Appendix A

The Decline of the U.S. TV Industry: Manufacturing

U.S. firms led the world in TV technology and production until the early 1970s. Then, foreign-owned firms gradually took control of the U.S. market. In particular, superior design and manufacturing techniques were implemented by Japanese manufacturers, in a financial and business environment that the Japanese Government took pains to make favorable to technology development and capital investment. Their government also assisted in developing overseas markets through a variety of export promotion incentives and protected the emerging Japanese companies from competition. The decline of the U.S. television industry was also hastened by dumping on the part of Japanese (and, later, other foreign) firms, and by the sluggish and inadequate response of the U.S. Government to that unfair trade practice. Finally, the diversification of Japanese producers from small, portable televisions into larger, higher value segments probably was speeded by Orderly Marketing Agreements, which limited the number of units that could be sold here.

Solid-state electronics were almost entirely invented in the United States, yet the Japanese pursued solid-state TV designs more vigorously. To reduce energy consumption by TVs, manufacturers requested that MITI sponsor a multi-company project to study the replacement of vacuum tubes with transistors. MITI assigned particular responsibilities to specific companies, and then circulated the results among all participants. The new designs, introduced in 1969 and 1970, used less than half the power of the older models.

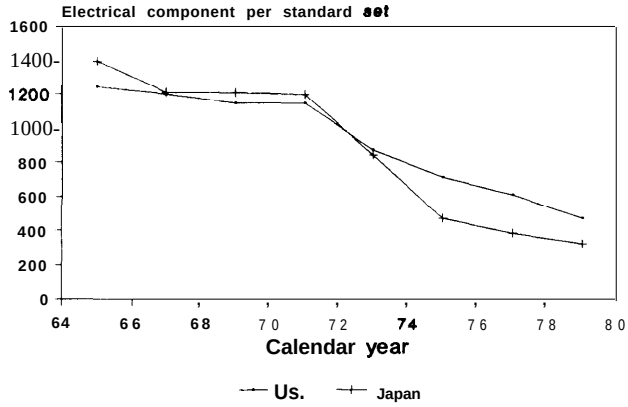
MITI followed this with another multi-company research program on the use of integrated circuits (IC) in color TV. The change to ICS allowed dramatic reductions in the number of electrical components used in a TV. From an average of 1,200 components per color TV in 1971, Japanese firms reduced the count to just 480 by 1975. In the same time period, U.S. firms only managed to reduce the component count from an average of 1,150 to 880 (figure A-l).

This enabled all the components to be squeezed onto a single printed circuit board, which reduced the number of contact points and made the TV both easier to assemble and more reliable. In contrast, American firms continued to use multiple-board designs for their ease of service. Thus, while Japanese firms designed faults out, American firms accepted faults as inevitable, designed for them, and in the process introduced them.

This difference in design philosophy could be seen at every stage of the manufacturing process. Japanese manufacturers worked to ensure ''zero" defects by: performing elaborate pre-production testing of new designs; coordinating closely with suppliers to eliminate defects in incoming parts; and adopting automated assembly. By 1978,65 to 80 percent of components were inserted automatically in Japan compared to 40 percent in the United States. This insistence on perfection even extended to the boxes that the finished TVs were shipped in. When Sanyo took over the Arkansas facilities of Warwick (U.S.), over a year was spent working with suppliers until the cardboard was flawless and the lettering perfect.

In contrast, American manufacturers allowed a certain percentage of incoming components to be defective, and relied on testing during and after the production process to catch the problems. As a result, typically less than 1 in 100 TVs had to be reworked during production due to

Figure A-l—Average Number of Electrical Components Per TV for U.S.-and Japanese-Made Color TVs



SOURCE: Based on data in Ira C. Magaziner and Robert B. Reich, *Minding America's Business (New York, NY:* Random House, 1983).

[1]Sources for this section include: Harvard Business School Cases, "The U.S. Television Set Market, Prewar to 1970, " "The U.S. Television Set Market, 1970-1979," "Sanyo Manufacturing Corporation-Forest City, Arkansas," "The Televisim Set Industry in 1979: Japan, Europe and Newly Industrializing Countries." Ira C. Magaziner and Robert B. Reich, "Minding America's Business" (New York, NY: Random House, 1983). J.M. Juran, "Japanese and Western QuaLity-A Contrast," *Quality Progress,* December 1978. James Howard Wooster, "Industrial Policy and International Competitiveness: A Case Study of U.S. Japanese Competition in the Television Receiver Manufacturing Industry," Ph.D. Thesis, University of Massachusetts, 1986. Developing World Industry and Technology, Inc., "Sources of Japan's International Competitiveness in the Consumer Electronics Industry: An Examination of Selected Issues," contractor report for the Office of Technology Assessment, 1980. James E. Millstein, "Decline in an Expanding Industry: Japanese Competition in Color Television," in *American Industry in International Competition,* John Zysman and Laura Tyson (eds.) (Ithaca, NY: Cornell University Press, 1983).

defects in Japan; many U.S. factories had to rework 50 percent or more. Strict control of the quality of incoming parts is also important if automation is to succeed. For example, Philco's automated circuit board assembly plant in Brazil ran for 3 months before they discovered that every IC from one of their suppliers had been defective. The cost of replacing the circuit board of every color TV produced during this period was an important factor in their owner's (Ford Motor Co.) decision to sell Philco to GTE-Sylvania and Zenith in 1973-74.

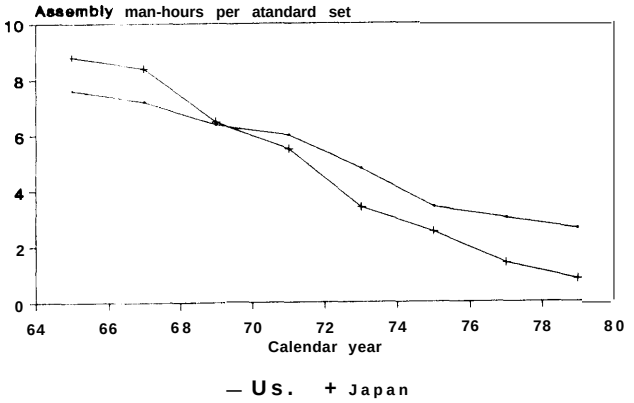
Reduced re-working of TVs during production, automation, and other factors reduced the assembly time for color TVs to 0.8 hours in Japan versus 2.6 hours in the United States in 1979 (figure A-2). Their TVs were also more reliable. Service calls for U.S.-made color TVs were five times more frequent than for Japanese-made TVs in 1974, dropping to two times the frequency by 1979 as U.S.-made sets improved.

These changes in failure rates had other impacts as well. Because of early reliability problems, many U.S. firms had developed dealer networks to sell and service TVs in the 1950s, as had Japanese electronics firms in Japan. The increasing reliability of TVs and the ability to market them through mass merchandisers in the United States, however, freed Japanese firms from supporting such dealers in the United States, and thus converted these dealer networks from a potential barrier to market entry into a liability for U.S. firms.

Meanwhile, the Japanese producers were protected from foreign competition at home. The government maintained strict controls on foreign direct investment, restricted import and currency exchange licenses, and set import quotas. Even without them, Japan's distribution systems and traditional business practices posed a formidable practical barrier to American exporters.

Some U.S. firms were competitive in manufacturing, however, and survived till quite recently (GE, RCA) or to the present (Zenith) even in the face of dumping by some foreign firms. Had this dumping and other trade violations not occurred, other U.S. firms might have had the time to learn and apply superior quality control and production techniques, and have had the profit margins needed to invest in R&D and automation to be fully competitive. In this context, it is important to note that U.S. manufacturing practices were superior to those of the Japanese in terms of component counts and assembly man-hours (figures A-1 and A-2) until the early 1970s.

Figure A-2—Man-hours To Assemble Color TVs in U.S. and Japanese Factories



SOURCE: Based on data in in Ira C. Magaziner and Robert B. Reich, *Minding America's Business (New York, NY:* Random House, 19s3).

Foreign-owned firms now dominate the U.S. TV industry and much of the skill-intensive design and production of electronic components and subassemblies is done abroad, in many cases leaving primarily screwdriver assembly operations to be done in the United States.