CHAPTER 12

Federal Policies Affecting Electronics: Options for the United States

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Overview

In 1982 electronics accounted for 10 percent of U.S. merchandise exports; manufacturers of electronic products contributed 4 percent of U.S. gross domestic product and 9 percent of total goods output; the industry employed more than a million and a half Americans. Beyond this, the electronics industry produces goods and knowledge that are vital for much of the rest of the economy and for society as a whole. Banks, insurance companies, and many other service sector enterprises could hardly conduct their businesses without electronic data processing. Entertainment industries like television broadcasting developed in conjunction with the manufacture of consumer electronic products. Before too long, prosthetic devices for the handicapped will routinely be built around "smart" microelectronic devices. Modern commercial aircraft depend as heavily on radar, computerized flight control systems, and electronic navigation aids as do military planes. Over the rest of the century, computer-aided manufacturing—shop floor management systems, automatic warehouses, smart robots—will help increase productivity and reduce costs throughout the Nation's manufacturing sector. If there is any single industry whose technological progress and competitiveness are critical to the economic growth and national security of the United States, it is electronics.

Yet even the most dynamic portions of the U.S. electronics industry—semiconductor production, where innovation is a way of life, computers, where markets seem to expand nearly as rapidly in bad times as good—find themselves increasingly challenged by foreign manufacturers, both here and overseas. Although few European firms have managed to capitalize fully on their technology—because of fragmented markets and less than inspired translations into commercial products—determined efforts, strongly supported by national governments, continue in countries like France and West Germany. Japan has moved swiftly from a position as technological laggard to being one of the leaders—not only in product development, but in the fundamentals of electronics technology. The strengths of the Japanese industry have been described in previous chapters: an ample supply of skilled and motivated employees; managements that approach markets on a global scale and have learned to do business effectively in countries ranging from Saudi Arabia to the United States; an economic system in which the tradeoffs between competitive rivalry and cooperation aimed at advancing common goals are well-managed; a government whose industrial policies consistently support and encourage the private sector. In the language of sports, the Japanese electronics industry has momentum. Elsewhere in Asia, developing countries can already make many consumer electronic products and components at less cost than Japan or the United States; these countries will continue to move into more sophisticated goods—though at first continuing to focus on consumer markets—supported by export-oriented industrial policies. Hong Kong, for one, has already made the transition from discrete transistors to integrated circuits (ICs)—computer chips as well as those for consumer products. This is not to say the American electronics industry risks overnight decline, It does mean that competition *will be difficult in the years ahead, and neither the technological leads that the United States still maintains nor the size and affluence of our domestic market will suffice to guarantee American primacy.*

Intensifying competition worldwide—in electronics, as in industries ranging from steel to biotechnology—is one reason the United States

might choose to move toward a more explicit industrial policy of its own. If other countries are adopting policies in support of industries like electronics—and having some success, or, more tellingly, moving down learning curves leading to more consistently productive efforts–then it makes sense to ask whether such an approach could also work here. Such questions need to be addressed in terms of concrete policy objectives and prospective mechanisms for achieving them—matters to which this chapter is devoted.

The United States could afford to live without a consciously formulated industrial policy in years past, but the realities of international economic competition changed dramatically during the 1970's. The "information society" is here; industries are no longer defined by national boundaries; new jobs are opening for Americans who are computer-literate at a time when employment of other types is in decline. If new approaches to industrial policy are to be considered, what is the range of possibilities?

After a brief review of the ad hoc nature of past U.S. industrial policies, the chapter outlines five options for a more focused approach:

- protection of, domestic markets;
- a "critical industries" policy;
- an orientation toward infrastructural support—primarily for technological development—and adjustment;
- promotion of competitive U.S. firms on a worldwide basis; and
- Federal withdrawal, where possible, in favor of the private sector.

The five are intended to span the realistic alternatives; they overlap somewhat—in several cases specific policy measures would be similar if not identical. Still, if the five options themselves are not exclusive, they are distinct. Each is discussed in terms of prospective effects on electronics—and, by extension, other high-technology sectors.

The options are discussed in terms of directions and objectives; they are intended to offer a set of alternative signposts. All start from the same point: the patterns of worldwide competition outlined in the preceding chapters; the increasing capital-intensity of critical sectors of the electronics industry; its continued dependence on research and development (R&D); needs for skilled labor and imaginative management. But each alternative implies a different route to a different destination.

The Current Policy Environment

Chapters 10 and 11 summarized U.S. industrial and trade policies as they affect competitiveness in electronics, contrasting them with policy approaches abroad. Federal policies have been notably ad hoc, formulated and implemented by many different agencies, no one of which has overriding authority. Trade policies are neither very predictable nor closely linked with domestic industrial and economic policies.

Outside the trade arena, regulation of broadcasting and telecommunications has been a continuing influence on consumer electronics. Among the recent issues with potential impacts on U.S. manufacturers, either direct or indirect, are: the rights of owners of video taping equipment to copy off the air; the fate of AM stereo broadcasting (where the Federal Communications Commission has avoided decisions on a standard system); regulation of home information services and data communications (videotext and teletext may be slow in coming, but will eventually be integrated into home entertainment and information systems). As with regulation of cable TV and rights to satellite transmissions, such matters may have only indirect consequences for manufacturers of consumer electronics products, but impacts that are no less real for this,

The U.S. semiconductor and computer industries benefited in their early years from Government-funded R&D and procurements;

military and space programs drove developments in microelectronics until the 1960's, while both civilian and military sides of the Government have been heavy purchasers of computers and related equipment. Although Federal R&D is still significant for both microelectronics and computers, particularly in terms of more basic research—and in the case of the Defense Department's Very High-Speed Integrated Circuit (VHSIC) program, process technology and applied research as well—it is now decidedly secondary to the industries' own spending. Furthermore, the declining fraction of total markets for both semiconductors and computers accounted for by Government has made Federal procurement a much weaker force than 10 or 15 years ago.

Indirectly, a wide variety of public policies affect U.S. semiconductor and computer firms: support for education and training, particularly of technical professionals; regulation of data communications; the 1982 antitrust settlements with IBM and AT&T; copyright and/or patent protection for chip designs and software; tax policies as they influence competition for funds within U.S. capital markets. On the other hand, Government policies directed specifically at the semiconductor or computer industries—either in the domestic context or in terms of their international competitive positions—are remarkable by their absence, the vacuum a striking contrast with ambitious, comprehensive, and supportive (if not necessarily very cost-effective) public policies in other countries. A major exception to the absence of policy is antitrust.

American electronics firms have often complained that antitrust enforcement hinders cooperative R&D and joint ventures in international trade—which, if allowed, would strengthen this country's competitive position. The Department of Justice—and, to the extent that it is involved in antitrust enforcement, the Federal Trade Commission (FTC)—reply that such cooperative activities are, in fact, generally permitted. The dialog, which has been going on for years, is part of the problem: Justice and the FTC have helped create a psychological climate in which industry is reluctant to test the bounds of the permissible, The two agencies generally act as if this status quo is desirable, with their public pronouncements nicely straddling the relevant issues.[1] While the enforcement attitudes of the Reagan administration differ somewhat from those of its immediate predecessors, the more relevant concern—at least from the viewpoint of Congress—might be: Do the antitrust *statutes* need reconsideration in light of changes in the character of international trade and competition since the Clayton and Sherman acts were passed in the early decades of the century? Where would antitrust fit within a more coherent U.S. industrial policy?

Beyond the intangible effects of Federal antitrust enforcement—beginning with their force in restraining clearly undesirable forms of anticompetitive behavior—chapter 10 mentioned the two recent and major antitrust actions directly involving the electronics industry—suits against IBM and AT&T, both recently settled, In both cases, critics of U.S. antitrust enforcement had claimed, with some validity, that the Government was trying in the name of competition to break up enterprises that were mainstays of U.S. competitiveness.

Regardless of possible rewrites of communications legislation by Congress, the AT&T settlement will change the form and function of Bell Laboratories. A weakening of the basic research foundation that Bell Laboratories helped

[1] Consider this quotation from the "Statement of William F. Baxter, Assistant Attorney General, Antitrust Division, Before The Subcommittee on Employment and Product ivity, Committee on Labor and Human Resources, UnitedStates Senate, Concerning Antitrust Policy and Productivity, Apr. 16, 1982, " pp. 12-13, "Joint ventures may foster efficiencies not available to individual firms, and may promote technological progress and enhance productivity. Such joint ventures should not be deterred by rigid or overly-broad applications of the antitrust laws, The Department's recently published *Guide Concerning Research Joint Ventures* is intended to assist businesses considering joint ventures by clarifying our enforcement policies in this regard, For example, as the *Guide* indicates, an important factor is whether a joint venture leaves a significant number of non-participatin firms free to engage independently in research. [f there are not a significant number of such non-participating firms, and the joint venture's research could be done individually by the participating firms, antitrust problems could arise. " Much of the lore of antitrust resides in such pronouncements.

lay for so much of the U.S.–and world–electronics industry seems inevitable. The reason is straightforward: Western Electric—the parent and main customer of Bell Labs—will be operating in a more competitive environment, It will lose some of its "guaranteed" markets, as well as implicit subsidies paid for in the past by all telephone subscribers. Western Electric and Bell Laboratories will have to learn to deal with a less predictable set of market conditions; basic research is likely to appear more in the nature of a luxury—and hence be deemphasized. Unless alternative mechanisms for performing basic research and diffusing the results evolve and thrive, one of the great sources of strength for the entire U.S. electronics industry will atrophy. The potential void is not restricted to microelectronics, but extends to communications and computer technologies as well; Bell Labs spawned the Unix operating system now so popular in small computers, as well as the transistor,

Leaving aside the special case of antitrust—and perhaps trade policies also, where activity has remained at high levels if without much sense of direction—Federal policies affecting electronics have been marginal, indirect, often simply absent. To those who regard Government involvement in the affairs of industry as a usually unnecessary evil, this may seem a blessing. But the reasons for the absence of policy are not so much conscious decisions that Federal initiatives would be counterproductive as a lack of agreement about what Government can and should do. The subject has been discussed—at considerable length, and in contexts ranging from trade reorganization to the Federal role in productivity improvement and the quality of working life. But the various parties disagree—beginning with the question of whether the U.S. Government should develop policies aimed at affecting the competitive position of American industries, and extending to questions of how the electronics industry, in particular, might fit into a more general framework for industrial policy.

On the one hand, some argue that the United States needs to search for new engines of growth to drive the economy into the 21st century. Others focus on organization, some advocating that the Department of Commerce be transformed into a more powerful agency—even a "Department of International Trade and Industry" modeled after Japan's MITI and responsible for coordinating and implementing policies on a sectoral basis. Another view, while agreeing that new mechanisms are needed if the Nation's de facto industrial policy is to be replaced by a more systematic approach, takes dispersal of responsibility for making and implementing policies to be a hallmark of the U.S. system, and sees a single centralized agency as impractical, if not dangerous. Still others, focusing on financial issues, argue that the first priority of the Federal Government should be to channel investment capital to speed "reindustrialization''--for example, through a publicly operated investment or development bank, In any of these views, electronics would plainly be an early subject of attention,

The dominant attitude within the executive branch since the election of President Reagan has run counter to the more activist positions. The Reagan administration has held that the proper role of Government is to stay far removed from the affairs of industry. Those of such persuasion believe that businessmen, rather than Government officials, have both the right and the ability to make decisions affecting the futures of their firms—and thus the futures of the industries of which they are members, and the competitiveness of the U.S. economy—that Government is largely incompetent in these areas. The corollary is that decisions made by private interests will affect local and regional economies, as well as the interests and livelihoods of the people who work for or otherwise depend on private industry.

Those at the extreme end of the spectrum hold that Government should minimize its efforts at macroeconomic policymaking, claiming that the Keynesian economists—who, many years ago, defined a government role in managing the aggregate economy through fiscal and monetary policies—represent a bankrupt tradition, Tax reductions and other measures aimed at capital formation, rather than de-

mand management, have been in vogue among the proponents of this view. Still, even advocates of supply-side economics or monetarism commonly maintain that—while Government should stay out of the affairs of business—it can and should ensure a climate conducive to economic growth.

There is a core of truth to the claims of those who advocate a Government pullback from micro-level involvement in economic affairs—this truth found in the past history of public policies that have affected U.S. industries with sometimes adverse consequences, to say nothing of the lack of relevant expertise and analytical capability in the executive branch. On the other hand, it is *clearly possible to devise a self-conscious industrial policy that does not depend on direct or extensive Federal intervention.* Thus, even if one feels that the political system in the United States works in such ways that Government involvements will always be riddled with mistakes and policy failures, this is more a counterargument to proposals for a strong, centralized industrial policy apparatus than to the *general* notion of a more explicit and coherent industrial policy,

In essence, two of the attitudes sketched above—centralized industrial policy versus Government pullback—represent extremes in opinion concerning the form and character of future industrial policies for the United States, Industrial policies have existed for several hundred years in this country; Federal Government actions will continue to exert influence over private sector decisions, On questions of how the process might be changed, as on specific policy issues, there are many shades of opinion, a variety of perspectives that fall between the extremes. These are illustrated in the remainder of the chapter.

Alternative Perspectives on Industrial Policies

Regardless of one's attitude toward Government involvement in economic affairs—when and where appropriate, for what reasons—policy choices will flow in part from analyses of the position of American industry, and the interpretations placed on these analyses, Each of OTA's five alternatives has as its foundation a somewhat different interpretation of the competitive situation of American electronics firms; while the discussion that follows takes its context from this industry, the policy options are not specific to electronics, or even to high-technology industries as a class. The five alternatives—which overlap to some extent while representing fundamentally different viewpoints—are:

1. policies intended to *ensure a strong domestic market base for U.S. industries*—without particular reference to the *nature* of the industries—along with preservation of existing jobs and job opportunities.
2. Policy measures designed to *protect and/or support a limited number of industries judged critical* on national security or other grounds.
3. Policies that will *support the technological base and institutional infrastructure for American industries,* particularly those undergoing structural change.
4. Policies designed to *promote the global competitiveness of U.S. firms and industries.*
5. A policy that *defers if possible to the private sector* when choices concerning industrial development are to be made.

All of these, even the last, accept at least implicitly that Government involvement in industry and the economy *is* inevitable—the questions being when, where, how, for what purpose. In each case, different sets of assumptions and goals underlie the policy orientation. From the repertory of policy tools available—outlined in chapter 10 and summarized in table 82—each of the five would call for a different mix and emphasis, The table is schematic, but gives an idea of the types of measures that

Table 82.—Measures Likely To Be Emphasized Under Alternative Approaches to Industrial Policy[a]

	Alternative				
	Protection	Critical industries	Infrastructure & adjustment	Global promotion	Minimum Government
Trade, foreign investment	✓	✓		✓	
Tax		✓		✓	✓
Competition (antitrust, merger)			✓	✓	
Human resources (education, retraining)		✓	✓		
Technology (R&D, innovation, diffusion)		✓	✓		
Investment (capital)		✓			
Government procurement		✓			

[a]This table is intended only to be suggestive; many possibilities exist under each alternative.

SOURCE Office of Technology Assessment

would be emphasized under each of the alternatives; a "critical industries" orientation, for instance, would entail a strong presence by Government compared to the other four.

Regardless of which of the five alternatives were chosen, a new approach to industrial policy for the United States would bring pitfalls as well as opportunities; experience in other countries shows that there is no substitute for good judgment in selecting and implementing individual policy measures. Table 82 stresses that it is not so much the individual policy tools but the way they are put together—the objectives pursued—that matters most, The remainder of the chapter treats the five alternatives in detail.

Ensure the Domestic Market Base for U.S. Industries

Protectionism is a loaded word. Not only does it imply reversal of the primary thrust of postwar U.S. foreign economic policy, but the arguments in support of open international trade are strong and widely accepted. Protecting domestic industries from import competition via tariffs, quotas, or other barriers distorts market mechanisms, decreases economic efficiency, and—by raising prices—results in a net loss in standard of living.' Hardly anyone disputes these general tenets; the issues more commonly raised concern the specific circumstances under which trade restraints might be justified to prevent or ameliorate greater harm to a few—vulnerable firms and their employees, communities and regions—at the expense of net benefits that, when spread over the Nation as a whole, are small.

Leave aside for a moment the political questions, as well as the use of protection to countervails the industrial policies of other nations, or unfair trade practices by foreign enterprises. The question is then an internal one: What are the impacts within the larger domestic economy of protection granted a particular industry? This is not only a matter of present-day costs and benefits—e.g., to consumers, to owners, managers, and other employees—but of the future prospects of industries granted protection. Some such industries may be in temporary decline, with reversal possible—others unequivocal victims of shifting comparative advantage. For example, long-term prospects for specialty steel manufacturers in the United States appear brighter than for makers of carbon steel. Not only do the technical demands of specialty alloys favor American firms, but the diversified, high-technology industries of the United States provide large and varied markets for alloy steels. Nonetheless, both specialty and carbon steel producers face short- as well as long-term problems. It is possible to argue on the one hand that trade protection will benefit specialty steelmaker by permitting them to rebuild their competitiveness so as to take advantage of longer term opportunities, while on the other that protection for carbon steel producers will

'For a brief review, see *US. industrial Competitiveness: A Comparison of Steel, Electronics, and Automobiles* (Washington, D. C.: Office of Technology Assessment, OTA-ISC-135, July 1981), pp. 181-182.

Photo credit RCA

American consumer electronic plant complex

only retard the inevitable contractions. At the same time, for domestic industries as large as steel or automobiles, the adjustment problems stemming from long-term shifts in competitiveness can be so severe that strong arguments for temporary trade protection can be constructed on this basis alone, This is one of the reasons escape clause actions are sanctioned under GATT (the General Agreement on Tariffs and Trade),

Bilateralism in Trade

Protective actions other than tariffs, involving—as they generally do-bilateral discussions with exporting nations, represent something of a turn away from the postwar U.S. emphasis on multilateral trade negotiations. Persistent trade friction between the United States and Japan has led to bilateral negotiations covering goods ranging from cigarettes to telecommunications equipment. Similar bargaining has taken place with European nations exporting steel, among other products, to the United States, as well as between Japan and the European Community—e.g., in the case of video cassette recorders (VCRS). S To some, this revival of a bilateral rather than multilateral approach to trade is a sign of possible return to the prewar era of widespread protectionism.

Bilateral negotiations between the United States and Japan first found a prominent place in U.S. trade policy during the early 1970's, when market penetration by Japanese textile imports became severe; in one of the more re-

[3]Faced with dumping complaints and informal import restrictions in France, Japan has voluntarily agreed to limit VCR shipments to the European Community. The ceiling will be 4.55 million annual]}, E, J, Dionne.Jr., "Japan Video Accord Leaves Europeans Wary but Hopeful,'" *New York Times*, Feb. 22, 1983, p. D5

cent cases, after a push from the U.S. side, the Japanese agreed in 1981 to accelerate tariff reductions on semiconductors (ch. 11). Further negotiations led to similar concessions on data processing equipment. Japan's continued reliance on tariff walls to protect domestic industries—whether or not they remain infants—and on an array of slowly crumbling and largely informal nontariff barriers, contrasts sharply with duties on imports into the United States that for many years have been low; as pointed out in the previous chapter, this country has only rarely imposed tariffs to protect domestic industries, preferring to negotiate quotas.[4]

Recently, those concerned with Japanese penetration into U.S. markets for products ranging from semiconductors to machine tools have been urging a variety of essentially protectionist responses. The mirror image of concern with imports lies in the persisting difficulties many American firms have faced in exporting to Japan, or investing there—even when the exports are goods in which the Japanese economy is uncompetitive. The paramount example has been agricultural products.[5] The perceived asymmetry has been a major force behind calls for reciprocity in trade.

While to some, trade reciprocity need not carry the implication of sector-specific bilateral concerns, to others it means just that: if nations such as Japan discriminate against U.S. exports or investment, we should retaliate swiftly and directly, During 1982, 20 or more bills related to trade reciprocity—and covering many shades of meaning—were introduced, with many re-introduced in the 98th Congress.[6] In April 1983, S. 144—the Trade and Investment Act of 1983, intended to strengthen the hand of the President in dealing with other nations—passed the Senate unanimously. House bills have made less progress.

Most broadly, reciprocity is a call for equal treatment, hence would entail measures to restrict imports originating in nations that themselves block the entry of American firms—particularly through indirect barriers. Spokesmen for the U.S. semiconductor industry, to take an example from electronics, object to unlimited imports of Japanese ICs at a time when they see themselves confronting a formidable array of obstacles to doing business in Japan—obstacles ranging from uncooperative customs inspectors to hidden controls on foreign investment.[7]

Pros and Cons of a Protected Market Base Strategy

Arguments for temporary as opposed to longer term or permanent trade protection turn on quite different points. Proponents of temporary protection for troubled industries often judge sharp upturns in import shipments, as for color televisions during the 1970's, to be particularly serious. Once lost, whatever the reasons, market share can be difficult to regain. Thus, a sudden penetration of U.S. markets—perhaps as a result of unfair trade practices—might devastate an industry, leaving it without the ability to recover. The remedy is to protect the industry. Whether the causes are lower costs for labor or other factors of production abroad, unfair trade practices such as dumping, or problems internal to the U.S. industry—which could range from outdated plant facilities to misjudgments of the market—the objective of Federal policy, in this view, should be to limit import penetration with the expectation that, after a limited period of relief, domestic firms will again be able to compete.

Preferred measures to achieve such goals depend on the circumstances of the import-affected sector. Examples from the recent past include tariffs, unilaterally imposed quotas,

[4] An outstanding exception has been the levies of 45 percent, declining over a 5-year period, placed on large Japanese motorcycles early in 1983. These were imposed as the result of an escape clause action. See "President Imposes Sharp Tariff Increase on Motorcycles, Japan Criticizes Act ion," *U.S. Import Weekly*, Apr. 6, 1983, p. 5.

[5] See, for instance, *Report on Trade Mission to Far East*, Subcommittee on Trade, Committee on Ways and Means, U.S. House of Representatives, Dec. 21, 1981.

[6] See A. Reifman and R. Ahearn, "Reciprocity y in Foreign Trade," Issue Brief No. IB82043, Congressional Research Service, Mar. 31, 1983. Most of these bills were intended to give the President added authority to impose restrictions on imports; several were directed largely at trade i n services.

[7] On the latter, see U.C. Lehner, "Japan's Aversion to Selling Companies May Be Ultimate Barrier to [J. S. Trade," *Wall Street journal*, Mar. 23, 1982, p. 38; also, S. Lohr, "Japan's Capital Market Has [J, S, Critics," *New York Times*, June 1, 1982, p. D3.

negotiated Orderly Marketing Agreements (OMAs), and voluntary restraint on the part of exporters. In industries where allegations of dumping have been common—consumer electronics, and, though there have been no formal complaints in recent years, semiconductors—alternatives to antidumping proceedings might be sought because legal redress has proven slow, notably in the case of television imports. The Trigger Price Mechanism for steel illustrates a more novel mechanism.

Beyond temporary protection, the notion that the Federal Government should provide a haven for U.S. industry appeals to many interests, Ostensible goals might be to help the American economy grow, to protect jobs, to maintain the prosperity of cities, States, and regions. What are the arguments for more comprehensive or longer term import restraints?

Policies designed to ensure a domestic market base for American industries might be justified on the assumption that a certain level of sales at home provide the necessary foundation for international competitiveness. In essence a variant of infant industry, senescent industry, and critical mass arguments, at root this perspective views import penetration as inherently dangerous, hence worthy of Government attention. Keeping out imports permits domestic manufacturers to achieve scale economies and to earn the profits necessary for investments in new production facilities and R&D. A protected home market would also insulate them from sudden and unexpected competitive threats, originating not only in profit-seeking overseas firms, but in government-controlled enterprises seeking to create jobs, earn foreign exchange, build industries that can support military adventures. In short, this strategy would insulate the Nation from the disarrays of a world economy that is simultaneously more open to all comers and more susceptible to manipulation by organizations seeking ends other than those of private corporations in the American mold.

If industrial piracy is too strong a term to describe foreign tactics, it is nonetheless true that nationalized enterprises can with considerable impunity set goals quite different from those of firms that must live off their own profits, And if not all countries have nationalized sectors the size of that in France, in many economies the incidence of government subsidy and control is such that market signals become distinctly secondary. The preceding chapter stressed the relative impotence of the traditional roster of trade laws—and of international negotiations—for countervailing the wide range of supports and subsidies that some governments now resort to. Those who see world trade as moving toward a no-win situation for the United States sometimes urge that we shut our own borders to imports, accepting the consequences in terms of reduced exports while relying on the size and diversity of the U.S. economy to keep productivity—more generally, the gross domestic product—high enough to maintain living standards acceptable to most Americans.

A related justification for trade restraints starts with international differences in wage rates—a point emphasized in chapter 4 (see table 27), Low-wage countries, many with huge and mounting labor surpluses, can now produce many types of goods at costs below those in advanced nations. Increasingly, this is true over a range from primary metals to manufactures like automobiles or the simpler electronics products that were mainstays of countries industrializing earlier. Although labor productivity in developing countries is often very low, if wages are also low, costs of production can be less than elsewhere. Even Japan–with pay scales in manufacturing industries little more than half those here, and labor productivities in some cases better—faces competitive difficulties in sectors like consumer electronics or steel.

How can the United States hope to compete under such circumstances? One answer is to offer products that are beyond the technological capabilities of low-wage *countries. In* more conventional products, it may be possible to improve labor productivity-through automation or other advanced manufacturing technologies-enough to offset existing wage differentials. Advocates of trade protection

point out that these avenues may not guarantee enough jobs to keep the American labor force employed. The alternatives are then to let wages in the United States drop, helping to maintain competitiveness across a broader range of production, or to keep out imports from low-wage countries. Given the levels to which U.S. wages might have to fall—depending on how swiftly developing countries can improve their own labor productivities—the first alternative is far from acceptable, The plight of unemployed auto and steelworkers in California, where plants in both industries have been shut down, illustrates the difficulty. Some if not all of the laid-off workers—many of whom had been making $12 to $15 an hour exclusive of fringe benefits—could find employment in Silicon Valley electronics firms. However, unskilled or semiskilled electronics work pays in the range of $6 per hour; and even at this level, Atari, for one, is moving some 1,700 jobs overseas. Given such a picture, trade protection and industrial self-sufficiency begin to seem attractive.

What is the other side of this scenario—the argument against either temporary or longer term trade restrictions? First, import restraints almost always result in higher prices for American consumers, Witness the automobile price increases following Japan's voluntary limits on exports in 1981. Indeed, under such circumstances price increases are generally intended; the common rationale is that import-affected U.S. firms must be temporarily shielded so that they can raise prices, generating increased profits to be invested in restoring their competitiveness. Of course, rising prices often ripple through the economy—causing inflationary pressures. To the extent that protection for domestic steelmaker has raised steel prices, costs have gone up for automobiles, consumer durables, roads, bridges and buildings, military hardware—everywhere steel is used.

Should these higher prices be considered the necessary costs for reviving import-affected industries? Where there is good reason to expect revival, the answer might be yes. Unfortunately, experience—e.g., in the case of color television—provides little evidence in support of trade protection as a road to recovery for sectors that have lost competitiveness internationally (which is not to say that protection might not serve other objectives, or be a necessary if not sufficient prelude to recovery). Industries and/or their employees may claim that import penetration stems from unfair trade practices, dubious management decisions, adverse effects of Government regulations, or other transient problems. If so, the argument runs, recovery is possible, given time. The reality is generally more tangled. Complaints of unfair competition or adverse regulations maybe well-founded but nonetheless only secondary factors; decline may result more fundamentally from long-term trends in the world economy—i.e., shifting comparative advantage, Where this is the case, trade protection will be ineffective if temporary, costly if permanent.

When a good argument can be made that revival is possible—that longer term trends favor the United States or at least do not run too strongly the other way—the question remains: How long will protection be necessary? Where the Government has imposed or negotiated import quotas, these have typically been for 3- or 4-year periods—with renewals not unheard of. Fixed periods are desirable so that domestic as well as foreign producers face a relatively predictable situation. Protection granted for an indefinite period risks de facto permanency, decreasing incentives for domestic firms to make new investments or alter their business strategies.

To illustrate some of the factors involved in decisions on protective mechanisms, consider the situation in early *1982* as concern mounted over imports of 64K RAM (random access memory) chips, Japanese penetration of the U.S. market—running at about *70* percent—was the outcome of a complex of factors: rapid capacity expansion in Japan facilitated by ample supplies of capital for investment; production problems at the plants of several prospective U.S. suppliers; price-cutting by both Japanese and American firms striving to build market share (accompanied by accusations of dumping leveled at the Japanese). At a time when only two American merchant firms—

Texas Instruments and Motorola—were able to produce 64K RAMs in large quantities, as opposed to six Japanese manufacturers, the first question from the standpoint of competitive dynamics became: How long would it be before other U.S. suppliers entered the arena? Given the learning and scale effects characteristic of RAM production, too great a head start might be virtually impossible to overcome. On the other hand, if American companies came in later but with superior designs, would they be able to turn the tables? These are nontraditional kinds of questions for U.S. policy makers, indeed difficult for governments anywhere to deal with; as emphasized in the previous chapter, the fast moving events characteristic of high-technology industries do not fit very comfortably into the existing framework of international trade policy. But effective Government action depends on grasping such facets of competition.

To return to the question of the costs associated with trade protection, note first that—regardless of rationale—import restrictions function as implicit subsidies for protected industries and their employees. The costs are paid by other sectors of the economy—i.e., by the public at large. Beyond direct costs in the form of higher prices, a protected industry may be able to attract resources such as capital away from other parts of the economy; in attempting to help one industry, Government policies can harm others.

These are not the only indirect effects for policy makers to worry about. Foreign competitors often pursue inward investment as a way around trade barriers—the pattern in color television, now also taking place in industries as different as microelectronics and automobiles. In contrast, foreign investment in U.S. steelmaking capacity has been small—no doubt because overseas investors do not see long-term trends favoring the production of iron and steel here. Direct investment is particularly attractive where companies feel they have competitive advantages that can be exploited regardless of location. American semiconductor and computer manufacturers invest overseas in part because their technological advantages are easily transportable.

At about the time Texas Instruments announced it was transferring all of its 64K RAM production to Japan, Hitachi, Nippon Electric, and Fujitsu revealed plans to move—or speed up previous timetables for moving—some of their own 64K RAM assembly here.[8] One motive was to dampen trade frictions; despite the absence of constraints or even formal complaints concerning RAM shipments, the color TV case appears to prefigure that in semiconductors. Is this an outcome that U.S. policymakers—whose actions accelerated onshore investments in consumer electronics—should welcome? Certainly there are major differences between the two industries. Competition in television manufacture is cost-driven, with technology playing a relatively minor role. In microelectronics, moving closer to markets is one way a company can capitalize on its technology to meet customer demands. Although decisions by Japanese semiconductor manufacturers were spurred by concern over trade, they see many other advantages to their presence here. For instance, they can learn from American technical expertise more easily—one way is to hire American engineers—if they have bases in this country, especially now that U.S. companies are guarding their own technology more closely. In the same way, technology acquisition has been one of the motives behind efforts by U.S. firms to set up R&D and manufacturing facilities in Japan.

When foreign firms invest in U.S. plants, they employ American workers—unskilled as well as skilled—although a substantial fraction of value added tends to remain overseas. But from the perspective of U.S. semiconductor firms, sales by Japanese-owned competitors—regardless of where the products are manufactured—represent a loss to the domestic industry. The numerous joint venture and technology exchange agreements that U.S. and Japanese electronics firms have entered into complicate matters further. With Hewlett-Packard getting RAM technology from Hitachi, National Semiconductor sharing with Oki, the computer firm Amdahl joined to Fujitsu, easy national distinctions vanish. Such trends are still

[8] M. Kanabayashi, "64K Ram Chips At Plants in [J. S.," *Wall Street Journal,* Mar. 2, 1982, p. 35.

more advanced in consumer markets; "American" consumer electronics products contain many parts and subassemblies produced overseas—in the extreme, VCRs made entirely in Japan are sold under leading American brand names. The U.S. workers who benefit are primarily those in distribution and servicing; sales of such products—even TVs, where foreign value added may be 50 percent—can hardly be counted as simple gains for the domestic economy. More such agreements can be expected in high-technology electronics, adding to the ambiguity facing policy makers.

Could a Market-Protection Strategy Work?

The patterns described above create a fundamental dilemma for an industrial policy founded on trade restrictions. How does one ensure a domestic market base when the boundaries between U.S. and foreign industries and interests blur, even disappear? In a given and narrow circumstance, it may be possible to turn trade policies to the strengthening of U.S. industry through protection. In the general case, the result might become less a policy than a collection of case-by-case decisions (such as we have now in the trade area) with decidedly mixed impacts. As industries and markets become more international in character, an industrial policy oriented toward preserving domestic markets rests on assumptions that are increasingly difficult to sustain.

More broadly still, attempting to ensure domestic markets for some types of goods may work against underlying shifts in comparative advantage; industrial policies that attempt this are seldom very successful. To the extent that a domestic market strategy attempts to freeze patterns of sectoral rise and decline, it may conflict with powerful forces outside the control of Government—in the end, a losing battle.

Most advocates—including those in organized labor—of a strategy that would emphasize the U.S. position in traditional markets focus on tangible goods, particularly manufactures. Trade in services—more generally still, international flows of capital—is often left out of account. Yet while the U.S. trade deficit on merchandise came to $36.3 billion in 1982, this figure was almost precisely balanced by a *surplus* on trade in services; the Nation's net deficit on goods and services in 1982 was but $225 million. Moreover, this follows a year in which the U.S. surplus on goods and services totaled $11 billion, the 1981 surplus on services far exceeding the merchandise deficit.[9] Stressing bilateral imbalances such as that between the United States and Japan—even more so particular products, whether semiconductors or automobiles—obscures these broad patterns still further. While the aggregate picture does nothing to blunt adjustment problems created by shifts in trade—nor the political dimensions of a merchandise deficit with Japan totaling $17 billion in 1982—that dislocations are severe and potentially long-lasting does not mean that protection is the best or even a viable remedy.

Finally, the reasons that trading nations have for many years been moving away from protectionism and toward an open system of world trade—albeit haltingly and with many counterexamples—should give pause to those who would advocate a market protection stance for the United States. This country led the movement for open trade in the belief that everyone would benefit, at least in the longer run. Historically, restrictions on trade flows have often led to retaliatory measures; in the 1930's, these contributed to both the depth and the length of the Depression. Retaliation need not be direct and obvious to have genuine impacts on U.S. interests. International negotiations may involve tariff concessions on computers in exchange for concessions on wheat; one outcome may be tariffs that differ among nations on a product-by-product basis, giving the appearance—and often the reality—of asymmetries. But if industrial policies intended to preserve domestic markets begin to provoke strong retaliatory measures, the entire system of international trade agreements, imperfect as it is, could be weakened.

[9] C. L. Bach, "U.S. International Transactions, Fourth Quarter and Year 1982," *Survey of Current Business,* March 1983, p. 42. Including financial flows reduces the surplus for 1981 and increases the deficit for 1982.

Fear of retaliation has been a very real factor in the choices made by the United States—e.g., concerning trade in steel, particularly imports from Europe. If the United States makes it too difficult for European steel to enter the American market, it risks restrictions on [J. S. exports of electronics products, or financial services—even military goods. Trade wars seldom benefit those involved so much as those in position to pick up the spoils.

Support for Critical Industries

Rather than attempting to preserve domestic markets in general-which would in large measure reward those able to build the strongest political constituencies—the Federal Government could decide to support and if necessary protect only those industries judged critical to national security. Security might be broadly or narrowly defined. Either way, such a policy would find deep historical roots. Governments support transportation technologies and systems—canals, railroads, highways, aviation—in part for reasons of national mobilization and defense; other examples range from armories and shipbuilding to telecommunications regulations and space exploration. A national security criterion—restricted to military security or extended to "economic security"--would narrow the focus compared to the market preservation alternative, helping to control the political pressures that will always bedevil efforts at industrial policy in a country like the United States.

Manufacturing sectors suffering from import competition frequently argue for Government remedies on the basis that their products—or their plant and equipment—contribute to national security. Some clearly have better cases than others. The end products of some companies and some industries consist of military hardware: armaments, communications systems. In other cases, end products may be used only indirectly for national defense, though no less critical for that. This is true of supercomputers, needed in the design of some types of military systems. In still other cases, the goods produced by an industry may be vital, but only some fraction of the industry's production capacity would ever be consumed in meeting military needs. Examples include the steel and machine tool industries.

The assumption underlying a critical or strategic industries alternative is that only a subset of the economy—perhaps relatively small-is indispensable for national defense; unless the list is kept short, this approach would differ little from the first option discussed above. Critical industries would begin with, but not be restricted to, the traditional defense sector: aerospace, suppliers of armaments, military electronics firms, R&D contractors—enterprises that, along with large numbers of suppliers and subcontractors, sell to the Department of Defense (DOD). Beyond this, other portions of the electronics industry would be obvious candidates for any critical industries list--computer hardware and software, integrated circuits, communications equipment. Indeed, numerous manufacturers of computer systems and semiconductor products have divisions devoted exclusively to military sales. In contrast, consumer electronics, as a sector, would have a weak case despite the fact that firms like RCA and GE are major defense contractors. Just as Chrysler's tank business was largely divorced from the automobile side of the corporation, so electronics suppliers that engage in military production generally do so through separate divisions or subsidiaries.

What is Critical?

The difficult questions in identifying "critical" firms and industries involve those that do not engage directly in defense-related research or production, but whose products or R&D might still have vital military applications under some circumstances. Synthetic fibers like nylon and Kevlar provide an example. Used in clothing, parachutes, body armor, and fiber-reinforced composite materials for structures ranging from missile casings to stealth aircraft, these materials are obviously critical to the defense base. But would this have been predicted when synthetic fiber technology was in its infancy? That is the nexus of the problem if the Federal Government is to support critical industries—identifying those that will be vital in the future,

If the criteria are to be extended to embrace economic strength, then the matter of identifying critical industries—without being so inclusive that support and protection go to everyone who asks—becomes still more perplexing. One reason is simply that terms like "economic strength" are not very meaningful. In practice, virtually any industry threatened by foreign competition would attempt to declare itself critical. The difficulty in recognizing industries that will be critical in the future would arise here as well—where it is a variant of the "sunrise industry" problem. Once the sun is up, and everyone knows it, Federal policy may not be especially important; opportunities will be evident, investors will be attracted. Although Government might be able to nurture the growing industry, its role could well be peripheral—more so in an economy like that of the United States than in Japan or France. But when an industry is truly an infant, its prospects for the future uncertain, then Government may be no better able to recognize its potential than the private sector (some would say less); the primary difference will be that Government's time horizons need not be constrained by the desire for quick returns on investments as for private suppliers of funds.

In any event, a strategic or critical industries approach implies that the Federal Government can and should identify such industries, then adopt policies to:

1. Ensure that the United States maintains an indigenous production capability sufficient to meet direct military needs, particularly in the event of national mobilization or crisis.
2. Support industries and technologies that have a substantial role in providing the underlying base—either in terms of R&D or production—for U.S. military strength,
3. Optionally, support industries and technologies that clearly and unambiguously contribute to *economic* strength.

In a context of growing East-West tension, advocates of such an approach—particularly those who emphasize direct military production—contend that the U.S. Government should take a more active role in ensuring the well-being of strategic industries.'" A primary strand in the argument is that if the United States comes to depend too heavily on foreign products or technologies the Nation's defensive capabilities could be impaired—not only in the event of war, but even in a rapidly escalating arms race.[11]

As table 82 indicated, a wide variety of policy instruments could be used to provide for the continued strength of critical industries, going well beyond tariffs or quotas for protecting domestic manufacturers and beyond the well-established relationships that already link DOD and the community of military contractors and suppliers, Multiyear procurements have been suggested as a means to strengthen the defense industrial base. DOD is also paying a good deal of attention to manufacturing technologies as one way of getting more for our money, as well as shortening procurement cycles. The attention to manufacturing will have spillover effects in the civilian economy that could be significant. Beyond such steps, sectoral policies could provide targeted supports and subsidies in much the same way that the American farmer has been given special consideration. Procurement could be steered to particular firms. DOD-sponsored R&D efforts like the VHSIC program and the other research and engineering activities of the services and the Defense Advanced Research Projects Agency—many of them related to electronics—might be enlarged and broadened still further, with the aim of strengthening the U.S. technological base and infrastructure, Manpower and education policies could channel institutional support toward engineering and relevant sciences, fund

[10]For a detailed presentation of this view, see "statement of Gen. Alton D. Slay, Former Commander, Air Force Systems Command," *Revitalization and the U.S. Economy,* hearings, Part I, Subcommittee on Economic Stabilization, Committee on Banking, Finance, and Urban Affairs, House of Representatives, Feb. 25; Mar. 25, 26, 1981, pp. 258-479.

[11]Such arguments were advanced by opponents of the award of contracts to Fujitsu for a Boston-Washington fiber-optic communications link, After intense lobbying by the DOD and others, AT&T gave the contract to its own subsidiary, Western Electric. See E. Meadows, "Japan Runs Into America, Inc., " *Fortune,* Mar. 22, 1982, p. 56.

students majoring in these fields, reward people who choose to work in defense industries, provide incentives for retraining and continuing education in advanced technical subjects. The services have recently argued that, in the years ahead, they may be unable to meet requirements for skilled workers—electronics technicians, aerospace fabricators, aircraft maintenance specialists—as well as engineers; a strategic industries policy would aim to rectify such problems.

Critical Industries for National Defense

Nations traditionally give special attention to economic sectors on which military strength and security depend. Shipyards and armories are obvious examples; for many years, historians and economists have probed the symbiosis between military and civilian production, exemplified by the evolution of precision manufacturing and interchangeable parts. If 19th century production technologies were driven in part by military needs, certainly the relationship between military and civilian sides of the economy has altered greatly since. The pervasiveness and complexity of modern technology makes identification and support of strategic industries more problematic—ships, arms, even missiles and planes, hardly exhaust the requirements of modern warfare. During World War II, automobile plants could be retooled to make weapons, but in the past four decades, military and civilian technologies have diverged. As for commercial technologies, new demands and applications come in rapid sequence—chemical and biological warfare, terrain-following cruise missiles, surveillance satellites, war in space, cryptology, computerized translation of foreign languages. One need not stop here. Economic warfare, in various forms, has a long history. Wheat, cobalt and chromium supplies, energy—all can be weapons. Ultimately, a nation's military potential is a function of the size and composition of its economy, the fraction of gross national product it is willing to spend on defense.

Sooner or later, then, any policy based on a critical industries approach will face a series of decisions on what is really essential. Lines will have to be drawn—in some cases fairly arbitrarily—because in the most general sense nearly all industries and technologies contribute in some way to defense readiness. Corporations may produce the boots that soldiers wear, the food they eat, or small computers for battlefield command and control, When only a portion of an industry's output goes to the military—whether the industry be steel or semiconductors—how might the Government allocate its support?

The struggles of DOD with the "militarily critical technologies list" recommended by the well-known Bucy report and endorsed by Congress in the late **1970's** shed light on the practical difficulties of a defense-centered industrial policy. The first list of 15 militarily critical technology categories was published in *1980.*[12] Included were computer networking, large computer systems, software, design and manufacture of very large-scale ICs, and a number of others related to electronics—of the 15 categories, only 3 had little or no electronics content. The thrust of the exercise was to develop a systematic approach to export controls; as a result, it was narrowly focused on military applications, Despite the well-defined purpose—in essence to update and supplant the Commodity Control List—progress has been painfully slow, Once the 15 general areas had been determined, the effort bogged down in details. Critics doubt that it will ever be possible to agree on procedures for reducing the case-by-case reviews of export licenses that are now necessary. If nothing else, the continuing debate over militarily critical technologies—which in principle seem relatively straightforward to define—indicates how difficult it would be to devise criteria for entire *industries*. After all, these industries would be rewarded—not with export licenses that might add a few percent to revenues—but in at least some cases with substantial subsidies and other Government favors.

[12] *Technology and East-West Trade: An Update (Washington,* D.C.: Office of Technology Assessment, May 1983), p. 37. A detailed critical technologies list published in classified form at the end of 1981 ran to 800 pages. Also see *Technology and East-West Trade* (Washington, D. C,: Office of Technology Assessment, OTA-I SC-1O1, November 1979), pp. 92-94,

Looking more narrowly at the electronics industry, consider again the situation created by imports of 64K RAMs from Japan and the resulting flurry of activity in the Federal bureaucracy. In December 1981, the Cabinet Council on Commerce and Trade authorized an interagency study of high-technology industries—carried out largely by the Department of Commerce.[13] Several months later, the Departments of Defense and Commerce began their joint examination of the national security consequences of 64K RAM imports, considering the advisibility of a more formal section 232 proceeding.[14] As pointed out in chapter 11, this section of the Trade Expansion Act of 1962 empowers the President to restrict imports in the event of harmful implications for national security; the remedies available include quotas or higher tariffs. At the time, domestic manufacturers were accusing the Japanese of dumping 64K chips–in fact, industry lobbying appeared responsible for much of the concern over national security .[15] Simultaneously, DOD was trying to convince the same group of Japanese firms to transfer some of their technology to the United States, as well as to produce components and equipment that would help meet American military needs. This was also the period when Texas Instruments was moving its 64K RAM production to Japan and Japanese firms were announcing plans to make these parts in the United States. A little later, the Justice Department announced its price-fixing probe of Japanese importers—investigating prices that might be too high instead of too low (ch. 11). Meanwhile, Congress was flooded with trade reciprocity bills, some motivated by trade friction in semiconductors.

Such is the circus for which a critical industries policy would provide the rings. Despite the concern generated by 64K RAM imports, the underlying national security question remains unanswered—a question which is in fact much broader than that of RAM chips or semiconductors in general. One way to frame the question—in the context of microelectronics—is as follows. As technologies become more complex and industries expand, opportunities for different countries to specialize in certain kinds of products grow; Japan's semiconductor manufacturers, at the moment, are specializing in RAMs. As a consequence, U.S. production might decline, with the result that the Nation could find it difficult to meet future defense needs, particularly in a situation calling for rapid mobilization.[16] Again, the point is that the ongoing dynamics of international competition hold one of the keys to policy choices.

So long as questions such as these remain narrowly defined—concerned with particular products or with classes of technology—it should be possible for policy makers to agree on priorities and make the necessary choices. In its recommendations for the fiscal 1984 defense budget, for example, the Defense Science Board ranked the following technologies in order of importance for future U.S. military systems:

1. Very high-speed integrated circuits, exemplified by the DOD R&D program (VHSIC) mentioned elsewhere,
2. Stealth aircraft.
3. Computer software.
4. Microprocessor-based teaching aids.
5. Fail-safe and fault-tolerant design methods for electronic systems.

[13] *An Assessment of U.S. Competitiveness in High Technology Industries* (Washington, D, C.: Department of Commerce, February 1983]. The first paragraph of the summary states: "This study is being released as a Department of Commerce document. The methodology, findings and conclusions do not necessarily represent the views of other Executive Branch agencies" (p. iii).

[14] C. H. Farnsworth, "Japanese Chip Sales Studied," New *York Times,* Mar, 4, 1982, p. D1. Also see ch. 11.

[15] On lobbying efforts by the industry, see "Horror Story," *Electronic News,* Feb. 8, 1982, p. 12. One of the reasons nothing came of the Section 232 study was simply that 64K RAMs—new products in the marketplace-had not yet been incorporated into any U.S. weapons systems, thus, the national security implications of a supply interruption remained matters of speculation concerning future weapons needs and designs.

[16] Part of the reason is simply that the military market does not attract that many manufacturers. The 20 percent of U.S. electronics sales that go to the military are unevenly distributed; in some product categories, defense needs account for only a small fraction of output—*Electronics,* Jan. 13, 1983, pp. 128-140. In semiconductors, the military market is perhaps 10 percent of the total (fig. 34, ch. 5), and heavily weighted toward less sophisticated devices; during 1982, any 64K RAMs going to DOD would have been embodied in commercially available hardward for use in offices or laboratories, not weapons.

[17] See R. Connolly, "The Big 17 Future Technologies," *Electronics,* May 5, 1982, p, 98.

Photo credit GCA Corp

Direct-step-on-wafer system for lithographic fabrication of integrated circuits

6. Rapidly solidified materials–-e.g., amorphous metals with high strength and resistance to corrosion.
7. Computer programs for artificial intelligence.
8. Supercomputers for nuclear weapons design and computational fluid dynamics,
9. Composite materials.
10. High-density focal-plane arrays for infrared imaging.
11. Radiation-hardening techniques for electronic systems.
12. Space nuclear powerplants.
13. High-power microwave generators.
14. Technologies for erecting large structures in space.
15. Optoelectronics.
16. Space-based radar.
17. Short-wavelength lasers.

As many as a dozen of these are electronics technologies, or systems for which electronics is a vital element.

Given some agreement on priorities--of which lists such as that above might form one starting point—and recognizing that priorities would have to be reexamined and updated more or less continuously, what policy measures, beyond decisions on R&D funding levels, might then be called for to ensure that military needs were met? Almost certainly, such questions would have to be approached much as for those dealing with research priorities--i.e., on a case-by-case basis; given past experience in trying to define critical technologies for export control, formulating general criteria for an industrial policy based on national security would seem a hopeless task, one compounded by uncertainties surrounding mobilization scenarios. Furthermore, quite apart from debates over the needs of high-technology sectors like electronics versus basic industries like steel or machine tools, an industrial policy that set defense priorities consistently above civilian needs would be politically painful, Like all sectorally based policies, such an approach is susceptible to the criticism that other industries—and economic welfare as a whole—would suffer relative t o sectors chosen for support.

One of the underlying questions—for this and other industrial policy alternatives-becomes: Given the policymaking environment in the United States, would this framework contribute to good decisions at the level of individual policy instruments, or would it simply confuse matters further? The Nation's policymaking system is not likely to change very quickly or very dramatically. As a result, one of the primary objectives of a more focused industrial policy for the United States can be viewed simply as a movement of the system toward better decisionmaking on the average. From such a perspective, it would seem more desirable to regard national security-particularly direct militar, procurement and production—as one factor to be weighed when making industrial policy decisions, but not the center-

piece. Where military security is genuinely at stake, DOD and the defense community generally prove more than capable of marshaling strong and effective arguments,

Critical Industries for the U.S. Economy

Could the United States profitably adopt a broader interpretation of critical industries, taking a leaf from the books of Japan or France —countries that have consciously tried to pick industries that will drive economic growth? This would be akin to an industrial policy built around support for "sunrise" industries, whose products or technologies will stimulate and support other sectors of the economy.

Such an alternative has its attractions. In principle, the Government could steer resources to sectors that would have a multiplier effect on the rest of the economy—or simply to those expected to grow rapidly, increasing employment and exports. In essence, an industrial policy that aimed at targeting such industries would be based on the premise that Government can do a reasonable job of predicting where the Nation's comparative advantages will lie in the future. This is part of what Japan attempts.

To pursue such an industrial policy successfully demands:

1. Prediction of the sectors that will be vital for future growth and competitiveness.
2. The design and implementation of Federal policies that will effectively support these sectors—strengthening their competitiveness in ways that markets alone could not or would not—but without creating unacceptable distortions or misallocation of resources elsewhere in the economy.
3. The political will to pursue such policies in the ordinary circumstance—when the pressures generated by declining firms and industries and their employees outweigh public perceptions of rewards for encouraging nascent industries.

The first of these is relatively easy, at least on the gross level. When the ability of Government to "pick winners" is questioned, the second and third points are generally at issue.

It is only a slight exaggeration to say that everyone knows where the winners will come from, For the United States and other advanced industrial economies, the current list includes, to take the most obvious:

- computers and semiconductors, along with related "information" technologies;
- programmable automated manufacturing;
- applications of biotechnology and genetic engineering;
- materials whose properties can be tailored for desired applications, especially polymers and composites.

Electronics has been at the top in many countries for years. Robotics and other forms of programmable automation are getting government attention in Western Europe and Japan, as well as through the U.S. Defense Department. Biotechnology is everyone's favorite example of an industry that should be supported now to reap dividends later. New materials—those with origins in both military and civilian applications—are steadily expanding in production volume. Such lists can be expanded or amplified upon almost ad infinitum, Places could be found for medical technologies, energy conversion devices, agriculture,

Once past the gross selection of winning industries, good policy decisions require careful analysis—but defining candidates for support is not, in principle, an intractable problem, If the chief objective is to stimulate economic growth, comprehensive support would not be needed (as it might be for militarily critical technologies). In electronics, good cases could be made for examples like the following:

- continued development of device technologies for high-speed, high-density ICs (gallium arsenide circuits and Josephson junctions as well as silicon-based devices);
- Ž processes for submicron lithography;
- computer-aided circuit design methods;
- automated inspection of ICs and printed circuits based on computerized pattern-recognition;
- automated generation of computer programs, together with other methods for en-

hancing productivity in software generation;
- Ž natural language programing and related topics in artificial intelligence;
- • fiber-optics and, more broadly, integrated optics.

Such a list, still quite general, would eventually have to be refined further, as is normal when planning R&D. At finer levels, uncertainties will mount, technical judgments diverge. From the Government perspective, this means primarily that payoffs in a number of areas might be possible, leading to strong arguments for supporting competing technologies. Several approaches to submicron lithography look promising—ion beams, X-rays, electron beams; it would be foolish for Government to "pick" one of these.

One of the implications of the discussion above is that the Federal role might be primarily a matter of technology development. How might the Government design and implement programs in support of commercial technologies? The United States has extensive experience in funding military research and engineering, but little background in civilian sectors; the principal exceptions are agriculture and energy, and the record in the latter is hardly flawless. One possibility is simply to find companies with expertise and good track records, then give them Government aid, This could be research funding (including further initiatives such as the Defense Department's internal R&D program, which sets aside money for industry-performed R&D on a "no-strings" basis to encourage innovation), a protected market, Federal procurements, loan guarantees, direct grants of investment capital—the list of possibilities comes from chapter 10 (see also table *82).*

From time to time, a number of European nations, as well as Japan, have followed policies that select companies for support. One example is CII-Honeywell Bull in France. The French have also built their integrated circuit program around chosen firms rather than competitive grants, although West Germany has taken the latter approach, Great Britain has channeled funds and procurements to ICL, capitalized the semiconductor firm Inmos. In Japan, a good deal of political jostling goes into the selection of participants for joint research projects such as the VLSI program or the fifth-generation computer effort. Experience in all these countries illustrates the pitfalls of company-centered support schemes. The European record, in particular, has been poor. Siemens has garnered the lion's share of funding in West Germany, with little evidence of significant returns in the form of enhanced competitiveness to the German electronics industry as a whole. Britain has recently been forced to bail out ICL. Although Le Plan Circuits Integres seems to be faring better, France's earlier Plan Calcul must be judged a failure.

Still, as in most of the countries experimenting with industrial policies, France appears to be learning from its experience: Le Plan Calcul supported a single company, while the microelectronics program has been structured to include an element of competition among several participants. In Japan, the record is rather different, MITI excluded Oki Electric from the VLSI project, believing that the company could not compete in advanced integrated circuits, Oki prevailed on Nippon Telegraph and Telephone (NTT) for help, and managed to enter the 64K RAM market. Given the multiplicity of competitive semiconductor manufacturers in Japan, this can hardly be judged a policy failure—but might have been in a country with a thinner array of prospective entrants.

In any event, direct aid for selected firms would not be an attractive option for the United States, going as it does against so many of our traditional attitudes, It is a big step from dropping the Government's long-running antitrust suit against IBM to making that company—or any other—the Nation's annointed champion. Precompetitive support, the approach taken by the European Community's Esprit program—which falls more naturally under the next alternative for a U.S. industrial policy—would fit the American system better.

Nonetheless, an industrial policy that focused on R&D—and perhaps technology demonstration, for mature industries as well as growth sectors—would begin with technical questions that can in principle be evaluated in relatively straightforward fashion. DOD experience with R&D contracts and procurements offers a model, at least for the case in which Government is the ultimate customer. This last is a major difference between supporting a defense industry and a commercial industry–and one of the chief reasons for sticking to technology; product development for civilian markets is a much riskier and less certain undertaking. Nevertheless, DOD's record–if littered with failures or partial failures in individual programs—does show that in an overall way the Federal Government can support and develop industries, particularly given procurement authority. On its results, the U.S. space program must also be judged a clear-cut success. Of course, that the Nation is militarily strong, or that the space shuttle flies, does not mean that the processes involved in reaching these objectives have been efficient, For an industrial policy aiming at economic development, however, efficiency is more urgent. If the ultimate goals include raising the standard of living—and this will always be one of the principal arguments in favor of an explicit industrial policy for a country like the United States—then improving productivity, economic efficiency, and international competitiveness become vital. As a spur to efficiency, competition for Government largess is a poor substitute for the marketplace. This does not imply that targeted R&D support for growth industries—where judgments can be made largely on technical grounds—might be counterproductive so much as that supports and subsidies going beyond technology could be.

Capital for Investment

Of the variants of supports and subsidies, channeling investment capital to selected industries has attracted a good deal of attention in the United States. The goal would be to enhance the competitiveness of industries that might be either growing or in decline. Advocates of such an approach—in essence, urging programs that would function as development banks or a Reconstruction Finance Corp.—focus on the cost and supply of funds as a bottleneck for critical or growing industries. Investments in ironmaking or integrated steelmaking, for example, have not been attractive in recent years; prospective investors can expect higher returns elsewhere. If the steel industry were judged critical, the Government could step in—as indeed it has in a very limited way—with loan guarantees or other forms of subsidized capital. Conversely, firms in some industries might be expanding so rapidly that they have difficulty in financing expansion—the case described in chapter 7 for portions of electronics. Venture capital markets tend to be spotty; at some stages in their development, entrants in high-risk sunrise industries may find themselves starved for capital because investors judge returns to be uncertain or too far in the future.

If capital constraints pose genuine problems for industries judged vital to U.S. interests, the Federal Government might indeed choose to respond with mechanisms such as a Reconstruction Finance Corp. or a publicly backed institutional supplier of risk capital. But *are* critical industries starved for funds? In countries where capital markets are less developed than in the United States, they may be—particularly where venture financing is hard to come by or simply unavailable, West Germany—even Japan—has experimented with government-financed venture capital programs, as has Great Britain with its National Enterprise Board.

That governments in some countries intervene in capital markets does not imply that public sector decisionmakers can do a better job of balancing risks and rewards than those in the private sector, but that the government has different criteria—namely, that the public welfare is paramount for government, rather than private returns to capital. Indeed, governments can set priorities ranging from maintenance of the defense base to employment stability or calming political turmoil. National

defense and employment have been particularly strong motives in Europe,

In the United States, too, Federal assistance to troubled firms has occasionally taken the form of loan guarantees or similar forms of capital subsidy, An overextended corporation in competitive difficulty will sooner or later find its access to financing cut off: examples include Lockheed, Chrysler, McLouth Steel, Braniff, International Harvester, The Federal Government aided the first two; McLouth has been rescued, at least temporarily, by a private investor; part of Braniffs aircraft fleet has been repossessed; International Harvester's fate remains in its own hands, If the Federal Government decides—on whatever grounds—that established enterprises which have fallen on hard times are indeed essential, precedents exist for bail-outs on a case-by-case basis. Should it regularize procedures for bail-outs? What about the more general situation? Should the Government take steps to make capital cheaper or more easily available?

If the Government were to channel investment funds to growth sectors, one reason would surely be to interject criteria other than those applied in capital markets—e.g., some broader notion of the public interest, rather than simply financial returns; where this is the case, capital subsidies are but one among many policy tools that Government might choose. On the other hand, it might be that the market does not do a good job of evaluating long-term opportunities where rewards are far in the future, risks high.[18] In many instances of new technologies or entire new industries, social returns have exceeded private returns, creating a particularly potent argument for Government action where the developments in question would have a multiplier effect on productivity or competitiveness elsewhere in the economy—e.g., microelectronics or biotechnology. Innovating firms in growth technologies or growth industries may not, for a variety of reasons, be able to capture all the rewards of their work. In the extreme, they may go out of business; economic history is littered with examples of early innovators who have failed, but whose ideas have later been picked up by others. This is one of the ways in which markets work—some innovators are a few years ahead of their time. In other cases, a business failure may be quite unrelated to new technology. Many of the pioneering semiconductor firms have disappeared; while typically absorbed by other companies, the circumstances have occasionally been such that financial rewards were slim.

The case for an industrial policy that channels capital toward long-range technology development or growth industries–especiall$_y$ to sectors where the effects will spill broadly over into the economy at large, giving social returns in excess of private returns—is then quite different from that for subsidizing sectors having trouble competing for investment funds because of stagnation or apparent decline. In the end, this second class—decisions on bail-outs—hinges, not on questions of capital markets, but on the justification for Government aid of any sort. If troubled industries are judged critical, and deserving of support, then capital preferences are one of several tools Government can chose from. The high-risk, growth industry case depends largely on the ability of Government decisionmakers to evaluate social returns and spillover effects, and to determine when innovators are likely to go unrewarded because the nature of their activities makes full capture of returns unlikely. Such analyses must be made on a case-by-case basis. Given recent examples of venture funding in microelectronics, computer software, robotics, and biotechnology, it is hard to argue in *general* that money for new and promising startups is not available; as pointed out in chapter 7, some observers have concluded that risk capital has been going even to projects with rather slim prospects. The cyclicality of venture capital markets is another question, as is that of gaps at stages such as pre-startup.

[18] The market failure argument for government intervention in capital (and other) markets is outlined in *U.S. Industrial Competitiveness: A Comparison of Steel, Electronics, and Automobiles*, op. cit., 1)1), 176- 1 77. Basic research—where virtually by de fin it ion the rewards cannot he fully captured hy the performing enterprise--is perhaps the plainest case.

In electronics, costs of capital—more fundamentally, sources of capital to sustain growth at high rates in the face of rising capital intensity—are matters of concern primarily for established companies that have already demonstrated their competitive ability. It would be difficult for Government to justify subsidies in the form of capital allocations, low-interest loans, or loan guarantees for such firms.

In essence, that brings back one of the points raised initially—the political context for selecting critical industries. Even for an industrial policy that devolved into a support scheme restricted to R&D and technology development, politics will perturb decisionmaking—decisions made by business as well as Government. As the experience of the Defense Department shows, company-funded R&D will tilt toward areas where eventual Federal support is more probable.

So long as the goal is relatively clear to all–i.e., military security—the political dimensions can be managed. National defense as an objective of public policy generates little controversy; disagreements center on the means. On the other hand, if the objective is competitiveness or economic efficiency—particularly in some nebulous future—then the less-than-concrete nature of this goal, and the intrinsic complexity of the supporting analysis, can easily contribute to obfuscation, confusion, and conflict. If the stakes are high, not only may politically powerful industries, if in decline, oppose programs that reward industries judged critical, but they will try to show that they are critical too. Growth industries might find themselves fighting among one other for the biggest slices of the pie. Can a board of experts inside the Government—or an advisory body including representatives of industry, labor, the financial community, the public at large—make decisions that will stick in such an environment? An "industrial policy advisory board" or "reconstruction finance board''—retired industry executives, leaders of Government and labor, well-known academics–might have the ability to make good decisions, particularly if backed by a competent staff.[19] They would have to be politically sensitive simply to keep the effort alive and pointed in the right direction. But is it realistic to expect that, even if good decisions were made, they could be implemented—given the political pressures—with any consistency? If not, such a process would be a poor substitute or supplement for U.S. capital markets. On the other hand, if Government support is modest enough to avoid conflicts, will not any positive impacts be equally modest?

Alternatively, the Government might choose simply to protect critical industries from trade pressures—adopting an essentially passive policy, rather than active support; one result might be to shift the risk/reward expectations of private investors. Protection for infant industries is a common element in the industrial policies of many countries, some of whom—notably Japan—have been accused of overdoing it. But in the end this is simply a variant on the more active approach, with most of the same pitfalls. It assumes, first, that protection will be—if not essential—at least a positive factor. Others would argue that exposure to foreign competition stimulates a nation's own industries, at least over the longer term. A country attempting to develop an industry where foreign enterprises are already strong may have a good case for protection. Even the United States—which is in a position to enter new industries at the same time as its competitors if not ahead of them—might choose to protect infants if competing nations try to protect their own. Absent this motive—and granting that it is counterproductive, if not impossible, to shield *all* industries—picking sectors to be protected would create much the same set of problems as picking some to receive capital preferences.

[19] For a typical suggestion, see L. C. Thurow, "Solving the Productivity Problem," *Strengthening the Economy: Studies in Productivity* (Washington, D. C.: Center for Democratic Policy, 1981), p. 18.

Infrastructural and Adjustment Policies

The thrust of this policy alternative—of the five, perhaps the hardest to summarize concisely—would be to create an environment that would aid private firms in strengthening their own competitive ability. As table 82 indicated, it would do so by relying preferentially on measures that support the infrastructure for industry—technology development (including R&D, incentives for innovation, diffusion of technology within the domestic economy), human resources (education and training, particularly in technical fields and including continuing education and retraining), and structural adjustment (measures that encourage mobility of capital and labor, investments in growth industries, competition domestically and internationally).

By designing policy instruments that target particular industrial sectors only under special circumstances, instead relying preferentially on measures that affect the economy in more aggregate fashion—often policies that fall in the category of market promotion—the United States might avoid the pitfalls of an industrial policy with a strong sectoral thrust.[20] Aiming to build future competitiveness, the role of the Government under this alternative would be to encourage beneficial change, while smoothing the negative impacts of adjustment.

Central to such an industrial policy is a sense of dynamics—the reality of change over time in national economies, in the world economy. Government policies that run counter to ongoing shifts in patterns of trade, competition, or technology are seldom effective in more than a marginal sense; they rarely succeed in reversing ongoing transformations, although perhaps slowing them. They can aggravate the associated dislocations. In contrast, policies that work in parallel with—even reinforce—processes of economic and technological change, or that aim at smoothing adjustment and easing dislocations, are more likely to have positive effects. This third alternative for a U.S. industrial policy flows from recognition that comparative advantages shift over time, with the result that some industries in some countries will thrive while others decline. Often the arc of growth or contraction is obscured by short-term fluctuations; sometimes declines prove temporary, expansion resumes. The U.S. textile industry is a case in point; the emergence of synthetic fibers provided an opportunity for revitalization through new investments that greatly increased productivity.

As the textile example illustrates, new technologies are one of the forces that can spark renewal. Rather than trying either to anticipate or counter them, governments can accept the reality of such shifts and work toward maximizing their positive impacts, minimizing the negative, Public policies that function in this fashion include:

- Aid and stimulus for the *development of new technologies,* which might range from money for R&D to improvement of the patent system.
- Better mechanisms for the *diffusion of technology* to industry, particularly to smaller companies; one possibility is a network of federally supported centers with this mission.
- Tax incentives or other aid for firms that install *manufacturing technologies* aimed at improving productivity and competitiveness—whether new production processes or those that are well-proven; examples range from microprocessor-controlled heat treating furnaces to robots.
- Support for *training and retraining* of employees displaced by economic change—those in blue- and grey-collar ranks, as well as professionals; this might entail encouragement of company-sponsored *continuing* education programs, as well as policies that would support training and retraining irrespective of the boundaries of particular companies or industrial sectors.
- Improvements in *vocational-technical ed-*

[20] Market promotion policies are defined and discussed in *U.S. Industrial Competitiveness; A Comparison of Steel. Electronics, and Automobiles,* op. cit. , pp. 155 ff; also pp. 175-182. Examples include ant it ru st, support for R&D and innovation, plus policies directed at labor and capital market s—e. g., for enhancing the mobility of capital and labor in response to changing economic cond it ions. The latter are commonly referred to as ad just ment policies.

ucation at the post-high school level, with particular attention to skills that will be needed as a result of predictable changes in the composition of U.S. industry—e.g., computer-aided drafting and manufacturing, service and repair of electronic systems.
- Continued emphasis on high-quality *engineering* education—backed by renewed Federal resource commitments—in fields such as electrical and computer engineering, materials science and engineering, design for automated production, and the wide range of other specialties that will be needed for continued growth in high-technology industries.
- In particular, renewed emphasis in universities, supported by Federal funds, on *engineering design and on manufacturing engineering—aimed* at upgrading the quality of the work force in these professions and bringing them more fully into the mainstream of the engineering sciences.
- Tax and other policies aimed at increasing the rate of *capital formation,* more especially at encouraging investments in emerging or rapidly expanding industries, as well as investments in R&D and in manufacturing technologies that will increase productivity in industries already well established.

Depending on the design of the instruments, such a list could also-fit quite comfortably under several of the other policy orientations discussed in this chapter.

Infrastructural Support

Human resources—defined broadly to include management styles and techniques that maximize the contributions of individual employees—are crucial for competitiveness. Any industry depends on the skills and abilities of the people it employs; chapter 8 outlined the current problems in technical education in the United States, as well as the general decline in technical literacy among the public at large, Education and training are traditional domains of public policy. Declining emphasis on technical and scientific training in American schools—as well as high unemployment alongside unmet demand for those with skills—point directly to problems calling for Federal action, Among the questions to be faced are: What should people be trained in, beyond the obvious needs for at least minimal competence in reading, writing, and mathematics? *How* can retraining best be accomplished? Within industry? Through community colleges and vocational educational programs? Whatever the response, it must incorporate a foundation for continuing learning—on the job and off—if people are to keep pace with advancing technology. Widespread public attention focused on such matters over the past year or two, together with new initiatives emerging from Congress and the executive branch, are positive signs; the danger remains of a response that will prove too little and too late.

Tax policies can create incentives for private industry to train or retrain workers, engage in R&D, invest in new production facilities. Still, incentives alone do not always suffice—one example being long-term basic research of the sort that undergirds industries like electronics. Only the larger firms find it in their self-interest to support much basic research; the foundation for the semiconductor industry, for instance, came in considerable measure from Bell Laboratories. However, the unique circumstances that caused Bell Labs, first, to perform a good deal of basic research, and, second, to help diffuse the results, seem bound to change as AT&T restructures and adapts to its new circumstances. Other large electronics companies —IBM, Texas Instruments, General Electric— also perform substantial amounts of basic work, although it has been less accessible to the R&D community at large. At various times, Government laboratories and Government-funded research have made significant contributions—currently, the more basic elements in the Defense Department's VHSIC program, as well as the **$20** million per year that the Defense Advanced Research Projects Agency is funneling into gallium arsenide.

Despite these examples, the level of research that supports the U.S. electronics industry is less than adequate. This is shown most graph-

ically by plans, originating within the industry itself, for joint R&D. Both the Semiconductor Research Cooperative, organized by the Semiconductor Industry Association to fund university projects, and Microelectronics & Computer Technology Corp. (MCC), an independent profit-seeking venture, are aimed at similar needs—technology development that will benefit a range of firms. The aims are to avoid excessive duplication, help diffuse research results, and undertake projects with longer time horizons than individual companies feel they can afford. Still, it is not at all clear that such efforts will fill the research—as opposed to advanced development—vacuum. For example, MCC will concentrate initially on four areas: computer-aided integrated circuit design; computer architectures, especially those designed with artificial intelligence in mind; productivity improvement techniques for software generation; and interconnections and packaging for microelectronics devices.[21] Three of these, if not all four, are well removed from the basic end of the spectrum. Likewise, the Semiconductor Research Cooperative has announced plans to develop prototype large-scale RAMS–an effort quite divorced from basic research. In any event, as part of its industrial policy the Federal Government could find positive ways to aid such joint research efforts; if direct assistance were not forthcoming, at least the Government could takes steps to see that public policies—e.g., antitrust enforcement—do not hinder R&D that could be vital for the competitiveness of U.S. industry.

Antitrust, one of the fundamental varieties of market promotion policy, is indeed showing signs of strain in the United States. As good an example as any is the seemingly pervasive concern of business executives that behavior they regard as innocuous—for instance, multifirm R&D efforts such as MCC proposes to undertake—will be subject to antitrust complaints. More fundamentally, when U.S. antitrust laws were drafted, most economic competition was a purely national affair; now in many industries it is worldwide. When American firms seek to cooperate in R&D, what weight should be placed on cooperation as a response to foreign joint R&D activities--sanctioned by governments and often funded by them as well? The case for trying to reduce the duplication of effort accompanying simultaneous pursuit of similar R&D objectives is, of course, strongest at the basic research end, fading as development is approached. In industries like semiconductors and computers, companies typically *want* to compete at the development end of the spectrum, and Government in the United States has encouraged this; in these highly competitive fields, American companies find it difficult to cooperate and probably always will (Japanese firms are not dissimilar). Nonetheless, antitrust enforcement seems to be a constant in business complaints over Government regulation, and a real barrier—although perhaps as much psychological as legal—even when firms desire to cooperate only in basic research, The guidelines on joint R&D published by the Justice Department in 1980 have done little to lower this barrier, ” Moreover, the point at which cooperation in R&D moves from being efficient and productive to inefficient and counterproductive will be industry- and technology-specific. Neither the Department of Justice nor the Federal Trade Commission seems very well prepared to deal with such questions.

The Federal Government can also play an important role in stimulating industrial development by helping ensure an open trading environment—something individual firms are ill--equipped to do on their own. Open trade would complement this policy alternative as well as the last two to be discussed. Indeed, for the next alternative—support for U.S. firms exporting or operating on a worldwide basis—it would be the centerpiece. In contrast, for the policy approach under discussion here, export

[21] C. Barney, "R&D Co-op Gets Set To open [Up Shop, ” *Electronics*, Mar. 24, 1983, p. 89.

[22] See *U.S. Industrial Competitiveness: A Comparison of Steel, Electronics, and Automobiles*, op. cit., pp 184-185, for a review of ant it rust law a nd enforcement, including the joint researc h guidel ines As pointed out earlier in this chapter insight into executive branch i ntent ions concerning ant i trust enforcement rn ust often be gleaned from sources which go unpublished—e.g., speeches at ha r a associat io n meet ings.

success would be ranked as but one among a number of goals.

Government efforts to reduce trade barriers —direct and indirect—contribute in immediate fashion to structural adjustment. An industrial policy intending to promote competitiveness should press for fair treatment of U.S. firms that export or invest overseas, as well as for vigorous competition within domestic markets. Thus, trade policies could take their place along with adjustment measures aimed at facilitating flows of capital and labor from static or contracting industries to those with good prospects for expansion and future competitiveness.

Adjustment

In many ways, facilitating structural adjustment lies, together with technology development, at the heart of this alternative, Adjustment policies are those that encourage movement of resources within the economy in response to market signals, as well as mitigating negative impacts—on sectors in decline, groups of workers affected by shifting competitiveness or technological change, particular communities or regions. While the United States has experimented with a variety of such measures in the past—ranging from Trade Adjustment Assistance (TAA) for employees who lose their jobs because of import competition to the many local and State development programs aimed at attracting new industry—few of these have functioned well. In particular, measures intended to aid workers or communities suffering from adjustment woes—TAA, administered by the Department of Labor, the Commerce Department's Economic Development Agency—have come to be widely regarded as failures.[23] This is one reason the current administration has turned away from Federal efforts at adjustment, arguing that markets—and those affected by them—should be left to their own devices.

There is no question that many Federal initiatives aimed at easing adjustment—including TAA, which functioned largely as a form of supplemental unemployment insurance rather than a positive aid to those seeking new skills and new jobs—have been less than successful. But the argument for falling back on the market, leaving those affected to shift for themselves, is weak; the people involved have little control over economic events or impacts, The plight of the individual is far different from that of the corporation. Rationales for adjustment assistance are well-accepted; they are grounded both in improved economic efficiency and in social equity.[24] It is true that market mechanisms will suffice for economic adjustment—in the long run and in an overall sense. However, the problems that adjustment policies are intended to remedy exist on a micro-level rather than in the aggregate. While U.S. experience with job training and retraining has not always been positive, the experiences of other countries (ch. 8) demonstrate that manpower policies can function effectively, If overall employment levels are a major objective, adjustment policies can play a mediating role between growing and declining sectors.

Consider the situation of an assembly worker in a color TV plant. As figures 57 and 59 in chapter 9 indicated, while employment levels have been declining in color TV, they have continued to rise in semiconductor production. But while the consumer electronics industry is concentrated in States like Illinois and Indiana, semiconductor firms have tended to locate in California. Since assembly labor in both industries is essentially unskilled, employers draw on local labor pools. It would make little sense for someone in Chicago who has been put out of work because of automation or foreign competition to move to Silicon Valley

[23] Economic adjustment programs in the United States are briefly reviewed in *U.S. Industrial Competitiveness: A Comparison of Steel, Electronics, and Automobiles,* op. cit., pp. 155-156.

[24] Ibid., pp. 177-179. The efficiency argument is based largely on barriers to mobility that keep people from moving to seek work, also on the friction that retards wage declines in response to changing market conditions. The equity argument, in simplest form, holds that those who bear the brunt of adjustment suffer from causes outside their control while others prosper–also for reasons quite independent of their own decisions; under such circumstances, society as a whole has good reasons for easing the burden.

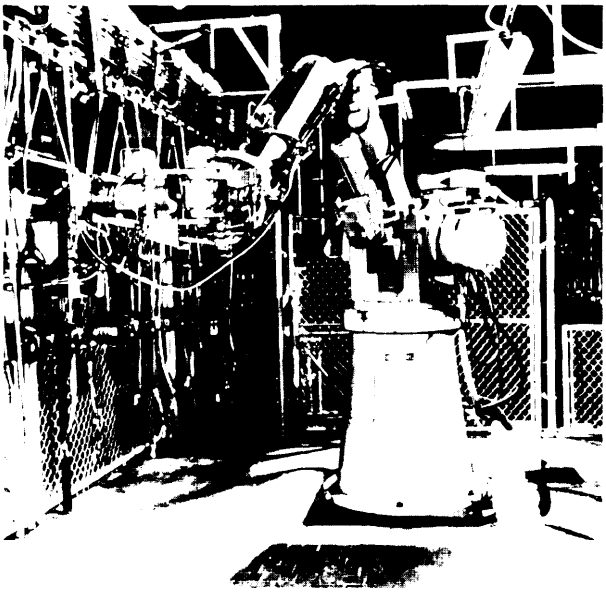

Photo credit Cincinnati *Milacron*

Robot transferring refrigerator compressors from one assembly conveyor to another

unless that person has specific skills that are in demand in the California labor market. Even then, relocation is a major hurdle, What sorts of assistance might Federal policies provide in this case? The obvious possibility is training in skills for which there is current need; even in the absence of relocation assistance, people would then have greater incentives to move to locations where jobs were available, The Government might operate the training program or simply provide financial assistance to those who could not finance schooling on their own.

Such programs can aid adjustment without introducing economic distortions. Much the same is true of supports for technology development and diffusion, Targeting the base and infrastructure for competitive industries—rather than targeting industries themselves—can contribute to economic efficiency without explicitly favoring some sectors of the economy, In this view, technology development and diffusion encompasses much more than simply R&D support. Indeed, diffusion—encouraging firms to utilize available technologies, particularly manufacturing processes that improve productivity—may, for many parts of the economy, be more vital than support for the development of *new* technologies.

Driving forces for technology diffusion and utilization vary dramatically across industries. Sectors at the forefront of technological change and international competition—semiconductors or commercial aircraft rather than consumer durables—must and do take advantage of the latest technical knowledge, There is less impetus in industries that are growing slowly or contracting; in the steel industry, American firms have often failed to install the latest production equipment, although this would save energy, improve labor productivity, and cut costs. One reason is simply that alternative investments promise higher returns. Yet it may not be wise, from the viewpoint of the economy as a whole, to wait until the need for more efficient production equipment mounts to very high levels—i.e., until payback periods are short. Manufacturing firms that lag in moving toward programmable automation or computer-aided design—perhaps because pressures to improve productivity and competitiveness build slowly at first—may at some point find themselves overwhelmed before they are able to react.

From a Government perspective, then, the primary objective of structural adjustment policies is to encourage resource flows-technological, human, material, capital—to the more productive and dynamic sectors of the economy, while providing assistance to workers and regions suffering from deteriorating competitiveness. For the United States, market promotion policies seem best suited to filling this role, but other countries have sometimes emphasized sectoral measures—picking winners and promoting them, for example—as a means to "positive adjustment. " This is much easier in simple economies, such as those of the newly industrializing countries.

Design and Implementation

What would be the likely effects on the U.S. electronics industry of an industrial policy oriented toward adjustment and infrastructural support? If one intent of such a policy is to en-

courage growing industries, the more dynamic sectors of electronics—computers (particularly smaller systems and software), semiconductors, instrumentation, robotics—would be logical beneficiaries. Electronics typifies ongoing structural shifts in the U.S. economy:

- growth in services, ranging from electronic banking and electronic mail to the production of computer software itself, many of these services made possible by cheap computing power;
- increasing relative demand for skilled workers—those with manual skills, as required for building, maintaining, and repairing advanced production equipment, and those with mental skills, as required of integrated circuit designers; and
- greater capital and R&D intensity associated with high technology.

Other growth sectors share similar characteristics.

The major assumption underlying an industrial policy oriented toward adjustment and infrastructural strengthening is that Government is capable in a general way of identifying the sources and impacts of economic change and designing policy measures that will speed the positive consequences while ameliorating the negatives. Government need not depend on sector-specific policies to accomplish this; much can be done with market promotion measures and other policies with aggregate objectives.

Industrial policies that call on Government to pick and choose among the sectors of the economy risk political defeat or deflection; furthermore, they depend on the ability of policymakers to devise programs tailored to particular sectors without gross sacrifices in overall economic efficiency, There are strong reasons for relying on market mechanisms where possible. Nonetheless, in many circumstances market forces alone are inadequate for achieving legitimate goals of public policy, Several of the cases were mentioned above: national defense, long-term basic research, Other times, Government actions may interfere with the operations of markets. Indeed, one of the fundamental tasks for industrial policy makers is to determine when markets are working well and when they are not.

The task of' devising policy measures appropriate to this third alternative for a U.S. industrial policy—what OTA has elsewhere termed macroindustrial policy—must therefore start with a strengthening of the Federal Government's analytical capability, Nowhere in Congress or the executive branch is there now the expertise to grapple with the evolving dynamics of industries or markets domestically, much less internationally, As in the case of a critical industries approach, the Government would need to begin by improving its abilities for identifying patterns of change, understanding the forces driving them, and formulating policy responses that would lead to desired policy outcomes. This is not an easy task, but it is certainly not impossible. Such a capability will be essential if U.S. industrial policies are to be redirected to support growth sectors, which almost by definition evolve in unexpected directions, As many examples in the short history of computers and microelectronics show, such industries follow paths that are full of detours and surprises, The reactive approach of the past, with Government policies are mostly responses to short-term economic and political pressures, is far from optimal.

Indeed, even if the goal were to defer as many decisions as possible to the private sector—the last of the five alternatives to be discussed—the Federal Government would still need a basis for deciding which responsibilities to retain. In any economy as complex as that of the United States, Government decisions influence business activities in many ways—often indirectly, and sometimes inadvertently, At the minimum, they do this through taxation, plus monetary and fiscal policies. To the extent that policy makers grasp the probable impacts of alternative courses of action, they can provide an environment that encourages international competitiveness. *Any of the five policy perspectives outlined in this chapter therefore implies an improvement in the Federal Government capability for analyzing industrial com-*

petitiveness and the effects of public policy on the activities of the private sector, Otherwise, industrial policy will be made in the future as it has in the past—by default—and other considerations will take precedence over competitiveness, productivity, and economic efficiency. In the absence of such analysis, successful implementation of a coherent and consistent industrial policy of any stripe would have to be judged something of an accident.

Promoting the Global Competitiveness of American Industries

An industrial policy directed at building the worldwide competitiveness of U.S. industries might be regarded as an extension of the long-standing thrust by this country toward open trade—a policy that would entail, not only continuing pressure to reduce tariff and nontariff barriers in all countries, but also active encouragement of exporting and foreign investment by American firms, Such an industrial policy would differ from the others discussed in this chapter first in its outward rather than domestic orientation. Drawing on past examples of industries that have expanded rapidly while marketing aggressively on a world scale—American manufacturers of computers or aircraft rather than steel or consumer electronics—a globally oriented approach to industrial and trade policy would be based on the presumption that active participation in markets all over the world is a primary route to maintaining competitiveness. Some advocates of such a policy would contend that if the U.S. consumer electronics and steel industries had, in fact, moved more decisively to export and invest overseas during the 1950's and 1960's, they would have been better positioned to maintain their competitiveness during the 1970's. Worldwide marketing and sales, along with multinational production, are then viewed as central elements of this policy alternative—which is based on the premise that the most competitive industries and firms are those that prepare themselves to compete in the global marketplace,

The United States has been a leader in the movement toward an open world trading system since the later years of the depression. After the passage of the Smoot-Hawley Act in 1930, tariffs steadily decreased—from levels near 50 percent, to the range of 5 percent (ch. 11). Following the war, as the Marshall Plan helped to rebuild the Western European and Japanese economies, U.S. international economic policy was directed at promoting ''free trade" through multilateral agreements such as GATT. This country provided much of the impetus for the establishment of GATT, and has almost always supported its efforts to lower barriers to international commerce; open markets have been viewed as an important objective of U.S. foreign policy, a vibrant world economy as central to the postwar political system.

Product Cycles and Structural Adjustment

This approach to industrial policy would take as a starting point the fact that some sectors of the economy, and some firms, will be better able to compete than others. Implicit are notions of product cycles and trade restructuring. The constant pressure of international competition, along with other forces acting on the world economy—particularly technological change—creates a dynamic of shifting comparative advantage. Manufacturers in countries at the leading edge of a technology introduce new classes of products first. In electronics, the obvious examples include digital computers, color television, dynamic random access memory chips, video cassette recorders—the first three commercialized by American firms, the last in Japan. As such products move through their lifecycles, the technologies they embody become better understood, easier for competing firms in other nations to duplicate, As a result, production costs grow more important—and manufacture spreads to economies that are not necessarily at the forefront of the technology Thus, terminals and small processors for computer systems are now made in many countries—although often by subsidiaries of Amer-

ican or Japanese firms; but while a nation like Brazil may have a burgeoning minicomputer industry, this does not mean it will manufacture larger mainframes. A few years after dynamic RAMs were introduced by American semiconductor firms, production was underway in Europe and Japan—by foreign manufacturers, as well as the overseas subsidiaries of U.S. multinationals; eventually, RAMs will be produced in countries like Hong Kong, South Korea, and Taiwan. The spread of color TV production has followed similar patterns; here, the comparative advantage of the United States has slipped further than for RAMs, and American firms have been able to maintain their competitiveness only by transferring manufacturing operations overseas, VCRs for consumer use were developed by Japanese firms, but as the technologies involved diffuse, production will begin in other parts of the Far East; it has already started in Korea,

Product cycles in most industries follow similar patterns; the common feature is specialization of production in parts of the world favored—at a given time—by comparative advantage. Thus the United States emphasizes agriculture and technology-intensive manufactured goods among its exports—along with services. Where wages are low, labor-intensive products are among the more competitive; to exploit high technology, countries need a well-trained work force—which normally will be well paid by world standards. An open system of international trade and investment is intended to allow product cycles to follow their natural course, with nations specializing in what they do best, Adjustment problems represent the darker side of the picture.

One rationale for an avowedly global U.S. industrial policy is simply the persistent concern that strains in the international trading system will undermine that system's openness. The most visible sign of strain is the proliferation of national industrial policies that, among other things, tend to protect local industries while discriminating against efficient producers in other countries. Another is the frequency of recourse to bilateral trade negotiations and agreements, rather than the multilateral appreach of GATT; prominent examples in the United States have included OMAs for color TVs, Western European nations have seldom been as committed to open trade as the United States, and disputes over steel, textiles, automobiles, and consumer electronics—ailing sectors in Europe as in this country—have led some observers to voice concern over revivals of protectionism, even trade war.

Slow and painful structural adjustments lie behind many of these pressures. Industries in advanced nations with large and complex economies seldom respond very quickly to change—increasing wages, escalating raw material and energy costs, technological advance, challenges from abroad, As living standards rise and social welfare programs proliferate, countries facing the need for rapid adjustment find that sudden and sharp dislocations bring equally swift political reactions, rather than the more or less resigned acceptance of earlier years and more primitive economies. Trade barriers are an easy response.

The Relation Between Open Trade and Industrial Policy

A global approach to industrial policy by the United States would find a natural anchor in the GATT system of multinational agreements. Absent special circumstances such as industries calling for protection, nations have tended to prefer the multilateral approach over bilateral negotiations—for consistency and to minimize discriminatory impacts on some nations, Advocates of a global approach stress the gains that producers in all countries can make if free to develop their own strategies, combining domestic and foreign resources in an open market system. A common corollary is to minimize restrictions on flows of technology, with barriers limited to those motivated by national security and arms control. Antitrust policies also fit naturally into an industrial policy oriented toward open trade and competition, Cartels and monopolies—international or domestic—are among the classic examples of market distortions, Because an industrial policy centered on open trade is motivated ulti-

mately by faith in market mechanisms, antitrust would be an essential element. Domestic antitrust policies, along with multilateral agreements fostering competition, would complement reductions in trade barriers.

What would this fourth alternative for a U.S. industrial policy then look like? It might embody:

- international trade agreements, on a multilateral basis, aimed at further opening of world markets and at keeping them open;
- measures intended to ensure equal treatment of firms from all nations seeking to export or to invest beyond their borders;
- standardization of customs and other national regulatory procedures—product standards, as well as those those dealing with exports and imports; and
- competition policies aimed at preventing monopolization and cartelization in both domestic and world markets.

As the list implies, nontariff and indirect barriers to trade would need a good deal of attention—as indeed they will regardless of the direction of U.S. industrial policy. Measures such as those listed would have generally favorable impacts on the U.S. electronics industry—particularly if genuine success were achieved in dismantling nontariff barriers. Portions of the industry that are already highly competitive would be helped the most.

Promoting U.S. Trade Competitiveness

What else—beyond essentially passive measures aimed at opening markets—would be needed for an industrial policy that encouraged the global competitiveness of American industry? Compared to the early postwar years when GATT was organized, the environment for international trade has changed markedly. At that time, the economic and political strength of the United States was literally overwhelming. The United States was able to push its allies—some, such as Japan, rather reluctantly—into the international system. Japan's reaction was to establish a new set of government supports for domestic industry in anticipation of trade liberalization, but at least that country—and many others—made a commitment to membership in the international trading community.

Now, over 30 years later, political and economic power are more widely dispersed; the United States is still first among trading nations, but without the preeminence it once possessed, Forging international agreements is more difficult in a multipolar world. The electronics industry is no longer the province of a handful of technologically advanced Western nations, but the battleground for increasingly intense competition involving industrializing countries as well. With the traditional leaders exhibiting quite understandable concern, rapidly expanding economies in the developing world look both to invade the markets of advanced countries and to protect themselves from those a rung or two down on the ladder of economic advance. As nations at all levels adopt government policies in support of their own industries, severe trade frictions can easily develop–particularly when overall growth slows. In essence, the current system of international trade is suffering its own adjustment problems—it was conceived in a different era, and is showing unmistakable signs of age.

More concretely, negotiations of past years covered matters on which it was easier to reach agreement—primarily tariffs—than those of today. In the Tokyo Round, still lower duties were achieved. In a few instances, renegotiations on a bilateral basis have hastened reductions—witness Japanese concessions on tariffs for semiconductors and computers. While this process could certainly be pursued further—and might be expanded to include the European Community—many tariffs are already at low levels. As parity is approached, attention shifts to areas less amenable to international agreement: government procurement policies, R&D subsidies, indirect barriers. Here, discussions between the United States and nations like Japan have borne less fruit.

The protracted discussions over the procurement practices of NTT illustrate some of these complexities. After months of negotiation and debate NTT agreed, in 1981, to open bidding to foreign firms, but American companies have

not had much success in selling to the corporation. While the Americans tend to ascribe this to informal barriers, the Japanese say U.S. firms are not trying hard enough.[25] Even rough symmetry in public sector procurement policies can be difficult to achieve when both corporate and government practices differ among countries. AT&T's decision, mentioned earlier, to give the Boston-Washington fiber-optics contract to its own subsidiary, Western Electric, is a case in point. Fujitsu, which entered the low bid, may (or may not) have offered a quotation below its reasonably expected costs in order to gain access to a rapidly expanding market, If it did so, the tactic is hardly unknown to firms outside Japan, AT&T's action was taken after intense lobbying efforts within the U.S. Government centering on claims that giving the work to a foreign enterprise would jeopardize national security.[26] After each such occurrence, it becomes more difficult for the United States to convince other governments that open trade is intended as a two-way street, Direct military procurement is, needless to say, an even more sensitive subject—one where national interests will necessarily remain paramount,

Given such considerations, a logical first step might be discussions on product standards and customs procedures, where differences tend to be visible and political controversy less intense. This is not to say that agreements would be easy or reach very far; the nations of the world have never been able to agree on standards for television broadcasting, electric power, or which side of the road to drive on. International discussions extending over many years aimed at settling on common designs for electrical outlets were abandoned in 1982 when it became clear that agreement would be impossible. Still, continuing progress in reducing nontariff barriers can be expected—albeit slow and painful. Many of these—e.g., government purchasing policies—are perceived as largely domestic issues; after all, people often feel that their own industries *should* be favored.

Export promotion—a recurrent theme in debates over U.S. trade policy—is another facet of the global approach to industrial competitiveness. Export incentives offered by the United States have often been criticized as weak and ineffective compared to those of other countries.[27] All trading countries employ export promotion measures of one form or another, even though these have generally been viewed as detrimental to a free and open trading system—particularly when they involve subsidies, as opposed to activities that function as advertising or related marketing aids. Subsidized export credits have been particularly controversial—e.g., the low-interest financing that Canada's Government offered to New York City for the purchase of subway cars (ch. 11).

The United States has recently taken a number of positive steps to help exporting firms. The Export Trading Company Act—easing restrictions on bank participation as well as providing protection against antitrust suits for firms that enter export joint ventures—which became law at the end of 1982 is one example. Estimates of the extent to which this act will help American exports and create new jobs vary considerably.[28] Consideration has also been given to finding replacements for the DISC (Domestic International Trade Corpora-

[25] See R. Neff, "NTT's open Door Draws No Crowd s," *Electronics*, Dec. *29, 1981,* p. 58.

[26] "Japan Runs Into America, Inc.," op. cit.

[27] See, for example, *Export Policy,* hearings, Subcommittee on International Finance, Committee on Banking, Housing, and Urban Affairs, U.S. Senate, especially *Part 3, Foreign Government Policies and Programs to Support Exports,* Mar. 9, 1978, *Part 6, U.S. Programs and Facilities Designed To Support Exports,* Apr. 5, 1978, and *Part 8, Oversight on Foreign Barriers to U.S. Exports,* May 17, 1978, Also *Export Stimulation Programs in the Major Industrial Countries: The United States and Eight Major Competitors,* prepared for the Committee on International Relations, House of Representatives, by the Foreign Affairs and National Defense and Economics Divisions, Congressional Research Service, Library of Congress, Oct. 6, 1978; H. L. Weisberg and C. Rauch, "A Comparative Study of Export Incentives in the United States, France, the United Kingdom, Germany and Japan," International Division, Chamber of Commerce of the United States, Washington, D. C., 1979; and R. A. Flammang, "U.S. Programs That Impede U.S. Export Competitiveness: The Regulatory Environment," Center for Strategic and International Studies, Georgetown University, Washington, D.C., 1980.

[28] C. H. Farnsworth, "Measure Expected To Spur Exports," New *York Times,* Oct. 5, 1982, p. D5; R. E. Taylor, "Law To Encourage Joint Export Ventures Is Expected To Be Signed by Reagan Today," *Wall Street Journal,* Oct. *8, 1982,* p, 12. A particular aim is to help smaller companies wishing to export.

tion) mechanism discussed in the preceding chapter. DISCS have been determined to violate U.S. obligations under GATT, and tax incentives that might have comparable impacts on export competitiveness have been proposed.[29] In the United States, as concern over apparently slackening competitiveness has mounted, many in Congress—as well as the business community—have also called for changes such as modification of the Foreign Corrupt Practices Act. The resistance during 1981 to proposals for scaling back the Export-Import Bank illustrates the importance that many place on a more active approach to promoting U.S. exports,

Still, export promotion is a limited tool. The roots of international competitiveness lie in domestic industry—in the efforts of private firms to design, manufacture, and market goods. How these firms adapt to the realities of shifting comparative advantage and changing competitive circumstance outweighs government policies aimed at encouraging exports unless these policies function as subsidies of substantial magnitude relative to the costs of the goods in question. Even then, no government can promote all exports all the time. In the longer term, therefore, export promotion seldom has major effects on trade competitiveness. Of course, in a given case it may make all the difference: promotional measures can help firms and industries in temporary difficulty; they can be useful as a means of equalizing competition by matching the efforts of other governments; they can help private industry get a foothold in new markets. But export promotion cannot reverse the tides of competitive change,

It is precisely this point that an industrial policy aimed at promoting the global competitiveness of U.S. industries would have to confront—and on which it might founder. A nation can certainly promote its industries; but no matter how extensively it does so, all its industries cannot export at once. There will always be winners and losers in world trade. A strategy aimed at promoting fair and open global competition implies that the mix of American firms able to take advantage of opportunities in the world marketplace would change over time—perhaps rather swiftly. It also implies involvement of foreign firms in U.S. markets—through direct investment as well as exports. More so than the other four alternatives—and especially a domestic market preservation strategy, which would take penetration by foreign firms to be, in and of itself, cause for concern—a global approach placing high priority on market access for entrants from all nations could be politically difficult to implement. As pointed out earlier, when firms and their employees in declining industries combine, their influence can outweigh that mustered by the friends of open trade. The negative implications for some sectors of the American economy might be difficult for an avowedly global U.S. industrial policy to deal with—particularly given the poorly developed adjustment mechanisms the Nation has in place.

The United States is already experiencing the considerable hardships that cities, regions, and occupational groups face when industries lose competitiveness slowly, as happened with the American steel industry—or, even worse, rapidly, as in the automobile industry. Whether or not these declines are permanent or transitory, the hardships are debilitating, and an industrial policy encouraging open world trade could bring such changes more quickly. The primary argument against a global promotional strategy then lies with these short-term negative impacts; extensive promotion of U.S. industries—without better methods for dealing with questions of adjustment—could place a heavy burden on those sectors unable, for whatever reasons, to compete effectively. In the long term, a global strategy might increase economic opportunities at the aggregate level, but in the meantime the price could well be judged too high. This will be particularly true to the extent that economic growth is slow; rapid expansion gives companies, employees, and communities adversely affected by rising foreign competitiveness a broader array of alternatives.

[29] "Administration's DISC Substitute Bill Introduced in Both House, Senate t' *U.S. Export Weekly*, August 9, 1983, p. 685.

Progress toward an open environment for world trade has never come easily; today, the pace of change may have picked up, interdependence risen, but the basic arguments in favor of trade between nations have not altered. The fundamental assumption underlying this fourth alternative for a U.S. industrial policy is that an open world trading system is in the long run interests of all nations. In the United States, despite periodic bouts of protectionist rhetoric, both parties have generally supported the proposition—flowing directly from notions of comparative advantage—that if each country devotes its efforts to goods for which it is, relatively speaking, an efficient producer, net economic welfare will be maximized. provided that world trade is not greatly impaired by tariff and nontariff barriers, the exchange of products and services among nations will permit people everywhere to attain standards of living that are as high as their resource endowments and state of development permit. An industrial policy based on this premise—a premise as true today as a hundred years ago—could be viewed as an extension and reinvigoration of traditional U.S. attitudes.

An Industrial Policy Centered in the Private Sector

A fundamental reason why there has been no coherent or consistent industrial policy in the United States has been the widespread belief that corporate executives rather than Government officials have not only the ability but the right to make decisions that affect business activities. While many disagree with this view, the political power of organized labor, consumer groups, and others who advocate a stronger Government role has had more impact on relatively narrow questions such as rules for collective bargaining or environmental protection than on matters of trade and competitiveness,

One of the more pointed indications of the state of Government-business relations in the United States is the attitude of the business community toward the Department of Commerce. Nominally the center of advocacy for business interests within the Federal Government, the Commerce Department is a weak sister among Cabinet agencies—not because corporations in America are weak, but because business and industry do not take the Department very seriously, and often bypass it.

At a time when some Federal officials join with spokesmen for industry in anti-Government rhetoric, the feeling that public agencies can do nothing right naturally grows. A more positive view might acknowledge that performance varies in both private and public sectors—that the ups and downs of an International Harvester or a Chrysler Corp. may not be all that different from the ups and downs of a Government agency. Nonetheless, there are political and institutional realities—many reviewed in earlier sections of this chapter—that must be altered if the Federal Government is to design and implement a more coherent industrial policy. The most pressing need is for a better developed understanding among Federal agencies of how industries actually function. Advocates of this fifth and concluding policy alternative believe—at least implicitly—that Government cannot hope to succeed at this, and should not try; they want to "get Government off the backs of industry, " and leave the private sector free to compete with minimum interference .30

Of course, some Federal involvement in the affairs of industry will always exist—a minimal level is necessary, indeed is one of the reasons governments exist. But advocates of an approach maximizing private sector responsibility for industrial policymaking argue that the narrower and more limited the Government's role the better. Beyond the posturing that afflicts such questions, the argument becomes: Government involvement in economic affairs

[30] When polled, corporate managers in the United States and Japan respond very differently on questions dealing with government "planning. " When asked whether their economy would benefit from: 1) more Government planning; 2) about the same amount; or, 3) less planning, 90 percent of American managers responded that less Government planning is called for; in Japan, the response was evenly divided among the three alternatives. See "Perspectives on Productivity: A Global View, " *American and Foreign Attitudes on Productivity*, hearing, Committee on the Budget, U.S. Senate, June 3, 1981, p. 64.

is counterproductive because it distorts market mechanisms; governments too often subsume or override the economic rationales for private choices, on both supply and demand sides.[31] Under these circumstances, economic efficiency decreases—to the presumed detriment of all. From this perspective, an industrial policy—whether intended to encourage economic growth and development or, at the other extreme, emphasizing regulations and constraints on business activity—must seem bound to weaken U.S. competitiveness. A related argument holds that Federal regulations cost industry and the public treasury more than the social gains set against them. The most extreme view is held by those who argue that *any* Government action impairs market mechanisms and hinders efficiency; a more moderate attitude grants the Government a place where market imperfections can be unequivocally demonstrated. A still more centrist perspective—the one to which the rest of this section is directed—holds that the appropriate role for Government lies in creating a climate conducive to economic growth, giving industry access to the tools for its own development. In many respects, this attitude is a traditional one in the United States, viewing macroeconomic policymaking—control of the money supply, taxation, Federal spending—as legitimate, but otherwise believing that Government intervention in economic affairs is to be tolerated mostly as a last resort.

Entrepreneurship has been a driving force for American industrial development, with business and Government coexisting rather uneasily, but an industrial policy that would defer where possible to the private sector does not, then, imply that Government plays no role at all, Public policies aimed at promoting capital formation would be consistent with such an approach; so would, presumably, regulation of business practices widely considered unfair or predatory, export promotion measures of at least some types, and a trade policy that otherwise supported American business interests overseas. What this alternative rules out first and foremost would be attempts to develop sector-specific policies targeting key industries—be these housing or semiconductors or energy,

Such an approach to industrial policy would be consistent with recent emphasis on reducing Federal spending and trying to control budget deficits, scaling back regulations, and cutting corporate taxes. This policy direction would, ideally, expand the financing available for dynamic and competitive firms while leaving them free to make their own business decisions. It would, at the same time, avoid subsidies for declining industries or firms, just as it would eschew attempts by public officials to select and support growth industries. To those favoring such a policy, it is the best hope of the United States for maintaining its international competitiveness into the future,

Central to this policy option might be tax and other measures aimed at capital formation. The rationale for the Economic Recovery Tax Act of 1981 (ERTA) was precisely this: Government policies aimed at promoting savings and investment were held to be the engines of growth for reviving the U.S. economy. As discussed in chapter 7, there is little evidence as yet that ERTA will serve this purpose, but its passage could be taken as a sign of movement in the direction of an industrial policy that would leave corporations to their own devices. Nonetheless, such a policy direction would have to be judged one that, rather than moving away from the fragmentation characterizing past U.S. industrial policies, reinforces this fragmentation. The reason is simple: without any evident justification, ERTA increases differentials in tax treatment across sectors of the economy (ch. 7).

On the other hand, movement toward deregulation of business activities represents a shift toward greater policy coherence to the extent that real progress is made in cutting back the total number of regulations, the conflicts that may exist among these, and the number of

[31] One of the more thoughtful expositions of this viewpoint is *Redefining Government's Role in the Market System: A Statement by the Research and Policy Committee of the Committee for Economic Development* (Washington, D.C.: Committee for Economic Development, July 1979),

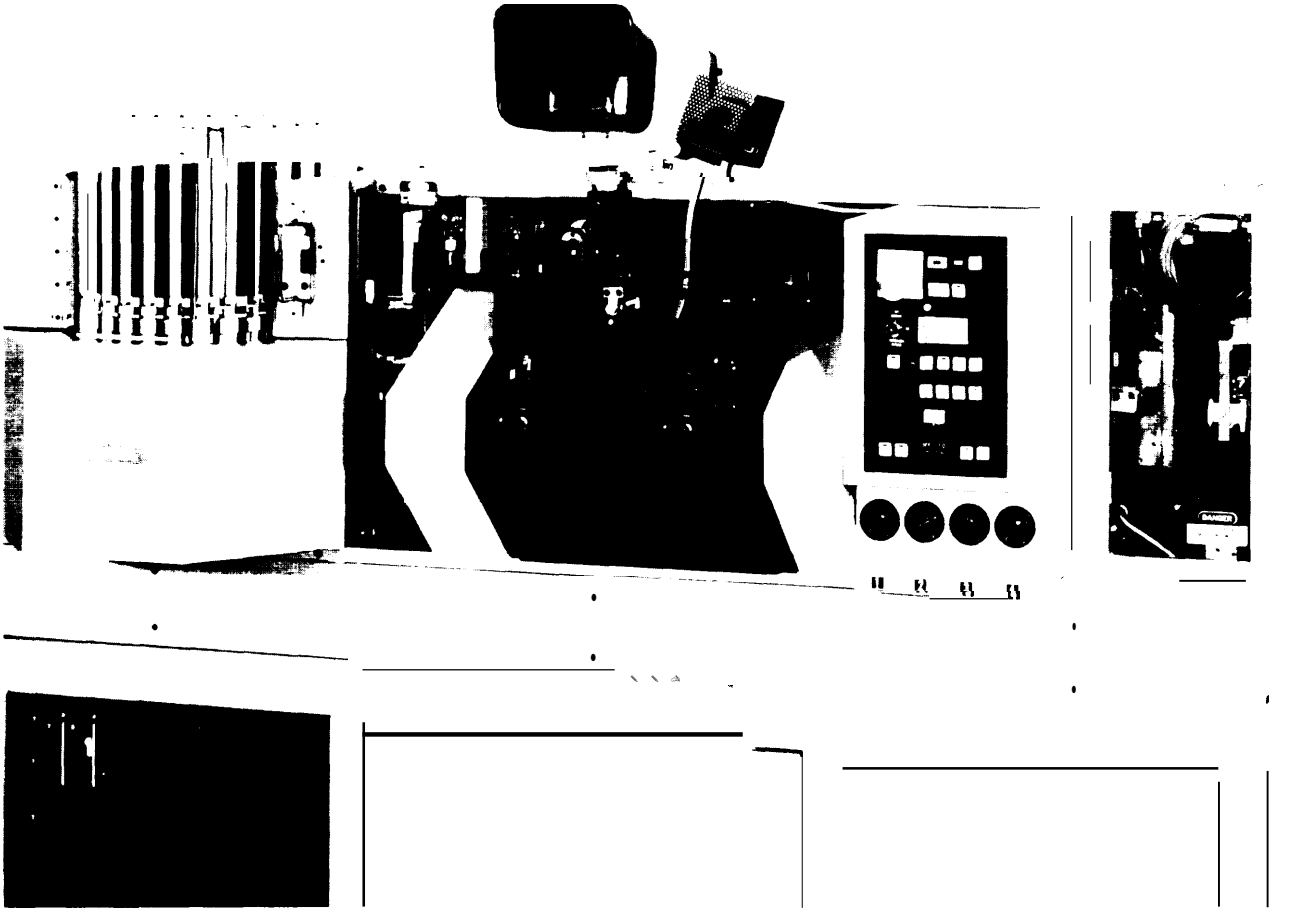

Photo credit Universal /instruments Corp

Automatic assembly machine for placing leadless carriers on ceramic substrates

agencies that administer them. Of course, to be effective in bringing a greater degree of consistency and harmony to regulatory policy, any move toward deregulation must proceed without creating a set of 50 differing regulatory policies at the State level.

In years past, Government regulations gradually developed into a set of constraints on private enterprise that—despite undeniable positive benefits—have often been judged inefficient. While the adverse impacts of regulatory policy on the competitiveness of American industries have frequently been overstated, regulations have had at least a small effect in dampening overall rates of productivity growth.[32] Even so, when Federal regulations are examined sector by sector, there are few cases of large and unambiguous adverse impacts on competitiveness. More often, the effects of regulation have been of the same general magnitude as for other public policies—having positive as well as negative effects on different sectors, different companies. At bottom, the most cogent criticism of Federal regulatory policy is simply that individual measures have too often been implemented without

[32] E.F. Denisen, "Explanations of Declining Productivity Growth," *Survey of Current Business*, August 1979, p. 1.

any explicit attention to the consequences for productivity, competitiveness, and economic efficiency—i.e., lacking even a rudimentary balancing of benefits against costs. This is hardly surprising given that most though not all regulatory policies are directed at objectives quite unrelated to competitiveness: clean air and water, safe products, minimization of workplace hazards. It may even be true that regulatory policy as a whole has come to be confused as well as sometimes inefficient, and that regulatory rulings have hindered industrial development while not always being effective in their avowed purpose-for instance, protecting consumers. Certainly, advocates of deregulation cast U.S. policies in an unfavorable light compared with approaches sometimes taken by other countries-where regulations may even be used, on occasion, to encourage economic development. Broadly speaking, however, most advanced industrial economies subject private business to regulatory requirements rather similar to those in the United States. Japan, for example, has instituted environmental protection measures that are restrictive by any standard. Nonetheless, many in the American business community continue to call for a rollback of safety and environmental regulations, as well as antitrust enforcement,

To some extent, this simply mirrors traditionally adversarial relations between business and Government in the United States—attitudes that in some cases must share responsibility for declining U.S. competitiveness. For instance, the differences in response among Japanese and American automobile firms faced by regulation of exhaust emissions and fuel economy in the U.S. market were striking. As might be expected from examining the corporate strategies employed by Japanese firms in other industries, automakers like Nissan, Honda, and Toyota have looked at regulations as new opportunities for finding a competitive edge. Within corporate headquarters, Japanese executives may regard Government regulation just as bleakly as their counterparts in Detroit—but they attempted to make the best of the situation, as a long string of new model introductions beginning in the *1970's* attests.

As the discussion above implies, financial, tax, and regulatory issues would no doubt comprise the core of a business-centered industrial policy. Tax reductions and deregulation have been at the head of corporate agendas for years, In the context of electronics, tax policy is much the more important, regulations having seldom had much impact. Chapter **7,** on financial issues, shows the ability to fund expansion in the face of rising capital intensity to be one of the key uncertainties for rapidly growing electronics companies. Fast-paced technical change—making manufacturing equipment obsolescent—together with high costs of design and development and rising levels of foreign competition create new financing pressures in computers as well as semiconductors. Other rapidly growing sectors of American industry, particularly where technology moves quickly, can expect similar problems—stemming in part from the common desire of U.S. managers to finance growth with internally generated funds, as well as the declining role of stock issues as sources of financing for American corporations.

Would an industrial policy that cut taxes and reduced regulations, leaving other matters to the business community, help high-technology sectors? The answer hinges on how they would fare compared with other portions of the U.S. economy. In terms of taxation especially, the issue comes back to differential affects. Tax policies, even when designed to be neutral across industries, will never fully achieve this. The depreciation schedules enacted by ERTA are only one example. These will probably help other sectors more than electronics, simply because many electronics manufacturers were able to depreciate production equipment quite rapidly under the old law; their capital cost recovery periods have sometimes been shortened, but not nearly as much as in heavy manufacturing or primary metals. Firms earlier required to depreciate newly purchased assets over many years get much greater benefits in terms of internally generated cash flows from ERTA. They may also find their ability to attract capital from external sources enhanced relative to electronics firms. Furthermore, accelerated depreciation tends to benefit com-

panics with substantial profits rather than new and growing concerns that may still be spending more than they take in. The larger computer firms, for example, maybe helped more than software vendors or semiconductor manufacturers, consumer electronics, where profits have been low for years, is not likely to gain much,

Is the example provided by ERTA typical of what could be expected from an industry-centered policy approach? If only because older and larger firms and industries tend to have more accumulated political power, the answer is probably yes; these sectors of the economy might be able to skew the policy process to their advantage, with newer industries suffering—if only in a relative sense, This is a major liability of an industrial policy that would defer where possible to business interests. Advocates of this policy orientation must be prepared to accept outcomes like the altered depreciation schedules in ERTA. Policy directions would continue to be determined largely by the political process, and the greatest rewards would probably go to the sectors that—together with their employees—could muster the greatest political strength. These are likely to be older, well-established industries—particularly those whose employees are unionized. Where such industries are suffering from international competition, they will seek to shape policy in ways that preserve their markets, profits, and jobs.

Of course, the electronics industry has been active and successful in its past lobbying efforts, and would be able to look out for itself under an industry-centered approach. ERTA legislation included a number of measures that electronics firms had actively sought, including the R&D tax credit and changes in tax treatment of income earned by Americans working overseas, These offer direct benefits to the electronics industry, particularly the R&D provisions. In addition to the tax credit, which permits a writeoff amounting to 25 percent of spending for R&D above a base figure, equipment used in research can be depreciated faster, Deductions are also allowed for apparatus and equipment donated to universities. These measures are scheduled to expire in 1985; until then, at least, they will assist firms in portions of the industry with extensive R&D activities.

A further point that an industrial policy following this approach would have to confront is the extent to which firms pursuing economic self-interest may neglect objectives important to the Nation as a whole. Basic research—the sort that does not promise immediate payoffs—provides one example. Nor is it likely that the health and safety of either the labor force or the public at large would be served by an industrial policy that deferred product and workplace standards to industry, Regional impacts, along with questions of adjustment assistance for displaced employees are additional cases where an industrial policy too heavily oriented toward the desires of the business community might be perceived by other segments of society as inadequate.

In the end, the question comes down to this: If other countries are developing ambitious and comprehensive programs to support certain of their industries, can the United States assume that *absence* of Government action is the best response?

Summary and Conclusions

The competitive situations of the U.S. consumer electronics, computer, and semiconductor sectors differ greatly, but they do have common features. How then to summarize the policy implications? The technological and market leads of American electronics firms are narrowing. Manufacturers in Japan especially have successfully followed strategies based on selecting particular market niches, establishing themselves in these markets, then expanding. This was their mode of entry into the U.S. consumer electronics market, it has allowed them

to deeply penetrate the American market for some types of ICs, and is the approach they will follow in computers. It has also helped Japanese firms to compete effectively in other parts of the world. Electronics companies in Japan have been aided by their government, although the form and impact of the aid has varied a good deal across the industry; still, the programs generated in recent years to stimulate the expansion of high-technology sectors in Japan, Western Europe, and several of the newly industrializing countries show a degree of concern for industrial development far outstripping that in the United States.

At this juncture, U.S. electronics firms face not only heightened competition, but also problems in financing continued expansion and in finding well-trained people to fill their staffs. The industry exemplifies the structural transformations taking place in the U.S. economy: ever-growing requirements for skilled labor and creative management; dependence on R&D and the commercialization of new technologies in order to establish new markets or retain old ones; rising capital intensity in the process technologies necessary to enhance productivity or simply to make state-of-the-art products; foreign competitors supported by the industrial policies of host governments. There are a multitude of problems ahead for the U.S. electronics industry, and for others at the forefront of economic development—biotechnology, robotics, communication and information technologies. Congressional interest in the international competitiveness of the U.S. electronics industry stems in part from the model it provides for other key sectors.

At the same time, it would be misleading to overemphasize the problems faced by industries like electronics. U.S. capital markets continue to function well. American semiconductor firms have made rapid strides in improving the quality of their products. The industry is still the world leader in technology, though not so far—nor so consistently—ahead. policies followed by the Federal Government have aided American electronics firms by opening world markets for makers of computers and semiconductors. Only infrequently have Federal policies been clear and direct obstacles to efforts by the industry to improve its competitiveness.

What is missing are the links between the bits and pieces of Federal policy that affect the various portions of the electronics industry. Government policies cannot and will not transform this industry or others: the private sector has provided the driving force for past development, a pattern that will continue. But public policies help create the environment within which competition takes place, they set rules, frame decisions. industrial policy could provide a setting conducive to capital formation, R&D, education and training, free market competition. To the extent that Government policies support technological development and structural adaptation, they work in the long-term interests of American industry and the American labor force. A more coherent and consistent industrial policy could make a significant contribution to the competitive position of the U.S. electronics industry.

In the United States, industrial policy still means different things to different people. To some, industrial policy is viewed much like supply-side economics was several years ago—as an untried theory. To others, it suggests government support for “sunrise” industries or trade protection for threatened sectors like steel or textiles. Some have argued that the American political scene is so disorderly that any attempt at a more consciously developed industrial policy would be pointless if not counterproductive. Despite the seemingly incessant debates over the successes and failures of industrial policies in Japan or Britain or Taiwan, all such views miss the essential point: *industrial policymaking is a routine activity of all governments*. In the United States, we can continue to leave industrial policy to the random play of events, or we can try to improve the system.

Politics lies at the heart of finding a more consistent and coherent approach to industrial policy for the United States. The starting point is to recognize that industrial policy decisions are being made all the time. The problems of American companies in consumer-electronics,

automobiles, or clothing and apparel were not created by Government policy, but the *absence* of a coherent approach to industrial policy has virtually guaranteed a devolution to special interest politics. Faced with seeming chaos in the political arena, many have simply thrown up their hands, This implies accepting as inevitable long and torturous courses of events in industries like color TV—where final outcomes of trade complaints going back to 1968 have yet to be determined, or steel—where claims by the American industry of dumping by foreign enterprises go back at least to 1959. It also implies relying on the blunt instruments of macroeconomic policymaking. Neither supply-side economics nor public pump-priming of years past offer plausible remedies for the current dilemmas of American industry. It is certainly true that deregulation, lower rates of inflation, and higher rates of overall economic growth will help a wide range of U.S. industries, but urgent needs such as technology development and diffusion, education and training for displaced workers, and seed capital for entrepreneurial businesses also call for attention by Government.

An industrial policy response following one of the alternatives discussed in this chapter could represent an attempt to find concrete solutions to particular problems. Such a response needs to be based on careful examination of the situation of American industry at a given point in time. Advocates of a more coherent industrial policy for the United States understand that Government decisions affect the activities of industry in many and often subtle ways; they would encourage policy makers to include competitiveness and technology development more explicitly in the objectives of policy, more consistently in its formulation and implementation. At the broadest level of generality, this implies a "vision" of long-term economic development interposed in the policy process; it means creating political constituencies for industrial policy rather than standing by while the myriad of interested parties attempt to promote their own typically narrow and short-term designs.

There is no doubt that improvement is possible; policymaking can be a purposeful activity characterized by learning from past experience within a framework of empirically based analysis, Developing a more effective industrial policy must begin in this spirit, while recognizing that the process is inherently political and always will be.

Although a variety of policy instruments could be used in pursuit of industrial policy objectives, *in the U.S. context, it appears that special stress should be laid on manpower training, R&D and technology diffusion, plus measures aimed at stimulating investment in new and innovative firms and an open environment for international trade and investment.* Such policy initiatives, emphasizing structural adjustment, would help in building foundations for international competitiveness in electronics and other industries.

The form that such an industrial policy might take would have to be determined by Congress, along with the executive branch and the many interest groups with a stake in the outcome. To be effective over the longer term, industrial policy must be based on practical understanding of the functioning of the economy on a sector-by-sector basis, with forward-looking analysis of both problems and prospects. OTA has outlined five alternative approaches to this task; more than anything else, *an effective industrial policy for the United States requires a clearer view of where industrial development in this country is headed, and of the Federal role in aiding this development.*