

# Breaking the Stalemate

VALUE CREATION STRATEGIES FOR THE GLOBAL STEEL INDUSTRY

THE BOSTON CONSULTING GROUP



BCG | REPORT



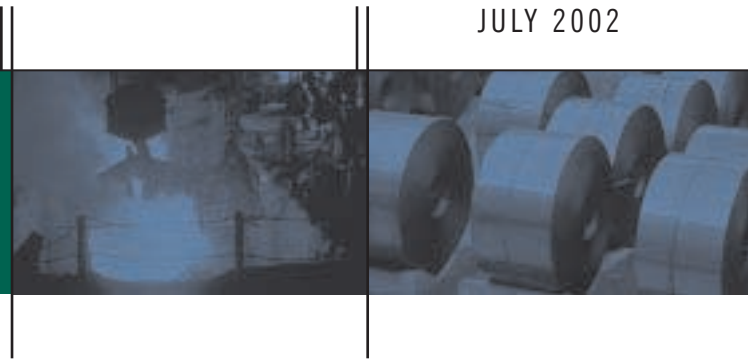
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JULY 2002

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## A WORD FROM THE AUTHORS

The ideas presented here have grown out of The Boston Consulting Group's client work and proprietary research. We would like to thank the many managers at steel companies who have shared their experiences with us, as well as our colleague François Rouzaud, who has made valuable contributions to this report. We would also like to acknowledge the contributions of the report's editors: Kathleen Lancaster, Barry Adler, and Sharon Slodki.

We hope you will find this publication useful, and we welcome your questions and comments. To inquire about this report or about the services offered by BCG's Industrial Goods practice, please contact any of the authors:



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## EXECUTIVE SUMMARY

The global steel industry is at an impasse. Although its products remain critically important to a wide range of industries, few steel companies are making money, and even fewer are achieving profitable growth. In fact, the industry as a whole has been destroying value by failing to earn its cost of capital.

In general, efforts by individual steel companies to improve their competitive position have not succeeded, because systemic factors such as a long-term downward price trend have eaten up most of their results. Moreover, because all the leading players have employed similar strategies, they have continued to find themselves in the same stalemate situation. Industry regulators, for their part, have perpetuated inefficiencies by protecting domestic steel companies with tariffs and quotas. If the industry is to break this stalemate, it must address not the symptoms of its malaise but the causes.

Driving the industry's difficulties are four root causes, which we discuss in detail in the report:

- Chronic overcapacity
- The commodity nature of steel
- The flatness of the supply curve
- The fragmentation of the industry

Of these root causes, only two—chronic overcapacity and industry fragmentation—offer real opportunity for significant change. In our view, that change cannot come about unless companies and regulators alike take action—individually and collectively—to break the present impasse. By *collective*

*action* we do not, of course, mean to suggest any “behind closed doors” activity that could possibly be construed as collusion or any other illegal behavior. Rather, we believe that key players in the steel industry, together with the bodies that regulate them, should openly and publicly examine the constraints that currently prevent the industry from functioning effectively, and then take action to remove those constraints.

The Boston Consulting Group has identified three paths to renewed value creation for the steel industry:

- Regional consolidation—to reduce the fragmentation of the industry and help eliminate overcapacity
- Specialization and downstream migration—to help individual companies escape from the commodity segments of their current businesses
- Deconstruction and global networking—to reduce global fragmentation and overcapacity while separating commodity and noncommodity businesses

Regional consolidation, which is well under way in Europe, will continue worldwide. We see it as a reasonable, if insufficient, next step toward rationalizing the industry. We anticipate that this trend will culminate not in the creation of regional monoliths but in the formation of companies that will control some 30 to 40 percent of their respective regions. Such companies will achieve further cost reductions of 4 to 6 percent as compared with today's players.

The second path to value creation—specialization and downstream migration—can move companies into higher-margin businesses. At their logical extreme, these strategies become a bold move to achieve *escape velocity*—to transform the company’s portfolio so radically that the company is no longer perceived as primarily a steel player. Those best positioned to pursue this path are the small and midsize players already occupying strategic niches.

The most promising long-term model for value creation is a “division of labor” approach based on deconstruction and global networking. In this approach, for example, a low-cost offshore producer of slabs might collaborate with a highly differentiated conversion specialist, thus reducing the cost of steel products by 10 to 20 percent, as compared with today’s best regional players, and generating substantial competitive advantage. Despite the great promise of this approach, no company has yet made a significant move in this direction because of the high costs of closing upstream production capacity, the fear of a supply shortage, or the risk of political opposition.

To change the rules of the game in the steel industry and permit it to achieve healthy and efficient value creation, steel companies will need to take at least one and possibly all three of these paths. As first steps, they should segment their business portfolios into commodities and differentiable products or services, and then evaluate the opportunities for the former to consolidate or be consolidated and for the latter to achieve escape velocity. They should also prepare to participate in global alliances by establishing relationships with potential partners and acquiring experience cooperating in areas in which risk is manageable.

But steel companies alone cannot transform the rules of the game. Regulators must support the renaissance of the industry by developing an economic and political framework that ensures a reasonably safe transition. Governments and other regulatory bodies should focus all regulatory actions on reducing overcapacity and promoting consolidation. They should also actively encourage the international trade of steel products and effectively mitigate the risks of cross-regional cooperation.



## INTRODUCTION

The recent furor over the U.S. imposition of tariffs on steel imports—including threats of retaliatory measures by the European Union, Japan, and others—reflects the important role that steel plays in the world’s economy. It also suggests that the solution to the chronic problems plaguing the industry will involve not only the leading steel players—whose strategic choices at this stage of the industry’s evolution will certainly have a huge impact on the sector’s recovery—but also governments in the major steel-producing regions. For, strategic choices notwithstanding, it is clearly true, as stated by Francis Mer, French minister of the economy, finance, and industry and former chairman of Arcelor, that “capitalism alone cannot solve this problem.”

Why is that? In large part, it is because many nations—rightly or wrongly—continue to see domestic steel production as critical to the fabric of their economies and to their national security. Historically, domestic production has engendered significant government intervention and protection. As a result, the management teams of many steel companies are only just beginning to fully confront the harsh forces of an open market system.

Thus, although steel prices have steadily eroded over the last 20 years, driven down by incremental increases in new low-cost capacity, management has continued to make capital investments and to endure the persistently inflating costs of labor and retiree benefits, driven by powerful union interests. Many management decisions have rested on the presumption that governments would provide some degree of protection. The result is huge excess ca-

capacity and an insupportably high cost base for labor and retirees. Those twin legacies are the biggest barriers to the emergence of a healthy industry.

Moreover, they lead to a conundrum: although the senior managers of steel companies may wish to close down capacity and restore the balance of supply and demand in order to boost profits, they don’t want to pick up the potentially crippling costs of the twin legacies that go along with that approach. Ironically, it appears that the industry may need one more round of government intervention to allow it to put its house in order.

For the problems of steel do indeed need to be solved. Despite its venerable age—iron smelting was well established by the end of the second millennium B.C.—steel remains one of the most widely used materials in modern engineering. The steel industry as a whole generates some \$300 billion in annual revenue and employs some 2 million people. In 2001 the world consumed 765 million metric tons of finished steel products. Key applications for steel are spread over many industries, including automotive, construction, appliances, oil and gas, packaging, railroads, shipbuilding, and industrial and agricultural equipment.

In many respects, the steel industry has come a long way. Over the past 40 years alone, technological leaps from open hearths to basic-oxygen and electric-arc furnaces, and from mold casting to continuous-slab and thin-slab casting—among numerous advances—have significantly boosted productivity and reduced the number of steelworkers.

Nevertheless, the steel industry is in a bad way. From the massive integrated mills that undertake the whole production process—smelting ore into iron, converting it to steel, rolling it, and finishing it in various ways—to the smaller, nimbler mini-mills that make steel from scrap, few companies are profitable. Even fewer are achieving adequate returns, and fewer still are experiencing profitable growth.

In part, this is because many countries have built up their own steel-production capacity, leaving the industry highly fragmented in terms of global market share. Only in the past dozen years—under heavy budget pressure—has government-sector ownership of steel-production capacity declined, from more than 70 percent globally in 1990 to less

than 30 percent today. Privatization has shifted the steel companies' focus from production and employment to profitability and shareholder value. However, most steel companies' efforts to maximize returns on their existing production capacity have not been successful. For much of the past decade, the global steel industry has actually destroyed value by failing to earn its cost of capital.

The issues facing the steel industry are fundamental and systemic. Nonetheless, we believe that today there is a real opportunity to set the stage for its recovery. The time has come to address the root causes of the industry's problems and to lay out the steps required to achieve a healthy and sustainable industry structure. Let's start by taking a close look at the critical issues confronting the industry.

# CRITICAL ISSUES FACING THE INDUSTRY



Generally, the long-term financial performance of steel companies has been poor. From 1989 to 2000, the industry's average total shareholder return was below zero. (See Exhibit 1.) It was also lower than the total shareholder returns of other basic-materials industries, such as nonferrous metals, pulp and paper, base chemicals, and petroleum refining.

It is important to note, however, that within this disturbing picture, some companies have performed

much better than others. There is a significant spread between the top and bottom quartiles of the distribution. The top quartile consists primarily of companies that either produce specialized or customized products or supply regional niches. Toward the bottom we find many structurally weak integrated players. The recent wave of Chapter 11 filings in the United States—such as those of Bethlehem Steel and National Steel—and the Chapter 7 (liquidation) filing of LTV Steel reflect the difficult situation in which these weaker companies find themselves.

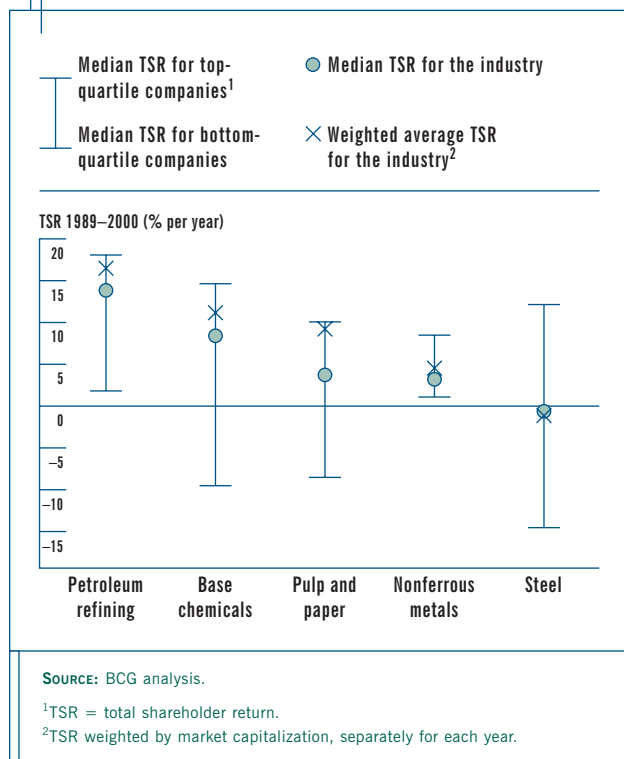
To open up opportunities to create real and lasting value, the steel industry must address the four root causes of its present difficulties:

- Chronic overcapacity
- The commodity nature of steel
- The flatness of the supply curve
- The fragmentation of the industry

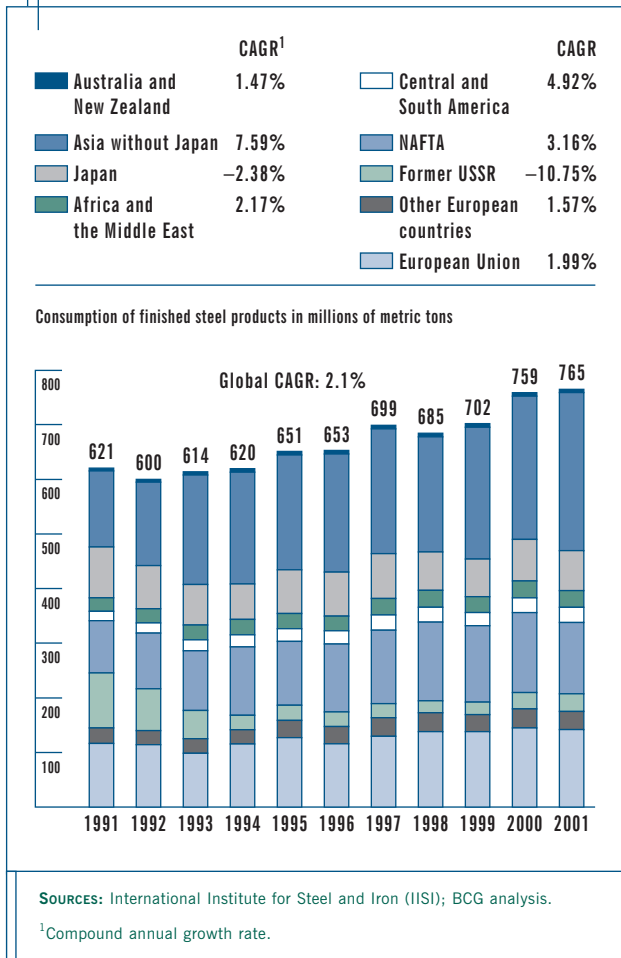
## Chronic Overcapacity

Basically, there is considerably more steel-making capacity than there is demand for steel. From 1991 through 2001, worldwide demand for steel grew only 2.1 percent per year. (See Exhibit 2, page 10.) Over the next ten years, we expect even slower growth, at just 1 to 1.5 percent per year. There will be more significant growth in demand only in Asia (excluding Japan) and Latin America. For example, China's share of worldwide demand will increase

**EXHIBIT 1**  
**AVERAGE TSR IS LOWER IN THE STEEL INDUSTRY THAN IN OTHER BASIC-MATERIALS INDUSTRIES**



**EXHIBIT 2**  
**GLOBAL DEMAND FOR STEEL HAS GROWN**  
**VERY SLOWLY IN THE PAST DECADE**



from 18 percent in 2000 to 21 percent in 2005. By 2010, about 45 percent of worldwide demand will be concentrated in Asia (excluding Japan), compared with 38 percent today.

The slow growth in demand for steel will lag considerably behind expected growth rates (in revenue terms) for steel’s most important applications industries—automotive, construction, and appliances. This discrepancy will come about in part because other materials will replace steel in some applications, and in part because improvements in steel’s own mechanical properties—such as strength and stiffness—will mean that steel buyers will be able to use smaller amounts (by weight) to do the same jobs.

Like global demand for steel, global steel-making capacity—and thus the industry’s overcapacity—is quite stable. (See the insert “Defining Steel-Making Capacity.”) Once installed, capacity is very hard to eliminate because of high exit costs. Even temporary reductions in capacity are difficult because of the inflexible nature of the integrated steel-production chain. The capacity of integrated iron- and steel-production processes cannot be cut back easily, because of the high costs of first idling and then bringing back on-stream a series of integrated facilities linking operations at the coke batteries, blast furnaces, steel shops, and hot and cold strip mills. Moreover, shutting down blast furnaces entails a considerable risk of damaging the refractory bricks that line them, because of the cooling involved. For this reason, integrated plants often find it cheaper—on a marginal cost-calculation basis—to avoid temporary shutdowns by continuing full production and then shipping their marginal tonnage to spot markets at low prices.

Permanent reductions in capacity are, of course, even more expensive because of high legacy costs, such as pension obligations and environmental liabilities. They are also difficult because of political sensitivity. Steel plants are often concentrated in “old” industrial areas, such as Llanwern in Wales, the Ruhr area in Germany, and northern Spain. In such regions, decades of productivity increases in steel manufacturing and coal mining have contributed to high unemployment. Local labor unions and governments tend to strongly oppose further capacity reduction.

Calculated on the basis of worldwide production of crude steel, global capacity utilization fluctuated between 70 and 80 percent from 1990 through 2000. (See Exhibit 3.) Given that we consider “healthy” capacity-utilization levels to be around 92 percent, effective worldwide overcapacity is about 20 to 25 percent of actual production.

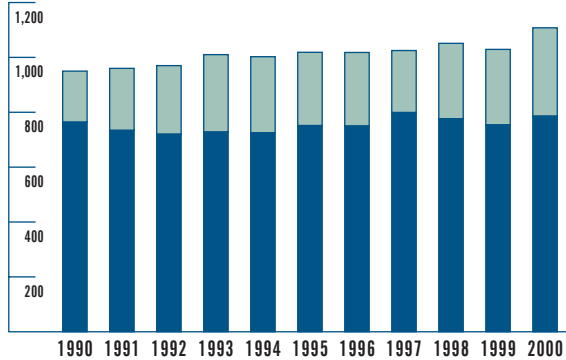
Moreover, the situation will not get better. From 2000 through 2003, *capacity creep*—estimated at between 15 million and 20 million tons per year worldwide—will completely cancel out planned

EXHIBIT 3  
**THE STEEL INDUSTRY SUFFERS  
 FROM CHRONIC OVERCAPACITY**

Global capacity utilization fluctuates  
 between 70 and 80 percent

Overcapacity Production

Estimated global capacity  
 and production in millions  
 of metric tons of crude steel<sup>1</sup>



Sources: OECD; BCG analysis.

<sup>1</sup>Includes stainless steel.

reductions in smelting capacity, which are anticipated primarily in the former Soviet republics, the Americas, and China. Over the same three-year period, new plants will actually add capacity of about 30 million tons, contributing to an overall expected capacity growth of about 1 percent per year. And the outlook for overcapacity for rolled stock is even worse than for smelting. Hence, without further incentives to reduce capacity, the

chronic overcapacity of the industry will not only fail to improve but will actually worsen.

Furthermore, the systemic attributes of the steel industry tend to amplify the impact on profits of even small changes in demand and prices. The steel value chain is a complex system in terms of the demand from steel-consuming industries and the behavior of stock-keeping traders and steel producers. The inventory buffers throughout the distribution and user supply chains—combined with utilization-oriented and demand-inflexible steel production—create higher volatility in prices (and therefore profits) than would be expected from slight changes in the balance of supply and demand or price alone. (See Exhibit 4, page 12.) In short, this system tends to amplify any fluctuation in demand or other disturbance. The oscillatory motion of steel prices is therefore a direct consequence of the industry’s systemic properties.

### The Commodity Nature of Steel

A second issue for steel producers is the fact that the lion’s share of global steel production is a cost-driven commodity business. Steel specifications are highly standardized, for both economic and safety reasons. Although the national structure of the industry has given rise to a broad spectrum of national standards—including ASTM in the United States, JIS in Japan, BS in the United Kingdom, and DIN in Germany—most high-volume grades of steel can easily be substituted across regions.

## DEFINING STEEL-MAKING CAPACITY

The capacity of a given steel plant is difficult to define for several reasons. An integrated steel plant incorporates multiple production steps, from iron and steel making to hot and cold rolling to further processing steps, such as galvanizing or other coating techniques. Depending on a plant’s production spectrum and the mix of products it actually sells, there may be significant differences in the “design”

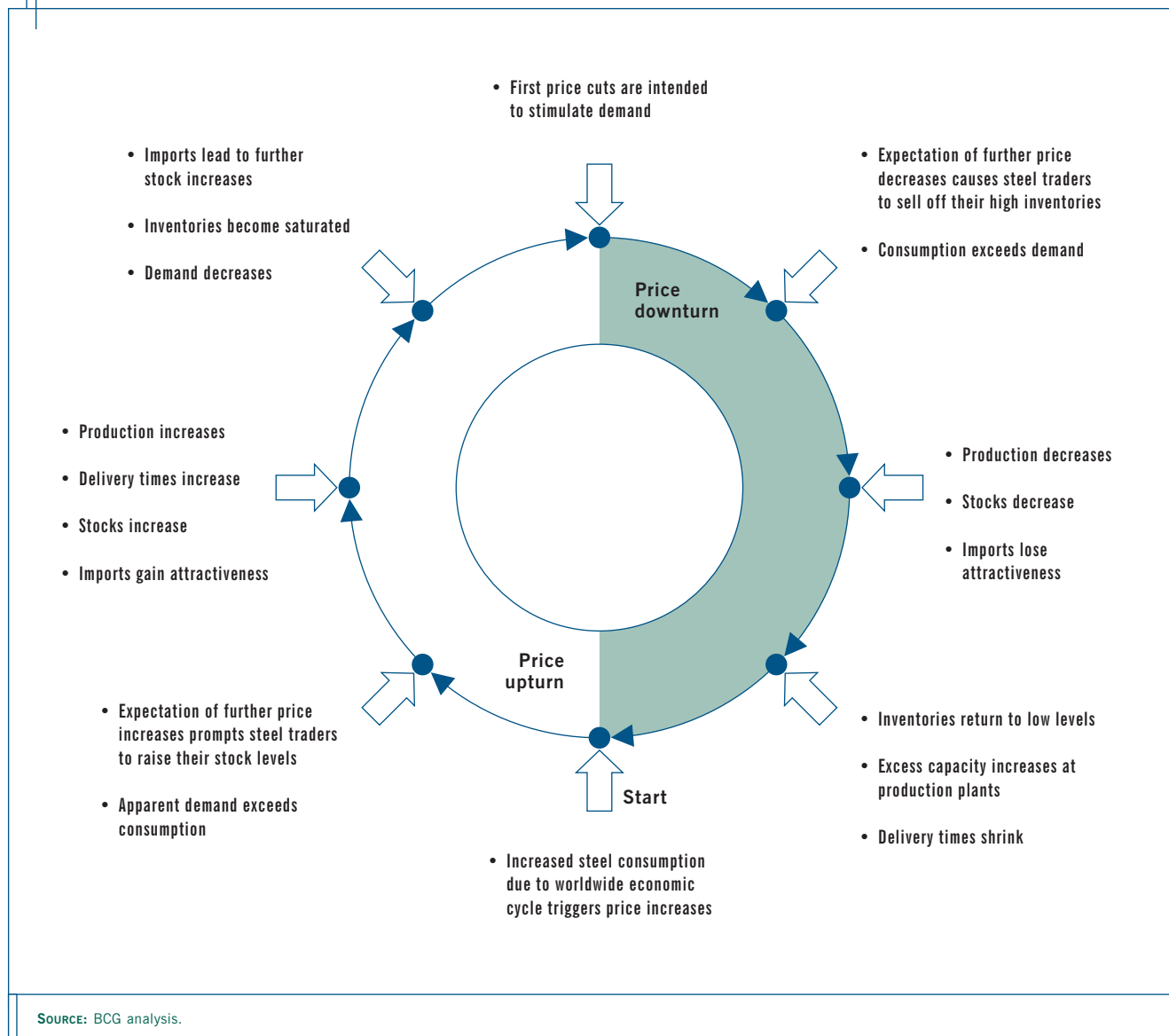
capacities of its individual production steps—that is, in the stated capacity at the time of construction. There may also be substantial differences between the design capacity of each process and its actual operational capacity. Operational capacity often comes to exceed design capacity over time, thanks to process rationalization and technological optimization. This process is known as *capacity creep*.

Nevertheless, it is also true that there is enormous variety among steel products, as illustrated by the fact that the U.S. government received more than 1,000 applications for exemptions from the imposed import tariffs, each claiming that the domestic steel industry could not deliver according to the particular specifications required. Steel companies seek to differentiate their product offerings in part because the potential for differentiation through service is limited. In this industry, service parameters—such as delivery performance, lead-time, or quality control measures—are determined

by customers' specifications and thus represent a sales precondition rather than a genuinely differentiating feature.

Most Western European and U.S. steel companies try to differentiate themselves from one another and from their lower-cost competitors in Asia, Latin America, and Eastern Europe by offering more sophisticated products, such as high-strength steel, isotropic steel, or grades with special surface qualities. However, grades that offer room for differentiation in this way are mostly low-volume specialties.

**EXHIBIT 4**  
**A VICIOUS CIRCLE LEADS TO STRONG CYCLICALITY OF STEEL PRICES**



Moreover, developing such grades usually requires investing in more sophisticated technology while also keeping higher inventories, because lot sizes are smaller and the production spectrum is broader.

As a result, many companies find themselves caught in an “investment trap”:

- Although profit margins may be higher on their more sophisticated products, their capital turnover may be so much lower—because of higher fixed assets and inventories—that they fail to realize any increase in returns on invested capital
- Moreover, since many competitors choose to invest in higher-margin products, competition often intensifies in the narrow top-product segments, putting pressure on margins

Thus, in this classic investment trap, the intended increase in profit margin is accompanied by an underestimated decrease in capital turnover. The return on capital often changes little, if at all, and little or no value is created. (See Exhibit 5.)

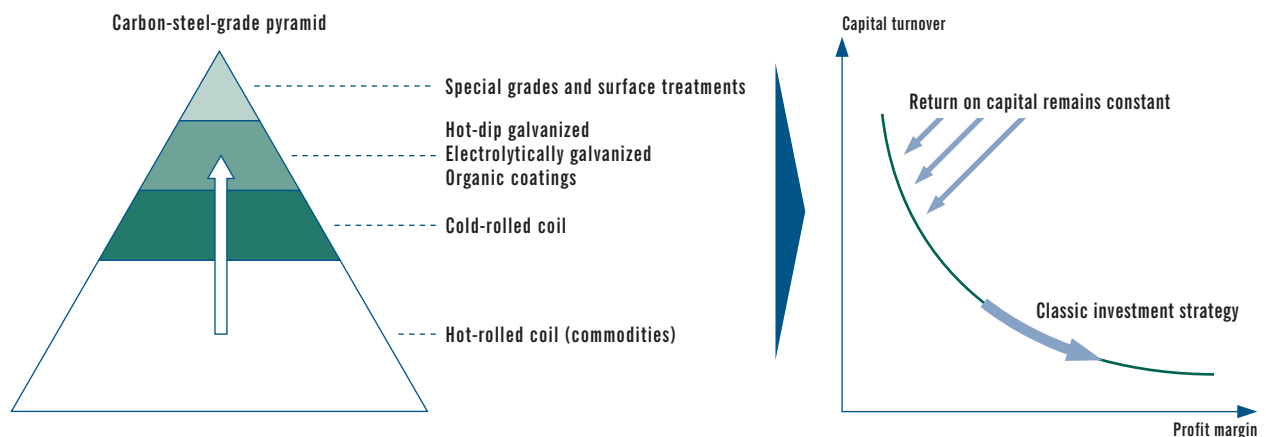
## The Flatness of the Supply Curve

At the beginning of 2002, European export prices for hot-rolled and cold-rolled coil reached a ten-year low at \$210 per ton and \$275 per ton, respectively. These prices represent a steep decline from the average nominal prices a decade earlier, in 1992: \$330 and \$450. Although prices are currently recovering from the ten-year low, the long-term downward trend of 2 to 4 percent per year for the deflated steel prices in all major steel-consuming regions (depending on the type of product) could well continue into the future. (See Exhibit 6, on page 14, for an example involving hot-rolled strip.)

According to macroeconomic theory, the long-term price of commodity goods equals the cash cost of the marginal producer. As companies bring new, lower-cost plants on-stream, the highest-cost producers are pushed even farther to the right-hand side of the supply curve and replaced by more efficient ones. Hence, capacity increases at lower cost levels, exacerbated by capacity creep, will result in a

### EXHIBIT 5 THE CLASSIC INVESTMENT TRAP

Trading up the carbon-steel-grade pyramid often comes at the expense of lower capital turnover

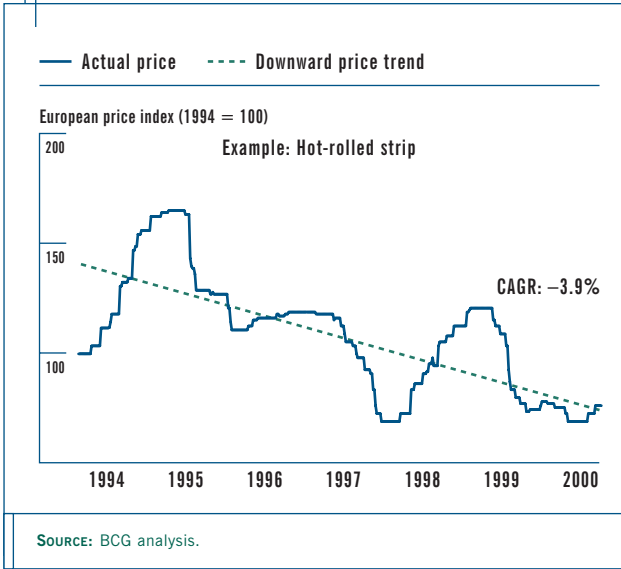


$$\text{Return on capital} = \frac{\text{Profit}}{\text{Capital}} = \frac{\text{Profit}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Capital}} = \text{Profit margin} \times \text{Capital turnover}$$

SOURCE: BCG analysis.



**EXHIBIT 6**  
**STEEL PRICES HAVE DECLINED STEADILY**



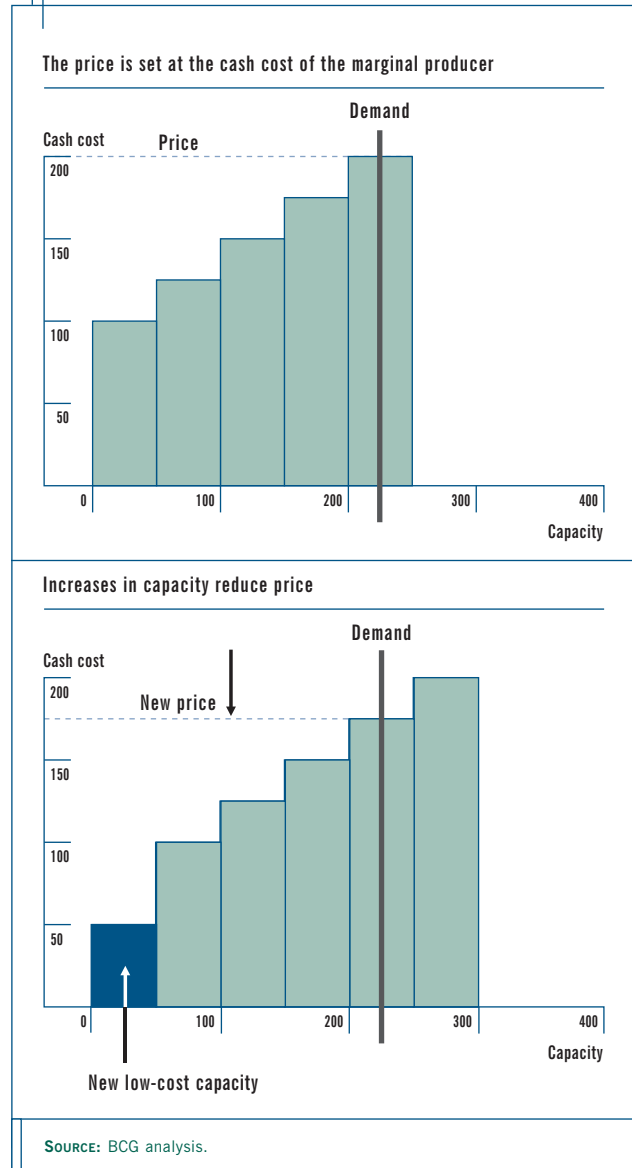
long-term downward price trend because these dynamics shift the supply curve to the right, lowering the long-term price equilibrium over time. (See Exhibit 7.)

Although downward price pressure is not uncommon in other commodity industries, such as aluminum, this phenomenon affects the steel industry more than the others because steel has a particularly flat supply curve. (See the insert “A Comparison of Supply Curves: Steel and Aluminum,” page 16.) Even the most efficient producers have very thin margins and low profitability. (See Exhibit 8.)

Steel companies are always striving to reduce costs in order to improve their position on the supply curve. Open any steel company’s annual report, and the odds are that you will find a description of a cost-cutting program that is either under way or being launched. However, because steel is an old and very mature industry, most companies have already traveled a long way down the experience curve; therefore, real cost differences among them are rather small. Moreover, most state-of-the-art steel technology is readily available to all industry participants because it is supplied predominantly by independent engineering companies, such as Danieli, SMS Demag, and VAI.

There is, of course, a significant difference in cost position between large integrated mills, which rely primarily on iron ore and coke, and smaller mini-mills, which melt scrap metal in electric-arc furnaces. Minimill technology has extensively penetrated the long-products segment precisely because it allows substantial cost reductions as compared with traditional steel-making technology. Ever since the minimill pioneer, Nucor Corporation, built the first flat-steel minimill—in Crawfordsville, Indiana, in 1989—minimill technology for flat-rolled or

**EXHIBIT 7**  
**SUPPLY CURVE LOGIC EXPLAINS**  
**THE LONG-TERM PRICE TREND**

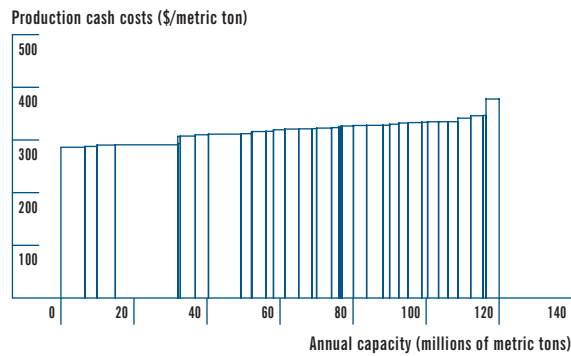




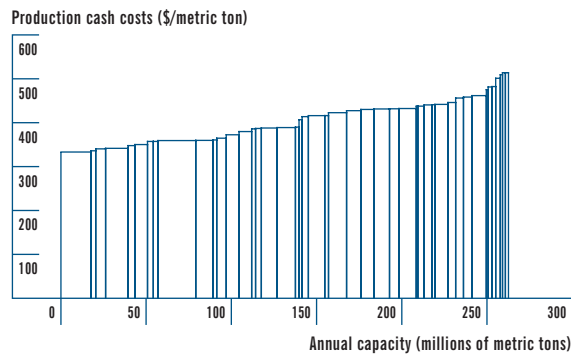
**EXHIBIT 8**  
**REGIONAL SUPPLY CURVES IN STEEL ARE VERY FLAT,**  
**RESULTING IN LOW MARGINS**

**Estimated Flat-Steel Capacity Curves by Region, 2000**

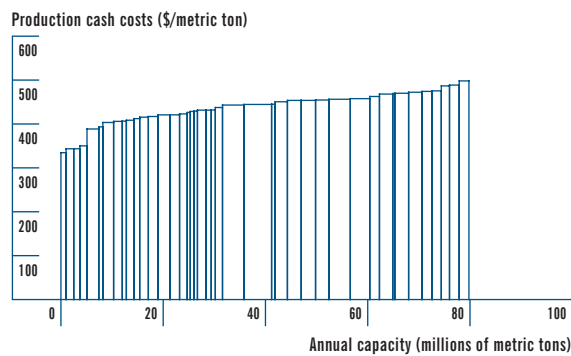
**Western European sites**



**Asian sites**



**North American sites**



Sources: World Steel Dynamics 2000; OECD Steel Outlook 1999/2000; IISI 1998; BCG analysis.

sheet products has inexorably gained market share. In the United States, this technology now represents about 25 percent of the industry. However, as long as sheet minimills are restricted by quality limitations to producing less demanding flat-steel products, modern integrated plants will remain protected to some extent from their competitive inroads.

Among modern integrated steel companies, opportunities to develop further scale-based cost differences are quite limited because direct operating costs are determined by the scale of the steel-producing plants; only purchasing, sales, and administration costs depend on the company's scale. Since many smaller and less efficient plants have already been replaced during modernization efforts, especially in Western Europe and Japan, opportunities to achieve further cost advantages through scale are limited in comparison with other industries.

Therefore, the cost savings to be achieved through mergers will not be very large. Inside the core business of steel production, where there is no substantial growth in demand, companies can achieve growth only by acquiring or displacing their direct competitors. However, in a low-growth, low-margin industry, an aggressive displacement strategy will usually destroy value, because recovery from the price war takes too long—if indeed the aggressor manages to recover at all. An acquisition or merger strategy will create value only if the newly formed company is significantly more profitable than the former one—not if the merger or acquisition process just ends up creating a somewhat larger but equally low-profit business.

In the merger of Arbed, Aceralia, and Usinor—which was announced in February 2001—annual savings in operating costs due to the merger are expected to reach about 2.3 percent of the companies' combined sales volume. In addition, the participants expect cumulative savings in investments of 1.2 percent over four years. This value is typical for many steel mergers or acquisitions that have taken place in Europe over the past ten years, such as ThyssenKrupp and Corus. But it is rather low in comparison with merger synergies achieved in

## A COMPARISON OF SUPPLY CURVES: STEEL AND ALUMINUM

The long-term average profitability of an industry reflects the shape of its supply curve. Because the long-term trend price is equal to the cash cost of the marginal producer, the margin gap between the least efficient and the most efficient producer increases with the steepness of the supply curve. Only in an industry with a steep supply curve can an average player achieve reasonable returns over time.

In the steel industry, the cash cost disadvantage of the least efficient players is typically about 30 to 50 percent. Western Europe is much more homoge-

neous than North America, where we find a sharp distinction between minimills and integrated producers. Asia is characterized by a distinct step between low-cost and high-cost countries.

In aluminum, the spread between the left and right ends of the supply curve is much more pronounced. The cash cost disadvantage of the least efficient players can be as high as 80 to 100 percent. Therefore, the average profitability of the whole industry—and especially the profitability of the market leaders—is much higher than for steel.

other industries, such as pharmaceuticals and aerospace, where synergies have amounted to as much as 6 to 7 percent of combined sales. It is worth noting that the stock markets responded favorably to the announcement of the Arcelor merger: the share prices of Arbed, Aceralia, and Usinor immediately soared by as much as 50 percent.

One way in which mergers can cut expenses is by exploiting regional differences among the costs of labor, energy, land, raw materials, and transportation, which are significant. Clearly, the relative attractiveness of steel exports from East Asia or Eastern Europe to North America and Western Europe depends strongly on current exchange rates. Despite protective measures such as import duties, import quotas, and government subsidies of national players, international trade in steel products has risen significantly. For example, global trade in steel products grew about 5 percent per year over the past ten years, and imports of steel to the European Union grew even faster, at 7 percent per year.

### The Fragmentation of the Industry

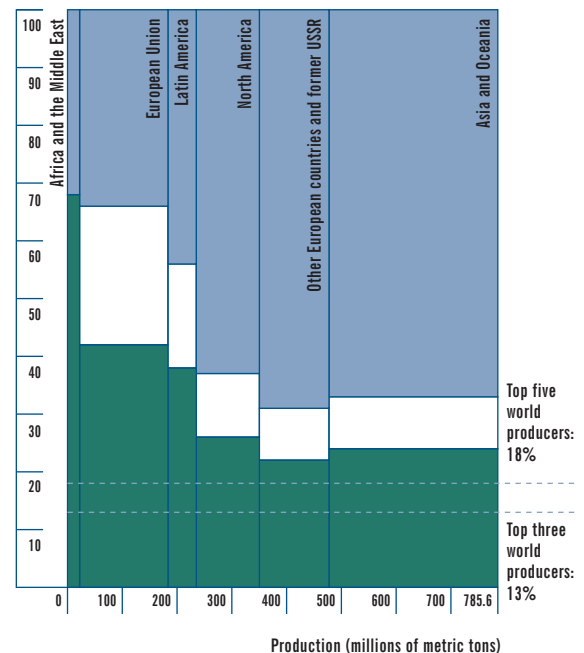
Despite recent mergers—especially in Europe—the global steel industry is still highly fragmented. In 2001, as in 2000, the top five steel companies supplied less than 20 percent of the world steel market. (See Exhibit 9.) In comparison, the top five auto-

EXHIBIT 9  
THE WORLDWIDE STEEL MARKET IS HIGHLY FRAGMENTED

#### Market Concentration by Region, 2000

- Additional producers
- Top five regional producers
- Top three regional producers

Concentration (%)



Sources: IISI; OECD Steel Outlook 1999 (2000 production forecast).

motive companies—key customers for steel—had a nearly 70 percent share of the world market. This structural imbalance between the steel industry and one of its principal customer industries means that steel companies are often at a disadvantage in negotiating contracts.

This high level of fragmentation evolved from the desire of developed and developing countries to control a captive source of steel to supply their civil and military steel-consuming industries. Unfortunately, fragmentation has kept steel producers from achieving enough influence to change the balance of power between supply and demand. Thus fragmentation is one of the main sources of the industry's current predicament.

## Repositioning the Industry

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The steel industry finds itself at an impasse. It is stuck—not only in its overall structure and function and its poor financial performance, but even in its cyclical nature and in the persistence of the structural issues that plague it. Despite companies' best efforts to improve profitability from year to year, systemic factors such as strong price cycles and a long-term downward price trend eat up most of their results.

Clearly, traditional value-creation approaches haven't worked. It's time to think about more enlightened strategies that will help not only individual companies but also the whole industry develop in a positive direction.

## THREE PATHS TO VALUE CREATION



Any effective cure for the ills besetting the global steel industry must attack the root causes of the present impasse—not its symptoms. The time has come for the industry to pull together and change the rules of the game. We do not, of course, mean to propose any secret action that could be construed as collusion or any other prohibited behavior. Rather, we think that the industry’s key players—together with their regulators—should publicly examine the constraints that prevent the industry from operating effectively and then act, independently and collectively, to remove them. Toward that end, it is essential to distinguish between approaches that may work—three of which we describe here—and ones that are destined to fail.

One approach that will inevitably fail is just to “keep running faster.” Persisting in doing what companies have been doing for decades—hammering down costs, partnering loosely when there is no risk, and trying to lose as little money as possible—is clearly not the way to attack any of the root causes. Improvement in any individual company’s situation must be accompanied by a strategy designed to allow broader and more lasting success.

Similarly, the remedies commonly espoused by national governments—including trade barriers and subsidies for existing low-efficiency plants—will preserve overcapacities rather than reduce them. Such policies will not significantly change available capacity unless, during the period in which the protective measures are in effect, other countries are forced to exit the steel business. Improvements that may occur in the average cost position of a nation’s

steel industry during the limited period of protection are unlikely to substantially reduce the cost differential between developed and developing countries. Therefore, we don’t believe that protective measures alone can buy national companies enough time to cure themselves.

In our view, three basic strategies can contribute to revitalizing the steel industry by attacking the root causes of its present impasse:

- Regional consolidation—to reduce the industry’s fragmentation and overcapacity
- Specialization and downstream migration—to help companies escape from the commodity segments of their businesses
- Deconstruction and global networking—to reduce fragmentation and overcapacity and separate commodity from noncommodity businesses

Some companies have already started moving forward along one of these paths. However, to achieve significant and lasting progress, it may be necessary to forge management strategies out of all three elements, not just one. Even so, governments too will have to play a role if the industry is to return to health and profitability. Let’s look at the potential that each strategy offers for value creation.

### Regional Consolidation

Although worldwide the steel industry remains highly fragmented, in Western Europe it has undergone intense consolidation over the past decade. As

a result, in 2000 the top five producers owned a combined regional market share of about 66 percent—up from just 40 percent in 1990. In 2005, after the 2001 merger of Arbed, Aceralia, and Usinor to form Arcelor—as well as other anticipated mergers—the top five European steel companies will attain a combined market share of approximately 80 percent, with individual players such as Arcelor managing a capacity of some 40 million tons. (See Exhibit 10.)

We expect consolidation to continue, not only in Europe but around the globe, for three reasons:

- For companies trying to grow, the economics of buying are better than the economics of building
- Consolidation offers improvement in the industry’s bargaining power vis-à-vis its main customers
- Reducing the number of decision makers allows the industry to have greater discipline over capacity and hence over price, thus avoiding potentially ruinous imbalances in supply and demand

Consolidation has generally been slower in the United States than in Europe because in Europe two decades of government action and management determination have solved the legacy problems of health-care and environmental liabilities,

high closure costs, and accelerated pension obligations. In the United States, however, no such solution has yet emerged. Nevertheless, the recent wave of Chapter 11 filings has prompted companies such as U.S. Steel, Bethlehem Steel, and National Steel to engage in new discussions of consolidation. In Japan the leading producers, NKK Corporation and Kawasaki Steel, agreed in December 2001 to consolidate their entire operations through the formation, by April 2003, of JFE Group, which will contain a steel segment called JFE Steel Corporation.

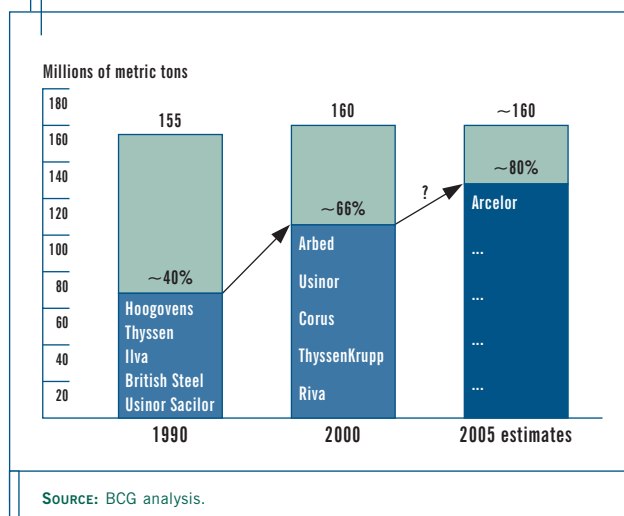
As we mentioned above, in all the major regions that face declining steel consumption—Europe, North America, and Japan—there are voices demanding the preservation of a strong national or regional steel industry, citing concerns about economic independence and national security. If these sentiments should prevail, the world could end up, at the logical extreme, with an oligopolistic steel industry consisting of a few large national or regional blocs, each supplying its own domestic or regional market. The cross-regional trade flow of steel products—which currently amounts to some 20 percent of global production—would drop precipitously and be confined to specialties.

Is this scenario likely? We don’t think so, for several reasons:

- First, the large steel-consuming industries—such as automotive, household appliances, and packaging—are becoming increasingly global. Suppliers to these industries will need to follow suit.
- Second, history offers some useful lessons about the efficacy of national steel industries. Several of them have had to be privatized in order to operate efficiently.
- Third, it is very unlikely that antitrust legislation would allow the formation of such large players.

It may be a useful exercise, nonetheless, to estimate the cost synergies that might be achieved through such extensive regional consolidation. Cost synergies for previous mergers of steel companies that were approximately equal in size have typically

**EXHIBIT 10**  
**THERE IS A CLEAR CONSOLIDATION TREND**  
**IN WESTERN EUROPE**



been in the range of 2 to 3 percent of combined revenues. Estimated on the basis of a scale curve calculation, the cost position of a hypothetical European Steel Corporation, American Steel Corporation, and Japanese Steel Corporation supplying their respective regional markets would be as much as 10 percent better than the cost positions of today's major regional steel companies. This calculation does not take into account any cost reductions that could result from rationalization efforts that the individual companies might undertake without consolidation, nor does it account for synergies still to be realized in the coming years by large integration efforts already in progress, such as Arcelor and JFE Group.

In our view, while it is improbable that regional monoliths will come to dominate the industry, some degree of regional consolidation is a logical, if insufficient, next step. The integration of companies that operate in the same markets and cultural environments and that know each other quite well can help resolve legacy issues and also realize cost synergies. It is more realistic to assume that regional consolidation may lead to the formation not of monolithic entities but of companies that would control 30 to 40 percent of their respective regional markets. We estimate that such companies might achieve cost reductions of 4 to 6 percent compared with today's costs. Arcelor and JFE Group are already addressing a part of this potential.

### Specialization and Downstream Migration

Most steel companies seek to maintain their profit margins by either specializing in some way or migrating their activities downstream. Specialization, for instance, might take the form of acquiring competence in a variety of materials, in addition to steel. For example, despite the growth of the automotive industry, steel usage in automobiles will shrink by at least 10 percent through 2010 as auto designers reduce body weight, substitute aluminum and plastics for steel, and expand the use of high-strength steel grades. Therefore, today's steel, aluminum, and plastics companies will increasingly have to support OEMs with know-how

in the application of materials in order to maintain their position.

Many of these companies recognize that they need to learn how to become development and engineering partners for the OEMs, involved early in component design. Some are already moving in this direction, but they still have a long way to go. In general, materials specialists should focus more on their direct customers' need for solutions than on further development of any individual material—whether steel, aluminum, or plastic.

As steel companies face declining market volumes in their core businesses, downstream migration—moving from producing the less technically challenging grades of steel to processing semifinished steel products, manufacturing parts and components, or providing distribution, logistics, and engineering services—offers an increasingly attractive growth opportunity. Voestalpine in Austria, for example, is supplying tailored blanks, pressed body parts, and other components to the automotive industry—as well as rails, turnouts, and other components to the railroad industry. ThyssenKrupp in Germany has developed its automotive division into one of the world's leading automotive suppliers, providing components and systems for the chassis, body, and power train.

Companies that are considering a move to supplying components should be aware of the business's distinctive requirements. The capabilities needed for developing, delivering, and integrating proprietary components into more complex systems can be very different from those in a steel producer's skill set, which are typically based on production processes. Also, extending the value chain toward the downstream end usually means competing, at least in part, with former customers. This strategy must be thought through very carefully.

At its logical extreme, the downstream migration strategy is a bold move to achieve *escape velocity*—that is, to transform the company's portfolio so radically that the company is no longer perceived as primarily a steel player. Two companies that have managed this transition (over a period of decades)



are Carpenter Technology in the United States and Sandvik in Sweden. Carpenter is now a materials specialist for the aerospace and automotive industries, among others. It supplies not only stainless steels (approximately 40 percent of its sales volume) but also nickel and titanium alloys, as well as ceramic materials. Sandvik has become a leading manufacturer of carbide cutting and drilling tools. Only one of its three divisions remains in the steel business, and it focuses on highly specialized stainless and high-alloy steel products. Although “breaking out” of a steel index is very difficult, the stock markets have clearly awarded higher multiples to these companies, reflecting their image as materials specialists.

Companies that wish to pursue an escape-velocity strategy need to address two basic questions:

- In their new downstream or specialties business, how can they help their customers differentiate themselves, and how can they have a major impact on their customers’ cost position?
- What should they do with the commodity part of their old upstream steel business? Can they (at some point) separate that part of the business completely from the downstream or specialty business? Would it be better to sell the upstream production of commodity steel or to keep only those parts that are most critical to the process?

To succeed in escaping the bulk steel business, companies will need to find answers to both questions. In our view, the companies best positioned to pursue this strategic path are the small and midsize players already occupying strategic niches today. In contrast, most companies with commodity-centered product portfolios are not likely to develop into multiniche companies because of their size and lack of capital resources.

## Deconstruction and Global Networking

Deconstruction of the value chain is a common phenomenon in many basic industries, including paper, oil, plastics, and energy. Whenever the required sets of key capabilities differ between the

upstream and downstream ends of the value chain, a deconstructed industry can open up opportunities for new business models focused on the requirements of just one part of the previously integrated chain. Steel offers just such an opportunity.

In terms of production planning and control, steel manufacturing is a divergent process. That is, the range of product specifications increases progressively over the different production steps. It is not unusual for a typical integrated steel mill to supply

- several hundred slab or billet specifications of different grades, widths, and lengths
- several thousand hot-rolled specifications—for example, for flat products of different grades, widths, lengths, and gauges (not including, among other things, differences in coiling temperature specifications)
- tens of thousands of cold-rolled and surface-treated specifications

Because of this divergence, a company taking a greenfield approach could minimize steel production costs by separating the less complex upstream production of standard-grade semifinished steel (slabs, billets, or even hot-rolled coils) from the more customized downstream production.

Such a separation would make economic sense because the two ends of the steel value chain have such different business models. Whereas the upstream end is driven primarily by cost and scale, the downstream end offers greater opportunities to achieve competitive advantage through differentiation. At this end, smaller submarkets are willing to pay for products with higher added value. Therefore, scale-sensitive costs for such factors as raw materials, energy, and depreciation become less important, while proximity to customers offers significant opportunities to erect customer-specific competitive barriers. These barriers include customized products, engineering support, special logistics services, and joint R&D.

Today many companies—including Arcelor, Corus, Voestalpine, and U.S. Steel—have invested in build-

ing up engineering skills to develop tighter bonds with their important customers. Some companies have wooed major customers by forming customer-specific engineering groups of up to 100 people, launching new design and development centers, and forming technical support teams.

Because of the differences between the upstream and downstream ends of the steel value chain, a “division of labor” approach between, for example, a low-cost offshore producer of slabs and a highly differentiated conversion specialist could reduce the cost of steel products substantially. Thanks to factor and scale advantages, the most efficient producer of standard-grade slabs or hot-rolled coils would be a large offshore plant with optimal access to raw materials, low labor costs, and efficient outbound logistics. Ideally, such a producer would work collaboratively with a variety of producers of specialty grades, as well as with a network of local conversion plants located close to their most valuable customers and deploying an optimized logistics system.

Such a combination would clearly constitute a new type of steel player with substantial competitive advantage. If a new competitor of this kind were to exploit fully all the efficiencies of cross-regional cooperation across the length of the value chain, we estimate that it could achieve a cost advantage of 10 to 20 percent, compared with today’s best regional players.

Despite the powerful savings this model offers (and although many large players have acquired stakes in steel makers in other regions or formed joint ven-

tures to enter foreign markets), there is today no real deconstruction-based player with an interlinked, cross-regional production network. Why has no company yet made such a strategic move? In addition to the high up-front costs involved and the risk of political opposition, a major deterrent has been fear of supply shortages. Letting go of proprietary capacity means becoming dependent on one or more suppliers of semifinished steel.

Concerns about shortages can be allayed in various ways, including outright ownership and long-term contracts. When Usinor decided to build a new cold-rolling and galvanizing plant in Vega do Sul, Brazil, to supply the local “big four” of the automotive industry, it could count on a reliable supply of hot-rolled feedstock from the Brazilian producer CST, in which Usinor owned a controlling stake. Moreover, recent examples of European companies buying slabs on the global market after internal supply problems, such as blast furnace accidents, indicate that supply—at least on a spot basis—may be more abundant than companies have traditionally assumed. There could be substantial opportunities to secure such supply through long-term contracts, thereby linking it to facility-rationalization and capital-planning strategies, and achieving the kind of deconstruction described above.

The steel company bold enough to create the first cross-regional division-of-labor or feeder network stands to gain a considerable competitive advantage. However, it is unlikely that the industry will develop very far in the direction of global networks until there is an economic and political framework in place to ensure a reasonably safe transition.



## THE CHALLENGE FOR LEADERSHIP

The past 20 years clearly show that the worldwide steel industry will not create value by continuing to pursue its traditional path. In order to overcome the structural impediments to value creation, the industry needs to change the established rules of the game. The solution lies in reducing fragmentation and moving toward a more consolidated industry, one in which the key players' shared understanding of the underlying drivers of value creation will contribute to a more rational use of assets. Benefits will include improvements in overall efficiency, reductions in overcapacity, and the reduction of acts of desperation by individual players.

Preparing the ground to achieve these benefits should in no way be interpreted as collusion or any other questionable form of cooperation. Other basic industries—including paper, aluminum, and glass—are much further advanced in their consolidation and globalization processes than is steel today. As a result, they can create considerably more value for their stakeholders.

### Implications for Steel Companies

As consolidation progresses, individual steel producers must fully understand their strategic options. To seize the initiative and play the role of an active consolidator—either within a region or across regions—a company will need deep financial resources, a stable cash flow, integration capabilities, and a clear view of strategic opportunities.

Naturally, large players will have more influence on the overall industry landscape than small players.

However, smaller companies that are well positioned within a strategically important steel business segment—particularly one with defensible competitive barriers—may find it rewarding to consolidate and thus stabilize the segment.

Companies that don't have the resources to play the role of an active consolidator should assess their options for either being acquired or selling parts of their portfolio. A new co-owner may be better positioned to develop the joint business.

In summary, our recommendation to the CEO of a steel company would look like this:

- Segment your business portfolio into commodities and differentiable products and services
- Evaluate the opportunities to achieve escape velocity in the differentiable businesses and to consolidate or be consolidated in the commodity businesses
- Allow differentiable businesses to develop independently and favorably by separating them from the bulk business wherever possible
- Prepare to participate in global alliances by establishing relationships with potential partners and by learning from cooperative efforts in small business areas, where the risk is manageable
- Monitor all activities that could promote the development of global alliances—such as long-term supply contracts, e-commerce platforms, and financial derivatives of steel products—and participate in those that fit your strategy

## Implications for Industry Regulators

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For the worldwide steel industry to forge a viable future, it will need political support. To date, however, industry regulators have focused on the symptoms of the industry's ills, rather than on the underlying causes. Moreover, in many cases the solutions they have put forward—primarily tariffs, quotas, trade barriers, and subsidies—have offered only local, short-term benefits and have exacerbated the very problems they were intended to solve. It is time for industry regulators, like the steel companies themselves, to address the industry's fundamental structural challenges: reducing overcapacity and promoting consolidation.

**Reducing Overcapacity.** Regulatory bodies should consider subsidies or support programs only if they are designed to lower exit costs and thus contribute to capacity reduction. Similarly, grants for post-closure environmental-compliance and support programs must be contingent on permanent capacity elimination. Such support payments should be made directly to former steel employees and not to the companies that employed them.

Regulators should avoid measures designed merely to shore up continuing operations, such as loan guarantees, environmental compliance grants, or transfers of pension or health-care liabilities. Measures of this kind rarely contribute to capacity reduction; indeed, they ultimately destroy value.

**Promoting Consolidation.** Industry regulators should strongly encourage intraregional and cross-regional consolidation efforts. These efforts will reduce fragmentation and ultimately eliminate unneeded capacity. Intraregional consolidation, like that under way in Europe, can be a useful first step toward an optimized regional industry.

In the longer term, cross-regional consolidation can further improve the industry's structure. However, this approach will work only if regulators actively encourage the international trade of steel products and effectively mitigate the risks. So regulatory action should be designed to keep the risks of cross-regional cooperation at manageable levels.

Of course, consolidation must be subject to antitrust regulations. But even within that regulatory framework, the current low concentration of the steel industry leaves plenty of room for optimization. Because a major barrier to consolidation is high legacy costs, one approach might be to lower exit barriers by spreading legacy costs across the global industry. For example, the world's largest steel companies as a group might create a global fund to pay down legacy liabilities, thus opening the door to consolidation and the elimination of excess capacity.

Another barrier to consolidation is government ownership, especially in Asia and Eastern Europe. We recommend that governments strongly support further privatization to reduce their ownership of steel company equity.

In the long run, in the high-volume segments and markets, we expect that some eight to ten international companies, each with a highly optimized structure of plants and logistics, will supply standard steel grades. In addition, we expect to see a broader spectrum of a few dozen specialist companies supplying smaller volumes of sophisticated products in combination with further value-added services, such as collaborative development and engineering and more complex logistics services.

## Conclusion

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The future of the global steel industry is in the hands of its key players: the companies that produce the world's steel and the regulatory bodies that govern its trade. We are convinced that the industry has a real opportunity to undertake a radical transformation—one that will render it leaner, more efficient, and more profitable.

This transformation will require shared insight and understanding, as well as a huge amount of vision, determination, and courage. It will also require strong leadership to implement bold new value-creation strategies. For the industry to develop in a positive direction, this is the work that must be done. We hope that this report will make a contribution to that process.

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