Industry & Trade Summary

Gemstones

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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 gemstones covers the period 1991 through 1995 and represents one of approximately 250 to 300 individual reports to be produced in this series. Listed below are the individual summary reports published to date on the minerals, metals, machinery, 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
2546	August 1992	Agricultural and horticultural machinery
2570	November 1992	Electric household appliance and certain heating equipment
2587	January 1993	Heavy structural steel shapes
2623	April 1993	Copper
2633	June 1993	Textile machinery and parts
2653	June 1993	Glass containers
2692	November 1993	Refractory ceramic products
2694	November 1993	Flat glass and certain flat glass products
2706	April 1994	Aluminum
2738	February 1994	Structural ceramic 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.

PREFACE-*Continued*

USITC publication number	*Publication date*	*Title*
2748	March 1994	Brooms, brushes, and hair-grooming articles
2756	March 1994	Air-conditioning equipment and parts
2757	March 1994	Builders hardware
2758	March 1994	Semifinished steel
2765	April 1994	Metalworking machine tools and accessories
2872	May 1995	Abrasives
2857	May 1995	Industrial food-processing machinery and related equipment
2858	May 1995	Precious metals
2880	June 1995	Stainless steel mill products

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ABSTRACT

The major product groups covered in this summary are natural and laboratory-grown gemstones in loose form and of a quality generally accepted by the industry for jewelry applications. Specific product groups are diamonds, pearls, and colored gemstones (a broad category that includes gemstones other than diamonds and pearls). Three distinct industry sectors participate in bringing these products to market: (1) individuals or organizations that mine gemstones and harvest natural and cultured pearls, (2) companies that manufacture synthetic gemstones, and (3) individuals or companies that process/cut natural and synthetic gemstones.

The U.S. gemstone industry is concentrated in the production of pearls and colored gemstones and the cutting of large diamonds (2 plus carats). Most gemstone producers are small, independent businesses that are widely dispersed. In contrast, the cutting sector is centered in New York City. Average annual domestic production of all types of gemstones during 1991-95 was approximately $664 million. Employment is estimated to range between 1,000-1,500 persons. Imports of gemstones during this period accounted for 92 percent of U.S. consumption. Most were imports of diamonds from Israel, Belgium, and India. Exports of U.S.-produced gemstones averaged 47 percent of production. The largest export markets were Switzerland, Hong Kong, and Canada.

This report analyzes the global structure of the gemstone industry and the interrelationship of industry sectors unique to the product specializations that have developed. It examines how changing market requirements and diverse factors of production have influenced shifts in diamond-cutting centers to new countries, the movement toward developing new products (such as synthetic diamonds), and a rationalization of products by one of the industry's controlling interests, De Beers.

In response to these market challenges, the report discusses the U.S. industry's concentration on the niche for specialty-cut gemstones, and some firms' active promotion of commercial synthesis of gem diamonds. Although the market's response to open trading of lower grade gem diamonds is uncertain because of a number of volatile factors, the report examines the relationships between supply, demand, and price that determine the market dynamics. An added factor affecting market access in the long term will be the quality and economies of scale achieved with synthesizing diamonds, versus mining.

INTRODUCTION

This report provides a global overview of the gemstone industry and examines market trends through a unique compilation of production and trade data that is not otherwise readily available. Industry products covered include: (1) natural and cultured pearls, (2) natural and synthetic diamonds, and (3) natural and synthetic colored gemstones. These products may be in a rough state or they may be cut and/or polished to enhance beauty and commercial value, but they are not yet mounted or set.[1] The report generally covers a 5-year period, 1991 to 1995.

Although the United States accounts for less than 1 percent of total global gemstone production, it is the world's largest consumer of gemstones, particularly diamonds. Imports supply virtually all domestic requirements; in 1995, imports accounted for 92 percent of estimated U.S. gemstone consumption ($4.9 billion). Diamonds are the principal imported product and accounted for nearly 81 percent of estimated consumption in 1995, followed by imports of colored gemstones (8 percent), pearls (2 percent), and synthetic stones (1 percent). The balance of consumption is accounted for by domestically produced products. This trend was consistent throughout the report period.

Most gemstones are mineral compositions; all types have long been held in high esteem for their beauty, rarity, and durability. Although each type of gemstone is homogenous in terms of chemical and physical characteristics, differences in value are a function of qualitative characteristics such as clarity, size, color, and absence of flaws. Like many commodities, colored gemstones and pearls are generally priced on a unit of weight measure and traded on a supply and demand basis that is often cyclical. The diamond industry differs somewhat from other gemstones in that prices are supported by controlling the number and quality of gems in the marketplace relative to demand, a function performed by the international diamond cartel De Beers through its Central Selling Organization (CSO). This practice has resulted in a relatively consistent and stable value for diamonds.

The first stage of production of natural pearls, diamonds, and colored gemstones is determined by geographical deposits; the later stage of cutting and polishing is usually performed in a different country. Recently, there has been a shift in cutting and polishing centers away from the historic industrialized centers (the United States, Belgium, and Israel) to developing countries (India, Thailand, and China). Because gemstone cutting is largely labor-intensive, gemstone cutting and processing skills have gradually migrated to nations with relatively lower labor costs. Moreover, some new centers have adopted advanced cutting technology to mass

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[1] Gemstones are provided for in chapter 71 of the *Harmonized Tariff Schedule of the United States*. The Standard Industrial Classification (SIC) coverage of these products generally corresponds with SIC 1499, Miscellaneous Nonmetallic Minerals, Except Fuels (that part pertaining to gemstone mining and processing); SIC 3299, Nonmetallic Mineral Products, Not Elsewhere Classified (pertaining to synthetic gemstone manufacturing); and SIC 3915, Jewelers' Findings and Materials, and Lapidary Work (pertaining to the cutting and polishing of gemstones).

produce low-value gems. In response to the competitive advantage of some developing nations, traditional cutting centers began to specialize in unique types of cuts or sizes of stones. This restructuring and specialization also has led to a reclassification of high-grade industrial diamonds to lower grade gem-quality diamonds that meet an important price-point niche in the market, attracting a broader customer base.

One unanticipated result of these changes in industry structure and specialization has been a rapid increase in production of substantially lower quality diamonds. The volume of low-quality output became so great that De Beers could no longer control wholesale prices. The result was the De Beers relaxation of the rigid and tightly controlled distribution structure as it applied to low-quality diamonds, and a re-focusing of the CSO's management on higher quality diamonds.

An emerging development that may soon impact gemstone markets is the synthetic production of diamonds. Although synthetic gem production is still relatively new and evolving, Russian research is concentrating in this area and several U.S. companies are already contracting for diamonds produced in Russia.

This summary provides an analysis of the gemstone industries. These industries are not self-contained in any one country. Gemstones are mined or grown in countries with economically viable deposits; they are cut and polished in countries with comparatively low labor costs or market niche specializations; and finally they are shipped to consuming countries that have populations with disposable discretionary income. The symbiotic structure of the industry and global transportation of gemstones has evolved because of the low-weight-to-value ratio of gemstones.

The summary begins by describing the origin, composition, and processing methods used to derive the various gemstone materials and to improve their intrinsic value and attractiveness. It includes an analysis of the market dynamics and the qualitative discriminators used to establish price benchmarks against standardized characteristics and market demand. Subsequent sections examine the U.S. industry and market in comparison to foreign industries and markets.

PROCESSING

The varied origin and composition of different gemstones determines the type of mining and processing. For example, organic gemstones like pearl and coral, are harvested from water bed environments and may be more fragile materials, while most other organic and inorganic

gemstones are mined from various rock formations (deposits).[2] Mining operations range from the most primitive to sophisticated, depending on the kind of deposit and on available financing.

Diamonds and Colored Gemstones

There are two basic kinds of deposits: alluvial/placer[3] and vein.[4] Both alluvial/placer and vein mining can range from a simple process of digging and sorting with hand tools in shallow deposits, to a complex process using mechanized, heavy-duty excavating, drilling, hauling, and sorting equipment. The most sophisticated technologies in gemstones mining operations are generally reserved for the extraction of diamonds from kimberlite vein deposits.[5]

In typical large-scale diamond-mining operations, kimberlite ores are first crushed and screened in stages to a size of about 1.25 inches (a 1.25 inch screen will pass a 350-carat[6] diamond) using jaw, gyrator, and roll crushers in sequence. In cases where crushing is deemed too severe, ore may be milled by putting the material in large rotating drums with water and rocks to gradually breakup the ore and release any diamonds.[7] The broken up ore is wetted and scrubbed to separate soft conglomerates; heavy minerals, including diamonds, are gravity concentrated on 14-foot diameter rotary washing pans. The heavy minerals are then passed to greased tables or belts that vibrate at high frequency; the diamonds adhere to the grease and a water wash removes the other minerals. A heated scrapper removes the grease-adherent diamonds from the table/belt and the grease is melted away with a boiling-water wash. Remaining diamond concentrate is screened at 7 mesh.[8] Coarse fractions are sorted by x-ray luminescence and then by hand. Finer fractions are milled to reduce any waste material to slime and washed away;

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[2] Organically formed gemstones, including pearl, amber, jet, coral, and petrified wood, are formed in one of three ways: (1) as dispersed substance of a living organism (e.g., pearl and coral), (2) as residual material (e.g., amber and jet), or (3) as product of solutions reacting with organic material (e.g. petrified wood).

[3] Alluvial or placer deposits are beds of gemstone material that have been eroded from the source of origin, transported along with earth, sand, and gravel by flowing water, and brought to rest on the earth surface and along river beds and shore lines.

[4] Vein deposits are fissures, fractures, and fault planes in a rock mass that have been filled with precipitated minerals from solution or with magmatic mineral material injected from the depths of the earth. Diamond-bearing veins are called kimberlites.

[5] Kimberlite is an outcropping of the mineral olivine (and other minerals of iron and magnesium) that crystallized deep within the earth, then converted and surfaced as aggregates of hydrous (water containing) magnesium silicate. Kimberlite occurs in vertical pipes, dikes, and sills. U.S. Department of the Interior, *A Dictionary of Mining, Mineral, and Related Terms*, (Washington: GPO, 1968), p. 611.

[6] Carat is a unit of weight used for gemstones, 1 carat equals 200 milligrams (about 3 grains of troy or avoirdupois weight).

[7] Eric Bruton F.G.A., *Diamonds*, 2d ed. (Radnor, Pennsylvania: Chilton Book Co., 1978), p. 144.

[8] Mesh is the number of holes or openings per linear inch in a sieve device, used to sort material by size.

remaining diamonds may be concentrated by skin flotation,[9] electrostatic separation,[10] or hand sorting.

Processing alluvial diamonds requires a different approach because they are coated with a film of mineral salts, making them water-avid and preventing adherence to the grease table. This condition is overcome by treating the concentrated minerals with maize oil and caustic soda, which creates a nonwettable surface on the diamonds so that they will adhere to the grease table/belt. Also the final treatment of alluvial diamonds requires a hydrofluoric acid wash to remove any adhering silicates.[11]

Synthetic Colored Gemstones

Colored gemstones are generally synthesized using variations of either the 'melt' or 'solution' crystal growth techniques, depending on the kind and quality of stone desired. Melt methods are reportedly easier to control than solution techniques and provide a rapid crystal growth rate (hours to days).

Melt Methods

Verneuil flame fusion and Czochralski pulled-growth (named for the developers) are the more common melt methods; prices range from $5-$50 per rough carat on average, with flame fusion priced lower than pulled-growth.[12] With the *Verneuil flame fusion method,* appropriate chemical compounds in powder form fall through a flame where the powder melts at a temperature of about 2,000 degrees Centigrade; resulting molten droplets fall onto a rotating fire-clay support, which is slowly withdrawn at a rate that allows the droplets to accumulate and solidify into a cylindrical shaped crystal, called a *boule*. Reportedly, boules weighing 30 carats have been made in about 30 minutes.[13] The *Czochralski pulled-growth method* melts ingredient powders in a crucible. A rotating rod with a seed crystal attached on one end is

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[9] This process separates diamonds from any remaining waste at the surface of a body of water, which relies on the surface tension of water and the fact that diamonds resist being wetted by water.

[10] This is based on the principle that like charges repel and unlike charges attract; finer diamond fractions and any remaining waste are dropped between positive and negative electrodes that rotate in opposite directions; nonrepelled materials fall in a vertical plane and susceptible materials fall in a position somewhat removed from the vertical plane.

[11] Norman L. Weiss, *SME Mineral Processing Handbook*, vol. 2 (New York: Society of Mining Engineers of the American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc., 1985), p. 28-4.

[12] Deborah A. Catalano, "Lab-Grown Gems: A Changing and Growing market," *National Jeweler*, Mar. 16, 1996, p. 30.

[13] Michael Weinstein, *The World of Jewel Stones* (New York: Sheridan House, Inc., 1958), p. 303.

lowered into the crucible until the seed touches the melt and is then slowly withdrawn. Both methods produce sapphire, ruby, and spinel; pulled growth also produces alexandrite.[14]

Solution Methods

Information on these techniques is somewhat guarded. Solution methods are generally used for 'luxury' synthetics because they take months to produce high-quality crystals with internal growth marks similar to those found in natural stones; however, a trained gemologist can identify a solution-made stone. Common solution methods are flux and hydrothermal; prices reportedly range from $25-$200 per carat (rough), depending on the producer and on the kind and quality of gemstone.[15] The *flux method* uses a nonwater solution with a relatively low melting point in which the ingredients to be synthesized are dissolved, creating a molten solvent. The solvent is cooled slowly to bring about crystallization of the desired gem product; commonly used to produce emerald, ruby, sapphire, spinel, and alexandrite. *Hydrothermal method* uses a water-based solvent with relatively high temperatures and high pressure to bring about crystallization; this method is commonly used for emeralds, aquamarine, morganite, and beryl.[16]

Synthetic Diamonds

Although synthetic diamonds are reportedly produced in the United States for industrial purposes only,[17] they are a natural evolution into the gem market. Therefore, the following simplified explanation of the temperature gradient method, developed by General Electric, is provided for informative purposes. *Temperature gradient*, as with the natural diamond-forming process, requires extreme temperatures (about 2,500-2,900 degrees Fahrenheit) and pressure (about 1.5 million pounds per square inch). The process begins by placing a carbon material (such as synthetic diamond grit) and a metal-alloy flux in a specially designed vessel. Seed crystals (usually small diamond crystals) are placed at the end(s) of the vessel. The temperature and pressure are gradually increased until the flux liquefies and the carbon material dissolves and blends with the flux. The vessel temperature is warmer in the center and cooler at the ends where the seeds are located. This temperature gradient causes carbon to precipitate from the carbon/flux solution and bond to the seed crystals, beginning a growth process. Successful synthesis of large, gem-quality diamonds requires slow growth in a stringently controlled

[14] Catalano, "Lab-Grown Gems," p. 28.
[15] Ibid., p. 30.
[16] Ibid., p. 28.
[17] Industrial applications include cutting, grinding, and polishing. In fact, industrial diamonds are used to cut and polish gem-grade diamonds.

environment; a growth rate that is too fast impedes crystal development. Industry sources report that it takes about 45 to 60 hours to synthesize a 1-carat gem-quality diamond.[18]

Natural and Cultured Pearls

Under *natural* conditions, a pearl is formed when a minute particle or small parasite gets lodged in the soft tissue (mantle) of a live oyster.[19] If the oyster cannot expel the unwanted foreign object, it becomes a source of irritation, causing the oyster to secrete concentric layers of calcium carbonate and organic matter around the object, thereby forming a pearl. Under *cultured* conditions,[20] the same principal applies, but a technician makes an incision in the mantle of an oyster and implants the irritant.[21] This surgical process is usually performed under sanitized laboratory conditions to prevent infection and provide optimal survival rates. Live host oysters are placed in holding tanks of water and then into wire mesh structures suspended in water from floating poles; environmental conditions are monitored and the oysters inspected and cleaned for a specified period of time. It can take from months to 2-5 years to develop a natural or cultured pearl, depending on the desired size and environmental conditions. It normally takes longer to grow a pearl in cold, fresh water than in warmer water temperatures. Harvesting pearls is similar for both natural and cultured varieties; the oyster is pried open and the pearl removed, or in some cases cut free of the shell. Divers remove natural pearl-bearing oysters from their habitat to harvest pearls, whereas cultured-pearl-bearing oysters are worked from the suspended structures.[22]

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[18] Sharon Wakefield, "Synthetic diamond jewelry: Are you prepared?," *Jewelers' Circular-Keystone* (Mar. 1996), p. 48.

[19] Pearl-producing oysters belong to the mussel family, also called mollusca; freshwater mussels common in the United States belong to the unionidae variety.

[20] Cultured half pearls were reportedly produced by Japanese scientist Mikimoto in 1894 and the whole pearl in 1913. In 1921, Japan started marketing the whole cultured pearl in mass quantity. See Weinstein, *The World of Jewel Stones*, pp. 88-89.

[21] For cultured pearls, the irritant is usually a piece of mantle wrapped around a bead of mother-of-pearl taken from a sacrificed oyster (generally, 20 to 30 irritants can be made from one oyster). Location of the irritant and whether or not it is free floating in the mantle material determines the shape of pearl; irritants that get lodged between the mantle and outer shell have to be cut from the shell and are usually flat and irregular in shape.

[22] A live oyster may be used for two or more cultivating periods; more than one implant may be made per live oyster, depending on the size of the oyster and size and shape of the pearls desired.

Cutting and Polishing

Once created or removed from their natural environment, gemstones are enhanced to bring out their beauty and affect a desirable display of the material. The cutting segment of the industry generally specializes in cutting either colored gemstones of both natural and synthetic origin (called "lapidary") or diamonds (called "cutting" or sometimes "manufacturing"). The rudiments of cutting diamonds are first learned on inexpensive colored gemstones. Unlike diamond cutters, however, lapidists generally perform the whole job of cutting, shaping, and faceting a colored gem.

Colored Gemstones

Colored gemstones are generally cut and/or polished in one of three basic ways, depending on the shape and structure of the stone.[23] (1) *Baroque gems*, which are of an irregular shape, may be left in their natural shape, but polished by tumbling in a rubber-lined drum using a polishing medium with or without water.[24] (2) *Opaque to semi-translucent gems* of crystalline structure are generally cut and polished into a convex hemispherical or oval shape with a smooth, rounded surface; this is called a *cabochon* cut and is commonly used for opals and star sapphires. (3) *Transparent, crystalline gems* of sufficient hardness are generally cut and polished into many small plane surfaces called "facets" to reflect light.

Colored gemstones can usually be cut in any direction and are soft enough that they can be shaped with an abrasive of silicon carbide or alumina powder. Traditionally, colored gemstones were cut for jewelry purposes, into one of four basic shapes (round, oval, pear, and step-cut),[25] with U.S. and European lapidists focused on perfecting faceted symmetrical planes to maximize the brilliance of a gem. As global competition showed that standardized cuts could be done in lower wage countries (chiefly in Asia) at lower prices and in greater quantities, production has shifted from the U.S. and Europe to new production centers.

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[23] Most gemstones are inorganic with a transparent, crystalline structure like diamonds. However, some colored stones have a compact amorphous massive structure making them opaque like opals. The structure depends on chemical composition and the basic geological formation process, of which there are three: (1) fusion—cooling and crystallization of magma (e.g., diamond, sapphire, and emerald); (2) metamorphic—chemical and physical change to a rock or mineral deposit deep within the earth as a result of heat, pressure, and moisture (e.g., garnet and emerald); and (3) solution—precipitation from aqueous solutions (e.g., opal and quartz). Some, like the emerald, are formed in more than one way, but all are mined from various rock formations.

[24] This method applies to polished pearls as well as other naturally soft gemstones. The choice of polishing medium and use of water depends on the characteristics of the gem material being polished and the desired finish.

[25] Step-cut is usually used for emeralds and for other crystalline gems, where the aim is to emphasize the body color of a stone and improve dispersion of light. Facets above and below the girdle line (the edge defining the upper and lower portion of a cut gem) are parallel and horizontal for a step effect; the general shape of the stone is oblong, square, or octagonal. (See Weinstein, *The World of Jewel Stones*, p. 33).

Advances in technology have also played a role in removing standard lapidary work from the hands of U.S. cutters. Computerized machinery can now calibrate standard cuts faster and more easily than a person can, often working a multiple number of stones at one time. However, most of the U.S. industry has not invested in equipment processing primarily because of cost. The U.S. sector is comprised mostly of individual cutters and small-size operations of 2 to 3 employees; the up-front investment would be substantial, particularly when competing with already established large-scale operations abroad. Moreover, machine cutting is not yet cost-effective for larger stones because the amount of waste created is greater than waste generated from a good hand-cutter. Larger stones cost more per rough carat than small- or medium-sizes and the additional waste could eliminate any profit for that stone.

During the transition of standard cuts to mechanized off-shore operations, U.S. and European lapidists started moving in the direction of a more individualized and creative form of free-style cutting, called "fantasy cuts." Both traditional and the new contemporary cuts vary optical properties of light to enhance the visual appeal of a gem; the difference is in "the direction of play." Traditional lapidists refract light and play of color out from the stone toward the viewer, giving sparkle and brilliance, but contemporary cuts strive to capture and reflect light in a way that draws the viewer toward and into the stone. This innovative concept in cutting has changed the role lapidists play in jewelry design to collaboration between metalsmith and gem cutter, a role that is reported to have materialized in the last decade as both jewelry designers and customers embraced the change.[26]

Diamonds

Gem-quality diamonds are always faceted; clarity and play of light against the facets creates the "brilliance" quality associated with these gems. In contrast to colored gemstones, diamonds are the hardest known substance and therefore must be cut and shaped with diamond abrasives. Because diamonds are also brittle, they can only be cut in certain directions.[27] Diamond cutters in the United States and worldwide (except maybe cutters of small, low-quality diamonds) tend to specialize in a particular phase of cut, rather than doing the entire job; one person may subdivide a diamond rough and eliminate flawed areas, another cut it into a basic shape, and yet another shape the facets.

Because of the high cost of labor, most of the low-valued diamonds marketed in the United States (including U.S. production) are cut in developing countries where hand labor is plentiful and relatively inexpensive. Diamond cutters in the United States earned an estimated monthly

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[26] Richard W. Wise, "A Cut Above: The New American Cutters," *National Jeweler*, June 1, 1996, pp. 68-76.

[27] Unlike free-style cutting that can be applied to colored gemstones, the physical characteristics of diamond tend to limit styles of cut to symmetrical planes, although new shapes and angles are always being developed to improve brilliance and create interest.

wage of $1,300 to $2,000 in 1992,[28] compared with $80 to $120 a month reported for China in 1994.[29] The United States has long been recognized as a master cutting center, in which craftsmen of the trade tend to specialize in the larger (2 carats plus), high-quality diamonds distributed directly to cutters or through gemstone dealers.[30]

Pearls

Because of the delicate characteristics of pearls, they are not cut to shape.[31] Instead, enhancement focuses on developing natural sheen or 'orient' identified with highly prized pearls.[32] Accordingly, some pearls may undergo a gentle buffing. One such method tumbles the pearls in a device filled with table salt; the pearls are then rinsed with fresh water, dried, and tumbled a final time with bamboo chips.[33] Small openings are generally drilled in the pearls for stringing and sometimes dying is employed to enhance their color. When dying, the hue collects in the porous layer called the *conchiolin*, located between the nucleus and the outer-most layer of the pearl. Bleaching may also be performed to remove any unwanted surface blemishes.

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[28] U.S. Department of Commerce, Bureau of the Census, Industry Series "Jewelry, Silverware, and Plated Ware, SIC 39152," (Lapidary work and diamond cutting and polishing), *Census of Manufacturers,* census years 1977 (p. 39A-12), 1987 (p. 39A-10), and 1992 (p. 39A-12).

[29] Vinod Kuriyan, "China—Upcoming Land of Promise for Gems & Jewelry," *Journal of Gem Industry*, June 1994, p. 13.

[30] Profit margins are higher for larger stones than for smaller ones, justifying higher U.S. labor costs. Also, the U.S. industry, by and large, has elected to not invest in modern (computerized) diamond-cutting equipment that cuts small-to-medium sized diamonds faster and more efficiently than cutting by hand. Clearly the industry has determined that the waste generated by machine cutting is greater than hand cutting, particularly for larger size diamonds that disproportionately reduces the absolute profit margins of larger stones. Larger diamonds cost more per carat than smaller ones, justifying U.S. specialization in traditional craftsmanship, as compared to an alternative of increased capitalization in automation.

[31] Pearls are among the softer gemstones, ranging from about 3 to 4 on Mohs hardness scale of 1 to 10. In terms of weight, about 90 percent of a pearl is calcium carbonate, the remainder is organic matter and water, with minute undetermined residue. Specific gravity generally ranges between 2.5 to 2.9. (Weinstein, p. 74.)

[32] Pearls are composed of thin translucent layers of calcium carbonate and organic matter formed in a concentric arrangement, from which light is diffracted and reflected. Color and quality of the 'orient' depend on the composition, thickness, and arrangement of the layers. (Weinstein, p. 289.)

[33] Deborah A. Catalano, "Cultivating Pearls Down Under," *National Jeweler*, vol. 39, No. 19, Oct. 1, 1995, p. 54.

MARKETING AND PRICING

Market Distribution

The distribution structure for gemstones is generally organized to move rough gems from producer, to dealers of rough gems, to cutters, to dealers of cut gems, and on to the ultimate customers (primarily jewelry manufacturers).[34] There are some distinctions in the flow of goods for each product group. The distribution of diamonds is more involved than for colored gemstones because diamonds include De Beers' role as a dealer in the market. Pearls have the simplest distribution because they enter the market as finished goods. (figures 1-3.)

Dealers generally specialize in natural and synthetic/cultured diamonds, pearls, or colored gemstones, although some dealers may handle all types. In the case of diamonds and colored gemstones, dealers tend to specialize further in handling either rough or cut goods. To facilitate the distribution of gemstones through the market, the industry has established trading clubs[35] in major cities throughout the world, including New York, Los Angeles, Chicago, Houston, and Miami in the United States. Clubs provide central locations for international members to trade on a daily basis. Like the member merchants and traders of gemstones, clubs generally specialize in diamonds, colored gemstones, or pearls; they bring together traders of all types of materials (e.g., rough, cut, natural, and synthetic/cultured) within these groups. These trading organizations are popular because they provide a sense of security and integrity in the industry; membership or sponsorship by a member is required to enter as a visitor. The clubs generally have rules concerning trade practices, and clubs communicate readily with each other worldwide.

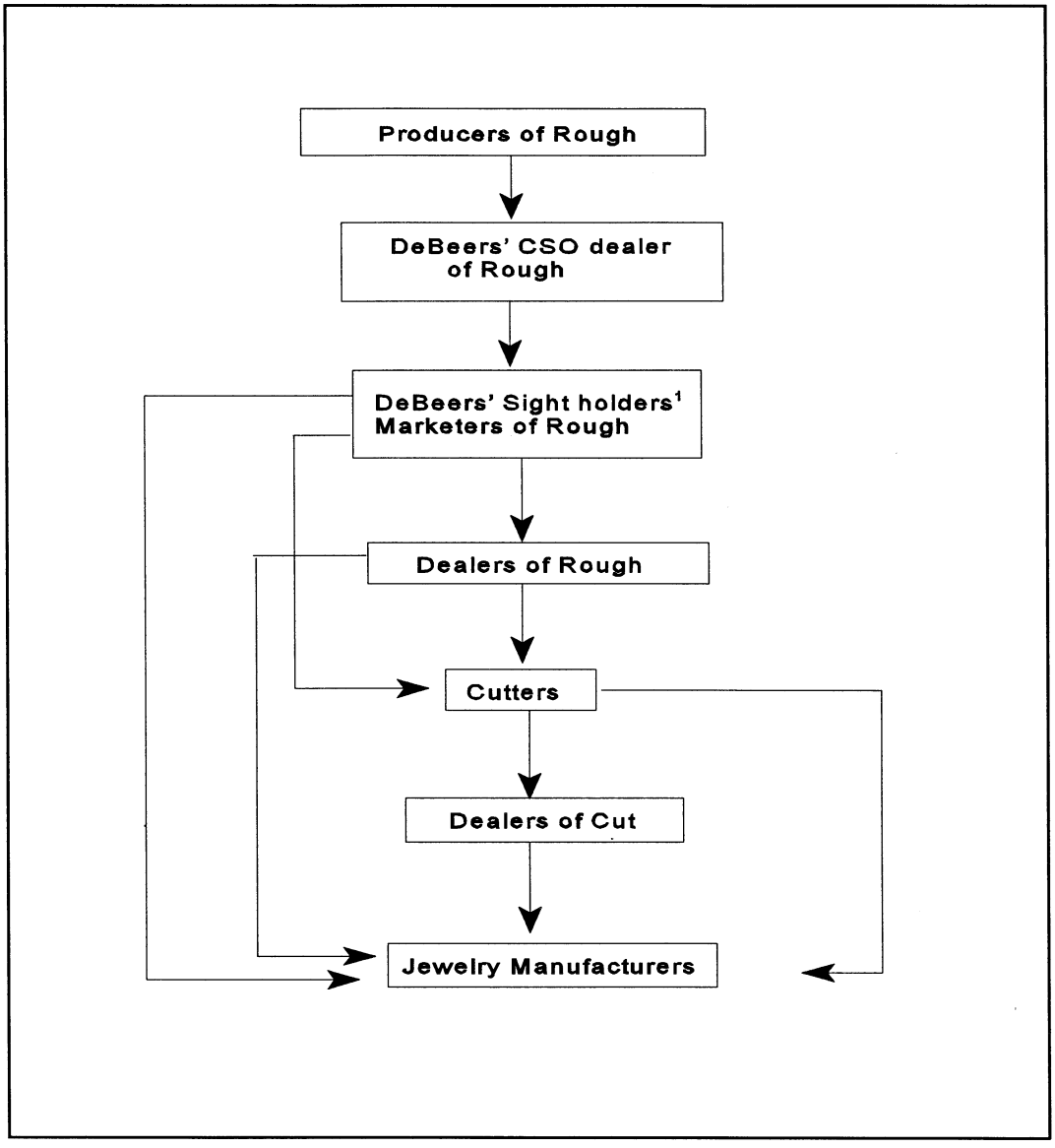
In addition to clubs, trade is conducted in offices of mining operations, dealers, and cutters. International gemstone trade shows are another major avenue for trade; shows provide a good one-stop selection for rough, cut, natural, and synthetic/cultured gemstones of all types. Major buyers of U.S. gemstones include gem and mineral merchants, cutting operations, jewelry manufacturers, wholesale and retail outlets, and gem and mineral shops.

The fundamental difference in distribution of these goods is the amount of control exercised to bring them to market. Pearls and colored gemstones (natural, cultured, and synthetics) enter through numerous dealers and on a competitive price basis. The entry of diamonds, however, is greatly influenced by De Beers, an international diamond cartel. De Beers reportedly controls 80 percent of the world diamond production, with indirect influence over the remaining

[34] The actual distribution flow in the market is very flexible in that any of the gem dealers can be bypassed; in the case of diamonds, approximately 20 percent of the value of world production can be sold outside the De Beers distribution network. There are also dealers who conduct all three operations: trading, cutting, and jewelry manufacturing.

[35] Trading clubs are also referred to as trading exchanges and, in the case of diamonds, as *bourses.*

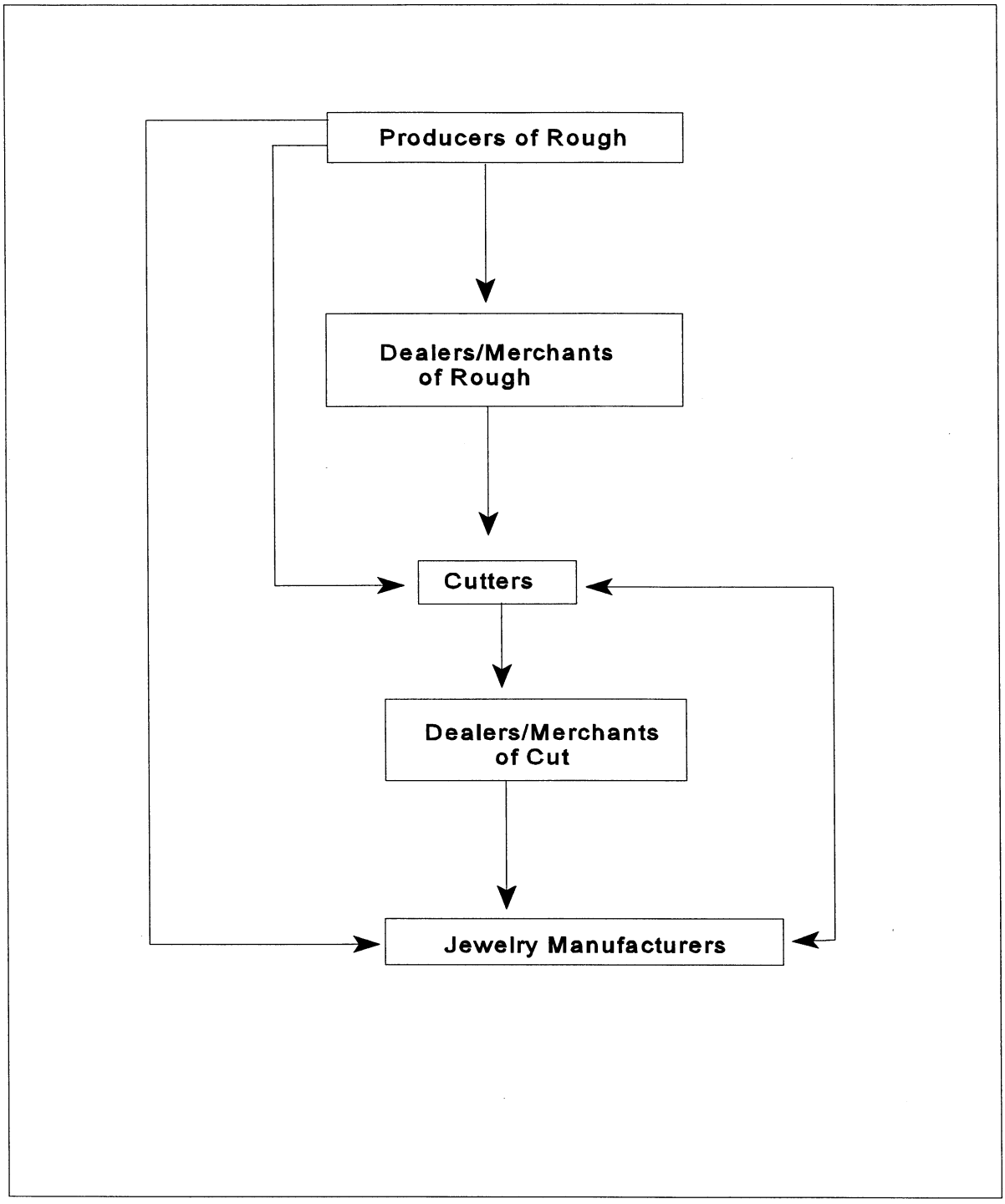
Figure 1
General distribution of natural diamonds



[1] Sight holders are a group of individuals selected and authorized by De Beers to buy rough diamonds directly from De Beers through what the organization refers to as sights; there are approximately 220 sight holders. De Beers conducts 10 sights a year open by invitation only to sight holders.

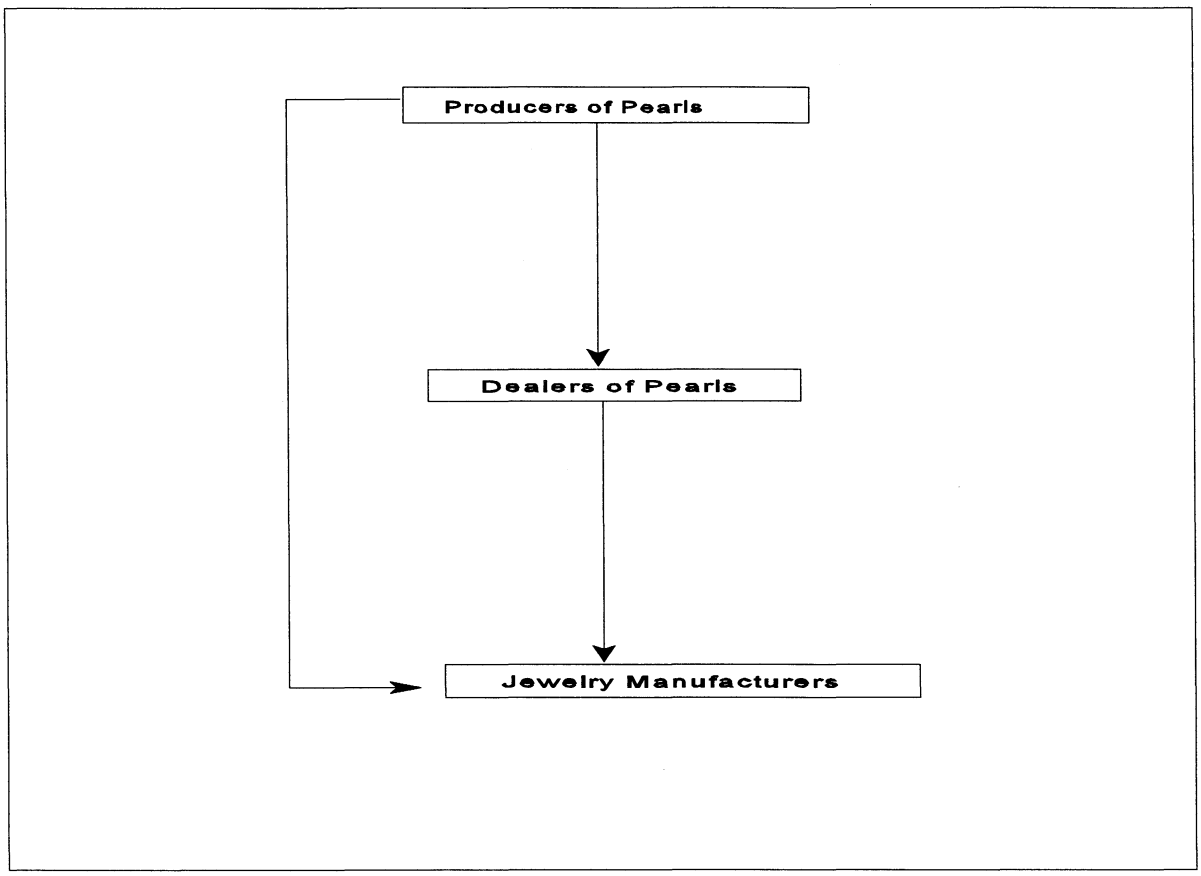
Source: Compiled by U.S. International Trade Commission staff based on various industry sources.

Figure 2
General distribution of colored gemstones, natural and synthetic



Source: Compiled by U.S. International Trade Commission staff based on various industry sources.

Figure 3
General distribution of pearls, natural and cultured



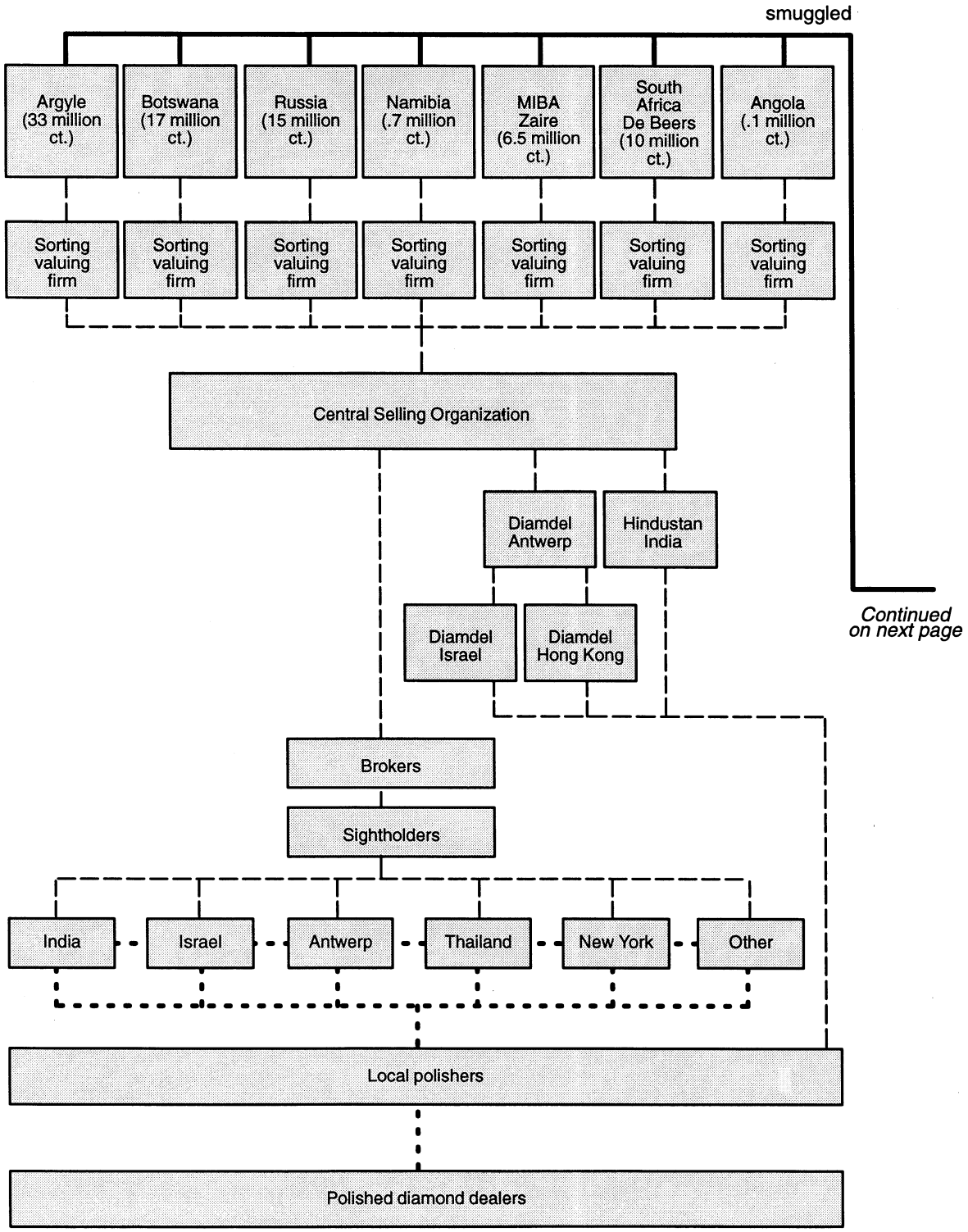
Source: Compiled by U.S. International Trade Commission staff based on various industry sources.

20 percent (figure 4). Through its Central Selling Organization (CSO), De Beers signs 5-year contracts with most major producers (including Argyle of Australia and the Governments of Botswana and Russia) to buy all, or almost all, of the producers' rough diamond output. The CSO also buys rough stones from the market (including production of Zaire, Brazil, and Venezuela). By achieving marketing control over world production, the cartel establishes the quantity, quality, and price of unworked diamonds supplied to the world market.

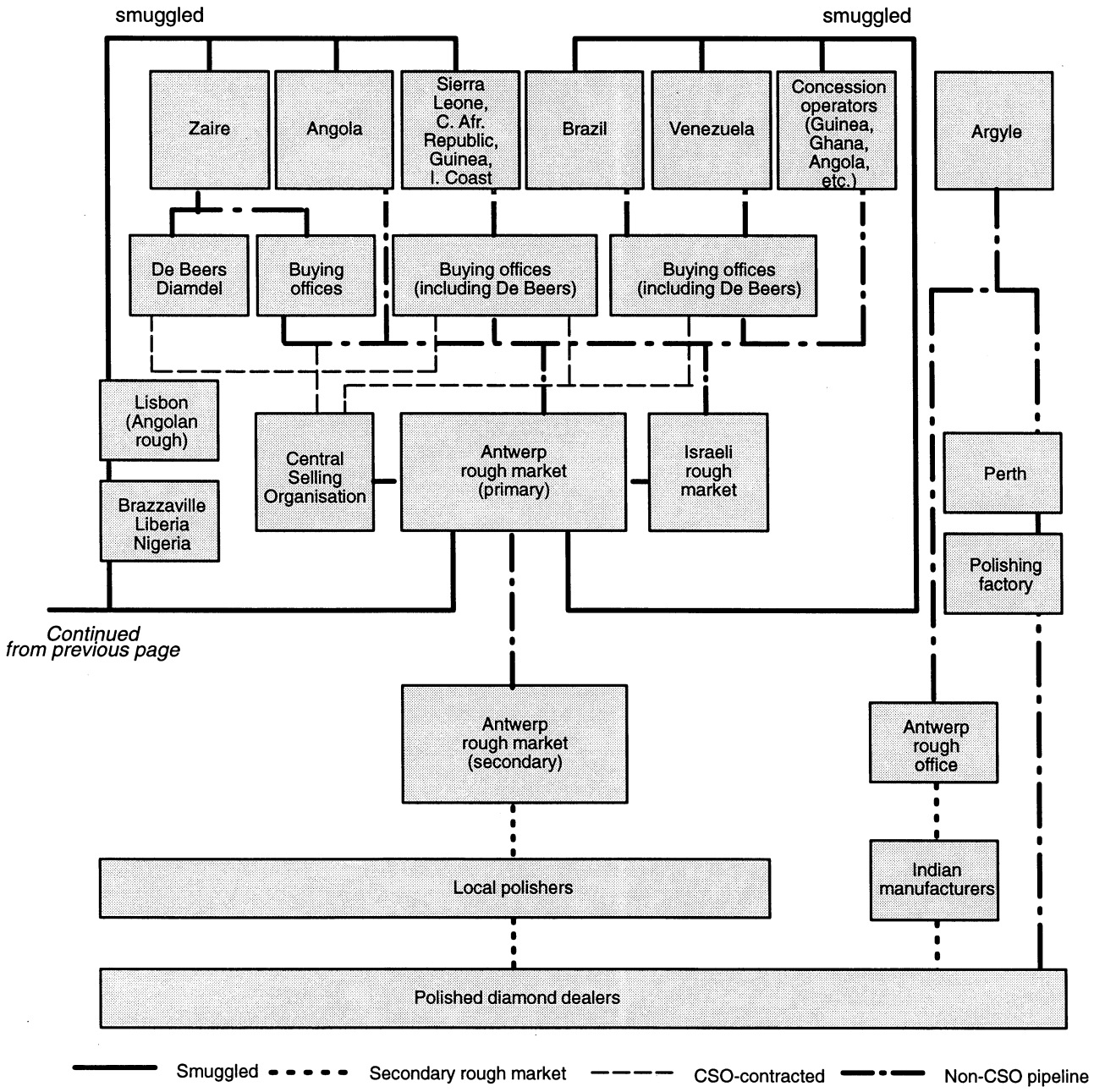
The CSO sells rough diamonds to about 220 "sight holders" (about 20 from New York City) 10 times a year.[36] Most of the sales are conducted in London through five brokerage firms that

[36] Sight holders tend to be owners of diamond cutting businesses or dealers of rough diamonds.

Figure 4
HOW ROUGH DIAMONDS GET FROM THE MINE TO THE STORE[1]



Producers not contracted to the Central Selling Organization



[1] This flow chart covers 1991-1994. Later, several changes took place including: (1) Argyle went independent from the Central Selling Organisation (CSO) in 1996; (2) Russia changed its marketing and exports through Almazi Rossi Sakha in place of the sorting valuing firm, and approximately half of Russia's production is now exported outside the CSO through joint ventures and "leakage;" and (3) Angola's production is all unofficial.

Source: Russell Shor, " Diamonds: From Rough to Cutting Wheel, " *Jewelers' Circular - Keystone,* July 1992, pp. 100-101.

serve as intermediaries between sight holders and the CSO.[37] The CSO determines the rough diamond allocation for each sight holder based on an assessment of the world diamond market conditions. The CSO reportedly applies a 10-percent markup to the producer price, and the brokerage firms collect an additional 1 percent of the sight value from the sight holder. The CSO's conditions of sales are simple—take the rough diamonds offered at the stated price, and pay cash up front.

Once in the market, rough diamonds are sold on a competitive price basis, relative to the same specific, although subjective, value determinants employed by the CSO: size (weight in carats), color, and quality.[38] These three value determinants for rough diamonds provide the basis for gauging what the stone will be worth to a cutter, as the rough quality determines how the stone is to be cut and polished. In turn, the amount of cutting and polishing determines the size of the final stone; these final steps reportedly reduce the size of a rough diamond by at least one-half. Market dynamics in the United States favor the processing of large high-quality diamonds, resulting in the U.S. niche in world diamond cutting. For diamonds, the average value added from cutting and polishing is estimated to range between 30-40 percent of the sale price,[39] depending on the cost of the original rough, quality of cut, and supply and demand of the cut stone.

General Pricing Standards

Cut and Polished Diamonds

Cut and polished diamonds have their own set of specific, although subjective, price determinants:[40] perfection of cut, color,[41] clarity, and size (in carats).[42] The degree of

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[37] In 1991, the brokerage firms were reported to be I. Hennig & Company Ltd., W. Nagel, Bonas & Company Ltd., H. Goldie & Company, and J.P. Morgan. (see Peter Harben and Richard Notstaller, "Diamonds—Scintillating Performance in Growth and Prices," *Industrial Minerals*, Mar. 1991, pp. 43-44).

[38] Quality includes the shape of the rough diamond crystal, and the number, size, darkness, and position of any flaws.

[39] Estimated by Commission staff based on rough and worked diamond trade data. There are insufficient data to estimate added value for colored gemstones.

[40] The sum of these determinants create the rarity factor, which is a measure of supply relative to demand and overall quality. Natural diamonds are an abundant commodity, but the supply of gem-quality diamonds is limited. From an annual production of about 12 tons of natural diamonds in the late 1970s, 20 percent was considered gem quality rough with an approximate value of US $3 billion, the remaining 80 percent was valued at approximately US $750 million. See Bruton, p. 17.

[41] Grading cut diamonds for color means determining the amount of deviation from the preferred truly colorless to gradual increases in tinges of color; yellow is the most common group. Full colored diamonds are marketed as fancies and are valued lower (in terms of color) than the colorless to near colorless category.

[42] Commission staff believes other contributing factors are higher diamond prices, increasing number of worked deposits, and a growing interest in the wide variety of colored gemstones.

influence exerted by color and clarity on price is about the same, depending on market preference; in some countries color is less important than clarity and the reverse in other countries. Larger diamonds of fine quality are the most rare and bring higher prices-per-carat than smaller sized stones of comparable quality; for stones of the same quality, prices rise as weight increases, but at gradually decreasing rates. A general rule during the 1970s was that cut diamonds of twice the weight of a stone of equal quality cost 4 times as much, with price differential leveling off at about 10 carats.[43] By 1992, the size/price ratio of U.S. cut diamonds dropped to about 1.5 to 2 times as much for comparable diamonds of twice the weight.[44] This was thought to be due largely to the sharp contraction in global demand from 1980 to 1986. Prior to this period, the diamond market was strong. Dealers of rough and cut diamonds started accumulating substantial inventories while prices were rising, financing their bank loans for additional inventory purchases with the value of diamonds on hand.[45]

Cut and polished diamonds are graded for color and clarity by several internationally recognized standard commercial scales. There are two standard color scales in the United States; one developed by the American Gem Society and the other by the Gemological Institute of America (GIA).[46] The GIA color scale ranges from the top-ranked colorless grade to yellow, using the letters of the alphabet from D (top grade) through X. The GIA clarity scale ranges from flawless (FL) when using a 10X lens, to imperfect, with inclusions just visible to the naked eye. Both GIA scales were the first to be universally applied. GIA encouraged the use of its scales by offering grading courses and designing and selling grading instruments. The GIA also set up a Gem Trade Laboratory in Los Angeles and one in New York City to grade diamonds and issue certificates for members of the trade and to the public.

Natural Pearls

Natural pearls are appraised by experts for size, shape, absence of surface blemishes, and orient (sheen). Round shapes (favored for strung necklaces) are the most valued, followed by drop and button shapes. Baroque shapes are the least valued. Larger, round pearls are favored because they are the most rare, although necklaces of round pearls of even graduation and all one color

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[43] Bruton, pp. 21 and 340.

[44] U.S. Bureau of Mines, *1992 Annual Report on Gemstones*, Table 6, p. 20.

[45] Investment buying and speculation were also common place. Dealers and investors became the only market for these goods, inducing even higher prices. This activity led to higher, albeit artificially inflated, demand and De Beers continued to supply goods to meet the apparent demand. The cycle spun out of control when prices outpaced purchasing/borrowing capacity, and the artificial demand could no longer support increased acquisition. Highly leveraged dealers/investors were caught with large inventories (including larger stones priced disproportionately higher per carat) and no customer at the asking price. Dealers/investors who could not service the cost of inventory were forced to sell stocks at a loss. De Beers, while not lowering its sight prices, reduced the number of stones it put on the market until supply and demand rationalized.

[46] Another major grading scale in the international market is the International Confederation of Jewelry, Silverware, Diamonds, Pearls, and Stones (C.I.B.J.O), composed of 13 members in 1976: Austria, Belgium, Britain, Denmark, France, Finland, Germany, Holland, Italy, Norway, Spain, Sweden, and Switzerland.

are also very rare and valuable. Pairs of pearls of equal size, shape, and color (used for earrings) are more valuable than single pearls. Also of value in fine pearls is a slight play of color known as 'orient' or sheen, caused by diffraction and reflection of light through thin, translucent layers of carbonate of lime and organic matter that form the pearl. Color and quality of the 'orient' depend on the composition, thickness, and concentric arrangement of these layers; larger, thicker layers do not always translate into fine orient. The relative price-influence of a pearl size versus its orient (sheen or play of color) depends on market preference, with both factors considered important quality characteristics.

Natural Colored Gemstones

Natural colored gemstones are more complex and, some believe, subjective to appraise than diamonds and pearls because of the many different kinds of gemstones and ranges of colors. There are about 100 kinds of gemstones, the bulk of them colored gemstones. The major three—emerald, ruby, and sapphire—and their value determinants are described in figure 5.

There are no internationally recognized grading scales for colored gemstones, but there are general descriptive guidelines used by the trade. Traditionally, colored gemstones have been valued by comparing the color/quality of a gemstone from a particular deposit to an established benchmark gemstone from a different country. This is sometimes referred to as "locality" or "origin nomenclature." For example, use of the phrase "Burmese ruby" could identify a ruby from Burma (the quality standard for rubies), or it could be used as a comparable description of color saturation and purity of rubies from more recent sources including Thailand, Vietnam, and Kenya. Misnomers have sometimes been used to describe the color/quality of different colored gemstones, i.e., "African emerald" for tourmaline, "Brazil diamond" for quartz, and "Manchurian jade" for soapstone. These descriptive devices are a growing controversy within the trade because they imply value/price by association.

Grading systems for colored gemstones have emerged in the past 15 to 20 years, but there are no universally applied systems. Some in the trade do not like the use of grading systems, believing that they eliminate the romance associated with buying gemstones. Others advocate the use of a standard grading system for colored gemstones, arguing that a gemstone from any deposit should be valued for its merits. They believe that grading systems will bring order to the market by providing a basis for determining prices and helping to instill public trust.

The GIA is encouraging the use of its grading guidelines for colored gemstones in the United States and in international markets by opening service and training branches in Taipei, Taiwan, and Venice, Italy. In addition, the International Colored Gemstone Association opened its first branch outside the United States in Jaipur, India, where an estimated 75 percent of the world's cut emeralds are traded, as well as a significant amount of other colored gemstones. The Gemological Association of Idar Oberstein, Germany (the world's oldest, established colored gemstone cutting and trading center) offers gemology service and provides training at its facility to English- and German-speaking students from any country.

Figure 5
Value determinants of gemstones

Diamond:
- . Quality of cut, accurately proportioned
- . Clarity, clean of surface and internal flaws for best refractive quality
- . Color, clear or free of color (sometimes referred to as white) favored
- . Weight, price increases with increase in weight.

Influence of color and clarity on price is about the same, depending on market preference; in some cases color is sacrificed over clarity and vice versa.

Pearl:
- . Natural versus cultured; natural favored
- . Clean of surface blemishes
- . Shape, round favored followed by drop and button shapes
- . Size, large and round considered most rare and valuable
- . Orient or sheen, esteemed in the finest pearls

Influence of color on price depends on market preference. Colors include white, off-white/cream, and shades of black, yellow, blue, green, and rosee.

Colored Gemstones, the three major gems:
Emerald -
- . Quality of cut, accurately proportioned
- . Green, strong saturation (amount of color) and strong tone (depth of color)
- . Clean of surface and internal flaws
- . Size

Emerald is a defined green shade of the mineral beryl (beryllium-aluminum silicate); generally in the range of medium to dark green. Beryl is also the basis for other gemstones including light green (green beryl), blue-green (aquamarine), shades of yellow (golden beryl), and rose pink (morganite).

Ruby -
- . Quality of cut, accurately proportioned
- . Red, strong saturation (amount of color) and strong tone (depth of color)
- . Clean of surface and internal flaws
- . Size

Ruby is the mineral corundum with sufficient amounts of chromium to create the color red. They can be orangy, purplish, or brownish, but dominant color must be red. Rubies tend to be valued by country of origin, with fine qualities from Myanmar (formerly Burma) setting the benchmark.

Sapphire -
- . Quality of cut, accurately proportioned
- . Color, blue favored
- . Clean of surface flaws, but very specific microscopic needle-point inclusions favored
- . Size

Sapphires represent all colors of the mineral corundum except red (ruby); colorless corundum with traces of titanium and iron make blue. Fine stones from Kashmir, India set the benchmark in quality for their cornflower-blue and velvety appearance, created by microscopic needle-point inclusions (solids, gas, or liquids enclosed within the mineral).

Source: Compiled by U.S. International Trade Commission staff based on various industry sources.

Cultured Pearls and Synthetic Gemstones

Cultured pearls and synthetic gemstones can be identified and appraised by the same experienced gemologists that appraise natural gems. They are appraised for the same characteristics as their natural counterparts, but at a lower price for comparable quality.

U.S. INDUSTRY PROFILE

Industry Structure

The gemstones industry has a global structure in which indigenous resources determine the leading countries producing natural goods. Because the United States has never had significant commercial deposits of gemstones, the United States has been primarily a consumer of imported goods, particularly diamonds. However, the United States does have a small but competitive segment of the industry devoted to cutting and polishing larger diamonds (2 carats or more). There is also a growing synthetic gemstone industry.

Producers, Employment, Geographic Distribution

The domestic natural gemstone industry is comprised of many small, independent producers of freshwater pearls (natural and cultured), colored gemstones, and synthetic products. Because of the inherent uncertainty associated with finding and recovering gem-quality deposits, large changes in the number of production operations are not atypical. Between 1991 and 1995, the industry experienced some rationalization when the estimated number of operations dropped from 393 to 346, believed to be due primarily to the inability to develop and sustain economically viable gemstone deposits and lack of long-term financing.[47] Colored gemstone mining accounted for the largest drop, from 330 to 282 operations, with an average from 2 to 3 production employees at each site.[48] The number of freshwater pearl operations decreased from 51 (owned by 5 companies) to 50 (3 companies), and the number of synthetic gemstone

[47] Other contributing factors include shifts in demand for gemstones typically produced in the United States; the basic diamond, emerald, ruby, sapphire, and round pearl gemestones make up only a small portion of U.S. production. Also, the number of individual miners and dealers that compose the U.S. industry and their movement into and out of business make it difficult to keep accurate data.

[48] Mining figures include operations where individuals may pay a fee to search for gemstones, keeping what they find. Crater Diamond State Park of Arkansas is a fee-site deposit operation and is the only known working diamond deposit in the United States. Reportedly, patrons found 135 carats of diamonds in 1993.

operations decreased by one to 13 (13 companies). There were no commercially viable domestic deposits of diamonds during 1991-95.[49]

The cutting sector for this industry is usually in or near populated urban centers with a high concentration of potential jewelry manufacturers and customers. According to the 1977 U.S. Census, there were an estimated 1,000 diamond and colored gemstone cutters concentrated in New York City.[50] After a sharp contraction in the global diamond market between 1980 and 1986, the number of U.S. cutters decreased to about 300 in 1992. As demand rejuvenated, cut work shifted to off-shore facilities in developing countries with a comparatively large and inexpensive labor force.

Natural Pearls and Gemstones

The location of gemstone operations in the United States, as in any country, is limited to the availability and economic viability of natural resources. Freshwater pearls are primarily harvested along the Mississippi River and tributaries, where the preferred habitat for most oyster species is in the gravel or sand bottom of a swift water current. [51] Colored gemstones are mined from naturally occurring deposits located in remote areas where low land values allow economic extraction. Although all 50 States report the production of natural gemstones, Tennessee, Alabama, Arkansas, North Carolina, Oregon, and Arizona accounted for the bulk of output in 1995 (see tabulation).[52]

Gemstone types	States	Products
Freshwater pearls	Tennessee[1]	Natural & cultured
	Alabama	Natural
Colored gemstones	Arkansas	Diamond and quartz crystal
	Arizona	Turquoise and peridot
	North Carolina	Emerald
	Oregon	Variety including jasper, agate, thunderegg, petrified wood, and labradorite

[1] Freshwater pearl production in Tennessee includes 6 cultured pearl farm operations.

[49] The first commercial U.S. diamond mine came into operation in late 1995/early 1996.

[50] There are no data available to delineate between lapidarian (colored gemstone cutters) and diamond cutters.

[51] Gemological Institute of America, *American Freshwater Natural Pearls,* prepared by James L. Sweaney and John R. Latendresse, (Camden, TN, 1982), p. 4.

[52] U.S. Department of the Interior, Division of Mineral Commodities, *Annual Report on Gemstones (1995)*, by Gordon T. Austin (Washington, DC: U.S. Bureau of Mines, 1996), p. 6.

Synthetic Colored Gemstones and Diamonds

In contrast to their natural counterparts, synthetic gemstones tend to be produced near urban centers where facilities are more readily available for product research and development, and where markets can be developed. Production for these materials was reported for nine States (table 1).[53]

U.S.-produced synthetic diamond first appeared in 1954 when General Electric (GE) successfully produced diamond grit (tiny crystalline pieces) at its research laboratory in Schenectady, NY; it was commercially marketed in 1957 for industrial abrasive applications. After another 15 years of research and development, GE announced in 1971 its successful synthesis of gem-quality diamonds, revealing "jewelry-size" samples of colorless, yellow, and blue crystals.[54] Reportedly these products are also intended for industrial application only. Although commercially available, some U.S. researchers maintain that synthesis of gem-quality diamond on a large scale is not yet economically viable when compared with the mined variety.[55] Even so, the prospect of expansion into the jewelry markets looms large; in 1995, rumors first surfaced that small quantities of yellow synthetic gem-quality diamonds were on the world market.[56] This U.S. commercial industry for synthetic gemstones seems to be quite stable with 11 of the 13 producers identified in table 1 in business throughout the 1991-95 period; GE is excluded because it reportedly produces synthetic gem diamonds only for industrial applications.

FOREIGN INDUSTRY PROFILE

The competitive strength of foreign producers is an indigenous supply of natural materials, primarily diamonds. In terms of the cutting sector, lower labor costs in developing countries prove beneficial where the more popular smaller cut diamonds (1 carat and less) are mass produced. In addition to the traditional low-cost cutting centers, a growing number of other countries are combining low cost labor advantages with advanced technology investments in cutting equipment and training as part of their effort toward economic growth, thus widening their margin of competitive strength; some of these countries include India, Thailand, China, and Botswana.

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[53] Notably excluded from the list is synthetic diamond.

[54] K. Nassau, "The Current Decade Synthetic Gemstones in the 1980s," *Lapidary Journal*, vol. 40 Mar. 1987, p. 37.

[55] Sharon Wakefield, "Synthetic diamond jewelry: Are you prepared?," *Jewelers' Circular-Keystone*, Mar. 1996, p. 49.

[56] In 1996, there have been additional reports that small amounts of synthetic diamonds produced in Russia have been sold (as synthetics) at various gem trade shows in the United States. So far, all of these diamonds are reported to range in color from light yellow to orange.

Table 1
U.S. producers of synthetic gemstones

States	Companies	Products
Arizona	R.T. Research Co	Malachite and azurite
California	Chatham Created Gems, Inc.	Emerald, ruby, and sapphire
	Creative Crystals	Alexandrite
	J.O. Crystal Company	Ruby
	Syntho Tek	Turquoise, coral, azurite, and malachite
Massachusetts	Ceres Corp	Cubic zirconia
Michigan	ICT, Inc.	Ruby, garnet, sapphire, and cubic zirconia
New Jersey	Regency Created Emeralds	Emerald
	Singh Industries	Cubic zirconia
North Carolina	Linton-Airtron	Alexandrite
Ohio	Sawyer Research	Amethyst
Texas	Ruyle Laboratories	Ruby
Washington	Union Carbide Crystal Prod.	Ruby

Source: U.S. Department of the Interior, U.S. Bureau of Mines.

Rough, Unworked Materials

Major operations associated with the production of natural gemstones and cultured pearls are located where deposits are economically viable, as determined in part, by real estate, environmental, and labor costs. These locations are primarily in developing countries that rely heavily on natural resources to create capital and foreign exchange, or in remote regions of industrialized countries.

Total global reserves of gemstones are unknown. However, world diamond reserves are estimated at 300 million carats (including near gem and cheap gem qualities), nearly all of which are in Australia, Africa, and Russia-Siberia.[57] Diamond reserve estimates will increase as new economically viable deposits are discovered; these are usually in tectonically stable regions with kimberlite[58] occurrences.[59] Despite scarcity and economic uncertainty of new exploration and diamond reserves, evaluations are being conducted in Australia, Canada, India, Finland, Russia,

[57] BOM, 1992 *Gemstone Yearbook*, pp. 3-4.

[58] Tectonic refers to forces within the earth that cause movement of the crust, i.e., earthquakes and faults. See Peter Harben and Richard Notstaller, "Diamonds--scintillating performance in growth and prices," *Industrial Minerals*, Mar. 1991, p. 37.

[59] Diamond-containing kimberlites, however, are rare. Of an estimated 5,000 kimberlite deposits identified worldwide, less than one-third contain diamonds and fewer yet are considered economically viable under current market conditions.

and Sweden. The 1994 announcement of diamond deposits found in Finland is the most recent and surprising discovery, but, Ashton Mining of Australia had been exploring that area since 1986.[60] Factors that encourage exploration include increasing demand for diamond jewelry, rising prices for rough diamonds, and depletion of developed deposits.

Diamonds

Diamond mining is reported for 32 countries in Africa, Asia, Australia, and South America. Together, seven countries reportedly accounted for approximately 93 percent of the value of annual world diamond production, and approximately 96 percent of the quantity (table 2).[61] All seven countries sell production to De Beers for distribution into the world market, with the negotiated option of retaining a percentage of production for their own sales outside the De Beers network.[62]

With the exception of Angola and Zaire, which tend to be troubled by civil disorder, diamond mining operations among major producers are highly capitalized and sophisticated. Moreover, the industry is dominated by two organizations with access to capital and the most advanced mining technology: De Beers Consolidated Mines Ltd. of South Africa, and Australia-based Argyle Diamond Mines Pty. Ltd., which is a joint venture between CRA Ltd. (57 percent), Ashton Mining Ltd. (38 percent), and Western Australia Development Corp. (5 percent). The Governments of Botswana and Namibia were able to acquire capital and technology for their diamond mining operations through contract negotiations with De Beers. In Russia, the Government provided capital and technology for diamond mining until the breakup of the Soviet Union; since then Russia has also turned to De Beers and other large foreign organizations for capital and mining development. Advances in mining equipment and methods of operation allow producers to bring into production formerly inaccessible deposits (most recently, off-shore diamond mining in Namibia) and extend the production life of developed deposits.[63] A discussion of mining conditions for each of the seven major diamond producers follows:

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[60] *Mining Journal*, London, Nov. 25, 1994, p. 385.

[61] Table 2 is intended to provide a frame of reference only. Although these same seven countries have long been reported as the principal sources of gem diamonds, the value and quantity of production varies from year to year and among different information sources, as noted when comparing quantity of production for these countries in figure 4 of this report. Quantity estimates provided by Bureau of Mines (BOM) tend to be more conservative than production quantity provided by other information sources; in this case, BOM data covers production in 1992. Commission staff was able to identify only the one source for a complete compilation of estimated value production; in this case, the production year was not provided but was reported in a 1994 publication.

[62] Russell Shor, "De Beers Closes Rough Road," *Jewelers' Circular-Keystone*, Oct. 1991, p. 69.

[63] Mine operations face marginally profitable ore grade (carats of diamond per ton of ore mined) as deposits are worked. The inherent economic advantage of higher ore concentration is reduced as the cost of mining increases with each new level of depth. Advances in deep-mining technologies have helped to bridge the gap between marginally decreasing ore concentration and rising costs, allowing producers to sustain long-term mining operations that would not otherwise be economically viable.

Table 2
Principal sources of gem diamonds, annual production, and relative quality, 1992

Countries	Production		Relative value
	Dollars	Carats	
	Billion	*Million*	*Average price per carat*
Russia	1.6	9.0	178
Botswana	1.4	10.0	140
South Africa	0.9	4.4	204
Zaire	0.7	3.0	233
Australia	0.4	21.0	19
Namibia	0.3	1.5	200
Angola	0.3	0.9	333
Other countries	0.4	2.2	N/A
Total	6.0	52.0	N/A

Source: Production value compiled from International Affairs, FBIS-USR-94-088, Aug. 15, 1994, p. 77; production quantity from U.S. Department of the Interior, Bureau of Mines, Mineral Commodity Summaries 1994, report on gemstones, p. 69.

Russia

Uncut natural diamonds are second only to petroleum as a major contributor to Russia's hard currency earnings.[64] The Republic of Sakha (formerly Yakutiya), in Siberia, accounts for about 98 percent of Russia's natural diamond production. Diamond mining in Russia employed 40,000-50,000 people prior to the collapse of the Soviet Union. Subsequently, the Governments of Russia and of the Republic of Sakha went through a series of organizational reforms in an effort to form a mutually beneficial commercial alliance. The diamond deposits of Sakha are reportedly owned by the Republic, with development responsibilities shared by the Russian and Republic Governments, and by the labor collective through the Diamonds of Russia and Sakha Company, which is a joint-stock company formed in 1992. The industry's organizational structure is further complicated in that De Beers reportedly has separate contractual agreements with both Russia and the Republic of Sakha.

In the 1990 contract with De Beers, the Republic of Sakha agreed to retain up to 10 percent of its diamond rough for cutting and/or sale outside the De Beers network. However, approximately $500 million of diamonds leaked out of Russia into the world market in the first half of 1994.[65] In turn, De Beers reduced the amount of diamond purchases from producers under contract, reduced the number of diamonds sold at sight sales, and purchased rough diamonds in the world market in an effort to support diamond prices.[66] Some industry reports

[64] FBIS-USR93-048, April 19, 1993, p. 20.

[65] "Russia Steps Up Pressure on the CSO," *Mining Journal*, Sep. 23, 1994, p. 227.

[66] This was also a period of decreasing world oil and metal prices and growing requirements for capital investments in Russia's mineral and metals mining industry. (See "Russia Steps Up Pressure

(continued...)

suggest that these extra diamonds were drawn from Russia's inventory and may have been part of an effort to influence negotiations with De Beers for a more favorable contract; possible contract provisions include an increase from 5 to 25 percent for diamonds sold outside the De Beers network; acquisition of De Beers' stock in exchange for part of the Federal diamond reserve; Russian representation on De Beers' Board of Directors; and assistance in the development of Russia's diamond cutting industry.[67] Russia's contract with De Beers expired December 31, 1995; negotiations for a new contract are reportedly ongoing with Russia's delegation including the Republic Government of Sakha (which controls mining and cutting in that region) and Russia's Treasury (which controls the diamond stockpile).[68]

Russia's industry benefits from low labor costs and an indigenous supply of jewelry-quality diamonds, but the Sakha deposit is in a permafrost zone, making mining operations difficult and costly. New diamond deposits have been discovered in Western Russia, but foreign investment capital is needed to finance exploration and development. A number of companies are reportedly involved in exploration efforts including De Beers, VNR Company and Ashton Mining of Australia, Canment Resources of Canada, Fal Marine of South Africa, and Arkhangel Exploration (subsidiary of Texon Star) of the United States.[69]

Botswana

Second only to Russia in terms of production value, uncut diamond sales are an important revenue source for Botswana, accounting for an estimated 50 percent of the Government's revenue and 40 percent of the country's gross domestic product.[70] The Government of Botswana (GOB) and De Beers share a 50-50 partnership in Debswana, Botswana's diamond mining company, which operates three mines (one each at Jwaneng, Letlhakane, and Orapa). Through contract agreement, the GOB secured 5 percent of De Beers' stock and has two members on De Beers' Board of Directors. Under the 1991 contract, De Beers agreed to build a 500-worker diamond cutting plant that will specialize in preparation work, but not faceting. Botswana sells all of its diamond production through De Beers.[71]

South Africa

De Beers owns and operates most of South Africa's diamond mines, and accounts for approximately 95 percent of the country's diamond production; the remaining 5 percent of South Africa's production is accounted for by independent miners and sold outside De Beers' network. For a work force of approximately 20,000 employees, wages and working conditions at De

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[66] (...continued)
on the CSO," p. 227.)

[67] Telegram from American Embassy Pretoria, South Africa, Pretoria 014042, Section 3 of 8, Sep. 29, 1994.

[68] FBIS-USR-94-088, Aug. 15, 1994, p. 78.

[69] FBIS-USR-94-086, Aug. 9, 1994, p. 30.

[70] Kenneth Gooding, "De Beers Digs Deeper into its Resources," *Financial Times*, Sep. 6, 1994, p. 26.

[71] Shor, "De Beers Closes Rough Road," p. 69.

Beers' diamond mines are reportedly better than for most other mined commodities in South Africa. In an effort to establish good labor relations, De Beers started a shareholders plan in 1987 offering employees with over 2 years service a maximum of 10 free shares of stock a year.[72]

Driven by decreasing ore grade and rising mining costs in its long established operations, De Beers discovered diamondiferous pipes at Venetia in 1980 and brought the facility on line in 1992. Located in the northern Transvaal near Messina, it is designed to employ 870 people from the local communities. As a conventional open pit mine, it is a low-cost, high-grade operation (137 carats per 100 tons of ore).[73] Production is reported to be 50-60 percent gem quality stones (40-50 percent industrial grade), accounting for 70 percent of the country's total 1991 production. The mine's life expectancy is estimated to be 20 years as an open pit operation, with the economic viability of an underground mine to be assessed at a later time. Environmental controls reportedly incorporated into the mine include construction of buildings to blend with the natural landscape, revegetation to occur during the course of operation, and establishment of an environmental monitoring committee. Other than Venetia, diamond mines in South Africa are mature operations coping with depleting deposits and growing operating costs as mining depths increase.[74]

Zaire

Zaire has experienced severe economic problems since the late 1970s and bouts of political unrest since 1990. In an environment of economic and political instability, Zaire's diamond trade is reportedly controlled by rebellious military factions and foreign merchants, providing little revenue for the government.[75] Although Zaire is among the top seven diamond producers in terms of quantity, the overall quality of its diamonds is relatively low at an average price of $9.00 per carat. Zaire does not have a formal diamond-marketing contract with De Beers, although MIBA (which is 80 percent Government-owned and 20 percent Sibeka of Brussels) sells through De Beers.

Australia[76]

Capitalizing on high-quality technological and financial resources, Australia's mining industry is a global leader in the exploration of diamonds both at home and abroad, including operations

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[72] Russell Shor, "Prosperity and Politics: Why Diamond Prices Will Continue to Rise in the 1990s," *Jewelers' Circular-Keystone*, Jun. 1990, p. 66.

[73] The mine was reportedly constructed at a capital cost of approximately $402 million. (See *Industrial Minerals*, Sep. 1992, p. 19.)

[74] *Industrial Minerals*, Sep. 1992, p. 19.

[75] Thomas W. Lippman and Andy Mosher, The *Los Angeles Times - Washington Post* news service received by NewsEDGE/LAN: Oct. 10, 1994 at 2:02am.

[76] Information on Australia was derived principally from the *Diamond Registry Bulletin*, Mar. 1993, p. 1; FBIS-USR-94-088, Aug. 15, 1994, p. 79; and David Federman, "Indo-Argyle's U.S. Market Gambit," *Modern Jeweler*, Oct. 1994, pp. 30-33.

in Finland, Canada, and Russia. In Australia, mined diamonds come primarily from Argyle Diamond Mines Pty. Ltd., a joint venture, owned and operated by Australia-based Ashton Mining Ltd., and Australia-based CRA Ltd. Starting production in 1985, Argyle has the advantage of being a relatively modern, low-cost open pit mine. Disadvantages include average temperatures of well over 100 degrees during summer months and relatively high labor costs compared with firms in other major diamond mining countries. With an output of 39 million carats of diamonds in 1992, the Argyle mine is the world's largest volume producer of diamonds, but value is relatively low with an average price of $9 per carat reported in 1994.[77] As part of its competitive strategy, Argyle has moved to ensure a market for its output by developing diamond-cutting and jewelry-manufacturing industries in low-cost labor markets through joint projects and financial investments, first in India and more recently in China.

Namibia

Diamond mining is reported to account for about 7 percent ($39.7 million) of Namibia's revenue.[78] Although total production value is relatively low, gemstone quality is high, with an average 1994 price of $300 per carat.[79] A continuing cooperative relationship was evident in the DeBeers' November 1994 agreement with the Government of Namibia that provided for 50/50 control of the newly formed Namdeb Diamond Corp. Ltd. Other companies operating in Namibia include a U.S. firm, Monarch Minerals and Mining, Inc., that started mining in the southeastern region in 1991,[80] and a Canadian company, Namibian Minerals Corp. (NAMCO), that started part of the country's off-shore exploration operations around early 1994.[81]

Angola

Development of Angola's diamond industry has been slowed by political unrest since 1992 when National Union for the Total Independence of Angola (UNITA) troops refused to accept the results of the country's first multiparty election. Although Endiama (the state diamond company) and De Beers operated under a marketing agreement, it contributed little stability to diamond prices in the world market because most diamonds reportedly are smuggled out through private channels; an estimated $500 million worth of diamonds were smuggled out of Angola in 1992.[82] De Beers reportedly bought most of these at market prices in order to more closely control world market supply and support prices.

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[77] Although Australia's overall diamond production is of relatively low value compared with other major producers, the country is famous for quality pink and champagne colored diamonds which are growing in popularity in the United States and abroad.

[78] As of September 1, 1994, the foreign rate of exchange was approximately 3.6 namdo to 1 U.S. dollar. Actual revenue from diamonds in 1993/94 was 143 million in Namibian currency; 143 divided by 3.6 = US$39.7 million.

[79] FBIS-USR-94-088, Aug. 15,1994, p. 79.

[80] BOM 1991 *Annual Gemstones,* p. 13.

[81] *Industrial Minerals*, Feb. 1994, p. 13.

[82] *Industrial Minerals*, Feb. 1993, p. 16.

Pearls

Traders dealing in **natural pearls** report that prices for these goods continue to firm with the depletion of natural stocks. Traditionally, rose-colored pearls (known in the trade as Indian pearls) came almost exclusively from the Persian Gulf. Larger pearls came from the North Australian coasts. Fancied colored pearls—black, yellow, red, and brown—were found in South Pacific waters, including the coasts of Tahiti (famous for black pearls), Pacific Isles, Venezuela, and Panama. The Red Sea area supplied small but good-quality pearls and cool coastal waters of Japan produced lustrous pearls with a light greenish tint. From the European continent, quality freshwater pearls were produced in the river beds of Scotland, Ireland, Germany, and Czechoslovakia.[83] In today's market, however, most natural pearls are obtained almost exclusively from old jewelry.[84]

Cultured pearls, however, provide a relatively steady source of new supplies and duplicate their natural counterparts when farmed under the same ecological conditions. Weather, specifically typhoons, is the primary disruptive factor in the production of both natural and cultured pearls; all major cultured pearl-producing countries seem equally affected. Cultured pearls are produced throughout the South Pacific and South Sea waters including white pearls in Burma, Indonesia, Philippines, and Thailand, and black pearls in Tahiti and the French Polynesian Islands. The largest producers of cultured pearls are Japan, and more recently China and Australia.

Japan[85]

Japan was the first country to produce cultured pearls on a commercial basis, introducing them on the world market in 1921. Japan reportedly produces 14.4 million momme (1 momme equals 18.75 carats) of cultured pearls and controls about 80 percent of the global market. Because of Japan's cool water temperatures, it became famous for the intense luster of its fine-quality pearls; cool water allows layers of cells that make up the nacre to grow slowly and pack tightly, creating the desired lustrous effect.

Japan is reportedly losing its quality edge in the world pearl market, however, due to a number of interrelated contributing factors. First, the industry is reportedly suffering from water pollution that results in smaller, less healthy oysters and thus lower quality pearls. In addition, Japan depleted its wild oyster supply and now propagates oysters for hatchery shells. Even under the best of conditions, propagated oysters produce inferior pearls compared to the stronger, healthier wild oysters found on ocean floors. Second, most culturists have shortened

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[83] Weinstein, *The World of Jewel Stones*, pp. 74-86.

[84] *Journal of Gem Industry*, Dec. 1993, p. 63.

[85] Information for Japan was derived principally from Deborah A. Catalano, "The Cultured Pearl Shakeout," *National Jeweler*, Nov. 16, 1995, p. 32; Deborah A Catalano, "Japanese Akoya Pearls: Production Down," *National Jeweler*, Apr. 16, 1996; *Jewelers' Circular-Keystone*, Dec. 1994, p. 14; and Weinstein, *The World of Jewel Stones*, pp. 88-89.

the pearl growth period in response to a larger market for mid-to low-priced product,[86] shifting from the traditional 3-year growing period to about 8 months. Third, there is increasing competitive pressure from China's relatively new cultured pearl industry, which is being developed in part by Japanese investors in response to relatively lower wages and more advantageous growing conditions in China.

China[87]

China started competing in the world market of cultured pearls around 1984, with inexpensive freshwater rice pearls (so named because of their shape and size), and by 1992 the quality of goods improved to include oval and round shapes. By 1993, China was producing and trading saltwater pearls and by 1994 Japan-based Taski and Taiyo Fisheries were reportedly investing in pearl-farming operations, to take advantage of China's relatively lower wages and more advantageous growing conditions. Although China reportedly produces about 10 tons of pearls compared with 65 tons in Japan, China has the potential to vastly increase its production. Like Japan, China's industry has tried to maximize the quantity of production by utilizing short growing periods, but China has the advantage of warmer waters which helps to generate faster growth. In terms of quality, China's goods tend to have thin nacre, medium luster, and surface blemishes. However, Chinese pearls serve the larger, lower priced end of the market and are reportedly 10-15 percent less expensive than their Japanese counterparts.

Australia[88]

Australia has replaced Myamar (Burma) as the leading pearl producer in the South Seas since the Government of Myamar nationalized its Japanese-owned pearl farms in the mid-1960s. Hosting 50 cultured pearl farms with a total output of approximately 240,000 momme, Australia is famous for its limited but dependable production of larger, 18mm to 20mm pearls; most are between 12mm to 14mm in size.

Environmental conditions and government restrictions tend to promote quality production over quantity. For example, in an effort to conserve natural habitat, the Government of Australia imposes, and reportedly strictly enforces, a quota limit on the removal of wild oysters from the ocean floor. This maintains Australia's competitive advantage in assuring healthier wild oysters from the ocean floor for pearl production; wild oysters account for approximately 60-65 percent of pearl production, with propagated oysters accounting for the remainder. Warmer equatorial

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[86] A growing period of about 3 years yields better quality pearls with a nacre thickness of about 0.5mm. By shortening the growing period, particularly in cool waters, the pearl does not have enough time to develop a sufficiently thick nacre for the desired luster and durability of a quality pearl.

[87] Information for China was derived principally from David Federman, "Chinese Akoya Pearls: Sudden Impact," *Modern Jeweler*, May 1994, p. 64 and from Richard W. Wise, "High-Quality Chinese Freshwater Pearls Are Out There," *National Jeweler*, Apr. 16, 1996, pp. 46-48.

[88] Information for Australia was derived principally from Russell Shor, "Building a New Image for Australian Pearls," *Jewelers' Circular-Keystone*, Oct. 1995, pp. 72-76 and Deborah A.. Catalano, "Cultivating Pearls Down Under," *National Jeweler*, Oct. l, 1995, pp. 44-56.

waters also provide an advantage in that warm temperatures stimulate the growth of larger oysters and saltwater pearls, as compared to the relatively cooler waters of Japan and China. However, warm water pearls tend to have a grainy/satiny finish, rather than the ceramic luster of cool water pearls. In conjunction with the warmer year-round climate, Australian farmers practice a 2-3 year growing period, allowing pearls to develop thicker nacre, typically 1.5 to 2 millimeters, compared with 0.5 millimeters for pearls from Japan.

Colored Gemstones

Foreign production of colored gemstones, unlike diamond and pearl, are primarily small, low-cost and widely dispersed operations; there are no dominant producers. Production is relatively limited. Most colored gemstones are mined in remote regions of Australia and developing countries. Market supply of colored gemstones is dependent on demand and price for a particular variety of gemstone; availability of accessible, economically viable deposits; and political stability within source countries. World production data for colored gemstones are not available. However, the U.S. Department of the Interior, Bureau of Mines, reported the major deposits by country (see the following tabulation).[89]

Country	Gemstone deposits [1]
Afghanistan	beryl, quonset, ruby, tourmaline
Australia	beryl, opal, sapphire
Brazil	agate, amethyst, beryl, quonset, ruby, sapphire, tourmaline, topaz
Myamar (Burma)	beryl, jade, ruby, sapphire, topaz
Colombia	beryl, sapphire
Kenya	beryl, garnet, sapphire
Madagascar	beryl, rose quartz, sapphire, tourmaline
Mexico	agate, opal, topaz
Sri Lanka	beryl, ruby, sapphire, topaz
Tanzania	garnet, ruby, sapphire, tanzanite, tourmaline
Zambia	amethyst, beryl

[1] Deposits of the mineral beryl is the basis of several colored gemstones including green beryl, aquamarine, morganite, and emerald.

Synthetic Gemstones

Synthesized **colored gemstone** (ruby) was first announced in Europe in the late 19th century. Today, a variety of colored gemstones are successfully synthesized to produce quality, cutting sizes. Products are primarily located in the industrial countries, including Australia, Austria, China, France, Germany, Italy, Russia, Switzerland, and the United Kingdom. Specific kinds of commercially synthesized gemstones suitable for jewelry applications include alexandrite,

[89] U.S. Department of the Interior, Bureau of Mines, *Gemstones Annual Report*, dated 1992, p. 10.

emerald, opal (various colors synthesized primarily in Australia),[90] ruby, sapphire (various colors including blue), and spinel. Current production and other industry data are not readily available; this tends to be a competitive sector, sharing very little information.[91]

Production of **synthetic diamonds** (minute crystals) was also first reported in the late 19th century. Synthetic stone sizes of gem quality followed in 1985 when Sumitomo Electric Industries of Japan announced large-scale production of yellow, gem-quality synthetic diamonds,[92] marketed for use as heat sinks for high powered semiconductor devices.[93] Then in 1987, it was reported that De Beers had been synthesizing gem-quality diamonds on an experimental basis since the 1970s. By 1993, De Beers was reportedly marketing yellow, single-crystal diamonds for industrial tools under De Beers Monocrystal trademark.[94]

Although these international producers, along with U.S.-based General Electric, are reportedly maintaining a policy of not selling synthetic diamonds for jewelry applications, crystal growers in Russia are not operating under such constraints.[95] Laboratories in Russia, formerly subsidized by the Soviet Union, are pursuing what some believe to be a potentially lucrative business in developing production of gem-quality synthetic diamonds for the jewelry industry. Chatham Created Gems, a U.S.-based producer of synthetic colored gemstones, is reported to have contributed funding to develop research and production capabilities to synthesize gem-quality diamonds about 1992, but laboratory recipients have had difficulty meeting product specifications.[96] Specifically, Chatham reportedly wanted about 14,000 carats a month of good quality colorless diamonds, with the bulk of production at 1 carat size, and with the crystal structure of each stone to have "a distinctive metallic content" to permit easy synthetic detection by testing for magnetic response.[97] Although not all specifications had been met, a production agreement was reportedly concluded in March 1996 specifying an initial delivery of 100 carats a month increasing to 1,000 carats a month in a few years.[98] In July, Chatham reportedly presented "the first samples. . . Russian-produced synthetic white stones" at a U.S. trade show.[99] However, availability of large-scale production of gem-quality synthetic colorless diamond is still unpredictable.

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[90] Australia also accounts for about 90 percent of world natural opal production. See D. A. Hiss, "Opal: The Down Under Wonder," *Jewelers' Circular-Keystone*, Mar. 1989, p. 178.

[91] To help put production capability in perspective, one dated source (1939) reported that major producers in Switzerland, France, and Germany together had a daily capacity of 750,000 to 1 million carats to produce rubies, sapphires, and spinels.

[92] Wakefield, "Synthetic Diamond Jewelry: Are you prepared?," p. 49.

[93] This application makes use of diamond's heat conductivity property. See K. Nassau, "The Current Decade Synthetic Gemstones in the 1980s," *Lapidary Journal*, Mar. 1987, p. 38.

[94] Wakefield, "Synthetic Diamond Jewelry: Are you prepared?," p. 50.

[95] Ibid., pp. 47-48.

[96] Russell Shor, "Chatham on Synthetic Diamond 'We're Still Working On It,' *Jewelers Circular-Keystone*, Oct. 1995, p. 82.

[97] Ibid., p. 83.

[98] Deborah A. Catalano, "Synthetic Diamonds Materialize in Tucson," *National Jeweler*, Mar. 16, 1996, p. 42.

[99] Bob Bates, "Synthetic Diamonds Offered for Sale," *National Jeweler*, Jul. 1, 1996, p. 4.

Two other U.S.-based companies reportedly are also working with laboratories in Russia. Morion Company, a distributor in Massachusetts, was reported to have Russian-grown synthetic diamonds at a trade show in 1996; these were all yellow stones ranging in sizes from 1-2 carats, selling for prices ranging from $265 to $1,360 per carat.[100] Superings Inc., a ring manufacturer located in Los Angeles, is also reported to be marketing synthetic diamonds grown at the Siberian Branch of the Russian Academy of Sciences. All diamonds for Superings' product line reportedly range in colors from light canary yellow to deep orange.[101] The Academy reportedly produces about 50 carats of synthetic diamond rough a month (which equates to about 20 carats cut) and most of these are yellow to light brown.[102] In white (or colorless) stones, the Academy produces only about 10 points[103] rough (about 3 points cut) a month.[104]

Cutting Sector

Gemstone cutting is an old craft, dating back to well over 5,000 years ago, that originated in the Middle East. The trade has spread as craftsmen migrated to new regions.

Diamonds

Recently, governments of developing countries have invested in training and advanced cutting technology in an effort to become competitive and create foreign exchange. These are generally joint efforts with De Beers and with other major gemstone mining companies as a means to market their output. Although diamonds are cut in a number of countries (including Belgium, Brazil, China, France, Germany, Holland, Hong Kong, India, Israel, Russia, South Africa, and Thailand), only a few centers dominate the market, as the dynamics of this industry sector shift with rising labor costs and decreasing availability of skilled cutters.[105]

Belgium and Israel were the major cutting and polishing centers for over 30 years, until the world diamond market sharply contracted between 1980 and 1986. During that period, these traditional cutting centers lost market share to developing countries (particularly India) where hand labor is plentiful and relatively inexpensive. In an effort to regain their competitive edge, Belgian and Israeli processing companies invested in automation; these efforts appear to have had mixed success. More recently, some companies in Belgium and Israel have invested in processing plants in China and Thailand, where they specialize in small-sized, lower quality goods.

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[100] Catalano, p. 3.
[101] "Superings to Market Russian Synthetics," *Jewelers' Circular-Keystone* May 1996, p. 62.
[102] Catalano, p. 42.
[103] Points in gemstones are a unit of weight equal to 1/100 of a carat.
[104] Catalano, p. 42.
[105] Eric Bruton, *Diamonds*, 2 ed. (Chilton), pp. 197-200.

Belgium

Today, Belgium's role in the industry is primarily that of a trade center, processing only an estimated 2 percent (.07 million carats) of its 1991 cut and polished diamond exports.[106] The number of cutters/polishers in Antwerp, Belgium decreased from an estimated 13,000 in the 1970s to about 3,000 in 1994. Antwerp's manufacturers relinquished the small, round standard cuts to lower-cost processing centers — India, China, and Thailand — and focused on larger stones and fancy cuts; labor typically accounts for only 10 percent of the finished cost of cut goods. In an effort to improve productivity, manufacturers have implemented flexible work schedules and employed automation. This has been a slow process, however, because of strict labor laws and resistance by powerful labor unions.[107] There are also several reports that Belgian firms have entered joint ventures in Hong Kong, China, and Russia in an effort to compete for global market share. In Russia, for example, Antwerp-based PHP Diamond, Smolensk Cutting Factory (the Antwerp office of Russalmaz), and Almazjuvelier Export in Moscow formed the Smolensk Gems NV venture to cut Russian rough into fancy cuts for sale in Antwerp.[108]

Israel

In contrast with Belgium, Israel remains a diamond cutting center. Based on 1991 data (latest available year) Israel processed an estimated 79 percent (2.28 million carats) of its cut/polished diamond exports.[109] Israel has 600 diamond cutting factories employing approximately 10,000 cutters. Like Belgium, the Israeli industry is facing higher production costs. As a result, investment in computerized machines and laser cutting equipment has increased and there is a shift to large-sized pieces and fancy cuts. Israel now reportedly produces 70 percent of the world's fancy cuts.[110]

In addition, there has been some transfer of Israeli production to off-shore facilities in Thailand and Russia. The Israeli firm Reichbart Arye is reported to have entered an agreement in 1992 with the Russian Republic of Sakha to supply diamond cutting equipment, technology, and training; diamonds are to be cut in Sakha and Israel.[111]

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[106] In 1991, Antwerp imported 70.84 million carats; it imported 4.58 million carats of polished but exported 4.65 million carats. (See "Special Report: Ramat Gan Plans to Consolidate its Role as Premier Trading Center," *Israel Diamonds*, May 1992, p. 30.)

[107] *Jewelers' Circular-Keystone,* Dec. 1994, p. 54.

[108] BOM *Gemstones Yearbook,* 1992, p. 11.

[109] Estimated by Commission staff. (See "Special Report: Ramat Gan Plans to Consolidate its Role as Premier Trading Center," p. 30.)

[110] *Jewelers' Circular-Keystone*, "Israel Facing the High Tech Future,"Apr. 1994, p. 7.

[111] BOM *Gemstones Yearkbook,* 1992, p. 11.

India

India's cutting industry is now reported to be the largest in the world in terms of value, quantity of production, and employment. The Indian industry reportedly exported an estimated 40 percent of the world's cut diamonds in terms of value in 1990.[112] In terms of quantity, India processes about half the world's production annually (50 million carats), mostly in small diamonds. The work force is largely a hand-labor cottage industry comprised of more than 500,000 artisans concentrated in Surat and Navassari.[113]

The development of India's cutting industry contrasts somewhat with that of other low-wage countries that have emerged recently as a result of foreign investments. India's industry initially was founded as cottage operations with individual workers seeking near-gem quality rough diamonds (formerly classified as industrial grade material) that the established cutting centers would not deal with. From these goods, India produced melee-sized stones (0.06 to 0.14 carats), of a quality suitable for jewelry.

The developed expertise of India's diamond cutters/polishers in small-sized, low quality goods attracted Australia's Argyle Diamond Mining Company as a ready market for its smaller stones that were suitable for labor-intensive working. In 1986, Argyle started sending India its cuttable rough and by 1994, India was processing 90 percent of the company's cuttable production. Today, India hosts some automated cutting factories and is competing with Belgium, Israel, and the United States for larger sized, better quality rough. In one reported project, Bombay-based Shyam Star Gems Ltd. reportedly collaborated with Suraj Gems P.V.B.A. Antwerp in 1993 to install a laser cutting machine.[114]

India's industry is also credited with expanding the customer base for diamonds and with influencing a change in jewelry designs to include clusters of small diamonds as well as traditional solitaires. In early 1994, Argyle founded Indo-Argyle Diamond Council (IADC) to stimulate a downstream market for its cut diamonds. IADC is made up of 17 Indian jewelry manufacturers, all Argyle diamond customers. These manufacturers have also been involved in India's campaign to modernize and upgrade its jewelry manufacturing industry by building state-of-the-art plants and importing technicians to train workers in the use of refining and casting equipment. Argyle manages the marketing of their products, which are largely directed to the U.S. market.[115]

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[112] Telegram from U.S. Embassy New Delhi, section 6, 18 New Delhi 04330, p. 1.

[113] BOM, *Gemstones Yearbook*, 1992, p. 3.

[114] *Journal of Gem Industry*, Dec. 1993, p. 73.

[115] Some 75 percent of Argyle's material yields sizes of 6/100ths of a carat or smaller. (See Federman, *"Indo-Argyle's U.S. Market Gambit,"* pp. 30-33.)

China

China is emerging as a major diamond-cutting center. In 1988, China reportedly had 30 cutting and polishing facilities, employing about 4,000 cutters/polishers.[116] Since then, foreign investment in China has increased, including a 1991 joint project between the Australian International Development Assistance Bureau (financed by Australia's Argyle Mining Company) and the China Pearl, Diamond, Gem and Jewelry Import and Export Corporation.[117] This diamond-cutting factory in Beijing, China, reported to be one of the world's most modern and well equipped at that time, has a planned labor force of about 900.[118]

Thailand[119]

Thailand is reported to have opened its first diamond cutting factory in 1980; by 1992 there were 7,000 cutters and three De Beers sight holders. However, diamond cutting production has not developed as rapidly in Thailand as some may have expected; without the advantages of direct sourcing from producers, early expectations for a cutting industry in Thailand may have been too optimistic for global market conditions.[120] However, the emergence of Israeli- owned processing facilities in Thailand is expected to transfer technology to the Thai work force, increasing productivity and influencing the flow of much-needed rough to Thailand through efforts to strengthen their own market position.[121]

Colored Gemstones

The international cutting/polishing sector for both natural and synthetic colored gemstones has shifted from Europe to Thailand, India, Hong Kong, Republic of Korea, China, and Brazil.[122] Because these countries benefit from a large labor force, low labor costs, and favorable export laws, they are able to mass-produce cut gems by hand. The industry in these countries is thought

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[116] "China Set to Become Gem Center," *Diamond News and S.A. Jeweler*, Jan. 1989, p. 13.

[117] Developing economically viable cutting and polishing markets for its rough output is fundamental to Argyle's mining success because of the labor-intensive quality of its mined output.

[118] BOM, *Gemstones Yearbook*, 1991, p. 13.

[119] "Development of Thai Cutting Industry Linked to Procurement of Necessary Rough," *Israel Diamonds*, May 1992, pp. 78-81.

[120] There reportedly was difficulty acquiring the amount of rough goods needed for both learning and production purposes; contributing factors include the global market condition and price-supported products with planned supply shortages. Unlike the cutting industry in India, which developed a market niche for near-gem quality diamonds from comparatively inexpensive readily available industrial-grade diamond rough, Thailand has been in the position of competing for limited supplies at relatively high prices. At the same time, De Beers raised its diamond prices and demand for near-gem quality material strengthened.

[121] "Development of Thai Cutting Industry Linked to Procurement of Necessary Rough," pp. 78-81.

[122] BOM, *Gemstones Yearbook*, 1992, p. 3.

to be mostly small, cottage operations that work both natural and synthetic materials. In contrast, Idar-Oberstein, Germany, one of the largest European centers, is no longer a major cutting center in terms of production. It remains, however, the oldest, well established cutting center for colored gemstones in terms of quality of workmanship. Comparatively high labor costs in Germany have reoriented production to specialized cutting, featuring large, fine quality gemstones, and one-of-a-kind cuts.

U.S. MARKET

Consumer Characteristics and Factors Affecting Demand

Gemstones used for jewelry and artifacts are luxury goods purchased primarily for reasons of fashion, prestige, and personal appeal. Because gemstones are deferable purchase items, the key factor influencing U.S. consumer spending for these goods is disposable personal income. Related economic factors that influence demand for gemstones include consumer confidence in the economy and declining interest rates.

Most U.S. consumers are concentrated in large, urban communities near jewelry manufacturers. In 1990, 40 percent of U.S. jewelry, silverware, and plated ware manufacture establishments were in Rhode Island and New York, while California had 13 percent of such establishments.[123]

Consumption

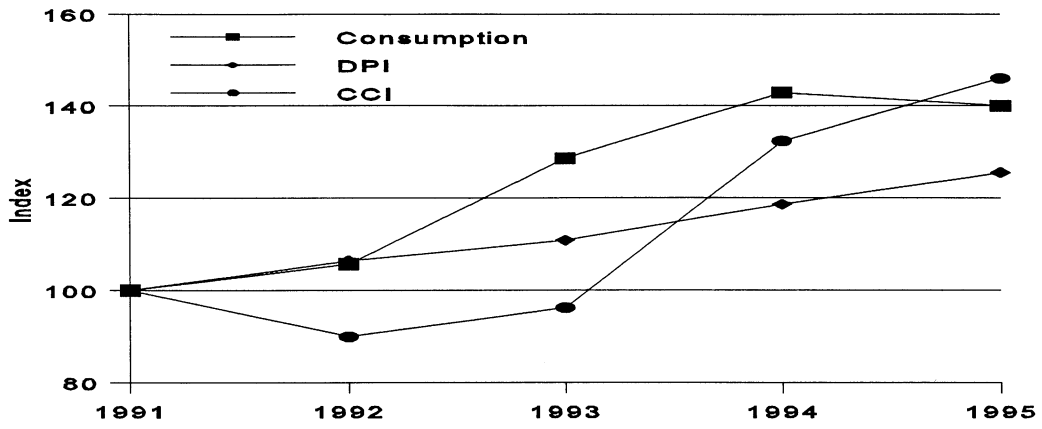
Fueled by a growing economy, a 10-percent increase in disposable personal income,[124] relatively low interest rates, and heightened consumer confidence (figure 6),[125] the 40-percent growth in U.S. consumption during 1991-95 (table 3) reflected increased demand for lower-priced

[123] Figures include silverware and plated ware manufacturers. *Jewelers' Circular-Keystone, 1993-1994 Directory Issue*, p. 610.

[124] From 1991-95, real GDP (based on billions of chained 1992 dollars) rose by 2.7 percent in 1992 followed by 2.2 percent in 1993, 3.4 percent in 1994, and then 1.5 percent in 1995.

[125] During the report period, the average prime interest rate charged by banks dropped from 8.46 percent in 1991 to 6.00 percent in 1993, and then rose to 7.14 percent in 1994 and on to 8.83 percent in 1995. Consumer Confidence Index, as measured by The Conference Board, decreased from 68.5 in 1991 to 61.6 in 1992 but then rose to 65.9 in 1993, 90.6 in 1994, and an even 100 in 1995.

Figure 6
Natural and synthetic gemstones: Change in U.S. apparent consumption relative to disposable personal income and consumer confidence indexes, 1991-95



Note: (1) Consumption = apparent consumption, based on current year dollars
(2) DPI = disposable personal income, based on current year dollars
(3) CCI = consumer Confidence Index

Source: Consumption estimated by Commission staff, DPI calculated from official data of the U.S. Department of Commerce, CCI calculated from data of the Consumer Research Center.

gemstone imports, primarily diamonds.[126] The exception was imports of rough diamond, which showed a decrease in the quantity demanded for higher-priced goods (figure 7); the large price hike in 1994 reflects a near-doubling of price for rough diamonds from Switzerland. Other product groups for which unit prices can be measured had decreasing prices during the period (see figures 8-10).[127] In 1995, a higher annual average prime interest rate levied by banks (almost 9 percent) and a reduction in GDP to 1.5 percent contributed to a slight decline in apparent consumption.

The ratio of net imports to estimated consumption fluctuated between 90 and 97 percent during 1991-95. Diamonds were the most important product group, ranging between 77 to 82 percent

[126] In terms of the overall price market, the trade weighted unit price of imported diamonds fluctuated downward from $469 to $437 per carat; unworked goods actually increased in value from $293 to $374 per carat but cuts decreased from $517 to $446 per carat, pulling down the trade weighted average.

[127] Trade weighted average unit price is based on gross imports, not net imports. The unit price is meaningless for net imports because in some years U.S. re-exports are more for some products than imports of the same products, relying on previous years' inventory. Instead, unit price is calculated on total imports for current and projected market trends. Unit prices cannot be calculated for pearls and synthetics because imports are not quantified.

Table 3
Natural and synthetic gemstones, all products: U.S. shipments, net imports for consumption, U.S. exports, and apparent U.S. consumption, 1991-95

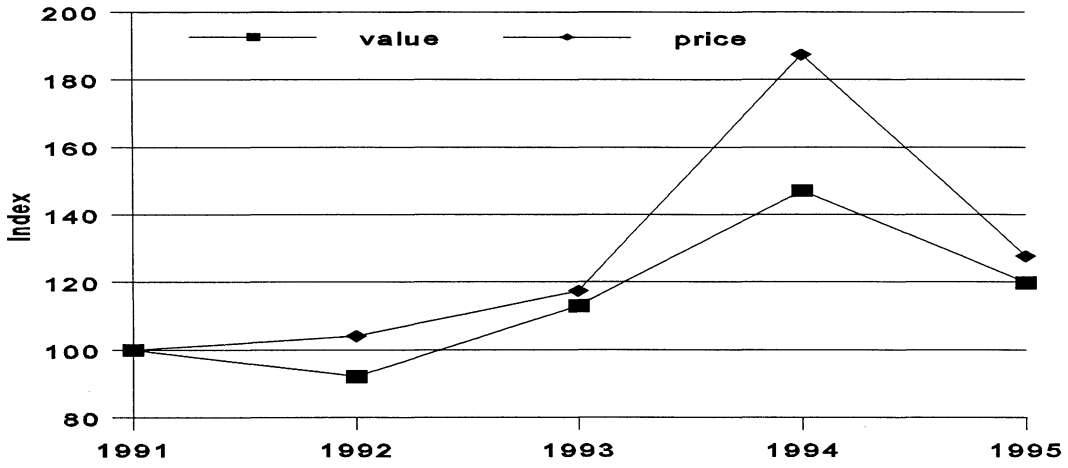
Year	U.S. production[1]	U.S. net imports[2]	U.S. exports	Apparent U.S. consumption	Ratio of net imports to consumption
			Million dollars		*Percent*
1991	618.5	3,206.4	324.4	3,500.4	92
1992	582.8	3,621.3	475.5	3,728.6	97
1993	614.1	4,119.4	231.2	4,502.3	92
1994	796.3	4,507.7	268.4	5,035.7	90
1995	706.8	4,462.7	268.0	4,901.5	91
Cut natural and synthetic gemstones:					
1991	516.2	2,716.5	271.5	2,961.1	92
1992	497.7	3,142.0	414.8	3,224.8	97
1993	538.3	3,603.8	180.1	3,962.0	91
1994	723.6	3,797.2	215.7	4,305.2	88
1995	606.9	3,856.8	207.2	4,256.6	91
Uncut natural and synthetic gemstones, including worked and unworked pearls:					
1991	102.3	489.9	52.9	539.3	91
1992	85.1	479.3	60.7	503.7	95
1993	75.8	515.6	51.1	540.3	95
1994	72.7	710.5	52.7	730.5	97
1995	99.9	605.8	60.8	644.9	94

[1] U.S. production of cut natural and synthetic gemstones was estimated by the staff of the U.S. International Trade Commission. Production of uncut natural and synthetic gemstones compiled from production data of the U.S. Department of Interior, Bureau of Mines.

[2] Net imports, defined as imports minus re-exports. Re-export is the exportation of imported goods with no value added.

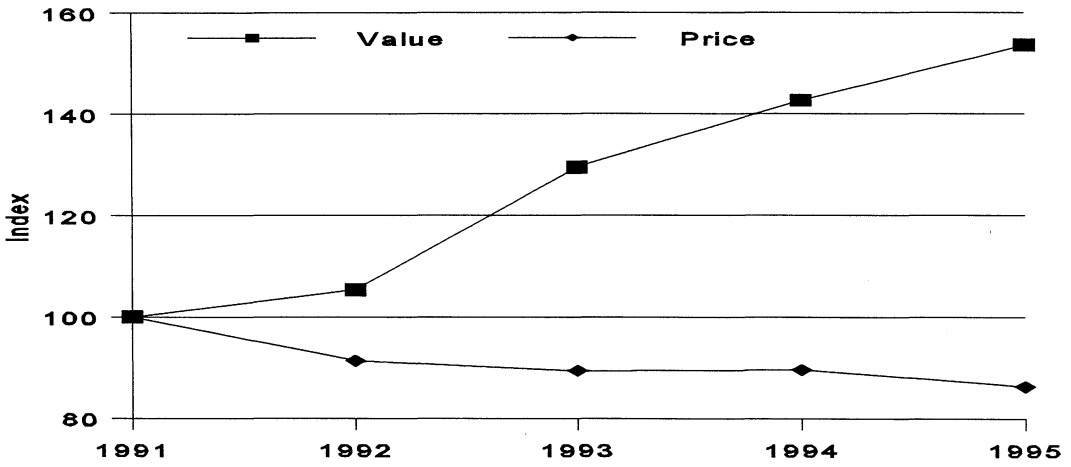
Source: Compiled from official statistics of the U.S. Department of Commerce, except as noted.

Figure 7
Indexes[1] of rough diamond import values and trade-weighted average unit price, 1991-95



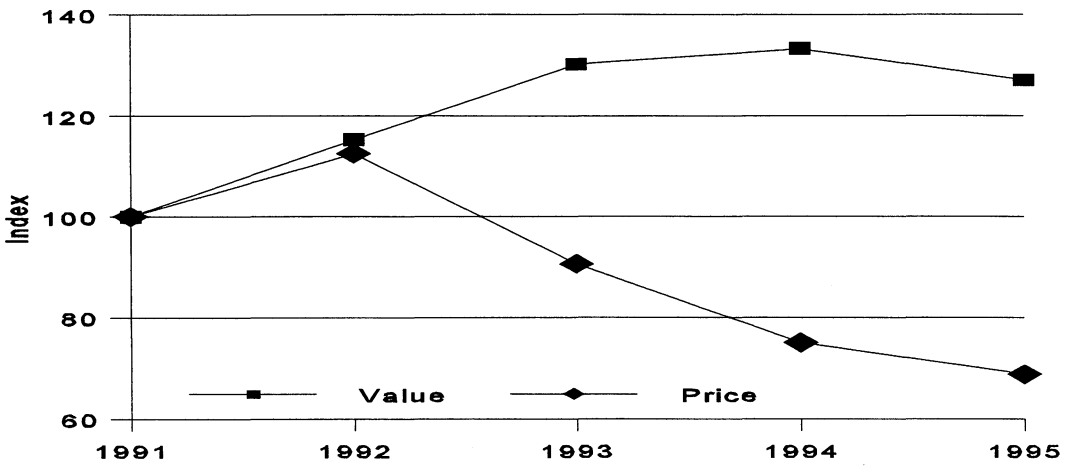
[1]Base: Average import value and average unit price in 1991.
Source: Compiled from official statistics of the U.S. Department of Commerce.

Figure 8
Indexes[1] of cut diamond import values and trade-weighted average unit price, 1991-95



[1]Base: Average import value and average unit price in 1991.
Source: Compiled from official statistics of the U.S. Department of Commerce.

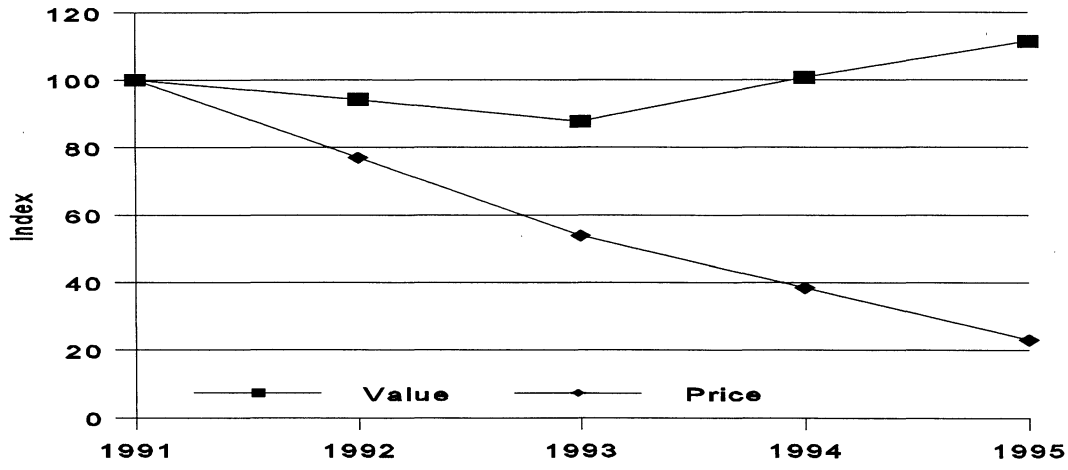
Figure 9
Indexes[1] of cut colored gemstone import values and trade-weighted average unit price, 1991-95



[1] Base: Average import value and average unit price in 1991.
Source: Compiled from official statistics of the U.S. Department of Commerce.

[1]Base: Average import value and average unit price in 1991.
Source: Compiled from official statistics of the U.S. Department of Commerce.

Figure 10
Indexes[1] of rough colored gemstone import values and trade-weighted average unit price, 1991-95



of consumption, followed by colored gemstones (8 to12 percent), natural and cultured pearls (1 to 2 percent), and synthetics (1 to 2 percent). Net imports of cut gemstones fluctuated between 88 and 97 percent of consumption, with cut diamonds alone accounting for 66 to 71 percent of the total.

Production[128]

Aided by a growing economy from 1991-94 and repeal of a 10-percent luxury tax on certain retail sales (including jewelry),[129] total estimated U.S. production of gemstones fluctuated upward by 29-percent to $796 million, but then dropped to $707 million in 1995 (see table 3). The slowing of the economy from a GDP of 3.4 percent in 1994 to 1.5 percent in 1995 contributed to the decline in U.S. production in 1995.

Favorable economic conditions also contributed, in part, to an estimated 40-percent increase in U.S. production of cut gemstones in 1994 to $724 million, which then dropped the following year to $607 million primarily due to the lower rate of growth in GDP. Data for cut gemstone production reflect, in part, the sector's reliance on imported rough (uncut) gemstone for cutting material. In 1995, net imports of rough accounted for almost 93 percent ($513 million) of gemstone material available for cutting, with rough diamonds comprising 89 percent ($492 million) of imported rough gemstones.

In spite of the healthy economy, however, production of mined gemstones and pearls (both natural and cultured) decreased by nearly 11 percent during 1991 to 1995, to $75.5 million. Offsetting this downward trend, however, was the production of synthetic material which increased by 36 percent to $24.4 million, resulting in only a 2-percent decrease in overall production of rough gemstones to $99.9 million in 1995.[130]

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[128] Estimated production data combine both rough and cutting sectors in the industry. However, cut gemstones accounted for 83 to 91 percent of estimated production during the report period. Thus, any change in production is primarily a function of demand for quality, large cut (two plus carats) diamonds that U.S. cutters tend to specialize in. Estimates may be overstated because they assume that all rough made available for a given year was cut rather than held in inventory. Information on inventory of gemstones is not readily available, but it is reported to be a major expense item for this industry in terms of the value of goods held, insurance, and handling costs. Inventories are generally held by distributors of rough goods and by distributors of cut goods. Jewelers and cutters generally do not hold large inventories of gemstones.

[129] The luxury tax was part of the Omnibus Budget Reconciliation Act of 1990 and was scheduled to terminate December 31, 1999. The tax added a 10-percent surcharge on that portion of retail jewelry sales prices that exceeded $10,000. The tax was repealed in August 1993, retroactive to January 1, 1993.

[130] It is generally recognized within the industry that synthetics bolster overall gemstone sales during a market downturn because they offer a ready supply at lower unit prices than natural gemstones of comparable quality.

U.S. TRADE

Overview

Increased imports caused the U.S. trade deficit in natural and synthetic gemstones to expand by $1.3 billion between 1991-1995, from $2.9 billion to $4.2 billion (table 4). Increased imports of smaller diamonds and colored gemstones from Israel, India, and Belgium (major diamond cutting and trading centers) were largely responsible for the expansion. However, the deficit expansion was somewhat tempered by a 42-percent ($730 million) growth in total exports. (See figure 12 for an overall picture on U.S. trade.)

U.S. Imports[131]

Influenced by a relatively strong economy, imports grew 44 percent during 1991-95 to nearly $6.7 billion (table 4). Both synthetic and natural gemstones are imported primarily by distributors specializing in specific gemstone types (i.e., diamonds, pearls, and colored gemstones); in the case of diamonds, distributors may specialize between cut and uncut materials.[132] During 1991-95, diamonds accounted for nearly 90 percent of all gemstone imports ($6 billion in 1995), far outpacing all other categories. Colored gemstones accounted for 8 percent ($553 million) of all imports during the period; pearls accounted for nearly 1 percent ($88 million). The portion of imports entering the country in cut form ranged between 85-88 percent, with uncut goods (including pearls) accounting for the balance. (See import tables in appendix B for a more detailed breakout by types of gemstones and major source countries.)

[131] Measurable amount of U.S. imports are re-exported. During 1991-95, a weighted average of nearly 30 percent ($8.3 billion) of U.S. imports were re-sold abroad with cut diamonds comprising the bulk of this trade. Net imports can be calculated by applying mathematical calculations to appendix B (imports) and D (re-exports).

[132] Synthetic and reconstructed gemstones and cultured pearls are generally imported and traded by distributors of the corresponding natural materials.

Table 4
Natural and synthetic gemstones: U.S. exports, imports for consumption, and merchandise trade balance, by selected country and country groups, 1991-95

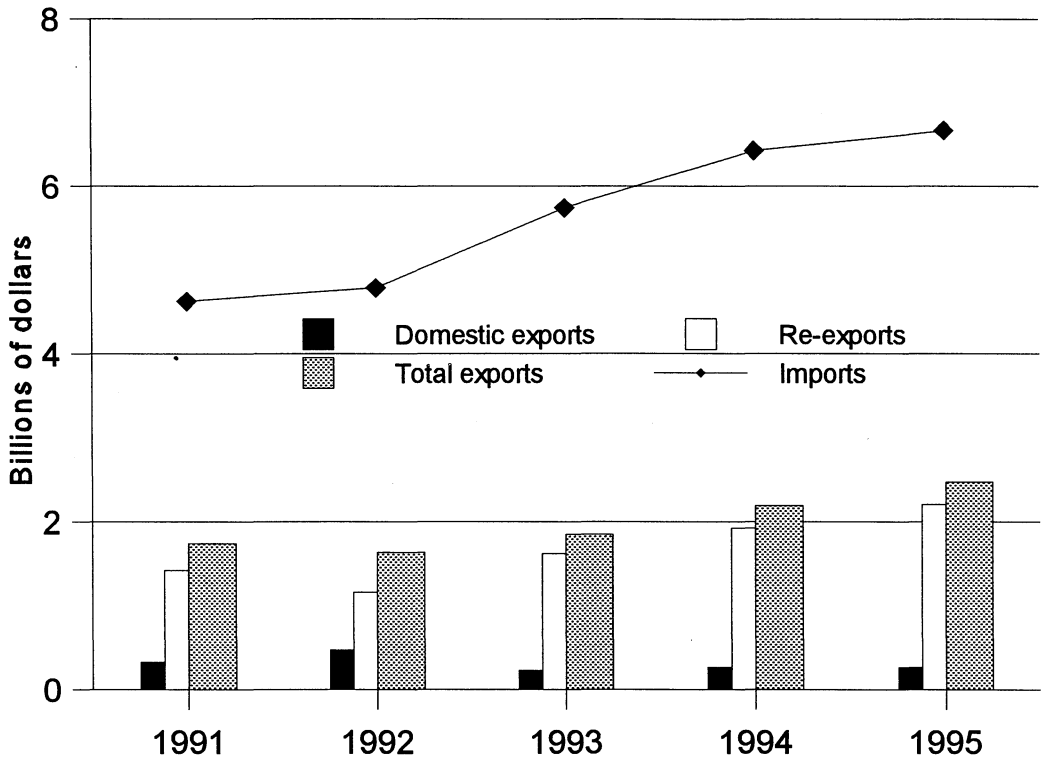
(Million dollars)

Item	1991	1992	1993	1994	1995
U.S. exports including re-exports:					
Israel	276	287	348	449	544
India	33	40	50	60	84
Belgium	437	373	443	513	559
Switzerland	171	169	195	226	216
U.K	45	56	50	72	71
Hong Kong	296	346	388	471	493
Thailand	111	52	43	41	53
Ghana	0	0	0	0	0
Russia[1]	NA	0	(2)	7	23
Colombia	2	1	1	(2)	(2)
All other	371	312	333	351	428
Total	1,741	1,637	1,851	2,189	2,471
Generalized System of Preferences	427	389	456	574	726
European Union	538	497	530	635	699
ASEAN	143	92	103	89	117
U.S. imports for consumption:					
Israel	1,231	1,328	1,646	1,977	2,153
India	902	981	1,282	1,325	1,457
Belgium	1,121	1,132	1,344	1,443	1,416
Switzerland	203	194	184	224	270
U.K.	296	232	270	280	202
Hong Kong	107	123	144	128	161
Thailand	199	171	154	174	148
Ghana	57	35	121	143	120
Russia[1]	NA	20	60	160	106
Colombia	53	99	127	97	98
All other	454	469	408	478	536
Total	4,623	4,783	5,739	6,429	6,666
Generalized System of Preferences	2,717	2,905	3,637	4,169	4,412
European Union	1,493	1,469	1,676	1,792	1,686
ASEAN	206	178	165	181	158
U.S. merchandise trade balance:					
Israel	-955	-1,041	-1,298	-1,529	-1,609
India	-870	-941	-1,231	-1,265	-1,373
Belgium	-684	-758	-901	-929	-857
Switzerland	-32	-24	11	2	-54
U.K.	-251	-176	-220	-208	-131
Hong Kong	189	223	244	342	332
Thailand	-88	-118	-111	-133	-95
Ghana	-57	-35	-121	-143	-120
Russia[1]	NA	-20	-60	-153	-83
Colombia	-52	-98	-126	-96	-98
All other	-83	-156	-75	-128	-107
Total	-2,882	-3,146	-3,888	-4,239	-4,195
Generalized System of Preferences	-2,290	-2,517	-3,180	-3,595	-3,686
European Union	-955	-972	-1,145	-1,157	-988
ASEAN	-64	-86	-62	-96	-41

[1] Trade data for Russia was not reported separate from the Soviet Union until February 1992.
[2] Less than $500,000.

Note.—U.S. exports cover domestic exports and re-exports. Import values are based on customs value; export values are based on f.a.s. value, U.S. port of export.
Source: Compiled from official statistics of the U.S. Department of Commerce.

Figure 11
Natural and synthetic gemstones: U.S. domestic exports, re-exports, total exports, and imports for consumption, 1991-95



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

Cut Gemstones

The import value of cut gemstones[133] increased by 48 percent to $5.9 billion in 1995, supported by increased demand for lower priced gems (see cut gemstone tables in appendix B).[134] Diamonds accounted for nearly 91 percent ($5.3 billion) of this total, with Israel, India, and Belgium together providing about 90 percent of diamond imports. Thailand, Colombia, and India were major suppliers of cut natural colored gemstones, together providing 55 percent of

[133] Pearls are excluded from this category; they are covered under uncut imports.

[134] Both the import value and quantity of cut diamonds increased during the report period, from $3.5 billion (6.7 million carats) in 1991 to $5.3 billion (11.9 million carats) in 1995, resulting in a 14-percent decrease in the trade-weighted unit price of imported cut diamonds to $446. Similarly, the value for all cut rubies, sapphires, and emeralds increased by 27 percent to $404 million while the quantity nearly doubled to 18 million carats, resulting in a 31-percent decrease in the trade-weighted unit price to $22 per carat. In contrast, the value of cut synthetic gemstones suitable for jewelry applications decreased by about 5 percent to $41 million. Unit prices for synthetics and other kinds of cut colored gemstones cannot be calculated because quantity of imports is not reported.

such imports.[135] In contrast to imports of cut diamonds and natural colored gemstones, the import value of cut synthetic and reconstructed materials decreased by 4 percent to $41.7 million.[136] Providing a total of 72 percent of imported synthetic materials ($29.6 million) were Germany, Thailand, Austria, and Switzerland.

Rough Gemstones

The import value of uncut gemstones fluctuated upward for a 21-percent increase in value to nearly $799 million in 1995, due primarily to higher priced uncut diamonds.[137] Diamonds alone made up 81 percent ($648.9 million) of all uncut gemstone imports in 1995 with the United Kingdom, Belgium, and Ghana together supplying 61 percent. Pearls comprised 11 percent of uncut imports ($88.2 million), with Japan, Australia, Hong Kong, and French Polynesia together supplying 91 percent of pearls. Colored gemstones comprised 6 percent of uncut gemstone imports ($49.3 million) with Brazil, Russia, and Colombia together supplying nearly 78 percent of colored gemstones; synthetics comprised the remaining 2 percent ($12.6 million) with Japan and Russia together supplying 68 percent of synthetics.[138]

U.S. Trade Measures

In 1995, over 96 percent ($6.4 billion) of total gemstone imports were eligible for duty-free entry under the *Harmonized Tariff Schedule (HTS)* column-1 general rates of duty. Table 5 shows the column-1 duty rates as of January 1, 1996. The aggregate trade-weighted, average rate of duty for imports from column-1 countries in 1996 was 0.06 ad valorem equivalent, exclusive of imports entering under special duty provisions. Duties were applied to nearly 3 percent ($179 million) of imports. Nearly $60 million was eligible for duty free entry under special programs including the Generalized System of Preferences, United States-Israel Free Trade Area, North American Free Trade Agreement, Caribbean Basin Economic Recovery Act, and the Andean Trade Preference Act. See appendix A for explanation of tariff and trade agreement terms. No U.S. nontariff measures were identified as affecting imports of gemstones, nor have there been any U.S. Government trade-related investigations conducted in recent years with respect to imports of gemstones.

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[135] India displaced Switzerland as the third largest supplier of cut colored gemstones in 1995; the value of imports from the two countries in that year was $66 million and $57 million, respectively (see appendix B for a comparison of prior years). Although it is too early to determine a trend, the shift is thought to be a result of India's push for capital investment and value-added production in the cutting sector along with increased demand for lower priced gems.

[136] Cut synthetics and reconstructed gemstones include those materials that may or may not have been worked but were not suitable for jewelry applications. They would have been used for artifacts or industrial applications and account for just 1 percent of the cut synthetics and reconstructed import group.

[137] Although the value of uncut diamond imports increased by 20 percent to $648.9 million, the quantity imported decreased by nearly 6 percent to 1.7 million carats, causing a 28-percent increase in the trade-weighted average unit price to $374.

[138] The bulk of imported synthetic rough ($11.3 million) includes piezo-electric quartz and other material that may be worked but for non-jewelry use. These materials are included in gem trade data because they are often of gem quality.

Table 5
Natural and synthetic gemstones: *Harmonized Tariff Schedule* subheading; description; U.S. col. 1 rate of duty as of Jan. 1, 1996; U.S. exports[1], 1995; and U.S. imports, 1995

HTS subheading	Description	Col. 1 rate of duty as of Jan. 1, 1996 General	Special[2]	U.S. exports[1], 1995	U.S. imports 1995
				Million dollars	
7101	Pearls (natural or cultured) not strung, mounted or set; ungraded pearls (natural or cultured) temporarily strung for convenience of transport:				
7101.10.00[3]	Natural pearls	Free		2.9	2.5
7101.21.00	Cultured pearls, unworked	1.3%	Free (A,CA,E,IL,J,MX)	32	6.4
7101.22.00[4]	Cultured pearls, worked	1.3%	Free (A,CA,E,IL,J,MX)	3.0	59.3
7102	Diamonds, not mounted or set:				
7102.10.00	Unsorted diamonds	Free		3.9	18.0
7102.31.00	Nonindustrial diamonds, unworked or simply sawn, cleaved or bruted	Free		137.7	630.9
7102.39.00	Nonindustrial diamonds, worked	Free		2,010.0	5,321.6
7103	Precious (other than diamonds) and semiprecious stones, not strung, mounted or set; ungraded precious (other than diamond) and semiprecious stones, temporarily strung for convenience of transport:				
7103.10.20	Unworked	Free		42.3	48.6
7103.10.40	Simply sawn or roughly shaped	16.8%	Free (A,CA,E,IL,J,MX)	5.7	0.7
7103.91.00	Rubies, sapphires and emeralds, worked	Free		153.0	404.3
7103.99	Other precious (other than diamonds) and semiprecious stones, worked but not strung, mounted or set:				
.10	Cut but not set, and suitable for use in the manufacture of jewelry	1.3%	Free (A*[5],CA,E,IL,J,MX)	27.8	91.5
.50	Cut precious and semiprecious stones, n.e.s.i.	16.8%	Free (A,CA,E,IL,J,MX)	12.2	8.1

Table 5—*Continued*

Natural and synthetic gemstones: *Harmonized Tariff Schedule* subheading; description; U.S. col. 1 rate of duty as of Jan. 1, 1996; U.S. exports[1], 1995; and U.S. imports, 1995

HTS subheading	Description	Col. 1 rate of duty as of Jan. 1, 1996		U.S. exports[1], 1995	U.S. imports 1995
		General	Special[2]		
				Million dollars	
7104	Synthetic or reconstructed precious or semiprecious stones not strung, mounted or set; ungraded synthetic or reconstructed precious or semiprecious stones, temporarily strung for convenience of transport:				
7104.10.00	Piezo-electric quartz	4.8%	Free (A,CA,E,IL,J,MX)	11.4	10.8
7104.20.00	Synthetic or reconstructed precious or semiprecious stones, except piezo-electric quartz, unworked or simply sawn or roughly shaped	4.8%	Free (CA,E,IL,J,MX)	14.3	1.3
7104.90.10	Synthetic or reconstructed precious or semiprecious stones, except piezo-electric quartz, cut and suitable for use in the manufacture of jewelry	1.9%	Free (A,CA,E,IL,J,MX)	11.5	41.2
7104.90.50	Cut synthetic or reconstructed precious or semiprecious stones n.e.s.i.	10.2%	Free (A,CA,E,IL,J,MX)	3.0	0.5

[1] U.S. exports include domestic and re-exports.

[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 or A*); North American Free-Trade Agreement, goods of Canada (CA) and Mexico (MX); Caribbean Basin Economic Recovery Act (E or E*); United States-Israel Free Trade Area (IL); and Andean Trade Preference Act (J or J*).

[3] *HTS* subheading broken into 7101.10.30 (natural pearls graded and temporarily strung for convenience of transport) and 7101.10.60 (other natural pearls).

[4] *HTS* subheading broken into 7101.22.30 (worked cultured pearls graded and temporarily strung for convenience of transport) and 7101.22.60 (other worked cultured pearls).

[5] Thailand is not eligible for duty free treatment for this product under the Generalized System of Preferences.

Source: U.S. exports and imports compiled from data of the U.S. Department of Commerce.

U.S. Exports

Principal Markets

Foreign markets are relatively important for the U.S. gemstone industry, as between 34 and 82 percent of domestic production was exported during the period (table 3).[139] Most exports (77 to 87 percent) were cut products, reflecting the U.S. niche as a cutting center and its lack of indigenous gemstones; remaining U.S. exports were pearls and uncut gemstones. Because gemstones are small and have a very low weight-to-value ratio, they are easily traded and are commonly transported from production to cutting centers and on to consumer markets several times before being used in an application. As in the U.S. market, factors that contribute to foreign demand for gemstones include disposable personal income, confidence in the economy, and declining or relatively low interest rates.

Belgium, India, and Israel are the major global cutting and trading markets for the gemstone industry. However, the United States has limited trade in these markets and they account for the largest trade deficits in gemstones. The United States shipped U.S.-produced and -cut gemstones to 71 countries in 1995 with Switzerland, Hong Kong, and Canada together accounting for about 54 percent ($146 million) of domestic exports.

Switzerland

Switzerland was the leading U.S. export market during 1991-95, accounting for 20 to 37 percent of all gemstone exports during the period as the value of U.S. exports to that country fluctuated. Cut diamonds comprised 85 to 91 percent of shipments on average. Switzerland has a relatively small gemstone-mining and cutting industry, but does have a well-established jewelry and watch manufacturing industry. Although a major U.S. export market, U.S. shipments represented only 3 percent of Swiss imports in 1995. The U.S. gemstone trade balance with Switzerland swung from a deficit of $32 million in 1991 to a surplus of $11 million in 1993 and back to a deficit of $54 million in 1995. This swing reflects a short term increase in demand for large cut, quality diamonds.

Hong Kong

Hong Kong is the second-largest U.S. export market in terms of value, accounting for 17 percent ($45.8 million) of U.S. trade in 1995. As with other export markets, cut diamonds accounted for the majority of shipments (67 percent), totaling $30.8 million. Hong Kong is a major international trading center of cut gemstones of all types and has an internationally-recognized jewelry manufacturing industry. Hong Kong is the only country with which the United States had a trade surplus in natural and synthetic gemstones throughout the report period. This surplus increased by 81 percent to $342 million between 1992 to 1994, and then declined to $332 million in 1995. The decline in 1995 was due primarily to increased U.S. imports of cut diamonds from Hong Kong.

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[139] During 1991-95, domestic exports fluctuated between $231 million and $476 million.

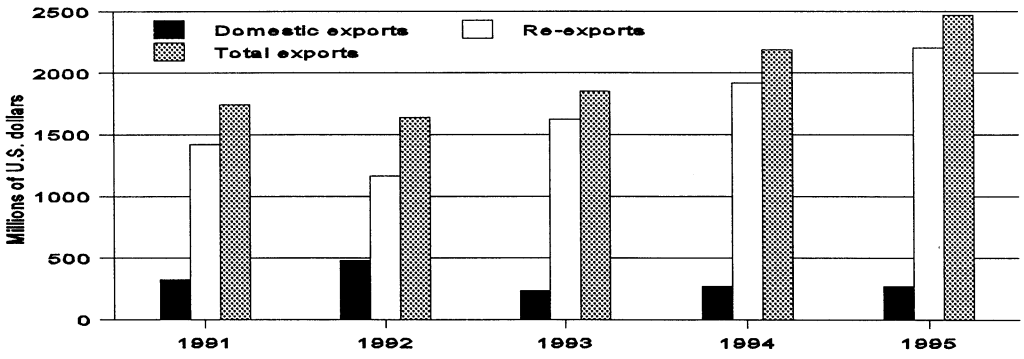
Canada

Canada is the third largest foreign market for U.S. exports of gemstones, and accounted for 13 percent ($35 million) of U.S. exports in 1995. Cut diamonds accounted for 43 percent ($15 million) of U.S. exports, and uncut diamonds for 23 percent ($8 million). With the exception of 1994, when exports rose to $53 million, trade with Canada has been fairly constant, ranging between $34-$38 million each year.

U.S. Export Levels

Because the United States is an international trade center for gemstones and relies on imports for supplies, U.S. exports of foreign merchandise (re-exports) are a fundamental characteristic of this industry.[140] Gemstones often are imported by U.S. market participants and subsequently exported with no intrinsic value added except for inherent value accrued exclusively through market clearing activities. The ratio of domestically produced goods exported to re-exports (exports of imported goods) shifted downward during the report period for an overall weighted average of about 19 percent (figure 12).[141] The downward shift was caused primarily by a decrease in world demand for U.S. cut (2 plus carat) diamonds. The ratio of domestic exports to re-exports is largely a function of world demand for large (2 plus carats) high-value cut diamonds, which are the specialized niche product of the United States.[142]

Figure 12
Natural and synthetic gemstones: Comparison of U.S. domestic exports, re-exports, and total exports, 1991-95



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

[140] Re-exports supplement U.S. production in fulfilling world demand for gemstones.

[141] The ratio first increased from nearly 23 percent in 1991 to 41 percent in 1992, and then dropped to 12 percent in 1995.

[142] In 1995, the trade-weighted average export price of U.S. cut diamonds over one-half carat was $4,662 per carat compared with $1,822 per carat for foreign cut re-exports. Similar price differences were common throughout the report period except in 1992 when the domestic trade-weighted average price was $2,453 and that for the re-export product was $1,829.

Total exports (re-exports and domestic goods exported) increased by 42-percent from $1.7 billion in 1991 to $2.5 billion in 1995, due in large part to increased foreign demand for cut diamonds. (See appendix E for a breakout of exports by types of gemstones and markets.) Re-exports alone increased by 55 percent to $2.2 billion, with cut diamonds increasing by 59 percent to $1.9 billion. Re-exports of cut and uncut colored gemstones, pearls, and synthetic and reconstructed materials together also increased in value, by 85 percent to $193 million. This increase reflected a 79 percent increase in exports of cut colored gemstones to $152 million. Primary markets for re-exports remained relatively constant through the report period with Belgium, Israel, Hong Kong, Switzerland, and Japan together accounting for 84 percent ($1.8 billion) in 1995 (see appendix D for a breakout of re-exports by types of gemstones and major markets).

In contrast to re-exports, domestically produced gemstone exports decreased by 17-percent during 1991-95 to $268 million, as a result of a decline in trade in cut materials. Exports of cut diamonds and cut colored gemstones decreased by 17 percent to $157 million and by 47 percent to $41 million, respectively. The only category of U.S. cut gemstones to show an improvement in exports was synthetics and reconstructed materials, which increased 73 percent to $9.6 million. Industry sources state that improved foreign demand for these materials was influenced by increased awareness of the variety of gemstones available and by the quality of workmanship in both growing and cutting synthetics compared with more expensive natural counterparts. Major foreign markets for U.S. cut materials (diamonds, synthetics/reconstructed, and colored gemstones) included Switzerland, Hong Kong, Canada, and Japan, which together accounted for 75 percent ($155 million) in 1995 (see appendix C for a more complete breakout of domestic exports by types of gemstones and major markets).

Domestic export patterns for uncut gemstones and pearls were mixed during the report period. Exports of uncut colored gemstones and synthetic material increased by 100 percent to $21.7 million and by 19 percent to $21.9 million, respectively; exports of rough (uncut) diamonds decreased by 28 percent to about $15 million.[143] Exports of natural pearls also decreased by 65 percent to $715,000 in 1995. At the same time, exports of cultured pearls increased by 31 percent to $2.0 million; contributing factors are believed to be reduced availability of natural pearls and growing reliability of cultured supplies. India, Canada, Hong Kong, and Switzerland were major foreign markets for U.S. exports of rough gemstones and pearls during the report period, together accounting for about 49 percent ($30 million) of total rough exports in 1995.

Both domestic and re-exports are primarily handled by distributors who tend to specialize in one gemstone category (e.g., diamonds, colored gemstones, or pearls). Generally, distributors handle both the natural and the synthetic materials of their category specialty; pearl distributors handle both natural and cultured. Diamond and colored gemstone distributors tend to specialize in either cut or uncut goods. Certainly exports are important to this industry but because the United States is a trading center and the world's primary gemstone market, the ratio of domestically produced goods exported to net imports ranged from only 6 percent to 13 percent between 1991-95, with each of the last 3 years showing 6 percent (see table 4).

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[143] Although the United States did not mine diamonds on a commercial basis during the report period, domestic exports of uncut diamonds includes imported unworked diamonds that have been simply sawn, cleaved, or bruted by U.S. cutters.

Foreign Trade Measures

Tariff rates in most U.S. gemstone export markets tend to be very low. The exception is India, where tariff rates for unworked and worked gemstone imports are 40 and 60 percent, respectively. However, India also has various drawback and countertrade programs for gemstones to help offset the high import rates and increase the industry's competitiveness vis-a-vis other world producers. Under the North American Free Trade Agreement (NAFTA), U.S. produced unworked and worked gemstones became eligible for duty-free treatment upon entering Mexico from the United States effective January 1, 1994. In terms of trade with Canada, U.S. produced unworked and worked gemstones were eligible for duty-free treatment upon entering Canada before the United States-Canada Free-Trade Agreement went into effect on January 1, 1989 and continue to receive duty-free treatment under NAFTA. (Canada and Mexico together accounted for nearly 14 percent of U.S. exports of domestic gemstones in 1995 and nearly 3 percent of all U.S. gemstone exports (e.g., domestic and re-exports combined).

Although markets in Thailand and China account for insignificant portions of U.S. exports, these countries have recently emerged as cutting centers for gemstones. In both countries, tariff rates are relatively high. China has the higher rates, ranging from 100 percent for pearls and 70 percent for worked diamonds and colored gemstones, to 30 percent for unworked. Thailand's rates are lower at 15-20 percent for worked gemstones and zero for unworked.

No foreign nontariff measures were identified as affecting U.S. exports of worked and unworked gemstones.

APPENDIX A
EXPLANATION OF TARIFF AND TRADE AGREEMENT TERMS

APPENDIX A
TARIFF AND TRADE AGREEMENT TERMS

In the *Harmonized Tariff Schedule of the United States* (HTS), chapters 1 through 97 cover all goods in trade and incorporate in the tariff nomenclature the internationally adopted Harmonized Commodity Description and Coding System through the 6-digit level of product description. Subordinate 8-digit product subdivisions, either enacted by Congress or proclaimed by the President, allow more narrowly applicable duty rates; 10-digit administrative statistical reporting numbers provide data of national interest. Chapters 98 and 99 contain special U.S. classifications and temporary rate provisions, respectively. The HTS replaced the *Tariff Schedules of the United States* (TSUS) effective January 1, 1989.

Duty rates in the ***general*** subcolumn of HTS column 1 are most-favored-nation (MFN) rates, many of which have been eliminated or are being reduced as concessions resulting from the Uruguay Round of Multilateral Trade Negotiations. Column 1-general duty rates apply to all countries except those enumerated in HTS general note 3(b) (Afghanistan, Cuba, Laos, North Korea, and Vietnam), which are subject to the statutory rates set forth in ***column 2***. Specified goods from designated MFN-eligible 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 rate of duty column 1 or in the general notes. If eligibility for special tariff rates is not claimed or established, goods are dutiable at column 1-general rates. The HTS does not enumerate those countries as to which a total or partial embargo has been declared.

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 for 10 years and extended several times thereafter, applied to merchandise imported on or after January 1, 1976 and before the close of May 31, 1997. Indicated by the symbol "A" or "A*" in the special subcolumn, the GSP provided duty-free entry to eligible articles the product of and imported directly from designated beneficiary developing countries, as set forth in general note 4 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. Indicated by the symbol "E" or "E*" in the special subcolumn, 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 7 to the HTS.

Free rates of duty in the special subcolumn 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 8 to the HTS.

Preferential nonreciprocal duty-free or reduced-duty treatment in the special subcolumn 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 as 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 11 to the HTS.

Preferential or free rates of duty in the special subcolumn followed by the symbol "CA" are applicable to eligible goods of Canada, and rates followed by the symbol "MX" are applicable to eligible goods of Mexico, under the ***North American Free Trade Agreement***, as provided in general note 12 to the HTS and implemented effective January 1, 1994 by Presidential Proclamation 6641 of December 15, 1993. Goods must originate in the NAFTA region under rules set forth in general note 12(t) and meet other requirements of the note and applicable regulations.

Other special tariff treatment applies to particular ***products of insular possessions*** (general note 3(a)(iv)), products of the West Bank and Gaza Strip (general note 3(a)(v), goods covered by the ***Automotive Products Trade Act*** (APTA) (general note 5) and the ***Agreement on Trade in Civil Aircraft*** (ATCA) (general note 6), ***articles imported from freely associated states*** (general note 10), ***pharmaceutical products*** (general note 13), and ***intermediate chemicals for dyes*** (general note 14).

The ***General Agreement on Tariffs and Trade 1994*** (GATT 1994), annexed to the Agreement Establishing the World Trade Organization, replaces an earlier agreement (the GATT 1947 [61 Stat. (pt. 5) A58; 8 UST (pt. 2) 1786]) as the primary multilateral system of disciplines and principles governing international trade. Signatories' obligations under both the 1994 and 1947 agreements focus upon 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, dispute settlement, and other measures. The results of the Uruguay Round of 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.

Pursuant to the **Agreement on Textiles and Clothing** (ATC) of the GATT 1994, member countries are phasing out restrictions on imports under the prior "Arrangement Regarding International Trade in Textiles" (known as the **Multifiber Arrangement** (MFA)). Under the MFA, which was a departure from GATT 1947 provisions, importing and exporting countries negotiated bilateral agreements limiting textile and apparel shipments, and importing countries could take unilateral action in the absence or violation of an agreement. Quantitative limits had been established on imported textiles and apparel of cotton, other vegetable fibers, wool, man-made fibers or silk blends in an effort to prevent or limit market disruption in the importing countries. The ATC establishes notification and safeguard procedures, along with other rules concerning the customs treatment of textile and apparel shipments, and calls for the eventual complete integration of this sector into the GATT 1994 over a ten-year period, or by Jan. 1, 2005.

APPENDIX B
IMPORTS

Table B-1
Natural diamonds: U.S. imports for consumption by principal source, 1991-95

Natural diamonds, unworked and cut:

Source	1991	1992	1993	1994	1995
			Quantity *(carats)*		
Israel	1,530,089	1,613,092	1,975,936	2,248,485	2,300,650
Belgium	1,839,483	1,788,644	1,776,684	1,924,957	1,734,323
India	3,472,088	4,288,257	5,680,795	6,481,320	7,631,338
Switzerland	110,150	22,962	28,584	24,864	35,147
United Kingdom	641,012	710,455	1,145,445	506,784	987,103
Ghana	138,014	110,919	204,494	226,435	163,176
Hong Kong	152,265	284,292	184,079	174,846	269,555
Russia[1]	N/A	16,617	70,927	122,838	76,017
Zaire	191,536	165,163	117,930	90,604	83,489
Rep. of S. Africa	35,597	26,936	43,783	61,852	49,647
All others	434,650	335,186	257,011	274,655	340,746
Total	8,544,884	9,362,523	11,485,668	12,137,640	13,671,191
			Value *(1,000 dollars)*		
Israel	1,204,142	1,298,402	1,609,247	1,945,108	2,118,407
Belgium	1,115,240	1,129,062	1,340,114	1,436,949	1,409,695
India	869,016	954,886	1,243,037	1,270,731	1,388,166
Switzerland	140,881	109,541	129,426	163,382	206,571
United Kingdom	286,863	225,628	265,915	272,109	195,923
Ghana	56,968	35,320	121,297	142,918	119,639
Hong Kong	63,602	75,081	86,616	74,116	105,103
Russia[1]	N/A	18,875	58,582	155,981	96,517
Zaire	70,679	83,479	41,674	32,048	82,199
Rep. of S. Africa	29,757	46,263	83,626	103,006	78,980
All others	168,990	171,147	119,066	143,910	169,344
Total	4,006,138	4,147,684	5,098,600	5,740,258	5,970,544
			Average unit value *(dollars per carat)*		
Israel	787	805	814	865	921
Belgium	606	631	754	746	813
India	250	223	219	196	182
Switzerland	1,279	4,771	4,528	6,571	5,877
United Kingdom	448	318	232	537	198
Ghana	413	318	593	631	733
Hong Kong	418	264	471	424	390
Russia[1]	N/A	1,136	826	1,270	1,270
Zaire	369	505	353	354	985
Rep. of S. Africa	836	1,718	1,910	1,665	1,591
All others	389	511	463	524	497
Total	469	443	444	473	437

Table continues on next page.

Table B-1—*Continued*
Natural diamonds: U.S. imports for consumption by principal source, 1991-95

Natural diamonds, cut:

Source	1991	1992	1993	1994	1995
			***Quantity** (carats)*		
Israel	1,510,974	1,585,814	1,961,844	2,225,358	2,261,856
India	3,415,221	4,280,477	5,677,396	6,399,578	7,565,709
Belgium	1,381,952	1,384,384	1,628,002	1,617,791	1,550,217
Switzerland	45,003	21,767	20,035	22,124	28,194
Hong Kong	146,931	262,175	180,043	174,162	259,456
Russia[1]	N/A	11,662	45,437	30,113	41,118
Rep. of S. Africa	21,808	12,969	17,446	23,366	23,705
United Kingdom	10,442	24,840	17,187	24,330	16,556
Thailand	40,366	20,972	41,482	36,884	79,120
Botswana	283	3,079	7,806	17,067	21,446
All others	125,653	115,737	106,555	115,038	86,594
Total	6,698,633	7,723,876	9,703,233	10,685,811	11,933,971
			Value *(1,000 dollars)*		
Israel	1,192,226	1,286,837	1,603,496	1,930,163	2,095,460
India	859,159	953,138	1,242,135	1,269,175	1,386,264
Belgium	1,074,005	1,046,689	1,227,938	1,262,075	1,290,226
Switzerland	121,393	99,691	116,856	155,569	196,735
Hong Kong	63,436	74,897	85,403	73,165	103,388
Russia[1]	N/A	18,753	53,547	59,857	63,861
Rep. of S. Africa	22,147	28,621	39,808	56,056	41,232
United Kingdom	35,521	36,493	36,563	47,261	39,607
Thailand	13,363	7,694	13,870	13,975	22,957
Botswana	253	1,552	4,912	9,446	10,990
All others	83,096	94,275	61,742	67,186	70,928
Total	3,464,599	3,648,640	4,486,270	4,943,928	5,321,648
			Average unit value *(dollars per carat)*		
Israel	789	811	817	867	926
India	252	223	219	198	183
Belgium	777	756	754	96	127
Switzerland	2,697	4,580	5,833	7,032	6,978
Hong Kong	432	286	474	420	398
Russia[1]	N/A	1,608	1,178	1,988	1,553
Rep. of S. Africa	1,016	2,207	2,282	2,023	1,671
United Kingdom	3,402	1,469	2,127	1,942	2,392
Thailand	331	367	334	379	290
Botswana	894	504	629	553	512
All others	661	815	579	584	819
Total	517	472	462	463	446

Table continues on next page.

Table B-1—*Continued*
Natural diamonds: U.S. imports for consumption by principal source, 1991-95

Natural diamonds, unworked:

Source	1991	1992	1993	1994	1995
			Quantity *(carats)*		
United Kingdom	630,570	685,615	1,128,258	482,454	970,547
Belgium	457,531	404,260	148,682	307,166	184,106
Ghana	137,533	109,447	202,358	225,774	162,191
Zaire	189,768	163,745	116,884	90,390	82,643
Rep. of S. Africa	13,789	13,967	26,337	38,486	25,942
Russia[1]	N/A	4,955	25,490	92,725	34,899
Israel	19,115	27,278	14,092	23,127	38,794
Sierra Leone	9,605	20,471	23,251	26,012	21,471
Congo	2,057	773	986	22,191	16,329
Switzerland	65,147	1,195	8,549	2,740	6,953
All other	321,136	206,941	87,548	140,764	193,345
Total	1,846,251	1,638,647	1,782,435	1,451,829	1,737,220
			Value *(1,000 dollars)*		
United Kingdom	251,341	189,136	229,352	224,848	156,316
Belgium	41,235	82,373	112,176	174,874	119,469
Ghana	56,001	34,936	119,583	142,865	119,136
Zaire	69,261	82,107	40,686	31,554	81,971
Rep. of S. Africa	7,611	17,641	43,818	46,950	37,748
Russia[1]	N/A	122	5,035	96,123	32,656
Israel	11,916	11,565	5,752	14,945	22,947
Sierra Leone	12,478	19,369	17,339	21,139	18,516
Congo	1,889	666	706	13,492	14,913
Switzerland	19,487	9,850	12,571	7,813	9,835
All other	70,320	51,280	25,312	21,727	35,389
Total	541,539	499,045	612,330	796,330	648,896
			Average unit value *(dollars per carat)*		
United Kingdom	399	276	203	466	161
Belgium	90	204	754	569	649
Ghana	407	319	591	633	735
Zaire	365	501	348	349	992
Rep. of S. Africa	552	1,263	1,664	1,220	1,455
Russia[1]	N/A	25	198	1,037	936
Israel	623	424	408	646	592
Sierra Leone	1,241	565	247	575	1,069
Congo	918	862	716	608	913
Switzerland	299	8,243	1,470	2,851	1,414
All other	219	248	289	154	183
Total	293	305	344	549	374

1 Data for imports from Russia were not reported separate of the Soviet Union in 1991 and covers only Feb. through Dec., 1992; data for 1993-95 are full-year figures.

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

Table B-2
Natural colored gemstones: value of U.S. imports for consumption by principal source, 1991-95
(1,000 dollars)

Source	1991	1992	1993	1994	1995
Natural colored gemstones, unworked and cut:					
Thailand	169,131	139,437	127,170	150,330	116,513
Colombia	52,938	97,089	125,710	95,992	97,467
India	31,819	25,189	37,595	52,950	57,507
Switzerland	57,546	77,892	48,369	55,415	67,014
Brazil	52,161	44,225	32,863	41,693	43,657
Hong Kong	37,190	40,829	48,473	44,099	46,889
Israel	26,846	29,451	36,932	32,107	34,578
Germany	20,690	22,971	19,484	25,220	19,021
Sri Lanka (Ceylon)	6,141	5,804	6,285	9,831	13,102
Russia[1]	N/A	772	904	3,562	8,601
All other	46,125	39,676	55,577	56,535	48,776
Total	500,587	523,335	539,362	567,734	553,125
Natural colored gemstones, unworked:					
Brazil	31,361	26,043	17,963	24,470	29,725
Russia[1]	N/A	377	608	190	5,266
Colombia	1,386	4,425	6,085	5,972	3,194
Australia	990	2,059	2,561	3,197	2,518
Tanzania	151	276	324	832	1,135
Zambia	850	986	826	916	808
Thailand	582	687	912	877	765
Pakistan	622	248	437	1,805	648
India	95	215	242	181	644
Germany	921	575	1,188	357	554
Hong Kong	1,895	782	1,191	865	481
Venezuela	242	0	9	0	456
All other	5,091	4,916	6,387	4,818	3,063
Total	44,186	41,589	38,733	44,480	49,257
Natural colored gemstones, cut:					
Thailand	168,549	138,750	126,258	149,453	115,748
Colombia	51,552	92,664	119,626	90,021	94,272
India	31,724	24,974	37,353	52,769	66,370
Switzerland	56,580	77,199	48,138	55,361	57,442
Hong Kong	35,295	40,047	47,282	43,234	43,175
Israel	26,680	29,384	36,693	31,759	34,578
Germany	19,768	22,397	18,296	24,862	18,467
Brazil	20,800	18,182	14,899	17,223	17,164
Sri Lanka (Ceylon)	6,062	5,683	6,267	9,808	13,077
Belgium	5,314	2,536	3,624	5,523	5,747
United Kingdom	7,400	6,327	3,990	8,166	5,486
France	5,352	6,024	2,707	2,619	5,300
All other	21,325	17,579	35,497	32,456	27,041
Total	456,401	481,746	500,630	523,254	503,867

Table continues on next page.

Table B-2—*Continued*
Natural colored gemstones: value of U.S. imports for consumption by principal source, 1991-95

Average unit value of certain natural colored gemstones, cut:

Source	1991	1992	1993	1994	1995
			Quantity *(carats)*		
Rubies	2,377,971	2,634,945	3,604,363	4,862,006	4,182,463
Sapphires	3,501,548	4,610,906	5,129,783	7,064,167	6,778,018
Emeralds	3,939,305	2,955,906	5,452,141	5,671,293	7,317,983
Total	9,818,824	10,201,757	14,186,287	17,597,466	18,278,464
			Value *(1,000 dollars)*		
Rubies	70,855	77,941	90,617	95,886	84,420
Sapphires	81,620	75,118	79,317	100,902	83,823
Emeralds	165,508	213,497	244,356	227,230	236,038
Total	317,983	366,556	414,290	424,018	404,281
			Average unit price *(dollars per carat)*		
Rubies	30	30	25	20	20
Sapphires	23	16	15	14	12
Emeralds	42	72	45	40	32
Total	32	36	29	24	22

Average unit value of certain natural colored gemstones, unworked:

			Quantity *(carats)*		
Unworked	338,300,443	408,236,447	558,899,682	971,437,017	1,420,946,445
Other	429,475	280,928	174,551	157,059	107,690,955
Total	338,729,918	408,517,375	559,074,233	971,594,076	1,528,637,400
			Value*(1,000 dollars)*		
Unworked	43,825	41,446	38,378	44,102	48,575
Other	361	143	355	377	682
Total	44,186	41,589	38,733	44,479	49,257
			Average Unit Price *(dollars per carat)*		
Unworked	$0.13	$0.10	$0.07	$0.05	$0.03
Other	$0.84	$0.51	$2.03	$2.40	$0.01
Total	$0.13	$0.10	$0.07	$0.05	$0.03

1 Data for imports from Russia were not reported separate of the Soviet Union in 1991 and covers only Feb. through Dec., 1992; data for 1993-95 are full-year figures.

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

Table B-3
Pearls: value of U.S. imports for consumption by principal source, 1991-95
(1,000 dollars)

Source	1991	1992	1993	1994	1995
Pearls: all products					
Japan	55,600	32,917	31,690	42,083	47,627
Australia	3,472	4,760	5,835	8,578	11,708
Hong Kong	4,888	4,071	6,515	8,120	10,852
French Polynesia	3,345	5,915	5,130	9,020	10,054
China	201	336	770	1,827	3,734
Switzerland	732	823	1,282	574	1,067
Indonesia	885	488	70	27	917
India	1,040	803	1,025	657	575
United Kingdom	298	172	58	93	443
Taiwan	131	253	126	36	334
All other	516	716	594	1,061	840
Total	71,108	51,254	53,095	72,076	88,151
Pearls, natural:					
India	1,004	775	951	616	532
French Polynesia	233	598	59	8	511
Switzerland	238	63	395	17	454
Hong Kong	538	457	248	381	304
Australia	374	288	198	34	217
Japan	342	122	342	115	205
United Kingdom	151	107	23	39	179
Italy	0	16	10	5	39
Argentina	0	0	0	0	37
China	5	17	31	92	23
All other	955	196	44	78	13
Total	3,840	2,639	2,301	1,385	2,514
Cultured pearls, unworked:					
Japan	8,131	8,729	9,187	9,743	10,043
French Polynesia	1,985	4,286	4,015	6,273	7,378
Hong Kong	1,958	926	985	2,064	4,009
Australia	539	828	907	1,349	2,328
China	13	33	53	837	2,103
Indonesia	0	16	7	0	261
Philippines	0	2	0	0	71
United Kingdom	64	8	0	0	56
Cooks Islands	44	2	0	18	51
Switzerland	269	93	185	266	28
All other	116	29	89	79	53
Total	13,119	14,952	15,428	20,629	26,381

Table continues on next page.

Table B-3—*Continued*
Pearls: value of U.S. imports for consumption by principal source, 1991-95
(1,000 dollars)

Source	1991	1992	1993	1994	1995
Cultured pearls, worked:					
Japan	47,127	24,066	22,162	32,224	37,379
Australia	2,559	3,643	4,730	7,195	9,162
Hong Kong	2,393	2,688	5,282	5,675	6,539
French Polynesia	1,127	1,032	1,055	2,739	2,165
China	183	285	687	898	1,608
Indonesia	0	472	63	27	656
Switzerland	225	667	702	291	585
Taiwan	108	252	107	18	328
United Kingdom	83	57	35	54	208
Cooks Islands	0	9	24	668	136
All other	344	492	519	273	490
Total	54,149	33,663	35,366	50,062	59,256

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

Table B-4
Synthetic and reconstructed gemstones: value of U.S. imports for consumption by principal source, 1991-95

(1,000 dollars)

Source	1991	1992	1993	1994	1995
Synthetic and reconstructed gemstones, all products:					
Germany	9,004	10,206	10,777	11,004	11,084
Japan	765	1,781	3,474	5,145	8,177
Thailand	16,206	23,365	12,703	10,061	8,041
Austria	3,414	6,310	3,746	5,050	6,257
Switzerland	3,531	5,309	4,571	4,231	5,033
China	220	517	813	976	3,053
Korea, South	4,880	4,271	2,164	1,498	1,634
Hong Kong	1,647	2,934	2,137	1,985	1,493
Italy	36	3	390	705	1,121
Australia	475	1,906	3,379	2,720	1,121
All other	5,154	4,108	3,724	5,185	6,840
Total	45,332	60,710	47,878	48,560	53,854
Synthetic and reconstructed gemstones, unworked:					
Switzerland	694	639	556	649	542
Canada	7	0	0	5	248
Ireland	460	89	55	157	90
Thailand	2	0	30	4	81
China	2	40	13	8	59
France	111	78	46	74	56
India	45	23	15	58	52
Hong Kong	4	14	20	41	49
Germany	208	52	7	24	47
Brazil	7	1	14	12	24
All other	42	177	136	76	88
Total	1,582	1,113	892	1,108	1,336
Synthetic and reconstructed gemstones,cut and suitable for jewelry:					
Germany	8,725	10,052	10,735	10,944	10,958
Thailand	16,034	23,161	12,506	9,821	7,911
Austria	3,414	6,310	3,746	5,046	6,251
Switzerland	2,823	4,614	3,837	3,528	4,434
China	142	430	739	908	2,828
Hong Kong	1,607	2,870	1,993	1,887	1,393
Korea, South	4,861	4,231	2,143	1,470	1,360
Australia	455	1,906	3,379	2,720	1,117
Italy	33	2	380	688	1,116
France	1,908	1,378	1,027	999	1,008
All other	2,818	2,996	3,622	2,943	2,802
Total	42,820	57,950	44,107	40,954	41,178

Table continues on next page.

Table B-4—*Continued*
Synthetic and reconstructed gemstones: value of U. S. imports for consumption by principal source, 1991-95

(1,000 dollars)

Source	1991	1992	1993	1994	1995
Synthetic and reconstructed gemstones; generally worked for nonjewelry use:					
Japan	29	602	1,892	4,052	7,641
Russia	0	0	65	288	1,020
Costa Rica	0	0	0	802	946
Venezuela	0	30	1	191	528
Korea, South	13	18	17	25	256
China	76	47	62	60	167
Taiwan	28	83	95	66	157
Germany	71	102	36	36	79
Brazil	19	69	31	51	60
Czech Republic[1]	13	0	0	2	59
All other	694	695	681	925	428
Total	930	1,646	2,880	6,498	11,341

[1] Trade reported under Czechoslovakia in 1991 and 1992.

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

APPENDIX C
DOMESTIC EXPORTS

Table C-1
Natural diamonds: U.S. exports of domestic merchandise to major markets, 1991-95

Natural diamonds, unworked and cut:

Markets	1991	1992	1993	1994	1995
			Quantity *(carats)*		
Switzerland	9,887	30,075	11,397	15,862	15,985
Hong Kong	13,119	55,930	16,141	5,698	43,453
Canada	294,252	398,128	199,310	223,519	78,698
Japan	24,198	22,123	11,845	5,419	34,390
France	4,656	4,658	4,330	2,110	1,280
United Kingdom	8,301	6,028	3,109	3,545	541
India	21,717	82,023	11,086	16,097	19,962
Singapore	3,566	4,799	3,136	1,012	5,824
Netherlands	1,270	2,451	1,399	3,985	2,425
Belgium	200,604	234,095	7,059	16,741	4,014
All others	35,941	29,157	113,094	71,566	101,867
Total	630,927	945,462	389,883	378,106	327,860
			Value *(1,000 dollars)*		
Switzerland	69,277	84,882	68,876	91,256	57,545
Hong Kong	23,586	50,824	8,149	8,204	32,851
Canada	29,702	27,855	29,967	41,094	23,612
Japan	6,658	13,707	13,475	9,490	23,006
France	14,348	18,299	4,471	13,294	7,742
United Kingdom	21,586	32,469	3,371	965	7,237
India	1,943	6,329	1,589	1,574	3,163
Singapore	4,730	4,696	2,518	1,171	2,698
Netherlands	5,501	8,543	3,506	2,462	2,350
Belgium	15,099	64,157	2,748	2,366	1,468
All others	16,769	55,717	14,202	11,341	9,461
Total	209,199	367,478	152,872	183,217	171,133
			Average unit value *(dollars per carat)*		
Switzerland	7,007	2,822	6,043	5,753	3,600
Hong Kong	1,798	909	505	1,440	756
Canada	101	70	150	184	300
Japan	275	620	1,138	1,751	669
France	3,082	3,929	1,033	6,300	6,048
United Kingdom	2,600	5,386	1,084	272	13,377
India	89	77	143	98	158
Singapore	1,326	979	803	1,157	463
Netherlands	4,331	3,486	2,506	618	969
Belgium	75	274	389	141	366
All others	467	1,911	126	158	93
Total	332	389	392	485	522

Table continues on next page.

Table C-1—*Continued*
Natural diamonds: U.S. exports of domestic merchandise to principal markets, 1991-95

Natural diamonds, cut:

Markets	1991	1992	1993	1994	1995
			Quantity *(carats)*		
Switzerland	9,432	19,564	9,680	15,763	15,773
Hong Kong	12,374	36,740	7,979	3,345	31,795
Japan	13,077	21,586	8,873	5,412	32,922
Canada	68,500	65,061	44,376	154,305	34,128
France	4,635	4,620	3,956	1,878	1,279
United Kingdom	4,515	4,639	1,805	643	365
India	7,524	10,702	11,086	15,918	16,997
Singapore	3,509	1,704	3,136	1,012	4,900
Netherlands	1,270	2,131	1,399	3,491	2,425
Netherland Antilles	286	742	1,689	1,093	1,986
All others	43,351	100,805	32,542	26,711	15,949
Total	168,473	268,294	126,521	229,571	158,519
			Value *(1,000 dollars)*		
Switzerland	68,750	83,959	68,651	90,717	56,271
Hong Kong	22,193	48,417	6,270	5,514	30,786
Japan	6,493	13,698	13,238	9,485	22,975
Canada	17,757	15,658	12,836	27,522	15,341
France	14,275	18,214	4,316	13,159	7,737
United Kingdom	20,601	32,204	3,340	910	7,129
India	1,322	2,874	1,589	1,559	2,621
Singapore	4,639	4,514	2,518	1,171	2,423
Netherlands	5,501	8,421	3,506	2,199	2,350
Netherland Antilles	208	679	944	1,446	1,320
All others	27,350	109,049	14,403	10,578	7,627
Total	189,089	337,687	131,611	164,260	156,580
			Average unit value *(dollars per carat)*		
Switzerland	7,289	4,292	7,092	5,755	3,568
Hong Kong	1,794	1,318	786	1,648	968
Japan	497	635	1,492	1,753	698
Canada	259	241	289	178	450
France	3,080	3,942	1,091	7,007	6,049
United Kingdom	4,563	6,942	1,850	1,415	19,532
India	176	269	143	98	154
Singapore	1,322	2,649	803	1,157	494
Netherlands	4,331	3,952	2,506	630	969
Netherland Antilles	727	915	559	1,323	665
All others	631	1,082	443	396	478
Total	1,122	1,259	1,040	716	988

Table continues on next page.

Table C-1—*Continued*
Natural diamonds: U.S. exports of domestic merchandise to major markets, 1991-95

Natural diamonds, unworked:

Markets	1991	1992	1993	1994	1995
			Quantity *(carats)*		
Canada	225,752	333,067	154,934	69,214	44,570
Hong Kong	745	19,190	8,162	2,353	11,658
Switzerland	455	10,511	1,717	99	212
India	14,193	71,321	0	179	2,965
Austria	0	0	0	0	72,770
Mauritius	0	0	122	0	371
Singapore	57	3,095	0	0	924
Lebanon	0	0	0	0	358
Thailand	3,282	358	358	0	8,703
Belgium	175,586	187,958	1,494	12,705	2,230
All others	42,384	51,668	96,575	63,985	24,580
Total	462,454	677,168	263,362	148,535	169,341
			Value *(1,000 dollars)*		
Canada	11,945	12,197	17,130	13,572	8,271
Hong Kong	1,393	2,407	1,879	2,690	2,064
Switzerland	527	924	225	539	1,274
India	621	3,455	0	15	542
Austria	0	0	0	0	414
Mauritius	0	0	74	0	278
Singapore	91	182	0	0	275
Lebanon	0	0	0	0	224
Thailand	115	9	6	0	176
Belgium	3,318	9,339	195	204	158
All others	2,100	1,279	1,752	1,936	878
Total	20,110	29,792	21,261	18,956	14,554
			Average unit value *(dollars per carat)*		
Canada	53	37	111	196	186
Hong Kong	1,870	125	230	1,143	177
Switzerland	1,158	88	131	5,444	6,009
India	44	48	N/A	84	183
Austria	N/A	N/A	N/A	N/A	6
Mauritius	N/A	N/A	607	N/A	749
Singapore	1,596	59	N/A	N/A	298
Lebanon	N/A	N/A	N/A	N/A	626
Thailand	35	25	17	N/A	20
Belgium	19	50	131	16	71
All others	50	25	18	30	36
Total	43	44	81	128	86

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

Table C-2
Natural colored gemstones: value of U.S. exports of domestic merchandise to major markets, 1991-95

(1,000 dollars)

Markets	1991	1992	1993	1994	1995
Natural colored gemstones, unworked and cut:					
India	6,788	4,283	12,746	12,617	16,383
Hong Kong	12,520	14,242	9,040	10,510	11,227
Switzerland	9,318	8,852	8,306	7,691	8,279
Canada	4,596	4,837	7,155	10,635	8,185
Germany	1,863	2,253	2,279	1,543	6,494
Japan	8,975	3,373	2,191	1,497	1,857
Thailand	28,858	26,274	3,754	1,741	1,574
Korea, South	2,043	684	391	362	1,200
Israel	1,316	1,691	121	87	1,094
France	1,942	2,201	2,920	2,316	937
All others	9,504	12,890	7,998	7,057	5,411
Total	87,723	81,580	56,901	56,056	62,641
Natural colored gemstones, unworked:					
India	3,036	1,385	6,703	8,443	12,060
Hong Kong	1,786	2,544	2,365	1,393	2,623
Korea, South	681	114	200	229	968
Israel	4	27	50	3	887
Germany	536	396	704	257	664
Canada	531	712	716	1,014	635
Netherlands Antilles	100	204	40	290	478
Thailand	1,598	2,265	615	1,042	433
Singapore	29	4	6	74	428
United Kingdom	251	321	111	399	283
All others	2,270	1,908	2,398	1,425	2,202
Total	10,822	9,880	13,908	14,569	21,661
Natural colored gemstones, cut:					
Hong Kong	10,733	11,697	6,675	9,118	8,605
Switzerland	9,097	8,730	8,276	7,662	8,133
Canada	4,065	4,125	6,440	9,621	7,550
Germany	1,326	1,857	1,575	1,286	5,830
India	3,752	2,897	6,043	4,174	4,324
Japan	8,076	3,164	2,046	1,223	1,685
Thailand	27,260	24,009	3,138	699	1,141
France	1,899	2,157	2,873	2,307	818
United Kingdom	1,363	1,727	737	321	564
Australia	650	765	843	109	318
All others	8,681	10,572	4,347	4,967	2,012
Total	76,902	71,700	42,993	41,487	40,980

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

Table C-3
Pearls: value of U.S. exports of domestic merchandise to major markets, 1991-95

(1,000 dollars)

Markets	1991	1992	1993	1994	1995
Pearls, all products:					
Canada	640	298	514	371	595
Japan	1,440	935	167	689	493
Hong Kong	778	1,328	1,841	218	391
United Kingdom	59	62	30	218	177
Paraguay	0	5	0	17	138
Germany	9	16	33	196	127
Singapore	13	0	0	7	120
Korea, South	15	238	0	5	112
Taiwan	0	1,594	0	32	105
French Polynesia	0	0	0	30	90
All others	634	1,216	460	119	392
Total	3,588	5,692	3,045	1,902	2,740
Pearls, natural:					
Canada	76	32	27	35	362
Singapore	13	0	0	0	120
Switzerland	54	125	0	0	67
Germany	9	0	13	23	61
Italy	7	0	44	0	27
United Kingdom	53	12	6	33	22
Brazil	5	0	0	0	12
Hong Kong	309	1,222	1,487	9	10
Japan	1,280	659	16	0	8
Mexico	41	38	0	0	7
All others	201	715	22	14	19
Total	2,048	2,803	1,615	114	715
Cultured pearls, unworked:					
Hong Kong	325	39	91	44	78
Canada	305	123	227	95	63
Spain	0	0	0	0	57
Japan	0	31	135	76	53
Colombia	0	4	11	0	41
United Kingdom	5	0	19	86	34
France	0	0	40	0	25
Peru	0	0	4	3	18
Germany	0	3	0	173	18
Australia	63	8	0	0	11
All others	60	1,733	294	67	26
Total	758	1,941	821	544	424

Table continues on next page.

Table C-3—*Continued*
Pearls: value of U.S. exports of domestic merchandise to major markets, 1991-95

(1,000 dollars)

Markets	1991	1992	1993	1994	1995
Cultured pearls, worked:					
Japan	160	245	17	612	431
Hong Kong	144	67	264	164	303
Canada	259	142	260	240	170
Paraguay	0	0	0	17	138
United Kingdom	0	50	6	99	121
Korea, South	0	0	0	0	112
Taiwan	0	0	0	17	105
French Polynesia	0	0	0	14	90
Germany	0	14	20	0	48
Mexico	4	124	0	20	31
All others	215	305	42	62	52
Total	782	947	609	1,245	1,601

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

Table C-4
Synthetic and reconstructed gemstones: value of U.S. exports of domestic merchandise to major markets, 1991-95

(1,000 dollars)

Markets	1991	1992	1993	1994	1995
Synthetic and reconstructed gemstones, all products:					
Taiwan	1,950	524	887	3,419	6,750
Germany	487	1,124	979	2,364	3,768
Japan	2,821	1,510	1,719	3,572	3,690
Mexico	1,419	1,580	1,951	3,721	2,530
Canada	1,152	1,035	652	759	2,155
Korea, South	3,805	2,590	2,567	1,384	1,699
Malaysia	2,336	2,545	1,578	1,225	1,496
Hong Kong	693	1,376	1,651	2,095	1,289
United Kingdom	715	533	766	970	1,145
France	458	307	415	442	1,027
All others	8,083	7,652	5,219	7,269	5,932
Total	23,919	20,776	18,384	27,220	31,481
Synthetic and reconstructed gemstones, unworked:					
Japan	1,262	1,099	1,212	2,451	2,733
Germany	308	927	303	1,589	1,878
Malaysia	2,336	2,529	1,559	1,216	1,496
Korea, South	3,249	2,002	2,334	975	806
Austria	2,255	3,464	945	1,259	647
Taiwan	989	205	368	370	621
India	359	135	226	231	477
Hong Kong	378	577	811	450	376
Rep. of S. Africa	0	0	109	61	300
Netherlands	503	11	109	93	297
All others	4,114	3,110	2,674	2,492	1,286
Total	15,753	14,059	10,650	11,187	10,917
Synthetic and reconstructed gemstones, cut and suitable for jewelry:					
Mexico	1,196	1,453	1,725	3,511	2,438
Canada	783	777	481	438	2,005
Korea, South	129	248	84	286	536
Brazil	0	0	0	110	369
Netherlands	0	0	0	0	331
United Kingdom	127	63	22	145	246
Hong Kong	33	65	40	92	193
Peru	0	0	0	72	114
Thailand	15	55	25	46	83
Israel	23	13	0	21	76
All others	546	325	554	1,705	367
Total	2,852	2,999	2,931	6,426	6,758

Table continues on next page.

Table C-4—*Continued*
Synthetics and reconstructed gemstones: value of U.S. exports of domesitc merchandise to major markets, 1991-95

(1,000 dollars)

Markets	1991	1992	1993	1994	1995
Synthetic and reconstructed gemstones, suitable for nonjewelry use:					
Taiwan	818	165	373	3,024	6,067
Germany	166	187	591	695	1,831
Japan	1,303	411	506	1,117	938
France	275	234	375	417	905
United Kingdom	505	215	205	432	762
Hong Kong	281	735	800	1,552	720
Korea, South	427	341	149	123	357
Costa Rica	0	0	10	279	306
China	73	0	21	4	248
Ireland	27	0	123	49	238
All others	1,439	1,430	1,649	1,914	1,434
Total	5,314	3,718	4,802	9,606	13,806

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

APPENDIX D
RE-EXPORTS

Table D-1
Natural diamonds: re-exports of foreign merchandise to major markets, 1991-95

Natural diamonds, unworked and cut:

Markets	1991	1992	1993	1994	1995
			Quantity *(carats)*		
Belgium	1,976,586	2,170,791	1,573,050	1,237,392	1,143,932
Israel	355,746	295,063	501,862	624,171	694,321
Hong Kong	278,418	142,488	267,027	220,554	442,367
Japan	101,062	58,830	83,553	49,632	116,868
Switzerland	106,359	22,372	26,537	23,796	39,188
United Kingdom	12,215	10,128	16,018	20,020	12,551
Singapore	17,087	19,414	11,468	13,571	20,683
Thailand	34,539	18,025	60,356	43,792	124,331
India	153,986	217,158	232,843	237,971	264,051
Russia[1]	N/A	0	0	4,654	9,925
All others	43,491	50,659	96,146	124,363	179,615
Total	3,079,489	3,004,928	2,868,860	2,599,916	3,047,832
			Value *(1,000 dollars)*		
Belgium	415,355	304,408	435,073	506,478	552,439
Israel	266,372	238,562	327,028	433,424	520,012
Hong Kong	246,794	261,692	327,089	396,766	403,623
Japan	189,636	107,803	131,703	124,948	135,942
Switzerland	80,376	61,476	91,565	100,291	126,903
United Kingdom	16,907	19,279	41,698	64,915	57,514
Singapore	22,726	26,214	33,178	34,383	53,798
Thailand	34,248	14,445	23,306	19,191	32,014
India	8,235	14,915	21,957	25,656	23,300
Russia[1]	N/A	0	0	6,740	23,054
All others	31,761	33,193	49,669	43,542	81,874
Total	1,312,410	1,081,987	1,482,266	1,756,334	2,010,473
			Average unit value *(dollars per carat)*		
Belgium	210	140	277	409	483
Israel	749	809	652	694	749
Hong Kong	886	1,837	1,225	1,799	912
Japan	1,876	1,832	1,576	2,517	1,163
Switzerland	756	2,748	3,450	4,215	3,238
United Kingdom	1,384	1,904	2,603	3,243	4,582
Singapore	1,330	1,350	2,893	2,534	2,601
Thailand	992	801	386	438	257
India	53	69	94	108	88
Russia[1]	N/A	0	0	1,448	2,323
All others	730	655	517	350	456
Total	426	360	517	676	660

Table continues on next page.

Table D-1—*Continued*
Natural Diamonds: re-exports of foreign merchandise to major markets, 1991-95

Natural diamonds, cut:

Markets	1991	1992	1993	1994	1995
			***Quantity** (carats)*		
Israel	252,673	198,845	312,718	386,122	493,351
Belgium	294,436	219,668	297,379	306,620	585,506
Hong Kong	105,847	106,176	208,949	185,398	423,155
Japan	93,298	53,869	62,313	49,606	116,854
Switzerland	26,782	12,732	18,956	20,384	37,162
United Kingdom	7,564	4,981	9,888	17,945	10,352
Singapore	4,938	5,858	11,468	12,951	20,683
Thailand	33,090	12,337	56,621	41,045	115,572
Russia[1]	N/A	0	0	3,529	9,925
France	3,205	2,260	4,875	8,971	22,457
All others	17,848	26,399	41,753	57,471	146,555
Total	839,681	643,125	1,024,920	1,090,042	1,981,572
			Value *(1,000 dollars)*		
Israel	232,728	209,733	281,764	388,183	477,327
Belgium	320,718	252,796	338,164	400,212	461,488
Hong Kong	244,035	261,102	324,955	393,188	401,994
Japan	188,927	107,653	130,071	124,945	135,934
Switzerland	74,464	61,281	91,435	98,854	124,774
United Kingdom	16,101	18,283	36,825	64,456	57,046
Singapore	22,361	25,579	33,178	34,333	53,798
Thailand	33,931	13,826	22,686	18,614	30,807
Russia[1]	N/A	0	0	6,717	23,054
France	8,012	6,240	6,037	13,572	22,218
All others	20,837	26,810	44,183	30,978	64,982
Total	1,162,114	983,303	1,309,298	1,574,052	1,853,422
			Average unit value *(dollars per carat)*		
Israel	921	1,055	901	1,005	968
Belgium	1,089	1,151	1,137	1,305	788
Hong Kong	2,306	2,459	1,555	2,121	950
Japan	2,025	1,998	2,087	2,519	1,163
Switzerland	2,780	4,813	4,824	4,850	3,358
United Kingdom	2,129	3,671	3,724	3,592	5,511
Singapore	4,528	4,367	2,893	2,651	2,601
Thailand	1,025	1,121	401	454	267
Russia[1]	N/A	0	0	1,903	2,323
France	2,500	2,761	1,238	1,513	989
All others	1,167	1,016	1,058	539	443
Total	1,384	1,529	1,277	1,444	935

Table continues on next page.

Table D-1—*Continued*
Natural Diamonds: re-exports of foreign merchandise to major markets, 1991-95

Natural diamonds, unworked:

Markets	1991	1992	1993	1994	1995
			***Quantity** (carats)*		
Belgium	1,682,150	1,951,123	1,275,671	930,772	558,426
Israel	103,073	96,218	189,144	238,049	200,970
India	149,897	206,544	217,936	223,080	185,272
Rep. of S. Africa	1,363	2,331	7,084	20,695	12,131
Mauritius	2,190	7,611	16,466	19,532	14,713
Switzerland	79,577	9,640	7,581	3,412	2,026
Canada	6,580	5,778	30,535	14,979	12,601
Hong Kong	172,571	36,312	58,078	35,156	19,212
Thailand	1,449	5,688	3,735	2,747	8,759
Netherlands	9,916	4,016	1,103	23	4,009
All others	31,042	36,542	36,607	21,429	48,141
Total	2,239,808	2,361,803	1,843,940	1,509,874	1,066,260
			Value *(1,000 dollars)*		
Belgium	94,637	51,612	96,909	106,266	90,951
Israel	33,644	28,829	45,264	45,240	42,685
India	4,848	8,597	14,153	14,075	9,199
Rep. of S. Africa	1,164	2,575	4,157	4,477	2,793
Mauritius	832	1,449	1,190	3,229	2,421
Switzerland	5,912	195	130	1,437	2,130
Canada	635	309	1,196	2,057	1,697
Hong Kong	2,759	590	2,134	3,578	1,629
Thailand	317	619	620	577	1,207
Netherlands	934	964	82	14	781
All others	4,614	2,945	7,133	1,332	1,558
Total	150,296	98,684	172,968	182,282	157,051
			Average unit value *(dollars per carat)*		
Belgium	56	26	76	114	163
Israel	326	300	239	190	212
India	32	42	65	63	50
Rep. of S. Africa	854	1,105	587	216	230
Mauritius	380	190	72	165	165
Switzerland	74	20	17	421	1,051
Canada	97	53	39	137	135
Hong Kong	16	16	37	102	85
Thailand	219	109	166	210	138
Netherlands	94	240	74	609	195
All others	149	81	195	62	32
Total	67	42	94	121	147

[1] Export data to Russia was not reported separate of the Soviet Union in 1991 and covers only Feb. through Dec. 1992; data for 1993-95 are full-year figures.

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

Table D-2
Natural colored gemstones: value of re-exports of foreign merchandise to major markets, 1991-95

(1,000 dollars)

Markets	1991	1992	1993	1994	1995
Natural colored gemstones, unworked and cut:					
Hong Kong	11,375	16,650	37,693	50,062	40,885
India	15,064	14,211	13,661	19,910	40,537
Israel	2,321	5,590	16,568	13,682	21,653
Switzerland	10,978	12,755	24,298	25,108	20,763
Thailand	40,091	7,062	13,191	19,304	17,934
Japan	4,544	3,799	3,835	4,302	6,882
France	1,657	4,063	4,178	1,972	6,618
Germany	1,730	3,441	2,161	2,931	5,438
Belgium	5,376	1,646	3,966	4,019	4,590
United Kingdom	4,395	1,817	2,984	3,857	3,596
All others	4,728	5,825	7,178	8,206	9,526
Total	102,259	76,859	129,713	153,353	178,422
Natural colored gemstones, unworked:					
India	13,883	11,336	10,225	15,676	20,765
Hong Kong	910	311	1,190	2,339	4,451
Israel	49	26	145	43	387
Thailand	939	578	271	30	283
Canada	73	81	176	120	137
Germany	70	344	182	185	120
Belgium	487	0	200	0	83
Korea, South	49	61	20	36	51
Bahamas	0	0	0	57	42
Switzerland	0	505	9	180	33
All others	639	718	225	286	45
Total	17,099	13,960	12,643	18,952	26,397
Natural colored gemstones, cut:					
Hong Kong	10,465	16,339	36,502	47,723	36,434
Israel	2,273	5,564	16,424	13,639	21,266
Switzerland	10,978	12,250	24,289	24,929	20,730
India	1,181	2,875	3,436	4,234	19,772
Thailand	39,151	6,484	12,920	19,274	17,650
Japan	4,171	3,347	3,781	4,274	6,878
France	1,657	4,063	4,079	1,955	6,618
Germany	1,659	3,097	1,980	2,746	5,318
Belgium	4,889	1,646	3,766	4,019	4,507
United Kingdom	4,224	1,817	2,953	3,852	3,596
All others	4,512	5,417	6,940	7,756	9,256
Total	85,160	62,899	117,070	134,401	152,025

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

Table D-3
Pearls: value of re-exports of foreign merchandise to major markets, 1991-95
(1,000 dollars)

Markets	1991	1992	1993	1994	1995
Pearls, all products:					
Hong Kong	122	14	2,544	1,064	2,289
Switzerland	429	455	904	1,076	1,701
Japan	360	101	165	1,787	868
Canada	195	111	67	100	215
Spain	36	0	0	309	76
Israel	6	79	88	34	75
France	59	0	56	6	60
United Kingdom	152	69	22	436	37
Italy	0	28	0	0	33
Colombia	0	0	0	0	25
All others	67	205	424	434	61
Total	1,426	1,062	4,270	5,246	5,440
Natural pearls:					
Hong Kong	0	0	661	68	1,186
Japan	105	0	70	167	500
Switzerland	296	42	379	87	336
United Kingdom	134	69	22	350	34
Spain	0	0	0	0	28
Belgium	0	10	0	12	19
France	59	0	6	0	17
Canada	38	15	7	10	12
Israel	6	79	52	34	5
All others	39	89	105	174	1
Total	677	304	1,302	902	2,138
Cultured pearls, unworked:					
Switzerland	109	133	526	820	909
Hong Kong	17	10	1,133	832	622
Canada	47	37	55	59	88
Spain	0	0	0	309	48
Japan	245	52	0	1,447	46
Israel	0	0	11	0	43
Italy	0	3	0	0	33
France	0	0	51	6	27
Bahamas	0	0	0	0	17
India	0	0	0	0	10
All others	14	11	291	118	18
Total	432	246	2,067	3,591	1,861

Table continues on next page.

Table D-3—*Continued*
Pearls: value of re-exports of foreign merchandise to major markets, 1991-95

(1,000 dollars)

Markets	1991	1992	1993	1994	1995
Cultured pearls, worked:					
Hong Kong	105	4	750	164	481
Switzerland	24	280	0	169	456
Japan	10	49	95	173	322
Canada	110	60	5	31	115
Israel	0	0	25	0	27
Colombia	0	0	0	0	25
France	0	0	0	0	16
All others	69	119	26	216	0
Total	318	512	901	753	1,442

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

Table D-4
Synthetic and reconstructed gemstones: value of re-exports of foreign merchandise to major markets, 1991-95

(1,000 dollars)

Markets	1991	1992	1993	1994	1995
Synthetic and reconstructed gemstones, all products:					
Mexico	39	68	1,221	2,259	2,467
Japan	0	13	148	302	2,276
Hong Kong	71	23	89	1,645	802
Canada	37	124	36	537	691
Australia	9	24	45	41	421
Switzerland	0	25	37	90	379
Austria	185	0	112	177	365
Brazil	0	0	0	76	330
Germany	35	25	358	105	256
Korea, South	4	220	145	41	213
All others	288	1,250	1,120	685	476
Total	668	1,772	3,311	5,958	8,676
Synthetic and reconstructed gemstones, unworked:					
Japan	0	0	145	248	1,005
Hong Kong	8	0	50	1,598	734
Australia	9	0	45	41	418
Mexico	0	0	28	236	266
Germany	0	0	358	105	251
Switzerland	0	0	9	6	230
Austria	0	0	0	0	140
Thailand	19	6	122	267	138
Taiwan	10	0	0	5	92
Singapore	0	0	43	0	33
All others	42	1,049	867	298	63
Total	88	1,055	1,667	2,804	3,370
Synthetic and reconstructed gemstones, cut and suitable for jewelry:					
Mexico	39	51	1,137	1,929	2,160
Japan	0	13	0	11	928
Canada	33	120	32	537	685
Brazil	0	0	0	76	330
Austria	185	0	112	177	225
Switzerland	0	25	28	84	149
United Kingdom	0	0	0	43	84
Hong Kong	0	3	39	5	57
Korea, South	4	108	0	24	50
Thailand	19	21	0	0	20
All others	104	156	61	61	30
Total	384	497	1,409	2,947	4,718

Table continues on next page.

Table D-4—*Continued*

Synthetic and reconstructed gemstones: value of re-exports of foreign merchandise to major markets, 1991-95

(1,000 dollars)

Markets	1991	1992	1993	1994	1995
Synthetic and reconstructed gemstones, whether or not worked and suitable for non-jewelry use:					
Japan	0	0	3	43	344
Korea, South	0	101	34	14	157
Mexico	0	17	56	94	41
France	0	0	0	0	31
Hong Kong	63	20	0	42	11
Germany	30	25	0	0	5
All others	103	56	142	13	0
Total	196	219	235	206	588

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

APPENDIX E
TOTAL EXPORTS

Table E-1
Natural diamonds: U.S. exports of domestic and foreign merchandise to major markets, 1991-95

Natural diamonds, unworked and cut:

Markets	1991	1992	1993	1994	1995
			***Quanity** (carats)*		
Belgium	2,177,190	2,404,886	1,580,109	1,254,133	1,147,946
Israel	364,495	335,521	507,048	629,634	695,964
Hong Kong	291,537	198,418	283,168	226,252	485,820
Switzerland	116,246	52,447	37,934	39,658	55,173
Japan	125,260	80,953	95,398	55,051	151,258
United Kingdom	20,516	16,156	19,127	23,565	13,092
Singapore	20,653	24,213	14,604	14,583	26,507
Canada	305,702	413,285	242,601	263,674	127,210
Thailand	39,748	23,057	62,225	44,016	140,269
France	8,746	7,455	9,214	11,081	23,916
All others	240,323	393,999	407,315	416,375	508,537
Total	3,710,416	3,950,390	3,258,743	2,978,022	3,375,692
			Value *(1,000 dollars)*		
Belgium	430,453	368,566	437,821	508,843	553,906
Israel	272,116	278,992	331,045	434,747	521,202
Hong Kong	270,380	312,516	335,239	404,970	436,473
Switzerland	149,653	146,358	160,441	191,547	184,449
Japan	196,295	121,510	145,178	134,437	158,947
United Kingdom	38,493	51,747	45,069	65,880	64,751
Singapore	27,455	30,909	35,696	35,554	56,496
Canada	32,073	30,730	33,582	46,176	44,370
Thailand	39,705	17,135	25,034	19,386	32,792
France	23,708	25,207	10,519	26,866	30,457
All others	41,278	65,795	75,514	71,145	97,763
Total	1,521,609	1,449,465	1,635,138	1,939,551	2,181,606
			Average unit value *(dollars per carat)*		
Belgium	198	153	277	406	483
Israel	747	832	653	690	749
Hong Kong	927	1,575	1,184	1,790	898
Switzerland	1,287	2,791	4,229	4,830	3,343
Japan	1,567	1,501	1,522	2,442	1,051
United Kingdom	1,876	3,203	2,356	2,796	4,946
Singapore	1,329	1,277	2,444	2,438	2,131
Canada	105	74	138	175	349
Thailand	999	743	402	440	234
France	2,711	3,381	1,142	2,425	1,273
All others	172	167	185	171	192
Total	410	367	502	651	646

Table continues on next page.

Table E-1—*Continued*
Natural diamonds: U.S. exports of domestic and foreign merchandise to major markets, 1991-95

Natural diamonds, cut:

Markets	1991	1992	1993	1994	1995
			Quantity *(carats)*		
Israel	257,704	239,184	317,893	389,200	493,889
Belgium	319,454	265,805	302,944	310,656	587,290
Hong Kong	118,221	142,916	216,928	188,743	454,950
Switzerland	36,214	32,296	28,636	36,147	52,935
Japan	106,375	75,455	71,186	55,018	149,776
United Kingdom	12,079	9,620	11,693	18,588	10,717
Singapore	8,447	7,562	14,604	13,963	25,583
Canada	73,370	74,440	57,132	179,481	70,039
Thailand	35,017	17,011	58,132	41,269	122,807
France	7,840	6,880	8,811	10,849	23,736
All others	33,433	40,250	63,482	75,699	148,369
Total	1,008,154	911,419	1,151,441	1,319,613	2,140,091
			Value *(1,000 dollars)*		
Israel	238,086	250,145	285,768	389,477	478,478
Belgium	332,499	307,615	340,717	402,374	462,797
Hong Kong	266,228	309,520	331,226	398,702	432,780
Switzerland	143,214	145,240	160,086	189,570	181,045
Japan	195,420	121,351	143,309	134,430	158,909
United Kingdom	36,702	50,487	40,164	65,366	64,175
Singapore	27	30,093	35,696	35,504	56,221
Canada	19,492	18,223	15,256	30,547	34,402
Thailand	39,273	16,508	24,408	18,809	31,409
France	22,287	24,455	10,353	26,732	29,956
All others	31,002	47,353	53,926	46,801	79,829
Total	1,351,203	1,320,990	1,440,909	1,738,312	2,010,001
			Average unit value *(dollars per carat)*		
Israel	924	1,046	899	1,001	969
Belgium	1,041	1,157	1,125	1,295	788
Hong Kong	2,252	2,166	1,527	2,112	951
Switzerland	3,955	4,497	5,590	5,244	3,420
Japan	1,837	1,608	2,013	2,443	1,061
United Kingdom	3,038	5,248	3,435	3,517	5,988
Singapore	3,196	3,980	2,444	2,543	2,198
Canada	266	245	267	170	491
Thailand	1,122	970	420	456	256
France	2,843	3,555	1,175	2,464	1,262
All others	927	1,176	849	618	538
Total	1,340	1,449	1,251	1,317	939

Table continues on next page.

Table E-1—*Continued*
Natural diamonds: U.S. exports of domestic and foreign merchandise to major markets, 1991-95

Natural diamonds, unworked:

Markets	1991	1992	1993	1994	1995
			Quantity *(carats)*		
Belgium	1,857,736	2,139,081	1,277,165	943,477	560,656
Israel	106,791	96,337	189,155	240,434	202,075
Canada	232,332	338,845	185,469	84,193	57,171
India	164,090	277,865	217,936	223,259	188,237
Hong Kong	173,316	55,502	66,240	37,509	30,870
Switzerland	80,032	20,151	9,298	3,511	2,238
Rep. of S. Africa	1,769	2,500	14,802	21,798	13,234
Mauritius	2,190	7,611	16,588	19,532	15,084
Thailand	4,731	6,046	4,093	2,747	17,462
Netherlands	9,916	4,336	1,103	517	4,009
All others	69,359	90,697	125,453	81,432	144,565
Total	2,702,262	3,038,971	2,107,302	1,658,409	1,235,601
			Value *(1,000 dollars)*		
Belgium	97,954	60,951	97,104	106,470	91,109
Israel	34,030	28,847	45,276	45,270	42,724
Canada	12,580	12,507	18,326	15,629	9,968
India	5,469	12,052	14,153	14,090	9,741
Hong Kong	4,152	2,996	4,013	6,268	3,693
Switzerland	6,440	1,118	355	1,977	3,404
Rep. of S. Africa	1,230	2,776	4,182	4,481	2,900
Mauritius	832	1,449	1,263	3,229	2,699
Thailand	432	627	626	577	1,382
Netherlands	934	1,087	82	277	781
All others	6,352	4,065	8,849	2,971	3,203
Total	170,405	128,475	194,229	201,239	171,604
			Average unit value *(dollars per carat)*		
Belgium	53	28	76	113	163
Israel	319	299	239	188	211
Canada	54	37	99	186	174
India	33	43	65	63	52
Hong Kong	24	54	61	167	120
Switzerland	80	55	38	563	1,521
Rep. of S. Africa	695	1,110	283	206	219
Mauritius	380	190	76	165	179
Thailand	91	104	153	210	79
Netherlands	94	251	74	536	195
All others	92	45	71	36	22
Total	63	42	92	121	139

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

Table E-2
Natural colored gemstones: value of U.S. exports of domestic and foreign merchandise to major markets, 1991-95

(1,000 dollars)

Markets	1991	1992	1993	1994	1995
Natural colored gemstones, unworked and cut:					
India	21,852	18,494	26,407	32,527	56,921
Hong Kong	23,895	30,892	46,732	60,572	52,113
Switzerland	20,296	21,606	32,604	32,800	29,041
Israel	3,637	7,281	16,689	13,769	22,748
Thailand	68,949	33,336	16,945	21,044	19,507
Germany	3,592	5,694	4,440	4,474	11,932
Canada	5,737	6,459	8,550	12,300	9,793
Japan	13,519	7,172	6,025	5,798	8,739
France	3,599	6,264	7,098	4,288	7,555
Belgium	6,121	3,796	4,862	4,154	4,625
All others	18,786	17,444	16,262	17,683	18,089
Total	189,983	158,438	186,614	209,409	241,063
Natural colored gemstones unworked:					
India	16,919	12,722	16,928	24,119	32,825
Hong Kong	2,696	2,855	3,555	3,732	7,074
Israel	52	53	195	46	1,274
Korea, South	730	175	220	266	1,019
Germany	606	739	885	442	784
Canada	605	793	892	1,135	772
Thailand	2,538	2,843	887	1,072	716
Netherland Antilles	100	204	40	292	478
Singapore	29	70	9	85	428
United Kingdom	422	321	141	403	283
All others	3,224	3,065	2,800	1,929	2,405
Total	27,921	23,840	26,552	33,521	48,058
Natural colored gemstones cut:					
Hong Kong	21,199	28,037	43,177	56,841	45,039
Switzerland	20,075	20,980	32,565	32,591	28,863
India	4,933	5,772	9,479	8,408	24,096
Israel	3,584	7,227	16,494	13,723	21,473
Thailand	66,411	30,493	16,058	19,972	18,792
Germany	2,986	4,954	3,555	4,033	11,148
Canada	5,132	5,666	7,658	11,165	9,021
Japan	12,247	6,511	5,827	5,497	8,563
France	3,556	6,220	6,952	4,262	7,436
Belgium	5,307	3,796	3,853	4,133	4,507
All others	16,632	14,943	14,445	15,263	14,067
Total	162,062	134,599	160,063	175,888	193,005

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

Table E-3
Pearls: value of U.S. exports of domestic and foreign merchandise to major markets, 1991-95
(1,000 dollrs)

Markets	1991	1992	1993	1994	1995
Pearls, all products:					
Hong Kong	900	1,342	4,385	1,281	2,680
Switzerland	492	588	904	1,111	1,767
Japan	1,800	1,035	333	2,475	1,361
Canada	836	408	580	470	810
United Kingdom	211	131	52	654	214
Paraguay	0	5	0	17	138
Germany	27	16	146	196	133
Spain	46	0	0	309	132
Singapore	13	0	0	7	120
Korea, South	15	334	70	5	112
All others	674	2,894	845	623	713
Total	5,014	6,753	7,315	7,148	8,180
Pearls, natural:					
Hong Kong	309	1,222	2,148	77	1,196
Japan	1,385	659	86	167	509
Switzerland	350	166	379	87	402
Canada	115	46	34	46	374
Singapore	13	0	0	0	120
Germany	27	0	26	23	61
United Kingdom	188	81	28	382	56
Spain	0	0	0	0	28
Italy	7	0	44	0	27
Belgium	0	40	0	15	19
All others	330	893	172	218	61
Total	2,724	3,107	2,917	1,015	2,853
Pearls, unworked cultured:					
Switzerland	109	133	526	820	909
Hong Kong	342	49	1,223	876	700
Canada	352	160	282	154	150
Spain	0	0	0	309	105
Japan	245	82	135	1,523	99
France	0	0	90	6	52
Israel	0	0	11	0	51
Colombia	0	4	11	0	41
Italy	0	10	139	13	37
United Kingdom	5	0	19	162	37
All others	137	1,749	452	272	103
Total	1,190	2,187	2,888	4,135	2,284

Table continues on next page.

Table E-3—*Continued*

Pearls: value of US. exports of domestic and foreign merchandise to major markets, 1991-95

(1,000 dollars)

Markets	1991	1992	1993	1994	1995
Cultured pearls, worked:					
Hong Kong	249	71	1,014	328	784
Japan	170	294	112	786	753
Switzerland	33	289	0	204	456
Canada	369	202	265	271	285
Paraguay	0	0	0	17	138
United Kingdom	18	50	6	110	121
Korea, South	0	6	0	0	112
Taiwan	0	0	3	39	105
French Polynesia	0	46	0	14	90
Germany	0	14	20	0	48
All others	261	487	90	229	151
Total	1,100	1,459	1,510	1,998	3,043

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

Table E-4
Synthetic and reconstructed gemstones: value of U.S. exports of domestic and foreign merchandise to major markets, 1991-95

(1,000 dollars)

Markets	1991	1992	1993	1994	1995
Synthetic and reconstructed gemstones, all products:					
Taiwan	2,045	534	941	3,449	6,848
Japan	2,821	1,524	1,867	3,875	5,966
Mexico	1,458	1,649	3,172	5,981	4,996
Germany	523	1,149	1,337	2,469	4,024
Canada	1,188	1,159	688	1,297	2,846
Hong Kong	764	1,399	1,740	3,740	2,091
Korea, South	3,809	2,810	2,712	1,425	1,912
Malaysia	2,336	2,548	1,578	1,225	1,496
United Kingdom	726	570	1,251	1,210	1,236
Austria	2,540	3,798	1,400	1,835	1,164
All others	6,377	5,408	5,009	6,672	7,578
Total	24,587	22,548	21,695	33,178	40,157
Synthetic and reconstructed gemstones, unworked:					
Japan	1,262	1,099	1,357	2,699	3,738
Germany	308	927	661	1,694	2,129
Malaysia	2,336	2,529	1,559	1,216	1,496
Hong Kong	387	577	861	2,048	1,110
Korea, South	3,249	2,013	2,446	978	813
Austria	2,255	3,464	945	1,259	787
Taiwan	999	205	368	375	713
India	359	135	262	242	477
Australia	75	23	137	136	470
Switzerland	695	778	479	213	385
All others	3,916	3,364	3,242	3,131	2,169
Total	15,841	15,114	12,317	13,991	14,287
Synthetic and reconstructed gemstones cut and suitable for jewelry:					
Mexico	1,235	1,504	2,863	5,440	4,599
Canada	815	898	513	975	2,690
Japan	255	13	0	15	946
Brazil	0	0	0	186	699
Korea, South	133	356	84	310	586
Netherlands	0	0	0	0	331
United Kingdom	127	63	22	188	329
Hong Kong	33	68	78	98	250
Austria	194	0	112	355	225
Switzerland	0	76	250	138	224
All others	444	518	418	1,669	597
Total	3,236	3,496	4,340	9,374	11,476

Tabe continues on next page.

Table E-4—*Continued*

Synthetic and reconstructed gemstones: value of U.S. exports of domestic and foreign merchandise to major markets, 1991-95

(1,000 dollars)

Markets	1991	1992	1993	1994	1995
Synthetic and reconstructed gemstones, whether or not worked and suitable for nonjewelry use:					
Taiwan	818	645	406	3,034	6,067
Germany	195	211	591	695	1,836
Japan	1,303	411	509	1,160	1,281
France	275	234	375	417	936
United Kingdom	512	252	288	432	762
Hong Kong	344	755	800	1,594	731
Korea, South	427	441	182	137	514
Costa Rica	0	0	15	279	306
China	73	0	21	4	248
Ireland	76	0	123	49	238
All others	1,487	1,469	1,727	2,012	1,476
Total	5,510	3,938	5,037	9,813	14,395

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