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# Flat-Panel Displays

## Background

From the late 1980s, the U.S. government attempted to create an entire industry—flat-panel displays (FPDs)—through industrial policy tools: first, through manipulating the antidumping laws and then through direct subsidy. As with other technologies described in this study, the lessons from this experience are abundant, including the failure of antidumping regimes to distinguish the national interest from private interests; the misuse of antidumping laws to undercut a highly successful industry in computers in favor of a *potential* flat-panel industry; the more or less open collusion between government agencies and private companies in manipulating dumping actions; the ability of the antidumping actions to cause a loss of jobs by forcing companies to move abroad; and finally, the basic flaws in targeting "strategic" industries in the name of industrial policy. The point is the United States during the 1990s never developed a flat-panel industry, and yet it outdistanced all of its major competitors technologically, including the much-feared Japanese, during the same decade (Barfield 1995).

## The Flat-Panel-Display Industry

Flat-panel displays are a class of advanced display technologies that have emerged to replace traditional cathode ray tubes because of advantages in weight, small power needs, high resolution, and high information content potential. There are several technologies competing for market share, and a number of niche applications. During the 1980s, pushed by leading Japanese companies, liquid crystal displays (LCDs) became the dominant commercial display technology. LCDs in turn come in two types: active and passive matrix LCDs. The more advanced (active) AMLCDs, which consist of a transistor attached to each pixel (short for picture elements that together form an image on a television

screen), figured most prominently in the antidumping actions of the 1990s.

In addition to LCDs, other technologies include plasma display panels (PDPs), in which ionized gases produce the light; field emission displays (FEDs), an improved cathode ray technology that combines with semiconductor technology; and electroluminescent displays (ELDs), which generate light from phosphorus, sandwiched between electrodes. All of these technologies are high-information content (HIC) displays, capable of containing large amounts of information, or pixels. Advanced uses of displays in, for example, high-definition television and computer displays can contain hundreds of thousands of pixels. Not all LCDs are high information; there is still a large market for low-information LCDs in such items as wristwatches, calculators, thermometers, and appliances (Monterey Institute 2001; Hart 1993).

Though U.S. companies pioneered the technology, today Japanese companies control 90 percent of the world market. The reason Japanese companies got in on the ground floor was directly related to their early concentration on low-end consumer electronics. U.S. firms, which pioneered the FPDs, moved out of these markets, and thus were quite willing to license the technologies to Japanese companies, which developed low-information displays for the wristwatches and calculators mentioned above. From this low-tech beginning, Japanese firms moved steadily up the technological ladder to the more advanced LCDs developed in the 1980s.

By the early 1980s, two trends were converging that would dramatically change the market for the FPD industry. First, advances in miniaturization of electronic components and in the computer industry made it realistic to consider manufacturing new products such as laptop computers, handheld televisions, high-definition television, and a new array of advanced information industrial and consumer devices. In addition, corporate planners began to see the outlines of an information revolution in which many human and business activities would be mediated though machine interfaces—even before the revolution that has accompanied the Internet—in the form of sophisticated display (Monterey Institute 2001; Council on Competitiveness 1993).

Japanese FPD companies were extraordinarily well positioned to take advantage of these technological trends. (Although outside the bounds of this paper, it must also be said that in almost all other high-end electronic sectors—particularly those associated with the Internet and allied

computer and software applications—the Japanese have fallen steadily behind the United States.) In any case, throughout the 1990s, there were more than a dozen Japanese firms competing in the various LCD technologies. Sharp, Toshiba, Seiko-Epson, Hitachi, Sanyo, and Matsushita were the largest, with Hitachi, Sharp, and a small firm, Hosiden, as clear leaders in AMLCDs. In the United States, in contrast, only one large firm, IBM, had any important presence in this sector, and IBM's effort consisted solely of a joint venture with Toshiba, including a plant in Japan. In the early 1990s, when the antidumping action began, the balance of American LCD manufacturers were very small companies, such as Optical Imaging Systems, Planar, Plasmaco, Photonics Systems, and Electro-Plasma (Hart 1993; Monterey Institute 2001).

## The Dumping Petition

It was the U.S. government as much as the private sector that was ultimately responsible for the antidumping petition that was launched against Japanese FPD companies in July 1990. In the late 1980s, concern about the national security implications of Japanese dominance in a number of high-tech electronics sectors, combined with an increasing bureaucratic itch by the Defense Department—particularly its high-tech development arm, the Defense Advanced Research Projects Agency (DARPA)—to take a lead role in restoring U.S. civilian technological leadership, led to pressure from the department for novel mandates. Ironically, while DARPA moved to shore up small U.S. FPD companies, two industry groups, the American Electronics Association and the Computer Systems Policy Project (composed of the leading U.S. computer companies), had turned down requests by U.S. FPD companies for help (Hart 1993; Council on Competitiveness 1993).

In the late 1980s, DARPA convened a number of meetings for small U.S. FPD companies, and in 1990 awarded research contracts to four of them. DARPA also encouraged the companies to form a lobbying arm, the Advanced Display Manufacturing Association (ADMA). And it was DARPA that encouraged the seven companies that formed ADMA to file an antidumping petition against the Japanese companies on July 17, 1990. The petition alleged that Japanese companies intentionally sold FPDs at 10 to 66 percent below cost and thereby had gained 90 percent of the U.S. market. ADMA requested antidumping duties of between 71 and 318 percent as recompense. In a fateful decision, the petition called

for duties only on displays and components, not on units assembled outside of the United States. It also directly alleged not only that the Japanese were selling below cost but also that this was a clear case of "predatory pricing" to drive all U.S. firms out of business and attain a complete monopoly (Magee and Yoon 1994; Monterey Institute 2001).

To make a long story short, in September 1990, the USITC issued a preliminary ruling that the U.S. display manufacturers were materially injured. In July 1991, the Commerce Department issued a final determination that AMLCDs and ELDs were being sold below cost and that dumping duties should be imposed. In August 1991, the USITC voted 3–1 to authorize dumping duties of 62.67 percent on AMLCDs and 7.02 percent on ELDs.

The decisions by the Commerce Department and the USITC raise several major issues: How is it that Commerce bent over backwards to define "like product" narrowly in the FPD sector, and then bent over the other way to define "like product" broadly with supercomputers? How does one balance the interest of producers with that of downstream users, the national interest, and the interests of workers in allied industries? Finally, how does one define—and discern—truly "strategic" industries that the United States must retain or create? (Magee and Yoon 1994; Council on Competitiveness 1993).

## What's an Industry?

In their original petition, ADMA argued that all four types of FPDs should be treated as one industry. American and Japanese computer companies strongly rebutted this contention, introducing testimony that showed there were substantial differences in physical characteristics, end users, expectations of ultimate purchasers, and distribution channels. They also pointed out that physical properties and characteristics exerted a strong influence on use: for instance, gas plasma is used when picture quality is of great import; and ELDs are best for portable computers and medical and security usage. Both the Commerce Department and the USITC ignored these obvious differences and accepted ADMA's position (Japan Economic Institute 1993; U.S. International Trade Commission 2000).

U.S. computer manufacturers raised a more basic question: Did a display industry even exist in the United States? And, if there were no real industry, how could injury have occurred? IBM, Apple, Compaq, and Tandy filed suit in the Court of International Trade (CIT), claiming that there were no viable U.S. suppliers of AMLCDs—which were essential for desk computers

and laptops—and therefore they were dependent on Japanese suppliers. A spokesman for the companies argued that dumping was not involved because "most U.S. [FPD] firms simply are not mass producers of panels for the portable computer market." He also stated that U.S. FPD manufacturers actually "preferred to stay in niche markets such as military products" because then they did not have to face Japanese competition (Monterey Institute 2001).

ADMA introduced—and ultimately the USITC accepted—a wholly novel argument in defending its suit. Implicitly accepting that no real industry existed at the time, it urged the government to agree that forcing Japanese manufacturers to raise their prices to levels that would allow them to compete was the only way they could create an industry through raising capital for R&D and for capital expenditures. The USITC accepted this argument and in its final determination indicated that its decision was intended to encourage U.S. computer manufacturers—at whatever cost—to help build a U.S. industry and stop purchasing from foreign suppliers. In a strange twist of events, in the midst of the proceedings, OIS (the only member of ADMA who made even a small quantity of AMLCDs) filed a request to lift the penalties on these displays, stating that it now agreed that U.S. computers would be hurt by the decision. Later, after further administrative byways, the USITC did finally remove AMLCDs from the penalty box, leaving only the tiny ELDs manufacturers helped by the whole proceeding (Judis 1993; Monterey Institute 2001; Harbrecht, Magnusson, and McWilliams 1993).

## The Consequences, Intended and Unintended

While the imposition of antidumping duties did little to help the fledgling and struggling U.S. FPD industry, it did trigger momentous consequences for the computer industry and for some U.S. workers. The imposition of 63 percent duties on imported display screens immediately caused a substantial increase in the price of American-made computers. A spokesman for Compaq estimated that the duty added $1,000 to the cost of building a computer in the United States. Depending on the company, such additional costs—which made them much less competitive with Japanese manufacturers—lasted from months to well over a year, depending on how quickly the company was able to get foreign factories converted or built.

That brings us to a second and even more negative consequence of the action: it impelled both U.S. and Japanese companies to move out of

the United States, causing job losses at a number of sites in this country (Johnson 1992). Since the antidumping suit had not included displays that were assembled offshore, the companies moved wholesale. In Compaq's case, it took eighteen months to construct a factory in Scotland, "much against our business plan and against our better judgment," according to a company spokesman (Monterey Institute 2001, 5). Toshiba's American plant in Irvine, California, ceased production of laptops with AMLCDs, while Apple moved production from California to Ireland. Sharp suspended operations in Texas and moved to Canada (Sanger 1991; Monterey Institute 2001). Finally, IBM moved a number of assembly operations offshore to various other locations. As a *Washington Post* writer stated at the time, "The administration's new tariff won't hurt the Japanese. In the fast-growing global market for laptop computers, they will make just as much money shipping display screens somewhere else. The only losers will be American workers who might have had jobs building laptop computers—until the Commerce Department stepped in" (Reid 1991).

## Denouement

In the tradition of the Hapsburgs, of whom it has been said that they "forgot nothing and they learned nothing," the Clinton administration in 1994, after the antidumping debacle had ended, launched one further effort to create a U.S.-based FPD industry. (For background and a debate on the material presented in this section, see Barfield 1994, 1995; Flamm 1994, 1995.) This time it hoped to use the cover of national security to subsidize the construction of four plants and achieve a 15 percent slice of the world market in LCDs by the year 2000. With the candor and confidence of a new administration, Clinton White House officials, who conceived the program despite its lodging in Defense, boldly stated that the ultimate purpose was to create a "model for technological development that will equip U.S. companies to break into markets already seized by Japanese companies." First, U.S. companies would compete in the market for LCDs, one White House official stated, and then robotics, ceramics, and precision tools.

With much fanfare, the administration announced plans for a National Flat-Panel Display Initiative that would spend $600 million in seed money to build four LCD plants. Dispassionate critics of the plan, from both the investment and electronics industries as well as from academia,

immediately challenged the assumptions behind it. The consensus was that it would take at least $3 billion of public money to come close to capturing 15 percent of the world LCD market. The outlook was bleak, not the least because the Japanese were moving steadily ahead and Korean firms were pouring huge amounts of capital into the same sectors. In addition, defense analysts pointed out, the administration had vastly overestimated defense needs over the next two decades—and existing and planned small niche plants could more than satisfy DOD's requirements (Barfield 1994, 1995). In the end, Congress after 1994 adamantly and wisely refused to fund this grandiose scheme, and the White House and DOD had to settle for small R&D grants and no plants.

For this study, one element of the proposal is of particular significance. The formal planning documents went far beyond technological development and tackled the more difficult tasks of creating and managing a private market, including stimulation of private demand and public procurement. High on the list of actions deemed necessary was the monitoring of world prices in LCDs and trade sanctions and antidumping actions against companies alleged to be engaging in price discrimination or predatory dumping. Thus, along with subsidy inevitably came dumping actions to protect the public investment. The DOD, with this program, had strayed a long way from its national security mission.

Finally, one other longer-term consequence of these attempts to create a new industry through protection or subsidy was predicted, but did not happen. A leading proponent of government intervention to "save" the FPD "industry" warned at the time that losing "generic technologies" like flat-panel screens would make it impossible for the United States to "stay at the technological frontier." ADMA's chief lawyer warned that the U.S. computer industry would rue the day it had not stepped in to help the FPD industry. He warned, "In ten years, we will hear from the computer industry when it is struggling with Japan as we are now." But ten years later, the United States still does not have a flat-panel industry. Yet not only is the U.S. computer industry flourishing, but today the United States also leads the world high-end electronic sectors and from all analyses is pulling steadily ahead of its competitors (Monterey Institute 2001, 5).