IRON AND STEEL

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During 1998, the United States continued its remarkable economic growth and prosperity. Since World War II, the U.S. economy had enjoyed only one longer period of expansion— from February 1961 to December 1969 (Garino, 1998). The end of the first quarter of 1991 marked the beginning of the current 93-month period of economic growth, during which U.S. industry, including the steel and steel scrap recycling sectors, has successfully met the challenges of domestic demand and global competition.

The Asian financial crisis of 1997, which continued throughout 1998, was characterized by currency devaluations, followed by stock market declines, plunging consumer demand, bankruptcies, and joblessness. Japan, whose economy accounts for about two-thirds of Asia's economy and is the world's second largest economy, fell into deep recession, from which it had not recovered by yearend 1998. At first, only Asian countries were affected—China, Hong Kong, Indonesia, Japan, the Republic of Korea, Malaysia, Singapore, Taiwan, and Thailand. Real gross domestic product fell by about 2% in 1998, the first downturn for that region since 1974 (Carter, 1999). Eventually, the economies of Russia and South America were affected. With the exception of U.S. foreign trade, and especially the steel industry, the U.S. economy as a whole appeared to be strong enough at yearend 1998 to resist the spread of financial turmoil.

The Asian economic problems adversely affected steel markets throughout the world. The rapid decline in currency exchange rates in Asia led to declining Asian demand for steel and ferrous scrap, excess steel-producing capacity, unusually low steel prices, and major export activity from Asia to the industrialized nations of the world, including the United States, where low-priced steel was welcomed by consumers. U.S. steelmakers were forced to compete with imports priced below $220 per metric ton for rebar and as low as $176 per ton for mesh-quality rod (Barrett, 1999). Cold-rolled steel available to large-volume buyers was priced as low as $397 per ton. The price of an eight-carbon-product composite fell from a high of $478 per ton in May to $385 in November (Carter, 1999). Domestic mills eventually reduced steel production and scrap consumption, which led to an oversupply of scrap and a plunge of almost 50% in scrap prices during the year to the lowest levels in many decades. The combined fourth-quarter operating income of 11 integrated producers of carbon flat-rolled steel fell by 79% compared with that of the prior year. Much of that decline was attributed to steel imports (Robertson, 1999).

Data regarding U.S. production of iron and steel and shipments of steel mill products were reported by the American Iron and Steel Institute (AISI). These data can be regarded as representing 100% of the raw steel producers in the United States. World production of iron and steel is reported by the International Iron and Steel Institute (IISI) and by foreign government agencies. Consistent with international usage and Federal Government policy, the U.S. Geological Survey reported all data on iron and steel in metric units, unless otherwise noted.

Environment

Steel mills receiving ferrous scrap have been exposed without warning to radioactive materials in measurement gauges used in manufacturing operations or in hospital equipment and radioactive scrap from decommissioned nuclear power and U.S. Department of Energy facilities. When shielded by lead, these radioactive objects can pass through sensitive radiation detection devices prior to being mixed with steel scrap in electric arc furnaces (EAF). The Nuclear Regulatory Commission (NRC) estimated that of the 2 million sources containing radioactive material in use, only 27,000 are specifically licensed (Zagone, 1998). Every year, about 200 radioactive sources and devices containing radioactive materials have entered the scrap supply in an uncontrolled manner, according to the NRC (Kelly, 1997). Since 1983, 40 meltings of this material have been confirmed, 25 of which were in the United States. The economic effects of inadequate radioactive-source control included costs of detection systems, personnel training, disposal of discovered sources, clean-up, and delays in steelmaking operations. Costs of accidental meltings average $10 million each; one minimill was reported to have spent as much as $23 million for decontamination, disposal, and shutdown (Kelly, 1997). In April 1998, the NRC began to develop a new program that would require additional labeling of devices to ensure better identification of radioactivity and tracing back to the responsible party in the event of loss of control. It also began to implement an enforcement program that includes a short amnesty program and increased civil penalties for both general and specific licensees for lost sources.

By signing the Kyoto Protocol in 1998, the United States agreed to reduce its 1990 levels of greenhouse gas emissions, principally carbon dioxide, by 7% between 2008 and 2012. Legislation (S. 2617) was introduced in October that would provide companies who agree to voluntarily reduce greenhouse gas emissions with credit towards meeting possible future regulatory requirements. The steel industry has made significant progress in reducing energy consumption and gas

emissions by investing in energy-efficient EAF steel production.

In July 1997, the U.S. Environmental Protection Agency (EPA) revision of the National Ambient Air Quality Standards (NAAQS) for particulate matter (PM), met with resistance by the steel industry. The EPA reduced the standard for airborne PM from 10 microns (PM10) to 2.5 microns (PM2.5) because of epidemiological evidence of a link between increased mortality, hospital admissions, and respiratory illness and ambient particulate levels below the previous standard (U.S. Environmental Protection Agency, 1998, p. 2). According to the EPA, the PM10 standard does not protect against fine particles produced by fossil fuel combustion that lodge deep in the lungs and that research indicates pose the greatest health hazard. The biological mechanism, or mechanisms, by which PM could cause health problems are uncertain. The Steel Manufacturer's Associations (SMA) response continued to be that the new standard could eliminate thousands of high-paying, high-skilled manufacturing jobs in the steel and supporting industries and produce no quantifiable benefits to public health (Steel Manufacturers Association, The Environmental Contribution, Fact Sheet, accessed September 10, 1999, at URL http://www.steelnet.org/sma/environ.html). Imports of steel products to satisfy domestic demand would come from countries having few or no environmental regulations comparable to those of the United States. According to the SMA, the result would be an increase in worldwide environmental degradation. The new standard will not be effective until a national PM monitoring network is established at the time of the next review of the NAAQS, scheduled for 2002.

In August, the EPA received approval from the Office of Management and Budget to begin collecting information to be used in the development of new waste-water-effluent guidelines and standards for the iron and steel industry. It will collect information by surveying more than 800 integrated mills, minimills, cokemaking sites, direct-reduced ironmaking and sintering sites, steel-finishing sites, and hot-forming sites. The April 1, 2002, deadline is dependent on a court ruling requested by the EPA.

The EPA has been encouraging redevelopment of industrial and commercial sites known as "brownfields," which are abandoned, idled, or underused industrial and commercial facilities where expansion or redevelopment has been complicated by real or perceived environmental pollution. Some brownfields were abandoned steel plants, which continued to deteriorate in urban centers. These industrial properties, sometimes thousands of acres in size, cannot be easily sold for redevelopment because of continuing seller liability after environmental cleanup. The EPA gave States considerable flexibility in the approval process for cleanup and redevelopment of abandoned sites. By 1998, 25 States had offered grants or low-interest loans to clean brownfields, and 23 States had given tax breaks or other financial incentives for the purchase of brownfields or for construction (Sissell, 1998).

Although steel mills are not known to systematically discharge mercury into Lake Michigan, three Indiana mills, Bethlehem Steel Corp.'s Burns Harbor Divison, Ispat Inland Inc.'s Indiana Harbor Division, and U.S. Steel Corp.'s Gary Works, signed a voluntary agreement to reduce the use of mercury at their facilities (New Steel, 1998). They agreed to inventory the mercury that is in equipment, materials, and storage and to identify ways that waste streams could accidentally be contaminated.

The U.S. Steel's Clairton Works became the first U.S. steelmaker to complete ISO 14001 certification. ISO 14001 is a voluntary international standard that establishes the requirements for an Environmental Management System (EMS) (Woker, 1998). The objective of the standard is for an organization to establish an EMS that is integrated with the overall business management process and systems so that environmental considerations are a part of all business decisions. Elements of the EMS include environmental policy, planning, implementation and operation, checking and corrective action, and management review. The EMS will continue to improve as communications, employee awareness, environmental performance, and emergency planning and response programs continue to improve.

The 95% reduction of benzene, toluene, and xylene emissions from three Bethlehem Steel coke plants earned the steelmaker inclusion in the EPA's 33/50 Program "Success Stories" (Robertson, 1997). Bethlehem was a participant in EPA's voluntary emission-reduction program of the early 1990's known as 33/50, which called for reducing 17 types of chemical emissions, first by one-third and then by one-half.

Production

Production of raw steel in the United States increased slightly to 98.6 million metric tons from 98.5 million tons in 1997. (See table 1.) AISI estimated raw steel production capability to be 113.6 million tons, up from 110.1 million tons in 1997. Production represented 86.8% of estimated capability, compared with 89.4% in 1997.

Integrated steel producers smelted iron ores to liquid iron in blast furnaces and used basic oxygen furnaces to refine this iron with some scrap to produce raw liquid steel. The basic oxygen process was used to make 54.1 million tons of steel (American Iron and Steel Institute, 1998, p. 74). The use of this process declined slightly to 54.9% of total steel production in 1998 from 56.2% in 1997. The integrated steel industry in the United States consisted of 15 companies operating ironmaking and steelmaking facilities at 23 locations. Several of these companies also operated nonintegrated plants and/or other steelmaking facilities at the same locations.

Minimills and specialty mills are nonintegrated steel producers. Minimills produce a limited product line. These plants always incorporate EAF's to melt low-cost raw materials (usually scrap), continuous casting machines, and a hot-rolling mill that is often closely coupled to the casting operation. Specialty mills include producers of stainless, alloy-electrical, and tool steel; high-temperature alloys; forged ingots; and other low-volume steel products. The nonintegrated sector of the industry, more than 65 companies having more than 90 steelmaking plants, used the EAF steelmaking process to produce 44.5 million tons, an increase of more than 3%

compared with that of 1997, and accounted for 45.1% of total steelmaking (American Iron and Steel Institute, 1998, p. 74).

Raw liquid steel is mostly cast into semifinished products in continuous casting machines. Only 4.5% of U.S. production was cast in ingot form and subsequently rolled into semifinished forms; this represented a decrease of 15% compared with that of 1997. Continuous casting production was 94.2 million tons, or 95.5% of total steel production, compared with 93.3 million tons, or 94.7%, in 1997 (American Iron and Steel Institute, 1998, p. 75.)

Consumption

Steel mill products are produced at a steel mill either by forging or rolling in forms normally delivered for fabrication or use. Some companies purchase semifinished steel mill products from other steel companies and use them to produce finished steel products. To avoid double counting steel mill product shipments under these circumstances, steel mills identify any shipments of steel mill products to other companies that are reporters of steel mill product shipments. The accumulated shipments of all companies less the shipments to other reporting companies are identified as "net" shipments.

The 6-year trend of steadily increasing net shipments of steel products to satisfy domestic demand ended in 1998 (American Iron and Steel Institute, 1998, p. 26). Shipments of steel mill products by U.S. companies decreased by 3.2%, to 92.9 million tons. Export shipments by AISI reporting companies decreased to 5.0 million tons from 5.47 million tons in 1997 (American Iron and Steel Institute, 1998, p. 45). Shipments to domestic customers decreased by 3.2% during 1998 (American Iron and Steel Institute, 1998, p. 30). Shipments to the oil and gas, mining, quarrying, and lumbering industries decreased by 31%, and shipments of construction products increased by 3.8%. Steel service center shipments were unchanged, and appliance shipments increased by 5.7%. Shipments of industrial and agricultural machinery, equipment, and tools increased by 9.1%. Shipments of automotive products to the largest single end-use market increased by 3.8%. Shipments of containers, packaging, and shipping materials decreased by 8%.

Prices

The Bureau of Labor Statistics Producer Price Index for steel mill products was down by 2.2% to 113.8 from 116.4 in 1997 (1982 base=100) (Bureau of Labor Statistics, Producer Price Index–Commodities, accessed September 21, 1999, at URL http://www.146.142.4.24/cgi-bin/surveymost?wp). The index was stable at about 115 during the first half of the year and then declined to a low of 108.7 in December.

Foreign Trade

Exports of steel mill products decreased to 5.0 million tons from 5.5 million tons in 1997 (American Iron and Steel Institute, 1998, p. 46). Canada again received the largest amount of U.S. exported steel, 3.0 million tons, down from 3.3 million tons in 1997. Mexico was again in second place, receiving 1.1 million tons, essentially the same as during 1997. Imports of steel mill products increased by 33% to 37.7 million tons from 28.3 million tons in 1997. Brazil, Canada, the European Union (EU), Japan, the Republic of Korea, Mexico, and Russia were major sources of steel mill product imports.

Despite rising domestic steel mill capacity, imports of steel mill products have increased more than 2.6 times since 1991, and imports of semifinished steel have tripled. Domestic producers have been unable to keep up with demand for semifinished products and finished steel, and an unfavorable currency exchange rate has made foreign steel prices much more competitive. Although U.S. steelmakers have viewed imported finished steel as competing directly with domestic products, imports of semifinished products have not been perceived as rivals. This dichotomy is based on the need for imported semifinished steel to make up for the domestic shortage of hot-metal capacity to satisfy the U.S. market demand for finished steel mill products.

From 1992 through 1994, total imports of semifinished steel, comprising mostly billets, blooms, ingots, and slabs for rolling, trended upward. These were believed to have been imported by U.S. steel companies to supplement steelmaking capacity and by companies that do not produce raw steel. This rising trend ended temporarily in 1995, and imports declined by 35% to 4.7 million tons from the 1994 high of about 7.2 million tons. During 1996, imports resumed their upward trend, increasing to 6.8 million tons, only to decline to 5.7 million tons during 1997 and then to rise to 6.2 million tons in 1998.

Imports of semifinished steel by steel companies must be taken into consideration in evaluating apparent consumption (supply) of steel mill products in the United States and the share of the market represented by imported steel. To avoid double counting, the imported semifinished steel and the products produced from it, the amount of semifinished steel consumed by companies that also produced raw steel must be subtracted from domestic consumption. Between 1993 and 1998, annual imports were estimated to be 2.5 million to 6.1 million tons. Prior to 1993, the annual amount was less than 0.2 million tons. By taking the imported semifinished steel into consideration, the share of the U.S. steel market represented by imported steel was an estimated 35% in 1998 compared with 25% in 1997.

Regarding the reporting of imports and exports, "fabricated steel products" are produced from steel mill products, but do not include products that incorporate steel products with other materials. Examples of fabricated steel products are fabricated structural steel and steel fasteners. "Other iron and steel products" refer to products that are not produced from steel mill products. Examples of other iron and steel products include iron or steel castings and direct reduced iron (DRI).

In 1998, the AISI reported an indirect steel trade surplus of 1.2 million tons, a 9% increase compared with that of 1997. The measurement (comprising imports minus exports of steel-containing products by world areas and steel-consuming markets, expressed in tons of steel) accounts for virtually all products made with steel, such as automobiles, machine tools, and appliances. According to AISI, this surplus, when compared with the 1986 indirect steel-trade deficit of 8.4

million tons, confirmed that U.S. manufacturers continued to be among the world's most competitive producers of high-quality steel-containing goods in 1998.

In August, the United Steelworkers of America and the Made in America Foundation filed a federal lawsuit challenging the constitutionality of the North American Free Trade Agreement (NAFTA). Their position was that NAFTA, which binds Canada, Mexico, and the United States into the economic equivalent of a military alliance, is a treaty negotiated by the executive branch of the Government. Because the treaty did not receive the constitutionally required approval by two-thirds of the Senate, it is unconstitutional.

In September, Acme Metals Co., Riverdale, IL, filed for Chapter 11 bankruptcy protection, a move blamed on these high imports. Also in September, a dozen U.S. minimill and integrated steel producers and the United Steelworkers of America filed antidumping trade cases to combat imports they said were damaging the U.S. steel industry. Petitioners were asking for import duty margins on imports from Brazilian, Japanese, and Russian hot-rolled carbon steel producers (Iron and Steelmaker, 1998). Brazil's immediate response was that Japan and Russia were responsible for 56% of the U.S. imports of hot-rolled steel during the first half of 1998, whereas its hot-rolled steel represented less than 5% (Kepp, 1998). Russian exports of inexpensive pig iron to the United States have caused Brazil, which routinely shipped pig iron to the U.S. market, to shut down blast furnaces during 1998 (Worden, 1998). Opponents of this legal action say that the curtailing of imports would cost U.S. consumers $6 billion, and the Federal Reserve Chairman said that import restrictions would be futile and harmful (New York Times, 1999).

World Review

World production of pig iron totaled about 541 million tons, slightly less than that of 1997. (See table 10.) In Asia, China continued to be the leading producer of pig iron in the world, producing more than 119 million tons, a 3% increase from that of 1997. Japan and the United States followed with 75 million and 48 million tons, respectively. The Republic of Korea's production increased slightly. Russia and Ukraine were the only major pig iron producers in the Commonwealth of Independent States (CIS). Production in Russia decreased by nearly 7% since 1997 and was less than that of 1995. During 1998, production in Ukraine was similar to the average production of the previous 4 years. In North America, the only major producer of pig iron was the United States, where production was nearly 3% less than that of 1997. In South America, the only major pig iron producer was Brazil, producing about 25 million tons. Germany was the top producer in the EU with a slight decrease to about 30 million tons. India increased production by about 5%.

DRI production worldwide was about 37.5 million tons, a slight increase from that of 1997, but a 57% increase compared with that of 1993. (See table 10.) The leading technology was the Midrex process, followed by the HYL I and the HYL III processes. Because of the demand for charge materials and the growth of thin-slab casting, interest in DRI by steel producers continued to increase. Direct reduction of iron ore proved to be a cost-effective way to encourage economic growth in developing countries, especially those with an abundance of natural gas. The leading producer was Mexico, followed by India, Venezuela, and Iran. (See table 10.) World capacity for DRI production was estimated to be more than 40 million tons per year (Midrex Direct Reduction Corporation, 1998). Additional DRI capacity of nearly 14 million tons was under construction in Australia, Egypt, India, Iran, the Republic of Korea, Mexico, Russia, Saudi Arabia, South Africa, Thailand, Trinidad and Tobago, the United States, and Venezuela.

World production of crude steel was about 781 million tons, a nearly 3% decrease from the 802 million tons (revised) produced during 1997. (See table 11.) As in previous years, production varied widely among major regions of the world. Asian countries produced about 38% of the world's steel; the EU, 21%; and North America, 17%. During 1998, China was again the world's leading steel producer, reaching 114 million tons, a gain of 5% compared with that of 1997. The leading producers behind China were the United States, Japan, Germany, and Russia. These five countries accounted for about one-half of world production. The combined steel production of the eight steel-producing countries in the CIS was about 74 million tons, a decrease of nearly 9% compared with that of 1997. Russia and Ukraine remained the top producers. Production in Russia continued a 4-year downward trend and Ukrainian production remained above its 1995 low.

Outlook

The IISI forecast declining world steel consumption of about 2.7% during 1999 from that of 1998 (Burgert, 1999). Apparent consumption in the United States will fall about 7%. The IISI also forecast declining apparent consumption in Brazil of 3%; China, 6.2%, the EU, 4.3%, and Japan, 2.1%. Consumption will increase in the Republic of Korea by 12% and in Turkey by 7%. The Organization for Economic Cooperation and Development (OECD), however, forecast slight increases in apparent steel consumption in Brazil, Europe, Japan, and Mexico for 1999 (Steel Times International, 1999). It also forecast a continuing average annual steel capacity growth of more than 6% through 1999 in non-OECD countries, including those in Central Europe, the CIS, Eastern Europe, the Middle East, and Southeast Asia. In the United States, exports, imports, prices, and shipments are expected to decline during 1999 (Carter, 1999).

As oversupply dominates the global market, the downward pressure on prices will continue and steel production and ferrous scrap demand throughout the world will decline during 1999 (Fish, 1999). A survey of the period from 1997 to 2000 by the United Nations Economic Commission for Europe revealed that the Asian financial crisis will benefit the world steel industry. As a result of postponement or cancellation of major steel projects, capacity increases during these years will be 56 million tons, about 37% less than had been forecast for the period from 1996 to 1999 (Steel Times International, 1998).

According to Forster (1999), EAF will be the primary steel production method in the United States by 2000 and in the

world by 2010 because inefficient integrated mills will be closed in favor of minimills that are more energy efficient and pollution free and will cost less to build and operate. The integrated mills and minimills that survive will have done so because their managers adopted thin-slab casting and hot rolling to reduce operating costs (Berry, 1998; Busse, 1998). These managers will also have improved the quality of the thin-slab-casting process and learned to produce steels as wide as 2,000 millimeters for a full product mix. The key to sustainability of the blast furnace will be an environmentally acceptable cokemaking technology.

The technology to produce low-cost iron units for use in an EAF, such as the ability to produce liquid pig iron from low-cost iron ore fines and steam coal, is expected to improve (Busse, 1998). Ferrous scrap will be available in the long term in sufficient quantities worldwide at prices that will be controlled by increasing quantities of scrap generated in developing countries, availability of merchant hot briquetted iron (HBI), on-site production of DRI, and the improved ability to blend HBI and pig iron with scrap in such a way that more low-quality scrap can be used (Katrak and others, 1999).

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[1]Prior to January 1996, published by the U.S. Bureau of Mines.

TABLE 1
SALIENT IRON AND STEEL STATISTICS 1/

(Thousand metric tons)

	1994	1995	1996	1997	1998
United States:					
Pig iron:					
Production 2/	49,400	50,900	49,400	49,600	48,200
Exports 3/	56	56	60	86	87
Imports for consumption 3/	2,440 r/	2,360	2,660	3,150	5,140
Direct-reduced iron:					
Production 4/	480	460	450	510	1,740
Exports 3/	18	5	3	8	5
Imports for consumption 3/	1,170	1,190	1,050	987 r/	939
Raw steel production: 5/					
Carbon steel	81,200	84,000	84,900	87,000	88,000
Stainless steel	1,840	2,050	1,870	2,160	2,010
All other alloy steel	8,180	9,080	8,710	9,290	8,600
Total	91,200	95,200	95,500	98,500	98,600
Capability utilization, percent	93.0	93.3	90.7	89.4	86.8
Steel mill products:					
Net shipments 2/	86,200 r/	88,400	91,500	96,000	92,900
Exports 5/	3,470	6,420	4,560	5,470	5,010
Imports 5/	27,300	22,100	26,500	28,300	37,700
Producer price index for steel mill products (1982=100.0) 6/	113.4	120.1	115.6	116.4	113.8
World production: 7/					
Pig iron	516,000	533,000	527,000 r/	551,000	541,000 e/
Direct-reduced iron 4/	27,700	31,100	32,700	35,800 r/	37,500 e/
Raw steel	730,000	758,000 r/	756,000 r/	802,000 r/	781,000 e/

e/ Estimated. r/ Revised.

1/ Data are rounded to three significant digits, except prices; may not add to totals shown.

2/ Data from American Iron and Steel Institute (AISI).

3/ Data from Bureau of the Census.

4/ Data from Midrex Direct Reduction Corp.

5/ Raw steel is defined by AISI as steel in the first solid state after melting, suitable for rolling.

6/ Data from Bureau of Labor Statistics.

7/ Data from U.S. Geological Survey and International Iron and Steel Institute.

TABLE 2
MATERIALS CONSUMED IN BLAST FURNACES AND PIG IRON PRODUCED 1/

(Thousand metric tons)

Material	1997	1998
Iron oxides: 2/		
Ores	1,540	785
Pellets	64,400	62,800
Sinter 3/	11,300	10,600
Total	77,200	74,300
Scrap 4/	1,720	1,500
Coke 2/	22,100	19,800
Pig iron produced	49,600	48,200

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ American Iron and Steel Institute.

3/ Includes sintered ore and pellet fines, dust, mill scale, and other revert iron-bearing materials; also some nodules.

4/ Mainly briquetted turnings and borings, shredded scrap, etc.; scrap produced at blast furnaces and remelt not included.

TABLE 3
DISTRIBUTION OF SHIPMENTS OF STEEL MILL PRODUCTS, BY STEEL TYPE, PRODUCT, AND MARKET 1/

	Thousand metric tons		Percent	
	1997	1998	1997	1998
Shipments by steel type:				
Carbon steel	88,400	85,700	92.1	92.3
Alloy steel	5,700	5,300	5.9	5.7
Stainless steel	1,880	1,850	2.0	2.0
Total	96,000	92,900	100.0	100.0
Steel mill products:				
Ingots, blooms, billets and slabs	2,380	1,900	2.47	2.04
Wire rods	4,810	4,650	5.01	5.00
Structural shapes-heavy	5,150	4,780	5.36	5.15
Steel piling	324	291	.34	.31
Plates-cut lengths	4,920	5,060	5.12	5.45
Plates-in coils	3,120	2,980	3.25	3.21
Rails	663	711	.69	0.77
Railroad accessories	131	140	.14	0.15
Bars, hot-rolled	7,400	7,430	7.70	8.00
Bars, light-shaped	2,320	2,250	2.42	2.42
Bars, reinforcing	5,610	5,360	5.85	5.77
Bars, cold finished	1,640	1,610	1.71	1.74
Tool steel	57	46	.06	.05
Pipe and tubing-standard pipe	1,390	1,220	1.45	1.31
Pipe and tubing-oil country goods	1,990	1,210	2.07	1.30
Pipe and tubing-line pipe	1,270	1,260	1.32	1.36
Pipe and tubing-mechanical tubing	1,060	993	1.10	1.07
Pipe and tubing-pressure tubing	35	35	.04	.04
Pipe and tubing-stainless	30	25	.03	.03
Pipe and tubing-structural	128	103	.13	.11
Pipe for piling	44	58	.05	.06
Wire	561	658	.58	.71
Tin mill products-blackplate	296	226	.31	.24
Tin mill products-tinplate	2,480	2,320	2.58	2.49
Tin mill products-tin-free steel	826	737	.86	.79
Tin mill products-tin coated sheets	82	89	.09	.10
Sheets, hot-rolled	16,500	14,300	17.21	15.35
Sheets, cold-rolled	12,100	12,000	12.58	12.87
Sheets, and strip hot dip galvanized	11,300	12,200	11.75	13.16
Sheets, and strip electrogalvanized	3,460	3,400	3.60	3.65
Sheets, and strip other metallic coated	1,860	1,960	1.94	2.01
Sheets, and strip electrical	463	532	.48	.57
Strip, hot rolled	737	811	.77	.78
Strip, cold rolled	915	1,620	.95	1.75
Total	96,000	92,900	100.00	100.00
Shipments by markets:				
Service centers and distributors	25,200	25,200	26.30	27.10
Construction	14,400	13,900	15.00	14.93
Automotive	13,800	14,400	14.40	15.47
Machinery	6,730	1,950	7.01	2.10
Containers	3,780	3,470	3.93	3.74
All others	32,100	34,100	33.40	36.67
Total	96,000	92,900	100.00	100.00

1/ Data are rounded to three significant digits; may not add to totals shown.

Source: American Iron and Steel Institute.

TABLE 4
U.S. IMPORTS AND EXPORTS OF STEEL MILL PRODUCTS, BY COUNTRY 1/

(Thousand metric tons)

Country	1997		1998	
	Imports	Exports	Imports	Exports
Argentina	139	29	147	12
Australia	399	15	863	8
Brazil	2,590	24	2,480	15
Canada	4,330	3,340	4,460	2,990
China	433	14	573	14
European Union	6,790	242	6,540	202
Finland	158	1	188	1
Japan	2,320	13	6,100	11
Korea, Republic of	1,490	21	3,110	12
Mexico	3,000	1,000	2,870	1,080
Russia	3,010	--	4,780	--
South Africa	285	3	589	2
Sweden	218	2	217	2
Taiwan	171	11	446	9
Trinidad and Tobago	(2/)	--	(2/)	--
Turkey	52	--	478	--
Ukraine	63	--	800	--
Venezuela	401	103	462	55
Other	2,420	655	2,550	595
Total	28,300	5,470	37,700	5,010

1/ Data are rounded to three significant digits; may not add to totals shown.
2/ Unable to distinguish country breakdown. Included with "Other."

Source: American Iron and Steel Institute.

TABLE 5
U.S. EXPORTS OF IRON AND STEEL PRODUCTS 1/

(Thousand metric tons)

	1997	1998
Steel mill products:		
Ingots, blooms, billets, slabs	191	212
Wire rods	77	67
Structural shapes-heavy	417	320
Steel piling	19	14
Plates-cut lengths	288	395
Plates-in coils	419	177
Rails-standard	47	51
Rails-other	20	12
Railroad accessories	17	18
Bars, hot-rolled	377	374
Bars, light-shaped	108	89
Bars, concrete reinforcing	163	129

See footnotes at end of table.

TABLE 5--Continued
U.S. EXPORTS OF IRON AND STEEL PRODUCTS 1/

(Thousand metric tons)

	1997	1998
Steel mill products--Continued:		
Bars, cold-finished	97	96
Tool steel	13	10
Pipe and tubing-standard pipe	65	58
Pipe and tubing-oil country goods	267	222
Pipe and tubing-line pipe	446	454
Pipe and tubing-mechanical tubing	16	4
Pipe and tubing-stainless	29	28
Pipe and tubing-nonclassified	291	262
Pipe and tubing-structural	104	78
Pipe for piling	9	9
Wire	124	125
Tin mill products-blackplate	7	12
Tin mill products-tinplate	324	239
Tin mill products-tin-free steel	40	40
Sheets, hot-rolled	335	251
Sheets, cold-rolled	474	456
Sheets, and strip-hot-dip galvanized	129	184
Sheets, and strip-electrogalvanized	168	179
Sheets, and strip-other metallic coated	121	124
Sheets, and strip-electrical	46	71
Strip, hot-rolled	69	74
Strip, cold-rolled	157	170
Total	5,470	5,010
Fabricated steel products:		
Structural shapes-fabricated	261	286
Rails-used	34	33
Railroad products	44	53
Wire rope	15	14
Wire-stranded products	26	38
Wire-other products	13	17
Springs	80	109
Nails and staples	33	33
Fasteners	482	479
Chains and parts	29	26
Grinding balls	29	33
Pipe and tube fittings	36	37
Other 2/	53	51
Total	1,140	1,210
Grand total	6,610	6,220
Cast iron and steel products:		
Cast steel pipe fittings	36 r/	37
Cast iron pipe and fittings	94 r/	73
Cast steel rolls	17	16
Cast grinding balls	30	23
Granules-shot and grit	26	26
Other castings	50	48
Total	253 r/	223

r/ Revised.
1/ Data are rounded to three significant digits; may not add to totals shown.
2/ Includes shapes-cold formed, sashes and frames, fence and sign post, and architectural and ornamental work, and conduit.

Source: American Iron and Steel Institute.

TABLE 6
U.S. IMPORTS OF MAJOR IRON AND STEEL PRODUCTS 1/

(Thousand metric tons)

	1997	1998
Steel mill products:		
Ingots, blooms, billets and slabs	5,770	6,150
Wire rods	2,030	2,150
Structural shapes-heavy	933	2,520
Steel piling	102	197
Plates-cut lengths	1,260	1,930
Plates-in coils	1,410	2,770
Rails and railroad accessories	216	306
Bars, hot-rolled	1,170	1,410
Bars, light-shaped	182	282
Bars, reinforcing	636	1,120
Bars, cold-finished	279	316
Tool steel	119	146
Pipe and tubing-standard pipe	675	829
Pipe and tubing-oil country goods	374	311
Pipe and tubing-line pipe	832	1,140
Pipe and tubing-mechanical tubing	355	443
Pipe and tubing-pressure tubing	35	61
Pipe and tubing-stainless	49	64
Pipe and tubing-nonclassified	12	14
Pipe and tubing-structural	403	454
Pipe for piling	13	21
Wire	594	633
Tin mill products-blackplate	181	159
Tin mill products-tinplate	260	291
Tin mill products-tin-free steel	137	146
Sheets, hot-rolled	4,630	7,750
Sheets, cold-rolled	3,350	3,710
Sheets, and strip-hot-dip galvanized	1,660	1,680
Sheets, and strip-electrogalvanized	180	164
Sheets, and strip-other metallic coated	103	123
Sheets, and strip-electrical	101	113
Strip, hot-rolled	58	87
Strip, cold-rolled	171	184
Total	28,300	37,700
Fabricated steel products:		
Structural shapes-fabricated	314	393
Rails-used	328	308
Railroad products	53	104
Wire rope	98	114
Wire-stranded products	156	147
Springs	319	419
Nails and staples	389	454
Fasteners	801	970
Chains and parts	99	106
Pipe and tube fittings	112	123
Other	263	344
Total	2,930	3,480
Grand total	31,200	41,100
Cast iron and steel products:		
Cast steel pipe fittings	112 r/	123
Cast iron pipe and fittings	34 r/	38
Other products	297	317
Total	443 r/	478

r/ Revised.
1/ Data are rounded to three significant digits; may not add to totals shown.

Source: American Iron and Steel Institute.

TABLE 7
U.S. IMPORTS OF STAINLESS STEEL 1/

(Metric tons)

Product	1997	1998
Semifinished	76,000	162,000
Plate	128,000	121,000
Sheet and strip	365,000	416,000
Bars and shapes	108,000	105,000
Wire and wire rods	93,400	77,700
Pipe and tube	49,000	64,000
Total	819,000	946,000

1/ Data are rounded to three significant digits; may not add to totals shown.

Source: American Iron and Steel Institute.

TABLE 8
U.S. SHIPMENTS OF IRON AND STEEL CASTINGS 1/

(Thousand metric tons)

	1997	1998
Ductile iron castings	3,930	NA
Gray iron castings	5,610	NA
Malleable iron castings	246	NA
Steel castings	1,100	NA
Steel investment castings	86	NA
Total	11,000	NA

NA Not available.
1/ Data are rounded to three significant digits; may not add to totals shown.

Source: Bureau of the Census.

TABLE 9
COAL AND COKE AT COKE PLANTS 1/ 2/

(Thousand metric tons)

	1997	1998
Coal: Consumption	26,700	25,600
Coke: 3/		
Production	20,100	18,200
Exports	755	561
Imports	1,420	3,480
Consumption, apparent	20,700	21,400

1/ Data are rounded to three significant digits.
2/ Includes furnace and merchant coke plants.
3/ Coke production and consumption do not include breeze.

Source: Energy Information Administration, Quarterly Coal Report, DOE/EIA-0121 (98/4Q).

TABLE 10
PIG IRON AND DIRECT-REDUCED IRON: WORLD PRODUCTION, BY COUNTRY 1/ 2/ 3/ 4/

(Thousand metric tons)

Country 5/	1994	1995	1996	1997	1998 e/
Albania e/	10	10	10	10	10
Algeria e/	919 6/	940 6/	800	700	700
Argentina:					
Pig iron	1,410	1,568	1,966	2,066	2,000
Direct-reduced iron	1,269	1,328	1,422	1,501	1,500
Australia	7,466	7,476	7,774	7,884	7,724 6/
Austria	3,362	3,838	3,416	3,965 r/	4,022 6/
Belgium	8,974	9,199	8,628	8,077	8,730 6/
Bosnia and Herzegovina e/	100	100	100	100	100
Brazil:					
Pig iron	25,177	25,090	24,121	25,000 e/	25,000
Direct-reduced iron	220	300	340	320	320
Bulgaria	1,442	1,607	1,513	1,644	1,500
Burma:					
Pig iron	1	1 r/	2 e/	2 e/	2
Direct-reduced iron	10	20	20 e/	40 e/	40
Canada:					
Pig iron	8,106 r/	8,464	8,638	8,670 r/	9,140
Direct-reduced iron	770	1,010	1,420	1,390	1,240 6/
Chile	886	855	850 r/ e/	860 r/ e/	870
China 7/	97,410	105,293	107,225	115,110 r/	118,600 6/
Colombia	245	282	274	322 r/	195
Czech Republic	5,287	5,289	4,898	5,200 e/	NA
Egypt:					
Pig iron e/	1,148 6/	1,062 6/	1,050	1,000	1,000
Direct-reduced iron	774	860	830	1,190	1,200
Finland	2,597	2,242	2,457	2,779 r/	2,914 6/
France	13,293	12,860	12,108	13,424	13,603 6/
Germany:					
Pig iron	29,923	29,828	30,012	30,939	30,215 6/
Direct-reduced iron	280	410	370	380 e/	360
Hungary	1,590	1,515	1,496	1,141	1,200
India:					
Pig iron	17,808	18,626	19,864 r/	20,000 e/	21,000
Direct-reduced iron	3,122	4,280	4,830	5,250 r/	5,500
Indonesia: Direct-reduced iron	1,620	1,860	1,800	1,600	1,400
Iran:					
Pig iron	1,883	1,532	1,867	2,153 r/	2,100
Direct-reduced iron	2,861	3,301	3,778	4,380	4,400
Italy	11,157	11,684	10,347	11,348	10,704 6/
Japan	73,776	74,905	74,597	78,519	74,981 6/
Kazakhstan	2,432	2,528	2,536	3,000 e/	2,594
Korea, North e/	6,600	6,600	6,600	6,600	6,600
Korea, Republic of	21,169	22,344	23,010	22,712	23,092 6/
Libya: Direct-reduced iron	852	970	862	990	1,000
Luxembourg 8/	1,927	1,028	829	437	--
Macedonia e/	20	20	20	20	20
Malaysia: Direct-reduced iron	990	1,090	1,049	1,720 r/	1,700
Mali	--	(9/)	--	-- e/	--
Mexico:					
Pig iron	3,500	4,142	4,229	4,450	4,532 6/
Direct-reduced iron	3,240	3,691	3,794	4,440	5,584 6/
Morocco e/	15	15	15	15	15
Netherlands 8/	5,443	5,647	5,545	5,804	5,561 6/
New Zealand	563	631	650 e/	534 r/	500
Nigeria: Direct-reduced iron	40	20	20 e/	-- e/	--
Norway e/	70	70	70	70	70
Pakistan e/	1,045 6/	1,100	1,500	1,400	1,500
Paraguay	90	103	103	95 r/ e/	100

See footnotes at end of table.

TABLE 10--Continued
PIG IRON AND DIRECT-REDUCED IRON: WORLD PRODUCTION, BY COUNTRY 1/ 2/ 3/ 4/

(Thousand metric tons)

Country 5/	1994	1995	1996	1997	1998 e/
Peru:					
Pig iron e/	150 6/	150	150	150 r/ 6/	150
Direct-reduced iron	20	3	20	20 r/ e/	20
Poland	7,082	7,373	6,581	7,480 r/	7,000
Portugal	415 e/	416	421	431	365 6/
Qatar: Direct-reduced iron	600	630	632	570	706 6/
Romania	3,496	4,203	4,025	4,557	4,000
Russia:					
Pig iron	36,116	39,762	36,061	37,327	34,827 6/
Direct-reduced iron	1,710	1,680	1,500	1,730	1,550 6/
Saudi Arabia: Direct-reduced iron	2,111	2,129	2,296	2,300 r/	2,110 6/
Serbia and Montenegro	17	108	535	907	980
Slovakia	3,330	3,300	3,300 e/	3,072	3,000
South Africa:					
Pig iron	6,982	7,137	6,876	6,192	6,000
Direct-reduced iron	980	950	900	1,090	1,100
Spain	5,447	5,108	4,128	3,926	4,278 6/
Sweden	3,037	3,020	3,255	3,060	3,373 6/
Switzerland e/	110	100	100	100	100
Taiwan	5,941	6,060 e/	6,050 e/	8,870	8,800
Trinidad and Tobago: Direct-reduced iron	947	1,039	954	1,140	1,073 6/
Tunisia	154	152 r/	145 r/	153 r/	118 6/
Turkey	4,604	4,363	5,263 r/	5,567 r/	5,000
Ukraine	21,200	20,000	18,143	20,561	20,840
United Kingdom	11,943	12,238	12,830	13,057	12,574 6/
United States:					
Pig iron	49,400	50,900	49,400	49,600	48,200 6/
Direct-reduced iron	480	460	450	510	1,740 6/
Venezuela: Direct-reduced iron	4,803	5,099	5,380	5,258	4,926 6/
Zimbabwe e/	100	209 6/	210	210 r/	210
Grand total	544,000	564,000	559,000 r/	587,000 r/	578,000
Of which:					
Pig iron	516,000	533,000	527,000 r/	551,000	541,000
Direct-reduced iron	27,700	31,100	32,700	35,800 r/	37,500

e/ Estimated. r/ Revised. NA Not available.

1/ World totals, U.S. data, and estimated data are rounded to three significant digits; may not add to totals shown.

2/ Production is pig iron unless otherwise specified.

3/ Direct-reduced iron is obtained from ore by reduction of oxides to metal without melting.

4/ Table excludes ferroalloy production except where otherwise noted. Table includes data available through August 3, 1999.

5/ In addition to the countries listed, Vietnam has facilities to produce pig iron and may have produced limited quantities during 1994-97, but output is not reported and available information is inadequate to make reliable estimates of output levels.

6/ Reported figure.

7/ Figures reported by State Statistical Bureau that the Chinese Government considers as official statistical data.

8/ Includes blast furnace ferroalloys.

9/ Less than 1/2 unit.

TABLE 11
RAW STEEL: WORLD PRODUCTION, BY COUNTRY 1/ 2/ 3/

(Thousand metric tons)

Country 4/	1994	1995	1996	1997	1998 e/
Albania e/	19	22	20	20	15
Algeria	808	827	620 r/	427	400
Angola e/	9	9	9	9	9
Argentina	3,314	3,581	4,075 r/	4,169 r/	4,150
Australia	8,424	8,447	8,415 r/	8,769	8,798 5/
Austria	4,405	4,537	4,442	5,196	5,298 5/
Azerbaijan	36	12	25	25	24
Bangladesh e/ 6/	34	36	37	36	35
Belarus	880	744	886 e/	1,220	1,299 5/
Belgium	11,319	11,606	10,773	10,738	11,617 5/
Bosnia and Herzegovina e/	100	115	115	115	115
Brazil 7/	25,747	25,076	25,076	25,100	25,100
Bulgaria	2,491	2,728	2,457	2,628 r/	2,500
Burma	17	24	25 e/	25 e/	24
Canada	13,897	14,415	14,735	15,554 r/	15,800 5/
Chile 7/	1,040	1,014	1,178 r/	1,167 r/	1,170
China 8/	92,610	95,360	101,241	108,940 r/	114,350 5/
Colombia	693	714	677	710	700
Croatia	63	45	46	69	70
Cuba	131	207	231	342	284 5/
Czech Republic	7,093	6,746	6,257	6,495	6,500
Denmark	723	654 e/	737	787	824 5/
Dominican Republic	--	--	6	64	36 5/
Ecuador	32	35	35 e/	44 r/	40
Egypt	2,622	2,642	2,618	2,717 r/	2,700
El Salvador	40 e/	10	42 e/	45	46
Finland	3,420	3,180 e/	3,301	3,687 r/	3,947 5/
France	18,028	18,096	17,630	19,773	20,241 5/
Georgia	141	84 e/	85	104	100
Germany	40,847	42,100 e/	39,791	45,005	44,018 5/
Greece	848	939	848	1,016	1,109 5/
Hong Kong e/	350	350	350	350	350
Hungary	1,937	1,865	1,969	1,829	1,900
India	19,285	22,800	23,753	23,748	18,547 5/
Indonesia e/	3,220 5/	3,500	3,400	3,450	3,330
Iran	4,498	4,696	5,420 e/	6,322	6,300
Iraq e/	300	300	300	300	300
Ireland	316	310	340	337	358 5/
Israel	180	200	203 r/	203 r/ e/	203
Italy	26,114	27,766	23,922	25,537	25,530 5/
Japan	98,295	101,640	98,801	104,545	93,548 5/
Jordan e/	-- r/	-- r/	-- r/	-- r/	--
Kazakhstan	2,969	2,963	3,142	3,900	3,120
Kenya e/	20	20	20	20	25
Korea, North e/	8,100	8,100	8,100	8,100	8,000
Korea, Republic of	33,745	36,772	38,903	42,554	39,896 5/
Latvia	332	279	293	465 r/	450
Libya	874	909	863 e/	897	900
Luxembourg	3,092	3,079	2,501	2,580	2,478 5/
Macedonia	85	33 r/	27 r/	30 r/ e/	30
Malaysia	2,046	2,450	3,216	2,962 r/	1,850 5/
Mauritania e/	7	5	5	5	5
Mexico	10,260	12,147	13,172	14,254	14,100 5/
Moldova	633 r/	663 r/	646 r/	810 r/	718 5/
Morocco e/	7	7	5	5	5
Netherlands	6,174	6,409	6,330 e/	6,640	6,379 5/
New Zealand	766	842	680 r/	680 r/	700
Nigeria e/	58	36	20	--	--
Norway	456	503	511	510 e/	500
Pakistan	344	409	416	450 e/	480

See footnotes at end of table.

TABLE 11--Continued
RAW STEEL: WORLD PRODUCTION, BY COUNTRY 1/ 2/ 3/

(Thousand metric tons)

Country 4/	1994	1995	1996	1997	1998 e/
Paraguay	87	95	96 r/	68 r/	56 5/
Peru e/	506 5/	515	510	510	510
Philippines e/	473 5/	923 r/	920 r/	950 r/	950
Poland	11,113	11,890	10,433	11,591	11,500
Portugal	749	829	871	905 r/	854 5/
Qatar	572	614	626	616	625
Romania	5,800	6,555	6,083	6,674	6,500
Russia	48,812	51,300	49,193	48,499 r/	43,822 5/
Saudi Arabia	2,411	2,451	2,683	2,539	2,550
Serbia and Montenegro	137	180	679	979	1,100
Singapore e/	500	500	500	500	500
Slovakia	3,948	3,255	3,200	3,000 e/	3,000
Slovenia	424	450	407 e/	400 e/	400
South Africa	8,525 r/	8,741 r/	7,999 r/	8,311 r/	8,500
Spain	13,574	13,937	12,036	13,644	14,400 5/
Sri Lanka e/	30	30	30	30	30
Sweden	4,952	4,926	4,910	5,147	5,569 5/
Switzerland e/	800	1,000	1,000	1,000	1,000
Syria e/	70	70	70	70	70
Taiwan	11,590	11,605	12,650	15,478 r/	16,900
Thailand	1,391	2,134	2,143	2,430 r/	2,100
Trinidad and Tobago	631	738	695	736	781 5/
Tunisia	184	201	187	195	210 5/
Turkey	12,074	12,745	13,382 e/	13,664 r/	13,000
Uganda e/	10	12	12	15	15
Ukraine	23,798	22,309	22,100	25,600	24,085 5/
United Kingdom	17,286	17,604	18,220	18,528	17,066 5/
United States	91,200	95,200	95,500	98,500	98,600 5/
Uruguay	36	40	34 r/	39 r/	52 5/
Uzbekistan	364	352	444	365 r/	344
Venezuela	3,524	3,568	3,941	4,019	3,700 5/
Vietnam	301 r/	271 r/	311 r/	314 r/	320
Zimbabwe e/	187 5/	210	212	240 r/	250
Total	730,000	758,000 r/	756,000 r/	802,000 r/	781,000

e/ Estimated. r/ Revised.

1/ World totals, U.S. data, and estimated data are rounded to three significant digits; may not add to totals shown.

2/ Steel formed in solid state after melting, suitable for further processing or sale; for some countries, includes material reported as "liquid steel," presumably measured in the molten state prior to cooling in any specific form.

3/ Table includes data available through August 2, 1999.

4/ In addition to the countries listed, Ghana and Mozambique are known to have steelmaking plants, but available information is inadequate to make reliable estimates of output levels.

5/ Reported figure.

6/ Data for year ending June 30 of that stated.

7/ Excludes castings.

8/ Figures reported by State Statistical Bureau that Chinese Government considers as official statistical data.