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by Murray Weidenbaum

The Clinton Administration is right in proposing a new technology policy for the United States. The existing array of federal activities ostensibly promoting research and development (R&D) remains unchanged from the early Cold War period and is clearly out of date. The Administration is wrong, however, in proposing that federal encouragement to commercial technology should take the traditional form — expenditure subsidy from the U.S. Treasury — that was favored when national security was the motivating force.

By its very nature, successful commercial technology is utilized by the private sector. It is private companies that produce and market the goods and services embodying the fruits of science and engineering advance. Hence, in order to be effective, any new technology policy should focus on enhancing the basic incentives of a private enterprise system. This requires reducing numerous governmental obstacles to the commercialization of new technology. In contrast, dependence on federal departments and agencies for achieving or even directing technological breakthroughs and their application will not work. As we will see from a cursory historical review, that approach is reminiscent of the discredited hangover remedy known as having some of the hair of the dog that bit you.

The Clinton Administration's Proposals

In its proposals to date, the Clinton Administration's technology program relies primarily on new and expanded federal spending.[1] One innovation it has introduced is to broaden the standard definition of federal support for infrastructure beyond the traditional bridge building and road construction to include a variety of projects justified as high-tech. These in-

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clude: investing in magnetic levitation transportation and high-speed rail; developing "smart highways"; producing a "clean automobile" powered by batteries or fuels like hydrogen and methane; building a national information "superhighway" to link up computers around the nation; expanding the role of the Commerce Department to promote joint ventures between business and government; and increasing partnerships between private industry and the national laboratories.

Two major arguments have been offered to support direct federal involvement in applying technology. First of all, over the years the federal government has financed many business undertakings, especially in the area of technology. Secondly, other nations, notably Japan, have gotten the jump on American industry supposedly because of the help from their governments. Let us examine each of these two arguments.

U.S. Governmental Efforts to Promote Technology

Over the years, the federal government has financed many high-tech undertakings, but past experience with government trying to force technological innovation is not comforting. The three billion dollars the federal government wasted in the abortive attempt to develop a commercial synthetic fuels industry was part of a vain effort to reduce our dependence on imported energy. (Deregulation of oil pricing was a far more effective approach.) A recent economic assessment of the synfuel program, by Linda Cohen and Roger Noll, is totally devastating:

> The entire synfuels program had a quality of madness to it. Project after project failed . . . Goals were unattainable from the start. Official cost-benefit studies estimated net benefits in the minus billions of dollars.[2]

But synfuels was not an isolated example. Similar failures occurred in the aborted supersonic transport project and in the Clinch River breeder reactor.[3] Similar shortcomings continue to this day. Witness the space shuttle still seeking to define its mission or the financially hemorrhaging superconducting super collider.[4] The General Accounting Office (GAO)

reports that the space shuttle's advanced solid rocket motor project has virtually doubled its development cost in recent years — to $3.25 billion. Meanwhile, the need for the advanced motor has declined.[5] Sadly, the list of problems with federal "investments" in new technology seems to be endless. In a December 1992 report on the National Aero-Space Plane, the GAO states that the program "has been fraught with turmoil, changes in focus, and unmet expectations."[6] These are only the latest examples of the basic failure of "industrial policy" efforts that extend back to the days of the Reconstruction Finance Corporation scandals in the 1950s.[7]

How does the government decide which industries, technologies, and projects to support? Based on experience, government favors politically powerful firms, which usually means older, labor-intensive companies. Over the years, these firms have invested substantial resources in improving their presence in Washington. Moreover, these firms are the "squeaky wheels," suffering the most from competitive forces.

New and growing firms may be economically strong, but they usually are politically weak. They have neither a record of extended financial contributions to political candidates nor sufficient knowledge of lobbying techniques and large groups of agitated employees/voters. Former Senator William Proxmire was right when he said, "Money will go where the political power is. Anyone who thinks government funds will be allocated to firms according to merit has not lived or served in Washington very long."[8]

The invention of the semiconductor shows the limits of government assistance. During World War II, the government sponsored a huge research program in the fundamental properties of germanium and silicon, to respond to the limitations of silicon diodes used in radar. Thirty to forty U.S. research laboratories were involved. Nevertheless, the important early semiconductor device was invented at the civilian Bell labs, which did not receive a research and development grant from the military for semiconductors — until after its invention.[9]

Every business going to Washington for financial help resents and tries to avoid the term "subsidy." In contrast to federal subsidies to farmers, corporate executives always de-

scribe their extraction from the federal treasury as an investment in future economic growth or some such worthy pursuit. The American-Japanese semiconductor agreement illustrates the danger of this rhetorical approach. The agreement surely helped some firms, but at the expense of the American computer manufacturing industry. The results are typical of special-interest legislation, benefitting some industry or companies or region, but at the expense of the national interest.

As recently as the early 1980s, the American semiconductor industry outsold Japanese firms. Japanese companies responded by investing more heavily than their American counterparts — at a time when American firms could have afforded to stay ahead of the foreign competition. Not surprisingly, by the middle 1980s, Japanese semiconductor producers began outselling American firms and American companies asked for a generous handout from the U.S. taxpayer.[10]

The government's response was to subsidize Sematech, a consortium for semiconductor manufacturing technology. It comes as no surprise to anyone familiar with the history of U.S. industrial policy that Sematech favored the older, more established companies at the expense of the newcomers who generate much of the innovation.[11]

Reading between the lines of a carefully and cautiously written report on Sematech by the General Accounting Office is revealing. Even if Sematech achieves all of its technological objectives, Japanese competition will continue to have lower manufacturing costs per semiconductor chip because their quality is higher (a higher percentage of chips produced meet specifications). GAO notes laconically that Sematech might have worked better if it had more thoroughly assessed the market position of U.S. semiconductor producers and then adopted an initial operating plan with realistic objectives and milestones. The agency notes that Congress has set no deadline for terminating the large federal contribution (currently $100 million a year[12]). Federal spending programs do have a life of their own. Another GAO report reveals that five member companies charged off part of their payments to Sematech as overhead costs on government contracts. Although legal, this procedure increases the federal government's

total support to Sematech.[13] It also helps to explain Sematech's popularity with the recipients of its largesse.

In any event, an important side benefit of the Sematech experience was the loosening of regulatory restraints to allow the member companies to work together on pre-competitive research.[14] That limited experiment in deregulation — which does not require any government subsidy — led to positive results and is worth repeating.

Independently, the U.S. chip industry has made an impressive comeback, concentrating on innovative designs not especially connected to Sematech's efforts.

The current debate on whether government or private industry should take the lead in building a new high-tech fiber-optic telecommunications network (the information superhighway) provides yet another striking case in point of avoidable governmental subsidy to high technology. The quickest way to achieve a data superhighway is to permit the existing telephone and cable TV companies to compete using their current digital technology. For example, Tele-Communications, Inc. of Denver is embarking on a $2 billion program to lay fibre-optic cable throughout more than 400 communities across the country by 1996.[15] Telephone companies are also showing a strong interest in this potential new market and could use existing copper telephone cables.[16] That will require the federal government to relax its ancient regulatory restraints on interindustry competition in telecommunications.

Freeing new portions of the radio spectrum now blocked by administrative action also could spur innovation. Rather than urging such long-overdue regulatory reform, proponents of the data superhighway concept are proposing that the federal government build a more technologically advanced system on its own. But, as any cynic or seasoned observer of the Washington scene would readily expect, the notion of government subsidy to telecommunications has attracted support from many quarters. The proponents of a new high-technology handout range from prospective suppliers of equipment (many companies are attracted by the prospect of lucrative contracts) to prospective users (who expect the government to subsidize their access to the network).[17] Moreover, some communications

experts warn that moving too rapidly would result in the United States having the first, but the world's most primitive, fiber-optic communications system.[18]

Foreign Experience

Proponents of more federal subsidies to private business, including the utilization of science and technology, cite the example of Japan. Japan's Ministry of International Trade and Industry (MITI) is often heralded as a fine example of successful business-government cooperation, but the details are not as convincing. MITI is a powerful agency of the Japanese government, with substantial influence over business decisionmaking. However, its own decisions have not been altogether wise. MITI attempted to keep Sony from entering the consumer electronic market. MITI also tried to keep Mazda and Honda out of the auto business because it badly underestimated the growth of Japan's export market. Then there was MITI's textile fiasco. MITI bought and scrapped 180,000 looms to finance the textile cartel it was setting up. At the same time, however, 160,000 illegal looms came into production.[19]

MITI also purchased a 30 percent stake in an international consortium building a new jet engine. In part because of numerous delays in the project, the major Japanese airlines continue to buy jet airliners powered by U.S.-built engines.

Shipbuilding is also portrayed as another classic MITI success story. Following World War II, MITI used subsidies to nurture this industry, and by 1957 Japan was the world's largest shipbuilder. In the early 1970s, when Korea's comparative advantage became clear, MITI began to shift resources out of shipbuilding in favor of new growth sectors — or so the admirers of MITI claim. While the results are essentially as portrayed, Japanese industrial policy was by no means so farsighted.

In practice, MITI's subsidies were provided only to ships that were to be operated under the Japanese flag and that employed Japanese seamen. As the rising wages of these seamen undermined their competitive position, Japanese shipping firms gradually switched to ships operating under foreign "flags of convenience" during the 1970s. (Sounds familiar?) The result

was a large decline in subsidized shipbuilding and, thus, in total Japanese shipbuilding. This negative trend occurred even while MITI was forecasting increases in the demand for Japanese-built ships. Japanese industrial policy plans did not foresee either a decline in domestic shipbuilding or an increase in the use of foreign ships. Once again, market forces thwarted government efforts to sustain a domestic industry.[20]

HDTV provides a current example of Japanese government failure. That government chose the technology that would be used for HDTV in its country and financed the development. However, it now seems that the analog technology selected by the Japanese government turns out to be inferior to other alternatives. Without the "benefit" of similar government assistance, the U.S. industry has developed promising alternatives to Japanese HDTV using digital technology which is of a higher quality.[21] This year, the European Community abandoned development of its analog approach to a new generation of television — acknowledging the superiority of U.S. digital technology.[22]

On a more positive note, the Japanese response since 1987 to the rise of the yen in world currency markets is very revealing. On their own, Japanese companies took quick and tough actions to restore their global competitiveness. Within weeks, or at most months, of the change in the external financial environment, many of them undertook vigorous campaigns to improve productivity. Efforts to upgrade quality were made. Some manufacturing operations were quickly moved to lower-cost locations and, in some cases, senior executives reduced their own salaries. MITI was not particularly involved at all.

A Free Lunch From the Peace Dividend?

Many people who are concerned with a lag of American industry in international competitiveness see a new source of financing for all sorts of panaceas — the peace dividend supposedly arising from the end of the Cold War. For example, some would have the Department of Defense finance civilian technology directly, conveniently overlooking the fact that the mil-

itary buildup was financed out of borrowed money. There is no surplus cash sloshing around in the U.S. Treasury.

Others justify their desire to have the Department of Defense subsidize civilian science and technology by pointing to the armed services as important users of society's pool of scientific and technical knowledge.[23] But there is no limit to that line of reasoning, given the large military purchases of items ranging from missiles to mittens, from ground support equipment to golf balls.

Proposals to expand the Defense Advanced Research Projects Agency (DARPA) are a convenient way of bypassing traditional military procurement procedures. Little known and small in size by Washington standards, DARPA provides funds to over 300 corporations and universities to conduct high-risk research. Over the past thirty years, DARPA-funded products have led to the development and commercialization of computer time-sharing, advanced aeronautics, new types of software, and new telecommunications procedures.

DARPA already finances private-sector R&D in a variety of areas — superconductivity, advanced semiconductors, high-definition television, and very sophisticated types of integrated circuits. While DARPA justifies its sponsorship of these projects because of their expected relevance to military missions, many of the technologies being developed are expected to help American industries compete in commercial markets. About one-half of DARPA's budget is currently allocated to such dual-use technologies that have both civilian and military applications. However, DARPA is no magician. It operates in the special world of military procurement, where one monopsonistic buyer dominates the market. Surely, DARPA has experienced its share of flops. After spending 200 million dollars, it closed the books on an experimental helicopter-airplane. Another project that fell short was a scheme to use artificial intelligence to guide a combat vehicle over rough terrain.[24]

Some compare DARPA with Japan's MITI. But, unlike DARPA, MITI is a cabinet-level agency that is charged with enhancing the nation's international competitiveness. Expanding the role of DARPA to include all of the civilian technology that other federal de-

partments and agencies are willing to sponsor, as is now being urged, would dilute DARPA's mission and weaken its focus. To a significant degree, DARPA has succeeded by virtue of its ability to bypass the Pentagon bureaucracy. If it gets much larger, it will likely lose this special characteristic.

A more fundamental objection to using the military budget to support private-sector technology is that it will politicize the process. Giving the Department of Defense, rather than the marketplace, the authority to choose the technologies and firms to be funded is an incentive for political pressures. History tells us that such opportunities will not go unused for long. We need go no further than the Army Corps of Engineers for an illustration. The Corps' military functions are first rate. Its civilian dam-building activities, however, are embroiled in politics and have generated numerous projects with little economic justification. The Corps' record of generating "pork" for powerful legislators is hardly a precedent that justifies expanding the role of the Department of Defense in the civilian economy. To sum up the point in this age of quantification, the direct role of the military establishment in promoting civilian technology should be, to four or more decimal places, zero!

Some analysts urge that a strengthened Department of Commerce should provide greater investment in the development of the nation's technology base. In 1988, Congress converted the staid old National Bureau of Standards into the National Institute of Standards and Technology (NIST). The expanded agency is handing out millions of dollars in seed money to the private sector to develop high-tech proposals and, as noted earlier, the Clinton Administration wants to expand these efforts rapidly. Having a federal civilian agency determine which new areas of commercial technology will be subsidized by government is only marginally better than giving the role to the Pentagon.

As we have seen, there is little in the history of federal support of technology to justify the optimism that underlies this approach. Government — at least in the United States — is not good at choosing which areas of technology to support and which organizations to do the work. We are much better off when private enterprises risk their own capital in selecting

technological activities and then carry through on the successful ventures. A recent report from the National Bureau of Economic Research (NBER) makes that point clearly. NBER Research Associate Frank Lichtenberg, professor of economics at Columbia University, found that the net impact on productivity of government R&D spending is lower than the return on privately funded R&D and may even be negative. In striking contrast, his research shows that the social return to private R&D investment is about seven times as large as on plant and equipment.[25]

This macroeconomic approach is reinforced by a more microeconomic study by the General Accounting Office. GAO reports that most small manufacturers cannot effectively use the advanced state-of-the-art automated technologies developed at the Department of Commerce's National Institute of Standards and Technology.[26]

On reflection, these results are not surprising. When a company's own laboratory comes up with a product or process advance, there are far fewer barriers to using it than when government takes on that role. The many pathetic efforts of the Department of Commerce to interest private business in using the research it has financed reminds me of a forlorn street corner vendor trying to peddle his wares to preoccupied passersby.

A Positive Approach to Encouraging Technology

Government can play an important role in promoting technology, and with a minimum of expenditure or intervention in private decisionmaking. So far, the Clinton Administration has ignored this positive approach. It is to create a business environment which is more conducive to using new technology by eliminating or at least reducing the numerous obstacles to innovation that government itself has erected over the years. Most proponents of increased federal spending for technology ignore the wide variety of regulatory restrictions that inhibit the growth and application of corporate R&D. It is futile for the federal government to pour vast sums into high-tech enterprises if, at the same time, it continues to erect statutory and ad-

ministrative roadblocks to the application of those new technologies. That's like a driver who has one foot on the gas pedal and the other on the brake.

The supporters of large-scale federal outlays for new technology seem to operate in a policy vacuum. They are oblivious to the fact that the deregulating trend of the late 1970s and early 1980s has been replaced by expanded government regulation of business.[27] Because many federal agencies exempt existing facilities, products, and processes from such directives, the main burden of expanding regulation falls on new enterprises, new undertakings, and new technology.

Consider America's world-class pharmaceutical industry, which generates substantially more exports than imports. President Clinton ran on an economic program that specified that he would be "cracking down" on the industry for its high prices and profits.[28] (Parenthetically, in recent years, prescription medicine prices have risen at about the same rate as health-care costs generally.) But if he carries out his threat, it is a sure-fire guarantee of slowing down the rapid rate of new-product innovation that characterizes the pharmaceutical industry.

In a large number of cases — chemicals, pharmaceuticals, and biotechnology — the supply of venture capital is substantial; the key limitation is not financial. The major constraint on commercializing technology arises from government itself.[29] Consider the hysterical reaction to the use of the protein BST in increasing the production of milk. Aside from health concerns, which have been fully addressed by the FDA, "consumer advocates" vehemently oppose the move because it *reduces* the price of milk. State legislatures follow their lead by preventing the use of this advance in biotechnology. Governmental actions like that have a powerfully negative effect on the incentive to commercialize new technology, notwithstanding large amounts of federal financial support for "precompetitive R&D."

The uncertainty engendered by government and special interest groups has hindered the development of biotechnology generally. While scientists are able to engineer more prolific crop strains, the regulatory framework governing the commercialization of their work remains

ill-defined. One analyst warns that, under such circumstances, some companies may avoid the problem by going overseas via joint ventures or establishing new subsidiaries.[30]

There is a modest direct role for government in supporting commercially oriented technology and here some reforms would be desirable.[31] For example, a simpler and more effective patent system would encourage the creation and diffusion of technology. Such a change would ensure that smaller inventors are not overwhelmed by the cost of obtaining patents and defending them against legal challenges. Also, larger firms would be encouraged to seek patents rather than protecting their new products and processes by maintaining secrecy.

In addition, revisions in the antitrust laws are needed to avoid impeding the formation of joint ventures to develop new technology. According to the private Council on Competitiveness, current antitrust laws — or even the perception of them — discourage technological cooperation among companies, trade associations, and professional societies.[32] The capital requirements to develop what is termed "generic" or "pre-competitive" technology are often beyond the financial capability of a single firm. Waiving or amending the antitrust statutes is a far more sensible approach than urging the federal government to provide the necessary financial support. But, most fundamentally, a substantial dose of deregulation — or at least regulatory reform — would be quite helpful.

Another desirable contribution that the federal government could make to foster private technology is to privatize the hundreds of national laboratories, converting them into private institutions for profit as well as non-profit. Given the substantial federal investment made in these laboratories during the Cold War, many of them constitute excellent research facilities. Private-sector use is now generally limited to specialized equipment, such as particle accelerators. The Clinton Administration's proposal to find a civilian mission for the labs through partnerships with private business is misguided. If, instead, these labs were privatized, firms in the private sector would be more likely to use their expertise designing new products.[33]

Tax Incentives

It is also necessary to respond to the concern that society as a whole underinvests in applied research and development because of various imperfections in the market economy. Potential entrepreneurs and financiers of new high-tech ventures may lack adequate information about the opportunities in and returns from such investments. As noted earlier, the overall returns on applied research and development are quite high in relation to traditional economic activity. Under the circumstances, government action to lower the private-sector's decision-making threshold on R&D would be useful, provided it is done in a manner that preserves the entrepreneurial nature of the individual firm's decision making. This would not be the case with large-scale direct subsidies. A more equitable and effective alternative to expenditure subsidies is for the federal government to provide generalized tax incentives for private-sector investment in R&D.

This approach has several attractive features. It would be available to all private companies that pay U.S. income taxes. Private companies receiving the incentive would choose the projects they wish to undertake. Finally, and most relevant, the private firms involved in R&D would continue to bear most of the financial risk; the government's share would be much smaller.

We have a good example of that approach in the R&D tax credit which expired last year. It should be revived and perhaps increased. Researchers in this field continue to debate the benefits and costs of that R&D tax credit.[34] There is one aspect, however, on which no controversy exists; namely that the reluctance of Congress to enact this provision on a permanent basis sharply reduces its effectiveness. To extend credit begrudgingly a year or two at a time makes it less likely that companies will take account of this incentive in their decision-making on long range commitments to R&D, such as building and operating expensive new laboratories.

A recent study at the National Bureau of Economic Research estimates that the response to a temporary change in the tax credit is about one-half of the reaction to a permanent

change. The report notes that R&D spending adjusts slowly to revisions in tax rules since many projects cannot be started or stopped on short notice. The NBER study also estimates that a permanent increase of 5 percent in the R&D tax credit would increase long-run private spending on R&D by about 5-10 percent.[35] The existing 10 percent credit for R&D surely should be made permanent. Consideration also should be given to increasing it, perhaps to 20 percent. Most important, the private firm undertaking the R&D would still be bearing most of the risk.

Reforming the Military Procurement Process

No serious discussion of encouraging new technology can ignore the present array of costly and burdensome regulation that accompanies the military acquisition process. This inhibits the cross-flow of innovation between the military and civilian sectors. Since the end of the Second World War, the Department of Defense has been a major financier of R&D and the largest purchaser and developer of new scientific applications. It is also true that past spin-offs from military technology constitute an impressive group — computers, jet airliners, composite materials, communications equipment, and scientific instruments. For decades, many companies primarily oriented to civilian markets benefitted from commercial use of spin-offs from high-powered defense research and development.

The Raytheon Corporation adapted radar technology to develop the microwave oven (first called the "Radarange"). Boeing drew on its military aircraft design work on the B-47 and KC-135 in developing the 707 commercial airliner, although the 707 and the KC-135 were both descended from a common company-sponsored prototype (the "dash 80").

Over the past decade, however, the relationship between military and civilian R&D has changed radically. The roles of the public and private sectors often have been reversed in the military sphere itself, in good measure because of the growing intricacies of the military acquisition procedures. As a result, if a technology has both civilian and military use, the more advanced models are now more likely to be seen at Radio Shack than in military systems.

In the case of semiconductors, extremely detailed military specifications have isolated defense production, dividing the U.S. industrial base between defense and commercial uses. Due to the rigidity of military specifications and requirements, chips made for the Defense Department are many times more expensive and often one or more generations behind their commercial counterparts.[36]

Many currently deployed weapons use technologies dating to the 1970s or earlier. The existing acquisition process often requires as much as twenty years to move a major weapon system from R&D to deployment. Clearly, that not only increases costs but it inhibits technological innovation. This drawn out development process also reduces the return on contractor-financed investments in defense R&D and thus reduces the incentives for such undertakings. The B-2 Stealth bomber and the Seawolf submarine both have computer chips in key components that are merely run-of-the-mill, rather than state-of-the-art. The design of electronic parts in these weapons had to be frozen years ago in order to meet the requirements of the lengthy military production cycle. But, since then, it has been the civilian computer industry that has been innovating at a rapid pace.

The armed services' ability to develop advanced weaponry depends more and more on how well they and their contractors can "spin on" civilian advances to military products. Military research in electronics, for example, is now so exotic and slow that it offers little commercial use. The tables have turned. The Department of Defense has become a net user of civilian research. However, the many barriers of the military acquisition process impede the transfer of advanced technology from the civilian economy to the military establishment.[37]

As a result, many high-tech manufacturers have set up walls to keep out those bureaucratic influences. To prevent their civilian-oriented divisions from becoming "contaminated" by the military's bureaucratic approach, companies selling to the armed services often go out of their way to insulate their military work. Thus, fiber optics companies doing business with the Department of Defense have set up special divisions to do so. In that way, the military's special accounting, auditing, and personnel requirements do not apply to the rest of the com-

pany. Unwittingly, of course, sensible actions such as these impede the flow of new technology between the public and private sectors.

Fundamental changes in the way that the military establishment make its purchases from the private sector are essential. Because American technology is increasingly oriented to civilian needs, the government's acquisition regulations should be modified to encourage, or at least permit, the defense establishment to draw more on commercial product developments. Of course, this is much easier said than done. The people in the Pentagon who make a career out of writing military specifications can be expected to object to any attempt to buy more off-the-shelf commercial products, whether they provide the Defense Department with superior technology or not. Such a shift in government purchasing on a large scale would put many regulation writers and acquisition reviewers out of work.

An egregious example of such bureaucratic busywork is the "Buy American" provisions of the federal procurement laws which inhibit purchasing from the open market. Officials responsible for acquisition must carefully check whether any one of the numerous components of a product contains a single forbidden foreign element. Other obstacles to buying more off-the-shelf commercial products include the rules on steering a certain percentage of procurement to small, handicapped, and minority firms and the onerous "do-it-by-the-numbers" provisions of the Competition in Contracting Act. Anyone who doubts the severity of the problem should be forced — as I recently have — to read the military procurement regulations cover to cover!

A dose of deregulation administered to the entire military procurement process would yield many benefits. First of all, the elimination or reduction of the numerous restrictions would reduce the overhead costs of both the government and the private contractors. Moreover, a streamlined acquisition system would make it easier for the military establishment to use the latest components available in the commercial economy. Because the Department of Defense remains a large customer of American business, such a reform would encourage the development of high-tech products on the part of private-sector firms that cater to both markets.

Conclusion

There are few, if any, overt advocates of socialism in the federal government. However, people often want to add just a "teeny weeny" bit of government guidance to help business work better. Over the years, numerous government subsidies with that type of justification have been enacted. These include many generalized subsidies to farmers, ship construction and operating companies, credit subsidies to a great variety of private-sector borrowers, and subsidies for a host of technological projects. As we have seen, most of this federal support proved wasteful or outright counterproductive. A reasonable argument can be made that each of these subsidies to what was a popular technological activity at the time served to divert money from more promising competing technologies. In some cases, the federal outlays pushed efforts toward premature commercialization that discredited the basic concept, perhaps even needlessly.

Technology policy has become the newest euphemism for the more controversial and discredited *industrial* policy. According to a former senior Commerce Department official, business executives do not advocate an industrial policy, rather "they want the government involved in high-risk, long-term, expensive, high-technology research projects."[38] Or, in the words of one academic supporter, "The government should not give handouts, but it should help strategically placed industries at strategic times."[39] Any long-term observer of the Washington scene knows that, inevitably, the political process will decide which high-risk, long-term, strategic industries and projects will be selected. The chosen few will, by definition, meet these subjective requirements. Politically weak companies by default will not be "strategic," "high-risk," or "long-term." The results will be indistinguishable from a federal spending program formally labeled "industrial policy."

Despite a surface attractiveness, current proposals for direct government support of commercially relevant technology fall into this category. Government has demonstrated no aptitude for choosing among promising new scientific or technological projects. The Clinton Administration enthusiasts for new government initiatives would do well to ponder on Paul Samuelson's cogent reminder:

> One of the small virtues of a market laissez-faire system is that when it makes a terrible mistake and produces mousetraps that people don't want or which don't work, somebody runs out of money and gets rapped on the knuckles. That's why the Lord created bankruptcy.

Samuelson goes on to note that, "In government we really do very often throw good money after bad even after almost everybody can see that something is not working."[40] That is precisely what happened in the case of the ill-fated supersonic transport when, in 1971, Senate supporters suggested that cancellation of the project would not be responsible in view of the substantial outlays that had been made for the SST.[41]

Government policymakers must learn to refrain from jumping every time a constituency asks for help. The current pressure to "do more" for the promotion of technology is not an exceptional case. Even a cursory examination of past and current large-scale government efforts to promote the use of civilian science and technology does not inspire confidence in the ability of federal agencies to choose among alternative technologies and their uses. The Clinton Administration should abandon its proposal to set up business-government partnerships in such areas as computer linkage, automobile design, and environmental technology. The United States holds a strong position in each of these areas. Governmental participation would constitute an unnecessary diversion with its usual combination of "free" money, but with lots of strings attached.

Some obstacles to the commercialization of technology, it must be recognized, arise from shortcomings in the private sector — shortcomings which can only be remedied by business executives themselves. For example, many experts contend that, despite superior American achievements in science per se, Japanese firms are strong competitors because they assign more talent to such engineering activities as detailed product design and quality control. They place their most talented engineers in production, unlike the U.S. practice. As a result, much of their product development is done in the factory where the product is produced rather than in a remote laboratory. Thus, Japanese firms often enjoy quicker responsiveness to market opportunities, lower costs, and equal or better quality than U.S. manufacturers.[42]

Not too surprisingly, widespread concern is evident in American industry about the ability to move products from the laboratory to the marketplace. An example frequently cited is the videocassette recorder (VCR), which was invented in the United States. Two Japanese firms, Sony and Matsushita, now control 90 percent of the U.S. market, and the remaining 10 percent is supplied by other foreign firms. There is only one place to lodge the responsibility for dealing with such challenges to American management and that is, of course, business management itself.

Notes

1. President William J. Clinton and Vice President Albert Gore, Jr., *Technology for America's Economic Growth, A New Direction to Build Economic Strength* (Washington, D.C.: The White House, February 22, 1993).

2. Linda R. Cohen and Roger G. Noll, *The Technological Pork Barrel* (Washington, D.C.: Brookings Institution, 1991), p. 297.

3. Ibid., pp. 97-147, 179-215.

4. Kent Jeffreys, *Super Boondoggle: Time to Pull the Plug on the Superconducting Super Collider* (Washington, D.C.: Cato Institute, 1992).

5. *Status of Advanced Solid Rocket Motor Program* (Washington, D.C.: U.S. General Accounting Office, 1992).

6. *National Aero-Space Plane: Restructuring Future Research and Development Efforts* (Washington, D.C.: U.S. General Accounting Office, 1992).

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