

Industry & Trade Summary

Unrecorded Media

USITC Publication 2879
May 1995

OFFICE OF INDUSTRIES
U.S. International Trade Commission
Washington, DC 20436



UNITED STATES INTERNATIONAL TRADE COMMISSION

COMMISSIONERS

Peter S. Watson, Chairman
Janet A. Nuzum, Vice Chairman
David B. Rohr
Don E. Newquist
Carol T. Crawford
Lynn M. Bragg

Robert A. Rogowsky
Director of Operations

Vern Simpson
Director of Industries

This report was prepared principally by

Douglas J. Puffert

Electronic Technology and Equipment Branch
Services, Electronics, and Transportation Division

Address all communications to
Secretary to the Commission
United States International Trade Commission
Washington, DC 20436

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 unrecorded media covers the period 1989 through 1993 and represents one of approximately 250 to 300 individual reports to be produced in this series during the first half of the 1990s. Listed below are the individual summary reports published to date on the electronics and transportation sectors.

<i>USITC Publication number</i>	<i>Publication date</i>	<i>Title</i>
2430	November 1991	Aircraft, spacecraft, and related equipment
2445	January 1992	Television receivers and video monitors
2505	April 1991	Construction and mining equipment
2540	July 1992	Photographic supplies
2648	July 1993	Measuring, testing, controlling, and analyzing instruments
2674	September 1993	Medical goods
2708	December 1993	Semiconductors
2728	February 1994	Capacitors
2746	March 1994	Aircraft and reaction engines, other gas turbines, and parts
2751	March 1994	Certain motor-vehicle parts and accessories
2820	October 1994	Telecommunications equipment
2821	October 1994	Computers, peripherals, and computer components
2822	October 1994	Audio and video recording and reproducing equipment
2849	January 1995	Motorcycles and certain other vehicles
2850	January 1995	Computer software and other recorded media
2851	February 1995	Optical fiber, cable, and bundles
2877	May 1995	Television picture tubes and other cathode ray tubes
2879	May 1995	Unrecorded media

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.

CONTENTS

	<i>Page</i>
Preface	i
Introduction	1
U.S. industry profile	4
Industry structure	4
Consumer characteristics and factors affecting demand	7
Foreign industry profile	7
U.S. trade measures	9
Tariff measures	9
Nontariff measures	10
U.S. Government trade-related investigations	10
Foreign trade measures	11
Tariff measures	11
Nontariff measures and trade-related investigations	11
U.S. market	11
Consumption	11
Production	14
Imports	14
Foreign markets	14
Foreign market profile	14
U.S. exports	16
U.S. trade balance	18
Appendix	
A. Explanation of tariff and trade agreement terms	A-1
Figures	
1. Unrecorded media: Principal products, by global market sizes, 1993	1
2. Unrecorded media: U.S. shipments, exports, imports, and apparent consumption, 1989-93	13
3. Unrecorded media: U.S. consumption, by industry segments, 1989-93	13
4. Unrecorded media: U.S. shipments, by industry segments, 1989 and 1993	15
5. Unrecorded media: U.S. imports for consumption, by industry segments, 1989 and 1993	16
6. Unrecorded media: U.S. exports of domestic merchandise, by industry segments, 1989 and 1993	17
Tables	
1. Global unrecorded media industry: Principal products, markets, and relative market sizes, 1993	3
2. U.S. unrecorded media industry: Major coaters and fabricators, by industry segments, 1994 ...	5
3. Global unrecorded media industry: Production, consumption, and net trade, by selected regions and countries, 1992	8
4. Global unrecorded media industry: Operations of 12 leading firms, 1994	9
5. Unrecorded media: Harmonized Tariff Schedule subheading; description; U.S. col. 1 rate of duty as of Jan. 1, 1994; U.S. exports, 1993; and U.S. imports, 1993	10
6. Unrecorded media: U.S. shipments, exports of domestic merchandise, imports for consumption, and apparent U.S. consumption, by industry segments, 1989-93	12
7. Unrecorded media: Value of U.S. imports for consumption, by principal sources, 1989-93	15
8. Unrecorded media: Value of U.S. exports of domestic merchandise, by principal markets, 1989-93	17
9. Unrecorded media: U.S. exports of domestic merchandise, imports for consumption, and merchandise trade balance, by selected countries and country groups, 1989-93	19

INTRODUCTION

This report discusses industry, market, and trade information for the global unrecorded media industry during the period 1989-93. Following this introduction, the report presents profiles of the U.S. and foreign industries, a description of tariff and nontariff measures that may affect trade, and a discussion of U.S. industry performance in domestic and foreign markets.

Unrecorded media include primarily blank magnetic tape, 70 percent of 1993 global industry sales, and magnetic disks, 29 percent (figure 1).¹ These products are used primarily for the recording of audio and video programming, accounting for 64 percent of global sales, and for computer software and data, 35 percent. Unrecorded media also include such small-volume products as magneto-optical and other recordable optical disks, increasingly used for both computer and audio applications; magnetic striping tape, used in vending and credit cards; and striped paper ticket stock. Standard compact discs (CDs) and phonograph records are not included, as these products are formed only in the process of recording.

¹ This report follows the usage of the unrecorded and recorded media industries in using the spelling "disk" for data storage media and "disc" for audio and video applications. The New York Times and some other authorities use "disk" for all products, whereas the Harmonized Tariff Schedule of the United States uses "disc" for all products.

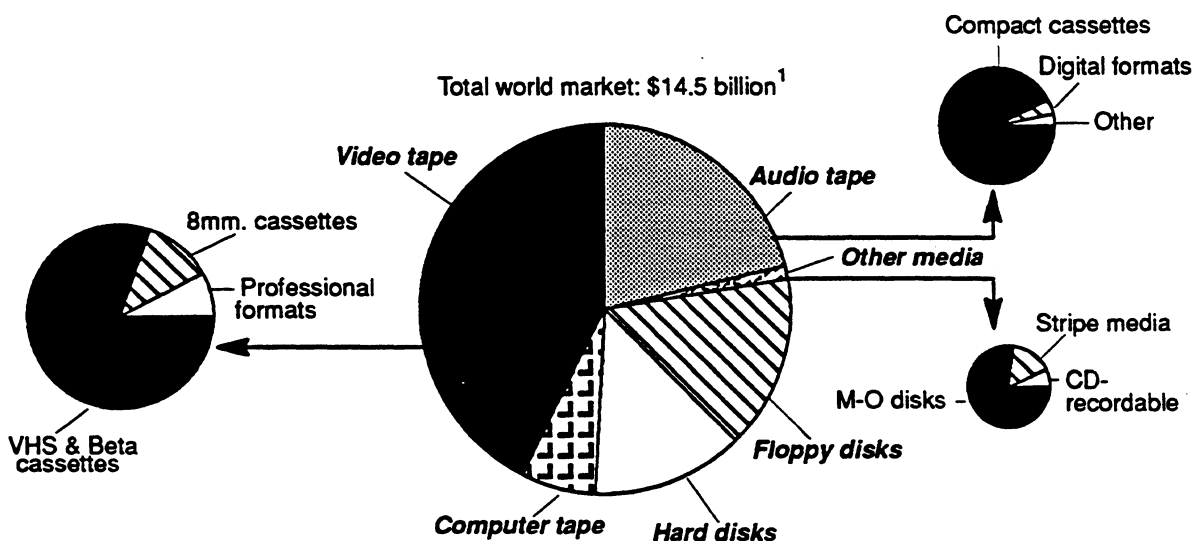
Magnetic tape, the first modern form of unrecorded media,² was invented by BASF in Germany in 1934 and commercialized in 1946. The first U.S. supplier, 3M Co., began production in 1947. Magnetic tape was first used for time-delayed commercial radio broadcasting in 1948, for computer data recording in 1953, and for television broadcasting in 1956. Tape was originally sold on open reels, but four- and eight-track endless-loop audio cartridges were introduced in 1954, and the audio compact cassette in 1962. Cassette formats were also developed for videotape recorders: the U-Matic (1970), Betamax (1975), VHS (1976), 8-mm. (1985), and various recent professional formats. In recent years, cartridge formats have largely replaced open-reel tape for computer data.

Rigid ("hard") and flexible ("floppy") magnetic disks were developed for computer data storage in 1965 and 1972, respectively.³ Both product types have gone through a series of technical improvements leading to smaller diameter formats and increased data density.

² Obsolete unrecorded media include the blank platters and discs that were inscribed by styli to produce early phonograph records and master phonograph recordings. Unrecorded discs may still be produced, in negligible volume, as curiosities. Steel wire and tape were also used for magnetic recording before coated plastic tape was developed.

³ The modern type of hard disk, the Winchester disk, was introduced in 1970.

Figure 1
Unrecorded media: Principal products, by global market sizes, 1993



¹ Includes the value of fabrication undertaken by "downstream" industries—for example, by tape duplicators that package bulk tape into cassettes.

Source: Derived principally from *Magnetic Media International Newsletter*, vol. 14, no.1 (May 26, 1994) and no.2 (Sep. 6, 1994).

The magneto-optical (M-O) disk, a recently introduced product type, is read like an optical disk but recorded by a magnetic process.⁴ M-O disks were first used for computer data storage, but in 1993, Sony Corp. (Japan) and other consumer electronics firms introduced an audio format, the 2.5-inch MiniDisc (MD), that incorporates digital data compression.⁵ Sony has indicated that it plans to develop a version of the MD for computer storage.

The recordable compact disc (CD-R) is both recorded and read optically.⁶ Unlike the M-O disk, it is an unerasable, "write-once" medium. It is most commonly used for small production runs of audio CDs and software CD-ROMs.

Write-once optical technology has also been developed for card formats. Although not yet commercialized, the technology has been proposed as a secure means of conveying such personal information as photographic identification, credit status, professional licensing, and medical history.⁷

Another type of medium, the phase-change (PC) optical disk, is also both read and recorded optically.⁸ PC disks are now used in very small quantities, but they are expected to become more common as new types of recording and reproducing hardware become available.⁹

Between 50 and 60 percent of audio and video tape and floppy disks are sold directly to end users, and the remainder of these products are sold to the recorded media sector for the recording of programming or software before resale (table 1). Hard disks are almost always installed in computer systems or stand-alone disk drives before sale to the end user,¹⁰ and magnetic-stripe media virtually always have information content added before sale to end users.

⁴ M-O disk recorders use lasers to heat the region of a disk to be recorded and then magnetize the region to affect its optical reflectivity.

⁵ MiniDiscs sold with pre-recorded audio programming are usually non-recordable optical discs and thus are not included in this report.

⁶ CD-Rs are written with relatively high powered lasers that "burn" a pattern into the disc.

⁷ George Taninecz, "Optical cards seek market openings," *Electronics Newsletter*, Oct. 10, 1994, p. 11.

⁸ Phase-change disks are recorded by means of a laser beam that gives each position on the disk either a crystalline or amorphous structure, making it either more or less optically reflective. The disks are read using a lower power laser.

⁹ Matsushita Corp. (Japan) introduced a combination CD-ROM player and PC recorder/player in November 1994. Other firms reportedly also have PC hardware under development.

¹⁰ The primary exception to this is removable hard disks.

Computer tape and M-O disks are usually sold blank to the end user.

The U.S. unrecorded media industry shipped approximately \$4.2 billion of products in 1993, and U.S. imports were \$1.9 billion that year. Magnetic tape made up approximately 57 percent of these shipments and 62 percent of imports. Magnetic disks, which generally incorporate more advanced technology than magnetic tape, accounted for 39 percent of shipments, 30 percent of imports, and 65 percent of U.S. exports in 1993. The United States ran a trade deficit of \$253 million in unrecorded media during 1993 after trade surpluses during 1990-92.

All magnetic and M-O media are manufactured by depositing a thin magnetic film onto a substrate material and then shaping and packaging the media. Except in the case of advanced hard disks, the magnetic film consists of fine particles. The most common magnetic material is gamma ferric oxide (Fe_2O_3), which is relatively inexpensive and easy to process. High-density and other higher quality media use materials with better coercivity (a measure of ability to retain a magnetic field) and other properties. The most common of these materials are chromium dioxide (CrO_2), cobalt-ferric oxide ($\text{Co-Fe}_2\text{O}_3$),¹¹ and pure metallic iron.¹² Barium ferrite ($\text{BaFe}_{12}\text{O}_{19}$) and other special materials are used for credit-card striping tape and for other specialized applications requiring resistance to erasure. Advanced hard disks use a cobalt-alloy metallic plating instead of a particle film. Substrate materials are almost always polyester for flexible media, highly polished aluminum or glass for hard disks, and polycarbonate for M-O disks.

Deposition or coating is the most technically demanding part of the manufacturing process, as the quality of the medium depends on the thickness, evenness, durability, and other properties of the magnetic material layer. Deposition is a wet-chemical coating process for most products. A mixture of magnetic particles ("pigment"¹³), a binder, and other chemicals is applied to large plastic sheets ("webs"), in the case of flexible media, or sprayed or spin-coated onto hard disk substrates. Some advanced hard disks are electroplated. In the case of other advanced hard

¹¹ Cobalt-ferric oxide consists of ferric oxide in which a cobalt ion replaces one of the iron ions in some of the molecules. Varieties include cobalt-doped ferric oxide and cobalt-adsorbed ferric oxide. In the latter variety, cobalt is included primarily in molecules on the surface of the magnetic particle.

¹² Small particles of pure, unoxidized iron have some of the best magnetic properties of any material, but they quickly rust or burn when exposed to air. Their use therefore requires special processing methods.

¹³ The term "pigment" derives from an analogy between the suspension of magnetic particles in a liquid binder and the mixing of paint, particularly because various ferric oxides have been used as paint pigments.

Table 1
Global unrecorded media Industry: Principal products, markets, and relative market sizes, 1993

Products	Common widths or diameters	Principal markets	Share of world market, 1993 ¹
	Millimeters ²		Percent
Magnetic tape:			
Audio:			
Compact cassette	3.81	Recording industry ³ , end users	19.7
Microcassette	3.81	Dictation and answering machine users	0.1
Open-reel:			
Standard ⁴	6.35	Recording studios, audiophiles	50.7
Mastering multitrack	12.7 - 50.8	Recording studios	(⁵)
Digital audio tape (DAT)	6.35 and 12.7	Recording studios, audiophiles	0.6
DAT cassette	3.81	Recording studios, audiophiles	0.1
Digital compact cassette (DCC) ..	3.81	Recording industry ³ , end users	(⁶)
8-track cartridge ⁴	6.35	Recording industry ³ , audiophiles	(⁶)
Other analog formats	Various	Recording studios, audiophiles	0.1
Consumer video:			
VHS and Beta cassettes	12.7	VCR users, video industry ³	31.9
VHS-C cassette	12.7	Video camera users	2.2
8 mm cassette	8.0	Video camera users	5.1
Digital cassette ⁷	6.35	(⁸)	(⁶)
Professional video:			
Open-reel formats ⁴	25.4 and 50.8	Television studios	0.3
U-matic cassette	19.05	Studios, educational video industry ³	0.6
Other analog cassette formats ..	25.4	Television studios	1.8
Digital cassette formats	12.7	Television studios	0.6
Computer and other data:			
Open-reel 9-track ⁴	12.7	Mainframe and mini-computer users	0.6
Instrumentation ⁴	12.7 - 50.8	Defense and space programs	0.5
3480 and 3490 cartridges	12.7	Mainframe and mini-computer users	0.8
QIC	6.35	Users of computers of all sizes	3.8
Other cartridges and cassettes ...	8.0, various	Users of computers of all sizes	0.8
Magnetic disks:			
Rigid ("hard") disks:			
Older formats	130, 200 ⁴ , 350 ⁴	Disk drive manufacturers ⁹	1.0
Current standard	95	Disk drive manufacturers ⁹	11.2
Newer formats	35 and 65	Disk drive manufacturers ⁹	1.0
Disk cartridges	65, 95, 130	Users of removable-disk drives	(¹⁰)
Flexible ("floppy") disks:			
Soft-jacket	130 and 200 ⁴	Computer users, software industry ³	1.9
Micro-floppy	86	Computer users, software industry ³	12.5
Newer formats	45 and 65	Computer users	0.6
lomega cartridges	130	Users of lomega data storage systems	0.3
Other:			
Magneto-optical disks	64, 86, 130	Computer users, studios, audiophiles	0.9
CD-recordable	120	Recording studios	0.1
Phase-change optical disks ⁷	130	Computer users ¹¹	(⁶)
Striping tape and coated tickets ..	Various	Credit card and ticket industries ³	0.2

¹ Shares include the value of fabrication undertaken by "downstream" industries—for example, by tape duplicators that package bulk tape into cassettes.

² Sizes are often cited in terms of inches, sometimes imprecisely in the case of disks. Conversions from millimeters to inches are as follows:

	Tape products							Disk products							
Millimeters:	3.81	6.35	8.0	12.7	19.05	25.4	50.8	35	45	64-65	86-95	120	130	200	350
Inches:	0.15	0.25	0.315	0.5	0.75	1.0	2.0	1.3	1.8	2.5	3.5	4.7	5.25	8.0	14.0

³ Product purchasers add recorded material before sale to end users.

⁴ Products are obsolete or substantially declining in use.

⁵ Share for mastering tape included with standard tape.

⁶ Less than 0.05 percent.

⁷ Emerging or yet-to-be-introduced products.

⁸ Product has not been introduced. Likely markets include digital VCR users and video industry.

⁹ Product is incorporated into disk drive equipment before sale to end users. Many transactions are in-house, as disk drive manufacturers often produce their own disks.

¹⁰ Shares for removable disk cartridges included with other hard disks of same sizes.

¹¹ Additional potential markets include audiophiles.

Note.—Due to rounding, percentages may not add to 100. For total shares of product groups, see figure 1.

Source: Compiled by staff of the U.S. International Trade Commission. Market shares derived principally from *Magnetic Media International Newsletter*, vol. 14, no. 1 (May 26, 1994) and no. 2 (Sep. 6, 1994).

disks, of all M-O disks, and of some high-grade magnetic tape, metal atoms are evaporated, or "sputtered," and made to condense upon the substrate.

In a latter stage of the coating process, tape webs and hard disks are subjected to strong magnetic fields in order to "orient" the magnetic particles,¹⁴ and media are then dried in ovens. As a next step, coated plastic for tape is cut to width and wound onto large reels known as "pancakes," and media for flexible disks are stamped into shape as "cookies."

The next part of the manufacturing process consists of assembly ("fabrication"). Tape is cut to length and packaged into cassettes, cartridges, or open reels. Flexible disks are attached to hubs and packaged within flexible plastic shells ("soft jackets") or rigid ones. M-O disks receive a plastic protective coating and are often packaged in cartridges. Rigid magnetic disks need no further packaging before permanent insertion into disk drives. Most disk media are also formatted, that is, marked with circular recording tracks, before sale. The final step in manufacturing is testing and certification of the media.

Coating is a highly automated, relatively capital-intensive and, in the case of tape products and floppy disks, relatively large-scale process. Fabrication and testing may be conducted either with highly automated, capital-intensive, and large scale methods or with smaller scale, labor-intensive methods.

U.S. INDUSTRY PROFILE

Industry Structure

The U.S. unrecorded media industry comprises approximately 55 domestic- and foreign-owned firms that manufacture in the United States.¹⁵ The leading industry participants and the locations of their parent corporations are indicated in the following tabulation:

Firms with estimated 1994 U.S. media production over \$200 million:

Fuji Photo Film U.S.A., Inc. (Japan)
IBM Corp. (United States)
Komag Inc. (United States)¹⁶
Seagate Magnetics, Inc. (United States)
Sony Recording Media of America (Japan)
TDK Electronics Corp. (Japan)
3M Co. (United States)

¹⁴ Orientation aligns the north-south polarity of particles in the direction that recording takes place—longitudinally in the case of audio and computer tape. The recording process works by reversing the direction of magnetization along a particular axis, and unaligned particles are relatively inefficient for recording information. It is not practical to orient webs for floppy disks.

¹⁵ The products discussed in this summary are covered for statistical reporting purposes by Standard Industrial Classification (SIC) product code 3695, magnetic and optical recording media. The final subheading under this

Firms with estimated 1994 U.S. media production of \$100 to \$200 million:

Ampex Recording Media Corp. (United States)
Hewlett-Packard Co. (United States)
JVC Company of America (Victor Co. of Japan, Ltd.—"JVC", Japan)
Kao Infosystems Co. (Japan)
Maxell Corp. of America (Hitachi Maxell Ltd., Japan)
Verbatim Corp. (Mitsubishi Kasei Kogyo Ltd., Japan)

3M is the largest single firm in the U.S. industry, with estimated annual ex-factory sales of unrecorded media of well over \$1 billion, and Sony is the second largest, with annual U.S. revenues of over \$500 million. The next five leading firms have estimated revenues of \$200 to \$300 million. Together, these seven leading firms account for a substantial majority of U.S. production in the industry.

3M makes the broadest range of unrecorded media products, encompassing all major categories except hard disks (table 2). Sony produces audio and video tape, floppy disks, and M-O disks. Ampex specializes in video and audio tape, for use by recording and broadcast studios and by high-end consumers, and in instrumentation tape used primarily by the U.S. Department of Defense and National Aeronautics and Space Administration.

IBM, Seagate, and certain smaller firms make hard disks for use only in those companies' own disk drives. Komag makes hard disks primarily for sale to disk drive makers that do not coat their own disks. Maxell, TDK, and several smaller Japanese- or Korean-owned suppliers do not coat media in the United States but rather assemble or fabricate tape products and floppy disks from pancakes and cookies imported from the parent company or, sometimes, purchased from other U.S. suppliers.¹⁷ Most of the smaller domestically owned firms also fabricate tape products and floppy disks from media coated by larger suppliers.

3M is by far the most vertically integrated firm in the U.S. industry, as it produces much of its own substrate material, magnetic particles, and binders. Most firms purchase these and other materials from chemical companies and other suppliers. 3M and some other unrecorded media firms formerly manufactured their own cassette cases, but these are now outsourced,

¹⁵—Continued
product code, other magnetic media and parts, includes parts of unrecorded media that are not covered by the import and export classifications used as a basis for this report.

¹⁶ A minority stake in Komag is held by Asahi Glass (Japan).

¹⁷ Fuji and JVC did not coat products in the United States until the period covered by this summary. JVC's U.S. consumer audio coating plant now supplies most of the company's needs for its Japan home market.

Table 2
U.S. unrecorded media industry: Major coaters and fabricators, by industry segments, 1994

Firms	Industry segments ¹						Total for all segments ¹
	Audio and video tape	Computer tape	Floppy disks	Hard disks	M-O disks	Other media	
Ampex	C ²	C ³	-	-	-	-	C
Fuji	C	-	F	-	-	-	C
IBM	-	-	-	C	C	-	C
Hewlett-Packard	-	-	-	C	C	-	C
JVC	C	-	-	-	-	-	C
Kao Infosystems	-	F	C	-	-	-	C
Komag	-	-	-	C	C	-	C
Maxell	F	-	F	-	-	-	F
Seagate Magnetics	-	-	-	C	-	-	C
Sony	C ²	-	C	-	F	-	C
TDK	F	-	F	-	-	-	F
3M	C ²	C	C	-	C	-	C
Verbatim	-	-	C	-	(⁴)	-	C
Total number of firms:							
Coaters of media	5	4	6	11	11	4	33
Fabricators only	6	14	12	1	0	0	22
Total	11	18	18	12	11	4	55
Total number of plants:							
Coaters of media	10	5	8	14	11	4	45
Fabricators only	8	14	14	1	1	0	30
Total	18	19	22	15	12	4	75

¹ "C" indicates firms that both coat and fabricate media in the United States. "F" indicates firms that fabricate but do not coat media in the United States. "-" indicates market segments in which particular firms do not participate.

² Firm produces professional audio or video tape in addition to consumer products. Other firms produce consumer products only.

³ Instrumentation tape.

⁴ Firm ceased production of this product during 1993.

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

primarily to production facilities in East Asia. Fuji produces some of its own materials in Japan for use in the United States.

During 1989-91, the industry employed approximately 25,000 persons, 16,000 of whom were production workers,¹⁸ and employment levels have remained relatively constant since then. Most processes in U.S. unrecorded media production are highly automated and require relatively little skill for production workers. However, the process of coating the media, particularly in the manufacture of hard disks and M-O disks, requires highly skilled technicians. Average 1991 wages for production workers in unrecorded media were \$11.20 per hour, about \$0.30 less than the average wages of factory workers in the U.S. economy as a whole.¹⁹

¹⁸ U.S. Department of Commerce (DOC), Bureau of the Census, *1991 Annual Survey of Manufactures* (Washington, DC: U.S. Government Printing Office, 1992).

¹⁹ Ibid.

Unrecorded media products are manufactured in Arizona, California, Massachusetts, Minnesota, New Hampshire, Texas and other states, but there is a particular concentration of the industry in Alabama, Georgia, and South Carolina. Firms with plants in these states include Ampex, Fuji, JVC, Maxell, Sony, 3M, and TDK. The industry presence in this region dates back to the 1950 founding of audio tape maker Orradio, a predecessor of Ampex, in Alabama. However, the presence of several Japanese firms in the region is reportedly due to the region's reputation for a capable, low-wage labor force.²⁰ Several hard disk manufacturers are located in California as a result of the concentration of the computer equipment industry there.

Research and development (R&D) expenditures in most segments of magnetic media are reported to be relatively low as a percentage of sales. However, expenditures to develop improved forms of hard disks and M-O disks appear to have been substantially

²⁰ Industry expert, telephone interview by USITC staff, Aug. 26, 1994.

higher, as a percentage of sales, than expenditures to improve more established product types.

In addition to corporate R&D, four universities have major unrecorded media research laboratories, funded by both the Federal government and industry. The University of Alabama pursues work, sponsored primarily by local Japanese-owned manufacturers, on pigments, binders, and other materials. Carnegie Mellon University pursues research on M-O media, while the University of Minnesota works on hard disks. The University of California at San Diego does general, non-product-specific research on magnetism.

Development activities throughout the U.S. industry have focused on increasing the density and reliability of information storage through improved magnetic and substrate materials and coating processes. Often, advances have been motivated by complementary improvements in recording, reproducing, and information processing equipment.²¹ Over the past decade, such advances have contributed to steep price declines and large increases in data storage density for hard disks, M-O disks, and computer tape. They have also enabled the development of new, digital formats for audio and video tape with a much higher storage density than the standard analog formats developed during the 1960s and 1970s.

The U.S. industry has been responsible for many innovations in the industry since the late 1940s. Ampex, 3M, and other companies have continually developed new tape products, with recent advances primarily in high-density computer tape. In past decades, IBM invented both hard and floppy disks. In recent years, several start-up companies have significantly improved hard-disk technology. By contrast, Japanese firms have taken the lead in consumer videotape and floppy disks, and Japanese firms have a larger role in M-O technology than U.S. firms.

The unrecorded media industry is substantially globalized through foreign direct investment in manufacturing by most of the world's leading firms.²² The eight leading Japanese firms in the industry all have manufacturing operations in the United States. Although the five largest U.S. manufacturers of hard disks are domestically owned,²³ nearly all the

²¹ These complementary improvements have included, for example, magnetic recording and reproducing heads that operate faster and focus on smaller portions of a tape or disk, simplifications of the mechanical design of recording and reproducing systems, and faster microprocessors that use recorded information.

²² The impact of globalization outside the United States is discussed more fully in the section below entitled "Foreign Industry."

²³ As noted above, a minority stake in Komag is held by Asahi Glass.

remaining firms in that segment have been purchased by large Japanese firms.²⁴ Some U.S. manufacturers of other media have been sold to foreign firms as well. For example, Verbatim, once independent and then owned by Kodak (United States), was sold to Mitsubishi Kasei Kogyo (Japan) in 1990.²⁵ The Memorex brand, once the trademark of a U.S. company, is now owned by a Hong Kong company for consumer audio and video tape and by a Japanese company for computer tape. Memorex tape is no longer made in the United States, although some Memorex computer tape was produced domestically as recently as 1992.

In contrast to this trend towards increasing globalization, BASF, the leading European firm in the industry and once a major manufacturer in the United States, sold its U.S. production facilities in 1992. BASF now supplies the U.S. market primarily from its European facilities.²⁶

3M is the most globalized U.S.-based firm, currently operating plants in Britain, Germany, and Japan. In the past three years, 3M has closed or sold other plants in Brazil, China, Italy, and Japan. 3M's foreign revenues were reportedly about \$300 million in 1991 but have declined since then. IBM has one hard-disk plant in Europe. Verbatim, which is U.S.-based although Japanese-owned, has floppy-disk plants in Ireland, Mexico, and Japan. Anacom Corp. produces more computer tape in Wales than in its home U.S. plant. Several U.S. hard-disk manufacturers have plants in Singapore, Malaysia, and Thailand for the incorporation of U.S.-made disks into drive assemblies. Komag also coats hard disks at plants in Malaysia and, in a joint venture with Asahi Glass, in Japan. Seagate recently opened a hard-disk plant in Singapore.

Unrecorded media are marketed both to the recorded media sector—primarily the audio and video recording and software industries—and directly to end users through electronics and computer stores, computer equipment catalogs, mass merchandisers, and a wide variety of other outlets. Tape for the audio and video recording industries is often sold in pancake form, in which case tape duplicators perform final assembly of the media.

Most major U.S. suppliers of unrecorded media distribute some products under their brand names that were originally manufactured by competing firms.

²⁴ Together, these Japanese-owned firms account for probably no more than 10 percent of U.S. production in the segment. Some of the manufacturing operations of these firms have been moved to Japan.

²⁵ Ironically, it was Verbatim that filed the petition that resulted in an antidumping duty order against Japanese producers of floppy disks, discussed below.

²⁶ BASF also has a plant in Indonesia, as discussed in the Foreign Industry section below.

Suppliers cooperate in distribution for two reasons. First, no one firm sells enough of certain niche products, such as particular computer cartridge formats, to achieve an efficient scale of production. Second, at almost any given time, some firms have excess production capacity while others are constrained in capacity.

Consumer Characteristics and Factors Affecting Demand

End-users of unrecorded media include nearly all users of audio tape and videocassette recorders, computers, and MiniDisc audio systems. These consumers include over 75 percent of U.S. households and a substantial majority of business offices. Direct consumers of unrecorded media also include the audio and video recording and software industries, which add information content to media before reselling them to end-users.

Consumer audio and video tape and floppy disks are, to some extent, commodity products. Because the technology for manufacturing these products is widespread, products of different manufacturers differ little, and manufacturers must closely match others' prices in order to make sales. However, certain well-known brands command a price premium due to a reputation for quality. Premium brands of high-density floppy disks typically sell for 50 percent or more above the price of generic products. For low-density floppy disks and tape, the price premium for high-end brands is much lower. Hard disks and M-O disks are highly differentiated by data capacity, durability, potential for product failure in use, and other characteristics and therefore compete on the basis of quality as well as price.

Demand for particular unrecorded media products is also affected by technical advances and price declines in those products, in competing products, and in complementary electronic hardware systems. Digital audio and video tape products are replacing analog tape in professional applications and may soon do so in consumer uses as well. Advances in metal-pigment (i.e., iron-particle) and metal-evaporated (i.e., sputtered) tape, together with improvements in recording equipment, have enabled the recent development of such products as highly compact consumer digital videocassettes. When these products are commercialized, they will likely compete with such other media as new video CD and M-O products and on-demand cable delivery of programming. Competing products in the consumer audio media market now include analog and digital compact cassettes, MD and CD-R disks, read-only CDs, and phonograph records.

In the field of computer memory, successive generations of hard and floppy disks, and disk drives, have continually rendered older products obsolete. Even so, hard and floppy disks also compete for various applications with a wide variety of other technologies, including tape, M-O disks, read-only CD-ROM, nonvolatile semiconductor memory devices, and electronic distribution of software. As any of these products improve in technology or price, they may take away demand from other products.

Many analysts believe that optical media, electronic distribution, and, especially, nonvolatile semiconductor memory devices are likely to replace magnetic media in most applications over the next 10 to 15 years.²⁷ Semiconductor devices are rapidly increasing in capacity and declining in price, and they have the advantage of recording and reproducing electronically, with no motors or moving parts.

FOREIGN INDUSTRY PROFILE

The global unrecorded media industry is relatively concentrated, both in terms of producing countries and producing firms. The top 4 countries accounted for approximately 75 percent of world production in 1992. After the United States, which supplied 32 percent of the world market, the countries with the largest production of unrecorded media were Japan, 27 percent; Korea, 8 percent; Germany, 8 percent; and China, 3 percent (table 3). Korea and China have been the fastest growing producers in recent years.

The top 4 firms together supplied approximately 40 percent of the world market in 1993 and 1994, and the top 12 firms supplied over 60 percent.²⁸ Eleven of the top 12 firms are multinational in their manufacturing operations (table 4), with foreign production primarily in North America and Europe. Six of the 12 leading firms have headquarters in Japan, 3 are headquartered in the United States, and the others are headquartered in Germany and Korea. 3M was the largest firm in the world industry until 1992, when it was overtaken by Sony.

BASF, which has produced magnetic media products since 1946, is the oldest firm in the global industry and the largest manufacturer in Europe, with

²⁷ "Speakers at ITA Seminar Say Tape is Now Obsolete," *This Week in Consumer Electronics*, Mar. 21, 1994, p. 1; "The Five Technologies That Will Remake the Magnetic Media Industry by 2000," *Magnetic Media International Newsletter*, vol. 14, no. 1 (May 26, 1994), pp. 1-30.

²⁸ Estimated by staff of the U.S. International Trade Commission.

Table 3
Global unrecorded media industry: Production, consumption, and net trade, by selected regions and countries,¹ 1992

(Millions of U.S. dollars)

Region and country	Production		Consumption		Apparent net trade
	Value	Share Percent	Value	Share Percent	
North America:					
Canada	55	0.4	241	2.0	-186
Mexico	2100	0.8	108	0.9	-8
United States ³	3,946	32.0	3,931	31.9	15
Total	4,101	33.3	4,280	34.7	-179
Europe:					
France	316	2.6	560	4.5	-244
Germany	1,006	8.2	1,088	8.8	-82
Ireland	325	2.6	83	0.7	242
Italy	114	0.9	405	3.3	-291
Netherlands	165	1.3	295	2.4	-130
Spain	28	0.2	255	2.1	-227
United Kingdom	279	2.3	693	5.6	-414
Other Europe ⁴	246	2.0	689	5.6	-443
Total	2,479	20.1	4,068	33.0	-1,589
Asia:					
China	400	3.2	182	1.5	218
Hong Kong	233	1.9	119	1.0	114
Japan	3,260	26.5	1,205	9.8	2,055
Korea	1,027	8.3	296	2.4	731
Singapore	67	0.5	620	5.0	-553
Taiwan	154	1.2	126	1.0	28
Other Asia ⁵	299	2.4	327	2.7	-28
Total	5,440	44.1	2,875	23.3	2,565
Other:					
Brazil	220	1.8	254	2.1	-34
Other ⁶	83	0.7	7846	6.9	-763
Total	303	2.5	1,100	8.9	-797
Grand total	12,323	100.0	12,323	100.0	0

¹ Includes 30 major and 9 emerging economies, and excludes Central and Eastern Europe and other former non-market, non-exporting economies.

² Appears to be inconsistent with U.S. imports from Mexico of \$165 million in 1992 (table 7).

³ Estimated by staff of the U.S. International Trade Commission.

⁴ Austria, Belgium, Denmark, Finland, Greece, Norway, Portugal, Sweden, Switzerland, and Turkey.

⁵ India, Indonesia, Malaysia, Philippines, and Thailand.

⁶ Producing countries include Australia, Egypt, Israel, New Zealand, Saudi Arabia, South Africa, and Venezuela.

⁷ Includes consumption in countries not among the producers in this table.

Note.—Countries presented are those with production of at least \$100 million or consumption of at least \$240 million in 1992.

Source: Elsevier Advanced Technology, *Yearbook of World Electronics Data* (Oxford: Elsevier, 1993 and 1994), except as noted.

several plants in Germany and France. In 1990, BASF absorbed the unrecorded media operations of its largest European competitor, Agfa-Gevaert (Germany). BASF then became the third largest firm in the global industry, but it has since fallen to sixth place. Philips (the Netherlands), which for several decades was another major European industry participant, has left all segments of the industry except M-O disks. The

other leading European manufacturers are all foreign-based firms: Fuji Film, JVC, 3M, and IBM in Germany, Sony in France, and Verbatim in Ireland. There are also a number of small locally owned firms, primarily fabricators but not coaters of tape products and floppy disks, in each of these countries as well as in the United Kingdom and Italy.

Table 4
Global unrecorded media industry: Operations of 12 leading firms, 1994

Firm ¹	Home country	Number of plants, by regions				Number of plants, by products				
		United States	Europe	Japan	Other	A/V tape ²	Other tape ³	Hard disks	Floppy disks	M-O disks
Sony	Japan	4	3	2	2	10	2	0	3	1
3M ⁴	U.S.	7	2	2	1	4	5	0	2	2
TDK	Japan	2	2	3	1	7	1	0	2	1
Hitachi Maxell	Japan	2	1	3	1	4	2	0	5	2
Fuji Film	Japan	2	1	3	0	4	1	0	4	0
BASF Magnetics	Germany	0	3	0	1	3	2	0	1	0
Mitsubishi (Verbatim)	Japan	2	1	2	1	0	1	1	5	1
Saehan Media	Korea	0	1	0	3	4	1	0	0	0
JVC	Japan	2	0	1	0	3	0	0	1	0
Komag/Asahi Komag	U.S./Japan	1	0	1	1	0	0	3	0	0
Sunkyong Chemical ..	Korea	0	0	0	1	0	0	0	1	0
Seagate Magnetics ...	U.S.	3	0	0	1	0	0	4	0	0

¹ Listed in order of estimated global annual sales.

² Consumer audio and/or video tape.

³ Computer tape or professional audio or video tape.

⁴ During 1994, 3M closed one plant in Europe and one in Japan.

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

In Japan, Sony and Fuji Film entered the industry in the early 1950s, and TDK and Hitachi Maxell entered during the 1960s. These have remained the leading Japanese producers, but at least ten Japanese firms have had annual revenues of \$100 million or more in recent years. In addition, there are about 18 other firms with annual revenues of at least \$10 million in the Japanese industry. 3M and Komag are the only foreign-based firms to manufacture in Japan, both through joint ventures with Japanese firms.

Korean companies became important producers of unrecorded media during the 1980s, focussing initially on consumer audio and video media and more recently on floppy disks as well. The leading suppliers are Saehan Media, Sunkyong Chemical, and Lucky Goldstar. It appears that no foreign-owned companies manufacture in Korea.

Nearly all coating of unrecorded media takes place in the United States, Europe, Japan, or Korea. The remainder of the global industry consists largely in the small-scale fabrication of tape and floppy disk products from imported coated media.

In Mexico, Sony, Hitachi, and Mitsubishi Verbatim fabricate floppy disks. Sony, Saehan Media, and 3M fabricate tape products there.

Hong Kong companies have produced audio and video tape since the 1970s. Taiwan became a center of floppy disk fabrication during the 1980s, with 6 major locally owned firms and about 20 smaller ones. During a global shortage of floppy disks in 1991 and 1992, Hong Kong interests promoted the production of those products in China. Perhaps 100 or more small fabricating plants quickly emerged, but as many as 80 of them left the industry by the end of 1993 because,

according to industry sources, they proved unable to attain competitive quality standards. Nevertheless, a number of Chinese plants produced acceptable products and have remained in operation.

Production of unrecorded media in Singapore, Malaysia, Indonesia, and Thailand is small but appears to be growing quickly. Most producers in these countries are locally owned fabricators of tape or floppy disks. BASF has invested in one audio cassette plant in Indonesia. Komag and Seagate recently opened hard-disk coating plants in Malaysia and Singapore, respectively, and IBM is expected to open a plant in either Singapore or Thailand during 1995. As noted above, most U.S. hard disk manufacturers have disk-drive assembly plants in Singapore, Malaysia, or Thailand.

U.S. TRADE MEASURES

Tariff Measures

As of January 1, 1994, the column 1 rate of duty on U.S. imports of unrecorded media was 4.2 percent ad valorem (table 5). However, approximately 12 percent of U.S. imports in 1993 entered free of duty under the Generalized System of Preferences (GSP) and other programs of special tariff treatment (appendix A). Furthermore, imports from Mexico are eligible to enter free of duty under the North American Free-Trade Agreement (NAFTA), effective January 1, 1994.²⁹ Imports of magnetic disks from Canada enter free of duty in accordance with terms of the NAFTA, and

²⁹ Before 1994, most imports from Mexico entered free of duty under the GSP. These imports constituted approximately 80 percent of U.S. GSP imports during 1993.

Table 5

Unrecorded media: Harmonized Tariff Schedule subheading; description; U.S. col. 1 rate of duty as of Jan. 1, 1994; U.S. exports, 1993; and U.S. imports, 1993

HTS heading or subheading	Description	Col. 1 rate of duty as of Jan. 1, 1994		U.S. exports 1993	U.S. imports 1993
		General	Special ¹		
8523	Prepared unrecorded media for sound recording or similar recording of other phenomena:				
	Magnetic tapes:				
8523.11.00	Of a width not exceeding 4 mm ..	4.2%	Free (A,E,IL,J,MX); 1.6% (CA)	46.3	260.8
8523.12.00	Of a width exceeding 4 mm but not exceeding 6.5 mm	4.2%	Free (A,E,IL,J,MX); 1.6% (CA)	185.2	177.0
8523.13.00	Of a width exceeding 6.5 mm	4.2%	Free (A,E,IL,J,MX); 1.6% (CA)	275.0	765.4
8523.20.00	Magnetic discs	4.2%	Free (A,CA,E,IL,J,MX)	1,088.2	571.8
8523.90.00	Other	4.2%	Free (A,E,IL,J,MX); 1.6% (CA)	80.2	152.7

— Million dollars —

¹ Programs under which special tariff treatment may be provided, and the corresponding symbols for such programs as they are indicated in the "Special" subcolumn, are as follows: Generalized System of Preferences (A); North American Free-Trade Agreement, goods of Canada (CA) and Mexico (MX); Caribbean Basin Economic Recovery Act (E); United States-Israel Free-Trade Area (IL); and Andean Trade Preference Act (J).

Source: U.S. International Trade Commission, *Harmonized Tariff Schedule of the United States* (1994). Exports and imports compiled from official statistics of the U.S. Department of Commerce.

imports of other unrecorded media from Canada were subject to a rate of duty of 1.6 percent ad valorem on January 1, 1994.³⁰ In 1993 the trade-weighted average U.S. duty rate for the products discussed in this summary was approximately 3.7 percent.

In the recently concluded GATT Uruguay Round of multilateral trade negotiations, the United States agreed to eliminate duties on all unrecorded media products. U.S. legislation to implement the Uruguay Round agreements provides for the duty reductions to be phased in over a 5-year period, beginning January 1, 1995. Hence, the 1995 U.S. column 1 duty rate for unrecorded media is 3.4 percent.

In February 1994, the U.S. Customs Service made a series of related classification decisions pertaining to unrecorded media. Certain importers of hard and floppy disks had asked that formatted disks be classified for tariff purposes as recorded disks, inasmuch as disk sectors are marked and, in the case of hard disks, other operating information is recorded. Such a classification would have made the disks subject to a tariff of 9.7¢ per square meter of recording surface (about 0.05¢ per 3.5-inch disk), much less than 4.2 percent ad valorem. The Customs Service ruled that formatting does not constitute recording for purposes of tariff classification.³¹

³⁰ Duties on magnetic disk imports from Canada were eliminated in 1989, and duties on most other unrecorded media imports have been declining since 1989, under the terms of the U.S.-Canada Free-Trade Agreement. The latter duties will be eliminated entirely as of January 1, 1998. Magnetic disks accounted for 97 percent of U.S. imports of unrecorded media from Canada in 1993.

³¹ U.S. Customs Service headquarters rulings HQ 953880, HQ 955027, and HQ 955442, Feb. 28, 1994.

Nontariff Measures

There are no known U.S. nontariff measures affecting imports of unrecorded media.

U.S. Government Trade-Related Investigations

The Commission has conducted one investigation in recent years with respect to unrecorded media. In March 1989, the Commission made an affirmative final determination under the U.S. antidumping law with respect to imports of 3.5" floppy disks and cookies from Japan, following notification from the U.S. Department of Commerce that such products were being sold in the United States at less than fair value.³² As a result of the Commission's determination, the Department of Commerce issued an antidumping duty order. Imports of such products from Japan are subject to special duties, in addition to other duties, in an amount equal to the margin of dumping.³³ This margin was found to vary from 27.73 to 51.00 percent ad valorem for the subject products of specific companies, for a weighted average 42.95 percent.³⁴ Subsequent administrative reviews have reduced this margin to between 0.96 and 16.96 percent for the

³² U.S. International Trade Commission (USITC), *3.5" Microdisks and Media Therefor from Japan* (investigation No. 731-TA-389 (Final)), USITC publication 2170, Mar. 1989.

³³ Department of Commerce, International Trade Administration, "Antidumping Duty Order of Sales at Less Than Fair Value: 3.5" Microdisks and Coated Media Thereof From Japan," 54 F.R. 13406-7, Apr. 3, 1989.

³⁴ Department of Commerce, International Trade Administration, "Final Determination of Sales at Less Than Fair Value: 3.5" Microdisks and Coated Media Thereof From Japan," 54 F.R. 6433-9, Feb. 10, 1989.

products of five specific companies;³⁵ duties for other companies remain at 42.95 percent.

U.S. MARKET

FOREIGN TRADE MEASURES

Consumption

Tariff Measures

Duty rates for most major U.S. trade partners in unrecorded media are low and are not considered to constitute a major trade barrier for U.S. exporters. The most important export markets for U.S. suppliers of unrecorded media are in North America, Europe, and East Asia. Exports of these products to Canada and Mexico have been free of duty since January 1, 1994 in accordance with terms of the NAFTA. European Union (EU) duty rates on unrecorded media were 4.9 percent during 1994. The EU reduced its duty rates on most unrecorded media to 3.5 percent under the Uruguay Round agreements, effective January 1, 1995, with still lower rates for audio cassette tape and for some other products. Exports to Japan, Singapore, and Hong Kong, with minor exceptions, are free of duty. Most unrecorded media exported to Thailand and Malaysia were nominally subject to duties of 60 and 20 percent, respectively, during 1994, but these duties have usually been waived because most of the products concerned, primarily hard disks, are components of devices manufactured in and exported from those countries. Thailand reduced its rates to 30 percent under the Uruguay Round agreements.

U.S. consumption of unrecorded media rose by approximately 20 percent, in nominal value terms, from \$3.7 billion to \$4.5 billion during the period 1989-93 (table 6, figure 2).³⁷ This increase reflects a combination of shifts in the U.S. market over the period: a substantial decline in the price of most specific products, a shift of demand from lower to higher valued products, and a substantial increase in the number of units sold.

Consumption of audio and video tape, the largest category of media, declined slightly in value over 1989-93 (table 6, figure 3), as declines in unit prices more than offset the increased number of units sold. Although there was a small shift toward such higher value products as VHS-C videocassettes and digital tape for professional applications, a substantial majority of sales throughout the period were of standard audio compact cassettes and VHS videocassettes.

Nontariff Measures and Trade-Related Investigations

There are no known nontariff measures affecting U.S. exports of unrecorded media. However, in September 1994 the European Commission initiated an investigation of a complaint that imports of floppy disks from the United States, Mexico, and Malaysia have been sold within the EU at less than fair value. The investigation is expected to conclude in July 1995. At that time, if an affirmative determination is made, provisional antidumping duties may be imposed. EU imports of floppy disks from China, Hong Kong, Japan, Korea, and Taiwan are already subject to antidumping duties. Additionally, in April 1995, the European Commission initiated an antidumping investigation concerning EU imports of floppy disks from Canada, Macau, and Indonesia.³⁶

The 70-percent increase in U.S. consumption of computer tape over 1989-93 accounted for a large proportion of the overall increase in consumption of unrecorded media. Computer tape consumption rose as a result of rising personal computer sales as well as the increasing popularity of tape as a backup storage medium. There was a substantial shift over 1989-93 from 9-track open-reel tape to the newer, higher density, higher value cartridge formats. As a result of this shift, the physical volume of tape consumed was relatively constant and may actually have declined over the period.

Consumption of magnetic disks declined in value from 1989 to 1990 and then rose to 30 percent above its 1989 level by 1993. However, prices of floppy disks declined by 35 to 55 percent over 1989-93, varying by the specific product, and prices of hard disks declined by an even greater percentage. Furthermore, floppy-disk consumption shifted from disks of less than 1-megabyte capacity in 1989 to primarily 1.44-megabyte disks in 1993. Similarly, hard disk consumption shifted to substantially higher capacities. Thus, 1993 consumption consisted of a substantially larger number of units and a higher value product mix than 1989 consumption.

³⁵ See *Federal Register* of Nov. 15, 1991 (56 F.R. 58040-8); Dec. 23, 1991 (56 F.R. 66430); and Mar. 23, 1994 (59 F.R. 13704-5).

³⁶ Staff of the European Commission, Washington, DC, telephone interviews by USITC staff, Apr. 6, 1995; "EC investigates floppy disc dumping charge," *Electronics Weekly*, Sep. 14, 1994, p. 2.

³⁷ Apparent consumption in this table and figure are derived as U.S. shipments, plus imports, minus exports.

Table 6

Unrecorded media: U.S. shipments, exports of domestic merchandise, imports for consumption, and apparent U.S. consumption, by industry segments, 1989-93

Year	U.S. shipments ¹	U.S. exports	U.S. imports	Apparent U.S. consumption ²	Ratio of imports to consumption
	<i>Million dollars</i>				<i>Percent</i>
Audio and video tape:					
1989	1,616	285	978	2,309	42.4
1990	1,759	491	1,008	2,276	44.3
1991	1,510	477	1,125	2,157	52.2
1992	1,599	381	1,022	2,240	45.6
1993	1,525	317	1,051	2,260	46.5
Computer tape:					
1989	619	222	89	486	18.2
1990	684	243	110	552	19.9
1991	775	240	135	671	20.1
1992	897	238	159	818	19.4
1993	866	189	152	829	18.3
Magnetic disks:					
1989	1,292	688	247	852	29.0
1990	1,332	863	275	744	37.0
1991	1,411	917	295	790	37.4
1992	1,472	1,057	408	822	49.6
1993	1,632	1,088	572	1,116	51.2
Other media:					
1989	103	97	68	73	92.1
1990	135	109	81	107	75.8
1991	144	126	117	136	86.5
1992	195	67	140	268	52.2
1993	195	80	153	267	57.1
Total unrecorded media:					
1989	3,630	1,292	1,381	3,720	37.1
1990	3,909	1,706	1,474	3,678	40.1
1991	3,840	1,759	1,673	3,754	44.6
1992	4,162	1,743	1,729	4,148	41.7
1993	4,218	1,675	1,928	4,471	43.1

¹ Shipments from U.S. manufacturing plants. Except for magnetic disks during 1990-93, shipments are estimated by staff of the U.S. International Trade Commission on the basis of official statistics of the U.S. Department of Commerce.

² Estimated by staff of the U.S. International Trade Commission.

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

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

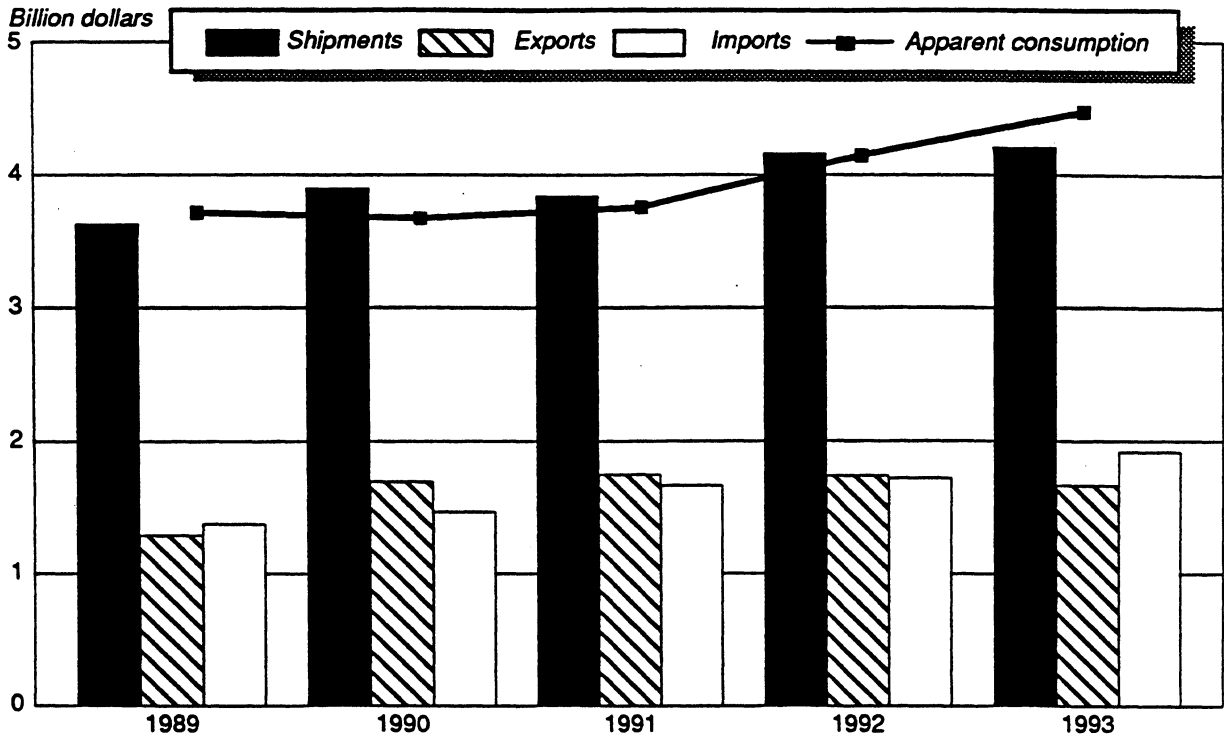
Consumption of other media rose from 1989-93, due in part to increasing use of M-O disks. Values for other media in table 6 should be used with some care, as data on shipments and trade may differ in the extent to which semi-finished tape and disks are included in the "other" category.

The relative stagnation of the audio and video tape segment of the unrecorded media industry is reflected in the decline of its share of total industry consumption from 62 percent in 1989 to 51 percent in 1993. By contrast, computer tape rose from 13 to 19 percent over the period. Magnetic disks rose from 23 to 25 percent

of consumption, and other media rose from 2 to 6 percent.

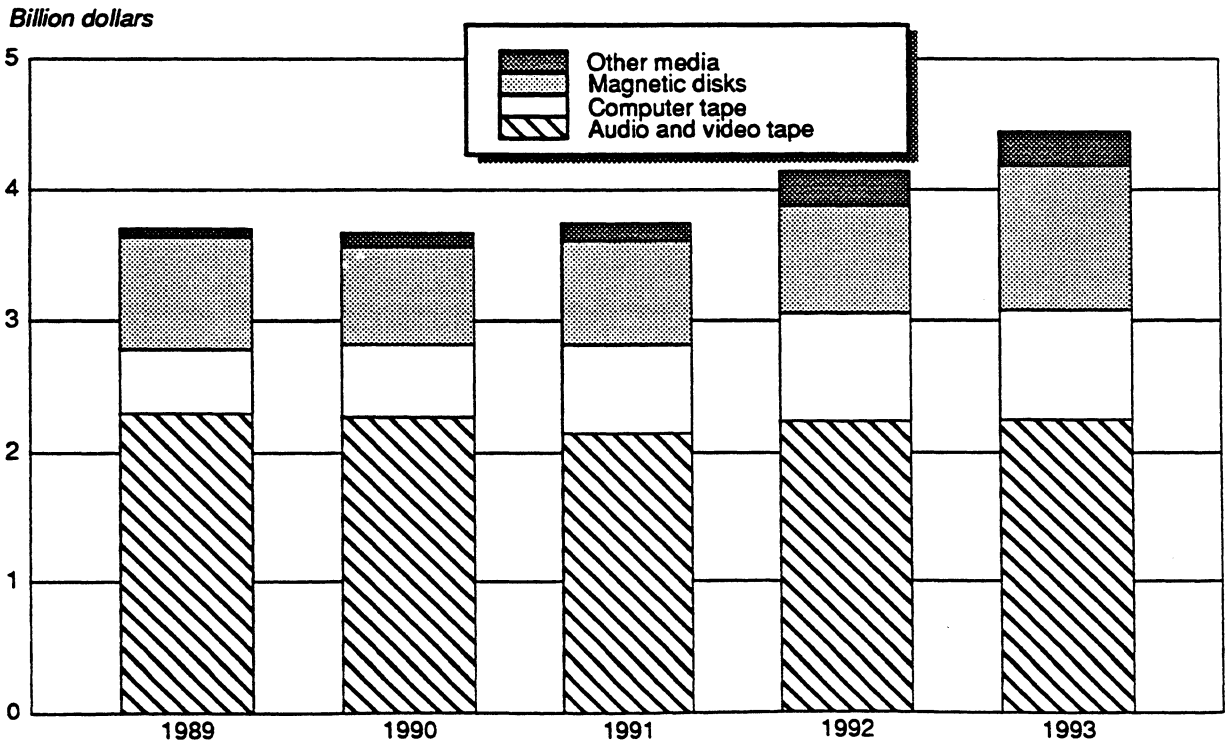
Imports as a share of consumption grew substantially during 1989-93, from approximately 37 to 43 percent for unrecorded media as a whole (table 6). The import share varied substantially by product: 47 percent for audio and video tape in 1993, 18 percent for computer tape, and 51 percent for magnetic disks. Within these categories, the import share was higher for audio than for video tape, and much higher for floppy than for hard disks. The relatively low import shares for computer tape and hard disks reflects,

Figure 2
Unrecorded media: U.S. shipments, exports, imports, and apparent consumption, 1989-93



Source: Exports and imports compiled from official statistics of the U.S. Department of Commerce. Shipments and apparent consumption estimated by staff of the the U.S. International Trade Commission.

Figure 3
Unrecorded media: U.S. consumption, by industry segments, 1989-93



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

in part, the U.S. industry's competitive advantage due to relatively quickly changing products and the proximity of the large U.S. computer products industry. By contrast, the 77-percent increase of the import share in magnetic disks reflects the diffusion of technology for the manufacture of floppy disks to new foreign sources of supply. Similarly, the high import share of audio tape reflects the wide diffusion of manufacturing technology for that product.

Production

The value of U.S. shipments of unrecorded media rose from \$3.6 billion in 1989 to \$4.2 billion in 1993 (table 6).³⁸ Shipments by industry segment followed a pattern similar to that of U.S. consumption, declining 6 percent during 1989-93 for audio and video tape, rising 40 percent for computer tape, and rising 26 percent for magnetic disks. These relative shifts are the result of the same trends in U.S. demand and import supply that led to shifts in consumption and import shares. In 1993, U.S. shipments of unrecorded media comprised approximately 36 percent audio and video tape, 21 percent computer tape, 22 percent hard disks, 16 percent floppy disks, and 5 percent other media (figure 4).

Imports

U.S. imports of unrecorded media increased by 40 percent from \$1.4 billion in 1989 to \$1.9 billion in 1993 (table 7). Most of this increase was accounted for by magnetic disks, almost exclusively floppy disks, which rose by 132 percent from \$247 million to \$572 million (figure 5). Imports of audio and video tape, primarily for consumer VCRs and video cameras, rose by 7 percent to \$1.1 billion, and imports of computer tape by 71 percent to \$152 million. Imports of other media, including M-O disks, increased by 125 percent to \$153 million. Thus, unrecorded media imports in 1993 comprised 55 percent audio and video tape, 8 percent computer tape, 30 percent magnetic disks, and 8 percent other media. A substantial majority of the

³⁸ Official statistics of the U.S. Department of Commerce cover factory shipments, not production per se. Shipments and production differ by the amount of changes in producer inventories. These changes were less than \$50 million annually during 1989-91, according to DOC's *Annual Surveys of Manufactures* for 1989, 1990, and 1991.

audio and video tape and magnetic disk imports, as well as some of the "other" imports, were relatively low value, consumer products.

Over 80 percent of U.S. unrecorded media imports came from East Asian economies in 1993. Magnetic tape accounted for 78 percent of imports from Japan and 99 percent from Korea, the first and second leading source, respectively. China and Taiwan together supplied the majority of imported magnetic disks, as these products made up 72 and 97 percent of U.S. imports from those economies, respectively. U.S. imports of magnetic disks from these two economies increased by over 900 percent from 1989 to 1993. Mexico, the fourth largest import source in 1993, supplied a more diversified product mix, consisting of approximately 60 percent tape and 40 percent disks.

In addition to imports of unrecorded media of foreign manufacture, the United States also had reimports, totalling \$100 million in 1993, of products assembled or processed from U.S. components. The U.S. domestic content of these products was \$34 million, with \$66 million in foreign value added. Approximately 99 percent of these products were processed in Mexico. Assembly or processing of unrecorded media in Mexico is likely to increase because of implementation of the NAFTA, as a result both of diversion of trade from low-wage Asian countries and of relocation of production from the United States.³⁹

The principal importers of unrecorded media are U.S. audio and video recording and software firms, U.S. subsidiaries of foreign manufacturers, and major U.S. retailers.

FOREIGN MARKETS

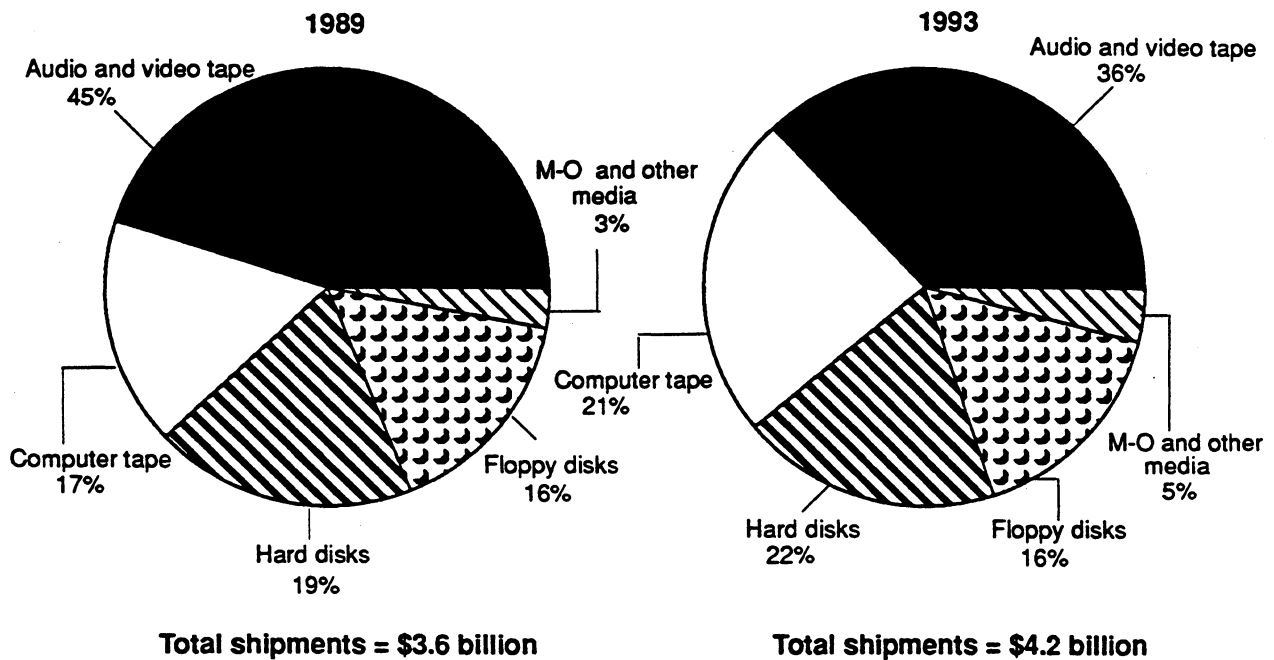
Foreign Market Profile

Western Europe constitutes approximately half of the non-U.S. market for unrecorded media, and Asia constitutes approximately one-third of that market (table 3). Japan and Germany, the two largest consumers of unrecorded media, are also among the largest producers and thus are largely self-sufficient. The world's largest net importer of unrecorded media is Singapore, which has substantial facilities for the manufacture of hard disk drives. Europe as a whole is a net importer of unrecorded media, and Asia is a net exporter.

The major factors affecting U.S. competitiveness in these markets are production costs, quality, technology, and exchange rates. The U.S. industry has little, if any, cost or quality advantage in such commodity products

³⁹ USITC, *Potential Impact on the U.S. Economy and Selected Industries of the North American Free Trade Agreement* (investigation No. 332-337), USITC publication 2596, Jan. 1993, p. 5-2.

Figure 4
Unrecorded media: U.S. shipments, by industry segments, 1989 and 1993



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

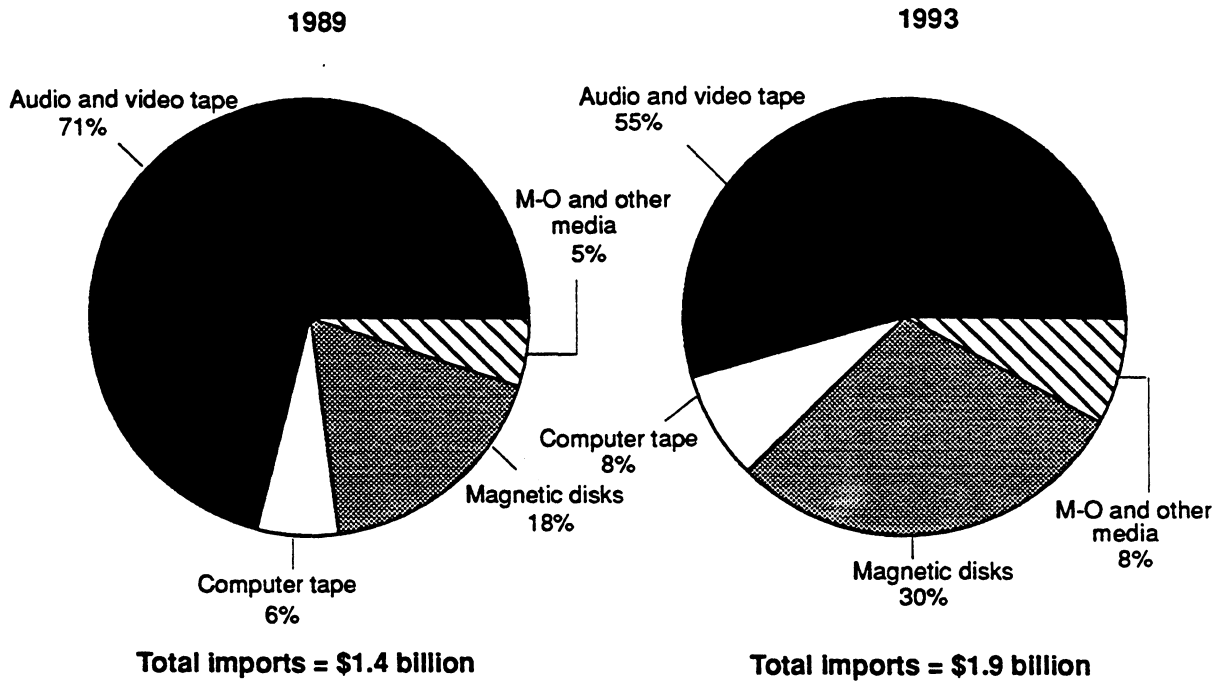
Table 7
Unrecorded media: Value of U.S. imports for consumption, by principal sources, 1989-93
(1,000 dollars)

Source	1989	1990	1991	1992	1993
Japan	662,311	718,932	803,427	775,108	812,900
Korea	227,123	252,632	316,330	282,801	278,617
China	18,995	40,231	95,916	165,004	223,722
Mexico	130,040	145,939	159,954	164,719	184,665
Taiwan	37,179	44,203	50,706	87,580	142,161
Germany ¹	86,791	102,559	117,069	105,357	112,357
Singapore	11,188	4,476	2,233	23,630	42,629
Hong Kong	154,472	110,671	77,251	62,228	36,707
Thailand	3,179	134	1,416	4,395	25,425
United Kingdom	16,491	16,224	18,639	16,213	15,151
All other	33,523	38,357	29,880	41,507	53,396
Total	1,381,292	1,474,358	1,672,822	1,728,541	1,927,730

¹ Includes the former German Democratic Republic (East Germany) before unification.
 Note.—Because of rounding, figures may not add to the totals shown.

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

Figure 5
Unrecorded media: U.S. Imports for consumption, by industry segments, 1989 and 1993



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

as consumer audio and video tape and floppy disks. However, the U.S. industry has a competitive advantage in product markets that require more advanced technology and higher quality control. The most important of these products are computer tape, professional audio and video tape, and hard disks. The competitiveness of U.S. products in Europe, where both costs and quality are relatively high, depends substantially on the exchange rates.

U.S. Exports

U.S. exports of unrecorded media increased by over 30 percent from \$1.3 billion in 1989 to \$1.7 billion in 1990 and then fluctuated near that level through 1993 (table 8). Exports accounted for approximately 36 percent of domestic shipments in 1989 and 40-46 percent of shipments during 1990-93.

The composition of U.S. exports has differed substantially from that of U.S. imports and domestic production. In 1993, 65 percent of exports were magnetic disks (figure 6), compared with 30 percent of imports and 38 percent of domestic shipments. A substantial proportion of the magnetic disk exports

were hard disks sent to Southeast Asia for incorporation into disk drive assemblies, whereas relatively few hard disks were imported. Nevertheless, most magnetic disk exports were floppy disks. Also, most floppy disk exports were leading brands with a reputation for quality, whereas imported floppy disks were primarily lower-valued, unbranded, commodity products.

By contrast with disks, only 19 percent of U.S. exports were audio and video magnetic tape, compared with 55 percent of imports and 36 percent of domestic shipments. This reflects the U.S. industry's lack of a competitive advantage in the supply of commodity, consumer tape products to export markets. Exported audio and video tape included a higher proportion of high-end, professional products than imported tape, as U.S. suppliers are highly competitive in these segments.

Computer tape accounted for 11 percent of exports, compared with 8 percent of imports and over 20 percent of shipments. The positive U.S. trade balance in this segment indicates the U.S. industry's competitive advantage, noted above.

Table 8
Unrecorded media: Value of U.S. exports of domestic merchandise, by principal markets, 1989-93

(1,000 dollars)

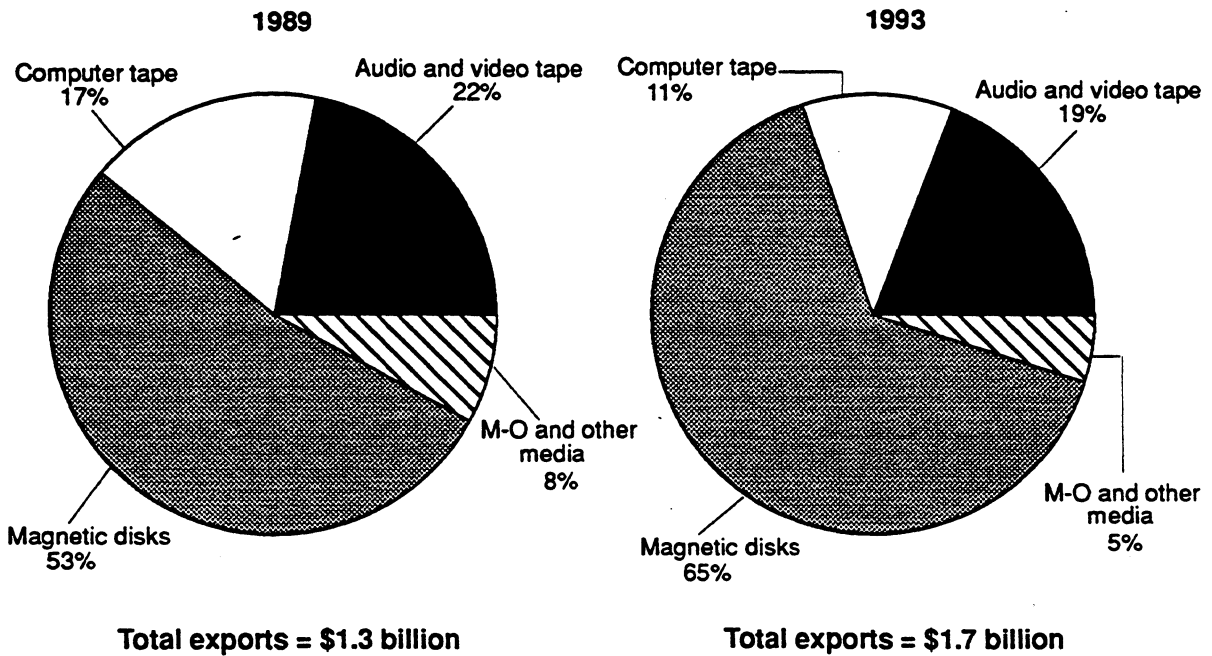
Market	1989	1990	1991	1992	1993
Singapore	262,913	361,629	418,389	513,738	378,839
Netherlands	102,048	173,528	157,497	171,826	152,885
Thailand	30,885	62,538	62,631	10,122	135,493
Mexico	114,811	155,062	160,887	153,621	119,031
Canada	91,165	96,284	100,703	98,528	101,896
Japan	123,254	134,793	99,901	84,617	96,986
United Kingdom	102,902	142,984	132,335	120,654	96,744
Germany ¹	133,229	177,116	172,139	132,158	73,267
Malaysia	1,296	2,055	11,803	31,710	72,713
Hong Kong	24,881	33,831	38,233	33,148	51,465
All other	304,389	365,700	404,824	392,633	395,567
Total	1,291,772	1,705,520	1,759,342	1,742,756	1,674,886

¹ Includes the former German Democratic Republic (East Germany) before unification.

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

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

Figure 6
Unrecorded media: U.S. exports of domestic merchandise, by industry segments, 1989 and 1993



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

The largest single market for U.S. unrecorded media exports throughout 1989-93 was Singapore. In 1993, 97 percent of exports to Singapore were magnetic disks, a large proportion of which were hard disks for assembly in disk drives. The Netherlands, the second largest market in 1992 and 1993, imported a broad range of U.S. products. Thailand, which became the third largest market in 1993, imported 98 percent magnetic disks, reflecting Thailand's emergence as a new location for the assembly of disk drives.

The largest category of exporters of unrecorded media has been U.S. manufacturers that sold products to foreign distributors. Other exporters have included U.S. manufacturers that shipped hard disks to affiliated disk drive assembly plants or sold them to nonaffiliated disk drive makers.

U.S. TRADE BALANCE

The United States had annual trade deficits in unrecorded media in 1989 and 1993 but had trade surpluses during 1990-92 (table 9). The increase in net

exports early in the period appears to have been largely the result of increased world demand for magnetic disks, a product in which U.S. suppliers have had a competitive advantage. The subsequent decrease in U.S. net exports was partly the result of increased production capacity for magnetic disks in other countries.

Although the United States has had substantial bilateral trade deficits with Japan, Korea, China, and Taiwan, it has had substantial trade surpluses with other Asian countries and also with Europe. The bilateral deficit with Germany that emerged in 1993 is largely accounted for by BASF's closing its U.S. manufacturing facilities and importing products from Germany.

Table 9
Unrecorded media: U.S. exports of domestic merchandise, imports for consumption, and merchandise trade balance, by selected countries and country groups, 1989-93¹
(Million dollars)

Item	1989	1990	1991	1992	1993
U.S. exports of domestic merchandise:					
Japan	123	135	100	85	97
Singapore	263	362	418	514	379
Korea	16	21	26	35	48
Mexico	115	155	161	154	119
China	6	6	3	6	4
Germany	133	177	172	132	73
Taiwan	26	37	21	20	30
Thailand	31	63	63	10	135
Netherlands	102	174	157	172	153
Canada	91	96	101	99	102
All other	386	482	537	517	535
Total	1,292	1,706	1,759	1,743	1,675
ASEAN	297	439	498	562	591
European Union	441	617	631	582	458
U.S. imports for consumption:					
Japan	662	719	803	775	813
Singapore	11	4	2	24	43
Korea	227	253	316	283	279
Mexico	130	146	160	165	185
China	19	40	96	165	224
Germany	87	103	117	105	112
Taiwan	37	44	51	88	142
Thailand	3	(2)	1	4	25
Netherlands	2	4	6	5	7
Canada	8	10	9	11	12
All Other	194	151	111	104	86
Total	1,381	1,474	1,673	1,729	1,928
ASEAN	16	6	4	36	79
European Union	124	142	152	141	152
U.S. merchandise trade balance:					
Japan	-539	-584	-704	-690	-716
Singapore	252	357	416	490	336
Korea	-211	-232	-290	-248	-231
Mexico	-15	9	1	-11	-66
China	-13	-34	-92	-159	-220
Germany	46	75	55	27	-39
Taiwan	-11	-8	-30	-67	-112
Thailand	28	62	61	6	110
Netherlands	100	169	152	167	146
Canada	83	87	91	88	89
All other	191	330	426	413	449
Total	-90	231	87	14	-253
ASEAN	281	433	494	526	512
European Union	317	474	479	441	307

¹ Import values are based on customs value; export values are based on f.a.s. value, U.S. port of export.

² Less than \$500,000.

Note.—Because of rounding, figures may not add to the totals shown. The countries shown are those with the largest total U.S. trade (U.S. exports plus imports) in these products in 1993.

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

APPENDIX A
EXPLANATION OF TARIFF AND TRADE AGREEMENT TERMS

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

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, Azerbaijan, Cuba, Kampuchea, Laos, North Korea, and Vietnam), which are subject to the rates set forth in *column 2*. Albania, Armenia, Belarus, Bosnia, Bulgaria, the People's Republic of China, Croatia, the Czech Republic, Estonia, Georgia, Hungary, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Macedonia, Moldova, Mongolia, Poland, Romania, Russia, Slovakia, Slovenia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan are accorded MFN treatment. 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 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 three times thereafter, applies to merchandise imported on or after January 1, 1976 and before the close of July 30, 1995. Indicated by the symbol "A" or "A*" in the special subcolumn, the GSP provides duty-free entry to eligible articles the product of and imported directly from designated beneficiary developing countries, as set forth in general note 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 those 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, implemented effective January 1, 1994 by Presidential Proclamation 6641 of December 15, 1993.

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

Officially known as "The Arrangement Regarding International Trade in Textiles," the *Multifiber*

Arrangement (MFA) provides a framework for importing and exporting countries to negotiate bilateral agreements limiting textile and apparel shipments, or for importing countries to take unilateral action in the absence or violation of an agreement. These agreements establish quantitative limits on 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—restrictions that would otherwise be a departure from GATT provisions. The United States has bilateral agreements with many supplying countries, including the four largest suppliers: China, Hong Kong, the Republic of Korea, and Taiwan.

