

Industry & Trade Summary

Capacitors



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UNITED STATES INTERNATIONAL TRADE COMMISSION

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PREFACE

In 1991 the United States International Trade Commission initiated its current *Industry and Trade Summary* series of informational reports on the thousands of products imported into and exported from the United States. Each summary addresses a different commodity/industry area and contains information on product uses, U.S. and foreign producers, and customs treatment. Also included is an analysis of the basic factors affecting trends in consumption, production, and trade of the commodity as well as those bearing on the competitiveness of U.S. industries in domestic and foreign markets.¹

This report on capacitors covers the period 1986 through 1992 and represents one of approximately 250 to 300 individual reports to be produced in this series during the first half of the 1990s. Listed below are the individual summary reports published to date on the electronic technology, instruments, and precision manufactures sector.

<i>USITC publication number</i>	<i>Publication date</i>	<i>Title</i>
2445	January 1992	Television Receivers and video monitors
2648	July 1993	Measuring, testing, controlling, and analyzing instruments
2674	September 1993	Medical goods
2708	December 1993	Semiconductors
2728	February 1994	Capacitors

¹ The information and analysis provided in this report are for the purpose of this report only. Nothing in this report should be construed to indicate how the Commission would find in an investigation conducted under statutory authority covering the same or similar subject matter.

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INTRODUCTION

Capacitors are components capable of storing electric energy that is useful for a number of functions in electric circuits. For example, in picture camera circuits, capacitors draw energy from the low-power battery of the camera over a relatively long period of time and then discharge this energy within a relatively short period of time in order to supply the high level of energy needed for flash activation.

Capacitors generally consist of two metal plates separated by an insulating material called a dielectric. Dielectrics can be either solid, liquid, gaseous, or a combination of these three states. The most commonly used dielectrics include the following: air, ceramic, aluminum, tantalum, plastic film, paper, mica, and glass. The ability of a capacitor to store energy is called capacitance. This ability depends largely upon the area of the capacitor plates and the type of dielectric materials used in its construction.

Capacitors are constructed either for electrical circuits such as those used in power transmission or in generation networks, or are constructed for electronic circuits such as those used in consumer electronic goods, automatic data processing machines, and telecommunications equipment. This summary covers only capacitors used in electronic circuits. The industry producing electronic capacitors accounts for most of the value and quantity of total capacitor production and is generally governed by trends and factors that differ from those of the industry producing electrical capacitors.

This summary also covers only discrete capacitors, as opposed to capacitors built as part of integrated circuits (ICs). Discrete capacitors are individually packaged and usually soldered along with other electronic components to printed circuit boards (PCBs). A single IC can incorporate the equivalent of thousands of these PCBs mounted with millions of capacitors and other components in a miniaturized form.¹ Since the invention of ICs in 1958, technological improvements have continually increased the number of electronic components that ICs can incorporate. As a result, the number of discrete capacitors used in electronic circuits has diminished relative to the total number of components produced.

There are many different types of capacitors, each of which is produced to handle a specific capacitance, current, voltage, and frequency. In addition, capacitors vary in their insulation strength, breakdown voltage, dissipation factor, performance in different environmental situations, and a host of other parameters. "Fixed" capacitors store a specified charge, whereas the user can change the capacitance of "variable" capacitors. There are also "preset" or "adjustable" capacitors, in which the capacitance may be adjusted within a narrow range to a precise value.

¹ ICs usually have sides of less than 10 millimeters and heights of less than 1 millimeter.

Certain types of capacitors provide greater tolerance to extreme temperature fluctuations or vibrations, others offer long shelf-lives, and some provide especially high capacitance per unit volume. These characteristics are determined by component design, and they result chiefly from the materials used as the dielectric.²

The processes, equipment, and technologies used in the manufacture of capacitors depend largely on the dielectric used in constructing the devices. Capacitors are produced in extremely high volumes and orders are commonly awarded to the lowest bidder. The technology used to produce capacitors is generally available widely, and, as a result, these devices are considered mature, commodity products. Nevertheless, innovation remains important in this industry. Manufacturers usually concentrate on producing capacitors using only one or a few of the various types of available dielectrics. There is considerable overlap in the performance characteristics among these various types of capacitors, and manufacturers can enhance their market share by extending the capabilities of their offerings through innovation. Moreover, manufacturers are under unceasing market pressure to reduce manufacturing costs and the size of devices, and to provide new packaging arrangements that increase the reliability and reduce the costs of incorporating capacitors on PCBs.³

During the 1980s, demand grew significantly for capacitor packages that could be soldered directly onto the surface of a PCB rather than being attached by connecting leads, as is done with conventional capacitors. Capacitors and other electronic components that are attached directly to a PCB are referred to as surface-mounted devices (SMDs), "chip", or "leadless" devices, while traditional capacitors are referred to as "leaded" devices. SMDs provide improved equipment reliability, better vibration performance, and greater immunity to electromagnetic interference.⁴ In addition, because of their smaller size, SMDs require less space on a PCB than conventional components, thus allowing for greater component density on circuit boards. Higher component density enables more functions or features to be offered in the same size unit, or conversely, higher density PCBs allow manufacturers of end products to reduce the size of their end products. Also, the assembly of SMDs onto PCBs may be automated by means of computer-controlled "insertion" or

² For further information on the functions and types of capacitors see *Encyclopedia of Electronics and Computers*, ed. Sybil P. Parker (New York: McGraw-Hill, 1984), pp. 93-100.

³ For more information on innovation in capacitor technologies, see P. C. Shaw, S.W. Cichanowski, and A. Yinlizio, "Changing Capacitor Technology-Failure Mechanisms and Design Innovations," *IEEE Transactions on Electrical Insulation*, vol. 16 (1981), pp. 399-413.

⁴ Elsevier Advanced Technology, *Profile of the Worldwide Capacitor Industry* (Oxford: Elsevier Science Publishing, Ltd., 1990), p. 47.

“placement” machinery that can significantly reduce the time needed to assemble electronic equipment.⁵

SMDs are now displacing sales of leaded products as more SMDs are used in the global electronics industry. Despite the advantages of SMDs, these “miniaturized” components are not used by all manufacturers. A typical surface-mounting system for one manufacturing line costs between \$1.5 million and \$2.0 million.⁶ Such investment may not be cost-effective in low-volume production runs or in applications where reducing the end-product size is not considered important.

Capacitors are found in virtually all electronic goods. The major U.S. consumers of capacitors are producers of consumer electronic equipment, automotive electronics, computers, and communications equipment.⁷ Figure 1 shows the relative size of the major world markets for these and other electronic goods in 1992. Demand for capacitors is cyclical and depends critically upon the output of these end-user industries. Hundreds of these components may be found in a camcorder, television receiver, personal computer, or automobile electronic control system.

During the 1986-92 period, the growth trend in U.S. shipments and imports of capacitors followed the growth trend in U.S. manufacturing of electronic

⁵ For more information on SMDs see Surface Mount Council, “Status of the Technology Industry Activities and Action Plan,” Electronic Industries Association (Washington, DC) and the Institute for Interconnecting and Packaging Electronic Circuits (Lincolnwood, IL), Aug. 1991.

⁶ “Surface Mounting Brings Major Growth,” *Electronic Business*, vol. 36 (July 16, 1990), p. 35.

⁷ Electronic Industries Association, *1991 Electronic Market Data Book*, (Washington, DC: Electronic Industries Association Marketing Services Department, 1992), p. 78.

equipment (see U.S. consumer characteristics and factors affecting demand below). From 1986 to 1992, U.S. shipments of capacitors rose on average by 3 percent per year from \$1.2 billion to \$1.5 billion. During this period U.S. imports of these devices rose on average by 10 percent per year; the import-to-consumption ratio for these products increased from 28 percent in 1986 to an estimated 43 percent in 1992. U.S. apparent consumption of capacitors represents less than 1.0 percent of the total value of U.S. sales of electronic equipment, which were an estimated \$260 billion in 1992.⁸

This summary of industry and trade information on capacitors covers the period 1986 to 1992. The report is organized into three major sections: U.S. and foreign industry profile; tariff and nontariff measures; and U.S. industry performance in domestic and foreign markets. In addition, appendices include definitions of tariff and trade agreement terms and a list of reports of the U.S. International Trade Commission pertaining to capacitors.

U.S. INDUSTRY PROFILE

Industry Structure⁹

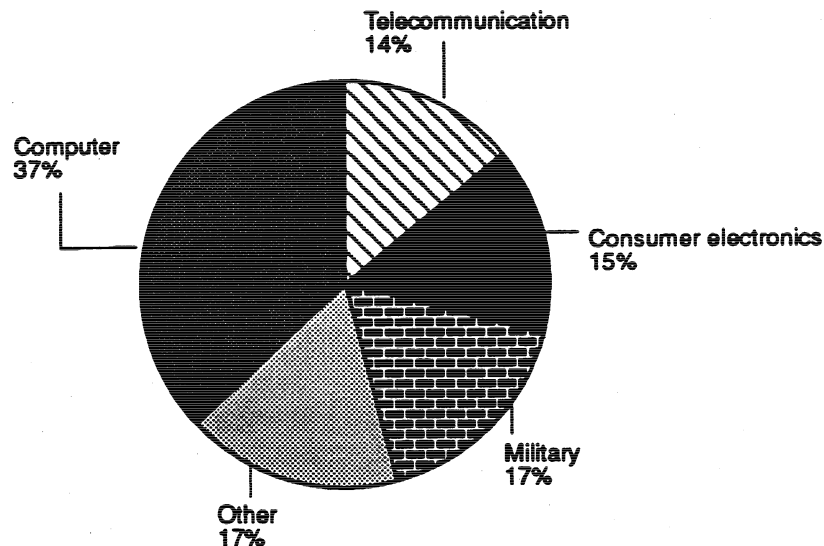
The number of U.S. producers of capacitors¹⁰ and their employment levels during the 1986-92 period are shown in table 1, and some of the principal characteristics of this industry are displayed in figure 2.

⁸ Estimated based on data from Electronic Industries Association (EIA) *1993 Electronic Market Data Book* (Washington, DC: EIA, 1993), pp. 2 and 98.

⁹ U.S. shipments of capacitors are reported under Standard Industrial Classification (SIC) code 3675.

¹⁰ Capacitors covered in this report are limited to those known as electronic or low-voltage capacitors.

Figure 1
Electronic equipment: Principal world markets, by end-use sector, 1992



Source: Elsevier Science Publishers, Oxford, United Kingdom.

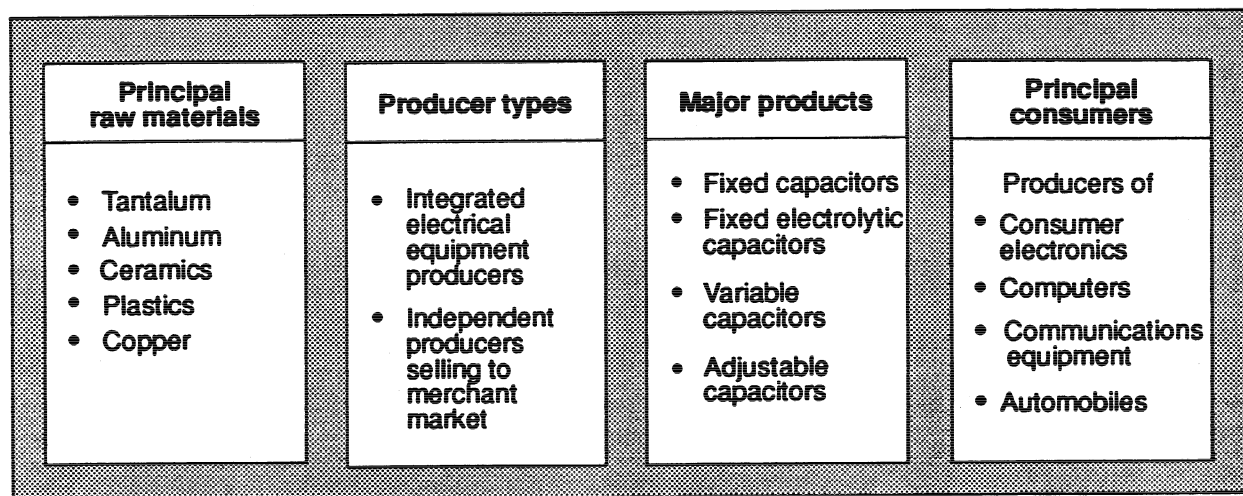
Table 1
Capacitors: Number of companies and employees in the U.S. industry, 1986-92

	1986	1987	1988	1989	1990	1991	1992
Companies	84	81	93	89	82	87	187
Employment (thousands)	22	22	24	21	20	19	119

¹ Estimated by the staff of the USITC.

Source: U.S. Department of Commerce, U.S. Bureau of the Census, *Current Industrial Report: Semiconductors, Printed Circuit Boards, and Other Electronic Components MA36Q* (Washington, DC: GPO, various years), and U.S. Department of Commerce, *Annual Survey of Manufacturers*, 1986-91 issues.

Figure 2
U.S. capacitor industry: Principal raw materials, producer types, major products, and principal consumers



Source: Compiled by the staff of the U.S. International Trade Commission.

The number of U.S. producers of capacitors and their employment levels during this period generally reflected the sharp increase in world demand for capacitors in 1987 and 1988 and a decline in this demand thereafter.

While the number of capacitor producers did not change appreciably during 1986-92, these producers' employment was affected by changes in the structure of the industry. From 1986 to 1992, while U.S. shipments in current prices increased by 14 percent, employment in the industry fell by 16 percent. As the industry has matured, producers have sought to reduce their manufacturing costs by turning to more capital-intensive automated production and by transferring labor-intensive manufacturing to low-wage countries.

U.S. capacitor producers consist of both large, diversified manufacturers of electronic and electrical equipment and components, and small producers concentrating on narrow lines of electronic components. The principal U.S. producers of capacitors are AVX (part of Kyocera of Japan since 1990), Kemet Electronics Corp., and Sprague

Technologies. In 1989, these firms had combined worldwide capacitor sales estimated at \$1.2 billion and ranked among the top 10 producers of capacitors in the world.¹¹ According to the U.S. Bureau of Labor Statistics, U.S. capacitor producers are concentrated in South Carolina, California, North Carolina, Massachusetts, and Florida.¹² These producers tend to locate their facilities near their major customers or close to transportation hubs.

U.S. production of capacitors is capital-intensive and highly automated¹³ and does not require specialized skills, as most jobs involve monitoring production machinery, loading and unloading inputs and finished devices, packaging, or routing merchandise for distribution. U.S. employees of capacitor manufacturers received an average of \$436 per week in wages in 1990 according to the U.S. Department of Labor. This is slightly below the

¹¹ Elsevier, *Profile*, p. 62.

¹² U.S. Department of Labor, *Employment and Wages*, Oct. 1991, p. 73.

¹³ Industry representatives, USITC staff interviews, Aug. 1992.

average weekly wage of all U.S. industry, which was \$454 in 1990.¹⁴

During the 1986-92 period, the structure of the U.S. capacitor industry changed in reaction to falling prices, intensified foreign competition, and the need for massive capital outlays to set up fabrication lines for producing SMDs. In particular, the recessionary pressures over the last few years and the level of maturity of the industry have contributed to consolidation and globalization and, in some cases, downsizing and divestitures among larger firms. These U.S. firms have pursued consolidation and globalization in an effort to (1) broaden their product lines and, thus, mitigate the effects of a temporary downturn in particular product segments of the market;¹⁵ (2) derive a competitive advantage from having a large presence in multiple markets and, thus, become insulated from short-term declines in demand in any one geographical location; and (3) have access to greater research and development (R&D) and capital resources.

Some notable examples of these trends include the following: starting in 1987, AVX took over a number of producers both nationally and internationally and in 1990 merged with the Japanese firm Kyocera, one of the world's largest producers of capacitors and the ceramic materials used in the production of these devices. In 1987, Sprague was divested from its parent corporation, Penn Central Corp., and Kemet was spun off by Union Carbide and formed into an independent firm. In 1989, Sprague announced a provision of \$80 million for the expected cost of a major restructuring program that included expanding operations in France, Canada, and Japan and abandoning a number of unprofitable capacitor businesses in the United States.¹⁶

Capacitors are distributed in the U.S. market by capacitor manufacturers and independent distributors. The Electronic Industries Association estimates that roughly 20 to 25 percent of U.S. capacitor sales are handled by independent distributors.¹⁷ Distributors usually deal in smaller lot sizes and they often concentrate on particular market niches, such as producers of military equipment or medical apparatus.

Research and development within the capacitor industry focuses on improving devices' capacitance in order to reduce the size of the devices, and thereby, save space on PCBs. This research involves experimenting with new materials and new production methods to achieve the same performance from smaller devices. During 1986-92, R&D in the U.S. capacitor industry has increasingly concentrated on improving

surface-mounting techniques.¹⁸ In addition, members of the industry are developing new, less costly designs for the packaging of capacitors.

Capacitors are generally produced and marketed as high-volume, commodity items under long-term contracts to original equipment manufacturers (OEMs). Prices for these components reflect sizeable scale economics in production and generally depend upon the cost of the primary materials used as the dielectric in these devices and the voltage rating, or amount of power that these devices can handle. However, specialized components designed to perform over a wide range of environmental conditions, or for extended periods with low failure rates, are produced in lower volumes and generally can command higher prices than commodity devices.

SMDs usually sell at higher prices than comparable leaded devices because end users are willing to pay a premium for the space savings and other advantages provided by SMDs. As SMDs enter more applications and production increases, this price difference should decline. Industry sources report that sales of SMD capacitors are rising rapidly in the U.S. market, displacing sales of the traditional leaded devices.¹⁹

Consumer Characteristics and Factors Affecting Demand

As noted earlier, the largest users of capacitors are manufacturers of consumer electronics, automobiles, computers, and communications equipment. These producers are collectively known as the U.S. electronic equipment industry and are dispersed across the Nation.²⁰ Demand for this equipment determines the demand for capacitors. Like the U.S. capacitor industry, the U.S. electronic equipment industry is part of a global industry, and many U.S.-headquartered producers of electronic equipment are employers and manufacturers in Europe, Canada, and many developing countries.

From 1986 to 1992, electronic equipment production in the United States grew overall at a considerably slower rate than in other major electronic-producing regions of the world. As a result, the U.S. share of the world's production of electronic equipment decreased from 41 percent in 1986 to 29 percent in 1992 (see figure 3). This loss in U.S. share may be attributable in part to the increased ability of Japan and newly industrialized countries, such as the Republic of Korea (Korea), Singapore, and Taiwan, to develop export-oriented manufacturing capabilities in both electronic components and finished equipment.²¹

¹⁴ Elsevier, *Profile*, pp. 44-50 and industry representatives, USITC staff interview, 1992.

¹⁵ David Gabel, "Changing Times for Capacitors," *Electronic Buyers' News* (Oct. 28, 1991), p. 32.

¹⁶ Some concentration of these producers exists in the Santa Clara Valley in California, Research Triangle in North Carolina, the Boston area in Massachusetts, and certain areas in Texas and New York. Based on data from *Annual Survey of Manufacturers* (various issues) and U.S. Department of Commerce, U.S. Bureau of the Census, Economic Surveys Division.

¹⁷ Electronic Industries Association, *1991 Electronic Market Data Book*, p. 78.

¹⁸ Industry representatives, USITC staff interviews, 1992.

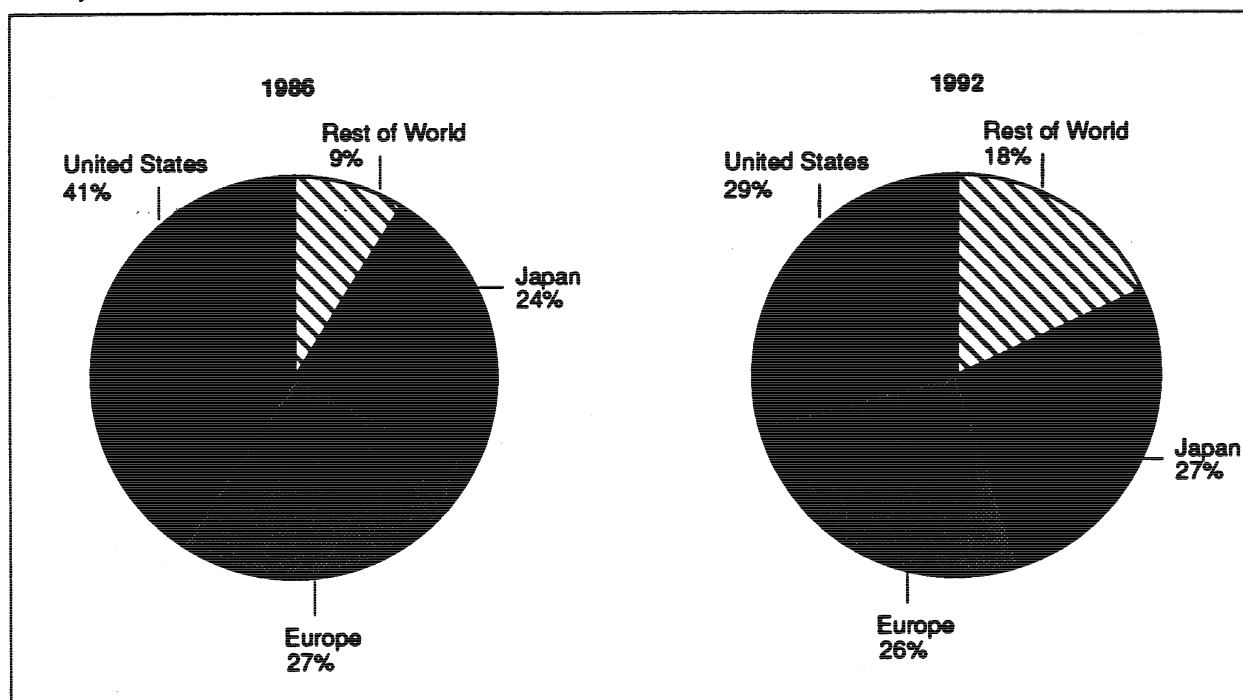
¹⁴ U.S. Department of Labor, *Employment and Wages*, p. 14.

¹⁵ U.S. Department of Commerce, *1992 U.S. Industrial Outlook* (Washington, DC: GPO, 1992), p. 16-19.

¹⁶ Elsevier, *Profile*, pp. 67-104 and "Suppliers Restructure as Shakeout Accelerates," *Electronic News* (Apr. 30, 1990), p. 30.

¹⁷ Electronic Industries Association, *1991 Electronic Market Data Book*, p. 78.

Figure 3
Electronic equipment: Production by geographical location for major producing areas in the world, 1986 and 1992¹



¹ Because of rounding, percentages may not total 100.

Source: Elsevier Science Publishers, Oxford, United Kingdom.

The relatively slower rate of growth in manufacturing of electronic equipment in the United States also reflects an increase in manufacturing by U.S.-headquartered firms abroad.

During the last 20 years, foreign firms, largely through imports, have displaced U.S. manufacturers as the primary U.S. suppliers for many consumer electronic products. Japanese, European, and to a lesser extent, Korean firms now dominate the U.S. markets for video cassette recorders, tape and compact disc players, radios, and car audio equipment.

Although roughly half of the color televisions sold in the U.S. market are manufactured in the United States,²² there are indications that these U.S.-made goods may still contain a significant number of foreign components. In particular, Japanese manufacturers operating plants in the United States reportedly purchase the bulk of the electronic components that they incorporate into televisions, automobiles, and other products from suppliers based in Japan.²³

²² U.S. International Trade Commission, *Industry & Trade Summary: Television Receivers and Video Monitors*, USITC Pub. 2445 (ET-1), Jan. 1992, table 2.

²³ "Spot Light on Resistors," Supplement to *Electronic News* (July 1, 1985), p. 6.

Capacitors have been gaining wider use in automobile electronics in the last 5 years, and the dollar value of electronic components per car has been rising and is expected to continue rising in the future. However, U.S. production of passenger cars, trucks, and buses declined irregularly during 1986-92, falling from 11.4 million units in 1986 to 9.8 million units in 1992.²⁴ There are no consistent data on the value or volume of capacitors used by the U.S. automotive industry. However, industry sources report that U.S. sales of automotive electronics grew by 5 percent in 1991, despite a 12-percent decline that year over 1990 in car production.²⁵

U.S. factory sales of communications equipment, computers, and industrial electronics all rose markedly during 1986-92, increasing from a combined value of \$129 billion in 1986 to \$151 billion in 1992.²⁶ These industries are undergoing continual technological change, however, and are increasing their reliance on advanced ICs and other solid-state components. Each IC uses a discrete capacitor to filter the voltage input to the device.

²⁴ 1993 *Automotive News Data Book*, Automotive News, May 26, 1993, p. 3.

²⁵ "Spotty Outlook Ahead for Consumer Electronics," *Electronics* (Jan. 1992), p. 41.

²⁶ Electronic Industries Association (EIA), 1993 *Electronic Market Data Book* (Washington, DC: EIA, 1993), p. 4.

As discussed earlier, improvements in IC design have resulted in capacitance being increasingly incorporated directly onto ICs, thus eliminating the need for discrete capacitors. The concomitant miniaturization of electronic equipment has also led to a decline in the power levels used to operate the end products that incorporate capacitors. Reducing the voltage within electronic devices lowers the number of, or sophistication of, the capacitors needed to protect the device.

There are essentially no substitutes for capacitors and, as a result, users of these devices usually insist on multiple sources of supply and on devices that are produced to industry standards. Price, performance, availability, and quality are the primary marketing factors, with price regarded as the principal factor.²⁷

²⁷ Industry representatives, USITC staff interviews, 1992.

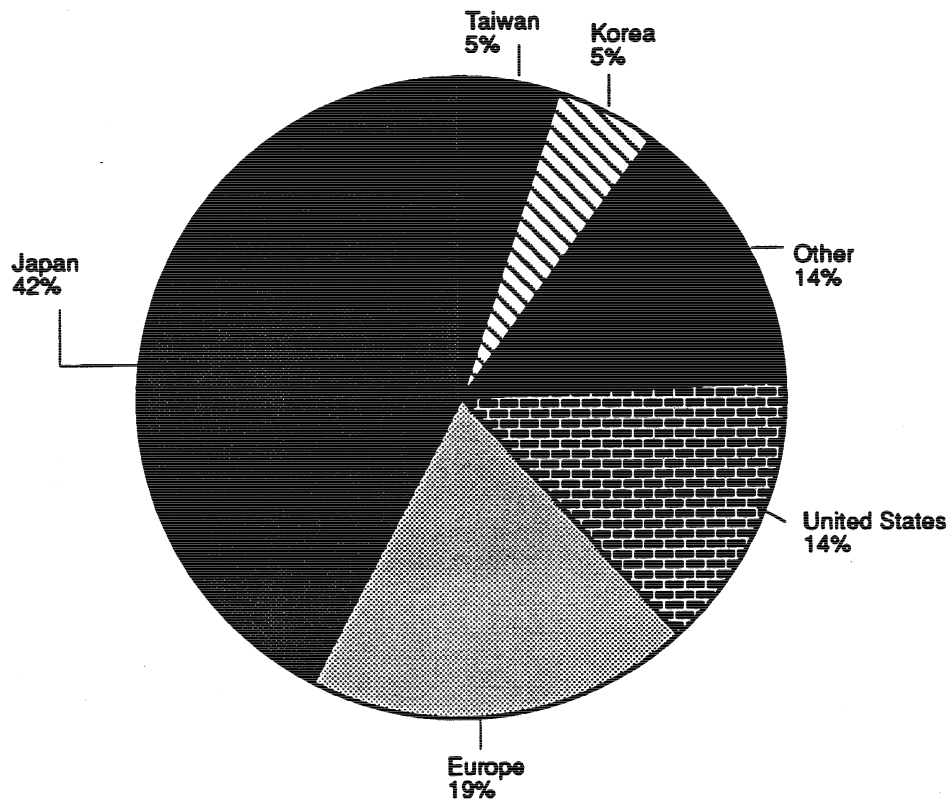
FOREIGN INDUSTRY PROFILE

Total world shipments of capacitors²⁸ rose from about \$6 billion in 1986 to about \$9 billion in 1992.²⁹ Japan, Europe, the United States, Korea, and Taiwan were the leading producers of capacitors during this period (see figure 4). These areas are the dominant suppliers of capacitors primarily because they also host large, diversified consumer electronics, automobile, computer, and communications equipment industries, which are the primary consumers of capacitors.

²⁸ Capacitors covered in this report are limited to those known as electronic or low-voltage capacitors.

²⁹ Production data in this section are estimated by the staff of the USITC based on data from Elsevier Advanced Technology, *Yearbook of World Electronics Data* (Oxford, United Kingdom: Elsevier Science Publishing Ltd, various issues). These data exclude capacitor parts classified in 3675 and are in current dollars for 1986-91 and projected in constant 1991-dollars for 1992.

Figure 4
Capacitors: Share of world production, by selected geographical region, 1992¹



1992 total \$8,839 million

¹ Due to rounding percentages may not total 100.

Source: Elsevier Scientific Publishing, Oxford, United Kingdom.

Japan

Japan is the largest producer of capacitors in the world, accounting for approximately 42 percent of the global output of these devices. Six of the world's 10 largest capacitor producers in 1989 were Japanese: Matsushita, Murata, Kyocera/AVX, Nippon Chemi-con, Nichicon, and TDK.³⁰ Production of capacitors in Japan increased on average by about 6.5 percent per year between 1986 and 1992, rising from about \$2.6 billion to \$3.8 billion. In contrast, total production of electronic equipment during this period in Japan increased by about 8.3 percent per annum, as Japanese producers increased their reliance on higher-value-added electronic products such as semiconductors, facsimile machines, and other advanced electronic products. The share of capacitors of the total value of electronics output in Japan decreased from 2.1 percent in 1986 to 1.9 percent in 1992.

Japanese producers of capacitors are closely integrated with the major Japanese manufacturers of consumer electronics, computer equipment, and automobiles. As a result, these integrated producers benefit from the steady demand for their output and often gain first-hand knowledge of the necessary specifications for components used in new devices such as camcorders, cellular phones, compact disc players, or facsimile machines when related divisions introduce these products.

During the 1986-92 period, Japanese producers of electronic equipment and components built or bought U.S. and European electronic-component-manufacturing facilities and expanded production of electronic components in other Asian nations. The purpose of this expansion was to lower labor and transportation costs and to supply electronic components to Japanese manufacturing operations overseas.³¹ For example, in 1990, Kyocera of Japan, a leading producer of capacitors and the ceramic materials used as the base for capacitor dielectrics, merged with AVX of the United States, the largest U.S. producer of ceramic capacitors.³² At the same time, Black and Decker of the United States sold its European capacitor operations to Nissei Electric of Japan.³³ In addition, Matsushita of Japan and Siemens of Germany, have formed a joint venture to develop capacitors and other electronic components in Europe, confirming the trend toward greater global cooperation and systematic rationalization of production in the international electronics industry.³⁴ By 1989, there were 100 Japanese-owned factories producing electronic equipment in Europe, 45 of which produced electronic components.³⁵

³⁰ Elsevier Advanced Technology, *Capacitor Profile* (Oxford, United Kingdom: Elsevier Science Publishing Ltd., 1991), p. 62.

³¹ "Suppliers Restructure as Shakeout Accelerates," *Electronic News* (Apr. 30, 1990), p. 30 and U.S. industry representatives, USITC staff interviews, 1992.

³² "Kyocera: SE Asia the Next Target," *Asian Business* (Feb. 1991), p. 12.

³³ Elsevier, *Capacitor Profile*, p. 11.

³⁴ Elsevier, *1990 Yearbook*, vol. 2, p. 99.

³⁵ Figures quoted from Elsevier, *1990 Yearbook*, vol. 2, p. 97.

Although SMDs were developed in the United States in the 1960s, Japanese producers of electronic equipment are the world leading users and low-cost suppliers of SMDs.³⁶ Matsushita and Sony, both Japanese electronics manufacturers, were the first to introduce SMDs into widespread use, initially in audio products and tape recorders. Since the late 1980s, SMDs have increasingly been used in other electronic equipment such as computers, automotive electronics, telephones, and photocopiers.

Germany

Germany is the largest electronic components manufacturer in Europe, and the world's third-largest producer of capacitors after Japan and the United States. Production of capacitors in Germany increased steadily from \$475 million in 1987 to \$590 million in 1991 and accounted for 6 to 8 percent of global output during the period. Germany is the largest producer of consumer electronics, electronic data processing office equipment, telecommunications equipment, and instrumentation and control apparatus in Europe. From 1986 to 1992, Germany's shipments of capacitors as a percent of the country's total electronic production decreased from approximately 2.1 percent to 1.1 percent. Demand for electronic equipment and related components in Germany has been fueled recently by the process of modernizing the industrial base of the former East Germany.³⁷ Siemens, which is a vertically integrated producer of electronics parts and equipment, is Europe's largest producer of capacitors. In 1987, Siemens was the world's ninth-largest producer of these devices and had worldwide sales of \$275 million.³⁸ Siemens also manufactures electronic components in the United States and other countries.

Korea

During the 1986-92 period, Korea was the fastest growing major world producer of capacitors. From 1986 to 1992, Korean production of capacitors increased annually on average by 11.3 percent, rising from \$251 million to \$477 million. As a result, Korea's share of world capacitor production increased from 4.1 to 5.4 percent.

Samhwa Capacitor Co. Ltd. is the largest producer of capacitors in Korea, and it claims that it accounts for about 30 percent of its home market of capacitors. This firm is also the nineteenth-largest producer in the world of these devices, with worldwide sales of \$135 million.³⁹ Korea's principal capacitor producers include some of the country's large vertically integrated electronics conglomerates such as Samsung Electric Co. and Daewoo. In addition, the country includes a number of subsidiaries of foreign firms such as Philips Electronics of the Netherlands, and Elna and TDK of Japan. These foreign firms have developed subsidiaries in Korea to supply the country's growing

³⁶ U.S. Department of Commerce, *1992 U.S. Industrial Outlook* (Washington, DC: GPO, 1992), p. 16-10.

³⁷ "Consolidation Holds Key to Europe's Growth," *Electronics*, Jan. 1992, p. 37.

³⁸ Elsevier, *Capacitor Profile*, p. 62.

³⁹ *Ibid.*

producers of electronic equipment. Korea's industry has benefited from the country's vibrant semiconductor, consumer electronics, and automobile industries, as well as from strong demand in export markets. Capacitors' share of the total value of Korea's output of electronic equipment and components decreased from 2.7 percent in 1986 to 1.9 percent in 1992, as Korean producers diversified into higher-value-added electronic products.

Taiwan

In 1992, Taiwan was the fifth-largest producer of capacitors in the world and accounted for roughly 5.3 percent of the world's output of capacitors. Taiwan's production of capacitors increased irregularly from \$224 million in 1986, to an estimated \$421 million in 1992. Taiwan's capacitor industry consists of about 300 firms, most of which are small independent firms with capital assets of less than \$1.5 million. About 47 percent of this industry's output was exported, principally to Hong Kong, the United States, and Singapore. Most of the remainder served Taiwan's export-oriented electronic equipment manufacturers.⁴⁰

U.S. TRADE MEASURES

Tariff Measures

Table 2 provides for each eight-digit Harmonized Tariff Schedule (HTS) electronic capacitor⁴¹ subheading the pre-Uruguay Round column 1-general rate of duty and preferential rates of duty as of October 31, 1992, and U.S. exports and imports for 1992.⁴² U.S. imports of capacitors from most-favored-nation (MFN) suppliers are assessed a tariff rate of 10 percent ad valorem. This rate has been in effect since 1971, and was derived from the fourth stage of duty reductions specified under the Kennedy Round of the General Agreement on Tariffs and Trade (GATT) that was concluded in 1967. The rate on capacitors was not subject to negotiation under the Tokyo Round of the GATT. The recently completed (December 1993) GATT Uruguay Round of trade negotiations may result in further reductions in U.S. and foreign duties on the articles covered by this summary. The Uruguay Round schedule of U.S. concessions was not available when this summary was prepared.

Classification of these products within the HTS depends on the device's dielectric material and power-handling level. There are separate HTS subheadings for fixed and variable devices, and for each of the primary solid dielectric materials. Also, within each HTS subheading there are distinctions made for SMDs. U.S. imports of capacitors enter duty-free under the Automotive Products Trade Act, the Caribbean Basin Economic Recovery Act, the United States-Israel Free-Trade Act, and the Andean

⁴⁰ U.S. Department of Commerce, American Institute in Taiwan telegram, Feb. 25, 1991, Taipei, message reference No. A-006, p. 9.

⁴¹ Capacitors covered in this report are limited to those known as electronic or low-voltage capacitors.

⁴² Appendix A includes an explanation of tariff and trade agreement terms.

Trade Preference Act. In addition, certain fixed capacitors and parts of capacitors enter duty-free under the Generalized System of Preferences (GSP).⁴³ U.S. imports of certain capacitors originating in the territory of Canada also enter duty-free under the terms of the United States-Canada Free-Trade Agreement (FTA).

The North American Free Trade Agreement (NAFTA), as implemented by the North American Free Trade Agreement Implementation Act (Public Law 103-182, approved Dec. 8, 1993), provided for the elimination of U.S. duties on most U.S. imports of electronic capacitors from Mexico, effective January 1, 1994. Duties on aluminum electrolytic fixed capacitors and fixed capacitors made of paper or plastics are scheduled in this agreement to be removed in 10 equal stages beginning on January 1, 1994 and to become duty free on January 1, 2003.

The aggregated U.S. trade-weighted average duty for capacitors in 1992 was about 8 percent ad valorem and remained essentially unchanged during the 1986-92 period. This duty was somewhat lower than the 10-percent nominal rate of duty on U.S. imports of capacitors because a large portion of these imports are built using U.S.-made parts whose value is not subject to duties on re-entering the United States. Mexico is the principal source of capacitors built using U.S.-made parts. During the 1986-92 period, the trade-weighted average duty of U.S. imports of capacitors from Mexico was about 4 percent ad valorem. In contrast, the trade-weighted average duty of such imports from sources other than Mexico was about 9.5 percent ad valorem.

U.S. Nontariff Measures

There are no known U.S. nontariff barriers to trade in capacitors.

FOREIGN TRADE MEASURES

Tariff Measures

Japan and Korea maintain a 15-percent ad valorem tariff rate on imports of capacitors.⁴⁴ The European Community imposes ad valorem tariff rates of 4.9 to 7 percent on imports of capacitors, and Korean import tariff rates for these items are 3 percent ad valorem.

Nontariff Measures

Neither the United States Trade Representative (USTR) nor the U.S. State Department report any substantial foreign nontariff trade barriers to U.S. exports of capacitors.⁴⁵

⁴³ Classified under HTS subheading 8532.29.00 and 8532.90.00, respectively.

⁴⁴ Capacitors covered in this report are limited to those known as electronic or low-voltage capacitors.

⁴⁵ See Office of the United States Trade Representative, *1992 National Estimate Report on Foreign Trade Barriers* (Washington, DC: GPO, 1992); and U.S. Senate, Committee on Foreign Relations, Committee on Finance, and U.S. House, Committee on Foreign Affairs, Committee on Ways and Means, *Country Reports on Economic Policy and Trade Practices*, report prepared by the Department of State in accordance with section 2202 of the Omnibus Trade and Competitiveness Act of 1988 (Washington, DC: GPO, 1991).

Table 2

Capacitors: HTS subheading; description; U.S. col. 1 rate of duty as of Jan. 1, 1993; U.S. exports, 1992; and U.S. imports, 1992

HTS subheading	Brief description	Col. 1 rate of duty as of Jan. 1, 1993		U.S. exports, 1992	U.S. imports, 1992
		General	Special ¹		
				<i>1,000 dollars</i>	
8532.21.00	Tantalum electrolytic fixed capacitors	10%	Free (B,CA,E,IL,J)	118,364	116,374
8532.22.00	Aluminum electrolytic fixed capacitors	10%	Free (B,CA,E,IL,J)	30,527	133,376
8532.23.00	Ceramic dielectric, fixed capacitors, single layer	10%	Free (B,CA,E,IL,J)	19,817	39,671
8532.24.00	Ceramic dielectric, fixed capacitors, multilayer	10%	Free (B,CA,E,IL,J)	173,423	149,478
8532.25.00	Fixed capacitors with dielectric of paper or plastic	10%	Free (B,CA,E,IL,J)	20,270	120,834
8532.29.00	Fixed electrical capacitors, nesi	10%	Free (A,B,CA,E,IL,J)	91,692	48,779
8532.30.00	Variable or adjustable (pre-set) capacitors	10%	Free (B,CA,E,IL,J)	33,478	10,897
8532.90.00	Parts of electrical capacitors, fixed, variable, or adjustable	3.9%	Free (A,B,CA,E,IL,J)	148,427	14,663

¹ Programs under which special tariff treatment may be provided, and the corresponding symbols for such programs as they are indicated in the "Special" subcolumn, are as follows: GSP (A); Automotive Products Trade Act (B); Agreement on Trade in Civil Aircraft (C); FTA (CA); Caribbean Basin Economic Recovery Act (E); United States-Israel Free Trade Area (IL); and Andean Trade Preference Act (J).

U.S. MARKET

Consumption

From 1986 to 1992, U.S. consumption of capacitors increased by 11 percent, rising from \$1.3 billion to \$1.4 billion, or at an annual average rate of increase of 2 percent (see table 3 and figure 5).⁴⁶ This

⁴⁶ Capacitors covered in this report are limited to those known as electronic or low-voltage capacitors.

growth was driven by a rise in demand for electronic equipment, and was significantly lower than the rise in demand for these end products.⁴⁷ U.S. consumption of capacitors grew steadily from 1986 to 1989, when the U.S. economy approached a recession and orders fell for electronic equipment, particularly personal

⁴⁷ See Consumer characteristics and factors affecting demand above.

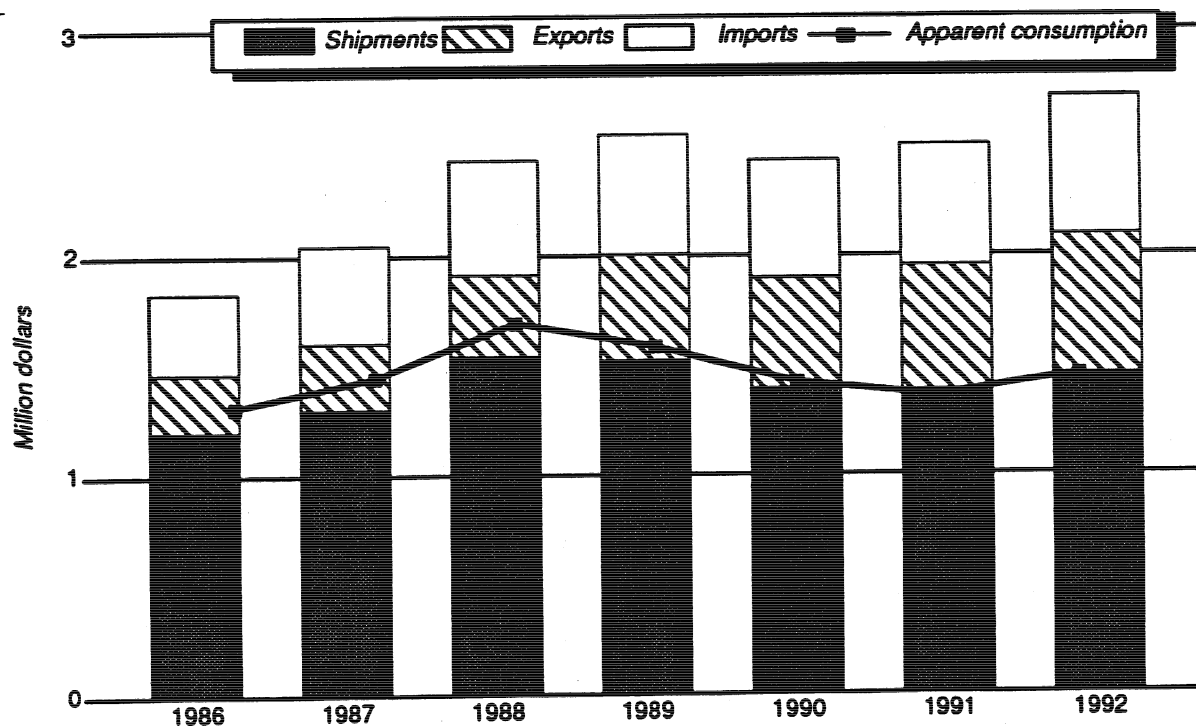
Table 3
Capacitors: U.S. producers' shipments, exports of domestic merchandise, imports for consumption, and apparent consumption, 1986-92

Year	U.S. producers' shipments	U.S. Exports	U.S. Imports	Apparent U.S. consumption	Ratio of imports to consumption
	<i>Million dollars</i>				<i>Percent</i>
1986	1,210	265	363	1,308	28
1987	1,304	303	440	1,441	31
1988	1,540	369	518	1,689	31
1989	1,526	482	538	1,582	34
1990	1,392	504	530	1,418	37
1991	1,380	569	542	1,353	40
1992	1,459	636	625	1,448	43

¹ Estimated by the staff of the U.S. International Trade Commission.

Source: Compiled from official statistics of the U.S. Department of Commerce, except as noted.

Figure 5
Capacitors: U.S. producers' shipments, imports, exports, and apparent consumption, 1986-92



Note.—Apparent Consumption = Producers' Shipments + Imports - Exports.

Source: Compiled from official statistics of the U.S. Department of Commerce, as noted in Table 3.

computers.⁴⁸ As a result of this recession and the continuing trend toward incorporating capacitance directly onto ICs rather than adding discrete capacitors to electronic circuits, U.S. consumption of capacitors decreased by 20 percent from 1988 to 1991. In 1992, growth in capacitor consumption resumed as U.S. demand for electronic equipment, particularly computers, increased significantly. U.S. imports of capacitors as a share of U.S. consumption of these devices increased from 28 percent in 1986 to about 43 percent in 1992, reflecting an increase in the competitiveness of foreign producers and the use of offshore manufacturing facilities by U.S.-headquartered firms.

Production

From 1986 to 1992, U.S. shipments of capacitors increased by 21 percent from \$1.2 billion to \$1.5 billion (see table 3). Most of this growth was driven by exports, with the proportion of U.S. shipments sold in the U.S. market declining from 72 to 57 percent of U.S. consumption (see figure 5). U.S. capacitors became particularly attractive in foreign markets because of the sharp decline in the value of the dollar

⁴⁸ According to the National Bureau of Economic Research, the private organization that officially dates the beginning and end of most recent recessions, this recession began in July 1990 and ended in March 1991.

during most of this period.⁴⁹ U.S. shipments also became attractive in export markets because the market for capacitors and other electronic components in Asia, Europe, and other major electronic equipment-producing areas generally increased faster than the market in the United States.

Imports

U.S. imports of capacitors increased by 72 percent from \$363 million in 1986 to \$625 million in 1992 (see table 4), or at an average annual rate of increase of 9 percent. The principal U.S. import suppliers of capacitors during this period were Japan and Mexico. Japanese suppliers increased their share of total U.S. imports from 37 percent in 1986 to 41 percent in 1992. During this period, Japanese suppliers benefitted particularly from their strong position in supplying SMDs and other advanced capacitors at a low cost. The share of total U.S. imports of Mexican suppliers remained unchanged at around 30 percent during the 1986-92 period. Most U.S. imports of capacitors from Mexico are produced using U.S.-made inputs in affiliates of major U.S. producers and imported into the United States under HTS subheading 9802.00.80. In 1992, 97 percent of total U.S. imports from Mexico were entered under this HTS subheading and Mexico accounted for 91 percent of all U.S. imports entered under this subheading.

⁴⁹ Industry representatives, USITC staff interviews, 1992.

Table 4
Capacitors: U.S. imports for consumption, by principal sources, 1986-92

(1,000 dollars)

Source	1986	1987	1988	1989	1990	1991	1992
Japan	133,506	167,927	221,056	211,861	208,129	216,287	256,045
Mexico	108,508	132,499	149,192	156,416	160,276	165,245	184,811
Taiwan	17,873	26,179	31,516	41,208	31,049	27,017	31,554
El Salvador	18,743	25,755	23,052	23,622	24,352	26,609	29,569
Germany	13,601	15,343	14,680	21,668	21,151	22,933	26,803
United Kingdom	5,490	8,973	11,477	13,042	12,289	13,211	23,880
South Korea	5,748	7,986	9,685	12,782	11,389	10,386	10,569
Canada	11,647	9,404	10,162	9,242	10,392	8,969	8,515
France	5,257	4,961	7,839	5,460	7,206	7,018	5,744
Belgium	1,713	2,615	2,144	3,717	4,341	5,794	6,187
All other	40,823	38,679	37,130	38,739	39,497	38,507	40,988
Total	362,909	440,321	517,933	537,757	530,071	541,976	624,665
EU-12	38,973	44,326	46,831	54,763	58,264	61,278	75,193
ASEAN	3,989	3,862	4,964	5,410	6,086	6,743	9,331
CBERA	27,273	34,443	32,157	31,151	31,658	32,564	32,042

Note.—Because of rounding, figures may not add to the totals shown.

Source: Compiled from official statistics of the U.S. Department of Commerce.

FOREIGN MARKETS⁵⁰

Foreign Market Profile⁵¹

Japan, Europe, and a number of developing countries in Asia are the largest foreign consumers of capacitors in the world. In 1992, Japan accounted for 29 percent of the world's consumption of capacitors, Europe accounted for 23 percent, the United States held 15 percent, and other areas of the world accounted for 33 percent of this consumption. From 1986 to 1992, consumption of capacitors in these foreign markets grew faster than in the United States, driven primarily by a surge in foreign production of electronic equipment (see figure 3). From 1986 to 1992, U.S. consumption of capacitors grew at an annual average of about 0.4 percent, while Japanese consumption grew at 5.0 percent, European consumption at 5.8 percent, and the consumption in other parts of the world at 11.0 percent.

Growth in the Japanese market resulted primarily from an increase in global demand for video cassette recorders, video movie cameras, and computers, many of which are exported for consumption overseas. The structure of the market for capacitors and other electronic components in Japan and, to a lesser extent, in Europe and developing countries in Asia is somewhat different from the structure of the market for these devices in the United States. In these foreign markets, a relatively large proportion of electronic components are used in the construction of consumer electronic goods. In contrast, a relatively large proportion of these components in the United States is used in the construction of computers.

⁵⁰ Capacitors covered in this report are limited to those known as electronic or low-voltage capacitors.

⁵¹ Market data in this section are estimated by the staff of the USITC based on data from Elsevier Advanced Technology, *Yearbook of World Electronics Data* (Oxford, United Kingdom: Elsevier Science Publishing Ltd, various issues). These data exclude capacitor parts classified in 3675 and are in current dollars for 1986-91 and projected in constant 1991-dollars for 1992.

During 1986-92, domestic economic growth in Europe spurred demand for consumer electronics goods, computers, and other capital equipment. Consumption of capacitors in Europe was also driven by an increase in U.S. and Japanese investment in electronic production in that region. U.S. computer firms alone increased their asset holdings in Europe by 62 percent from \$36.7 billion in 1986 to \$59.6 billion in 1989.⁵² U.S. and other foreign firms increased their production in Europe to better supply that region's market.

Most foreign capacitor consumption outside Europe and Japan takes place in developing countries in Asia. The electronic equipment industries in those countries are often owned and operated by U.S.- or Japan-headquartered firms, and they depend heavily on imports of capacitors, parts of capacitors, and other inputs from the United States and Japan.

U.S. Exports

During 1986-92, U.S. producers' exports of capacitors grew faster than their domestic shipments of these devices. During this period, the proportion of U.S. shipments exported increased from 22 to 44 percent. From 1986 to 1992, U.S. exports of capacitors more than doubled, increasing from \$265 million to \$636 million at an annual average rate of increase of 16 percent (see table 5). As discussed earlier, demand for U.S. exports was particularly strong during this period because of the favorable value of the U.S. dollar. U.S. exports also benefited from the relatively stronger growth in the market for capacitors

⁵² U.S. Department of Commerce, U.S. Bureau of the Census, *U.S. Direct Investment Abroad: Operations of U.S. Parent Companies and their Foreign Affiliates*, 1986 and 1989 editions, table 5.

Table 5
Capacitors: U.S. exports of domestic merchandise, by principal markets, 1986-92

(1,000 dollars)

Market	1986	1987	1988	1989	1990	1991	1992
Japan	6,553	5,456	8,241	9,571	10,943	19,190	9,623
Mexico	56,342	59,213	73,116	131,680	142,585	159,940	219,526
Taiwan	10,083	13,642	12,587	14,611	12,134	31,753	31,619
El Salvador	12,913	15,909	13,532	17,587	18,367	15,910	15,546
Germany	20,752	19,777	23,518	30,199	32,829	34,617	28,005
United Kingdom	20,695	26,691	26,583	27,537	22,259	24,789	27,502
South Korea	6,586	6,950	6,821	8,542	6,412	11,447	15,312
Canada	32,191	39,957	43,644	42,137	71,695	71,543	69,092
France	11,139	18,086	21,592	21,083	23,877	32,711	18,823
Belgium	2,309	1,922	2,207	3,572	2,121	1,064	1,720
All other	85,435	95,615	137,068	175,020	161,016	165,738	199,231
Total	264,998	303,218	368,909	481,539	504,238	568,702	635,999
EC-12	71,750	86,530	102,533	113,046	110,419	116,438	106,623
ASEAN	14,680	18,453	31,647	48,263	61,324	66,385	78,311
CBERA	17,843	22,188	23,925	27,373	26,663	21,327	17,802

Note.—Because of rounding, figures may not add to the totals shown.

Source: Compiled from official statistics of the U.S. Department of Commerce.

in Europe, Asia, and other major electronic equipment-producing areas and the growth in U.S. production-sharing operations in Mexico.

Mexico, the European Union (EU)⁵³, the Association of South-East Asian Nations (ASEAN) countries, and Canada were the major destinations of U.S. exports during 1986-92, and together they accounted for 74 percent of total U.S. exports of capacitors in 1992. Among these markets, Mexico and ASEAN markets showed significant increases in their share of total U.S. exports during this period. On the other hand, Canada's and the EU's shares of these exports declined.

During 1986-92, U.S. exports to Mexico increased on average by 25 percent annually and those to ASEAN markets increased on average by 32 percent annually. A large portion of U.S. exports to Mexico are unfinished devices sent to that country for lead attachment, testing, and packaging and then returned to

⁵³ Formerly known as European Community.

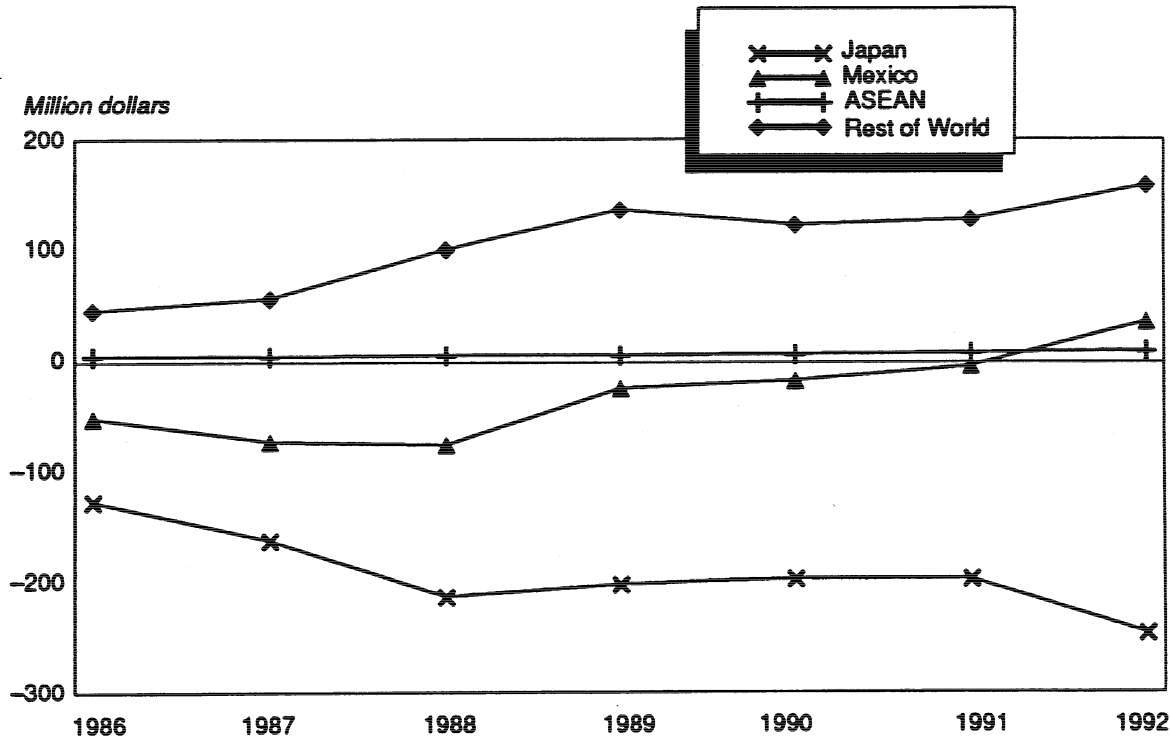
the United States for sale. U.S. capacitor exports to Mexico and ASEAN countries also supply numerous U.S., Japanese, and European affiliates of producers of automotive electronic parts, computers, communications apparatus, and other electronic equipment.

U.S. TRADE BALANCE⁵⁴

From 1986 to 1992, the U.S. balance of trade in capacitors changed from a deficit of \$98 million to a surplus of \$11 million. Excluding trade with Japan, the U.S. trade balance was a surplus of \$29 million in 1986 and this surplus increased to \$258 million in 1992. The growth of this surplus was primarily accounted for by U.S. exports to Mexico, ASEAN countries, and a large number of small trading partners (see figure 6 and table 6).

⁵⁴ Capacitors covered in this report are limited to those known as electronic or low-voltage capacitors.

Figure 6
U.S. trade balance in capacitors, 1986-92



Source: Compiled from official statistics of the U.S. Department of Commerce

Table 6

Capacitors: U.S. exports of domestic merchandise, imports for consumption, and merchandise trade balance, by selected countries and country groups, 1986-92¹

(Million dollars)

Item	1986	1987	1988	1989	1990	1991	1992
U.S. exports of domestic merchandise:							
Japan	7	5	8	10	11	19	10
Mexico	56	59	73	132	143	160	220
Taiwan	10	14	13	15	12	32	32
El Salvador	13	16	14	18	18	16	16
Germany	21	20	24	30	33	35	28
United Kingdom	21	27	27	28	22	25	28
South Korea	7	7	7	9	6	11	15
Canada	32	40	44	42	72	72	69
France	11	18	22	21	24	33	19
Belgium	2	2	2	4	2	1	2
All other	85	96	137	175	161	166	199
Total	265	303	369	482	504	569	636
EU-12	72	87	103	113	110	116	107
OPEC	2	1	2	2	2	1	2
ASEAN	15	18	32	48	61	66	78
CBERA	18	22	24	27	27	21	18
Eastern Europe	(²)	(²)	(²)	1	(²)	(²)	(²)
US imports for consumption:							
Japan	134	168	221	212	208	216	256
Mexico	109	132	149	156	160	165	185
Taiwan	18	26	32	41	31	27	32
El Salvador	19	26	23	24	24	27	30
Germany	14	15	15	22	21	23	27
United Kingdom	5	9	11	13	12	13	24
South Korea	6	8	10	13	11	10	11
Canada	12	9	10	9	10	9	9
France	5	5	8	5	7	7	6
Belgium	2	3	2	4	4	6	6
All other	41	39	37	39	39	39	41
Total	363	440	518	538	530	542	625
EU-12	39	44	47	55	58	61	75
OPEC	(²)	(²)	(²)	(²)	(²)	(²)	(²)
ASEAN	4	4	5	5	6	7	9
CBERA2	27	34	32	31	32	33	32
Eastern Europe	(²)	(²)	(²)	(²)	(²)	(²)	(²)
US merchandise trade balance:							
Japan	-127	-162	-213	-202	-197	-197	-246
Mexico	-52	-73	-76	-25	-18	-5	35
Taiwan	-8	-13	-19	-27	-19	5	0
El Salvador	-6	-10	-10	-6	-6	-11	-14
Germany	7	4	9	9	12	12	1
United Kingdom	15	18	15	14	10	12	4
South Korea	1	-1	-3	-4	-5	1	5
Canada	21	31	33	33	61	63	61
France	6	13	14	16	17	26	13
Belgium	1	-1	(²)	(²)	-2	-5	-4
All other	45	56	100	136	122	127	158
Total	-98	-137	-149	-56	-26	27	11
EU-12	33	42	56	58	52	55	31
OPEC	2	1	2	2	2	(²)	2
ASEAN	11	15	27	43	55	60	69
CBERA	-9	-12	-8	-4	-5	-11	-14
Eastern Europe	(²)	(²)	(²)	1	(²)	(²)	(²)

¹ Import values are based on customs value; export values are based on f.a.s. value, U.S. port of export. U.S. trade with East Germany is included in "Germany" but not "Eastern Europe."

² Less than \$500,000.

Note.—Because of rounding, figures may not add up to the totals shown.

Source: Compiled from official statistics of the U.S. Department of Commerce.

APPENDIX A
EXPLANATION OF TARIFF AND TRADE AGREEMENT TERMS

TARIFF AND TRADE AGREEMENT TERMS

The *Harmonized Tariff Schedule of the United States* (HTS) replaced the *Tariff Schedules of the United States* (TSUS) effective January 1, 1989. Chapters 1 through 97 are based upon the internationally adopted Harmonized Commodity Description and Coding System through the 6-digit level of product description, with additional U.S. product subdivisions at the 8-digit level. Chapters 98 and 99 contain special U.S. classification provisions and temporary rate provisions, respectively.

Rates of duty in the *general* subcolumn of HTS column 1 are most-favored-nation (MFN) rates; for the most part, they represent the final concession rate from the Tokyo Round of Multilateral Trade Negotiations. Column 1-general duty rates are applicable to imported goods from all countries except (1) those enumerated in general note 3(b) to the HTS plus Serbia and Montenegro, whose products are dutied at the rates set forth in *column 2*, and (2) countries whose goods are subject to embargo. Goods from Albania, Armenia, Belarus, Bulgaria, the People's Republic of China, the Czech Republic, Estonia, Georgia, Hungary, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Moldova, Mongolia, Poland, Romania, Russia, Slovakia, Turkmenistan, and the Ukraine are currently eligible for MFN treatment, as are the other republics of the former Socialist Federal Republic of Yugoslavia. Among articles dutiable at column 1-general rates, particular products of enumerated countries may be eligible for reduced rates of duty or for duty-free entry under one or more preferential tariff programs. Such tariff treatment is set forth in the *special* subcolumn of HTS column 1. Where eligibility for special tariff treatment is not claimed or established, goods are dutiable at column 1-general rates.

The *Generalized System of Preferences* (GSP) affords nonreciprocal tariff preferences to developing countries to aid their economic development and to diversify and expand their production and exports. The U.S. GSP, enacted in title V of the Trade Act of 1974 and renewed in the Trade and Tariff Act of 1984, applies to merchandise imported on or after January 1, 1976 and before September 30, 1994. Indicated by the symbol "A" or "A*" in the special subcolumn of column 1, the GSP provides duty-free entry to eligible articles the product of and imported directly from designated beneficiary developing

countries, as set forth in general note 3(c)(ii) to the HTS.

The *Caribbean Basin Economic Recovery Act* (CBERA) affords nonreciprocal tariff preferences to developing countries in the Caribbean Basin area to aid their economic development and to diversify and expand their production and exports. The CBERA, enacted in title II of Public Law 98-67, implemented by Presidential Proclamation 5133 of November 30, 1983, and amended by the Customs and Trade Act of 1990, applies to merchandise entered, or withdrawn from warehouse for consumption, on or after January 1, 1984; this tariff preference program has no expiration date. Indicated by the symbol "E" or "E*" in the special subcolumn of column 1, the CBERA provides duty-free entry to eligible articles, and reduced-duty treatment to certain other articles, which are the product of and imported directly from designated countries, as set forth in general note 3(c)(v) to the HTS.

Preferential rates of duty in the special subcolumn of column 1 followed by the symbol "IL" are applicable to products of Israel under the *United States-Israel Free Trade Area Implementation Act* of 1985 (IFTA), as provided in general note 3(c)(vi) of the HTS. Where no rate of duty is provided for products of Israel in the special subcolumn for a particular provision, the rate of duty in the general subcolumn of column 1 applies.

Preferential rates of duty in the special subcolumn of column 1 followed by the symbol "CA" are applicable to eligible goods originating in the territory of Canada under the *United States-Canada Free-Trade Agreement* (CFTA), as provided in general note 3(c)(vii) to the HTS.

Preferential nonreciprocal duty-free or reduced-duty treatment in the special subcolumn of column 1 followed by the symbol "J" or "J*" in parentheses is afforded to eligible articles the product of designated beneficiary countries under the *Andean Trade Preference Act* (ATPA), enacted in title II of Public Law 102-182 and implemented by Presidential Proclamation 6455 of July 2, 1992 (effective July 22, 1992), as set forth in general note 3(c)(ix) to the HTS.

Other special tariff treatment applies to particular *products of insular possessions* (general note 3(a)(iv)), goods covered by the *Automotive Products Trade Act* (APTA) (general note

3(c)(iii)) and the *Agreement on Trade in Civil Aircraft* (ATCA) (general note 3(c)(iv)), and *articles imported from freely associated states* (general note 3(c)(viii)).

The *General Agreement on Tariffs and Trade* (GATT) (61 Stat. (pt. 5) A58; 8 UST (pt. 2) 1786) is the multilateral agreement setting forth basic principles governing international trade among its 111 signatories. The GATT's main obligations relate to most-favored-nation treatment, the maintenance of scheduled concession rates of duty, and national (nondiscriminatory) treatment for imported products; the GATT also provides the legal framework for customs valuation standards, "escape clause" (emergency) actions, antidumping and countervailing duties, and other measures. Results of GATT-sponsored multilateral tariff negotiations are set forth by way of separate schedules of concessions for each

participating contracting party, with the U.S. schedule designated as Schedule XX.

Officially known as "The Arrangement Regarding International Trade in Textiles," the *Multifiber Arrangement* (MFA) provides a framework for the negotiation of bilateral agreements between importing and producing countries, or for unilateral action by importing countries in the absence of an agreement. These bilateral agreements establish quantitative limits on imports of textiles and apparel, of cotton and other vegetable fibers, wool, man-made fibers and silk blends, in order to prevent market disruption in the importing countries—restrictions that would otherwise be a departure from GATT provisions. The United States has bilateral agreements with many supplying countries, including the four largest suppliers: China, Hong Kong, the Republic of Korea, and Taiwan.

APPENDIX B
REPORTS OF THE U.S. INTERNATIONAL TRADE COMMISSION
PERTAINING TO CAPACITORS

Non-recurring Reports

U.S. International Trade Commission. *Summary of Trade and Tariff Information, Electrical Capacitors and Resistors*, Control No. 6-5-3 (supplement). USITC publication 841, July 1983.

_____. *Summary of Trade and Tariff Information, Electrical Capacitors and Resistors*, Control No. 6-5-3 (supplement). USITC publication 841, May 1981.

_____. *Tantalum Electrolytic Fixed Capacitors from Japan* (investigation No. AD1921-159). USITC publication 1092, 1980.

_____. *Tantalum Electrolytic Fixed Capacitors from Japan* (investigation No. AA1921-159). USITC publication 789, October 1976.

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