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GOVERNMENT POLICY AND THE PRODUCTIVITY PREDICAMENT

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ABSTRACT

The poor performance of the American economy since 1970 has given rise to numerous proposals to increase the role of government in supporting the commercialization of new technologies through government demonstration programs and other policies designed to promote a specific new technical idea. This paper examines the political incentives acting upon government in supporting new technology, using several specific cases to illustrate the general principle that targeted demonstration projects are more likely to be the cause of declining productivity of American Industry than to be the cure.

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The decline in the growth of productivity in American industries has given rise to numerous proposals for government action to attack the problem. While many of these ideas are potentially useful and generate interesting discussion, the overall debate about the causes and cure for sagging productivity is in several ways dissatisfying. First, it tends not to be well informed about the experiences of history or of other countries today. Second, it typically does not address in a realistic, pragmatic way what government can — and cannot -- do well.

A brief summary of the history of the economies of the advanced industrialized nations during the 1960s and 1970s illustrates the first point -- and brings out in bold relief that the United States is facing a truly perplexing problem. Consider the following paradoxes.

1. In 1962, a 10 percent tax reduction (with no concommitant expenditure reduction) was followed by the longest continuous period of prosperity and productivity growth in American history; a similar action in 1981 preceded the worst recession since the economic readjustment at the close of World War II -- with there being some

chance that it will grow to be the worst economic setback since the Great Depression.

2. In 1965, J.-J. Servan-Schreiber´s The American Challenge was published in the United States. Its main argument was that the United States was so overwhelming an economic force that the other advanced nations were highly unlikely ever to free themselves from American economic domination. Within ten years, exactly the same arguments were being made in the United States about Japan, West Germany — and even France.

3. Americans are prone to blame the poor performance on the productivity front on a long list of economic problems: OPEC, inflation, high interest rates, insufficient reinvestment in capital stock, etc. Yet there is no evidence that any of these is the cause of the problem. Other advanced industrialized nations have had to live with OPEC and with a greater dependence on imported energy resources than is the case in the United States. Most other advanced industrialized nations have experienced inflation and interest rates comparable to ours. And, despite several years of trying, absolutely no evidence has been found to support the view that either the quality or amount of investment per worker declined in the 1970s.

Something very dramatic seems to have happened since the 1960s. Other countries, faced with similar conditions, seem to be doing better than the United States, whereas they used to do worse. Conventional policy actions do not seem to work. So what has changed?

One candidate is the rise of environmental, health and safety regulation. The automobile industry is fond of attributing part of its decline to regulation, and business generally has argued that the costs of regulatory compliance are a major factor in the erosion of productivity growth. While there are undoubtedly many important examples of silly and overly expensive regulations, overall the argument as stated simply is not supported by the facts. The costs of regulatory compliance in the manufacturing sector explain at most 20 percent of the drop in productivity growth. Moreover, in some of the most heavily regulated sectors -- agriculture and chemicals, for example — productivity performance has been much better than in most manufacturing industries.

Nevertheless, there is a more subtle way in which regulation may be an important contributory factor. Much of regulation is an illustration of a more general phenomenon throughout the American spectrum of government policies that emerged in the 1970s. It is that, for the first time, public policy developed a ubiquitous, comprehensive stance on economic change. For the first time, government became self-conscious about the effect of government policy on the overall pattern of technological change and economic growth, and policies were adopted to encourage certain kinds of technical advances — not at the level of basic research and advances in general knowledge, but at the level of pushing commercialized technology in specific ways.

It is the self-conscious development of public policies about new technology and economic change that is the focus of this paper. The argument is as follows: first, these policies have largely failed to obtain the specific technical goals that they were designed to achieve; second, they have created a potentially serious barrier to overall technical progress in the economy; and third, this failure is largely due to inherent problems with the way the government process works, rather than rectifiable mistakes, so that attempts to resolve the productivity predicament by an expanded governmental role in the development of new technology is more likely to make matters worse than to improve them.

THE DEVELOPMENT OF TECHNOLOGY POLICIES

Except for national defense, the United States government has normally kept itself free from policies to push particular technologies. But a qualitative change in policy took place in the 1950s with the "Atoms for Peace" program. The light-water nuclear reactor, and later the liquid metal fast-breeder reactor, were technologies selected by government agencies to be commercialized, with substantial government subsidies along the way. They introduced the notion of government being in the business of demonstrating a new technology that for some reason the private sector was unwilling to pursue. These programs were followed by similar efforts in urban mass transit (leading to the San Francisco and Washington, D.C. subway systems), construction (specifically targeted on improved productivity in housing construction), and, most important of all, a wide array of

new energy technologies in the wake of the 1973 crisis in the world oil market.

Regulation, too, took an increasingly important technological stance. Most obvious is so-called "technology-forcing" regulations. These are designed to guarantee a market for new methods to abate pollution or achieve other regulatory objectives. One technique is to enact a performance requirement before it is technically feasible; another is to require the best available control technology for any new facility -- the so-called new source performance standard.

A third innovation in public policy was the scrutiny with which economic change was examined. The creation of the Office of Technology Assessment is symbolic, revealing the public stance that new technologies ought to be studied — and appropriately regulated -- before they are unleashed on the world. Implicit in this view is the notion that new technologies are more threatening than old, that if one is not careful, they are likely to make society worse off. Hand in hand with the skepticism of the new was protectionism for the old: the unprecedented move by the federal government into the bail-out of failing firms. Sometimes the bail-out took the form of direct subsidy (Lockheed and Chrysler); sometimes the technique was the use of protective regulation (the "trigger price" method for protecting domestic steel producers from foreign competition); once it was even de facto nationalization (CONRAIL and AMTRAK).

A common, easy judgment is to write off most of these ventures as failures. Certainly, if the basis for the judgment is to be the extent to which they had a salutory effect on the development of beneficial technical advances, most were surely failures. But in some ways these policies are both better and worse: better in that they may have served other political purposes and so are looked upon with affection by some, worse in that their overall effect on the rate and direction of technological advance for the entire economy was perhaps the most devastating consequence. To illustrate these points, let us examine a few sacred cows: the Clinch River Breeder Reactor, the Space Shuttle, the stack-gas scrubber requirements for new coal-fired power plants, and the bail-outs.

Clinch River[1]

The Clinch River Breeder Reactor was initially proposed as the facility that was going to "demonstrate" the economic feasibility of breeder reactors in the United States. The original idea was that the facility would cost $200 million, with the government paying 40 percent of the costs and electric utilities the remaining 60 percent. It was to be completed by 1978, with expenditures beginning in fiscal 1970. Risks of cost overruns were to be assumed by the reactor manufacturer, in the spirit of the "turnkey" era of light-water reactors a few years before.[2]

By the fiscal 1982 budget, the cost estimate had escalated to $3 billion, no construction had yet been started even though several hundred million dollars had already been spent, and the expected completion date was 1990 — that is, in twelve years the time horizon

for completing the project had not advanced at all. But the project remains the single highest priority energy research and development activity of the federal government.

This is all the more surprising when one examines the diminishing rationale for the project. In the late 1960s, the Clinch River Breeder Reactor was at the edge of technology; by the early 1980s, it was outmoded. The original rationale of demonstrating the commercial feasibility of breeders was also influenced by a strong economic case for them. Until energy prices began escalating in the 1970s, energy use had been growing substantially more rapidly than the overall economy. In order to provide generation capacity for rapid growth in elecricity use, nuclear reactors were expected to be far more important in the United States energy picture than they in fact turned out to be. Breeders were expected to be an economic necessity by the mid-1980s because of the importance, by that time, of their effects on fuel supply and waste disposal requirements.

Rapidly increasing real prices of all forms of energy during the 1970s caused the United States to turn to energy conservation, rather than increased supplies. Regulatory and political problems certainly affected the growth of nuclear power; however, had energy use grown as rapidly as had been predicted, these factors probably would have been overcome by an overwhelming economic need for more generation capacity. But stagnant energy demand made it inexpensive to oppose nuclear power. In any case, between 1970 and 1980 the predicted date at which the country would need breeders was moved from

1985 to 2020 — that is, the date was speeding into the future at a rate of 3.5 years per year! Meanwhile, numerous technical problems arose in the design of the Clinch River reactor that required more research and development.

In the private sector, all of these facts would quite likely have led to a reorientation of the program away from commercialization and back towards research. The distant time-horizon for an economic need, the technical problems encountered in design and component production, and the escalating cost of the basic technology would all have pointed towards this change in emphasis. But for Clinch River, the declining importance of a commercial feasibility demonstration led to a redefinition of the purposes, but not the nature, of the project.

The first change was to redefine the thing to be demonstrated from economic feasibility to technical feasibility — that is, to show that a breeder reactor of this size and type would work. But in the mid-1970s, two things were happening. In Europe, technical feasibility of the concept of a breeder was already demonstrated by the French Phoenix. In addition, the design of the Clinch River Breeder Reactor with respect to fuel composition, the nature of the heat transfer system, and other technical matters came increasingly into question as a potentially useful technology to demonstrate. Interest began to grow in experimenting with different approaches to improve performance, reduce costs and enhance safety.

That the Clinch River reactor gradually became a technology in which there was declining interest in a technical demonstration led

once again not to a redefinition of the program back towards research, but a redefinition of the objectives of the demonstration. By the late 1970s, it became to demonstrate the possibility of building and operating a breeder, regardless of design or economics. One element was to demonstrate that it was feasible to license a breeder reactor in the commercial (as opposed to experimental) reactor licensing process at the Nuclear Regulatory Commission; e.g. the Department of Energy was to demonstrate that the Nuclear Regulatory Commission could perform its function. The other element was symbolic: to demonstrate nationally and internationally the commitment of the United States to nuclear power in the face of political opposition to it at home and abroad.

The lesson of the Clinch River Breeder Reactor as I interpret it is as follows. The government, once committed to a large-scale, technology-forcing demonstration project faced great difficulty in turning it off. This observation has nothing to do with the wisdom of the nuclear power strategy for future energy development, nor of the breeder concept. Assuming that the United States must continue to depend heavily on nuclear power and, by 2020 or some such date, must have a commercialized breeder technology, the conclusion still remains that Clinch River should have been canceled several years ago. The attenuated time horizon for its need, the unanticipated technical problems, and the results of the Phoenix demonstration in France all should have led to a major reemphasis in the breeder reactor program towards research on components of the system where technical uncertainties remained. But once a commitment was made to demonstration, it proved difficult to turn off.

The source of the continuing commitment to the project has been Congress. In nearly every year since 1970, Congress has ended up appropriating more for the project than was requested by the President. And, in the late 1970s, the Carter Administration tried to reallocate substantial portions of the Clinch River budget to the larger research program in civilian reactors generally and the specific research program dedicated to liquid metal fast breeders. In fiscal 1979, Congress more than doubled the President's request, and in fiscal 1980 and 1981, when the President requested nothing for the Clinch River program, Congress continued to allocate full funding.

The effect on the American research program for nuclear power has been dramatic. In 1970, Clinch River was estimated to consume about 1 percent of the total budget for research on civilian reactors and 2 percent of all research on breeders. By 1982, these proportions were 34 percent and 40 percent, respectively. Opponents of nuclear power may find some solace in these figures, but proponents who believe in the future of nuclear energy and the breeder ought to wonder whether this continued pursuit of an outmoded, costly project will undermine the nation's ability to develop a usable technology.

Space Shuttle

The original idea of the space shuttle circa 1970 was to develop a commercially important space transportation system that used reusable launch vehicles that could carry large payloads at a cost per

pound that was much lower than could ever be achieved with expendable launch vehicles. The aim was twofold: to reduce the costs of launches for civilian and military space programs, and to achieve low enough costs for business to find space commercially attractive for some manufacturing activities.

Of course, building a reusable launch vehicle that was capable of carrying a manned crew and a very large payload was known to be very expensive compared to building an expendable launcher for smaller payloads. The plan was to make up the cost differential by using the space shuttle very frequently over a long useful life.

Unfortunately, as work on the space shuttle progressed, unanticipated problems arose — as might naturally be expected in any research and development activity that attempts such a great leap forward in technology. For one thing, expectations about the size of the payload had to be scaled back as it became clear that the space shuttle was going to have substanitally less power at launch than was originally hoped. For another thing, the turn-around time on the ground had to be longer, and cost much more, than was initially expected because the vehicle was less resilient, and more vulnerable to its own shaking at launch, than was initially expected. Of course, smaller payloads and less frequent, more costly launches meant that the cost per pound of payload went up dramatically — so much so that it may never catch up to expendable vehicle capabilities. With these developments, of course, the interests of business in commercial use of shuttle capacity faded -- somewhat fortunately in a sense, since the number of launches that were possible shrunk so dramatically that they approached the number needed for military and civilian space programs.

All of these things became evident in the mid-1970s, and became painfully obvious a few years later as the space shuttle began to absorb an increasing share of the nation's space budget. Indeed, cost-overruns led to drastic cuts in the most dramatically successful part of the space program during the period, the unmanned photographic missions to the planets (and the attendant scientific work that occupied most of the space on these missions). This was, of course, ironic, in that one purpose of the space shuttle was to reduce launch costs for deep space missions so that, among other things, the nation could afford more and better space science.

Once again, the rational business strategy circa 1976 or 1977 would have been to reorient the program. More research was clearly going to be required on both the launch system and the spacecraft itself if the objective of low costs and large payloads was to be achieved. Meanwhile, great progress had been made on expendable vehicles, which were providing increasingly reliable and inexpensive service. Thus, continued primary reliance on expendable launch technology, with a space shuttle program designed more for research and development purposes than for commercialization, was a preferable option for all concerned: the military, NASA and potential private sector customers.

Instead, the nation redefined its goals in the space shuttle program and proceeded to convert it to the only American launch system. The policy became the following: (1) to base the American launch system on the necessity to use men as pilots, rather than unmanned systems, as an end in itself, rather than because the former was in some sense a better approach; and (2) to redefine the purposes of the space program as being those things that best suit the shuttle, rather than designing a launch system to perform the nation's most desired objectives. By the 1980s, all civilian space missions had to be designed to use the shuttle, even though that meant using a more expensive launch system (and thereby fewer missions for a given budget) and ruling out some of the more promising missions for which the shuttle was unsuited (even though they would be cheaper than the less desirable substitutes that the shuttle can handle).

As with the Clinch River Breeder Reactor, the space shuttle demonstrates the tenaciousness with which government demonstration programs cling to life long after their commercial appropriateness has been called into question. And, like Clinch River, the cost to the American space effort may well be that we lose our leadership. While we have been developing the space shuttle, the European Space Agency has been developing the next generation of expendable launch vehicles, and soon will be able to undertake cheaper and better space projects than we can. The space shuttle has caused us to cancel our participation in one major multinational activity, the International Solar-Polar Mission, and to be the only country active in space that will not investigate Halley's Comet when it next passes in 1986. The Japanese, Europeans, Canadians and Russians will all be there. Meanwhile, there is some chance that by 1986 the space shuttle will still not be capable of launching a spacecraft for planetary exploration.

Were the sacrifice of scientific objectives accompanied by a commerically usable vehicle, the cost/benefit calculation would at least have some chance of proving the program worthwhile. But the program has no significant benefits that could not have been achieved by a scaled down program: one or two space shuttles instead of five, one space shuttle port (at Kennedy Space Center) rather than two (the second will be Vandenberg), and continuation of parallel development of expendable vehicles. Like the breeder, the space shuttle was pushed too fast; unlike the breeder, we have gone one step further, placing total reliance on the new technology long before it is ready. And, like the breeder, the impact on other elements of the space program — both research and utilization activities — is seriously to retard progress, and perhaps cost the nation leadership in a major new technical arena.

Scrubbers

A political event of major national importance in the late 1960s was the rise in popularity of government programs in the environmental, health and safety area. Especially important was significant increases in the commitment of government to improve air and water pollution.

A major early skirmish in the battle to clean up the environment was the controversy between regulators and the automobile industry over emissions reductions for automobiles. The reluctance of some in the industry to take any significant steps in this direction led proponents of environmental policies to conclude that business could not be relied upon to improve technology for emissions reduction. The result was a new concept, technology-forcing regulation, whereby government would require universal adoption of technologies either that did not yet exist or that were currently so expensive and/or ineffective that they did not make sense to adopt. The idea was that by forcing technology, government would create the necessary pressure on industry to come up with something that worked — and to guarantee a market for it when it was developed.

An excellent example of this type of regulation is the new source performance standards for coal-fired electric generation facilities that were written into the Clean Air Act amendments of 1977.[3] These require a fixed <u>percentage</u> reduction in potential emissions, regardless of the characteristics of the fuel that is used, that can only be satisfied by installing stack-gas scrubbers. What this means is that electric utilities have no reason to burn relatively clean coal -- coal that has a very low sulfur content — for even if they do, they must still reduce their emissions by the same fixed percentage that would be required if they burned dirty coal. Burning clean coal with no scrubbers is both cheaper and creates less pollution than burning dirty coal with a scrubber. Thus, the new source performance standard, by pushing the industry towards scrubbing technology, achieves worse environmental results, but manages to cost more in the process.

This is not the only effect. By making new coal-fired plants install scrubbers, Congress created an economic incentive not to build new generation facilities. Instead, utilities will find it more attractive to keep old, inefficient facilities -- which normally are not required to use scrubbers. The older facilities are even more polluting, and are less efficient in the conversion of fuel to electricity. Thus, in addition to having more pollution and higher costs than are necessary, the nation also has the pleasure of using its energy resources faster.

The effect of such a decision illustrates an important consequence of poorly designed regulatory programs. Every measure of productivity we can imagine will suffer from retarding the rate at which new technology (here electric generation plants) is adopted and, when it is adopted, insisting that it use inefficient methods to achieve regulatory goals. Lower sales of generation equipment will lower the incentives to invest in research in the technology. Now, if the result were maximal achievement of environmental goals, one could at least have an interesting argument about whether the effort was worthwhile; however, the approach of specifying the scrubber technology (not allowing an equal chance for coal desulfurization and low-sulfur coal, or even combinations of the three that involve less scrubbing) gives one technology a boost, but handicaps others that

look more promising both economically and environmentally. To justify these standards, the government had to redefine its goals in dealing with electric generation facilities. No longer was the object of policy to reduce SO_x emissions for electric generation facilities and thereby reduce particulate matter in the atmosphere as well as acid rain. Instead, the objective became to promote scrubber technology.

<u>Bail-Outs</u>

The last example from the 1970s to be examined here is the emergence of quasinationalization of failing firms and industries. Three important cases are the railroads, Lockheed and Chrysler.

In each case, the government can claim to have been partly responsible for the problems of the failing firms. Lockheed was subjected to considerable pressure to use Rolls Royce engines from Britain for reasons of international relations. This was not a good choice, for the bankruptcy and nationalization of Rolls Royce was partly responsible for cost and delay problems in introducing the L-1011 aircraft in the wide-body market. The railroads' problems were surely aggravated by transportation regulation, which has tended to favor airlines and trucks and, therefore, has contributed to the decline of the railroads. Chrysler, as all American automobile manufacturers, has suffered because complying with various regulatory standards for emissions, safety and fuel efficiency is more difficult for large cars than for small ones.

At the same time, the policy necessity of saving all three, particularly in the manner it was done, can be called to question. The L-1011 was one of three wide-body aircraft introduced at about the same time in the United States; had the L-1011 not been introduced, it is not at all clear that the entire slack would not have been taken up by Boeing and MacDonald-Douglas. Moreover, to the extent that the L-1011 was a commercially viable product, bankruptcy of Lockheed would not have led to the cancellation of the plane and the shut-down of the assembly line. Rather, the Lockheed creditors would have sold or reorganized L-1011 production as a valuable going concern.

The railroads, meanwhile, have suffered at least as much from their own management and labor practices as from regulation. Moreover, some rail services -- notably passenger trains — are probably uneconomic in any case in the American market. Even European passenger rails also tend to be big subsidy sinks.

Chrysler also is not free of responsibility for its fate. It was laggardly in shifting to smaller cars even in relation to other American manufacturers, and was the most resistant of the three major manufacturers to environmental, safety and fuel efficiency regulation.

But the real question is not whether in some sense these companies ought to be saved through subsidies (Chrysler or Lockheed) or even nationalized (some railroads). More important is the implication of the policy for the overall performance of the economy -- and with regard to the government's abilities to make decisions

about the structure of the economy. To be willing to save very large firms when they are in trouble is to do two things: to lessen the cost of mismanagement and an eroded competitive position, and to favor large, bureaucratized companies over companies that are not large enough to be politically visible and therefore eligible for help. In automobiles (and steel as well), productivity per worker in the newest plants is high; the problems, in addition to high labor costs, have to do primarily with older, lower-productivity, outmoded facilities. Saving companies with heavy investments in the old — and keeping them operating at losses -- obviously hurts rather than helps in advancing productivity. Moreover, while the largest firms have historically been an important source of steady, incremental change in technology, major break-throughs have tended to come from smaller companies. Innovation in relation to size tends to be highest among medium-sized firms.[4] Encouraging firms to be large and politically visible so the government will bail out their mistakes is therefore contrary to the nation's interest in rapid technological advance.

<u>Summary of Lessons from the Seventies</u>

These and other examples of government actions affecting technological advance produce some lessons. First, government tends to pick losers that the business community elects not to touch. Second, once into something, the government has a hard time changing direction or backing out. In regulatory policy, this has been called the "tar-baby effect": the tendency of one regulatory action to lead to another to offset the unanticipated problems of the first.[5] But the phenomenon is more general: the government could not cut losses or change directions in Clinch River or the space shuttle, and a sequence of poor policy choices ended up with the new source performance standards in environmental regulations and bail-outs and nationalizations in rails, autos and aircraft. Third, government is prone to redefining objectives as a program evolves, rather than adjusting programs to meet the initial objectives. Moreover, there is a natural progression from efficiency objectives to technical objectives to symbolic objectives as the program unravels more and more. When one hears politicians talking in vague ways about "showing the world we are still commited to X," one knows that the technical and economic merits of the project no longer justify it!

The Political Economy of Industrial Policy

The task that remains is to find a systematic explanation for why the preceding observations are true. The search starts with the following presumption: that the people who advocate policies like the ones described above are intelligent and are rationally pursuing objectives that are sensible. The explanation sought should not turn on the superior wisdom of the critic, but the differences in perceptions between the critic and the advocate about what is worth doing -- and why these differences might arise.

The argument made here is that the political environment is not primarily interested in efficiency because the incentives facing people in politics are not closely related to it. Consequently,

government actions will give very little weight to these concerns. As a result, an industrial policy at the level of specific firms, industries and regions is especially pernicious, for goals other than efficiency, productivity advance, and performance will dominate the actions of the government.

The analysis begins with two assumptions: politicians want to be reelected, and citizens are motivated by self-interest when confronted with matters of national economic policy. What follows will be some simple propositions derived from these assumptions.

First, when a politician calculates the costs and benefits of a proposed policy, the procedure is quite different than for conducting an economic benefit/cost analysis. The politician, seeking reelection, seeks to provide benefits to constituents in the hope that grateful constituents will be favorably inclined on voting day. One of the deliverables is government goods. Another is the expenditures on their production that are made in the district of the specific member of the legislature who can then claim credit for getting the project. Thus, some elements of the economic cost of a program will be perceived as a benefit by politicians.[6]

A second source of difficulty is the low information content of most elections, and the implications this has for campaign strategies. A rational voter, having little effect on the outcome of an election, will devote little time and cost to gaining expertise on a wide spectrum of issues in order to identify the best candidate. Instead, voters will be quite passive, responding to information provided for them by others and assessing candidates on the basis of their perception of the general state of affairs and any personal experiences with politicians that they have had. From the standpoint of a candidate, this creates a strong incentive to campaign on issues that are not controversial, and to avoid specific discussions on issues in which the candidate may have participated in a decision that was either controversial or a mistake.[7] Among the characteristics of politicians that this induces are never admitting mistakes, finding scapegoats (preferably in the bureaucracy) for the mistakes that become public issues, favoring extensive bureaucracy for taking blame and for extensive symbolic reporting and monitoring of a program, emphasizing vague, symbolic issues (international threats, general economic progress), and taking credit for jobs and projects when dealing with recipients of federal contracts.

A third problem is the procedural bias in government processes in favor of the old over the new. The Constitutional due process clause has led to the development of a number of procedural and substantive safeguards for people who might be harmed by a change in government policy. Moreover, political processes tend to favor the established over the proposed because the identity of the beneficiaries of the status quo is normally better known than the potential winners if a change takes place. For example, the people who work at an inefficient plant that is threatened with closure are identifiable and usually organized, whereas the people who will work at a modern, efficient facility to be opened in the future are not

fully aware of that fact, and are probaby not organized. Thus, once a government activity is undertaken, a political constituency is created for continuing it that is stronger than the constituency that brought it about. The result is apparent in Congressional voting on program budgets. Programs that are highly controversial when enacted and that pass by very slim majorities within a short time are likely to be reauthorized and budgeted by near-unanimity. An outstanding example is Medicare, a program that took several years to pass and eventually barely squeeked through, but that within a few years had become an untouchable, "uncontrollable" item in the budget of a very conservative Republican President.

Finally, as far as the dollars at stake are concerned, the "politics of efficiency" is small potatoes in the greater scheme of things at stake in the political process. When the economy is performing poorly, productivity is "creeping" along at 1 or 2 percent per year; when the economy is really humming, it is "racing" forward at 3 or 4 percent! Thus, at stake is 1 or 2 percent of national income. And, of course, on any specific issue, the productivity effect is very tiny -- no single government program accounts for a very large fraction of the total effect government has on technological advance and productivity enhancement. The amount of money at stake in a government program usually will be very large in relation to its productivity effect; hence the quest for establishing the size of the program and obtaining the contracts will dominate all else.

All of these phenomena add up to the pattern we have observed in the government programs described above. Programs are undertaken to provide benefits to constituents in numerous forms besides the particular objective of the program in terms of ultimate output or outcome. Hence, a program with poor technical and economic prospects (e.g. a loser) may be adopted because of its favorable impact on supporting constituents. In any event, once the program is underway, it generates new political momentum from its costs as well as its benefits. In addition, political actors will seek to avoid careful scrutiny of its progress, especially if the technical success does not become an important political issue. Even if the project becomes known in the government as less than a success, there will be important political reasons to continue to defend it -- and to defend it in the form of symbolic, general issues that are least likely to stir controversy.

These arguments all operate at the level of the general theory of the political process with respect to a broad category of programs -- namely, programs that involve specific, visible expenditures or other actions that hit specific subsets of the population. Targeted programs for enhancing technology, like Clinch River and the space shuttle, have characteristics placing them in the same category as rivers and harbors, post offices, and other elements of the political pork barrel. So, too, do industry-specific assistance programs, like bail-outs and technology-forcing regulation. Thus, the characteristics observed in these activities, and in particular the

tenacious clinging to a poorly performing approach, is a predictable feature of any such program.

For this reason, to undertake to solve the nation's technical and productivity problems through government demonstrations and other targeted, big ticket industry aid programs is likely to hurt, rather than help, the economic future of the country. Such programs in the 1970s deflected technical resources into large projects that had low payoffs, and kept resources in places where productivity was neither high nor advancing.

The preceding argument does not lead to the conclusion that government has no necessary or beneficial role in enhancing the growth of productivity. The logic of the preceding argument warns against certain kind of approaches, not against policy altogether. The key is to structure programs such that a major theme for assessing them is performance, and to avoid the political benefits of economic costs. All expenditure programs will have the characteristic of generating their own political inertia; however programs that lack the targeting feature, that cannot easily become aimed at a specific industry or geographic region, stand a better chance of success, as do programs where individual technical decisions are not made, and do not have to be defended, by political leaders. General support for research and development, especially without targeting to a specific industry and without government management of the projects, is likely to be freer of distracting political incentives than targeted programs are likely to be. A similar argument can be made for programs to support expanded technical education or for tax incentives for corporations to undertake more research.

Since the middle of the nineteenth century, the American economic system has performed quite well. Our problems in recent years should not make us lose sight of the overall historical record, which is impressive, indeed. One interpretation of the decade of the 1970s is that the economic system that brought us this far is now outmoded, and requires a far more active role for government in selecting and promoting new technology. Another interpretation is essentially exactly the opposite: that the lesson of the 1970s should be that we began in earnest to undertake such a government policy, and it produced very poor results.

The government has done quite well in research and development activities that have not had commercialization as a primary objective. The Apollo Project at NASA is an outstanding example. But the country may have made a false generalization in believing that government commercial demonstration projects would work out as well. The economic and political forces at work in the latter simply do not mesh with high performance. The tenacious commitment that is necessary for an Apollo Project to push ahead regardless of the costs and problems is inappropriate when the purpose is economic performance, not technical achievement. Recognition of the differences in orientation between government and business is essential to designing public policies that work — and especially so in trying to attack the productivity problem in a way that proves effective. The lesson is to

stay away from programs that look like pork barrel; to keep the government operating at a high level of generality in program areas that enhance the nation's underlying technical resources, but to avoid asking the government to pick winners.

FOOTNOTES

1. I am indebted to Linda Cohen for most of the research and ideas in this section; see her paper, "The Clinch River Breeder Reactor: Background and Discussion," California Institute of Technology, May 1982.

2. H. Stuart Burness, W. David Montgomery and James P. Quirk, "The Turnkey Era in Nuclear Power," Land Economics 56 (May 1980): 188-202. That the turnkey episode nearly bankrupted manufacturers of light-water reactors seems to have been overlooked by officials who planned to duplicate the program for breeders.

3. For a thorough analysis of this case, see B. A. Ackerman and W. T. Hassler, Clean Coal/Dirty Air, New Haven: Yale University Press, 1981.

4. On the relationship between industrial structure and innovation, see Edwin Mansfield, Industrial Research and Technological Innovation, New York: Norton, 1968; and F. M. Scherer, Industrial Market Structure and Economic Performance, Second Edition, Chicago: Rand McNally, 1980, Chapter 15.

5. James McKie, "Regulation and the Free Market: The Problem of Boundaries," Bell Journal of Economics I (Spring 1970):6-26.

6. Barry R. Weingast, Kenneth A. Shepsle and Christopher Johnsen, "The Political Economy of Benefits and Costs: A Neoclassical Approach to the Politics of Distribution," Journal of Political Economy 89 (1981).

7. On the theory of campaigning in low information elections, see Morris P. Fiorina, Retrospective Voting in American National Elections, New Haven: Yale University Press, 1981; Morris P. Fiorina and Roger G. Noll, "Majority Rule Models and Legislative Elections," Journal of Politics 41 (November 1979):1081-1104; and John A. Ferejohn and Roger G. Noll, "Uncertainty and the Formal Theory of Political Campaigns," American Political Science Review 72 (June 1978):492-505.