7

Steel

The U.S. Steel Industry: Obsolescence and Technological Resurgence

The U.S. steel industry would in many ways seem to fit oddly into the themes and examples in this study. But the history of this industry illustrates another important phenomenon: In order to survive and prosper, traditional manufacturing in advanced industrial economies (steel, textiles, chemicals, as examples) must continually move up the technological ladder and ultimately find niches where the combination of new technological processes and a highly skilled labor force provides the means to retain a comparative advantage over less-developed economies. Advances such as computer-assisted design and manufacturing in the textile industry, and electric-arc furnaces and Steckel mill technology in the steel industry, have thus allowed smaller but highly efficient traditional industries to survive in the United States and other advanced economies.

Unfortunately, the highly protectionist use of trade remedy laws has dampened and slowed this healthy adjustment process in the U.S. steel industry. As the accompanying table illustrates, for three decades the American steel industry has been the most prolific user of these protectionist tools (Table 5). Ultimately a failure as a means of saving obsolete segments of the U.S. steel industry, antidumping and countervailing actions have also impeded the emergence of a high-tech U.S. steel minimill industry that can compete in world markets for many steel products.

The U.S. Steel Industry since 1945. In many ways, the U.S. steel industry was a victim of the overwhelming U.S. victory in the Second World War and the quick onset of the Cold War almost immediately thereafter. During World War II, the U.S. government had underwritten the construction of huge new steel capacity (15 million new tons annually) as part of the war mobilization effort. The outbreak of the Korean War and the subsequent Cold War defense effort brought an additional expansion of some

TABLE 5
SHARE OF U.S. STEEL AD/CVD CASES (1973–2002) IN ABSOLUTE NUMBERS

Years	Total AD Cases	AD Cases on Steel Products	Total CVD Cases	CVD Cases on Steel Products
1973–1979	8	2	1	0
1980–1984	9	1	1	0
1985–1989	51	20	9	5
1990–1994	66	33	12	9
1995–1999	54	27	10	7
2000–2002	70	40	18	12
Total	258	123	51	33

Source: Author's calculations.

40 million tons by 1960. These pressures—and opportunities—in a U.S. market as yet unchallenged by foreign operations led to the first of many strategic technological errors. (Sources for the postwar history of the U.S. steel industry described in this study include: Barnett and Schorsch 1983; Hogan 1994; Tiffany 1988; Tornell 1997; Barringer and Pierce 2000.)

In meeting the great new demands of the U.S. defense and civilian markets, U.S. steel makers opted for two pathways: expanding existing but already obsolete open-hearth furnaces (OHF); and attempting to graft the more advanced basic oxygen furnace (BOF) onto old mills, many of which dated back to the nineteenth century. Though much less costly to bring online (roughly 75 percent), the expanded OHF and fused-BOF mills were both technologically inferior and much less efficient than if new mills wholly adapted to the new BOF technology had been constructed. (OHF furnaces use an external source of heat that can take up to six hours to reach maximum heat efficiency; in contrast, BOF furnaces produce this maximum efficiency in forty minutes by injecting oxygen into a holding vessel containing iron, scrap, and lime and allowing the oxygen to interact with the iron to generate the necessary heat.) As late as 1960, outmoded OHF technology accounted for 90 percent of domestic steel's total capacity—and by that time both Europe and Japan had rebuilt their steel industries at "greenfield sites" utilizing the latest steel-making technologies (Hogan 1994).

The decision to add capacity at existing sites in the East and Midwest meant that the plants were remote from Pacific Coast states, where demand exploded after the war—thus increasing the logistical costs of shipping and customer service. Other transportation and logistical advances outside the

United States further undermined U.S. international competitiveness. U.S. steel makers long enjoyed a cost advantage because of their proximity to coal and iron ore deposits, but by the early 1970s the discovery of high-quality iron deposits outside the United States (in Australia and Brazil), combined with the introduction of new ocean-going bulk tankers, drastically reduced this advantage. One study has estimated that between 1958 and 1980, by sourcing low-cost ore and using huge bulk carriers, Japan turned a 28 percent cost disadvantage on steel raw materials into a 30 percent advantage (Barnett and Schorsch 1983).

From the late 1960s through the 1970s, European and Japanese competitors also outdistanced U.S. companies by early adoption of another major technological breakthrough in steel making: continuous casting. Continuous casting represented a big advance over the ingot casting technology that had been utilized since the days of Andrew Carnegie. In ingot casting, raw molten steel is poured into a mold, allowed to cool into an ingot, then transported to a rolling facility where the ingot is reheated and transformed into a slab, which is finally rolled into a finished product. Continuous casting eliminates all of the steps from raw steel to slab by channeling the raw steel directly from a furnace to a casting machine that molds the steel into the slab form, after which it can be shaped into a finished product. As late as 1980, only 20 percent of U.S. facilities used continuous casting, while over 60 percent of Japanese plants had installed the new technology; in 1989, the U.S. figure had risen to 65 percent, but the totals for Japan and the EU were 93 percent and 88 percent, respectively (Tornell 1997; Barringer and Pierce 2000).

Industrial Structure, Capital Markets, and Labor Relations

While technology constituted the exogenous driving force in the postwar history of the steel industry, in each national economy it interacted differentially with other factors, such as industrial structure (conditions of competition), capital markets, labor relations, and last but not least, the role of government. In the immediate postwar United States, eight large integrated steel makers which operated through time-honored oligopolistic tactics dominated the U.S. steel industry. Rather than investing in new technologies and innovative new products, they often sought super-normal profits (rents, in economists' terms) through price collusion (Acs 1984).

Price collusion was directly linked with labor relations. For two decades after 1945, each year Big Steel, in what was dubbed the annual "rites of spring," would agree to sizable wage increases with the United Steelworkers Union and then announce increased steel prices. (From 1947 to 1957, average wage increases were 6.6 percent, and average steel price increases were 7 percent.) In addition, relations between management and labor remained poisonous throughout the period, and five major strikes occurred between 1945 and 1960. Two rules regarding labor relations in the industry contributed to the turmoil and outsized wage increases: one allowed reopening of wage talks at any time during a contract, and the second provided for industry-wide bargaining, resulting in total industry shutdowns at almost any time the workers at one plant decided to strike (Hoerr 1988). This highly disruptive pattern first caused U.S. steel users to look abroad for more stable (and cheaper) suppliers. During the 1960s, steel imports rose from 5 million tons to 18 million tons per year.

In 1973, in response to this outside threat, Big Steel and the labor unions agreed to a "no lockout, no strike" policy that mandated binding arbitration in labor disputes. Though resulting in relative labor peace, this new rule only exacerbated the competitiveness problems of the large, integrated steel companies. The agreement mandated arbitration of wage disputes and also provided for automatic cost-of-living increases for union members. Subsequently, in regard to union demands for wage increases beyond cost-of-living adjustments, arbitrators tended to split the difference, leading to an upward spiral of wages throughout the period. The result was that by 1977 the average wage of steelworkers was over 70 percent higher than the average of all U.S. manufacturing workers—and this figure climbed to 95 percent in the early 1980s (Crandall 1981).

Technological obsolescence and outmoded industrial practices and plants inevitably produced lower profits, a trend that caused capital markets to cast a jaundiced eye at the industry. A vicious cycle ensued in which the low return on investments made it difficult to issue new stock, finance long-term debt, or even retain enough earnings to finance R&D or badly needed investment in new capital stock and equipment. In a desperate attempt to break out of this cycle, during the late 1970s Big Steel launched major—and stunningly misguided—efforts to diversify into other industries (Tornell 1997; Barringer and Pierce 2000). These moves significantly drained what little retained earnings the companies had at their disposal away from plant and equipment upgrading and in the end resulted in a squandering of the money. U.S. Steel led the parade in 1982 when it acquired Marathon Oil for almost $6 billion—just at the time it was lobbying Congress hard for tax breaks to modernize its inefficient steel plants. U.S. Steel went on to invest in a chemical company, a domestic barge line, a dock company, and a gas utility. Other integrated companies also diversified into transportation, insurance, and savings and loan firms. (One telling additional factoid: in 1983, when U.S. Steel lost over $200 million in the first quarter alone, it still allocated over 80 percent of its capital expenditures to upgrading facilities at Marathon.)

Early Import Penetration. The combined effects described above of corporate mismanagement and retrograde technology left the U.S. steel industry ill-equipped to meet the challenge of international competition, when other European and Asian economies recovered in the two decades after 1945. Thus, even before the onslaught of the minimill revolution rocked U.S. steel companies, foreign steel came pouring across the border in increasing quantities. Between 1963 and 1983, imports of foreign steel increased from about 5 percent to 25 percent of total U.S. consumption. Much of this steel was lower-grade semifinished slabs that U.S. steel companies themselves imported because of their own inadequate raw-steel-making capacity *and* because it could be purchased more cheaply than they could make it. Increasingly, however, foreign steel imports competed for markets of more technologically refined steel products (Crandall 1981; Barringer and Pierce 2000).

The Gradual—but Decisive—Minimill Revolution

From their introduction in the late 1960s, minimills—utilizing a new electric arc furnace technology that transformed scrap steel into semifinished and later finished steel products—advanced slowly but steadily as competitors to Big Steel. Then they took off during the 1990s, as major new technological breakthroughs in their production processes allowed them to encroach dramatically on the high-end steel markets that had previously been the preserve of the integrated steel companies (Barnett and Crandall 1986; Tornell 1997). In 2002, minimills produced about 50 percent of all steel products in the United States. Despite the jingoistic, antiforeign rhetoric of Big Steel, minimills—rather than the Japanese, the Europeans, or the Koreans—were the real cause of decline of integrated steel makers.

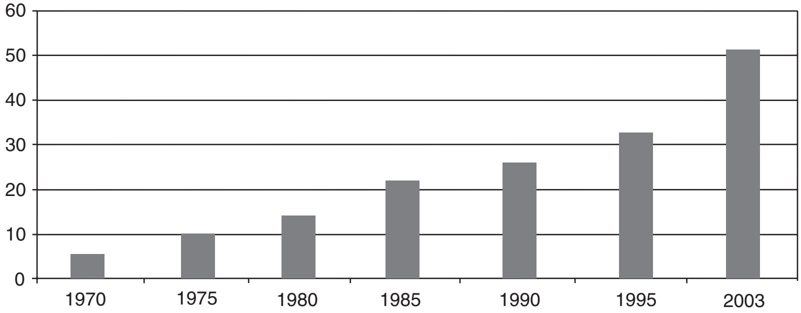
Electric arc furnaces, which utilize scrap steel or scrap substitutes as their feedstock, generate heat through electric charges that leap between electrodes in the furnace lid. One scholar succinctly described the advantages and efficiencies of minimill technology:

> Minimill technology consists of pouring scrap into an electric furnace to produce molten steel. This process bypasses the processes of coking, palletizing and melting pig iron that are used in integrated plants. Since this process does not use blast furnaces of BOFs (which need a minimum plant size of 3 million tons per year), it realizes economies of scale at much lower production levels (less than one million tons per year). This reduces capital costs significantly. The other advantage of minimills is that because they are small, they can be located closer to each of their markets, thus reducing transport costs. (Tornell 1997, 14)

In their earliest form, minimills had a limited capacity of 250,000 to 500,000 tons annually—and technologically they were capable of producing only low-end (so-called long steel) products such as slabs, rods, and bars. The real minimill revolution, however, occurred during the 1990s, beginning in 1989 when Nucor Steel opened the world's first thin-slabbed, flat-rolling plant in Crawfordsville, Indiana. As the name implies, this new technology allowed for continuous casting of much thinner slabs—two inches—as compared with traditional slabs of eight to ten inches. Production of thinner slabs translated into much lower construction costs (from $1000 per ton of annual capacity to $200 per ton) and provided the impetus for minimill operators to compete directly in the flat-rolled market (steel for construction equipment and machine tools). For the first time, minimills could become "maximills" and reach capacities equal to those of Big Steel—up to 4–5 million tons of hot-rolled capacity per year. In addition, the efficiency costs per ton of steel now far outstripped those of traditional Big Steel plants: For 1997, one study estimated that the most efficient thin-slab minimills achieved labor productivity breakthroughs that were four times more efficient than the most efficient integrated mills (Tornell 1997). These numbers set off a wave of new minimill construction during the 1990s. From 1990 to 1998, while integrated mill capacity increased only 3.2 percent, minimill capacity expanded by 50 percent (Figure 2).

To complete the technological story—at least to date—in 1999, yet another breakthrough allowed the minimills to assault the summit of high-end steel making—the plate market. This came with the introduction of so-called Steckel technology, which (as with thin-slab flat-rolling technology for hot-rolled steel) greatly reduces the number of steps needed to produce steel plate from slabs. This enables minimills to transform more raw steel

FIGURE 2
GROWTH OF U.S. MINIMILL INDUSTRY, 1970–2003 (IN PERCENTAGE)



Source: Steel Manufacturers Association 2003a, 2003b.

into a finished product than conventional plants do, and reduces capital construction costs because the minimum scale (1–1.25 tons) is much lower than older plate technologies (Barringer and Pierce 2000).

In summary, minimills currently enjoy at least four advantages over Big Steel: one, lower labor costs due to the utilization of more advanced technology in steel making and the absence of front-end, labor-intensive coking and blast furnace operations; two, lower construction costs and reduced minimum scale of production have allowed minimill owners great flexibility in constructing new plants close to major markets in the Southeast and on the West Coast; three, lower capital costs have also allowed for a continuous, timely introduction of new productivity-enhancing technologies; and finally, newer "greenfield" plants have recruited a younger, more skilled, non-union work force and terminated many of the rigid work rules that impeded productivity advances in older, integrated plants.

The Role of Government: Protect and Subsidize

Ironically, even though the rise of domestic minimills provided the greatest competitive challenge to Big Steel, virtually all political animus was directed at "foreign steel," which, it was alleged from the late 1960s on, engaged in "unfair" competition against U.S. steel companies. Under the prodding of a powerful Steel Caucus in Congress, the federal government alternately (and sometimes simultaneously) protected and subsidized the domestic steel industry.

Government Subsidies. Foreign government subsidies have been repeatedly cited by the U.S. steel industry as a rationale for government aid and costly preferences in procurement. Yet it is rarely acknowledged that for the past thirty years, U.S. steel makers have received a steady stream of taxpayer-funds subsidies. The consulting firm Ernst and Young in 1989 estimated that to date, federal, state, and local government subsidies amounted to over $30 billion (Ernst and Young Consulting 1989). A more recent study, using more conservative assumptions and measurements, has calculated the combined total (through 1999) at over $16 billion (Barringer and Pierce 2000). A detailed accounting of these subsidies is beyond the purview of this study, but a list of the most prominent since the mid-1970s would include the following, in order of their estimated magnitude.

The most expensive cost to U.S. taxpayers has come from special exemptions from federal environmental regulations granted specifically to the steel industry, largely from the Clean Air Acts of 1981 and 1990. The 1981 Clean Air Act originally mandated the installation of new air pollution abatement equipment by December 1982. Through the intervention of the Steel Caucus, Congress granted steel companies a reprieve until December 1985, saving them almost $6 billion. In reaction to stringent proposed regulations against toxins generated by the coke ovens in the 1990 Clean Air Act, the steel companies and the Steel Caucus forced through a thirty-year "stretch out" provision that will save them another $4.5 billion (Barringer and Pierce 2000).

Steel companies (including minimills) have also greatly benefited from various "Buy American" acts. Under the provisions of these acts, foreign steel companies are foreclosed from competing for contracts in a number of highway construction, mass transit, pollution abatement, state and local public works, and airport construction programs. Over the past three decades, it is estimated that such subsidies have cost U.S. taxpayers over $4 billion.

Furthermore, responsibility for funding pension benefits has shifted from a number of steel companies to the federal government—that is, the Pension Benefit Guarantee Corporation, which was established as an insurance program against under- or nonfunded private pension programs. During the 1980s, particularly, a number of integrated steel companies, faced with huge unfounded pension liabilities, filed for bankruptcy and thus offloaded these liabilities to the federal government. The cost to taxpayers and other U.S. businesses through 1999 has been estimated at over $3.5 billion; however, the PBGC has recently announced it would take over the $3 billion liabilities of the bankrupt U.S. Steel Corporation, adding another large tranche of federal subsidies to this account (Sorkin 2003).

Over the past three decades, other notable subsidies to the steel industry include special federal tax exemptions, R&D grants, state and local tax exemptions, and—in 2000—a new federal loan guarantee program. Together, these additional subsidies add up to over $4.5 billion.

Finally, it should be noted that, as the steel companies endlessly proclaim, many foreign governments have also been guilty of wasteful subsidies of doubtful WTO legality. But at the same time, as the above narrative demonstrates, any move to introduce a truly "level playing field" worldwide—*sans* subsidies—would result in a wrenching adjustment for the steel industry in the United States, given its steady diet of government largesse for three decades.

Market Restrictions. In response to the first wave of foreign steel imports during the late 1960s, the steel industry and its allies in Congress forced the Nixon administration to negotiate a series of "voluntary" import restraints against Europe and Japan, after the United States threatened to enact a "surcharge" on steel imports. These restraints ran from 1969 to 1974. (This section of the study is gleaned from the following sources: Barfield 1999; Hufbauer and Goodrich 2001; Lindsey, Griswold, and Lukas 1999; Barringer and Pierce 2000.) Inexorably, however, because of the weak competitiveness of the technologically backward Big Steel companies, steel imports began to climb again under President Carter. Once again, trade restrictions became the first (and futile) line of defense, beginning with the filing of nineteen antidumping suits, followed by the establishment of a so-called trigger price mechanism (1978–1982), under which the federal government set a floor price on imported steel. When the Reagan administration abolished the trigger price scheme, the companies responded with a wave of over 100 antidumping suits, filed a Section 301 (unfair trade practices) suit alleging collusion between European and Japanese steel companies, and to gild the lily also filed a Section 201 escape clause action for emergency protection. The Reagan administration rejected both the Section 301 and the Section 201 requests; instead, it negotiated a series of "voluntary" import quotas on key steel products. These "voluntary" quotas lasted from 1982 to 1992.

For most of the 1990s, steel imports stabilized at about 20 percent of total U.S. production, but strong domestic demand for steel as a result of a booming U.S. economy muted calls for trade restrictions. This situation changed dramatically in 1998, and the years from 1998 to 2002 have been marked by downturn and turmoil in the U.S steel industry, resulting partly from foreign factors and partly from changes in the U.S. economy.

In 1998, the Asian financial crisis hit just as new producers from Russia and the former Soviet states began pushing new steel exports onto world markets. In the late 1990s, Southeast Asia was the largest regional steel market, importing some 75 million tons. All of Asia produced 300 million tons, or about 40 percent of world output. After the onset of the financial crisis, Southeast Asian consumption fell precipitously, and output was diverted to North America and Europe. As a result of political upheaval and cuts in military and civilian demand, producers in eastern Europe and the former Soviet bloc greatly increased exports and diverted those exports from Asia to the United States and Europe. Another factor that added to the pressure on the U.S. steel market was a large decrease in the value of many countries' currencies against the dollar, with declines ranging from 15 percent (Japan) to over 60 percent (Russia and Korea). In 1998 and early 1999, domestic factors in the U.S. market further made life difficult for U.S. companies: to wit, a sustained strike at General Motors sharply cut domestic demand and left domestic mills with significant overcapacity (Barfield 1999). But by the end of 1999, the markets had stabilized, prices rose, and steel imports leveled off at about 20 to 25 percent of total demand.

Then, to bring the story up to date, the dot.com crash and the ensuing downturn in the U.S. economy in 2000–2001 once again increased pressure on the steel industry. Capacity utilization dropped under 80 percent, and between 1998 and June 2003, forty steel companies filed for bankruptcy (Table 6). In addition, a major consolidation occurred in the integrated steel sector: International Steel Group acquired the assets of LTV Steel, Acme Metals, and Bethlehem Steel; U.S. Steel Corporation bought the assets of National Steel; Nucor Steel acquired the assets of Birmingham Steel and Trico Steel; and several producers of long steel merged to form Gerdau Ameristeel (Schneider 2003; USITC 2003a).

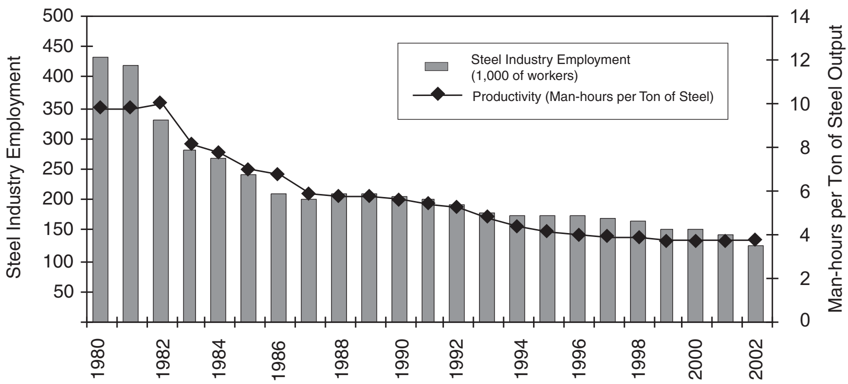
During this period, some 150 steel antidumping orders were in effect, covering almost 80 percent of all steel imports (Hufbauer and Goodrich

TABLE 6
U.S. STEEL INDUSTRY FILINGS FOR CHAPTER 11
BANKRUPTCY PROTECTION, 1998–2003

1998/99	Acme Metals	(9/29/98)
	Laclede Steel	(11/30/98)
	Geneva Steel	(2/1/99)
	Qualitech Steel SBQ	(3/24/99)
	Worldclass Processing	(3/24/99)
	Gulf States Steel	(7/1/99)
2000	J&L Structural Steel	(6/30/00)
	Vision Metals, Inc.	(11/13/00)
	Wheeling-Pittsburgh Steel	(11/16/00)
	Northwestern Steel and Wire	(12/20/00)
	Erie Forge and Steel	(12/22/00)
	LTV Corp.	(12/29/00)
2001	CSC Ltd.	(1/12/01)
	Heartland Steel	(1/24/01)
	GS Industries	(2/7/01)
	American Iron Reduction	(3/23/01)
	Trico Steel	(3/23/01)
	Republic Technologies	(4/2/01)
	Great Lakes Metals	(4/11/01)
	Freedom Forge (Standard Steel)	(7/13/01)
	Precision Specialty Metals	(7/16/01)
	Excaliber Holding Corp.	(7/18/01)
	Laclede Steel	(7/30/01)
	Edgewater Steel	(8/6/01)
	Riverview Steel	(8/7/01)
	GalvPro	(8/10/01)
	Bethlehem Steel	(10/15/01)
	Metals USA	(11/15/01)
	Sheffield Steel	(12/7/01)
	Action Steel	(12/28/01)
2002	Geneva Steel	(1/25/02)
	Huntco Steel	(2/4/02)
	National Steel	(3/6/02)
	Calumet Steel	(3/19/02)
	Birmingham Steel	(6/4/02)
	Cold Metal Products	(8/16/02)
	Geneva Steel Holdings (Geneva Steel's parent)	(9/13/02)
	Bayou Steel	(1/23/03)
2003	Kentucky Electric	(2/6/03)
	Slater Steel	(6/2/03)

Source: Association of Iron and Steel Engineers 2003.

FIGURE 3
U.S. DOMESTIC STEEL JOBS AND PRODUCTIVITY



Source: American Iron and Steel Institute 2002.

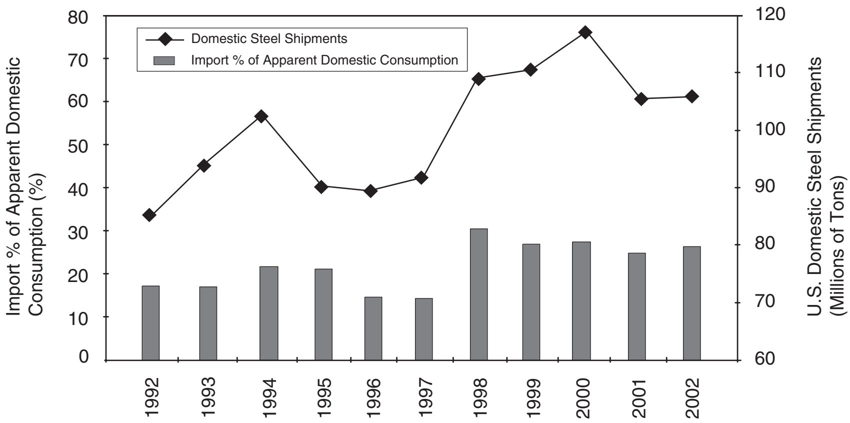
2002). But in 2001, upon the arrival of the new Bush administration—with a narrow victory and heavy dependence (it seemed at the time) on retaining or capturing key steel states such as West Virginia, Ohio, and Michigan, in order to win reelection in 2004—the congressional Steel Caucus sharply increased pressure for even greater protective insurance. In March 2002, the Bush administration capitulated and invoked Section 201 of the basic U.S. trade act to impose "safeguards" in the form of tariffs of up to 30 percent on many steel imports, in addition to the existing antidumping orders (Barfield 2002).[4]

Steel and the State: Or the State of Steel, 2003

Now five decades after the Second World War, just what is the state of the U.S. steel industry, where does it stand in world competition, and what lessons can one take from the almost perpetual government intervention to save and foster this industry? The real drivers behind the changes in the U.S. steel industry's structure and employment are increased productivity through technological advance and the rise of the minimills—not unfair foreign competition, as spokesmen for the integrated steel companies continually assert.

As the above history and analysis have demonstrated, two steel industries now exist in the United States: one consisting of the older,

FIGURE 4
U.S. DOMESTIC STEEL SHIPMENTS AND IMPORT PERCENTAGE OF APPARENT DOMESTIC CONSUMPTION, 1992–2002



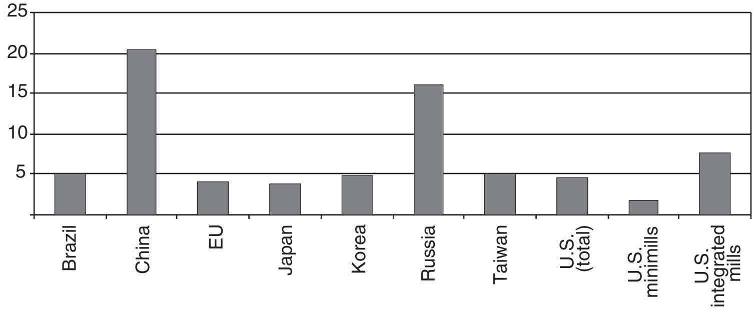
Source: U.S. Census Bureau 2003; American Iron and Steel Institute 2003.

increasingly uncompetitive integrated mills, and a second made up of more efficient, high-tech minimills. This reality must be kept in mind when dealing with all steel-related statistics. The accompanying figures illustrate this two-sided story.

Figure 3 shows a clear correlation between increased productivity and declining total employment in the steel industry: since 1980, the number of man-hours to produce a ton of steel in the United States has dropped by more than 50 percent, from ten man-hours in 1980 to less than four man-hours in 2002. Since U.S. basic demand for steel has not increased proportionally, fewer workers are required—a reality chronicled in the reduction of total U.S. steel jobs by almost two-thirds, from 435,000 in 1980 to 124,000 in 2002.

Total domestic shipments did increase, however, by some 25 percent between 1992 and 2002 (Figure 4)—thus reinforcing the argument that increased productivity, not declining total production, was one major cause of the decline in total steel employment. This decline will continue apace for the next decade. According to the U.S. Bureau of Labor Statistics, "Employment in the steel industry is expected to decline by about 22 percent over the 2000–2010 period, primarily due to increased use of labor-saving technologies and machinery. Other factors affecting

FIGURE 5
RELATIVE LABOR PRODUCTIVITY, 2001 (IN MAN HOUR/TON)



Source: World Steel Dynamics 2001.

employment in the industry include foreign trade, overall economic conditions, growth of EAFs [electric arc furnaces], and environmental regulations" (U.S. Bureau of Labor Statistics 2002, 80).

Though Figure 3 tells a story of huge increases in the productivity of the U.S. steel industry since 1980, Figure 5 reveals the real productivity leaders are the minimills, with the integrated firms lagging behind key U.S. competitors in man-hours per ton. While minimills take less than two man-hours to produce a ton of steel, the integrated mills take over seven man-hours to accomplish the same task.

Thus, as minimills climbed the technology ladder over the past two decades and competed increasingly for high-end finished products, they grabbed more and more of the U.S. domestic market.

Figure 2 traces the rise of minimills in the U.S. market since 1970. Meanwhile, as Figure 4 shows, the share of import foreign steel averaged 23 to 27 percent through the 1992–2002 period—kept down largely by the succession of antidumping countervailing duty orders chronicled in the previous sections.

In an ironic twist, considering the demand that Congress "Stand Up for Steel," U.S. integrated steel companies have over the past several decades become major importers of foreign steel, particularly low-end semifinished steel—slabs for steel sheet, billets for steel girders, and blooms for rebar. In 1998, integrated steel companies imported 6 million tons as inputs for more finished steel products (Lindsey, Griswold, and Lukas 1999).

TABLE 7
MAJOR STEEL-PRODUCING COUNTRIES, 2002
(MILLION METRIC TONS CRUDE STEEL PRODUCED)

Rank	Country	Tonnage	Rank	Country	Tonnage
1	China	181.6	6	South Korea	45.0
2	Japan	107.7	7	Ukraine	33.4
3	United States	92.2	8	India	29.6
4	Russia	59.8	9	Brazil	28.8
5	Germany	45.4	10	Italy	26.1
			—	World	902.2

Source: International Iron and Steel Institute 2003.

The World Market. Steel manufacturing has become global in nature. Once the domain of industrialized countries, it is now produced in fifty-six countries around the world, with the top five countries in 2002 (China, Japan, the United States, Russia, and Germany) accounting for only about 50 percent of total world production of crude steel (Table 7).

Although proximity to markets provides a competitive advantage, international steel trade has risen significantly over the past several decades; in many industrialized countries, including the United States, imports are a substantial component of domestic consumption. Despite the very large capacity of some steel operations, and mergers within and across borders, no individual producer or group dominates the global market. In 2002, the world's ten largest steel companies accounted for only a few percentage points of world production (Table 8).

Geographic Production Shifts. Between 1992 and 2002, world crude steel production increased by 182 million metric tons. During this period, the NAFTA countries' share of global production decreased slightly, from 14.8 percent to 13.6 percent. Over the same period, Japan's strong position weakened somewhat, largely as a result of the persistent weakness of the yen and because reduced demand for Japanese automobiles curtailed Japanese domestic steel consumption. Reduction in capacity by some former central and eastern European countries and the breakup of the Soviet Union repressed production in these areas. This has been offset, however, by increased output in Asian countries other than Japan. Asia now accounts for over 43 percent of world crude steel production, with output from China almost doubling, from 11.2 percent to 20.1 percent (Figure 6).

TABLE 8
THE LARGEST STEEL-PRODUCING COMPANIES, 2002
(MILLION METRIC TONS CRUDE STEEL OUTPUT)

Rank	Company	Steel Output	Rank	Company	Steel Output
1	Arcelor	44.0	6	Corus	16.8
2	LNM Group	34.8	7	Thyssen	16.4
3	Nippon Steel	29.8	8	NKK	15.2
4	POSCO	28.1	9	Riva	15.0
5	Shanghai Baosteel	19.5	10	U.S. Steel	14.4

Source: International Iron and Steel Institute 2003.

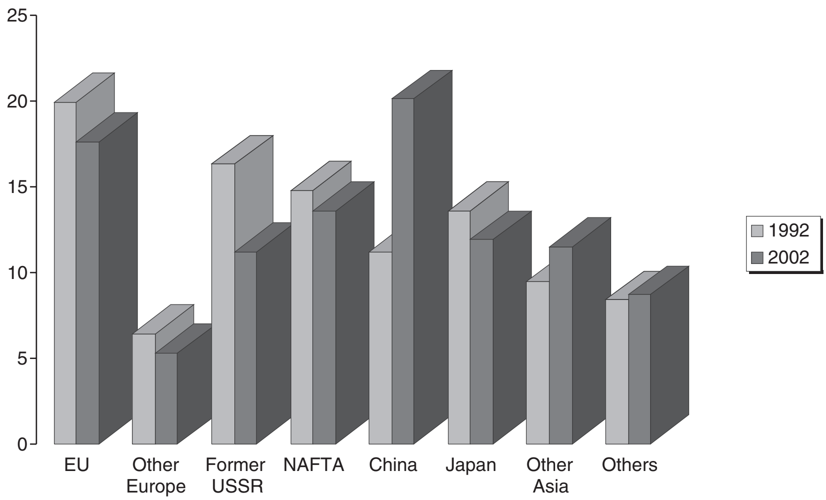
Public Policy Lessons from the Steel Industry

1. Neither Subsidy nor Protection Can Roll Back Technological Change and Shifting Comparative Advantage. A recent study has estimated that over the past thirty years, the U.S. steel industry has received subsidies of more than $16 billion, at the same time benefiting from a market strongly protected from foreign competition through the use of antidumping safeguards and countervailing duty actions (Barringer and Pierce 2000). Yet as we have seen, over the same three decades the U.S. steel industry has dramatically shrunk, with employment down by two-thirds and capitalization only one-tenth its former valuation. From 1998 to 2000, the peak years of the dot.com boom, twelve U.S. steel companies filed for bankruptcy (Table 6).

2. The Costs of Steel Protection to the U.S. Economy and U.S. Consumers Far Outweigh the Benefits to the Steel Industry. Even more than with DRAMs and FPDs, the long history of the use of trade remedy laws to protect the steel industry presents a clear example of the costs to the U.S. economy and U.S. consumers far exceeding the benefits to the steel industry. One estimate of the total costs to U.S. consumers over the past three decades places the range between $46 and $76 million in nominal dollars (Barringer and Pierce 2000).

A recent economic study has calculated the effects on the U.S. economy of trade remedy actions that would reduce steel imports by 25 percent (Francois and Baughman 2001). Before recounting these results, it should be recalled that the economic importance of steel-using industries is far greater than that of the steel-producing industry to the overall health of the U.S. economy. Steel-using manufacturers include automobiles and

FIGURE 6
STEEL PRODUCTION: GEOGRAPHICAL DISTRIBUTION,
1992 AND 2002 (IN % OF TOTAL PRODUCTION)



Source: International Iron and Steel Institute 2003.

automobile parts, farm machinery and equipment, construction machinery and equipment, aircraft and parts, electrical equipment, and other fabricated metal products. Depending on how broadly one defines and counts "steel-using" industries, the ratio of steel-using workers to steel-production workers ranges from 20:1 up to 40:1 (Francois and Baughman 2001; Lindsey, Griswold, and Lukas 1999). Steel import protection in effect just transfers money from downstream consuming companies to upstream companies. Prices will rise and be passed on to the ultimate consumer (for example, a domestic car purchaser) for two reasons: less competition from lower-price foreign competitors, and reduced net supply of steel. (Since U.S.-produced steel is not perfectly substitutable with imported steel, a net reduction in supply would occur, and in some cases much higher prices, as the industry would pass the increased price on to manufacturers and consumers.)

Assuming that antidumping duties and safeguard quotas reduce imports by 15 percent, the Francois and Baughman study calculates that the steel industry would benefit by a one-time preservation of some 6,000 jobs; but in return, downstream industries and consumers would be forced to pay about $2.7 billion, or $450,000 per job saved. In addition, given the relative size of the steel and steel-using industries, a rule of thumb would be that for every steel job saved, roughly three steel-using jobs would be jeopardized—in the case in point, about 18,000 jobs.

3. The National Security Defense Remains "the Last Refuge of a Scoundrel," to Paraphrase Dr. Johnson. Inevitably, defenders of steel protection and subsidy have trumpeted the alleged national security implications of downsizing the U.S. steel industry. After 9/11 these pleadings reached a fever pitch, as when a spokesman for the Steelworkers Union stated, "[9/11] should be a reminder to people that steel is a critical industry for the United States, both strategically and economically. Driving steel out of business economically has the same impact as physical bombings" (quoted in Ikenson 2002, 9). This quite recent statement strongly echoes hysterical and false assertions, quoted earlier in this study, by proponents of similar policies for the semiconductor and flat-panel display industries in the 1990s. In what may well be the most misbegotten statement of his presidency, George W. Bush supported this defense connection at an event for the steelworkers, when he stated, "If you're worried about the security of the country and you become over-reliant upon foreign sources of steel, it can easily affect the capacity of our military to be well supplied" (Ikensen 2002, 9).

Fortunately for the president, studies by his own administration belie this dire and foolish assertion. In 2001, the Commerce Department, home of antidumping protection, stated in a study that national defense requirements for finished steel (and by extension iron ore and raw steel) were "very low" and likely to remain so for the foreseeable future. Commerce also stated that domestic demand would "readily be satisfied" by domestic production (U.S. Department of Commerce 2001). Even if these demand projections were not accurate, the huge supply (and oversupply) of steel around the world would assure more than adequate supplies for the Defense Department. As we have seen, more than fifty countries produce steel today in hundreds of plants—hardly a situation that should cause heartburn in the military. The irony is that by cutting off major suppliers of both semifinished and finished steel through the highly protectionist antidumping regime, the United States ultimately hurts its own defense effort—by placing a greater burden on the U.S. economy and U.S. taxpayers to fund legitimate defense needs.