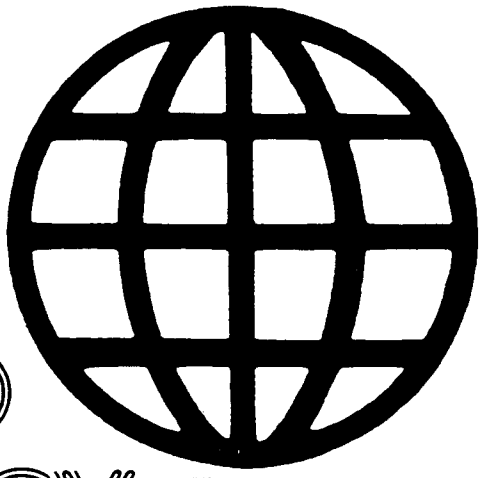
July 1997



INDUSTRY TRADE AND TECHNOLOGY REVIEW

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PREFACE

The *Industry, Trade, and Technology Review* (*ITTR*) is a quarterly staff publication of the Office of Industries, U.S. International Trade Commission. The opinions and conclusions it contains are those of the authors and do not necessarily reflect the views of the Commission or of any individual Commissioner. The report is intended to provide analysis of important issues and insights into the global position of U.S. industries, the technological competitiveness of the United States, and implications of trade and policy developments.

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Mobile Satellite Services

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Consortia directed by U.S. firms are currently developing and deploying mobile satellite service (MSS) systems that will provide global telecommunication service. These consortia, Iridium, Globalstar, and Odyssey, have obtained permission from the Federal Communications Commission (FCC) to provide wireless telecommunication services using low-earth orbit (LEO) and medium-earth orbit (MEO) satellites in the United States, and all have aggressively moved to market their services abroad, forming strategic relationships and securing regulatory approval in foreign markets.[1] These MSS systems are intended to extend the coverage of cellular networks, and augment substandard terrestrial[2] telecommunication systems. This article examines MSS systems, the competitive environment, and the treatment of these systems in the World Trade Organization (WTO) agreement on basic telecommunications.

In the early 1960s, the U. S. Government promoted international satellite communications to help ensure equal and universal access to the unproven and expensive technology. In 1962, Congress passed the Communications Satellite Act, establishing the Communications Satellite Corporation (Comsat). Comsat[3] contributed significantly to the creation of the International Telecommunications Satellite Organization (Intelsat). Established in 1964 under multilateral agreement, Intelsat provides affordable global telecommunication service on a nondiscriminatory basis. Currently, 139 member countries own shares of Intelsat and use satellites owned by Intelsat to provide services. Another international satellite organization (ISO), the International Maritime Satellite Organization (Inmarsat), was created in 1979 to offer satellite communications primarily to the maritime and aeronautical markets. Like Intelsat, Inmarsat's satellites are collectively funded by corporate signatories to the organization, which are appointed by member-country governments. In the years since, countries have established several other ISOs, such as EUTELSAT, ARABSAT, and INTER-SPUTNIK.

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[1] For information on certain other international alliances of telecommunication service providers, *see*, "Telecommunication Services: Bell Companies Act to Join Global Network Alliances," *Industry, Trade, and Technology Review*, USITC, May 1995.

[2] Terrestrial telecommunication networks include cellular, traditional wireline telephone, and all other networks that do not rely on spacecraft for signal transmission or switching.

[3] Comsat is the sole U.S. signatory to Intelsat and Inmarsat. Signatory responsibilities include promoting the interests of both the U.S. Government and the U.S. telecommunications industry. Comsat, a private, for-profit organization, is regulated by the FCC as the dominant international satellite communications carrier in the United States. Comsat representative, telephone interview with USITC staff, Apr. 9, 1997.

MSS systems have little in common with the geostationary, or geosynchronous[4] (GEO), satellites deployed by ISOs, telecommunication companies, and other companies. GEO satellites orbit at an altitude of approximately 36,000 kilometers (km). By contrast, the satellites used by MSS systems are deployed at much lower altitudes: MEO satellites orbit at altitudes between 8000 and 20,000 km and LEOs, up to 2000 km. The primary advantage of a higher altitude GEO satellite is their large "footprint," or area in which signal strength is adequate for purposes of telecommunication. To compensate for smaller footprints, LEO and MEO systems must have more satellites,[5] although these are smaller, less costly, and easier to launch than GEOs. Due to their closer proximity to earth, LEO and MEO systems inherently reduce transmission delays and signal strength requirements, allowing for size reductions in the battery, antenna, and other components of user equipment. These characteristics result in improved performance and hand-held portability.

International regulation of the new mobile satellite services and GEO-based services also differ. Iridium, Globalstar, and Odyssey have faced international technological, commercial, and legal issues that are difficult to address because of a lack of formal international policy regarding MSS regulation. However, innovative solutions are being devised to resolve problematic issues concerning licensing, frequency coordination, and interconnection with terrestrial networks.

U.S. Contenders

Although Odyssey, Iridium, and Globalstar have important functional differences, they will likely share basic operational characteristics. Each system will have a space segment based on a constellation of non-geostationary satellites, portable end user telephony equipment, ground-based satellite-control facilities, and gateway earth stations linking the satellites to existing terrestrial communications systems. A message transmitted from a subscriber's transceiver will be received by a satellite or a terrestrial wireless network and relayed to a gateway earth station to be analyzed for purposes of routing and billing. Thereafter, the message will be relayed by satellite to another terminal or directed to the public switched telephone network (figure 1). When operating in satellite mode, the three systems reportedly will function best when there is an unobstructed line-of-sight between the user and one or more satellites.[6] Obstacles such as buildings or trees may degrade service quality, more so than would be the case with terrestrial cellular systems, and service may not be available in the core of large buildings.

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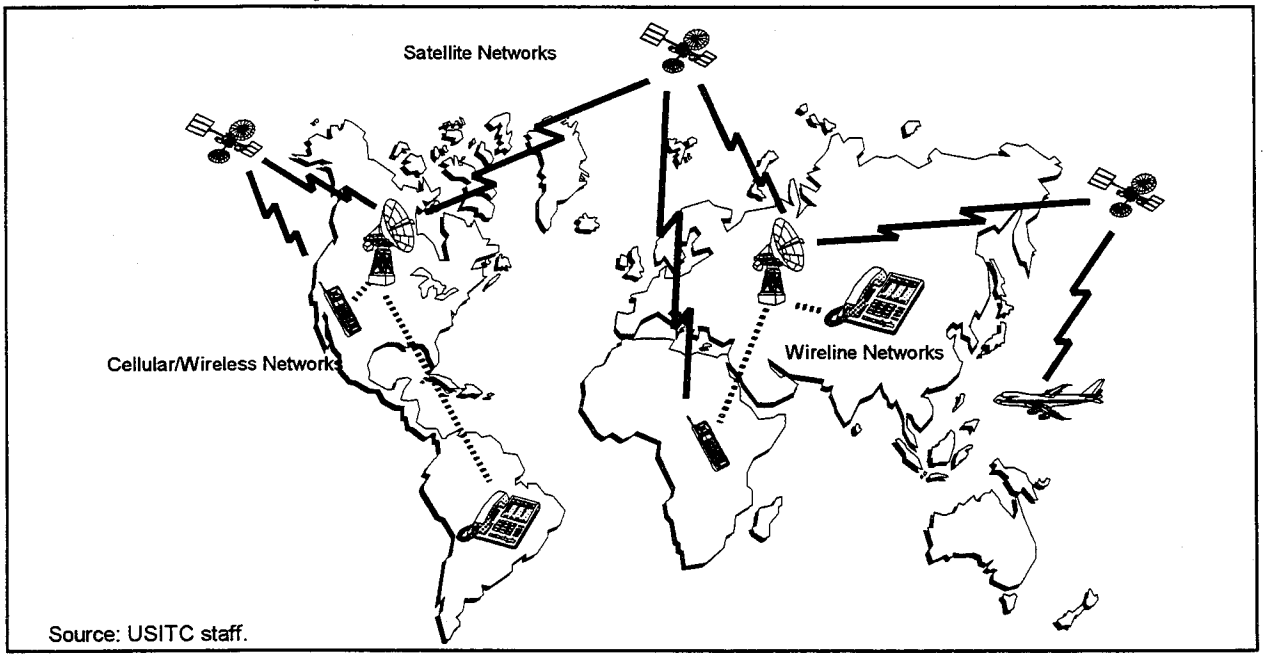
[4] Geosynchronous and geostationary satellites are synonymous. By definition, these satellites have a circular orbit above the Earth's equator, and travel at the same speed at which the Earth rotates, thereby remaining permanently above a fixed location on the Earth's surface.

[5] To fully cover the earth, LEO systems require 40-70 satellites, MEO systems require 6-20 satellites, and GEO systems require 3-6 satellites. World Wide Web, retrieved May 11, 1997, http://www.i-co.co.uk/, *ICO System*, ICO Global Communications.

[6] The Odyssey, Iridium, and Globalstar networks will be multi-modal, transmitting signals through satellite or terrestrial networks, depending on which is most efficient.

Figure 1
Mobile satellite service systems



Source: USITC staff.

Globalstar[7]

Globalstar was founded by Loral Corp. and Qualcomm Inc. Globalstar's digital telecommunications system is expected to offer virtually worldwide telephone, paging, facsimile, and message services over a network of 48 LEO satellites. Launches are scheduled to begin in the second half of 1997 with commercial service scheduled to begin in 1999. Globalstar plans to provide telecommunications in areas where terrestrial systems cannot be justified economically, areas lacking basic telephone service, and areas not adequately served by cellular systems. A variety of user equipment will be available, including mobile units similar to cellular telephones, fixed telephones similar to ordinary wireline telephones or phone booths, data terminals, and facsimile machines. Multi-mode phones designed to receive and transmit signals conforming to two or more protocols will provide access to the Globalstar infrastructure, and to cellular and switched wireline networks. About 50 percent of sales is likely to come from the multi-mode phone market, where cellular compatibility will come into play.[8] Regional service providers will set retail pricing schedules and are expected to pay

[7] Effective April 23, 1996, a merger between Loral and Lockheed Martin Corporation was completed. In conjunction with the merger, Loral's space and communications businesses were transferred to Loral Space & Communications Ltd., a Bermuda company. World Wide Web, retrieved May 7, 1997, http://www.sec.gov/, Globalstar Telecommunications, Ltd. Annual Report, SEC form 10-K, filed Mar. 10, 1997.

[8] World Wide Web, retrieved June 19, 1997, http://biz.yahoo.com/finance/, "Globalstar sees Big Satellite Phone System Market," Reuter, June 10, 1997.

Globalstar approximately 35¢ to 55¢ per minute.[9] The expected price for the mobile terminal is $750.

Globalstar has raised or received commitments for approximately $2.0 billion in financing, representing 80 percent of the total financing required to complete the system and begin worldwide operations.[10] Loral, which owns 38 percent of Globalstar, indicated that it would provide back-stop financing should Globalstar be unable to raise necessary funding.[11]

Although the project is progressing, Globalstar still has a significant number of steps to execute before it can launch commercial service. The FCC has assigned radio frequency spectrum for Globalstar's service links, which are transmissions between satellites and end-users, and the feeder links, which are the transmissions between satellites and gateway earth stations. Separate authorizations must still be obtained from the FCC for operation of gateways and telephony equipment in the United States.

Iridium

Iridium is owned by private and public telecommunication companies from more than a dozen nations. Motorola owns 25 percent of Iridium and is primarily responsible for building and launching the satellites. The system is designed to provide services including voice, facsimile, data, and paging over a 66-LEO satellite constellation linked to a terrestrial infrastructure capable of switching calls over cellular networks.[12] Iridium Cellular Roaming Service (ICRS),[13] the satellite constellation, and regional gateways, which will be owned and operated independently of Iridium, will allow connectivity virtually anywhere in the world. User costs

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[9] The service prices provided for MSS systems may entail different elements and, therefore, may not be strictly comparable. For example, Globalstar's per minute charges do not include additional earth station gateway costs.

[10] On February 14, 1995, Globalstar completed an initial public offering of 10,000,000 shares of common stock, which resulted in net proceeds of approximately $484 million. World Wide Web, retrieved May 7, 1997, http://www.sec.gov/, Globalstar Telecommunications, Ltd. Annual Report, SEC form 10-K, filed Mar. 10, 1997.

[11] World Wide Web, retrieved June 19, 1997, http://biz.yahoo.com/finance, "Moody's Rates Globalstar," Reuters Limited, June 10, 1997.

[12] Scheduled to occur in January 1997, Iridium's initial satellite launch was postponed following a Delta II rocket failure. Five satellites were successfully launched on July 9, 1997, bringing the total of orbiting Iridium satellites to 17. Iridium Launch Hotline (888 952-8624), May-July 1997.

[13] As designed, ICRS will provide access to terrestrial wireless networks, even if the host and home networks use different cellular protocols (e.g., AMPS, CDMA, and GSM). However, before such interconnection is possible, Iridium must have roaming agreements with all networks to be bridged. Iridium expects to have service agreements with approximately 60 countries by the commencement of commercial service in September 1998. Iridium will not have full global coverage until all agreements are enacted in every market. World Wide Web, retrieved May 7, 1997, http://www.sec.gov/Archives/, Iridium World Communications, ltd. Preliminary Prospectus, SEC form S-1, filed Mar. 17, 1997.

will include a $2,500 telephone and a monthly subscription fee. Airtime charges will be determined by Iridium's local service providers.[14]

Iridium was originally designed to provide service to about 1 million subscribers, largely in such less developed communication markets as Africa and India, and in other areas not served by adequate telecommunication service. However, in response to changing market conditions driven largely by the proliferation of cellular service, Iridium recently revised its subscriber base expectations to 3 million users, comprised mainly of traveling professionals and the corporate/industrial sectors.[15] In an attempt to gain market share, Iridium is also moving to serve mobile customers that need to travel through multiple regions using different cellular protocols.[16] Iridium's ICRS cellular translator will allow customers to roam onto the Iridium system through their current cellular service provider.

Another recent system change involves satellite signal processing. Initially, Iridium's satellites were to have the capability to switch telecommunication traffic. Satellites will now act only as signal relays and calls will be switched by terrestrial control centers, thus simplifying the space segment.[17] Iridium's ground-based switching scheme will provide the additional benefit of reducing signal degradation that is likely to occur when user equipment is unable to maintain adequate contact with satellites.

Iridium's strategic investors include enterprises from around the world with skills and experience in developing, manufacturing, licensing, and distributing satellite and telecommunication products and services. These investors have collectively invested, or have committed to invest, approximately $3.5 billion. This represents more than 80 percent of Iridium's projected total funding needs through the end of September 1998, when Iridium expects to commence commercial operations.[18]

Odyssey

The Odyssey personal communications system is scheduled to deliver phone, facsimile, and digital data services worldwide, beginning in 2001. TRW, Inc. (United States) is the primary investor in the parent company, Odyssey Telecommunications International, Inc., and is the

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[14] This is the same cost model to be used by the other MSSs. "Iridium Plans to Adopt Costs for Each Market," *Space News*, May 5-11, 1997, vol.8, no.18, p. 2.

[15] Iridium appears to be ceding much of the world's rural mobile-phone market to competitor Globalstar, which uses a lower cost and less complex satellite system. Quentin Hardy, "Iridium Phone Project Maps an Upscale Orbit," *The Wall Street Journal*, Jan. 10, 1997, p. A14.

[16] This strategy may eventually prove problematic as certain terrestrial wireless service providers are offering, or have announced their intention to offer, inter-protocol roaming services that would be in direct competition with Iridium. Roaming agreements between Iridium and such service providers may not be feasible. World Wide Web, retrieved May 7, 1997, http://www.sec.gov/, Iridium World Communications, ltd. Preliminary Prospectus, SEC form S-1, filed Mar. 17, 1997.

[17] The "bent pipe" signal relay approach is similar to system architecture used by the other MSS systems.

[18] On June 10, 12 million shares of class A common stock were priced at US$20 each. World Wide Web, retrieved June 19, 1997, http://biz.yahoo.com/finance, "Iridium World in IPO and Satellite Race," Reuters Limited, June 10, 1997.

general contractor for the project. Teleglobe Inc., based in Montreal, Canada, is also a founding shareholder. Odyssey's space segment will consist of 12 MEO satellites, which will serve as relay stations connecting user equipment to the nearest ground station where all switching and processing will be performed.[19] The ground segment will include 7 earth stations connected by a global wide-area network (WAN) running over leased fiber optic cable that will link the WAN to the public telephone system. The expected price for the cellular phone handset is $250-$300, with airtime service priced at 65¢ per minute for fixed-location communications and 95¢ per minute for mobile communication.

TRW is making progress in arranging equity financing for the Odyssey system. TRW itself has committed to invest $100 million and may eventually invest as much as $200 million. Odyssey will not begin satellite production until an initial $600 million of equity financing is secured.[20] Total system cost is estimated at $2 to $3 billion.

Odyssey will operate primarily as a wholesale provider of telecommunication services to national service operators, who in turn will provide Odyssey services to retail consumers. The system will interconnect with local telecommunication networks via GSM-compatible gateways owned and operated by Odyssey service providers. Most service subscribers are expected to be outside the United States, with fixed-site telephone services in rural areas accounting for 50 percent of business and the remainder coming from mobile customers and private networks.

The Competitive Environment

Iridium, Globalstar, and Odyssey continue to face a number of obstacles associated with the design, construction, and deployment of their MSS systems. Hurdles include developing software that will enable MSS space segments to communicate with public telecommunication networks. Differences in national and international licensing procedures also pose regulatory challenges to global adoption of these systems, which will be unable to provide service where they do not have approval from the local telecommunications regulator. For example, obtaining operating licenses may be difficult in areas such as Russia and Brazil, where local satellite systems have applied to use the radio spectrum on which Globalstar is designed to operate. Also, when operating in developing countries the MSS systems may face economic, political, or diplomatic conditions more volatile than those commonly experienced in the United States, increasing business risk. Furthermore, the increasingly crowded telecommunication services market has already reduced potential business opportunities for all the MSS systems and promises to offer intense competition once the systems are operational.

Intra-MSS Competition

The primary space-based competition initially faced by Odyssey, Iridium, and Globalstar will probably be from one another. However, as a number of similar services reach the market, competition among multiple wireless systems may prove intense. Odyssey, Globalstar, and

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[19] World Wide Web, retrieved May 7, 1997, http://www.trw.com/seg/sats/ODY.html, "Odyssey Telecommunications International, Inc: World Wide Personal Communications Satellite Services," TRW, Inc., Mar. 27, 1997.

[20] Ralph Winter, "TRW Lines Up Financing for Odyssey," Dow Jones Newswires, Apr. 30, 1997.

Iridium had planned to avoid some competition by differentiating their subscriber bases, but these have converged somewhat. The most likely subscriber for all MSS services is the business traveler using the service in areas where cellular coverage is poor or non-existent. As a result, rivalry over global market share may spark price competition that significantly reduces overall industry revenues or depletes certain providers' subscriber pools below the level necessary to maintain profitability. Yet, for the company that is first to bring a customer-ready service to market, there may be long-lasting competitive advantages. For instance, the first commercially successful system may establish technical conventions that become industry standards, according those with rights to the technology further technical and financial advantages. In addition, the first to market may avoid the expense of luring customers away from competing providers.

Cellular Competition

Initially, Iridium did not consider competition from the cellular telephone industry a serious concern. However, since the Iridium system was announced in 1990, the wireless voice market has grown more than ten-fold -- from about 12 million to 135 million subscribers.[21] The range of cellular networks is also expanding rapidly, with coverage of all major commercial markets expected in the near future. Already, every four lane highway in the United States is covered by cellular service that is less expensive than proposed mobile satellite services.[22] Consequently, the subscriber base Iridium initially envisioned has already been significantly diminished as a result of expanding cellular service.[23] Also, cellular roaming premiums are currently being reduced or eliminated in favor of widening local area rate zones. Such price restructuring may render the premium MSS rates for both terrestrial roaming and satellite services uncompetitive. Iridium has already shifted its marketing strategy to focus on urban business persons who tend to be price-insensitive users of terrestrial cellular systems.

Globalstar and Odyssey will be similarly affected by the market conditions created by cellular competition. Furthermore, all the MSS providers realize their services will be more expensive than terrestrial wireless services and therefore do not plan to compete with them directly; rather, MSS service providers expect to market their service as a valuable complement to existing cellular systems. However, MSS services may eventually be threatened by the build out of wireline and cellular networks into the areas where MSS service providers would be most likely to cultivate customers.

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[21] World Wide Web, retrieved July 2, 1997, http://www.iridium.com/public/public.html, "Ready to Roam," *IRIDIUM Today*, spring 1997.

[22] Dr. Jerome Lucas, seminar, "Understanding Telecommunications Technologies for Non-Engineers," Washington, DC, Sept. 12-13, 1996.

[23] For example, Evergrowth Telecom Ltd. recently awarded a $34-million contract to Motorola's International Cellular Infrastructure Division to build a digital cellular telephone network in Punjab, India. The global system for mobile communications (GSM) network initially will serve about 100,000 subscribers. The sub-standard telecom infrastructure of this region would have been a prime candidate for MSS upgrading.

ICO Global Communications

Inmarsat created ICO Global Communications (ICO) in January 1995 as a private company to provide global mobile satellite services. ICO is a multinational business corporation owned by 47 investors, primarily telecommunication and technology companies, from 44 countries. Inmarsat is a shareholder in ICO; however, ICO is not a subsidiary of Inmarsat and Inmarsat has no operational or commercial control of ICO.[24] Headquartered in the United Kingdom, the company currently is developing a world-wide infrastructure of regional offices and service partners (table 1).

Table 1
Overview of U.S. mobile satellite systems and ICO[1]

System name	Globalstar	Iridium	Odyssey	ICO
Operator	Globalstar, L.P.	Iridium L.L.C.	Odyssey Telecommunications International Inc.	ICO Global Communications Ltd.
Primary owners	Loral Space & Communications, Ltd. and Qualcomm Inc.	Motorola, Inc.	TRW, Inc. and Teleglobe Canada	Inmarsat (10.4%) and numerous international telecommunications operators and service providers
Location of headquarters	United States	United States	United States	United Kingdom
Primary services	Voice, data, fax	Voice, data, fax	Voice, data, fax	Voice, data, fax
Coverage	Worldwide	Worldwide	Worldwide	Worldwide
Initial launch	1997	1997	1998	1998
Commercial service	1999	1998	2000	2000
Cost (*billion dollars*)	2.6	4.4	2.0-3.0	4.6
Satellites (operational)	48	66	12	10
Orbit (*km*)	1,390	780	10,354	10,355
Mobile terminal cost	$750	$2,500	$250-$300	$200 above cellular handset
Airtime charge[2]	$0.35-$0.55	([3])	$0.65-$0.95	$1.00-$1.50

[1] Industry representatives note that system characteristics and charges may be adjusted before services commence.
[2] The service prices provided for MSS systems may entail different elements and, therefore, may not be strictly comparable.
[3] Not available.

Source: USITC staff.

[24] Correspondence with ICO Global Communications by USITC staff, Apr. 3, 1997.

ICO is scheduled to begin full commercial service in 2000, providing digital voice, data, facsimile, and messaging services. Service subscribers will use dual-mode handsets that will communicate with cellular systems whenever possible. The $4.6-billion system will be comprised of 10 operational MEO satellites arranged in two intermediate circular orbits.[25] The satellites will communicate with ground networks through the ICONET. This will consist of 12 ground stations located around the globe with high-capacity terrestrial links between them.[26] Like the MSS systems previously mentioned, ICO will supply service to customers through a distribution chain of national wholesalers, franchisees and retailers.

The system has not yet obtained FCC licensing, although ICO plans to participate in upcoming proceedings to receive worldwide authorization as a mobile satellite service.[27] Consequently, ICO and the U.S.-led systems may eventually compete vigorously in the MSS market. The relationships between ICO, Inmarsat, and numerous national governments are a cause for concern within the U.S. mobile satellite service industry from the standpoint of potential competition implications. Inmarsat's signatories include national postal, telegraph, and telephone (PTT) agencies that act both as government regulators and monopoly (or dominant) service providers in many markets.[28] As regulators, the signatories control local market access, licensing, spectrum allocation, gateway construction, interconnection with terrestrial networks, and other factors that will affect the international competitiveness of the U.S. providers. As for-profit service providers, the signatories also strive to maximize profits or market share. Thus, U.S. firms have expressed concern that ICO may receive preferential treatment from PTT investors.

Responding to the concerns expressed by potential competitors, ICO maintains its corporate policy is to promote transparent, non-discriminatory, and non-intrusive regulatory policies which govern the sharing of the radio spectrum, the licensing of services and user terminals, and interconnection to terrestrial networks.[29] ICO further maintains that the investor profiles of Globalstar, Iridium, and Odyssey are very similar to its own, in that all have investors or affiliates, including PTTs, from around the world.[30] For instance, the Italian Government operator STET is an Iridium partner and France Telecom has invested in both ICO and

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[25] The intermediate orbit is similar enough to the MEO configuration that TRW sought and received protection for its MEO-based Odyssey system from the U.S. Patent and Trademark Office. TRW believes these patents make it virtually impossible for a competitor to bring a system on-line without infringing on the patents. World Wide Web, retrieved May 7, 1997, http://www.businesswire.com/trw, TRW Press Release, TRW News, Sept. 5, 1996.

[26] World Wide Web, retrieved May 15, 1997, http://www.i-co.co.uk/nonshock/aboutico.htm, *ICO News*, ICO Global Communications.

[27] World Wide Web, retrieved May 7, 1997, http://www.fcc.gov/Daily_Releases/Daily_Business, "Amendment of the Commission's Rules to Allocate Spectrum for use by the Mobile-Satellite Service," *FCC News*, Mar. 14, 1997.

[28] The term "dominant service provider" usually refers to recently de-monopolized companies with commanding market shares.

[29] World Wide Web, retrieved June 25, 1997, http://www.i-co.co.uk, "Global Personal Mobile Communications Services," conference address by Mohamed Youssif, ICO Global Communications.

[30] "ICO Close to Decision on Public Offering, Change in Ownership Structure," *Mobile Communications Report*, June 3, 1996.

Globalstar.[31] Further, the ICO satellite constellation is not expected to be operational before the year 2000, which could provide Iridium and Globalstar with a first-to-market advantage.

International Cooperation

The trans-national nature of satellite services requires international cooperation on technical, financial, and regulatory issues. MSS technology must enable space-based networks to interact with terrestrial systems while not interfering with existing services. Regulatory requirements range from obtaining approval to establish national gateways, which may encounter foreign investment caps and other restrictions, to securing authorization for subscriber equipment. To address these issues effectively, the MSS providers are negotiating with private corporations, telecommunications regulators, and national governments. They also are active within multi-national groups such as the International Telecommunications Union[32] (ITU) that bring governments and industry together to resolve technical issues such as spectrum allocation and orbiting patterns. Last October, the ITU sponsored the first World Telecommunications Policy Forum, hoping to smooth the way for the introduction of global mobile personal communications. National telecommunication regulators and global satellite operators reached a consensus that is expected to give the private sector and national administrations a common starting point as countries proceed with licensing services for global satellite systems.[33]

International Economic Relationships

To effectively access foreign markets, the MSS systems are seeking to establish equity and service relationships throughout the world. As noted, Iridium's investors include enterprises with skills and experience in developing, manufacturing, licensing, and distributing satellite and telecommunication products and services. These investors are expected to use their wireless communication sales and service organizations to market Iridium services and equipment in territories that cumulatively have an existing base of approximately 14 million wireless subscribers. In addition, the local prominence of many of these investors may prove beneficial to Iridium's efforts to obtain necessary regulatory approvals.[34]

For similar reasons, Globalstar is also establishing international relationships. In Russia, for example, Globalstar formed a joint venture with the principal telecommunication operator, Rostelecom, to provide regional service. Globalstar service will also be offered in Indonesia. Globalstar noted the nation is particularly well-suited for MSS services because it has over

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[31] Industry representative, interview by USITC staff, New York, Sept. 24, 1996.

[32] The ITU is the telecommunications agency of the United Nations, established to provide standardized communication procedures and practices, including those pertaining to satellite frequency allocation, on a worldwide basis. Organized by the ITU, the World Radiocommunication Conference (WRC) is a forum wherein international radio frequencies are allocated and satellite orbit locations are established. Under the ITU's rules, MSS systems must coordinate with all other domestic and foreign users of assigned frequency bands.

[33] World Wide Web, retrieved May 7, 1997, http://www.globalstar.com/news/, "Global Mobile Satellite Accord Will Ease Industry Start Up," *Space Business News*, Oct. 30, 1996.

[34] World Wide Web, retrieved May 7, 1997, http://www.sec.gov/Archives/, Iridium World Communications, ltd. Preliminary Prospectus, SEC form S-1, filed Mar. 17, 1997.

13,000 islands, making it costly to build out landline networks. Also, less than two percent of the population currently has landline service.[35] Globalstar now has service provider agreements in 104 countries, and licenses in 14. Like Iridium, Globalstar believes relationships with local service providers will aid in the process of securing local regulatory approval, as well as provide local marketing and technical expertise as a competitive benefit.

Odyssey is also working to establish an international association of partners, service providers, and investors. In January 1997, Odyssey entered into a memorandum of understanding with ChinaSat, a wholly-owned subsidiary of China's Ministry of Post and Telecommunications. The agreement gives ChinaSat exclusive rights to distribute Odyssey services in the People's Republic of China. The Beijing earth station will be a key hub in China and the northeast Pacific ocean through which Odyssey expects to be serving more than 200,000 Chinese subscribers by 2002 and 1.3 million by 2010.[36] Such business agreements will likely prove critical to Odyssey's bid to capture foreign market share.

The World Trade Organization

On February 15, 1997, the WTO successfully concluded nearly 3 years of extended negotiations on basic telecommunication services. The agreement comprises commitments on market access, national treatment, and pro-competitive regulatory principles. The agreement provides U.S. companies market access for local, long-distance, and international service, either on a facilities basis or through resale of existing network capacity. The agreement ensures that U.S. companies can establish, acquire, or hold a significant stake in telecommunication companies and network infrastructure around the world. Signatories to the agreement, which is scheduled to enter into force on January 1, 1998, account for 91 percent of global telecommunication revenues.

The WTO agreement incorporates several features relevant to the provision of mobile satellite services. In fact, it was the complexity of encompassing satellite services within the agreement, in part, that required the negotiations to be extended from the initial April 30, 1996, deadline to February 1997. One feature important to satellite service providers is that commitments under the WTO agreement are "technology neutral," meaning that commitments pertain to any and all modes of transmission (e.g., traditional wireline, terrestrial cellular, and satellite services and networks), unless signatories list explicit exceptions. Thus, so long as countries do not carve out satellite services, investment rights guaranteed under the agreement will allow mobile satellite service systems to establish or acquire gateways, while regulatory principles will, for instance, allow MSS systems to establish interconnection with terrestrial networks at nondiscriminatory prices and avail themselves of transparent and publicly available licensing criteria. By negotiation's end, 51 governments had scheduled commitments on some or all types of mobile satellite services or transport capacity. Significantly, these commitments also recognize the scarcity of radio frequency spectrum and the validity of spectrum management as

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[35] World Wide Web, retrieved May 7, 1997, http://www.globalstar.com/news/, "Globalstar to Provide Mobile Satellite Services in Indonesia," Globalstar Press Release, Dec. 18, 1996.

[36] World Wide Web, retrieved May 7, 1997, http://www.businesswire.com/trw/bw.011997. "ChinaSat and Odyssey Agreement to Offer Broad, Economical, Satellite Phone Service in China," TRW Press Release, Jan.17, 1997.

a component of telecommunication regulation, but limit signatories' ability to impose effective market access restrictions by unnecessarily restricting foreign firms' use of available spectrum.

One significant concern pertaining to satellite services was not resolved by February 1997. Whereas signatories agreed that international satellite organizations, like Intelsat and Inmarsat, are exempt from the agreement, there was not explicit agreement regarding the future treatment of ISO affiliates like ICO. The United States indicated that, whereas it is not concerned about ICO in particular, it will analyze potential future ISO affiliates closely for anti-competitive practices before providing them unfettered access to the U.S. market. Other signatories were unclear as to how they would treat ISO affiliates.[37]

Future Prospects

Globalstar, Iridium, and Odyssey hope to profit from the worldwide demand for wireless communications, anticipating strong demand for communication services in areas where wireline or terrestrial wireless service are not currently available or accessible. Although the three MSS providers remain optimistic, they all have several hurdles to clear before subscriber-ready systems can commence service. Technical problems remain to be solved. Glimpses of the impending competition have already shifted marketing strategies. The regulatory environment faced by the MSS systems also offers challenges.

Multilateral negotiations will be required to resolve regulatory issues concerning interconnection rates, reciprocity of payments, and access charges, as well as technical issues such as interoperability between various networks and protocols. In this connection, the WTO telecommunication negotiations support efforts to fashion a regulatory environment conducive to the provision of satellite-based services. Through their commitments, numerous national governments have agreed to the principle of national treatment, ensuring nondiscriminatory treatment for satellite systems from WTO member countries, and opened formerly closed telecommunication markets to competition and foreign investment.■

[37] U.S. Department of State cable, "Touching Base with the French on the Eve of the WTO Telecom Endgame," message reference No. 3268, Feb. 11, 1997.

India's Steel Industry Emerging as a Competitive Global Player

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Boosted by the Government's liberalized economic policies and privatization efforts instituted since 1991, the Indian steel industry has shown substantial growth and enhanced competitiveness. Although India currently is the ninth-largest producer of steel in the world, planned capacity and increased productivity are forecast to propel the Indian steel industry into the top ranks of steel production within a few years. While still burdened by infrastructure problems, out-of-date technology, expensive raw materials (in the case of Indian minimills), and a slowing economy, India's steel industry has improved quality and lowered costs, and increased production by enough to lessen reliance on imports. Already net exporters of steel products, Indian producers hope to export much more. This article examines the impact of economic liberalization on India's steel industry and the competitive factors and challenges that are influencing India's emergence in the global steel market.

A glossary of technical terms appears at the end of this article.

From 1947, when India gained independence from Great Britain, until 1991, the Indian steel industry has been subject to government control. A series of 5-year development plans, coupled with a government-managed industrial policy, gave the public sector effective control over vital sectors of the economy, including steel. During four decades, India's steel industry grew in a highly protected and controlled environment, with high tariffs, administrative control over prices and distribution, and state allocation of imported resources. An import substitution strategy helped boost domestic crude steel production from 1.5 million metric tons to more than 15 million metric tons by 1990.[1] However, by the 1980s, calls began for the private sector to play a larger role in the economy, as it became apparent that the postindependence controls and regulations put in place to strengthen the economy were mostly just hindering economic productivity.[2]

[1] N.K. Raghupathy, Joint Secretary, Ministry of Steel, "India and the Steel Industry," Organization for Economic Cooperation and Development (OECD) Workshop on Steel Trade and Adjustment Issues, Paris, 1996, p. 2.

[2] N. Narayan, "A Passage to India: Weathering the Political Storms," *New Steel*, Mar. 1996, pp. 60-61.

Growing external debt and trade deficits led the Government of India to institute wide-ranging economic reform policies in 1991 that effectively brought an end to Government control of the Indian economy.[3] These policies included paring subsidies, privatization of state enterprises, delicensing,[4] trade policy reform, and ensuring the freedom of foreign capital movement affected the steel industry in significant ways. The industry began to expand as plans for new steelworks were formulated in the private sector. Existing integrated producers were forced to modernize and improve costs in order to compete with newer, more technologically advanced private sector mills, and the public sector was prohibited from establishing new steelworks. Although the transition is still in the early stages, the industry has undergone significant restructuring, including heavy investment and partial privatization of key state-owned entities. Scores of new projects underway will result in significant new capacity, and new technology is increasing efficiency in both carbon and specialty steel production. The reforms have increased the steel industry's competitiveness in terms of cost and quality. As a result of these changes, India is emerging as a competitive participant in the global steel market. However, there are several problems facing Indian steel producers, including inadequate infrastructure and power supplies, and implementation of ambitious capacity expansion plans despite a slowing economy. India must overcome these obstacles for the Indian steel industry is to maintain its viability over the long term.

Industry Structure

The three major components to India's steel industry are (1) integrated producers, commonly referred to as "main producers," which dominate steel production; (2) "secondary producers," which include minimills, or producers of steel in electric arc furnaces (EAFs), and processors/converters, which transform semifinished steel into finished products; and (3) raw material suppliers, including producers of direct reduced iron (DRI), an increasingly important raw material in steel production.

The largest integrated producer is the state-owned Steel Authority of India Ltd. (SAIL). SAIL is the tenth largest steel maker in the world and has five integrated plants (table 1).[5] Of these, the Bokaro and Bhilai steel plants have emerged as among the lowest cost producers of

[3] Ibid.

[4] During the era of government control, companies were required to be registered with the government before they were permitted to participate in the Indian steel industry. With this tool, the government could regulate companies' production levels and prices.

[5] Although the liberalization efforts included plans to privatize state-owned enterprises, SAIL's privatization is only partial. In 1993 the Government sold 10.5 percent of SAIL to Government-owned financial institutions, who later sold a portion to the general public. In 1994, a tentative decision was reached to sell a further 20 percent. These changes, although somewhat modest, have been sufficient to open the company up to an unprecedented level of public scrutiny. (Milton Nurse, "Indian Steel: The Revolution Rolls On," *Metal Bulletin Monthly*, Feb. 1995, p. 10). Also, these developments have forced the steel giant to modernize its works in order to compete with smaller, more technologically advanced plants that were being commissioned in the private sector at a rapid pace.

Table 1
Main integrated firms in India

Firm	Steelworks	Raw steel capacity, 1995 (*Million metric tons*)	Primary products	Percentage of India's total production
SAIL	Bhilai	3.85	Semifinished, flat	18
	Bokaro	3.85	Semifinished, flat	18
	Durgapur	1.43	Semifinished, long	6
	Rourkela	1.54	Semifinished, flat	7
	Burpur of IISCO	0.33	Semifinished, flat, long	2
Tisco	Jamshedpur	3	Semifinished, long, electrical steel	14
RINL	Vizag	2	Semifinished, long	10
			TOTAL	75

Source: Compiled by USITC staff from various industry publications.

hot-rolled coil and heavy steel plate in the world.[6] After SAIL, the second-largest integrated steel company is privately owned Tata Iron and Steel Co. (Tisco). Tisco and the other main integrated producer, Rashtriya Ispat Nigam Ltd. (RINL) are reported to be the world's lowest cost producers of wire rod.[7] These seven integrated plants are India's main producers, representing 75 percent of India's total steel production capacity. They yield all of the hot rolled strip produced in the country. Of the crude steel produced by these seven, 80 percent is still produced by state-owned enterprises.[8]

EAF producers or minimills are mainly involved in specialty steel making, hot rolling of long products, and cold processing strip, bars, and wire.[9] Minimills emerged in the 1970s in order to promote the use of indigenously available scrap, which, until then, had been mostly exported to Japan. The increased steel production also was intended to reduce steel imports and save on foreign exchange. Nearly 180 EAF units have been built in India, with a total capacity of 10 million metric tons per year (tpy), as well as about 800 induction furnace units with a total capacity of 5.8 million metric tpy.[10] However, more than 50 percent of the EAF units are

[6] SAIL also has three specialty steel plants: Salem Steel, which is the stainless steel cold rolling plant, the Alloy Steel Plant at Durgapur, and Visvesvaraya Iron and Steel Company.

[7] N. Narayan, "Freeing Indian Steel," *New Steel*, Jun. 1995, p. 22.

[8] Steel Authority of India Ltds., "Public Sector Moves to Meet Domestic Demand and International Competition," *Steel Times International*, May 1996, p. 26.

[9] George Messin, "Steel in India: Issues and Prospects," *Steel Times International*, May 1996, p. 12.

[10] Several minimills established in the 1970s eventually evolved to produce specialty steel, including Mukand, Mahindra Ugine Steel, and Panchmahal Steels. Panchmahal is moving towards

(continued...)

closed because of the rising cost of electricity.[11] Despite economic liberalization efforts that have contributed to the growth of this segment of the steel industry, EAF steel is generally not price-competitive with the steel produced by India's integrated companies because the EAFs have lower capacity utilization rates, 40-45 percent, as compared with 75-80 percent rates for integrated mills. The low rate of EAFs is due to poor scrap availability, power shortages, and demand constraints for the products. Table 2 depicts the main minimills[12] operating in India.

Table 2
Main minimills in India

Firm	Steel capacity, 1995 *(Metric tons)*	Primary products
Alloy Steel Plant (SAIL)	260,000 finished	Stainless/alloy semi, flat products
Bhoruka Steel Ltd.	150,000 finished	Carbon/alloy long products
Essar Gujarat Ltd.	2 million raw steel	Carbon flat products
Jindal Strips	250,000 raw steel 220,000 finished	Carbon/stainless flat products
Lloyds Steel Industries	400,000 raw steel 600,000 finished	Carbon/alloy flat products
Mahindra Ugine Steel Co. (Muscosteel)	150,000 finished	Carbon/stainless/ tool semifinished, long products
Mukand	335,000 finished	Carbon/alloy/stainless long products
Nippon Denro Ispat	325,000 finished	Carbon/galvanized flat products
Salem Steel (SAIL)	142,000 finished	Stainless flat products
Usha Alloys and Steels Division	194,000 finished	Carbon/alloy long products
Visvesvaraya Iron and Steel Company (SAIL)	180,000 raw steel 190,000 finished	Carbon/alloy/specialty semifinished

Source: Compiled by USITC staff from various industry publications.

[10] (...continued)
being a dedicated stainless steel producer of long products with a capacity of 125,000 metric tons by 1997. Expansion at ISI Bars will take it to an integrated stainless steel capacity of 75,000 metric tons of ingot, with one wire drawing and two bright bar divisions (See: D.A. Chandekar, "Indian EAFs Struggle in Liberalized Climate," *Metal Bulletin Monthly*, Dec. 1996, p. 23; and Markus A. Moll and Keith Armitage, "Overview of Stainless Steel Expansion in Emerging Countries," *Steel Times International*, May 1996, p. 43).

[11] Gilbert Lobo, "Uncertain Future for Indian Steel," *Metal Bulletin Monthly*, Feb. 1997, p. 11. The electricity price, at over 3 rupees ($0.005-$0.110) per kWh, is very expensive by international standards (Peter F. Marcus and Karlis M. Kirsis, Paine Webber, *World Steel Dynamics*, "India: The Ultra Dynamic Flat-Rolled Steel Industry," June 1997, p. 3).

[12] Generally limited to those minimills that maintain at least 150,000 metric tons of capacity.

India's total steel production capacity is approximately 28 million metric tons.[13] Government officials expect steel production capacity to reach 32 million metric tons in 1997, and 40 million metric tons by 2000.[14]

The key raw materials suppliers provide iron ore, pig iron, and DRI for steel production. In FY 1994,[15] 235 iron ore mines were in operation, of which 202 were in the private sector. SAIL is the largest iron ore producer, with a capacity of 20 million metric tons per year, followed by the National Mineral Development Corp. with 12 million metric tons per year and Kudremukh Iron Ore Co. (KIOCL) with 7.5 million metric tons per year.[16] SAIL is also the main pig iron supplier to the domestic market, selling on average over 1 million tpy. RINL, which operates the state-owned Visakhapatnam project, has started in recent years to export about 800,000 tpy of pig iron (see glossary of technical terms).[17]

Although minimills were set up to use plentiful scrap resources, the available supply today cannot keep pace with the demand of India's functioning EAFs. A major reason for the domestic shortage is low generation of automobile scrap in India, where car owners tend to maintain their vehicles for at least 20 years before replacing them. As a result, EAF steel makers must rely on imported scrap, making them susceptible to exchange rate fluctuations that limit their competitiveness. Because of the scrap shortage, a number of EAF producers are using an increasing amount of direct reduced iron (DRI) to feed their furnaces.[18] Essar Gujarat is the largest DRI producer in India. In addition to supplying its adjacent steelworks, as well as other Indian steelmakers, Essar Gujarat exports a significant amount of its output. As part of the economic liberalization program that began in 1991, licensing restrictions were removed from DRI and hot-briquetted iron (HBI) production. Now plants with large capacities are permitted to come on stream, providing more potential sources of scrap substitutes.[19] A list of the main DRI producers, grouped by technology used, is presented in table 3.

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[13] Raghupathy, p. 2.

[14] OECD, "Steelmaking Capacity in Non-OECD Countries," 1995, pp. 13-17.

[15] India's fiscal year runs from April 1 to March 31.

[16] Sanjay Sengupta, "India Invests in Iron Ore," *Metal Bulletin Monthly*, Sept. 1996, p. 72.

[17] Gilbert Lobo, "New Challenges in Pig Iron," *Metal Bulletin Monthly*, Apr. 1995, p. 13.

[18] The first experimental DRI unit was set up by the Indian Government and Sponge Iron India Ltd. (SIIL) in 1977 with the assistance of the United Nations Development Project (UNDP). The unit used noncoking coal and lumpy iron ore. The experiment was successful, and the technology is now used by a number of companies. SIIL now acts as consultant for coal-based direct reduction technology and as a regional center for direct reduction technology research projects (Lobo, "Mixed Fortunes for Indian DRI," *Metal Bulletin Monthly*, Apr. 1995, p. 23).

[19] At the Government's behest, DRI prices in the domestic market are kept at a lower level than world prices in order to promote it as a viable alternative to scrap. This is adversely affecting the DRI industry, which, in order to raise the prices of EAF feedstocks, has called on the government to increase the customs duty on imported scrap to ten percent (Chandekar, p. 25).

Table 3
DRI Capacity in India

Producer	Installed Capacity (*1,000 tons*)
COAL-BASED	
Sponge Iron India Ltd.	60
Tamil Nadu Sponge Ltd.	30
Bellary Steel	60
Kumav Metallurgical Ltd.	150
HEG Ltd.	60
Raipur Alloys	60
Ipitata Sponge Ltd.	120
Bihar Sponge Iron Ltd.	150
Prakash Industries Ltd.	150
Nova Steel	150
Orissa Sponge Iron Ltd.	120
Lloyds Metal Industries	300
Sunflag Iron & Steel Ltd.	150
Goldstart Iron & Steel Ltd.	220
Jindal	300
Monnet Ispat	180
TOTAL	2,260
GAS-BASED	
Essar Gujarat Ltd.	1,750
Nippon Denro Ispat	1,000
Grasim (Vikram Ispat)	750
TOTAL	3,500

Source: *Metal Bulletin Monthly*, 1995.

Production and Consumption

As the world's ninth-largest steel producer, India produced 21.55 million metric tons of raw steel in FY 1995. Integrated producers clearly dominate in crude steel production, producing about 75 percent of India's crude steel. Secondary producers, which include minimills and re-rollers, are claiming an increasingly larger share. In the year for which the most recent data are available, they accounted for about 25 percent of India's crude steel production (table 4).

Table 4
Indian crude steel production, main producers vs. secondary producers

Fiscal Year	Main producers	Secondary producers	Grand total	Percentage share of secondary producers
	Million metric tons			
1991	12.95	4.20	17.14	24.5
1992	13.66	4.18	17.84	23.4
1993	13.90	3.70	17.60	21.0
1994	15.20	4.57	19.77	23.1
1995[1]	16.06	5.49	21.55	25.4

[1] Preliminary.
Source: JPC, from Raghupathy, p. 3.

Specialty steel production is increasing rapidly; it has almost doubled since 1991, rising from 1.21 million metric tons to more than 2 million in FY 1995. Stainless steel has averaged about 19 percent of total specialty steel production during FY 1991-95 (table 5). Jindal Strips was the leading volume producer in 1994, followed closely by Mukand, Panchmahal, and Salem, ranging in output between 40-60,000 metric tons per year. All other producers were below 20,000 metric tons per year.[20]

Table 5
Indian specialty steel production, stainless vs. other specialty steel
(*Million metric tons*)

Fiscal year	Stainless steel	Other specialty steel	Total
1991	.23	.98	1.21
1992	.26	1.04	1.30
1993	.25	1.13	1.38
1994	.32	1.45	1.77
1995[1]	.44	1.60	2.04

[1] Preliminary.
Source: Alloy Steel Producers Association (ASPA), from Raghupathy, p. 6

In terms of raw materials, India is a major coal and iron ore producer, but its production lacks the full range of qualities needed by its steel industry, so it must import a portion of these key

[20] Moll and Armitage, p. 43.

components. Planning of pig iron projects continue either as the basis for integrated steelworks or to produce iron for sale.[21] Domestic iron ore production in FY 1995 has been estimated by the Indian Bureau of Mines at 64.9 million metric tons, 27.2 million of which was exported.[22] Indian production of pig iron was expected to increase from 2 million metric tons in FY 1993 to 3.1 million metric tons in FY 1996, with SAIL supplying the bulk.[23] Although the increase in production has also helped boost exports and decrease imports of pig iron, production is forecast to decline as the integrated steel plants decrease their sales in order to consume their production internally.[24]

India is the second-largest DRI producer in the world after Venezuela, producing over 4 million metric tons annually.[25] Since 1991, production has increased almost fourfold, from 1.31 to 4.4 million metric tons in 5 years. Over 3 million metric tons is gas-based HBI equal in quality to world standards. Essar Gujarat, Vikram Ispat, and Nippon Denro are the major gas-based plants, and these three maintain the largest portion of installed capacity at 2.2 million metric tons. The major DRI producers using coal-based technologies include Jindal and Lloyds Metal Industries. However, the economic liberalization policies that have almost eliminated tariffs on imported scrap are threatening the economic viability of the more expensive coal-based units.

Although per capita steel consumption in India is well behind the world average of over 100 kg/year, domestic demand for steel has grown as a result of the economic liberalization policies in 1991 and subsequent economic growth.[26] Apparent consumption of steel was approximately 22 million metric tons in FY 1995, up from 20 million metric tons in 1991.[27] India's consumption should continue to grow into the next century, driven by expected GDP growth of 7 percent a year during the period 1997-2002.[28]

The main consumers of steel in India are the construction and engineering sectors, which account for 70 percent of demand. Major expansion is expected in the cement, fertilizer, energy, petroleum, and mineral sectors that would help boost demand for steel. Also, the government plans to spend at least $100 billion for infrastructure development between 1992-2000. Developing infrastructure, including energy, roads, telecommunications and ports will increase construction activity and thus demand for steel.[29] The Indian steel ministry estimates that domestic consumption will rise to 32.68 million metric tons in FY 2001 and 48.8 million metric tons in FY 2006.[30]

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[21] For example, in 1994 Usha Ispat began production of merchant pig iron at a new 200,000 tpy works at Redi, Maharashtra, not far from the Goan iron ore fields. It also plans to build a 250,000 tpy integrated steelworks, with capacity rising eventually to 500,000 tpy (Nurse, p. 15).

[22] Sengupta, p. 72.

[23] Lobo, "New Challenges in Pig Iron," p. 13.

[24] Sengupta, p. 72.

[25] Chandekar, p. 25.

[26] Gilbert Lobo, "Uncertain Future for Indian Steel," *Metal Bulletin Monthly*, Feb. 1997, pp.7-8.

[27] OECD, "Steelmaking Capacity in Non-OECD Countries," 1995, p. 19.

[28] Ibid. The GDP growth level is based on expectations of the Indian Planning Commission.

[29] U.S. Department of Commerce," India -- Big Emerging Sectors," (http://www.stat-usa.gov/bem), Mar. 18, 1997.

[30] Lobo, "Uncertain Future for Indian Steel," p. 8.

Government Policy

The steel industry was among the industries delicensed by India's new industrial policy announced in 1991.[31] In addition, the Government opened the steel industry fully to the private sector, and foreign investment limitations were reduced. All capacity restrictions have been lifted whereas previously, new EAF mills were not permitted to produce more than 25,000 metric tpy. Price and distribution controls were eliminated, and the government pledged not to start any new greenfield steelworks. The freight equalization scheme (FES)[32] was largely eliminated, and customs duties were reduced (see text box for additional details).[33]

Highlights of India's Industrial Policy for Steel

- Delicense the industry, open it fully to the private sector, lift capacity restrictions.
- Lift most price and distribution controls. Government still requires a guaranteed supply of steel to high priority consumers: defense, railways, small-scale industries and the northeast region.
- No new steelworks owned by the government.
- Reduce direct state ownership through progressive disinvestment.
- Abolish freight equalization scheme, except to pay part of the freight costs for customers beyond a certain distance.
- Reduce customs duties on imported steel, raw materials and capital goods.
- Eliminate corporate income tax for new mills in any 5 of the first 10 years; cut excise duties on indigenous capital equipment.
- Permit imports of needed raw materials, capital goods, and intermediate goods.
- Reduce bureaucratic roadblocks to raising capital abroad and make rupees fully convertible to foreign currencies.

Further reforms reduced the bureaucracy that controlled the steel industry: the Directorate General of Technology Development (DGTD) was dismantled. The Monopolies and Restrictive Trade Practices (MRTP) Act of 1969 was radically amended to permit considerable freedom for large enterprises to grow and diversify, which greatly aided the steel industry.[34]

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[31] Industries that still require licensing include those with strategic or security concerns, environmental implications, or health concerns. An example of such an industry is the defense sector.

[32] The bulk of Indian steel (83 percent) is produced in India's five eastern states. The FES was devised to make steel products available at the same price throughout the country.

[33] N. Narayan, "Freeing Indian Steel," *New Steel*, Jun. 1995, p. 25.

[34] N. Narayan, "A Passage to India: Weathering the Political Storms," *New Steel*, Mar. 1996, p. 60.

Trade

Trade liberalization reforms implemented in 1991 placed all steel imports under Open General License; customers are now free to import any quantity of steel without having to obtain an import license. The customs duties on imported steel are also being reduced, albeit gradually. India's budget for FY 1995 cut peak import duty rates for most iron and steel products and non-ferrous metals to 40 percent from the earlier range of 50 to 60 percent. In the budget for FY 1996, the import duty on hot-rolled coil was lowered from 30 to 25 percent and on cold-rolled products was reduced from 40 to 30 percent. There is a possibility that in the FY 1997 budget these duties may be lowered further.[35]

U.S.-India Trade Friction

India has been named in a number of antidumping investigations launched by the U.S. Department of Commerce since 1991, mostly dealing with stainless steel products. Antidumping duties were imposed by Commerce on Indian stainless steel wire rod and stainless steel flanges in 1993 and 1994, respectively, after an affirmative determination by the Commission of injury to a U.S. industry. Similarly, in 1995, India was found to be dumping stainless steel bar on the U.S. market. Later that year, however, a case involving certain carbon steel butt-weld pipe fittings from India ended after the Commission determined that no injury to a U.S. industry had occurred.

As for raw materials, the government in FY 1994 reduced the import duty on iron ore concentrates and pellets to 10 percent from FY 1993 levels of 20 percent and 15 percent, respectively. It also reduced the import duty on noncoking coals[36] from 85 percent to 25 percent. However, the DRI manufacturers are calling for the duty on such coal to be reduced from 25 to 5 percent to bring the rates in line with the duty on coking coal imports.[37]

Total imports of finished carbon steel increased from 997,000 metric tons in FY 1991 to 1.5 million metric tons in FY 1995, the majority of which was flat products. There was a nearly 60-percent increase from FY 1994 to FY 1995, primarily as a result of general economic recovery.[38] From FY 1995 to FY 1996 imports reportedly increased even further, to 2.36 million metric tons due to a strong demand for alloy steel in the construction and manufacturing industries.[39] In FY 1995, India also imported 1.2 million metric tons of scrap, 40 percent of which came from the United States.[40]

Since economic liberalization in 1991, exports have increased threefold, rising from 373,000 metric tons in 1991 to 1.6 million metric tons in 1993. Although exports were down in FY

[35] Lobo, "Uncertain Future for Indian Steel," p. 11.

[36] Coking coals are used for integrated, blast furnace production. Coal-based DRI processes use non-coking coals.

[37] Gilbert Lobo, "Mixed Fortunes for Indian DRI," *Metal Bulletin Monthly*, Apr. 1995, p. 21.

[38] Raghupathy, p. 6.

[39] Comtex Scientific Corp., "India's Steel Imports Go Up Sharply," received by NewEDGE/LAN, Apr. 8, 1996.

[40] N. Vasuki Rao, "India Steel Modernization Offers Opportunity for U.S. Exports, Embassy Says," *The Journal of Commerce*, received by NewsEDGE/LAN, Dec. 28, 1995.

1994 in response to increased domestic demand, government officials see great potential for exports of steel from India.[41] Eighty-five percent of Indian steel exports is semifinished products, bars, rods, and plates, exported mainly to the Middle East and Asia, where Indian producers enjoy a distinct freight advantage over European and Latin American shippers.[42] However, exports of value-added flat products, like hot-rolled sheets/coils, cold-rolled and coated sheets are increasing, as are exports of pig iron and DRI.[43] Essar Gujarat exports nearly 50 percent of its 1.5 million metric tpy production of DRI and the other two major producers, Vikram Ispat and Nippon Denro, have also begun to export.[44] Overall, the government and industry project steel exports to reach 2.5 million metric tons in FY 1996 and 6 million metric tons in FY 2001.[45]

Modernization and Expansion

To enhance international competitiveness, the Indian steel industry has undertaken ambitious plans to expand India's steel production capacity, modernize existing facilities, and incorporate state-of-the-art technology at greenfield sites.[46] In the process, companies are using enhanced communications and information technology to improve marketability, sales, and distribution of their products.

The elimination of restrictions on foreign investment and licensing requirements have spurred plans for many new works, some in the building stages and some in the process of being commissioned. According to India's Secretary for Steel, J.K. Bagchi, some $1.7 million has already been invested in seven greenfield steelworks, adding 3.9 metric tons of saleable steel to available capacity. Another 13 projects calling for the investment of $3.7 million have been cleared by financial institutions and are at various stages of implementation, contributing a further 7.35 metric tons of capacity.[47] Some sources estimate the industry's rapid growth could result in a capacity level of 35 million metric tons by 2010.[48] Others predict it could go as high as 50 million metric tons.[49]

Among the significant projects underway, the Jindal Group is building Jindal Vijayanagar Steel Ltd. (JVSL), an ore-based integrated steelworks serving South India. Currently there is no manufacturer of hot-rolled coils in that part of the country. JVSL will use Corex technology for ironmaking. Ispat Industries, a company already well established in the flat product sector, plans to build a hot strip mill to be completed in two phases; the first 1.5 million metric tpy

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[41] Exports rose from 1.2 million metric tons in FY 1994 to 1.3 million metric tons in FY 1995. Raghupathy, p. 8.

[42] Narayan, "Freeing Indian Steel," June 1995, p. 26.

[43] Ibid, p. 8.

[44] Gilbert Lobo, "Mixed Fortunes for Indian DRI," *Metal Bulletin Monthly*, Apr. 1996, p. 21.

[45] U.S. Department of Commerce, International Trade Administration, "Steel Industry Overview: India--1995," *Market Research Reports*, Nov. 1995.

[46] The term "greenfield" refers to the establishment of new steelworks where no plant had previously existed.

[47] Lobo, "Uncertain Future for Indian Steel," p. 8.

[48] SAIL, "Public Sector Moves to Meet Domestic Demand and International Competition," *Steel Times International*, May 1996, p. 26.

[49] Paine Webber, World Steel Dynamics.

phase is due to be in commercial operation by the end of 1997. The second, which will result in full capacity of 3 million metric tpy, will be completed a year later.[50]

The newly liberalized economic climate has spurred numerous plans for capacity expansions throughout the industry, mainly at established plants. These efforts seek to modernize and implement technical improvements designed to improve capital productivity, labor productivity, and decrease energy consumption. Product quality improvement was also sought, as well as the optimum utilization of raw materials. For example, SAIL announced a major expansion program in 1994 that will see capacity rise from 11 million to 17 million tpy, mainly by improving the performance of the steelmaking shops at each of its works.[51] SAIL's modernization plans have four major goals: (1) to improve the quality of coke, raw material handling and preparation, and improved blast furnace performance; (2) BOF replacing the open hearths; phasing in of continuous casting to replace conventional ingot casting; (3) improving product quality and acquiring flexibility to produce a wider spectrum of products in long and flat categories in carbon, alloy and special steels; and (4) automation with computer control.[52]

India's capacity expansion plans are partly fueled by projects to increase production of stainless steel. Panchmahal is exerting effort to become a dedicated stainless producer of long products with a capacity of 125,000 metric tons by 1997.[53] In 1994, India produced 400,000 metric tons of stainless steel; by 1996 its output was expected to rise to 730,000 metric tons. By 1999, analysts estimate that Indian stainless production could surpass 1.8 million metric tons, and thus emerge as the third largest producer, after Japan and the United States, displacing Germany from its long-held ranking. This is particularly significant, because as recently as 1994, India was ranked as the 12-largest producer of stainless steel. Jindal Strips was the largest stainless steel producer in 1994, closely followed by Mukand, Panchmahal and Salem, all with output ranging between 40-60,000 tpy. All other producers were below 20,000 tpy.[54]

Outlook

Steel is key to developing India's underdeveloped infrastructure; it is needed for highways, a reliable power grid, safe drinking water, and the pipelines to carry water, sewage, and natural gas. With few restrictions on importing industrial materials, foreign investment, private enterprise, and foreign exchange lifted as a result of government reforms, it should be easier to overcome these obstacles. However, India's viability in the international steel market will depend on its ability to effectively deal with several challenges facing steel producers, including obsolete equipment and technology, inadequate infrastructure development, and insufficient power supplies. In the last year, industry sources have expressed concern that the multiple capacity expansion projects undertaken have proved overly ambitious in view of the slowing

[50] D.A. Chandekar, "Decontrol Stimulates New Projects," *Metal Bulletin Monthly*, Feb. 1997, p. 15.

[51] Nurse, p. 10.

[52] SAIL, "Public Sector Moves to Meet Domestic and International Competition," *Steel Times International*, May 1996, pp. 26-27.

[53] Markus A. Moll and Keith Armitage, "Overview of Stainless Steel Expansion In Emerging Economies," *Steel Times International*, May 1996, p. 38.

[54] Ibid.

economy and the cheaper imports entering the market.[55] Further, the efforts to privatize state-owned industries reportedly have not turned out as expected. The privatization process is moving slowly, and the transition has been difficult for some of the most established state-owned enterprises, including SAIL. Government sales of these entities have not generated the prices expected.

Labor reform is one area the 1991 economic liberalization policies did not address. As the largest employer in the country, SAIL faces a difficult task in reducing its labor force to enhance its competitiveness. Indian industrial enterprises are generally overmanned, particularly in the public sector industries, and any move to trim the workforce sometimes results in disruptive law-and-order problems. This objective is more challenging because the Government reportedly has no clear-cut exit policy to assist employees who are laid off, nor a social-security system or unemployment fund. While a Government fund exists for assisting public-sector companies in offering voluntary-retirement plans for their employees, this fund is meager.[56]

However, a number of factors will help counteract these problems. Joint ventures are increasing in India's liberalized economic climate, which will benefit the steel industry by attracting foreign investment and new technology. U.S. and Japanese steel makers, including Inland Steel Co., are studying how to form partnerships with Indian companies to sell top-quality steel to the growing India market. Part of the economic liberalization was a concentrated effort to increase foreign investment on all levels, and it appears to be paying off. In FY 1992, foreign investment stood at $433 million; by FY 1994, it had increased to $4.89 billion. A study by the Ministry of Steel has indicated that $8.3 billion is likely to be invested by the private sector in areas related to iron and steel manufacturing.[57] Inflation has also fallen considerably after the economic reforms. In August 1991, the inflation rate was 17 percent; it now stands at 6 percent.

India's growing role in world steel trade may impact the United States industry in various ways. As India increases its capacity of carbon and stainless steel production, the potential exists to produce beyond the needs of the domestic market, thus making more steel available for export. Despite antidumping duty orders that remain outstanding on certain products, an increasing amount of competitively priced Indian steel could potentially enter the U.S. market. Also, U.S. producers will increasingly find themselves competing in traditional export markets of Indian producers, particularly Asia and the Middle East. This is particularly significant in the case of specialty steel trade, where India's industry is expected to compete directly with top world steel producers, including the United States, Japan, and Germany, within a few years. ■

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[55] Lobo, "Uncertain Future for Indian Steel," p. 8.

[56] N. Narayan, "A Passage to India: Weathering the Political Storm," *New Steel*, Mar. 1996, p. 62.

[57] Raghupathy, p. 10. However, Indian steel companies have reportedly suffered a loss in appeal among investors over the last 2 years, because of slow steel demand growth in 1996, concern about oversupply, and losses at some companies, among other factors (See Marcus and Kirsis, *World Steel Dynamics*, 1997, p. 3).

Glossary of Technical Terms

BOF Basic Oxygen Furnace. The chief method of producing steel. The furnace is charged with molten iron from a blast furnace and steel scrap. Oxygen is blown into the furnace at high velocity to speed combustion and refine the iron and scrap.

Blast furnace Cylindrical steel vessel, lined with heat-resistance brick, which, once charged with coke, iron ore, and limestone and heated, produces molten iron for further refining in a steelmaking furnace.

Continuous casting Steelmaking process in which molten steel is cast (poured) directly into the desired cross-sectional dimensions of the semifinished steel shape and are cut to desired length following solidification.

DRI Direct Reduced Iron. A high-iron content input produced by the solid-state reduction of iron ore which is primarily used as a scrap substitute and/or complement.

EAF Electric Arc Furnace. A furnace in which iron and steel scrap, limestone, and other additives are melted and converted to steel. Heat supplied by an electric arc melts and refines the charge.

Flat products Steel products which have cross sectional proportions that are more oblong than square, as their width is at least four times their thickness. Slabs are a semifinished product used to produce of downstream flat products, including sheet, strip, and plate.

HBI Hot-Briquetted Iron. DRI that has been compacted for ease of shipment.

Ingot casting Steelmaking process in which molten steel is poured or "teemed" into ingot molds. As the steel begins to solidify, the mold is stripped from the ingot and the ingot is transferred to a "soaking pit" where the temperature of the steel is equalized. Following removal from the soaking pit, the ingots are hot-rolled on a primary breakdown mill to slab, bloom, or billet sizes.

Integrated Method of steelmaking, typically with BOF, that makes steel from the virgin material of iron ore, coal, and limestone.

Long products Steel products which generally are of rectangular, square or circular cross sections, having a length several times greater than the maximum cross-section dimensions, and if rectangular, a width less than four times the thickness. Blooms and billets are semifinished products used to produce downstream products such as bars, rods, and wire.

Minimills Sometimes called "non-integrated" mills, mills that usually bypass the first three steps of steelmaking (ore processing, cokemaking, and ironmaking) and use scrap as the primary raw material in electric arc furnaces.

Pig iron High-carbon iron made by the reduction of iron ore in the blast furnace.■

Textiles and Apparel: India's Integration into the World Economy and Opportunities for U.S. Firms

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India and nine other developing countries have been identified as having "great promise for large incremental gains in U.S. exports."[1] These 10 countries account for one-half of world population. The U.S. Department of Commerce has projected that they would more than double their collective share of world imports to nearly 27 percent by 2010, while world exports to India would more than triple during the period to $79 billion; U.S. exports to India are projected to increase in the next 5 years to more than $10 billion.

Commitments made by India during the Uruguay Round trade negotiations to open its domestic markets further will likely afford additional opportunities for U.S. industry. The globalization of textile and apparel manufacturing means that U.S. producers can no longer rely on their home market for sales growth. India has a dynamic textile sector, a need for capital and technology that cannot be met domestically, and a growing middle class looking for fashion and brand merchandise. These international and domestic market challenges call for India's textile industry to restructure and modernize its operations. This article analyzes the market potential in India for textiles and apparel, as well as opportunities for U.S. producers to expand their trade and investment in the Indian market.

The potential for expanded U.S. trade with India stems not only from its large population (which is second only to China, at more than 900 million people), but also its adoption of 1991 economic reforms, which have contributed to real economic growth of 6.3 percent in 1994-95 and 6.2 percent in 1995-96.[2] Since India opened up many sectors of the economy to foreign investors in 1991, approvals for foreign direct investment have risen rapidly, from $1.4 billion

[1] The other countries include the Chinese Economic Area (China, Hong Kong, and Taiwan), Indonesia, South Korea, Mexico, Argentina, Brazil, South Africa, Turkey, and Poland. U.S. Department of Commerce, International Trade Administration, *Business America*, "The Big Emerging Markets," Mar. 1994, p. 4.

[2] For information on India's reforms, see U.S. International Trade Commission (USITC), "Special Focus: India's Economic Liberalization," *International Economic Review*, USITC publication 3040, Apr. 1997, pp. 19-28.

in 1992 to $9.9 billion in 1995[3] and to more than $10 billion in 1996. The United States is the leading foreign investor in India[4] as well as India's largest trading partner, accounting for 11 percent of India's merchandise imports and 17 percent of its merchandise exports in 1996. Textiles and apparel made up about one-third, or $1.8 billion, of India's exports to the U.S. market. By contrast, Indian imports of U.S. textiles and apparel totaled $105 million, nearly two-thirds of which consisted of raw materials like cotton and wool fibers.

The World Trade Organization (WTO) Agreement on Textiles and Clothing (ATC) went into effect on January 1, 1995. It calls on developed and developing countries to reduce trade barriers on textiles and apparel in their home markets. The United States negotiated market access commitments with a number of developing countries that are major exporters of textiles and apparel to the U.S. market. With implementation of the United States-India Textile Agreement on January 1, 1995, India agreed to open its domestic market to U.S. exports of textiles and apparel for the first time. Immediate market access was provided for fibers, yarns, and industrial fabrics. Market access for other textile goods will be provided as soon as India lifts its balance of payments (BOP) exemption[5] or in no more than 3 years for home furnishings and apparel fabrics, 5 years for most apparel, and 7 years for other articles.[6] India also agreed to reduce its tariffs by 1998 to not more than 20 percent for yarns and fibers, 25 percent for industrial fabrics, 30 percent for most apparel fabrics, and 35 percent for most home furnishings and apparel.[7]

At the same time, India will be a major beneficiary of the phaseout of textile and apparel quotas maintained by the United States and other developed countries under the 1974 Multifiber

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[3] Indo-American Chamber of Commerce, Bombay, *Data on Indo-US Economic Relations,* Aug. 1996, p. 18. In 1995, India's textile industry sector accounted for over 4 percent of the foreign investments approved according to investment statistics published by the U.S. Department of Commerce, International Trade Administration (ITA).

[4] During 1992-96, actual foreign direct investment totaled $6.4 billion; the United States accounted for roughly one-fifth of the total.

[5] India has claimed virtually all its quantitative import restrictions on BOP grounds under GATT 1994 Article XVIII. Under WTO rules, countries may impose import restrictions if their BOP deteriorates to dangerous levels, but they must scrap them if conditions improve. Recently, the WTO Committee on Balance of Payments notified India that it does not have a BOP problem and asked India to come up with a proposal to phase out its remaining import restrictions. India plans to request a 7-year adjustment period to phase out its remaining restrictions. *The Journal of Commerce*, "India Ministry Offers to Speed Phaseout of Import Restrictions," June 17, 1997.

[6] On July 15, 1997, the United States requested WTO dispute settlement consultations with India regarding India's BOP restrictions. According to the United States Trade Representative (USTR), India no longer meets WTO criteria for use of BOP provisions, thus the measures currently in place are no longer justified. Over the last 2 years, the United States and other WTO countries have sought to reach agreement with India on the phaseout of these measures within a reasonably short period; however, the WTO BOP Committee concluded that there was no consensus on an appropriate phaseout plan. See USTR, "United States Requests WTO Dispute Settlement Consultations with India Regarding India's Balance of Payments Restrictions," press release No. 97-68, July 15, 1997.

[7] Office of the United States Trade Representative, "Kantor Announces Textile Market Access Agreement with India," press release No. 95-01, Jan. 1, 1995. Currently, India's tariffs are 25 to 30 percent for most yarns and 25 to 50 percent for most fabrics. In addition, India applies excise tariffs known as countervailing duties to the c.i.f. value of imported products.

Arrangement (MFA). The ATC obligates WTO members to gradually phase out quotas maintained under the MFA on imports from other WTO countries and "integrate" their textile and apparel trade into the WTO regime of trade rules applicable to goods of most other industrial sectors. The integration process will occur in three stages over 10 years ending on January 1, 2005. The first stage began on January 1, 1995, when WTO countries were obligated to integrate at least 16 percent of their sector trade into the WTO regime and to raise annual growth rates for the remaining quotas by 16 percent for major suppliers. The second stage begins in 1998, when at least another 17 percent of the trade is to be integrated, followed by at least an additional 18 percent in 2002. The rest of the trade is to be integrated at the end of the 10-year period.

Trade and Investment Policies

The Government of India provides foreign investors with special concessionary tax rates that are not available to local producers. Long-term capital gains of foreign companies are taxed at the rate of 20 percent compared with 30 percent for Indian companies.[8] The profits can be freely converted into foreign exchange.[9] Further, firms that are engaged solely in export activities are exempt from corporate and personal income taxes and may spend as much as 5 percent of their export earnings on duty-free imports of certain specified items.[10]

The Government of India has taken steps to promote foreign investment in the textile and apparel industry, particularly in the home furnishings, fabric processing and finishing, and apparel sectors.[11] To improve the global competitiveness of India's textile mills, the Government has reduced import duties to 10 percent for sophisticated textile machinery and equipment, such as autoconers with spicers and electronic cleaners with autodoffing systems, shuttleless looms, auto-control type humidification plants, and modern processing machines for yarns and fabrics.[12] Other export-oriented policies of the Government, designed to encourage the modernization of sector production and further stimulate exports, provide the benefit of duty drawback[13] to firms that export. Export-oriented firms can import machinery and raw materials free of duty so long as they export 75 percent of their output and satisfy certain value-added requirements.[14]

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[8] The Indian Cotton Mills' Federation, *Report for the Year 1995-96,* Mumbai, 1996, p. 60. The Indian Government reduced the long-term capital gains tax on domestic companies to 20 percent effective on Apr. 1, 1997.

[9] Center for Global Development, Tempe, AZ, *India on Its Way to Integrating Into Global Economy, India - an Awakening of a Giant,* May 12, 1994.

[10] Far Eastern Economic Review, *Made to Order in India's South and West, New Companies Proliferate,* Mar. 17, 1994, pp. 50-52.

[11] Mr. Pradeep Laroia, Chief, Trade Development Division, Department of Commerce, India, USITC staff interview, New Delhi, Oct. 23, 1996.

[12] The Indian Cotton Mills' Federation, *Report for the Year 1995-96,* Mumbai, 1996, p. 59. The effective duty rate, including excise and other duties, on such machinery is reduced to 23.2 percent.

[13] Import duties or taxes paid by the importer are reimbursed by the Government, in whole or in part, when the imported goods are re-exported or used in the manufacture of exported goods.

[14] U.S. Department of State report No. 04-014, "Cotton: Special Request Report on Cotton Yarn & Fabrics," prepared by U.S. Embassy, New Delhi, for the U.S. Department of Agriculture, Foreign

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Structure and Competitiveness of India's Textile and Apparel Sector

The Uruguay Round results are likely to pose major competitive challenges for India's textile and apparel sector. Although India accounts for only 2.6 percent of global textile and apparel trade, this sector is the largest industry in India with annual shipments of $20 billion and a work force of 20 million people. It generates 7 percent of India's gross domestic product, 20 percent of its industrial output, and 38 percent of its export earnings.[15]

The competitive position of India in textiles and apparel largely reflects its vast domestic fiber base; a huge low-cost and skilled work force; established allied industries; significant yarn and fabric capacity; and manufacturing flexibility. India ranks among the world's largest producers of cotton and, as such, its textile and apparel sector is cotton based. In 1995-96, cotton accounted for about 80 percent of the 2.7 million tons of fiber consumed.[16] India also has a sizable manmade-fiber textile industry; a growing wool industry; and a silk industry, second in size only to China. India's knitwear production has grown rapidly in recent years, consistent with recent global trends. Knit fabrics accounted for 15 percent of India's total fabric output and knitwear represented 43 percent of total apparel exports by volume and 27 percent by value in 1995-96.[17]

Textiles

The textile industry in India comprises three interrelated but competing sectors--the organized mill sector, the powerloom sector, and the handloom sector.[18] The organized mills produce almost all of the yarn in India, but only 8 percent of the fabric (table 1). The vast majority (82 percent) of the 1,569 textile units in the organized mill sector as of March 1996 were yarn spinning mills and the rest were composite (spinning and weaving) mills.[19] The spinning segment, with installed capacity of 31.25 million spindles and 0.21 million open-end (OE) rotors, is technologically advanced and globally competitive.[20] Although India accounts for only 1.5 percent of the world's installed capacity of OE rotors, the number of OE rotors has

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[14] (...continued)
Agricultural Service, Sept. 30, 1996, p. 1.

[15] U.S. Department of State, "Special Report on Cotton," p. 2.

[16] The Indian Cotton Mills' Federation, New Delhi, *Report for the Year 1995-96,* pp. 3-6.

[17] Ibid., p. 53.

[18] The organized mill sector includes large textile mills which are subject to various statutory laws and taxation. This sector includes large integrated mills that are involved with specific operations such as spinning, weaving, finishing or knitting. By contrast, the unorganized sector includes the powerloom and handloom sectors, which consist mostly of small units and are generally exempt from a number of statutory laws. The unorganized sector arose partly as a result of Indian government policy immediately following independence in 1947 to encourage the creation of small cottage industries and to provide large-scale employment opportunities.

[19] In addition, there are over 1,000 small spinning units, mostly in South India, according to the South India Small Spinners' Association, The Indian Cotton Mills' Federation, New Delhi, *Report for the Year 1995-96,* p. 1.

[20] USITC staff interviews with officials of Valliappa Textiles, Bangalore, India, Oct. 14, 1996; Bombay Millowners' Association, Bombay, Oct. 16, 1996; Bombay Dyeing and Morarjee Mills, Bombay, Oct. 17 and 18, 1996; and The Indian Cotton Mills' Federation, New Delhi, Oct. 22, 1996.

Table 1
India's production of yarns and fabrics, FY1991-92 to FY1995-96[1]

Product	1991-92	1992-93	1993-94	1994-95	1995-96
Yarn (*million kilograms*)	1,806	1,895	2,067	2,090	2,378
Cotton	1,450	1,523	1,622	1,586	1,788
Fabrics (*million square meters*)	22,598	25,045	27,472	28,175	30,151
Organized mills	2,376	2,000	1,990	2,271	2,036
Powerloom sector	13,262	14,644	15,994	15,979	16,332
Handloom sector	4,123	5,219	5,851	6,180	7,020
Knitwear	2,837	3,182	3,637	3,748	4,763

[1] India's fiscal year (FY) starts on April 1 and ends on March 31 of the following year.

Source: The Indian Cotton Mills' Federation, *Report for the Year 1995-96, Mumbai, 1996*, and The Millowners' Association, Mumbai, *Report for the Year 1995-96, Mumbai, India.*

increased in recent years. The weaving segment (fabric production) of the organized mill sector in India, by contrast, is generally antiquated and globally uncompetitive, with 80 percent of the 139,300 looms at least15 years old; only 30 percent of the looms are automatic and 4 percent are shuttleless.[21]

The powerloom sector accounts for 70 percent of India's fabric output and the handloom sector 22 percent. These sectors have an estimated 1.2 million looms. The handloom sector in India employs 12.9 million weavers. Government policies designed to promote employment in the country traditionally tend to favor the handloom and powerloom sectors and, in turn, have slowed the modernization of the weaving segment. The average cost of fabric made in the powerloom sector is 20 percent lower than that of the organized mill sector due to lower capital investment, wages, energy costs, taxes, and excise duties. However, the average daily output of the powerloom sector is much lower; 22 to 25 meters per loom versus 100 meters for shuttleless looms of the organized mill sector. Because Indian fabrics produced by the powerloom sector tend to be of low quality and limited variety, India's textile and apparel exports are concentrated in low-valued goods.

Low productivity and product quality, largely attributable to low technology and inadequate worker training, remain major problems facing the Indian textile industry.[22] A study of textile production costs in India and six other countries showed that lower productivity and higher energy and capital costs offset India's labor cost advantage.[23] Whereas average labor costs in

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[21] The number of shuttleless looms in India's weaving sector total only about 7,300, compared with about 73,500 in Korea, 56,100 in China, and 33,000 in Taiwan.

[22] A 1995 study stated that India's textile industry must invest some $400 million in new production technology to improve productivity and competitiveness. See International Textile Manufacturers Federation (ITMF), *Textiles and Clothing in India*, Zurich, Issue 1, 1995, pp. 12-14.

[23] International Textile Manufacturers Federation (ITMF), *1995 International Production Cost Comparison: Spinning/Weaving/Knitting*, Aug. 1995. Skilled workers in India's spinning, knitting,

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India's textile industry were only 20 to 22 percent of those in Korea and about one-half of those in Thailand, India's manufacturing costs were almost identical to those of Korea and Thailand in spinning and knitting, and higher in weaving (table 2). India's average labor costs in the textile industry were only 8 percent of those in the United States, but India's manufacturing costs were only 20 percent lower than those of U.S. spinning and weaving mills. India's cost of electricity was higher than that of the other countries in the study except Japan, and its cost of capital was higher than the others except Brazil.[24]

Table 2
Comparison of manufacturing costs in spinning, weaving, and knitting in selected countries, 1995

Item	Brazil	India	Italy	Japan	Korea	Thailand	United States
Ring spinning:	Total manufacturing costs *(Percent)*						
Waste	13	17	15	14	21	21	15
Labor	8	2	30	29	8	5	19
Power	8	15	8	17	9	10	6
Auxiliary materials	5	5	4	5	6	8	5
Depreciation	29	30	25	26	33	28	38
Capital	37	31	18	9	23	28	17
Total manufacturing costs (per *kilogram* of yarn)	$2.75	$2.25	$3.00	$3.40	$2.25	$2.20	$2.81
Weaving:	Total manufacturing costs *(Percent)*						
Labor	16	7	35	40	16	8	30
Power	7	12	9	15	10	13	7
Auxiliary materials	12	13	8	10	17	13	9
Depreciation	31	38	30	27	35	36	39
Capital	34	31	18	8	23	30	15
Total manufacturing costs (per *yard* of fabric)	$0.474	$0.391	$0.598	$0.651	$0.390	$0.338	$0.486
Knitting:	Total manufacturing costs *(Percent)*						
Labor	16	4	53	53	20	10	40
Power	9	20	7	15	11	14	6
Auxiliary materials	9	12	6	7	11	12	9
Depreciation	30	31	20	19	25	32	13
Capital	36	33	14	6	23	32	13
Total manufacturing costs (per *yard* of fabric)	$0.130	$0.089	$0.182	$0.213	$0.100	$0.086	$0.151

Source: International Textile Manufacturers Federation, *1995 International Production Cost Comparison: Spinning/Weaving/Knitting,* Zurich, Aug. 1995, pp. 10-13.

[23] (...continued)
and weaving sectors earned an average of $1.04 to $1.16 per hour, compared with $5.25 in Korea and $1.99 in Thailand.

[24] India's average capital cost in the production of 1 kilogram of 30s combed yarn was 31 percent of manufacturing costs, compared with 28 percent in Thailand, 17 percent in the United States, 9 percent in Japan, and 23 percent in Korea.

Apparel

India's export-oriented apparel industry consists of roughly 8,000 mostly small establishments employing an estimated 3 to 3.5 million people. The proliferation of small units in the industry partly reflects government regulations limiting benefits of small-scale industries to apparel units with investment of not more than Rs. 6 million ($172,000).[25] The industry is India's largest source of foreign exchange, generating one-half, or $4.5 billion, of India's textile and apparel exports in the fiscal year ending March 31, 1996.[26] Although India's apparel exports have increased significantly during the 1990s, the growth also has been restricted because of limited availability of export-quality fabrics and quota restrictions in major markets. Two-thirds of India's apparel exports go to countries with which India is subject to quotas; the United States alone accounted for one-fourth of India's apparel exports.[27]

Textile Machinery

The textile machinery industry is one of the largest segments of India's capital goods industry. More than 100 plants are engaged in producing textile machinery ($450 million) and about 500 plants make accessories and components ($63 million) and, together, employ about 30,000 people.[28] Indian consumption of textile machinery grew by 22 percent a year during 1992-95, reaching $733 million in FY 1994-95.[29]

Most of the growth came from imports, which doubled their share of the Indian market in the period to 46 percent.[30] Indian consumption of textile machinery is expected to grow by 15 to 17 percent a year in the next several years. The Indian market for textile machinery is dominated by the cotton spinning and the synthetic fiber segments, followed by the weaving segment. The ongoing expansion and modernization of the Indian textile and apparel sector, the need for developing state-of-the-art processing facilities, and the reduction in import duties on machinery should immediately provide opportunities in the Indian market for foreign textile machinery producers, either through direct exports or joint ventures with local firms.[31]

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[25] Mr. Jayant Dasgupta, Director, Ministry of Textiles, New Delhi, USITC staff interview, Oct. 23, 1996.

[26] "JTN Report: India," *JTN Monthly*, Apr. 1996, pp. 46-54, and The Indian Cotton Mills' Federation, *Report for the Year 1995-96*. According to The Bombay Millowners' Association, India's apparel exports rose from $3.1 billion in 1992-93 to $4.5 billion in 1995-96.

[27] U.S. Department of State, "Special Report on Cotton".

[28] "Indian Textile Machinery Industry," *JTN Monthly*, Sept. 1995, pp. 104-106.

[29] Ibid. In 1996, the demand crossed $1 billion.

[30] "World Capacities and Shipments of Textile Machinery," *Textile Outlook International*, Jan. 1997, pp. 110-125. During 1986-95, India took 28 percent of global shipments of short staple spindles, 9 percent of long staple spindles, and 3.3 percent of OE rotors. In 1995, India took almost one-half of global shipments of short staple spindles, 29 percent of long staple spindles, and 13 percent of OE rotors.

[31] "JTN Report: India," *JTN Monthly*, Apr. 1997, pp. 46-54.

Restructuring in the Indian Textile and Apparel Industry

India's textile and apparel sector has recognized the need for structural changes to improve its competitiveness in view of the likely competition in the domestic and international markets, especially from low-cost producers such as China, Sri Lanka, Vietnam, Bangladesh, and Pakistan. The phaseout of textile and apparel quotas in major developed-country markets and elimination of India's market access barriers will likely lead to lower prices, better quality products, shorter delivery schedules, and a higher level of service. In addition, these structural changes are found essential by the industry because of constraints on cotton production, growing demand for manmade-fiber textiles, easier expansion of the synthetic fiber textile industry following economic deregulation by the government, cost advantages of synthetic fibers due to anticipated growth in India's production capacities, and a phased reduction of the tax rate on synthetic fibers.[32] These market challenges have driven Indian textile mills to upgrade their technology and expand their operations on their own or through joint ventures with foreign firms. The industry's capital investment now totals about $4 to $5 billion annually.[33] A list of selected Indian textile firms involved in major modernization, expansion, and joint venture activity is presented in the annex at the end of this article. U.S. firms participated in 14 of the 49 joint ventures listed in the annex table A, followed by Italian firms with 10, German and Japanese firms with 6 each, and Korea with 4.

Within the organized textile mill sector, establishments producing manmade-fiber textiles have significantly modernized and expanded their operations during the 1990s. Nearly one-half of the 37 firms in the sector included in annex table A are expanding or involved in joint ventures in the manmade-fiber textile business. The majority of the expansion or joint venture activities are aimed at producing better quality cotton and blended fabrics, both woven and knit, and worsted and blended woolen suit-fabrics for domestic use and exports. In denim, large Indian-owned firms such as Arvind Mills, Raymond, Century Textiles, Ashima Syntex, Modern Denim, LNJ Bhilwara Group, and Mafatlal Textiles have increased their capacity with technical and marketing assistance from leading foreign firms to meet the growing demand for denim in India and global markets. In addition, there have been some joint ventures and expansion activities in industrial fabrics. Plans are also underway to expand the dyeing, processing, and finishing sectors; firms such as Morarjee Mills,[34] Vardhman Group, Ginni Filaments, and Bantswara Syntex have entered into joint venture arrangements with foreign firms. Arvind Mills, Bombay Dyeing, and S. Kumar Synfabs have also expanded their operations in home furnishings with technical assistance from foreign firms. Some of the joint ventures involve buyback

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[32] Synthetic and Rayon Textile Export Promotion Council (SRTEPC), Bombay, *Manmade Textile Industry - India*, and USITC staff interview with O.P. Dhawan, Advisor, SRTEPC, Bombay, Oct. 17, 1996.

[33] "India Textiles & Apparel," *Supplement to JTN Monthly,* Apr. 1997, p. 20. Total capital investment includes an investment of over $190 million annually on upgrading the existing technology. As a result, about one-third of the industry is now relatively modernized.

[34] Morarjee Mills, in addition to collaboration in the area of processing technology for fabrics, also is exploring joint ventures to manufacture blended yarn with a buyback agreement from the joint venture participant. Mr. Harish H. Shah, Vice President-Production and other officials of the firm, USITC staff interview, Bombay, Oct. 17, 1996.

arrangements[35] or certain export obligations. In apparel, most of the joint ventures are in the form of licensing, contracting, or technical collaboration.[36] The apparel joint ventures mostly produce suits, jackets, jeans, and shirts.

Market Profile and Potential Growth Opportunities

India's population is expected to reach 1 billion by the year 2000 and it has a sizable middle class, estimated at 200 million people, which is expected to double in 10 years.[37] Although 25 percent of the population is considered very poor, an estimated 40 million live in households with an annual income of more than $30,000 which, in purchasing power parity, is equivalent to over $500,000.[38] India currently is the world's fifth-largest market in terms of purchasing power parity,[39] and is expected to improve this position into the 21st century.

Indian households spend about 10 percent of their disposable income on apparel, compared with 5 percent in the United States. Clothing expenditures in India tend to be higher for households with higher incomes and a large proportion of this income group spends more on clothing.[40] Thus, the large and growing Indian market, which is currently served mostly through local manufacturers because of India's market access barriers, is of interest to U.S. and other foreign apparel producers who want to use India as a manufacturing base for intermediate and final products and to serve regional or other price-sensitive export markets.

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[35] A buyback arrangement involves a contractual obligation on the part of a foreign joint venture participant to buy all or some of the products manufactured in the host country joint venture facilities.

[36] "India Textiles & Apparel," *Supplement to JTN Monthly,* Apr. 1997. Levi Strauss & Co. has set up a fully-owned subsidiary, Levi Strauss India, which contracted with Gokuldas Image of India to manufacture Levi jeans for the subsidiary. Arvind Mills, with technical collaboration from U.S.-based VF Corp., has introduced Lee jeans and Lee apparel, and also makes Arrow shirts under license from Cluett Peabody of the USA. Other important alliances include Marzotto of Italy with KB &T for men's suits; Grouppa La Perla of Italy with Mafatlal for Lingerie; Schiesser of Germany with Mafatlal for knitwear; Samsung of Korea with Niryat for men's suits; and Sara Lee of USA with Gokuldas Images for lingerie. Several global brands have entered the Indian market through joint ventures such as Louis Philippe, Van Heusen, Arrow, La Coste, Oshkosh B'Gosh, Jockey, Pringle, Nike and Ted Lepidas.

[37] A recent study by a consulting group (McKinsey) shows that purchasing power of the Indian population begins at a per capita income of $2,000, which is the low end of the middle class per capita income. ITS Textile Leader, *India Poised to Become a True Open Market, A Multitude of Opportunities,* vol. 1, Spring 1996, pp. 14-18.

[38] L'Observatoire Europeen du Textile et de L'Habillement (OETH), *Quarterly Bulletin: Textiles and Clothing,* "Country Profile - India," vol. V- No. 1/1996, Brussels, Mar. 1996, p. 88.

[39] Bank of India, *Trade Opportunities in India*, found at Internet http://www.Bank of India.com/boi-trade.html.

[40] Dr. Sri Ram Khanna, International Business Consultants, New Delhi, USITC staff interview, Oct. 22, 1996. According to a clothing expenditure study of India's population, only 16 percent of the lowest income group in the study making less than $775 per year spend over $116 on apparel. In comparison, about one-half of households in the income group $775 to $1,550 spend over $116 on apparel. Similarly, two-thirds and 78 percent, respectively, of the households in income groups $1,550 to $2,325, and over $2,325, spend over $116 on apparel.

Trade sources in India predict that India's textile and apparel exports, which totaled almost $9 billion in 1995-96, will reach $16 billion in 1999-2000 and $32 billion in 2004-05 (table 3). This would provide potential opportunities for U.S. and other foreign investors to enter this rapidly growing Indian market. U.S. opportunities for direct exports to India, however, are limited at least in the short term because of India's market access barriers on a number of textile and apparel products. Consequently, U.S. firms may enter into joint venture arrangements with Indian mills to meet the domestic demand for quality apparel fabrics, home furnishings, specialized fabrics, and branded apparel.

Table 3
India's exports of textiles and clothing by major product groups, FY1994-95 (actual), FY1999-2000 and FY2004-05 (projected)

Product group	1994-95	1999-2000	2004-05	Average annual growth 2004-05/1994-95
	Million dollars			*Percent*
Total exports	8,468	16,253	31,747	14
Cotton yarn	832	1,467	2,584	12
Cotton fabrics and madeups	1,471	2,710	4,994	13
Manmade fiber textiles (except clothing)	784	1,871	4,465	19
Clothing	4,433	8,916	17,934	15
Wool and woolen	171	240	336	7
Silk products	298	345	400	3
Handloom	479	704	1,034	8

Source: International Business Consultants, New Delhi, India, USITC staff interview with Dr. Sri Ram Khanna, Oct. 22, 1996.

U.S. export and investment opportunities in India are promising in the synthetic-fiber textiles and specialized cotton products, which are production inputs for India's expanding apparel industry. India currently is the sixth-largest producer of synthetic fibers and yarns, after the United States, China, Taiwan, South Korea, and Japan.[41] With the completion of large-scale projects in this sector by the year 2005, industry sources predict that India will become the world's second-largest supplier of manmade-fiber products after China.[42] India's output of blended spun yarns, manmade fibers, and manmade-fiber filament yarns is expected to show significant increases from 1995 to 2005 (table 4). This growth in output would not only meet rapidly increasing domestic demand but would also boost exports.[43] By contrast, the composite

[41] "India: Self Sufficiency Prospect for all Fibers," *ITS Leader, The Magazine for International Textile Management*, vol. 3, autumn 1996, p. 82.

[42] Dr. Sri Ram Khanna, International Business Consultants, New Delhi, USITC staff interview, Oct. 22, 1996. Reliance Industries, India's largest and fully integrated textiles and petrochemical group is investing $3.7 billion in 1997, the largest by a private sector enterprise in a single location. This unit will have annual capacity of 15 million tons, which is claimed as the largest of its kind in the world. In addition, Reliance is setting up a polypropylene factory with a capacity of 400,000 tons a year and a paraxylene unit manufacturing 1.4 million tons a year, 1997 Comtex Scientific Corporation, Received by NewsEDGE/LAN, May 31, 1997.

[43] JTN monthly, January 1997, *India: SRTEPC Chairman Calls for Strategic Global Alliances*, pp. 33-35. In 1995-96, India's demand totaled nearly 900,000 tons, about one-third of all fibers

(continued...)

Table 4
India's production of textiles by major product groups, FY1994-95 (actual), FY1999-2000 and FY2004-05 (projected)

Product group	1994-95	1999-2000	2004-05	Average annual growth *(Percent)* 2004-05/1994-95
Spun yarn (*million kilograms*)	2,090	2,693	3,454	5
Cotton	1,586	1,838	2,131	3
Blended	346	582	981	11
Noncotton	158	233	342	8
Manmade fibers (*1,000 tons*)	475	765	1,234	10
Manmade filament yarn (*1,000 tons*)	397	640	1,031	10
Fabrics, all types (*billion square meters*)	24.3	32.9	44.5	6
Worsted woolen yarn (*million kilograms*)	34.4	38.7	43.6	2
Nonworsted yarn (*million kilograms*)	56.0	69.6	86.4	4
Wool/acrylic knit goods (*million kilograms*)	12.0	13.9	16.1	3
Silk (*1,000 tons*)	15.3	20.2	26.6	6

Source: International Business Consultants, New Delhi, India, USITC staff interview with Dr. Sri Ram Khanna, Oct. 22, 1996.

cotton textile mills are expected to retain mostly specialized product lines, such as denim, suitings, home furnishings, and high-valued fabrics where they need foreign assistance in capital, technology, and marketing.

India's imports of textiles and clothing totaled $908 million in FY 1994-95. Imports are projected to grow by an average of 22 percent a year in the next 5 years, to $2.4 billion in FY 1999-2000 (table 5)[44] and then double in the following 5 years, to $5 billion in 2005. Almost all the expected import growth will be in nonapparel items, such as manmade-fiber staple and filament yarns, special woven and coated fabrics, and home furnishings for which U.S. firms are among the world's largest and most efficient producers. Adequate supply of quality inputs for apparel production in India, either through direct imports or local manufacture, will boost output in India's apparel sector and enhance its competitive position in global markets.

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[43] (...continued)
consumed. See "India Textiles & Apparel," *Supplement to JTN Monthly,* Apr. 1997.

[44] Dr. Sri Ram Khanna, International Business Consultants, New Delhi, USITC staff interview, Oct. 22, 1996. These projections are based on the recent growth in imports and the relative competitive position of each of the sub-sectors of the industry and India reducing specific import duties on textiles and clothing as envisaged in the Indo-U.S. and Indo-EU textile agreements of December 1994.

Table 5
India's imports of textiles and clothing by major product group, FY1994-95 (actual) and FY1999-2000 (projected)

HTS chapter	Product group	1994-95	1999-2000	Average annual growth
		Million dollars		*Percent*
50	Silk	118	337	23
51	Wool (not carded or combed)	102	209	15
52	Cotton textiles	14	169	64
54	Manmade filaments	142	432	25
55	Manmade staple fibers	157	478	25
58	Special woven fabrics	19	59	25
59	Impregnated, coated or laminated	49	148	25
	All other, including apparel	291	525	15
	Total imports	891	2,357	22

Source: International Business Consultants, New Delhi, India, USITC staff interview with Dr. Sri Ram Khanna, Oct. 22, 1996.

Growth opportunities in India for U.S. and other foreign textile firms, however, will depend largely on the continued economic reforms, pace of expansion and modernization of India's apparel industry, and its ability to compete in the global market. The expected increase in demand for quality yarn and fabric by India's knitwear and apparel sectors and removal of import restrictions on apparel fabrics by no later than 1998 could spur U.S. exports of yarn and fabric to India, or encourage U.S. firms to enter into joint ventures with India's large composite mills to produce for local and export sales. These joint ventures would provide potential customers the confidence and guarantee of the parent U.S. company and its established record of quality service.

The rapidly growing production of denim in India has attracted many local and foreign investors.[45] Indian denim producers have already entered into technical and marketing arrangements with U.S. and other foreign producers, and installed advanced equipment to attain world quality standards in denim. The prospects for growth are substantial in this segment as India has an abundant supply of cotton especially suited to the production of denim fabrics. Indian demand for denim is expected to grow by 30 to 35 percent annually to 287 million meters by the turn of the century. Indian denim production in existing facilities is expected to grow from 100 million meters in 1996 to 304 million meters in 2000; export demand is expected to increase from 65 to 390 million meters. To help meet the increased demand for denim, the Indian industry plans to install 340 million meters of additional capacity by 2000.

[45] "India's Denim Industry, Blue Revolution Takes India by Storm," *JTN Monthly*, Mar. 1996, pp. 73-78.

Growth opportunities for U.S. firms in India's domestic market also exist in industrial fabrics, which have been freely imported into India since 1995, and intimate apparel. India's domestic market for industrial fabrics has grown in recent years due to strong demand for automotive fabrics from the rapidly expanding automobile industry. As a result, Indian producers of industrial fabrics seek to modernize and expand their dyeing, processing, and finishing subsectors and a number of foreign firms have entered into joint ventures with Indian companies. The demand for intimate apparel is expected to increase significantly in the next 10 years.

India has a large and growing, fashion-conscious middle class that has a preference for brand-name and ready-made apparel. The "westernized" college students are another large market for foreign casual attire. These market segments in India are not served adequately by local producers. The Indian Government has now permitted foreign brands in India's domestic market. However, opportunities for direct U.S. exports are limited in the immediate future because of India's existing import restrictions on apparel based on its BOP exemption already noted. In addition, India's tariffs on apparel imports are prohibitively high, although India has agreed to lower the tariffs on apparel to 35 percent by 1998. As a result, in the short term, U.S. producers can introduce their brands in the Indian market by licensing or through joint alliances with local producers. Many foreign producers of men's clothing currently focus on the upscale segment of men's clothing in India, where consumption is estimated at 3.5 million pieces and is growing at 20 percent a year.[46] However, once India's import restrictions on apparel are lifted and apparel tariffs are lowered, U.S. firms can start exporting specialized and branded merchandise in which they are most competitive and the demand is high in India. U.S. firms also could use India as a production base for local markets or for export, taking advantage of India's low labor costs and various government incentives.

Outlook

India's textile and apparel sector needs considerable financial, technical, and marketing assistance from foreign investors to undertake the major structural changes needed for the sector to compete in the global market in the next decade, given the evolving competitive environment without MFA quotas and market access barriers at home. Substantial private and foreign investment is needed to improve India's poor infrastructure to make India attractive for foreign firms. However, the growth in foreign direct investment has stagnated after a promising start following the implementation of economic reforms in 1991.

India's 1997-98 economic budget[47] does not provide any new incentives to attract additional foreign direct investment and the ongoing infrastructure projects involving foreign investors reportedly have faced bottlenecks because of a lack of political consensus on many aspects of economic policy. However, the budget provides for additional reductions in import tariffs and in personal and corporate income taxes. The Government cut the tax rate on royalty and

[46] U.S. Foreign Commercial Service, Madras, India, Extracted from National Trade Data Bank, *India-Textile Trade Show*, Mar. 2, 1996.

[47] U.S. Department of State report No. 002461, "Update on Economic Developments in India," prepared by U.S. Embassy, New Delhi, India, Mar. 1997 and American Consulate report No. 00741, "A Second Look at the National Budget from India's Business Capital," Mumbai, India, Mar. 1997.

technical service fees payable to foreign firms from 30 to 20 percent. The Government has also indicated an intention to lower tariff levels to the levels of ASEAN countries and to become as competitive as any other country in the region by 2000, and to match the investment climate of any country in the world by 2005.[48]

The trade and investment climate in India's textile and apparel sector is significantly better now than that which existed prior to the economic reforms. Market opportunities in industrialized fabrics, quality apparel fabrics, home furnishings, denim, intimate apparel, and branded apparel are in product sectors that are less developed in India and for which potential is great for their rapid expansion. U.S. brand-names are among the most widely recognized by consumers in India.

Although India has reduced tariffs for textiles and apparel, its tariffs are significantly higher than those of most other Asian countries. The Government of India also levies countervailing and excise duties that makes the cost of importing into India even higher. In addition, although market access was provided for fibers, yarns, and industrial fabrics with the implementation of the United States-India Textile Agreement on January 1, 1995, import restrictions on other textile goods, including apparel, will continue until India lifts its BOP exemption. Consequently, the potential for direct U.S. exports of textiles and apparel to India is small, at least in the short term. However, immediate export opportunities do exist for U.S. firms in yarns and specialized fabrics. U.S. firms can also enter into joint venture agreements with large Indian textile firms to produce quality yarn and fabric for the rapidly expanding domestic market. A number of joint ventures have already been finalized (annex table A).

In the apparel sector, however, U.S. firms can establish operations in India only if they undertake certain export obligations or have alliances with local firms providing for some type of buyback arrangement. Therefore, the best alternative for U.S. apparel firms with recognized brand names is to enter the Indian market through licensing. These brands can impart obvious competitive advantages to the firm that uses them and the brand-names for which Indian consumers are willing to pay a premium. Firms owning such assets can, of course, license country-specific production rights, rather than deciding to invest in foreign production facilities.

In the long run, when further economic reforms are implemented, import tariffs are reduced, and existing import restrictions on textiles and apparel are lifted, U.S. textile and apparel firms would have greater incentive for direct exports to India. In addition, in an effort to minimize production costs, U.S. firms might establish production sites in India as a means of meeting demand for products--including production inputs--in particular markets. Certain products need to be produced in proximity to consumers; local production also makes it easier to adjust to local product standards.

India's labor costs are low and will continue to remain low despite the demand brought about by the industrialization. Unlike the newly industrialized countries of Asia, India has an abundance of skilled labor and industrialization will have minimal impact on wages. Apparel

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[48] U.S. Department of State report No. 002537, "Finance Minister: India to be Competitive with Asian Countries by the Year 2000," prepared by U.S. Embassy, New Delhi, India, Mar. 1997.

production is a global operation and India provides global firms a viable and profitable manufacturing base for the rapidly expanding domestic market and price-sensitive export markets.

Annex

Table A
Major expansion/modernization activity in India's textile and apparel industry during the 1990s

Company/product	Expansion/modernization	Partner in venture	Activity
1. Reliance Textiles (Fully integrated manmade fiber)	Investment of $1 billion in new capacity to bring total capacity to 6 million tons per year by 1997		
	Polyester staple fiber, partially oriented yarn, industrial yarn	DuPont (USA)	Technical
	Ethylene and related products	Stone & Webster (USA)	Technical
	Polyvinyl chloride	BF Goodrich (USA)	Technical
	Polyethylene terephthalate (PET)	Sinco (Italy)	Technical
	Polyethylene plant	DuPont (Canada)	Technical
	Polyester industrial fiber	Hoechst Fibers (Germany)	50/50 joint venture
2. Arvind Mills (Fully integrated composite mill)	Invest $270 million to increase denim capacity to 100 million meters per year by 1997	None	Expansion
	$83 million investment in new capacity to produce cotton and blended shirt fabrics	FM Hammerle (Austria)	Technical and marketing
	$33 million unit to produce cotton and cotton-blend knit fabric	Almanac Knit Fabric (USA) (Div. of West Point Stevens)	Technical and marketing
	$33 million unit to manufacture voiles	Spinneri & Weberei Dietfurt AG (Div. Oerlikon-Buhrle, Switz)	Technical and marketing
	$70 million investment on home furnishings (negotiations are underway)	West Point Stevens (USA)	Technical
	Production of blended cotton fabrics for trousers (negotiations are underway)	Lauffenmuhle (Germany) & Delta Woodside (USA)	Technical
	Lee jeans and Lee apparel with 500,000 units of jean production capacity increasing to 2 million per year in 3 years; maximum capacity 4 million	VF Corporation (USA)	Technical
	Arrow shirt production to double to 2 million units	Cluett Peabody & Co (USA)	Licensing
	Bed linen and towels (talks underway)	Not known	Joint venture

Table A--*Continued*
Major expansion/modernization activity in India's textile and apparel industry during the 1990s

3. Raymond Ltd. (Diversified, woolen textiles)	Doubled capacity of worsted and blended woolen fabric to 10 million meters	None	Expansion
	Plan to commission a $80 million unit to produce 5 million meters of high quality worsted and blended fabrics in 1997/98	None	Expansion
	New denim manufacturing unit with an annual capacity of 10 million meters	Calintri (Italy)	Joint venture
	Quality improvement & marketing	Piacenza (Italy)	Technical and marketing
		Gaetano Marzotto (Italy)	Technical
4. Century Textiles (Composite mill, cotton & manmade)	Add 25,000 spindles (plans underway)	None	Imported machinery
	$30 million investment on 100 percent export-oriented denim producing unit with a 10 million meter capacity which will double later	None	Diversification
	5,000 ton viscose filament yarn unit	None	Plans are on hold
5. Morarjee Mills (Fully integrated composite mill)	$27 million spent during the last 3 years; another $31 million planned	None	Modernization
	Plan to improve processing operation	Seeking partner	Joint venture
	Spindle capacity in one plant to double to 42,360	None	Expansion
	$22 million investment in 100 percent export-oriented unit (EOU) to produce high value cotton fabrics for shirts with a 10 million meter capacity per year.	Manifattura di Valle Brembana (Italy)	50/50 joint venture
	$50 million on casual wear fabrics new unit with 15 million meter capacity; will double in 3 years	Legler Industria Tessile (Italy)	50/50 joint venture
6. Indo Rama (Cotton & manmade fiber textiles)	$186 million integrated plant producing 67,000 tons per year of polyester fiber and filament complex in 1995		
	Partially oriented yarn	DuPont (USA)	Technical
	Polyester staple fiber	Toyobo (Japan)	Technical
	Output to increase by 235,000 tons with spindle capacity increasing to 59,180 in Sept. 96	DuPont & Toyobo	Technical
	Plan to produce PTA and paraxylene; $320 million investment	None	Diversification

Table A–*Continued*
Major expansion/modernization activity in India's textile and apparel industry during the 1990s

7. Vardhman Group (Cotton & manmade fiber textiles & thread)	$215 million investment in 14 projects		
	$86 million upstream to produce acrylic fiber	Japan Exlan Co. Ltd. (Japan)	Technical
	Dyehouse for fiber and yarn	Nihon-Sanmo Dyeing (Japan)	Technical
	Gas mercerized dyeing plant	Kyung Bang Ltd. (S.Korea)	Technical
	Manufacture of industrial threads	Barbour Campbell (Ireland)	Technical
	20,000 spindle capacity on EOU melange yarn	Kyung Bang Ltd. (S.Korea) & Marubeni Corp. (Japan)	Technical
	20,000 spindle capacity EOU combed yarn	Marubeni Corp. (Japan) & Toho Rayen Co. (Japan)	Technical
8. GTN Textiles (Cotton yarn and knit fabrics)	Started 100 percent EOU (spinning)	Itochu Corp. (Japan)	Equity
	Increase capacity from 100,000 to 158,260 spindles; yarn processing capacity from 2 to 10 tons per day and knit fabrics from 3 to 20 tons per day	Italian firm	Technical
	Looking into joint ventures with overseas firms to process knitted fabrics (10 tons per day) and produce garments for export markets	Exploring	Joint venture
9. Ginni Filaments Ltd. (Yarn and fabrics)	Plan to invest $71 million on a new plant with 80,000 ring spindles and 30 knitting machines	None	Expansion
	Plan downstream integration into processing, dyeing, finishing, and garment making	Exploring	Joint venture
10. LNJ Bhilwara Group (Diversified)	Vertiacally integrated denim production with an investment of $100 million in 1996; capacity to produce 12 million meters initially, doubling in the second phase.	Swift Textiles (USA) Div. of Dominion Textiles	Joint venture
	An $8 million project in 1995 to manufacture automobile fabrics with an annual capacity of 1.8 million meters; 40 percent for exports	Melba Industries (Australia)	50/50 joint venture
	100 percent EOU producing cotton knitwear	Devanlay (France)	Technical

Table A--*Continued*
Major expansion/modernization activity in India's textile and apparel industry during the 1990s

11. Mafatlal Textiles (Fully integrated composite mill)	Denim production expected to begin in 1997; 12 million meters per year initially	Burlington Industries (USA)	Technical with 50 percent buyback
	100 percent EO apparel unit began in 1994; shirts, casual wear, sleepwear for men	Gruppo La Perla (Italy)	Joint venture with 25 percent equity option
	Sunanda Industries (sub) with a capacity of 6 million pieces of knitwear per year, operation started in 1996	Schiesser (Germany)	Joint venture with 50 percent buyback
12. Modern Group (Diversified)	Plan a 26,850 ton per year polyester staple fiber plant	Zimmer AG (Germany)	Technical
-Modern Denim	Dyeing facilities	Atlantic Mills (Europe)	Joint venture
-Modern Syntex	Fully integrated project producing 52,500 tons per year of POY, PFY, and polyester chips	None	Expansion
-Modern Thread	$33 million investment on modernization & new unit for additional 250,000 spindles	None	Expansion
	New 100 percent EOU with a capacity of 6,740. Spindles for spinning polyester/viscose grey yarn of premium quality	None	Expansion
13. Ashima Syntex (Manmade fiber)	Expanding capacity from 10.2 to 26.5 million meters per year	None	Expansion
14. KG Denim (Fabrics)	Doubling capacity to 21 million meters per year by 1997	None	Expansion
15. Sanghi Polyesters Ltd. (Manmade fiber)	$70 million modernization and expansion plans		
	Modernization of PFY unit	None	Import machinery
	250,000 tons per year of PTA manufacture	Technimount (Italy)	Technical
		Kohap (S. Korea)	Technical
16. Nova Petro Chemicals (Manmade fiber)	Invest $18 million to manufacture PFY (partially oriented) at a capacity of 11,977 tons per year	None	Machinery from Germany
17. S. Kumar Synfabs Ltd. (Home furnishings & suit fabrics)	Invest $101 million to manufacture house linen	Erbele & Textine Myster Hoff (Germany)	Joint venture
	Manufacture & market worsted suitings	Reid & Taylor (Scotland)	Joint venture
18. Bombay Dyeing Ltd. (Composite & fully integrated)	Increase dimethyl terephthalate (DMT) capacity from 112,000 to 160,000 tons per year	None	Expansion
	Paraxylene unit as a main feedback for DMT	None	Expansion
	Towel producing plant by 1998	Not known	Expansion

Table A--*Continued*
Major expansion/modernization activity in India's textile and apparel industry during the 1990s

19. Rajastan Petro Synthetics (Diversified)	Started production of polyester filament yarn with a capacity of 3,550 tons per year	NOY Val Lesina (Italy)	Joint venture
20. BSL Ltd. (Textiles)	Plan to set up a unit producing premium quality suitings at an investment of $13 million	None	Looms from Switzerland
21. Garware Polyester (Diversified)	20,000 tons per year capacity DMT plant at $13 million	None	Expansion
22. Banswara Syntex (Composite)	Modernize spinning and weaving at $11 million		
	Install 9,120 spindles and 48 Sulzer Ruti airjet projectile looms	None	Expansion
	Upgrade processing, finishing & marketing	Altex Ltd. (U.K)	Technical and marketing
23. National Rayon Corp. (Manmade fiber)	Expanding viscose filament yarn (VFY) capacity from 1,000 to 1,200 tons per month with additional bleaching capacities, conveyor systems, and spinning and conditioning units	None	Expansion
24. GSL (India) Ltd. (Threads)	Set up a sewing thread plant	Threads U.S.A. (USA)	Technical and marketing
25. Indian Rayon (Manmade fiber)	Expand VFY capacity from 13,000 tons to 13,500 tons per year at a cost of $12 million	None	Expansion
26. Alok Textiles (Cotton & manmade fiber textiles)	Expansion and diversification to cater to export sector with an investment of $43 million	None	Expansion and diversification
	Start a modern plant to process 20 million meters of woven fabrics and 2,688 tons of knit fabrics per year	None	Expansion and diversification
27. Sharda Textile Mills (Manmade fiber)	Start a spinning unit of 25,000 spindles to draw yarn of polyester viscose and polyester cotton blends	None	Expansion
28. Birla Group Dormeuil Birla VXL Ltd. (Diversified and fully integrated, woolen textiles)	Started manufacturing suit fabrics for India and Nepal	Dormeuil Freres(France)	51percent French equity; design, technical and manufacturing
	Expand spindle capacity by 12,000 and fabric capacity from 4 to 7 million meters per year at an investment of $80 million Second phase has a production target of 20 million meters per year by 1998	None	Expansion
	Increase trouser production from 1,000 to 3,000 per day	None	Expansion

Table A–*Continued*
Major expansion/modernization activity in India's textile and apparel industry during the 1990s

29. Gokuldas Images (Diversified, apparel)	Manufacture Levi Strauss jeans for Levi Strauss, India	Levi Strauss & Co. (USA)	Contracting
	Blazers & men's suits 25,000 units per year	Steilmann (Germany)	Joint venture
	Lingerie	Sara Lee (USA)	Joint venture
30. Hanil Era Textiles (Yarn, cotton & manmade fiber)	100 percent EOU producing quality yarns, both cotton, manmade fibers, and blended. Plan to increase capacity by 100,000 spindles.	Hanil Synthetic Fiber (S. Korea)	Technical and financial
31. Oswal Knit India (Woolen knitwear)	100 percent cashmere knitwear with cashmere imported from Pringle of U.K.	Pringle of Scotland (UK) Subsidiary of Dawson Int'l	Licensing and technology transfer
32. Niryat Sam Apparels (Apparel)	Investment of about $6 million to produce 92,000 woolen suits per shift per year starting in 1996. Plan to double the production by 1997-98 with an additional investment of about $2 million.	Samsung Corporation (S. Korea)	Technical 75 percent export obligation
33. Samtex Fashions (Apparel)	Started producing in 1994 in export processing zone. Daily production capacity of 1,000 trousers, 500 jackets, and 200 shorts. Plan to set up a new facility in EPZ to increase overall capacity to 1,700 trousers, 700 jackets and 400 shorts per day	Samsung Corporation (S. Korea)	Technical 75 percent export obligation
34. KB+T (Apparel)	Established in 1993; men's suits, separates and trousers in wool,wool blends and super wool fabrics. Has an installed capacity of 255,000 suits and 150,000 pairs of trousers per year	Marzotto (Italy)	Technical and financial
35. Filaments India Ltd. (Manmade textiles)	Commissioned state-of-the-art equipment from U.K. to manufacture high quality poly-propylene, fully drawn yarn in a single process	None	Expansion
36. ATL Group (Cotton textiles)	5 tons per day dyeing, printing, and processing knitted fabrics	None	Expansion
	Expansion of current 42,000 spindle capacity	None	Expansion
	A 6.6 tons per day cotton yarn processing plant	Unknown (Italy)	Joint venture
	Increase capacity of knitting unit from 30 to 300 tons per month	None	Expansion
37. Coats Viyella, India (Diversified,textiles and apparel)	Plan producing premium shirting and tire cords with a capital expenditure of about $30 million	None	Expansion

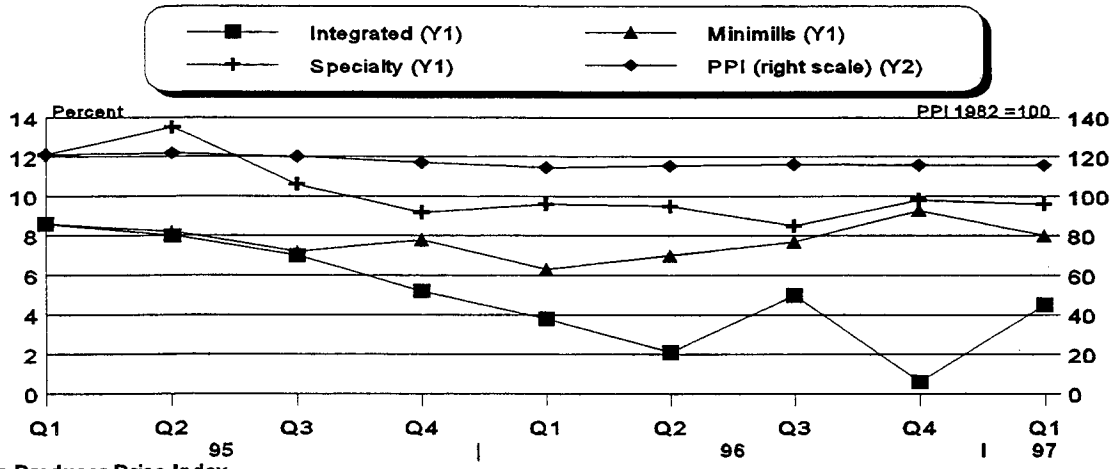
Source: Compiled principally from articles in *Textile Outlook International*,authored by Dr. Sri Ram Khanna of International Business Consultants, New Delhi, India, and published by Textile Intelligence in association with Economist Intelligent Unit, U.K.; *Indian Synthetic and Rayon*, published by The Synthetic & Rayon Textiles Export Promotion Council, Bombay, India; and other articles from textile magazines around the world.■

Appendix A
Key Performance Indicators of Selected Industries

- **STEEL** (Tracy Quilter, 202-205-3437/tquilter@usitc.gov)
- **AUTOMOBILES** (Laura A. Polly, 202-205-3408/Polly@usitc.gov)
- **ALUMINUM** (Karl S. Tsuji, 202-205-3434/tsuji@usitc.gov)
- **SERVICES** (Christopher Melly, 202-205-3461/melly@usitc.gov)

STEEL

Figure A-1
Steel industry: Profitability by strategic group[1]



PPI = Producer Price Index
[1]Operating profit as a percent of sales
Source: Individual company financial statements and U.S. Bureau of Labor Statistics.

- Although the Producer Price Index was essentially unchanged this period, all segments of the steel industry announced price increases during the first quarter of 1997. LTV Corp. led integrated steelmakers by announcing increased prices in May 1997 on hot-rolled, cold-rolled, and galvanized sheet products. Specialty steel producers also introduced a price increase in March on flat products, while some minimills are set to raise prices later this year on reinforcing bar and structurals.
- Net sales of the integrated steelmakers for the first quarter were down 1 percent from the previous quarter; however, operating income recovered in the first quarter 1997 from the events of 1996, such as the blast furnace breakout at U.S. Steel Group and restructuring costs incurred by Bethlehem Steel, resulting in an improved profitability ratio of 4.5 percent. AK Steel led the industry in profitability, followed by US Steel Group. Weirton Steel Corp. experienced continued losses due to an unplanned outage at its hot strip mill and rebuilding and startup costs associated with its No. 1 blast furnace. The strike at WHX's Wheeling-Pittsburgh facility continued to affect the sector's financial results.
- The profitability of minimills and specialty steel producers slipped slightly in the first quarter of 1997, in part due to start-up and pre-opening expenses at Birmingham Steel and profit sharing cost increases at Nucor Corp.

Table A-1
Steel mill products, all grades

Item	March 1997	Percentage change, Mar. 1997 from Dec. 1996	Jan.-Mar. 1997	Percentage change, 1st Q 1997 from 1st Q 1996
Producer's shipments (*1,000 short tons*)	8,529	2.0	25,250	1.5
Imports (*1,000 short tons*)	2,480	-5.5	8,036	42.8
Exports (*1,000 short tons*)	488	20.9	1,391	-6.6
Apparent supply (*1,000 short tons*)	10,521	-0.7	31,895	10.0
Ratio of import to apparent supply (*percent*)	23.6	[2]-1.4	25.1	[2]5.1

[1]Based on unrounded numbers.
[2]Percentage point change.
Note.-Because of rounding, figures may not add to the totals shown.
Source: American Iron and Steel Institute.

STEEL--*Continued*

Table A-2
Steel service centers

Item	March 1997	Percentage change, Mar. 1997 from Dec. 1996[1]	1st Quarter 1997	1st Quarter 1996
Shipments *(1,000 net tons)*	2,347	7.8	7,090	6,535
Ending inventories *(1,000 net tons)*	7,068	1.5	7,068	6,168
Inventories on hand *(months)*	2.9	-14.7	2.9	2.7

[1]Based on unrounded numbers.

Note.-Becuase of rounding, figures may not add to the totals shown.

Source: Steel Service Center Institute.

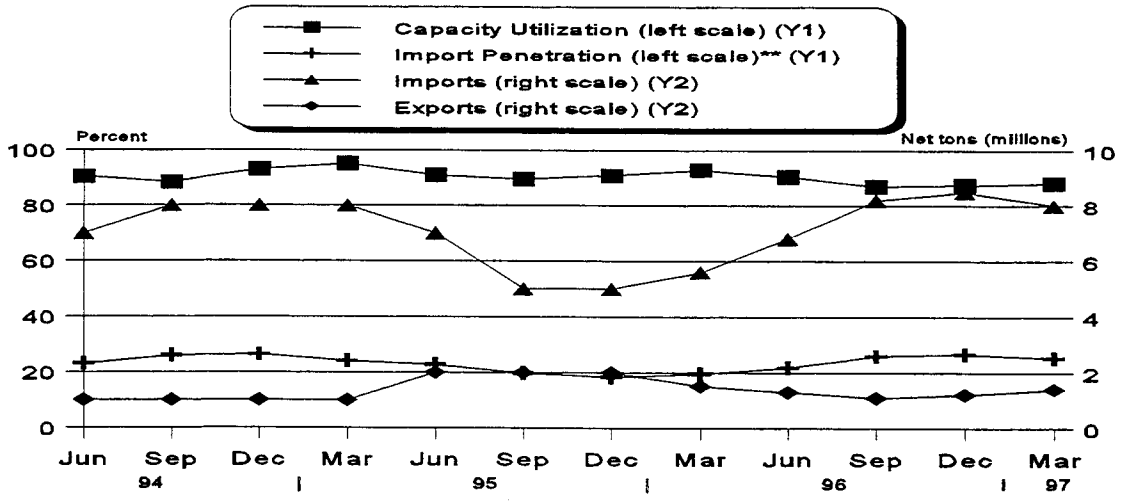
- Steel service center shipments increased 8.5 percent, and inventories for the three months ended March 1997 were 7.1 million tons. The Steel Service Center Institute cites the increase in the shipping rate to explain the drop to 2.9 months inventories on hand from December 1996 to March 1997.[1] Current trends in the steel service center industry include consolidation, supply-chain management, and an increase in value-added services, such as heat treating and fabricating.

- First quarter imports of steel mill products increased compared to the same period in 1996, while exports decreased, largely due to the strength of U.S. demand for such products. However, overall import penetration decreased slightly to 25.1 percent from its peak of 26.5 percent at the end of 1996. Total year-to-date U.S. producer's shipments increased 1.9 percent to 25.2 million tons.

- During 1996, and continuing in 1997, steelmakers increased capacity in long and flat products by investing in greenfield projects and modernizing equipment. Despite U.S. flat rolled capacity rising a reported 8.6 million tons between the third quarter 1996 and the first quarter 1997, capacity utilization increased slightly in the first quarter, reflecting strong demand.

[1] Steel Service Center Institute Business Conditions Report, Apr. 1997.

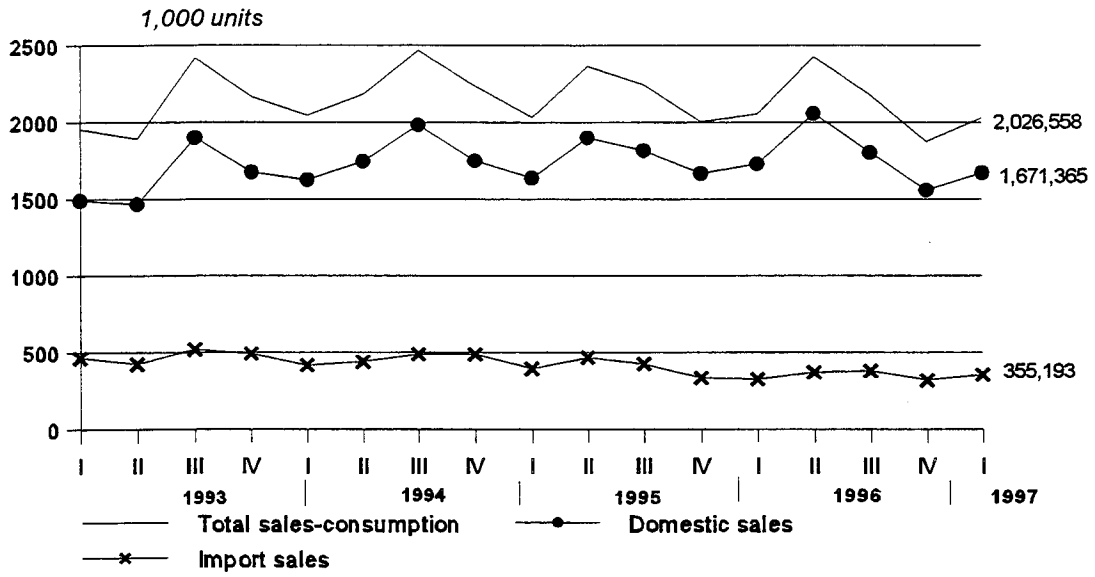
Figure A-2
Steel mill products, all grades: Selected industry conditions



**Import share of apparent open market supply.
Source: American Iron and Steel Institute.

AUTOMOBILES

Figure A-3
U.S. sales of new passenger automobiles, by quarter



Note.--Domestic sales include all automobiles assembled in Canada and imported into the United States under the United States-Canadian automobile agreement; these same units are not included in import sales.

Source: *Automotive News*; prepared by staff of the U.S. International Trade Commission.

Table A-3
U.S. sales of new automobiles, domestic and imported, and share of U.S. market accounted for by sales of total imports and Japanese imports, by specified periods, Jan. 1996-Mar. 1997

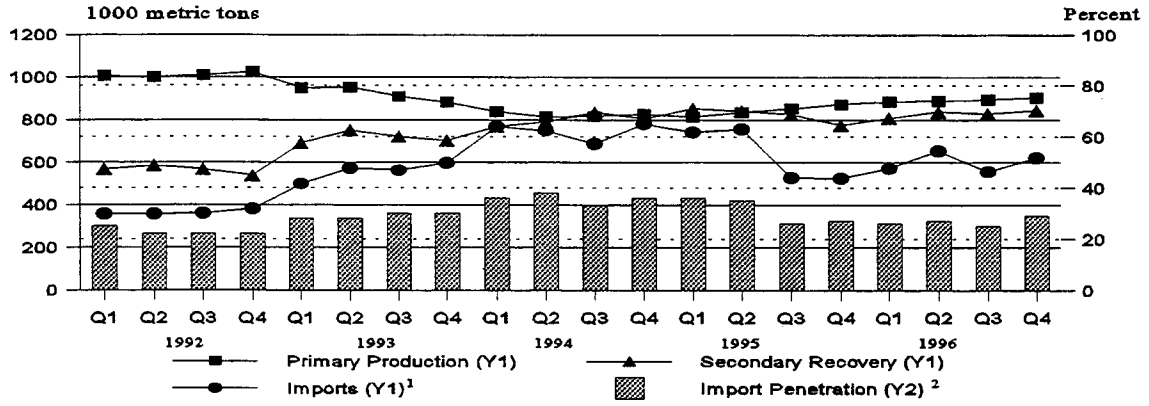
Item	Jan.-Mar. 1997	Percentage change-- Jan.-Mar. 1997 from Oct.-Dec.1996	Jan.-Mar. 1997 from Jan.-Mar. 1996
U.S. sales of domestic autos (*1,000 units*)[1]	1,671	-18.7	-3.2
U.S. sales of imported autos (*1,000 units*)[2]	355	-3.7	9.5
Total U.S. sales (*1,000 units*)[1, 2]	2,027	-16.5	-1.2
Ratio of U.S. sales of imported autos to total U.S. sales (*percent*)[1, 2]	17.5	15.2	10.8
U.S. sales of Japanese imports as a share of the total U.S. market (*percent*)[1, 2]	13.3	69.0	4.5

[1] Domestic automobile sales include U.S.-, Canadian-, and Mexican-built automobiles sold in the United States.
[2] Does not include automobiles imported from Canada and Mexico.

Source: Compiled from data obtained from *Automotive News*.

ALUMINUM

Figure A-4
Aluminum: Selected U.S. industry conditions

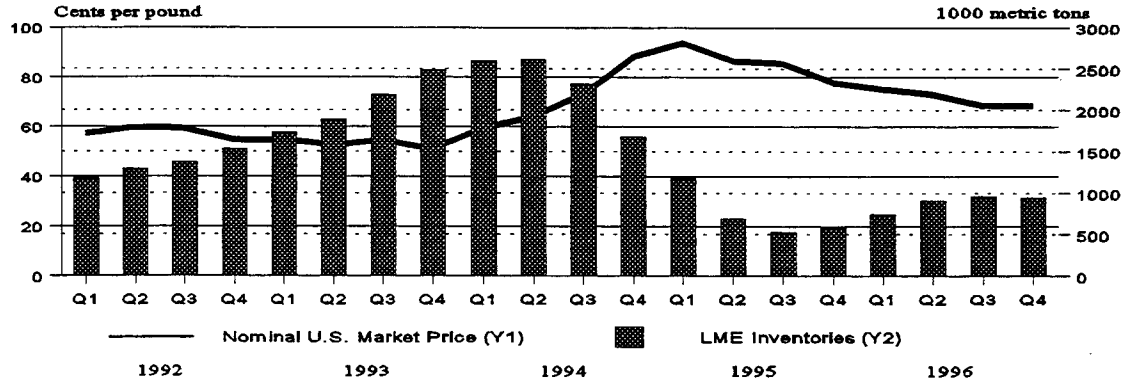


[1]Crude (metals and alloys) and primary (e.g. plates, sheets, and bars) forms for consumption.
[2]Percent share of imports to apparent domestic supply.

Source: U.S. Geological Survey.

- During the fourth quarter 1996, the global aluminum market recovered from conditions of slack demand, rising production levels, and warehousing of surplus metal that characterized the industry for nearly two years. A tighter supply-demand balance is attributable to stronger growth in orders world wide after extensive periods of drawing down previously overstocked consumer inventories. At the same time, primary production operating rates approached 94 percent, as previously idled capacity was not restarted. As a result, aluminum holdings of the LME declined slightly, dropping 16,000 metric tons to 946,000 metric tons, two percent below the previous quarter's level. Likewise, the average U.S. price for primary ingot also firmed slightly from 68.5 to 68.6 cents per pound, reversing a falling trend over the past year and a half.
- The U.S. aluminum market reflects a shift from oversupply conditions as growth in consumption outpaced growth in supplies during the fourth quarter 1996. Although U.S. primary and secondary production were up slightly over the previous quarter's levels to a combined output of 1.7 million metric tons, downstream demand for new metal surged as the drawdown of overstocked industry inventories over the past year and a half finally ran its course. To help fill the supply-demand gap, aluminum imports rose 65,000 metric tons (12 percent) to 622,000 metric tons. Under these conditions, import penetration increased two percentage points to 29 percent.

Figure A-5
Aluminum: Price and inventory levels

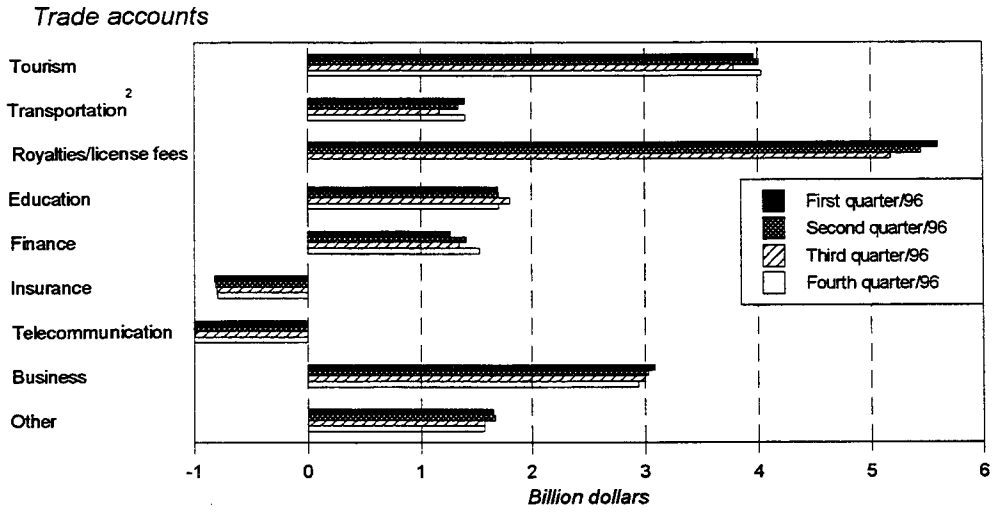


[1]Quarterly average of the monthly U.S. market price of primary aluminum ingots.
[2]End of quarter inventories.

Sources: U.S. Geological Survey, World Bureau of Metal Statistics, Metals Week, and U.S. Bureau of Economic

SERVICES

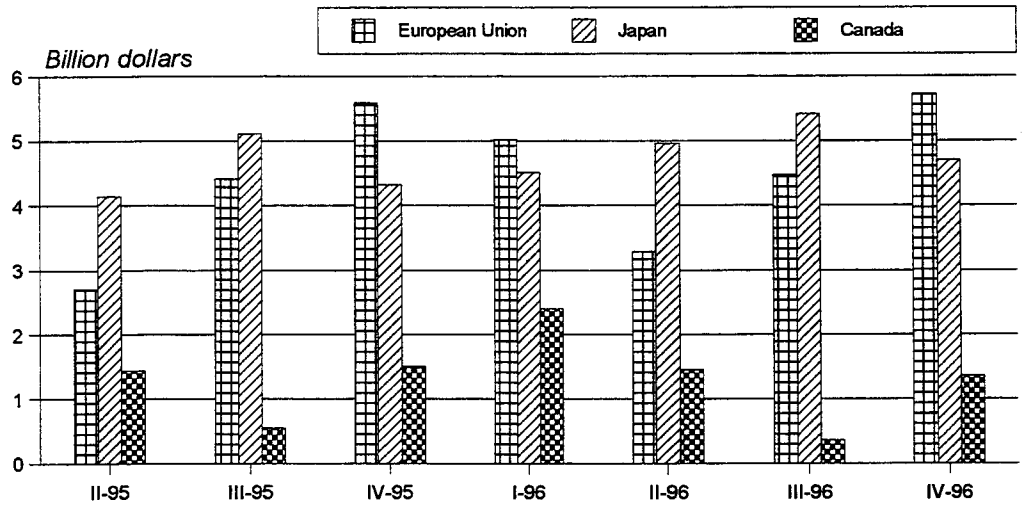
Figure A-6
Balance on U.S. service trade accounts, fourth quarter 1995 through fourth quarter 1996[1]



[1] Figures reflect trade among unaffiliated firms only.
[2] Includes port fees.

Source: Bureau of Economic Analysis, *Survey of Current Business*, Apr. 199 7, table 3, p. 48.

Figure A-7
Surpluses on cross-border U.S. service transactions with selected trading partners, by quarter, 1995-96[1]



[1] Figures reflect private-sector transactions only; military shipments and other public-sector transactions have been excluded.

Source: Bureau of Economic Analysis, *Survey of Current Business.*, table 10, Apr. 1997, pp. 57-59.