



United States
General Accounting Office
Washington, D.C. 20548

Resources, Community, and
Economic Development Division

B-274518

September 20, 1996

The Honorable Robert S. Walker
Chairman, Committee on Science
House of Representatives

Dear Mr. Chairman:

Earlier this year, we issued a report on the Advanced Technology Program (ATP), a federal cost-sharing program that supports research and development (R&D) projects to stimulate economic growth and to improve the competitiveness of U.S. industry through the development of technology.¹ That report discussed the sources of R&D funding for firms that applied for ATP funding. As agreed with your office, this report provides you with information on the sources of R&D funding by the size of firms. Specifically, we identified the major types of funds that firms used to finance R&D and the relationship between the size of the firm and the sources of R&D funding.

The information for this report and our earlier report was obtained by surveying two groups of ATP applicants, which we called "winners" and "near winners." Both groups submitted proposals that were rated highest during ATP's first 4 years (1990-93), but the near winners did not receive ATP funding. Because our survey was limited to firms that applied for ATP funding, the results are not likely to be representative of the patterns of R&D funding for firms in the general economy or even for high-technology firms.² On the other hand, the results may provide insights into the patterns of R&D funding for firms that are likely recipients of public funding.

¹*Measuring Performance: The Advanced Technology Program and Private-Sector Funding* (GAO/RCED-96-47, Jan. 11, 1996).

²Firms' responses are based on R&D expenditures for the fiscal year prior to the firms' application to ATP. Thus, the funding source data do not include the firms' ATP award.

In summary, the 78 firms included in the survey used four major sources of R&D funding: (1) internal financing from the firm, (2) venture capital investors, (3) federal sources, and (4) contract R&D funding from other private firms.³ However, the major source of funding varied significantly according to the size of the firm. For example, venture capital provided the largest share of R&D funds for firms with fewer than 10 employees but was not cited as a source of funds for firms with more than 500 employees. In contrast, internal funding provided virtually all of the funding for large firms but provided a relatively small share for the small firms. Furthermore, most of the firms received virtually all of their funding from one or two sources. Among the firms with fewer than 10 employees, venture capital provided the largest share of the funding for R&D, while internal financing provided the bulk of R&D support among the largest firms. In contrast, federal sources provided supplemental support for R&D across all sizes of firms. Enclosure I presents details of our objectives, scope, and methodology; enclosure II presents additional details on the sources of funding; and enclosure III contains the source tables on which our analysis is based.

We conducted our work from August through September 1996 in accordance with generally accepted government auditing standards. We are sending copies of this report to the Secretary of Commerce and will make copies available to others on request.

Major contributors to this report were Robin M. Nazzaro and Andrew J. Vogelsang, Resources, Community, and Economic Development Division, and

³Venture capital includes both professionally managed venture capital funds and private individuals (business angels). Contract R&D includes funds provided by another private firm for R&D activities.

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Loren Yager, Office of the Chief Economist. Please contact me at (202) 512-3841 if you or your staff have any questions. You may also reach me on the Internet at rezendesv.rced@gao.gov.

Sincerely yours,

A handwritten signature in black ink, appearing to read "Victor S. Rezendes", written over a faint, illegible typed name.

Victor S. Rezendes
Director, Energy, Resources,
and Science Issues

Enclosures - 3

OBJECTIVES, SCOPE, AND METHODOLOGY

This analysis grew out of prior work that we did for our 1996 report on the Advanced Technology Program (ATP) and private-sector funding.¹ To answer the objectives of that review, we surveyed firms that had applied to ATP. The responses to our survey provided R&D funding data on program applicants. The objective of this report was to use that data to report on the sources of funding by the size of firms. Such information illustrates the relationship between the size of the firm and the sources of R&D funding.

Our prior work focused on two groups of ATP applicants, whom we referred to as "winners" and "near winners." Both groups submitted proposals that were rated highest during ATP's review, but the near winners did not ultimately receive ATP funding. We surveyed by telephone all applicants who qualified as winners or near winners during ATP's first 4 years (1990-93) and achieved a 100-percent response rate from the 123 respondents whom we included in our analysis (89 winners and 34 near winners).

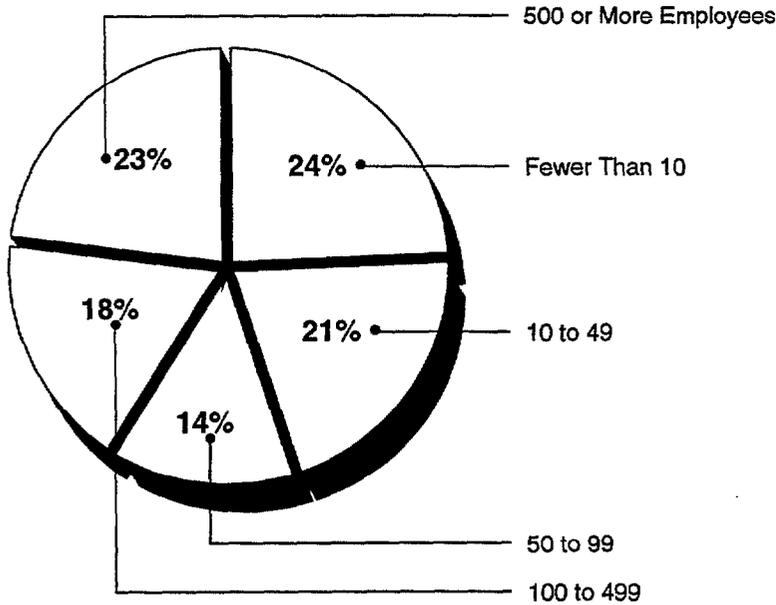
We asked the applicants what percentage of their company's direct R&D budget was provided by federal government agencies, state government agencies, industry groups or trade associations, other private companies for contract R&D, venture capitalists, internal funding from company income, or any other source. Many of the responses to "other sources" were redistributed to the appropriate categories. Applicants were requested to base their answers on the last fiscal year completed before they applied to ATP.

For the purpose of this analysis, the joint ventures in the group were removed, since the information on the joint venture operations was not comparable with the information for individual firms. In addition, the duplicate entries from firms that applied in successive years were removed so that the same firm would not appear twice. This left a set of 78 responses, which we grouped into categories of more than 10 firms to protect any firm's confidential information.

Figure I.1 shows the distribution of firms that we included in our analysis. The largest group of firms (19) had fewer than 10 employees, and an additional 16 firms had fewer than 50 employees. More than 75 percent of the firms in the survey meet the National Science Foundation's standard definition of small firms—those that contain fewer than 500 employees.

¹*Measuring Performance: The Advanced Technology Program and Private-Sector Funding* (GAO/RCED-96-47, Jan. 11, 1996).

Figure I.1: Distribution of Firms by Number of Employees



Note: The number of firms analyzed was 78.

Because of both self-selection and selection by the program, the results of our survey may not represent the patterns of R&D funding for firms in the general economy or even high-technology firms. For example, these firms may have higher-than-average R&D expenditures than firms in the general economy, including some expenditures for R&D efforts that do not have immediate applicability to the commercial products of the firm. In addition, these firms are likely to be more aware of the various federal programs that provide private industry with funds for R&D and are capable of responding to those opportunities. These skills might be different from the skills necessary to raise funds from private markets.

R&D FUNDING SOURCES FOR ATP APPLICANT FIRMS

ATP survey data provide information about the sources of R&D funding for individual-applicant firms. The data show the major types of funds that selected firms used to finance R&D and the relationship between the size of the firm and the sources of R&D funding.

MAJOR FUNDING SOURCES

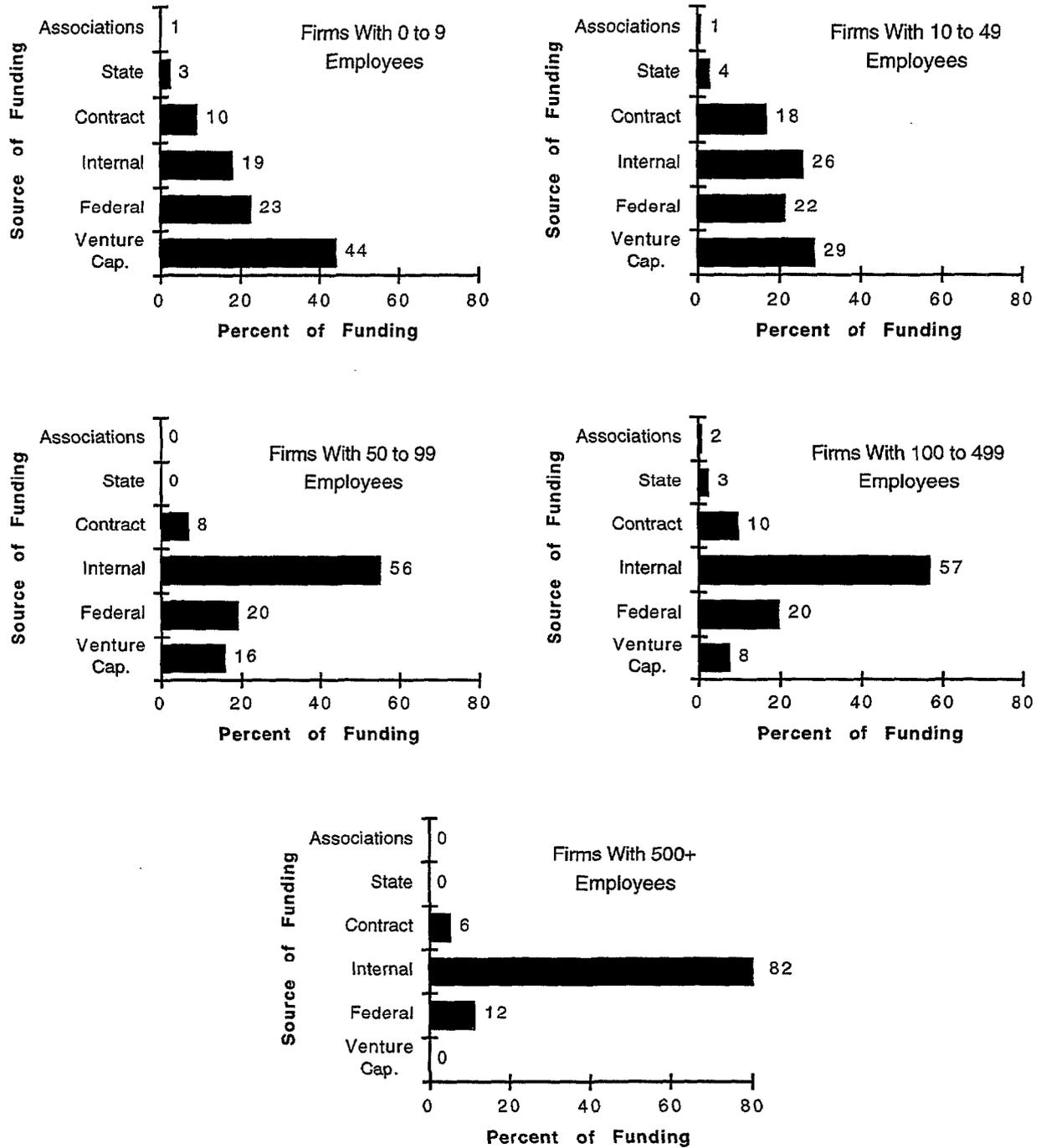
The firms that we surveyed used four major sources of funding for R&D: (1) internal financing from the firm, (2) venture capital investors, (3) federal sources, and (4) contract R&D funding from other private firms. States and industry associations provide a much smaller share of funding than these other sources.

FUNDING SOURCES CORRELATED TO SIZE OF FIRM

The source of a firm's R&D funding varied greatly according to the size of the firm, as shown in figure II.1.¹

¹The figures are based on simple averages of the responses of the firms within each of the groups. The averages hide significant variations in the responses of individual firms. These are detailed in the following section.

Figure II.1: Sources of R&D Funding by Size of Firm



We divided the firms into five groups according to their size, and the responses differed by the group. This is most evident in the declining importance of venture capital and the increasing importance of internal financing as a firm's size increases. Among the firms with fewer than 10 employees, venture capital supplied 44 percent of the R&D funds. This source declined consistently as the size of the firms increased. Firms with 100 to 499 employees received less than 10 percent of their funds from venture capital sources and firms with 500 or more employees received no funding from them.

The role of internal financing showed the opposite trend, although even among the firms with fewer than 10 employees, internal financing supplied a significant share (19 percent) of the funding. For three groups of the firms (those with 50 to 99 employees, 100 to 499 employees, and 500 or more employees), internal financing provided the majority of funding for R&D. For groups of firms with 10 to 49 and zero to 9 employees, internal financing provided 26 percent and 19 percent, respectively.

Federal funding provided about 20 percent of R&D funding for the firms in all but the largest category, for which it provided 12 percent. State funding was reported by firms in three of the five size categories and was a funding source only for the firms with less than 500 employees. As discussed in enclosure I, the high levels of public sector involvement in R&D funding among these firms is not unexpected, given the fact that the survey was conducted of firms that were among a group of applicants for federal funding of R&D. As a result, the level of public support for R&D funding among these firms is not comparable with the larger universe of firms in the U.S. economy.

INDIVIDUAL FIRMS RELY ON FEW SOURCES FOR R&D FUNDS

Although firms have numerous potential sources of funds for private R&D, individual firms get a large percentage of their funding from one source, and most of the firms received their funding from their top two sources. Figure II.1 indicates the pool of R&D funds available for firms of various size categories, but it is important to distinguish between the averages for a group of firms and the funding patterns of individual firms.

Figure II.2: R&D Funding Sources for Smallest and Largest Firms

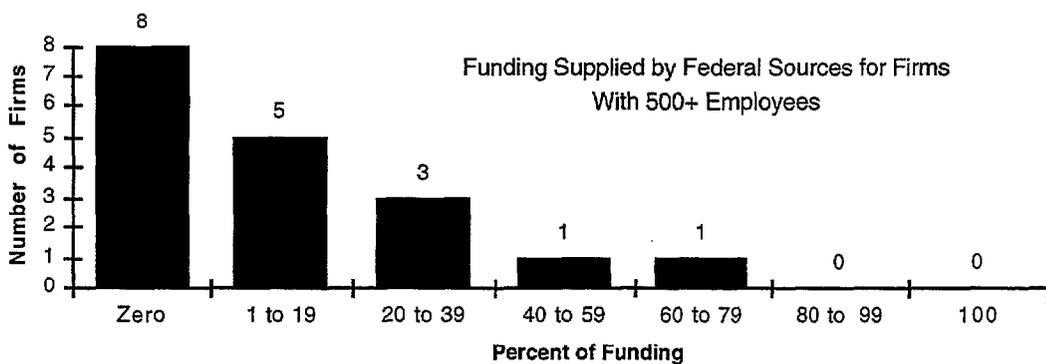
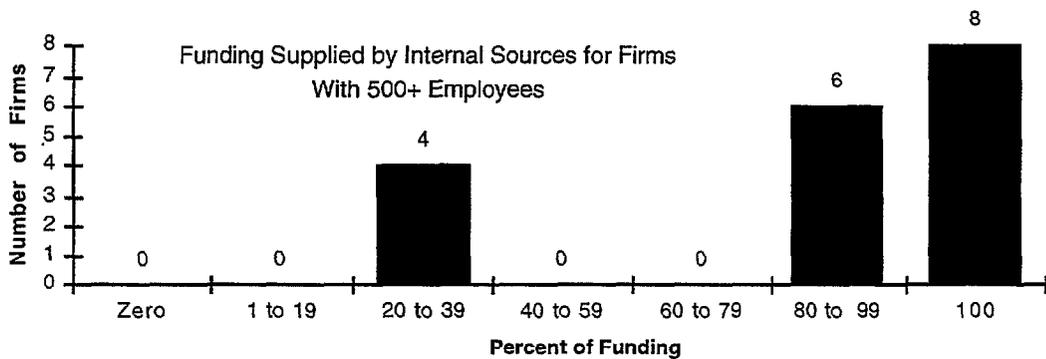
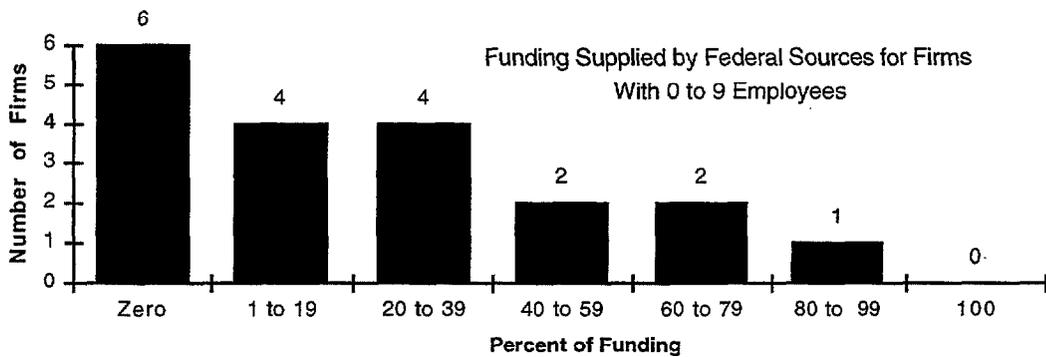
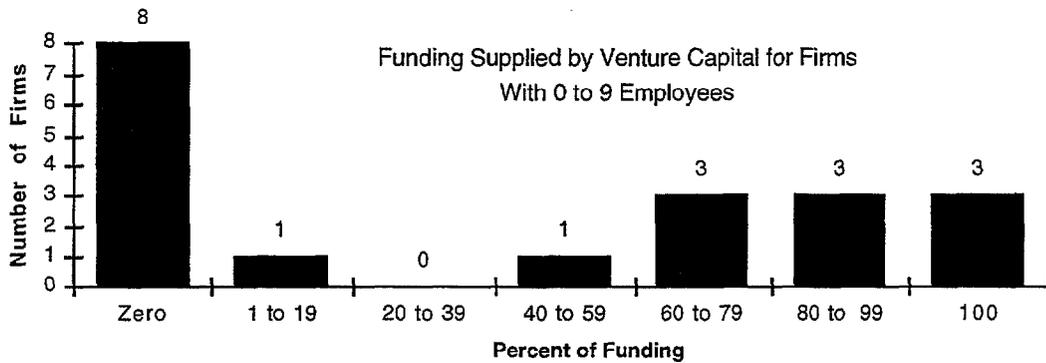


Table II.1 and figure II.2 provide some insight into this pattern of funding for individual firms. Table II.1 indicates the percentage of R&D funds provided by the largest and second largest source of funds for each size group.

Table II.1: Share of Funds Provided by Largest Sources

Size of firm (employees)	Share of largest funder by percent	Share of second largest funder by percent	Share of remaining funders by percent
Fewer than 10	78	20	2
10-49	72	17	11
50-99	85	13	2
100-499	82	12	5
500 or more	86	10	4

Note: Percentages may total less than 100 percent because of rounding.

As the table shows, most firms receive virtually all of their funds from one or two funding sources. The apparent contradiction between these results and the results in figure II.1 occurs because an individual firm's R&D funding is provided by one or two sources, but these top sources differ for firms in the same size category. For example, if 50 percent of the firms receive all of their funding from venture capital sources and the other 50 percent receive all of their funding from internal sources, the average for the category would be 50 percent venture capital and 50 percent internal funding. However, no individual firm would have received funding in those proportions.

In the case of the ATP data, the firms with 500 or more employees used fewer sources because their R&D funding was dominated by internal funding. However, the dominance of the largest funding source for R&D among firms with fewer than 50 employees is not apparent from the data in figure II.1.

One of the reasons for the concentration of funding sources is that some of the funding sources—especially venture capital—tended to be all-or-nothing sources of funds. For example, venture capital investors either provided a particular firm with a large proportion of the funds or provided no funds. This kind of exclusivity is not evident among other sources, such as federal funding.

Figure II.2 illustrates the distribution of funding provided by venture capital and federal funding for firms with fewer than 10 employees. Venture capital investors

provided eight of these firms with no funding but provided nine of these firms with more than 60 percent of their funding. By contrast, federal sources provided over half of these firms in the survey with from 1 to 59 percent of their funding.

Figure II.2 also provides information on the internal and federal funding for the firms with 500 or more employees. Internal sources provided 14 of the 18 firms with virtually all of their R&D funding. Federal sources provided almost half of these firms with between 1 and 39 percent of their funding. Source tables for these distributions appear in enclosure III.

SOURCE TABLES

The following tables provide additional detail on the sources of funding for firms in our survey. These tables were used to generate figure I.2.

Table III.1: Percentage of R&D Funds Used by Individual Firms With Fewer Than 10 Employees

Types of sources	Percent of funds						
	Zero	1-19	20-39	40-59	60-79	80-99	100
Internal	12	2	1	1	1	1	1
Federal	6	4	4	2	2	1	0
Venture capital	8	1	0	1	3	3	3
Private	14	2	0	2	0	1	0
State	16	2	0	1	0	0	0
Industry	18	0	1	0	0	0	0

Note: This category includes 19 firms.

Table III.2: Percentage of R&D Funds Used by Individual Firms With 10 to 49 Employees

Types of sources	Percent of funds						
	Zero	1-19	20-39	40-59	60-79	80-99	100
Internal	6	4	2	1	0	1	2
Federal	6	3	4	1	0	2	0
Venture capital	8	1	2	2	0	2	1
Private	5	5	4	1	0	1	0
State	13	1	2	0	0	0	0
Industry	14	2	0	0	0	0	0

Note: This category includes 16 firms.

Table III.3: Percentage of R&D Funds Used by Individual Firms With 50 to 99 Employees

Types of sources	Percent of funds						
	Zero	1-19	20-39	40-59	60-79	80-99	100
Internal	3	1	0	1	1	1	4
Federal	5	3	0	1	1	1	0
Venture capital	8	1	0	0	1	1	0
Private	7	3	0	1	0	0	0
State	10	1	0	0	0	0	0
Industry	10	1	0	0	0	0	0

Note: This category includes 11 firms.

Table III.4: Percentage of R&D Funds Used by Individual Firms With 100 to 499 Employees

Types of sources	Percent of funds						
	Zero	1-19	20-39	40-59	60-79	80-99	100
Internal	2	3	1	0	0	4	4
Federal	7	2	1	2	1	1	0
Venture capital	12	1	0	0	0	0	1
Private	8	3	2	1	0	0	0
State	13	0	0	1	0	0	0
Industry	12	2	0	0	0	0	0

Note: This category includes 14 firms.

Table III.5: Percentage of R&D Funds Used by Individual Firms With 500 or More Employees

Types of sources	Percent of funds						
	Zero	1-19	20-39	40-59	60-79	80-99	100
Internal	0	0	4	0	0	6	8
Federal	8	5	3	1	1	0	0
Venture capital	18	0	0	0	0	0	0
Private	15	0	3	0	0	0	0
State	18	0	0	0	0	0	0
Industry	17	1	0	0	0	0	0

Note: This category includes 18 firms.

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