The Irrationality of Anti-Dumping Laws in the New Economy*

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This study traces the misguided attempts to protect three U.S. high-technology industries through the use of anti-dumping laws: supercomputers, flat panel television screens, and DRAM computer chips. The most important lessons learned from these analyses are that in at least two of the three high-tech sectors, one of the following negative consequences occurred. (1) costs to U.S. companies and workers far outweighed benefits of the anti-dumping protection; (2) political interventions undermined the integrity of the administrative and legal processes; (3) dumping actions were based on historically erroneous notion that each of the industries was "strategic," or central to overall U.S. competitiveness; and (4) the appearance of new technologies made irrelevant the original anti-dumping actions. The study concludes with recommendations for the reform of U.S. anti-dumping laws, including folding anti-dumping laws into competition policy laws; adding a nation economic interest test to decisions about whether to protect U.S. producers with anti-dumping orders; and substituting safeguards actions for anti-dumping actions, and suspending all anti-dumping actions after safeguards protection is granted.

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INTRODUCTION

The explosion of high technology products onto the world market, in addition to making many aspects of our lives easier, is one of the principal engines driving economic growth. Whether one is talking about computers, pharmaceuticals, telecommunications, or the internet, advances in high-technology sectors are redefining the way we live and conduct our lives. High-technology sectors cover a range of industries, of course, but they share one defining trait—they all require intensive research and development (R&D) for inputs, either directly at the final manufacturing stage or through the intermediate goods used in their production. The capital outlays, while varying by industry, are often quite large and well beyond the capacity of single individuals or firms.

In an era of globalization, it should not come as a surprise that the competitive environment is much more intense. Long gone are the days when only U.S. companies dominated the world market in high-technology sectors. No longer can U.S. companies rest on their laurels as many did in the 1970s, when they lowered their expenditures devoted to R&D. Competition from European and Asian companies has become increasingly intense. Contrary to what some might believe, however, foreign competition has served both U.S. companies and consumers well. In addition to introducing a range of new products to U.S. consumers, competition (whether domestic or foreign) is forcing most U.S. companies to become more efficient.

A prerequisite for reaping the benefits of foreign competition, of course, is an international trading system that allows for the free flow of goods and services between countries. Broadly speaking, such a system exists. With the signing of the General Agreement on Tariffs and Trade (GATT) in 1947 down to the formation of its successor in 1995, the World Trade Organization (WTO), the multilateral trading system has become increasingly open. Overall, the WTO has done a good job of advancing the cause of free trade. The result is that global economic welfare has increased and millions have been lifted out of immigrating poverty.

Unfortunately, no international institution is perfect and the WTO is no exception. The WTO has rules that allow countries to define arbitrarily 'unfair' trading practices of other countries and to restrict the free flow of goods by invoking trade remedy laws designed to protect against import surges. Finding themselves unable to compete effectively on their own merits, companies can seek the help of governments to restrict foreign competition in lieu of becoming more efficient. The weapon of choice for many of these companies is anti-dumping law. The law allegedly targets 'unfair' trading practices of foreign competitors accused of exporting (or 'dumping') products onto a market at below-cost price, or prices below that charged in domestic or third markets, otherwise known as price discrimination. If a foreign competitor is found guilty of anti-dumping, a country is allowed to impose anti-dumping duties on those imports (Beltrick and Litan 1991).

Anti-dumping laws are fundamentally at odds with the free trade policies that have

increased global economic welfare in manifold ways over the past few decades. Anti-dumping laws may indeed be WTO-legal, but that does not speak to the economic wisdom of their application. Anti-dumping laws are tantamount to 'WTO legalized protectionism.' The procedures by which anti-dumping laws are applied are arbitrary and do not properly identify so called 'unfair' trading practices of foreign competitors. Anti-dumping laws also do little to offer an effective remedy for those companies who claim they have been 'materially injured' by 'unfair' foreign competition and their pricing practices.

Ironically, the self-proclaimed champion of free trade, the United States, is among the most flagrant and egregious abusers of anti-dumping laws. Historically confined only to traditional sectors like textiles and steel, the U.S. anti-dumping law is now increasingly being used by high-tech companies that no longer hold an edge over their foreign competitors. Unfortunately, in a classic example of 'hoisted on your own petard,' other countries (particularly in the developing world), are following the example of the United States. They are now passing their own anti-dumping laws, which are being increasingly used against U.S. companies. Worldwide, anti-dumping cases rose 48.6 percent between 1993 and 1998. Attempts by many countries to discuss the reform of anti-dumping laws at the latest Seattle Ministerial meeting of the WTO were quashed by an intransigent United States government.

While the application of anti-dumping laws is problematic in any sector, it is particularly troublesome in high-technology sectors for two primary reasons. First, given the inherently dynamic nature of high technology firms, products which have had duties imposed upon them are often obsolete by the time the inevitably contentious anti dumping case is resolved. Many of the strategic rationales articulated by some as reason to protect domestic producers in the United States turned out to be ill-conceived. The product that was once strategic finds no market just a few short years later. The petitioner in the domestic market is thus offered little relief. Second, the high degree of multi-sourcing from different countries in the chain of production results in situations where anti-dumping duties are sometimes actually imposed on domestic competitors (Hindley and Messerlin 1996).

The empirical record of the misguided application of the U.S. anti-dumping law is telling. In this analysis, we analyze how the law has been applied in three high technology industries: 1) Supercomputers; 2) flat-panel displays (FPDs); and 3) Dynamic Access Random Memory (DRAM) computer chips.

To briefly set forth the most important lessons gleaned from these analyses, the study found that in at least two of the three sectors one of the following occurred: (1) negative consequences for other industries, U.S. consumers and/or workers that far outweighed the purported protectionist benefits (DRAMs and FPDs); (2) political interventions that trampled the integrity of administrative and legal processes (Supercomputers and FPDs); (3) dumping actions that were based upon the historically erroneous prediction that U.S. competitiveness was inextricably wrapped up the protection of a particular "strategic" industry (DRAMs, Supercomputers and FPDs); and

(4) the serendipitous appearance of new technologies that made the original anti-dumping actions irrelevant (DRAMs and Supercomputers).

More specifically, anti dumping actions in DRAMs transferred at least \$4.5 billion from U.S. computer manufacturers and consumers to Japanese semiconductor companies; anti-dumping actions on FPDs ultimately drove U.S. and foreign computer manufacturers offshore, displacing thousands of U.S. workers; the naked political intervention of the Commerce Department in the Supercomputer case resembled the actions of a third world government; and despite the predictions of hand-wringing industrial policy advocates, the U.S. economy has not only survived but thrived without an FPD industry.

TRENDS IN HIGH-TECHNOLOGY TRADE

Competition: The Key to Innovation

Two factors have played a pivotal role in fostering the growth of high-technology industries. The first factor is an education system that nurtures creative individuals and allows them the freedom to innovate. The second factor fostering the growth of advanced technologies is less readily apparent—competition and the ability to reap rewards from success. While individual inventors may be willing to take years to bring a product to market, the investors who are so critical to providing the necessary capital for R&D are not. And while individual inventors may in some cases have such a passionate devotion to their profession that they are less interested in and willing to eschew financial remuneration, the investors who provide the capital to fund advances are guided primarily by profit motive.

Competition has spurred innovation, particularly so in high-technology sectors in which the product life span of many new technologies is short. A defining characteristic of high-technology sectors is that they seem to be subject to what people now widely refer to as "Moore's Law," which states that the amount of performance received per dollar spent doubles every 18 months because of technical innovation. Computers built three years ago are now largely obsolete. Older computer chips are now almost worthless as improvements in the techniques of electronic data storage now allow businesses and consumers to store ever-increasing amounts of data on ever smaller microchips. Think too of a company that relied solely on developing, for example, hand-held calculators (which cost on average \$100 in 1972!). If that company did not invest in R&D in expanding the range of functions the hand-held calculator could perform, it would be out of business. In the year 2000, we have hand-held units that in addition to performing the functions of a calculator, serve as your appointment and address book, and allows you to send electronic mail. In short, one must keep innovating or else go out of business.

The Globalization of High-Technology Trade

In the 1950s and 1960s, the United States clearly enjoyed a comparative advantage in many high technology sectors and was the envy of the world. So much so that foreign businessmen at the time were fearful that by the 1980s Americans would have a monopoly on know-how, science, and intellectual power. This situation did not materialize. In the 1970s and 1980s, many European and East Asian companies' R&D expenditures began outpacing their U.S. competitors'. Not surprisingly, the release of a range of innovative products from both regions followed.

While there are many variables influencing productivity growth, it is clear that lower R&D investment strongly correlated with lower productivity growth rates. In the 1950s and 1960s, when U.S. R&D expenditures were growing at a 6.4 percent annual rate, productivity growth for the private sector averaged around 2.75 percent annually. In the 1970s and 1980s, when U.S. investment in R&D declined in some years before following an erratic and small increase, productivity for the private sector averaged around 1.2 percent annually (Scherer 1992). A direct consequence of this economic malaise was the palpable fear that the United States was losing its competitive edge. Some even went so far as to say: "The Cold War is over and Japan won" (Johnson 1995). Others predicted that the U.S. economy would be "hollowed out" and that Americans would trade 'low value' goods for 'higher value' goods made overseas.

By the year 2000, it was clear that the above prediction did not come to fruition. The United States has undergone a dramatic turnaround. While the export of raw materials and agriculture is still a key component of U.S. exports, capital goods, which are largely confined to high-technology sectors, still constitute over 40 percent of U.S. exports. The anecdotal evidence is compelling as well. Silicon Valley is now synonymous with many of the world's leading computer, internet and software designers. Similarly, people now refer to Route 66 in Northern Virginia as the 'high-tech corridor' in light of the proliferation of high-tech firms that have set up operations there.

What accounts for this unprecedented expansion of the U.S. economy and prosperity? While there is no single answer, it is clear that many companies in the United States rose to the challenge posed by increased foreign competition. Whether in telecommunications, computers, or in providing a platform for the expansion of the U.S. services economy, advances and innovation in high-technology have played a critical role.

To be sure, the specific responses by U.S. companies to the challenge of increased foreign competition ranges by both industry and individual firms. In a variety of ways, though, firms are interacting with and seizing the opportunities that the increasingly global economy has to offer. Whether through joint ventures, wholly owned subsidiaries, or the establishment of production overseas plants, a number of companies are reaping the benefits that globalization has to offer.

High-tech companies in particular are becoming increasingly globalized. For many

high-tech companies, there is an emerging international division of labor, where countries can specialize in the manufacture of individual components for complex products rather than the entire product. Some companies, for example, have set up research facilities overseas with impressive results. A Swiss and German scientist based in Switzerland but working for IBM, for example, made key breakthroughs in high-temperature superconductivity. Similarly, Texas Instruments' software has engineering laboratories in India, while Toyota has a major research center in southern California.

The specifics of the three sectors we survey—Supercomputers, Flat Panels, and DRAMs—are discussed below. The broader point to establish here is that increased foreign competition has benefited greatly those companies that have risen to the challenge. To be sure, it means companies have to work harder, be more savvy, and break new technological frontiers. The payoff, though, is quite large. In the words of one of the world's leading economists, Frederick M. Scherer:

"As more and more nations have elected to play the trading game according to the new high-technology rules, participants have had to run twice as fast in order to secure the rewards of leadership—substantial export and foreign subsidiary sales, supra-normal profit margins, and for employees, compensation providing the purchasing power to enjoy a high and improving standard of living" (Scherer 1992).

ANTI-DUMPING LAWS: THE EASY WAY TO STAY IN THE MARKET

Some companies have failed to seize the new opportunities that globalization has to offer. Finding themselves unable to compete, they turn to their government for assistance. Over the course of the past few decades, the means by which these companies can procure government assistance have dwindled. Tariffs and quotas are largely disappearing, and direct subsidies and bailouts, while they still occur, do so much less frequently. Unfortunately, there remain two important outlets for companies to restrict imports and foreign competition. Both deal with import surges. One is the special safeguard law (more on this later), the other is the anti-dumping law.

The specific failing of the U.S. anti-dumping law in three high-tech sectors is discussed below. At the outset, though, a broader discussion on some of the problems with the U.S. anti-dumping law is warranted. While this discussion is limited to the U.S. law, it applies well to the anti-dumping laws of many other countries as well.

Economists identify a number of different categories of 'dumping' actions, related to the underlying motivations of the exporting company. Market-expansion dumping takes place when there are differences in demand between two discrete and separable markets. Cyclical dumping occurs when a sudden downturn in demand creates a situation of oversupply. State trading dumping occurs when a non-market economy wants to get hard currency or perhaps creates an oversupply in an industry due to ill-thought-out planning. None of these three types of dumping is related to expanding

a company's market power. One might refer to these as relatively 'benign' forms of dumping.

The actions that most concern proponents of anti dumping laws occur when companies engage in dumping in order to increase market power to such a high degree that they will be able to charge, in effect, a monopoly price. Broadly speaking, economists identify two general categories of actions that could constitute two kinds of 'dumping' onto a market.

The first type of market-power dumping is known as 'predatory dumping.' Predatory dumping occurs when companies export at low prices to drive rivals out of business and obtain a monopoly position. Four basic prerequisites are necessary for predatory dumping to take place and be successful. First, a country must possess a large protected market share at home that serves as a 'sanctuary market.' Second, there must exist the possibility of invading a different market in order to obtain larger market shares. Third, there must be collusion among producers in the domestic market for the long-term price hike (or the effect taking out competition in the predicated market would be undercut). Finally, significant barriers to entry must exist in the industry. If not, as soon as the price hike took effect, there would be strong incentives for competitors to enter the market and undermine the monopolistic position (Scherer 1992).

The second form of dumping relates to the expansion of market power is referred to as 'strategic dumping.' Strategic dumping combines low export prices with a protected home market to give exporters an advantage in industries with static (fixed R&D and capital expenses) or dynamic (learning by doing) economies of scale. With access to both home and foreign markets, foreign firms gain a cost advantage over domestic firms that are unable to compete abroad. This advantage allegedly eventually gives the exporting firms market power (Hindley and Messerlin 1991).

Assigning motivations to a particular firm's motives for dumping is difficult at best. Anti-dumping laws do not require a country to investigate behavior that is consistent or inconsistent with normal competition. All that petitioners are required to show is that dumping and 'unfair' pricing is taking place and that they have been 'materially injured' somehow. A brief review of the process illustrates these flaws.

Dumping cases are handled by two U.S. government agencies. The U.S. Department of Commerce establishes whether or not dumping is taking place and to what degree. This stage is essentially a pro forma "yes." Between 1980 and 1997, the U.S. Department of Commerce ruled that dumping was taking place in 96 percent of the cases it reviewed (804 of 837 petitions). The case then proceeds to the International Trade Commission (ITC), which decides whether the U.S. industry in question is suffering injury. If a finding of injury takes place, the dumping companies are required to place a cash deposit or bond with U.S. customs equal to the dumping margin determined by the Commerce Department. Provisions are in place to review these findings, and vary by circumstance.

The methodologies, though, upon which these two agencies rely are arbitrary

at best and based on faulty methodologies at worst (Ikenson 2001). First, comparing prices between markets is difficult. In addition to variations on the demand side due to shifting consumer preference, there is tremendous variation in supply as well, costs in the different factors of production from inputs to labor. All of these factors exert great influence on the price of a product in a given market.

Second, there are considerable asymmetries in the methodology used to calculate price differences between markets. Economists have long established that firms will sell products at marginal, not average costs, under typical competitive conditions. The U.S. anti-dumping law equates fair value with average costs plus an allowance for profit. It is thus possible for a firm to be selling at a price exactly the same as the U.S. firm and be found guilty of dumping.

Third, even if one accepts the methodology used by U.S. government agencies, it is difficult to discern whether or not dumping is taking place at all since the law does not require evidence of the one variable that transcends all forms of market-expanding dumping, that is, a 'sanctuary' or protected home market. It seems reasonable to conclude that if dumping can only take place when a government abroad enacts regulations to protect its home market, then these potential practices should at least be investigated (Hindley and Messerlin 1996).

To illustrate in more detail the failings of the U.S. anti-dumping law, we discuss these problems in the context of three cases: Supercomputers, FPDs, and DRAM computer chips.

THE SUPERCOMPUTER STORY

Background

In the spring of 1996, the University Corporation for Atmospheric Research (UCAR), an agency funded by the National Science Foundation (NSF), signaled its intention to give a procurement award of \$32.25 million for a supercomputer system to Nippon Electronic Corporate (NEC), a Japanese supercomputer manufacturer. When UCAR's intention became known, Cray the leading U.S. supercomputer manufacturer, immediately went into action - first by lobbying Congress to prevent the award and then ultimately filing an anti-dumping petition with the Commerce Department, alleging that NEC was dumping in order to force U.S. manufacturers out of the market (Maur and Messerlin 1999).

Even before the formal petition, two highly significant political events occurred. First, Rep. David Obey (S-WI), who represented Cray, introduced an amendment, which the House of Representatives passed, that would have withheld the salaries of NSF personnel if they awarded the contract to the Japanese company. At the same time, political officials at the Commerce Department launched an investigation of their own and concluded that dumping existed. An assistant secretary at the Commerce De-

partment also informed the NSF that the NEC sale would "threaten the U.S. super computer industry with material injury" (a determination that only the ITC is supposed to make after careful analysis of market conditions) (T.R. Goldman 1996; John Maggs 1996; John Maggs 1997; *Inside U.S. Trade*, May 24, 1996; Dumler 1997).

Despite the charged political atmosphere, NSF officials pushed ahead with plans to award the contract to NEC. They did so for two reasons: one, NSF had hired a trade consultant who concluded, contrary to the Commerce Department's assessment, that dumping had not occurred; and two, NSF officials in charge of the competition steadfastly believed NEC had submitted a much superior bid. They would reaffirm this (despite congressional threats to their salaries) throughout the proceedings that followed. Indeed, during the ITC's final hearings, the director of the competition process, stated that the Cray machine met only one of four technical criteria established for the contract. For that reason, UCAR concluded that NEC "offered and demonstrated overwhelmingly superior technical performance and low risk relative to Cray" (*Inside U.S. Trade*, August 2, 1996).

Subsequently, the Commerce Department found a dumping margin of 454 percent, and the ITC followed with a determination of "material injury." Interestingly, unlike other Japanese companies in other proceedings, NEC throughout the process took a bold and defiant stance—actually to the discomfort and dismay of Ministry for International Trade Industry (MITI), which feared U.S. retaliation on other trade and diplomatic issues. NEC refused to cooperate during the proceedings and publicly stated that Cray had not and could not meet the bid requirements. It directly challenged the Commerce Department's handling of the case, and later appealed the department's and the ITC's final determinations to the Court of International Trade and then to a Federal Circuit court, arguing in part that the original political intervention had corrupted the decision process. Ultimately, NEC lost the appeals, and the anti-dumping duties are currently in place. (U.S. International Trade Commission 1999).

The supercomputer proceedings teach a remarkable series of lessons, some of which duplicate lessons from the experience in semiconductors and advanced FPD industries. With supercomputers, as with semiconductors and flat-panels, government officials never really understood (or willfully ignored) the sector's structure or the industry or the nature of international competition in the sector; and with supercomputers, as with semiconductors and flat-panels, they seemed blissfully unaware of technological trajectories in the industry. Thorough knowledge of industry structure and competition, as well as future technological pathways, would demonstrate how unlikely, if not impossible, it is for predatory tactics—the only real justification for anti-dumping actions—to succeed in the high-tech industry.

The Structure of the Supercomputer Industry and the Nature of Competition

Industrial policy proponents, who argue that anti-dumping is a key tool for "leveling the playing field," and allowing U.S. firms to keep up with foreign (particularly Asian)

competitors, have identified supercomputers (and earlier Cray as the leading U.S. company in the area) as strategic assets that must be protected at all costs. With supercomputers and other high-tech electronic sectors, U.S. firms despaired of matching the keiretsu system of Japanese companies, with its strong financial ties and low costs of capital. As Maria Anchordoguy, a current industrial policy advocate has lamented: "The Japanese corporate structure seems to be more suitable to the development of high cost, high risk technologies such as supercomputers..." (Anchordoguy 1994).

Yet the record of recent years belies these gloom and doom forecasts, even as it raises doubts about the use of anti-dumping as an industrial policy tool for the United States. A look at the evolving structure of the supercomputer industry and the market's competitors will illustrate why this is so.

Supercomputers are often divided into three main categories based on processor architecture (the key input of the machines): vector processors and parallel vector processors (PVPs), massively parallel processors (MPPs) and symmetric multiprocessor systems (SMPs).¹ The Cray and NEC computers that formed the basis of the anti-dumping action were both vector computers, and so significantly, the ITC confined the affected market for calculating anti-dumping margins narrowly to vector computers.

Processors used in supercomputers can be divided into two categories: "off the shelf" processors and custom processors. Custom processors are used in PVPs and are very powerful chips designed for a specific architecture. "Off the shelf" processors are basically commodity chips that are used in MPPs and SMPs. Large semiconductor manufacturers use them in both supercomputers and for less advanced mainframes and servers. Supercomputers made with "off the shelf" chips are substantially cheaper than those with custom chips, but until recently lacked the flexibility and capability attained by custom processors. That situation is changing rapidly and will form a key part of our story.

The point is that changes in technology and resulting shifts in market structure, with the entrance of new players, highlight the general absurdity of U.S. anti dumping analysis and the inability of U.S. government officials to fathom not only trends in the distant future but also short-term trends right under their noses. A recent study by Patrick Messerlin and Jean-Christophe Maur has calculated changes in the markets for various supercomputer technologies as well as the growth of computing power. They trace the steeply rising total capacity of supercomputers in the mid-1990s, with huge increases between 1995 and 1997 (just the period of the anti-dumping investigation) resulting from the introduction of more advanced technology for MPPs and a new generation of parallel vector systems. Of greater significance for the Cray/NEC case is the revolution that occurred in the competition between vector and non vector supercomputers. Astonishingly, the share of the supercomputer market supplied by vector

¹ With vector processors the memory is "shared" only one instruction is needed to perform an operation on an array of numbers. Non vector systems, or parallel processing, require as many instructions as there are numbers.

computers dropped from almost 35 percent in 1993 to 12 percent in 1999 (Maur and Messerlin 1999).

Further, because of technological leaps, particularly with regard to MPPs, the global supercomputer industry experienced major structural changes. First, there was the entrance of new players, most of whom were large established electronic or computer firms such as IBM, Hewlett-Packard, Intel, and Sun Microsystems. The reason for their sudden appearance was that their firm position in "off-the-shelf" processors allowed them to gain a footing in the supercomputer market. In addition, because of the squeeze from new competition, the industry concentrated, with Cray itself being absorbed by SGI, Convex by Hewlett-Packard, and Digital by Compaq. Today, they share the bulk of the world market with Cray (SGI), the historic leader of the industry (U.S. National Science and Technology Council 1999; and Maur and Messerlin 1999).

Finally, there is Cray's charge that NEC's UCAR bid was part of a pattern of Japanese predatory dumping. In a press release, SGI stated: "Japanese vendors of supercomputers are attempting to drive U.S. competition from the market by establishing unsustainable low prices for such systems." (close to the textbook definition of predation: i.e., decrease prices in order to drive competition out of business and introduce even larger monopoly prices afterward). In any case, what is the likelihood that NEC could have pulled off this feat. First, we will deal with the entire supercomputer market and then narrow the focus to vector supercomputers.

In assessing the potential for successful predation, there are several tests that can be introduced: is there the possibility of large market power in the U.S. market; is there the possibility of large market power in the world market; is there collusion among Japanese firms; and are there significant barriers to entry into the sector? None of these tests is positive for Japanese supercomputer firms.

First, in the United States the Japanese share of the total supercomputers runs between 2-3 percent. Second, the market share of Japanese supercomputers worldwide is about 15 percent, again an unlikely base from which to embark upon predation. Regarding the potential collusion among Japanese supercomputer firms, NEC, Hitachi and Fujitsu are about the same size in terms of capacity installed, and industry specialists cite evidence that they compete vigorously in foreign markets. At the same time, Hitachi has turned away from vectors supercomputers entirely, while Fujitsu and NEC generally pursue different end use capabilities. Finally, given the sizeable numbers of new entrants into the supercomputer fields described above, it is clear that barriers to entry are not high or off putting (U.S. International Trade Commission 1999).

There is, however, one ironic potential result from the anti-dumping assault on Japanese companies. With Japanese market share stagnant or falling in the United States as well as around the world, and with the consolidation taking place in the U.S. supercomputer markets, there is an increasing risk of anti-competitive behavior by U.S. firms. At the moment the anti-dumping system essentially protects U.S. supercomputer manufacturers from any foreign competition.

FLAT-PANEL DISPLAYS (FPDs)

Background

From the late 1980s, the U.S. government attempted to create an entire industry-FPDs-through industrial policy tools: first, through manipulating the anti-dumping laws and then through direct subsidy. As with other technologies described in this White Paper, the lessons from this experience are abundant, including the failure of anti-dumping regimes to distinguish the national interest from private interests; the misuse of anti-dumping laws to undercut a highly successful industry in computers in favor of a potential FPD industry; the more or less open collusion between government agencies and private companies in manipulating dumping actions; the loss of domestic jobs caused by anti-dumping actions that forced 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 FPD industry, and yet it outdistanced all of its major competitors technologically, including the much-feared Japanese, during this decade (Barfield 1995).

The FPD Industry

FPDs are a class of advanced display technologies that have emerged to replace traditional cathode ray tubes because of its 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 (pixel, short for picture element are the smallest addressable part of a screen), figured most prominently in the anti-dumping actions of the 1990s. In addition to LCDs, other technologies include Plasma Display Panels (PDPs) where 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 usage 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 in creating the technology, today Japanese companies control 90 percent of FPD the world market. The reason that the 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 in the FPDs, moved out of these markets, and thus were quite willing to license the technologies to Japanese companies who developed low-information displays for products like the wristwatches and calculators mentioned above. From this low-tech beginning, Japanese firms moved steadily up the technological frontier 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 electronics components and in the computer industry made it realistic to consider manufacturing new products such as laptop computers, hand held 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 through machine interfaces—even before the revolution that has accompanied the internet—in the form of sophisticated displays (Monterey Institute 2001; Council on Competitiveness 1993).

Japanese FPD companies were extraordinarily well-positioned to take advantage of these technological trends (However, though 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), and, there are more than a dozen Japanese firms competing in the various LCD technologies. Sharp, Toshiba, Seiko-Epson, Hitachi, Sanyo, and Matsushita are the largest, with Hitachi, Sharp, and a small firm, Hosiden, as clear leaders in AMLCDs. In contrast, the United States has only one large firm, IBM, with any important presence in this sector, and IBM's efforts consist solely of a joint venture with Toshiba, including a plant in Japan. In the early 1990s, when the anti-dumping action began, the balance of U.S. 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 responsible ultimately for the anti-dumping petition 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 Project 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 shoo 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 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 encouraged the seven companies that formed ADMA to file an anti-dumping petition against the Japanese companies on July 17, 1990. The petition alleged that Japanese companies intentionally had sold FPD at 10 to 66 percent below cost and thereby had gained 90 percent of the U.S. market. ADMA requested anti-dumping duties of between 71 and 318 percent as recompense. In a fateful decision, the petition called for duties only on displays and components, and not on units assembled outside of the United States. It also directly alleged that not only were the Japanese selling below cost, but 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 ITC made a preliminary ruling that the U.S. display manufacturers were materially injured. Then, in July 1991, the Commerce Department issued a final determination that AMLCDs and EIDs were being sold below cost and that dumping duties should be imposed; and in August 1991, the ITC voted 3-1 to authorize dumping duties of 62.67 percent on AMLCDs and 7.02 percent of EIDs.

The decisions by the Commerce Department and the ITC raise several major issues: how is it that Commerce Department bent over backwards to narrowly define "like product" in the FPD sector and then bent over the other way to broadly define "like product" with supercomputers; how does one balance the interest of producers with that of downstream users and with the national interest and the interests of workers in allied industries; and 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 had argued that all four types of FPDs should be treated as one industry. U.S. computer companies and the Japanese companies strongly rebutted this contention, introducing testimony that showed that 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 EIDs are best for portable computers and medical and security usage. Both the Commerce Department and the ITC 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 key for desk 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, which the ITC ultimately 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 ITC 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, during 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 ITC did finally remove AMLCDs from the penalty box, leaving only the tiny EIDs 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 anti dumping duties did little to help the "fledgling but doomed" 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 screen immediately caused a substantial increase in the price of U.S.-manufactured 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 not only in the United States but worldwide lasted from months to well over a year depending on how quickly they were able to bet foreign factories converted or built.

And that brings us to a second, and even more negative consequence of the action: it impelled both U.S. and Japanese companies to move offshore and out of the United States, thus causing job losses at a number of sites in this country (Johnson 1992). The original suit had not included displays that were assembled offshore, and thus, they moved wholesale. In Compaq's case, it took 18 months to construct a factory in Scotland ("much against our business plan and against our better judgment"), according to a company spokesman. Toshiba's American plant in Irvine, California, ceased production

of laptops with AMI.CDs; Apple moved production from California to Ireland. Sharp suspended operations in Texas and moved to Canada (Sanger 1991; Monterey Institute 2001). And finally IBM moved a number of assembly operations offshore. 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 is said that they "forget nothing and they learn nothing," the Clinton administration in 1994, after the anti-dumping 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; and 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 (Barfield 1994)." First, in LCDs, a White House official stated, and then robotics, ceramics and precision tools.

With much fanfare, the administration announced plans for a National FPD Initiative that would spend \$600 in seed money to build four LCD plants. Dispassionate critics of the plan, from both the investment and electronics industry and 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 15 percent of the world LCD market. Even the outlook was bleak, not the least because the Japanese were moving steadily ahead, but now 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 that existing and planned small niche plants could more than satisfy Department of Defense (DOD)'s requirements. 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 paper, there was one element of the proposal that 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, trade sanctions

and anti-dumping 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, there was one other longer term consequence of these attempts to create a new industry through protection or subsidy-or more accurately a predicted consequence that 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." And 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 the fact is that ten years later the United States still does not have a FPD industry. Yet not only is the U.S. computer industry flourishing, but today the United States leads the world high-end electronic sectors and from all analyses is pulling steadily ahead. (Monterey Institute 2001).

Government certainly has a role in this burgeoning technological revolution, but the lesson from supercomputers, flat-panels and semiconductors is that using government to fight alleged unfair trading practices with economically unsound anti-dumping actions is not only futile but also deeply counterproductive.

SEMICONDUCTORS

A Defining Experience: The U.S./ Japan Crisis of the 1980s

Though an entire decade has passed and the industry and international competitive conditions have changed dramatically, semiconductor trade policies remain haunted by precedents, actions-and mistakes-made during the period (1986-1991) of extreme conflict between the United States and Japan over semiconductors. From the origin of the industry to the 1980s, U.S. semiconductor firms had dominated the market, though Japanese companies had appeared on the scene as real players by the late 1970s as demand for semiconductors shifted away from U.S. government defense and space purchases toward consumer electronics and other commercial applications. In the mid-1980s, consumer electronics accounted for almost half of semiconductor demand in Japan, while data processing accounted for 44 percent of U.S. demand.

At the end of the 1970s, U.S. firms accounted for 60 percent of the world market and the Japanese less than 30 percent. By 1985, however, both countries held world market shares of about 45 percent, with the Japanese moving to a position of leadership. Most Japanese inroads came in DRAMs, the natural entree point (as it would be later for Korea) because of the straightforward design technology compared to other semiconductor devices. In DRAMs, by the mid-1980s Japanese had completely

reversed positions with the U.S., controlling 70 percent of the world market, a percentage held by the United States in the late 1970s (Flamm 1996; Irwin 1998).

The crisis was precipitated by a number of factors, including in the background a high U.S. dollar that greatly undermined U.S. export capacity and decreased fixed investment because of the high cost of capital. Then a substantial boom in the semiconductor market between 1983 and 1984 quickly turned into a deep industry recession in 1985, triggered largely by a slump in computer sales. As a result, the DRAM market contracted by 60 percent. Interestingly, the recession itself was the chief cause of the grief that came to U.S. semiconductor manufacturers. Three quarters of the decline in revenue in the mid-1980s stemmed from declining overall demand; only one quarter came from lost market share. This boom and bust cycle process has been a defining characteristic of the semiconductor industry right down to the present time, with the main variation being that individual product life cycles have become even shorter. Typically, several years after a bust, demand once again swells suddenly and often unexpectedly, and DRAM manufacturers all scramble to increase capacity in order to maintain market share; in the end a glut of chips has once again been produced or there is a shift in demand to a more advanced or different technology. The market then crashes again, accompanied by the cyclical dumping described above.

In 1985, irrespective of these economic realities, huge pressures rose for the U.S. government to counter Japanese "predatory practices." Though the semiconductor trade association never achieved consensus on antidumping actions, individual companies mounted suits against particular semiconductor chip technologies, and in an unprecedented step, the Commerce Department self-initiated a case against Japanese makers of DRAMS. Preliminary determinations by the DOC found high dumping margins, and the U.S. ITC also quickly reached an affirmative decision of material injury against U.S. companies.

Japan capitulated in the summer of 1986, and on July 30 signed the infamous Semiconductor Trade Agreement with the United States in return for suspension of the dumping actions. Under the agreement, Japan agreed to take steps to end alleged dumping into the U.S. market, and Japanese firms agreed to supply price and sales data on a monthly basis to the Commerce Department (Flamm 1996; Dick 1995; Lindsey 1992; Irwin 1996).

MITI actually had no statutory authority to force Japanese firms to reduce production, and initially it had trouble getting them to comply with its request, which included a target of 10 percent reduction over a short period. In April 1987, however, the United States strengthened MITI's hand when it unleashed a stunning tariff retaliation (100 percent tariffs on Japanese electronics merchandise, including DRAMS)—at this point Japanese semiconductor firms fell into line and in effect MITI put together a government-led cartel. As the supreme Japan basher of the time, Clyde Prestowitz, admitted: "For the free traders of the United States to be asking Japan to cartelize its industry was the supreme irony" (Prestowitz 1989).

As we have seen with supercomputers and FPDs, the result of wielding the heavy-

handed weapon of anti-dumping policy had both negative and unintended consequences for the DRAM industry. In the year after the Semiconductor Trade Agreement (STA), DRAM prices skyrocketed, and Japanese semiconductor companies went along for the ride because, as Prestowitz again stated, "the Japanese government forc(d) its companies to make a profit" (Prestowitz 1989).

Actually, they were already making a profit, and what the STA did was to force them to make a "super profit." A Brookings Institution study estimated that extra profits on 1M DRAM sales for Japanese producers was \$1.2 billion in 1988 alone and between \$3 and \$4 billion in 1989 on all devices. This represented a direct transfer of money from U.S. consumers and U.S. computer and other companies dependent on semiconductor chips for their final products. Aware that the STA had instantly made them much less competitive against Japanese firms in the world market, the U.S. computer industry promptly established its own organization in order to counter the negative competitive effects of U.S. government policy (Flamm 1996).

The action also did not save U.S. semiconductor companies, all of whom exited the DRAM market with the exception of Micron Technology and Hewlett-Packard. What the U.S. action did accomplish, however, was to accelerate the entrance of Korean companies onto the world DRAM scene—as with Japanese companies, the supernormal profits that were obtainable in the years immediately after the U.S.-Japan agreement allowed Korean firms such as Hyundai, Samsung and LG to reap unexpected returns and gain a foothold at the lower end of the semiconductor technology ladder. This was a very expensive way to increase world competition, however, and provide additional DRAM sources for U.S. computer companies (Yoon 1992; Irwin 1998).

Further, in terms of historical lessons, it is clear in retrospect that once again U.S. government officials, including the Pentagon, wholly misunderstood the technological trajectory of a high-tech industry. A Defense Science Board report in 1987 stated firmly that DRAMS were the key to future U.S. technology leadership, a central element of the "technology food chain," and that loss of the DRAM industry would cripple the ability of U.S. firms to compete in all other high-tech electronic sectors. What the Defense Science Board and other policy entrepreneurs pushing industrial policy for the United States did not understand was that U.S. companies had already discerned that DRAMS were becoming a high-volume, low-profit commodity and that the wave of the future for U.S. firms was in more advanced microprocessors and specialty chips, along with chip design rather than actual production (U.S. Department of Defense 1987).

Finally, the mantra of U.S. government officials, corporate leaders and purveyors of gloom and doom about America's technological future during the entire period had been the necessity to dismantle "Japan, Inc." and with it MITI's alleged control of Japanese industries. But the STA had just the opposite effect: it allowed MITI officials, who actually had been losing control of Japanese multinationals, to reassert their authority. For it was MITI who divided the spoils by setting the production targets for individual companies, and it was MITI that monitored prices so that high rates of

profit would be maintained. As Kenneth Flamm of the Brookings Institution (often a supporter of activist policies for semiconductors) stated at the time:

"The U.S. semiconductor industry cannot have it both ways. If American chip makers genuinely want the U.S. government to insist that MITI's postwar role as the administrative guide of the Japanese industry has no place in the trading system of the 1990s, and continue to push for structural change within Japan, they cannot at the same time promote an agenda that implicitly strengthens the system to allow, behind the scenes, the quasi-legal guidance they have condemned" (Flamm 1996).

POSTSCRIPT

By the mid-1990s, U.S. fortunes in the global semiconductor sector reversed and worldwide, for all types of chips and microprocessors, U. S. firms regained a parity with Japan and the producers from other nations (though U.S. firms, as noted above, had moved up the technology ladder, leaving the production of DRAMs largely to other nations such as Korean, and more recently Taiwan). Japan remained an important presence in DRAMS, but this lingering hold on a comparatively low technology chip is taken by most observers as a telling sign that, in contrast to the dire predictions of the mid-1980s, Japan has fallen far behind the United States in many segments of the high-tech end of electronics.

Still, old habits die hard, and during the entire decade, one of the two surviving U.S. DRAM manufacturers, Micron, whose sales had jumped sixfold during the STA crisis, continued to attempt to use U.S. antidumping laws as a competitive tool, abetted as always by the U.S. trade and commercial officials. In April, 1992, Micron filed an anti-dumping suit against the new boys on the block, the Koreans (Hyundai Electronics, Samsung and LG Semicon[LGS]). The DOC found small dumping margins, and a year later a deeply divided U.S. ITC (3-3 vote) declared that the domestic U.S. industry suffered material damage (U.S. International Trade Commission 1993).

Three years later, Samsung, the largest Korean DRAM manufacturer, won an appeal against the DOC's determination, resulting in its removal from the anti-dumping order (U.S. Department of Commerce 1995; U.S. Department of Commerce 1996). This left the order standing only against Hyundai (which later in 1999 took over LGS). In subsequent years, though, the Commerce Department's annual reviews of Hyundai's prices found no continuing evidence of dumping for three straight years, it refused to lift the original 1993 dumping order—even after a successful direct appeal from the Korean government to the WTO in 1998 (U.S. Department of Commerce 1999).

To bring the overall story up to date, Micron continued its strategic use of the anti-dumping laws by filing suit against Taiwanese DRAM producers in October, 1998. Dutifully, the Commerce Department found dumping margins of 8 to 69 percent, but then, in a surprising, but economically sound, decision, the U.S. ITC ruled that Micron

and other U.S. producers were not being injured or even threatened with injury by Taiwanese imports (U.S. International Trade Commission 1999). As a result of this decision, the only outstanding U.S. government anti-dumping action against foreign manufacturers in the semiconductor industry at the beginning of 2000 was the anomalous order still pending against Hyundai.

Flash Forward: The Year 2000

At the end of 1999, U.S. trade officials at the Commerce Department and the ITC began a "sunset review" of the anti-dumping order against Hyundai under new rules negotiated during the Uruguay Round, which mandate that WTO members review all anti-dumping orders after they have been in place for five years. The aim of a sunset review is to determine whether revocation would lead to either continued dumping or injury to the U.S. industry. The broader review relates to material injury because the U.S. ITC will examine a number of factors such as the composition of the industry, the effects on prices and volume of imports, likely production shifts, and a kind of catch-all, the overall impact on U.S. producers.

With respect to the anti-dumping duty order on DRAMs from Korea, the ITC never completed its sunset review analysis because Micron essentially gave up in the middle of the proceeding. Just as the ITC was about to begin its final analysis Micron submitted a letter to the Commerce Department stating that, in a change from its earlier position, Micron no longer opposed termination of the anti-dumping duty order. As a result of Micron's letter, the Commerce Department found that no domestic interested party had an interest in continuing the anti-dumping duty order and therefore revoked it (U.S. Department of Commerce 2000).

Micron's decision to "sue for peace" before the ITC's analysis was not surprising. Any economic analysis of the competitive realities of the worldwide semiconductor industry, whether conducted as a part of a sunset review or for *de novo* anti-dumping proceedings, would directly lead to the conclusion that not only was this particular anti-dumping duty order unwarranted, but the entire rationale behind anti-dumping actions for this industry is flawed and inevitably results in a reduction of world economic welfare.

Internationalization and Consolidation of the Semiconductor Industry

What a difference a decade makes. As we have seen, ten years ago it was widely predicted that Japan would dominate the semiconductor market and that U.S. companies would permanently exit the sector, with no one paying much attention to upstarts like Korea or Taiwan. Today, Japanese companies are leaving DRAMS behind; one U.S. company, Micron, has become the world's technology leader; and the Koreans, followed by the Taiwanese, have become major players.

The recent history of the semiconductor industry has been characterized by consolidation and internationalization. The accompanying table demonstrates the major

changes within the industry over the past several years. As late as 1997, there were ten DRAM producers with more than five percent of the world market share. Today, the top five DRAM manufacturers control 80 percent of the market. The consolidation began in 1998 when Micron bought out TI's semiconductor business. It continued in 1999, first with the acquisition by Hyundai of LG Semicon, and then with the announcement that NEC and Hitachi would merge their DRAM businesses with a jointly owned company to be spun off in the year 2000. Today, five companies dominate world market: Samsung, Hyundai, Micron, NEC/Hitachi and Infineon (spinoff from Siemens). Micron accounts for 60 percent of the production in the U.S. market, and is the world's third largest producer, behind Samsung and Hyundai (Industry Trade Reports 1997-2000). And in a "world turned upside down" event, in 1999 KMT Semiconductor (Micron's joint venture with Kobe Steel), became a leading DRAM producer in Japan (along with NEC and Hitachi), largely as a result of Micron's new wafer process technology that hugely increased production rates and lowered costs.

Of greater importance for this paper is the fact that identifying companies by their original home market makes less and less sense. National borders and markers are of little importance to the Big Five DRAM producers as all of them have worldwide manufacturing and marketing strategies. As the accompanying table shows, all of the major producers have expanded into several markets, and of particular significance in regards to anti-dumping is that *all* of them have production facilities in the key U.S. market.

For instance, Hyundai, the only company still subject to a U.S. anti dumping order, is producing more and more of its chips for the U.S. market here in the United States. Since 1998, Hyundai has been manufacturing DRAMS at its Eugene, Oregon, facility Hyundai Semiconductor American (HSA). By the end of 1999, the HSA proportion of total Hyundai (excluding LGS) 64Mb chips sold in the United States had climbed to 70 percent. Hyundai plans to invest substantial funds-hundreds of millions of dollars-needed to ensure that its U.S. production facility remains state of the art, with the ultimate goal of producing in the United States virtually all of the DRAMs it sells here. In terms of anti-dumping, Hyundai's current production capabilities in the United States, combined with its ambitious plans to source all U.S. sales from fabs here makes it *wholly irrational* for the company to dump chips in competition with its own U.S. manufactured products. The same is true obviously for other "foreign" companies who have sizeable semiconductor production in the United States.

Finally, it should be noted that while the industry has consolidated overall, new complementary technological and structural trends are also producing the potential of a countertrend toward fragmentation. This results from the bifurcation of portions of the DRAM industry into design companies, which only design chips and do not engage in actual manufacturing, and foundries, which do not design but merely manufacture to the specifications of contracted designs (Industry Trade Reports 1997-2000). Some of these "fabless" companies, such as Rambus, have become important players in the

market by only supplying brain power. Further, integrated vendors such as IBM are increasingly turning to foundries in Asia, particularly in Taiwan, to handle their factory needs. These trends underscore once again the absurdity of anti-dumping's targeting of where the factory is located the real brains behind that factory are now often in another country, controlled by another firm.

Micron

Over the past two years, Micron's world has also changed dramatically, with important consequences for current and future U.S. anti-dumping policy toward semiconductors. Long called the "America First" DRAM maker and noted for its aggressive use of anti-dumping laws as a competitive tool, over the past two years Micron has been catapulted onto the world scene as a major player with the acquisition of TI's manufacturing plants in Italy, Japan, Scotland, and Singapore. This is a startling development for a company whose international operations as late as mid-1998 consisted of 60 workers in sales offices scattered around Asia and in the UK. By the end of the year 2000, according to Micron's CEO, Steve Appleton, more than 50 percent of Micron's DRAM production will be outside of the United States (Industry Trade Reports 1997-2000).

Industry observers view Micron as the potential new world leader in competition with Korean and Taiwanese companies. First, at the moment the process Micron utilizes to produce chips is technologically more advanced than those of other companies and also allows the company to be the world's lowest cost producer. After the TI acquisition, Micron moved aggressively to retool all of its newly acquired plants with the more advanced chip-making processes.

Second, industry experts also point out that as a bonus from the TI acquisition Micron mastered one lesson of international competition without even trying. TI had done the necessary homework for placing plants strategically-near its customers-around the world. In Singapore, for instance, Hewlett-Packard and Dell build PCs using Micron chips; and the Micron plant in Scotland is a forty minute drive from Compaq, Hewlett-Packard and Sun Microsystems manufacturing plants.

The TI acquisition and the expansion into the international arena has brought the potential for much greater profit. In the first two years, while the entire industry was under great pressure from a glut of chips, Micron's foreign plants and sales allowed it to increase sales 80 percent from \$1.4 billion in 1998 to \$2.6 billion in 1999, and cut its losses from almost \$250 million in 1998 to just under \$70 million in 1999. During fiscal 2000 Micron had an operating income of more than \$2 billion, on just \$7 billion in sales (U.S. Securities and Exchange Commission 2000).

Policy Lessons

If Micron's transition from a national to a multinational company is the stuff of

business school casebooks, it also presents fascinating challenges to the company in the public policy arena and the question, in the words of Jack Robertson, one of the keenest reporters observing the industry, of whether the company might "soften its feisty stand on some international issues" (Industry Trade Reports 1997-2000).

First, and of great relevance for this paper, was the shot across the bow with anti-dumping in Taiwan. After Micron filed an antidumping claim against Taiwanese companies in 1998, the Taiwanese responded almost immediately with a counterclaim that Micron was dumping in Taiwan's market. Later, after the United States found that Taiwanese companies were not injuring the U.S. semiconductor industry, the Taiwanese government reversed a preliminary decision of guilt and dropped the case. As this paper has pointed out earlier, the spread of anti-dumping actions around the world, particularly targeting the United States and Europe, is coming back to haunt U.S. companies that have repeatedly used U.S. trade remedies acts as tools to beat back more efficient competitors. The Taiwanese response is part of this changing pattern, and it will be interesting to see if Micron itself adopts new strategies in the face of its new multinational position.

RECOMMENDATIONS

As described in this White Paper, the economic and technological "facts" about the world semiconductor industry, as well as the supercomputer and FPD industries, demonstrate both the damage anti-dumping actions incur upon market competition and their futility as weapons to save uncompetitive companies and sectors. This is especially the case in high technology sectors where short product cycles, global strategies and pricing, multiple sourcing of parts, and multinational production facilities render impossible precise targeting of allegedly unfair trade practices. Anti-dumping actions were problematical in the old economy; they are ludicrous in the new economy.

Furthermore, as some of the most successful U.S. global companies such as IBM, General Motors, and Caterpillar have begun to point out, anti-dumping actions are two-edged swords that can be wielded against U.S. exporters. Until recently, the United States and the European Union were the leading practitioners of this form of protection. During the 1990s, however, developing countries showed a remarkable learning ability: in 1990, the United States had 193 anti-dumping orders in place; the EU, 95; and all other countries 118; by 1997, the United States had 294; the EU, 135; and all other countries, 438. In particular, Mexico, Brazil, Turkey and Argentina had become star pupils. In 2000, more than 60 nations have anti-dumping laws on their statute books, and each year the number grows (Barfield 1999; Miranda, Torres, and Ruiz 1998).

Thus, it is strongly in the U.S. national interest to take the lead in abolishing, or at least substantially revising the way national anti-dumping regimes are administered. What follows are three recommendations that encompass these options.

Fold Anti-dumping Laws into Antitrust Laws

Clearly, if political considerations were not predominant, the most economically sensible course would be to treat allegations of price discrimination and less-than-average-cost pricing as potential infractions against a country's competition policy regime. As we have noted above, predatory dumping to create a monopoly can only occur under special circumstances, the most important being the existence of a "sanctuary market"; high barriers to entry into the market under attack; and the potential for collusion to keep prices high in industries with few producers.

Recently, Joel Klein, chief of the antitrust division of the U.S. Justice Department, proposed the creation of an international organization to coordinate national policies and actions in the antitrust area. We endorse this proposal, and would suggest that a top priority for this new body should be harmonization of antitrust and anti-dumping rules on a worldwide basis.

Further down the road in the WTO, future negotiations should hinge upon the adoption by member states of up-to-date competition policy regulations and the phase-out of anti-dumping as a legitimate trade remedy tool. The ultimate goal for the WTO—as in all substantive areas—should be to introduce national treatment, one of the fundamental concepts behind the international trading regime, into anti-dumping. This would mean that domestic and foreign firms would receive equal scrutiny under the same competition laws.

Reform of the WTO Anti-dumping Rules

If for political reasons, it proves impossible to do away with national anti-dumping laws entirely, several reforms should be negotiated in future WTO trade rounds that would at least partially introduce more rational economic analysis into the system. First, a clear distinction should be drawn between industries with a large number of producers worldwide and those with relatively few producers. By and large, the presumption would be that dumping can not occur when many firms are competing against one another in many markets. An exception would be if the importing country can demonstrate the existence in that market of a cartel fixing domestic prices in the exporting country. Under this scenario, there would be a high legal threshold for proof of dumping in the DRAM industry as it has evolved today.

In industries where there are only a few producers and the possibility of a sanctuary market exists, the WTO's priority should be to open up the sanctuary market of the exporting country, not to create another sanctuary market in the importing country. Anti-dumping authorities who claim sustained differential-price dumping should be required to produce an explanation of how a higher price is maintained in the home market, either through private action or with some government support. Once this explanation is satisfactorily provided, negotiations would first be conducted between the exporting-country and importing-country governments aimed at dismantling the barriers

exporting-country and importing country governments aimed at dismantling the barriers to entry into the sanctuary market. Should these fail, anti-dumping orders could be imposed immediately. Evidence from these negotiations could also be grounds for anti-dumping actions by other WTO members (Hindley and Messerlin 1996).

A second reform that would create a more balanced decision regarding the national interest of WTO member states would come from expanding anti-dumping economic analysis to include an assessment of the costs and benefits of individual actions across the entire economy. At the present time, only the costs to the petitioning industry are examined by the U.S. ITC. A broader analysis, as suggested here, would include the costs and benefits to corporate users of the dumped products, as well as the overall costs to final consumers of the product. In addition, consumer groups and downstream corporate industries should be granted standing to appear before the U.S. ITC to introduce their viewpoints into the proceedings.

Substitute Safeguard Actions for Anti-dumping

The final recommendation is to shift national trade remedy actions away from anti-dumping toward the greater use of safeguard actions. One further change is also recommended in the current administration of safeguards and anti-dumping laws: that is, if safeguards are invoked, then for the duration of the safeguards action, all anti-dumping actions for that product should be suspended. U.S. producers should not have two bites at the protectionist apple (Barfield 1999).

Under U.S. law (Section 201 of the basic trade law) as sanctioned by WTO rules, the government may intervene to ameliorate the negative effect of import surges on industries and workers. As Section 201 operates, upon petition by an industry or union, the House and Senate trade committees, or the President, or the U.S. ITC may determine whether an industry is threatened by "serious" injury caused by a sudden increase in imports and then recommend remedies to the President, who then makes the final decision. Under current WTO rules, the relief can be granted for up to four years, with the possibility of an extension for another four years (If the relief is granted for less than three years, other countries cannot demand compensation for tariff increases or quantitative restrictions that are part of the remedy.) (Barfield 1999).

There are four strong advantages to substituting safeguard actions for anti-dumping actions (Barfield 1999). First, safeguards actions are much more flexible in both substance and duration. The president, who has final authority on the trade remedy package, can thus tailor it to match individual situations. As we have seen, anti-dumping duties, once levied, remain in place for at least five years and thus can continue long after the alleged dumping has ended.

Second, in determining a safeguards action, the President can take into account the overall national welfare (including consumer and corporate users interests) as well as other political and diplomatic factors-considerations that cannot be done with anti-dumping actions. For example, in the semiconductor and EPDs situations of the later 1980s,

use of safeguards would have allowed the Reagan and Bush administrations to assess the overall impact of trade actions on the U.S. computer industry.

Third, safeguard actions require that the petitioning industry, as a condition of receiving temporary protection, put together a plan to increase its competitiveness. Thus, unlike anti-dumping actions, safeguards introduce pressure for action-forcing results and do not allow industries to drift supinely under the cover of government protection (though in many cases a successful recovery strategy may not be possible).

Finally, increased use of safeguards actions would reduce the inflammatory and often spurious comparisons made between "fair" and "unfair" trade practices. With more naked honesty, the government would temporarily decrease imports in order to allow a U.S. industry to put together and execute a plan for recovery. Certainly there would be pressure to extend these bail-outs to the fullest allowable time, but at least consumers and U.S. industries whose interests would be damaged by the protective package could have their voices heard in opposition up front and on a continuing basis.

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