Solving Steel’s Value-Added Riddle
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The widespread belief in the global steel industry is that adding value—by developing products with advanced metallurgical properties or moving further downstream in manufacturing—boosts profitability. New BCG research suggests otherwise.

**The Move to Add Value**
A close look at the industry’s weighted average cost of capital (WACC) shows that return on invested capital (ROIC) often does not cover the industry’s capital costs and, therefore, create economic value. To address this, producers around the world have been moving into a higher level of added value in their product mix.

**Adding Value Is Not Sufficient**
Despite significant variation among four key regions—China, North America, Europe, and developed countries in Asia—all have one thing in common: a lack of correlation between profitability and the value that is added to steel products.

**Seeking Differentiation**
Discontinuing the effort to add value would not only fall short as a strategy but also threaten companies’ survival. A variety of value-added strategies, large and small, can help steel producers differentiate themselves from the competition.
The conventional wisdom in the steel industry today is that adding value by developing products with advanced metallurgical properties or by moving further downstream in the manufacturing process is a clear route to higher profitability. European manufacturers in particular are racing to manufacture high-strength steel for their automotive clients, following the value-added path in the hope of leaving commodity-level profits behind.

Yet a new BCG analysis reveals that focusing on adding value does not generate superior results for steel manufacturers. Many of the producers that have taken risks and invested substantial sums in the effort now find themselves selling pretty much the same high-value-added products as their competitors—eliminating the opportunity to earn back their cost of capital through premium pricing.

There are good reasons for the trend toward higher levels of added value, and reversing that trend is not an option. In industrialized economies in particular, customers have come to expect added value; a steel player that eliminated or reduced added value in its product mix would soon be left behind by the competition. As a result, steel producers face a difficult riddle: how to boost profitability while continuing on their current path. We offer a number of ways steel companies can begin to solve this riddle.

Steel Returns Are Insufficient

The steel industry’s profitability has deteriorated worldwide since the financial crisis of 2008–2009. During the 2002–2008 economic boom in China, the global industry generated an average EBITDA margin of 16%. However, demand for steel has since slowed worldwide, and the industry now suffers from overcapacity, mainly but not exclusively in China. As a result, the growth of the global steel industry has slowed, from 8% per year before the financial crisis to less than 2% per year in today’s “new normal.” Although we find differing regional patterns, EBITDA margins generally declined to a more-or-less stable industry average of 8% from 2011 to 2015 before recovering to 11% in 2016 and then rising slightly to 12% to 13% in the first three quarters of 2017.

While producers may feel, given these EBITDA margins, that they are doing well enough on their current path, steel making is very capital intensive and therefore requires a comparatively high return on invested capital (ROIC). In fact, when we look closely at the industry’s weighted average cost of capital (WACC), more often than not we find that ROIC is no longer enough to cover capital costs and create economic value. (See Exhibit 1.)
The industry’s insufficient ROIC is mostly the result of an unfavorable supply–demand balance, whether because of regional overcapacity or high net imports. As a consequence, asset utilization is relatively low and the fixed costs per ton of steel produced are high. Moreover, the steel industry is much more fragmented than both its raw materials suppliers and some of its primary customers for a high-value-added product mix. This fragmentation leads to limited bargaining power on both ends of the supply chain—particularly at low utilization.

Comparing Added Value to Profitability
The steady move to higher levels of added value in the product mix in response to this difficult situation, most pronounced in Europe and developed Asian countries, is based on the firm belief that this move boosts profitability. It’s a belief that has been reinforced in recent years by a few success stories.

However, investing in production facilities to, for instance, produce steel with advanced metallurgical properties or steel that is rolled and coated, is a major strategic move, one that involves significant investment as well as market risk. Any decision to do so should be backed by considerable profitability expectations. So while the logic of adding value seems plausible—and the industry seems to have accepted it—is it true?

We analyzed the relationship between added value and profitability in the steel industry, collecting data from 2002 through 2016 on a representative set of 77 steel business units from 63 steel producers—both long and flat carbon steel manufacturers from around the world. For each company, we compared the value added and the profitability of the steel business unit on an annual basis. To ensure that we tested this relationship comprehensively, we measured whether a product mix with a high level of added value leads to higher profitability and then analyzed two technical components of added value that may increase profits. To avoid issues of comparability, we excluded from our analysis business units that produce pipes or engineered components, as well as the mining subsidiaries of steel players.
For both analyses—the influence of product mix and the influence of components of added value—we used EBITDA margins (EBITDA divided by total revenue) as our proxy for profitability to ensure that we compared the results on a relative basis.

**Product Mix.** The influence of product mix on profitability in the steel industry can be measured indirectly as the markup of a steel producer’s product over the price of a standard product. For our purposes, we defined added value as the absolute difference between the average sales price per ton of a producer’s product mix and the annual average regional price of a defined standard product. As base products, we used hot-rolled coil (HRC) for flat steel and wire rod for long steel. For companies with mixed portfolios (those that include more than 25% of both flat and long steel), we used the average of the two. Following this logic, the added value reflects the perceived value of a companies’ product mix above the base product’s value, regardless of the source of that value—be it metallurgical composition, downstream processing, or additional services.

**Components of Added Value.** To ensure comparability when analyzing the components of the added value that may increase profitability, we included only companies that dedicate at least 25% of their steel production to flat carbon steel. For these players, we disaggregated the value added to their products into the two technical components they employ: metallurgical enhancement processes and downstream processing (companies typically apply a combination of the two). Value-enhancing metallurgical characteristics include a high cleanliness of the steel—that is, the absence of nonmetallic inclusions and unwanted elements—and minimal deviations from the desired chemical composition. Downstream processing includes a series of rolling and heat treatment steps.

For this deep-dive analysis, we used an average of data for 2014 to 2016 from two samples: a global sample and a subsample that includes only steel companies from Europe and developed Asia (defined here as Japan, South Korea, Taiwan, and Australia, or JKTA), since the countries in this subsample are the most advanced in terms of the level of added value in their product mix.

For both samples, we used the percentage of crude steel capacity that can be vacuum degassed as a proxy for the level of metallurgical enhancement. When that percentage for a company was above the median of its sample, we classified the company as a value-added player. We classified companies below this threshold in the commodity group. To assess the value added from downstream processing, we used the percentage of HRC capacity that has associated metal-coating capacity—that is, capacity for hot-dipped galvanized steel, electrolytically galvanized steel, or tin-plated steel. When that percentage was above the median, we placed the company in the category of value-added players; we placed companies below the median in the commodity group.

We have excluded from our analysis several factors that can influence profitability. These include services, trade flows, and variations in utilization levels. However, we were able to eliminate some of the bias that might have been created by these factors by analyzing a representative peer group and then running four regional analyses, allowing us to look at subsamples that faced similar market situations.

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The logic of adding value seems plausible—and the industry seems to have accepted it—but is it true?
Does Product Mix Affect Profitability?

To find out if product mix affects profitability, we created a correlation matrix to illustrate our data set. The farther to the right of the matrix that a company appears, the more value that company adds throughout its product portfolio. The higher that a company appears, the higher its profitability. The horizontal line illustrates the average value added by the industry; the vertical line shows average EBITDA margins from 2002 through 2016. The outcomes of this global analysis are surprising. As Exhibit 2 shows, the resulting matrix has a densely populated center. However, we do not see any clear indication of a relationship between the level of added value in the product mix and EBITDA margins. This result holds true across regions, when comparing both flat and long carbon steel, and when looking at boom years and more recent “new normal” years.

We do find significant variations in the relationship between added value and EBITDA margins among the four regions in our analysis—China, North America, Europe, and JKTA. These variations are mainly the result of economic and political factors and stages of economic and technological development. China and North America generally have a low-value-added product mix and below-average profitability, whereas in Europe and JKTA, the full range of manufacturing operations can be observed, from commodity producers with high profitability to high-value-added producers with low profitability. Still, all four regions have one thing in common: the lack of correlation between profitability and the level of added value in the product mix. (See Exhibit 3.)

**China.** Our sample of Chinese companies, which consists only of large, listed steel producers, is mostly in the low-value-added and low-profitability quadrant. The industry in China has a relatively low share of high-quality steel-making equipment and downstream processing. This reflects the country’s economic development

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**EXHIBIT 2 | There Is No Clear Link Between Added Value and EBITDA Margins at the Global Level**

![Graph showing correlation between added value and EBITDA margins](chart)

**Sources:** BCG Steel Financial Model; S&P Capital IQ.

**Note:** Only carbon steel companies included; pipe and engineered-components business units excluded. Negative added value indicates a lower sales price than the average price for a corresponding standard product, such as when semifinished steel is part of the product mix.

1Developed Asia includes Japan, South Korea, Taiwan, and Australia.
status as well as its end customers, most of which require long steel for infrastructure and construction. Hence, the Chinese market seems to be in line with the conventional wisdom that a product mix with a low level of added value is relatively unprofitable.

Additionally, China’s explosive 15% annual growth in demand for steel in the decade before the global financial crisis has slowed to 2.5% since the crisis, and we expect growth will more or less stagnate over the next few years. This slowdown has revealed the massive structural overcapacity in the region, which has led, in turn, to low utilization, high exports, and low profitability for the industry.

**North America.** Perhaps surprisingly, the positioning of North American companies, and US companies in particular, in their regional value matrix is comparable to that of Chinese companies, in the low-profit and low-value-added area—although North American companies would be positioned to the upper right of the Chinese group. And on further inspection, we find that the North American steel industry does indeed have a relatively low share of value-adding equipment, such as vacuum-degassing capacity, compared with the rest of the industrialized world.

While there are some US companies that have a higher-value-added product mix, even they do not seem to achieve profitability levels significantly higher than those of other players. This can be explained in part by the relatively high cost of steel making in the US and by the resulting high spread between US prices and those in many other countries, which has turned the US into an attractive export destination. Although technically speaking the US should be able to fulfill its domestic steel demand with domestic capacity, high imports have led to low overall capacity utiliza-

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**EXHIBIT 3 | There Is No Clear Link Between Added Value and EBITDA Margins at the Regional Level**

Sources: BCG Steel Financial Model; S&P Capital IQ.
Note: Only carbon steel companies included; pipe and engineered-components business units excluded.

1Developed Asia includes Japan, South Korea, Taiwan, and Australia.
tion. This, in turn, has put pressure on domestic players and has made it difficult for them to realize higher profits for their products.

**Europe and Developed Asia.** Producers in both Europe and developed Asia are spread across the matrix in terms of both added value and EBITDA margins. Both groups also show a familiar trend: companies that focus on adding value do not generate superior profits.

**Do Any Value-Added Components Affect Profitability?**

After discovering that a high level of added value in the product mix does not generate greater profitability overall, we analyzed the overall sample and four subgroups to determine whether there may still be some value-added components that do boost profitability. First, we calculated the average profitability of our sample companies for this part of our analysis (those with over 25% of production in flat carbon steel). Second, we analyzed the profitability of companies in this sample that have a high share of vacuum-degassing capacity, using this as a proxy for superior metallurgical capabilities, and compared that with the profitability of the remaining companies. We then did the same for companies with a high share of metal-coating capacity, a proxy for downstream capabilities. Our results are shown in Exhibit 4. We performed this analysis on a global sample and a subsample that included companies in Europe and developed Asia.

**The Global Analysis.** In the global analysis, we found no difference in profitability between companies that have high value-added capabilities and those that do not. For vacuum degassing, both groups (those below and above the median 33% share of vacuum degassing) had an average EBITDA margin of 10% to 11%. Likewise, for metal coating, both groups (those below and above the 18% median), had an average EBITDA margin of 10% to 11%.

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<th>EXHIBIT 4</th>
<th>Results Indicate That Value-Adding Components Do Not Directly Boost Profitability</th>
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<td><strong>AVERAGE EBITDA MARGIN 2014–2016 (%)</strong></td>
<td><strong>AVERAGE EBITDA MARGIN 2014–2016 (%)</strong></td>
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<tr>
<td>Overall peer group</td>
<td>High vacuum degassing</td>
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<td>10.4</td>
<td>10.3</td>
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**Sources:** BCG Steel Financial Model; Plantfacts; S&P Capital IQ.

**Note:** Overall peer group includes companies that have more than 25% of production in flat carbon steel; pipe and engineered-components business units excluded.
These results indicate that offering value-adding enhancements does not boost profitability in the global steel industry. We see this as a serious issue in today’s market, as steel players are unable to realize a margin uplift when investing in such capabilities. Perhaps it is virtually impossible to charge a premium for products with added value, given customers’ high consolidation and resulting market power.

While we did not analyze other factors influencing the relationship between added value and profitability, such as services, the EBITDA margins of all five samples—the overall sample and four subgroups—in our analysis are comparable. It therefore seems unlikely that steel players can realize sufficiently high prices for services in order to achieve profitability that is much above average.

The Regional Analysis. Given that a value-added strategy is popular in many developed countries, we analyzed the players in those regions—Europe and JKTA in particular—more closely. In this high-value-added subsample, the median of production dedicated to vacuum degassing was 57% and the median for metal coating was 38%. Our analysis again found no significant difference in EBITDA margins between companies in these regions that do significant vacuum degassing and metal coating and those that do not. Interestingly, however, the absolute level of profitability for the two regions diverged. Whereas our European sample achieved below-global-median profitability levels of 7% to 8%, the JKTA players outperformed the global steel industry, with levels of around 12%.

One explanation for the difference could lie in the structure of the two markets. The JKTA steel industry is more concentrated. In South Korea, for example, three companies cover almost the entire market. Combined with high export shares, this concentration may lead to higher profitability. In contrast, European steel producers have considerably lower market power because of high consolidation among their customers, along with a flat cost curve, cross-border competition, and detailed knowledge of steel producers’ cost structures in some customer industries. The European steel industry also faces significant overcapacity, a typical phenomenon among economies with decreasing steel intensity in their GDP; this overcapacity has been amplified by operational excellence programs that incumbent steel producers have run for decades, allowing them to become so productive that demand and capacity have gotten out of balance.

As a result, steel producers in Europe, particularly flat steel producers, find it difficult to negotiate higher prices in their primary value-added markets. They are therefore unable to monetize their superior metallurgical and technological capabilities. In fact, these effects are typical in highly efficient markets; in such an environment, no company is able to achieve superior margins for its products for any extended period. After one company introduces a product mix or technology with a high level of added value, others follow quickly, and new profit margins soon recede.

Macro-Political Changes May Help
We see macro-political changes that may increase the profitability of the steel industry in general.
For example, China is actively addressing its overcapacity problem. Capacity has already been reduced by more than 200 million metric tons (including substandard induction-furnace capacity) from 2015 to 2017, to slightly above 980 million metric tons at the end of 2017. These capacity cuts are having two major effects on the industry. First, they have already increased utilization to 80% to 85% in China, which, together with other large-scale initiatives, recently enabled local steel companies to realize sustainable profits and sell larger shares of their production to the Chinese market. Second, the cuts are reducing the price pressure on global steel markets from cheap Chinese imports.

The US government has been making active use of trade defense instruments, targeting specific products from specific countries with antidumping and antisubsidy duties. It is currently investigating further trade defense initiatives, such as Section 232 of the Trade Expansion Act of 1962, which authorizes the Secretary of Commerce to investigate the potential effects of imports of any product on the national security of the United States. Should these import restrictions be enacted as expected, they would tip the supply–demand balance in favor of US steel players and allow them to sell their products domestically at higher prices.

These initiatives may also have negative long-term consequences for the US steel industry. If the industry as a whole does not use the window of opportunity offered by trade defense measures to sufficiently increase its international competitiveness, it will be in a much more difficult situation should these measures eventually be lifted, as value-added exports to the US may become even more attractive for overseas players once US prices have increased. Furthermore, higher steel prices for manufacturers of products that contain steel may render these products uncompetitive relative to imports, which could ultimately decrease steel demand in the US.

**Corporate Initiatives to Consider**

While such broad political changes may help the industry overall, steel companies can also pursue various initiatives—both small and large—that will allow them to differentiate themselves from the competition in a sustainable way.

**Small-Scale Initiatives.** One promising small-scale strategy is to reduce price pressure by moving into several niche markets that few others have entered. These could involve products or services that are adapted to specific customer requirements. Examples are quenched and tempered plate, which requires specific process know-how; steel-based products that require an engineering component; and specific equipment, such as extra-wide plate or steel produced at the lowest tolerances. In addition, companies might charge for extra services, such as the provision of customized digital certificates that document the adherence to required quality levels.

Certain technologically strong companies could also consider selling their intellectual property (IP) for value-added technologies, products, or services. Several players in the industry have already developed specific strategies in this vein, selling their IP to developing countries in strategic partnerships, joint ventures, or other cooperative models. This strategy seems to be especially popular in JKTA, where we observe several examples of this type of cooperation.
**Large-Scale Initiatives.** Steel companies that want to achieve substantial differentiation need to follow strategies that either call for greater capital investments or require a merger with another company. One approach is to complement any value-added product strategy with a value-added customer strategy. This is an important concomitant or precondition to success, given that these products often go to relatively sophisticated customers. Here, steel producers can improve the customer interface by investing in “smart” supply chain or digital opportunities. Such investments can allow manufacturers to make better use of their value-added capabilities on a commercial level. In addition, they can decrease overall complexity in the end-to-end production process by generating a superior understanding of customer needs and supporting the development of tailored solutions, improved planning, and the fit and pricing of products to better meet market demand.

Another approach, one we currently see in Europe, is the consolidation of value-added steel players. After several consolidation rounds in recent decades, in fact, only one flat steel champion remains in many countries. These national champions compete across borders, creating an oligopoly market. However, we believe that even further consolidation will take place, as major players are already planning to join forces. It is too early to say whether this consolidation wave will lead to capacity reductions, greater pricing discipline in the market, or an increase in negotiating power for steel players relative to their large customers, since they will still have an enormous share of commodity products, and large companies are not necessarily the most agile in R&D. However, it certainly offers an opportunity for companies not only to reduce industry overcapacity but also to create advantages over competitors.

A third approach that is already creating substantial advantage deals with a change in production technology. We have observed minimills in the US that are investing in modern flat steel capacity, thereby creating a domestic source of competition that targets products and end-use markets traditionally served by integrated suppliers. With their lower cost and greater flexibility, these minimills are beginning to take market share in the appliance and automotive steel markets. Initial signs indicate that this model can work outside of the US as well. For example, a leading producer of high-quality products in Europe is considering replacing its integrated upstream capacity with a flat-steel-producing electric arc furnace in anticipation of increasingly strict environmental regulations. In the end, however, the success of this strategy may depend on the availability and cost of the high-quality direct-reduced iron that minimills require.

**Should Steel Companies Stop Adding Value?**
Given that adding more value to steel products does not generally increase profitability, one could argue that steel companies should stop trying to do so. However, we believe that would not only fall short as a strategy but also have dramatic consequences, putting companies’ very existence at risk. For one, market participants are used to a given level of quality and innovation, and it is doubtful they would accept less. No customer would buy outdated steel grades, for example, if a newer, better grade were available at a similar price. Similarly, large customers are unlikely to accept a lower level of added value in their products, just as their own clients would not accept products and services that are of lower quality than those they could
find elsewhere. And competitors that continue to add value would soon leave behind any lagging player. Adding value can therefore be perceived as a move to preserve the right to play, not solely as an effort to enhance profitability. Without a high level of added value in the product mix, the steel industry in developed markets could become superfluous.

In addition, although adding value may not lead to superior bottom-line performance, it can lead to other, nonmonetary benefits. For example, the constant pressure to improve and enhance their capabilities can keep steel companies on their toes and ensure a certain level of agility, an important characteristic for survival in today’s demanding environment, given that most initiatives do not influence profitability for very long. As a result, new initiatives are continually needed if companies are to stay one step ahead of the competition and avoid the ever-present commoditization threat.

We’ve only just begun to solve the value-added riddle in the global steel industry. Our analysis disproves the mantra that adding value always leads to higher profits, yet steel CEOs and leadership teams will find there are few easy solutions. Only one thing is clear: steel companies will need to enhance their current value-added capabilities and determine new ways to differentiate themselves if they are to earn back their cost of capital and be competitive in the future.
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