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The current capacity shake-up in steel and how the industry is adapting

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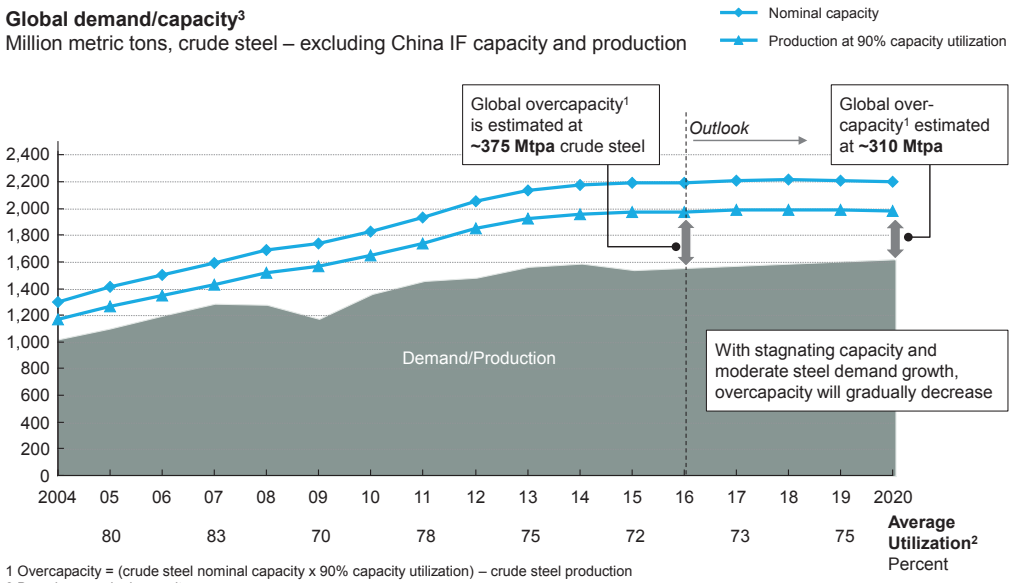
The current capacity shake-up in steel and how the industry is adapting

The early years of the new millennium were a profitable period for steelmakers, largely driven by the surging Chinese economy. Now, with China's growth slowing, a new reality has set in. Starting in 2014, growth in steel demand began to stall. The global industry, which had dramatically expanded production to meet perceived demand from Asia – at an average rate of 4.9 percent a year between 2004 and 2013 – now faces the typical post-boom challenge of excess supply. While the steel industry had reached its demand peak in 2013, capacity continued to expand all the way up to 2016 due to inertia of capital investment, adding another 60 million metric tons of worldwide capacity against a backdrop of falling demand. As a result, by the beginning of 2016, the industry had fallen into a severe crisis with too many plants producing too much steel relative to dwindling demand, and industry profits plunging to zero or into negative territory for the majority of players.

While the industry situation has improved quite markedly since then, surplus steel capacity is likely to remain a long-term problem. Despite this year's rebound in steel production, much of the demand growth is rather virtual, due to the impact of China shutting down its illegal induction furnace (IF) capacity and replacing it with production from legal plants. Globally, excess steelmaking capacity reached about 375 million metric tons per annum (MTPA) in 2015-16 (in addition to more than 100 million tons of illegal IF capacity in China). The excess is now projected to drop to around 300 MTPA towards the end of the decade (Exhibit 1), with total production capacity stabilizing at 2.2 billion metric tons by 2020. As a result, average plant utilization is expected to improve gradually, yet remain below 76 percent – a significant drop from the high of 83 percent 10 years ago, when the industry was at its peak.

EXHIBIT 1

Overcapacity in the steel industry is likely to continue for the foreseeable future



1 Overcapacity = (crude steel nominal capacity x 90% capacity utilization) – crude steel production
2 Based on nominal capacity
3 McKinsey capacity estimates (not OECD estimates)

SOURCE: McKinsey analysis

This overcapacity is especially pronounced in China, Europe, the Middle East, and North Africa. As the imbalances have resulted in poor industry economics, producers have felt compelled to turn increasingly to exports. The rise in exports has, in turn, been driving a new wave of trade disputes and protectionist measures. Since 2011, OECD statistics show

that anti-dumping and countervailing duty cases, many of them involving China, have been up five-fold for complainant economies and three-fold for defendants.

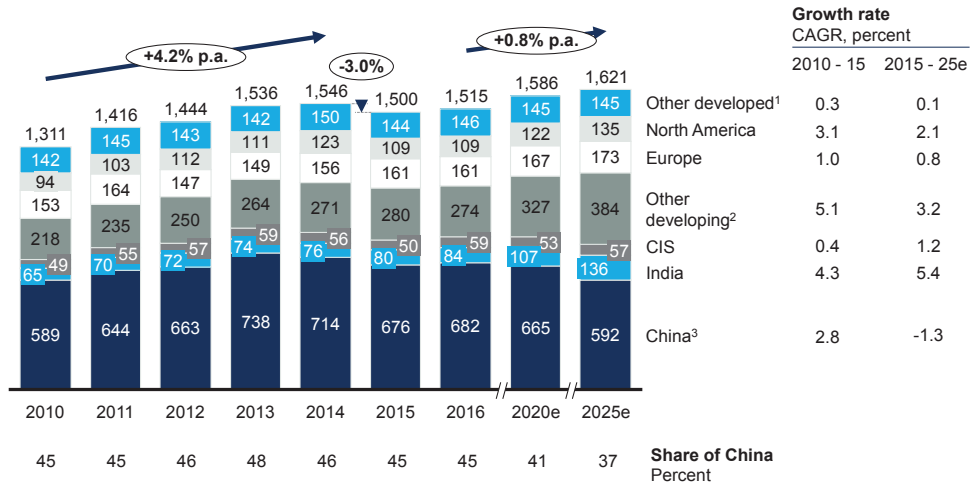
With demand expected to recover slowly – at just 0.8 percent per year on average from 2016 to 2025, the industry faces a volatile decade (Exhibit 2). The slowdown in China caught most industry players by surprise. Consolidation efforts in some parts of the world have been largely offset by continuing expansion elsewhere and, in some countries, state intervention has prevented closure of inefficient plants, distorting market dynamics. The result is a global industry that remains fragmented and ripe for further restructuring. So, how are steelmakers adjusting? What differences exist across markets? What moves could help the industry shape up or position an individual steel producer for success?

EXHIBIT 2

Global steel demand is expected to grow slowly at ~0.8% p.a., with significant downside risks

Apparent steel use/demand (August 2017)
Million metric tons

BASE CASE



	Growth rate CAGR, percent	
	2010 - 15	2015 - 25e
Other developed[1]	0.3	0.1
North America	3.1	2.1
Europe	1.0	0.8
Other developing[2]	5.1	3.2
CIS	0.4	1.2
India	4.3	5.4
China[3]	2.8	-1.3

1 Japan, South Korea, Taiwan, Australia and New Zealand
2 CIS, Latin America, Sub-Saharan Africa, Other Asia
3 Including Hong Kong

SOURCE: World Steel Association (worldsteel); McKinsey integrated steel demand model

The purpose of this paper is to provide a baseline overview and, in what follows, outline the implications of the overcapacity challenge for the global steel industry. Accordingly, for the main steel-producing regions, we analyze the prevailing market dynamics and assess the drivers, constraints, and conditions for industry consolidation, capacity rationalization, and return to economic profitability.

THE REGIONAL PICTURE

China: a rush to refocus and shrink a troubled industry

While the financial crisis and geopolitical tensions in Russia, Brazil, and elsewhere have all contributed somewhat to slowing global demand for steel, it is China that looms as the largest factor in the industry's current overcapacity. The country's industrialization and urbanization have been the main drivers of demand for steel since around 2000. However, China reached its peak for steel demand much faster than most developed countries ever had before, due to the government's focus on rapidly expanding urban and industrial

infrastructure. Likewise, the dip in the country's development trajectory also arrived much sooner than the historical norm. In 2014, China's demand for finished steel began to decline, dropping more than 8 percent to 676 MTPA by 2015 from the official peak of 738 MTPA. A slight recovery in 2016 has been followed by roughly 3 percent growth this year, but we believe demand will not return to the peak levels seen earlier in this decade. The reason is simple: China's per capita steel consumption is already well above the level in most developed countries, even during their peak years, and China's industrialization and urbanization cannot accelerate forever. With more people now living in cities, and China's economy going through services-led transformation, most likely the opposite will occur.

During the boom, China's own steel industry expanded rapidly. Today, nearly half of the world's 25 largest steelmakers are Chinese-owned. Many Chinese players – the vast majority of which are integrated producers of commodity steel – have been hit hard in recent years by the slowdown in their domestic market and, until last year, they lacked the funds to continue upgrading their facilities. This year, the industry has shown signs of recovery, but in light of continued overcapacity and fragmentation, the future for most producers is expected to remain challenging. In the last quarter of 2015, EBITDA margins of Chinese steelmakers dropped by 14 percentage points on average from an already low 5 percent in early 2015, resulting in a negative cash flow for most of the domestic industry. The moderate rebound in the past 2 years has helped publicly listed Chinese players recover to pre-2015 margin levels. However, with no significant improvement in demand on the horizon, China's overall steel sector remains oversupplied, and its economics will stay mediocre at best.

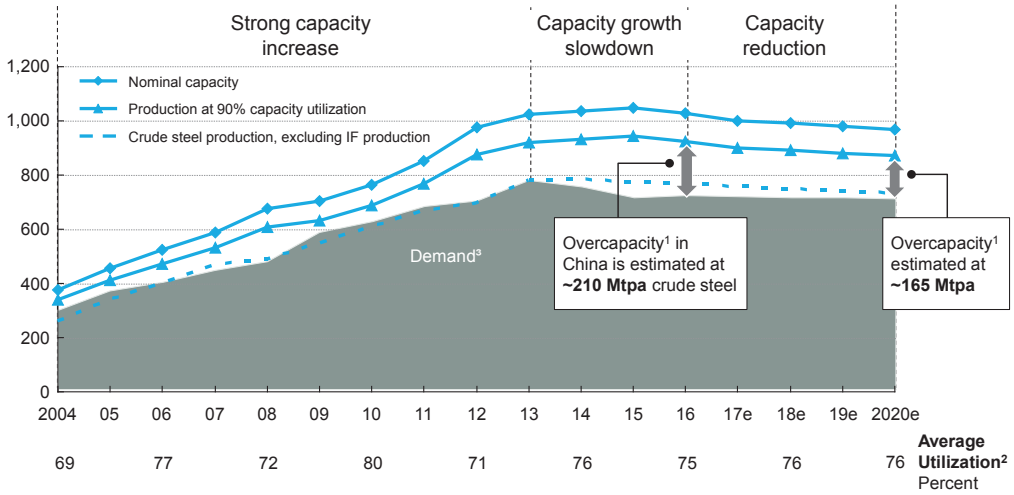
It has long been the Chinese government's policy to discourage the export of low-value-added steel and, instead, push the industry to focus on higher-grade products and specialty steel. Over the past 2 years, Beijing has been orchestrating the sector's restructuring, with the target of decreasing total capacity to less than 1 billion metric tons by 2020. Reaching that goal will require eliminating more than 100 MTPA of outdated capacity, above and beyond closing the outlawed IF capacity (see below). Growth in production capacity has slowed as a result, with new facilities largely offset by plant closures. While at least ten new plants were commissioned in 2015, there have been no new announcements since January of that year. In addition, in the first half of 2017, the Chinese government is believed to have closed most of the remaining illegal IF plants, which represented roughly 50 to 75 MTPA of "grey" steel production in 2016.

To promote industry consolidation, the government is pushing to close inefficient plants and providing funds for worker reeducation. In December 2015, President Xi Jinping announced, "To actively and steadily promote the survival of the fittest, we will clear the market through mergers and acquisitions, bankruptcy, and liquidation." Moves to eliminate capacity have so far been heavily concentrated in the eastern and coastal areas, especially in Hebei province. China is also keen on cross-regional M&A, as illustrated by the recent merger of Baosteel and Wuhan to form the China Baowu Steel Group. Nevertheless, despite the efforts to crack down on illegal production and shut down obsolete capacity, we expect China will continue to face excess capacity, as decreasing demand will likely keep pace with or exceed the rate of rationalization (Exhibit 3).

EXHIBIT 3

Overcapacity is likely to dog China's steel industry for years, as the impact of closures will be roughly offset by declining demand

China demand/capacity[3]
Million metric tons, crude steel



1 Overcapacity = (crude steel capacity x 90% capacity utilization) – crude steel apparent demand
2 Crude steel production/nominal capacity
3 Based on domestic finished steel consumption, assuming 95% crude to finished yield

SOURCE: China Iron and Steel Association (CISA); McKinsey BMI China Steel Demand Model Q1 2017

Faced with a tough market at home, China's top steel producers have been looking to exports to bolster sagging sales. Between 2009 and 2014, Chinese steel exports grew by about 90 million metric tons (MMTs). In 2015 and 2016 alone, the country exported a record 107 MMTs – roughly 14 percent of its total production. A significant share of these exports simply served to keep the Chinese plants operating; with improving domestic demand in 2017, however, China's producers have started to scale down their exports.

In an effort to protect their markets against dumping and unfair trade practices, several regions – the US and Europe in particular – have turned to trade measures. At this stage, 33 trade complaints have been filed in the US (up from 18 in September 2016), 14 of which target steel products from China. The trend is even more evident in Europe, with 11 of the 15 trade cases filed (up from 10 in 2016) relating to Chinese steel. Globally, the number of such complaints was around 160 in September 2017, compared to 100 in September 2016. With the increase in trade complaints, Chinese exports dropped by about 30 percent in the first half of 2017, compared with the first half of 2016.

Chinese steel companies, facing poorer growth prospects at home, are looking abroad for more than just export markets. Between 2013 and 2016, the industry cumulatively invested about USD 4 billion to acquire foreign assets. The primary targets have been in ASEAN countries and South Africa, where Chinese companies have pursued joint ventures in integrated steel mills and distribution centers. China's steelmakers are also seeking ways to extend their value chains and market presence in Europe, and trying to acquire technology that can help them shift to products with higher added value.

An important factor complicating the global oversupply issue is the growing availability of Chinese scrap, as steel products in the country reach the end of their life cycles and enter the recycling value chain. By 2020, if China continues to rely on basic oxygen

furnace (BOF) technology, it may have insufficient electric arc furnace (EAF) capacity to process all the scrap available domestically. In 2017 alone, China has seen a significant jump in surplus scrap following the crackdown and closure of IF capacity. Given that China has been by far the biggest importer of iron ore, its gradual shift to recycling scrap will have significant implications for the global steel raw material market. (For more on this topic, see: "The growing importance of steel scrap in China."[1])

To summarize, we believe that true demand is likely to continue to fall but not in a significant way (by roughly 1 percent, with potential upsides from the Chinese government's refocus on growth), while supply reform and industry consolidation are mostly likely to continue. Hence, the confrontation with overcapacity will remain a dominant theme, with potential for a comeback by "grey" capacity given margin upticks towards 10 percent that have occurred in Europe and the US in recent quarters . Still, China's regulation of its steel industry has intensified, and the industry is now generally much more under central government control than in 2015/2016. By 2025 or even as soon as 2020, we expect the steel industry to return to generating a profit margin similar to that of other industrial sectors in China, i.e., 3 to 5 percent.

Europe: accelerating consolidation to restructure the industry

The steel industry in Europe is pulling itself together. The drop in global steel prices has forced European players to restructure in order to remain competitive. The drop was partially due to the slump in regional demand from roughly 185 to 155 thousand metric tons per year (minus 17 percent in structural demand) and the surge in cheap imports from China, the Commonwealth of Independent States (CIS), and South Korea. The European industry's overcapacity in crude steel currently stands at 31 MTPA, which is in relative terms comparable with overcapacity in China. Unlike China, however, the European steel sector has already undergone considerable consolidation, but overall utilization is still not at an economically healthy level. The headline news in June 2017 was the deal ArcelorMittal reached to purchase Ilva and, in September 2017, the joint venture letter of intent signed by Tata Steel Europe and ThyssenKrupp Steel to combine assets within the next year. However, there is still a very long list of roughly 150 small and niche steel players in Europe, with an average production of less than one MTPA, suggesting substantial further potential for consolidation and industry rationalization.

While the downturn resulted in lower utilization, no significant closures took place, The pace of shuttering production has been slow, with only about 7 MTPA taken off-line in the past 3 years. Companies have tried to rationalize upstream capacity by making mainly incremental adjustments. Some plants changed the targeted production, idled single pieces of equipment, etc., but only two relatively large upstream sites were fully taken off-line in the recent years. As a result, the overall utilization stood at a low of 73 percent in 2016. If more consolidation and restructuring efforts take place, along with natural debottlenecking of existing facilities, we anticipate that European crude steel capacity utilization will recover to around 80 percent by 2020 in an optimistic scenario.

1 https://www.mckinsey.com/industries/metals-and-mining/our-insights/the-growing-importance-of-steel-scrap-in-china

The profit picture is mixed as well. In 2015, average EBITDA margins for European flat steel producers declined from about an already low 8 percent at the beginning of the year to below 5 percent by year-end, largely due to low prices combined with a surge of imports into the region, putting the industry as a whole into an unsustainable situation. Today, some specialty players are back to better financial health, while most of the larger producers continue to struggle financially [2]. In today's economic environment, most players can hardly finance any innovation capex, or develop their asset base.

The experience of the past years points to the emergence of a two-speed steel industry in Europe, with several reasonably profitable players with operational excellence, innovative product portfolios, and well-utilized production assets that are linked to specific market demand, while other players will continue to suffer until the excess capacity is finally phased out. As commodities will then remain the low-margin end of the market, those European players have to prepare to be a part of an increasingly global market and will need to ponder new sources of competitive advantage.

The region's players have been increasing their global market share recently, and benefiting from the recent growth in demand. For higher-value-added products downstream, rising demand may even create local supply/demand tightness in the coming years. Such tightening is already evident in the coated flat steel market, where capacity utilization in 2017 has already been approaching 90 percent.

NAFTA: US protectionism rises, while Mexico expands

The dawn of the Trump administration generated considerable optimism in the US steel industry. The new administration's ambitious plans to boost domestic steel demand and production with a focus on infrastructure, combined with increased protectionist action, have raised hopes of a revival in the American steel sector. Whether it can become the regional segment known for long-term competitiveness still remains to be seen. While demand is picking up, the market share of imports is also growing again (expanding from 25 percent to 30 percent in recent months). This increase suggests that US anti-dumping and countervailing duty measures are not as effective as desired, and most US players do not have cost structures that are lean enough to compete on a global scale.

The ongoing renegotiation of the North American Free Trade Agreement (NAFTA) is adding to the uncertain climate. The three NAFTA countries' domestic steel industries have vastly different cost positions, with Mexican steel producers benefiting from low production costs, while US companies face higher processing costs, mainly due to the relatively strong US dollar and relatively old asset base. In fact, over the past 5 years, the US and European steel players have swapped their positions on the cost curve, with Europe now boasting lower operating costs. This is due to higher operational efficiency, as well as a relatively weaker euro, and to the unfavorable exposure of some North American players to higher domestic iron ore prices. Furthermore, North America has seen limited M&A activity over the past 2 years (Canadian producers Essar Algoma and U.S. Steel Canada).

The United States has been taking action to protect its steel industry against what it sees as unfair trade practices from both Asia and Europe. The main efforts involve implementing higher tariffs and initiating investigations of imports under the national security provisions of Section 232

2 Based on historic assessment of EBITDA margins for different steel companies

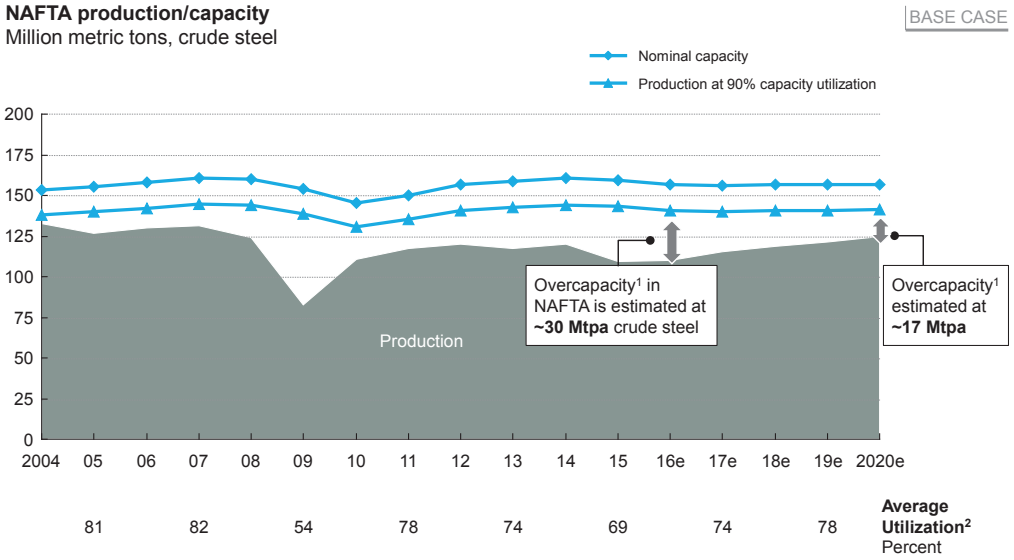
of the Trade Expansion Act. In 2016, the US imposed anti-dumping duties on hot-rolled coil steel, for example, that ranged from 5 to 9 percent for South Korea and up to 184 percent for Russia. The measures led to a sharp 34 percent drop in steel imports in 2015, but import volumes have since recovered. While a better environment since the first quarter of 2016 has helped US companies improve their profitability, most of the integrated steel players still lack the cash for investments needed to remain viable in the longer term.

The outlook for steel demand growth in the US remains uncertain, although a roughly 2 percent annual growth rate could be expected in the next 5 years (from the 2016 low) in the wake of projected US GDP growth of more than 2 percent annually based on increasing consumer confidence and strengthening investment activity. However, this outlook is subject to political uncertainty around tax reform and infrastructure projects as well as oil price dynamics.

Yet even as capacity reduction continues, albeit slowly, in the US and Canada, the Mexican steel industry is expanding, enjoying its status as the region's low-cost producer to boost volumes of specialty products targeted at its NAFTA partners. The combination of these somewhat contradictory national trends within NAFTA leads us to conclude that NAFTA crude steel utilization will recover gradually to about 78 percent by 2020 from the recent low of 69 percent in 2015 (Exhibit 4).

EXHIBIT 4

NAFTA crude steel utilization will gradually recover to 78%, after taking a dip at 69% in 2015



1 Overcapacity = (crude steel capacity x 90% capacity utilization) – crude steel production
2 Crude steel production / nominal capacity

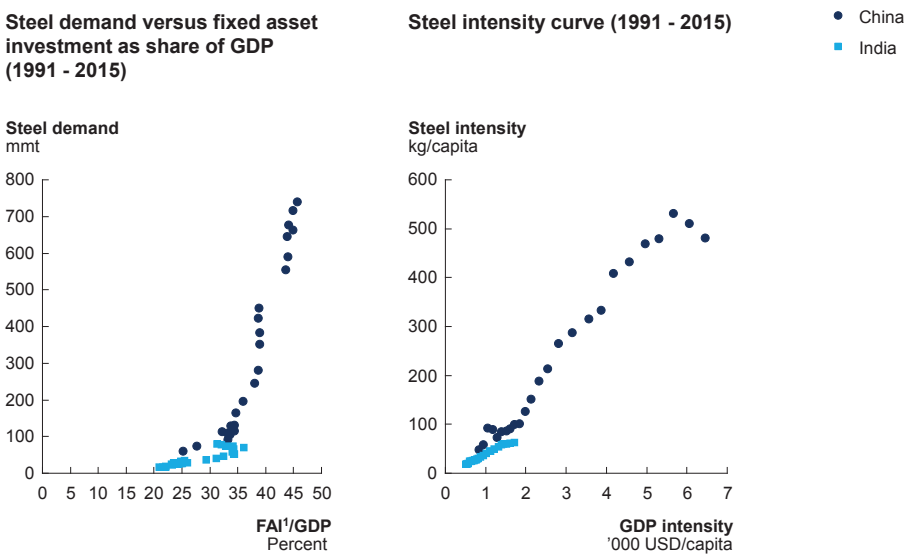
SOURCE: World Steel Association (worldsteel); McKinsey steel capacity database and metallics model

India: steady incremental growth, but challenges remain

Through roughly the first decade of the millennium, India saw rapid growth in domestic steel demand. Averaging 8 percent per year, this growth was primarily driven by infrastructure expansion and urbanization. In 2012, however, an economic downturn caused that growth to slow to less than 4 percent per year. An improving economy beginning in 2014 has produced average annual GDP gains of 7.2 percent, but steel demand growth has largely failed to budge. Recent policy measures such as the November 2016 demonetization created further aggravation (all existing 1,000 and 500 rupee bills ceased to be legal tender and were subsequently replaced with new bills, in a somewhat turbulent transition). The implications for steel makers were a liquidity crunch and a contraction in major steel-consuming sectors such as construction. As a result, steel demand grew by only 2.7 percent in 2016 (Exhibit 5).

EXHIBIT 5

Compared with China, India has a different growth path, as its economy is less centralized, and steel's contribution to the overall economy is different



1 Fixed asset investment

SOURCE: World Steel Association (worldsteel); IHS Markit Economics and Country Risk; McKinsey analysis

Between 2005 and 2011, Indian steel companies launched major capacity expansions. Installed capacity grew from 75 MTPA in 2010 to 125 MTPA in 2016, a rate of 8.8 percent per year. As demand weakened in recent years, capacity utilization has fallen from the 90 percent peak levels before 2011 to less than 77 percent currently, creating a considerable surplus.

Cheaper imports from China, South Korea, and Japan have also negatively affected Indian producers. In response, the government has been trying to protect the domestic steel industry. In February 2016, for example, it gave the sector some temporary relief by imposing a minimum import price. The government also placed provisional anti-dumping duties on hot-rolled and cold-rolled products in August 2016, on wire rods in November 2016, and on color-coated rods in January 2017. These measures succeeded in pushing imports down by 38 percent last year (April 2016 to March 2017), from a peak of 12 MTPA in 2015.

Despite this relief, recent headwinds have taken a heavy toll on Indian steel players' balance sheets. Credit Suisse reports that the steel sector accounts for 15 percent or around

USD 28 billion of the country's total non-performing assets. Five steel companies account for USD 23 billion of that amount. Some interest has been expressed in consolidation, but without any results to date. Furthermore, the profitability of steel producers is expected to improve in the near term, given a somewhat improved global environment. These improvements have enabled Indian steel producers to increasingly tap overseas markets (from April to August 2017, there has been a 57 percent year-on-year increase in exports). Another reason for healthier profitability is a revival of domestic demand growth (increasing at a rate of 4.4 percent year-on-year from April to August 2017, up from 2.5 percent in the same period in 2016).

Driven by infrastructure and urbanization, steel demand in India is expected to grow in the near term at 5 percent to 7 percent a year to 110 to 115 MTPA by 2021. Combined with slower capacity growth than in the past few years, India's domestic industry can expect to see improved capacity utilization, rising from 77 percent in 2016 to 85 percent in 2021.

In sum, we expect India to continue its incremental steel demand growth. Its political and economic situation makes it unlikely that steel will follow a growth path similar to China's boom. As a consequence, we believe that India's role in the global steel markets will be less impactful than China's.

HOW STEEL PRICES ARE ADJUSTING: VOLATILITY LIKELY TO PERSIST

Steel price volatility is likely to persist over the coming decade. While there are several underlying factors, they should not be allowed to mask the need for further consolidation worldwide: even the periods of high prices will be relatively short and will provide only limited rewards to steelmakers.

Then there is also the question as to whether the price of steel is the right measure to use to monitor the market. Arguably, it is not, or not in isolation. Over time, we have found it useful to measure steelmakers' performance by also tracking the spread over raw materials prices. This spread is explained by two factors. First, there are fluctuations in the cost of raw materials, which steelmakers cannot really influence and in most cases pass through, and, second, the gross margins steel makers can achieve, the gross margin being a combination of a conversion cost and the net margin.

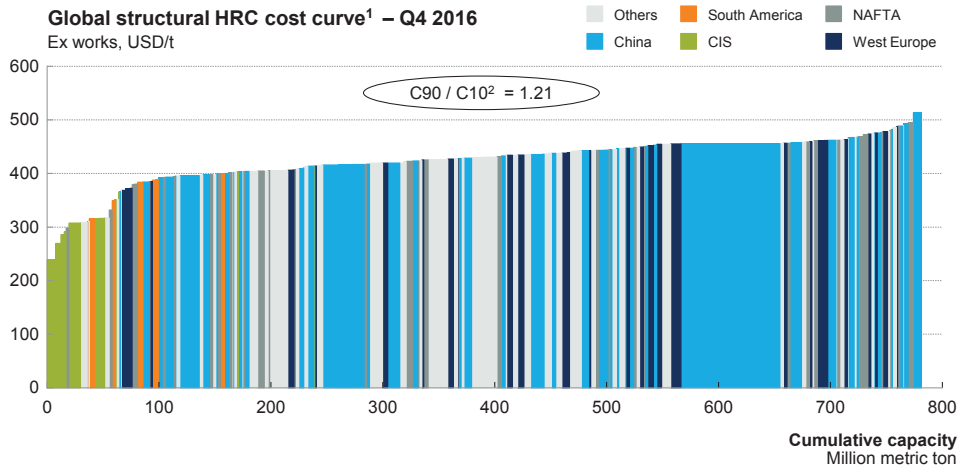
- **Prices of iron ore and coking coal** mostly follow a typical supply/demand cost curve. Depending on the difference between supply and demand, the price ranges at the low end from a cash-cost regime in line with the marginal cost producer to the high end of greenfield incentive pricing (or even price increases) with margins of up to 20 percent, even for marginal cost producers. Since demand is growing very slowly most of the time, price shocks occur mainly as a result of supply fluctuations, such as shortages due to mine flooding in Australia or mandated weekend shutdowns in China, and also reflect seasonal stocking and destocking patterns.

- **Scrap prices,** on the other hand, strongly correlate with iron ore and coking coal prices, since scrap is a substitute for these raw materials. In most markets, this correlation is quite consistent. However, this dynamic may change in the coming years due to the rising supply of scrap from the steel produced to feed the recent economic boom in China. The conversion of older equipment and infrastructure into scrap in China may create a massive surplus of scrap, lowering its price relative to the raw material basket.

We define the difference between the raw material cost and the realized steel price as the margin over raw materials or “spread” for short. The tighter the steel market becomes, the higher this margin rises. The steel cost curve and, more precisely, its steepness play an important role in determining the health and dynamics of the global industry. Since the boom cycle ended in 2008, the cost difference separating the more efficient steel players from the less efficient ones has been shrinking, indicating a flattened cost curve. For most steelmakers today, that flattening cost difference is driven mainly by access to raw materials rather than by transformation cost (i.e., additional cost above raw materials) (Exhibit 6).

EXHIBIT 6

Steel’s cost curve has flattened due to global declines in raw material prices and limited technological differentiation, while the advantage for CIS players here is attributable to low-cost captive or stranded raw materials



1 Proxy for majority of global steel demand; cash costs excl. SG&A, assuming 90% capacity utilization and value of captive raw materials at cost
2 Cost differential between 90% and lowest-cost 10%

SOURCE: McKinsey Flat steel cost model 2016_v4.1

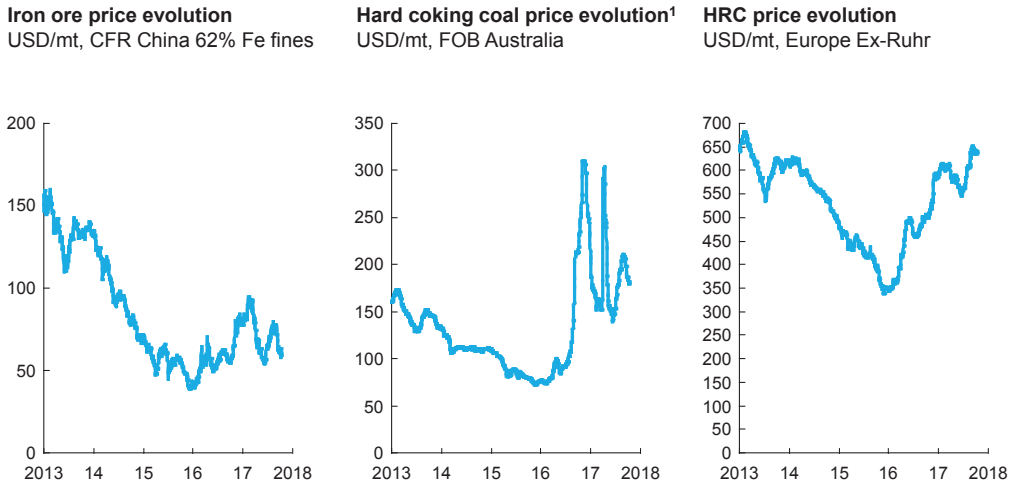
On the other side of the equation is the price of steel. Over the past decade, market rebalancing in developed regions – in the wake of the financial crisis and the severe demand slowdown in China – has lowered steel prices. Production overcapacity and low utilization rates in turn have pushed down prices of raw materials, causing mounting surpluses of both iron ore and coking coal. Consequently, raw material costs for steelmakers have dropped by more than 60 percent in the past 4 years (though those costs are on the rise again).

In addition, low utilization rates have depressed steelmakers’ margins over raw materials. They now stand at levels comparable to the pre-boom period, i.e., the 1990s. The industry’s overall profitability reflects this trend, with EBITDA margins dropping from more than 18 percent 10 years ago to about 10 to 11 percent in recent years (Exhibit 7) – below levels we believe are necessary to enable continuous re-investment in operations.

Along with these longer-term trends linked to industry fundamentals, the steel sector is experiencing increasing volatility, largely caused by sudden shortfalls of raw materials or steel supply. Severe weather events such as hurricanes, temporary mine closures, geopolitical conflicts, and trade disputes and the resulting protectionist measures have all contributed to these fluctuations.

EXHIBIT 7

While recovering from historic lows at year-end 2015, prices for iron ore, coking coal, and steel also became much more volatile in the course of 2016 and 2017



1 Premium low volatile

SOURCE: S&P Global Platts SBB; McKinsey analysis

The 2016 steel price trajectory vividly illustrates this volatile climate and its effect on profitability.

- At the end of 2015 and the beginning of 2016, steel prices were at historically low levels due to major declines in global steel demand and production, and a huge oversupply of iron ore and coking coal. Spot prices for iron ore and coking coal dropped as low as USD 40 per metric ton (IODEX 62 percent CFR China) and USD 80 per metric ton (Premium low volume HC CFR China), respectively.

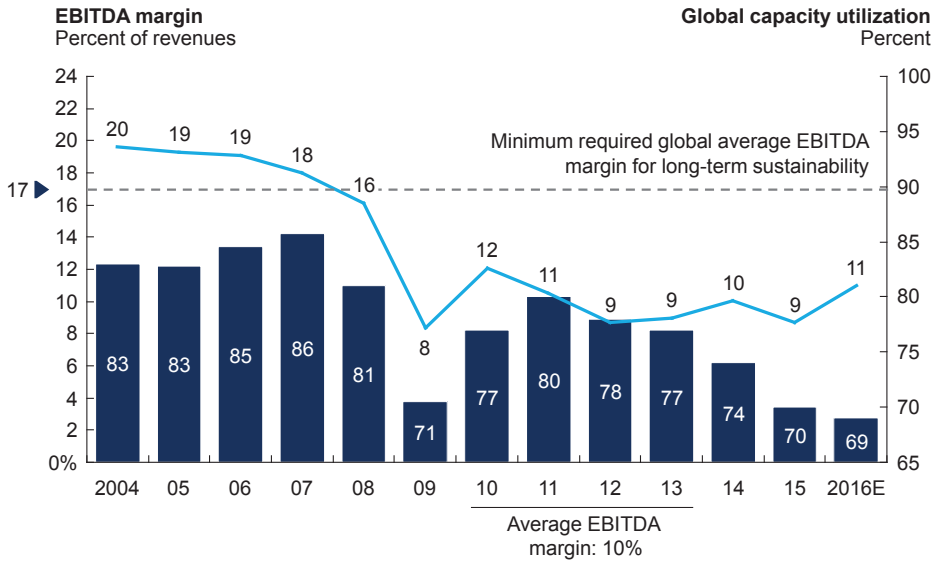
- In the second quarter of 2016, expectations of higher demand due to restocking and a spring uptick in construction drove global steel production up 10 percent compared with January 2016 (with China producing 15 percent more steel). During this period, prices for both iron ore and coking coal increased by USD 15 per metric ton. As a result, on average, steel prices rose by 35 percent: 10 points due to the higher raw material costs and 25 points from margin improvement.

- In the third quarter of 2016, steel demand suffered from lower summer activity, but prices remained stable.

- Then, in the fourth quarter of 2016 and throughout the first quarter of 2017, supply shortages of coking coal (due to both structural and temporary effects, such Chinese government intervention and bad weather) pushed the spot price above USD 300 per metric ton and, at the same time, the iron ore price rose to USD 70 per metric ton. These increases, together with a pickup in steel demand, pushed steel prices up by 30 percent during the 2016 to 2017 winter season (Exhibit 8).

EXHIBIT 8

With growing overcapacity, average EBITDA has deteriorated to below the level of long-term sustainability



1 Considering sample of 81 companies

SOURCE: World Steel Association (worldsteel); Corporate Performance Analytics, by McKinsey

The continuing surplus in global capacity makes a significant further rise in steel prices or the margins over raw material unlikely in the near future. Analysts generally forecast a slight decrease in steel prices in the long term, i.e., beyond 2020, but a significant spread around the median suggests that analyst consensus is weak. Most likely, global steel prices will continue to fluctuate around a slowly rising average, reflecting the seasonal pattern in construction and stocking and destocking activities, as well as abrupt supply-side events, such as mine accidents or closures, fluctuations in scrap collection, or geopolitical events affecting the major raw-material producing countries.

HOW COMPANIES ARE ADAPTING: GROWING FOCUS ON VALUE-ADD AND INNOVATION

Steel players around the world, and especially in Europe, South Korea, and Japan, are adjusting to global overcapacity by pursuing new products and business model extensions that enable them to move up the value chain. Some are venturing into parts manufacturing, while others concentrate on one or two premium end-use sectors, collaborating closely with customers on new steel grades and solutions. Voestalpine, for example, has launched a "selective downstream expansion strategy" into business segments where its materials expertise and deep knowledge of the value chain (in body-in-white auto parts, for example) gives it a competitive edge, while Posco has focused on high-end products for the automotive and shipbuilding industries.

Major disruptive trends in sectors such as automotive and energy are also creating opportunities for steel producers willing and able to invest in innovation. Several leading steel companies – including Posco, ArcelorMittal, Nippon Steel, and Voestalpine – have consistently earmarked 1.0 to 1.5 percent of their revenues for R&D in pursuit of product differentiation that can help them achieve price premiums and market leadership.

- In the **automotive industry,** for example, the shift to electric vehicles and lightweight materials, supported by strict CO2 emission targets, has created demand for high-strength steel substitutes for commodity flat steel grades. To meet this demand, Posco has developed the GIGA steel family, with improved elongation characteristics. ArcelorMittal has developed the S-in-motion line, a set of lightweight steel solutions for trucks and mid-size electric and hybrid vehicles. By 2030, 30 to 40 percent of all cars are projected to be battery electric vehicles, leading to increasing demand for non-grain-oriented electrical steel, for use in electric motors thanks to this product's excellent magnetic properties and lower iron losses at high speeds.

- In the **energy sector,** meanwhile, a key trend driving innovation is renewables' increasing share of the energy mix. Traditionally, aluminum alloys have been the material of choice in photovoltaic (PV) mounting systems because of their light weight and corrosion resistance. Meanwhile, however, steel producers have developed new alternate products, such as lighter structural steel profiles with anti-corrosion Zn-Al-Mg coatings, which are gaining more acceptance also in other segments, especially construction. Another important demand trend has arisen from the increasing complexity of crude oil production, requiring new steel grades able to operate under harsh combinations of high pressure, low temperature, severe corrosion, etc., with leading steel players increasingly offering innovative solutions to keep pace with industry demand.

In addition, innovation in steel also encompasses the core production processes, aiming at solutions to reduce production costs, improve the functionality of products, or reduce the environmental burden. At some point, truly integrated digital solutions will kick in, but, currently Posco's FINEX technology is one of the rare examples of how to combine the push towards a lower cost of hot metal production with a reduced environmental burden of this most polluting stage of the steel value chain.

In coming years, we expect more leading players to experiment with radical innovations in production processes, breaking the long-held belief that steel production technology has matured and thus has limited room for further productivity gains. As we see this trend taking shape in many parts of the world, we are also keen to explore it further, and plan to present more insights in upcoming pieces about the steel industry.

CONCLUSIONS

As our analysis suggests, the steel industry will be facing **several volatile years.** Although demand for steel is slowly picking up, growth rates will not return to boom-year levels any time soon, let alone on a global scale. In this context, protectionism is likely to persist in some of the large markets, especially against the backdrop of rising geopolitical tensions. A more efficient answer, however, would be for all stakeholders to secure "leveled playing fields" and, in parallel, secure cost competitiveness – and consider ways to close or restructure the weakest sites.

Meanwhile, **consolidation,** especially in Europe and China, should help to advance much-needed capacity rationalization. Provided China's central government succeeds in shutting down the illegal IF capacity as well as the uneconomic and obsolete BF/BOF facilities by 2020, as announced, this reduction will help gradually restore the industry's financial health. As in previous industry shake-ups, there will be winners and losers, with losers quitting the business, by either selling out, or even worse, by phasing out the capacity that they can no longer modernize and keep viable.

Industry leaders will also increasingly move from producing mostly commodity products and competing on operating efficiency, to producing a larger share of **sophisticated products** with advanced features and offering **complex solutions.** However, given that there is not enough space for all of them to take this path, the industry will need to have "benchmark"-efficient players, who make use of technological advances in the basic steel production and processing technology, and who will also need to adopt various Industry 4.0 tools throughout the entire steel value chain.

We expect that this polarization will create **a two-speed steel industry,** with innovation leaders consolidating the productivity gains, and setting the stage for further expansion, while laggards slide further into negative profitability. Thus, while the key to success in the boom years was "to control the main resources for production" and, in the recent down-cycle, "to excel at operating efficiency," the next decade will see the rewards going to those steelmakers who are able **"to adapt the fastest"** – both to innovate the fastest (including through large-scale adoption of new digital opportunities) and to commercialize their innovations the fastest This will open a new era for the industry and bring many interesting value-creation opportunities to its most agile players.

Thus, while the overall industry picture may look somewhat uneven, there are **new opportunities** for those players that have secured a high level of operating efficiency and are now willing to jump on disruptive trends in their end-user industries. The shift from commodity steel to value-added products, and the introduction of new business models will help rejuvenate the industry and, over time, return its leaders to healthy levels of profitability.

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