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Fiberglass Products

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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 fiberglass products covers the period 1988 through 1992 and represents one of approximately 250-300 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 minerals, metals, and miscellaneous manufactures sector.

USITC publication number	*Publication date*	*Title*
2426	November 1991	Toys and models
2475	July 1992	Fluorspar and certain other mineral substances
2476	January 1992	Lamps and lighting fittings
2504	November 1992	Ceramic floor and wall tiles
2523	June 1992	Prefabricated buildings
2587	January 1993	Heavy structural steel shapes
2623	April 1993	Copper
2653	June 1993	Glass containers
2692	November 1993	Refractory ceramic products
2694	November 1993	Flat glass and certain flat glass products
2742	March 1994	Fiberglass products

[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

This summary covers fiberglass products, including glass wool (wool),[1] fiber, and woven fabric, for use primarily in the construction and automotive markets. It examines the U.S. and foreign industry structure, tariff and nontariff measures, and U.S. industry performance in domestic and foreign markets during 1988-92.

The U.S. industry pioneered the development of fiberglass products, helped disseminate production technology worldwide, and remains one of the world's most competitive fiberglass producers, along with the industries of the European Union (EU) and Japan. Weak demand in Europe and the United States has led to overcapacity problems, increased pricing pressures, and the need to reduce costs. U.S. producers have reacted to these market conditions by improving the efficiency of their domestic and foreign operations to improve productivity, reduce costs, and remain competitive. Although the European market remains weak, the U.S. market has shown signs of recovery.

International competition is based on quality, price, service, product performance, and the research-and-development skills to improve product performance and develop new products and applications. The U.S. industry is making significant efforts in all of these areas. U.S. producers are stressing the quality of their products by obtaining certification that their facilities at home and abroad meet international quality standards. They are restructuring operations to increase efficiency, boost productivity, reduce product cost, and become more price competitive. U.S. producers are expanding overseas facilities to reduce transportation costs and improve customer service. Finally, they are investing in research-and-development skills to improve product performance and remain competitive in current applications, and to create new applications such as fiberglass-composite window frames and sashes. Production technology for the fibers themselves is relatively similar worldwide.

For the global industry, there is substantial growth potential, but at the cost of increased operating expenses because of environmental concerns. Heightened concern over fuel costs is increasing demand for fiberglass insulation in the construction industry, and for weight-saving, fiberglass-reinforced products in the automotive and aerospace industries. At the same time, regulations governing the industry's emissions, raw materials, and hazardous waste disposal increase production costs. In addition, many discarded fiberglass products have proven to be uneconomical to recycle and must be landfilled.

Although traditional wool products are believed to represent the largest segment of the world fiberglass market, international trade and competition in the industry have focused largely on the fiber segment because of its growth potential and high value added. Consumers increasingly have replaced traditional materials with fiber products to improve product performance. Fiber is the fastest growing segment of the U.S. industry,[2] and the United States is the world's largest fiber producer (figure 1). The need to work closely with fiber consumers to develop applications and to service customer needs has contributed to the global spread of manufacturing facilities. Much of the U.S. industry's foreign investment in production facilities has involved fiber, and at least one U.S. producer is expanding vertically into the production of fiber-based products.

The globalization of the fiberglass industry continued during 1988-92, with French, Japanese, and U.S. firms expanding their worldwide networks of production facilities through construction of new plants, acquisitions, joint ventures, and the licensing of production technology (table 1). U.S. and French foreign investment was widely dispersed in Europe, the Western Hemisphere, and Asia during 1988-92; Japanese foreign investment during the period was largely limited to Asia. This expansion and restructuring reflects an approach used by many of these diversified companies in other product lines to remain competitive in a global marketplace. Globalization allows firms to spread risks among geographic areas and markets, reduce high transportation costs, and better serve the product requirements of local markets. Other competitive responses of the industry include targeting product niches, trimming employment, eliminating inefficient operations, developing new products, and reducing product cycle time from development to production.

Production Process

The raw materials used to make fiberglass products include silica (in the form of silica sand or scrap glass), clay, limestone, boric acid, and fluorspar. Raw materials are proportioned to produce specific physical characteristics, mixed, and then fed into a melting tank (or furnace) where temperatures of about 1,500 degrees Celsius reduce the materials to molten glass. Individual glass fibers are formed by feeding the molten glass into bushings (wool or fiber) or rotating cylindrical containers (wool) whose surface is pierced by a large number of small holes. Individual fibers are produced as the glass passes through the holes. The production of wool and fiber products diverge significantly at this point.

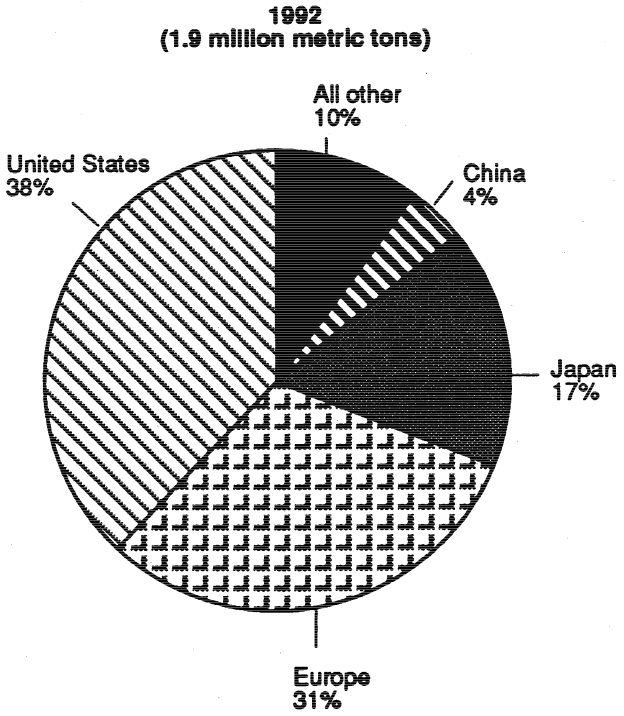
Wool

The fibers that emerge from bushings or rotating cylindrical containers may be coated with binding agents and randomly dispersed to form a fleecy mass of intertwined glass fibers called wool. The wool is cut to size and may be combined with various lining or support materials. Wool may be in bulk or in such forms as batts, rolls, blankets, mats, felts, or pads,

[1] Glass wool, a mass of intertwined glass fibers that has a fleecy, wool-like texture, is used primarily in insulation applications.

[2] The average annual growth rate of fiber shipments by quantity was 7 percent during the 1980s, compared with 2 percent for wool shipments. Data are not available for woven fabric.

Figure 1
Fiberglass products, fiber: World production, by selected regions or countries, 1992



Source: Compiled from Fiber Organon, June 1993, p. 103.

whether or not coated, impregnated, or bonded with other substances such as glue or plastics. Wool may also be lined, covered, or supported by various materials, including paper, paperboard, fabrics, and metal mesh or foil. The predominant use for wool is as thermal and acoustical insulation in construction. It is also used as an insulator in industrial, equipment, and appliance applications and as a filtering medium in air-conditioning and ventilating apparatus. Many wool products can be produced to standard specification.

Fiber

The individual fibers that emerge from bushings may also be coated with binding agents or lubricants and then gathered together into multi-fiber strands used to produce fiber products (fiber). The fibers are typically gathered as continuous filaments.[3] The strands may be cut into short lengths for reinforcement applications (chopped strand) or grouped in parallel without twist to form "roving" that may be used as a reinforcing material. Continuous filaments or sliver may be twisted to produce yarn to be used as a textile fiber, reinforcing material, or woven into fabric. Manufacturing consumers are increasingly choosing fiber as a means to improve the performance of their products. Significant applications include printed circuit boards; insect and solar screening; medical casts; and reinforcements for paper, tape, foil, automotive parts, marine parts, shingles, sports equipment, underground storage tanks, and tub and shower stalls. Unlike wool products, fiber products and their binding agents often have to be specially tailored to meet specific customer needs, and fiber production and marketing require significant expenditures on technical support staffs.

Woven Fabric

A relatively small amount of glass fiber is woven into fabric on the same types of weaving machinery as textile fibers. The electronics industry is the largest market for woven fiberglass fabric, which is coated with plastic and used as substrate material. Additional uses for the woven fabric include window shades, flame-resistant furnishings, industrial filtration fabrics, and reinforcements in aircraft, automotive, and sporting products.

Product Mix

The product mix of U.S. producers' shipments is weighted toward wool products, whose insulation applications have historically dominated industry output and U.S. consumption of fiberglass products. In

[3] Fibers are sometimes intentionally broken into short lengths (staple fiber) before being gathered into strands to produce a product called sliver that is used to produce staple fiber yarns.

Table 1
Fiberglass products: Foreign investment in selected facilities, by regions and countries, 1988-92

Region and country	Year	Nature of investment
North America:		
United States	1988	La Compagnie de Saint Gobain (St. Gobain) of France acquired CertainTeed Corp.
	1989	St. Gobain announced that its U.S. subsidiary, CertainTeed Corp., was expanding its reinforcement facility at Wichita Falls, Texas, with completion expected by 1991.
	1989	St. Gobain's U.S. subsidiary, CertainTeed Corp., announced an applications development facility at Toledo, Ohio to provide technical assistance to customers of its continuous strand mat that can be combined with resin to produce composite products used in car and truck bodies.
	1992	St. Gobain splits off fiber reinforcement facilities from CertainTeed Corp. to establish Vetrotex CertainTeed Corp.
Canada	1989	Owens-Corning Fiberglas, Inc. (Owens-Corning), of the United States acquired full ownership of Fiberglas Canada, Inc.
South America:		
Argentina	1990	St. Gobain purchased the fiberglass subsidiary of Pilkington Brothers, Ltd. (United Kingdom).
Brazil	1989	Owens-Corning completed a plant expansion at its Brazilian subsidiary.
	1990	St. Gobain announces investment in new plant.
Venezuela	1988	Joint venture between PPG Industries, Inc. (PPG), of the United States and Venezuelan firm formed to produce continuous strand fiberglass.
	1990	Joint venture between PPG and Venezuelan firm to produce continuous strand fiberglass expanded. The plant now produces fiberglass reinforcements for marine, construction, automotive, electrical, and corrosion-resistant applications.
Eastern Europe:		
Estonia	1992	Joint venture between Ahlstrom Insulation Ltd. of Finland and Estonian firm formed to open fiberglass insulation plant by end of year.
Hungary	1988	Joint venture between firms from Liechtenstein, Italy, and Hungary formed to produce fiberglass.
	1990	Joint venture between Japanese partners, Nitto Boeski, Paramount Glass, and the International Finance Corp. and Hungarian firms to produce glass wool opened.
Western Europe:		
Denmark	1988	St. Gobain acquired producer of glass wool.
Germany	1992	Schuller International (United States) agrees to purchase plant located in former East German territory.
Netherlands	1990	PPG acquired total ownership of Silenka B.V., Dutch producer of fiberglass textiles and reinforcements.
Spain	1990	St. Gobain purchased fiberglass subsidiary of Pilkington Brothers, Ltd.
United Kingdom	1990	PPG added second furnace to plant.
Asia:		
Korea	1989	Joint venture between Porcher Textile (French manufacturer of technical fabrics) and Korean firm set up to weave fiberglass. Plant expected to be in operation in two years, with producers of printed circuit boards the key market.
	1989	Joint venture of subsidiary of St. Gobain and Korean firm formed to manufacture fiberglass. Plant expected to be operational in 1991.

Table 1—Continued
Fiberglass products: Foreign investment in selected facilities, by regions and countries, 1988-92

Region and country	Year	Nature of investment
Asia:—*Continued*		
Korea—*Continued*		
	1992	Joint venture between Owens-Corning, Asahi Glass/Asahi Fiber Glass (Japan) and Lucky Gold Star/Lucky Ltd. (Korea) to build plant announced.
Taiwan	1988	Joint venture of Nitto Boseki Company (Japan) and Norplex Oak, Inc. (U.S. producer of printed circuit boards) began operation.
	1989	Joint venture of PPG and Taiwanese plastics producer opens to manufacture fiberglass for electronics industry and reinforcements for engineered plastics.

Source: Compiled by the staff of the U.S. International Trade Commission from telephone interviews with U.S. industry representatives; Commission of the European Communities, *Panorama of EC Industries 1991-92* (Luxembourg: Office for Official Publications of the European Communities, 1991), p. 5-33; and articles appearing in various issues of *American Glass Review, Ceramic Industry,* and *Glass Industry.*

contrast, U.S. imports are concentrated in the higher-value-added, emerging product areas of fiber and woven fabric (figure 2). Trade in wool products is limited because their inherent bulkiness makes their storage and shipping costs high compared to their sales price.[4] In addition, national differences in building codes, climate, and building techniques discourage trade in wool products and encourage the servicing of foreign markets through establishment of foreign subsidiaries.[5]

U.S. INDUSTRY PROFILE

Industry Structure

The U.S. fiberglass industry[6] is the world's largest producer of fiberglass, followed by the industries of the EU and Japan. The basic structure of the U.S. industry is shown in figure 3. The U.S. industry consists of an estimated 186 companies, 259 establishments, and 36,000 employees.[7] California, Georgia, Indiana, Ohio, North Carolina, Pennsylvania, South Carolina, and Texas are the major producing areas. Production facilities are geographically dispersed throughout the United States and the world to minimize shipping costs of raw materials and finished products. Shipping costs can be significant for relatively bulky, low-value fiberglass products such as wool; shipping costs associated with U.S. imports of fiberglass products in 1992 equaled about 7 percent of import value, exclusive of imports from Canada and Mexico. Diversified multinational producers are predominant in the United States and other major fiberglass-producing countries. Major firms in the United States (table 2) and in the market economies tend to be publicly held corporations.

Wool products continue their historic domination of the fiberglass industry on the strength of their insulation applications, but fiber products are beginning to challenge wool's dominance because of their expanding applications and higher value added. Fiber is the fastest growing segment of the industry, as industrial consumers have sought to improve their products by utilizing nontraditional materials such as fiberglass. Commission staff estimate that wool represents 61 percent of the value of industry shipments, fibers 28 percent, and woven fabrics 11 percent. A number of firms produce both wool and fiber, but fiber producers generally are not vertically integrated into the production of woven fabric. One exception is a firm that entered a joint venture in 1993 to produce woven fabric.[8] A number of firms are vertically integrated into the production of roofing shingles that incorporate fiber and the production of resins to be used with glass fibers; one is vertically integrated in the production of windows, fiberglass-reinforced plastic pipe, and underground storage tanks reinforced with fiber.

The wool segment of the U.S. industry is relatively concentrated, with the four largest companies accounting for 71 percent of U.S. shipments.[9] The fiber segment of the industry is similarly concentrated. Although many U.S. fiberglass firms are diversified into other products, company manufacturing facilities are dedicated almost solely to the production of fiberglass, as indicated by the relatively high

[4] Commission of the European Communities, *Panorama of EC Industries 1991-92* (Luxembourg: Office for Official Publications of the European Communities, 1991), pp. 5-32 to 5-33.

[5] Ibid., p. 5-33.

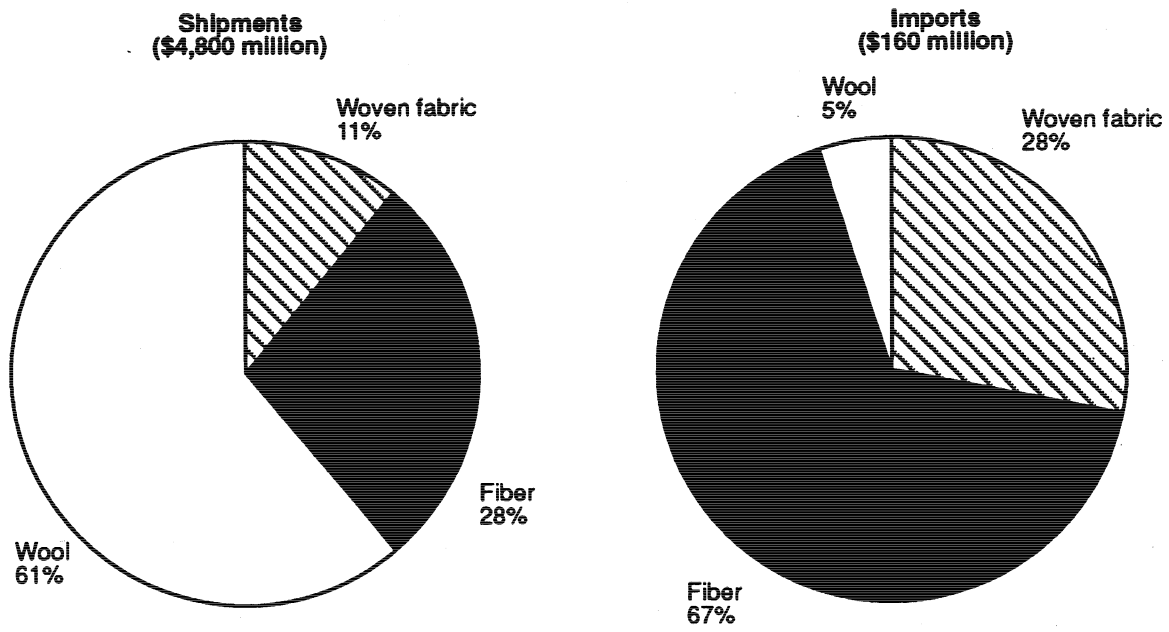
[6] The coverage includes parts of the industries included in Standard Industrial Classification (SIC) 2221, Broadwoven Fabric Mills, Manmade Fiber and Silk; SIC 2241, Narrow Fabric and Other Smallwares Mills: Cotton, Wool, Silk, and Manmade Fiber; SIC 3229, Pressed and Blown Glass and Glassware, Not Elsewhere Classified; and SIC 3296, Mineral Wool.

[7] Data are overstated to the extent that they include rock and slag wool.

[8] "Owens-Corning Enters Joint Venture," *Glass Industry,* Feb. 1993, pp. 6-7.

[9] U.S. Bureau of the Census, *1987 Census of Manufactures: Concentration Ratios in Manufacturing,* Feb. 1992, p. 6-27.

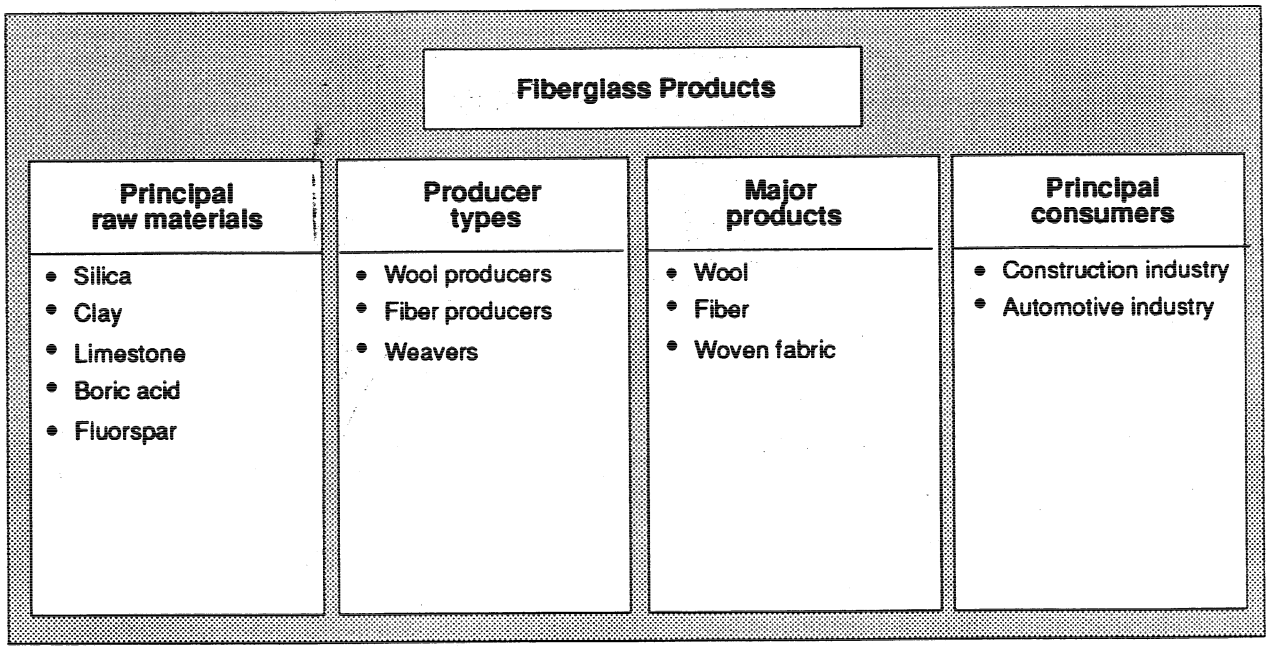
Figure 2
Fiberglass products: Value of U.S. producers' shipments[1] and imports for consumption, by types, 1992



[1] Data for wool are overstated to the extent that they include rock and slag wool.

Source: Shipment data estimated by the staff of the U.S. International Trade Commission; import data compiled from official statistics of the U.S. Department of Commerce.

Figure 3
Fiberglass products: Principal raw materials, producer types, major products, and principal consumers



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

Table 2
Fiberglass products: Major U.S. producers, by product types, 1992

Product type	Firm
Wool	CertainTeed Corp.[1]
	Guardian Industries Corp.
	Knauf Fiber Glass.
	Owens-Corning Fiberglas Corp.
	Schuller International Inc.[2]
	Western Fiberglass Inc.
Fiber	Owens-Corning Fiberglas Corp.
	PPG Industries, Inc.
	Schuller International Inc.[2]
	Vetrotex CertainTeed Corp.[1]
Woven fabric	BGF Industries, Inc.[3]
	Clarke-Schwebel Corp.[4]
	Hexcel Corp.
	JPS Textile Group, Inc.

[1] Subsidiary of French producer, La Compagnie de Saint Gobain.

[2] Subsidiary of Manville Corp., a holding company with subsidiaries that produce building products. Name of subsidiary changed from Manville Sales Corp. in 1992.

[3] Subsidiary of French producer, Porcher Textile S.A.

[4] Subsidiary of Springs Industries, Inc., a U.S. textile manufacturer.

Source: U.S. industry representatives, various interviews by staff of the U.S. International Trade Commission.

specialization ratios[10] of 96 percent[11] for the wool industry and 99 percent[12] for the fiber industry.[13]

Material and labor costs in the U.S. fiberglass industry reflect a production process that requires relatively abundant unprocessed raw materials and considerable labor input. A comparison of 1991 data for wool, fiber, and all U.S. manufacturing establishments reveals that material costs represented 53 percent of the value of shipments for all U.S. manufacturing industries, compared with 41 percent for wool producers and 35 percent for fiber producers.[14] In contrast, labor costs represented 15 percent of the value of shipments for wool producers and 18 percent for fiber producers, compared with 9 percent for all U.S. manufacturing establishments.[15] Labor costs are higher for fiber producers, since the production process is less automated than that for wool production. The industry's above-average labor cost reflects the higher wages paid by producers to a relatively skilled workforce; production workers were paid an average hourly wage of $14.53 per hour in the wool industry in 1991, compared with $13.04 for the fiber industry and $11.49 for all U.S. manufacturing establishments.[16]

Productivity rates vary among segments of the U.S. fiberglass industry. The productivity[17] of wool producers of $57.06 per hour in 1991 was only slightly above the average figure of $56.64 for all U.S. manufacturing establishments.[18] The less automated, more labor-intensive fiber segment of the industry had below average productivity of $45.84 per hour in 1991.[19]

Capital costs are above average in the U.S. fiberglass industry. The end-of-year, depreciable-assets-per-employee values of $87,460 for wool producers in 1987[20] and $83,462 for fiber[21] give an indication of the industry's high capital costs, being almost double the average figure of $48,636 for

[10] Specialization ratio represents the ratio of primary product shipments to total product shipments (primary and secondary, excluding miscellaneous receipts) for the establishments classified in the industry. U.S. Bureau of the Census, *1987 Census of Manufactures: Glass Products*, Appendix A, p. A-4.

[11] U.S. Bureau of the Census, *1987 Census of Manufactures: Abrasive, Asbestos, and Miscellaneous Nonmetallic Mineral Products*, p. 32E-6.

[12] U.S. Bureau of the Census, *Glass Products*, p. 32A-5.

[13] Non-shipment data presented for the fiber segment of the U.S. industry are estimated from data for the entire four-digit SIC industry (SIC 3229, Pressed and Blown Glassware, Not Elsewhere Classified) that encompasses fiber producers as well as producers of other products.

[14] Compiled by the staff of the U.S. International Trade Commission from official statistics of the U.S. Bureau of the Census. U.S. Bureau of the Census, *1991 Annual Survey of Manufactures: Statistics for Industry Groups and Industries*, pp. 1-5 and 1-18.

[15] Ibid.

[16] Ibid.

[17] As measured by the value added per production worker.

[18] Compiled by the staff of the U.S. International Trade Commission from official statistics of the U.S. Bureau of the Census. U.S. Bureau of the Census, *Statistics for Industry Groups and Industries*, pp. 1-5 and 1-18.

[19] Ibid, p. 1-18.

[20] Compiled by the staff of the U.S. International Trade Commission from official statistics of the U.S. Bureau of the Census. U.S. Bureau of the Census, *Abrasive, Asbestos, and Miscellaneous Nonmetallic Mineral Products*, pp. 32E-6 and 32E-11.

[21] Compiled by the staff of the U.S. International Trade Commission from official statistics of the U.S. Bureau of the Census. U.S. Bureau of the Census, *Glass Products*, pp. 32A-5 and 32A-9.

all U.S. manufacturing establishments.[22] In addition, wool producers spent 4 percent of the value of shipments during 1988-91 on new capital expenditures, compared with 8 percent for fiber producers and 3 percent for all U.S. manufacturing establishments.[23] The higher rate of capital expenditures for the fiber segment of the industry is believed to be necessary to remain competitive in the development of rapidly-evolving applications for end-use markets.

Heightened environmental considerations provide the industry with benefits of increased consumer demand as well as greater costs to meet legislated environmental standards. For example, increased concern over ecological and financial costs associated with the burning of fossil fuels have pushed thermal insulation standards higher, increasing demand for wool. Such concern has also increased the utilization of fiberglass in the automotive and aerospace industry to lower vehicle weight and reduce fuel consumption.

U.S. producers also face the challenge of mounting environmental regulation that they believe establishes standards that are not always cost effective to achieve.[24] The industry is especially concerned that the Clean Air Act Amendments of 1990 appears to base pollution-control equipment requirements on technological feasibility alone.[25] Costs to meet environmental standards can be substantial for this industry. Although data are not available for the U.S. industry, 20 percent of investment by EU wool manufactures is for pollution control.[26] In addition, the industry is facing repercussions of some medical research that questions the safety of worker exposure to glass fibers.[27]

Owens-Corning Fiberglas Corp. (Owens-Corning), a pioneer in fiberglass production that dominated world production until it began licensing the use of its production technology to other firms in the 1950s, is the largest U.S. producer of fiberglass. Although the firm produces products other than fiberglass (such as asphalt roofing shingles and polyester resins), it is among the least diversified of the major U.S. producers. Owens-Corning and La Compagnie de Saint Gobain (St. Gobain) of France are currently vying for the position of world production leader, with Owens-Corning believed to lead in tonnage[28] and St. Gobain in value.[29] St. Gobain's challenge to Owens-Corning's world leadership extended to the United States during 1988-92, with St. Gobain's purchase of U.S. producer, CertainTeed Corp. and the establishment of a U.S. subsidiary company, Vetrotex CertainTeed Corp.

Foreign operations are a key component of Owens-Corning's business, providing 27 percent of the firm's sales in 1992.[30] The firm believes that its operations in Canada and Mexico make Owens-Corning well prepared to benefit from the North American Free-Trade Agreement (NAFTA).[31] As the only firm with production-facility investments in all three markets, Owens-Corning should be able to take advantage of any changes in fiberglass trade or consumption patterns that occur within these three markets because of NAFTA. The number of Owens-Corning foreign facilities is expected to expand in the future, as the firm has focused on growth in new markets around the world.[32] Owens-Corning believes, for example, that outstanding market opportunities exist in the Far East, where energy dependency and conservation encourage insulation products, and in Eastern Europe.[33] Owens-Corning has the most extensive foreign operations of any U.S. producer, involving 18 countries, as summarized in the following:

Nature of involvement	Country
Controlling interest	Brazil
	Belgium
	Canada
	France
	Netherlands
	Norway
	Spain
	Sweden
	United Kingdom
	United States
Minority interest	Japan
	Korea
	Mexico
	Saudi Arabia
	Thailand
Licensing agreement	Australia
	Colombia
	New Zealand

Another major domestic producer, PPG Industries, Inc. (PPG), which also manufactures flat glass, chemicals, coatings, and resins, greatly expanded its foreign fiberglass operations during 1988-92. PPG

[22] Compiled by the staff of the U.S. International Trade Commission from official statistics of the U.S. Bureau of the Census. U.S. Bureau of the Census, *1987 Census of Manufactures: General Summary*, Mar. 1991, pp. 1-2 and 1-95.

[23] Compiled by the staff of the U.S. International Trade Commission from official statistics of the U.S. Bureau of the Census published in the 1988-91 issues of *Annual Survey of Manufactures*.

[24] "Glass Problems Meeting Sets Records, Tackles 1990s Regulations," *American Glass Review*, Jan. 1992, pp. 4-8.

[25] James T. Destefano, "How the Clean Air Act Impacts Glass Producers," *Glass Industry*, May 1992, pp. 32-35, 50.

[26] EC Commission, *Panorama of EC Industries 1991-1992*, p. 5-33.

[27] Fiberglass producers that once produced asbestos continue to incur expenses relating to worker exposure to asbestos fibers years after asbestos production has ceased.

[28] U.S. industry representative, interview by USITC staff, July 22, 1993.

[29] "Giants in Glass," *Ceramic Industry*, Aug. 1991, p. 41.

[30] *Compact d SEC: Corporate Information on Public Companies Filing with the SEC* (Bethesda: Disclosure Inc., June 1993), distributed on compact disc data storage.

[31] Lowell E. Perrine, "Productivity and Global Growth—Two Keys to Success," *Glass Industry*, Mar. 1993, p. 40.

[32] Ibid.

[33] "Owens-Corning Adjusts to a Global Economy," *Glass Industry*, Nov. 1992, pp. 18-19.

opened facilities in Taiwan and Venezuela, increased its ownership share in the Netherlands, and expanded operations in the United Kingdom. This expansion in foreign fiberglass production facilities is believed to be part of PPG's overall corporate effort to increase the share of total revenues represented by foreign operations to 40 percent by 1994.[34] PPG has made substantial progress toward achieving this 40-percent goal; the share of PPG's sales represented by foreign operations increased from 30 percent in 1988 to 36 percent in 1992.[35]

Other U.S. producers involved with foreign production facilities include Hexcel Corp. in France; Schuller International Inc. in Germany; and Springs Industries, Inc. in Belgium, Japan, and the United Kingdom.

The domestic fiberglass industry uses two channels of distribution, selling to (1) large retailers and intermediate consumers such as weavers, manufacturers (users of fiberglass products in the production of aircraft, appliances, automobiles, marine vessels, and mobile homes), and building contractors and (2) distributors that serve retailers, intermediate consumers, and end users. Price lists are used in the industry, but producers may offer discounts from list prices based on market conditions, quantities purchased, or type of customer.

Consumer Characteristics and Factors Affecting Demand

Consumers of fiberglass products are numerous, diverse in nature, and scattered throughout the United States. They include intermediate consumers, building contractors, distributors, and the ultimate end users. Demand for fiberglass products is based primarily on the construction and automotive industries that experienced downward trends during 1988-92. Consumers' purchasing considerations usually are based on the same combination of factors that drive purchase decisions for many products: price, quality, service, and product performance. Producer research-and-development efforts contribute to a firm's competitive position in product performance and at the same time expand the fiberglass market by stimulating the substitution of fiberglass for competitive materials. Fiberglass has numerous performance advantages over competitive materials because glass fiber is strong, will not burn, has high heat resistance, will not stretch or shrink because of atmospheric conditions, has excellent moisture resistance, resists corrosion from most chemicals, and has low thermal conductivity.[36] Compared with polyurethane and extruded polystyrene rigid foam insulation for example, fiberglass has a lower cost and higher fire rating, although it is a less efficient insulator. Compared with slag- and rock-wool insulation, fiberglass is a lighter, more efficient insulator with a lower fire rating, at similar cost.

FOREIGN INDUSTRY PROFILE

World fiberglass production, consumption, and trade are concentrated in the EU, Japan, and the United States.[37] The industries in each market are technologically comparable and their relative sizes are shown in table 3. Demand for fiberglass in each of these markets is filled primarily by domestic production, with only the EU being a net importer of fiberglass (figure 4).

EU

The EU is the world's second-largest producer and consumer of fiberglass following the United States, and St. Gobain of France is the U.S. industry's most active competitor in world markets. St. Gobain, a conglomerate formerly owned by the French Government, is believed to be the world's largest producer of fiberglass in terms of value; however, subsidiaries of U.S. producers represent a significant and growing portion of the EU industry. U.S. firms strengthened their already strong competitive position in the fiber and woven fabric segments of the EU industry during 1988-92 by expanding and restructuring their EU operations to further improve their service capabilities and efficiencies and reduce product costs. Much of the U.S. industry's competitive strength in the EU stems from its extensive EU production facilities (table 4) that enable it to match the service of locally-owned producers. U.S. firms have not been as successful in the wool segment of the EU industry because government standards relating to insulation in the EU favor a competitive mineral wool product, rock wool.[38]

St. Gobain is a diversified multinational firm with operations in 37 countries. The firm's products, in order of their 1991 sales volume, include flat glass, industrial ceramics and abrasives, glass containers, insulation, paper and wood, pipe, building materials, fiber-reinforcements, and other nonspecified products. St. Gobain's most significant product line, flat glass, represented 18 percent of sales in 1991; the insulation and fiber-reinforcements categories that include products made from fiberglass and other materials represented a combined 17 percent of sales.[39] St. Gobain constructed or invested in foreign plants in a number of product lines during 1988-92, including

[34] "Who Will Head Up PPG?," *American Glass Review*, Mar. 1993, p. 15.

[35] PPG Industries, Inc., official, interview by USITC staff, Nov. 1, 1993.

[36] Commission of the European Communities, *Panorama of EC Industries 1991-92*, 1991, p. 6-17.

[37] The European Union, Japan, and the United States represented 85 percent of world fiberglass exports and 76 percent of total world trade in 1991 according to United Nations data, exclusive of yarns, sliver, rovings, and woven fabric.

[38] Rock wool is produced from molten rock; it typically is heavier than glass wool and is a less efficient insulator, but it has a higher fire resistance. U.S. industry representative, interview by U.S. International Trade Commission staff, July 1993.

[39] *Disclosure Worldscope Global: Corporate Information on the World's Leading Companies* (Bethesda: Disclosure Inc., June 1993), distributed on compact disc data storage.

Table 3
Fiberglass products: industry profiles for selected countries, 1992

Item	European Union[1]	Japan	United States
Production (1,000 metric tons)[2]	[3]1,510	434	2,335
Exports (million dollars)	334	175	392
Imports (million dollars)	370	50	160
Trade balance (million dollars)	-36	125	232

[1] Trade data are for EU external trade in 1991. Data are not available for 1992.

[2] Production data are for 1988, the most recent comparable data, and do not include woven fabric.

[3] Figure is overstated to the extent that it includes all forms of mineral wool.

Source: Data for the European Union compiled from official statistics of the European Union; Japanese data compiled from official statistics of the Japanese Government; and U.S. data compiled from official statistics of the U.S. Department of Commerce.

fiberglass production facilities.[40] Expansion activity is expected to be limited for the foreseeable future, however, as the company reportedly does not plan any major purchases that would add to company debt.[41] Outside of the EU, St. Gobain's has investments in fiberglass plants in the countries of Argentina, Brazil, Korea, Sweden, Switzerland, and the United States.

While St. Gobain expanded its fiberglass operations during 1988-92, Pilkington Brothers, Ltd. (Pilkington), of the United Kingdom reduced its global presence in the industry through the sale of its fiberglass facilities in Argentina and Spain to St. Gobain. This appears to be part of Pilkington's effort to focus on its core business of flat glass. Flat glass represented 80 percent of Pilkington sales in 1992, compared with 3 percent for insulation.[42]

The bulk of EU trade in fiberglass products is internal; trade with non-EU countries represented 23 percent of the value of total EU imports in 1991 and 22 percent of the value of total exports. The EU external trade surplus of $39 million in 1988 declined to a deficit of $36 million in 1991, as import growth of 30 percent outpaced export growth of 3 percent. The U.S. share of the value of EU external imports declined by nearly 5 percentage points to 35 percent, despite an 11 percent increase in the value of U.S. exports to that market during the 1988-91 period, primarily because of the growth in imports from other European countries. The product mix of imports from the United States was relatively stable during the period. EU exports to the United States grew by 3 percent over the period, matching the growth of exports to all countries during the period and maintaining the U.S. share of EU external exports at 9 percent. The most significant change in the product mix of exports to the United States during 1988-91 was a minor shift from fibers to woven fabric.

[40] Such investments were previously listed in table 1.

[41] "No Expansion as St. Gobain Aims to Cut Debt," *American Glass Review*, Jan. 1991, p. 10.

[42] Disclosure, Inc., *Corporate Information on the World's Leading Companies.*

Japan

Japan is the world's third-largest producer and consumer of fiberglass, but its industry's efforts to compete internationally through the establishment of foreign production facilities have largely been limited to Asian countries that have also attracted investments by U.S. and French competitors. Japanese producers have not established production facilities in either the United States or the EU. The Japanese industry consists of the following major producers, with limited foreign investment, as compiled by the staff of the U.S. International Trade Commission from various sources:

Firm	Products
Arisawa Mfg. Co., Ltd.	Woven fabric
Asahi Fiber Glass Co., Ltd.[1]	Fiber, wool
Asahi-Schwebel Co., Ltd.[2]	Woven fabric
Nippon Electric Glass Co., Ltd.	Fiber
Nippon Glass Fiber Co., Ltd.[3]	Fiber
Nippon Sheet Glass Co., Ltd.	Wool
Nitto Boseki Co., Ltd.	Fiber, wool, woven fabric
Central Glass Co., Ltd.	Fiber, wool

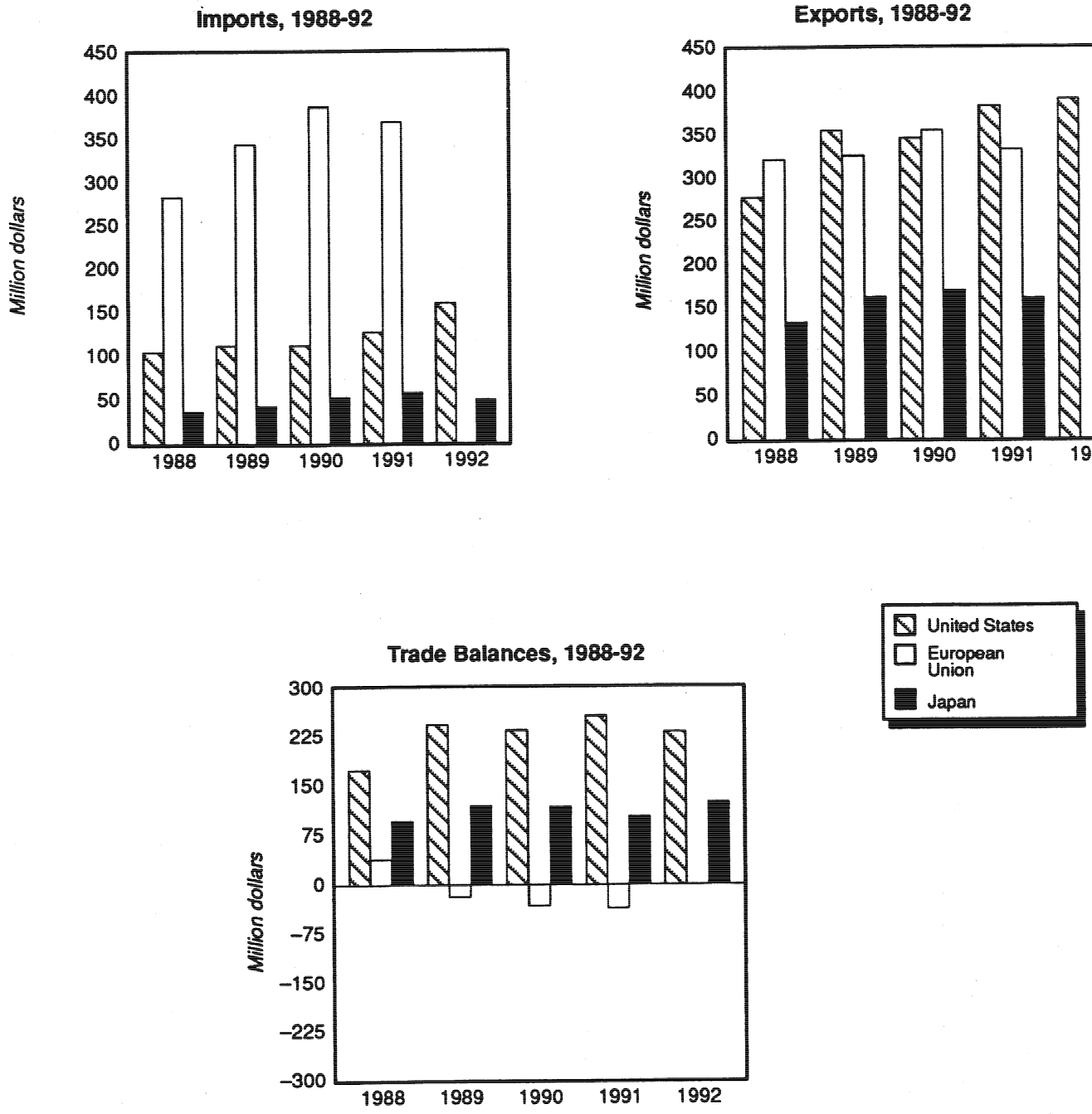
[1] Controlling interest held by Asahi Glass Co., Ltd., of Japan; minority interest held by Owens-Corning Fiberglas Corp. of the United States.

[2] Controlling interest held by Asahi Chemical Industries Co. Ltd. of Japan; minority interest held by Springs Industries Inc. of the United States.

[3] Controlling interest held by Nippon Sheet Glass Co., Ltd.

As in the United States and EU, Japanese producers tend to be diversified multinational corporations. Firms tend to be more vertically integrated into the production of woven fabrics and articles of fiberglass and resins than is the case in the United States. All three of Japan's primary producers of flat glass, Asahi Glass Co., Ltd. (Asahi), Central Glass Co., Ltd., and Nippon Sheet Glass Co., Ltd., are participants in this industry. Asahi and Nitto Boseki

Figure 4
Fiberglass products: Value of imports, exports, and trade balances, by selected countries,[1] 1988-92[2]



[1] EU data are for external trade.

[2] EU data are not available for 1992.

Note.—Trade balances calculated from unrounded data.

Source: U.S. data compiled from official statistics of the U.S. Department of Commerce; EU data compiled from official statistics of the European Union, and Japanese data compiled from official statistics of the Japanese Government.

Table 4
Fiberglass products: Major producers of the European Union, by product types and countries, 1992

Product type	Firm	Country
Wool	La Compagnie de Saint Gobain	Denmark
		France
		Germany
		Italy
		Spain
		The Netherlands
	European Owens-Corning Fiberglas[1]	Belgium
	Pilkington Brothers, Ltd.	United Kingdom
Fiber	Bayer	Germany
	European Owens-Corning Fiberglas[1]	Belgium
		France
		Spain
		United Kingdom
	La Compagnie de Saint Gobain	France
		Germany
		Italy
		Spain
	PPG Industries (UK) Ltd.[2]	United Kingdom
	PPG Industries Fiber Glass B.V.[2]	The Netherlands
Woven fabric	Clarke-Schwebel International S.A.[3]	Belgium
	Clarke-Schwebel Ltd.[3]	United Kingdom
	Hexcel Corp.[4]	France
	Porcher Textile S.A	France

[1] Subsidiary of Owens-Corning Fiberglas Corp. of the United States.

[2] Subsidiary of PPG Industries, Inc., of the United States.

[3] Subsidiary of Springs Industries, Inc., a U.S. textile manufacturer.

[4] U.S.-owned.

Source: U.S. industry representatives, various interviews by the staff of the U.S. International Trade Commission; Commission of the European Communities, *Panorama of EC Industry 1991-92*, (Luxembourg: Office for Official Publications of the European Community, 1991), pp. 5-31 to 5-34 and 6-16 to 6-18; and *International Directory of Corporate Affiliations* Vol. 1, (New Providence: National Register Publishing, 1992), pp. N-551 to N-552, N-612 to N-615, and US-314 to US-315.

Co., Ltd., are the only firms known to have investments in foreign fiberglass operations. Japan was a net exporter of fiberglass throughout the 1988-92 period, maintaining trade surpluses in all product areas except wool. The U.S. trade surplus in fiberglass with Japan declined from $5 million in 1989 to $1 million in 1992, as U.S. imports from Japan increased and exports to Japan declined. The United States represented 57 percent of Japan's imports and 11 percent of Japan's exports in 1992.

U.S. TRADE MEASURES

Tariff Measures

Customs classification of fiberglass products is based on method of manufacture, application, and physical characteristics, i.e., silica content, color, and size. The aggregate trade-weighted, average rate of duty for general imports from column 1 countries in 1992 was 7.2 percent ad valorem, excluding imports entering under special duty provisions (appendix A). Table 5 shows the column 1 rate of duty for products entering under *Harmonized Tariff Schedule of the United States* (HTS) subheadings 7019.10.10 to 7019.90.50, as of January 1, 1993. U.S. tariffs on imports from Canada are being reduced gradually under the United States-Canada Free-Trade Agreement (CFTA) and will be totally eliminated on January 1, 1998.

The NAFTA, as implemented by the North American Free Trade Agreement Implementation Act (Public Law 103-182, approved Dec. 8, 1993), provides for the phaseout of U.S. duties over a 6-year period. Mexico is obligated to phase out its duties on imports of such goods from the United States over a 10-year period. The NAFTA became effective for both the United States and Mexico on January 1, 1994.

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.

Nontariff Measures

The U.S. trade agreements program under the Multifiber Arrangement (MFA)[43] places quantitative

[43] The MFA is a multilateral agreement negotiated under the auspices of the General Agreement on Tariffs and Trade. The MFA provides a general framework and guiding principles for the negotiation of bilateral agreements between textile importing and exporting countries, or for unilateral action by an importing country if an agreement cannot be reached. In effect since 1974, the MFA was established to deal with problems of market disruption in textile trade, while permitting developing countries to share in expanded export opportunities.

Table 5
Fiberglass products: Harmonized Tariff Schedule subheading; description; U.S. col. 1 rates of duty as of Jan. 1, 1993; U.S. exports, 1992;[1] and U.S. imports, 1992[1]

HTS subheading	Description	Col. 1 rate of duty as of Jan. 1, 1993		U.S. exports, 1992	U.S. imports, 1992
		General	Special[2]	— Million dollars —	
	Glass fibers (including glass wool) and articles thereof (for example, yarn, woven fabrics):				
	Slivers, rovings, yarn and chopped strands:				
	Yarns:				
7019.10.10	Not colored[3]	7.4%	0.7% (IL) 3.7% (CA)[5]	[4]38	10
7019.10.20	Colored[3]	9.6%	1% (IL) 4.8% (CA)[5]	[4]27	7
7019.10.30	Chopped strand	6.2%	Free (A,E,IL,J) 3.1% (CA)	21	8
7019.10.40	Rovings	6%	Free (A,E,J) 0.6% (IL) 3% (CA)	[4]50	22
7019.10.60	Other	6%	Free (E*,J*) 0.6% (IL) 3% (CA)	[4]14	6
	Woven fabrics, including narrow fabrics:				
7019.20.10	Narrow fabrics[3]	6%	0.6% (IL) 3% (CA)[5]	10	2
	Other:				
7019.20.20	Not colored[3]	8.3%	0.8% (IL) 4.1% (CA)[5]	[4]44	38
7019.20.40	Colored[3]	11.1%	1.1% (IL) 5.5% (CA)[5]	[3]7	6
	Thin sheets (voiles), webs, mats, mattresses, boards and similar nonwoven articles:				
7019.31.00	Mats	6.2%	Free (A,B,E,IL,J) 3.1% (CA)	23	17
7019.32.00	Thin sheets (voiles)	6.2%	Free (A,B,E,IL,J) 3.1% (CA)	3	1
	Other:				
7019.39.10	Insulation products	6.2%	Free (A,B,E,IL,J) 3.1% (CA)	36	9
7019.39.50	Other	6.2%	Free (A,B,E,IL,J) 3.1% (CA)	59	4
	Other:				
7019.90.10	Woven	6.9%	Free (E,J) 0.7% (IL) 3.4% (CA)	3	3
7019.90.50	Other	6.2%	Free (A,B,E,IL,J) 3.1% (CA)	57	28

[1] Compiled from official statistics of the U.S. Department of Commerce, except as noted.
[2] 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: Generalized System of Preferences (A); Automotive Products Trade Act (B); Agreement on Trade in Civil Aircraft (C); United States-Canada Free-Trade Agreement (CA); Caribbean Basin Economic Recovery Act (E); United States-Israel Free Trade Area (IL); and Andean Trade Preference Act (J).
[3] The United States monitors shipments of these products to administer the U.S. textile trade agreements programs.
[4] Estimated by the staff of the U.S. International Trade Commission.
[5] Canadian-origin yarns and woven fabrics of electrically nonconductive continuous glass fiber filaments having a diameter of not less than 9.3 microns but not more than 10.7 microns, and impregnated, coated or covered with resorcinol formaldehyde latex are free of duty.

Source: USITC, *Harmonized Tariff Schedule of the United States (1993)*, p. 70-13, except as noted.

limits on U.S. imports of fiberglass yarns and woven fabrics from about 20 countries. U.S. import volumes from these countries currently remain far below specified limits.

FOREIGN TRADE MEASURES

Foreign tariffs applicable to imports from the United States tend to be higher than those of the United States (appendix B, table B-1). Tariffs on fiberglass products range from 6.5 to 9.5 percent ad valorem in the EU to 10.2 to 25 percent in Canada, 10 to 15 percent in Mexico, and 25 percent in Japan. Canadian tariffs on imports from the United States are being reduced gradually under the CFTA and will be totally eliminated on January 1, 1998. Under the NAFTA, Mexican tariffs on imports of fiberglass products from the United States are eliminated, as of January 1, 1994, for 33 percent of line items; over 5 years for 7 percent; over 6 years for 41 percent; and over 10 years for 19 percent.

U.S. MARKET

Consumption and Production

The value of U.S. consumption and shipments of fiberglass products (figure 5) followed the general downward trend of primary end-use markets (the construction and automotive industries) during 1988-91 and shared in their recovery in 1992 (figure 6). U.S. consumption and shipment values failed to return to 1988 levels and finished the period down 11 and 9 percent, respectively, compared with an increase in U.S. imports of 53 percent (table 6). The share of the value of U.S. consumption represented by imports finished the period up one and one half percentage points to 3.5 percent, but at least some of this growth may be represented by increased sourcing by U.S. producers from their foreign subsidiaries.

Consumption and shipment values followed a similar downward trend in all segments of the industry during 1988-92 with one exception: import growth was sufficient to overcome a decline in shipments and result in an overall increase in consumption of woven fabric. Overall import growth during 1988-92 was limited to fiber and woven fabric and roughly doubled the import penetration ratios in these two areas to 9 and 8 percent, respectively. The decline in wool imports during the same period kept the import penetration ratio for wool well below 1 percent.

U.S. production, capacity, and capacity utilization data are limited for fiberglass products.[44] The U.S. industry followed the general trend of fiber producers during the period, adding more capacity than production levels warranted and increasing worldwide excess capacity. The growth potential of fiber apparently encouraged firms to add capacity despite softening demand in various markets around the world. Production of fiber, for example, declined by 4 percent during 1988-92 to 700,000 metric tons;[45] at the same time U.S. capacity increased by 14 percent to 920,000 metric tons, reducing the capacity utilization rate of fiber producers by 15 percentage points to 76 percent (table 7).

[44] Available data on production, capacity, and capacity utilization are limited to fiber.

Imports

Excess worldwide fiber capacity likely contributed to U.S. import growth during the period and is likely to continue to encourage imports until foreign production and demand are more balanced. Excess capacity and soft demand in areas such as Europe have increased competition for business, and the U.S. position as the world's largest consumer of fiberglass products makes the United States a focus of export efforts. Efforts by U.S. firms to rationalize production at their most efficient manufacturing facilities may have also contributed to the growth of imports, since U.S. producers have foreign subsidiaries, are known to be importers of fiberglass products, and likely could source some products from either U.S. or foreign facilities. The value of U.S. imports resisted the downward trend in U.S. consumption during 1988-92, posting an overall increase of 53 percent (table 8). Product mix was relatively stable during 1989-92, while the EU replaced Canada as the largest supplier (figure 7).[46] The softening EU market likely forced EU producers to look for foreign marketing opportunities and contributed to growth of EU exports to the United States. U.S. importers typically consist of intermediate consumers and fiberglass producers, both U.S. and foreign.

The value of imports entering under special duty provisions increased nearly fivefold during the period on the strength of imports from Canada, and their share of total import value increased from 11 percent in 1988 to 46 percent in 1992. The United States-Canada Free-Trade Agreement (CFTA) was the most significant of these special duty provisions, with imports under the CFTA valued at $48 million in 1992 (table 9). There also were significant increases in U.S. fiberglass imports from Canada under the Automotive Products Trade Act and in imports of rubber reinforcing cord or yarn and tire cord fabric from various countries under temporary duty suspensions that expired on December 31, 1992.

FOREIGN MARKETS

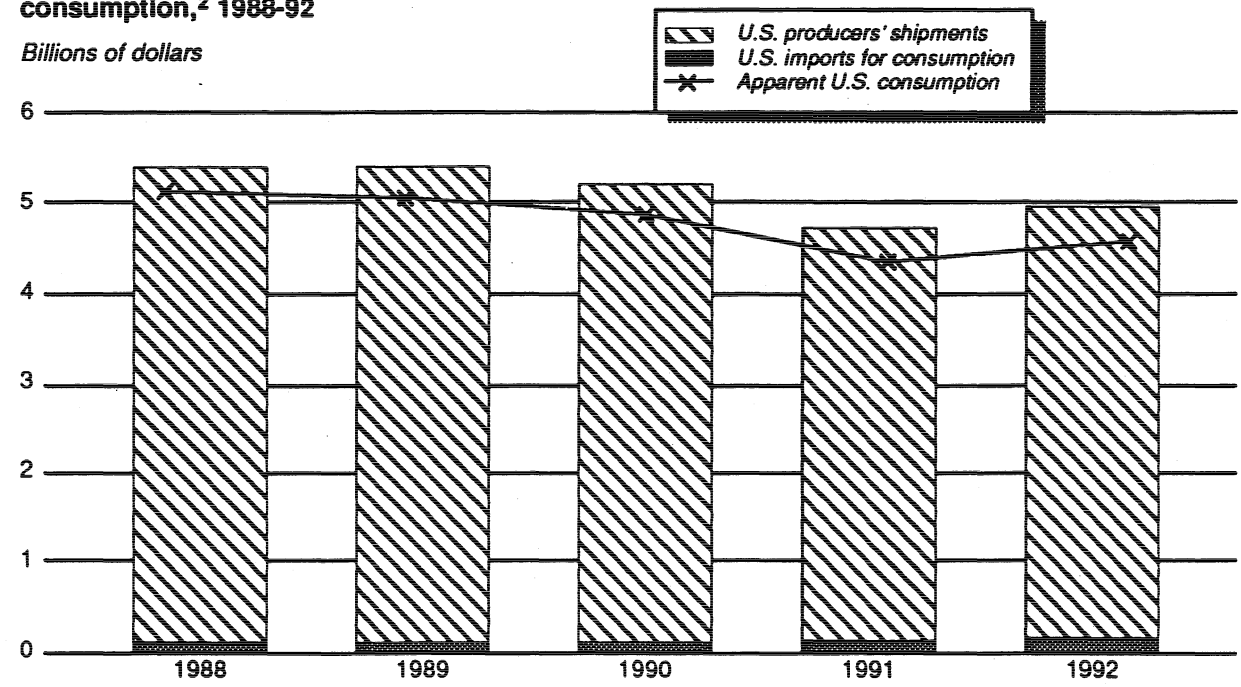
Foreign Market Profile

The high transportation costs associated with wool products and the need to work closely with customers of fiber and woven fabric products often encourage U.S. producers to penetrate markets through corporate ownership or affiliation. U.S. producers have investments in production facilities in all four of the top U.S. markets, and the United States has trade surpluses with all four. The EU is the largest U.S. market, although it declined slightly during 1989-92

[45] *Fiber Organon*, June 1993, p. 103.

[46] Comparable data by products and countries are not available for 1988.

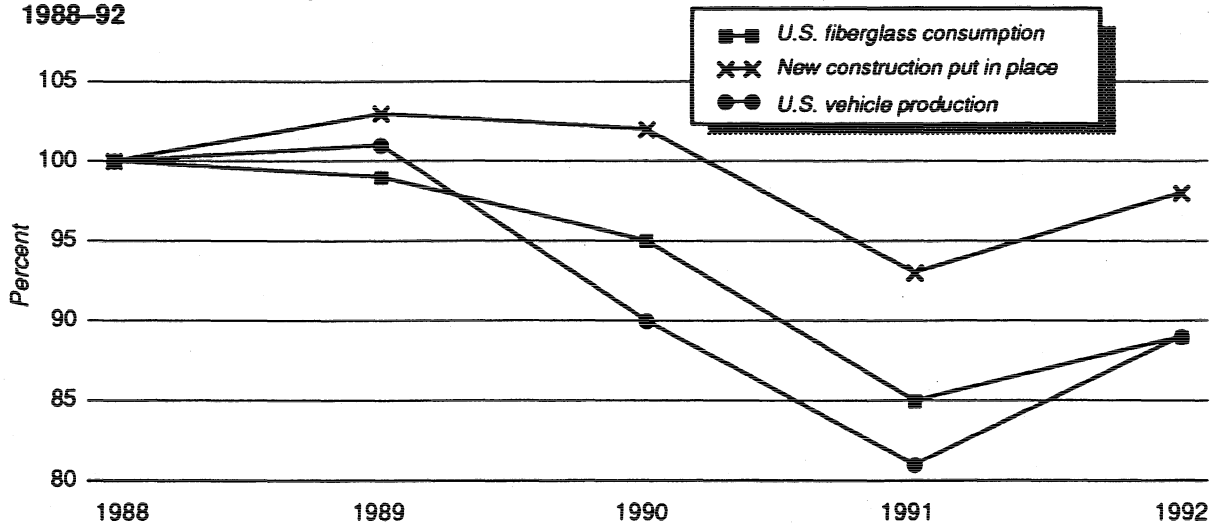
Figure 5
Fiberglass products: U.S. producers' shipments,[1] imports for consumption, and apparent U.S. consumption,[2] 1988-92



[1] Data partially estimated by the staff of the U.S. International Trade Commission.
[2] Apparent consumption = producers' shipments + imports - exports.

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

Figure 6
Fiberglass products: Indexes of the value (in current dollars) of U.S. fiberglass consumption[1] and new construction put in place and the number of vehicles produced in the United States,[2] 1988-92



[1] Data partially estimated by the staff of the U.S. International Trade Commission.
[2] Compiled from *1992 Market Data Book*, published by *Automotive News*, p. 3, and *Automotive News*, Jan. 11, 1933, p. 51.

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

Table 6
Fiberglass products: U.S. shipments,[1] exports of domestic merchandise, imports for consumption, and apparent U.S. consumption, 1988-92

Year	U.S. shipments[2]	U.S. exports	U.S. imports	Apparent U.S. consumption	Ratio of imports to consumption
	1,000 dollars				*Percent*
1988	5,300,000	278,688	104,539	5,125,851	2.0
1989	5,300,000	355,616	111,974	5,056,358	2.2
1990	5,100,000	346,979	112,496	4,865,517	2.3
1991	4,600,000	384,162	127,445	4,343,283	2.9
1992	4,800,000	391,617	159,627	4,568,010	3.5

[1] Data partially estimated by the staff of the U.S. International Trade Commission.

[2] Data are overstated to the extent that they include data for rock and slag wool.

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

Table 7
Fiberglass products, fiber: World capacity, production, and capacity utilization, by regions or countries, 1988-92

Region or country	1988	1989	1990	1991	1992
	Capacity (*1,000 metric tons*)				
China	95	100	110	110	110
Europe:					
U.S.S.R. and successor states	185	200	200	190	190
Other	540	540	600	570	570
Japan	350	350	380	341	341
Western hemisphere:					
United States	806	826	823	872	920
Other	78	80	85	100	100
All other[1]		65 80	100	120	140
Total	2,119	2,176	2,298	2,303	2,371
	Production (*1,000 metric tons*)				
China	65	70	75	65	75
Europe:					
U.S.S.R. and successor states	125	133	120	133	130
Other	465	470	445	441	442
Japan	340	345	371	293	307
Western hemisphere:					
United States	730	735	675	650	700
Other	65	65	60	75	83
All other[1]	55	65	80	102	120
Total	1,845	1,883	1,826	1,759	1,857
	Capacity Utilization (*Percent*)				
China	68	70	68	59	68
Europe:					
U.S.S.R. and successor states	68	67	60	70	68
Other	86	87	74	77	78
Japan	97	99	98	86	90
Western hemisphere:					
United States	91	89	82	75	76
Other	83	81	71	75	83
All other[1]	85	81	80	85	86
Average	87	87	79	76	78

[1] Countries covered include Australia, India, Korea, the Republic of South Africa, and Taiwan.

Source: Compiled from various issues of *Fiber Organon.*

Table 8
Fiberglass products: U.S. imports for consumption, by principal sources, 1988-92

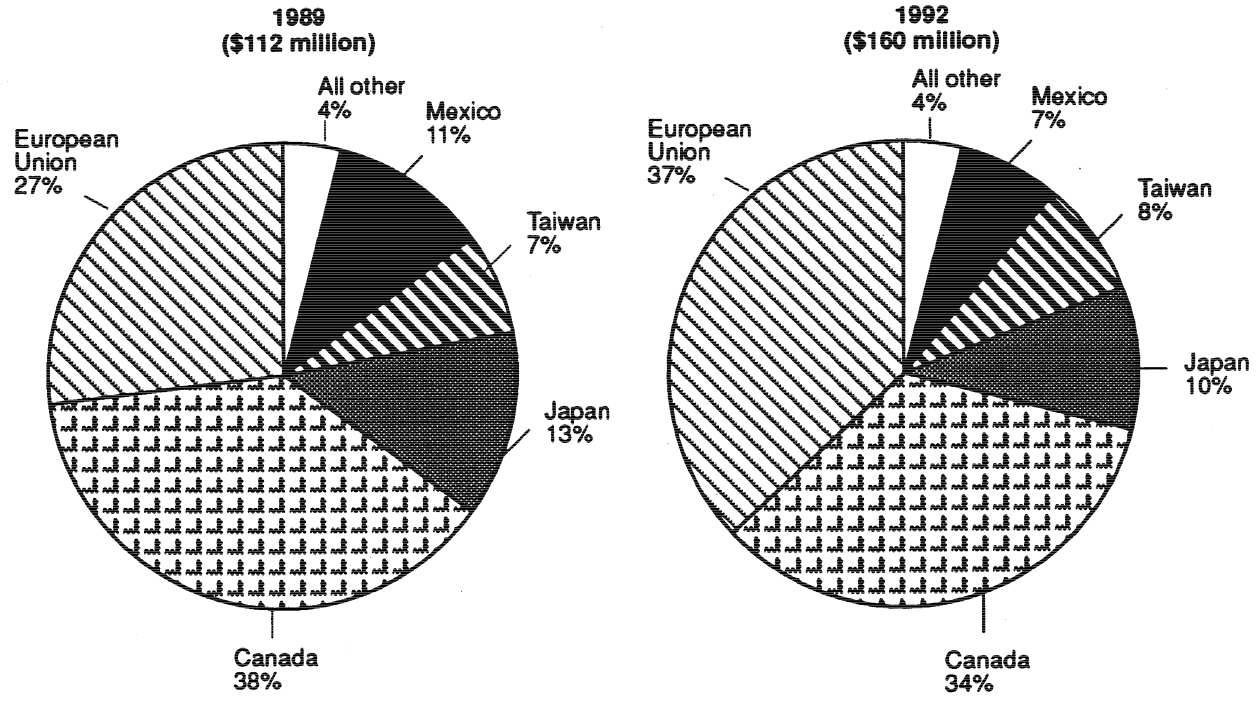
(In thousands of dollars)

Source	1988	1989	1990	1991	1992
Canada	(1)	42,448	32,328	41,665	53,744
Japan	(1)	14,103	14,149	15,540	16,461
Germany	(1)	7,374	9,508	8,790	14,772
France	(1)	9,154	9,465	12,709	14,692
United Kingdom	(1)	9,033	12,575	14,582	14,292
Taiwan	(1)	8,336	9,386	9,462	12,507
Mexico	(1)	11,980	10,410	9,937	11,842
Italy	(1)	2,153	3,225	3,913	8,626
Belgium	(1)	1,099	792	1,527	5,181
Venezuela	(1)	1,232	4,907	4,536	3,092
All other	(1)	5,062	5,751	4,784	4,418
Total	104,539	111,974	112,496	127,445	159,627

[1] Country-level detail is provided only for years in which there are actual trade data under the *Harmonized Tariff Schedule of the United States* (HTS).

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

Figure 7
Fiberglass products: Value of U.S. imports for consumption, by principal sources, 1989 and 1992



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

Table 9
Fiberglass products: U.S. imports for consumption under special duty provisions, by types, 1988-92

(In thousands of dollars)

Type	1988	1989	1990	1991	1992
United States-Canada Free-Trade Agreement	(1)	30,315	27,483	35,855	48,234
Generalized System of Preferences	10,303	11,319	12,196	12,731	11,125
Duty suspension	(2)	(2)	1,254	6,759	8,927
Automotive Products Trade Act	351	303	1,035	4,164	4,644
Imports under HTS Subheading 9802	900	360	223	399	645
United States-Israel Free-Trade Agreement	74	40	6	3	67
Andean Trade Preference Act	(3)	(3)	(3)	(3)	2
Caribbean Basin Economic Recovery Act	0	0	7	0	0
Total	11,628	42,337	42,204	59,911	73,644

[1] Agreement did not become effective until 1989.

[2] Duty suspensions applicable to subheadings 7019.10.10, 7019.10.20, 7019.10.60, 7019.20.10, 7019.20.20, and 7019.20.50 under the *Harmonized Tariff Schedule of the United States* (HTS) did not become effective until 1990.

[3] Act did not become effective until 1992.

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

because of weak European demand. Canada is the fastest growing of the major markets, and the expanding Mexican and Korean markets round out the top four. The EU and Canada are clearly the most significant markets, representing 60 percent of the value of U.S. exports in 1992, up slightly from 56 percent in 1989 (figure 8). Eastern Europe and the Far East are viewed by some U.S. producers as having outstanding market opportunities, but those opportunities may not translate into increased U.S. exports, because U.S. firms may choose to service such markets from their foreign, rather than U.S., facilities.

EU

The U.S. industry's EU production facilities likely contribute to the U.S. industry's competitiveness in the EU market by increasing its understanding of the market and improving its ability to service customers, whether those customers are serviced by products manufactured in EU or U.S. plants. The United States is the EU's largest source of external imports, supplying 35 percent in 1991; most of the other suppliers are European countries that have shorter lines of transportation and communication to EU customers. The EU is a net importer of fiberglass products, with trade deficits in wool and fiber in 1991, and a trade surplus in woven fabric. Recessionary economic conditions appear likely to depress EU demand in the near future, and the long-term outlook for U.S. exports to that market is uncertain. The recent expansion of U.S.-owned EU facilities and attempts to improve efficiency and lower production costs at such facilities may reduce the significance of the EU market in the future, should U.S. firms decide to service the market primarily from their improved EU facilities.

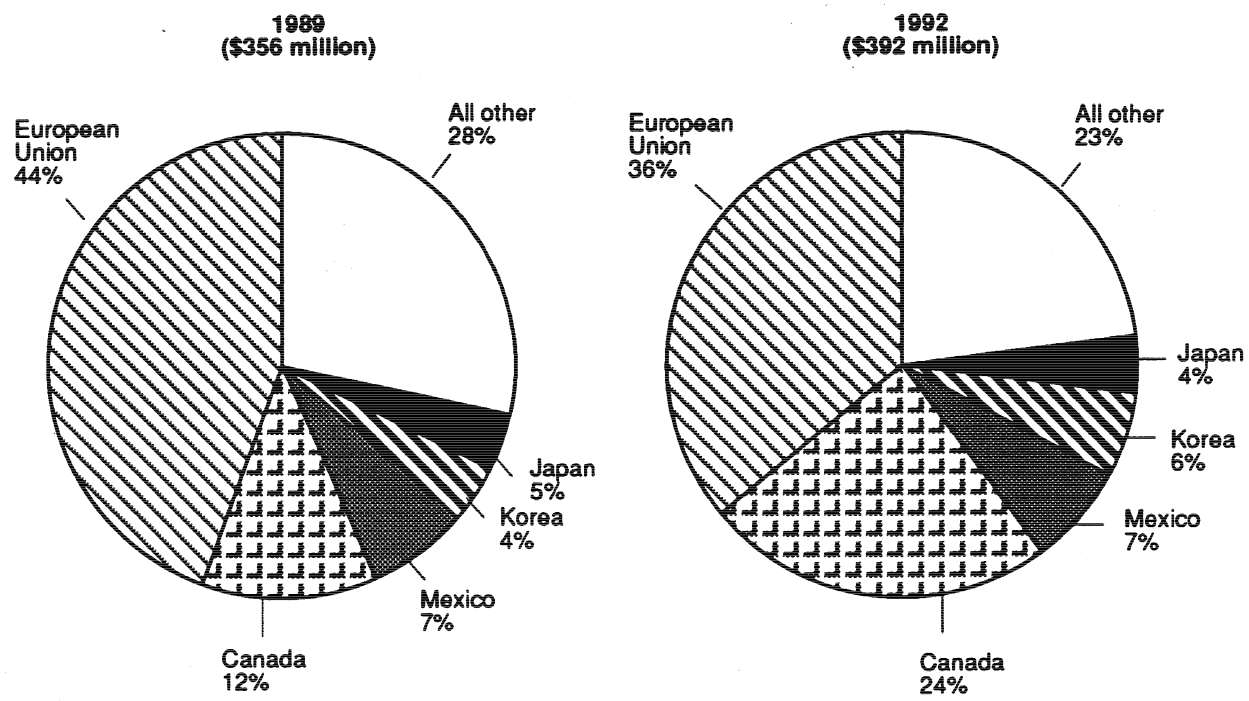
Canada

Short lines of transportation and communication to Canadian customers, limited Canadian competition, corporate affiliation with the leading U.S. producer, and improved market access under the United States-Canada Free-Trade Agreement (CFTA) have been key to the U.S. industry's competitiveness in Canada. The relatively close proximity of Canada to U.S. producers makes U.S. producers more price competitive than other foreign competitors, reducing transportation and communication costs and minimizing service disadvantages such as shipping times. There are only two Canadian producers, and the dominant firm, Fiberglas Canada Inc., is owned by Owens-Corning.

The Canadian industry's limited capacity, corporate affiliation with globally invested Owens-Corning, and relatively small home market tend to limit the Canadian industry's ability to compete in global markets. Canada was a net importer of fiberglass during 1992, running trade deficits in all product areas except woven fabrics and mats. The United States represented 94 percent of Canada's imports and 77 percent of Canada's exports in 1992.

The CFTA appears to have contributed to Canada's position as the second-largest U.S. foreign market. In 1992, Canada accounted for 24 percent of the value of U.S. exports, and the U.S. trade balance in fiberglass products with Canada increased to a surplus of $41 million (up from a deficit of $1 million in 1989). The

Figure 8
Fiberglass products: Value of U.S. exports of domestic merchandise, by principal markets, 1989 and 1992



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

value of U.S. exports to Canada increased significantly during 1989-92 to $95 million in 1992, concurrent with the implementation of the CFTA.

Mexico

Growth of maquiladora operations consuming fiberglass, rather than U.S. investment in fiberglass-producing facilities, was the key to U.S. competitiveness in the Mexican market. U.S. exports to Mexico doubled during 1988-92, making Mexico the third-largest U.S. foreign market. Fiber was responsible for most of the export growth. However, the bulk of U.S. exports to Mexico (82 percent in 1991) is not destined for Mexican consumption but is shipped to maquiladora operations and subsequently exported.[47]

Mexico has one known producer of fiberglass, a subsidiary of Vitro, S.A., a holding company for 85 companies, many of them glass-related. Owens-Corning owns 40 percent of the subsidiary. When imports for maquiladora operations are excluded, official statistics of the Government of Mexico indicate that Mexico was a net exporter of fiberglass in 1991. According to the same data, the United States was Mexico's most significant export market (46 percent) and leading supplier (77 percent) of imports. Prospects for the Mexican market are considered to be favorable, as the automotive industry, a major consumer of fiberglass, continues to expand in Mexico. The NAFTA will likely give U.S. exports to Mexico an additional boost when Mexico phases out its duties on imports of such goods from the United States over a 10-year period, since Mexico's duties on these products are slightly higher than those of the United States.

Korea

The rapid growth of Korea's fiberglass-consuming industries such as the automotive and electronics industries and lack of sufficient Korean fiberglass capacity to meet demand were the primary reasons behind the U.S. industry's competitive success in Korea. Korea was the fourth-largest U.S. foreign market in 1992, but its importance as a U.S. export market is expected to decline as foreign investments in Korean fiberglass facilities continue to expand, reducing the need for import sourcing. Korea was a net importer of fiberglass during 1992, running trade deficits in all product areas except wool. The United

[47] Mexican import data for consumption (which exclude shipments to maquiladoras) were provided to the Commission by the Mexican Government. These data were compared with U.S. export data for the same period to determine the volume of U.S. exports shipped to maquiladoras.

States represented 26 percent of Korea's imports and 10 percent of Korea's exports in 1992.

U.S. Exports

The value of U.S. exports increased by 41 percent during 1988-92 to $392 million (table 10) on the strength of increased shipments to Canada. The EU and Canada remained the dominant markets during 1989-92, with the export product mix shifting slightly toward wool (figure 9).[48] Owens-Corning's efforts to reduce capacity and move production to the most efficient facilities may have contributed to the shift toward wool exports. Owens-Corning closed its oldest insulation plant in Canada in 1991,[49] and the bulk of the increase in wool exports occurred in 1992 and consisted of exports to Canada.

[48] Comparable data by countries and products are not available for 1988.

[49] "Owens-Corning Reports Losses; CEO Sees No Turn Around Soon," *American Glass Review*, July 1991, p. 29.

U.S. TRADE BALANCE

The positive U.S. trade balance expanded during 1988-92 on the strength of export growth. Increased exports to Canada were responsible for much of the improvement in the trade balance during the period, with the U.S. trade surplus reaching $232 million in 1992 (table 11). Prospects for continued strength in the trade balance with Canada appear favorable, as tariffs continue to decrease under the CFTA. Trade balances with European countries may deteriorate in the future because of declining U.S. exports to the region, should U.S. firms decide to service such markets from their improved and expanded European facilities.

Table 10
Fiberglass products: U.S. exports of domestic merchandise, by principal markets, 1988-92

(In thousands of dollars)

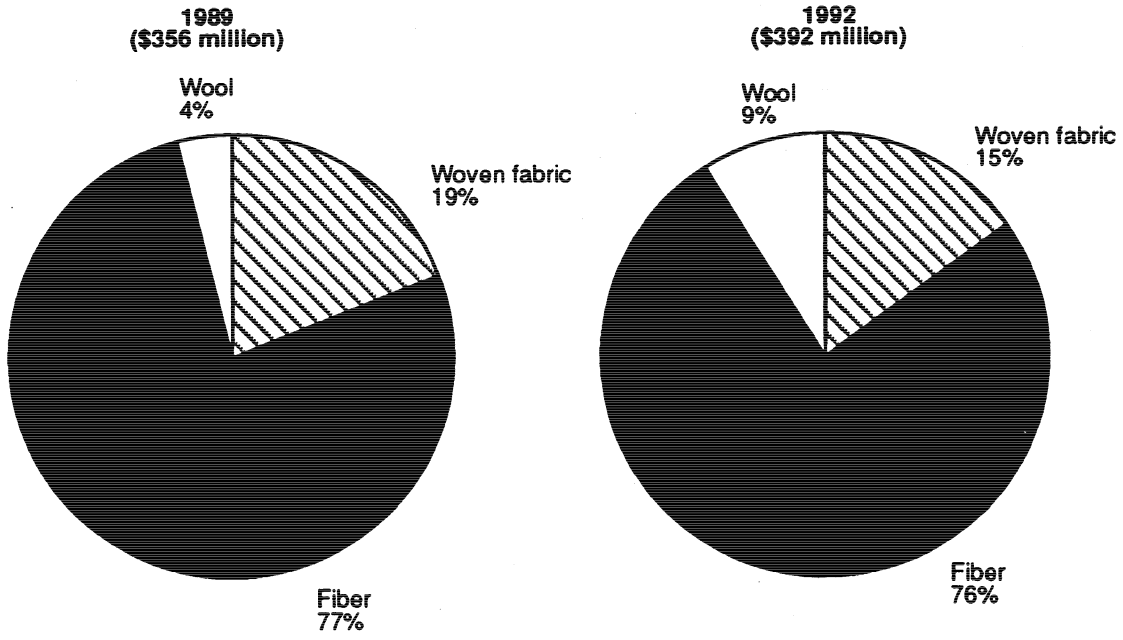
Market	1988	1989	1990	1991	1992
Canada	(1)	41,083	67,029	86,982	94,631
Belgium	(1)	42,907	31,737	40,922	40,285
Germany	(1)	30,798	32,523	32,227	30,251
United Kingdom	(1)	26,542	25,978	25,895	29,277
Mexico	(1)	25,733	17,178	25,863	28,819
Korea	(1)	12,906	17,219	23,109	22,929
Japan	(1)	19,369	20,346	21,548	17,312
Italy	(1)	20,630	16,741	15,870	14,165
France	(1)	26,366	14,794	14,657	13,871
Sweden	(1)	11,066	12,509	11,519	10,028
All other	(1)	98,215	90,925	85,570	90,048
Total	278,688	355,616	346,979	384,162	391,617

[1] Country-level detail is provided only for years in which there are actual trade data under the *Harmonized Tariff Schedule of the United States* (HTS).

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

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

Figure 9
Fiberglass products: Value of U.S. exports of domestic merchandise, by types, 1989 and 1992



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

Table 11
Fiberglass products: U.S. exports of domestic merchandise, imports for consumption, and merchandise trade balance, by selected countries and country groups, 1988-92[1]

(Million dollars)

Item	1988	1989	1990	1991	1992
U.S. exports of domestic merchandise:					
Canada	(2)	41	67	87	95
Belgium	(2)	43	32	41	40
Germany	(2)	31	33	32	30
United Kingdom	(2)	27	26	26	29
Mexico	(2)	26	17	26	29
Japan	(2)	19	20	22	17
France	(2)	26	15	15	14
Korea	(2)	13	17	23	23
Italy	(2)	21	17	16	14
Taiwan	(2)	25	17	12	7
All other	(2)	85	86	85	93
Total	279	356	347	384	392
European Union	(2)	158	134	143	142
OPEC	(2)	9	9	9	15
ASEAN	(2)	6	6	8	12
CBERA	(2)	5	5	5	7
Eastern Europe	(2)	0	0	0	0
U.S. imports for consumption:					
Canada	(2)	42	32	42	54
Belgium	(2)	1	1	2	5
Germany	(2)	7	10	9	15
United Kingdom	(2)	9	13	15	14
Mexico	(2)	12	10	10	12
Japan	(2)	14	14	16	16
France	(2)	9	9	13	15
Korea	(2)	1	1	1	0
Italy	(2)	2	3	4	9
Taiwan	(2)	8	9	9	13
All other	(2)	6	10	9	7
Total	105	112	112	127	160
European Union	(2)	30	37	42	59
OPEC	(2)	1	5	5	3
ASEAN	(2)	0	0	0	0
CBERA	(2)	0	0	0	0
Eastern Europe	(2)	0	0	0	0
U.S. merchandise trade balance:					
Canada	(2)	-1	35	45	41
Belgium	(2)	42	31	39	35
Germany	(2)	24	23	23	15
United Kingdom	(2)	18	13	11	15
Mexico	(2)	14	7	16	17
Japan	(2)	5	6	6	1
France	(2)	17	6	2	-1
Korea	(2)	12	16	22	23
Italy	(2)	19	14	12	5
Taiwan	(2)	17	8	3	-6
All other	(2)	79	76	76	86
Total	174	244	235	257	232
European Union	(2)	128	97	101	83
OPEC	(2)	8	4	4	12
ASEAN	(2)	6	6	8	12
CBERA	(2)	5	5	5	7
Eastern Europe	(2)	0	0	0	0

[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."

[2] Country-level detail is provided only for those years in which there are actual trade data under the *Harmonized Tariff Schedule of the United States* (HTS) and the new Schedule B (based on HTS).

Note.—Because of rounding, figures may not add 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 those enumerated in general note 3(b) to the HTS, whose products are dutied at the rates set forth in ***column 2***. 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, Russia, Slovakia, and the Ukraine are currently eligible for MFN treatment. 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 July 4, 1993. 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
STATISTICAL TABLE

Table B-1
Fiberglass products: Comparison of rates of duty for selected countries and country groupings
(Percent ad valorem)

HTS subheading	Description	United States	Canada	European Union	Japan	Mexico
	Glass fibers (including glass wool) and articles thereof (for example, yarn, woven fabrics):					
7019.10	Slivers, rovings, yarn and chopped strands	6-9.6%	8.5-15%	9.5%	25%	10%
7019.20	Woven fabrics, including narrow fabrics	6-11.1%	15.1-25%	9.5%	25%	10-15%
	Thin sheets (voiles), webs, mats, mattresses, boards and similar nonwoven articles:					
7019.31	Mats	6.2%	15-25%	9.5%	25%	10%
7019.32	Thin sheets (voiles)	6.2%	10.2-25%	6.5%	25%	10%
7019.39	Other	6.2%	10.2-25%	6.5%	25%	10%
7019.90	Other	6.2-6.9%	10.2-25%	9.5%	25%	10-15%

Source: U.S. data compiled by the staff of the U.S. International Trade Commission from *Harmonized Tariff Schedule of the United States (1993)*, p. 70-13; Canadian data from *McGoldrick's Canadian Customs Tariff "Harmonized System"* (Canada, 1990), Vol. 2, pp. 70-12 to 70-13; EU data from *The International Customs Journal: European Economic Community, Year 1991-1992* (Brussels, 1992), p. 269; Japanese data from *The International Customs Journal: Japan, Year 1990-1991* (Brussels, 1990), p. 246; and Mexican data from *North American Free-Trade Agreement*, annex 302.2, Schedule of Mexico, pp. 9-10.