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Case Study: Managed Trade: The US and Japanese Semiconductor Industries, 1970-2002

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Managed Trade: The U.S. and Japanese Semiconductor Industries 1970-2002

The development of the U.S. semiconductor industry was driven by the interaction between technological innovation and market expansion. In 1947 Bell Telephone introduced the transistor, an invention that would mark the beginning of the microchip revolution. In the late 1950s, Jack Kilby, an engineer from Texas Instruments, and later Robert Noyce, co-founder of Intel, prompted a boost in the industry with the development of the integrated circuit. In 1970, Intel Corporation launched the Dynamic Random Access Memory (DRAM), which became an important component of computers and other electronics. Modern semiconductors consist of the memory and logic chips and are used in a wide range of products that include consumer electronics, computers, telecommunication equipment, automobiles and machine tools.[1]

During the course of history, control over the semiconductor market has alternated between countries. From the early 1950s until the beginnings of 1980s, American companies were the global leaders in the commercial development and production of semiconductors. In the mid-1970s, they controlled 98 percent of the domestic market and about 70 percent of international market. During the 1980s the U.S. lost market shares to their Japanese competitors. By 1989, Japan had supplanted the U.S. as the world's largest market for semiconductors. Throughout this period, the Japanese semiconductor enterprises increased their global market share by 25 percent: from 44 percent at the end of the 1970s to 49 percent by 1990. In 1988, Japanese firms reached 80 percent of the world market share for DRAM. By the end of the 1990s, a combination of political and economic factors returned the leadership to the U.S. manufactures in the Erasable Programmable Read Only Memory (EPROM) market and opened opportunities for the newcomers of South Korea and Taiwan.[2]

There is a general consensus that Japan's industrial policy had a significant impact on the development of the Japanese semiconductor industry during the 1970s and 1980s; however, there is also the theory that it was market forces rather than industrial policy that promoted the increase of the Japanese market share of low-end semiconductors. There is, however, no argument that the rise of the Japanese manufacturers came at the expense of American producers.

In a 1989 report presented to the President and Congress of the United States, the National Advisory Committee on Semiconductors identified the three main causes of the decline of the U.S. semiconductor industry as: the difference in business environments among countries, the migration of their customer market of electronic systems to the far East, and the delayed cooperation of manufacturers in technological developments. The report stated that the most significant differences between the U.S. semiconductor industry and its foreign counterparts were "the access to low-cost capital, the ability and willingness of foreign producers to benefit from trade practices such as closed markets and dumping, the failure of US schools to adequately

[1] History, September 2009 <http://www.sia-online.org/cs/about_sia/history>.

[2] "Managed Trade: The U.S. and Japanese Semiconductor Industries, 1970-2002," International Business: Competing in the Global Marketplace (McGraw Hill, n.d.).

train the work force, and the difficulty of enforcing U.S. legal rights abroad."[3] These differences represented a competitive disadvantage for the U.S. manufacturers who, during the 1980s, witnessed their decline in market dominance as Japanese firms became more prominent.

The development and success of the Japanese semiconductor industry during the 1970s and 1980s are frequently attributed to government trade policies and industrialization strategies. The Japanese government limited foreign penetration into the domestic market by setting high import tariffs and restrictive quotas and limiting the percent share that a foreign company could acquire in a Japanese semiconductor firm. For example, by 1974 Texas Instruments was the only foreign company with a wholly owned manufacturing subsidiary in Japan. To avoid the 12 percent ad valorem tariff imposed on U.S. integrated circuits, other American firms used offshore assembly facilities in the developing countries of South Asia to penetrate the Japanese market.[4] The government also implemented a range of financial and promotional policies to promote the development of the domestic industry. It increased the availability of stable sources of cheap capital and structured the terms of domestic competition. The Japanese Ministry of International Trade and Industry mandated that any licensing by foreign firms was to be provided to all Japanese firms that requested its access, which promoted the rapid diffusion of technology and knowledge throughout the Japanese semiconductor industry. These policies undoubtedly helped the Japanese producers to preserve their leadership in the domestic market and to gain an international competitive advantage.

Another theory contends that the shift of market dominance from the United States to Japan was a consequence of investment decisions rather than unfair trade policies. In a 1991 article, the Heritage Foundation asserted that: "normal market forces and competition were the primary factors resulting in the dominance of the low-end computer chip market by Japanese firms."[5] In the mid-1970s, American manufactures shifted investment from lower-end DRAMs and EMPROMs to high-end computer chips. Japanese firms, on the other hand, invested heavily in modernization and expanded their semiconductor production capacity to meet the domestic demand not just of consumer electronic products, but also of computer and telecommunications. Large Japanese firms, like NEC and Toshiba, manufactured semiconductors mainly for their own internal use in their electronic products. In contrast, the U.S. exported semiconductor 'parts and accessories' to U.S. offshore assembly facilities and imported the finish 'integrated circuits'. The different investment and business strategies employed by American and Japanese companies led to the decline of the DRAM market share of the former and promoted the rise of the latter.[6]

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[3] National advisory Commitee on Semiconductors, Semiconductors: A Strategic Industry at Risk (Washington , 1989).

[4] Michael Borrus, James E Millestein and John Zysman, "Trade and Development in the Semiconductor industry: Japanese Challenge and American Response," American Indsutry in International Competition, ed. John Zysman and Laura Tyson (Cornell University Press, 1983) 142-248.

[5] Bryan T Johnson, "ISSUES>Asia and the Pacific," 24 January 1991, The Heritage Foundation, 30 September 2009 <http://www.heritage.org/research/asiaandthepacific/bg805.cfm>.

[6] Michael Borrus, James E Millestein and John Zysman, "Trade and Development in the Semiconductor industry: Japanese Challenge and American Response," American Indsutry in

The semiconductor industry in Japan emerged and developed under the umbrella of the national government, but it was the strategic decisions of firms that ultimately determined the success of the Japanese firms in the international market during the 1980s. The Japanese government facilitated the management of complex processes of product development and manufacturing and provided protection to domestic firms against foreign competition. The firms excelled in taking advantage of the domestic business environment and in delivering high quality products that satisfied the domestic and international demands.

In the dynamic business environment of globalization, however, social and economic factors often change the rules of the game. The 1991 semiconductor pact, in which the Japanese government guaranteed at least 20 percent of the domestic market to foreign enterprises, the appreciation of the yen against the dollar, and the inability of Japanese companies to reduce production costs of their high-quality DRAMs caused the Japanese to lose their leadership position in the semiconductor market. These developments mainly favored producers in South Korea and Taiwan, and returned to the U.S. manufactures their dominance of the microchip global market.[7] Once again in history, the market and the government exercised their command to alter the course of trade flows.

International Competition, ed. John Zysman and Laura Tyson (Cornell University Press, 1983) 142-248.

[7] Takashi Yunogami, "Mistake of Japanese Semiconductor Industry," 2 May 2006, Azo Materials, 30 September 2009 <http://www.azom.com/Details.asp?ArticleID=3420>.

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