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The Need for an American Industrial Policy

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I. INTRODUCTION

In the years following World War II, the American economy enjoyed unparalleled and often unchallenged success. American companies were leaders in virtually every important manufacturing and technological industry. In part because of the war-time devastation of the Japanese and European economies, American corporations dominated a wide range of important industries including steel, automobiles, aviation and textiles. In addition, America was most often the pioneer in important new technologies. The success of American business and industry at home and abroad translated into relatively high-paying jobs for American workers and one of the highest standards of living in the world.

The economic dominance that America once enjoyed, however, has rapidly diminished over the last few decades. Many of the industries which American corporations once dominated have now become the almost exclusive domain of foreign competitors. There are now virtually no American producers of such consumer electronic goods as televisions, VCRs, camcorders, and compact disc players. American industries which produce many other important products have been continually losing market share and are themselves in danger of following the American consumer electronics industry into extinction. The General Accounting Office (GAO) recently found that during the 1980s American companies lost ground to foreign competitors in ten of eleven high technology sectors, including telecommunications equipment, fiber optics, semiconductors, robotics and supercomputers.[1]

Numerous reasons exist for America's inability to compete with foreign companies in so many important industries. Part of the blame can certainly be laid on the complacency and inefficiency of American businesses themselves. However, many other factors beyond the control of American private businesses have also contributed to America's industrial decline. This comment focuses on some of these factors and analyzes how

1. *Bentsen Asks for Action; GAO Finds U.S. High Tech Is Slipping*, COMM. DAILY, Nov. 20, 1992, at 3.

they have threatened and continue to threaten America's industrial and economic health. This comment also examines several measures which may be taken to strengthen America's industrial position. Although much of the burden of solving America's industrial and manufacturing problems must rest with American private industry, this paper focuses primarily on several government policies, the adoption of which could help reverse the trend of manufacturing and industrial decline in the United States.

II. THE NEED FOR A LIMITED INDUSTRIAL POLICY

A. Industrial Policy Defined

The notion that government might intervene in the marketplace to aid and encourage domestic businesses is often referred to as "industrial policy." Although the term "industrial policy" means different things to different people, for purposes of this paper industrial policy is defined as government assistance to "aid[] industry by helping to develop critical technologies and by providing fertile conditions for the industries of tomorrow to grow."[2]

B. Tensions Between Industrial Policy and Free Market Theory

Despite the decline of many important industries over the past few years, the U.S. government has generally been reluctant to intervene in the market to assist troubled domestic businesses because of its adherence to free trade economic theory. Instead, the government has traditionally preferred to rely on market forces to determine which domestic industries will expand and which will contract. Free market theorists argue that if a nation is losing a particular industry to a foreign competitor, it is because foreign producers have a comparative advantage in that industry relative to domestic producers.[3] Government aid to certain businesses or industries, it is

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2. Steven Greenhouse, *The Calls for an Industrial Policy Grow Louder*, N.Y. TIMES, July 19, 1992, § 3, at 5.

3. According to free trade theory, differences in climate, natural resources, culture and skills give each country a comparative advantage in the production of certain kinds of goods and a relative disadvantage in the production of others. Paul R. Krugman, *Introduction: New Thinking About Trade Policy*, *in* STRATEGIC TRADE POLICY AND THE NEW INTERNATIONAL ECONOMICS 7 (Paul R. Krugman ed., 1986).

argued, only subsidizes comparatively inefficient industries that cannot succeed by themselves and therefore do not deserve to survive. If a domestic producer cannot compete against a foreign competitor, then according to free market economic theory, the domestic producer's resources would be better allocated in another industry. Accordingly, proponents of free trade theory are generally opposed to government intervention in the market to assist domestic businesses.

C. Why the United States Can No Longer Afford to Be Without an Industrial Policy

Although the government's traditional hands-off relationship with industry has generally been successful in the past, it is clear that this policy does not always work well today. Perhaps it would still work if all countries adhered to the same practice. However, not all countries intend to confine government to a more or less passive role in the marketplace. In fact, most of America's major competitors practice some form of overt industrial policy.

Japan, with its Ministry of International Trade and Industry (MITI), is an excellent example of a nation with an active industrial policy. MITI's mission is simply "to advance the well-being of the Japanese people through rapid economic growth."[4] MITI seeks to accomplish its objective by "chang[ing] the industrial structure by placing it in accordance with world markets and competitive forces driven by advancing technology."[5] Rather than ignoring the realities of the market, MITI "shapes and alters market forces and accepts the market's judgments of the success or failure of [its] initiatives."[6] Japan seeks to channel resources to strategic industries with proven or great potential market value by "encourag[ing] their development through grants [and] subsidized investment."[7] Japan has also employed various protectionist measures to help certain fledgling industries gain a foothold in the market. Although Japan's industrial policies have produced some notable failures, they have also helped create successful industries in a number of areas which

4. WILLIAM S. DIETRICH, IN THE SHADOW OF THE RISING SUN: THE POLITICAL ROOTS OF AMERICAN ECONOMIC DECLINE 116 (1991).

5. *Id.*

6. *Id.* at 117.

7. R.C. Longworth, *Experts Agree Government Must Help to Save Computer Industry*, CHI. TRIB., May 20, 1992, § 1, at 12.

would likely have never come into existence if left entirely to market forces.[8]

The Europeans have also employed industrial policies to help important industries become moré competitive in the world market. Europe's Airbus Industrie is one example of how foreign industrial policies have hurt American competitors. This four-nation aircraft consortium[9] "has badly bruised McDonnell-Douglas and has become Boeing's main challenger thanks to an estimated $20 billion in aid from European governments."[10]

The loss or decline of certain American industries is thus not simply the result of other nations having a natural comparative advantage. Rather, it is often the result of foreign industrial policies which have targeted those industries. Dr. Allan Bromley, the science advisor to President Bush, warned that without government programs to aid American high tech industries "we will not only cease to establish the frontiers of knowledge, but we will be so far behind we won't even be players anymore."[11]

D. The Rationale for Limited Government Participation in the Market

Despite the widespread belief in the United States that government should not interfere in the market, many economists have recognized that some cases exist in which government interference is justified. These include situations where promotion of an industry is necessary for purposes of national defense, or where an "infant" industry needs protection for a few years to enable it to compete against more established foreign industries.[12]

Some economists have also recently argued that government participation in the market may be justified to assist industries that produce "external economies" for the nation in

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8. WILLIAM R. NESTER, JAPANESE INDUSTRIAL TARGETING: THE NEOMERCANTILIST PATH TO ECONOMIC SUPERPOWER 22, 38 (1991).

9. The countries supporting Airbus are France, Germany, Spain and the United Kingdom.

10. Greenhouse, *supra* note 2, at 5.

11. Peter G. Gosselin, *In High Tech, Mergers Outpace US Policy*, BOSTON GLOBE, July 19, 1992, at 1, 14.

12. *See* ADAM SMITH, THE WEALTH OF NATIONS 429-39 (Edwin Cannan ed., Modern Library 1965) (1776); *see also* RICHARD E. CAVES & RONALD W. JONES, WORLD TRADE AND PAYMENTS 26, 228-29 (4th ed. 1985).

which they are located. External economies are "benefit[s] from some activity that accrue[] to . . . individuals or firms [other] than those engaging in the activity."[13] In other words, investment in some industries "yield[s] high returns to society because in addition to their own earnings they provide benefits to capital and labor employed elsewhere."[14]

From a societal perspective, the market underinvests in industries which generate external economies because not all the benefits of the investment go to those who make the investment. Some industries may provide a high rate of return to the economy at large because of the high level of external economies and yet fail to attract any private investment because the return to private investors is so low.[15] This seems to be particularly true for investments in technologies or industries which involve very large investments, high risk, or delayed payoffs.[16] In such situations, the market may fail to direct investments to areas which would yield the highest returns to the economy as a whole.

Two areas of the economy which generate large external economies are high technology and manufacturing industries. Because investors in these industries do not themselves receive all the benefits their investments provide, they are unlikely to invest as much in these areas as the good of society would suggest. The following sections examine three different types of external economies that these industries provide and the danger that their loss would cause to the U.S. economy.

1. Linkages

One way that an industry may generate external economies is through "linkages." The premise of "linkage" is that the health of some industries is inextricably linked to the health of other industries. The existence of one industry in the domestic economy may provide widespread societal benefits through the creation of jobs in related industries. Accordingly, the success

13. Krugman, *supra* note 3, at 13.

14. *Id.* Studies of industrial research and development (R&D) investments, for example, have found "that, on average, the social rate of return is roughly twice the private rate." CONGRESSIONAL BUDGET OFFICE, U.S. CONGRESS, THE BENEFITS AND RISKS OF FEDERAL FUNDING FOR SEMATECH 33 (1987).

15. *See* OFFICE OF TECHNOLOGY ASSESSMENT, U.S. CONGRESS, MAKING THINGS BETTER: COMPETING IN MANUFACTURING 21 (1990) [hereinafter COMPETING IN MANUFACTURING].

16. *Id.* at 33.

of the related industries is linked to the success of the original industry. However, through these same linkages, the loss of one domestic industry may have widespread negative effects on other industries.

a. The link between manufacturing and service jobs. Many service jobs are so tightly linked to manufacturing that if the manufacturing processes are moved offshore, the service jobs will follow in a very short time. The U.S. textile industry is a good example of this type of linkage. The U.S. textile industry creates

> some 15,000 to 20,000 trucking jobs, specialized in moving and warehousing, chemicals, raw materials, yarn, cloths, pieces of garments, and even packaging, right up to, but not including, the completed garment (at which point imports would have the same employment effect). Few of these roles would exist without an onshore textile/apparel industry. The same is obviously true for those who repair and service the machinery used in manufacturing: in almost all cases, they have to be located close to the machines that will need servicing. The same conditions apply to the numerous security guards, janitors, bookkeepers, and data processors hired.[17]

Admittedly, many services such as advertising or retailing may be unaffected by whether goods are manufactured domestically or abroad; however, a great number of service jobs are lost when manufacturing processes are moved offshore.

b. The link between manufacturing industries and "upstream" and "downstream" producers. The loss of domestic producers of certain manufactured goods may also have a serious impact on domestic manufacturers that are "upstream" and "downstream" in the production process.[18] If domestic producers of certain manufactured goods go out of business and the production of these goods is subsequently moved offshore, the former domestic suppliers may encounter difficulties in finding new buyers or becoming suppliers for the new foreign manufac-

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17. STEPHEN S. COHEN & JOHN ZYSMAN, MANUFACTURING MATTERS: THE MYTH OF THE POST-INDUSTRIAL ECONOMY 23-24 (1987).

18. The concept of upstream and downstream linkages simply reflects the idea that producers of end products are dependent upon suppliers for critical parts and components. For example, computer manufacturers are dependent upon companies that make semiconductors. Semiconductor manufacturers are in turn dependent upon companies that produce semiconductor manufacturing equipment. Likewise, suppliers are also dependent upon the producers of end products because suppliers obviously cannot stay in business if there are no buyers for their products.

turer. Given time, new suppliers will likely develop in the same region where the end product is being manufactured, and given the preference of many companies to buy from suppliers in geographical proximity and from suppliers of the same national origin, the American suppliers would be in serious danger of being displaced.

Similarly, if the domestic suppliers of a domestic manufacturer are displaced by foreign suppliers, the domestic manufacturer could be placed at a disadvantage vis-à-vis its foreign competition because in many industries foreign suppliers of component parts are also competitors in the end product. Given this situation, once a domestic manufacturer is dependent upon foreign suppliers, the foreign suppliers may be tempted to delay selling the most advanced products to the American manufacturer in order to give themselves an advantage in the marketplace.

The American supercomputer industry provides a good illustration of this problem. "America's remaining supercomputer producer, Cray, is dependent on Japanese suppliers for most of its key components."[19] Unfortunately, many of these Japanese suppliers also produce supercomputers themselves or are closely aligned with other Japanese companies that produce supercomputers. This dependence on Japanese suppliers, who are also competitors, has often been exploited by these suppliers. For example, "[t]he management of Cray . . . has at times been told that the latest and best of these components are 'not yet available for export' from Japan. They are, however, available to Japanese supercomputer makers, and the Japanese supercomputers themselves *are* ready for export."[20] The same type of problem has also been encountered in other industries, including the semiconductor industry.[21]

(1) The case of the U.S. semiconductor industry—how its health depends on the health of "downstream" users of semiconductors. The semiconductor industry demonstrates the importance of upstream and downstream linkages. A semiconductor is a silicon chip upon which thousands of electronic

19. NESTER, *supra* note 8, at 200.

20. COMPETING IN MANUFACTURING, *supra* note 15, at 15-16.

21. *Office of Technology Assessment Report "Competing in Manufacturing": Hearing Before the Senate Comm. on Banking, Housing, and Urban Affairs*, 101st Cong., 2d Sess. 124-25 (1990) [hereinafter *OTA Report*] (statement of Sanford L. Kane, former president, U.S. Memories).

circuits are fabricated. Semiconductors are "the foundation on which computers, office automation products (such as copiers, fax machines, and word processors), consumer electronics, robots, telecommunications equipment, and many other technologically advanced industries are built."[22] The loss of the American domestic semiconductor market would be devastating to the American economy. The world market for semiconductors in 1991 was $66 billion.[23] In addition, the world market for electronic products, to which semiconductors are crucial, exceeded $650 billion in 1989.[24] The electronics industry is currently "the biggest employer in America, providing more jobs than the auto, aerospace and steel industries combined."[25]

The technology for semiconductors was originally developed and refined in the United States, and the United States was the undisputed leader in basic semiconductor technology until the mid-1980s.[26] However, by 1991 the Japanese had captured 52% of the worldwide market for semiconductors.[27] At the same time, the United States saw its semiconductor market share drop from 60% in 1980 to 35% in 1991.[28] Four of the top five producers of semiconductors are now Japanese.[29]

Part of the problem for U.S. semiconductor makers is that a large portion of the downstream users of semiconductors are foreign manufacturers. Because the Japanese are leading producers of products which use large amounts of semiconductors (such as consumer electronics and automobiles), it is not surprising that Japan, rather than the United States, is the world's leading buyer of semiconductors.[30]

According to free trade theory, the nationality of the end users of semiconductors should not matter to U.S. semiconductor producers. Buyers of semiconductors should buy their chips from whomever produces the highest quality chip at the lowest price regardless of national origin. However, the reality of the

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22. DIETRICH, *supra* note 4, at 26.

23. *See* Neil Gross et al., *Making Deals—Without Giving Away the Store*, BUS. WK., June 17, 1991, at 96, 96.

24. DIETRICH, *supra* note 4, at 26.

25. David Gergen, *America as a Techno-Colony*, U.S. NEWS & WORLD REP., Apr. 1, 1991, at 88, 88.

26. DIETRICH, *supra* note 4, at 26.

27. Gergen, *supra* note 25, at 88.

28. Gross et al., *supra* note 23, at 96.

29. *Id.*

30. In 1991, Japanese chip buyers purchased an estimated 40% of the world's semiconductors compared with an estimated 28% for the United States. *Id.* at 98.

world marketplace is an entirely different matter. Although the Japanese market accounts for 40% of worldwide semiconductor demand, Japanese firms bought only 12.3% of their semiconductors from American manufacturers in 1990, up from 8.5% in 1985.[31] That this purchasing pattern is not simply due to poor quality or high prices of American semiconductors is supported by the fact that American producers have 66% of the American automobile market in semiconductors, and more importantly by the fact that American producers of semiconductors have 56% of the European market—a presumably neutral ground.[32]

Another reason that American companies cannot sell semiconductors (and many other products) in Japan is that Japanese companies, motivated in part by nationalistic sentiment, prefer to buy from Japanese suppliers.[33] In fact, Japanese companies will often buy inferior products from Japanese suppliers and then work with those suppliers to improve their quality.[34] Japanese buyers purchase "American goods and equipment only when [a] Japanese product is not available or until the product can be made in Japan."[35] Given this reality, an American company's loss of market share can devastate domestic upstream industries which supply components and parts to that company.[36]

(2) The dependence of U.S. semiconductor producers on the health of "upstream" American suppliers of semiconductor manufacturing equipment. In a somewhat similar vein, the health of the U.S. semiconductor industry also depends upon

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31. Paul Magnusson, *The New Chip Pact: This Time It'll Probably Pay Off*, BUS. WK., June 17, 1991, at 98, 98.

32. *Decline of U.S. Semiconductor Infrastructure: Hearing Before the Subcomm. on Commerce, Consumer Protection, and Competitiveness of the House Comm. on Energy and Commerce*, 101st Cong., 2d Sess. 30 (1990) (testimony of Rep. Doug Walgren).

33. *Cf. Semiconductors and the Electronics Industry: Hearing Before the Subcomm. on Science, Technology, and Space of the Senate Comm. on Commerce, Science, and Transportation*, 101st Cong., 2d Sess. 65 (1990) (statement of Peter H. Mills, Senior Vice President, Sematech). Many American companies also admittedly prefer to buy equipment from American suppliers when possible. *Id.*

34. *Id.*

35. *Id.* at 35-36 (statement of Joe Parkinson, Chairman & CEO, Micron Technology, Inc.).

36. American producers would have a greater proportion of the world semiconductor market open to them if American producers had remained in the consumer electronics industry or if American automakers were able to regain some of their lost market share. *See id.* at 21 (statement of John A. Armstrong, Vice President for Science and Technology, IBM Corp.).

the success of domestic producers of semiconductor manufacturing equipment. To compete in the semiconductor market, producers must have access to state-of-the-art manufacturing equipment. Those producers which are able to employ the most efficient, productive and reliable manufacturing equipment will obviously have an advantage over those who do not or cannot.

Like the semiconductor industry itself, the U.S. semiconductor manufacturing equipment industry enjoyed a substantial lead over its competitors ten years ago. However, the domestic semiconductor manufacturing equipment industry has suffered such severe losses to Japanese competitors that its very survival has been questioned. In 1980, the top five semiconductor manufacturing equipment makers were U.S. companies.[37] By 1990, four of the top five equipment makers were Japanese.[38] Moreover, in 1981 American companies held 73% of the international market for manufacturing equipment,[39] but by 1990 that share had dropped to 38%.[40]

This deterioration of the American semiconductor manufacturing equipment industry threatened the health of domestic semiconductor producers by making them dependent on foreign suppliers for manufacturing equipment.[41] This would not be a serious problem if American semiconductor manufacturers could buy the latest and best equipment from foreign suppliers on the same terms as their foreign competitors. However, some evidence indicates that the Japanese suppliers were intentionally delaying sales of their most advanced equipment to American firms in order to give their Japanese competitors an advantage in the semiconductor market.[42] Given this sort of nationalistic behavior on the part of foreign suppliers, the continued health of the domestic manufacturing equipment industry is crucial to the viability of the American semiconductor industry.

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37. *Proposed Foreign Acquisition of LTV Debated*, 57 Fed. Cont. Rep. (BNA) 904, 905 (June 15, 1992).

38. *Decline of U.S. Semiconductor Infrastructure*, *supra* note 32, at 71.

39. Elizabeth Corcoran, *U.S. Semiconductor Toolmakers Regain Ground*, SCI. AM., July 1992, at 108.

40. John Markoff, *Rethinking the National Chip Policy*, N.Y. TIMES, July 14, 1992, at D1, D6.

41. The American semiconductor manufacturing equipment industry had deteriorated so badly by 1986 that semiconductors could not be produced using all U.S.-made manufacturing equipment. Thus, American producers had to buy Japanese equipment in order to produce semiconductors.

42. *Semiconductors and the Electronics Industry*, *supra* note 33, at 54 (statement of Peter H. Mills, Senior Vice President, Sematech).

2. Infrastructure

A second way that an industry may generate external economies is by contributing to a nation's economic infrastructure. Certain industries are essential to a nation's economy because they provide "critical or strategic inputs that must be available as infrastructure to the rest of the economy."[43] Industries such as steel and semiconductors, for example, are essential to the existence and growth of many other related industries.[44]

Other industries are critical to the U.S. economic infrastructure because of the knowledge and skills they provide to American workers. Science-based industries, for example, are critical because they "play a role akin to that of universities in building and preserving the nation's stock of human capital—that is, both scientific and engineering knowledge and the ability to expand it."[45] This infrastructure is essential to the success of small, high technology, entrepreneurial companies which are often seen as one of America's greatest economic strengths. These "niche" companies do not generally come into existence without a supporting foundation. Rather, "most of the leading entrepreneurial companies were started by men who learned their trade in the laboratories and on the production lines of larger companies."[46] Furthermore, these companies cannot continue to "survive without an infrastructure in which they assume specific roles and from which they draw talent, expertise, components, equipment and a market . . . . [T]hey must operate in an environment that provides them the support they need."[47]

The existence of domestic industries in certain areas is also critical because "the *future* growth and technological development of a nation is moulded by the *current* composition of its industries and activities."[48] The high technology products and industries of the future are often developed by applying new technologies and improvements to existing products.[49] If the

43. John Zysman, *Trade, Technology and National Competition*, 7 INT'L J. TECH. MGMT. 161, 162 (1992).

44. NESTER, *supra* note 8, at 16.

45. CONGRESSIONAL BUDGET OFFICE, *supra* note 14, at xviii.

46. *OTA Report*, *supra* note 21, at 123 (statement of Sanford L. Kane, former president, U.S. Memories).

47. *Id.*

48. Zysman, *supra* note 43, at 164.

49. In addition, innovations that lead to new products or that greatly improve

products of today are no longer produced by American companies, the scientific or technological breakthroughs which are made in the United States may not translate into substantial benefits for the U.S. economy. The absence of domestic companies in industries which can actually apply new technological breakthroughs to commercially viable products causes the technology to be sold to foreign companies which can use it.[50] Accordingly, the additional investment, profits and job creation which new technologies make possible may not be realized by the United States, but by other countries.

Government assistance to industry may sometimes be necessary because individual American firms are generally not concerned about whether their decision to abandon a particular industry will hurt the national economic infrastructure. Individual American firms operate under the notion of opportunity cost. If they are able to make more money by abandoning an industry and concentrating in another, they will do so.[51] In Japan, by contrast, the opposite approach is taken. "[T]he Japanese feel that to abandon a product or market means the potential loss of other related products and markets and, therefore, the loss of valuable infrastructure."[52]

3. *Spillovers*

A third way that an industry may generate external economies occurs through the process of "spillover," in which "[t]echnological knowledge in one sector or activity . . . provide[s] the basis for innovation in another."[53] In other words, the lessons learned in developing and making products which are considered "technology drivers," such as semiconductors or high-definition television (HDTV), are applicable to other industries.[54] The consumer electronics business, for example,

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existing products often occur not in a scientific laboratory but on the factory floor. The factory floor is itself a laboratory where incremental improvements and advances are made which may lead to new products. If the factory floor no longer exists on domestic soil, it is extremely difficult to develop a domestic capability in the next-generation products which use related but more advanced technology.

50. *See Acceleration of U.S. Technology Utilization and Commercialization: Hearing Before the Subcomm. on Technology and Competitiveness of the House Comm. on Science, Space, and Technology*, 102d Cong., 1st Sess. 57 (1991) (statement of Richard J. Elkus, Jr., Chairman, Prometrix Corp.).

51. *Id.* at 61-62.

52. *Id.*

53. Zysman, *supra* note 43, at 165.

54. *OTA Report*, *supra* note 21, at 125 (statement of Sanford L. Kane, former

has become an increasingly important source of technological spillovers because the technologies used in these products are converging with those used in computers and other business products.[55] America's virtual absence from the consumer electronics industry has put American firms at a disadvantage in the development of new products, especially in the area of computers and business products.[56] This is because foreign firms are able to use the technology and experience gained from producing consumer electronics products to gain an advantage in these other related industries.

> For example, firms in Japan, Korea, and Taiwan adapted the superior CRTs [cathode ray tubes] they developed for television to computers, and took a large share of that CRT market . . . . Canon used its expertise in optics, developed in producing consumer cameras, to help in gaining its present eminence in photocopiers. Perhaps most important, Japanese firms producing consumer products such as VCRs gained experience with automated production lines which they are now applying to the manufacture of computers.[57]

Although the exact level of spillovers generated by an industry is impossible to predict, certain technologies hold such great promise and such potential widespread application that their development merits government support. Some of the underlying technologies for HDTV, such as flat panel liquid crystal displays, are possible candidates for such support.[58] Innovations and developments in HDTV technology are likely to have application to computers, telecommunications, medical imaging, education, and publishing.[59] In addition, HDTV is likely to "push advances in manufacturing processes" which may be applicable to other areas of the electronics industry.[60] Knowledge of manufacturing process technology for HDTV could help U.S. companies become more competitive by helping them to improve manufacturing processes for other products.

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president, U.S. Memories).

55. COMPETING IN MANUFACTURING, *supra* note 15, at 84.
56. *See id.*
57. *Id.*
58. *See id.* at 85-89.
59. *See id.* at 80-85.
60. *Id.* at 83.

III. WHAT U.S. INDUSTRIAL POLICY SHOULD LOOK LIKE

For many years the United States has had a limited and unspoken industrial policy. However, in order for American companies to be internationally competitive, the U.S. government needs to take a more active role to promote the health and growth of American industries. The goal of a U.S. industrial policy should be to enhance the economic prosperity of its citizens by helping to create and to maintain high value-added jobs for American workers. Because high value-added jobs are found in the manufacturing and high technology industries, one important objective of an American industrial policy should be to adopt policies that encourage the growth and enhance the competitiveness of these industries. The following sections examine three strategies that the U.S. government could employ to achieve these objectives.

A. Government-Industry Consortia

One strategy frequently employed by other nations as a part of their overall industrial policy is an effort to bring government and industry together to collaborate on important projects. This effort often takes the form of government-sponsored cooperation between competitors in the same industry in "pre-competitive research and development." This cooperation allows competing companies to avoid duplicating research in pre-competitive areas and helps them to stretch their research and development budgets further than otherwise possible. Such cooperation also enables companies in an important industry to engage in expensive and risky, but potentially profitable, research projects that no individual company could afford to undertake alone.

This type of government-sponsored consortium has the potential to help American companies compete in a number of industries. Consortia may be particularly helpful in high tech industries where technology advances rapidly and where American companies already spend four to five times as much on research and development (R&D) as other manufacturing companies. The United States already has a prototype program, known as the Semiconductor Manufacturing Technology Consortium, or Sematech, after which other programs could be modeled.

1. Sematech as an example of a successful government-sponsored consortium

Sematech is a manufacturing technology consortium consisting of the federal government and eleven companies which produce semiconductors or semiconductor manufacturing equipment.[61] At the time of Sematech's creation in 1987, both the semiconductor and the semiconductor manufacturing equipment industries were in serious trouble due to intense Japanese competition.[62] Critical American suppliers of semiconductor manufacturing equipment had fallen far behind the Japanese and were dropping out of the industry.[63] American producers of semiconductors had become dependent upon Japanese suppliers for their manufacturing equipment, "and they feared that they would not have reliable access to the latest and most efficient models—jeopardizing the whole chip industry's ability to compete."[64]

Administered under the guidance of the Defense Advanced Research Projects Agency (DARPA), Sematech was created with the goal of returning technological and manufacturing superiority in the semiconductor industry back to the United States. Sematech's approach was to reduce the R&D burden on member companies by pooling their resources and those of the federal government to conduct joint research in pre-competitive technologies.[65] The consortium focuses on "areas that offer industry-wide benefit without providing new product technology with which members can directly compete."[66] The federal government contributes $100 million annually to the consortium, an amount that is matched by the eleven member companies.[67]

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61. The consortium began in 1987 with 14 participants from private industry. Three of these original members (Micron Technology Corp., Harris Semiconductor, and LSI Logic) have since withdrawn from the consortium because of a lack of common goals.

62. Between 1983 and 1989 the industry lost more than $4 billion and 25,000 jobs. Thomas McCarroll, *Chips Ahoy!*, TIME, Nov. 23, 1992, at 62, 62.

63. James Flanigan, *U.S. Semiconductor Industry Rebounds from Hard Knocks*, L.A. TIMES, Oct. 4, 1992, at D1, D5.

64. *When Industrial Policy Works*, WASH. POST, Aug. 29, 1992, at A18.

65. Flanigan, *supra* note 63, at D5.

66. Peter Burrows, *Consortia: Are They Getting Better?*, ELECTRONIC BUS., May 18, 1992, at 47, 49.

67. *Semiconductors and the Electronics Industry*, *supra* note 33, at 56 (statement of Peter H. Mills, Senior Vice President, Sematech). The leveraging effect of

Because of the perilously weak position of the manufacturing equipment industry and the dependence of U.S. semiconductor producers on foreign suppliers of manufacturing equipment, Sematech's first objective was to restore the health of the manufacturing equipment industry. Sematech sought to "rebuild a U.S. capability at every step of the semiconductor production [process]."[68] In pursuit of this goal, Sematech has entered into more than fifty partnerships with forty-five American companies designed to improve the technology and reliability of U.S. manufacturing equipment.[69] Sematech has also worked to improve the manufacturing equipment industry "by pinpointing areas of technical discontinuities and engineering problems, rather than developing specific products or manufacturing processes."[70] Consequently, the biggest benefits to the industry have come not through great leaps in technology, but rather through incremental improvements in equipment and manufacturing techniques.[71]

Some quantifiable evidence suggests that these efforts are helping to make U.S. equipment manufacturers more efficient. For example, as a result of Sematech's efforts,

> ATEQ cut a year off development of a laser mask writer. LAM Research cut development costs 33% on an ECR machine for laying down dielectric. Working with six Sematech members, GCA Corp. improved the mean-time-between-failure of a new wafer stepper from 150 hours to more than 800 hours, making it competitive with Japan's best.[72]

In addition, "NCR Corp. said new technology was introduced into its manufacturing process nine to 12 months sooner as a result of Sematech's programs."[73] Sematech will also save the industry millions of dollars through its development of "a chem-

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the federal spending is even greater because when Sematech works with suppliers of important manufacturing equipment, the supplier puts in three dollars for every dollar that Sematech invests in the project. *Id.* at 65-66.

68. Longworth, *supra* note 7, at 12.

69. Peter Burrows, *Bill Spencer Struggles to Reform Sematech*, ELECTRONIC BUS., May 18, 1992, at 57, 60.

70. *Sematech Consortium Head Says U.S. Must Solve Its Own Problems, Stop Blaming Japan*, BNA INT'L TRADE DAILY, Feb. 12, 1992, *available in* LEXIS, World Library, BNAITD File.

71. *See* Burrows, *supra* note 66, at 49-50.

72. Burrows, *supra* note 69, at 60.

73. Daniel Southerland, *Sematech's Critical Juncture: Hailed as Success, Chip Consortium Faces Budget Cuts*, WASH. POST, Aug. 28, 1992, at B1, B2.

ical reclamation program, which reprocesses sulfuric acid" and results in "minimal disposal requirements and reduced environmental hazards."[74]

Although less tangible, one of Sematech's most important accomplishments is instilling a greater spirit of cooperation between makers of manufacturing equipment and the companies who actually use such equipment. As one analyst has observed, "the once-warlike relations between chip makers and equipment makers are [now] far more cooperative."[75] A GAO report noted that "some Sematech initiatives emulate Japanese practices by working with key suppliers to develop the next generation of equipment."[76] As a result, "[t]he big semiconductor companies are now developing long-term relationships with their suppliers instead of regarding them as potential competitors."[77]

Similarly, Sematech has helped foster greater cooperation between competitors in the pre-competitive stage. Sematech has "developed lower-cost methods of chip manufacturing by creating computer models that simulate semiconductor assembly lines. And it has devised uniform testing guidelines for equipment to replace the hodgepodge of standards set by different chipmakers."[78] In addition, Sematech member Intel points out that they now share all of their "internal methodologies for characterizing, qualifying, and debugging [their] equipment."[79]

During its first five years, Sematech has been instrumental in helping reverse the fortunes of the U.S. semiconductor industry. For the first time in almost a decade, U.S. makers of semiconductor manufacturing equipment actually saw their world market share increase in 1991 to 41%, up from 38% in 1990.[80] "This increase represented jobs generated in the United States, or not lost, greater than the government investment in the [Sematech] experiment."[81]

The improvement appears to be due largely to the efforts of

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74. *Semiconductors and the Electronics Industry*, *supra* note 33, at 62 (statement of Peter H. Mills, Senior Vice President, Sematech).
75. Burrows, *supra* note 69, at 62.
76. Southerland, *supra* note 73, at B2.
77. *When Industrial Policy Works*, *supra* note 64, at A18.
78. McCarroll, *supra* note 62, at 63.
79. Burrows, *supra* note 69, at 62.
80. Markoff, *supra* note 40, at D6.
81. William J. Spencer, *Technologies Need Nurturing*, N.Y. TIMES, July 10, 1992, at D1, D4.

Sematech. Some buyers of manufacturing equipment who had previously relied on foreign suppliers have noted that the improvements in the American equipment fostered by Sematech enabled them to buy more American equipment than they had originally planned. Intel, for example, noted that it bought 50% of its new equipment for a fabrication facility from U.S. producers rather than the 30% it had expected to buy.[82] Likewise, Motorola bought over 80% of its equipment for a new fabrication facility from American sources instead of the 25% for which it had planned.[83] Robert W. Galvin, the chairman of Sematech and the former chairman of Motorola, stated that "he believed that if Sematech had not been created five years ago, some American semiconductor producers that are now thriving would be out of business today."[84]

2. *The role of government in sponsoring consortia*

Although some experiments with government-industry consortia are now being conducted,[85] these efforts have been limited and only begin to tap the vast potential benefits which may be realized from this type of cooperation. In the electronics industry, for example, only 60 of over 20,000 companies are full

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82. Burrows, *supra* note 66, at 48.

83. *Id.*

84. Southerland, *supra* note 73, at B2.

85. In addition to Sematech, a limited number of other consortia currently exist. One such consortium is the Advanced Battery Consortium, consisting of the Big Three automakers (Ford, Chrysler and General Motors) and the federal government. The consortium's purpose is to develop advanced electric-car batteries for the future. *See* Donald Woutat, *Big 3 U.S. Auto Firms Team Up on Key Projects*, L.A. TIMES, June 9, 1992, at A1, A10.

The Defense Advanced Research Projects Agency (DARPA) has also recently proposed a new government-industry consortium to develop flat-panel displays, which are on everybody's list of critical technologies, and for which there is currently a $5 billion market. *Proposed U.S. Venture Would Try to Combat Japanese Lead in Flat Panel Display Market*, DAILY REP. FOR EXECUTIVES (BNA), Nov. 23, 1992, *available in* LEXIS, Nexis Library, DREXEC File. The flat-panel display consortium would be modeled after Sematech and would be directed by members from private industry. This proposed consortium would be an important experiment because it would be designed to get a new industry going rather than to shore up an existing industry. *Id.* The first three-year phase of the proposed project would "generate knowledge about display manufacturing and accelerate development of new technologies." Don Clark, *Pentagon Plans New Effort on Flat-Panel Displays*, S.F. CHRON., Aug. 5, 1992, at B1, B12. The second phase might include financing by DARPA to encourage U.S. companies to begin full-scale manufacturing. *Id.* DARPA's current plan proposes spending $12 million of federal funds on the project in the first year. *Proposed U.S. Venture Would Try to Combat Japanese Lead in Flat Panel Display Market*, *supra*.

participants in some type of government-industry consortium.[86] Additional consortia in existing industries and in promising new industries could potentially yield significant benefits to U.S. industry and the U.S. economy.

Although private consortia may often succeed without government assistance, some potentially successful consortia may never even come into existence without government participation. Competitors within an industry often distrust each other and are frequently reluctant to cooperate with one another.[87] This distrustful attitude often impedes the formation of an effective research consortium even when the consortium promises to yield substantial benefits.[88] Government participation may be of great importance in such situations because in addition to providing financial incentives, government involvement lends credibility to the venture, lessens suspicion, and helps increase the commitment of the individual members.[89] Government involvement may also be important because of its "convening power," or in other words, "its ability to organize and sponsor or sanction the activity."[90]

B. Manufacturing Extension Centers

The creation of manufacturing extension centers throughout the country is another program which could prove highly beneficial to the health of U.S. manufacturing industries. Modeled after the highly successful agricultural extension centers, the purpose of these centers would be to assist U.S. manufacturers, particularly small and medium-size manufacturers, in applying the latest manufacturing and production technology. A need for such centers certainly exists because manufacturing capability is an area in which the United States trails its foreign competitors. As one observer notes, "[c]ompared with their Japanese competitors, many of America's 357,000 manufacturing firms are stuck in a time warp today . . . . [A] combination of inertia and high capital costs has kept many from adopting improvements."[91]

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86. Burrows, *supra* note 66, at 47.

87. *See* CONGRESSIONAL BUDGET OFFICE, U.S. CONGRESS, USING R&D CONSORTIA FOR COMMERCIAL INNOVATION: SEMATECH, X-RAY LITHOGRAPHY, AND HIGH-RESOLUTION SYSTEMS 40 (1990).

88. *See id.*

89. *See* COMPETING IN MANUFACTURING, *supra* note 15, at 207, 209.

90. *See* CONGRESSIONAL BUDGET OFFICE, *supra* note 87, at 12.

91. Susan Dentzer, *Sharpening Our High-Tech Edge*, U.S. NEWS & WORLD

Small firms in particular find it difficult to keep up with advancing manufacturing technology. These firms "often lack the capital, the tax incentives, the access to information, the management strategies, and the training" necessary to effectively apply advanced manufacturing technology.[92] Small firms also often lack the expertise necessary to determine "what equipment best fits their needs, [and] how to use it efficiently."[93]

Failure of small and medium-size manufacturers to keep up with technological advances has nationwide economic implications. The failure to adopt advanced manufacturing techniques and equipment creates competitive problems for the small firms as well as for the larger manufacturers who rely on them for components.[94] The lack of modern manufacturing expertise also forces American companies with innovative ideas to go overseas to manufacture their products.[95] Unfortunately, this translates into lost jobs and lower wages for American workers.

One reason American companies have lagged behind their Japanese counterparts in manufacturing is that the United States devotes most of its research resources to basic scientific research as opposed to process technology.[96] "According to one study, Japanese companies invest roughly 70% of their R&D in process technology, whereas comparable U.S. companies invest

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REP., Dec. 16, 1991, at 71, 73.

92. *Critical Technologies: Machine Tools, Robotics, and Manufacturing: Hearing Before the Subcomm. on Technology and Competitiveness of the House Comm. on Science, Space, and Technology*, 102d Cong., 1st Sess. 60 (1991) (statement of Leo Reddy, President, National Coalition for Advanced Manufacturing).

93. COMPETING IN MANUFACTURING, *supra* note 15, at 158.

94. *See id.* at 25.

95. For example, even though Japanese labor rates are similar to U.S. rates, LSI Logic decided to move its semiconductor wafer fabrication plant from the United States to Japan because factory productivity rates were two to four times higher in Japan than in the United States. Given this differential, the company felt that it had no choice but to relocate its plant. Louise Kehoe, *Cost Constraints Prompt a Continental Shift: LSI's Decision to Close Its German Plant Shows the Problems Facing High-Tech Manufacturing in Europe*, FIN. TIMES, Aug. 25, 1992, at 13.

96. Process technology generally refers to the way that products are manufactured and brought to market. For example, improvements in the way that products are manufactured may reduce the number of defects found in a manufactured product or reduce the cost and time required to design and manufacture a new product and bring it to market. Basic scientific research, on the other hand, focuses on developing new technologies which can lead to the creation of entirely new products.

about the same proportion in product R&D."[97] As a result, although U.S. companies are usually the leaders in developing the technologies which lead to new products, the Japanese profit from the developments because of their superiority in manufacturing and process technologies. The key to keeping a manufacturing company successful in the global market today depends less on major scientific breakthroughs and more on "[c]ost-sensitive design, new process technologies, [and] manufacturing systems engineering."[98] Manufacturing extension centers could help U.S. manufacturers improve their production processes and hence the quality and reliability of their products. Significant gains could be achieved by helping "companies to improve their ability to use new process technologies such as computer-aided design, computer-controlled machine tools, or electronic data interchange."[99]

Although there are consultants in the private sector which specialize in helping manufacturers apply new technologies, the availability of private sector assistance does not appear to have been effective in helping small manufacturers. Small and medium-size manufacturers hesitate to use private consultants because they "don't trust their ability to find a consultant who will tailor his advice to what the manufacturer needs rather than what the consultant has to sell."[100] Some small firms also cite difficulties in obtaining competent help from private consulting firms, perhaps because " '[t]he engineering service consultants usually send out the new guys to small firms.' "[101] On the other hand, because state government extension services "are not trying to sell the companies anything or collect big fees," small manufacturers are more likely to trust their objectivity and impartiality.[102]

The federal government and some state governments have already made some limited efforts to promote the diffusion of manufacturing technology. The federal government recently established a technology extension program which provides for six Manufacturing Technology Centers.[103] Twenty-three

97. Lewis M. Branscomb, *Does America Need a Technology Policy?*, HARV. BUS. REV., Mar.-Apr. 1992, at 24, 25.
98. *Id.*
99. *Id.* at 30.
100. COMPETING IN MANUFACTURING, *supra* note 15, at 174.
101. *Id.* at 180 (quoting Gary Brooks, President, Brooks Manufacturing).
102. *Id.* at 179.
103. *See id.* at 26.

states "are spending a total of $50 million a year supporting 27 technology extension centers."[104] Many state industrial extension centers have already demonstrated the value that such programs can have for the nation's manufacturing industries. "Georgia Institute of Technology, for example, has helped almost 3,000 companies over the past five years solve manufacturing-process problems."[105] In Pennsylvania, a team of experts from a state-sponsored industrial extension center helped Scheirer Machine Co. to "reorganize its shop floor and raise productivity by about 15% in just six months. The center lent Scheirer $150,000 at 5% interest to buy a computerized lathe. And the company will get ongoing assistance to upgrade its technology further."[106] The services provided by the extension centers are in such demand that some of the centers do not "advertise for fear of attracting too much business."[107]

The existing state and federal programs are, however, still very limited and underfunded. All of the programs combined probably reach less than two percent of all small manufacturing firms.[108] This effort is dwarfed by the Japanese, who spend over $470 million supporting 185 technology extension centers.[109]

The Office of Trade and Technology Assessment estimates that the cost to run industrial extension programs in all states would be about $480 million.[110] However, the net cost to the federal government for such a nationwide industrial extension program is likely to be significantly less than the actual cost because the government can expect to receive a return on its investment. Improving the productivity and profitability of U.S. manufacturers should help retain and create high-wage jobs in the United States and thereby increase tax revenues.[111] This

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104. Christopher Farrell et al., *Industrial Policy*, BUS. WK., Apr. 6, 1992, at 70, 73.

105. *Id.* at 73.

106. Michael Schroeder, *Small Business Has a Friend in Pennsylvania*, BUS. WK., Apr. 6, 1992, at 75, 75.

107. COMPETING IN MANUFACTURING, *supra* note 15, at 183.

108. *Id.* at 18.

109. *Id.* The current amount spent for industrial extension services is also insignificant when compared with the Agricultural Extension Service, which receives $1.2 billion (31% federal) in funding and has 4,650 scientific and technical staff. *Id.* at 55. An increase in funding for industrial extension services would appear justified considering that "agriculture contributes 2 percent to the gross national product, and manufacturing 19 percent." *Id.*

110. Farrell et al., *supra* note 104, at 73.

111. This appears to be the case with agricultural extension programs.

appears to be the motivation for the states which have already set up industrial extension programs. Their goal is to preserve and develop "stable, high-paying factory jobs,"[112] which in turn strengthens their tax base.

C. *Lower the Cost of Capital and Improve Tax Incentives*

During the last decade, U.S. competitiveness was hindered by the high cost of capital for U.S. companies compared to the cost for their Japanese and many of their European counterparts.[113] Since the decline of the Japanese stock market, the cost of capital for Japanese companies has approached that of U.S. companies. However, U.S. companies still face a competitive disadvantage in their ability to finance investment in equipment and R&D due to the low U.S. savings rate and unfavorable tax laws. Thus, one final element of an effective American industrial policy would be to enact laws which would increase the U.S. savings pool and encourage investment in high technology and high value-added industries.

1. *The low U.S. savings rate*

For the past several years, the U.S. savings rate has been well below that of many of America's economic competitors.[114] Theoretically, a low domestic savings rate should not necessarily be detrimental to U.S. companies. Assuming that world capital markets are completely open, U.S. companies should be able to borrow from foreign lenders and investors at the same rate as their foreign competitors. In theory then, U.S. companies should be at no disadvantage with reference to the avail-

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> Two studies have found high rates of return on investments in agricultural research, extension, and farmers' schooling. One study estimated internal rates of return (value of agricultural product/research and extension expenditures) of 27 percent on such public investments in the State of Virginia . . . . The other study found a social internal rate of return to public crop research of 62 percent, and 15 percent to farmers' schooling.

COMPETING IN MANUFACTURING, *supra* note 15, at 55 n.46 (citations omitted).

112. Schroeder, *supra* note 106, at 75.

113. James Flanigan, *In Adversity, U.S. Finds New Strength*, L.A. TIMES, May 13, 1992, at D1, D3. The cost of capital is defined as "the total cost of financing a company through borrowing and issuing stock." *Id.*

114. The U.S. savings rate, which has recently averaged about 5.5% of GNP, looks particularly bad when compared with the Japanese savings rate, which has averaged around 18%. *Decline of U.S. Semiconductor Infrastructure*, *supra* note 32, at 43 (statement of Robert N. Noyce, President, Sematech).

ability and cost of capital. This theory, however, is seriously flawed.[115] It assumes that the source or national origin of the capital is irrelevant. Unfortunately, American competitiveness is affected by the source of capital, especially in high technology industries.

In order to modernize their manufacturing facilities or to invest in a promising R&D project, companies are required to raise large amounts of capital. Because U.S. capital is lacking, companies are often forced to look to Japan for investment. In 1988, for example, twenty percent of all U.S. semiconductor equipment and materials suppliers who work with Sematech had to get their expansion financing from Japanese sources.[116] Japan clearly has the capital to invest, as a result of its huge trade surplus (a cumulative $400 billion with the United States over the last decade).[117] However, in return for desperately needed Japanese capital, companies are at times forced to make critical concessions to competitors or potential competitors. Often, a company must agree to share its technology or grant a license in return for access to Japanese capital.[118] As a result, Japan is able to transfer many high value-added jobs to the Japanese economy.[119]

Japanese companies have also used their pools of excess capital to buy American high technology firms. The large number of acquisitions of American high technology companies by Japanese firms is alarming, to say the least. The Economic Strategy Institute in Washington reported that between 1988 and 1991, Japanese companies accounted for 87 of 133 foreign purchases of all or part of U.S. computer companies,

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115. The cost of capital for American firms might be higher than for their foreign competitors even if they had equal access to capital from foreign lenders. Cost of capital is influenced not only by "the cost of funds—interest rates or the cost of equity"—but also by other factors such as "corporate tax rates, the economic depreciation of the investment and its tax treatment, and other fiscal incentives for investment." COMPETING IN MANUFACTURING, *supra* note 15, at 94. Thus, even if the capital markets of all countries were open, and there is some evidence that they are not, the cost of capital is likely to vary in different countries as a result of differing tax and fiscal policies.

116. *Decline of U.S. Semiconductor Infrastructure*, *supra* note 32, at 43 (statement of Robert N. Noyce, President, Sematech).

117. Longworth, *supra* note 7, at 12.

118. *See* Jack Robertson, *Yields on Joint Ventures*, ELECTRONIC NEWS, July 27, 1992, at 11, 11.

119. *Decline of U.S. Semiconductor Infrastructure*, *supra* note 32, at 43 (statement of Robert N. Noyce, President, Sematech).

> 26 of 48 foreign investments in U.S. electronics firms, 48 of 53 investments in semiconductor companies, 27 of 37 investments in companies making semiconductor equipment, 30 of 59 telecommunications investments and 36 of 48 investments in companies making advanced materials . . . . [I]n at least half these deals, the Japanese bought a majority ownership.[120]

In contrast, it is extremely difficult for an American firm to acquire a Japanese firm. "In 1990, there were 801 mergers and acquisitions in Japan; only 10 involved foreign firms buying Japanese firms. In all 10 cases, it was a friendly acquisition in a low tech business."[121] The problem is not the amount of Japanese investment, but rather the fact that the Japanese are targeting specific high technology industries, and that the technology flow in these industries is one-way from the United States to Japan.[122] The danger is that America's technological advantage in many industries is being rapidly eroded as Japanese competitors cheaply acquire American technology in exchange for capital. The loss of technological advantage makes it more difficult for other American firms to compete, and this in turn results in lost market share, lost manufacturing base, lost jobs and a higher trade deficit. This situation creates a vicious circle. A large trade surplus with the United States gives the Japanese a large pool of excess capital with which to acquire U.S. companies and technology. This acquired technology in turn helps the Japanese companies gain market share over U.S. companies, thereby generating an even larger trade surplus.[123]

To alleviate this problem, the U.S. savings rate must be increased, thereby increasing the available pool of U.S. capital. This objective may be accomplished in a number of ways.[124] A broad-based tax on consumption would raise the savings rate but would likely be so unpopular as to be politically infeasible. Another possible solution is to give tax breaks for savings and

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120. R.C. Longworth, *Japanese Find Variety of Ways to Buy U.S. Ideas*, CHI. TRIB., May 19, 1992, § 1, at 1, 15.

121. *Id.*

122. *See* Robertson, *supra* note 118, at 11.

123. *See Decline of U.S. Semiconductor Infrastructure*, *supra* note 32, at 38 (statement of Robert N. Noyce, President, Sematech).

124. A lengthy discussion of these alternatives is beyond the scope of this comment.

investment. One often suggested method is to reduce or completely eliminate the capital gains tax for long-term investments of five to ten years or more. Most of America's competitors have very low or no capital gains tax.[125] To level the playing field with these competitors, the U.S. capital gains tax on long-term investments should be significantly lowered. Another possibility is to expand existing savings programs such as Individual Retirement Accounts by increasing the amount of income that may be deducted and deferred, and by expanding the class of individuals who are allowed to participate.

2. Unfavorable tax policies

American companies are also faced with a competitive disadvantage with respect to their Japanese and European competitors due to unfavorable laws relating to depreciation schedules and credits for investment. The pace of innovation and change is so great in high tech industries that firms have to invest huge amounts of money just to keep up with the latest technology. The cost of constructing high tech manufacturing facilities is staggering and is expected to increase. The Japanese are able to depreciate their high technology equipment investments in three years as opposed to five years for American companies.[126] This makes investment much cheaper and therefore more attractive to Japanese companies.[127]

Changing the depreciation schedules to allow for a faster write-off of high tech investments would more accurately reflect the reality of the market because technology changes so quickly that most high tech investments are actually obsolete in three years.[128] Allowing American companies to depreciate their in-

125. *Decline of U.S. Semiconductor Infrastructure, supra* note 32, at 13 (statement of Michael P. Skarzynski, Assistant Secretary for Trade Development, Department of Commerce).

126. *See* Jack Robertson, *Equipment Tax Break—Picking Up the Pieces*, ELECTRONIC NEWS, Apr. 13, 1992, at 10, 10.

127. For example, one industry executive noted that " '[i]f Intel invests $1 billion in new plant and equipment, it will pay $270 million more in taxes over five years than a Japanese company will . . . . This is because the Japanese can write this investment off over two or three years, while our write-off is five years.' " Longworth, *supra* note 7, at 12 (quoting Michael Maibach, government affairs manager, Silicon Valley Co.).

128. *See Semiconductors and the Electronics Industry, supra* note 33, at 6 (statement of John A. Armstrong, Vice President for Science and Technology, IBM Corp.).

vestments in high technology equipment more rapidly would encourage such investment and would allow American companies to compete more effectively with foreign rivals.

The government could also encourage investment in high technology industries by restructuring the current R&D tax credit. The government should first make the R&D tax credit permanent. Because Congress never made the credit permanent, it must vote to reenact the tax credit every year. The uncertainty regarding the future availability of the credit may actually thwart a company's long-term investment plans.[129] Furthermore, to encourage investment in improving manufacturing processes and techniques, the credit should be extended to process and engineering R&D in addition to product R&D.

The R&D credit should also be made available to "first dollar" investments. In the current system, the credit only applies to incremental increases in R&D spending over the average spending during the base years 1984 to 1988.[130] This system fails to provide an adequate incentive for significant R&D spending because the years 1984 to 1988 were "among the most prosperous in U.S. manufacturing to date."[131] As one observer of the semiconductor industry has noted, the problem "is not one of an increment in R&D funding, the problem is one of keeping the R&D funding even at a constant real rate . . . . [T]he R&D tax credit only on the increment is not of much use to the industry."[132]

IV. CONCLUSION

American industry has not performed particularly well over the last ten to twenty years. America has seen the decline of many important industries and is currently witnessing the decline and destruction of several others. The U.S. manufacturing industry and infrastructure are vital to the health of the overall American economy, including the service and technology industries. Instead of watching passively as American manufacturing and support jobs are moved abroad, the federal govern-

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129. Dentzer, *supra* note 91, at 75.

130. *Manufacturers Urge 'Aggressive' Steps on Innovation, Call for R&D Credit, ITC*, DAILY REP. FOR EXECUTIVES (BNA), Nov. 25, 1992, *available in* LEXIS, Nexis Library, DREXEC File.

131. *Id.*

132. *Semiconductors and the Electronics Industry*, *supra* note 33, at 6 (statement of John A. Armstrong, Vice President for Science and Technology, IBM Corp.).

ment should take an active role in creating the conditions in which American industry can flourish. Although the government need not pick winners and losers in the market, the government should assume the role of a partner with business with the common goal of promoting economic prosperity. By participating in research consortia in important industries, establishing a network of manufacturing extension centers, and providing incentives for greater savings and investment, the government can help American industry gain a competitive edge in the world market.

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