Strategic Trade and National Security:
Promoting the Flat Panel display Industry

Case C (1993-1996)

I. Measuring the Effects of Antidumping

The decision to levy antidumping duties against Japanese FPD exports was largely a reactive measure to curb perceived unfair trading practices from Japanese competitors. By raising the relative price of Japanese FPDs, such duties could, in theory, make domestic FPDs more attractive to manufacturers and allow American manufacturers to take away a portion of market share from Japanese producers. However the implementation of the antidumping penalties raised difficult issues for U.S. industry and government policy makers. Analysts questioned both the short and long- term implications of imposing antidumping duties. In its final decision the ITC had admitted that the duties would impose a short term cost, namely higher prices for displays and some movement of production offshore, but had ruled on the grounds that this would be made up for in the long term as U.S. suppliers were able to enter the market.

Critics asserted that this type of disguised protectionism would not of itself make it possible for U.S. firms to enter into high volume production. Even worse, the duties weren't very protective. Japanese firms would still be able to engage in predatory pricing in third country markets. Additionally, because U.S. Customs authorities had been opposed to including assembled systems in the penalties, there would be nothing to stop dumped displays from entering the U.S. in finished products. *Tariff schedule*

For these and other reasons many economists were disparaging towards antidumping penalties as a way to respond to unfair competition. To begin with, the imposition of antidumping penalties necessarily favored import competitors over consumers: in the case of FPD's, dumped screens would very much help U.S. computer makers to lower production costs. This factor would become increasingly important as the cost of the displays escalated relative to the final product. It was little surprise when the penalties provoked vigorous protests from American and Japanese firms with laptop computer manufacturing facilities in the United States, a number of whom announced that they would transfer their assembly of laptop computers to offshore locations.

The Japanese AM-LCD manufacturers Toshiba and Sharp both announced that they would have to move their U.S. laptop assembly operations offshore, back to Japan and to Canada, respectively. Hoshiden suspended exports of AM-LCD's to the US, and following this action, Apple announced plans to shift its assembly from California to Cork, Ireland or Singapore. Both Compaq and IBM indicated that they would move their assembly of laptops offshore. The attorney for the ADMA, Paul Rosenthal, responded that "American computer firms were driven by short term pricing considerations in buying displays from Japan. I hope the US computer industry does not become dependent

on their major competitors. In 10 years we will hear from the computer industry when it is struggling with Japan as we are now." However, other industry observers noted that it made little since to put the interests the moribund U.S. display industry ahead of those of the successful computer industry

On June 21, 1993 the ITC finally released its decision under the remand investigation. Despite OIS's withdrawal of support for the penalties,*this won't be in case b now so explain* in the course of the investigation two aspiring AM-LCD makers, Planar Systems and Standish Industries, had requested a continuation of the duties so that they could raise the necessary capital to begin volume production. However the ITC ruled that they lacked legal standing because they did not at the time produce AM-LCD's, and without any petitioner actually in production the duties on these displays were revoked.

The revocation of the antidumping penalties left the U.S. FPD industry in a difficult position. Reactive trade measures had failed to provide the industry with protection from what the ADMA had alleged were strategic trading practices by Japanese competitors. Whether or not this should be of serious economic concern for the country as a whole was subject to some debate.

II. Strategic Trade for High Tech Industries

III.

The revocation of the antidumping penalties left the U.S. FPD industry in a bind. Reactive trade measures had failed to provide the industry with protection from the Japanese competition hey Whether or not this should be of serious economic concern for the country as a whole was subject to some debate. Rewrite this whole section as this is where barriers to entry should go – not architecture of supply yet.

Traditional economic theory, which could trace its lineage from Adam Smith to more recent proponents such as the "Chicago School" of economics and Paul Krugman at the Massachussetts Institute of Technology (MIT), counseled that trade and competition policies should be structured strictly in terms of their impact on consumer welfare and allocative efficiency. Their views were rooted in the idea that international trade was a positive-sum game, as Dr. Krugman would assert:

> "One of the most popular, enduring misconceptions of practical men is that countries are in competition with each other in the same way that companies in the same business are in competition…An introductory economics course should drive home to students the point that international trade is not about competition, it is about mutually beneficial exchange."

However, by the early 1990's a burgeoning literature was examining a confluence of trends in high technology sectors, particularly microelectronics, and concluding that new approaches were needed to promote U.S. competitiveness. As this type of analysis developed a consensus emerged in some economic policy making circles that the time was right for the U.S. to think seriously about adopting limited industrial policies similar to those which had promoted innovations and increased manufacturing efficiency in Japan and the Newly Industrializing Countries (NIC's) in East Asia.

The so called "strategic traders" were influenced by a seminal paper by the economists Brander and Spencer, who demonstrated that under some very specific assumptions, government subsidies to industries could provide first mover advantages and allow domestic firms to capture market share foreign competitors. The FPD industry, with its wide variety of commercial uses, high value added manufacturing, and sigificant spillover effects to semiconductor manufacturing and other high technology fields, was viewed as the perfect example of an industry that could benefit from such policies. At the same time both Japanese and Western authors were conducting extensive analyses of the nature of Japan's ability to rapidly innovate in key manufacturing endeavors.

In various sectors, it was shown that Japan's success rested in large part upon a sequence of innovative cycles in which firms would move down a rapid learning path to attain manufacturing efficiencies. These cycles were dependent upon licensing key technologies, making large initial investments in high volume manufacturing sustained by forward pricing, and the diffusion of manufacturing technologies among distributed networks of suppliers who could then in turn implement their own innovations. Because these supplier networks were more closly integrated than was the case in the United States, incremental innovations in materials and processes could be integrated into the final products developed by marketing divisions at a much more rapid pace. This allowed the firms to establish first mover advantages and finance the next round of innovations.

In a groundbreaking paper entitled *Display's the Thing: The Real Stakes in the Conflict over High-Resolution Displays*, Michael Borrus and Jeffrey Hart argued that the United States could not afford to lose the FPD market to overseas competitors. They showed that key trends in the industry were linking success in display production with the ability to maintain a presence in other manufacturing endeavors:

> "*Advanced displays* and *integrated display systems* will provide strategic leverage to shape competitive outcomes in future electronics markets. Advanced displays will contribute a sizeable and perhaps increasing portion of the total value-added of electronic systems…Integrated display systems will require the development or refinement of technologies used in almost every branch of electronics- lithography, etching, deposition, bonding, packaging, testing, and so forth…control over display technologies will become almost as important in future electronics markets as control over integrated circuit technology has been for the past three decades."

Borrus and Hart were concerned with the future of U.S. manufacturing in the FPD industry because research had shown that technology development was a path dependent process in which manufacturing experience counted more than access to technology. By accumulating years of high volume manufacturing experience Japan had created a mature supply base or what they termed an "architecture of supply", defined as "the structure of the markets and of other organized interactions through which component, materials, and equipment technologies reach producers." In a telling statistic published in Japan in 1993, of nearly fifty companies involved in supplying equipment to the AM-LCD manufacturing industry, only five were American firms.

Borrus and Hart called for a broad ranging, activist program to encourage a reinvestments in infrastructure and education, targeted programs to encourage repatriation of manufacturing know how through foreign direct investment controls, the diffusion of advanced technology and practices throughout domestic industry, and a program of strategic bargaining to ensure market access for U.S. exports.

To these recommendations were added calls from other sources for more direct encouragement of domestic production capacity, including government subsidies and R&D programs. Normally many of these proposals would have fallen on deaf ears in Washington. The Bush administration had been very weary of proposals for industrial policies to develop high definition television (HDTV) in the late 1980's, despite similar arguments from industry observers. However, the incoming Clinton administration brought in a decidedly favorable approach to strategic trade policy. This was signaled from the outset by the President's appointment of Laura D. Tyson as chair of the Council of Economic Advisors. Ms. Tyson had cautiously advocated strategic trade policies for certain high technology sectors as a member of the Berkely Roundtable on the International economy.

Prior to her appointment Ms. Tyson had published a book entitled *Trade Conflict in High-Technology Sectors* in which she suuported the arguments of Borrus and Hart. While supporting the goals of the ADMA, she rejected the argument that Japanese tarding practices had been responsible for their failure to establish a manufacturing presence in the industry. Citing weakness in manufacturing capabilities and a shortage of available long-term captial, she welcomed efforts to engage in more proactive policies such relaxation of antitrust regulations, provision of public funds for R&D, and policies to promote high-volume domestic production. Also, she welcomed the increasing interest the U.S. Department of Defense (DoD) was showing in the industry.

IV. Defense Applications of Flat Panel Displays

V. The increased interest in the FPD industry within the DoD reflected both a new approach towards Defense procurement, brought on by increased budget constraints, and heightened sense of the importance of FPD's for a variety of crucial military applications.

As discussed in Case A of this study, for most of the post-war period the United States had relied upon a spin-off approach towards developing crucial military technologies, wherebye DoD funds were used to support R&D programs which then funneled knowledge and manufacturing technologies to specialized defense suppliers. With some lag time the new technologies would be applied to commercial manufacturing. This approach worked well because at the time defense contracts constituted the greater portions of these specialized markets, and therefore this demand was enough to sustain an adequate, if expensive, manufacturing base.

However, by the early 1990's it was clear that the rapid technological innovations made possible by high volume commercial manufacturing were outpacing anything limited application defense sectors could come up with. Not only were defense suppliers no longer able to maintain technological leadership, but many key advances were now taking place overseas in crucial applications to weapons systems, such as semiconductors, materials processing, and FPD's. These factors led planners at the Pentagon to consider reorienting dfense procurement strategies to reflect both the changes in technology supply base and the need for lower cost procurement options in the face of budgetary constraints.

At the same time, the DoD was calculating a significant increase in its demand for display solutions to battlefield information systems. A variety of modern defense weapons systems depended upon the visual dislay of real time information in conditions that demanded the durability, lower power draw, compactness, and performance only available in FPD's. As the allied repsonse to the Persian Gulf crisis demonstrated with remarkable clarity, these weapons systems translated into significant tactical advantages.

While some programs were already underway, the new approach was fully developed in a 1995 DoD report entitled *Dual Use Technology: A Defense Strategy for Affordable, Leading Edge Technology*. The three main pillars outlined in the program were:

- Invest in dual use technologies critical to military applications
- Integrate military and commercial production
- Insert commercial components into military systems

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At the same time, the development of a domestic flat-panel display industry was considered by some to be important to America's economy. The loudest calls for a domestic industry came from the Department of Defense. Dr. Kenneth Flamm, Deputy

Assistant Secretary of Defense for Dual-Use Technology Policy and International Programs. authored a study that investigated the military and commercial uses of Flat-Panel Displays. The conclusions of that report can be summarized as follows:

1) Flat-panel displays were regarded as crucial to development of current and future military hardware: helmets with built-in displays, advanced tanks, jets, etc.

2) American FPD producers, while having the technical knowledge necessary to produce FPDs, could not produce FPDs in mass volume to meet the DoD's demand.

3) Foreign FPD producers could and would not effectively customize their FPDs to meet military needs. The DoD required customizable displays for military purposes-the production of which would require new production lines. Such customized displays would be more easily produced by US manufacturers. In addition, many Japanese companies refused to sell directly to the US military or provide them with model versions of displays.

4) For reasons of national security, the DoD was apprehensive about allowing foreign producers have access to the production of US military hardware. Recommendations from this DoD study clearly called for American producers to acquire a significant market share in the production of FPDs. At the same time, economists and policy advocates (such as Laura D' Andrea Tyson) believed that high-technology industries could have signigcant spillover effects to other industries and that the knowledge gained from FPD production could be used in the production of other high-tech commercial products and result in higher-paying jobs for American workers. As Ross Perot succintly put it, "We need computer chips, not potato chips." An industrial policy to subsidize the production of FPDs would have been a more proactive effort to support a flailing domestic FPD industry. However, such policies were not supported on the executive level until the Clinton administration came to power. Clinton was largely influenced by supporters of a limited industrial policy in certain high-technology industries. Clinton's height of support for these ideas came when he appointed Laura D'Andrea Tyson, a self-described cautious activist concerning industrial policy, as Chair of the Council of Economic Advisors. These "strategic traders" as one economist likes to call them, base their ideas on a famous paper by two economists, Brander and Spencer. Brander and Spencer showed, that under some very specific assumptions, government subsidies of certain domestic industries could provide a first-mover advantage and take away market share from foreign competition. While many economists and policy analysts did not completely accept the Brander-Spencer argument due to its many strict assumptions, it was conceded that a *limited* strategic trade policy may be effective in certain cases. The flat-panel display industry with its wide variety of commercial uses, high wages and profits, and large spillovers to semiconductor manufacturing and other high-technology fields, was though to be a perfect target for government subsidies. Government support of a domestic industry had even broader backing, however, by the Department of Defense.

5) As a result of this study, the Undersecretary of Defense for Acquisition John M. Deutch, announced in 1994 a five-year $587 million program to help US companies produce FPDs in high volume, the National Flat-Panel Display Initiative (NFPDI). The funding plan for the NFPDI is as follows:

	FY94	FY95	FY96	FY97	FY98	Total
Core R&D	46	68	68	68	68	318
Manufacturing test bed	50	0	0	0	0	50
R&D incentives tied to manufacturing	0	25	50	50	74	199
Purchase Incentives	0	10	10			20
Total	96	103	128	118	142	587

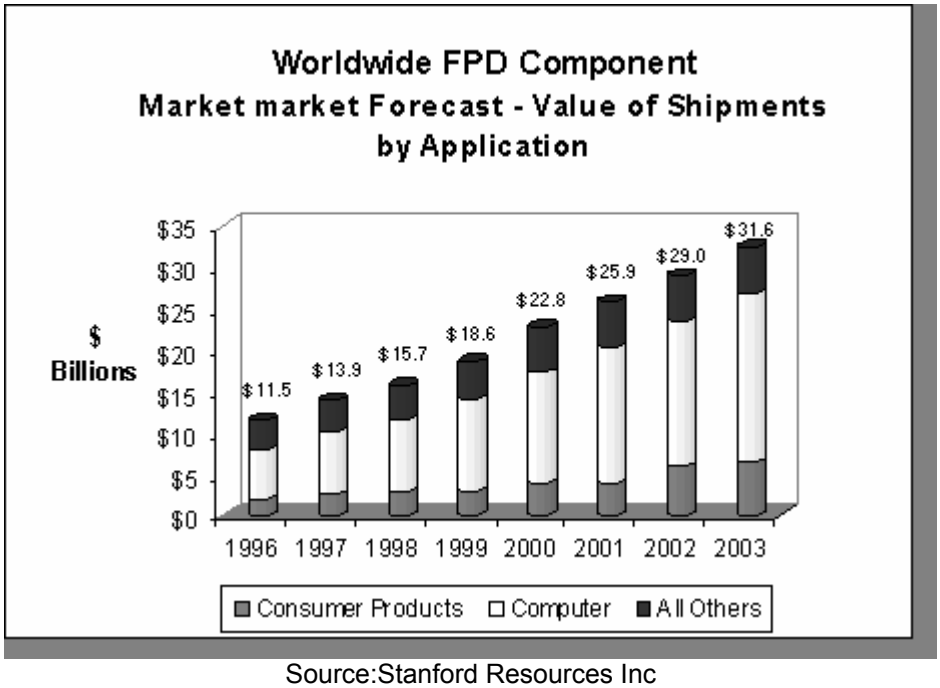
6) The goal of the NFPDI was clear, a 15% market share to US companies by the year 2000. Many analysts , like Joseph Castellano of Stanford Resources Inc, believe that the $587 million proposed would be largely inadequate for reaching such a target and estimated needed funds to be at least $3 billion.

-Questions:

Does a limited strategic trade policy work? What are the catalysts that will make a trade?

Was the NFPDI a success?

Exhibit 1



Source:Stanford Resources Inc

Exhibit 2

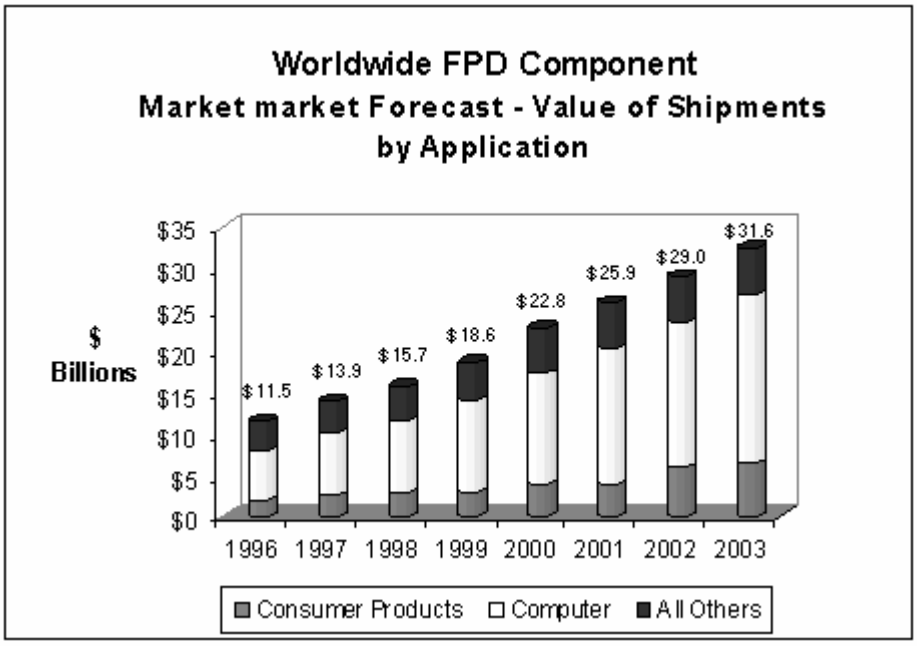
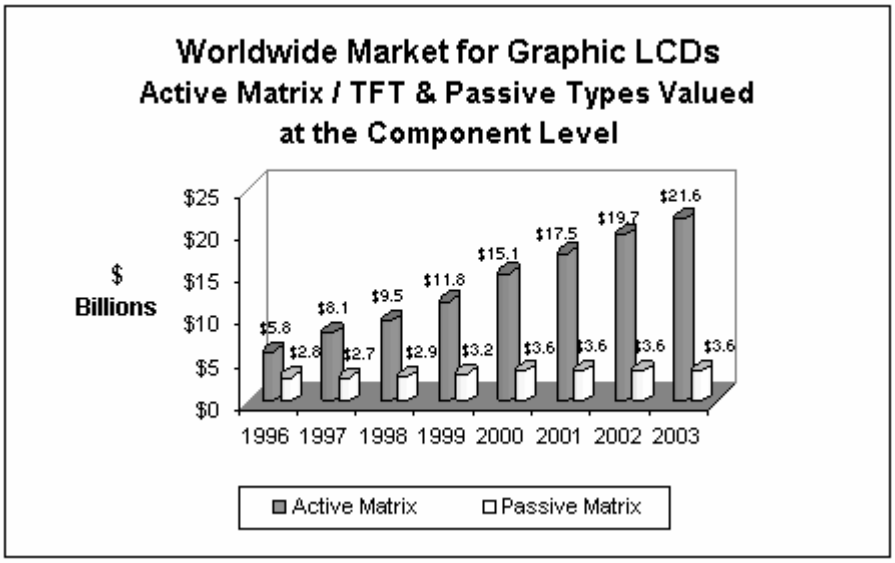


Exhibit 3.



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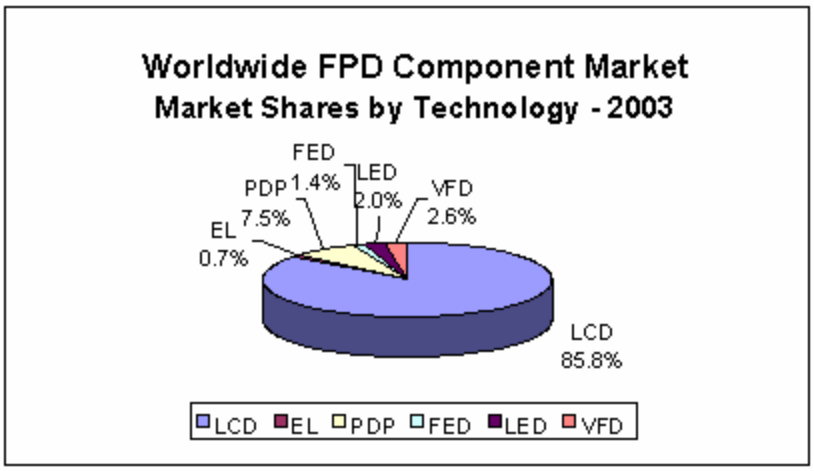

Worldwide FPD Component Market
Market Shares by Technology - 2003
FED
1.4%
LED
2.0%
PDP
7.5%
VFD
2.6%
EL
0.7%
LCD
85.8%
LCD
EL
PDP
FED
LED
VFD

Exhibit 5.

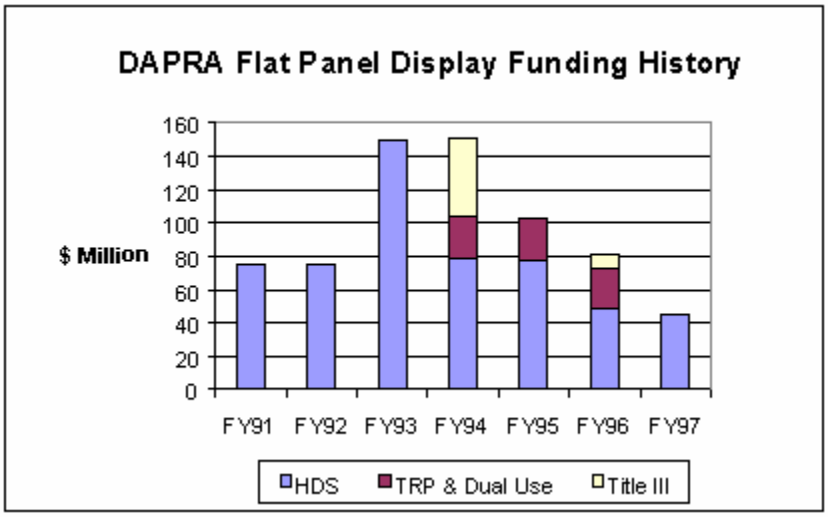
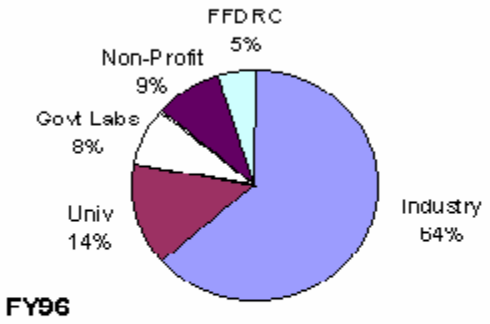

DAPRA Flat Panel Display Funding History
$ Million
160
140
120
100
80
60
40
20
0
FY91
FY92
FY93
FY94
FY95
FY96
FY97
HDS
TRP & Dual Use
Title III

Exhibit 6.

National Flat Panel Display Initiative (NFPI)



FY96

BUDGET ($ Million)

	FY 96	FY97	FY98
Basic Research	76.5	90.7	76.0
Applied Research	754.2	710.0	029.9
Adv Tech Dev	1,358.4	1,298.7	1,256.6
MGMT & Spt	80.1	41.0	43.9
TOTALS	2,269.2	2,140.4	2,206.4

Appendix A Technical Notes on FPD Technologies and Manufacturing

As a class of display technologies FPD's have several advantages over traditional Cathode Ray Tube (CRT) displays. In general they are lighter in weight, occupy a comparatively small volume, and require modest amounts of power. The most advanced displays in operation today, including those in lap top computers, hand held televisions and digital cameras, and High Definition Television (HDTV) prototypes, are capable of delivering high information content, full color, video quality images. However, the process of reaching this advanced level of manufacturing ability, beginning with the first limited applications of LED FPD's to hand held calculators and digital watches, has been a long and arduous one that has presented Japanese and American firms alike with difficult technology management and investment decisions.

Not least of the problems facing firms in the industry is that there are several technologies competing for dominant market share and for a range of niche applications. These types of displays, there strengths and weaknesses, and associated difficulties in manufacturing are presented as follows:

Appendix B

WHY DO NATIONS FOCUS ON HIGH-TECH INDUSTRIES?

The (national) benefits attributed to high-technology industries rest on a number of interlocking observations.

First, high-technology firms are associated with innovation. Firms that are innovative tend to gain market share, create new product markets, and use resources more productively. This proposition is supported by the findings of a recent National Research Council1[1] conference on the impact of innovation on productivity, wages, and employment.

Second, high-technology firms perform larger amounts of R&D than more traditional industries. High-technology firms are identified by the very high percentage of their revenue devoted to research – often more than 10 percent – as compared with a 3 percent level for more traditional industries. Collectively, high-technology industries constitute a disproportionate share of total private R&D spending in the U.S. and the social returns of such R&D spending are widely believed to far exceed the private returns.

Third, these positive spillover effects benefit other commercial sectors by generating new products and process that can lead to productivity gains and generate new manufacturing opportunities. Advanced in electronics have made it a key enabling industry responsible for new methods of manufacturing in steel, automobiles, aerospace, and even agriculture, as well as the creation of a whole gamut of consumer electronic and defense related products. There is substantial economic literature underscoring the high returns of technological innovation, with private innovators obtaining a rate of return in the 20 to 30 percent range with spillover (or social return) averaging about 50 percent.

Fourth, the positive spillover effects are often locally concentrated. Firms frequently concentrate in particular locations to benefit from the externalities associated with a qualified labor supply with appropriate skills, specialized suppliers of inputs and supporting services, and informal horizontal information networks for the exchange of the "tacit" knowledge required for the exploitation of new techniques and processes. These network systems flourish in regional agglomerations where repeated interaction builds shared identities and mutual trust while at the same time intensifying rivalries.

Source: National Research Council et al, Conflict and Cooperation in National Competition for High-Technology Industry, National Academy Press, Washington, D.C., 1996.

Because these local externalities tend to be self-reinforcing, the competitive position of the relevant industry trends to improve over time. Conversely, the decline in an industry's position tends to erode builds specialized infrastructures as well.

Fifth, high-technology products are a major source of national economic growth in all of the major industrialized countries, because the global market for high-technology manufactured goods is growing at a faster rate than are the markets for other manufactured goods. For example, in the United States, sectors such as aerospace, information systems (software, computers, and semiconductors), chemicals, pharmaceuticals, biotechnology, and medical equipment are all leading sources of U.S. exports. Moreover, as noted above, these high-technology industries also account for a disproportionate amount of total industrial R&D.

Sixth, as one would expect from the above, high-technology firms are associated with high valued-added manufacturing and importantly, the creation of high wage employment. The firms that innovate rapidly, introduce new technologies, develop new products, and expand exports [ctcd1]are also the firms that increase employment and contribute disproportionately to the national R&D effort.

Seventh, many high-technology industries have important consequences for core government missions. Foremost among these is national defense. Early, assured access to advance, low-cost technologies is viewed by many as a critical element in a viable defense strategy for the next century. As one informed observer remarked, without technological superiority, military superiority becomes a question of numbers and training. The impact of new enabling technologies can be equally crucial for major government missions in energy development, environmental protection, and health care (where new technologies offer major advances in methods, drugs, devices, and equipment.)