	1.000
Rubber products	30	.007	.007	.143	1.000	1.000
Stone, clay, and glass products	32	.005	.005	.143	1.000	1.000
Ferrous metals and products	331-32,3391,3399	.005	.005	.100	1.000	1.000
Nonferrous metals and products	333-36,3392	.005	.005	.500	1.000	1.000
Fabricated metal products	34	.005	.005	.100	1.000	1.000
Machinery	35	.005	.005	.100	1.000	1.000
Radio and TV receiving equipment	365	.067	.067	1.000	1.000	1.000
Communication equipment and electronic components	366-67,48	.025	.025	1.000	1.000	1.000
Other electrical equipment	361-64,369					
Motor vehicles and other transportation equipment	[3]71,373-75,379					
Aircraft and missiles	372,19					
Scientific and mechanical measuring instruments	381-82					
Optical, surgical, photographic, and other instruments	383-87					
Transportation, except railroads[3]	41-47					
Public utilities and sanitary services	49					
Wholesale trade	50-52					
Retail trade	53-59					
Finance, insurance, and real estate	60-67					
Miscellaneous business services	739					
Medical and dental laboratories	807					
Engineering and architectural services	891					
Other manufacturing industries	21,27,31,39					
Other nonmanufacturing industries	.....					

[1] Executive Office of the President, Bureau of the Budget, *Standard Industrial Classification Manual, 1967* (Washington, D. C. 20402: Supt. of Documents, U. S. Government Printing Office.)

[2] Companies in this employment-size group and industry group were not sampled.

[3] Companies primarily engaged in rail transportation were not i surveys, such companies account annually for a relatively small a national total (less than 0.25 percent).

1.—Sampling ratios used in the selection of manufacturing and facturing companies included in the survey of industrial research nd development, by industry and size of company, 1972

s with total employment of—			
	100-499	500-999	1,000 or more
010	0 020	0.200	1.000
050	.050	.100	1.000
050	.100	.500	1.000
005	.033	.500	1.000
005	.025	1.000	1.000
005	050	.500	1.000
005	.050	1.000	1.000
083	1.000	1.000	1.000
250	1.000	1.000	1.000
007	.333	1.000	1.000
050	1 000	1.000	1.000
007	.143	1.000	1.000
005	.143	1.000	1.000
005	.100	1.000	1.000
005	.500	1.000	1.000
005	.100	1.000	1.000
005	.100	1.000	1.000
067	1.000	1.000	1.000
025	1 000	1.000	1.000

ustrial Classification Manual, 1967

Industry	SIC code	Companies with total employment of—				
		1-49	50-99	100-499	500-999	1,000 or more
Other electrical equipment	361-64,369	.050	.050	.250	1.000	1.000
Motor vehicles and other transportation equipment	371,373-75,379	.014	.014	.333	1.000	1.000
Aircraft and missiles	372.19	.083	.083	1 000	1.000	1.000
Scientific and mechanical measuring instruments	381-82	.143	.143	1.000	1.000	1.000
Optical, surgical, photographic, and other instruments	383-87	.050	.050	1.000	1.000	1.000
Transportation, except railroads[1]	41-47	(2)	.020	.020	.100	1.000
Public utilities and sanitary services	49	(2)	.100	.500	1.000	1.000
Wholesale trade	50-52	(2)	.010	.020	.200	1.000
Retail trade	53-59	(2)	.010	.020	.200	1.000
Finance, insurance, and real estate	60-67	(2)	.010	.020	.200	1.000
Miscellaneous business services	739	.005	.200	.200	1.000	1.000
Medical and dental laboratories	807	(2)	1.000	1.000	1.000	1.000
Engineering and architectural services	891	.005	.500	1 000	1.000	1.000
Other manufacturing industries	21,27,31,39	.005	.005	.050	1.000	1.000
Other nonmanufacturing industries		(2)	.010	.020	.200	1.000

[1] Companies primarily engaged in rail transportation were not included in the sample because, according to earlier surveys, such companies account annually for a relatively small amount of research and development in terms of the national total (less than 0 25 percent).

Table A-2.—Standard error of estimates (percentage) of funds for R&D performance for all company size groups and for companies with less than 1,000 employees, by industry: 1972[1]

Industry	Total	Companies with less than 1,000 employees
Total	(2)	1
Food and kindred products	2	20
Textiles and apparel	(2)	(2)
Lumber, wood products, and furniture	6	41
Paper and allied products	1	34
Chemicals and allied products	2	28
Industrial chemicals	(2)	12
Drugs and medicines	(2)	5
Other chemicals	10	49
Petroleum refining and extraction	(2)	6
Rubber products	3	48
Stone, clay, and glass products	3	41
Primary metals	1	16
Ferrous metals and products	1	6
Nonferrous metals and products	1	28
Fabricated metal products	9	52
Machinery	1	15
Electrical equipment and communication	(2)	11
Radio and TV receiving equipment	(2)	(2)
Communication equipment and electronic components	(2)	18
Other electrical equipment	(2)	11
Motor vehicles and other transportation equipment	(2)	39
Aircraft and missiles	(2)	5
Professional and scientific instruments	1	7
Scientific and mechanical measuring instruments	3	11
Optical, surgical, photographic, and other instruments	(2)	5
Other manufacturing industries	1	8
Nonmanufacturing industries	(2)	1

[1] A description of the standard error of estimate is given in appendix A under "Methodology of Survey." The percentage (or relative) standard errors in this table may be converted to standard errors of estimate by multiplying the percentage shown by the associated estimate. For example, the relative standard error of estimate for R&D performance of all company-size groups in the food and kindred products industry (SIC 20) is shown as .2 percent, and the associated total R&D estimate for this industry is shown as $258 million in the table entitled, "Funds for R&D Performance by Industry and Selected Company Size Groups, 1972." The standard error of estimate, then, is .02 times 258 equal 5.16.

[2] Less than 0.5 percent.

Table A-3.—Percent of total R&D funds [illegible] research, applied research, and developm[illegible] of respondent distribut[illegible]

Industry
Total
Food and kindred products
Textiles and apparel
Lumber, wood products, and furniture
Paper and allied products
Chemicals and allied products
Industrial chemicals
Drugs and medicines
Other chemicals
Petroleum refining and extraction
Rubber products
Stone, clay, and glass products
Primary metals
Ferrous metals and products
Nonferrous metals and products
Fabricated metal products
Machinery
Electrical equipment and communication
Radio and TV receiving equipment
Communication equipment and electronic components
Other electrical equipment
Motor vehicles and other transportation equipment
Aircraft and missiles
Professional and scientific instruments
Scientific and mechanical measuring instruments
Optical, surgical, photographic, and other instrumen[illegible]
Other manufacturing industries
Nonmanufacturing industries

[1] More than 50 percent.

s (percentage) of funds
y size groups and for
ees, by industry: 1972[1]

	Total	Companies with less than 1,000 employees
.....	(2)	1
.....	2	20
.....	(2)	(2)
.....	6	41
.....	1	34
.....	2	28
.....	(2)	12
.....	(2)	5
.....	10	49
.....	(2)	6
.....	3	48
.....	3	41
.....	1	16
.....	1	6
.....	1	28
.....	9	52
.....	1	15
.....	(2)	11
.....	(2)	(2)
.....	(2)	18
.....	(2)	11
.....	(2)	39
.....	(2)	5
.....	1	7
.....	3	11
.....	(2)	5
.....	1	8
.....	(2)	1

der "Methodology of Survey." The percentage
ors of estimate by multiplying the percentage
estimate for R&D performance of all company-
percent, and the associated total R&D estimate
ds for R&D Performance by Industry and
times 258 equal 5.16

Table A-3.—Percent of total R&D funds for which a distribution by basic research, applied research, and development was estimated in the absence of respondent distributed data: 1972

Industry	SIC code	Percent
Total	.....	7
Food and kindred products	20	14
Textiles and apparel	22,23	41
Lumber, wood products, and furniture	24,25	(1)
Paper and allied products	26	8
Chemicals and allied products	28	7
Industrial chemicals	281-82	2
Drugs and medicines	283	10
Other chemicals	284-87,289	17
Petroleum refining and extraction	29,13	1
Rubber products	30	9
Stone, clay, and glass products	32	9
Primary metals	33	23
Ferrous metals and products	331-32,3391,3399	37
Nonferrous metals and products	333-36,3392	9
Fabricated metal products	34	32
Machinery	35	6
Electrical equipment and communication	36,48	9
Radio and TV receiving equipment	365	(1)
Communication equipment and electronic components	366-67,48	11
Other electrical equipment	361-64,369	5
Motor vehicles and other transportation equipment	371,373-75,379	2
Aircraft and missiles	372,19	1
Professional and scientific instruments	38	7
Scientific and mechanical measuring instruments	381-82	38
Optical, surgical, photographic, and other instruments ..	383-87	2
Other manufacturing industries	21,27,31,39	23
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	19

[1] More than 50 percent.

APPENDIX B
Statistical Tables

In all tables of this report—

- **Details may not add to totals because of rounding.**
- **Percentages were calculated on the basis of thousands of dollars and may differ from those based on the rounded figures shown.**
- **Percentage changes are increases unless otherwise indicated.**

Total Funds for Research and Development

Federal Funds for Research and Development

Company Funds for Research and Development

Geographic Dist

Distribution of

Employment of

Total Funds for Research and Development

Federal Funds for Research and Development

Company Funds for Research and Development

Geographic Distribution of R&D Funds

Distribution of R&D Funds, by Major Type of Cost

Employment of R&D Scientists and Engineers

R&D Funds Related to Employment and Net Sales

Funds for Research and Funds for Development

Table B-1.—Trends in funds for industrial research and development, by source: 1953-72

[Dollars in millions]

Year	Total R&D		Federal		Company[1]	
	Amount	Percent change from previous year	Amount	Percent of total	Amount	Percent of total
1953	$3,630	.....	$1,430	39	$2,200	61
1954[2]	4,070	12	1,750	43	2,320	57
1955[2]	4,640	14	2,180	47	2,460	53
1956	6,605	42	3,328	50	3,277	50
1957	7,731	17	4,335	56	3,396	44
1958	8,389	9	4,759	57	3,630	43
1959	9,618	15	5,635	59	3,983	41
1960	10,509	9	6,081	58	4,428	42
1961[3]	10,908	4	6,240	57	4,668	43
1962	11,464	5	6,434	56	5,029	44
1963	12,630	10	7,270	58	5,360	42
1964	13,512	7	7,720	57	5,792	43
1965	14,185	5	7,740	55	6,445	45
1966	15,548	10	8,332	54	7,216	46
1967	16,385	5	8,365	51	8,020	49
1968	17,429	6	8,560	49	8,869	51
1969	18,318	5	8,451	46	9,867	54
1970	18,062	—1	7,779	43	10,283	57
1971	18,311	1	7,666	42	10,645	58
1972	19,437	6	8,090	42	11,347	58

[1] Company funds include all funds for industrial research and development performed within company facilities except funds provided by the Federal Government. The data do not include company-financed research and development contracted to outside organizations such as research institutions, universities and colleges, or other nonprofit organizations. In 1972 industrial firms contracted $221 million in company-financed R&D projects to outside organizations.

[2] Estimates of funds by source were derived by interpolating data on source of funds obtained in 1953 and 1956 surveys of industrial research and development.

[3] Funds by source estimated by the National Science Foundation.

Table B-2.—Selected data for R&D-performing companies, by industry, 1971 and 1972

[Dollars in millions]

Industry[1]	SIC code	Total R&D funds		Federal R&D funds		Company R&D funds	
		1971	1972	1971	1972	1971	1972
Total		$18,311	$19,437	$7,666	$8,090	$10,645	$11,347
Food and kindred products	20	245	258	2	1	244	257
Tobacco manufactures	21	33	34	—	—	33	34
Textile mill products	22	52	54	—	—	52	54
Apparel	23	7	7	1	1	7	6
Lumber and wood products, except furniture	24	26	27	(2)	(2)	(2)	(2)
Furniture and fixtures	25	22	24	—	—	22	24
Paper and allied products	26	187	186	(2)	(2)	(2)	(2)
Printing, publishing, and allied industries	27	29	32	—	—	29	32
Chemicals and allied products	28	1,819	1,909	184	196	1,635	1,713
Petroleum refining and extraction	29,13	505	473	17	15	488	458
Rubber products	30	230	263	19	32	211	231
Leather and leather products	31.12	7	7	—	—	7	7
Stone, clay, and glass products	32	155	167	3	3	152	164
Primary metals	33	272	264	6	12	266	252
Fabricated metal products	34	233	241	11	11	222	230
Machinery	35	1,773	1,964	291	339	1,482	1,625
Electrical equipment and communication	36.48	4,534	4,946	2,302	2,504	2,232	2,442
Transportation and ordnance	37.19	6,668	6,996	4,201	4,372	2,467	2,624
Professional and scientific instruments	38	744	804	172	168	572	636
Miscellaneous manufacturing industries	39	67	70	(2)	(2)	(2)	(2)
Electric, gas, and sanitary services	49	49	78	9	7	40	70
Miscellaneous business services	739	421	419	339	329	82	90
Miscellaneous services	89	154	152	90	90	64	62

Industry	SIC code	R& an Janu 197
Total		34
Food and kindred products	20	
Tobacco manufactures	21	
Textile mill products	22	
Apparel	23	
Lumber and wood products, except furniture	24	
Furniture and fixtures	25	
Paper and allied products	26	
Printing, publishing, and allied industries	27	
Chemicals and allied products	28	4
Petroleum refining and extraction	29.13	
Rubber products	30	
Leather and leather products	31.12	
Stone, clay, and glass products	32	
Primary metals	33	
Fabricated metal products	34	
Machinery	35	4
Electrical equipment and communication	36.48	8
Transportation and ordnance	37.19	10
Professional and scientific instruments	38	1
Miscellaneous manufacturing industries	39	
Electric, gas, and sanitary services	49	
Miscellaneous business services	739	
Miscellaneous services	89	

[1] Industries, industry group, and product fields shown separately in statistical tables are classified according to thier Standard Industrial Classification Manual codes. See appendix A, footnote 3.

[2] Not separately available but included in total.

Table B-2.—Selected data for R&D-performing companies, by industry, 1971 and 1972

[Dollars in millions]

R&D funds		Federal R&D funds		Company R&D funds	
	1972	1971	1972	1971	1972
11	$19,437	$7,666	$8,090	$10,645	$11.347
45	258	2	1	244	257
33	34	—	—	33	34
52	54	—	—	52	54
7	7	1	1	7	6
26	27	(2)	(2)	(2)	(2)
22	24	—	—	22	24
87	186	(2)	(2)	(2)	(2)
29	32	—	—	29	32
19	1,909	184	196	1,535	1,713
05	473	17	15	488	458
30	263	19	32	211	231
7	7	—	—	7	7
55	167	3	3	152	164
72	264	6	12	266	252
33	241	11	11	222	230
73	1.964	291	339	1,482	1,625
34	4.946	2.302	2,504	2.232	2,442
68	6.996	4.201	4,372	2.467	2,624
44	804	172	168	572	636
67	70	(2)	(2)	(2)	(2)
49	7(	9	7	40	70
21	419	329	329	82	90
54	152	90	90	64	62

tely in statistical tables are classified according footnote 3.

Industry	SIC code	R&D scientists and engineers		Net sales		Total employment (thousands)	
		January 1972	January 1973	1971	1972	1971	1972
Total	.....	349,900	359,900	$532,776	$576,778	14,046	14,082
Food and kindred products	20	6,600	6,700	52,988	56,328	961	984
Tobacco manufactures	21	800	800	8,473	8,724	112	113
Textile mill products	22	1,500	1,500	10,177	11,011	442	448
Apparel	23	300	300	2,434	2,611	144	153
Lumber and wood products, except furniture	24	800	900	4,197	4,689	133	133
Furniture and fixtures	25	900	900	2,989	3,159	119	125
Paper and allied products	26	4,900	4,900	20,858	22,561	609	612
Printing, publishing, and allied industries	27	900	900	4,453	4,679	141	139
Chemicals and allied products	28	40,900	41,600	48,219	52,469	1,049	1,062
Petroleum refining and extraction	29,13	8,300	8,200	58,264	62,308	544	531
Rubber products	30	5,800	5,800	12,549	13,764	365	367
Leather and leather products	31,12	200	200	847	1,414	60	60
Stone, clay, and glass products	32	3,900	4,000	9,267	10,218	333	343
Primary metals	33	6,000	5,700	33,398	36,500	1,089	1,038
Fabricated metal products	34	6,400	6,600	20,303	21,326	682	688
Machinery	35	41,100	42,600	45,849	49,734	1,483	1,479
Electrical equipment and communication	36,48	87,700	93,300	62,149	68,231	2,314	2,360
Transportation and ordnance	37,19	100,500	102,300	87,822	95,268	2,318	2,276
Professional and scientific instruments	38	15,100	15,700	13,320	14,795	460	475
Miscellaneous manufacturing industries	39	1,800	1,800	3,744	4,236	138	145
Electric, gas, and sanitary services	49	500	500	10,788	11,969	184	186
Miscellaneous business services	739	8,500	8,500	1,709	1,846	73	71
Miscellaneous services	89	4,200	4,200	896	938	30	29

Table B-3.—Funds for research and development, by industry and size of company: 1956-58 and 1963-72

[Dollars in millions]

Industry and size of company	SIC code[1]	1956	1957	1958	1963	1964	1965	1966
Total		$6,605	$7,731	$8,389	$12,630	$13,512	$14,185	$15,548
Distribution by industry								
Food and kindred products	20	64	74	83	130	144	157	164
Textiles and apparel	22,23	[1]	15	26	30	32	38	51
Lumber, wood products, and furniture	24,25	[1]	14	12	11	12	11	12
Paper and allied products	26	36	35	42	69	77	94	117
Chemicals and allied products	28	641	705	792	1,239	1,284	1,356	1,407
Industrial chemicals	281-82	460	503	553	809	865	908	918
Drugs and medicines	283	94	104	128	216	234	267	308
Other chemicals	284-89	87	98	111	214	185	181	181
Petroleum refining and extraction	29,13	182	211	246	317	393	397	371
Rubber products	30	[1]	107	89	156	158	162	168
Stone, clay, and glass products	32	60[2]	69[2]	75[2]	100	109	112	117
Primary metals	33	90	108	131	183	195	213	232
Ferrous metals and products[3]	331-32,3391,3399	[1]	64	80	106	116	128	139
Nonferrous metals and products	333-36,3392	[1]	44	51	77	79	85	93
Fabricated meral products	34	116	135	162	153	148	145	154
Machinery	35	543	669	781	958	1,015	1,065	1,217
Electrical equipment and communication	36,48	1,516	1,804	1,969	2,866	2,972	3,200	3,626
Radio and TV receiving equipment	365	[4]	[4]	[4]	[4]	[4]	[4]	47
Communication equipment and electronic components	366-67,48	[1]	748	868	1,773	1,872	1,989	2,249
Other electrical equipment	361-64,369	[1]	1,056	1,101	1,093	1,100	1,211	1,330
Motor vehicles and motor vehicles equipment	371	688	707	856	1,090	1,182	1,230	1,344
Other transportation equipment	373-75,379							
Aircraft and missiles	372,19	2,138	2,574	2,609	4,712	5,078	5,148	5,526
Professional and scientific instruments	38	200	249	294	284	331	403	468
Scientific and mechanical measuring instruments	381-82	97	139	156	70	74	80	87
Optical, surgical, photographic, and other instruments	383-87	103	110	138	214	257	323	381
Other manufacturing industries	21,27,31,39	[1]	93	105	54	65	71	77
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	[1]	[1]	117	276	319	384	497
Distribution by size of company (based on number of employees)								
Less than 1,000		369	542	532	619	632	659	621
1,000 to 4,999		550[2]	632[2]	642	1,022	1,035	956	1,043
5,000 to 9,999		5,686[2]	6,557[2]	7,215	10,989	11,846	12,569	793
10,000 or more								13,097

Industry and size of company	SIC code[1]	1967	1968
Total		$16,385	17
Distribution by industry			
Food and kindred products	20	183	
Textiles and apparel	22,23	57	
Lumber, wood products, and furniture	24,25	12	
Paper and allied products	26	128	
Chemicals and allied products	28	1,507	
Industrial chemicals	281-82	966	
Drugs and medicines	283	343	
Other chemicals	284-89	198	
Petroleum refining and extraction	29,13	371	
Rubber products	30	182	
Stone, clay, and glass products	32	136	
Primary metals	33	242	
Ferrous metals and products[3]	331-32,3391,3399	135	
Nonferrous metals and products	333-36,3392	107	
Fabricated metal products	34	163	
Machinery	35	1,326	
Electrical equipment and communication	36,48	3,867	
Radio and TV receiving equipment	365	45	
Communication equipment and electronic components	366-67,48	2,425	
Other electrical equipment	361-64,369	1,397	
Motor vehicles and motor vehicles equipment	371	1,354	
Other transportation equipment	373-75,379		
Aircraft and missiles	372,19	5,669	
Professional and scientific instruments	38	542	
Scientific and mechanical measuring instruments	381-82	104	
Optical, surgical, photographic and other instruments	383-87	438	
Other manufacturing industries	21,27,31,39	90	
Nonmanufacturing industries	07-12,14-17,41-47 49,67,739,807,891	559	
Distribution by size of company (based on number of employees)			
Less than 1,000		687	
1,000 to 4,999		1,017	
5,000 to 9,999		892	
10,000 or more		13,790	

[1] Not separately available but included in total
[2] Estimated by the National Science Foundation
[3] SIC codes 3391 and 3399 included in the nonfer metals and products group for 1956 to 1965.
[4] Included in the other electrical equipment group.

-3.—Funds for research and development, by industry and size of company: 1956-58 and 1963-72

[Dollars in millions]

958	1963	1964	1965	1966
$8,389	$12,630	$13,512	$14,185	$15,548
83	130	144	157	164
26	30	32	38	51
12	11	12	11	12
42	69	77	94	117
792	1,239	1,284	1,356	1,407
553	809	865	908	918
128	216	234	267	308
111	214	185	181	181
246	317	393	397	371
89	156	158	162	168
75[2]	100	109	112	117
131	183	195	213	232
80	106	116	128	139
51	77	79	85	93
162	153	148	145	154
781	958	1,015	1,065	1,217
1,969	2,866	2,972	3,200	3,626
[4]	[4]	[4]	[4]	47
868	1,773	1,872	1,969	2,249
1,101	1,093	1,100	1,211	1,330
856	1,090	1,182	1,230	1,344
2,609	4,71[illegible]	5,078	5,148	5,526
294	284	331	403	468
156	70	74	80	87
138	214	257	323	381
105	54	65	71	77
117	276	319	384	497
532	619	632	659	621
642	1,022	1,035	956	1,043
				793
7,215	10,989	11,846	12,569	13,092

Industry and size of company	SIC code[1]	1967	1968	1969	1970	1971	1972
Total		$16,385	17,429	$18,308	$18,062	$18,311	$19,437
Distribution by industry							
Food and kindred products	20	183	187	205	235	245	258
Textiles and apparel	22,23	57	58	60	58	59	61
Lumber, wood products, and furniture	24,25	12	19	15	48	48	51
Paper and allied products	26	128	144	188	178	187	186
Chemicals and allied products	28	1,507	1,588	1,659	1,766	1,819	1,909
Industrial chemicals	281-82	966	985	1,013	1,040	1,020	1,045
Drugs and medicines	283	343	393	434	464	510	558
Other chemicals	284-89	198	210	212	262	289	306
Petroleum refining and extraction	29.13	371	437	467	515	505	473
Rubber products	30	182	205	217	220	230	263
Stone, clay, and glass products	32	136	142	159	157	155	167
Primary metals	33	242	251	257	275	272	264
Ferrous metals and products[3]	331-32,3391,3399	135	135	136	149	144	137
Non-ferrous metals and products	333-36,3392	107	115	121	126	128	126
Fabricated metal products	34	163	183	182	200	233	241
Machinery	35	1,326	1,477	1,536	1,640	1,773	1,964
Electrical equipment and communication	36,48	3,867	4,105	4,401	4,352	4,534	4,946
Radio and TV receiving equipment	365	45	55	57	70	64	54
Communication equipment and electronic components	366-67,48	2,425	2,538	2,713	2,736	2,881	3,173
Other electrical equipment	361-64,369	1,397	1,512	1,631	1,546	1,589	1,719
Motor vehicles and motor vehicles equipment	371	1,354	1,491	1,558	1,582	1,756	1,982
Other transportation equipment	373-75,379						
Aircraft and missiles	372,19	5,669	5,776	5,909	5,245	4,912	5,014
Professional and scientific instruments	38	542	660	734	745	744	804
Scientific and mechanical measuring instruments	381-82	104	112	109	118	110	123
Optical, surgical, photographic, and other instruments	383-87	438	548	625	627	633	680
Other manufacturing industries	21,27,31,39	90	102	107	132	136	143
Nonmanufacturing industries	07-12,14-17,41-47 49,67,739,807,891	559	603	655	705	704	711
Distribution by size of company (based on number of employees)							
Less than 1,000		687	[1]	[1]	904	884	886
1,000 to 4,999		1,017	[1]	[1]	1,233	1,195	1,273
5,000 to 9,999		892	969	1,033	1,095	1,170	1,238
10,000 or more		13,790	14,780	15,435	14,830	15,063	16,039

up for 1956 to 1965

Table B-4. Funds for research and development, by industry and selected company size group: 1972

Industry	SIC code	Millions of dollars			Percent distribution		
		Companies with total employment of—			Companies with total employment of—		
		Total	5,000 to 9,999	10,000 or more	Total	5,000 to 9,999	10,000 or more
Total		$19,437	$1,238	$16,039	100	6	83
Food and kindred products	20	258	28	173	100	11	67
Textiles and apparel	22,23	61	5	41	100	8	67
Lumber, wood products, and furniture	24,25	51	7	24	100	14	47
Paper and allied products	26	186	13	150	100	7	81
Chemicals and allied products	28	1,909	326	1,283	100	17	67
Industrial chemicals	281-82	1,045	41	923	100	4	88
Drugs and medicines	283	558	222	239	100	40	43
Other chemicals	284-89	306	64	121	100	21	40
Petroleum refining and extraction	29,13	473	21	430	100	4	91
Rubber products	30	263	18	210	100	7	80
Stone, clay, and glass products	32	167	23	126	100	14	75
Primary metals	33	264	19	185	100	7	70
Ferrous metals and products	331-32, 3391,3399	137	(1)	98	100	(1)	72
Nonferrous metals and products	333-36,3392	126	(1)	87	100	(1)	69
Fabricated metal products	34	241	32	128	100	13	53
Machinery	35	1,964	100	1,606	100	5	82
Electrical equipment and communication	36,48	4,946	288	4,377	100	6	88
Radio and TV receiving equipment	365	54	(1)	38	100	(1)	70
Electronic components	367	3,173	207	2,799	100	7	88
Communication equipment & communication	366,48						
Other electrical equipment	361-64,369	1,719	(1)	1,540	100	(1)	90
Motor vehicles and motor vehicles equipment	371	1,962	39	1,911	100	2	96
Other transportation equipment	373-75,379						
Aircraft and missiles	372,19	5,014	139	4,770	100	3	95
Professional and scientific instruments	38	804	154	473	100	19	59
Scientific and mechanical measuring instruments	381,82	123	48	11	100	39	9
Optical, surgical, photographic, and other instruments	383-87	680	105	462	100	15	68
Other manufacturing industries	21,27,31,39	143	16	81	100	11	57
Nonmanufacturing industries	07-12,14-17,41-47 49-67,739,807,891	711	10	70	100	1	10

[1] Not separately available but included in total.

Table B-5.—Funds for research and and selected company s

Industry	SIC code	M
		Total
Total		$18,31
Food and kindred products	20	2
Textiles and apparel	22,23	
Lumber, wood products, and furniture	24,25	
Paper and allied products	26	1
Chemicals and allied products	28	1,81
Industrial chemicals	281-82	1,02
Drugs and medicines	283	51
Other chemicals	284-89	2
Petroleum refining and extraction	29,13	50
Rubber products	30	23
Stone, clay, and glass products	32	15
Primary metals	33	27
Ferrous metals and products	331-32, 3391,3399	14
Nonferrous metals and products	333-36,3392	12
Fabricated metal products	34	23
Machinery	35	1,77
Electrical equipment and communication	36,48	4,53
Radio and TV receiving equipment	365	6
Electronic components	367	2,88
Communication equipment & communication	366,48	
Other electrical equipment	361-64,369	1,58
Motor vehicles and motor vehicles equipment	371	1,75
Other transportation equipment	373-75,379	
Aircraft and missiles	372,19	4,91
Professional and scientific instruments	38	74
Scientific and mechanical measuring instruments	381,82	11
Optical, surgical, photographic, and other instruments	383-87	63
Other manufacturing industries	21,27,31,39	13
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	70

[1] Not separately available but included in total.

lopment, by industry
roup: 1972

dollars		Percent distribution		
nies with total oyment of—		Companies with total employment of—		
o	10,000 or more	Total	5,000 to 9,999	10,000 or more
238	$16,039	100	6	83
28	173	100	11	67
5	41	100	8	67
7	24	100	14	47
13	150	100	7	81
326	1,283	100	17	67
41	923	100	4	88
222	239	100	40	43
64	121	100	21	40
21	430	100	4	91
18	210	100	7	80
23	126	100	14	75
13	185	[illegible]	7	70
(1)	98	100	(1)	72
(1)	87	100	(1)	69
32	128	100	13	53
100	1,606	100	5	82
288	4,377	100	6	88
(1)	38	100	(1)	70
207	2,799	100	7	38
(1)	1,540	100	(1)	90
39	1,911	100	2	96
139	4,770	100	3	95
154	473	100	19	59
48	11	100	39	9
105	462	100	15	68
16	81	100	11	57
10	70	100	1	10

Table B-5.—Funds for research and development, by industry and selected company size group: 1971

Industry	SIC code	Millions of dollars			Percent distribution		
		Companies with total employment of—			Companies with total employment of—		
		Total	5,000 to 9,999	10,000 or more	Total	5,000 to 9,999	10,000 or more
Total	.....	$18,311	$1,170	$15,063	100	6	82
Food and kindred products	20	245	26	164	100	11	67
Textiles and apparel	22,23	59	6	38	100	10	64
Lumber, wood products, and furniture	24,25	48	6	22	100	13	46
Paper and allied products	26	187	12	154	100	6	82
Chemicals and allied products	28	1,819	305	1,236	100	17	68
Industrial chemicals	281-82	1,020	39	907	100	4	89
Drugs and medicines	283	510	204	219	100	40	43
Other chemicals	284-89	289	62	110	100	21	38
Petroleum refining and extraction	29,13	505	20	463	100	4	92
Rubber products	30	230	16	180	100	7	78
Stone, clay, and glass products	32	155	24	113	100	15	73
Primary metals	33	272	18	194	100	7	71
Ferrous metals and products	331-32, 3391,3399	144	(1)	104	100	(1)	72
Nonferrous metals and products	333-36,3392	128	(1)	90	100	(1)	70
Fabricated metal products	34	233	32	124	100	14	53
Machinery	35	1,773	90	1,437	100	5	81
Electrical equipment and communication	36,48	4,534	297	3,977	100	7	88
Radio and TV receiving equipment, Electronic components	365 367	64	(1)	50	100	(1)	78
Communication equipment & communication	366,48	2,881	221	2,511	100	8	87
Other electrical equipment	361-64,369	1,589	(1)	1,416	100	(1)	89
Motor vehicles and motor vehicles equipment	371	1,756	37	1,691	100	2	96
Other transportation equipment	373-75,379						
Aircraft and missiles	372,19	4,912	111	4,692	100	2	96
Professional and scientific instruments	38	744	145	424	100	19	57
Scientific and mechanical measuring instruments	381,82	110	41	10	100	37	9
Optical, surgical, photographic, and other instruments	383-87	633	104	414	100	16	65
Other manufacturing industries	21,27,31,39	136	17	76	100	13	56
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	704	8	77	100	1	11

[1] Not separately available but included in total.

Table B-6.—Funds for research and development, by industry, size of company, and size of R&D program: 1972

Industry and size of company	SIC code	Total	Size of R&D program (thousands of dollars)				
			Less than $200	$200—$999	$1,000—$9,999	$10,000—$99,999	$100,000 or more
		Millions of dollars					
Total	.....	$19,437	$251	$393	$2,114	$4,763	$11,915
Distribution by industry							
Food and kindred products	20	258	9	26	142	82	.....
Textiles and apparel	22,23	61	3	15	44	.....	.....
Lumber, wood products, and furniture	24,25	51	7	10	34	.....	.....
Paper and allied products	26	186	4	9	64	108	.....
Chemicals and allied products	28	1,909	27	28	251	(1)	(1)
Industrial chemicals	281-82	1,045	6	15	76	(1)	(1)
Drugs and medicines	283	558	2	5	61	490	.....
Other chemicals	284-89	306	20	9	114	163	.....
Petroleum refining and extraction	29,13	473	5	4	56	408	.....
Rubber products	30	263	8	5	51	200	.....
Stone, clay, and glass products	32	167	10	8	41	107	.....
Primary metals	33	264	11	18	105	130	.....
Ferrous metals and products	331-32,3391,3399	137	7	8	53	69	.....
Nonferrous metals and products	333-36,3392	126	4	10	52	61	.....
Fabricated metal products	34	241	36	22	55	128	.....
Machinery	35	1,964	51	65	260	(1)	(1)
Electrical equipment and communication	36,48	4,946	32	82	244	788	3,800
Radio and TV receiving equipment	365	54	1	3	(1)	(1)	.....
Electronic components	367	3,173	15	49	(1)	(1)	(1)
Communication equipment & communication	366,48						
Other electrical equipment	361-54,369	1,719	17	30	(1)	(1)	(1)
Motor vehicles and motor vehicles equipment	371	1,982	7	10	60	109	1,796
Other transportation equipment	373-75,379						
Aircraft and missiles	372,19	5,014	5	15	191	341	4,462
Professional and scientific instruments	38	804	17	22	118	289	358
Scientific and mechanical measuring instruments	381,82	123	11	14	(1)	(1)	.....
Optical, surgical, photographic, and other instruments	383-87	680	6	8	(1)	(1)	(1)
Other manufacturing industries	21,27,31,39	143	4	18	70	51	.....
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807.891	711	17	36	329	329	.....
Distribution by size of company (based on number of employees)							

Lumber, wood products, and furniture							
Paper and allied products	26	186	4	9	64	108	.....
Chemicals and allied products	28	1,909	27	28	251	(1)	(1)
Industrial chemicals	281-82	1,045	6	15	76	(1)	(1)
Drugs and medicines	283	558	2	5	61	490	.....
Other chemicals	284-89	306	20	9	114	163	.....
Petroleum refining and extraction	29,13	473	5	4	56	408	.....
Rubber products	30	263	8	5	51	200	.....
Stone, clay, and glass products	32	167	10	8	41	107	.....
Primary metals	33	264	11	18	105	130	.....
Ferrous metals and products	331-32,3391,3399	137	7	8	53	69	.....
Nonferrous metals and products	333-36,3392	126	4	10	52	61	.....
Fabricated metal products	34	241	36	22	55	128	.....
Machinery	35	1,964	51	65	260	(1)	(1)
Electrical equipment and communication	36,48	4,946	32	82	244	788	3,800
Radio and TV receiving equipment	365	54	1	3	(1)	(1)	.....
Electronic components	367	3,173	15	49	(1)	(1)	(1)
Communication equipment & communication	366,48						
Other electrical equipment	361-64,369	1,719	17	30	(1)	(1)	(1)
Motor vehicles and motor vehicles equipment	371	1,982	7	10	60	109	1,796
Other transportation equipment	373-75,379						
Aircraft and missiles	372,19	5,014	5	15	191	341	4,462
Professional and scientific instruments	38	804	17	22	118	289	358
Scientific and mechanical measuring instruments	381,82	123	11	14	(1)	(1)	.....
Optical, surgical, photographic, and other instruments	383-87	680	6	8	(1)	(1)	(1)
Other manufacturing industries	21,27,31,39	143	4	18	70	51	.....
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	711	17	36	329	329	.....
Distribution by size of company (based on number of employees)							
Less than 1,000	.....	886	233	212	342	98	.....
1,000 to 4,999	.....	1,273	15	141	624	493	.....
5,000 to 9,999	.....	1,238	2	24	322	(1)	(1)
10,000 or more	.....	16,039	1	16	826	(1)	(1)

(1) Not separately available but included in total.

Table B-7.—Federal funds for research and development, by industry and size of company: 1957-58 and

[Dollars in millions]

Industry and size of company	SIC code	1957	1958	1963	1964	1965	1966
Total		$4,335	$4,759	$7,270	$7,720	$7,740	$8,332
Distribution by industry							
Food and kindred products	20	[1]	6	[1]	1	1	3
Textiles and apparel	22,23			[1]	[1]	[1]	[1]
Lumber, wood products, and furniture	24,25			[1]	[1]	[1]	
Paper and allied products	26	[1]				[1]	[1]
Chemicals and allied products	28	89	126	234	202	191	188
Industrial chemicals	281-82	80	110	146	140	147	158
Drugs and medicines	283	[2]	2	9	[1]	[1]	[1]
Other chemicals	284-89	9	14	79	[1]	[1]	[1]
Petroleum refining and extraction	29,13	11	12	21	61	48	18
Rubber products	30	37	21	46	23	22	19
Stone, clay, and glass products	32	[1]	[1]	3	4	3	3
Primary metals	33	5	14	10	8	8	8
Ferrous metals and products[5]	331-32,3391,3399	1	2	2	2	1	3
Nonferrous metals and products	333-36,3392	4	12	8	6	7	5
Fabricated metal products	34	38	57	24	19	15	17
Machinery	35	272	343	250	246	239	286
Electrical equipment and communication	36,48	1,196	1,337	1,849	1,873	1,983	2,201
Radio and TV receiving equipment	365	[6]	[6]	[6]	[6]	[6]	[1]
Communication equipment & electronic components	366-67,48	518	615	1,209	1,259	1,292	1,428
Other electrical equipment	361-64,369	678	722	640	614	691	[1]
Motor vehicles and motor vehicles equipment	371	190	296	291	322	325	344
Other transportation equipment	373-75,379						
Aircraft and missiles	372,19	2,275	2,276	4,261	4,621	4,499	4,724
Professional and scientific instruments	38	109	117	81	95	132	145
Scientific and mechanical measuring instruments	381,82	80	93	16	20	22	22
Optical, surgical, photographic, and other instruments	383-87	29	44	65	75	110	123
Other manufacturing industries[7]	21,27,31,39	74	134	3	4	4	[1]
Nonmanufacturing industries	07-12,14-17,41-47, 49-67, 739,807,891			190	229	268	367
Distribution by size of company (based on number of employees)							
Less than 1,000		167	233	194	215	224	234
1,000 to 4,999		225	[1]202	425	432	378	385
5,000 to 9,999		3,942	[1]4,324	6,651	7,072	7,138	182
10,000 or more							7,530

[1] Estimated by the National Science Foundation
[2] Less than $0.5 million.
[3] Not separately available but included in total.
[4] Included in the other manufacturing industries group.

Industry and size of company	SIC code	196
Total		$
Distribution by industry		
Food and kindred products	20	
Textiles and apparel	22,23	
Lumber, wood products, and furniture	24,25	
Paper and allied products	26	
Chemicals and allied products	28	
Industrial chemicals	281-82	
Drugs and medicines	283	
Other chemicals	284-89	
Petroleum refining and extraction	29,13	
Rubber products	30	
Stone, clay, and glass products	32	
Primary metals	33	
Ferrous metals and products[5]	331-32,3391,3399	
Nonferrous metals and products	333-36,3392	
Fabricated metal products	34	
Machinery	35	
Electrical equipment and communication	36,48	
Radio and TV receiving equipment	365	
Communication equipment & electronic components	366-67,48	
Other electrical equipment	361-64,369	
Motor vehicles and motor vehicles equipment	371	
Other transportation equipment	373-75,379	
Aircraft and missiles	372,19	
Professional and scientific instruments	38	
Scientific and mechanical measuring instruments	381,82	
Optical, surgical, photographic, and other instruments	383-87	
Other manufacturing industries[7]	21,27,31,39	
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	
Distribution by size of company (based on number of employees)		
Less than 1,000		
1,000 to 4,999		
5,000 to 9,999		
10,000 or more		7

[5] SIC codes 3391 and 3399 included in the nonferrous metals and produ
[6] Included in the other electrical equipment group.
[7] For 1957 and 1958 include textiles and apparel; lumber, wood produc

funds for research and development, by industry and size of company: 1957-58 and 1963-72

[Dollars in millions]

1958	1963	1964	1965	1966
$4,759	$7,270	$7,720	$7,740	$8,332
6	(1)	1	1	3
...	(1)	(1)	(1)	(1)
...	(1)	(1)	(1)	.
...	...	...	(1)	(1)
126	234	202	191	188
110	146	140	147	158
2	9	(1)	(1)	(1)
14	79	(1)	(1)	(1)
12	21	61	48	18
21	46	23	22	19
(4)	3	4	3	3
14	10	8	8	8
2	2	2	1	3
12	8	6	7	5
57	24	19	15	17
343	250	246	239	286
1,337	1,849	1,873	1,983	2,201
(5)	(5)	(5)	(5)	(1)
615	1,209	1,259	1,292	1,428
722	640	614	691	(1)
296	291	33*	325	344
2,276	4,261	4,621	4,499	4,724
137	81	95	132	145
93	16	20	22	22
44	65	75	110	123
134	3	4	4	(1)
.	190	229	268	367
233	194	215	224	234
[2]202	425	432	378	385
[3]4,324	6,651	7,072	7,138	182
				7,530

Industry and size of company	SIC code	1967	1968	1969	1970	1971	1972
Total	...	$8,365	$8,560	$8,451	$7,779	$7,666	$8,090
Distribution by industry							
Food and kindred products	20	2	2	1	3	2	3
Textiles and apparel	22,23	(1)	(1)	(1)	(1)	1	1
Lumber, wood products, and furniture	24,25	(1)	..	...	...	(1)	(1)
Paper and allied products	26	(1)	(1)	(1)	(1)	(1)	(1)
Chemicals and allied products	28	210	199	192	180	184	196
Industrial chemicals	281-82	181	173	166	160	162	175
Drugs and medicines	283	(1)	(1)	(1)	(1)	(1)	(1)
Other chemicals	284-89	(1)	(1)	(1)	(1)	(1)	(1)
Petroleum refining and extraction	29,13	16	34	10	22	17	15
Rubber products	30	22	22	27	22	19	32
Stone, clay, and glass products	32	2	3	1	2	3	3
Primary metals	33	8	9	10	10	6	12
Ferrous metals and products[3]	331-32,3391,3399	1	1	2	1	2	2
Nonferrous metals and products	333-36,3392	6	8	9	9	4	10
Fabricated metal products	34	13	18	8	6	11	11
Machinery	35	322	337	259	239	291	339
Electrical equipment and communication	36,48	2,296	2,345	2,412	2,261	2,302	2,504
Radio and TV receiving equipment	365	(1)	(1)	(1)	(1)	(1)	(1)
Communication equipment & electronic components	366-67,48	1,495	1,538	1,579	1,483	1,546	1,699
Other electrical equipment	361-64,369	(1)	(1)	(1)	(1)	(1)	(1)
Motor vehicles and motor vehicles equipment	371	360	372	284	308	301	303
Other transportation equipment	373-75,379						
Aircraft and missiles	372,19	4,531	4,544	4,554	4,032	3,900	4,068
Professional and scientific instruments	38	189	234	238	204	172	168
Scientific and mechanical measuring instruments	381,82	37	35	32	29	21	24
Optical, surgical, photographic, and other instruments	383-87	152	199	206	175	151	144
Other manufacturing industries[7]	21,27,31,39	(1)	(1)	(1)	(1)	(1)	(1)
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	387	431	448	480	452	432
Distribution by size of company (based on number of employees)							
Less than 1,000	...	228	(1)	(1)	355	318	300
1,000 to 4,999		351	(1)	(1)	412	367	376
5,000 to 9,999		251	299	257	211	214	226
10,000 or more		7,536	7,662	7,525	6,801	6,766	7,187

[3] SIC codes 3391 and 3399 included in the nonferrous metals and products group for 1957 to 1965.
[4] Included in the other electrical equipment group
[7] For 1957 and 1958 include textiles and apparel, lumber, wood products, and furniture, and nonmanufacturing industries.

Table B-8.—Federal funds for research and development, by industry and selected company size group: 1971 and 1972

[Dollars in millions]

Industry	SIC code	1971			1972		
		Total	Companies with total employment of—		Total	Companies with total employment of—	
			5,000 to 9,999	10,000 or more		5,000 to 9,999	10,000 or more
Total		$7,666	$214	$6,766	$8,090	$226	$7,187
Food and kindred products	20	2		1	1		1
Textiles and apparel	22,23	1			1		
Lumber, wood products, and furniture	24,25	(1)			(1)		
Paper and allied products	26	(1)		(1)	(1)		(1)
Chemicals and allied products	28	184	2	176	196	2	187
Industrial chemicals	281-82	162		162	175		175
Drugs and medicines	283	(1)	2	(1)	(1)	2	(1)
Other chemicals	284-89	(1)		(1)	(1)		(1)
Petroleum refining and extraction	29,13	17		17	15		15
Rubber products	30	19	(1)	(1)	32	(1)	(1)
Stone, clay, and glass products	32	3	1	2	3		2
Primary metals	33	6	(1)	(1)	12	(1)	(1)
Ferrous metals and products	331-32,3391,3399	2	(1)	(1)	2	(1)	
Nonferrous metals and products	333-36,3392	4		(1)	10		(1)
Fabricated metal products	34	11	(1)	(1)	11	(1)	(1)
Machinery	35	291	(1)	(1)	339	(1)	(1)
Electrical equipment and communication	36,48	2,302	115	2,120	2,504	102	2,333
Radio and TV receiving equipment	365	(1)		(1)	(1)		(1)
Electronic components	367	1,546	(1)	(1)	1,699	(1)	(1)
Communication equipment & communication	366,48						
Other electrical equipment	361-64,369	(1)	(1)	(1)	(1)	(1)	(1)
Motor vehicles and motor vehicles equipment	371	301	(1)	(1)	303	(1)	(1)
Other transportation equipment	373-75,379						
Aircraft and missiles	372,19	3,900	71	3,777	4,068	91	3,923
Professional and scientific instruments	38	172	16	67	168	19	64
Scientific and mechanical measuring instruments	381-82	21	(1)	(1)	24	(1)	(1)
Optical, surgical, photographic, and other instruments	383-87	151	(1)	(1)	144	(1)	(1)
Other manufacturing industries	21,27,31,39	(1)		(1)	(1)		(1)
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	452		(1)	432		(1)

[1] Not separately available but included in total.

Table B-9.—Federal funds for research and development by selected industry and agency: 1963-72

[Dollars in millions]

Industry	SIC code	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
		Total Federal									
Total	.....	$7,270	$7,720	$7,740	$8,332	$8,365	$8,560	$8,451	$7,779	$7,666	$8,090
Chemicals and allied products	28	234	202	191	188	210	199	192	180	184	196
Machinery	35	250	246	239	286	322	337	259	239	291	339
Electrical equipment and communication	36,48	1,849	1,873	1,983	2,201	2,296	2,345	2,412	2,261	2,302	2,504
Motor vehicles and other transportation equipment	371,373-75,379	291	322	325	344	360	372	284	308	301	303
Aircraft and missiles	372,19	4,261	4,621	4,499	4,724	4,531	4,544	4,554	4,032	3,900	4,068
Other industries	.....	385	465	518	604	669	769	771	759	688	679
		DOD									
Total	.....	$4,700	$4,192	$3,808	$4,241	$5,144	$5,427	$5,688	$5,321	$5,315	$5,872
Chemicals and allied products	28	(1)	104	63	53	64	64	49	35	40	51
Machinery	35	148	132	147	227	228	173	150	181	184	232
Electrical equipment and communication	36,48	1,200	1,120	1,130	1,292	1,437	1,536	1,614	1,520	1,531	1,739
Motor vehicles and other transportation equipment	371,373-75,379	(1)	194	221	229	261	271	244	274	249	238
Aircraft and missiles	372,19	2,700	2,389	2,006	2,239	2,745	2,822	3,083	2,801	2,865	3,153
Other industries	.....	(1)	242	262	290	419	508	538	541	446	458
		NASA									
Total	.....	$1,800	$2,725	$3,166	$3,233	$2,290	$2,311	$1,868	$1,421	$1,391	$1,178
Chemicals and allied products	28	(1)	2	1	1	2	5	5	1	3	1
Machinery	35	(1)	91	101	129	79	94	72	70	71	70
Electrical equipment and communication	36,48	300	264	468	497	404	431	343	281	310	276
Motor vehicles and other transportation equipment	371,373-75,379	(1)	120	98	97	87	82	33	33	48	59
Aircraft and missiles	372.19	1,400	2,084	2,340	2,291	1,595	1,554	1,298	966	911	725
Other industries	.....	(1)	165	163	220	138	145	119	70	48	48

[1] Not separately available but included in total

Table B-10.—Company funds for research and development, by industry and size of company: 1957-58 and 1973-72[1]

Industry and size of company	SIC code	1957	1958	1963	1964	1965	1966
Total		$3,336	$3,630	$5,360	$5,792	$6,445	$7,216
Distribution by industry							
Food and kindred products	20	74	77	(3)	143	156	161
Textiles and apparel	22,23	14	20	28	(3)	(3)	(3)
Lumber, wood products, and furniture	24,25	14	12	(3)	(3)	(3)	12
Paper and allied products	26	35	42	69	77	93	(3)
Chemicals and allied products	28	616	666	1,004	1,082	1,165	1,219
Industrial chemicals	281-82	423	443	662	725	761	760
Drugs and medicines	283	104	126	207	(3)	(3)	(3)
Other chemicals	284-89	89	97	135	(3)	(3)	(3)
Petroleum refining and extraction	29,13	200	234	296	332	349	353
Rubber products	30	70	68	111	124	140	149
Stone, clay, and glass products	32	(3)	(3)	97	105	109	114
Primary metals	33	103	117	174	186	205	224
Ferrous metals and products[4]	331-32,3391,3399	63	70	105	114	127	136
Nonferrous metals and products	333-36,3392	40	39	69	72	78	88
Fabricated metal products	34	97	105	129	129	129	137
Machinery	35	397	438	709	769	8[illegible]	931
Electrical equipment and communication	36,48	608	632	1,017	1,099	1,217	1,426
Radio and TV receiving equipment	365	(5)	(5)	(5)	(5)	(5)	(5)
Electronic components	367	230	251	564	613	697	821
Communication equipment & communication	366,48						
Other electrical equipment	361-64,369	378	379	453	486	520	(3)
Motor vehicles and motor vehicles equipment	371	517	560	799	860	905	1,000
Other transportation equipment	373-75,379						
Aircraft and missiles	372,19	299	33	452	457	649	802
Professional and scientific instruments	38	140	157	202	236	271	323
Scientific and mechanical measuring instruments	381-82	59	63	53	54	58	65
Optical, surgical, photographic, and other instruments	383-87	81	94	149	182	213	258
Other manufacturing industries	21,27,31,39	19	39	52	61	67	(3)
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	(3)	55	85	90	116	130
Distribution by size of company (based on number of employees)							
Less than 1,000		375	299	425	417	435	387
1,000 to 4,999		[2]406	[2]440	596	602	579	657
5,000 to 9,999		[2]2,615	[2]2,891	4,338	4,773	5,431	5,561
10,000 or more							

[1] See table 1, footnote 1.
[2] Estimated by the National Science Foundation
[3] Not separately available but included in total.

Industry and size of company	SIC code	1967
Total		$8,020
Distribution by industry		
Food and kindred products	20	181
Textiles and apparel	22,23	(3)
Lumber, wood products, and furniture	24,25	12
Paper and allied products	26	123
Chemicals and allied products	28	1,297
Industrial chemicals	281-82	765
Drugs and medicines	283	(3)
Other chemicals	284-89	(3)
Petroleum refining and extraction	29,13	355
Rubber products	30	160
Stone, clay, and glass products	32	134
Primary metals	33	234
Ferrous metals and products[4]	331-32,3391,3399	134
Nonferrous metals and products	333-36,3392	109
Fabricated metal products	34	151
Machinery	35	1,004
Electrical equipment and communication	36,48	1,571
Radio and TV receiving equipment	365	(5)
Electronic components	367	930
Communication equipment & communication	366,48	
Other electrical equipment	361-64,369	(5)
Motor vehicles and motor vehicles equipment	371	994
Other transportation equipment	373-75,379	
Aircraft and missiles	372,19	1,134
Professional and scientific instruments	38	353
Scientific and mechanical measuring instruments	381-82	62
Optical, surgical, photographic, and other instruments	383-87	286
Other manufacturing industries	21,27,31,39	8[illegible]
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	172
Distribution by size of company (based on number of employees)		
Less than 1,000		455
1,000 to 4,999		666
5,000 to 9,999		643
10,000 or more		6,256

[4] SIC codes 3391 and 3399 included in the nonferrous metals and products
[5] Included in the other electrical equipment group.

any funds fc esearch and development, by industry and size of company: 1957-58 and 1973-72[1]

1963	1964	1965	1966
$5,360	$5,792	$6,445	$7,216
(2)	143	156	161
28	(2)	(2)	(2)
(2)	(2)	(2)	12
69	77	93	(2)
1,004	1,082	1,165	1,219
662	725	761	760
207	(2)	(2)	(2)
135	(2)	(2)	(2)
296	332	349	353
111	124	140	149
97	105	109	114
174	186	205	224
105	114	127	136
69	72	78	88
129	129	129	137
709	769	826	911
1,017	1,099	1,217	1,426
(3)	(3)	(3)	(3)
564	613	697	821
453	486	520	(3)
799	860	905	1,000
452	457	649	802
202	236	271	323
53	54	58	65
149	182	213	258
52	61	67	(3)
85	90	116	130
425	417	435	387
596	602	579	657
4,338	4,773	5,431	5,561

Industry and size of company	SIC code	1967	1968	1969	1970	1971	1972
Total		$8,020	$8,869	$9,867	$10,283	$10,643	$11,347
Distribution by industry							
Food and kindred products	20	181	185	204	232	244	257
Textiles and apparel	22,23	(2)	(2)	(2)	(2)	59	61
Lumber, wood products, and furniture	24,25	12	19	15	48	(2)	(2)
Paper and allied products	26	123	(2)	(2)	(2)	(2)	(2)
Chemicals and allied products	28	1,297	1,389	1,467	1,586	1,635	1,713
Industrial chemicals	281-82	785	812	847	880	858	870
Drugs and medicines	283	(2)	(2)	(2)	(2)	(2)	(2)
Other chemicals	284-89	(2)	(2)	(2)	(2)	(2)	(2)
Petroleum refining and extraction	29,13	355	403	457	493	488	458
Rubber products	30	160	183	190	198	211	231
Stone, clay, and glass products	32	134	139	158	155	152	164
Primary metals	33	234	241	247	265	266	252
Ferrous metals and products[4]	331-32,3391,3399	134	134	135	148	142	135
Nonferrous metals and products	333-36,3392	100	108	112	117	124	116
Fabricated metal products	34	151	165	174	194	222	230
Machinery	35	1,004	140	1,277	1,410	1,482	1,625
Electrical equipment and communication	36,48	1,571	1,760	1,982	2,091	2,232	2,442
Radio and TV receiving equipment	365	(3)	(3)	(3)	(3)	(3)	(3)
Electronic components	367	930	1,000	1,134	1,253	1,334	1,474
Communication equipment & communication	366,48						
Other electrical equipment	361-64,369	(3)	(3)	(3)	(3)	(3)	(3)
Motor vehicles and motor vehicles equipment	371	994	1,119	1,274	1,274	1,455	1,679
Other transportation equipment	373-75,379						
Aircraft and missiles	372,19	1,138	1,232	1,355	1,213	1,[illegible]	945
Professional and scientific instruments	38	353	426	496	541	57[illegible]	636
Scientific and mechanical measuring instruments	381-82	67	77	77	89	89	99
Optical, surgical, photographic, and other instruments	383-87	286	349	419	452	483	537
Other manufacturing industries	21,27,31,39	88	(2)	(2)	(2)	(2)	(2)
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	172	172	207	225	252	278
Distribution by size of company (based on number of employees)							
Less than 1,000		459	(2)	(2)	549	565	586
1,000 to 4,999		666	(2)	(2)	821	828	897
5,000 to 9,999		642	661	775	884	956	1,012
10,000 or more		6,254	7,118	7,909	8,029	8,297	8,852

[4] SIC codes 3391 and 3399 included in the nonferrous metals and products group for 1957-1965.
[3] Included in the other electrical equipment group.

Table B-11.—Company funds for research and development, by industry and selected company size group: 1971 and 1972

[Dollars in millions]

Industry	SIC code	1971			1972		
		Total	Companies with total employment of—		Total	Companies with total employment of—	
			5,000 to 9,999	10,000 or more		5,000 to 9,999	10,000 or more
Total		$10,645	$956	$8,297	$11,347	$1,012	$8,852
Food and kindred products	20	244	26	163	257	28	172
Textiles and apparel	22,23	59	6	38	61	5	41
Lumber, wood products and furniture	24,25	(1)	6	22	(1)	7	24
Paper and allied products	26	(1)	12	(1)	(1)	13	(1)
Chemicals and allied products	28	1,635	303	1,060	1,713	324	1,096
Industrial chemicals	281-82	858	39	746	870	41	748
Drugs and medicines	283	(1)	202	(1)	(1)	219	(1)
Other chemicals	284-89	(1)	62	(1)	(1)	64	(1)
Petroleum refining and extraction	29,13	488	20	446	458	21	416
Rubber products	30	211	(1)	(1)	231	(1)	(1)
Stone, clay, and glass products	32	152	24	111	164	23	125
Primary metals	33	266	(1)	(1)	252	(1)	(1)
Ferrous metals and products	331-32,3391,3399	142	(1)	(1)	135	(1)	(1)
Nonferrous metals and products	333-36,3392	124	(1)	(1)	116	(1)	(1)
Fabricated metal products	34	222	(1)	(1)	230	(1)	(1)
Machinery	35	1,482	(1)	(1)	1,625	(1)	(1)
Electrical equipment and communication	36,48	2,232	182	1,856	2,442	186	2,044
Radio and TV receiving equipment	365	(1)	(1)	(1)	(1)	(1)	(1)
Electronic components	367	1,334	(1)	(1)	1,474	(1)	(1)
Communication equipment & communication	366,48						
Other electrical equipment	361-64,369	(1)	(1)	(1)	(1)	(1)	(1)
Motor vehicles and motor vehicles equipment	371	1,455	(1)	(1)	1,679	(1)	(1)
Other transportation equipment	373,75,379						
Aircraft and missiles	372,19	1,012	40	915	945	47	847
Professional and scientific instruments	38	572	130	357	636	134	409
Scientific and mechanical measuring instruments	381-82	89	(1)	(1)	99	(1)	(1)
Optical, surgical, photographic, and other instruments	383-87	483	(1)	(1)	537	(1)	(1)
Other manufacturing industries	21,27,31,39	(1)	17	(1)	(1)	16	(1)
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	252	8	(1)	278	10	(1)

[1] Not separately available but included in total.

Table B-12.—Company-financed researc outside organizations, by industry, an 1971 and

[Dollars in mi

Industry and size of company
Total
Distribution by industry
Food and kindred products
Textiles and apparel
Lumber, wood products, and furniture
Paper and allied products
Chemicals and allied products
Industrial chemicals
Drugs and medicines
Other chemicals
Petroleum refining and extraction
Rubber products
Stone, clay, and glass products
Primary metals
Ferrous metals and products
Nonferrous metals and products
Fabricated metal products
Machinery
Electrical equipment and communication
Radio and TV receiving equipment
Electronic components
Communication equipment & communication
Other electrical equipment
Motor vehicles and motor vehicles equipment
Other transportation equipment
Aircraft and missiles
Professional and scientific instruments
Scientific and mechanical measuring instruments
Optical, surgical, photographic, and other instruments
Other manufacturing industries
Nonmanufacturing industries
Distribution by size of company (Based on number of employees)
5,000 to 9,999
10,000 or more

[1] Not separately available but included in total

d development, by industry
o: 1971 and 1972

1		1972		
anies with total loyment of—			Companies with total employment of—	
to 9	10,000 or more	Total	5,000 to 9,999	10,000 or more
$956	$8,297	$11,347	$1,012	$8,852
26	163	257	28	172
6	38	61	5	41
6	22	(1)	7	24
12	(1)	(1)	13	(1)
303	1,060	1,713	324	1,096
39	746	870	41	748
202	(1)	(1)	219	(1)
62	(1)	(1)	64	(1)
20	446	458	21	416
(1)	(1)	231	(1)	(1)
24	111	164	23	125
(1)	(1)	252	(1)	(1)
(1)	(1)	135	(1)	(1)
(1)	(1)	116	(1)	(1)
(1)	(1)	230	(1)	(1)
(1)	(1)	1,625	(1)	(1)
182	1,856	2,442	186	2,044
(1)	(1)	(1)	(1)	(1)
(1)	(1)	1,474	(1)	(1)
(1)	(1)	(1)	(1)	(1)
(1)	(1)	1,679	(1)	(1)
40	915	945	47	847
130	357	636	134	409
(1)	(1)	99	(1)	(1)
(1)	(1)	537	(1)	(1)
17	(1)	(1)	16	(1)
8	(1)	278	10	(1)

Table B-12.—Company-financed research and development contracted to outside organizations, by industry, and selected company size group: 1971 and 1972

[Dollars in millions]

Industry and size of company	SIC code	1971	1972
Total		$190	$221
Distribution by industry			
Food and kindred products	20	7	10
Textiles and apparel	22,23	1	1
Lumber, wood products, and furniture	24,25	1	1
Paper and allied products	26	5	6
Chemicals and allied products	28	56	70
Industrial chemicals	281-82	11	11
Drugs and medicines	283	37	49
Other chemicals	284-89	8	10
Petroleum refining and extraction	29,13	7	10
Rubber products	30	3	3
Stone, clay, and glass products	32	3	2
Primary metals	33	4	4
Ferrous metals and products	331-32,3391,3399	1	1
Nonferrous metals and products	333-36,3392	3	2
Fabricated metal products	34	2	3
Machinery	35	15	16
Electrical equipment and communication	36,48	30	23
Radio and TV receiving equipment	365	(1)	(1)
Electronic components	367		
Communication equipment & communication	366,58	(1)	(1)
Other electrical equipment	361-64,369	14	16
Motor vehicles and motor vehicles equipment	371	20	24
Other transportation equipment	373-75,379		
Aircraft and missiles	372,19	2	2
Professional and scientific instruments	38	11	11
Scientific and mechanical measuring instruments	381-82	1	1
Optical, surgical, photographic, and other instruments	383-87	10	10
Other manufacturing industries	21,27,31,39	5	5
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	17	30
Distribution by size of company (Based on number of employees)			
5,000 to 9,999		33	42
10,000 or more		106	120

(1) Not separately available but included in total

Table B-13.—Companies with 1,000 or more employees[1] contracting research and development to outside organizations, by industry and size of company: 1972

Industry	SIC code	Companies with total employment of—							
		1,000 or more		1,000 to 4,999		5,000 to 9,999		10,000 or more	
		Total	Contracting outside	Total	Contracting outside	Total	Contracting outside	Total	Contracting outside
Total	.....	1,175	423	661	176	213	85	301	162
Food and kindred products	20	105	44	55	19	20	9	30	16
Textiles and apparel	22,23	62	11	30	5	10	1	22	5
Lumber, wood products, and furniture	24,25	33	9	24	5	5	2	4	2
Paper and allied products	26	49	23	20	5	12	6	17	12
Chemicals and allied products	28	104	62	53	25	22	16	29	21
Industrial chemicals	281-82	39	21	16	7	5	2	18	12
Drugs and medicines	283	26	20	11	6	9	8	6	6
Other chemicals	284-89	39	21	26	12	8	6	5	3
Petroleum refining and extraction	29,13	26	18	6	4	5	1	15	13
Rubber products	30	35	9	23	1	6	5	6	3
Stone, clay, and glass products	32	34	17	17	5	7	3	10	9
Primary metals	33	75	24	42	12	12	2	21	10
Ferrous metals and products	331-32,3391,3399	49	16	27	10	10	2	12	4
Nonferrous metals and products	333-36,3392	26	8	15	2	2	.....	9	6
Fabricated metal products	34	69	21	48	11	11	5	10	5
Machinery	35	155	40	102	22	25	6	28	12
Electrical equipment and communication	36,48	138	39	80	18	20	7	38	14
Radio and TV receiving equipment	365	9	.....	6	.....	1	.....	2	.....
Electronic components	367								
Communication equipment & communication	366,48	62	11	30	3	10	2	22	6
Other electrical equipment	361-64,369	67	28	44	15	9	5	14	8
Motor vehicles and motor vehicles equipment	371	49	15	22	4	13	5	14	6
Other transportation equipment	373-75,379								
Aircraft and missiles	372,19	45	11	15	2	12	3	18	6
Professional and scientific instruments	38	58	16	37	9	12	3	9	4
Scientific and mechanical measuring instruments	381-82	27	9	20	5	5	3	2	1
Optical, surgical, photographic, and other instruments	383-87	31	7	17	4	7	.....	7	3
Other manufacturing industries	21,27,31,39	74	31	50	15	12	5	12	11
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	64	33	37	14	9	6	18	13

[1] Data not available for companies with less than 1,000 employees.

Table B-14.—R&D-performing companies in manufacturing and nonmanufacturing industries, by size of company: 1972

Size of company (based on number of employees)	Number of companies		
	Total	Manufacturing industries	Nonmanufacturing industries
Total	11,175	(1)	(1)
Less than 1,000	[2]10,000	(1)	(1)
1,000 to 4,999	661	624	37
5,000 to 9,999	213	204	9
10,000 or more	301	283	18

(1) Not separately available but included in total.
(2)This estimate represents the midpoint of a range from 6,000 to 14,000

Table B-15.— R&D-performing companie by size of company and

Size of company (based on number of employees)	Total	Siz Less t $20
Total	1,175	
1,000 to 4,999	661	
5,000 to 9,999	213	
10,000 or more	301	

[1] Data not available for companies with less than 1,000 employees.

manufacturing and company: 1972

mber of companies	
Manufac-turing industries	Nonmanu-facturing industries
(1)	(1)
(1)	(1)
624	37
204	9
283	18

Table B-15.— R&D-performing companies with 1,000 or more employees,[1] by size of company and R&D program: 1972

Size of company (based on number of employees)	Total	Size of R&D program (thousands of dollars)				
		Less than $200	$200—$999	1,000—$9,999	$10,000—$99,999	$100,000 or more
Total	1,175	174	326	480	163	32
1,000 to 4,999	661	148	257	236	20	.....
5,000 to 9,999	213	19	40	120	33	1
10,000 or more	301	7	29	124	110	31

[1] Data not available for companies with less than 1,000 employees.

Table B-16.—R&D-performing manufacturing companies with 5,000 or more employees,[1] by industry and percent change in R&D funds: 1971-72

Industry	SIC code	Total	10 percent or more increase	10 percent or more decrease	Less than 10 percent change
Total	.....	487	150	74	263
Food and kindred products	20	50	11	6	33
Textiles and apparel	22,23	32	7	8	17
Lumber, wood products, and furniture	24,25	9	3	.....	6
Paper and allied products	26	29	9	5	15
Chemicals and allied products	28	51	16	2	33
Industrial chemicals	281-82	23	2	2	19
Drugs and medicines	283	15	7	.....	8
Other chemicals	284-89	13	7	.....	6
Petroleum refining and extraction	29.13	20	2	4	14
Rubber products	30	12	7	.....	5
Stone, clay, and glass products	32	17	4	3	10
Primary metals	33	33	7	10	16
Ferrous metals and products	331-32,3391,3399	22	5	6	11
Nonferrous metals and products	333-36,3392	11	2	4	14
Fabricated metal products	34	21	3	4	14
Machinery	35	53	22	9	22
Electrical equipment and communication	36,48	58	22	10	26
Radio and TV receiving equipment	365	3	1	2	.....
Electronic components	367	32	16	6	10
Communication equipment & communication	366,48				
Other electrical equipment	361-64,369	23	5	2	16
Motor vehicles and motor vehicles equipment	371	27	9	3	15
Other transportation equipment	373-75,379				
Aircraft and missiles	372,19	30	13	7	10
Professional and scientific instruments	38	21	7	.....	14
Scientific and mechanical measuring instruments	381-82	7	2	.....	5
Optical, surgical, photographic, and other instruments	383-87	14	5	.....	9
Other manufacturing industries	21,27,31,39	24	8	3	13

[1] Manufacturing companies with 5,000 or more employees are classified into those increasing 10 percent or more, those decreasing 10 percent or more or those changing less than 10 percent based on their ratio of change for total R&D funds between 1971 and 1972

Table B-17.—Percent of total, Federal, and company funds of R&D-performing companies ranked by size of R&D program: 1963-72

Companies ranked by size of R&D program (based on total R&D funds)[1]	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
	Percent of total R&D funds									
First 4	21	22	21	22	22	21	19	16	19	19
First 8	35	35	35	36	35	35	34	31	33	34
First 20	56	57	57	57	57	57	56	54	54	54
First 40	70	70	70	71	70	70	68	65	65	65
First 100	82	82	82	82	82	82	80	77	78	78
First 200	88	89	89	89	89	89	88	85	85	85
First 300	91	92	92	92	92	92	91	89	90	90
	Percent of Federal R&D funds									
First 4	28	27	28	31	34	33	22	13	18	18
First 8	46	47	47	45	43	43	43	34	38	39
First 20	71	71	73	73	73	73	70	71	72	70
First 40	86	87	86	89	88	88	85	83	84	83
First 100	95	95	95	95	95	96	93	91	90	91
First 200	97	97	97	98	98	98	96	94	93	94
First 300	98	99	99	99	99	99	97	95	96	96
	Percent of company R&D funds									
First 4	12	15	14	12	9	9	16	19	20	20
First 8	20	19	21	26	27	28	27	28	30	31
First 20	37	38	38	39	41	43	43	41	41	43
First 40	48	49	51	50	52	53	53	51	51	52
First 100	64	65	67	67	68	70	70	67	68	68
First 200	76	77	78	79	79	81	81	78	79	79
First 300	82	83	84	85	85	87	86	84	84	84

[1] Companies were ranked individually for each year. Therefore, particular companies comprising the size groups may have changed from year to year.

Table B-18.—Percent of net sales and employment of R&D-performing companies ranked by size of R&D program: 1963-72

Companies ranked by size of R&D program (based on total R&D funds)[1]	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
	Percent of net sales									
First 4	8	8	8	8	4	4	7	6	7	7
First 8	10	10	11	11	11	11	10	11	12	13
First 20	18	18	19	19	19	21	17	16	17	18
First 40	25	25	27	25	28	27	25	24	25	25
First 100	41	41	43	45	42	44	39	38	39	39
First 200	54	54	55	58	55	59	51	51	52	52
First 300	62	63	65	68	67	68	63	60	60	60
	Percent of employment									
First 4	8	7	9	9	5	5	8	7	8	7
First 8	12	12	13	13	12	12	12	13	13	13
First 20	20	21	21	21	21	22	19	19	20	19
First 40	27	28	28	28	29	29	27	27	27	27
First 100	41	41	42	43	43	43	40	39	39	39
First 200	52	54	54	54	54	56	51	50	50	50
First 300	60	62	63	63	64	65	61	59	58	58

[1] Companies were ranked individually for each year. Therefore, particular companies comprising the size groups may have changed from year to year.

Table B-19.—Percent of total and Federal R&D funds and of net sales of R&D-performing companies ranked by size of R&D programs, by industry: 1972

Industry	SIC code	Percent of total R&D funds			Percent of Federal R&D fund		
		First 4 companies	First 8 companies	First 20 companies	First 4 companies	First 8 companies	First compa
Total	.....	19	34	54	18	38	
Food and kindred products	20	28	43	68	27	27	
Textiles and apparel	22,23	36	54	77	83	83	
Lumber, wood products, and furniture	24,25	51	63	81	.....	.....	
Paper and allied products	26	51	69	88	81	86	
Chemicals and allied products	28	32	45	65	73	88	
Industrial chemicals	281-82	58	76	92	82	99	
Drugs and medicines	283	42	64	94	18	42	
Other chemicals	284-89	41	57	74	97	97	
Petroleum refining and extraction	29,13	51	76	96	90	94	
Rubber products	30	76	84	94	73	79	
Stone, clay, and glass products	32	63	78	91	39	70	
Primary metals	33	39	56	76	71	71	
Ferrous metals and products	331-32,3391,3399	55	70	88	13	13	
Nonferrous metals and products	333-36,3392	54	73	92	91	91	
Fabricated metal products	34	35	46	59	28	48	
Machinery	35	62	72	81	83	94	
Electrical equipment and communication	36,48	56	71	88	60	77	
Radio and TV receiving equipment	365	85	94	99	100	100	
Electronic components	367	58	75	92	59	76	
Communication equipment & communication	366,48						
Other electrical equipment	361-64,369	86	90	94	99	99	
Motor vehicles and motor vehicles equipment	371	92	96	99	95	98	
Other transportation equipment	373-75,379						
Aircraft and missiles	372,19	56	80	95	56	82	
Professional and scientific instruments	38	62	73	85	80	89	
Scientific and mechanical measuring instruments	381-82	35	49	74	87	87	
Optical, surgical, photographic, and other instruments	383-87	73	85	96	93	94	
Other manufacturing industries	21,27,31-39	36	52	76	96	96	
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	22	32	49	31	42	

—Percent of total and Federal R&D funds and of net sales of R&D-performing companies ranked by size of R&D programs, by industry: 1972

SIC code	Percent of total R&D funds			Percent of Federal R&D funds			Percent of net sales of all R&D-performing companies		
	First 4 companies	First 8 companies	First 20 companies	First 4 companies	First 8 companies	First 20 companies	First 4 companies	First 8 companies	First 220c companies
.....	19	34	54	18	38	70	7	13	18
20	28	43	68	27	27	52	8	19	40
22,23	36	54	77	83	83	83	28	38	59
24,25	51	63	81	.....	.....	100	42	52	67
26	51	69	88	81	86	100	21	41	71
28	32	45	65	73	88	94	20	26	42
281-82	58	76	92	82	99	100	38	52	80
283	42	64	94	18	42	98	27	51	91
284-89	41	57	74	97	97	100	35	45	62
29,13	51	76	96	90	94	100	39	65	94
30	76	84	94	73	79	99	64	74	85
32	63	78	91	39	70	70	37	54	80
33	39	56	76	71	71	90	31	43	65
331-32,3391,3399	55	70	88	13	13	97	50	61	77
333-36,3392	54	73	92	91	91	98	42	58	87
34	35	46	59	28	48	90	25	32	46
35	62	72	81	83	94	96	22	33	48
36,48	56	71	88	60	77	96	33	47	65
365	85	94	99	100	100	100	73	94	99
367	58	75	92	59	76	95	37	67	80
366,48	86	90	94	99	99	100	52	57	75
361-64,369	92	96	99	95	98	100	78	81	90
371	56	80	95	56	82	96	30	49	82
373-75,379	62	73	85	80	89	94	32	46	72
372,19	35	49	74	87	87	96	27	42	64
38	73	85	96	93	94	100	43	68	88
381-82	36	52	76	96	96	96	18	44	65
383-87	22	32	49	31	42	54	10	18	51
21,27,31-39									
07-12.14-17,41-47, 49-67,739,807,891									

Table B-20.—R&D-performing companies with 1,000 or more employees[1] and number with Federal R&D funds, by industry and size of company: 1972

Industry	SIC code	Companies with total employment of—							
		1,000 or more		1,000 to 4,999		5,000 to 9,999		10,000 or more	
		Total	Federal	Total	Federal	Total	Federal	Total	Federal
Total	.....	1,175	246	661	73	213	43	301	131
Food and kindred products	20	105	4	55	1	20	.....	30	3
Textiles and apparel	22,23	62	3	30	2	10	.....	22	1
Lumber, wood products, and furniture	24,25	33	1	24	1	5	.....	4	.....
Paper and allied products	26	49	3	20	.....	12	.....	17	3
Chemicals and allied products	28	104	27	53	2	22	5	29	20
Industrial chemicals	281-82	39	14	16	1	5	1	18	12
Drugs and medicines	283	26	10	11	.....	9	4	6	6
Other chemicals	284-89	39	3	26	1	8	.....	5	2
Petroleum refining and extraction	29,13	26	9	6	.....	5	.....	15	9
Rubber products	30	35	5	23	.....	6	1	6	4
Stone, clay, and glass products	32	34	5	17	.....	7	2	10	3
Primary metals	33	75	14	42	6	12	2	21	6
Ferrous metals and products	331-32,3391,3399	49	7	27	2	10	2	12	3
Nonferrous metals and products	333-36,3392	26	7	15	4	2	.....	9	3
Fabricated metal products	34	69	12	48	3	11	3	10	6
Machinery	35	155	23	102	10	25	2	28	11
Electrical equipment and communication	36,48	138	51	80	15	20	8	38	29
Radio and TV receiving equipment	365	9	2	6	.....	1	.....	2	2
Electronic components; Communication equipment and communication	367; 366,48	62	37	30	12	10	7	22	19
Other electrical equipment	361-64,369	67	12	44	3	9	1	14	8
Motor vehicles and motor vehicles equipment; Other transportation equipment	371; 373-75,379	49	14	22	2	13	4	14	8
Aircraft and missiles	372,19	45	35	15	8	12	9	18	18
Professional and scientific instruments	38	58	21	37	7	12	7	9	7
Scientific and mechanical measuring instruments	381-82	27	7	20	2	5	3	2	2
Optical, surgical, photographic, and other instruments	383-87	31	14	17	5	7	4	7	5
Other manufacturing industries	21,27,31,39	74	3	50	2	12	.....	12	1
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	64	16	37	14	9	.....	18	2

[1] Data not available for companies with less than 1,000 employees.

Table B-21.—Geographic distribution of funds for industrial research and development: 1963-72

[Dollars in millions]

Area	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
UNITED STATES, TOTAL	$12,630	$13,512	$14,185	$15,548	$16,385	$17,429	$18,318	$18,062	$18,311	$19,437
NORTHEAST	3,818	4,105	4,385	5,092	5,438	5,867	6,095	6,333	6,510	6,886
New England	993	1,072	1,175	1,494	1,661	1,870	1,835	1,854	1,884	1,960
Maine	4	5	6	5	8	9	6	10	9	10
New Hampshire	6	7	8	27	49	43	49	49	52	40
Vermont	6	7	11	15	14	20	32	34	61	58
Massachusetts	481	526	616	826	915	986	977	1,004	1,082	1,172
Rhode Island	7	9	9	9	14	17	45	52	51	43
Connecticut	489	518	526	612	663	795	726	705	629	637
Middle Atlantic	2,825	3,034	3,210	3,598	3,777	3,997	4,260	4,479	4,626	4,927
New York	1,176	1,334	1,429	1,573	1,718	1,830	1,981	2,038	2,066	2,163
New Jersey	958	959	1,005	1,119	1,098	1,117	1,202	1,292	1,403	1,532
Pennsylvania	691	741	777	906	911	1,050	1,077	1,149	1,157	1,231
NORTH CENTRAL	2,791	2,877	2,978	3,382	3,638	3,766	4,216	4,388	4,840	5,230
East North Central	2,230	2,312	2,500	2,857	3,157	3,291	3,570	3,622	3,833	4,161
Ohio	583	588	648	774	879	910	925	982	945	984
Indiana	236	243	278	316	377	386	431	428	448	459
Illinois	398	417	448	539	612	625	680	729	792	849
Michigan	862	908	962	1,049	1,089	1,162	1,305	1,259	1,413	1,586
Wisconsin	149	155	164	179	201	208	229	224	235	283
West North Central	562	565	478	525	480	475	646	766	1,007	1,068
Minnesota	149	180	186	225	239	250	298	286	289	325
Iowa	58	76	73	103	75	71	87	138	138	136
Missouri	304	287	193	156	125	99	211	(1)	(1)	(1)
North Dakota	.....	.....	.....	.....	.....	.....	(1)	(1)	(1)	(1)
South Dakota	(1)	1	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Nebraska	(1)	2	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Kansas	47	18	20	30	34	45	41	50	36	49
SOUTH	1,701	2,076	2,227	2,437	2,414	2,531	2,488	2,341	2,348	2,551
South Atlantic	931	925	1,015	1,179	1,220	1,304	1,466	1,424	1,455	1,619
Delaware	26	26	36	41	37	26	34	51	(1)	(1)
Maryland	267	276	275	254	310	301	361	386	419	430
District of Columbia	12	14	18	19	23	47	30	31	21	24
Virginia	93	93	123	(1)	(1)	(1)	(1)	(1)	133	131
West Virginia	89	71	53	59	63	61	54	48	40	48
North Carolina	71	71	81	124	120	138	157	175	184	210
South Carolina	28	31	32	47	48	51	59	65	(1)	(1)
Georgia	61	71	75	(1)	(1)	(1)	(1)	(1)	122	105
Florida	284	273	323	338	375	436	424	371	422	547
East South Central	280	305	416	487	473	416	364	346	342	354
Kentucky	22	35	36	41	48	51	53	55	52	61
Tennessee	139	136	158	206	221	199	194	183	191	186
Alabama	116	132	221	238	203	164	114	105	96	101
Mississippi	2	2	1	2	2	2	3	3	3	7
West South Central	491	846	796	771	721	811	658	571	551	578
Arkansas	2	2	1	5	5	6	5	7	5	5
Louisiana	131	282	255	237	154	127	103	38	51	66
Oklahoma	53	93	121	99	83	71	73	81	63	66
Texas	304	469	419	430	479	607	477	445	431	440
WEST	4,320	4,453	4,594	4,635	4,897	5,264	5,519	5,000	4,613	4,770
Mountain	465	473	457	446	489	596	651	687	650	689
Montana	(1)	(1)	(1)	(1)	(1)	(1)	.....	.....	(1)	(1)
Idaho	27	29	28	(1)	(1)	21	(1)	(1)	30	23

New Jersey	958	959	1,005	1,119	1,098	1,117	1,202	1,292	1,403	1,532
Pennsylvania	691	741	777	906	911	1,050	1,077	1,149	1,157	1,231
NORTH CENTRAL	2,791	2,877	2,978	3,382	3,638	3,766	4,216	4,388	4,840	5,230
East North Central	2,230	2,312	2,500	2,857	3,157	3,291	3,570	3,622	3,833	4,161
Ohio	583	588	648	774	879	910	925	982	945	984
Indiana	236	243	278	316	377	396	431	428	448	459
Illinois	398	417	448	539	612	625	680	729	792	849
Michigan	862	908	962	1,049	1,089	1,162	1,305	1,259	1,413	1,586
Wisconsin	149	155	164	179	201	208	229	224	235	283
West North Central	562	565	478	525	480	475	646	766	1,007	1,068
Minnesota	149	180	186	225	239	250	298	286	289	325
Iowa	58	76	73	103	75	71	87	138	138	136
Missouri	304	287	193	156	125	99	211	(1)	(1)	(1)
North Dakota	.....	.....	.....	.....	.....	.....	(1)	(1)	(1)	(1)
South Dakota	(1)	1	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Nebraska	(1)	2	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Kansas	47	18	20	30	34	45	41	50	36	49
SOUTH	1,701	2,076	2,227	2,437	2,414	2,531	2,488	2,341	2,348	2,551
South Atlantic	931	925	1,015	1,179	1,220	1,304	1,466	1,424	1,455	1,619
Delaware	26	26	36	41	37	26	34	51	(1)	(1)
Maryland	267	276	275	254	310	301	361	386	419	430
District of Columbia	12	14	18	19	23	47	30	31	21	24
Virginia	93	93	123	(1)	(1)	(1)	(1)	(1)	133	131
West Virginia	89	71	53	59	63	61	54	48	40	48
North Carolina	71	71	81	124	120	138	157	175	184	210
South Carolina	28	31	32	47	48	51	59	65	(1)	(1)
Georgia	61	71	75	(1)	(1)	(1)	(1)	(1)	122	105
Florida	284	273	323	338	375	436	424	371	422	547
East South Central	280	305	416	481	473	416	364	346	342	354
Kentucky	22	35	36	41	48	51	53	55	52	61
Tennessee	139	136	158	206	221	199	194	183	191	186
Alabama	116	132	221	229	203	164	114	105	96	101
Mississippi	2	2	1	2	2	2	3	3	3	7
West South Central	491	846	796	771	721	811	658	571	551	578
Arkansas	2	2	1	5	5	6	5	7	5	5
Louisiana	131	282	255	237	154	127	103	38	51	66
Oklahoma	53	93	121	99	83	71	73	81	63	66
Texas	304	469	419	430	479	607	477	445	431	440
WEST	4,320	4,453	4,594	4,635	4,897	5,264	5,519	5,000	4,613	4,770
Mountain	465	473	457	446	462	596	651	687	650	689
Montana	(1)	(1)	(1)	(1)	(1)	(1)	.....	.....	(1)	(1)
Idaho	27	29	28	(1)	(1)	(1)	(1)	(1)	30	23
Wyoming	1	1	(1)	2	2	2	3	3	5	1
Colorado	126	109	105	108	119	139	149	217	220	231
New Mexico	(1)	185	168	146	154	151	179	179	(1)	(1)
Arizona	86	97	110	116	125	180	197	152	155	171
Utah	71	29	22	18	21	21	25	22	17	26
Nevada	(1)	(1)	21	38	52	55	37	37	(1)	(1)
Pacific	3,854	3,981	4,137	4,189	4,407	4,668	4,868	4,313	3,964	4,082
Washington	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Oregon	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	38	38
California	3,512	3,754	3,768	(1)	(1)	(1)	(1)	(1)	3,468	3,546
Alaska	.....	.....	.....	.....	.....	.....	(1)	(1)	(1)	(1)
Hawaii	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	3	3

[1] Not separately available but included in total.

Table B-22.—Geographic distribution of funds for industrial research and development, by source of funds: 1972

[Dollars in millions]

Area	Total		Federal		Company	
	Amount	Percent of U.S. total	Amount	Percent of U.S. total	Amount	Percent of U.S. total
UNITED STATES, TOTAL	$19,437	100	$8,090	100	$11,347	100
NORTHEAST	6,886	35	2,582	32	4,304	38
New England	1,960	10	954	12	1,006	9
Maine	10	(2)	.....	.....	10	(2)
New Hampshire	40	(2)	(1)	(1)	(1)	(1)
Vermont	58	(2)	(1)	(1)	(1)	(1)
Massachusetts	1,172	6	662	8	510	4
Rhode Island	43	(2)	(1)	(1)	(1)	(1)
Connecticut	637	3	228	3	409	4
Middle Atlantic	4,927	25	1,629	20	3,298	29
New York	2,163	11	792	10	1,371	12
New Jersey	1,532	8	453	6	1,079	10
Pennsylvania	1,231	6	383	5	848	7
NORTH CENTRAL	5,230	27	973	12	4,257	38
East North Central	4,161	21	402	5	3,759	33
Ohio	984	5	195	2	791	7
Indiana	459	2	87	1	372	3
Illinois	849	4	(1)	(1)	(1)	(1)
Michigan	1,586	8	86	1	1,500	13
Wisconsin	283	1	(1)	(1)	(1)	(1)
West North Central	1,068	5	571	7	498	4
Minnesota	325	2	(1)	(1)	(1)	(1)
Iowa	136	(1)	(1)	(1)	(1)	(1)
Missouri	(1)	(1)	(1)	(1)	(1)	(1)
North Dakota	(1)	(1)	(1)	(1)	(1)	(1)
South Dakota	(1)	(1)	.....	.....	(1)	(1)
Nebraska	(1)	(1)	(1)	(1)	(1)	(1)
Kansas	49	(2)	(1)	(1)	(1)	(1)
SOUTH	2,551	13	1,237	15	1,314	12
South Atlantic	1,619	8	880	11	738	7
Delaware	(1)	(1)	(1)	(1)	(1)	(1)
Maryland	430	2	191	2	239	2
District of Columbia	24	(2)	4	(2)	21	(2)
Virginia	131	(1)	36	(2)	95	1
West Virginia	43	(2)	(1)	(1)	(1)	(1)
North Carolina	210	1	52	1	158	1
South Carolina	(1)	(1)	(1)	(1)	(1)	(1)
Georgia	105	(1)	(1)	(1)	(1)	(1)
Florida	547	3	479	6	67	(1)
East South Central	354	2	203	3	151	1
Kentucky	61	(2)	.....	.....	61	1
Tennessee	136	1	(1)	(1)	(1)	(1)
Alabama	101	(1)	(1)	(1)	(1)	(1)
Mississippi	7	(2)	.....	.....	(1)	(1)
West South Central	578	3	153	2	425	4
Arkansas	5	(2)	.....	.....	5	(2)
Louisiana	66	(2)	(1)	(1)	(1)	(1)
Oklahoma	66	(2)	(1)	(1)	(1)	(1)
Texas	440	2	123	2	317	3
WEST	4,770	25	3,298	41	1,472	13
Mountain	689	4	386	5	303	3
Montana	(1)	(1)	.....	.....	(1)	(1)
Idaho	23	(2)	(1)	(1)	(1)	(1)
Wyoming	1	(2)	.....	.....	1	(2)
Colorado	231	1	(1)	(1)	(1)	(1)
New Mexico	(1)	(1)	(1)	(1)	(1)	(1)

NORTH CENTRAL						
East North Central	4,161	21	402	5	3,759	33
Ohio	984	5	195	2	791	7
Indiana	459	2	87	1	372	3
Illinois	849	4	(1)	(1)	(1)	(1)
Michigan	1,586	8	86	1	1,500	13
Wisconsin	283	1	(1)	(1)	(1)	(1)
West North Central	1,068	5	571	7	498	4
Minnesota	325	2	(1)	(1)	(1)	(1)
Iowa	136	(1)	(1)	(1)	(1)	(1)
Missouri	(1)	(1)	(1)	(1)	(1)	(1)
North Dakota	(1)	(1)	(1)	(1)	(1)	(1)
South Dakota	(1)	(1)	.....	.....	(1)	(1)
Nebraska	(1)	(1)	(1)	(1)	(1)	(1)
Kansas	49	(2)	(1)	(1)	(1)	(1)
SOUTH	2,551	13	1,237	15	1,314	12
South Atlantic	1,619	8	880	11	738	7
Delaware	(1)	(1)	(1)	(1)	(1)	(1)
Maryland	430	2	191	2	239	2
District of Columbia	24	(2)	4	(2)	21	(2)
Virginia	131	(1)	36	(2)	95	1
West Virginia	48	(2)	(1)	(1)	(1)	(1)
North Carolina	210	1	52	1	158	1
South Carolina	(1)	(1)	(1)	(1)	(1)	(1)
Georgia	105	(1)	(1)	(1)	(1)	(1)
Florida	547	3	479	6	67	(1)
East South Central	354	2	203	3	151	1
Kentucky	61	(2)	.....	.....	61	1
Tennessee	186	1	(1)	(1)	(1)	(1)
Alabama	101	(1)	(1)	(1)	(1)	(1)
Mississippi	7	(2)	.....	.....	(1)	(1)
West South Central	578	3	153	2	425	4
Arkansas	5	(2)	.....	.....	5	(2)
Louisiana	66	(2)	(1)	(1)	(1)	(1)
Oklahoma	66	(2)	(1)	(1)	(1)	(1)
Texas	440	2	123	2	317	3
WEST	4,770	25	3,298	41	1,472	13
Mountain	689	4	386	5	303	3
Montana	(1)	(1)	.....	.....	(1)	(1)
Idaho	23	(2)	(1)	(1)	(1)	(1)
Wyoming	1	(2)	.....	.....	1	(2)
Colorado	231	1	(1)	(1)	(1)	(1)
New Mexico	(1)	(1)	(1)	(1)	(1)	(1)
Arizona	171	1	72	1	99	1
Utah	26	(2)	(1)	(1)	(1)	(1)
Nevada	(1)	(1)	(1)	(1)	(1)	(1)
Pacific	4,082	21	2,912	36	1,169	10
Washington	(1)	(1)	(1)	(1)	(1)	(1)
Oregon	38	(2)	(1)	(1)	(1)	(1)
California	3,546	18	2,557	32	990	9
Alaska	(1)	(1)	(1)	(1)	(1)	(1)
Hawaii	3	(2)	(1)	(1)	(1)	(1)

[1] Not separately available but included in total.
[2] Less than 0.5 percent.

Table B.23—Distribution of R&D costs, by industry and type of cost: 1972

Industry	SIC code	Coverage ratio[1]	Millions of dollars				
			R&D costs	Wages: Scientists and engineers	Wages: Supporting personnel	Materials and supplies	Other R&D costs
Total	.....	84	$19,437	$5,835	$3,718	$3,473	$6,409
Food and kindred products	20	85	258	97	54	40	67
Textiles and apparel	22,23	62	61	24	13	10	14
Lumber, wood products, and furniture	24,25	49	51	26	7	13	4
Paper and allied products	26	62	186	61	33	49	43
Chemicals and allied products	28	83	1,909	683	380	292	554
Industrial chemicals	281-82	87	1,045	352	231	170	292
Drugs and medicines	283	85	558	217	89	67	185
Other chemicals	284-89	66	306	114	60	55	77
Petroleum refining and extraction	29,13	91	473	144	83	48	198
Rubber products	30	77	263	84	45	39	95
Stone, clay, and glass products	32	69	167	57	35	36	39
Primary metals	33	75	264	85	64	39	75
Ferrous metals and products	331-32,3391,3399	63	137	46	34	23	34
Nonferrous metals and products	333-36,3392	86	126	39	30	16	41
Fabricated metal products	34	64	241	90	49	40	62
Machinery	35	84	1,964	664	433	258	609
Electrical equipment and communication	36,48	91	4,946	1,460	898	851	1,737
Radio and TV receiving equipment	365	15	54	[2]	[2]	[2]	[2]
Electronic components	367	90	3,173	918	505	572	1,178
Communication equipment & communication	366,48						
Other electrical equipment	361-64,369	97	1,719	515	380	275	549
Motor vehicles and motor vehicles equipment	371	97	1,982	526	610	317	529
Other transportation equipment	373-75,379						
Aircraft and missiles	372,19	86	5,014	1,303	651	1,153	1,907
Professional and scientific instruments	38	63	804	255	210	125	213
Scientific and mechanical measuring instruments	381-82	79	123	41	28	15	35
Optical, surgical, photographic, and other instruments	383-87	61	680	210	58	110	178
Other manufacturing industries	21,27,31,39	85	143	54	33	20	36
Nonmanufacturing industries	07-12,14-17,41-47 49-67,739,807,891	76	711	220	120	144	227

[1] The coverage ratio is derived by dividing R&D funds for which a distribution by type of cost was reported by total R&D funds, including those for which a distribution was not reported.

[2] Data withheld because of high imputation rate.

Industry	SIC code	Cove rat
Total	.....	
Food and kindred products	20	
Textiles and apparel	22,23	
Lumber, wood products, and furniture	24,25	
Paper and allied products	26	
Chemicals and allied products	28	
Industrial chemicals	281-82	
Drugs and medicines	283	
Other chemicals	284-89	
Petroleum refining and extraction	29,13	
Rubber products	30	
Stone, clay, and glass products	32	
Primary metals	33	
Ferrous metals and products	331-32,3391,3399	
Nonferrous metals and products	333-36,3392	
Fabricated metal products	34	
Machinery	35	
Electrical equipment and communication	36,48	
Radio and TV receiving equipment	365	
Electronic components	367	
Communication equipment & communication	366,48	
Other electrical equipment	361-64,369	
Motor vehicles and motor vehicles equipment	371	
Other transportation equipment	373-75,379	
Aircraft and missiles	372,19	
Professional and scientific instruments	38	
Scientific and mechanical measuring instruments	381-82	
Optical, surgical, photographic, and other instruments	383-87	
Other manufacturing industries	21,27,31,39	
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	

Table B.23—Distribution of R&D costs, by industry and type of cost: 1972

Industry	SIC code	Coverage ratio[1]	Percent distribution				
			R&D costs	Wages		Materials and supplies	Other R&D costs
				Scientists and engineers	Supporting personnel		
Total		84	100	30	19	18	33
Food and kindred products	20	85	100	38	21	16	26
Textiles and apparel	22,23	62	100	39	21	16	23
Lumber, wood products, and furniture	24,25	49	100	55	14	24	8
Paper and allied products	26	62	100	33	18	26	23
Chemicals and allied products	28	83	100	36	20	15	29
Industrial chemicals	281-82	87	100	24	22	16	28
Drugs and medicines	283	85	100	39	16	12	33
Other chemicals	284-89	66	100	37	20	16	25
Petroleum refining and extraction	29,13	91	100	30	18	10	42
Rubber products	30	77	100	32	17	15	36
Stone, clay, and glass products	32	69	100	34	21	22	23
Primary metals	33	75	100	32	24	15	28
Ferrous metals and products	331-32,3391,3399	63	100	34	25	17	25
Nonferrous metals and products	333-36,3392	86	100	31	24	13	33
Fabricated metal products	34	64	100	37	20	17	26
Machinery	35	84	100	34	22	13	31
Electrical equipment and communication	36,48	91	100	30	18	17	35
Radio and TV receiving equipment	365	15	100	[2]	[2]	[2]	[2]
Electronic components	367	50	100	29	16	18	37
Communication equipment & communication	366,48						
Other electrical equipment	361-64,369	97	100	30	22	16	32
Motor vehicles and motor vehicles equipment	371	97	100	27	31	16	27
Other transportation equipment	373-75,379						
Aircraft and missiles	372,19	86	100	26	13	23	38
Professional and scientific instruments	38	63	100	32	26	16	26
Scientific and mechanical measuring instruments	381-82	79	100	37	23	12	28
Optical, surgical, photographic, and other instruments	383-87	61	100	31	27	16	26
Other manufacturing industries	21,23-31,39	85	100	38	23	14	25
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	76	100	31	17	20	32

Millions of dollars				
	Wages			
R&D costs	Scientists and engineers	Supporting personnel	Materials and supplies	Other R&D costs
$19,437	$5,835	$3,718	$3,473	$6,409
258	97	54	40	67
61	24	13	10	14
51	28	7	12	4
186	61	33	49	43
1,909	683	380	292	554
1,045	352	231	170	292
558	217	89	67	185
306	114	60	55	77
473	144	83	48	198
263	84	45	39	95
167	57	35	36	39
264	85	64	39	75
137	46	34	23	34
126	39	35	16	41
241	90	49	40	62
1,964	664	433	258	609
4,946	1,460	898	851	1,737
54	[2]	[2]	[2]	[2]
3,173	918	505	572	1,178
1,719	515	380	275	549
1,982	526	610	317	529
5,014	1,303	651	1,153	1,907
804	255	210	125	213
123	45	28	15	35
680	210	182	110	178
143	54	33	20	36
711	220	120	144	227

[1] Distribution by type of cost was reported by total

Table B-24.—Distribution of R&D costs, by industry and type of cost: 1971

Industry	SIC code	Coverage ratio[1]	Millions of dollars				
			R&D costs	Wages: Scientists and engineers	Wages: Supporting personnel	Materials and supplies	Other R&D costs
Total		85	$18,311	$5,565	$3,513	$3,258	$5,974
Food and kindred products	20	83	245	94	51	38	62
Textiles and apparel	22,23	66	59	24	12	9	14
Lumber, wood products, and furniture	24,25	47	48	27	6	11	4
Paper and allied products	26	66	187	61	34	49	43
Chemicals and allied products	28	83	1,819	659	368	271	521
Industrial chemicals	281-82	87	1,020	346	228	161	285
Drugs and medicines	283	84	510	201	82	61	166
Other chemicals	284-89	64	289	112	58	49	70
Petroleum refining and extraction	29,13	91	505	156	92	51	206
Rubber products	30	75	230	74	39	34	83
Stone, clay, and glass products	32	68	155	55	34	31	35
Primary metals	33	74	272	90	71	41	70
Ferrous metals and products	331-32,3391,3399	64	144	49	38	25	32
Nonferrous metals and products	333-36,3392	85	128	41	33	16	38
Fabricated metal products	34	56	233	89	47	38	59
Machinery	35	91	1,773	603	393	226	551
Electrical equipment and communication	36,48	86	4,534	1,362	825	783	1,564
Radio and TV receiving equipment	365	10	64	[2]	[2]	[2]	[2]
Electronic components	367	81	2,881	849	465	519	1,048
Communication equipment & communication	366,48						
Other electrical equipment	361-64,369	96	1,589	483	344	259	503
Motor vehicles and motor vehicles equipment	371	98	1,756	487	550	282	437
Other transportation equipment	373-75,379						
Aircraft and missiles	372,19	87	4,911	1,279	640	1,122	1,870
Professional and scientific instruments	38	63	744	238	195	114	196
Scientific and mechanical measuring instruments	381-82	77	110	42	25	14	29
Optical, surgical, photographic, and other instruments	383-87	61	633	196	170	100	167
Other manufacturing industries	21,27,31,39	83	316	51	32	19	34
Nonmanufacturing industries	07-12,14-17,41-47 49-67,739,807,891	75	704	216	124	139	225

Industry	SIC code	Coverage ratio[1]	R&D costs
Total		85	
Food and kindred products	20	83	
Textiles and apparel	22,23	66	
Lumber, wood products, and furniture	24,25	47	
Paper and allied products	26	66	
Chemicals and allied products	28	83	
Industrial chemicals	281-82	87	
Drugs and medicines	283	84	
Other chemicals	284-89	64	
Petroluem refining and extraction	29,13	91	
Rubber products	30	75	
Stone, clay, and glass products	32	68	
Primary metals	33	74	
Ferrous metals and products	331-32,3391,3399	64	
Nonferrous metals and products	333-36,3392	85	
Fabricated metal products	34	56	
Machinery	35	91	
Electrical equipment and communication	36,48	86	
Radio and TV receiving equipment	365	10	
Electronic components	367	81	
Communication equipment & communication	366,48		
Other electrical equipment	361-64,369	96	
Motor vehicles and motor vehicles equipment	371	98	
Other transportation equipment	373-75,379		
Aircraft and missiles	372,19	87	
Professional and scientific instruments	38	63	
Scientific and mechanical measuring instruments	381-82	77	
Optical, surgical, photographic, and other instruments	383-87	61	
Other manufacturing industries	21,27,31,39	83	
Nonmanufacturing industries	07-12,14-17,41-47 49-67,739,807,891	75	

[1] The coverage ratio is derived by dividing R&D funds for which a distribution by type of cost was reported by total R&D funds, including those for which a distribution was not reported.

[2] Data withheld because of high imputation rate.

B-24.--Distribution of R&D costs, by industry and type of cost: 1971

Millions of dollars				Industry	SIC code	Coverage ratio[1]	Percent distribution				
Wages								Wages			
Scientists and engineers	Supporting personnel	Materials and supplies	Other R&D costs				R&D costs	Scientists and engineers	Supporting personnel	Materials and supplies	Other R&D costs
$5,565	$3,513	$3,258	$5,974	Total		85	100	30	19	18	33
94	51	38	62	Food and kindred products	20	83	100	38	21	16	25
24	12	9	14	Textile, and apparel	22,23	66	100	41	20	15	24
27	6	11	4	Lumber, wood products, and furniture	24,25	47	100	56	13	23	8
61	34	49	43	Paper and allied products	26	66	100	33	18	26	23
659	368	271	521	Chemicals and allied products	28	83	100	36	20	15	29
346	228	161	285	Industrial chemicals	281-82	87	100	34	22	16	28
201	82	61	166	Drugs and medicines	283	84	100	39	16	12	33
112	58	49	70	Other chemicals	284-89	64	100	39	20	17	24
156	92	51	206	Petroleum refining and extraction	29,13	91	100	31	18	10	41
74	39	34	83	Rubber p[illegible]	3[illegible]	75	100	32	17	15	36
55	34	31	35	[illegible]y, and [illegible]s products	3[illegible]	68	100	35	22	20	23
90	71	41	70	Primary metals	33	74	100	33	26	17	22
49	32	25	32	Ferrous metals and products	331-32,3391,3399	64	100	34	26	17	22
41	33	16	38	Nonferrous metals and products	333-36,3392	65	100	32	26	13	30
89	47	38	59	Fabricated metal products	34	56	100	38	20	16	25
603	393	226	551	Machinery	35	91	100	34	22	13	31
1,362	825	783	1,564	Electrical equipment and communication	36,48	86	100	30	18	17	34
(2)	(2)	(2)	(2)	Radio and TV receiving equipment	365	1[illegible]	1[illegible]	(2)	(2)	(2)	(2)
849	465	519	1,048	Electronic components Communication equipment & communication	367 366,48	81	100	29	16	18	36
483	344	259	503	Other electrical equipment	361-64,369	96	100	33	22	16	32
487	550	282	437	Motor vehicles and motor vehicles equipment	371	98	100	28	31	16	25
1,279	640	1,122	1,870	Other transportation equipment	373-75,379						
238	195	134	196	Aircraft and missiles	372,19	87	100	26	13	23	38
				Professional and scientific instruments	38	63	100	32	26	15	26
42	2[illegible]	14	29	Scientific and mechanical measuring instruments	381-82	77	100	38	23	13	26
196	170	100	167	Optical, surgical, photographic, and ot[illegible]er instruments	383-87	61	100	31	27	16	26
51	32	19	34	Other manufacturing industries	2[illegible],27,31,39	83	100	38	24	14	25
216	124	139	225	Nonmanufacturing industries	1[illegible]-17,41-47						
					737,807,891	75	100	31	18	20	[illegible]

[illegible]gh a distribution by type of cost
[illegible]eported

Table B-25.—Full-time equivalent number of R&D scientists and engineers, by industry and size of company: 1957-58 and 1963-72

[In thousands]

Industry and size of company	SIC code	January					
		1957	1958	1963	964	1965	1966
Total		229.4	243.9	327.3	340.2	343.6	353.2
Distribution by industry							
Food and kindred products	20	3.6	4.8	5.1	5.7	6.2	6.2
Textiles and apparel	22,23	.7	.8	1.0	1.2	1.2	1.4
Lumber, wood products, and furniture	24,25	.8	.8	.5	.5	.5	.6
Paper and allied products	26	1.5	1.7	2.5	3.8	3.8	4.3
Chemicals and allied products	28	29.4	31.0	38.3	35.8	37.9	38.0
Industrial chemicals	281-82	18.0	18.8	22.9	22.2	24.3	23.3
Drugs and medicines	283	4.7	5.1	6.9	6.9	7.2	7.5
Other chemicals	284-89	6.7	7.1	8.5	6.7	6.4	7.2
Petroleum refining and extraction	29,13	6.9	7.4	8.9	8.1	8.7	8.9
Rubber product.	30	4.7	4.7	5.8	6.0	5.8	5.7
Stone, clay, and glass products	32	(1)	(1)	3.6	3.3	3.5	3.1
Primary metals	33	5.1	5.2	5.2	5.1	5.5	5.5
Ferrous metals and products[2]	331-32,339 ,3399	2.9	3.0	.9	2.8	3.2	3.2
Nonferrous metals and products	333-36,3392	2.2	2.2	2.3	2.3	2.3	2.3
Fabricated metal products	34	8.4	8.3	6.8	7.0	6.6	6.3
Machinery	35	24.9	27.4	31.4	27.3	29.4	30.5
Electrical equipment and communication	36,48	42.9	47.9	85.8	89.5	87.8	92.0
Radio and TV receiving equipment	365	(1)	(1)	(1)	(1)	(1)	(1)
Electronic components	367	19.2	22.1	55.1	60.4	58.8	62.3
Communication equipment & communication	366,48						
Other electrical equipment	361-64,369	23.7	25.6	30.7	29.1	29.0	29.7
Motor vehicles and motor vehicles equipment	371	13.6	15.0	21.1	23.3	24.1	24.8
Other transportation equipment	373-75,379						
Aircraft and missiles	372,19	58.7	58.6	90.7	101.1	99.2	99.3
Professional and scientific instruments	38	10.2	11.0	9.4	10.8	11.5	12.5
Scientific and mechanical measuring instruments	381-82	5.8	6.5	3.5	3.8	3.6	3.8
Optical, surgical, photographic, and other instruments	383-87	4.4	4.5	5.5	7.0	7.9	8.7
Other manufacturing industries	21,27,31,39	15.1	19.2	2.8	2.0	2.4	2.3
Nonmanufacturing industries	07-12,14-17,41-47 49-67,739,807,891			8.2	9.8	9.6	11.7
Distribution by size of company (based on number of employees)							
Less than 1,000		44.3	45.8	34.1	32.5	32.4	30.0
1,000 to 4,999		22.4	24.0	35.0	34.5	32.1	30.1
5,000 to 9,999							
10,000 or more		162.2	171.3	27.2	273.2	279.1	293.1

[1] Data included in the other manufacturing industries group

[2] SIC codes 3391 and 3399 included in the nonferrous metals and products group for January 1957 to January 1966.

Industry and size of company	SIC code	1967
Total		36
Distribution by industry		
Food and kindred products	20	
Textiles and apparel	22,23	
Lumber, wood products, and furniture	24,25	
Paper and allied products	26	
Chemicals and allied products	28	3
Industrial chemicals	281-82	2
Drugs and medicines	283	
Other chemicals	284-89	
Petroleum refining and extraction	29,13	
Rubber products	30	
Stone, clay, and glass products	32	
Primary metals	33	
Ferrous metals and products[1]	331-32,3391,3399	
Nonferrous metals and products	333-36,3392	
Fabricated metal products	34	
Machinery	35	3
Electrical equipment and communication	36,48	9
Radio and TV receiving equipment	365	
Electronic components	367	
Communication equipment & communication	366,48	6
Other electrical equipment	361-64,369	3
Motor vehicles and motor vehicles equipment	371	
Other transportation equipment	373-75,379	2
Aircraft and missiles	372,19	10
Professional and scientific instruments	38	1
Scientific and mechanical measuring instruments	381-82	
Optical, surgical photographic, and other instruments	383-87	
Other manufacturing industries	21,27,31,39	
Nonmanufacturing industries	07-12,14-17,41-47 49-67,738,807,891	1
Distribution by size of company (based on number of employees)		
Less than 1,000		27
1,000 to 4,999		3
5,000 to 9,999		2
10,000 or more		28

[1] Included in the other electrical equipment group

[2] Not separately available but included in total

Table B-25.—Full-time equivalent number of R&D scientists and engineers, by industry and size of company: 1957-58 and 1963-72

[In thousands]

Industry and size of company	SIC code	January						
		1967	1968	1969	1970	1971	1972	1973
Total		367.2	376.7	387.1	384.1	366.8	349.9	359.9
Distribution by industry								
Food and kindred products	20	6.1	6.3	6.3	6.3	6.7	6.6	6.7
Textiles and apparel	22,23	1.9	2.5	2.6	2.9	1.8	1.8	1.8
Lumber, wood products, and furniture	24,25	.5	.5	.9	1.0	1.7	1.7	1.8
Paper and allied products	26	4.7	4.8	4.8	4.9	5.0	4.9	4.9
Chemicals and allied products	28	36.9	38.9	40.3	40.2	42.8	40.9	41.6
Industrial chemicals	281-82	21.7	22.3	22.6	21.9	22.4	19.7	19.5
Drugs and medicines	283	8.7	9.8	10.1	11.4	11.6	11.8	12.5
Other chemicals	284-89	6.5	6.8	7.6	6.9	8.8	9.5	9.6
Petroleum refining and extraction	29,13	8.7	9.2	10.0	9.9	9.2	8.3	8.2
Rubber products	30	5.8	6.1	6.3	6.8	5.9	5.8	5.8
Stone, clay, and glass products	32	3.3	4.1	4.2	4.6	4.1	3.9	4.0
Primary metals	33	5.9	5.5	6.2	6.3	6.3	6.0	5.7
Ferrous metals and products	331-32,3391,3399	3.3	3.1	3.2	3.2	3.4	3.4	3.3
Nonferrous metals and products	333-36,339pt	2.5	2.7	3.0	3.1	2.9	2.6	2.4
Fabricated metal products	34	6.3	5.6	6.6	5.9	6.9	6.4	6.6
Machinery	35	33.9	37.4	39.4	41.4	40.5	41.1	42.6
Electrical equipment and communication	36,48	98.6	98.4	101.6	102.4	95.2	87.7	93.3
Radio and TV receiving equipment	365	.9	1.0	1.2	1.9	2.4	2.1	1.9
Electronic components	367	66.7	67.4	67.4	66.3	63.6	57.2	61.8
Communication equipment & communication	366,48							
Other electrical equipment	361-64,369	31.0	30.0	33.0	34.2	29.2	28.4	29.7
Motor vehicles and motor vehicles equipment	371	25.2	24.3	25.0	25.1	27.8	29.3	29.4
Other transportation equipment	373-75,379	100.4	101.1	99.9	92.6	78.3	71.2	72.9
Aircraft and missiles	372,19	13.0	14.1	15.1	14.8	15.1	15.1	15.7
Professional and scientific instruments	38	3.5	3.8	3.9	3.7	4.2	4.1	4.3
Scientific and mechanical measuring instruments	381-82	9.4	10.3	11.2	11.1	10.9	10.9	11.4
Optical, surgical, photographic, and other instruments	383-87	2.2	2.4	2.8	2.7	3.9	3.7	3.7
Other manufacturing industries	21-27,31,39	14.1	15.1	15.1	16.3	15.6	15.7	15.4
Nonmanufacturing industries	10-14,40-47,49-67,738							
Distribution by size of company (based on number of employees)								
Less than 1,000		27.4	27.2	(1)	(1)	28.2	28.4	28.8
1,000 to 4,999		30.5	29.9	(1)	(1)	31.6	30.9	31.9
5,000 to 9,999		24.0	24.6	24.6	28.5	28.7	28.4	29.1
10,000 or more		285.3	295.0	307.3	299.1	278.1	262.4	270.3

[1] Included in the other electrical equipment group.
[2] Not separately available but included in total.

January 1957 to January 1966

Table B-26.—Full-time-equivalent number of R&D scientists and engineers, by industry and selected company size group: January 1972 and January 1973

Industry	SIC code	January 1972			January 1973		
			Companies with total employment of—			Companies with total employment of—	
		Total	5,000 to 9,999	10,000 or more	Total	5,000 to 9,999	10,000 or more
Total	...	349,900	28,400	262,400	359,900	29,100	270,300
Food and kindred products	20	6,600	700	4,500	6,700	700	4,600
Textiles and apparel	22,23	1,600	200	1,300	1,600	100	1,300
Lumber, wood products, and furniture	24,25	1,700	200	700	1,800	200	800
Paper and allied products	26	4,900	300	3,800	4,900	300	3,900
Chemicals and allied products	28	40,900	8,200	23,200	41,600	8,400	23,400
Industrial chemicals	281-82	19,700	900	16,700	19,500	900	16,500
Drugs and medicines	283	11,800	5,400	3,800	12,500	5,600	4,100
Other chemicals	284-89	9,500	1,900	2,700	9,600	1,900	2,800
Petroleum refining and extraction	29,13	8,300	400	7,300	8,200	400	7,200
Rubber products	30	5,800	500	4,300	5,800	500	4,300
Stone, clay, and glass products	32	3,900	500	2,500	4,000	500	2,700
Primary metals	33	6,000	600	4,000	5,700	600	3,700
Ferrous metals and products	331-32,3391,3399	3,400	(1)	2,100	3,300	(1)	2,000
Nonferrous metals and products	333-36,3392	2,600	(1)	1,900	2,400	(1)	1,700
Fabricated metal products	34	6,400	1,100	2,200	6,600	1,100	2,300
Machinery	35	41,100	1,900	31,000	42,600	2,100	32,000
Electrical equipment and communication	36,48	87,700	6,400	72,500	93,300	6,500	77,600
Radio and TV receiving equipment	365	2,100	(1)	(1)	1,900	(1)	(1)
Electronic components	367	57,200	5,000	47,100	61,800	5,000	51,300
Communication equipment & communication	366,48						
Other electrical equipment	361-64,369	28,400	(1)	(1)	29,700	(1)	(1)
Motor vehicles and motor vehicles equipment	371	29,300	1,000	27,500	29,400	1,000	27,500
Other transportation equipment	373-75,379						
Aircraft and missiles	372,19	71,200	2,400	66,200	72,900	5,000	67,700
Professional and scientific instruments	38	15,100	3,300	7,900	15,700	3,500	7,900
Scientific and mechanical measuring instruments	381-82	4,100	1,000	(1)	4,300	1,000	(1)
Optical, surgical, photographic, and other instruments	383-87	10,900	2,300	(1)	11,400	2,500	(1)
Other manufacturing industries	21,27,31,39	3,700	500	1,800	3,700	400	1,900
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	15,700	200	1,800	15,400	200	1,600

[1] Not separately available but included in total

Table B-27.—Man-years of R&D scientists and engineers, by industry, size of company, and R&D program, 1972

Industry and size of company	SIC code	Total	Size of R&D program (thousands of dollars)				
			Less than $200	$200—$999	$1,000—$9,999	$10,000—$99,999	$100,000 or more
Total	.....	355,600	14,600	12,400	54,400	95,000	179,200
Distribution by industry							
Food and kindred products	20	6,700	300	700	4,400	1,300	.....
Textiles and apparel	22,23	1,800	100	500	1,200	.....	.....
Lumber, wood products, and furniture	24,25	1,800	400	400	1,000	.....	.....
Paper and allied products	26	4,900	100	300	1,800	2,700	.....
Chemicals and allied products	28	41,300	2,300	1,000	7,100	(1)	(1)
Industrial chemicals	281-82	19,600	500	500	2,000	(1)	(1)
Drugs and medicines	283	12,200	200	100	2,200	9,700	.....
Other chemicals	284-89	9,600	1,600	400	2,900	4,700	.....
Petroleum refining and extraction	29,13	8,300	100	100	1,300	6,800	.....
Rubber products	30	5,800	200	100	1,200	4,300	.....
Stone, clay, and glass products	32	4,000	600	200	1,000	2,200	.....
Primary metals	33	5,900	600	600	2,300	2,400	.....
Ferrous metals and products	331-32,3391,3399	3,400	500	300	1,300	1,300	.....
Nonferrous metals and products	333-36,3392	2,500	100	300	1,000	1,100	.....
Fabricated metal products	34	6,500	1,800	700	1,500	2,500	.....
Machinery	35	41,900	2,400	1,800	6,300	(1)	(1)
Electrical equipment and communication	36,48	90,500	2,100	2,400	8,100	18,600	59,300
Radio and TV receiving equipment	365	2,000	100	100	(1)	(1)	.....
Electronic components	367						
Communication equipment & communication	366,48	59,500	1,200	1,400	(1)	(	(1)
Other electrical equipment	361-64,369	29,100	800	900	(1)	(1)	(1)
Motor vehicles and motor vehicles equipment	371						
Other transportation equipment	373-75,379	29,400	400	300	1,600	1,700	25,400
Aircraft and missiles	372,19	72,100	200	400	3,200	6,400	61,900
Professional and scientific instruments	38	15,400	1,000	800	4,200	(1)	(1)
Scientific and mechanical measuring instruments	381-82	4,200	500	600	(1)	(1,	.....
Optical, surgical, photographic, and other instruments	383-87	11,200	500	200	(1)	(1)	(1)
Other manufacturing industries	21,27,31,39	3,700	200	600	1,800	1,100	.....
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	15,600	1,800	1,500	6,400	5,900	.....
Distribution by size of company (based on number of employees)							
Less than 1,000	.....	32,200	13,500	5,800	8,200	1,500	.....
1,000 to 4,999	.....	31,200	900	5,200	19,300	5,800	.....
5,000 to 9,999	.....	28,000	100	800	10,700	(1)	(1)
10,000 or more	.....	264,200	100	600	16,200	(1)	(1)

[1] Not separately available but included in total.

Table B-28.—Full-time-equivalent number of R&D scientists and engineers, by industry and source of R&D funds: January 1972 and January 1973

Industry	SIC code	January 1971			January 1972		
		Total	Federal	Company	Total	Federal	Company
Total		349,900	118,100	232,000	359,900	122,200	237,900
Food and kindred products	20	6,600	1	1	6,700	(1)	(1)
Textiles and apparel	22,23	1,800	(1)	(1)	1,800	(1)	(1)
Lumber, wood products, and furniture	24,25	1,700	(1)	(1)	1,800	(1)	(1)
Paper and allied products	26	4,900	(1)	(1)	4,900	(1)	(1)
Chemicals and allied products	28	40,900	2,900	38,000	41,600	3,300	38,300
Industrial chemicals	281-82	19,700	2,400	17,300	19,500	2,600	16,900
Drugs and medicines	283	11,800	(1)	(1)	12,500	(1)	(1)
Other chemicals	284-89	9,500	(1)	(1)	9,600	(1)	(1)
Petroleum refining and extraction	29,13	8,300	(1)	(1)	8,200	(1)	(1)
Rubber products	30	5,800	600	5,200	5,800	600	5,200
Stone, clay, and glass products	32	3,900	(2)	3,900	4,000	(2)	4,000
Primary metals	33	6,000	100	5,900	5,700	100	5,600
Ferrous metals and products	331-32,3391,3399	3,400	(2)	3,400	3,300	(2)	3,300
Nonferrous metals and products	333-36,3392	2,600	100	2,500	2,400	100	2,300
Fabricated metal products	34	6,400	200	6,200	6,600	300	6,300
Machinery	35	41,100	5,700	35,400	42,600	6,600	36,000
Electrical equipment and communication	36,48	87,700	37,400	50,300	93,300	40,200	53,100
Radio and TV receiving equipment	365	2,100	(1)	(1)	1,900	(1)	(1)
Electronic components	367	57,200	25,700	31,500	61,800	28,000	33,800
Communication equipment & communication	366,48						
Other electrical equipment	361-64,369	28,400	(1)	(1)	29,700	(1)	(1)
Motor vehicles and motor vehicles equipment	371	29,300	6,100	23,200	29,400	4,500	24,900
Other transportation equipment	373-75,379						
Aircraft and missiles	372,19	71,200	53,500	17,700	72,900	55,900	17,000
Professional and scientific instruments	38	15,100	2,800	12,300	15,700	2,400	13,300
Scientific and mechanical measuring instruments	381-82	4,100	800	3,300	4,300	900	3,400
Optical, surgical, photographic, and other instruments	383-87	10,900	1,900	9,000	11,400	1,500	9,900
Other manufacturing industries	21,27,31,39	3,700	(1)	(1)	3,700	(1)	(1)
Nonmanufacturing industries	07-12,,4-17,41-47, 49-67,739,807,891	15,700	8,200	7,500	15,400	7,900	7,500

[1] Not separately available but included in total.
[2] Less than 50.

Table B-29.—Federally supported R&D scientists and engineers, by selected industry and agency: 1963-72[1]

Industry	SIC code	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
		Total Federal									
Total	.....	163,500	163,800	162,700	162,500	156,200	157,300	154,200	140,400	123,600	120,200
Chemicals and allied products	28	(2)	5,100	4,100	3,700	3,900	3,800	3,300	3,400	3,100	3,100
Machinery	35	(2)	6,600	6,600	7,400	8,100	8,400	8,500	6,800	5,500	6,200
Electrical equipment and communication	36,48	49,300	49,600	50,300	52,700	51,100	51,800	52,500	47,500	40,600	38,800
Motor vehicles and other transportation equipment	371,373-75,379	(2)	(2)	(2)	6,900	6,500	6,400	5,700	5,100	6,100	5,300
Aircraft and missiles	372,19	80,800	83,700	82,200	80,700	74,400	74,000	70,800	64,400	55,800	54,700
Other industries	.....	(2)	(2)	(2)	11,100	12,200	12,900	13,400	13,200	12,700	12,300
		DOD[3]									
Total	.....	111,800	97,100	88,500	89,000	98,400	103,200	104,400	94,600	87,200	87,300
Chemicals and allied products	28	(2)	2,600	1,700	1,200	1,200	1,400	1,000	1,100	800	900
Machinery	35	(2)	4,500	4,200	4,500	5,600	5,500	5,700	4,200	3,400	4,000
Electrical equipment and communication	36,48	34,800	30,900	29,800	28,300	31,600	34,700	35,600	33,300	28,800	28,300
Motor vehicles and other transportation equipment	371,373-75,379	(2)	(2)	(2)	4,200	4,200	4,100	4,400	3,700	4,400	4,000
Aircraft and missiles	372,19	55,100	48,700	41,500	45,300	48,800	50,000	49,700	43,900	41,800	41,900
Other industries	.....	(2)	(2)	(2)	6,100	7,600	8,100	8,700	8,400	8,000	8,200
		NASA[3]									
Total	.....	35,800	49,300	56,800	55,200	40,900	38,700	33,500	29,100	21,200	18,000
Chemicals and allied products	28	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Machinery	35	(2)	2,300	2,500	3,000	2,200	2,700	2,500	2,000	1,200	1,200
Electrical equipment and communication	36,48	6,400	8,200	11,300	15,100	11,200	9,700	9,300	7,300	5,500	4,000
Motor vehicles and other transportation equipment	371,373-75,379	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Aircraft and missiles	372,19	22,100	31,400	35,800	31,500	22,900	21,700	17,900	16,600	11,700	10,100
Other industries	.....	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)

[1] For 1963-70, the number of R&D scientists and engineers was derived by using the arithmetic mean of the full-time equivalent number of R&D scientists and engineers employed in Januarys of two consecutive years; for 1971 and 1972, man-years were used.
[2] Not separately available but included in total.
[3] Estimates based on approximately 200 companies leading in Federal R&D funds.

Table B-30.—R&D scientists and engineers per 1,000 employees, by industry and size of company: 1958 and 1963-72[1]

Industry and size of company	SIC code	1958	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
Total	.....	21	28	30	30	27	27	26	26	26	26	25
Distribution by industry												
Food and kindred products	20	6	7	7	7	7	7	7	6	7	7	7
Textiles and apparel	22,23	1	3	3	3	3	3	4	5	4	3	3
Lumber, wood products, and furniture	24,25	5	4	5	5	4	4	4	5	6	7	7
Paper and allied products	26	6	6	6	6	6	6	6	6	8	8	8
Chemicals and allied products	28	39	40	41	39	38	36	36	37	39	40	39
Industrial chemicals	281-82	42	40	40	38	35	33	33	33	35	34	32
Drugs and medicines	283	46	47	54	53	53	51	51	57	73	73	73
Other chemicals	284-89	30	38	33	32	35	33	33	32	29	33	34
Petroleum refining and extraction	29,13	15	17	16	17	17	18	18	19	17	16	16
Rubber products	30	19	20	19	18	17	17	17	18	17	16	16
Stone, clay, and glass products	32	[2]	12	12	12	13	14	14	14	12	12	12
Primary metals	33	5	5	5	5	5	5	5	6	6	6	6
Ferrous metals and products[3]	331-32,3391,3399	4	4	4	4	4	4	4	4	4	4	5
Nonferrous metals and products	333-36,3392	6	8	8	8	8	8	8	9	9	9	8
Fabricated metal products	34	16	15	16	15	13	14	11	11	9	10	9
Machinery	35	22	28	28	27	27	28	27	28	27	28	28
Electrical equipment and communication	36,48	43	55	55	53	44	43	45	42	41	40	38
Radio and TV receiving equipment	365	[4]	[4]	[4]	[4]	[4]	18	22	32	33	35	30
Electronic components	367	52	67	69	66	53	52	51	46	45	43	42
Communication equipment & communication	366,48											
Other electrical equipment	361-64,369	37	41	40	39	38	35	40	37	36	34	34
Motor vehicles and motor vehicles equipment	371	16	19	20	20	20	20	19	19	20	22	22
Other transportation equipment	373-75,379											
Aircraft and missiles	372,19	72	99	110	113	95	89	80	76	73	74	75
Professional and scientific instruments	38	44	36	37	36	33	32	34	30	29	33	32
Scientific and mechanical measuring instruments	381-82	57	38	35	33	28	26	27	24	26	31	30
Optical, surgical, photographic, and other instruments	383-87	33	35	38	39	36	35	37	33	30	34	33
Other manufacturing industries	21,27,31,39	[2]	9	8	8	7	6	6	8	8	8	8
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891		9	11	10	12	13	12	13	28	28	28
Distribution by size of company (based on number of employees)												
Less than 1,000	.....	18	27	27	27	28	28	28	[2]	26	29	30
1,000 to 4,999	.....	12	19	19	18	16	16	16	[2]	18	18	18
5,000 to 9,999	.....	25	31	32	31	30	15	16	19	19	18	18
10,000 or more	.....						31	30	28	29	28	27

[1] The number of R&D scientists and engineers per 1,000 employees for 1972 is derived by dividing the arithmetic mean of the number of scientists and engineers employed in January 1972 and January 1973 by the number of company employees in all activities in March 1972. Similar procedures were used in earlier years except 1967-69 where data were derived by dividing the man-years of R&D scientists and engineers for the year by the March employment figures.

[2] Not separately available but included in total.

[3] SIC codes 3391 and 3399 included in the nonferrous metals and products group for 1958 to 1966.

[4] Included in the other electrical equipment group for 1958 to 1966.

Table B-31.—Cost per R&D scientist or engineer by industry and size of company: 1957-58 and 1963-72[1]

Industry and size of company	SIC code	1957	1958	1963	1964	1965	1966
Total		$32,700	$32,800	$37,800	$39,500	$40,700	$43,200
Distribution by industry							
Food and kindred products	20	17,200	16,800	25,200	24,200	25,300	26,700
Textiles and apparel	22,23	20,000	28,900	26,400	26,700	29,200	30,900
Lumber, wood products, ar furniture	24,25	17,500	13,300	22,000	24,000	20,000	21,800
Paper and allied products	26	21,900	22,700	27,000	20,300	23,200	26,000
Chemicals and allied products	28	23,300	24,600	32,600	34,800	35,700	37,600
Industrial chemicals	281-82	$27,400	28,400	34,800	3[illegible],200	38,200	40,800
Drugs and medicines	283	21,200	23,300	30,200	33,200	36,300	38,000
Other chemicals	284-89	14,200	15,300	27,900	28,200	26,600	26,400
Petroleum refining and extraction	29,13	29,500	32,600	35,400	46,800	45,100	42,200
Rubber products	30	22,800	18,700	26,500	26,800	28,200	29,200
Stone, clay, and glass products	32	(2)	(2)	26,000	32,100	33,900	36,600
Primary metals	33	21,000	24,000	35,700	36,800	38,700	40,700
Ferrous metals and products[4]	331-32,3391,3399	21,700	24,600	37,400	38,700	40,000	(3)
Nonferrous metals and products	33-36,3392	20,000	23,200	33,500	34,300	37,000	(3)
Fabricated metal products	34	15,200	18,800	22,200	21,800	22,500	24,400
Machinery	35	25,600	27,500	31,000	35,800	35,600	38,000
Electrical equipment and communication	36,48	39,700	38,200	33,000	33,500,	35,600	38,000
Radio and TV receiving equipment	365	(3)	(3)	(3)	(3)	(3)	(3)
Electronic components	367						
Communication equipment & communication	366,48	36,000	34,600	31,700	31,400	32,800	34,900
Other electrical equipment[5]	361-64,369	42,800	41,900	35,400	37,900	41,300	(3)
Motor vehicles and motor vehicles equipment	371						
Other transportation equipment	373-75,379	49,400	53,800	49,400	49,900	50,300	53,800
Aircraft and missles	372,19	43,900	41,900	49,600	50,700	51,900	5[illegible],300
Professional and scientific instruments	38	23,500	25,600	29,900	29,700	33,600	36,700
Scientific and mechanical measuring instruments	381-82	22,600	23,100	18,400	20,000	21,600	23,500
Optical, surgical, photographic, and other instruments	383-87	24,700	29,100	37,500	34,500	38,900	42,100
Other manufacturing industries	21,27,31,39	(3)	(3)	23,700	29,500	30,200	34,200
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	(3)	(3)	31,000	32,900	36,100	38,500
Distribution by size of company (based on number of employees)							
Less than 1,000		11,600	12,000	18,600	19,500	21,100	21,600
1,000 to 4,999		[6]27,200	25,100	29,400	31,100	30,700	34,400
5,000 to 9,999		[6]39,400	39,700	41,400	42,900	43,900	46,100
10,000 or more							

[1] The number of R&D scientists and engineers are derived by using the arithmetic mean of the full-time equivalent of R&D scientists and engineers employed in the Januarys of two consecutive years.

[2] Included in the other manufacturing industries group.

[3] Not separately available but included in total.

Industry and size of company	SIC Code
Total	
Distribution by industry	
Food and kindred products	20
Textiles and apparel	22,23
Lumber, wood products, and furniture	24,25
Paper and allied products	26
Chemicals and allied products	28
Industrial chemicals	281-82
Drugs and medicines	283
Other chemicals	284-89
Petroleum refining and extraction	29,13
Rubber products	30
Stone, clay, and glass products	32
Primary metals	33
Ferrous metals and products[4]	331-32,3391,3399
Nonferrous metals and products	333-36,3392
Fabricated metal products	34
Machinery	35
Electrical equipment and communication	36,48
Radio and TV receiving equipment	365
Electronic components	367
Communication equipment & communication	366,48
Other electrical equipment	361-64,369
Motor vehicles and motor vehicles equipment	371
Other transportation equipment	373-75,379
Aircraft and missiles	372,19
Professional and scientific instruments	38
Scientific and mechanical measuring instruments	381-82
Optical, surgical, photographic, and other instruments	383-87
Other manufacturing industries	21,27,31,39
Nonmanufacturing industries	07-12,14-17,41-47 49-67,739,807,891
Distribution by size of company (based on number of employees)	
Less than 1,000	
1,000 to 4,999	
5,000 to 9,999	
10,000 or more	

[4] SIC codes 3391 and 3399 included in the nonferrous metals and

[5] Included in the other electrical equipment group.

[6] Estimated by the National Science Foundation.

.—Cost per R&D scientist or engineer by industry and size of company: 1957-58 and 1963-72[1]

	1963	1964	1965	1966
00	$37,800	$39,500	$40,700	$43,200
00	25,200	24,200	25,300	26,700
00	26,400	26,700	2[illegible] 200	30,900
00	22,000	24,000	20,000	21,800
00	27,000	20,300	23,200	26,000
00	32,600	34,800	35,700	37,600
00	34,800	37,200	38,200	40,800
00	30,200	33,200	36,300	38,000
00	27,900	28,200	26,600	26,400
00	35,400	46,800	45,100	42,200
00	26,500	26,800	28,200	29,200
[2])	26,000	32,100	33,900	36,600
00	35,700	36,800	38,700	40,700
00	37,400	38,700	40,000	([3])
00	33,500	34,300	37,000	([3])
00	22,200	21,800	22,500	24,400
00	31,000	35,800	35,600	38,000
00	33,000	33,500,	35,600	38,000
[3])	([3])	([3])	([3])	([3])
00	31,700	31,400	32,800	34,900
00	35,400	37,900	41,300	([3])
00	49,400	49,500	50,300	53,800
00	49,600	50,700	51,900	55,300
00	29,900	29,700	33,600	36,700
00	18,400	20,000	21,600	23,500
00	37,500	34,500	38,900	42,100
[3])	23,700	29,500	30,200	34,200
[3])	31,000	32,900	36,100	38,500
00	18,600	19,500	21,100	21,600
00	29,400	31,100	30,700	34,400
00	41,400	42,900	43,900	46,100

ean of the full-time equivalent of R&D scientists

Industry and size of company	SIC Code	1967	1968	1969	1970	1971	1972
Total		$44,100	$45,600	$47,500	$48,100	$51,100	$54,800
Distribution by industry							
Food and kindred products	20	29,500	29,700	32,500	36,200	36,800	38,800
Textiles and apparel	22,23	25,900	22,700	25,500	24,700	32,800	33,900
Lumber, wood products, and furniture	24,25	24,000	27,100	15,800	35,600	28,200	29,100
Paper and allied products	26	26,900	30,000	38,800	36,000	37,800	38,000
Chemicals and allied products	28	39,800	40,100	41,200	42,600	43,500	46,300
Industrial chemicals	281-82	43,900	43,900	45,500	47,000	48,500	53,300
Drugs and medicines	283	37,100	39,500	40,400	40,300	43,600	45,900
Other chemicals	284-89	29,800	29,200	29,200	33,400	31,600	32,000
Petroleum refining and extraction	29,13	41,500	45,500	46,900	53,900	57,700	57,300
Rubber products	30	30,600	33,100	33,100	34,600	39,300	45,300
Stone, clay, and glass products	32	36,800	34,200	36,100	36,100	38,800	42,300
Primary metals	33	41,000	41,500	41,100	43,700	44,200	45,100
Ferrous metals and products[4]	331-32,3391,3399	42,200	42,900	42,500	45,200	42,400	40,900
Nonferrous metals and products	333-36,3392	41,200	40,400	39,700	42,000	46,500	50,400
Fabricated metal products	34	26,400	30,000	29,100	31,300	35,000	37,100
Machinery	35	37,400	38,500	38,000	40,300	43,500	46,900
Electrical equipment and communication	36,48	39,300	41,100	43,100	44,000	49,600	54,700
Radio and TV receiving equipment	365	47,400	50,000	36,800	32,600	28,400	27,000
Electronic components	367						
Communication equipment & communication	366,48	36,200	37,700	40,600	42,100	47,700	53,300
Other electrical equipment	361-64,369	45,800	48,000	48,500	48,800	55,200	59,200
Motor vehicles and motor vehicles equipment	371						
Other transportation equipment	373-75,379	54,700	60,500	62,200	59,800	61,500	67,500
Aircraft and missiles	372,19	56,300	57,500	61,400	61,400	65,700	69,600
Professional and scientific instruments	38	40,600	45,200	49,100	49,800	49,300	52,200
Scientific and mechanical measuring instruments	381-82	28,100	29,100	28,700	29,900	26,500	29,300
Optical, surgical, photographic, and other instruments	383-87	44,500	51,000	56,100	57,000	58,100	61,000
Other manufacturing industries	21,27,31,39	39,700	39,200	38,900	40,000	35,800	38,600
Nonmanufacturing industries	07-12,14-17,41-47 49-67,739,807,891	38,300	39,900	41,700	44,200	45,000	45,700
Distribution by size of company (based on number of employees)							
Less than 1,000		25,200	26,500	([3])	([3])	31,200	31,000
1,000 to 4,999		33,700	35,500	([3])	([3])	38,100	40,500
5,000 to 9,999		36,700	39,000	38,900	38,300	41,000	43,100
10,000 or more		45,800	49,100	50,900	51,400	55,700	60,200

[4] SIC codes 3391 and 3399 included in the nonferrous metals and products group for 1957 to 1 [illegible].
[5] Included in the other electrical equipment group.
[6] Estimated by the National Science Foundation.

Table B-32.—Cost per R&D scientist or engineer, by industry and selected company size group: 1972[1]

Industry	SIC code	Total	Companies with total employment of—	
			5,000 to 9,999	10,000 or more
Total	.....	$54,800	$43,100	$60,200
Food and kindred products	20	38,800	40,000	38,000
Textiles and apparel	22,23	33,900	33,300	31,500
Lumber, wood products, and furniture	24,25	29,100	35,000	32,000
Paper and allied products	26	38,000	43,300	39,500
Chemicals and allied products	28	46,300	39,300	55,100
Industrial chemicals	281-82	53,300	45,600	55,600
Drugs and medicines	283	45,900	40,400	60,500
Other chemicals	284-89	32,000	33,700	44,000
Petroleum refining and extraction	29,13	57,300	52,500	59,300
Rubber products	30	45,500	36,000	48,600
Stone, clay, and glass products	32	42,300	46,000	48,500
Primary metals	33	45,100	31,700	48,100
Ferrous metals and products	331-32,3391,3399	40,900	(2)	47,800
Nonferrous metals and products	333-36,3392	50,400	(2)	48,300
Fabricated metal products	34	37,100	29,100	56,900
Machinery	35	46,900	50,000	51,000
Electrical equipment and communication	36,48	54,700	44,700	58,300
Radio and TV receiving equipment	365	27,000	(2)	(2)
Electronic components	367	53,300	41,400	56,900
Communication equipment and communication	366,48			
Other electrical equipment	361-64,369	59,200	(2)	(2)
Motor vehicles and motor vehicles equipment	371	67,500	39,000	69,500
Other transportation equipment	373-75,379			
Aircraft and missiles	372,19	69,600	55,600	71,200
Professional and scientific instruments	38	52,200	45,300	60,300
Scientific and mechanical measuring instruments	381-82	29,300	48,000	(2)
Optical, surgical, photographic, and other instruments	383-87	61,000	43,800	(2)
Other manufacturing industries	21,27,31,39	38,600	35,600	43,800
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	45,700	50,000	41,200

[1] See table B-31, footnote 1.
[2] Not separately available but included in total.

Table B-33.—Cost per R&D scientist or engineer in companies ranked by size of R&D program: 1963-72[1]

Companies ranked by size of R&D program[2] (based on total R&D funds)	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
First 4	$51,700	$56,700	$59,300	$60,700	$57,200	$60,900	$65,300	$58,000	$66,200	$70,900
First 8	53,400	54,900	55,700	57,600	57,100	58,400	64,700	61,800	65,900	70,700
First 20	48,300	49,200	51,500	55,000	54,600	57,500	61,300	61,600	64,700	67,700
First 40	45,300	46,800	48,000	50,600	50,900	53,900	57,000	58,000	62,800	65,600
First 100	43,500	44,800	46,000	48,500	49,100	51,600	54,500	55,500	60,300	64,300
First 200	42,300	43,200	44,400	47,100	47,500	50,100	52,300	53,700	57,500	60,400
First 300	41,700	42,600	43,800	46,400	46,900	49,100	51,300	52,600	56,600	59,100
Average, all R&D-performing companies	37,800	39,500	40,700	43,200	44,100	45,600	47,500	48,100	51,100	54,800
Other R&D-performing companies	20,200	20,100	21,800	23,500	21,100	26,600	27,700	29,500	27,200	28,400

[1] The number of R&D scientists and engineers are derived by using the arithmetic mean of the full-time equivalent of R&D scientists and engineers employed in the Januarys of two consecutive years.

[2] Company rankings were made independently of one another. Thus, the individual companies comprising a particular group in the current year may differ from those in the group for earlier years.

Table B-34.—Total and company R&D funds per employee, by size of company: 1963-72[1]

Size of company (based on number of employees)	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
	Total R&D funds per employee									
Total	$1,110	$1,170	$1,170	$1,160	$1,800	$1,210	$1,220	$1,250	$1,300	$1,380
Less than 1,000	520	560	550	620	660	[2]	[2]	840	920	920
1,000 to 4,999	580	610	570	550	770	[2]	[2]	700	690	730
5,000 to 9,999	1,310	1,360	1,360	540	5[illegible]	690	670	720	750	790
10,000 or more				1,450	1,470	1,450	1,450	1,470	1,540	1,630
	Company R&D funds per employee									
Total	$470	$500	$530	$540	$580	$610	$660	$710	$760	$810
Less than 1,000	360	370	370	390	420	[2]	[2]	510	590	610
1,000 to 4,999	340	350	350	340	370	[2]	[2]	470	480	510
5,000 to 9,999	520	550	590	410	420	470	500	580	620	650
10,000 or more				620	660	690	740	800	850	900

[1] Averages were derived by dividing total and company R&D funds for a calendar year by employment figures for March of that year.

[2] Not separately available but included in total.

Table B-35.—Total employment of R&D-performing companies, by industry and selected company size group: 1971 and 1972

[Thousands]

Industry	SIC code	1971			1972		
		Total	Companies with total employment of—		Total	Companies with total employment of—	
			5,000 to 9,999	10,000 or more		5,000 to 9,999	10,000 or more
Total	.. ..	14,046	1,553	9,802	14,082	1,564	9,817
Food and kindred products	20	961	135	650	984	136	668
Textiles and apparel	22,23	586	63	434	601	63	448
Lumber, wood products, and furniture	24,25	252	41	128	258	42	130
Paper and allied products	26	607	76	455	612	76	458
Chemicals and allied products	28	1,045	150	686	1,062	153	693
Industrial chemicals	281-82	613	38	515	614	37	515
Drugs and medicines	283	160	59	70	166	61	74
Other chemicals	284-89	276	53	101	282	55	104
Petroleum refining and extraction	29,13	544	35	489	531	34	4,7
Rubber products	30	365	30	233	367	33	233
Stone, clay, and glass products	32	333	55	214	343	56	222
Primary metals	33	1,009	97	828	1,038	93	783
Ferrous metals and products	331-32,3391,3399	766	(1)	588	733	(1)	556
Nonferrous metals and products	333-36,3392	323	(1)	240	305	(1)	225
Fabricated metal products	34	682	115	290	688	119	290
Machinery	35	1,483	162	878	1,479	159	873
Electrical equipment and communication	36,48	2,314	165	1,854	2,361	167	1,898
Radio and TV receiving equipment	365	65	(1)	(1)	66	(1)	(1)
Electronic components	367	1,406	99	1,197	1,429	99	1,220
Communication equipment & communication	366,48						
Other electrical equipment	361-64,369	843	(1)	(1)	865	(1)	(1)
Motor vehicles and motor vehicles equipment	371	1,312	100	1,134	1,317	101	1,137
Other transportation equipment	373-75,379						
Aircraft and missiles	372,19	1,006	82	809	959	81	770
Professional and scientific instruments	38	460	83	248	475	87	258
Scientific and mechanical measuring instruments	381-82	136	31	(1)	138	32	(1)
Optical, surgical, photographic, and other instruments	383-87	324	52	(1)	337	55	(1)
Other manufacturing industries	21,27,31,39	451	83	202	457	88	206
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	550	76	270	551	76	273

[1] Not separately available but included in total.

Table B-36.—Employees in R&D-performing companies; total and company R&D funds per employee, by industry and selected company size group: 1972[1]

Industry and size of company	SIC code	Number employed March 1972 (thousands)	Total R&D funds per employee	Company R&D Funds per employee
Total	.....	14,082	$1,380	$810
Distribution by industry				
Food and kindred products	20	984	260	260
Textiles and apparel	22,23	601	100	100
Lumber, wood products, and furniture	24,25	258	200	[2]
Paper and allied products	26	612	300	[2]
Chemicals and allied products	28	1,062	1,800	1,610
Industrial chemicals	281-82	614	1,700	1,420
Drugs and medicines	283	166	3,360	[2]
Other chemicals	284-89	282	1,090	[2]
Petroleum refining and extraction	29,13	531	890	860
Rubber products	30	367	720	630
Stone, clay, and glass products	32	343	490	480
Primary metals	33	1,038	250	240
Ferrous metals and products	331-32,3391,3399	733	190	180
Nonferrous metals and products	333-36,3392	305	410	380
Fabricated metal products	34	688	350	330
Machinery	35	1,479	1,330	1,100
Electrical equipment and communication	36,48	2,361	2,090	1,030
Radio and TV receiving equipment	365	66	820	[2]
Electronic components	367			
Communication equipment and communication	366,48	1,429	2,220	1,030
Other electrical equipment	361-64,369	865	1,990	[2]
Motor vehicles and motor vehicles equipment	371			
Other transportation equipment	373-75 379	1,317	1,500	1,270
Aircraft and missiles	372,19	959	5,230	990
Professional and scientific instruments	38	475	1,690	1,340
Scientific and mechanical measuring instruments	381-82	138	890	720
Optical, surgical, photographic, and other instruments	383-87	337	2,020	1,590
Other manufacturing industries	21,27,31,39	457	310	[2]
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	551	1,290	500
Distribution by size of company (based on number of employees)				
5,000 to 9,999	.....	1,564	790	650
10,000 or more	.....	9,817	1,630	900

[1] Averages were derived by dividing total and company R&D funds for a calendar year by employment figure for March of that year.

[2] Not separately available but included in total.

Table B-37.—Net sales of R&D-performing manufacturing companies, by industry and selected company size group: 1971 and 1972

[Dollars in millions]

Industry	SIC code	1971			1972		
			Companies with total employment of—			Companies with total employment of—	
		Total	5,000 to 9,999	10,000 or more	Total	5,000 to 9,999	10,000 or more
Total		$502,30.	$52,906	$360,018	$544,045	$56,905	$39,366
Food and kindred products	20	52,988	8,557	29,900	56,328	9,167	32,126
Textiles and apparel	22,23	12,611	1,818	8,808	13,622	1,938	9,607
Lumber, wood products, and furniture	24,25	7,186	1,318	3,435	7,848	1,303	3,975
Paper and allied products	26	20,858	2,405	15,725	22,581	2,689	16,945
Chemicals and allied products	28	48,719	7,293	29,535	52,469	7,946	32,512
Industrial chemicals	281-82	26,169	1,627	21,007	28,509	1,792	22,885
Drugs and medicines	283	6,793	2,645	2,803	7,470	2,933	3,134
Other chemicals	284-89	15,257	3,021	5,725	16,490	3,220	6,493
Petroleum refining and extraction	29,13	58,264	2,772	54,267	62,308	3,073	57,924
Rubber products	30	12,549	848	8,924	13,764	1,013	9,833
Stone, clay, and glass products	32	9,267	1,615	5,863	10,218	1,705	6,646
Primary metals	33	33,398	2,967	24,835	36,500	3,226	27,322
Ferrous metals and products	331-32,3391,3399	21,096	(1)	16,045	23,277	(1)	17,834
Nonferrous metals and products	333-36,3392	12,302	(1)	8,790	13,222	(1)	9,488
Fabricated metal products	34	20,303	2,913	9,975	21,325	3,251	10,267
Machinery	35	45,849	4,491	25,591	49,734	4,792	28,292
Electrical equipment and communication	36,48	6,2149	4,618	49,685	68,23[illegible]	5,108	54,756
Radio and TV receiving equipment	365	2,618	(1)	(1)	2,912	(1)	(1)
Electronic components	367	34,817	2,725	29,494	38,212	2,963	32,511
Communication equipment & communication	366-48						
Other electrical equipment	361-64,369	24,713	(1)	(1)	27,107	(1)	(1)
Motor vehicles and motor vehicles equipment	371	56,904	3,559	50,664	64,416	3,839	57,791
Other transportation equipment	373-75,379						
Aircraft and missiles	372,19	30,919	2,709	25,200	30,851	2,896	25,020
Professional and scientific instruments	38	13,320	2,224	7,427	14,795	2,392	8,533
Scientific and mechanical measuring instruments	381-82	3,443	557	(1)	3,743	643	(1)
Optical, surgical, photographic, and other instruments	383-87	9,878	1,668	(1)	11,052	1,749	(1)
Other manufacturing industries	21,27,31,39	17,517	2,799	13,183	19,052	2,567	11,816

[1] Not separately available but included in total.

Table B-38.—R&D funds as percent of net sales in R&D-performing manufacturing companie by industry and size of company: 1957-58 and 1963-72

Industry and size of company	SIC code	1957	1958	1963	1964	1965	1966
Total		3.4	3.6	4.5	4.6	4.3	4.2
Distribution by industry							
Food and kindred products	20	.3	.3	.4	.4	.4	.4
Textiles and apparel	22,23	[1]	.3	.5	.5	.5	.5
Lumber, wood products, and furniture	24,25	[1]	.4	.5	.5	.4	.4
Paper and allied products	26	.6	.7	.8	.8	.8	.9
Chemicals and allied products	28	3.5	3.8	4.3	4.5	4.3	4.4
Industrial chemicals	281-82	5.0	5.4	5.1	5.0	4.7	4.6
Drugs and medicines	283	3.6	4.1	4.7	6.3	6.4	7.3
Other chemicals	284-89	1.3	1.5	2.8	2.5	2.3	2.2
Petroleum refining and extraction	29,13	.7	1.1	1.0	1.1	1.0	.9
Rubber products	30	1.7	1.8	2.3	2.0	1.9	1.9
Stone, clay, and glass products	32	[2]	[2]	1.6	1.6	1.6	1.5
Primary metals	33	.5	.7	.8	.8	.8	.7
Ferrous metals and products[3]	331-32,3391,3399	[1]	.6	.7	.7	.7	.7
Nonferrous metals and products	333-36,3392	[1]	.7	1.1	1.0	.9	.8
Fabricated metal products	34	1.6	1.7	1.6	1.5	1.3	1.3
Machinery	35	3.4	3.8	4.2	4.2	4.0	3.9
Electrical equipment and communication	36,48	7.6	10.3	10.1	9.9	9.1	8.5
Radio and TV receiving equipment	365	[4]	[4]	[4]	[4]	[4]	2.0
Electronic components	367	[1]	11.3	13.0	13.0	11.4	10.3
Communication equipment & communication	366,48						
Other electrical equipment	361-64,369	[1]	9.7	7.3	7.0	7.0	7.3
Motor vehicles and motor vehicles equipment	371	2.9	4.2	3.4	3.6	3.1	3.2
Other transportation equipment	373-75,379						
Aircraft and missiles	372,19	16.8	17.7	26.7	28.3	27.0	23.7
Professional and scientific instruments	38	7.0	7.8	5.9	6.0	5.9	5.5
Scientific and mechanical measuring instruments	381-82	9.5	10.2	4.1	4.3	4.0	3.7
Optical, surgical, photographic, and other instruments	383-87	5.2	6.3	6.9	6.8	6.7	6.1
Other manufacturing industries	21,27,31,39	[1]	1.3	.7	.7	.7	.6
Distribution by size of company (based on number of employees)							
Less than 1,000		1.8	1.3	1.9	2.4	2.1	2.7
1,000 to 4,999		[5]1.8	1.8	2.4	1.8	2.0	2.3
5,000 to 9,999		[5]3.9	4.8	5.3	5.3	4.5	1.9
10,000 or more							5.3

[1] Not separately available but included in total.
[2] Included in the other manufacturing industries group.
[3] SIC codes 3391 and 3399 included in the nonferrous metals and products group for 1957-1965.
[4] Included in the other electrical equipment group.

Industry and size of company	SIC code
Total	
Distribution by industry	
Food and kindred products	20
Textiles and apparel	22,23
Lumber, wood products, and furniture	24,25
Paper and allied products	26
Chemicals and allied products	28
Industrial chemicals	281-82
Drugs and medicines	283
Other chemicals	284-89
Petroleum refining and extraction	29,13
Rubber products	30
Stone, clay, and glass products	32
Primary metals	33
Ferrous metals and products[3]	331-32,3391,3399
Nonferrous metals and products	333-36,3392
Fabricated metal products	34
Machinery	35
Electrical equipment and communication	36,48
Radio and TV receiving equipment	365
Electronic components	367
Communication equipment & communication	366,48
Other electrical equipment	361-64,369
Motor vehicles and motor vehicles equipment	371
Other transportation equipment	373-75,379
Aircraft and missiles	372,19
Professional and scientific instruments	38
Scientific and mechanical measuring instruments	381-82
Optical, surgical, photographic, and other instruments	383-87
Other manufacturing industries	21,27,31,39
Distribution by size of company (based on number of employees)	
Less than 1,000	
1,000 to 4,999	
5,000 to 9,999	
10,000 or more	

[5] Separate data for companies with 5,000 or more employee estimated by the National Science Foundation for 1957. Revisions of R& yield separate data for companies in these size groups.

R&D funds as percent of net sales in R&D-performing manufacturing companies, by industry and size of company: 1957-58 and 1963-72

1958	1963	1964	1965	1966
3.8	4.5	4.6	4.3	4.2
.3	.4	.4	.4	.4
.3	.5	.5	.5	.5
.4	.5	.5	.4	.4
.7	.8	.8	.8	.9
3.8	4.3	4.5	4.3	4.4
5.4	5.1	5.0	4.7	4.6
4.1	4.7	6.3	6.4	7.3
1.5	2.8	2.5	2.3	2.2
1.1	1.0	1.1	1.0	.9
1.8	2.3	2.0	1.9	1.9
(1)	1.6	1.6	1.6	1.5
.7	.8	.8	.8	.7
.6	.7	.7	.7	.7
.7	1.1	1.9	.9	.8
1.7	1.6	1.5	1.3	1.3
3.8	4.2	4.2	4.0	3.9
10.3	10.1	9.9	9.1	8.5
(1)	(1)	(1)	(1)	2.0
11.3	13.0	13.0	11.4	10.3
9.7	7.3	7.0	7.0	7.3
4.2	3.4	3.6	3.1	3.2
17.7	26.7	28.3	27.0	23.7
7.8	5.9	6.0	5.9	5.5
10.2	4.1	4.3	4.0	3.7
6.3	6.9	6.9	6.7	6.1
1.3	.7	.7	.7	.6
1.3	1.9	2.4	2.1	2.7
1.8	2.4	1.8	2.0	2.3
4.8	5.3	5.3	4.5	1.5 5.3

[1] for 1957-1965.

Industry and size of company	SIC code	1967	1968	1969	1970	1971	1972
Total		4.2	4.0	4.0	3.7	3.5	3.4
Distribution by industry							
Food and kindred products	20	.5	.5	.4	.5	.5	.5
Textiles and apparel	22,23	.5	.5	.6	.5	.5	.4
Lumber, wood products, and furniture	24,25	.3	.4	.4	.8	.7	.7
Paper and allied products	26	.9	.9	1.0	.9	.9	.8
Chemicals and allied products	28	4.6	4.2	4.2	3.9	3.8	3.6
Industrial chemicals	281-82	4.8	4.3	4.4	4.2	3.9	3.7
Drugs and medicines	283	8.0	7.2	7.2	7.6	7.5	7.5
Other chemicals	284-89	2.3	2.2	2.1	1.8	1.9	1.9
Petroleum refining and extraction	29,13	.8	.8	.9	1.0	.9	.8
Rubber products	30	1.9	2.0	1.9	1.9	1.8	1.9
Stone, clay, and glass products	32	1.8	1.6	1.7	1.7	1.7	1.6
Primary metals	33	.8	.8	.8	.8	.8	.7
Ferrous metals and products[1]	331-32,3391,3399	.8	.7	.7	.7	.7	.6
Nonferrous metals and products	333-36,3392	1.0	1.0	1.0	1.0	1.0	1.0
Fabricated metal products	34	1.3	1.3	1.2	1.2	1.1	1.1
Machinery	35	4.2	4.1	3.9	3.8	3.9	3.9
Electrical equipment and communication	36,48	8.6	8.5	7.9	7.4	7.3	7.2
Radio and TV receiving equipment	365	1.9	2.2	2.2	2.7	2.4	1.9
Electronic components	367	10.3	10.0	8.9	8.3	8.3	8.3
Communication equipment & communication	366,48						
Other electrical equipment	361-64,365	7.3	7.4	7.3	6.6	6.4	6.3
Motor vehicles and motor vehicles equipment	371	3.4	3.1	3.1	3.5	3.1	3.1
Other transportation equipment	373-75,379						
Aircraft and missiles	372,19	19.7	17.4	18.3	16.0	15.9	16.3
Professional and scientific instruments	38	5.4	5.8	5.7	5.5	5.6	5.4
Scientific and mechanical measuring instruments	381-82	3.9	3.9	3.3	3.2	3.2	3.3
Optical, surgical, photographic, and other instruments	383-87	6.0	6.4	6.5	6.3	6.4	6.2
Other manufacturing industries	21,27,31,39	.6	.7	.7	.8	.8	.8
Distribution by size of company (based on number of employees)							
Less than 1,000		1.7	(1)	(1)	1.9	1.7	1.8
1,000 to 4,999		1.7	(1)	(1)	1.7	1.6	1.6
5,000 to 9,999		2.1	2.3	2.1	2.3	2.2	2.2
10,000 or more		5.2	4.7	4.7	4.4	4.2	4.1

[1] Separate data for companies with 5,000 or more employees and for companies with 1,000 to 4,999 employees were estimated by the National Science Foundation for 1957. Revisions of R&D statistics by the U.S. Bureau of the Census for this year did not yield separate data for companies in these size groups.

Table B-39.—Company R&D funds as percent of net sales in R&D performing manufacturing companie by industry and size of company: 1957-58 and 1963-72

Industry and size of company	SIC code	1957	1958	1963	1964	1965	1966
Total		1.5	1.6	1.9	2.0	2.0	2.0
Distribution by industry							
Food and kindred products	20	.3	.3	(1)	(1)	.4	.4
Textiles and apparel	22,23	(1)	.2	.4	.4	.4	(1)
Lumber, wood products, and furniture	24,25	(1)	.4	(1)	(1)	(1)	.4
Paper and allied products	26	.6	.7	.8	.8	.8	(1)
Chemicals and allied products	28	3.1	3.2	3.6	3.8	3.7	3.8
Industrial chemicals	281-82	4.2	4.3	4.1	4.2	3.9	3.8
Drugs and medicines	283	3.6	4.0	4.5	5.6	5.4	(1)
Other chemicals	284-89	1.2	1.3	1.8	1.9	2.0	(1)
Petroleum refining and extraction	29,13	.7	1.1	1.2	1.0	.9	.9
Rubber products	30	1.1	1.4	1.6	1.6	1.7	1.7
Stone, clay, and glass products	32	(2)	(2)	1.6	1.5	1.5	1.5
Primary metals	33	.5	.6	.7	.7	.7	.7
Ferrous metals and products[3]	331-32,3391,3399	(1)	.6	.7	.6	.7	.7
Nonferrous metals and products	333-36,3392	(1)	.6	.9	.9	.9	.8
Fabricated metal products	34	1.1	1.1	1.4	1.3	1.2	1.1
Machinery	35	2.0	2.1	3.1	3.2	3.1	3.0
Electrical equipment and communication	36,48	2.6	3.3		3.6	3.6	3.4
Radio and TV receiving equipment	365	(4)	(4)	(4)	(4)	(4)	(4)
Electronic components	367	(1)	3.3	4.2	4.3	4.3	3.8
Communication equipment & communication	366,48						
Other electrical equipment	361-64,369	(1)	3.3	3.0	3.1	3.0	(1)
Motor vehicles and motor vehicles equipment	371	2.1	2.8	2.5	2.6	2.3	2.4
Other transportation equipment	,73-75,379						
Aircraft and missiles	372,19	2.0	2.3	2.6	2.5	3.4	3.4
Professional and scientific instruments	38	3.9	4.1	4.2	4.2	4.0	3.8
Scientific and mechanical measuring instruments	381-82	4.0	4.0	3.1	3.1	2.9	2.8
Optical, surgical, photographic, and other instruments	383-87	3.8	4.1	4.8	4.8	4.4	4.1
Other manufacturing industrie.	21,27,31,39	(1)	(1)	.6	.6	.7	(1)
Distribution by size of company (based on number of employees)							
Less than 1,000		1.4	.7	1.5	1.4	1.7	1.4
1,000 to 4,999		[1.2]	1.3	1.5	1.6	2.1	1.3
5,000 to 9,999		1.6[5]	1.9	2.1	2.1	2.1	1.5
10,000 or more							2.2

Industry and size of company	SIC code	1967
Total		2.1
Distribution by industry		
Food and kindred products	20	.5
Textiles and apparel	22,23	(1)
Lumber, wood products, and furniture	24,25	.3
Paper and allied products	26	(1)
Chemicals and allied products	28	4.0
Industrial chemicals	281-82	3.9
Drugs and medicines	283	(1)
Other chemicals	284-89	(1)
Petroleum refining and extraction	29,13	.8
Rubber products	30	1.7
Stone, clay, and glass products	32	1.7
Primary metals	33	.8
Ferrous metals and products[3]	331-32,3391,3399	.7
Nonferrous metals and products	333-36,3392	.9
Fabricated metal products	34	1.2
Machinery	35	3.2
Electrical equipment and communication	36,48	3.5
Radio and TV receiving equipment	365	(1)
Electronic components	367	
Communication equipment & communication	366,48	3.9
Other electrical equipment	361-64,369	(1)
Motor vehicles and motor vehicles equipment	371	2.5
Other transportation equipment	373-75,379	
Aircraft and missiles	372,19	4.0
Professional and scientific instruments	38	3.5
Scientific and mechanical measuring instruments	381-82	2.5
Optical, surgical, photographic, and other instruments	383-87	3.9
Other manufacturing industries	21,27,31,39	(1)
Distribution by size of company (based on number of employees)		
Less than 1,000		1.6
1,000 to 4,999		1.4
5,000 to 9,999		1.6
10,000 or more		2.3

[1] Not separately available but included in total.
[2] Data included in the other manufacturing industries group.
[3] SIC codes 3391 and 3399 included in the nonferrous metals and products group for 1957 to 1965.
[4] Included in other electrical equipment group.
[5] Estimated by the National Science Foundation.

ny R&D funds as percent of net sales in R&D performing manufacturing companies by industry and size of company: 1957-58 and 1963-72

	1963	1964	1965	1966
1.6	1.9	2.0	2.0	2.0
.3	(1)	(1)	.4	.4
.2	.4	.4	.4	(1)
.4	(1)	(1)	(1)	.4
.7	.8	.8	.8	(1)
3.2	3.6	3.8	3.7	3.8
4.3	4.1	4.2	3.9	3.8
4.0	4.5	5.6	5.4	(1)
1.3	1.8	1.9	2.0	(1)
1.1	1.2	1.0	.9	.9
1.4	1.6	1.6	1.7	1.7
(2)	1.6	1.5	1.5	1.5
.6	.7	.7	.7	.7
.6	.7	.6	.7	.7
.6	.9	.9	.9	.8
1.1	1.4	1.3	1.2	1.1
2.1	3.1	3.2	3.1	3.0
3.3		3.6	3.6	3.4
(4)	(4)	(4)	(4)	(4)
3.3	4.2	4.3	4.3	3.8
3.3	3.0	3.1	3.0	(1)
2.8	2.5	2.6	2.3	2.4
2.3	2.6	2.5	3.4	3.4
4.1	4.2	4.2	4.0	3.8
4.0	3.1	3.1	2.9	2.8
4.1	4.8	4.8	4.4	4.1
(1)	6	.6	.7	(1)
.7	1.5	1.4	1.7	1.4
1.3	1.5	1.6	2.1	1.3
1.9	2.1	2.1	2.1	1.5 2.2

products group for 1957 to 1965.

Industry and size of company	SIC code	1967	1968	1969	1970	1971	1972
Total		2.1	2.1	2.2	2.2	2.1	2.0
Distribution by industry							
Food and kindred products	20	.5	.5	.4	.5	.5	.5
Textiles and apparel	22,23	(1)	(1)	(1)	(1)	.5	.4
Lumber, wood products, and furniture	24,25	.3	.4	.4	.8	(1)	(1)
Paper and allied products	26	(1)	(1)	(1)	(1)	(1)	(1)
Chemicals and allied products	28	4.0	3.7	3.8	3.5	3.4	3.3
Industrial chemicals	281-82	3.9	3.6	3.6	3.6	3.3	3.1
Drugs and medicines	283	(1)	(1)	(1)	(1)	(1)	(1)
Other chemicals	284-89	(1)	(1)	(1)	(1)	(1)	(1)
Petroleum refining and extraction	29.13	.8	.8	.9	.9	.8	.7
Rubber products	30	1.7	1.8	1.7	1.7	1.7	1.7
Stone, clay, and glass products	32	1.7	1.6	1.7	1.7	1.6	1.6
Primary metals	33	.8	.8	.8	.8	.8	.7
Ferrous metals and products[3]	331-32,3391,3399	.7	.7	.7	.7	.7	.6
Nonferrous metals and products	333-36,3392	.9	.9	.9	.9	1.0	.9
Fabricated metal products	34	1.2	1.2	1.2	1.1	1.1	1.1
Machinery	35	3.2	3.1	3.3	3.3	3.2	3.3
Electrical equipment and communication	36,48	3.5	3.7	3.6	3.5	3.6	3.6
Radio and TV receiving equipment	365	(1)	(1)	(1)	(1)	(1)	(1)
Electronic components	367	3.9	4.0	3.7	3.8	3.8	3.9
Communication equipment & communication	366,48						
Other electrical equipment	361-64,369	(1)	(1)	(1)	(1)	(1)	(1)
Motor vehicles and motor vehicles equipment	371	2.5	2.3	2.5	2.8	2.6	2.6
Other transportation equipment	373-75,379						
Aircraft and missiles	372,19	4.0	3.7	4.2	3.7	3.3	3.1
Professional and scientific instruments	38	3.5	3.7	3.8	4.0	4.3	4.3
Scientific and mechanical measuring instruments	381-82	2.5	2.6	2.3	2.4	2.6	2.6
Optical, surgical, photographic, and other instruments	383-87	3.9	4.1	4.4	4.5	4.9	4.9
Other manufacturing industries	21,27,31,39	(1)	(1)	.7	.8	(1)	(1)
Distribution by size of company (based on number of employees)							
Less than 1,000		1.6	(1)	(1)	1.6	1.5	1.5
1,000 to 4,999		1.4	(1)	(1)	1.3	1.3	1.3
5,000 to 9,999		1.6	1.6	1.7	1.8	1.8	1.8
10,000 or more		2.3	2.3	2.4	2.4	2.3	2.3

[4] Included in other electrical equipment group.
[5] Estimated by the National Science Foundation.

Table B-40.—R&D funds as percent of net sales in R&D-performing manufacturing companies ranked by size of R&D program, by industry: 1972

Industry	SIC code	First 4 companies	First 8 companies	First 20 companies
Total		9.1	9.1	10.1
Food and kindred products	20	1.5	1.1	.8
Textiles and apparel	22,23	.6	.7	.6
Lumber, wood products and furniture	24,25	.8	.8	.7
Paper and allied products	26	2.0	1.7	1.1
Chemicals and allied products	28	6.0	6.3	5.2
Industrial chemicals	281-82	6.0	5.4	4.6
Drugs and medicines	283	11.5	9.3	8.2
Other chemicals	284-89	2.2	2.3	2.3
Petroleum refining and extraction	29,13	1.0	1.0	.8
Rubber products	30	2.2	2.2	2.1
Stone, clay, and glass products	32	2.9	2.5	1.8
Primary metals	33	.9	.9	.8
Ferrous metals and products	331-32,3391,3399	.7	.6	.6
Nonferrous metals and products	333-36,3392	1.3	1.2	1.0
Fabricated metal products	34	1.6	1.6	1.4
Machinery	35	11.2	8.6	7.0
Office, computing, and accounting machines	357	12.7	11.6	9.6
Electrical equipment and communication	36,48			
Radio and TV receiving equipment	365	2.2	1.9	1.9
Electronic components	367	13.0	9.3	9.3
Communication equipment & communication	366,48			
Other electrical equipment	361-64,369	10.5	10.0	8.0
Motor vehicles and motor vehicles equipment	371	3.6	3.6	3.4
Other transportation equipment	373-75,379			
Aircraft and missiles	372,19	29.8	26.6	18 9
Professional and scientific instruments	38	10.4	7.8	6.5
Scientific and mechanical measuring instruments	381-82	4.2	3.7	3.8
Optical, surgical, photographic, and other instruments	383-87	10.4	7.8	6.7
Other manufacturing industries	21,27,31,39	1.5	.8	.8

Table B-41.—Company R&D funds as percent of net sales in R&D-performing manufacturing companies ranked by size of net sales, by industry: 1972

[Dollars in millions]

Industry	SIC code	Company R&D funds		Net sales		Company R&D funds as percent of net sales	
		First 8 companies	First 20 companies	First 8 companies	First 20 companies	First 8 companies	First 20 companies
Total	.....	2,606	$4,373	$86,978	$137,748	3.0	3.2
Food and kindred products	20	67	136	17,067	29,186	.4	.5
Textiles and apparel	22,23	23	42	6,046	9,520	.4	.4
Lumber, wood products, and furniture	24,25	30	39	4,855	6,168	.6	.6
Paper and allied products	26	102	154	11,455	17,746	.9	.9
Chemicals and allied products	28	605	972	18,130	27,064	3.3	3.6
Industrial chemicals	281-82	772	947	16,282	23,971	4.7	4.0
Drugs and medicines	283	331	488	4,314	6,520	7.7	7.5
Other chemicals	284-89	162	215	8,099	11,348	2.0	1.9
Petroleum refining and extraction	29,13	329	448	41,831	60,990	.8	.7
Rubber products	30	216	237	10,415	11,869	2.1	2.0
Stone, clay, and glass products	32	122	148	6,044	8,578	2.0	.7
Primary metals	33	125	188	17,820	27,820	.7	-
Ferrous metals and products	331-32,3391,3399	92	112	15,194	19,496	.6	.6
Nonferrous metals and products	333-36,3392	82	108	9,222	12,046	.9	.9
Fabricated metal products	34	94	126	7,816	11,202	1.2	1.1
Machinery	35	1,049	1,204	18,484	26,575	5.7	4.5
Electrical equipment and communication	36,48	1,655	1,901	36,391	48,072	4.5	4.0
Radio and TV receiving equipment	365	(1)	(1)	2,742	2,904	(1)	(1)
Electronic components	367	1,085	1,229	25,636	32,484	4.2	3.8
Communication equipment & communication	366,48						
Other electrical equipment	361-64,369	(1)	(1)	18,056	21,700	(1)	(1)
Motor vehicles and motor vehicles equipment	371	1,612	1,658	54,059	59,912	3.0	2.8
Other transportation equipment	373-75,379						
Aircraft and missiles	372,19	694	843	16,663	26,317	4.2	3.2
Professional and scientific instruments	38	450	519	8,376	10,913	5.4	4.8
Scientific and mechanical measuring instruments	381-82	46	78	2,009	2,901	2.3	2.7
Optical, surgical, photographic, and other instruments	383-87	503	650	8,131	9,980	6.2	6.5
Other manufacturing industries	21,27,31,39	51	99	10,683	15,557	.5	.6

[1] Not separately available but included in total.

Table B-42.—Funds for basic research, applied research, and development: 1953-72

[Dollars in millions]

Year	Total	Basic research	Applied research	Development
1953	$3,630	$151	[1]$726	[1]$2,753
1954	4,070	166	[1]814	[1]3,090
1955	4,640	189	[1]928	[1]3,513
1956	6.605	253	1,268	5,084
1957	7,731	271	1,670	5,790
1958	8,389	295	1,911	6,183
1959	9,618	320	1,991	7,307
1960	10,509	376	2,029	8,104
1961	10,908	395	1,977	8,537
1962	11,464	488	2,449	8,527
1963	12,630	522	2,457	9,651
1964	13,512	549	2,600	10,362
1965	14,185	592	2,658	10,934
1966	15,548	624	2,843	12,081
1967	16,385	629	2,915	12,842
1968	17,429	642	3,124	13,663
1969	18,318	618	3,287	14,413
1970	18,062	629	3,399	14,034
1971	18,311	610	3,384	14,318
1972	19,437	611	3,521	15,304

[1] Estimated by the National Science Foundation.

Table B-13.—Funds for basic research, applied research, and development, by selected industry and size of company: 1971 and 1972

[Dollars in millions]

Industry and size of company	SIC code	1971 Total	1971 Basic research	1971 Applied research	1971 Development
Total	...	18,311	610	3,384	14,318
Distribution by industry					
Food and kindred products	20	245	20	107	118
Textiles and apparel	22,23	59	2	21	37
Lumber, wood products, and furniture	24,25	48	(1)	(1)	39
Paper and allied products	26	187	4	57	126
Chemicals and allied products	28	1,819	241	707	872
Industrial chemicals	281-82	1,020	120	436	464
Drugs and medicines	283	510	101	184	226
Other chemicals	284-89	289	20	87	182
Petroleum refining and extraction	29,13	505	21	224	259
Rubber products	30	230	4	58	168
Stone, clay, and glass products	32	155	9	49	97
Primary metals	33	272	17	113	142
Ferrous metals and products	331-32,3391,3399	144	(1)	(1)	88
Nonferrous metals and products	333-36,33392	128	(1)	(1)	54
Fabricated metal products	34	233	(1)	(1)	167
Machinery	35	1,773	20	248	1,504
Electrical equipment and communication	36,48	4,534	145	692	3,697
Radio and TV receiving equipment	365	64	(1)	(1)	44
Electronic components	367	2,881	127	447	2,307
Communication equipment and communication	366,48				
Other electrical equipment	361-64,369	1,589	(1)	(1)	1,345
Motor vehicles and motor vehicles equipment	371	1,756	13	148	1,595
Other transportation equipment	373-75,379				
Aircraft and missiles	372,19	4,912	54	464	4,393
Professional and scientific instruments	38	744	16	85	643
Scientific and mechanical measuring instruments	381-82	110	4	19	88
Optical, surgical, photographic, and other instruments	383-87	633	12	66	555
Other manufacturing industries	21,27,31,39	136	7	33	96
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	704	31	309	364
Distribution by size of company (based on number of employees)					
5,000 to 9,999	...	1,170	72	337	761
10,000 or more	...	15,063	451	2,416	12,197

Industry and size of company	SIC code
Total	...
Distribution by industry	
Food and kindred products	
Textiles and apparel	22,2
Lumber, wood products, and furniture	24,2
Paper and allied products	
Chemicals and allied products	
Industrial chemicals	281-8
Drugs and medicines	28
Other chemicals	284-8
Petroleum refining and extraction	29,1
Rubber products	
Stone, clay, and glass products	
Primary metals	
Ferrous metals and products	331-31,3391,33
Nonferrous metals and products	333-36,33
Fabricated metal products	
Machinery	
Electrical equipment and communication	36,
Radio and TV receiving equipment	3
Electronic components	3
Communication equipment and communication	366, 361-64,3
Motor vehicles and motor vehicles equipment	3
Other transportation equipment	373-75,3
Aircraft and missiles	372,
Professional and scientific instruments	
Scientific and mechanical measuring instruments	381
Optical, surgical, photographic, and other instruments	383
Other manufacturing industries	21,27,31
Nonmanufacturing industries	07-12,14-17,41- 49-67,739,807
Distribution by size of company (based on number of employees)	
5,000 to 9,999	...
10,000 or more	...

(1) Not separately available but included in total.

e B-43.—Funds for basic research, applied research, and development, by selected industry and size of company: 1971 and 1972

[Dollars in millions]

Industry and size of company	SIC code	1972 Total	1972 Basic research	1972 Applied research	1972 Development	1971 Total	1971 Basic research	1971 Applied research	1971 Development
Total		19,437	611	3,521	15,304	18,211	610	3,384	14,318
Distribution by industry									
Food and kindred products	20	258	20	105	134	245	20	107	118
Textiles and apparel	22,23	61	2	21	38	59	2	21	37
Lumber, wood products, and furniture	24,25	51	(1)	(1)	41	48	(1)	(1)	39
Paper and allied products	26	186	4	62	120	187	4	57	126
Chemicals and allied products	28	1,909	246	753	909	1,819	241	707	872
Industrial chemicals	281-82	1,045	120	450	475	1,020	120	436	464
Drugs and medicines	283	558	107	205	247	510	101	184	226
Other chemicals	284-89	306	19	99	187	289	(1)	87	182
Petroleum refining and extraction	29,13	473	23	221	230	505	21	224	259
Rubber products	30	263	4	58	201	230	4	58	168
Stone, clay, and glass products	32	167	11	51	105	155	9	49	97
Primary metals	33	264	12	105	147	272	17	113	142
Ferrous metals and products	331-31,3391,3399	137	(1)	(1)	86	144	(1)	(1)	88
Nonferrous metals and products	333-36,3392	126	(1)	(1)	61	128	(1)	(1)	54
Fabricated metal products	34	241	(1)	(1)	175	233	(1)	(1)	167
Machinery	35	1,964	23	267	1,673	1,773	20	248	1,504
Electrical equipment and communication	36,48	4,946	145	806	3,996	4,534	145	692	3,697
Radio and TV receiving equipment	365	54	(1)	(1)	37	64	(1)	(1)	44
Electronic components	367	3,173	126	527	2,521	2,881	127	447	2,307
Communication equipment and communication	366,48 361-64,369	1,719	(1)	(1)	1,438	1,589	(1)	(1)	1,345
Motor vehicles and motor vehicles equipment	371	1,982	11	156	1,815	1,756	13	148	1,595
Other transportation equipment	373-75,379								
Aircraft and missiles	372,19	5,014	57	424	4,533	4,912	54	464	4,393
Professional and scientific instruments	38	804	15	94	695	744	16	85	643
Scientific and mechanical measuring instruments	381,82	123	3	25	95	110	4	19	88
Optical, surgical, photographic, and other instruments	383-87	680	11	69	600	633	12	66	555
Other manufacturing industries	21,27,31,39	143	6	31	105	136	7	33	96
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	711	27	297	386	704	21	309	364
Distribution by size of company (based on number of employees)									
5,000 to 9,999		1,238	74	345	819	1,170	72	337	761
10,000 or more		16,039	455	2,558	13,026	15,063	451	2,416	12,197

Table B-44.—Funds for basic research, applied research and development, by industry, source, and selected company size group: 1972

[Dollars in millions]

Industry and size of company	SIC code	Federal				Company			
		Total	Basic research	Applied research	Develop-ment	Total	Basic research	Applied research	Develop-ment
Total		$8,090	$131	$956	$7,003	$11,347	$480	$2,565	$8,302
Distribution by industry									
Food and kindred products	20	1	(1)	(1)	(1)	257	(1)	(1)	(1)
Textiles and apparel	22,23	1	(1)	(1)	(1)	61	(1)	(1)	(1)
Lumber, wood products, and furniture	24,25	(1)			(1)	(1)	(1)	(1)	(1)
Paper and allied products	26	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Chemicals and allied products	28	196	45	67	84	1,713	201	686	825
Industrial chemicals	281-82	175	39	63	73	870	81	386	403
Drugs and medicines	283	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Other chemicals	284-89	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Petroleum refining and extraction	29,13	15	(1)	12	(1)	458	(1)	209	(1)
Rubber products	30	32	(1)	(1)	31	231	(1)	(1)	170
Stone, clay, and glass products	32	3		2	1	164	11	49	104
Primary metals	33	12		9	3	252	12	96	144
Ferrous metals and products	331-32,3391,3399	2		(1)	(1)	135	(1)	(1)	(1)
Nonferrous metals and products	333-36,3392	10		(1)	(1)	116	(1)	(1)	(1)
Fabricated metal products	34	11	(1)	(1)	10	230	(1)	(1)	164
Machinery	35	339	(1)	(1)	242	1,625	(1)	(1)	1,432
Electrical equipment and communication	36,48	2,504	47	320	2,138	2,442	98	486	1,858
Radio and TV receiving equipment	365	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Electronic components	367	1,699	44	227	1,428	1,474	82	300	1,053
Communication equipment & communication	366,48								
Other electrical equipment	361-64,369	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Motor vehicles and motor vehicles equipment	371								
Other transportation equipment	373-75,379	303	(1)	(1)	295	1,679	(1)	(1)	1,520
Aircraft and missiles	372,19	4,068	15	251	3,802	945	42	173	731
Professional and scientific instruments	38	168	4	11	152	636	11	82	543
Scientific and mechanical measuring instruments	381-82	24	(1)	(1)	16	99	(1)	(1)	80
Optical, surgical, photographic, and other instruments	383-87	144	(1)	(1)	137	537	(1)	(1)	463
Other manufacturing industries	21,27,31,39	(1)		(1)	(1)	(1)	(1)	(1)	(1)
Nonmanufacturing industries	07-12,14-17,41-47	432	18	176	238	278	9	121	148
	49-67,739,807,891								
Distribution by size of company (based on number of employees)									
5,000 to 9,999		226	6	79	141	1,012	68	266	678
10,000 or more		7,187	88	674	6,425	8,852	367	1,884	6,601

(1) Not separately available but included in total.

Table B-45.—Funds for basic research, by industry and size of company: 1957-58 and 1963-72

[Dollars in millions]

Industry and size of company	SIC code	1957[1]	1958[1]	1963	1964	1965	1966
Total		$271	$295	$522	$549	$592	$624
Distribution by industry							
Food and kindred products	20	4	5	12	14	10	13
Textiles and apparel	22,23	1	1	1	[2]	[2]	1
Lumber, wood products, and furniture	24,25				[2]	[2]	
Paper and allied products	26	1	[2]	2	2	3	4
Chemicals and allied products	28	82	92	152	153	173	176
Industrial chemicals	281-82	[2]	[2]	105	105	119	[2]
Drugs and medicines	283	18	21	33	35	38	45
Other chemicals	284-89	6	6	14	[2]	[2]	9
Petroleum refining an extraction	29,13	35	34	34	37	34	29
Rubber products	30	4	[2]	8	[2]	[2]	5
Stone, clay, and glass products	32	[2]	[2]	6	5	9	[2]
Primary metals	33	6	7	11	11	13	12
Ferrous metals and products[4]	331-32,3391,3399	5	5	8	8	10	[2]
Nonferrous metals and products	333-36,3392	[2]	2	3	3	3	3
Fabricated metal products	34	1	1	5	4	4	4
Machinery	35	17	20	25	26	22	26
Electrical equipment and communication	36,48	53	63	133	134	148	122
Radio and TV receiving equipment	365	[5]	[5]	[5]	[5]	[5]	[2]
Electronic components	367	36	43	110	112	121	96
Communication equipment & communication	366,48						
Other electrical equipment	361-64,369	17	21	23	22	27	[2]
Motor vehicles and motor vehicles equipment	371	5	[2]	28	38	37	[2]
Other transportation equipment	373-75,379						
Aircraft and missiles	372,19	25	26	59	68	74	74
Professional and scientific instruments	38	8	10	[2]	[2]	[2]	[2]
Scientific and mechanical measuring instruments	381-82	3	2	4	3	3	[2]
Optical, surgical, photographic, and other instruments	383-87	6	8	[2]	[2]	[2]	[2]
Other manufacturing industries	21,27,31,39	13	8	3	4	4	4
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	[2]	[2]	28	25	29	51
Distribution by size of company (based on number of employees)							
Less than 1,000		[2]	[2]	[2]	[2]	[2]	39
1,000 to 4,999		24	32	31	34	40	67
5,000 to 9,999		218	240	439	461	488	38
10,000 or more							480

[1] Estimated by the National Science Foundation.
[2] Not separately available but included in total.
[3] Data included in the other manufacturing industries group.

Industry and size of company	SIC code	1967
Total		$62
Distribution by industry		
Food and kindred products	20	1
Textiles and apparel	22,23	
Lumber, wood products, and furniture	24,25	
Paper and allied products	26	
Chemicals and allied products	28	18
Industrial chemicals	281-82	
Drugs and medicines	283	
Other chemicals	284-89	1
Petroleum refining and extraction	29,13	
Rubber products	30	
Stone, clay, and glass products	32	
Primary metals	33	1
Ferrous metals and products[4]	331-32,3391,3399	
Nonferrous metals and products	333-36,3392	
Fabricated metal products	34	
Machinery	35	
Electrical equipment and communication	36,48	13
Radio and TV receiving equipment	365	
Electronic components	367	
Communication equipment & communication	366,48	11
Other electrical equipment	361-64,369	
Motor vehicles and motor vehicles equipment	371	
Other transportation equipment	373-75,379	
Aircraft and missiles	372,19	
Professional and scientific instruments	38	
Scientific and mechanical measuring instruments	381-82	
Optical, surgical, photographic, and other instruments	383-87	
Other manufacturing industries	21,27,31,39	
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	
Distribution by size of company (based on number of employees)		
Less than 1,000		
1,000 to 4,999		
5,000 to 9,999		
10,000 or more		

[4] SIC codes 3391 and 3399 included in the nonferrous metals and produc
[5] Included in the other electrical equipment group.

Table B-45.—Funds for basic research, by industry and size of company: 1957–58 and 1963–72

[Dollars in millions]

Industry and size of company	SIC code	1957–58[1]	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
Total		$295	$522	$549	$592	$624	$629	$642	$618	$629	$610	$611
Distribution by industry												
Food and kindred products	20	5	12	14	10	13	17	17	18	20	20	20
Textiles and apparel	22,23	1	1	(2)	(2)	1	2	2	2	2	2	2
Lumber, wood products, and furniture	24,25	.....	.....	(2)	(2)	.....	.....	(2)	(2)	(2)	(2)	(2)
Paper and allied products	26	(2)	2	2	3	4	4	4	4	5	4	4
Chemicals and allied products	28	92	152	153	173	176	184	201	206	230	241	246
Industrial chemicals	281-82	(2)	105	105	119	(2)	(2)	(2)	(2)	(2)	120	120
Drugs and medicines	283	21	33	35	38	45	45	59	65	89	101	107
Other chemicals	284-89	6	14	(2)	(2)	9	14	13	13	18	20	19
Petroleum refining and extraction	29,13	34	34	37	34	29	36	37	38	26	21	23
Rubber products	30	(2)	8	(2)	(2)	5	5	6	7	5	4	4
Stone, clay, and glass products	32	(3)	6	5	9	(2)	(2)	(2)	(2)	(2)	9	11
Primary metals	33	7	11	11	13	12	13	14	16	18	17	12
Ferrous metals and products[4]	331-32,3391,3399	5	8	8	10	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Nonferrous metals and products	333-36,3392	2	3	3	3	3	4	5	8	8	(2)	(2)
Fabricated metal products	34	1	5	4	4	4	3	3	3	4	(2)	(2)
Machinery	35	20	25	26	22	26	26	31	21	20	20	23
Electrical equipment and communication	36,48	63	133	134	148	122	131	134	134	144	145	145
Radio and TV receiving equipment	365	(3)	(3)	(3)	(3)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Electronic components	367	43	110	112	121	96	112	115	118	127	127	126
Communication equipment & communication	366,48											
Other electrical equipment	361-64,369	21	23	22	27	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Motor vehicles and motor vehicles equipment	371	(2)	28	38	37	(2)	(2)	(2)	(2)	(2)	13	11
Other transportation equipment	373-75,379											
Aircraft and missiles	372,19	26	59	68	74	74	73	71	67	63	54	57
Professional and scientific instruments	38	10	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	16	15
Scientific and mechanical measuring instruments	381-82	2	4	3	3	(2)	(2)	(2)	(2)	(2)	4	3
Optical, surgical, photographic, and other instruments	383-87	8	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	12	11
Other manufacturing industries	21,27,31,39	8	3	4	4	4	5	5	5	5	7	6
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	(2)	28	25	29	51	52	45	43	38	31	27
Distribution by size of company (based on number of employees)												
Less than 1,000	.....	(2)	(2)	(2)	(2)	39	56	(2)	(2)	38	36	33
1,000 to 4,999	.....	32	31	34	40	67	45	(2)	(2)	58	51	50
5,000 to 9,999	.....	240	439	461	488	38	50	55	62	62	72	74
10,000 or more						480	478	490	469	471	451	455

[4] SIC codes 3391 and 3399 included in the nonferrous metals and products group for 1957 to 1965.

[5] Included in the other electrical equipment group.

Table B-46.—Funds for basic research, by industry and selected company size group: 1971 and 1972

[Dollars in millions]

Industry	SIC code	1971 Total	1971 Companies with total employment of— 5,000 to 9,999	1971 Companies with total employment of— 10,000 or more	1972 Total	1972 Companies with total employment of— 5,000 to 9,999	1972 Companies with total employment of— 10,000 or more
Total	.....	$610	$72	$451	$611	$74	$455
Food and kindred products	20	20	1	16	20	1	16
Textiles and apparel	22,23	2	(1)	1	2	(1)	1
Lumber, wood products, and furniture	24,25	(1)	.....	(1)	(1)	.....	(1)
Paper and allied products	26	4	(1)	(1)	4	(1)	(1)
Chemicals and allied products	28	241	49	166	246	51	168
Industrial chemicals	281-82	120	(1)	(1)	120	(1)	(1)
Drugs and medicines	283	101	41	52	107	44	53
Other chemicals	284-89	20	(1)	(1)	19	(1)	(1)
Petroleum refining and extraction	29,13	21	(1)	(1)	23	(1)	(1)
Rubber products	30	4	(1)	3	4	(1)	3
Stone, clay, and glass products	32	9	(1)	8	11	(1)	11
Primary metals	33	17	(1)	16	12	(1)	10
Ferrous metals and products	331-32,3391,3399	(1)	(1)	(1)	(1)	(1)	(1)
Nonferrous metals and products	333-36,3392	(1)	(1)	(1)	(1)	(1)	(1)
Fabricated metal products	34	(1)	(1)	(1)	(1)	(1)	(1)
Machinery	35	20	2	17	23	2	20
Electrical equipment and communication	36,48	145	8	126	145	8	123
Radio and TV receiving equipment	365	(1)	.....	(1)	(1)	.....	(1)
Electronic components	367	127	8	108	126	8	104
Communication equipment & communication	366,48						
Other electrical equipment	361-64,369	(1)	.....	(1)	(1)	.....	(1)
Motor vehicles and motor vehicles equipment	371	13	5	8	11	5	6
Other transportation equipment	373-75,379						
Aircraft and missiles	372,19	54	(1)	51	57	(1)	56
Professional and scientific instruments	38	16	(1)	8	15	(1)	8
Optical and mechanical measuring instruments	381-82	4	(1)	(1)	3	(1)	(1)
Optical, surgical, photographic, and other instruments	383-87	12	(1)	(1)	11	(1)	(1)
Other manufacturing industries	21,27,31,39	7	(1)	5	6	(1)	4
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	31	(1)	1	27	(1)	3

[1] Not separately available but included in total.

Table B-47.—Funds for basic rese 1967-72

[Dollars in mil

Field of science	1967	19
Total	$629	
Physical sciences	308	
Chemistry	162	
Physics	(1)	
Astronomy	(1)	
Mathematics	12	
Environmental sciences	14	
Atmospheric sciences	(1)	
Geological sciences	(1)	
Oceanography	(1)	
Engineering (including metallurgy)	172	
Life sciences	69	
Biological sciences	(1)	
Clinical medical sciences	(1)	
Other sciences	53	

[1] Not separately available but included in total.

by industry and selected company
71 and 1972

[llions]

	1971			1972	
	Companies with total employment of—			Companies with total employment of—	
	5,000 to 9,999	10,000 or more	Total	5,000 to 9,999	10,000 or more
510	$72	$451	$611	$74	$455
20	1	16	20	1	16
2	(1)	1	2	(1)	1
(1)	.....	(1)	(1)	.....	(1)
4	(1)	(1)	4	(1)	(1)
241	49	166	246	51	168
120	(1)	(1)	120	(1)	(1)
101	41	52	107	44	53
20	(1)	(1)	19	(1)	(1)
21	(1)	(1)	23	(1)	(1)
4	(1)	3	4	(1)	3
9	(1)	8	11	(1)	11
17	(1)	16	12	(1)	10
(1)	(1)	(1)	(1)	(1)	(1)
(1)	(1)	(1)	(1)	(1)	(1)
(1)	(1)	(1)	(1)	(1)	(1)
20	2	17	23	2	20
45	8	126	145	8	123
(1)	.....	(1)	(1)	.....	(1)
27	8	108	126	8	104
(1)	.....	(1)	(1)	.....	(1)
13	5	8	11	5	6
54	(1)	51	57	(1)	56
16	(1)	8	15	(1)	8
4	(1)	(1)	3	(1)	(1)
12	(1)	(1)	11	(1)	(1)
7	(1)	5	6	(1)	4
31	(1)	1	27	(1)	3

Table B-47.—Funds for basic research, by field of science: 1967-72

[Dollars in millions]

Field of science	1967	1968	1969	1970	1971	1972
Total	$629	$642	$618	$629	$610	$611
Physical sciences	308	317	324	303	287	289
Chemistry	162	191	213	196	186	188
Physics	(1)	(1)	(1)	(1)	(1)	(1)
Astronomy	(1)	(1)	(1)	(1)	(1)	(1)
Mathematics	12	13	13	13	14	14
Environmental sciences	14	11	11	8	8	8
Atmospheric sciences	(1)	(1)	(1)	(1)	3	3
Geological sciences	(1)	(1)	(1)	(1)	3	3
Oceanography	(1)	(1)	(1)	(1)	2	2
Engineering (including metallurgy)	172	181	170	170	159	159
Life sciences	69	76	74	107	117	117
Biological sciences	(1)	50	58	71	77	77
Clinical medical sciences	(1)	26	16	36	40	40
Other sciences	53	43	26	28	24	24

[1] Not separately available but included in total.

Table B-48.—Funds for basic research, by selected industry and field of science: 1972

[Dollars in millions]

Industry	SIC code	Total	Physical sciences	Mathematics	Environmental sciences	Engineering (including metallurgy)	Life sciences	Other sciences
Total		$611	$289	$14	$8	$159	$117	$24
Food and kindred products	20	20	9	.....	.....	.....	9	1
Textiles and apparel	22,23	2	1	.....	.....	1	.....	.....
Lumber, wood products, and furniture	24,25	(1)	.....	.....	.....	.....	(1)	.....
Paper and allied products	26	4	4	.....	.....	.....	.....	.....
Chemicals and allied products	28	246	141	(1)	.....	(1)	83	(1)
Industrial chemicals	281-82	120	80	(1)	.....	(1)	21	(1)
Drugs and medicines	283	107	46	.....	.....	(1)	58	(1)
Other chemicals	284-89	19	15	.....	.....	.....	4	.....
Petroleum refining and extraction	29,13	23	16	.....	2	4	1	.....
Rubber products	30	4	4	.....	.....	.....	.....	.....
Stone, clay, and glass products	32	11	(1)	.....	.....	(1)	(1)	.....
Primary metals	33	12	3	.....	.....	7	2	.....
Ferrous metals and products	331-32,3391,3399	(1)	(1)	.....	.....	(1)	(1)	.....
Nonferrous metals and products	333-36,3392	(1)	(1)	.....	.....	(1)	(1)	.....
Fabricated metal products	34	(1)	(1)	.....	.....	(1)	.....	.....
Machinery	35	23	11	(1)	(1)	(1)	(1)	.....
Electrical equipment and communication	36,48	145	54	6	.....	70	8	7
Radio and TV receiving equipment	365	(1)	(1)	.....	.....	.....	.....	.....
Electronic components	367	126	44	(1)	.....	(1)	8	6
Communication equipment & communication	366,48							
Other electrical equipment	361-64,369	(1)	(1)	(1)	.....	(1)	.....	.....
Motor vehicles and motor vehicles equipment	371	11	4	(1)	.....	3	(1)	(1)
Other transportation equipment	373-75,379							
Aircraft and missiles	372,19	57	17	2	1	33	1	3
Professional and scientific instruments	38	15	(1)	.....	(1)	4	4	.....
Scientific and mechanical measuring instruments	381,82	3	(1)	.....	.....	(1)	(1)	.....
Optical, surgical, photographic, and other instruments	383-87	11	(1)	.....	(1)	(1)	(1)	.....
Other manufacturing industries	21,27,31.39	6	4	.....	.....	(1)	.....	(1)
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	27	(1)	(1)	(1)	(1)	(1)	(1)

(1) Not separately available but included in total.

Table B-49.—R&D-performing companies with 5,000 or more employees and number of companies performing basic research only, by industry: 1972

Industry	SIC code	Companies with total employment of—					
		5,000 to 9,999 performing			10,000 or more performing		
		R&D	Basic research	Basic research as percent of R&D	R&D	Basic research	Basic research as percent of R&D
Total	.....	213	71	33	301	151	50
Food and kindred products	20	20	11	55	30	12	40
Textiles and apparel	22,23	10	5	50	22	7	32
Lumber, wood products, and furniture	24,25	5	.....	.....	4	1	25
Paper and allied products	26	12	1	8	17	8	47
Chemicals and allied products	28	22	15	68	29	22	76
Industrial chemicals	281-82	5	4	80	18	14	78
Drugs and medicines	283	9	8	89	6	5	83
Other chemicals	284-89	8	3	38	5	3	60
Petroleum refining and extraction	29,13	5	2	40	15	14	93
Rubber products	30	6	2	33	6	4	67
Stone, clay, and glass products	32	7	5	71	10	6	60
Primary metals	33	12	6	50	21	9	43
Ferrous metals and products	331-32,3391-3399	10	4	40	12	2	17
Nonferrous metals and products	333-36,3392	2	2	100	9	7	78
Fabricated metal products	34	11	1	9	10	2	20
Machinery	35	25	5	20	28	13	46
Electrical equipment and communication	36,48	20	5	25	38	21	55
Radio and TV receiving equipment	365	1	.....	.....	2	1	50
Electronic components Communication equipment and communication	367 366,18	10	5	50	22	11	50
Other electrical equipment	361-64,369	9	.....	.....	14	9	64
Motor vehicles and motor vehicles equipment	371	13	4	31	14	5	36
Other transportation equipment	373-75,379						
Aircraft and missiles	372,19	12	2	17	18	12	67
Professional and scientific instruments	38	12	2	17	9	5	56
Scientific and mechanical measuring instruments	381-82	5	1	20	2	1	50
Optical, surgical, photographic, and other instruments	383-87	7	1	14	7	4	57
Other manufacturing industries	21,27,31,39	12	3	25	12	5	42
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	9	2	22	18	5	28

Table B-50.—Funds by applied research and development, by product field: 1963-72

[Dollars in millions]

Product field	SIC code	1963	1964	1965	1966	1967
Total		$12,095	$12,948	$13,592	$14,924	$15,757
Atomic energy devices[1]		609	709	642	627	675
Ordnance, except guided missiles	19, except 192	92	94	103	153	218
Guided missiles and spacecraft	192	3,345	3,496	3,772	4,031	3,741
Food and kindred products	20	102	118	131	130	134
Textile mill products	22	([2])	([2])	21	42	55
Chemicals, except drugs and medicines	28, except 283	861	949	1,019	1,036	1,119
Industrial inorganic and organic chemicals	281	242	304	330	324	347
Plastics materials and synthetic resins, rubber, and fibers	282	379	402	420	438	474
Agricultural chemicals	287	45	48	64	77	92
Other chemicals	284-86	196	195	204	197	205
Drugs and medicines	283	227	234	274	322	346
Petroleum refining and extraction	29,13	194	205	211	206	215
Rubber and miscellaneous plastics products	30	87	102	112	128	132
Stone, clay, and glass products	32	74	85	92	99	121
Primary metals	33	152	164	178	194	208
Ferrous metals and products	331-32,3391,3399	90	97	108	104	117
Nonferrous metals and products	balance of 33	62	68	70	90	91
Fabricated metal products	34	135	150	153	161	204
Machinery	35	913	970	1,113	1,254	1,293
Engines and turbines	351	124	126	138	173	192
Farm machinery and equipment	352	76	79	96	100	102
Construction, mining, and materials handling machinery	353	58	60	69	110	119
Metalworking machinery, and equipment	354	58	66	52	76	67
Office, computing, and accounting machines	357	412	458	549	573	714
Other machinery, except electrical	balance of 35	185	182	209	222	199
Electrical equipment, except communication	36 except 365-67	277	305	319	375	
Electric transmission and distribution equipment	361	47	46	51	69	
Electrical industrial apparatus	362	77	84	87	111	
Other electrical equipment and supplies	363-64 and, 369	152	175	181	195	3,053
Communication equipment and electronic components	365-67	2,150	2,223	2,258	2,396	
Motor vehicles and other transportation equipment	37, except 372	651	678	713	807	831
Motor vehicles and equipment	371	623	651	685	757	755
Other transportation equipment	373-75 and 379	28	27	28	50	76
Aircraft and parts	372	[3]1,520	[3]1,670	1,599	1,953	2,168
Professional and scientific instruments	38	298	346	372	461	535
Other product fields, not elsewhere classified		[3]421	[3]463	511	548	710

Product field	SIC code	1968
Total		$16,78
Atomic Energy devices[1]		
Ordnance, except guided missiles	19, except 192	20
Guided missiles and spacecraft	192	3,78
Food and kindred products	20	1
Textile mill products	22	
Chemicals, except drugs and medicines	28, except 283	1,1
Industrial inorganic and organic chemicals	281	3
Plastics materials and synthetic resins, rubber, and fibers	282	4
Agricultural chemicals	287	
Other chemicals	284-86	2
Drugs and medicines	283	3
Petroleum refining and extraction	29,13	2
Rubber and miscellaneous plastics products	30	1
Stone, clay, and glass products	32	1
Primary metals	33	2
Ferrous metals and products	331-32,3391,3399	1
Nonferrous metals and products	balance of 33	
Fabricated metal products	34	4
Machinery	35	1,2
Engines and turbines	351	2
Farm machinery and equipment	352	
Construction, mining, and materials handling machinery	353	1
Metalworking machinery, and equipment	354	
Office, computing, and accounting machines	357	6
Other machinery, except electrical	balance of 35	2
Electrical equipment, except communication	36 except 365-67	
Electric transmission and distribution equipment	361	
Electrical industrial apparatus	362	3,3
Other electrical equipment and supplies	363-64 and, 369	
Communication equipment and electronic components	365-67	
Motor vehicles and other transportation equipment	37, except 372	
Motor vehicles and equipment	371	
Other transportation equipment	373-75 and 379	
Aircraft and parts	372	2,3
Professional and scientific instruments	38	
Other product fields, not elsewhere classified		1,1

[1] Distributed according to SIC code from 1968 to present.
[2] Not separately available but included in total.
[3] Estimated by the National Science Foundation.

Table B-50.—Funds by applied research and development, by product field: 1963-72

[Dollars in millions]

1964	1965	1966	1967	Product field	SIC code	1968	1969	1970	1971	1972
$12,948	$13,592	$14,924	$15,757	Total		$16,787	$17,700	$17,433	$17,702	$18,825
709	642	627	675	Atomic Energy devices[1]						
94	103	153	218	Ordnance, except guided missiles	19, except 192	201	186	192	192	205
3,496	3,772	4,031	3,741	Guided missiles and spacecraft	192	3,786	3,711	3,115	2,832	2,724
118	131	130	134	Food and kindred products	20	165	179	204	207	229
(2)	21	42	55	Textile mill products	22	58	66	55	60	60
949	1,019	1,036	1,119	Chemicals, except drugs and medicines	28, except 283	1,168	1,214	1,312	1,316	1,311
304	330	324	347	Industrial inorganic and organic chemicals	281	382	390	398	398	402
402	420	438	474	Plastics materials and synthetic resins, rubber, and fibers	282	466	482	521	511	483
48	64	77	92	Agricultural chemicals	287	99	104	126	130	123
195	204	197	205	Other chemicals	284-86	221	237	267	277	303
234	274	322	346	Drugs and medicines	283	375	417	447	506	532
205	211	206	215	Petroleum refining and extraction	29.13	239	252	272	266	304
102	112	128	132	Rubber and miscellaneous plastics products	30	160	163	193	215	253
85	92	99	121	Stone, clay, and glass products	32	130	157	128	128	111
164	178	194	208	Primary metals	33	207	224	235	230	234
97	108	104	117	Ferrous metals and products	331-32,3391,3399	119	125	127	114	123
68	70	90	91	Nonferrous metals and products	balance of 33	88	99	108	116	111
150	153	161	204	Fabricated metal products	34	478	504	622	701	673
970	1,113	1,254	1,293	Machinery	35	1,396	1,562	1,676	1,783	1,965
126	138	173	192	Engines and turbines	351	203	196	204	246	292
79	96	100	102	Farm machinery and equipment	352	96	99	89	90	91
60	69	110	119	Construction, mining, and materials handling machinery	353	129	154	182	196	229
66	52	76	67	Metalworking machinery, and equipment	354	90	83	86	86	88
458	549	573	614	Office, computing, and accounting machines	357	678	812	863	901	996
182	209	222	199	Other machinery, except electrical	balance of 35	201	218	252	264	261
305	319	375		Electrical equipment, except communication	36 except 365-67					
46	51	69		Electric transmission and distribution equipment	361					
84	87	111	3,053	Electrical industrial apparatus	362	3,363	3,409	3,372	3,615	3,947
175	181	195		Other electrical equipment and supplies	363-64 and, 369					
2,223	2,258	2,396		Communication equipment and electronic components	365-67					
678	713	807	831	Motor vehicles and other transportation equipment	37, except 372	956	1,139	1,138	1,404	1,647
651	685	757	755	Motor vehicles and equipment	371	860	1,051	1,046	1,258	1,469
27	28	50	76	Other transportation equipment	373-75 and 379	96	88	90	146	178
[3]1,670	1,599	1,953	2,168	Aircraft and parts	372	2,370	2,579	2,556	2,423	2,534
346	372	461	535	Professional and scientific instruments	38	719	814	724	652	852
[4]463	511	548	710	Other product fields, not elsewhere classified		1,103	1,124	1,191	1,172	1,246

Table B-51.—Funds for applied research and development, by product field and source: 1972

(Dollars in millions)

Product field	SIC code	Total	Federal	Company
Total	.....	$18,825	$7,959	$10,868
Ordnance, except guided missiles	19, except 192	205	112	93
Guided missiles and spacecraft	192	2,724	2,388	336
Food and kindred products	20	229	(1)	(1)
Textile mill products	22	60	.....	60
Chemicals, except drugs and medicines	28 except 283	1,287	35	1,252
Industrial inorganic and organic chemicals	281	382	13	369
Plastics materials and synthetic resins, rubber, and fibers	282	477	16	461
Agricultural chemicals	287	121	(1)	(1)
Other chemicals	284-86	305	(1)	(1)
Drugs and medicines	283	532	11	521
Petroleum refining and extraction	29,13	304	(1)	(1)
Rubber and miscellaneous plastics products	30	253	(1)	(1)
Stone, clay, and glass products	32	111	3	108
Primary metals	33	234	(1)	(1)
Ferrous metals and products	331,332,3391,3399	123	(1)	(1)
Nonferrous metals and products	balance of 33	111	(1)	(1)
Fabricated metal products	34	673	(1)	(1)
Machinery	35	1,965	160	1,805
Engines and turbines	351	292	(1)	(1)
Farm machinery and equipment	352	99	—	99
Construction, mining, and materials handling machinery	353	229	(1)	(1)
Metalworking machinery and equipment	354	88	(1)	(1)
Office, computing, and accounting machines	357	996	93	903
Other machinery, except electrical	balance of 35	261	31	230
Electrical equipment, except communication	36 except 365-67			
Electric transmission and distribution equipment	361			
Electrical industrial apparatus	362	3,947	2,162	1,785
Other electrical equipment and supplies	363-64 and 369			
Communication equipment and electronic components	365-67			
Motor vehicles and other transportation equipment	37, except 372	1,647	(1)	(1)

Resins, rubber, and fibers	282	477	16	461
Agricultural chemicals	287	121	(1)	(1)
Other chemicals	284-86	305	(1)	(1)
Drugs and medicines	283	532	11	521
Petroleum refining and extraction	29,13	304	(1)	(1)
Rubber and miscellaneous plastics products	30	253	(1)	(1)
Stone, clay, and glass products	32	111	3	108
Primary metals	33	234	(1)	(1)
Ferrous metals and products	331,332,3391,3399	123	(1)	(1)
Nonferrous metals and products	balance of 33	111	(1)	(1)
Fabricated metal products	34	673	(1)	(1)
Machinery	35	1,965	160	1,805
Engines and turbines	351	292	(1)	(1)
Farm machinery and equipment	352	99	—	99
Construction, mining, and materials handling machinery	353	229	(1)	(1)
Metalworking machinery and equipment	354	88	(1)	(1)
Office, computing, and accounting machines	357	996	93	903
Other machinery, except electrical	balance of 35	261	31	230
Electrical equipment, except communication	36 except 365-67			
Electric transmission and distribution equipment	361			
Electrical industrial apparatus	362	3,947	2,162	1,785
Other electrical equipment and supplies	363-64 and 369			
Communication equipment and electronic components	365-67			
Motor vehicles and other transportation equipment	37, except 372	1,647	(1)	(1)
Motor vehicles and equipment	371	1,469	(1)	(1)
Other transportation equipment	373-75 and 379	178	(1)	(1)
Aircraft and parts	372	2,534	1,571	963
Professional and scientific instruments	38	883	224	659
Other product fields, not elsewhere classified	.....	1,239	774	465

[1] Not separately available but included in total.

Table B-52.—Funds for applied research and development, by industry and product field: 1972

[Dollars in millions]

Industry	SIC code	Total	Product field and SIC code												
			Ordnance, except guided missiles	Guided missiles and spacecraft	Food and kindred products	Textile mill products	Chemicals, except drugs and medicines	Drugs and medicines	Petroleum refining and extraction	Rubber products	Stone, clay, and glass products	Primary metals	Fabricated metal products	Machinery	El eq a m
			19, except 192	192	20	22	28,except 283	283	29.13	30	32	33	34	35	
Total		$18,825	$205	$2,724	$229	$60	$1,287	$532	$304	$253	$111	$234	$673	$1,965	
Food and kindred products	20	239	.....	.....	165	(1)	26	15	.....	3	2	.....	3	12	
Textiles and apparel	22,23	59	.....	.....	1	40	3	.....	.....	4	.....	(1)	2	(1)	
Lumber, wood products, and furniture	24,25	51	.....	.....	.....	.....	9	.....	.....	.....	.....	(1)	6	.....	
Paper and allied products	26	182	.....	.....	.....	(1)	8	.....	.....	(1)	.....	.....	2	36	
Chemicals and allied products	28	1,662	21	9	32	5	864	446	18	23	6	18	32	24	
Industrial chemicals	281-82	925	21	7	10	(1)	625	38	(1)	17	(1)	16	31	20	
Drugs and medicines	283	451	.....	.....	7	(1)	34	384	.....	4	(1)	(1)	.....	(1)	
Other chemicals	284-89	286	1	1	14	.....	205	24	(1)	2	(1)	(1)	1	(1)	
Petroleum refining and extraction	29.13	451	(1)	.....	2	.....	109	3	265	4	.....	6	39	(1)	
Rubber products	30	260	8	.....	.....	2	32	.....	.....	151	(1)	(1)	8	5	
Stone, clay, and glass products	32	156	.....	.....	.....	(1)	21	.....	.....	5	68	(1)	2	2	
Primary metals	33	252	(1)	.....	.....	.....	18	.....	(1)	6	3	158	22	8	
Ferrous metals and products	331-32.3391,3399	131	(1)	.....	.....	.....	6	.....	.....	1	1	85	8	4	
Nonferrous metals and products	333-36.3392	121	.....	.....	.....	.....	12	.....	(1)	5	2	73	14	5	
Fabricated metal products	34	235	1	2	2	1	24	4	3	4	4	3	85	41	
Machinery	35	1,941	2	2	4	.....	27	.....	5	4	3	15	(1)	1,196	
Electrical equipment and communication	36,48	4,801	65	638	3	.....	46	4	.....	3	11	10	(1)	341	
Radio and TV receiving equipment	365	52	.....	.....	.....	.....	.....	.....	.....	.....	.....	(1)	.....	.....	
Electronic components	367	3,047	16	438	(1)	.....	9	(1)	.....	(1)	4	2	14	218	
Communication equipment and communication	366,48														
Other electrical equipment	361-64,369	1,702	49	200	(1)	.....	37	(1)	.....	(1)	5	(1)	(1)	123	
Motor vehicles and motor vehicle equipment	371	1,972	49	25	(1)	(1)	23	16	(1)	17	(1)	5	12	134	
Other transportation equipment	373-75,379														
Aircraft and missiles	372,19	4,957	13	1,981	(1)	.....	23	6	.....	17	(1)	9	42	54	
Professional and scientific instruments	38	789	(1)	13	(1)	5	22	34	(1)	(1)	3	(1)	13	31	
Scientific and mechanical measuring instruments	381,82	120	(1)	5	(1)	(1)	2	(1)	(1)	(1)	1	(1)	10	5	
Optical, surgical, photographic, and other instruments	383-87	669	(1)	8	(1)	(1)	20	(1)	(1)	(1)	3	(1)	3	26	
Other manufacturing industries	21,27,31,39	137	12	4	13	.....	13	2	.....	5	2	5	13	34	
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	683	31	51	4	3	2	3	9	3	4	3	6	40	

[1] Not separately available but included in total.

s for applied research and development, by industry and product field: 1972

[Dollars in millions]

Product field and SIC code																
ance, cept ded siles	Guided missiles and spacecraft	Food and kindred products	Textile mill products	Chemicals, except drugs and medicines	Drugs and medicines	Petroleum refining and extraction	Rubber products	Stone, clay, and glass products	Primary metals	Fabricated metal products	Machinery	Electrical equipment and communication	Motor vehicles and other transportation equipment	Aircraft and parts	Professional and scientific instruments	Other product fields, N E C
except 192	192	20	22	28, except 283	283	29,13	30	32	33	34	35	36	37, except 372	372	38	.....
$205	$2,724	$229	$60	$1,287	$532	$304	$253	$111	$234	$673	$1,965	$3,947	$1,647	$2,534	$883	$1,239
.....	.....	165	(¹)	26	15	.....	3	2	.....	3	12	(¹)	.....	.....	.....	8
.....	.....	1	40	3	...	.....	4	.....	(¹)	2	(¹)	3	.....	.....	.....	4
.....	...	...	.....	9	...	.....	.....	.....	(¹)	6	.....	(¹)	.....	.....	.....	34
.....	...	.....	(¹)	8	.....	.....	(¹)	...	...	2	36	.....	...	.....	(¹)	132
21	9	32	5	864	446	18	23	6	18	32	24	19	8	7	13	116
21	7	10	(¹)	625	38	(¹)	17	(¹)	16	31	20	13	8	.....	7	89
.....	...	7	(¹)	34	384	.....	4	(¹)	(¹)	.....	(¹)	(¹)	.....	.....	7	8
1	1	14		205	24	(¹)	2	(¹)	(¹)	1	(¹)	(¹)	...	7	.....	19
(¹)	...	2	.....	109	3	265	4	...	6	39	(¹)	(¹)	(¹)	.....	3	13
8	...	...	2	32	.....	.....	151	(¹)	(¹)	8	5	15	3	2	.....	32
.....	...	.....	(¹)	21	.....	.....	5	68	(¹)	2	2	9	3	(¹)	2	39
(¹)				18		(¹)	6	3	158	22	8	7	(¹)	(¹)	.....	23
(¹)	...	...	.....	6	.....	.....	1	1	85	8	4	1	(¹)	(¹)	.....	22
				12		(¹)	5	2	73	14	5	6	(¹)	.....	.....	1
1	2	2	1	24	4	3	4	4	3	85	41	16	7	6	4	29
2	2	4	...	27	.....	5	4	3	15	(¹)	1,198	424	36	7	11	170
62	638	3		45	4		3	11	10	(¹)	341	2,476	28	390	116	321
...	...	...	.....	...	...	.....	.....	.....	(¹)	.....	.....	(¹)	.....	.....	.....	.....
16	438	(¹)	.....	9	(¹)	.....	(¹)	4	2	14	218	1,879	16	79	83	282
49	200	(¹)		37	(¹)		(¹)	6	(¹)	(¹)	123	(¹)	12	310	34	39
49	25	(¹)	(¹)	23	16	(¹)	17	(¹)	5	12	134	318	1,358	4	8	.....
13	1,981	(¹)	.....	23	6	.....	17	(¹)	9	42	54	400	171	2,074	(¹)	159
(¹)	13	(¹)	5	22	34	(¹)	(¹)	3	(¹)	13	31	46	(¹)	6	583	21
(¹)	5	(¹)	(¹)	4	(¹)	(¹)	(¹)	1	(¹)	10	5	32	(¹)	(¹)	42	12
(¹)	8	(¹)	(¹)	20	(¹)	(¹)	(¹)	3	(¹)	3	26	14	(¹)	(¹)	541	9
12	4	13	...	13	2	...	5	2	5	13	34	16	12	3	3	.....
31	51	4	3	2	3	9	3	4	3	6	40	192	12	33	133	139

Table B-53.—Funds for applied research and development, by industry and product field: 1971

[Dollars in millions]

Industry	SIC code	Total	Product field and SIC code												
			Ordnance, except guided missiles	Guided missiles and spacecraft	Food and kindred products	Textile mill products	Chemicals, except drugs and medicines	Drugs and medicines	Petroleum refining and extraction	Rubber products	Stone, clay, and glass products	Primary metals	Fabricated metal products	Machinery	
			19,except 192	192	20	22	28, except 283	283	29.13	30	32	33	34	35	
Total		$17,702	$192	$2,815	$207	$60	$1,279	$490	$286	$215	$102	$230	$701	$1,783	
Food and kindred products	20	225	.....	.....	147	(1)	24	19	.....	2	1	.....	3	12	
Textiles and apparel	22,23	58	.....	.....	1	42	2	.....	.....	3	.....	(1)	1	(1)	
Lumber, wood products, and furniture	24,25	47	.....	.....	(1)	.....	8	.....	.....	(1)	(1)	(1)	5	1	
Paper and allied products	26	183	.....	.....	.....	(1)	12	.....	.....	(1)	.....	.....	2	37	
Chemicals and allied products	28	1,578	14	11	27	4	845	413	14	18	6	18	30	22	
Industrial chemicals	281-82	900	13	9	9	(1)	614	45	(1)	13	(1)	16	29	17	
Drugs and medicines	283	409	.....	.....	4	(1)	35	345	.....	4	(1)	(1)	.....	(1)	
Other chemicals	284-89	269	1	1	14	.....	195	23	(1)	1	(1)	(1)	1	(1)	
Petroleum refining and extraction	29.13	484	.....	2	2	.....	120	2	257	4	.....	2	72	(1)	
Rubber products	30	227	3	.....	.....	2	48	.....	.....	137	(1)	(1)	4	4	
Stone, clay, and glass products	32	146	.....	.....	.....	(1)	16	.....	.....	5	65	(1)	3	4	
Primary metals	33	255	(1)	.....	.....	.....	22	.....	(1)	4	3	161	23	10	
Ferrous metals and products	331-32,3391,3399	136	(1)	.....	.....	.....	7	.....	.....	1	1	87	10	6	
Nonferrous metals and products	333-36,3392	119	.....	.....	.....	.....	15	.....	(1)	3	3	74	13	5	
Fabricated metal products	34	227	3	2	2	1	32	1	2	6	2	6	81	42	
Machinery	35	1,753	2	2	3	.....	23	.....	3	1	2	10	30	1,068	
Electrical equipment and communication	36,48	4,389	65	625	3	.....	45	2	.....	2	10	9	349	336	
Radio and TV receiving equipment	365	62	.....	.....	.....	.....	.....	.....	.....	.....	.....	(1)	.....	2	
Electronic components	367	2,754	15	427	(1)	.....	8	(1)	.....	(1)	4	2	14	222	
Communication equipment and communication	366,48														
Other electrical equipment	361-64,369	1,573	50	198	(1)	.....	37	(1)	.....	(1)	6	(1)	334	111	
Motor vehicles and motor vehicles equipment	371	1,743	50	46	(1)	(1)	17	16	.....	14	(1)	3	27	101	
Other transportation equipment	373-75,379														
Aircraft and missiles	372,19	4,857	13	2,056	(1)	.....	19	6	.....	13	(1)	10	42	51	
Professional and scientific instruments	38	728	(1)	13	(1)	4	19	26	(1)	(1)	3	(1)	10	26	
Scientific and mechanical measuring instruments	381-82	106	(1)	7	(1)	(1)	2	(1)	(1)	(1)	1	(1)	8	5	
Optical, surgical, photographic, and other instruments	383-87	622	(1)	6	(1)	(1)	17	(1)	(1)	(1)	12	(1)	2	21	
Other manufacturing industries	21,27,31,39	129	11	3	15	.....	11	1	.....	1	2	3	10	33	
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	673	29	55	4	3	19	3	10	3	4	4	10	33	

(1) Not separately available but included in total.

Funds for applied research and development, by industry and product field: 1971

[Dollars in millions]

Product field and SIC code																
Ordnance, except guided missiles	Guided missiles and spacecraft	Food and kindred products	Textile mill products	Chemicals, except drugs and medicines	Drugs and medicines	Petroleum refining and extraction	Rubber products	Stone, clay, and glass products	Primary metals	Fabricated metal products	Machinery	Electrical equipment and communication	Motor vehicles and other transportation equipment	Aircraft and parts	Professional and scientific instruments	Other product fields, N.E.C.
19, except 192	192	20	22	28, except 283	283	29,13	30	32	33	34	35	36	37, except 372	372	38	.....
$192	$2,815	$207	$60	$1,279	$490	$286	$215	$102	$230	$701	$1,783	$3,605	$1,404	$2,372	$834	$1,127
.....	.....	147	(1)	24	19	.....	2	1	.....	3	12	(1)	.....	.....	.....	14
.....	.....	1	42	2	.....	.....	3	.....	(1)	1	(1)	2	.....	.....	.....	3
.....	.....	(1)	.....	8	.....	.....	(1)	(1)	(1)	5	1	(1)	(1)	.....	.....	31
.....	.....	.....	(1)	12	.....	.....	(1)	.....	.....	2	37	.....	.....	.....	(1)	129
14	11	27	4	845	413	14	18	6	18	30	22	15	6	9	12	115
13	9	9	(1)	614	45	(1)	13	(1)	16	29	17	12	6	.....	5	91
.....	.....	4	(1)	35	345	.....	4	(1)	(1)	.....	(1)	(1)	.....	.....	6	9
1	1	14	.....	195	23	(1)	1	(1)	(1)	1	(1)	(1)	.....	9		16
.....	2	2	.....	120	2	257	4	.....	2	72	(1)	(1)	(1)	.....	3	13
3	.....	.....	2	48	.....	.....	137	(1)	(1)	4	4	15	2	3	.....	6
.....	.....	.....	(1)	16	.....	.....	5	65	(1)	3	4	10	4	(1)	1	35
(1)	.....	.....	.....	22	.....	(1)	4	3	161	23	10	6	(1)	(1)	1	18
(1)	.....	.....	.....	7	.....	.....	1	1	87	10	6	1	(1)	(1)	1	18
.....	.....	.....	.....	15	.....	(1)	3	3	74	13	5	5	(1)	.....	.....	
3	2	2	1	32	1	2	6	2	6	81	42	11	9	5	3	23
2	2	3	.....	23	.....	3	1	2	10	30	1,068	389	35	7	10	166
65	625	3	.....	45	2	.....	2	10	9	349	336	2,083	23	391	110	339
.....	.....	.....	.....	.....	.....	.....	.....	.....	(1)	.....	2	(1)	.....	.....	.....	4
15	427	(1)	.....	8	(1)	.....	(1)	4	2	14	222	1,650	13	72	79	244
50	198	(1)	.....	37	(1)	.....	(1)	6	(1)	334	111	(1)	10	319	31	91
50	46	(1)	(1)	17	16	.....	14	(1)	3	27	101	265	1,173	6	1	22
13	2,056	(1)	.....	19	6	.....	13	(1)	10	42	51	552	124	1,914	(1)	53
(1)	13	(1)	4	19	26	(1)	(1)	3	(1)	10	26	42	(1)	4	552	19
(1)	7	(1)	(1)	2	(1)	(1)	(1)	1	(1)	8	5	28	(1)	(1)	39	10
(1)	6	(1)	(1)	17	(1)	(1)	(1)	12	(1)	2	21	14	(1)	(1)	513	9
11	3	15	.....	11	1	.....	1	2	3	10	33	16	10	2	6	6
29	55	4	3	19	3	10	3	4	4	10	33	191	12	30	131	134

Table B-54.—Funds for applied research and development, by industry and secondary product field: 1972

[Dollars in millions]

Industry	SIC code	Product field and SIC code											
		Chemicals, except drugs and medicines				Primary metals		Machinery					
		Industrial inorganic and organic chemicals	Plastics, synthetic resins, rubber and fibers	Agricultural chemicals	Other chemicals	Ferrous metals and products	Nonferrous metals and products	Engines and turbines	Farm machinery and equipment	Construction mining, and materials handling machinery	Metalworking machinery and equipment	Office, computing, and accounting machines	Other machinery, except electrical
		281	282	287	284-86	331-32,3391 3399	333-36, 3392	351	352	353	354	357	Balance of 35
Total		$382	$477	$121	$305	$123	$111	$292	$99	$229	$88	$996	$261
Food and kindred products	20	7	9	(1)	5			2	(1)				9
Textiles and apparel	22,23	(1)	3			(1)	(1)						(1)
Lumber, wood products, and furniture	24,25	(1)	4	(1)	(1)	(1)	(1)						
Paper and allied products	26	2	(1)		2							(1)	30
Chemicals and allied products	28	231	317	85	232	(1)	(1)	(1)	(1)	(1)	(1)		14
Industrial chemicals	281-82	195	295	47	88	(1)	(1)	(1)	(1)	(1)	(1)		(1)
Drugs and medicines	283	12	4	5	13		(1)						(1)
Other chemicals	284-89	24	18	32	131		(1)						(1)
Petroleum refining and extraction	29,13	45	34	11	20	(1)	(1)						
Rubber products	30	10	19	(1)	(1)		(1)			(1)			
Stone, clay, and glass products	32	7	10	(1)	(1)		(1)			(1)	(1)		
Primary metals	33	11	5	(1)	2	91	67	(1)	1	(1)	2	(1)	
Ferrous metals and products	331-32,3391,3399	3	(1)		1	(1)	7		(1)	(1)	(1)	(1)	(1)
Nonferrous metals and products	333-36,3392	8	(1)	(1)	1	(1)	60	(1)	(1)	(1)	(1)		(1)
Fabricated metal products	34	5	9		10	2	1		(1)	11	12		12
Machinery	35	5	10		12	2	12	94	64	169	44	735	92
Electrical equipment and communication	36,48	27	15	(1)	(1)	4	6	63	10	11	10	206	4
Radio and TV receiving equipment	365						(1)						
Electronic components	367												
Communication equipment and communication	366,48	(1)	1	(1)		(1)	(1)	2	(1)	(1)	(1)	183	1
Other electrical equipment	361-64,369	(1)	(1)	(1)	(1)	(1)	4	61	(1)	(1)	(1)	23	(1)
Motor vehicles and motor vehicles equipment	371	(1)	10	6	(1)	5	(1)	92	13	(1)	3	(1)	(1)
Other transportation equipment	373-75,379												
Aircraft and missiles	372,19	(1)	(1)	1	(1)	(1)	8	16	(1)	(1)	7	(1)	(1)
Professional and scientific instruments	38	(1)	(1)	(1)	7	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Scientific and mechanical measuring instruments	381-82	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)		(1)
Optical, surgical, photographic, and other instruments	383-87	(1)	(1)	(1)	(1)	(1)				(1)		(1)	(1)
Other manufacturing industries	21,27,31,39	(1)	6	3	1	2	3	8	4	5	3	2	1
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	11	5	2	2	2	(1)	15		3	(1)	17	

[1] Not separately available but included in total.

Table B-54.—Funds for applied research and development, by industry and secondary product field: 1972

[Dollars in millions]

Product field and SIC code														
except drugs and medicines			Primary metals		Machinery						Electrical equipment, except communication		Motor vehicles and other transportation equipment	
Plastics, synthetic resins, rubber and fibers	Agricultural chemicals	Other chemicals	Ferrous metals and products	Nonferrous metals and products	Engines and turbines	Farm machinery and equipment	Construction mining, and materials handling machinery	Metalworking machinery and equipment	Office, computing, and accounting machines	Other machinery, except electrical	Electrical transmission and distribution equipment	Electrical industrial apparatus	Motor vehicles and equipment	Other transportation equipment
282	287	284-86	331-32,3391 3399	333-36, 3392	351	352	353	354	357	Balance of 35	361	362	371	373-75,379
$477	$121	$305	$123	$111	$292	$99	$229	$88	$996	$261	$170	$243	$1,469	$178
9	(1)	5	.....	.....	2	(1)	.....	.....	.....	9	.....	(1)	.....	.....
3	.....	.....	(1)	(1)	.....	.....	.....	.....	.....	(1)	.....	.....	.....	.....
4	(1)	(1)	(1)	(1)	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
(1)	.....	2	.....	.....	.....	.....	.....	.....	(1)	30	.....	.....	.....	.....
317	85	232	(1)	(1)	(1)	(1)	(1)	(1)	.....	14	.....	10	8	.....
295	47	88	(1)	(1)	(1)	(1)	(1)	(1)	.....	(1)	.....	(1)	8	.....
4	5	13	.....	(1)	.....	.....	.....	.....	.....	(1)	.....	(1)	.....	.....
18	32	131	.....	(1)	.....	.....	.....	.....	.....	(1)	.....	(1)	.....	.....
34	11	20	(1)	(1)	.....	.....	.....	.....	.....	1	.....	(1)	(1)	.....
19	(1)	(1)	.....	(1)	.....	.....	(1)	.....	.....	4	(1)	(1)	3	.....
10	(1)	(1)	.....	(1)	.....	.....	(1)	(1)	.....	1	.....	.....	3	.....
5	(1)	2	91	67	(1)	1	(1)	2	(1)	3	2	1	2	(1)
(1)	.....	1	(1)	7	.....	(1)	(1)	(1)	(1)	(1)	(1)	.....	(1)	(1)
(1)	(1)	1	(1)	60	(1)	(1)	(1)	(1)	.....	(1)	(1)	1	(1)	(1)
9	.....	10	2	1	.....	(1)	11	12	.....	17	1	4	(1)	(1)
10	.....	12	2	12	94	64	169	44	735	92	(1)	9	35	(1)
15	(1)	(1)	4	6	63	10	11	10	206	41	144	148	18	11
.....	.....	.....	.....	(1)	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1	(1)	.....	(1)	(1)	2	(1)	(1)	(1)	183	19	41	54	12	(1)
(1)	(1)	(1)	(1)	4	61	(1)	(1)	(1)	23	(1)	103	94	(1)	(1)
10	6	(1)	5	(1)	92	13	(1)	3	(1)	(1)	4	39	1,324	34
(11	1	(1)	(1)	8	16	(1)	(1)	7	(1)	(1)	(1)	(1)	56	115
(1)	(1)	7	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	.....	(1)	(1)	(1)	(1)	(1)
(1)	(1)	(1)	(1)	.....	.....	.....	(1)	.....	(1)	(1)	.....	(1)	.....	.....
6	3	1	2	3	8	4	5	3	2	12	2	5	4	8
5	2	2	2	(1)	15	.....	3	(1)	17	4	11	3	6	6

Table B-55.—Funds for applied research and development, by industry and secondary product field: 1971

[Dollars in millions]

Industry	SIC code	Product field and SIC code											
		Chemicals, except drugs and medicines				Primary metals		Machinery					
		Industrial inorganic and organic chemicals	Plastics, synthetic resins, rubber and fibers	Agricultural chemicals	Other chemicals	Ferrous metals and products	Nonferrous metals and products	Engines and turbines	Farm machinery and equipment	Construction mining, and materials handling machinery	Metalworking machinery and equipment	Office, computing, and accounting machines	Other machinery except electrical
		281	282	287	284-86	331-32,3391, 3399	333-36, 3392	351	352	353	354	357	Balance of 35
Total		$383	$496	$130	$270	$114	$116	$246	$90	$196	$86	$901	$26
Food and kindred products	20	5	11	(1)	5			1	(1)				
Textiles and apparel	22,23	(1)	2			(1)	(1)						
Lumber, wood products, and furniture	24,25	(1)	4	(1)	(1)	(1)	(1)			(1)	(1)		
Paper and allied products	26	7	(1)		2							(1)	
Chemicals and allied products	28	228	324	98	195	(1)	(1)	(1)	(1)	(1)	(1)		
Industrial chemicals	281-82	193	294	44	83	(1)	(1)	(1)	(1)	(1)	(1)		
Drugs and medicines	283	10	8	5	12		(1)						
Other chemicals	284-89	25	22	48	100		(1)						
Petroleum refining and extraction	29,13	46	36	13	25	(1)	(1)	(1)					
Rubber products	30	14	31	(1)	(1)		1			(1)			
Stone, clay, and glass products	32	7	7	(1)	(1)		(1)			(1)	(1)		
Primary metals	33	12	7	(1)	2	93	68	(1)	1	(1)	4	(1)	
Ferrous metals and products	331-32,3391,3399	4	(1)		1	(1)	8		(1)	(1)	(1)	(1)	
Nonferrous metals and products	333-36,3392	8	(1)	(1)	1	(1)	60	(1)	(1)	(1)	(1)		
Fabricated metal products	34	8	13		11	4	2	1	(1)	9	12		
Machinery	35	5	8		10	2	8	106	58	144	43	636	
Electrical equipment and communication	36,48	22	19	(1)	(1)	2	7	59	9	9	10	208	
Radio and TV receiving equipment	365						(1)					2	
Electronic components	367	(1)	2	(1)		(1)	(1)	7	(1)	(1)	6	183	
Communication equipment and communication	366,58												
Other electrical equipment	361-64,369	(1)	(1)	(1)	(1)	(1)	6	52	(1)	(1)	4	23	
Motor vehicles and motor vehicles equipment	371	(1)	7	4	(1)	2	(1)	38	14	(1)	2	(1)	
Other transportation equipment	373-75,379												
Aircraft and missiles	372,19	(1)	10	1	(1)	(1)	10	20	(1)	(1)	7	(1)	
Professional and scientific instruments	38	(1)	(1)	(1)	7	(1)	(1)	(1)	(1)	(1)	(1)	(1)	
Scientific and mechanical measuring instruments	381,82	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)		
Optical, surgical, photographic, and other instruments	383-87	(1)	(1)	(1)	(1)	(1)				(1)		(1)	
Other manufacturing industries	21,27,31,39	(1)	5	3	1	1	2	8	1	2	3	9	
Nonmanufacturing industries	07-12,14-17,41-47, 49-67,739,807,891	10	4	1	3	2	(1)	11		4	(1)	15	

[1] Not separately available but included in total

Table B-55.—Funds for applied research and development, by industry and secondary product field: 1971

[Dollars in millions]

Product field and SIC code																
emicals, except drugs and medicines				Primary metals		Machinery						Electrical equipment, except communication		Motor vehicles and other transportation equipment	
trial anic di nic icals	Plastics, synthetic resins, rubber and fibers	Agricultural chemicals	Other chemicals	Ferrous metals and products	Nonferrous metals and products	Engines and turbines	Farm machinery and equipment	Construction mining, and materials handling machinery	Metalworking machinery and equipment	Office, computing, and accounting machines	Other machinery, except electrical	Electric transmission and distribution equipment	Electrical industrial apparatus	Motor vehicles and equipment	Other transportation equipment
281	282	287	284-86	331-32.3391, 3399	333-36, 3392	351	352	353	354	357	Balance of 35	361	362	371	373-75,379
$383	$496	$130	$270	$114	$116	$246	$90	$196	$86	$901	$264	$150	$210	$1,258	$146
5	11	(1)	5	. . .	. . .	1	(1)	. . .	. . .	. . .	10	. . .	(1)	. . .	. . .
(1)	2	. . .	. . .	(1)	(1)	. . .	. . .	. . .	. . .	. . .	(1)	. . .	. . .	. . .	. . .
(1)	4	(1)	(1)	(1)	(1)	. . .	. . .	(1)	(1)	. . .	1	. . .	. . .	1	(1)
7	(1)	. . .	2	. . .	. . .	. . .	. . .	. . .	. . .	(1)	35	. . .	. . .	. . .	. . .
228	324	98	195	(1)	(1)	(1)	(1)	(1)	(1)	. . .	14	. . .	. . .	6	. . .
193	294	44	83	(1)	(1)	(1)	(1)	(1)	(1)	. . .	(1)	. . .	(1)	6	. . .
10	8	5	12	. . .	(1)	. . .	. . .	. . .	. . .	. . .	(1)	. . .	(1)	. . .	. . .
25	22	48	100	. . .	(1)	. . .	. . .	. . .	. . .	. . .	(1)	. . .	(1)	. . .	. . .
46	36	13	25	(1)	(1)	(1)	. . .	. . .	. . .	. . .	2	. . .	(1)	(1)	. . .
14	31	(1)	(1)	. . .	1	. . .	. . .	(1)	. . .	. . .	3	(1)	(1)	2	. . .
7	7	(1)	(1)	. . .	(1)	. . .	. . .	(1)	(1)	. . .	2	. . .	1	4	. . .
12	7	(1)	2	93	68	(1)	1	(1)	4	(1)	4	1	2	2	(1)
4	(1)	. . .	1	(1)	8	. . .	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
8	(1)	(1)	1	(1)	60	(1)	(1)	(1)	(1)	. . .	(1)	(1)	(1)	(1)	(1)
8	13	. . .	11	4	2	1	(1)	9	12	. . .	19	1	3	(1)	(1)
5	8	. . .	10	2	8	106	58	144	43	636	81	(1)	4	32	(1)
22	19	(1)	(1)	2	7	59	9	9	10	208	39	125	132	13	10
. . .	. . .	. . .	. . .	. . .	(1)	. . .	. . .	. . .	. . .	2	. . .	. . .	. . .	. . .	. . .
(1)	2	(1)	. . .	(1)	(1)	7	(1)	(1)	6	183	18	30	43	9	(1)
(1)	(1)	(1)	(1)	(1)	6	52	(1)	(1)	4	23	(1)	95	89	(1)	(1)
(1)	7	4	(1)	2	(1)	38	14	(1)	2	(1)	(1)	3	37	1,140	33
(1)	10	1	(1)	(1)	10	20	(1)	(1)	7	(1)	(1)	(1)	(1)	42	82
(1)	(1)	(1)	7	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	. . .	(1)	(1)	(1)	(1)	(1)
(1)	(1)	(1)	(1)	(1)	. . .	. . .	. . .	(1)	. . .	(1)	(1)	. . .	(1)	(1)	(1)
(1)	5	3	1	1	2	8	1	2	3	9	10	2	4	5	5
10	4	1	3	2	(1)	11	. . .	4	(1)	15	2	13	4	5	7

APPENDIX C

Reproduction of Covering Letters, Questionnaires, and Instructions

APPENDIX C

f Covering Letters, s, and Instructions

Page

RD-1-L1
(1972)

NATIONAL SCIENCE FOUNDATION
WASHINGTON, D.C. 20550

Gentlemen:

The National Science Foundation requests the cooperation of your company in completing the enclosed questionnaire for the 1972 survey of industrial research and development. These annual surveys are conducted to better understand and strengthen the overall national effort in research and development.

Your participation and that of other companies enable the Foundation to present current and historical data on research and development in industry. This information is useful to Government officials in formulating public policies to encourage and strengthen scientific and technological development in the United States. Individual companies have also found the aggregate data valuable in analyzing and planning their own research and development programs.

The United States Bureau of the Census serves as the collecting and compiling agent for the Foundation. Inquiries regarding the survey should be directed to the U.S. Department of Commerce, Bureau of the Census, Washington, D.C. 20233.

We appreciate your cooperation in furnishing the data for this survey, and will be pleased to send your company a copy of the published report upon your request.

Sincerely yours,

H. Guyford Stever
Director

Enclosures

RD-1-L1
(1972)

U.S. D
Social
BUREAU
Washingt
OFFICE O

Gentlemen:

Enclosed are copies of Form RD-1, "Survey
velopment During 1972"; an instruction mam
your report; and a letter from the National
sors this survey. The 1972 report on Form
company, unless otherwise designated.

Your report to the Census Bureau is confid
States Code, Section 9). It may be seen o
and may be used only for statistical purpo
copies retained in your files are immune f

With the exception of data supplied in Ite
Item 5C, the information requested on RD-1
data in Items 2 and 5C are a basic part of
cal program on manufacturing companies and
Census mandatory Report Form, MA-121, if t
RD-1.

We thank you for filing reports with the C
look forward to your continued cooperation
ter from the National Science Foundation r
importance of the survey results. If you
this report, please write to the Industry
Washington, D. C. 20233.

Sincerely.

JOSEPH R. WRIGHT JR.
Acting Dircctor
Bureau of the Census

Enclosures

ATION

cooperation of your com-
for the 1972 survey of
nnual surveys are conduct-
erall national effort in

s enable the Foundation
earch and development in
rnment officials in for-
engthen scientific and
s. Individual companies
n analyzing and planning

as the collecting and
s regarding the survey
Commerce, Bureau of the

the data for this survey,
py of the published report

ly yours,

ord Stever
rector

RD-1-L1
(1972)

U.S. DEPARTMENT OF COMMERCE
Social and Economic Statistics Administration
BUREAU OF THE CENSUS
Washington, D.C. 20233

OFFICE OF THE DIRECTOR

Gentlemen:

Enclosed are copies of Form RD-1, "Survey of Industrial Research and Development During 1972"; an instruction manual to assist you in completing your report; and a letter from the National Science Foundation which sponsors this survey. The 1972 report on Form RD-1 should cover your entire company, unless otherwise designated.

Your report to the Census Bureau is confidential by law (Title 13, United States Code, Section 9). It may be seen only by sworn Census employees and may be used only for statistical purposes. The law also provides that copies retained in your files are immune from legal process.

With the exception of data supplied in Item 2 and in Columns 2 and 4 of Item 5C, the information requested on RD-1 is voluntary. The specified data in Items 2 and 5C are a basic part of the Census Bureau's statistical program on manufacturing companies and would have to be reported on Census mandatory Report Form, MA-121, if they were not provided on Form RD-1.

We thank you for filing reports with the Census Bureau in the past and look forward to your continued cooperation in the RD-1 Survey. The letter from the National Science Foundation referred to above emphasizes the importance of the survey results. If you have any questions regarding this report, please write to the Industry Division, Bureau of the Census, Washington, D. C. 20233.

Sincerely.

Joseph R. Wright Jr.

JOSEPH R. WRIGHT JR.
Acting Director
Bureau of the Census

Enclosures

DUE DATE: 30 DAYS AFTER RECEIPT OF FORM — O.M.B. No. 41-R1883; Approval Expires November 30, 1973

FORM RD-1 (11-24-72)

U.S. DEPARTMENT OF COMMERCE
SOCIAL AND ECONOMIC STATISTICS ADMINISTRATION
BUREAU OF THE CENSUS
COLLECTING AND COMPILING AGENT FOR THE NATIONAL SCIENCE FOUNDATION

SURVEY OF INDUSTRIAL RESEARCH AND DEVELOPMENT DURING 1972

TO: Bureau of the Census
Jeffersonville, Indiana 47130

GENERAL INSTRUCTIONS

- Please complete and return this form in the envelope provided within 30 days. Retain the file copy for your records. This report should cover your entire company, including all subsidiaries and affiliates, unless otherwise designated.
- Enter "None" where appropriate, rather than leaving a blank space.
- Reasonably accurate estimates are acceptable.
- Be sure 1971 and 1972 figures are comparable.

PLEASE READ ENCLOSED INSTRUCTIONS BEFORE COMPLETING THIS FORM.

Data supplied in item 2 and in item 5C, columns 2 and 4, for 1972 on this form, will satisfy the mandatory reporting requirement of Census form MA-127 (Title 13, U.S. Code).

NOTICE – Your report to the Census Bureau is confidential by law (Title 13, U.S. Code). It may be seen only by sworn Census employees and may be used only for statistical purposes. The law also provides that copies retained in your files are immune from legal process.

ITEM 1 – NAME AND ADDRESS OF COMPANY *(Please correct any error in name and address including ZIP code)*

Group 4 | Survey 4001

(PLEASE RETURN THIS COPY)

CENSUS USE ONLY | 1 | 2 | 3 | 4 | 5 | 6

Name of person who supplied 1971 data

Section I – GENERAL COMPANY DATA

ITEM		C.T.	1971 [1]	1972 [2]
2	A. Net sales and receipts of this company *(Thousands of dollars)*	2001	$	$
	B. Total company employment in all activities during the pay period which includes the 12th of March, 1971 and 1972	2002		
ITEM 3	Are research and development expenditures for entire company, including subsidiaries and affiliates, reported on this form? ..... ☐ Yes ☐ No If "No," please explain in Remarks or transmittal letter.			

Section II – RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY IN THE UNITED STATES

(Exclude R and D financed by the company but performed by others. Report such R and D in section III.)

ITEM 4	NUMBER OF RESEARCH AND DEVELOPMENT SCIENTISTS AND ENGINEERS *(See instruction manual, page 3)*	C.T. 2	January 1972 [1]	January 1973 [2]	Man-years for 1972* [3]
	A. Federal research and development	3001			
	B. Company and other research and development	3002			
	C. TOTAL NUMBER *(Sum of A and B)* →	3099			

*For companies in which the number of research and development scientists and engineers did not change significantly during 1972, the average of columns 1 and 2 will supply an acceptable estimate for column 3. Other companies may use the average of quarterly or monthly employment figures.

ITEM 5	COST OR RECEIPTS FOR RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY BY MAJOR TYPE AND SOURCE OF FUNDS		C.T. 2	*Thousands of dollars* 1971 TOTAL [1]	1972 Federal funds [2]	1972 Company and other funds, except Federal [3]	1972 TOTAL *(Sum of columns 2 and 3)* [4]
	A. Basic research		3510	$	$	$	$
Please complete 5E also	B. Applied research and development	1. Applied research	3521				
		2. Development	3522				
		3. Total *(Sum of lines 1 and 2)*	3529				
	C. TOTALS *(Sum of A and B3)* →		3599	$	$	$	$
	1971 TOTALS →				$	$	$
	Company and other funds, except Federal budgeted for the year 1973 →		C.T. 1 3800			$	

ITEM 6	COMPANY RESEARCH AND DEVELOPMENT ALLOWED AS INDIRECT COSTS OF FEDERAL CONTRACTS Approximately what amount of the total reported in item 5C, column 3, was allowed as indirect costs of Federal contracts? (In accordance with ASPR Regulation 15.205 and the same regulation as used in NASA and other Federal contracts.)	C.T. 1	*Thousands of dollars* 1971 [1]	1972 [2]
		3900	$	$

ITEM 7	COST OR CONTRACT VALUE OF RESEARCH AND DEVELOPMENT PERFORMED WITHIN THIS COMPANY BY MAJOR TYPE OF EXPENSE		1	2
	A. Wages and salaries of research and development scientists and engineers	4010	$	$
	B. Wages and salaries of all supporting personnel (include technicians, secretaries, and other personnel)	4020		
	C. Costs of materials and supplies consumed (do not include in this item components, models, and other materials supplied by other research organizations)	4030		
	D. Other costs (include service and supporting costs, depreciation, and share of overhead)	4040		
	E. TOTAL COSTS *(Sum of A through D) (Same as item 5C, columns 1 and 4)*	4099	$	$

the mandatory reporting requirement of Census form MA-121 (Title 13, U.S. Code).

Name of person who supplies the data

Section I – GENERAL COMPANY DATA

		C.T. 1	1971 [1]	1972 [2]
ITEM 2	A. Net sales and receipts of this company (*Thousands of dollars*)	2001	$	$
	B. Total company employment in all activities during the pay period which includes the 12th of March, 1971 and 1972	2002		
ITEM 3	Are research and development expenditures for entire company, including subsidiaries and affiliates, reported on this form?. . . . . ☐ Yes ☐ No If "No," please explain in Remarks or transmittal letter.			

Section II – RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY IN THE UNITED STATES

(Exclude R and D financed by the company but performed by others. Report such R and D in section III.)

		C.T. 2	January 1972 [1]	January 1973 [2]	Man-years for 1972* [3]
ITEM 4	NUMBER OF RESEARCH AND DEVELOPMENT SCIENTISTS AND ENGINEERS (*See instruction manual, page 3*)				
	A. Federal research and development	3001			
	B. Company and other research and development	3002			
	C. TOTAL NUMBER (*Sum of A and B*) →	3099			

*For companies in which the number of research and development scientists and engineers did not change significantly during 1972, the average of columns 1 and 2 will supply an acceptable estimate for column 3. Other companies may use the average of quarterly or monthly employment figures.

			C.T. 2	*Thousands of dollars* 1971 [1] TOTAL	1972 Federal funds [2]	1972 Company and other funds, except Federal [3]	1972 TOTAL (*Sum of columns 2 and 3*) [4]
ITEM 5	A. Basic research		3510	$	$	$	$
Please complete 5E also	B. Applied research and development	1. Applied research	3521				
		2. Development	3522				
		3. Total (*Sum of lines 1 and 2*)	3529				
	C. TOTALS (*Sum of A and B3*) →		3599	$	$	$	$
	D. 1971 TOTALS →				$	$	$
	E. Company and other funds, except Federal budgeted for the year 1973 →		C.T. 1 3800	$			

		C.T. 1	*Thousands of dollars* 1971 [1]	1972 [2]
ITEM 6	COMPANY RESEARCH AND DEVELOPMENT ALLOWED AS INDIRECT COSTS OF FEDERAL CONTRACTS Approximately what amount of the total reported in item 5C, column 3, was allowed as indirect costs of Federal contracts? (In accordance with ASPR Regulation 15.205 and the same regulation as used in NASA and other Federal contracts.)	3900	$	$

			1	2
ITEM 7	COST OR CONTRACT VALUE OF RESEARCH AND DEVELOPMENT PERFORMED WITHIN THIS COMPANY BY MAJOR TYPE OF EXPENSE			
	A. Wages and salaries of research and development scientists and engineers	4010	$	$
	B. Wages and salaries of all supporting personnel (include technicians, secretaries, and other personnel)	4020		
	C. Costs of materials and supplies consumed (do not include in this item components, models, and other materials supplied by other research organizations)	4030		
	D. Other costs (include service and supporting costs, depreciation, and share of overhead)	4040		
	E. TOTAL COSTS (*Sum of A through D*) (*Same as item 2C, columns 1 and 4*)	4099	$	$

			1	2
ITEM 8	FIELDS OF BASIC RESEARCH (Of the total reported in item 5A for basic research, please give cost for the following fields.)			
	1. Chemistry	5001	$	$
	2. Engineering (including Metallurgy)	5002		
	3. Geological sciences	5003		
	4. Mathematics	5004		
	5. Physics	5005		
	6. Astronomy	5006		
	7. Atmospheric sciences	5007		
	8. Oceanography	5008		
	9. Biological sciences	5009		
	10. Clinical medical sciences	5010		
	11. Other sciences	5011		
	12. TOTAL BASIC RESEARCH COSTS (*Same as item 5A, columns 1 and 4*)	5099	$	$

Please complete form and sign certification on reverse side.

USCOMM-DC

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A-67

Section II – RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY IN THE UNITED STATES – Continued
(Exclude R and D financed by the company but performed by others. Report such R and D in section III.)

ITEM 9 APPLIED RESEARCH AND DEVELOPMENT BY PRODUCT GROUP (Of the total reported in item 5B, line 3, for applied research and development, please give cost of project for each of the following.)	C.T. 2	Thousands of dollars 1971 Federal 1	1971 Total 2	1972 Federal 3	1972 Total 4
1. Atomic energy devices *(See Instruction Manual, page 6)*					
2. Food and kindred products	6200	$	$	$	$
3. Textile mill products	6220				
4. Industrial inorganic and organic chemicals	6281				
5. Plastics materials and synthetic resins, rubber, and fibers	6282				
6. Drugs	6283				
7. Agricultural chemicals	6287				
8. All other chemicals	6289				
9. Petroleum refining and extraction	6290				
10. Rubber and miscellaneous plastics products	6300				
11. Stone, clay, glass, and concrete products	6320				
12. Primary ferrous products	6331				
13. Primary and secondary nonferrous metals	6339				
14. Fabricated metal products	6340				
15. Engines and turbines	6351				
16. Farm machinery and equipment	6352				
17. Construction, mining, and materials handling machinery	6353				
18. Metalworking machinery and equipment	6354				
19. Office, computing, and accounting machines	6357				
20. Other machinery, except electrical	6359				
21. Electric transmission and distribution equipment	6361				
22. Electrical industrial apparatus	6362				
23. Radio and television receiving sets, except communication types	6375				
24. Electronic components and accessories, communications equipment	6366				
25. Other electrical machinery equipment and supplies	6369				
26. Missiles	6197				
27. Space vehicles	6198				
28. Aircraft and parts	6372				
29. Motor vehicles and equipment	6371				
30. Other transportation equipment	6379				
31. Professional and scientific instruments	6380				
32. Ordnance, except missiles	6199				
33. Other *(Specify)*	6998				
34. TOTAL APPLIED RESEARCH AND DEVELOPMENT COSTS *(Same as item 5B, line 3, columns 1, 2, and 4)*	6999	$	$	$	$

ITEM 10 COST OF RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY, BY STATE

Were all of the research and development costs reported in item 5C, column 4, for 1972, performed in the State listed in the address block (item 1) of this form? ..... ☐ Yes ☐ No

If "No," list the home State and any other States in which the various R and D laboratories or facilities are located, and estimate the costs associated with each State. If desirable, report up to 10 percent of your total as "Not distributed by State."

State *(Attach additional sheet if necessary)*	C.T. 1	Thousands of dollars 1971 1	1972 2
A.	71	$	$
B.	71		
C.	71		
D.	71		
E.	71		
F.	71		
G. TOTAL COSTS *(Same as item 5C, columns 1 and 4)* →	7199	$	$

Section III – RESEARCH AND DEVELOPMENT PERFORMED OUTSIDE THE DOMESTIC COMPANY WITH COMPANY FUNDS

ITEM 11	C.T. 1	Thousands of dollars 1971 1	1972 2
TOTAL COMPANY FUNDS SPENT FOR RESEARCH AND DEVELOPMENT ACTIVITIES PERFORMED OUTSIDE THE COMPANY WITHIN THE UNITED STATES →	8001	$	$

20. Other machinery, except electrical	6359					
21. Electric transmission and distribution equipment	6361					
22. Electrical industrial apparatus	6362					
23. Radio and television receiving sets, except communication types	6365					
24. Electronic components and accessories, communications equipment	6366					
25. Other electrical machinery equipment and supplies	6369					
26. Missiles	6197					
27. Space vehicles	6198					
28. Aircraft and parts	6372					
29. Motor vehicles and equipment	6371					
30. Other transportation equipment	6379					
31. Professional and scientific instruments	6380					
32. Ordnance, except missiles	6199					
33. Other *(Specify)*	6998					
34. **TOTAL APPLIED RESEARCH AND DEVELOPMENT COSTS** *(Same as item 5B, line 3, columns 1, 2, and 4)*	6999	$	$	$	$	

ITEM 10 **COST OF RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY, BY STATE**

Were all of the research and development costs reported in Item 5C, column 4, for 1972, performed in the State listed in the address block (item 1) of this form? . . . . . ☐ Yes ☐ No

If "No," list the home State and any other States in which the various R and D laboratories or facilities are located, and estimate the costs associated with each State. If desirable, report up to 10 percent of your total as "Not distributed by State."

State *(Attach additional sheet if necessary)*	C. T. 1	Thousands of dollars 1971 | 1	1972 | 2
A.	71	$	$
B.	71		
C.	71		
D.	71		
E.	71		
F.	71		
G. **TOTAL COSTS** *(Same as item 5C, columns 1 and 4)* →	7199	$	$

Section III – RESEARCH AND DEVELOPMENT PERFORMED OUTSIDE THE DOMESTIC COMPANY WITH COMPANY FUNDS

	C. T. 1	Thousands of dollars 1971 | 1	1972 | 2
ITEM 11 **TOTAL COMPANY FUNDS SPENT FOR RESEARCH AND DEVELOPMENT ACTIVITIES PERFORMED OUTSIDE THE COMPANY WITHIN THE UNITED STATES** →	8001	$	$

Remarks *(Attach additional sheet if necessary)*

Name of person to cor. sgarding this report	Address *(Number and street, city, State, ZIP code)*	Telephone *(Area code, number, extension)*

CERTIFICATION – This report is substantially accurate and has been prepared in accordance with instructions.

Name of company	Address *(Number and street, city, State, ZIP code)*	
Signature of authorized official	Title	Date

FORM RD-1 (11-24-72) USCOMM-DC

DUE DATE: 30 DAYS AFTER RECEIPT OF FORM O.M.B. No. 41-R1883; Approval Expires November 30, 1973

FORM RD-1I
(11-24-72)

U.S. DEPARTMENT OF COMMERCE
SOCIAL AND ECONOMIC STATISTICS ADMINISTRATION
BUREAU OF THE CENSUS
COLLECTING AND COMPILING AGENT FOR THE NATIONAL SCIENCE FOUNDATION

ATTACHMENT TO FORM RD-1

SURVEY OF INDUSTRIAL RESEARCH AND DEVELOPMENT DURING 1972

Complete this attachment and return it with the COMPLETED Form RD-1 to the Bureau of the Census, Jeffersonville, Indiana 47130.

NOTICE – Your report to the Census Bureau is confidential by law (Title 13, U.S. Code). It may be seen only by sworn Census employees and may be used only for statistical purposes. The law also provides that copies retained in your files are immune from legal process.

ITEM 1 – Name and address of company *(Please correct if any error in name and address including ZIP code)*

Group	Survey
4	4001

(PLEASE RETURN THIS COPY)

CENSUS USE ONLY → | 1 | 2 | 3 | 4 | 5 | 6 |

The following supplementary information is requested from you as one of the companies with the largest research and development programs:

Breakdown of items 4 and 5 of Form RD-1 – Companies reporting Federal research and development of more than $1 million are asked to provide separate figures for the three categories of Federal agencies: Department of Defense, National Aeronautics and Space Administration, and all other Federal agencies. In general, most companies performing large amounts of research and development for the Government will have one or more separate organizational units charged with responsibility for most Federal contracts. Reporting of the requested data has been simplified for some companies by using the data available from the accounts of such units as the basis for the overall company figures on the number of scientists and engineers and the costs of Federal programs. For example; if 80 percent of the work for Federal agencies is performed by units with separate accounts, it should be reasonable to estimate the company totals on the basis of such figures rather than make special tabulations or separate estimates for each of the company units that may be doing some work on Government research and development.

In part A below, please distribute the research and development scientist and engineer man-years (Item 4A, column 3 of Form RD-1) according to the share of research and development time devoted to each program.

In part B below, please distribute the costs of the research and development work (Item 5C, column 2 of Form RD-1) by Federal agency.

Item 10 for companies with the largest research and development programs – Companies with the largest research and development programs are being asked to report here the breakdown, by State, of Federal as well as total research and development. For such companies, Item 10 on Form RD-1 will be left blank.

ITEMS 4 AND 5 *(Breakdown)* – **RESEARCH AND DEVELOPMENT INFORMATION BY PRINCIPAL FEDERAL AGENCY**

A. Research and development scientist and engineer man-years *(Breakdown of item 4A, column 3, of RD-1)*	C.T.1	Man-years for 1971 | 1	Man-years for 1972 | 2
1. Department of Defense	3601		
2. National Aeronautics and Space Administration	3602		
3. All other Federal Agencies	3603		
4. TOTAL FEDERAL SCIENTISTS AND ENGINEERS →	3699		

B. Cost of Federal research and development during 1972 *(Breakdown of item 5C, column 2, of RD-1)*	C.T.1	Thousands of dollars: 1971 | 1	1972 | 2
1. Department of Defense	3701	$	$
2. National Aeronautics and Space Administration	3702		
3. All other Federal Agencies	3703		
4. TOTAL FEDERAL RESEARCH AND DEVELOPMENT →	3799	$	$

ITEM 10 **COSTS OF RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY BY STATE**

Were all of the research and development costs reported in Item 5C, column 4, on Form RD-1 for 1972 performed in the State listed in the address block (Item 1) of this form? . . . . . ☐ Yes ☐ No

If "No," list the home State and any other States in which the various research and development laboratories or facilities are located, and estimate the costs associated with each State. If desirable, report up to 10 percent of your total as "Not distributed by State."

State *(Attach an additional sheet if necessary)*	C.T.1	Research and development *(Thousands of dollars)* 1971 Federal | 1	1971 Total | 2	1972 Federal | 3	1972 Total | 4
A.	71	$	$	$	$
B.	71				
C.	71				

more than $1 million are asked to provide separate figures for the three categories of Federal agencies: Department of Defense, National Aeronautics and Space Administration, and all other Federal agencies. In general, most companies performing large amounts of research and development for the Government will have one or more separate organizational units charged with responsibility for most Federal contracts. Reporting of the requested data has been simplified for some companies by using the data available from the accounts of such units as the basis for the overall company figures on the number of scientists and engineers and the costs of Federal programs. For example; if 80 percent of the work for Federal agencies is performed by units with separate accounts, it should be reasonable to estimate the company totals on the basis of such figures rather [illegible] work on Government research [illegible]

In part A below, please distribute the research and development scientist and engineer man-years (Item 4A, column 3 of Form RD-1) according to the share of research and development time devoted to each program.

In part B below, please distribute the costs of the research and development work (Item 5C, column 2 of Form RD-1) by Federal agency.

Item 10 for companies with the largest research and development programs – Companies with the largest research and development programs are being asked to report here the breakdown, by State, of Federal as well as total research and development. For such companies, Item 10 on Form RD-1 will be left blank.

ITEMS 4 AND 5 — *(Breakdown)* — **RESEARCH AND DEVELOPMENT INFORMATION BY PRINCIPAL FEDERAL AGENCY**

A. Research and development scientist and engineer man-years *(Breakdown of item 4A, column 3, of RD-1)*	C.T.1	Man-years for 1971 | 1	Man-years for 1972 | 2
1. Department of Defense	3601		
2. National Aeronautics and Space Administration	3602		
3. All other Federal Agencies	3603		
4. TOTAL FEDERAL SCIENTISTS AND ENGINEERS →	3699		

B. Cost of Federal research and development during 1972 *(Breakdown of item 5C, column 2, of RD-1)*	C.T.1	Thousands of dollars: 1971 | 1	1972 | 2
1. Department of Defense	3701	$	$
2. National Aeronautics and Space Administration	3702		
3. All other Federal Agencies	3703		
4. TOTAL FEDERAL RESEARCH AND DEVELOPMENT →	3799	$	$

ITEM 10 — **COSTS OF RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY BY STATE**

Were all of the research and development costs reported in Item 5C, column 4, on Form RD-1 for 1972 performed in the State listed in the address block (item 1) of this form? . . . . . ☐ Yes ☐ No

If "No," list the home State and any other States in which the various research and development laboratories or facilities are located, and estimate the costs associated with each State. If desirable, report up to 10 percent of your total as "Not distributed by State."

State *(Attach an additional sheet if necessary)*	C.T.1	Research and development *(Thousands of dollars)* 1971 Federal | 1	1971 Total | 2	1972 Federal | 3	1972 Total | 4
A.	71	$	$	$	$
B.	71				
C.	71				
D.	71				
E.	71				
F.	71				
G.	71				
H.	71				
I.	71				
J.	71				
K.	71				
L.	71				
M.	71				
N.	71				
O.	71				
P. TOTAL COSTS → *(Same as Item 5C, Form RD-1)*	7199	$	$	$	$

Use reverse side for remarks

USCOMM-DC

FORM RD-1 (11-24-72)
(Instruction Manual)

U.S. DEPARTMENT OF COMMERCE
SOCIAL AND ECONOMIC STATISTICS ADMINISTRATION
BUREAU OF THE CENSUS
COLLECTING AND COMPILING AGENT FOR
THE NATIONAL SCIENCE FOUNDATION
WASHINGTON, D.C. 20233

INSTRUCTIONS FOR SURVEY OF INDUSTRIAL RESEARCH AND DEVELOPMENT DURING 1972

GENERAL

Information About Reporting: Additional Forms – Reporting on this form may require that companies resort to the use of estimates in answering some of the questions. We are satisfied, however, that the comparability of data among companies with research and development programs is sufficient to develop meaningful totals and measures of changes from year to year.

If you require additional copies of the form, write to the Bureau of the Census, Jeffersonville, Indiana 47130. If you have any questions regarding reporting on this form, write to the Bureau of the Census, Washington, D.C. 20233.

Companies Reporting in Survey for the First Time – Companies not reporting in 1971 Survey should fill in the figures for both years. If the company had no expenditures for research and development, complete only "Item 2." Enter "No R & D" in the space for remarks on page 2 of the form, sign and return the form.

Figures for Earlier Years are Preposted on the Form – If your company reported on Form RD-1 for 1971, certain figures from that form have been copied to the present form. Please describe in the "Remarks" section (page 2 of the form) the reasons for any substantial increases or decreases in the 1972 figures entered on this form when compared to corresponding 1971 figures. Examples of such reasons are new government contracts, acquisitions and disposals, revised accounting method, etc. If you acquired or disposed of a unit performing an important amount of research and development during the two-year period, please identify the unit in remarks, and give the total amount of research and development accounted for by such unit.

Revision of Earlier Year Figures – The 1971 figures should be revised if necessary to assure comparability with 1972 data. Please explain in remarks, any significant change in the 1971 figures. If your company did not report for 1971 or no entries have been entered in the 1971 column, fill in the figures for both years.

Report for Your Entire Company – Research and development activities for your entire company should be reported, including all subsidiaries and divisions of the company. If you desire to have subsidiaries report separately, please write to the Census Bureau and list your subsidiaries.

Period Covered by Report – The figures reported should cover the calendar year if at all possible. However, fiscal year data are acceptable for all items except employment, provided your fiscal year ends between September and May. Please report employment figures (Items 2B and 4) for the period identified in each of the items mentioned.

Geographic Area Covered – The data are intended to relate to business firms in the fields of manufacturing, minerals and other economic areas which operate one or more establishments in one or more of the 50 States or the District of Columbia.

Section I – GENERAL COMPANY DATA

Item 2 – Sales and Employment for Company – In Item 2A, report the net sales and receipts of this company and its subsidiaries to customers outside the company. (Exclude domestic intra-company transfers and sales by foreign subsidiaries. Include transfers to such foreign subsidiaries, however.) The reported figures should represent value f.o.b. plant after discounts and allowances and should not include freight charges; excise taxes should be included. In Item 2B report the number of persons employed at the company in all activities in the 50 States or the District of Columbia during the pay period which includes the 12th of March, 1971 and 1972. This figure would be the same as that shown by the company in Item 14 of Treasury Form 941, if the company filed one Form 941 for the entire company.

DEFINITION OF RESEARCH AND DEVELOPMENT

Research and development includes basic and applied research in the sciences and in engineering, and design and development of prototypes and processes. For the purposes of this questionnaire, research and development includes activities carried on by persons trained, either formally or by experience, in the physical sciences including related engineering, and the biological sciences including medicine but excluding psychology, if the purpose of such activity is to do one or more of the following things:

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AND DEVELOPMENT DURING 1972

s for research and development, complete 2." Enter "No R & D" in the space for page 2 of the form, sign and return the

Earlier Years are Preposted on the Form – npany reported on Form RD-1 for 1971, ures from that form have been copied to form. Please describe in the "Remarks" ge 2 of the form) the reasons for any increases or decreases in the 1972 figures his form when compared to corresponding s. Examples of such reasons are new contracts, acquisitions and disposals, ounting method, etc. If you acquired or a unit performing an important amount and development during the two-year se identify the unit in remarks, and give amount of research and development or by such unit.

Revision of Earlier Year Figures – The 1971 figures should be revised if necessary to assure comparability with 1972 data. Please explain in remarks, any significant change in the 1971 figures. If your company did not report for 1971 or no entries have been entered in the 1971 column, fill in the figures for both years.

Report for Your Entire Company – Research and development activities for your entire company should be reported, including all subsidiaries and divisions of the company. If you desire to have subsidiaries report separately, please write to the Census Bureau and list your subsidiaries.

Period Covered by Report – The figures reported should cover the calendar year if at all possible. However, fiscal year data are acceptable for all items except employment, provided your fiscal year ends between September and March. Please report employment figures (Items 2B and 4) for the period identified in each of the items mentioned.

Geographic Area Covered – The data are intended to relate to business firms in the fields of manufacturing, minerals and other economic areas which operate one or more establishments in one or more of the 50 States or the District of Columbia.

Section 1 – GENERAL COMPANY DATA

Item 2 – Sales and Employment for Company – In Item 2A, report the net sales and receipts of this company and its subsidiaries to customers outside the company. (Exclude domestic intra-company transfers and sales by foreign subsidiaries. Include transfers to such foreign subsidiaries, however.) The reported figures should represent value f.o.b. plant after discounts and allowances and should not include freight charges; excise taxes should be included. In Item 2B report the number of persons employed at the company in all activities in the 50 States or the District of Columbia during the pay period which includes the 12th of March, 1971 and 1972. This figure would be the same as that shown by the company in Item 14 of Treasury Form 941, if the company filed one Form 941 for the entire company.

DEFINITION OF RESEARCH AND DEVELOPMENT

Research and development includes basic and applied research in the sciences and in engineering, and design and development of prototypes and processes. For the purposes of this questionnaire, research and development includes activities carried on by persons trained, either formally or by experience, in the physical sciences including related engineering, and the biological sciences including medicine but excluding psychology, if the purpose of such activity is to do one or more of the following things:

1. Pursue a planned search for new knowledge, whether or not the search has reference to a specific application.

2. Apply existing knowledge to problems involved in the creation of a new product or process, including work required to evaluate possible uses.

3. Apply existing knowledge to problems involved in the improvement of a present product or process.

Research and development includes the activities described above whether assigned to separate research and development organizational units of the company or carried on by company laboratories and technical groups not part of a research and development organization. We recognize that the reporting activities of such latter groups will require the use of estimates for some of the questions.

Activities to be Excluded from Research and Development – Research and development for purposes of this survey does not include quality control, routine product testing, market research, sales promotion, sales service, research in the social sciences or psychology, or other nontechnological activities or technical services.

More specifically, exclude from research and development such nontechnological activities as market research, including statistical surveys of product acceptance, estimates of market size, and studies of channels of distribution; and market development, including the sale of either old or new products to obtain acceptance of them in new outlets; economic research and other research in the social sciences; and legal work in connection with patent applications and litigation, and the sale or licensing of patents.

Also exclude from research and development such technical services as: quality and quantity control tests and analyses, trouble-shooting in connection with breakdowns in full-scale production, including related analytical work; technical plant sanitation control; work required for minor adaptations of a specific product to meet the requirements of a specific customer, including installation and servicing in a customer's plant; engineering and other technical service furnished in accordance with agreements to licensees outside the company; aid furnished by the research and development organization to manufacturing divisions to enable them to operate in accordance with previously determined formulas, standard practice instructions, or finished product specifications; aid furnished to develop advertising programs and to promote or demonstrate new products or processes, including the cost of material furnished for trial or demonstration; assistance in preparation of speeches and publications for persons not engaged in research and development; and experimental work performed at the request of the patent division to provide information needed during the prosecution of a patent litigation.

Section II – RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY, IN THE UNITED STATES

Item 4 – Research and Development Scientists and Engineers – Scientists and engineers for this survey are defined as all persons engaged in scientific or engineering work at a level which requires a knowledge of physical or life sciences or engineering or mathematics equivalent at least to that acquired through completion of a four-year college course with a major in these fields, regardless of whether they held a college degree in the field.

As in the past, the figure on R&D scientists and engineers will be obtained primarily from two sources:

1. Records on the number of scientists and engineers assigned to research and development. This source is satisfactory so long as the scientists and engineers of the unit are assigned to research and development on a full-time basis (i.e., no more than 5 percent of their time is spent on non-research and development). For example, for company laboratories performing only research and development, report the number of scientists and engineers on the rolls in January. For other units, use Source 2.

2. Figures on the proportion of total work time of scientists and engineers that is devoted to research and development. For example, if the engineering department of a manufacturing plant had 60 scientists and engineers in January 1973 and one-fourth of the scientists' and engineers' time during that month was charged to research and development projects, the figure for the number of research and development scientists and engineers included for that unit would be 15.

Estimates of Man-Years – Each of the above two methods yields an estimate of man-months (for the month of January). If the average of the two January figures is representative of the entire year, the average should be entered in Item 4C, Column 3, as an estimate of man-years. Otherwise, the figure in column 3 should be estimated separately on the basis of quarterly, monthly, or other time records. Total man-years of research and development scientists' and engineers' time is the same as the average number of scientists and engineers working during the year.

Separate figures are requested on the number of scientists and engineers working on Federal and company and other research and development projects. Where research and development work for the Government and for the company is performed by the same group of scientists and engineers, it will be necessary to distribute the total number of such scientists and engineers according to the program, Federal or company, for which the research and development work was performed, i.e. to use the proportion of the total work time of research and development scientists and engineers that is devoted to Federal and company research and development programs, in order to distribute the total reported in Item 4C. The resulting figures should be reported to the nearest man-year, in order to present a reasonable division of time assigned to Federal and company and other research and development programs.

Please divide the requested figures into the related cost figures and check the resulting cost figure of research and development per scientist and engineer for reasonableness.

Cost or Receipts for Research and Development Performed Within the Company by Major Type and Source of Funds – Include all costs incurred to support research and development, exclusive of capital expenditures, but including depreciation and overhead. If you perform research and development for others on contract, include the total charged for the work performed, including profit.

The relevant costs usually include but are not limited to the elements listed below:

1. Wages, salaries, and related costs. Material and supplies consumed (or purchased, if consumption figures are not available); utilities, such as telephone, telegraph, electricity, water, gas, and fuel; books and periodicals; travel and entertainment costs and professional dues.

2. Property taxes and other taxes (except income taxes) incurred on account of the research and development organization or on the facilities which the research and development organization uses. Insurance expense. Maintenance and repair, including the maintenance of buildings and grounds, depreciation on buildings, equipment, and vehicles; or rentals, if any facilities are leased.

3. Company overhead. Estimate a fair share of the cost of any functions which support research and development activities. The basis and method of estimating overhead costs will depend upon company practice. The important point is to be sure that all companies include an allowance for overhead. Items normally coveted in overhead include the following:

Personnel, including personnel, medical and safety departments, and employee or industrial relations department; accounting control and fiscal (Treasurer's office); procurement and inventory, including purchasing, receiving, inspection, storage, transportation, control, and issue of materials and supplies; other services, including legal, public relations, shopwork, analytical work, plant protection, rearrangement of facilities, drafting, printing, duplicating, transportation of material and personnel, maintenance of motor vehicles, messenger service, stenographic service, and photography, salaries and related costs of research executives not on the payroll of the research and development organization.

Do not net your research and development expenditures by the amount of royalties received from either noncompany organizations or company units; or the credits received for research and development work charged or "sold" to other departments or divisions of reporting company or to outside organizations.

Types of Expense to be Excluded from Research and Development Costs – Exclude from the cost of research and development performed within the company the cost of research and development carried on for the company by noncompany research and development organizations of any kind; or fellowships, grants, and gifts to promote research and development or the study of the sciences and engineering. That part of company held research and development contracts subcontracted to research and development organizations outside reporting company. Any work that was done for your laboratories and other technical units by noncompany organizations which are not research and development organizations (for example, model construction by a noncompany model shop) is to be considered as a purchase of equipment, material, or supplies for the company research organization rather than as subcontracted research and development.

Capital expenditures, royalties paid, patent expense, income taxes, or interest. Income from sale of products manufactured in the research and development organization if these were sold to bona fide customers.

Item 5 – Research and Development Performed Within the Company by Type and by Source of Funds.

This item provides separate columns for reporting in 1972 the costs of research and development in Federal contracts and subcontracts, and Company and Other research and development by the three types, basic, applied, and development. Definitions of "Federal," and of "Company and Other" are provided below, after the definitions of types and methods for estimating the breakdowns by type.

Types of Research – Breakdown the total reported in Item 5 into the categories shown below:

Item 5A – Basic Research – Include the cost of research projects which represent original investigation for the advancement of scientific knowledge and which do not have specific commercial objectives, although they may be in the fields of present or potential interest to the reporting company.

Item 5B1 – Applied Research – Include the cost of research projects which represent investigation directed to discovery of new scientific knowledge and which have specific commercial objectives with respect to either products or processes. Note that this definition of applied research differs from the definition of basic research chiefly in terms of the objectives of the reporting company.

Item 5B2 – Development – Include the cost of projects which represent technical activity concerned with nonroutine problems which are encountered in translating research findings or other general scientific knowledge into products or processes. Do not include routine technical services to customers or other items excluded from definition of research-development above.

Methods of Estimating Research and Development Expenditures by Type – Many of the companies in this survey have accounts they believe substantially

reasonable division of time assigned
pany and other research and devel-

requested figures into the related
check the resulting cost figure of
lopment per scientist and engineer

for Research and Development the Company by Major Type and
Include all costs incurred to sup-
development, exclusive of capital
including depreciation overhead.
search and develop - others
de the total charged for the work
ng profit.

usually include but are not limited
ted below:

, and related costs. Material and
d (or purchased, if consumption
ailable); utilities, such as telephone,
city, water, gas, and fuel; books and
l and entertainment costs and pro-

and other taxes (except income
account of the research and devel-
ion or on the facilities which the
elopment organization uses. Insur-
aintenance and repair, including the
uildings and grounds, depreciation
uipment, and vehicles; or rentals,
e leased.

ead. Estimate a fair share of the
ctions which support research and
vities. The basis and method of
ad costs will depend upon company
portant point is to be sure that all
e an allowance for overhead. Items
in overhead include the following:

ding personnel, medical and safety
employee or industrial relations
nting control and fiscal (Treasurer's
ent and inventory, including pur-
g, inspection, storage, transporta-
d issue of materials and supplies,
cluding legal, public relations, shop-
work, plant protection, rearrangement
ting, printing, duplicating, transpor-
and personnel, maintenance of motor
ger service, stenographic service,
; salaries and related costs of
es not on the payroll of the research
rganization.

research and development expendi-
unt of royalties received from either
nizations or company units; or the
for research and development work
" to other departments or divisions
ny or to outside organizations.

Types of Expense to be Excluded from Research and Development Costs – Exclude from the cost of research and development performed within the company the cost of research and development carried on for the company by noncompany research and development organizations of any kind, or fellowships, grants, and gifts to promote research and development or the study of the sciences and engineering. That part of company held research and development contracts subcontracted to research and development organizations outside reporting company. All work that was done for your laboratories and other technical units by noncompany organizations which are not research and development organizations (for example, model construction by a noncompany model shop) is to be considered as a purchase of equipment, material, or supplies for the company research organization rather than as subcontracted research and development.

Capital expenditures, royalties paid, patent expense, income taxes, or interest. Income from sale of products manufactured in the research and development organization if these were sold to bona fide customers.

Item 5 – Research and Development Performed Within the Company by Type and by Source of Funds.

This item provides separate columns for reporting in 1972 the costs of research and development in Federal contracts and subcontracts, and Company and Other research and development by the three types, basic, applied, and development. Definitions of "Federal," and of "Company and Other" are provided below, after the definitions of types and methods for estimating the breakdowns by type.

Types of Research – Breakdown the total reported in Item 5 into the categories shown below:

Item 5A – Basic Research – Include the cost of research projects which represent original investigation for the advancement of scientific knowledge and which do not have specific commercial objectives, although they may be in the fields of present or potential interest to the reporting company.

Item 5B1 – Applied Research – Include the cost of research projects which represent investigation directed to discovery of new scientific knowledge and which have specific commercial objectives with respect to either products or processes. Note that this definition of applied research differs from the definition of basic research chiefly in terms of the objectives of the reporting company.

Item 5B2 – Development – Include the cost of projects which represent technical activity concerned with nonroutine problems which are encountered in translating research findings or other general scientific knowledge into products or processes. Do not include routine technical services to customers or other items excluded from definition of research-development above.

Methods of Estimating Research and Development Expenditures by Type – Many of the companies in this survey have accounts they believe substantially meet the definitions used in this survey for basic research, applied research, and development. In most cases, companies have found it possible to allocate their own accounts to these categories.

If your company does not keep records that meet or can be allocated to these specific categories, there are two principal ways to reduce the task of providing the data requested.

1. Isolate the projects that clearly fall in the development category. If your company fabricates products, such development activity will include the design, construction, and testing of prototypes and models. Some defense contracts typically call for several test models. If your company's research and development frequently involves the development of a "process" as in chemicals and petroleum, such development activity would include operations beyond the bench scale, primarily the design and operations of pilot plants or semiworks.

2. Isolate the organizational units whose research and development can be readily classified. If a company has two or more laboratories, the expenditures of some of these laboratories may be all classified in one or another type of research and development on the basis of the function assigned to the laboratory. There are laboratories assigned only development type work. There are others engaged only in applied or basic research. If research and development work is done in production units as well as in various laboratories, the research and development work in the production units will generally be of a development type.

The separate classification of clearly identified development operations, particularly in the industries producing expensive prototypes, will greatly reduce the balance to be distributed. The distribution will have to be estimated on the basis of a review of individual projects or on the basis of other summaries of the work. Please use the definitions for basic, applied, and development, as given above. If, despite these instructions, you feel that you are unable to distribute your research and development expenditures into groupings approximating the categories requested, please write to the Census Bureau describing your accounts and indicating your special problems. The Bureau may be able to make or obtain some suggestions that will be helpful in completing the report form.

Types of Activity Included in Development – The design and operation of pilot plants or semi-works plants so long as the principal purposes are to obtain experience and to compile engineering and other data to be used in evaluating hypotheses, in writing product formulas or in establishing finished product specifications, in designing special equipment and structures required by a process, and in preparing operating instructions or manuals. The engineering activity required to advance the design of a product or a process to the point where it meets specific functional and economic requirements and can be turned over to manufacturing units. The design, construction, and testing of preproduction prototypes and models and "engineering follow-through" in the early production phase is included.

The development of designs for special manufacturing equipment and tools is included but tool making and tool tryout are not included. The preparation of reports, drawings, formulas, specifications, standard practice instructions or operating manuals, and other media for transmitting to operating units information obtained from the above activities is included. However, the production of detailed construction drawings or manufacturing blueprints is not included. The question, "When does development end and production begin?" is often asked. If the primary objective is to make further improvements on the product or process, then the work comes within the definition of research and development. If, on the other hand, the product or process is substantially "set," and the primary objective is to develop markets or to do preproduction planning, or to get the production process going smoothly, then the work is no longer research and development.

Source of Funds – A separate column in Item 5 is provided for each of the following:

Item 5, Column 2 – Federal – Include the cost of work done on research and development contracts or subcontracts, and research and development portions of procurement contracts and subcontracts during the year.

Do not include here, or elsewhere in the report, research and development contracts and the portions of procurement contracts that you subcontracted to other research and development organizations. To do so would cause duplication in the statistical totals derived from these reports.

Item 5, Column 3 – Company and Other – Include the cost of all company-sponsored research and development performed within the company. (Report company-sponsored research and development performed outside the company in Item 11.) Research and development is performed by a few manufacturing companies for others than the Federal Government. Such research and development should be included in this column.

In Item 5E, report the expected or estimated cost of company-sponsored research and development that will be performed within the company during 1973.

Item 6 – Company Research and Development Allowed as Indirect Costs of Federal Contracts – Enter in Item 6, the approximate amount of company-initiated research and development costs (included in Item 5C, Column 2) which was allowed as indirect costs of Federal contracts. These charges are allowed in accordance with ASPR Regulation 15.205 and the same regulation as used in NASA and other Federal contracts.

Item 7 – Cost or Contract Value of Research and Development Performed Within the Company by Major Type of Expense – The type of information requested here will be available for separate research and development organizational units or for companies with separate research and development accounts. It is not requested that special analyses be made of cost records where research and development and other functions are combined and if existing records do not yield estimates for this item, the item need not be completed. However, if most research and development is performed in units where summaries are regularly prepared by element of cost it should be possible to base the breakdown of research and development costs upon the records of such establishments.

For wages and salaries report the gross earnings paid in calendar year 1972 to employees engaged in research and development, including dismissal pay, paid bonuses, vacation and sick-leave pay, and compensation in kind, and prior to such deductions as employees' Social Security contributions, withholding taxes, group insurance, and savings bonds. (You should follow the definition of salaries and wages that is used for calculating the withholding tax.) Include salaries of officers in the research establishment(s), if a corporation; exclude payments to proprietor or partners, if an unincorporated concern. Exclude payments to members of armed forces and pensioners carried on your active payroll. (Scientists and engineers are defined on page 3 (Item 4).)

For materials and supplies, report the delivered cost for all purchased materials consumed, whether received from other companies, withdrawn from inventory, or received from other establishments of this company.

Item 7C – Materials and Supplies, and Item 7D – Other Costs may be combined if a separate figure cannot be obtained or reasonably estimated from present accounts.

Item 8 – Fields of Basic Research – The following definitions are supplied for fields included in the item:

Engineering – Includes aeronautical, astronautical, chemical, civil, electrical, and mechanical engineering, and metallurgy and materials.

Geological sciences – Includes geodesy, hydrology, geochemistry, seismology, soil sciences, etc.

Atmospheric sciences – Includes aeronomy, weather modification, meteorology, etc.

Biological sciences – All sciences, other than clinical medical sciences, which deal with life processes, including plant and animal sciences, bacteriology, pathology, microbiology, pharmacology, etc.

Clinical medical sciences – All sciences concerned with the use of scientific knowledge for the identification, treatment, and cure of disease. Includes internal medicine, neurology, preventive medicine and public health, psychiatry, dentistry, pharmacy, etc.

Other sciences – To be used for multidisciplinary and interdisciplinary projects which cannot be classified within one of the above primary fields of science.

Item 9 – Applied Research and Development by Product Group – Enter both Federal and total costs of Applied Research and Development by product group. Costs should be entered in the field or product group in which the research and development project was actually carried on regardless of the classification of the field of manufacturing in which the results are to be used. For example, research on an electrical component for a farm machine should be reported as research on electrical machinery. Also, research on refractory bricks to be used by the steel industry should be reported as research on stone, clay, glass, and concrete products rather than primary ferrous metals, whether performed in the steel industry or the stone, clay, glass, and concrete industry. Research and development work on an automotive head lamp would be classified in Group 25, regardless of whether performed by an automotive o. electrical company. Fields of Applied Research and Development are listed below. For those companies familiar with the Standard Industrial Classification, the 1967 SIC number or numbers are given after each title. Note, however, that the SIC definition here applies to the field of research and development effort, and not necessarily to the field in which your company's manufacturing output is classified.

Product Group

1 Atomic Energy Devices – Applied Research and Development on atomic energy devices, previously reported separately, should be included with research and development as classified in the categories listed on lines 2–33. Examples of the fields of research and development activities on atomic energy devices and the product groups in which such activities should be reported are as follows:

Activity	Product group No.
Radioactive isotopes and other radiation sources	4
Partially fabricated reactor fuel element materials and control rods	12
Nuclear reactors	14
Reactor components and equipment	
Core structurals (barrels, cans, boxes, plates, etc.)	
Heat exchangers and condensers	
Valves	
Complete reactor fuel elements and control rods for use in:	
Propulsions	
Power plants	
Other	
Atomic waste casks	
Fuel handling equipment	20
Control rod drive mechanism and components for:	
Power plants	
Propulsions	
Other	
Pressurizers, components and auxiliary equipment	
Pumps	
Accessory instrumentation for reactor control	22
Atom smashers (particle accelerators)	24
Hot laboratory equipment	31
Special instrumentation	

base the breakdown of research and osts upon the records of such estab-

salaries report the gross earnings paid ear 1972 to employees engaged in development, including dismissal pay, vacation and sick-leave pay, and com- ind, and prior to such deductions as ial Security contributions, withholding insurance, and savings bonds. (You the definition of salaries and wages for calculating the withholding tax.) es of officers in the research estab- a corporation; exclude payments to artners, if an unincorporated concern. nts to members of armed forces and ied on your active payroll. (Scientists re defined on page 3 (Item 4).)

nd supplies, report the delivered cost d materials consumed, whether received panies, withdrawn from inventory, or other establishments of this company.

terials and Supplies, and Item 7D – ay be combined if a separate figure tained or reasonably estimated from ts.

s of Basic Research – The following supplied for fields included in the item:

Includes aeronautical, astronautical, , electrical, and mechanical engineer- urgy and materials.

nces – Includes geodesy, hydrology, seismology, soil sciences, etc.

ciences – Includes aeronomy, weather eteorology, etc.

ences – All sciences, other than al sciences, which deal with life cluding plant and animal sciences, thology, microbiology, pharmacology, etc.

l sciences – All sciences concerned f scientific knowledge for the iden- ment, and cure of disease. Includes ine, neurology, preventive medicine , psychiatry, dentistry, pharmacy, etc.

– To be used for multidisciplinary linary projects which cannot be clas- one of the above primary fields of

lied Research and Development by – Enter both Federal and total costs search and Development by product ould be entered in the field or product the research and development project rried on regardless of the classifica- of manufacturing in which the results . For example, research on an elec- nt for a farm machine should be earch on electrical machinery. Also, ractory bricks to be used by the steel be reported as research on stone. concrete products rather than primary ferrous metals, whether performed in the steel industry or the stone, clay, glass, and concrete industry. Research and development work on an automotive head lamp would be classified in Group 25, regardless of whether performed by an automotive or electrical company. Fields of Applied Research and Development are listed below. For those companies familiar with the Standard Industrial Classification, the 1967 SIC number or numbers are given after each title. Note, however, that the SIC definition here applies to the field of research and development effort, and not necessarily to the field in which your company's manufacturing output is classified.

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Partially fabricated reactor fuel element materials and control rods	12
Nuclear reactors	14
Reactor components and equipment	
Core structurals (barrels, cans, boxes, plates, etc.)	
Heat exchangers and condensers	
Valves	
Complete reactor fuel elements and control rods for use in:	
Propulsions	
Power plants	
Other	
Atomic waste casks	
Fuel handling equipment	20
Control rod drive mechanism and components for:	
Power plants	
Propulsions	
Other	
Pressurizers, components and auxiliary equipment	
Pumps	
Accessory instrumentation for reactor control	22
Atom smashers (particle accelerators)	24
Hot laboratoty equipment	31
Special instrumentation	

2 Foods and Kindred Products (SIC 20) – Foods and beverages for human consumption and certain related products, such as vegetable and animal fats and oils, prepared feeds for animals and fowls.

3 Textile Mill Products (SIC 22) – Mill preparation of fibers and mill manufacture of yarn, thread, braids, twine, and cordage; manufacture of broad and narrow woven fabric, knit fabric, carpets and rugs from yarn; dyeing and finishing fiber, yarn, and knit apparel; coating, waterproofing, or otherwise treating fabric; the integrated manufacture of knit apparel and other finished articles from yarn; the manufacture of felt goods, lace goods, bonded fiber fabrics, and miscellaneous textiles.

4. Basic Industrial Inorganic and Organic Chemicals (SIC 281). Includes radioactive isotopes and other radiation sources.

5 Plastics Materials and Synthetic Resins, Synthetic Rubber, Synthetic and Other Man-Made Fibers Except Glass (SIC 282) – Exclude glass.

6 Drugs (SIC 283) – Medicinal Chemicals, biological and botanical products, and pharmaceutical preparations.

7 Agricultural Chemicals (SIC 287) – Fertilizers, agricultural pesticides, and other agricultural chemicals.

8 All Other Chemicals (Balance of SIC 28) – Explosives, soaps, glycerins, detergents and cleaning preparations, paints and varnishes, toilet preparations, and miscellaneous chemical products.

9 Petroleum Refining and Extraction, and Natural Gas (SIC 13 and 29) – Exclude geological and geophysical exploration activities.

10 Rubber and Miscellaneous Plastics Products (SIC 30) – Fabricated rubber such as industrial and mechanical rubber goods and fabricated plastics products.

11 Stone, Clay, Glass, and Concrete Products (SIC 32) – Ceramics, glass, clay products, abrasives and asbestos products, cement, stone products, concrete products, and other nonmetallic mineral products.

12 **Primary Ferrous Products (SIC 331, 332, 3391, and 3399)** – Products of blast furnaces, steel works, rolling and finishing mills, iron and steel castings and forgings. Includes partially fabricated reactor fuel element materials and control rods.

13 **Primary and Secondary Nonferrous Metals (Balance of SIC 33)** – Primary and secondary smelting and refining of nonferrous metals; rolled, drawn, and extruded nonferrous metal products, castings and forgings.

14 **Fabricated Metal Products (SIC 34)** – Tinware, hand tools, nonelectric heating apparatus, fabricated structural metal products, metal stampings, fabricated wire products, etc. Includes: nuclear reactors; reactor components and equipment; core structurals (barrels, cans, boxes, plates, etc.); heat exchangers and condensers; valves; complete reactor fuel elements and control rods for use in: propulsions, power plants, and other systems; atomic waste casks.

15 **Engines and Turbines (SIC 351)** – Steam engines, steam, gas and hydraulic turbines, diesel and other internal combustion engines, n.e.c.

16 **Farm Machinery and Equipment (SIC 352)** – Farm machinery, including tractors for farm use.

17 **Construction, Mining, and Material Handling Machinery and Equipment (SIC 353)** – Construction, mining, and oil field machinery and equipment, elevators, conveyors, hoists, industrial trucks, tractors, trailers and stackers.

18 **Metalworking Machinery and Equipment (SIC 354)**– Machine tools, dies, machine tool accessories, rolling mill machinery, power driven hand tools, wire fabricating machinery and equipment, and automobile maintenance machinery and equipment.

19 **Office, Computing, and Accounting Machines (SIC 357)** – Typewriters; electronic computing equipment; calculating and accounting machines; scales and balances (except laboratory); and other computing and office machines.

20 **Other Machinery, Except Electrical (Balance of SIC 35)** – Special industrial machinery, except metalworking, such as food products machinery, textile and paper industries machinery, general industrial machinery and equipment, and miscellaneous machinery except electrical. Includes atomic fuel handling equipment; control rod drive mechanism and components for: power plant, propulsions; pressurizers, components and auxiliary equipment; pumps.

21 **Electric Transmission and Distribution Equipment (SIC 361)** – Electric measuring instruments and test equipment, power, distribution and specialty transformers, switchgear and switchboard transformers, etc.

22 **Electrical Industrial Apparatus (SIC 362)** – Electric motors and generators, motor starters and controls. welding apparatus, carbon and graphite brushes, electrodes, capacitors, condensors, and rectifiers. Includes accessory instrumentation for reactor control.

23 **Radio and Television Receiving Sets, Except Communication Types (SIC 365)** – Radio and television receiving sets, except communication types and phonograph records.

24 **Electronic Components and Accessories, Communications Equipment (SIC 366–67)** – Electron tubes, cathode ray tubes, resistors-capacitors, transformers and other components for electronic end products, solid state electronic devices, and telephone and telegraph apparatus. Also includes electronic guidance control subassemblies, radar and radio equipment, and electronic sighting devices. Includes atom smashers (particle accelerators).

25 **Other Electrical Machinery Equipment and Supplies (Balance of SIC 36)** – Household appliances, electric lighting and wiring equipment, and miscellaneous electrical machinery equipment and supplies.

26 **Missiles (SIC 192)** – Including frames or structures, launching and handling support equipment and work on the missile system as a whole. Electronic guidance control subassemblies and radar should be included in Group 24 above. Rocket motors should be included in Group 28 below.

27 **Space Vehicles (SIC 192)** – Including frames or structures, launching and handling support equipment and work on the space vehicle as a whole.

28 **Aircraft and Parts (SIC 372)** – Piloted and unpiloted aircraft and parts of all types, including engines and auxiliary equipment such as landing gear, deicing equipment, turrets and turret drives, and other auxiliary equipment specifically adopted for aircraft. Radar and radio equipment and electronic sighting devices should be included in Group 24 above. Aeronautical instruments should be included in Group 31 below.

29 **Motor Vehicles and Equipment (SIC 371)** – Applied research and development related to motor vehicles, including automobiles, trucks, busses, and special purpose motor vehicles such as ambulances, fire engines, personnel carriers, amphibian motor vehicles, and truck and automobile trailers, and to motor vehicle equipment and parts (exclude batteries, tires, engine electrical equipment, etc.).

30 **Other Transportation Equipment (Balance of SIC 37)** – Ship and boat building and repairing, railroad equipment, motorcycles, bicycles and parts, etc.

31 **Professional Scientific and Controlling Instruments, Photographic and Optical Goods; Watches and Clocks (SIC 38)** – Engineering, laboratory, and scientific and research instruments, instruments for measuring, controlling and indicating physical characteristics. Optical instruments and lenses, surgical, medical, and dental instruments; fire control apparatus; ophthalmic goods, photographic equipment; and watches, clocks, etc. Includes hot laboratory equipment, and special instrumentation.

32 **Ordnance, Except Missiles (Balance of SIC 19)** – Artillery, small arms, ammunition, tanks, and parts, etc.

ansmission and Distribution Equipment – Electric measuring instruments and ent, power, distribution and specialty s, switchgear and switchboard trans-.

Industrial Apparatus (SIC 362) – Elec- and generators, motor starters and welding apparatus, carbon and graphite electrodes, capacitors, condensors, iers. Includes accessory instrument- actor control.

Television Receiving Sets, Except tion Types (SIC 365) – Radio and receiving sets, except communication phonograph records.

Components and Accessories, Com- s Equipment (SIC 366–67) – Electron thode ray tubes, resistors-capacitors, rs and other components for electronic ts, solid state electronic devices, and nd telegraph apparatus. Also includes guidance control subassemblies, radar equipment, and electronic sighting Includes atom smashers (particle rs).

trical Machinery Equipment and Supplies f SIC 36) – Household appliances, elec- g and wiring equipment, and miscella- trical machinery equipment and supplies.

(SIC 192) – Including frames or struc- nching and handling support equipment n the missile system as a whole. Elec- dance control subassemblies and radar included in Group 24 above. Rocket hould be included in Group 28 below.

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and Parts (SIC 372) – Piloted and aircraft and parts of all types, including nd auxiliary equipment such as landing ing equipment, turrets and turret drives, auxiliary equipment specifically adopted ft. Radar and radio equipment and elec- ghting devices should be included in above. Aeronautical instruments should d in Group 31 below.

icles and Equipment (SIC 371) – Applied and development related to motor including automobiles, trucks, busses, rial purpose motor vehicles such as es, fire engines, personnel carriers, motor vehicles, and truck and auto- ailers, and to motor vehicle equipment (exclude batteries, tires, engine elec- ipment, etc.).

30 Other Transportation Equipment (Balance of SIC 37) – Ship and boat building and repairing, railroad equipment, motorcycles, bicycles and parts, etc.

31 Professional Scientific and Controlling Instruments, Photographic and Optical Goods; Watches and Clocks (SIC 38) – Engineering, laboratory, and scientific and research instruments, instruments for measuring, controlling and indicating physical characteristics. Optical instruments and lenses, surgical, medical, and dental instruments; fire control apparatus; ophthalmic goods, photographic equipment; and watches, clocks, etc. Includes hot laboratory equipment, and special instrumentation.

32 Ordnance, Except Missiles (Balance of SIC 19) – Artillery, small arms, ammunition, tanks, and parts, etc.

Item 10 – Cost of Research and Development Performed Within the Company, by State – List the States in which your research and development laboratories or facilities are located and report the cost of research and development for each State. It is not intended that information reported reflect individual assignments outside the home State of the particular research staff. As much as 10 percent of the total may, if desired, be reported as "Not distributed by State."

Section III – RESEARCH AND DEVELOPMENT PERFORMED OUTSIDE THE COMPANY

Item 11 – Total Company Funds Spent for Research and Development Activities Performed Outside the Company Within the United States – Report the amount of company funds spent for research and development performed outside of the company within the United States. This item includes contracts to outside organizations, but specifically excludes subcontracting of Federal Government or other company contracts.

Other Science Resources Publications

REPORTS	NSF No.	Price
Immigrant Scientists and Engineers in the United States. A Study of Characteristics and Attitudes	73-302	$1.25
A Price Index for Deflation of Academic R&D Expenditures	72-310	$0.25
Scientific Human Resources: Profiles and Issues	72-304	$0.25
Papers and Proceedings of a Colloquium on Research and Development and Economic Growth/Productivity	72-303	$0.75
1969 & 1980 Science & Engineering Doctorate Supply & Utilization	71-20	$0.50

HIGHLIGHTS

"State Agency R&D Expenditures Almost Quadrupled From FY 1964 to FY 1973"

"1973 Graduate Science Enrollment Down Another 2 Percent"

"Federal Funding in Higher Education: Academic Science Shown Decline in FY 1973"

"Immigration of Scientists and Engineers Drops Sharply in FY 1973; Physician Inflow Still Near FY 1972 Peak"

"Federal Scientific and Technical Personnel Increase Slightly in 1972; Health Personnel Gain Sharply"

"Selected Characteristics of Five Engineering and Scientific Occupational Groups, 1972"

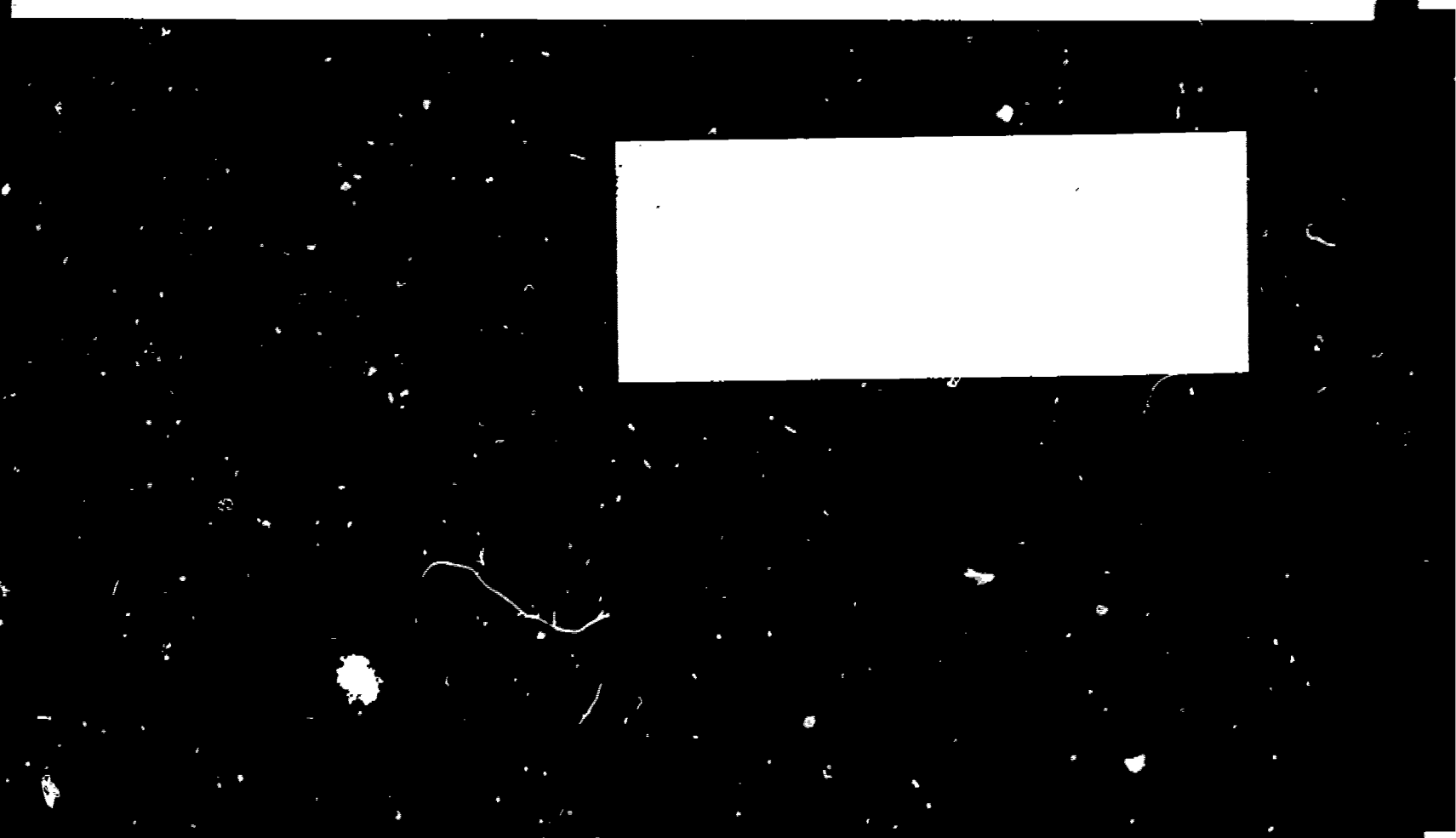
"Changes in Graduate Programs in Science a Engineering, 1970-72 and 1972-74"

"Undergraduate Enrollments in Science and Engineering"

Publications

NSF No.	Price			
		HIGHLIGHTS		
		"State Agency R&D Expenditures Almost Quadrupled From FY 1964 to FY 1973"	74-311	----
		"1973 Graduate Science Enrollment Down Another 2 Percent"	74-308	----
		"Federal Funding in Higher Education: Academic Science Shown Decline in FY 1973"	74-307	----
73-302	$1.25	"Immigration of Scientists and Engineers Drops Sharply in FY 1973; Physician Inflow Still Near FY 1972 Peak"	74-302	----
72-310	$0.25	"Federal Scientific and Technical Personnel Increase Slightly in 1972; Health Personnel Gain Sharply"	74-301	----
72-304	$0.25	"Selected Characteristics of Five Engineering and Scientific Occupational Groups, 1972"	73-306	----
72-303	$0.75	"Changes in Graduate Programs in Science and Engineering, 1970-72 and 1972-74"	72-311	----
71-20	$0.50	"Undergraduate Enrollments in Science and Engineering"	71-42	----

National Science Foundation
Washington, D.C. 20550



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