ISSUE ALERT

U.S. Small Business Administration Office of Advocacy

Innovation in Small Firms

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A series of special reports on key small business issues identified by participants in the State White House Conferences on Small Business.

Innovation in Small Firms

Issue Alert Number 8
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This is the eighth in a series of Issue Alerts on key concerns of delegates to the National White House Conference on Small Business. The information in this report has been compiled from a number of sources in order to inform the delegates of current issue debates. The discussion does not necessarily represent the position of the Small Business Administration on individual issues.

Key Facts About Innovation and Small Business

- The small business sector is an important participant in technological innovation, which contributes to a large share of economic growth. Large businesses, because of their size and the widespread acceptance of their brand names, are often considered the originators of new processes or innovative products. Research funded by the U.S. Small Business Administration (SBA), however, shows that many of today's large producers may have capitalized on the innovation of a small firm.

- Research does not necessarily support the assumption that large firms are more likely to generate innovations in manufacturing processes because they produce more and have more to gain from cost-cutting innovations. A study of innovations important to the production system showed a prominent and nearly equal innovative role for small business in the industries being studied.

- Small firms are sometimes assumed to be less talented technically and less prepared to carry out the fundamental research necessary for some projects. Yet a National Science Foundation survey shows that small firms spend twice as many of their research and development (R&D) dollars on basic research as large firms, and proportionately more on applied research.

- The notion advanced in the early decades of this century -- that market power and innovation are more likely to occur together -- also is not supported by research. One indicator of market power is the degree of concentration in an industry. Innovations are most often found in industries of medium concentration, i.e., industries in which shipments by the four largest firms are 21 to 40 percent of the total. Major changes in established product lines and process equipment do not seem to occur as often where the firms are both very large and in highly concentrated industries.

- The best role for government in innovation is not to be the direct creator of innovations; the marketplace seems to fill that role best. On the other hand, the Federal government procures significant amounts of products and services, often resulting in the creation of new products, such as those deriving from the space program. Federal government purchases of R&D services constitute a significant portion of R&D funding in our economy--47 percent in 1985. One existing mechanism to encourage small business participation in Federal procurement of R&D services is the Small Business Innovation Research program.

The Issue

At the time of the Nation's birth, 90 percent of all workers were farm workers. Today, only 4 percent of the American work force is agricultural, feeding the United States and exporting the balance of its production to the rest of the world. The change from an agricultural to an industrial economy was accomplished through technology and innovation in both the marketplace and the intermediate processes of production and distribution. Innovation and technological change are responsible for much of U.S. economic growth.

To understand innovation in the economy, it is useful to examine evidence on the innovative capability of large and small firms, the obstacles faced by both small and large firms, and the role of the Federal government in innovation, as addressed by the Small Business Innovation Development Act of 1982.

Conventional wisdom has large firms leading in innovations because of certain assumptions about their size and market power. It is true that the fixed costs of research and development (R&D) can be spread over more units in a large company. Market power allows a company to price a new product to recover its research and development costs.

However, research does not support the assumptions that size or market power enables large firms to lead in innovation. Smaller firms also have proven to be leaders in innovation. They may also produce innovations at lower cost: smaller firms performing R&D spend half as much per scientist-engineer as larger firms.

The relationship between firm size and the capacity for innovation has been widely studied for larger firms.[1] Yet only about 0.3 percent of all U.S. firms--fewer than 15,000 firms--have more than 500 employees.[2] The remaining 99+ percent are considered small. These smaller firms include one-half of all private sector employment and about 43 percent of private sector gross domestic product. A large part of the U.S. private sector has not been studied in traditional innovation research. This omission becomes more significant when one considers the number of small firm innovations.

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[1]See Morton I. Kamien and Nancy L. Schwartz, Market Structure and Innovation (Cambridge, Mass.: The University Press, 1982).

[2]U.S. Small Business Administration, Office of Advocacy, Small Business Data Base. Of 4,369,114 firms in the data base for 1982, 14,813 had more than 500 employees; 7,391 had 500 to 1,000 employees; 5,901 had 1,000 to 5,000 employees; 745 had 5,000 to 10,000 employees; and 776 firms had more than 10,000 employees.

Large Firm Innovators

Large firms can support innovative research for new and improved products from profits earned on existing products. Research and development expenditures are recovered from the higher volumes sold by larger firms. With their greater resources, large firms can reduce R&D risks by taking on more projects, either through alternative approaches to the same goal or by starting entirely new projects. And because large firms tend to produce more products, it is more likely that any unexpected results of their R&D efforts will be useful to them.

The largest R&D establishments are in large firms. A 1982 survey by the U.S. Bureau of the Census reported R&D activity for 13,829 firms with $59 billion in R&D funds, 523,000 R&D scientists and engineers, 16 million employees, and $1.75 trillion in net sales (Table 1). The average R&D establishment in firms with more than 1,000 employees had about 100 times as many scientists and engineers as the smaller firms. While R&D funds per dollar of sales were about twice as high for large firms as for small, the number of R&D scientists and engineers per thousand employees were equal. Large firms received 33 percent of their research and development dollars from the Federal government and were more dependent on Federal R&D dollars than small firms, which received only 21 percent of their R&D funds from the Federal government. Small firms performed R&D at one-half the cost per scientist/engineer, compared to larger firms, at least partly because of salary differentials and the amount of capital equipment necessary for certain kinds of R&D.

It is often claimed that large firms are the only ones capable of large projects. This may be true for the construction of large airframes or the development of large naval vessels. But even with such large procurements, small business on occasion may be able to compete efficiently. A recent research report by the SBA's Office of Advocacy describes a consortium of twelve firms that competed with a large firm for the design of an attack helicopter.[3] The prototype, designed and built by this team of twelve, won the fly-off over the large firm and received the follow-on production contract for several billion dollars. While negotiations with such consortia may involve more work for Federal procurement offices, this type of procurement brings a wider selection of vendors to the Federal government and more price and quality competition to the procurement process.

Small Firm Innovators

Just as large firms have inherent strengths and incentives to innovate, small firms have innovative advantages. Researchers have documented the strong motivation of the inventor-entrepreneur: financial rewards are reinforced by the desire for independence, the creative drive, and the need for recognized achievement. Dedicated innovators are not as easily blocked by major obstacles as are professional managers.[4]

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[3]Henry J. Russell, Rockford Acromatic Products, A Small Business Participates in Major Government Procurements (Washington, D.C.: U.S. Small Business Administration, Office of Advocacy, 1981, NTIS #PB81 163826).

[4]James Brian Quinn, "Managing Innovation: Controlled Chaos," Harvard Business Review, 63(3), May-June 1985, pp. 73-84.

Table 1. Companies Performing Research and Development in 1982

	Firms With Fewer Than 1,000 Employees	Firms With 1,000 Employees or More	All Firms
Companies Performing R&D	12,500	1,329	13,829
R&D Scientists & Engineers	41,550	481,150	522,700
R&D Funds (Millions of Dollars):			
Total	2,485	56,474	58,960
Company	1,960	37,940	39,901
Federal	525	18,534	19,059
Net Sales (Millions of Dollars)	132,162	1,619,618	1,751,781
Total Employment (Thousands)	1,248	14,862	16,110
Per Company:			
R&D Scientists & Engineers	3	362	38
R&D Funds (Thousands of Dollars)	199	42,494	4,264
Net Sales (Millions of Dollars)	11	1,219	127
Employees	100	11,183	1,165
R&D Funds per R&D Scientist or Engineer (Dollars)	59,807	117,373	112,799
R&D Scientists & Engineers per Thousand Employees	33	32	32
R&D Funds as Percent of Net Sales	1.88	3.49	3.37
Net Sales per Employee (Dollars)	105,899	108,977	108,739

Note: 1,000 employees is the smallest breakpoint used by the National Science Foundation in these annual surveys. From a one-time analysis, it can be estimated that R&D activities in firms with fewer than 500 employees are about 80 percent of the R&D activities in all firms with fewer than 1,000 employees. See U.S. National Science Foundation, Trends in Small Companies' R&D Expenditures (Washington, D.C.: U.S. National Science Foundation, June 1984) p. 4.

Source: Derived from Tables B-2, B-5, B-9, B-13, B-17, B-34, B-36, B-38, and B-39 in U.S. National Science Foundation, Research and Development in Industry, 1982 (Washington, D.C.: U.S. Government Printing Office, 1984).

Because of their size, small companies have an internal communication advantage over large firms. About 20 percent of the inventions patented in 1953 originated from employees in the operating end of industry.[5] These individuals, almost without exception, were employed by small and medium-sized firms. There is a marked difference in both opportunity and incentive between a worker in a small firm and one in a large firm.

Large firms tend to be more than mere scaled-up versions of small ones: they cut the work up finer, narrow each employee's responsibility and further reduce his scope of vision. Small firm employees, understanding more of what is going on, are more able to contribute to the improvement of products and processes. In small firms, too, each worker's influence is greater, and suggestions have more chance of acceptance.[6] In complex organizations, "the overriding problem often is maintaining an adequate commitment to a new idea in the face of internal obstacles to change. There is an understandable reluctance to depart from what has been a successful pattern of business."[7]

More large firms are attempting to capture some of the advantages of small firms, as well as retain the advantages of a larger size, by emphasizing relative independence for units charged with research, development, and/or innovation. This practice is known as "intrapreneurship."

New Evidence of Small Firms' Innovativeness

In the past six years, the SBA's Office of Advocacy has completed six research studies on innovation. These studies, drawing on a series of extensive surveys, either confirm or shed new light on the value of innovation by small business.

Small firms produce twice as many innovations per employee as large firms.[8] In a study by the Futures Group of Glastonbury, Connecticut, a total of 8,074 innovations were identified in 46 technology, engineering, and trade journals

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[5]Jacob Schmookler, "Inventors Past and Present," Review of Economics and Statistics, 39(3), August 1957, pp. 321-333.

[6]Jacob Schmookler, "The Size of Firm and the Growth of Knowledge," Statement to the Senate Subcommittee on Antitrust and Monopoly of the Committee on the Judiciary, May 26, 1965, printed in Zvi Griliches and Leonid Hurwicz (editors), Patents, Invention, and Economic Change: Data and Selected Essays (Cambridge, Mass.: Harvard University Press 1972), pp. 44-45.

[7]U.S. Panel on Invention and Innovation, Technological Innovation: Its Environment and Management (Washington, D.C.: U.S. Government Printing Office, January 1967) p. 28.

[8]The Futures Group, Characterization of Innovations Introduced on the U.S. Market in 1982 (Washington, D.C.: U.S. Small Business Administration, Office of Advocacy, March 1984, NTIS #PB84 212067). See also Gellman Research Associates, The Relationship Between Industrial Concentration, Firm Size, and Technological Innovation (Washington, D.C.: U.S. Small Business Administration, Office of Advocacy, May 1982, NTIS #PB82 226119) and Gellman Research Associates, Indicators of International Trends in Technological Innovation (Washington, D.C.: U.S. National Science Foundation, April 1976.)

published in 1982. By comparing total employment in the 362 industries of the innovating enterprises with the total number of innovations, The Futures Group found that there were 313 innovations per million employees for large firms and 745 innovations per million employees for small firms, or 2.38 times as many innovations per employee in small firms.[9] Small firms were estimated to be responsible for 55 percent of the approximately 8,000 innovations, which included innovations of different levels of significance.

Significance of Small Firms' Innovations

Small firms also produce about twice as many significant innovations per employee as large firms. The Futures Group innovations were assigned a level of significance: (1) first of its type, (2) a significant improvement of existing technology, or (3) a modest improvement of an existing product. Small firms were found to produce 1.91 times as many first-of-type innovations, 1.92 times as many significant improvements, and 2.46 times as many modest improvements per employee as large firms.

Spending on Research and Development

Small firm research includes basic scientific investigation. Small businesses spend proportionately twice as much of their R&D dollars on fundamental research as large firms: six percent of all small firm R&D funds in 1981 were spent on basic research, while large firms spent only 3 percent.[10] Small firms spent 28 percent of their R&D funds on applied research; large firms spent 20 percent. Consequently, small firms allocated less to development (66 percent) than large firms (77 percent) (Chart 1).

The limited resources of the small firm may mean that it can perform research more fully than the more expensive later stages of innovation (development, production, marketing, and distribution). If small firms find development too expensive, or choose to specialize in research, they may sell the research results to a large firm. The research may even have been done for a large firm in the first place: 13 percent of large firms contract out some R&D. Large firm contract dollars are only 2 percent of total large firm private R&D, but 30 percent of small firm private R&D.[11] While many of these large firm contracts go to universities and nonprofits, there are still substantial R&D linkages between large and small firms.

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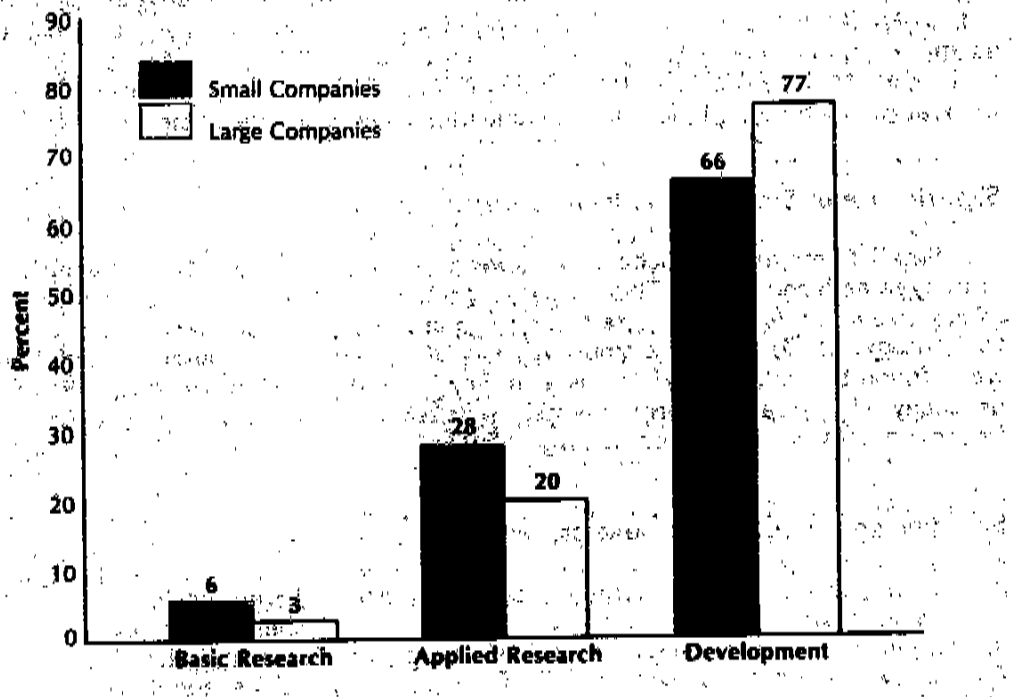
[9]The employment measure includes all jobs in both small and large firms in the industries in question whether or not the firms were associated with any of the innovations. Employment was taken from special tabulations by the Bureau of the Census for the Small Business Administration.

[10]U.S. National Science Foundation, Trends to 1982 in Industrial Support of Basic Research (Washington, D.C.: U.S. Government Printing Office, 1983, NSF 83-302), Table B-2.

[11]Derived from Tables B-5, B-7, and B-8 in U.S. National Science Foundation, Research and Development in Industry, 1981 (Washington, D.C.: U.S. Government Printing Office, 1983).

Chart 1 Allocation of Research and Development Funds in 1981



Source: Derived from U.S. National Science Foundation, *Trends to 1982 in Industrial Support of Basic Research* (Washington, D.C.: U.S. Government Printing Office, 1983). A small firm employs fewer than 1,000 employees.

Innovations by Concentration Ratio

Introducing an innovation does not usually require concentrated market power. The most innovative manufacturing industries are moderately concentrated: the top four firms have 21 to 40 percent of the value of shipments (Table 2). In industries with concentration ratios of 41 to 60 percent, small firms are almost four times as innovative per employee as large firms.

A number of factors enter into this dynamic phenomenon. A supplier-buyer relationship may exist between small and large firms within these industries. Also, four large firms with 41 to 60 percent of an industry comprise an attractive market target, which draws small firms to compete. In addition, large firms can let small firms innovate and then come in as a "fast second," introducing a similar product that captures much of the market and profits.[12]

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[12]W.L. Baldwin and G.L. Childs, "The Fast Second and Rivalry in Research and Development," Southern Economic Journal, 36 (1), July 1969, pp. 18-24.

Table 2 Innovations and Employment by Firm Size and Concentration Ratio

Industry Concentration Ratio (Percent)	Innovations		Industry Employment (Thousands)		Innovations per Million Employees		
	Large Firms	Small Firms	Large Firms	Small Firms	Large Firms	Small Firms	Ratio of Small to Large Firms
0-20	356	403	1,892.0	2,306.6	188	175	0.93
21-40	913	827	3,100.0	1,369.6	295	604	2.05
41-60	826	598	3,289.8	611.3	251	978	3.90
61-100	343	55	1,840.3	172.2	186	319	1.72
Subtotal	2,438	1,883	10,122.1	4,459.7	241	422	1.75
Unassigned	1,193	2,560	1,479.1	1,507.0	NA	NA	NA
Total	3,631	4,443	11,601.2	5,966.7	313	745	2.38

Note: Unassigned innovations are primarily those of firms not found in directories of companies, but also those associated with industries for which industry employment or concentration ratio (top four firms by value of shipments) were not available in the 1977 Economic Census. A small firm employs fewer than 500 employees.

Source: The Futures Group, Characterization of Innovations Introduced on the U.S. Market in 1982 (Washington, D.C.: U.S. Small Business Administration, Office of Advocacy, under award no. SBA-6050-OA-82, March 1984).

Process Innovations

The earlier SBA studies focused on product innovation. To complete the picture, the SBA contracted with The Futures Group to examine small business' role in process and other innovations important to the production system of the U.S. economy.[13] The results covered innovations in studies of technological change by the U.S. Bureau of Labor Statistics (BLS).[14] For these innovations, small firms were 0.76 times as innovative per employee as large firms.

Because these innovations were studied after the fact, researchers frequently used library sources of information about firms. Only the larger firms are usually found in such reference books. This introduces a bias to the study in favor of those firms large enough to be included in such published data sources. As a result, the number of large firm innovations identified was greater. In spite of this bias, small firms were 76 percent as innovative per employee as large firms.

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[13]U.S. Department of Labor, "Technological Change," Chapter 15 of BLS Handbook of Methods (Washington, D.C.: U.S. Government Printing Office, 1982).

[14]The Futures Group, Innovations by Firm Size in Studies of the Bureau of Labor Statistics (Washington, D.C.: U.S. Small Business Administration, Office of Advocacy, under award no. SBA-7198-OA-83, forthcoming).

A narrower, more intensive study limited to the food processing industry showed that while large firms originated half of the industry's in-house productivity innovations, three times as many innovations came from machinery manufacturers as were devised in-house.[15] Small manufacturers contributed more than two-thirds of the machinery manufacturers' innovations.

Innovation and R&D

A study for the NSF by Professors Hansen, Stein, and Moore of Boston University compared new products, net sales, and R&D for a sizable group of firms. Firms with 1982 net sales under $100 million (about the size of those with fewer than 1,000 employees in Table 1) had a new product for every ten million dollars of net sales, or 7.8 times the rate for all firms.[16] The smaller firms had 2.1 new products per million dollars of R&D, 3.5 times the rate for all firms.

Employment Growth

Small business' relative contribution to employment growth in high technology is twice that of large business. Employment in high-technology firms grew 4.5 percent per year between 1976 and 1980, compared to 2.8 percent for low-technology firms. Small high-technology firms were the fastest growing, at an annual rate of 8.3 percent (Chart 2).

Innovation Profits

Innovation produces economic benefits and costs for the innovating firm as well as its customers, suppliers, competitors, and others. The net benefits to society from investment in innovation -- the social return -- differ from the net benefits to the innovator -- the private return, or profit. The social benefits of an innovation may include lower prices and/or increased quality for the users of an innovation, and more demand for inputs from suppliers to the innovating organization. Profits lost by competitors are deducted from social benefits in calculating net social benefits, as are the costs of any unsuccessful R&D by competitors on the innovation.

A series of studies for the National Science Foundation indicated that the social rate of return on innovation is generally greater than the private rate of return; subsequent research for the SBA suggests that the differences between social and

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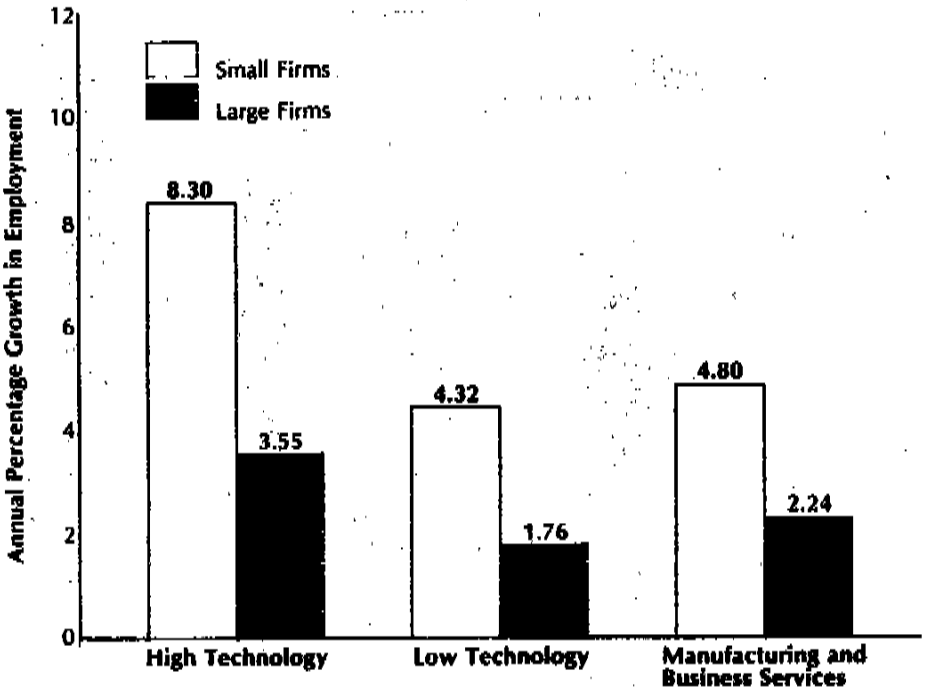
[15] Willard F. Mueller, John Culbertson, and Brian Peckham, Market Structure and Technological Performance in the Food Manufacturing Industries (Madison, Wisc.: University of Wisconsin-Madison, College of Agricultural and Life Sciences, February 1982), p. 69, cited in The State of Small Business, 1983, p. 122.

[16] John A. Hansen, James I. Stein, and Thomas S. Moore, Industrial Innovation in the United States: A Survey of Six Hundred Companies (Boston, Mass.: Boston University, Center for Technology and Policy, August 1984), pp. 105 and 128.

Chart 2 Employment Growth by Level of Technology and Size of Firm, 1976-1980



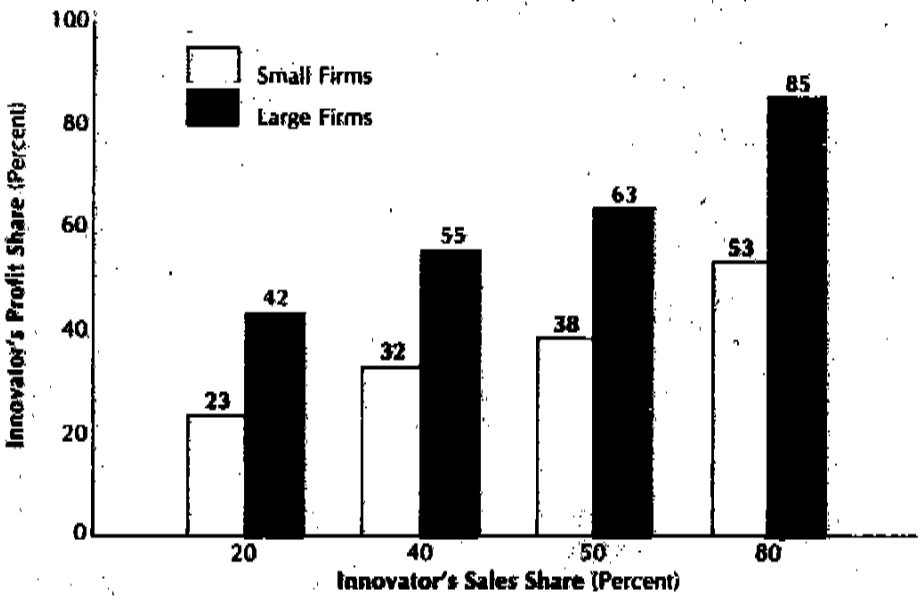
Source: Brookings Institution, *High Technology Employment Growth, 1976-1980: Considerations of Firm Size* (Washington, D.C.: U.S. National Science Foundation, 1984). A small firm employs fewer than 500 employees.

private rates of return are somewhat greater for small firms, which tend to contribute to higher social rates of return while taking slightly less relative profit for their innovations.[17]

Differences between the social and private rates of return vary with the size of the innovating firm for several reasons. Large and small firms do not have the same ability to prevent other firms from imitating an innovation. The large firm, with its greater resources, can defend itself better against patent infringement. It also is more likely to own related patents, which would deter an imitator. Large follower firms can often move into a market in less time than originally required by a small

[17]Anthony A. Romeo and John Rapoport, Social Versus Private Returns to the Innovations by Small Firms Compared to Large Firms (Washington, D.C.: U.S. Small Business Administration, Office of Advocacy, July 1984, NTIS #PB85 196996), also cited in the U.S. National Science Board, Science Indicators: The 1985 Report (Washington, D.C.: U.S. Government Printing Office, November 1985), p. 84. The studies cited included calculations of the benefits and costs to many parties affected by a total of 71 innovations.

Chart 3 Sales and Profit Shares Five Years after Innovation



Source: Gerhard O. Mensch, *Effect of the Follower Firm on the Innovating Small Firm* (Washington, D.C.: U.S. Small Business Administration, Office of Advocacy, award no. SBA-7199-OA-83, forthcoming). A small firm employs fewer than 500 employees.

Note: The innovator's profit and sales shares begin at 100 percent at the time of the innovation.

innovator, because of greater resources that can be brought to bear and/or a clearer idea of the most productive direction for R&D after the innovation has been introduced.

The innovators' shares of profits and sales, five years after the introduction of an innovation, have been analyzed for 200 cases.[18] Initially, an innovator has 100 percent of the sales of its innovative product or service. As more competitors introduce similar products, the innovator's share drops--typically to about 40 percent after five years.

Profit shares are another matter. A small firm innovator with about 40 percent of the sales gets about 32 percent of the profits; a large firm innovator in a similar position gets about 55 percent of the profits. For any sales share, the profit share of a large innovator is greater than that of a small innovator (Chart 3).[19]

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[18]Gerhard O. Mensch, Effect of the Follower Firm on the Innovating Small Firm (Washington, D.C.: U.S. Small Business Administration, Office of Advocacy, under award no. SBA-7199-OA-83, forthcoming).

[19]Profits to large firm innovators are estimated to be $10 billion more annually than profits to small firm innovators.

The Role of Government in Innovation

The research on social and private rates of return indicates that society and the economy benefit even more from innovation than the innovators themselves. Also implied is that some beneficial innovations will not be undertaken because the expected return is too low for both large and small businesses. It is in the interest of the U.S. economy, therefore, that all firms, small and large, have the opportunity to profit from innovative activity.

In a general way, government economic policies can encourage innovation by giving appropriate attention to market imperfections affecting small firms that are efficient innovators but may be less able to appropriate the economic gain from their innovations. Creating a fully competitive environment for small firms may yield a large social payoff.

Does the government have a more specific role in encouraging innovation? When the term "high-tech" is mentioned, discussion often follows on Federal intervention in the marketplace to achieve a desired industrial balance. Such intervention would have to be clairvoyant to predict the most successful new products and processes in future markets.[20] Nonetheless, government can and does play a major role simply by purchasing its R&D requirements from a variety of sources. Half of all R&D funding comes from government. Many argue that the best role for government in innovation is to continue sponsorship of a strong science base at all levels of education, to maintain a stable economy, and to be an equitable purchaser of R&D services from all performers, including the small business community.[21]

A byproduct of government R&D procurement is that it plays a particularly important role in new, small high-technology firms, which usually have limited profits and capital to support their research.[22] Without government R&D contracts

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[20]Council of Economic Advisers, Economic Report of the President (Washington, D.C.: U.S. Government Printing Office, February 1984), Chapter 3.

[21]The Organisation for Economic Co-operation and Development (OECD) interviewed executives in 52 industries in six countries to determine which government activities best facilitated innovation within their firms. Of four policies--direct subsidy, grants to universities, creation of infrastructure and government purchases--the survey respondents overwhelmingly selected government's procurement role as the chief determinant of innovation for their firms. See Roy Rothwell and Walter Zegveld, Industrial Innovation and Public Policy (Westport, Conn.: Greenwood Press, 1981), pp. 52-53, cited in The State of Small Business, 1983, p. 128.

[22]A study of 33 high-technology, fast-growing companies shows that nearly one-half depended upon government contracts for more than 50 percent of their revenues during their first year. Two-thirds stated that government R&D contracts were an important source of funding for the technological base of their product lines. Today less than one-third still depend upon government contracts for more than 50 percent of their sales. Research and Planning Institute, Case Studies Examining the Role of Government R&D Contract Funding in the Early History of High Technology Companies (Washington, D.C.: U.S. Small Business Administration, Office of Advocacy, July 1980, NTIS #PB82 190869), cited in The State of Small Business, 1983, p. 122.

during the initial years, many small high-technology companies could never have made their contribution to employment and growth in the U.S. economy. This does not imply that such beneficial results should be a goal of government procurement policy, but only that they underline the importance of a neutral procurement policy with respect to contract performers.

Small firm participation in Federal government R&D procurement, however, is less than its participation in private sector R&D activity. The small firm percentage of Federal R&D expenditures is 2.75 percent, about two-thirds of the small firm percentage of total Federal and company R&D funds, at 4.21 percent. These data include subcontracts. The small firm percentage of R&D prime contract dollars is 5.65 percent, about one-third of its 18.58 percent of total sales in the industries represented.[23]

Why is the small firm proportion of private sector activity greater than its proportion of Federal R&D activity? Are there barriers to small firm participation in government R&D procurement? One possible barrier is the size of government contracts. A study conducted for the SBA of new definitive contracts showed that small firms receive a much smaller percentage of dollars in R&D contracts initially above $1 million than in contracts under $1 million. Yet most new definitive contract dollars are in contracts over $1 million; 43 percent are in contracts above $5 million.[24] Two other kinds of barriers to small firm participation in Federal R&D procurement, in addition to contract size, are the fixed costs to business of learning about and responding to R&D procurements, and the perceived risks of dealing with a small firm.

The Small Business Innovation Research Program

Research by the National Science Foundation (NSF) on the barriers to small firm participation in Federal R&D procurement formed the basis for the design of the Small Business Innovation Research (SBIR) program at the NSF--the predecessor program to the Small Business Innovation Development Act of 1982. As documented in the SBIR hearings, the reasons found for the lack of small business participation in Federal R&D procurement, and the SBIR features designed to eliminate the problems are:

1. Winning proposals are often too long and expensive for small business to undertake.	1. Limit proposals to 25 pages and to small business. Advertise availability of guides to proposal preparation. Limit proposal instructions to 20 pages.

[23]Industries are weighted according to the R&D procurement dollars flowing to each. Jack Faucett Associates, Procurement Share vs. Industry Share (Washington, D.C.: U.S. Small Business Administration, Office of Advocacy, under award no. SBA-8566-OA-84, February 1986) Appendix C.

[24]Washington Management Group, Federal Procurement Cost Growth by Performer and Contract Size, Type, and Method, FY 1979-1982 (Washington, D.C.: U.S. Small Business Administration, Office of Advocacy, under award no. SBA-6051-OA-82, March 1984). New definitive contracts, which contain all the terms and conditions of the agreement, are generally much smaller than those that begin as letter contracts.

2. Projects are often bundled into funding agreements too large for small business.	2. Offer only up to $50,000 as a first round award, with competitive follow-on awards possible.
3. Project managers often prefer established institutions.	3. Limit the size of Phase I awards and add new vendors to a mailing list to assure a qualified group of respondents to any technology that might be solicited. (Announcements of all agency solicitations are sent to an SBA mailing list of over 35,000 small R&D firms.)
4. There is insufficient awareness of opportunities; information from frequent visits may be necessary to respond adequately.	4. Address meetings around the country to discuss the program; mail announcements of upcoming solicitations.
5. Response times are often too short and bunched together.	5. Require solicitation closing dates to allow enough time to fully respond. Space solicitation closing dates throughout the year.
6. Awards are not always competitive because of "follow-ons" and other noncompetitive awards.	6. Make numerous, competitive Phase I awards to get broadest possible competition for Phase II awards.

Payoffs in Competition and Efficiency

The SBIR program is not a federal assistance award program. Every item in a solicitation is to be consistent with the programmatic goals and objectives of the agency. The program brings new technological vendors to science and engineering research programs.

The cost of such a program may be thought to be in the extra effort of reading more proposals, making more and smaller awards, building a mailing list, attending outreach conferences, and composing instructional materials. But it should also be borne in mind that the proposals are shorter. Positive reports on the SBIR program cite not only research successes, but also the merits of this method of soliciting R&D. The payoff from this program is in the breadth of new ideas and the cost-efficiency of the vendors--that is, the increased competitiveness in the procurement process.

Federal procurement of research and development services already has an allowed cost--the independent research and development and bid and proposal expense (IR&D/B&P). The IR&D/B&P provisions allow firms with Federal technical contracts to charge to the Government not only the bid and proposal preparation cost, but also part of the cost for approved independent research and development. Successful independent research and development can lead to additional government contracts. Thus, technical contractors with the Federal Government--predominately larger firms--have an advantage over new competitors, which must fund their proposals and the supporting research from retained earnings or other sources. It has been estimated that present large business vendors claim $2 billion a year more than small firms in IR&D/B&P costs.[25]

The result is that IR&D/B&P costs the Government twice: once in the extra permitted charges and again in the resulting exclusion of possible new entrants. This does not mean that the IR&D/B&P program is uneconomical or improper, but only that it has functioned as a barrier to entry. The SBIR program has improved the competitiveness of the R&D contract award process.

How the Program Works

The twelve government agencies with extramural R&D obligations over $100 million annually participate in Small Business Innovation Research. Each agency sets aside a small percentage of its external R&D budget for the program. The percentage increases to 1.25 percent in the fourth year for the civilian agencies, and in the fifth year for the Department of Defense.

The agencies issue solicitations on subjects related to their missions. Topics studied include laser engineering, subatomic particles, genetic engineering, photovoltaics, new chemical compounds, bacteriology, artificial intelligence, cell culture methods, electronic speech recognition, robotics, semiconductor switches and circuits, computer algorithms, and applied mathematics.[26] Small firms are providing unique ideas and demonstrating capabilities far beyond the traditional stereotypes of small business.

SBIR projects are funded in two phases (Table 3). The first phase awards funds for feasibility studies, usually for six months and less than $50,000. Successful projects enter a second phase of two years with up to $500,000 in funding. Where two or more proposals for a second phase are evaluated as being of approximately equal scientific and technical merit and feasibility, special consideration is given to those proposals with non-Federal capital commitments for a third phase. Phase III is the keystone of the program and involves private sector investment and support to bring the innovation into the marketplace. If a Federal agency has continued interest and need for the innovation, acquisition may proceed with non-SBIR funds.

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[25]D.G. Soergel, An Estimate of New Business Expenses Which Are Paid and Subsidized by U.S. Taxpayers (Washington, D.C.: U.S. Small Business Administration, Office of Advocacy, 1981, NTIS #PB81 208027).

[26]U.S. Small Business Administration, Report to the Congress: Second Year Results under the Small Business Innovation Development Act of 1982 (Washington, D.C.: U.S. Government Printing Office, March 15, 1985, Report 453).

Table 3 SBIR Program Activities

	Year	Phase I	Phase II	Total
Topics Offered	FY 1983	614	-	614
	FY 1984	1,650	-	1,650
	FY 1985	1,169	-	1,169
Proposals Received	FY 1983	8,814	-	8,814
	FY 1984	7,955	599	8,554
	FY 1985	9,086	765	9,851
Awards	FY 1983	686	-	686
	FY 1984	999	338	1,337
	FY 1985	1,398	405	1,803
Dollars (Millions)	FY 1983	45	-	45
	FY 1984	48	63	111
	FY 1985	69	130	199
	FY 1986	NA	NA	320E

Note: E = estimated.

Source: U.S. Small Business Administration, Office of Innovation, Research, and Technology.

In order to meet the legislated purpose of product commercialization, the SBA has developed a computerized commercialization matching system (CMS), which can link SBIR awardees with potential sources of capitalization (venture capitalists and large businesses). SBIR awardees are provided a list of commercial technology areas and select those which best fit their innovation. A computer search identifies potential sources of capital that indicated an interest in the same industry area. SBIR awardees are sent information on each source, including names of contact persons. The potential source of capital is sent the technical abstract of the SBIR project and the company name.

Evaluating the Results

The law expires October 1, 1988. At least one year before that, the Comptroller General will report ". . . on the implementation of, and nature of research conducted under this Act, including the judgments of the heads of Departments and agencies as to the effect of this Act on research programs."

Because the first Phase II projects of the governmentwide program are only now being completed, it is too soon for a full evaluation of the results of SBIR. However, preliminary data are available from a survey of approximately 200 ongoing or completed projects at 130 companies that received awards from the predecessor

National Science Foundation and Department of Defense programs.[27] The average company was ten years old, with 35 employees, and received its SBIR award three years before the survey. Twenty-four percent of the firms and 34 percent of the projects had received subsequent outside financing, which amounted to twice the dollar amount of the SBIR awards. Twenty percent of the projects had resulted in joint ventures, which were just as likely to be with large firms as with other small firms.

Viewpoints

At the State White House Conference on Small Business held across the nation in 1985-86, small business owners have offered a variety of recommendations to encourage small business innovation, including reauthorizing the SBIR, streamlining the patent process, facilitating startups through small business "incubators," encouraging technology transfer of government-owned inventions to the private sector, and providing R&D tax credits. The following are the key recommendations concerning the SBIR.

Reauthorize the SBIR

Delegates to well over half of the state conferences recommended that the Small Business Innovation Development Act be reauthorized. Proponents maintain that the Act has been successful in increasing opportunities for small innovative firms, while enhancing the Federal government's ability to meet its research needs. Thirty states have developed similar or complementary programs.

Some opponents of reauthorizing SBIR hold that the Act was intended only to get the government moving toward enlisting small businesses in its R&D efforts. Having accomplished that, they maintain, it should be allowed to expire on its sunset date of October 1, 1988. Others say that mandatory set-asides have the potential of propping up shaky firms.

Increase the SBIR Small Business Set-Aside

Some have recommended that the Federal agency R&D set-aside for small business be increased from 1.25 to 2.5 percent of extramural budgets to make room for more of the small business innovators now submitting proposals under the SBIR program. Testimony before the House Small Business Committee indicates that the program has been an effective "feeder" for encouraging follow-on private investment in successful firms. Increasing the set-aside would increase the pool of funds available and ease the way into commercial applications for many more firms.

Opponents say that increasing the set-aside would wrest a larger portion of agency R&D funds from the hands of the professional managers directed to plan the government's R&D investments, and possibly reduce competition by universities and

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[27] Price Waterhouse, Survey of Small High-Tech Businesses Shows Federal SBIR Awards Spurring Job Growth, Commercial Sales (Washington, D.C.: Small Business High Technology Institute, April 1985).

research centers. Others maintain that mandatory set-asides create potential for fraud even in a well-structured program. Also, while the response to the 1.25 percent set-aside has been favorable, they say, there is no guarantee this will continue.

Include in SBIR All Agencies with R&D Budgets Over $20 Million

Currently, twelve agencies with extramural R&D budgets over $100 million participate in SBIR. Agencies with R&D budgets over $20 million must establish goals for such funding, and it has been proposed that these agencies be formally included in the program. Proponents say that lowering the threshold would both benefit the government programs and broaden the base of potential R&D sources. Six agencies would be added: the Department of Housing and Urban Development, the Agency for International Development, the Veterans Administration, the Tennessee Valley Authority, the Smithsonian Institution, and the Department of Justice.

Opponents say that lowering the threshold would impose unjustified additional administrative costs. They maintain that most of the six agencies with R&D budgets of $20-$100 million are already meeting their small business goals and that including them under a mandatory set-aside is unnecessary.

Modify Phase I and II Criteria; Bridge the Funding Gap

Small businesses that successfully complete Phase I may face a hardship in the interim period while Phase II funding is under consideration. Some favor either bridging the gap with funds or requiring agencies to make an earlier decision on Phase II funding for a particular project. Alternatively, funds could come from other sources: New York State, for example, has a Small Business Innovation Research Promotion Act that provides for state matching research contract awards to recipients of Phase I SBIR contracts.

Opponents of such funding by the Federal government say that while the government must be sensitive to the needs of less financially secure business it cannot act irresponsibly. Phase II funding is based on a detailed technical evaluation of Phase I results, and the government has no way of predicting who the Phase II contract winners will be. Interim funding would be excessive and an unjustified use of government funds.

Status of Proposed Legislation

In June 1986, the House Small Business Committee unanimously (40-0) approved H.R. 4260, a bill to repeal the sunset provision of the Small Business Innovation Development Act. The SBIR program is due to expire in 1988 under this provision. The bill has been referred to several other House committees for action by August 1.

Current law requires the Comptroller General to report in Fiscal Year 1987 on the implementation of the law and the nature of research conducted under the SBIR program.

Conclusion

Small business accounts for one-half of all innovation, which in turn accounts for a sizable portion of the Nation's economic growth. Small firms are efficient innovators. The job growth rate in small high-technology companies is twice that of large firms, even though small firms receive less in profits from their innovations.

Small business' percentage of government R&D procurement is considerably less than its percentage of private sector R&D, although the small business community has shown its technical excellence and its innovativeness. The Small Business Innovation Research program is one way to encourage an influx of innovative small business ideas into the government's research and development programs.

Government can play a critical role in the innovation process. While it cannot predict the fortunes of any one industry, it can foster an environment conducive to innovation by encouraging a strong science base at all levels of education, maintaining a stable economy, and purchasing R&D services for its own needs from all performers in an equitable manner.

No industry today can be singled out as the wave of the future. However, small businesses in many industries will certainly continue to test new ideas, products, and processes. Some of those businesses and ideas will succeed, while others will fail. Through this dynamic process, innovation will continue to contribute to the growth of a healthy economy.

Collins, Eileen L. Tax Policy and Innovation: A Synthesis of Evidence. Washington, D.C.: National Science Foundation, 1981 (PRA Research Report 82-1). Identifies the principal features of the U.S. income tax code that influence R&D and innovation and assesses the effects of tax variables on innovation. Part I summarizes the provisions of the U.S. tax code before the 1981 tax legislation that related directly to R&D and technological innovation and sketches changes introduced by the Economic Recovery Tax Act of 1981. Part II uses existing evidence to assess the influence a tax incentive can have on industrial innovation.

The Futures Group. Characterization of Innovations Introduced on the U.S. Market in 1982. Washington, D.C.: U.S. Small Business Administration: Office of Advocacy, March 1984, NTIS #PB84 212067. A total of 8,074 innovations were identified in 46 technology, engineering, and trade journals published in 1982. By comparing total employment in the 362 industries of the innovating enterprises with the total number of innovations, The Futures Group found that there were 313 innovations per million employees for large firms and 745 innovations per million employees for small firms, or 2.38 times as many innovations per employee in small firms.

The Futures Group. Innovation by Firm Size in Studies of the Bureau of Labor Statistics. Washington, D.C.: U.S. Small Business Administration, Office of Advocacy, under award no. SBA-7198-OA-83, forthcoming. Examines innovations covered in studies of technological change by the U.S. Bureau of Labor Statistics, i.e., process and other innovations important to the production system of the U.S. economy. Because these innovations were studied after the fact, only the larger firms were often identifiable from available sources. In spite of this bias, small firms were estimated to be 76 percent as innovative per employee as large firms.

Gellman Research Associates, Inc. The Relationship Between Industrial Concentration, Firm Size, and Technological Innovation. Washington, D.C.: U.S. Small Business Administration, Office of Advocacy, May 1982, NTIS #PB82 226119. Focuses on the relationships between innovating firms and their industry as a variable of innovative performance, with special emphasis on firm size. A total of 635 innovations marketed in the United States since 1970 were studied. The analysis yielded a number of findings regarding the relative levels of innovativeness of small firms for the industries studied.

Kamien, Morton I., and Schwartz, Nancy L. Market Structure and Innovation. Cambridge, England: Cambridge University Press, 1982. The theoretical basis for a set of "Schumpeterian hypotheses" is presented, including hypotheses about the relationship between firm size and inventive and innovative activity. The authors review empirical evidence and reach conclusions on the innovative activity of small firms.

Kent, Calvin A., Sexton, Donald L., and Vesper, Karl H. Encyclopedia of Entrepreneurship. Englewood Cliffs, New Jersey: Prentice-Hall, 1982. Contains 19 chapters on research and education in entrepreneurship. Chapter 15, "The Role of Entrepreneurs in Innovation," by O.J. Kransner (pp. 227-287), discusses the definition of innovation, the role entrepreneurs play in innovations, and the "types" of innovations most appropriate for various institutions.

Mensch, Gerhard O. Effect of the Follower Firm on the Innovating Small Firm. Washington, D.C.: U.S. Small Business Administration, Office of Advocacy, under award no. SBA-7199-OA-83, forthcoming. Analyzes the innovators' shares of profits and sales five years after the introduction of an innovation for 200 cases. Initially, an innovator has 100 percent of the sales of its innovative product or service. As more competitors introduce similar products, the innovator's share drops--typically to about 40 percent after five years. Profit shares are another matter: a small firm innovator with about 40 percent of the sales gets about 32 percent of the profits; a large firm innovator in a similar position gets about 55 percent of the profits.

Mueller, Willard F., Culbertson, John, and Peckham, Brian, Market Structure and Technological Performance in the Food Manufacturing Industries. Madison, Wisconsin: University of Wisconsin-Madison, College of Agricultural and Life Sciences, February 1982. Examines productivity increases in food manufacturing industries by analyzing the relationship between their competitive structure and their R&D investments and outputs and by identifying the origins of inventions and innovations influencing productivity.

Obermayer, Judith H. The Role of Patents in the Commercialization of New Technology for Small Innovative Companies. Washington, D.C.: U.S. Small Business Administration, Office of Advocacy, August 1981. Presents the findings of a survey that explored the interaction between businesses and the patent system from the point of view of small high-technology firms. The author investigates the effect of the patent system on market protection, litigation, trade secrets, and corporate strategy and presents a number of recommendations for changing patent policy.

Organisation for Economic Co-Operation and Development. Innovation in Small and Medium Firms. Paris, France: Organisation for Economic Cooperation and Development, 1982. Analyzes the role of small and medium-sized firms in contemporary technical change, identifying the climates that are conducive to innovation and outlining the policies undertaken by the governments of 19 OECD members to stimulate innovation in small and medium-sized firms. The authors suggest a number of ways governments might adapt their policies to stimulate innovation in small and medium firms.

Research and Planning Institute. Case Studies Examining the Role of Government R&D Contract Funding in the Early History of High Technology Companies. Washington, D.C.: U.S. Small Business Administration, Office of Advocacy, July 1980, NTIS #PB82 190869. Presents cases describing early stages in the evolution and growth of 33 innovative companies. Focuses on the technological contributions of, jobs created by, and government involvement in the companies examined in the case studies.

Roberts, Edward B. "Small Can Be Beautiful . . . Getting New Ventures Off the Ground." Management Review, June 1980, 69(6):51-56. Analyzes the characteristics of new high-technology entrepreneurial firms and reviews published data by Enos, Hamberg, Jewkes, and Peck on the contributions of small firms to commercially oriented innovation. The author also discusses the problems of and constraints on growth and entrepreneurial development within older, established firms and weighs the relative merits of different approaches to new ventures.

Romeo, Anthony A. and Rapoport, John. Social Versus Private Returns to the Innovations by Small Firms Compared to Large Firms. Washington, D.C.: U.S. Small Business Administration, Office of Advocacy, July 1984, NTIS #PB85 196996. Includes calculations of the benefits and costs to many parties affected by a total of 71 innovations. The differences between the median annual social and private rates of return were 30 percentage points for large firms and 39 percentage points for small firms. To some extent, this discrepancy was because the small firm innovations had higher social rates of return. Large firms were able to appropriate 44 percent of the median social returns to their innovations as profits, almost identical to the 43 percent for small firms.

Senchack, Andrew J., Jr. "Characteristics of Small Manufacturing Firms' R&D Activities." Journal of Small Business Management, January 1981, 19(1):48-55. Surveys the R&D activities of 260 small manufacturing firms in the chemical, fabricated metals, machinery, and scientific controlling instruments industries. The author reports on the percentage of respondents conducting R&D and relates firm size to incidence of in-house R&D activities.

U.S. General Accounting Office. Consistent Criteria Are Needed to Assess Small-Business Innovation Initiatives. Washington, D.C., July 7, 1981. Shows the influences of economy-wide, industry-specific, and individual-firm factors on the environment within which small businesses innovate. Included are criteria for judging the efficacy of federal initiatives intended to foster small-business innovation.

U.S. National Science Foundation, Problems of Small, High-Technology Firms, Washington, D.C.: National Science Foundation, 1981 (Special Report NSF 81-305). Identifies 11 problem areas for small technically oriented firms. The report is based on data collected in a 1977 survey of almost 13,000 high-technology companies with fewer than 500 employees that were believed to be active in research and development and on a subsequent series of interviews with 71 firms.

Innovation On The Line

Delegates to the White House Conference suggest ways to increase research funding.

By Mary-Margaret Wantuck

Joseph Lahoud, president of Greenbriar Systems, a Fairfax, Va., firm that develops automated computer systems for specialized applications, says his company would have foundered without the Small Business Innovation Research program.

"I seriously don't think we'd be in existence today if it were not for SBIR and the five grants we've received totaling $950,000," he says.

The Small Business Innovation Development Act of 1982 requires federal agencies with research and development budgets of $100 million or more (there are now 12) to award up to 1.25 percent of the budget to smaller science and technology companies through SBIR grants.

More than $1 billion in SBIR funding will have been provided through 1987 (the law expires in 1988). Yet this $1 billion amounts to less than 5 percent of available federal research money.

SBIR has stabilized the percentage of federal research contracts awarded to small business, which had been dropping, at the 1982 level. Increasing research funding is a major goal of planners for next year's White House Conference on Small Business.

"There is no doubt that the government's role is crucial in funding initial innovation research," says Lahoud, who has been elected a delegate to the national conference. "The private sector is just not willing to put its money into high-risk projects at the beginning. Venture capitalists usually step in once newly developed technologies are ready for commercialization."

Based on past experience, the SBIR program has a chance to lure a sizable amount of follow-up private capital. SBIR was tested in a pilot program by the National Science Foundation in 1977. The NSF has invested $20 million, which has so far been leveraged eight times over with private funding. If the larger agency SBIR programs match that performance, the $1 billion government investment could lead to an additional $8 billion in private-sector money.

But improvements can be made, say people familiar with the program.

SBIR needs greater flexibility, maintains Andre Pettigrew, vice president of TEM & Associates, a Berkeley, Calif., research and planning firm. Says Pettigrew, who served on the White House Conference's innovation task force: "One of our long-term goals is to get into hard science research and innovation and develop ourselves into a manufacturing-based company. We'll probably turn to SBIR when we do. A limitation we see, however, is that a small business must make a proposal based on a research project that has already been identified by an agency. If my company wanted to initiate a research study that did not conform with an agency project, chances are very poor that it would make it under SBIR. This stifles creativity."

Small businesses seeking federal research grants should be allowed more room for original projects, says Heinz Poppendiek, a member of the White House Conference's innovation task force.

PHOTO: BRENT CUNGHAM

Heinz Poppendiek, another task force member and president of Geoscience Ltd., an energy research and development company in Solana Beach, Calif., agrees with Pettigrew that "at the very least, 20 percent of the proposals should be completely original."

If not, he says, and agencies continue to select proposed topics based on work they are already involved in, "then the question arises of what 'innovation' really means."

Lahoud says the program's biggest drawback is the amount of time allowed to lapse—as long as 18 months—between the two phases of a project. Up to $50,000 is given for six months of feasibility studies before a second stage of awards from $200,000 to $500,000 for two years of related research and development of promising projects.

In Richmond, two months ago, at the first of the state conferences being held preliminary to the White House conference, a resolution was passed calling for less delay.

Small companies also say they need better access to current research. Pettigrew favors more formal joint innovation ventures between small firms and large federal and university research labs that have the financial resources to buy the latest sophisticated equipment.

Lahoud says the problem is that small businesses do not know where to go for the information. "It's a lack of communication, not information," he says.

The federal government has tried to get the information out. In 1974, the

Federal Laboratory Consortium for Technology Transfer was established to make research at the federal level available to state and local governments and the private sector. The Stevenson-Wydler Innovation Technology Act of 1980 requires agencies to encourage the commercialization of technology developed under federal contracts in government laboratories.

Individual agencies have also made efforts. The National Aeronautics and Space Administration publishes a manual that summarizes the inventions and projects it has been working on.

Barbara Griffin, president of Whale Scientific, Inc., in Commerce City, Colo., suggests that perhaps the way to let small firms know what research projects are commercially applicable is to issue a federal register of all the agencies' projects.

Griffin raises the issue of the government's passing out the intellectual property of companies that apply for patents.

"We manufacture plastic injection disposable parts for use in hospital and research labs and make diagnostic kits for use in clinical chemistry labs," she says. "Twice when we have put 'confidential' and 'not to be released' on our patent information, the data have been given out under the Freedom of Information Act, and I was not notified until after the fact. I don't understand what this law does except give my competitors access to my trade secrets."

FOIA allows the public access to information on loans, financial developments, production plans, new formulas or products that are collected by federal agencies. There is an exemption to protect "trade secrets and commercial or financial information," but it is so narrowly defined that most business information does not qualify. Pending legislation in Congress would allow businesses an opportunity to prevent release of data they must submit.

As general manager of PPS Consultants, Phoenix, a high technology headhunting firm, Martin Jacobs sees a different innovation problem facing small businesses: attracting innovators—engineers and scientists—to their staffs.

He offers suggestions for enticing high tech innovators to small business: making tax treatment of incentive stock options more attractive so they will be used more by small companies; allowing employes to transfer years of service for pension plans from one company to another; and providing a tax incentive for small firms when hiring high tech personnel.

"Smaller businesses have a lot going for them," says Jacobs. "They are the first to hire and the last to fire, mainly because of the personal, almost parental relationship forged with employes who are more than just numbers."

Poppendiek concurs with Jacobs' assessment and adds: "Small business people are a plucky bunch. I think that if we go to the next White House Conference and really speak up and say what is in our hearts and stick to the critical issues, there's a wonderful opportunity to be successful." NB

This paper was prepared by the Office of Advocacy, U.S. Small Business Administration, Frank S. Swain, Chief Counsel for Advocacy. The primary writer was William Scheirer, with expert assistance from William Whiston. The article was edited by Kathryn Tobias and Giordano Chiaruttini. Additional assistance was provided by Lucille Robinson, Staff Assistant.