U.S. - JAPAN COMPETITION AND TRADE IN THE GLOBAL SEMICONDUCTOR INDUSTRY

This trade case and its various aspects is one of the most cited and published in U.S. trade history. It has drawn a high level of attention due to a number of unique events, the terms of the three agreements, and global industry outcomes. Because of these elements, the U.S.-Japan Semiconductor Trade Agreements (1986, 1991, 1996) have been the subject of numerous short cases at various points in the overall 20-year period of U.S.-Japan trade conflicts in semiconductors. These new cases, presented here, cover the entire period in four parts (A, B, C, Epilogue). The case presentations follow in chronological order.

U.S.-Japan Competition and Trade in the Global Semiconductor Industry

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CASE A (1977-1986)

I. THE CRITICAL EVENTS

For nearly three decades following World War II, the United States reigned supreme in all high-technology and knowledge-based industries, including electronics. But by the mid-1960s this began to change, and by the end of the 1970s, the Japanese had replaced American firms as the dominant firms in the U.S. consumer electronics market. The production and sale of products such as television, video games, and radios, all came under the domination of Panasonic, Nintendo, Sony, Matsushita, and other Japanese manufacturers. And the threat to American manufacturers in the various fields of electronics products did not stop with consumer products.

Since it was believed that the dominant Japanese electronic products manufacturers obtained chip components from their internal suppliers, who were also members of their *keiretsu*—vertically aligned systems of business relationships—the loss of American consumer electronics manufacturers also meant a loss of American semiconductor markets for American chip producers. Furthermore, this resulting increase in Japanese chip production would also be the basis for a more competitive Japanese supply of chips to other world electronic products markets with potential future losses to American firms

in these markets. Although the threat of even more intense competition from Japan was quite apparent to industry analysts, few at that time could expect that the fiercely competitive entrepreneurs of Silicon Valley, California, would for the next two decades seek the assistance of the federal government to engage in a long, drawn out political battle with their Japanese competitors.

Although they understood well the conditions that were driving changes in their industry, the independent-minded CEOs of American semiconductor and equipment manufacturers were divided along lines separating their respective economic interests. Merchant chip makers, captive chip producers, semiconductor production equipment makers, and computer systems companies each had their own different set of interests that they voiced to various agencies in the U.S. government. Complicating things further, these various government agencies had their own concerns as to the degree of impact that the relative positions and policies of the United States, Japan, and Europe would have in the next decade.

As a response to the increasing concerns over the encroachment of Japanese competition, five chip company executives—Wilfred Corrigan (Fairchild), Bob Noyce (Intel), Jerry Sanders (Advanced Micro Devices), Charles Sporck (National Semiconductor), and John Welty (Motorola)—met in early 1977. Above all, these executives expressed frustration at their companies' inability to penetrate the Japanese market. Although each company had formed joint ventures, opened sales and applications offices in Japan, and attempted to woo Japanese customers, they found it virtually impossible to increase their share of the Japanese market. At the same time, Japanese chip companies were selling to American electronics companies at a greater rate than ever before. The five semiconductor company executives believed that the success of the Japanese companies in the United States might be the result of dumping—selling devices at less than their production cost. As they viewed their options, one possibility appeared to be in their collective interests: the formation of a trade association that would provide them the means to pursue their concerns about Japanese competition while sharing the costs and influence that each could bring to bear.

In March 1977, the group formed the Semiconductor Industry Association (SIA) with John Welty as chairman. When they met, they reviewed the recent industry market experience with regard to Japanese competition and felt the need to take immediate action. The first action they decided on was to establish and maintain an industry database system to track shipments and orders. That would provide evidence of their complaints. Second, they set up a smaller group to study the options open to them to counter Japan's alleged anti-competitive practices of dumping their products in the world market while maintaining a closed market at home.

The newly appointed SIA subgroup was called the International Trade Committee (later known as the Public Policy Committee). It was initially led by Bob Noyce (Intel) and later by George Scalise of Advanced Micro Devices (AMD). The committee consisted primarily of executives from the larger chip firms, each one with limited experience in dealing with international trade matters or the related legal and political actions that could be taken. The broad array of options that the executives considered ranged from asking the federal government to stop all imports of Japanese chips to the other extreme—attempting to find some acceptable direct nongovernment accommodation with the Japanese firms. Because of limited experience and lack of unanimity—the SIA board of directors engaged a well respected Washington attorney, Alan Wolff, a former deputy ambassador at the Office of the United States Trade Representative (USTR), as SIA's lead counselor. Wolff and his law firm immediately undertook a study of Japanese marketing practices, began to update U.S. government leaders, and finally communicated to Japanese officials that the U.S. industry would pursue political and legal actions against Japanese firms if market abuses were not corrected. As a result of this activity and following the suggestion of Ministry of International Trade and Industry (MITI) Minister Abe, a high technology working group (HTWG), was formed, consisting of representatives from Ministry of International Trade and Industry MITI (Japan), the U.S. Department of Commerce (DOC), and the USTR.

A meeting of the HTWG government officials was held in Hawaii, during which both sides had access to industry representatives. By November 1982, an HTWG agreement was drawn up. Finally, in February 1983, a letter of agreement was signed by

both sides. The HTWG agreement was framed to eliminate the tariffs on chips imported into either country; remove Japanese impediments to trade and investment by foreigners; strengthen intellectual property laws and their enforcement in Japan; and provide an early warning device for dumping practices by Japanese firms. The HTWG agreement, in principle, appeared to closely meet the objectives of U.S. industry and to indicate the willingness of the Japanese industry to comply. The agreement had no specific or numerical measurements of results nor did it have penalties or incentives to motivate the participants.

The SIA board of directors accepted the agreement as a possible solution but did not place their entire faith in it. Using national security and economic arguments as the basis of its appeal, the SIA board continued to complain to various branches and agencies in the U.S. government about unfair Japanese trade practices. The board also pursued a *sui generis* intellectual property bill, which became law in 1984, protecting the topographic design of integrated circuits; it established a Semiconductor Research Corporation to provide funds for basic research and training of engineers and scientists; it created an SIA chapter in Japan for U.S. subsidiary company executives to unify industry efforts in Japan; it improved its communications with its computer systems customers in the United States, who also bought a significant number of chips from Japanese companies; and it attempted to convince the semiconductor production equipment industry to join its alliance against unfair Japanese trading practices, even though these companies were also major suppliers of materials and capital equipment to Japanese chip makers.

The Japanese companies argued during the same period that although they were in agreement with the HTWG principles, their increasing penetration of the U.S. and world marketplaces was not due to unfair practices but rather to their higher chip quality, greater efficiency, lower costs, and higher investments in applied research and manufacturing facilities. The Japanese firms also stated that any shortfall in the U.S. market share in Japan was the result of a lack of U.S. company efforts and to the unique characteristics of the Japanese market for semiconductors.

These differences in American and Japanese views of the marketplace put the two nations' industries on a collision course.

II. LOOKING BACK: THE EVOLUTION OF A GLOBAL HIGH TECHNOLOGY INDUSTRY AND THE ROOTS OF CONFLICT

Strife between nations rarely occurs without reason; indeed, conflict has many origins and the friction that led up to the conclusion of the U.S.-Japan Semiconductor Agreements is no exception. The agreements are very much the product of differences between the political and economic development of the two nations. This section of Case A will highlight how the semiconductor industry emerged in the three most advanced economies of the world—the United States, Japan, and the European Union—and how differences in the developmental strategies employed in these economies led to political tension between the United States and Japan as competition heated up and national markets began to merge.

The invention of the transistor at Bell Telephone Laboratories (BTL) in 1948 signaled the beginning of a revolution in electronics and the start of a semiconductor industry. The industry produces semiconductor devices—transistors, memories, microprocessors, and logic circuits. Although also popularly know as "computer chips," for their common usage in computer hardware industry, all electronic equipment in fact uses these silicon-based components.

In the years from 1948 to 1958, from the discovery of the transistor to the invention of the integrated circuit, the emergence of semiconductor technology and the subsequent growth in production of chips were affected by two major forces; the U.S. Department of Defense (DOD), and American Telephone and Telegraph Corporation (AT&T) through its Bell Telephone Laboratories and its manufacturing arm, Western Electric. Initially, large established U.S. firms such as General Electric and RCA were the main benefactors from the development and diffusion of semiconductor technology. But by the end of the 1950s, a $300 million production level lured smaller entrepreneurial firms, namely, Texas Instruments, Motorola, and Fairchild, into the business. Toward the end the 1960s and the beginning of the 1970s, other present-day U.S. industry leaders,

like Intel, Advanced Micro Devices (AMD), and National Semiconductor, began to emerge.

While these firms sold products in the open merchant market, a parallel course of internal production and use was developed by AT&T, International Business Machines, Hewlett Packard, and Digital Equipment Corporation. The combined output of these in-house producers was estimated to be as much as 25% of all U.S. production. These internal production operations were captive chip manufacturers and subsequently called "captives."

By 1970, the total world market was well over $1 billion and countries besides the U.S. commenced development of their own semiconductor industries. In Europe, the large electrical and electronics firms such as Philips (Holland), Siemens (Germany), and SGS-Thomson (France and Italy), strongly supported R&D and chip production. Presently, these European manufacturers of semiconductors rank among the top 25 producers of chips in the world. While the rise of European firms is certainly notable, the greatest advances in production and increase of shipments of semiconductors during the early 1970s were made by Japanese firms: NEC, Hitachi, Toshiba, Fujitsu, Mitsubishi, Matsushita, and Oki, as well as other smaller, specialized producers.

THE UNITED STATES TO 1977

In the early years, the U.S. industry was supported by a reliable defense industry market and development funds from the DOD. But by the late 1960s, the demand for semiconductors shifted from military applications to commercial use by manufacturers of computers, consumer electronic products, and industrial equipment. As the industry refined its design and manufacturing methods, more complex devices were produced at dramatically lower costs each year. At the time, conventional wisdom asserted that chip prices would fall by 30% for every doubling of unit volume, and unit volume was growing at rates as high as 50% per year.

By the late 1960s, dynamic random access memories (DRAMs) were the cutting edge "technology drivers" of the times. Large investments in R&D and capital equipment,

which led to rapid improvements in design, volume, and costs, allowed firms to achieve continually greater economies of scale and scope. Expenditures for R&D and capital equipment purchases together accounted for approximately 25% of annual revenue, a level that was among the highest of all U.S. manufacturing industries. However, despite high industry growth rates averaging around 15% per year, the industry was plagued by lumpy investment patterns, which produced booms and busts in the market. These chronic shifts in the supply and demand of chips resulted in sharp annual growth followed by steep declines (all occurring over a three- to five-year period), becoming known to market observers as the "silicon cycle."

Much of the initial success of U.S. firms can be attributed to both the DOD's commitment to funding R&D and the nation's pool of engineering and scientific talent. As time progressed, the U.S. industry benefited from expanded access to vast amounts of venture capital. A large amount of this capital was used by entrepreneurial semiconductor engineers and managers who had left larger U.S. companies to start up their own firms. Many of these new firms located their headquarters and research and development (R&D) centers in the greater San Jose metropolitan area. Thus, this region of California (Santa Clara County) became known as "Silicon Valley."

In the global market, the U.S. maintained a trade surplus in semiconductors. Its firms possessed major investments in fabrication and assembly facilities in Europe and low-level assembly plants throughout the developing nations of Asia, where labor costs were low. There were also U.S. semiconductor operations in Japan; however, due to that nation's restrictions on foreign direct investment, the U.S. presence there was minimal.

By the end of the 1970s, the U.S. industry controlled 80% of the world semiconductor market. Despite the high cost of capital equipment and R&D expenditures, U.S. firms dominated the industry. Growth was fueled further by a high level of demand from abroad and by rapid reductions in the costs and prices of devices as their complexity and applicability increased.

EUROPE TO 1977

Whereas the U.S. semiconductor industry was established by entrepreneurial firms funded with venture capital, the European approach to the development of a semiconductor industry was to place its trust in large corporations, namely, Philips, Siemens, SGS (at that time Italy), and Thomson (at that time France). Government policies also encouraged foreign (non-European) firms to invest directly in Europe rather than simply exporting their products to European customers. The European Community's (EC) strategy was to establish a European production base, regardless of ownership of the facilities. European-based firms as well as American and Japanese semiconductor subsidiaries were protected and supported in several ways: rules of origin, which blocked the use of imported semiconductors; tariffs as high as 17%; preferential procurement practices; and R&D support through European consortia and cooperatives. The weaknesses of the EC strategy were that it tended to rely on fragmented national markets rather than international ones; its failure to recognize the needs of domestic users of semiconductor chips such as the computer industry; and its failure to promote the development of indigenous skills to manufacture integrated circuits in high volume.

JAPAN TO 1977

The Japanese semiconductor industry began with infant-industry protection; a successful commercial industry take-off; the promotion of an efficient and effective number of *keiretsu*-affiliated semiconductor companies; and a high degree of success in foreign markets. The Japanese government rejected almost all applications for wholly owned foreign subsidiaries and instead allowed only joint ventures; restricted foreign purchases of semiconductors; kept high tariffs and low quotas; and reviewed all requests for assistance and licensing agreements. At first the Ministry of International Trade and Industry (MITI) controlled and then guided the diffusion of foreign technology to Japanese firms. Although U.S. firms held almost 80% of the U.S. market and 60% of the European market, toward the end of the 1970s foreign firms (primarily U.S. and European firms) held only a 10% share of the Japanese market.

As Japanese firms began to specialize in manufacturing efforts on devices for consumer electronics in the mid 1960s, the Japanese government slowly began to ease

formal barriers to trade and foreign investment. Ironically, however, as Japanese firms increasingly became exposed to foreign competition at home, MITI began to promote cooperation in technological development among national firms. Prior to this period Japan lagged behind in research and development of new semiconductor products. But by sponsoring joint R&D projects and encouraging the rationalization of production, MITI took it upon itself to promote innovation.

In spite of the easing of restrictions, only six Japanese firms dominated the semiconductor market in Japan, controlling 80% of the market. These firms were all directly associated with vertically integrated *keiretsu* combinations which some foreign observers believed had led to a cartelization of the market. These alleged anti-competitive trading practices were believed to be restricting all but the most advanced foreign products from entering the Japanese market. Foreign shares in Japan were held to 10% despite the apparent technological superiority and lower device cost of non-Japanese firms. In addition, foreign firms claimed that the Japanese companies had unfair access to subsidized investment capital, which allowed them to maintain their growth, even during the down cycle of world semiconductor industry markets.

III. HEADING TOWARD CONFLICT

Keeping in mind the origin of the friction between the semiconductor industries of U.S. and Japan, these two countries attempted to implement resolutions concluded by the High Technology Working Group.

The HTWG agreement seemed to be a foundation to build on. However, both industries—the SIA through its board and its members (which now numbered over 30, including the captive chip divisions of IBM, HP, DEC, and AT&T) and the Electronic Industries Association of Japan (EIAJ), representing the Japanese chip makers—continued attempts to influence American government and private interests. However, market forces during the next two years soon brought about a widening of the gap, which separated the interests of the two nations.

In 1984, the year after the HTWG agreement was signed, the world's chip industry grew dramatically—46% over the previous year. The boom appeared to lessen tensions to some degree and most of the world's chip makers appeared to be performing relatively well. Only one U.S. firm, the Mostek Corporation (a major producer of DRAMs) believed that dumping had not ceased. Most SIA members felt not only that U.S. firms were doing well overall, but also that the industry's political influence was improving. The events of 1985 were to emphasize, however, that the good times were only temporary.

In 1985, the world chip market was rapidly eroded by a recession. When the final numbers for the year were in, the industry had declined globally over 17% from the previous year. The U.S. market was up 24% in 1983, up 49% in 1984, but down 30% in 1985. A large number of American firms were unprofitable and in danger of failing. Many of them were forced to withdraw from the DRAM market, which now became the principal market for the Japanese firms. The U.S. competitors accused Japanese firms of dumping memory chips, but their U.S. customers defended them as higher-quality, lower-cost suppliers. In fact, Hewlett-Packard executives stated publicly that Japanese chips had only one-tenth the level of defects of U.S. chips.

Accusations were strident, and the earlier agreements of the HTWG were virtually dismissed by SIA as empty promises. By spring 1985, the U.S. chip industry believed that it would be annihilated by the Japanese competition unless quick and drastic action was taken. At the SIA board meeting in early 1985, the public policy committee headed by George Scalise (AMD) and the board of directors chaired by Gary Tooker (Motorola) struggled with the question of how far and how fast members of the U.S. industry should act to change the existing state of affairs. Before any action could be taken, however, leaders in the U.S. semiconductor industry had to reach a consensus among the different interests represented by the SIA. Each company had different relations with Japanese firms, which could possibly be adversely affected if a dumping suit against Japan were initiated. After a vigorous discussion leading to unanimity among the corporate chief executives, the U.S. industry decided to act aggressively.

On June 14, 1985, the SIA filed a trade action petition USTR under Section 301 of the Trade Act, stating its complaints. A week later, Micron Technology, a prominent U.S. DRAM maker and one of the few nonmembers of SIA, filed a separate 64K DRAM dumping suit with the Department of Commerce. By October 1985, Intel, National Semiconductor, and Advanced Micro Devices filed an EPROM (another form of memory) dumping suit with the Department of Commerce. In December, the DOC self-initiated a 256K DRAM dumping case. It appeared that an avalanche of political and legal activity against Japan had begun.

The SIA moved to consolidate its position with other American electronic industry interests as well as any U.S. government officials that were not in accord with its actions. Furthermore, the SIA also met in California with representatives of the European chip makers—Philips, SGS-Thomson, and Siemens—in an attempt to convince them to support the SIA and U.S. government actions. The Europeans' position was follows: The United States would be ultimately unsuccessful in opening the Japan market; therefore, they saw no value in fighting a losing market access battle. Second, they were initiating their own dumping suit against Japan. And furthermore, they implied they might initiate a dumping suit against the Americans! Most surprising, they tentatively stated that the United States should give up a share of the European market to them on an agreed upon basis, in an informal market sharing agreement. Obviously, the SIA was unwilling to accept any of the European positions, but it did promise to keep the Europeans informed of further American actions.

Since the SIA had filed the complaint with USTR in summer 1985, Japan had one year—until July 1986—to agree to terms with the United States or then-President Reagan could retaliate against Japan as he saw fit. By January 1986, Japanese industry was seeking some way to avoid presidential action. One more attempt was made by the U.S. and Japanese industries- to stave off government action. Akio Morita, chairman of Sony Corporation (Japan) and Bob Galvin, chairman of Motorola (U.S.A.), agreed to hold an industry-to-industry meeting in Los Angeles in March 1986. Key members of the Japanese and American industries and their attorneys attended, as did Japanese government representatives.

During this meeting, MITI indicated that it would encourage the traditional "top 5"Japanese firms, representing 30%-35% of the Japanese market, to increase their foreign semiconductor content from 13% to 20%—this would be the model for other Japanese firms over the next five years. In subsequent negotiation sessions, MITI offered to impose a uniform floor price to settle the dumping suits, but the United States rejected these offers because they would allow inefficient Japanese firms to dump down to the uniform floor price and would prevent the efficient Japanese firms from pricing below the floor.

No U.S. government officials attended these meetings. The outcomes, although not definitive, were provided to the Japanese and U.S. government officials negotiating the Section 301 action. As the summer drew near and the July 31 deadline loomed closer, the SIA faced a number of questions on which its success in the 301 negotiations hinged. The questions that the SIA board faced were the following:

Should the European Economic Community be left out of the agreement? Should SIA accept 20% share of market from only the top 10 Japanese firms? What actions must the Japanese industry and the government of Japan take to satisfy the U.S. chip industry? How could these actions be taken so that other domestic interests—chip customers, chip manufacturing equipment suppliers, can be satisfied? Should the U.S. agree to uniform worldwide floor prices as preferable to imposing dumping duties by individual Japanese companies? Which actions would not negatively impact the other nations' industry? How far was the U.S. government willing to go to obtain the U.S. chip industry's goals?

In order to help you answer these questions, the following exhibits are given with Case A.

A.1 JAPANESE-IMPORTED DRAM & U.S. SELLING PRICES

A.2 U.S.-BASED SEMICONDUCTOR COMPANIES WORLDWIDE SALES FIRMS

A.3 FOREIGN FIRM'S SHARE OF THE JAPANESE SEMICONDUCTOR MARKET 1973-1986

A.4 U.S. SHARE OF THE JAPANESE MARKET VERSUS JAPAN'S SHARE OF THE U.S. MARKET

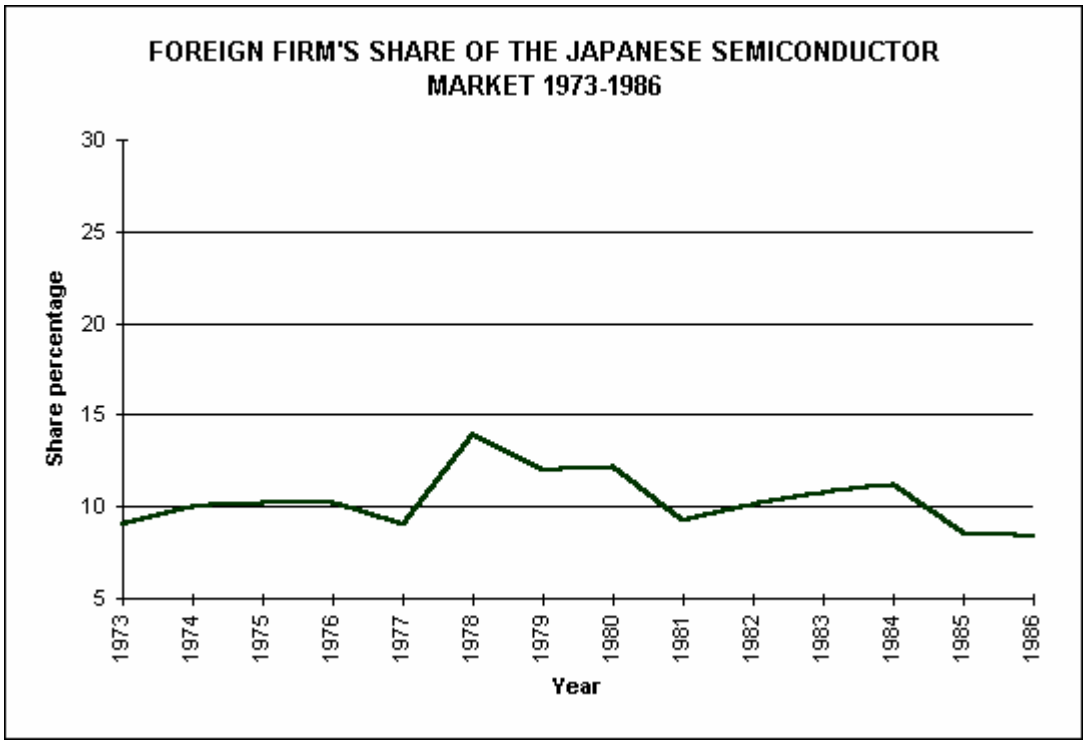
A.5 U.S. & JAPAN WORLD SHARE OF THE SEMICONDUCTOR MARKET

A.6 DUMPING OF EPROMS AND 256K DRAMS IN THE U.S. MARKET 1986

Exhibit A.1

Exhibit A.2

Exhibit A.3



Exhibt A.4

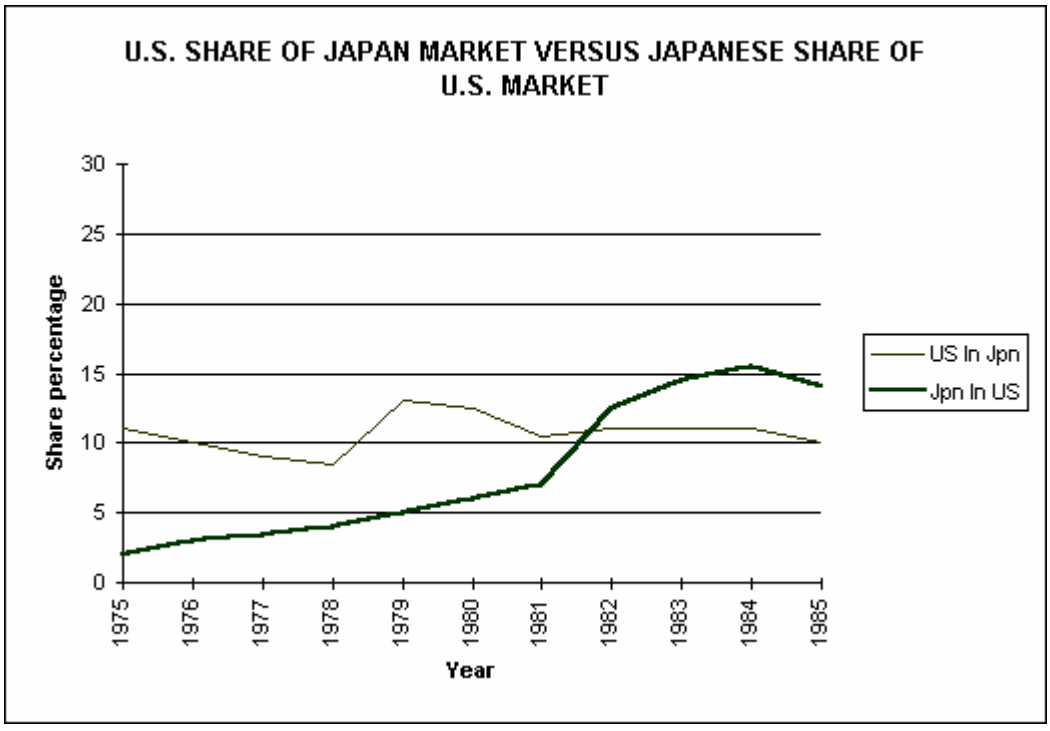


Exhibit A.5

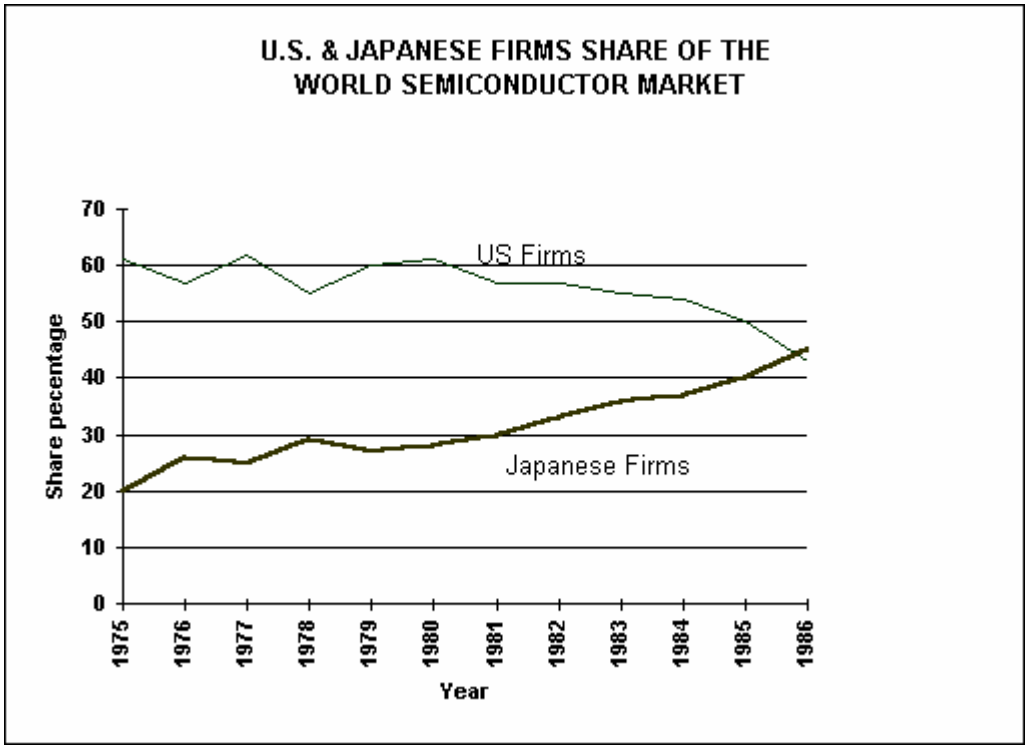
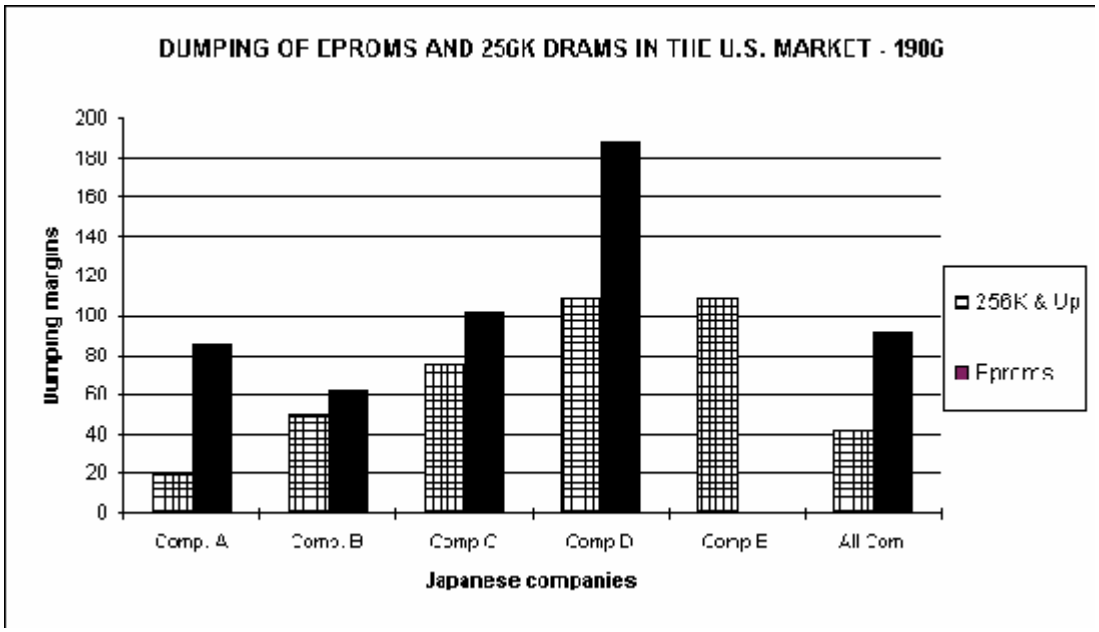

U.S. & JAPANESE FIRMS SHARE OF THE WORLD SEMICONDUCTOR MARKET
Share pecentage
70
60
50
40
30
20
10
0
US Firms
Japanese Firms
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
Year

Exhibit A.6


DUMPING OF EPROMS AND 25GK DRAMS IN THE U.S. MARKET - 1986
Dumping margins
200
180
160
140
120
100
80
60
40
20
0
Comp. A
Comp. B
Comp C
Comp D
Comp E
All Com
Japanese companies
256K & Up
Eproms