Congressional Research Service

Report 95-499

R&D Partnerships: Government-Industry Collaboration

Wendy H. Schacht, Science Policy Research Division

Updated November 17, 1998

Abstract. Efforts by the 104th Congress to eliminate several government-industry-university research and development partnership programs reflected some opposition to federally funded programs designed to facilitate the commercialization of technology. Within the context of the budget decisions, the 106th Congress is expected to again debate the government's role in promoting collaborative ventures focused on generating new products and processes for the marketplace.

95-499 SPR
Updated November 17, 1998

R&D Partnerships: Government-Industry Collaboration

Wendy H. Schacht
Specialist in Science and Technology
Science, Technology, and Medicine Division

Summary

Over the past 15 years, congressional initiatives have created programs and policies encouraging the establishment of government-industry-university research and development (R&D) partnerships to stimulate technological innovation and economic growth. Efforts to eliminate several of these activities during the 104th Congress reflected opposition to certain programs designed to facilitate the commercialization of technology, particularly those involving direct federal funding. Many of the same questions were raised in the 105th Congress; however, established program continued to receive support. Within the context of budget decisions, the 106th Congress is expected to again debate the government's role in promoting collaborative ventures focused on generating new products and processes for the marketplace.

Policy Development

There were several attempts during the 104th Congress, and to a lesser extent in the 105th Congress, to terminate government programs that provide direct, and sometimes indirect, federal assistance to facilitate the commercialization of technology by the private sector. Such efforts were based upon the rationale articulated in a March 16, 1995 House Budget Committee statement that argued that while the federal government has a role in basic research, "... it should not be engaged in applied research." This was a major change from various policies supported in the past by both Republicans and Democrats in Congress and by previous Administrations. Over the past 15 years, federal programs, mandated by congressional legislation, have acted to expand basic research as well as encourage industry application of the results of this research.

Traditionally, the U.S. government has extensively funded research and development to meet the mission requirements of the federal departments and agencies. It also supports work in areas where there is an identified national need for research, primarily basic research, not being performed in the private sector. Federal financing is based principally upon a consensus that while basic research is the foundation for many

innovations, the rate of return to society as a whole generated by investments in such work is significantly larger than the benefits that can be captured by those performing the research. This often leads to underinvestment by the private sector.[1]

In the past, government efforts to expand basic research leading to new technology development had been based upon a "linear" model of innovation. This theory viewed technological advancement as a series of sequential steps starting with idea origination and moving through basic research, applied research, development, commercialization, and diffusion into the economy. Increases in federal funds in the basic research stage were expected to result in concomitant increases in new products and processes. However, the linear concept is no longer considered accurate. Innovations often occur that do not require new basic or applied research or development; in fact most innovations are incremental improvements to existing products or processes. In certain areas, such as biotechnology, the distinctions between basic research and commercialization are small and shrinking. In others, the differentiation between basic and applied research is artificial. For the economy, the critical factor is the commercialization of the technology, the speed at which a product, process, or service is brought to the marketplace. Economic benefits accrue only when new or improved technologies are sold in the marketplace or when a new or improved process can be utilized to increase quality and productivity. It is widely accepted that technological progress is responsible for up to one-half the growth of the U.S. economy and is one principal driving force in long-term economic expansion and increases in the nation's standard of living.

The dilemma faced by policymakers in the 1980s was that while the United States had a strong basic research enterprise, foreign firms often appeared more adept at taking the results of these scientific efforts and making commercially viable products. At times, U.S. companies competed in the global marketplace against goods and services developed by foreign industries from research performed in the United States. In 1985, the President's Commission on Industrial Competitiveness (under President Reagan) found that "foreign firms have increased the speed with which they adopt and commercialize technology developed in the United States and they have also improved their ability to develop technology on their own."[2] In an increasingly interconnected world, it is extremely difficult to keep technologies and knowledge within domestic borders. Thus, there was expanded congressional interest in mechanisms to accelerate the development and commercialization processes in the American industrial community.

By the late 1980s, the changing world order—with changing defense needs, increased market competition, and the globalization of the economy—led Congress to reassess the federal contribution to the national science and technology enterprise. The traditional role of the government in supporting basic research expanded toward advancing the development of technology to meet other national needs, including the economic growth that flows from the commercialization and use of new products and production processes. This approach involves creation of an environment within which

---

[1]For a detailed discussion of government initiatives see: Congressional Research Service, *Industrial Competitiveness and Technological Advancement: Debate Over Government Policy*, by Wendy H. Schacht, CRS Issue Brief 91132.

[2]President's Commission on Industrial Competitiveness, *Global Competition, The New Reality, Vol. II*, Washington, D.C.: G.P.O., 1985, p. 22.

government-industry-university cooperation is achieved. The idea of such partnerships reflects the thesis that while commercialization is the responsibility of the private sector, academia, industry, and government often have complementary functions and can contribute to the goal of generating new goods and services for the marketplace. Joint projects allow for the sharing of costs, risks, facilities, and expertise.

A bipartisan legislative approach evolved that was intended to facilitate collaboration among the three sectors.[3] This included the creation and support of various programs that provide direct federal funding, on a cost-shared basis with the private sector, for government-industry efforts. The Advanced Technology Program (ATP) of the National Institute of Standards and Technology (NIST), Department of Commerce, provides federal seed financing, matched by private sector investment, to companies or consortia of universities, businesses, and government laboratories for development of pre-competitive, generic technologies that have potential application within a range of industries. Awards are made on technical, scientific, and business merit. New selection requirements encourage joint ventures that include both small and large firms. Also managed by NIST, the Manufacturing Extension Partnership (MEP) is a program of regional centers designed to facilitate the movement to the private sector of knowledge and technologies developed under the auspices of NIST and other federal agencies in pursuit of mission requirements. The centers receive at least half their funding from U.S.-based, non-profit institutions or organizations. The Small Business Technology Transfer pilot program provides federal support for research proposals that are developed and executed cooperatively between a small firm and a scientist in a university, government laboratory, or non-profit institution.

In addition, Congress has enacted various laws that offer indirect measures to encourage collaborative activities leading to technology commercialization. Included in this is the research and experimentation tax credit which provides a credit for incremental increases in a company's R&D expenditures as well as for payments to universities for basic research. Changes to the antitrust laws are designed to clarify their application in regard to cooperative research and manufacturing ventures thereby removing certain barriers to such activities. Other laws facilitating technology transfer and establishing patent ownership incentives were enacted to stimulate industrial and academic use of the results of federally-funded R&D. The "Bayh-Dole" Act has been of major significance to the evolution of cooperative R&D. Providing title to inventions made under federal financing to small business, university, or non-profit contractors has encouraged collaborative efforts to further develop products and processes based on these patents and bring them to the marketplace.[4]

A New Approach?

The 104th Congress signaled the beginning of a challenge to a significant part of this approach. The role of government in partnerships was called into question as were activities that involve federal funding to promote collaborative ventures. Government

---

[3]For additional information see: Congressional Research Service, *Cooperative R&D: Federal Efforts to Promote Industrial Competitiveness,* by Wendy H. Schacht, CRS Issue Brief 89056.

[4]See: Congressional Research Service, *R&D Partnerships and Intellectual Property: Implications for U.S. Policy*, by Wendy H. Schacht, CRS Report 98-862.

programs were seen by opponents as financing applied technology development and "picking winners and losers" for the business sector. It has been argued that commercialization choices should be market-driven and agency discretion in selecting technologies would inevitably be subjected to political pressures. In a March 15, 1995 letter to Budget Committee Chairman John Kasich, the 27 Republican members of the House Science Committee condemned partnership activities as "... product development using taxpayer resources [imposing] federal control over market decisions ..."[5] Speaker of the House Newt Gingrich stated that while he favored long run increases in federal R&D support, the country should spend "... much less trying to have the U.S. government as a `partner' with industry."[6]

In place of such efforts, many in Congress suggested the creation of tax incentives that, proponents argued, would provide the capital resources necessary for industry to invest in additional R&D. According to Mr. Gingrich, capital formation is the largest barrier to American innovation. He and former House Science Committee Chairman Robert Walker foresaw a permanent and expanded research and experimentation tax credit as a substitute for government cost-shared programs.[7] Changes in the capital gains tax were also intended to increase the amount of funding available for industrial use. Mr. Walker stated that he believed changes in the capital gains tax to be more important to start-up companies than the government-industry programs currently in operation.[8]

Opponents of plans to terminate government-industry partnerships argued that this reflects a misunderstanding of current programs. They maintained that such federal activities are industry-led and support the advancement of technologies in areas chosen by the private sector which are expected to have applications across different sectors of the economy. Merit based awards are for work that is high-risk and past the basic research stage but not yet ready for commercialization. Claims have been made that manufacturing extension is a response to industry needs as defined by actual private sector requests for assistance and is designed for small and medium sized companies which do not have the resources of major firms.

It was also argued that the government has traditionally played a role in the development of critical technologies. Industries in which American companies enjoy a favorable balance of trade (e.g., commercial aviation, pharmaceuticals, weapons) tend to be those which have received federal agency mission R&D support over the years. When a statement was made at March 23, 1995 hearings (Technology Subcommittee, House Committee on Science) to the effect that IBM internally financed work on artificial intelligence because it was a wise business decision, then Undersecretary of Commerce for Technology, Mary Good, responded that, in actuality, much of funding came from the Department of Defense and the National Science Foundation.

Agency spokesmen have disputed the charge that these cooperative programs are "corporate welfare" for large companies. At the same hearings, Arati Prabhaker, then

---

[5]*McGraw-Hill's Federal Technology Report*, March 30, 1995, p. 6.

[6]*New Technology Week*, March 13, 1995, p. 2.

[7]Ibid., p. 1.

[8]*McGraw-Hill's Federal Technology Report*, March 30, 1995, p. 2.

Director of NIST, testified that while many big firms are involved in collaborative programs, the cooperative nature of these efforts means that many who actually receive assistance are the smaller suppliers to these large corporations. Recent information provided by the National Institute of Standards and Technology indicates that of the 413 awards made by the Advanced Technology Program between 1990 and 1998 almost one-half went to joint ventures. In the last solicitation (October 1998), the 79 projects receiving awards involved more than 150 companies, 11 universities, and several federal laboratories.

Also at issue is the question whether tax treatments alone will achieve their goals. Critics charged that tax relief is at the expense of federal support for education, R&D, training, and cooperative industry-university-government ventures that are at the core of the innovation process as they see it. Agreeing that tax incentives can be beneficial, they maintained that this approach should not be implemented to the exclusion of other activities. Proponents of on-going federal programs pointed to studies they claim indicate that the R&E tax credit promotes continuation of research already performed by firms and does not necessarily encourage new, high risk work. In addition, such tax credits are of little use to a company which has no taxable income, a situation often encountered when small firms are in the process of developing innovative, leading-edge technologies.

Responding to arguments that tax incentives will increase the amount of capital available to companies such that government funding for programs like ATP would no longer be necessary, opponents maintained that venture capitalists are interested in investing in technologies which have reached the prototype stage. However, they noted, current federal programs provide support to companies for work prior to prototype development. The venture capital that would be necessary to finance this long-term, high risk R&D is not currently available, and the assumption that a pool of funds to serve this function will be created in response to these tax proposals, they stated, is not borne out by any evidence.

These deliberations were revisited in the 105th Congress. However, there was significantly less opposition to on-going federal activities. The Advanced Technology Program remains operational, due, in part, to strong support by President Clinton. Funding levels declined for FY1998, but increased 6% for FY1999. The Manufacturing Extension Partnership also received continued funding at an increased level for FY1998. Appropriations for FY1999 declined, but the figure reflects a decrease in the federal share of center funding not reduced support for the MEP effort. The research and experimentation tax credit was renewed for one year through June 30, 1998 by the Taxpayer Relief Act of 1997 and again through June 30, 1999 by the Omnibus Consolidated Appropriations Act (P.L. 105-277). The Small Business Technology Transfer program has been extended through FY2001.

Issues For Consideration

An assessment of the potential impact of any changes in approach to cooperative R&D is partially dependent on an understanding of the environment within which such work is performed by the private sector. The focus of industrial research and development tends to be short term; concentrating on R&D which will bring investors quick returns. Small innovative firms tend to need early stage venture capital to fund work as well as business assistance to translate viable ideas into commercially acceptable

goods and services. Larger companies may be financially capable of supporting R&D, but the nature of this work has changed from large centralized laboratories which performed fundamental research (e.g., Bell Labs, David Sarnoff Research Laboratory) to smaller, decentralized facilities performing applied R&D tied to operating units. Increasingly, companies are looking to government laboratory establishments and to universities to provide the basic research needed for innovation and long term technological advances. Within this context, what legislative initiatives might be most effective?

To date, Congress has determined that providing title to inventions made under federal funding to contractors and /or collaborating parties should be used to support technology development and commercialization. In return for patent ownership, Congress has accepted as satisfactory the anticipate payback to the country through goods and services to improve our health, welfare, and standard of living. These benefits have been considered more important than the initial cost of the technology to the government or any potential unfair advantage of one company over another in a cooperative venture. However, as such effort become more widespread and as new issues emerge, additional decisions may need to be made on how to maintain a balance between the importance of bringing new products and processes to the marketplace and protecting the public investment in R&D.

The role of state governments in cooperative R&D might be another consideration. Increasingly, these jurisdictions are providing resources to augment local participation in related federal programs, particularly the Advanced Technology Program, the Manufacturing Extension Partnership, and the Small Business Technology Transfer Program. To this end, the U.S. Innovation Partnership has been established between the National Governor's Association and the federal departments designed "... to create an environment that promotes innovation, creates new jobs, and helps to advance 21st century technologies." What might be the result of state and local activities on federal efforts to facilitate government-industry collaboration?

Among the additional questions which may be addressed as this issue is debated are: Do programs such as ATP and MEP actually shift private sector decisionmaking to the public sector? Do they address imperfections in the marketplace? What results have these programs achieved? What are the benefits and costs of such efforts? Will companies expand their R&D expenditures if the research and experimentation tax credit is made permanent? If so, will this additional R&D support the type of long-term, high risk technology development which current federal programs are designed to facilitate? What will such a tax credit cost the U.S. Treasury relative to current R&D activities? Will capital gains tax changes provide increased funding for private sector research and development? Can and/or should the capital gains tax be structured to encourage the formation of venture capital for early stage R&D? Should it be tied to longer term investments often necessary for innovation?