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Industry Update

The Dragon has landed already

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But a slowing China, still needs more steel

Those arguing about whether China will have a soft or hard landing are missing the point. It has landed already. In 2007 steel production growth stepped down from the 23% (achieved since 2001) and has been running at 8.9% since then. Despite the step-down, iron ore prices continued upwards. We believe that Chinese steel production will grow so long as GDP growth stays above 3%. Meanwhile, the miners continue to struggle to keep up.

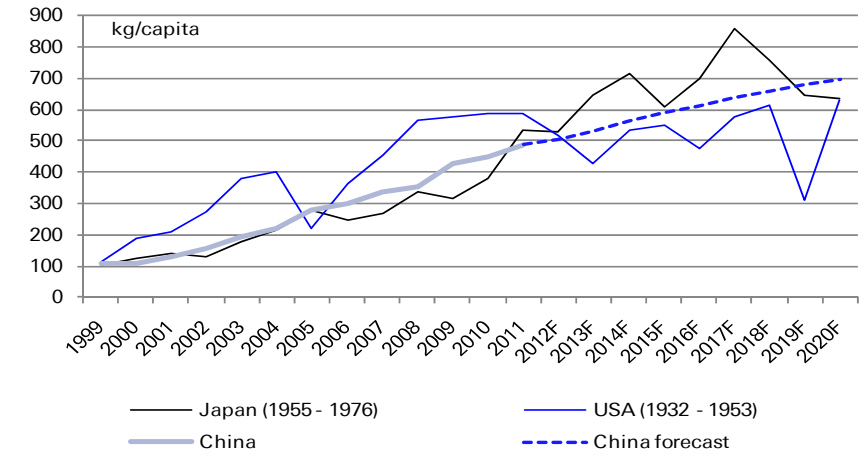
Chinese steel intensity likely to peak in 2018 based on the US and Japan

Steel is a good barometer for an economy's evolution; it is the first commodity to ramp up and the first to peak. Despite the ramp in Chinese steel production so far, we do not expect steel intensity per capita in China to peak until 2018 – anything less than this would leave a developed coastal region and undeveloped inland. A country divided into haves and have nots is demonstrably not tenable for the Chinese Government. A slowing GDP and a diminishing steel to GDP ratio (DB's base case) is still bullish for iron ore.

The market is pricing in a drop to $76/t iron ore – this is too bearish

To justify the current share prices on the listed iron ore producers we need to drop our price forecast to US$76/t from this year into perpetuity. This would render more than half of China's domestic iron ore production loss making and would need ~150Mt of additional imports to replace it. This would be particularly difficult for an export market that has only been able to achieve increases of around 65Mtpa despite the massive price incentives. The iron ore price has significantly more upside than downside risk (which is supported by cost of production in China) and the iron ore producers are being mispriced. Our two top iron ore picks are Rio Tinto and African Minerals.

Figure 1: China still needs more steel -even in a lower growth environment.



Source: World Steel Association, IMF, CEIC, Deutsche Bank

Top picks	
Rio Tinto (RIO.L),GBP3,406.50	Buy
African Minerals (AMIq.L),GBP543.50	Buy
Randgold (RRS.L),GBP5,150.00	Buy

Companies Featured	
Anglo American (AAL.L),GBP2,269.50	Buy
African Minerals (AMIq.L),GBP543.50	Buy
BHP Billiton Plc (BLT.L),GBP1,877.00	Buy
ENRC PLC (ENRC.L),GBP573.00	Buy
Ferrexpo Plc (FXPO.L),GBP291.90	Buy
Rio Tinto (RIO.L),GBP3,406.50	Buy
Vedanta Resources (VED.L),GBP1,210.00	Buy

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China is still growing

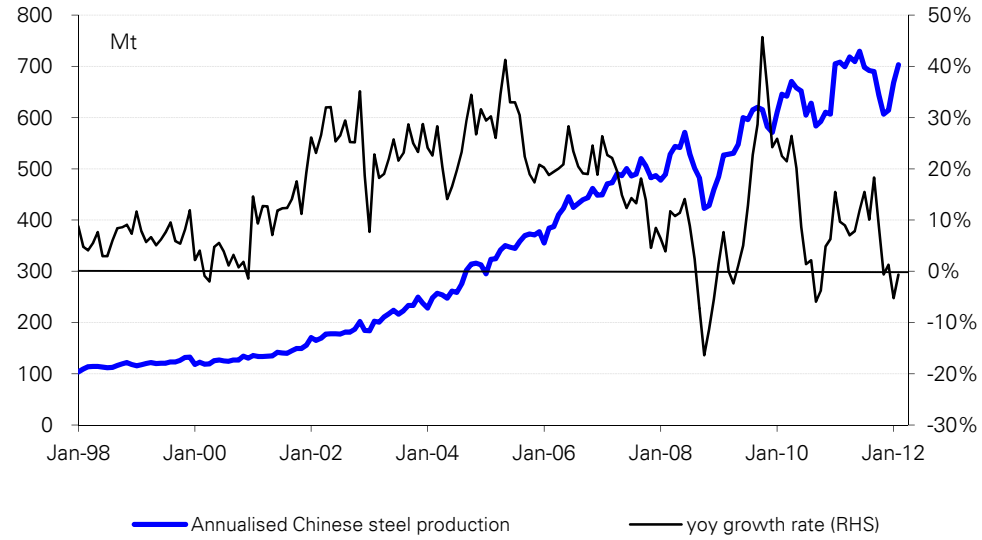
The binary debate over whether China has a hard or soft landing (whatever these actually mean) is overshadowing the fact that China is still growing (we have not heard an argument that GDP growth in China will be negative). We have examined steel consumption as the basic building block for emerging economies; and is the first to ramp up in consumption per capita and the first to peak. We do not believe Chinese steel consumption per capita will peak until the second half of the decade. Our analysis suggests 2018 as the peak year.

If you are waiting for Chinese steel production growth to step down, you have missed it; it happened in 2007 (October 2007 to be precise) while everyone was focused on ramping prices (and iron ore prices since then have never been stronger). Under most growth scenarios (other than an ultra-bearish one) for China, the country will need more steel production capacity. We believe Chinese GDP growth would need to fall to 3% for steel production in China to become negative over an extended period.

Is 700Mtpa of steel enough?

A 15% CAGR from the Chinese steel industry over the last decade has lifted the annualised run rate to over 700Mtpa (703Mtpa in February 2012). This is a large number: it was nearly half the global production in February, 4x the amount of steel produced in Europe, 6.5x the amount produced in Japan and 8x the amount produced in the US. However, the cumulative amount of steel produced during China's ramp-up falls well short of the levels reached by other economies as they developed. We estimate that China will need to reach a rate of 850 – 900Mtpa to meet normal levels of development. We note however that the volatility in steel production has increased, with tight margins in the steel producers making them much more responsive to short-term changes in demand.

Figure 2: Chinese annualised steel production and yoy growth rate.



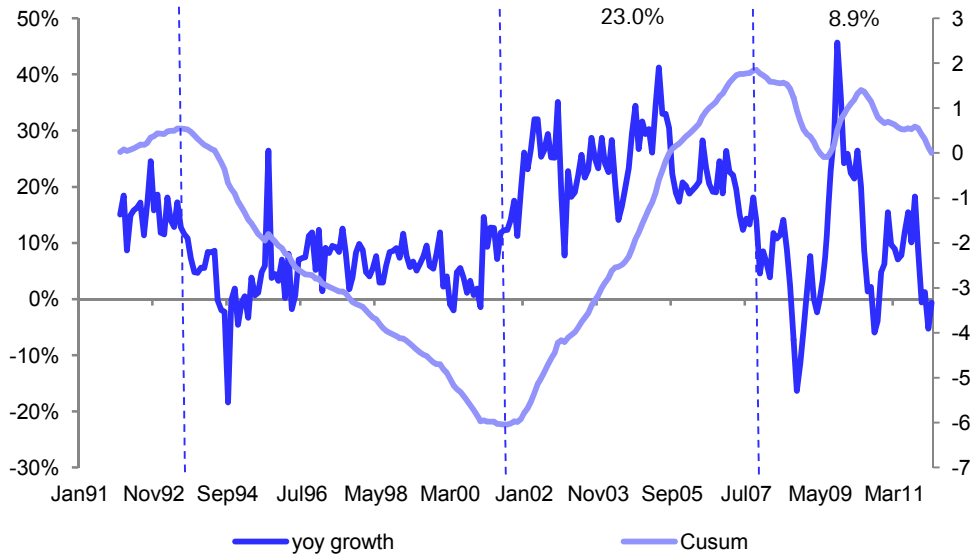
Source: IISI, Deutsche Bank

China is currently producing steel at a run rate of 700Mtpa-equating to nearly half the global steel production. China will need to reach a rate of 850 to 900Mtpa in order reach the levels attained by developed economies.

We certainly do not believe that steel production growth in China will continue at levels seen last decade. As mentioned earlier a step change in steel production growth rate has already occurred. The chart below shows the year-on-year change in steel production in China and Cusum line highlighting the turning points in growth. From August 2001 until October 2007, China grew its steel production at an average annual rate of 23%, since then the average growth rate has fallen to 8.9% (we ignore the signalled changes through 2009 from the short impact of the first global financial crisis) We are expecting steel production growth of 4.9% for China this year – well below our 8.9% GDP forecast, but enough to place increased demands on a tight iron ore supply chain that remains stretched.

We do not believe that steel production will grow at historical rates…. But it will grow and need more raw materials to feed that growth.

Figure 3: Chinese yoy steel production growth and Cusum turning points



Source: IISI, Datastream, Deutsche Bank

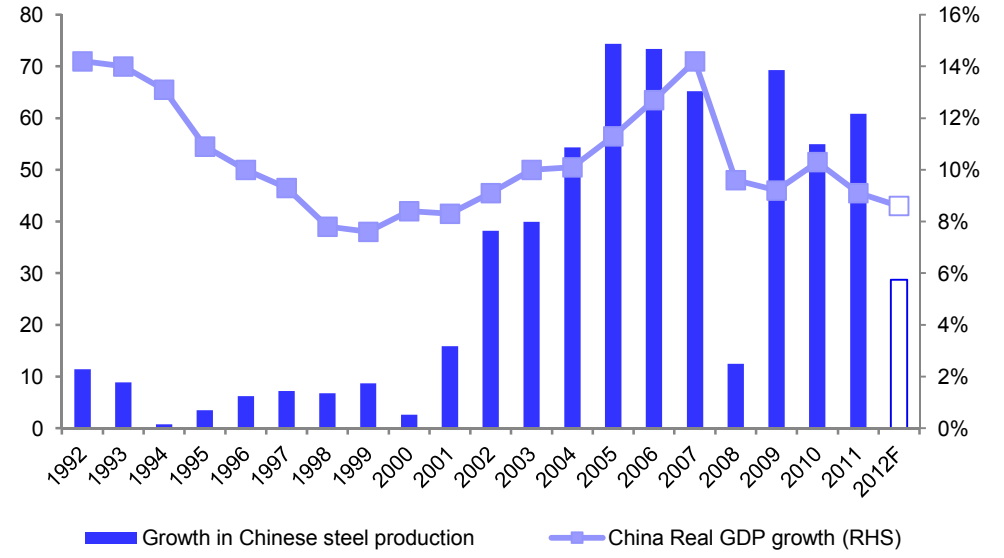
The rate of steel production growth has already stepped down. An average yoy production growth of 23% from 2001 to 2007 dropped to 8.9% since then.

China's steel uses

China has been increasing its steel production at a rate of around 60Mtpa (see Figure 4). This year with lower GDP growth we expect around 30Mt more will be needed, the second lowest increment in a decade, beaten only by 2008, the year of the financial crisis.

We expect China to produce 30Mt more steel in 2012 than it did in 2011 – this is a conservative view, but will still be difficult for the raw material producers to meet.

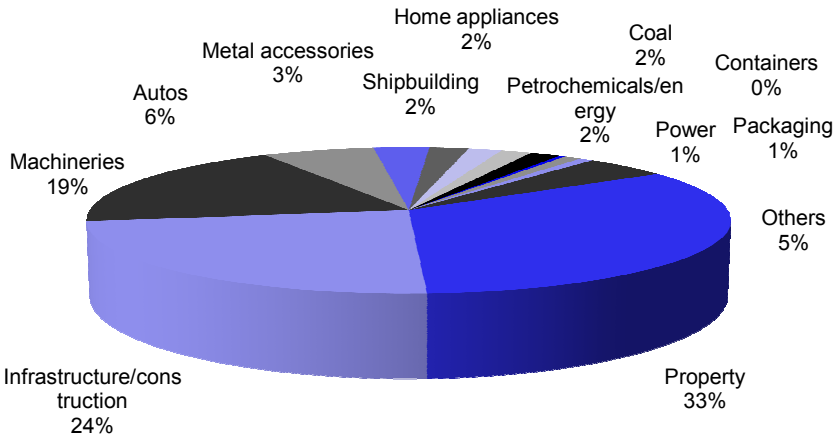
Figure 4: Chinese growth in steel production and Chinese GDP.



Source: China custom stats, Deutsche Bank

The biggest sector for Chinese steel consumption is property construction (33%) followed by infrastructure construction at 24%.

Figure 5: 2012F steel consumption split by application (673Mt total)



Source: Deutsche Bank

As economies mature, the mix of applications for steel consumption gradually changes. We expect to see some change in the Chinese mix as the coastal regions hit developed

economy consumption levels. Figure 6 shows our growth expectations by application—note the significant change including negative growth expectations for railway, shipbuilding and containers.

Figure 6: China steel consumption by application

	2007	2008	2009	2010E	2011E	2012E	2013E	2014E
Consumption by application (mn tonnes)								
Property	143	150	177	198	216	225	238	252
Infrastructure/construction	85	99	129	144	155	158	162	167
Transport	12	12	17	19	21	22	23	24
Railway	7	11	19	22	23	21	21	22
Machineries	70	83	96	106	121	128	136	147
Autos	26	26	32	38	41	43	48	51
Metal accessories	14	16	18	19	21	22	22	23
Shipbuilding	10	13	14	15	17	15	14	14
Home appliances	10	11	12	12	13	13	13	14
Petrochemicals/energy	10	10	10	10	12	12	12	13
Coal	6	8	10	9	11	12	13	15
Containers	7	6	1	2	3	2	2	2
Packaging	5	5	6	6	7	7	7	7
Power	4	4	4	4	5	5	6	6
Others	40	38	40	40	35	33	33	33
Total	**430**	**469**	**549**	**604**	**655**	**673**	**707**	**745**
Consumption growth assumption (YoY %)	**2007**	**2008**	**2009**	**2010E**	**2011E**	**2012E**	**2013E**	**2014E**
Property	20.0%	4.7%	18.0%	12.0%	9.0%	4.0%	6.0%	6.0%
Infra/construction	21.0%	17.2%	30.0%	12.0%	7.0%	2.0%	3.0%	3.0%
Transport	12.8%	1.4%	41.1%	10.0%	10.0%	5.0%	5.0%	5.0%
Railway	23.0%	53.3%	69.2%	15.0%	5.0%	-10.0%	3.0%	5.0%
Machineries	30.0%	19.2%	15.8%	10.0%	15.0%	5.0%	7.0%	8.0%
Autos	23.4%	0.0%	25.0%	20.0%	6.0%	6.0%	10.0%	8.0%
Metal accessories	21.5%	13.2%	15.0%	8.0%	8.0%	3.0%	4.0%	5.0%
Shipbuilding	49.0%	27.4%	5.0%	5.0%	15.0%	-10.0%	-5.0%	0.0%
Home appliances	19.2%	4.7%	10.0%	3.0%	5.0%	2.0%	3.0%	3.0%
Petro/energy	12.9%	1.3%	-2.3%	-5.0%	20.0%	3.0%	3.0%	5.0%
Coal	21.8%	26.1%	25.3%	-10.0%	20.0%	10.0%	12.0%	10.0%
Containers	35.2%	-16.1%	-82.1%	120.0%	50.0%	-30.0%	-10.0%	5.0%
Packaging	31.0%	1.9%	10.0%	3.0%	5.0%	3.0%	3.0%	3.0%
Power	0.0%	-8.0%	0.0%	5.0%	13.0%	10.0%	8.0%	6.0%
Others	-33.3%	-5.0%	5.3%	-0.7%	-11.9%	-7.0%	0.0%	0.0%
Overall	13.8%	8.9%	17.1%	10.0%	8.5%	2.8%	5.1%	5.4%

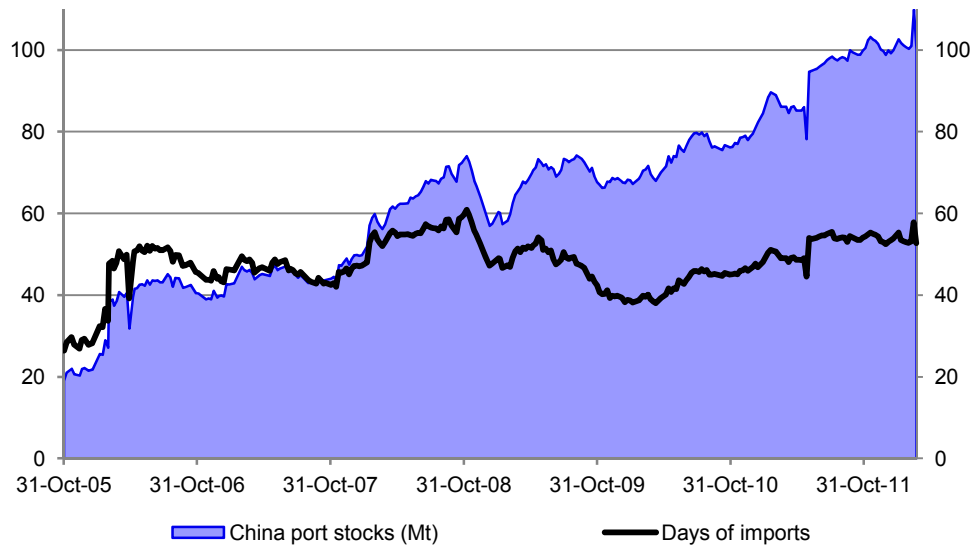
Source: Deutsche Bank estimates/forecasts

What are the trends showing us?

Chinese port stocks are rational

Chinese port stocks of iron ore have been growing and are now over 100Mt. This has been noted in the market as point of concern—we think it is not a concern and indeed completely appropriate given the rise in imports. Figure 7 shows the Chinese port stocks of iron ore and how many days of imports they represent. It is clear that port stocks have been constant at between 50 and 55 days of imports

Figure 7: Chinese iron ore port stocks are fine



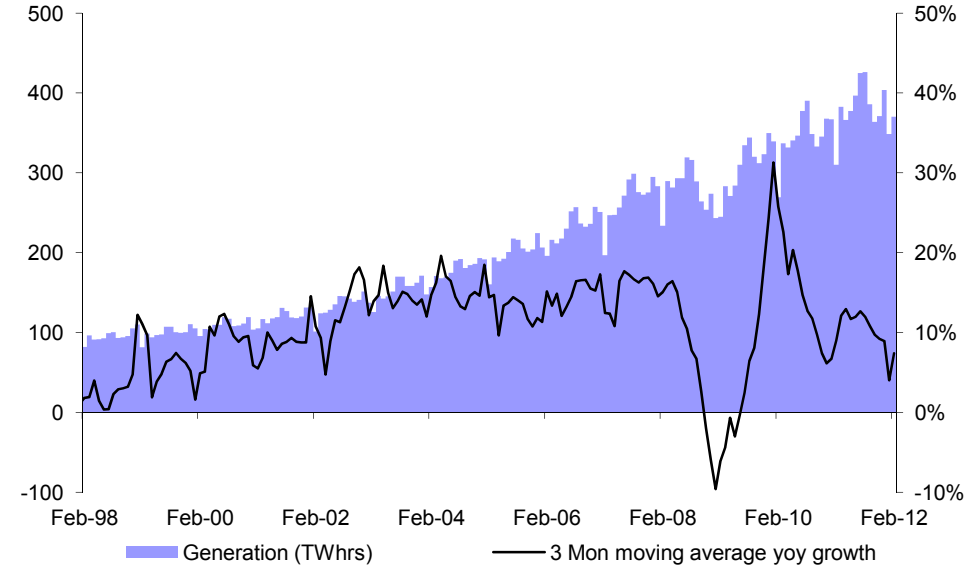
Source: China customs data, Deutsche Bank

Chinese port stocks are not at elevated levels as measured by days of imports.

Power production growth remains healthy tool

We like power production as an indicator of activity for China as power cannot be readily stored, and so does not suffer from the inventory movements and time lags that many other measures have. While January and February have been impacted by the Chinese New Year celebrations in late January, power production growth remains at a healthy level of around 8%

Figure 8: Chinese power production



Source: Deutsche Bank

Power production is good indicator of economic growth in our view.

2018 steel intensity peak in China

Peak China steel consumption in 2018/19 – bullish for iron ore even in a slowing steel production environment

After a pick-up in China's steel production post the New Year, a key question from investors is how sustainable are growth rates in China's steel demand? Or, phrased differently, how quickly will China's internal structural changes in the economy—moving away from a fixed asset investment (FAI) driven development to a consumption-driven economy, lead to a slowdown in steel demand? Despite the fact that all economies evolve differently, we believe it is informative to look at economies further down the evolutionary path than China, to establish some frame of reference. Building on the work undertaken by Deutsche Bank's Chief China economist Jun Ma in the note "China: Themes and Strategy for 2012, From slowdown to recovery" 4 Jan 2012, we have looked at the likely peak in Chinese steel demand, and the likely path to this "peak-demand" level. Our conclusion is that the steel intensity peak is likely to occur in the second half of the decade, specifically in 2018 according to our growth trajectory. This ties in very closely with Jun Ma's estimate of 2017. We have focused on two methodologies to ascertain peak steel demand in China.

As China develops and moves away from FAI driven development to a consumption driven economy, steel intensity will flatten; but not yet, we estimate this will not occur until 2018/2019.

- **Comparing per capita consumption:** Implicit in this analysis, is that different countries tend to see their per capita consumption of raw materials peak at similar levels. Empirically, this is not the case, but nevertheless the comparison has some merit in our view.
- **Comparing cumulative per capita consumption:** The basis for this methodology is that some countries may adopt unique strategies for investing in infrastructure and real estate (such as trying to adopt anti-cyclical measures in commodity intensive sectors), or that significant world events such as wars may disrupt the normal course of economic development. However, the peak of cumulative consumption after a period of significant growth is likely to be more stable and comparable across countries.

We outline the cumulative steel consumption per capita for the US, developed EU countries, Taiwan, South Korea, Japan and China in Figure 9. The apparent steel consumption per capita on an annual basis for each of these countries is shown in Appendix A. We make the following observations:

- Only the US, France and the UK show an inflection point where the rate of cumulative steel consumption flattens off, all around the late 1960s, early 1970s.
- The more export-oriented nations, such as Germany, Italy, Taiwan, Japan and South Korea, show very little indication of an inflection point. This is a reflection of steel exports in the form of finished or semi-finished goods, not captured in the "apparent" demand estimation.
- The "step-down" in Germany's cumulative steel consumption per capita is a function of the inclusion of the former East German population in the per capita calculation.

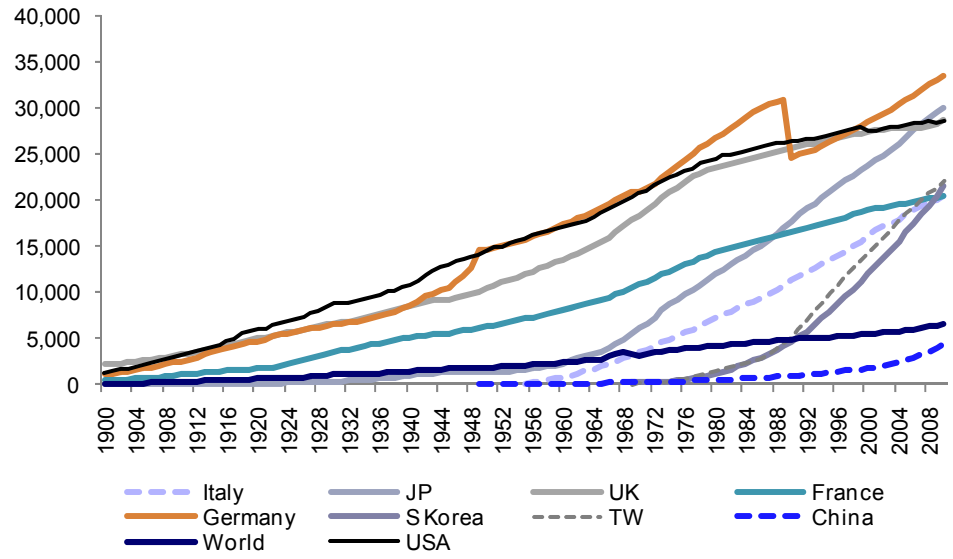
Export driven economies tend not to see a flattening out of cumulative steel consumption. We have assumed that China will ultimately not be a significant export economy and hence will see a flattening of its cumulative consumption.

- China's cumulative steel consumption at c.4,500kg/capita is still lagging that of the world's cumulative steel consumption per capita of c.6,600kg/capita, and is well behind that of Germany or Japan at 31,000-33,000kg/capita. This is despite the significant growth in steel consumption over the past decade.

Our conclusion is that China's steel consumption per capita still lags the developed economies. This includes both export-oriented and consumption-oriented economies, which implies that there is still a significant appetite for steel in China irrespective of the economic path that is followed.

Figure 9: Cumulative steel consumption (kg) per capita since 1900

China's cumulative steel consumption is well behind many developed countries.



Source: World Steel Association, IMF, CEIC, Deutsche Bank

Both methodologies point to a 5- to 6-year time frame until the peak in Chinese steel capacity consumption per capita is likely. The average annual steel consumption per capita peak is 811kg, if we include Taiwan and South Korea, both of which have a peak per capita consumption close to 1200kg. The average drops to 687kg/capita if we exclude these two countries. The peak period in the US, Europe (big 3) and Japan was 1968-1973, with Taiwan, Italy and South Korea following much later. If we assume that China's steel consumption trajectory follows our base-case growth trajectory (we highlight the assumptions later on in the section), then the peak year for China's steel consumption is 2019, coinciding with a consumption per capita of 678kg.

The average annual steel consumption per capita for non-exporting economies is 687kg/capita. We expect China to reach this level in 2019.

Most economies went through a phase of rapid industrialization, and during these periods, the cumulative steel consumption increased rapidly. The rate at which the cumulative consumption increased and the time period does vary from country to country. Similarly the saturation point varies from country to country, with the US being the lowest at c.5000kg/capita over a 15-year period and Italy being the highest at c.11,500kg/capita over a 25-year period.

Figure 10: Cumulative steel consumption per capita at the estimated saturation point

Country	Period	Years	Cumulative steel consumption at saturation after a burst of growth (kg/capita)
USA	1896 - 1917	21	4,096
USA	1931 - 1943	12	3,340
USA	1958 - 1973	15	5,071
USA	***1933 -1973***	***40***	***13,132***
Japan	1946 - 1973	27	6,709
UK	1946 - 1968	22	7,693
France	1946 - 1973	27	6,218
Germany	1945 - 1969	24	10,535
Italy	1981 - 2006	25	11,430
S Korea	1980 - 1997	17	8,410
Taiwan	1980 - 1993	13	6,418
Average			**7,550**
China	**1998 –to date**	**13**	**3,355**

Source: World, Steel Association, IMF, Deutsche Bank

We point out, that if one considers the longer 40-year period of growth in the US, post the Great Depression, the cumulative steel consumption per capita build-up is much higher at c.13,000kg/capita. This extended period does however cover WWII, in which the US was relatively unaffected, and was effectively an exporter of steel in various forms.

If we take the start of China's period of accelerated growth as 1998, just post the Asian crisis, the cumulative steel consumption per capita reached c.3,000kg/capita in 2010. On our base case growth trajectory, China is likely to reach the saturation steel consumption point by 2018/19 to reach the average saturation point of 7,800kg/capita. There are both bullish and bearish points to consider should China follow a US trajectory more closely. On the bearish side, if China peaks at c.5,000kg/capita, the peak would come sooner at 2014/15, but likewise if the trajectory is longer-dated, the peak year is only likely in 2026.

Figure 11: Implied "peak" China steel consumption, based on two methodologies

	Peak annual consumption	% urbanisation	Peak year	Cumulative intensity saturation after a burst of growth
	kg/capita			kg/capita
USA	696	74%	1973	5,071
Japan	857	55%	1973	6,709
UK	712	77%	1968	7,693
France	495	80%	1973	6,2186
Germany	704	70%	1969	10,535
Italy	657	68%	2006	11,430
S Korea	1194	82%	2010	8,410
Taiwan	1175	77%	1993	6,418
Average	**811**	**73%**		**7,810**
Average excl. TW and S Korea	687	71%		
China	**486**	**50%**	**2010 so far**	**2,890**
Implied peak year	**2019**			**2018/19**

Source: World Steel Association, IMF, CEIC, Deutsche Bank

Four potential growth trajectories

We have looked at four possible scenarios for the evolution of Chinese steel demand to 2025F, and the impact of these four scenarios on iron ore demand; bullish, base, bearish and ultra bearish scenarios. Even if we accept China still has some way to go before reaching peak steel demand, the year-on-year movements can clearly have a significant impact on iron ore demand from period to period. US steel demand has arguably been the most enduring, and has been through a number of cycles. The best decades for steel growth were the 1900s, 1910s, 1930s, 1940s, 1960s and the 1990s, with CAGR's ranging from 9.9% to 2.6%. The GDP multiplier during the growth decades were above 1x in the early part of the 1900s, but have been less than GDP since the 1940s, ranging from 0.6 -0.8x.

We have looked at 4 potential growth trajectories for China. We have assumed a steel growth multiplier less than 1 in all cases.

Figure 12: Steel consumption growth versus GDP in the US

USA	Steel Growth	Average GDP	Multiplier
1900's	9.9%	2.5%	3.9
1910s	4.9%	2.6%	1.9
1920s	-0.3%	2.5%	-0.1
1930s	3.9%	2.0%	2.0
1940s	3.8%	6.2%	0.6
1950s	0.2%	4.0%	0.1
1960s	3.4%	4.1%	0.8
1970s	-1.1%	2.9%	-0.4
1980s	-1.0%	2.9%	-0.3
1990s	2.6%	3.3%	0.8
2000s	-3.6%	1.8%	-2.0

Source: World Steel Association, IMF, Deutsche Bank

Japan's steel growth grew rapidly in the 1960s, at a CAGR of 14.1%, before slowing significantly in the 1970s and 1980s to just above 1.0%, before contracting in the 1990s and 2000s. During the 1960s the steel growth to GDP multiplier was 1.4x, before slowing to 0.2x in the subsequent two decades. As with the US economy, there is a threshold GDP growth rate, below which steel consumption contracts. For the US, the threshold is 3% GDP growth in the latter half of the century and 2% for Japan.

Japan and the US did not see a negative steel growth multiplier (steel production dropping until their GDP growth levels fell below 2-3%.

Figure 13: Steel consumption growth versus GDP in Japan

Japan	Steel Growth	Average GDP	Multiplier
1960s	14.1%	9.8%	1.4
1970s	1.0%	4.5%	0.2
1980s	1.1%	4.5%	0.2
1990s	-1.2%	1.6%	-0.7
2000s	-1.1%	1.2%	-0.9

Source: World Steel Association, IMF, Deutsche Bank

China's steel consumption has registered growth over the past 6 decades albeit off a low base. For the most part the GDP multiplier has been above 1x, due to strong government involvement. The 2000s saw a period of strong GDP growth (above 10%), accompanied by strong steel growth (above 15%). This period of growth is reminiscent of Japan's growth phase in the 1960s. In outlining our base case assumption, we have assumed a slowing GDP growth and a progressively lower GDP to steel consumption multiplier. Over the period 2010 to 2020F, we forecast 4.9% steel growth at an average multiplier of 0.7x GDP.

China's steel production ramp up through the 2000s is reminiscent of the ramp-up that Japan went through in the 1960s.

Our base case of slowing GDP growth, combined with a decreasing steel consumption to GDP ratio is still bullish for iron ore demand

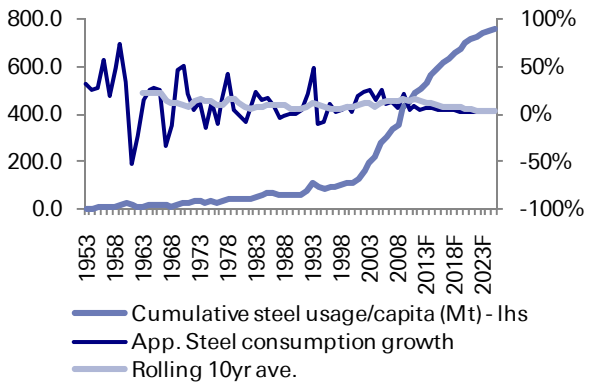
Figure 14: Steel consumption growth versus GDP in China

China	Steel Growth	Average GDP	Multiplier
1950s	40.0%	9.6%	4.2
1960s	9.8%	5.0%	2.0
1970s	7.6%	7.5%	1.0
1980s	4.9%	9.2%	0.5
1990s	7.4%	9.8%	0.7
2000s	15.2%	10.2%	1.5
2010s forecast	4.9%	7.5%	0.7

Source: World Steel Association, IMF, Deutsche Bank

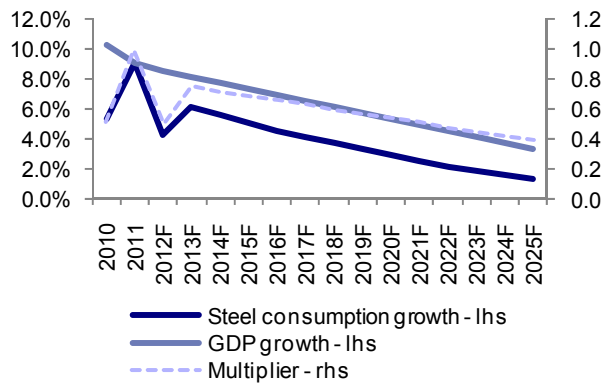
Our base case assumptions for Chinese steel growth are highlighted in the charts below: We have assumed that GDP growth slows from 8.6% in 2012F to 3.4% by 2025F, and that the multiplier declines from 0.75x in 2013F (after rebounding modestly from 0.5x in 2012F) to 0.39x by 2025F. This equates to an additional 410Mtpa of steel or 650Mtpa of iron ore at 62% grade. Even in 2012, where we forecast a slowdown in the GDP multiplier, we estimate China will need an additional 45Mt of iron ore.

Figure 15: Base case – China steel consumption growth



Source: World Steel Association, IMF, CEIC, Deutsche Bank

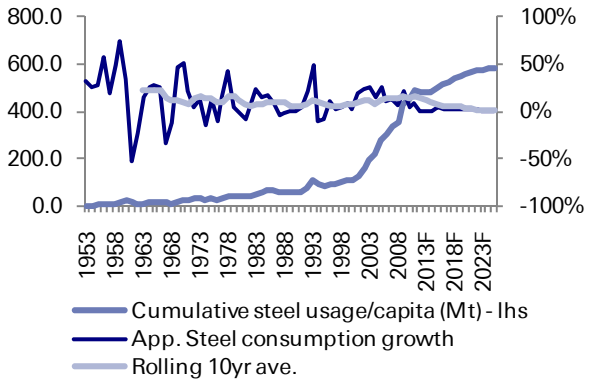
Figure 16: Base case - China GDP versus steel demand



Source: World Steel Association, IMF, CEIC, Deutsche Bank

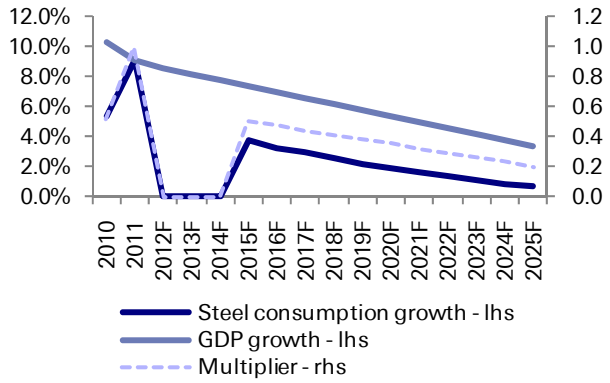
Our bear case scenario draws from the Japanese experience, where the steel growth declined from 14% in the 1960s to 1% in the 1970s, with the GDP multiplier falling from 1.4x to 0.3x. In our scenario we have assumed that Chinese steel consumption shows no growth over the next three years, 2012 to 2014F, before resuming at 3.7% in 2015F. The CAGR steel growth over the decade works out to 2.5%, at a GDP multiplier of 0.3x. In this scenario, China will consume an additional 160Mtpa of steel, which equates to an additional iron ore consumption of 256Mtpa. Under this scenario, China falls short of the steel intensity per capita as the "average" developed nation, and reaches a peak cumulative steel consumption per capita by 2021F.

Figure 17: Bear case – China steel consumption growth



Source: World Steel Association, IMF, CEIC, Deutsche Bank

Figure 18: Bear case - China GDP versus steel demand

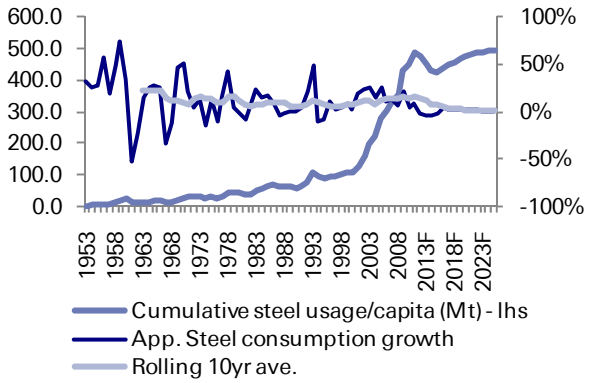


Source: World Steel Association, IMF, CEIC, Deutsche Bank

Our second bear case assumes a "hard-landing" especially with respect to steel consumption. In the case of Japan and Taiwan, the peak in steel consumption per capita was followed by a few years of declining steel consumption, before stabilizing and ultimately recovering. In our ultra-bearish scenario, we assume declining steel consumption for four years, which implies a negative GDP multiplier. In this scenario, China would lose a total of 75Mtpa of steel capacity, which equates to 120Mtpa of iron ore capacity. Under this scenario we would assume that demand recovers and that by 2025F, Chinese steel consumption would be marginally higher than in 2011, adding 37Mtpa or 59Mtpa of iron ore.

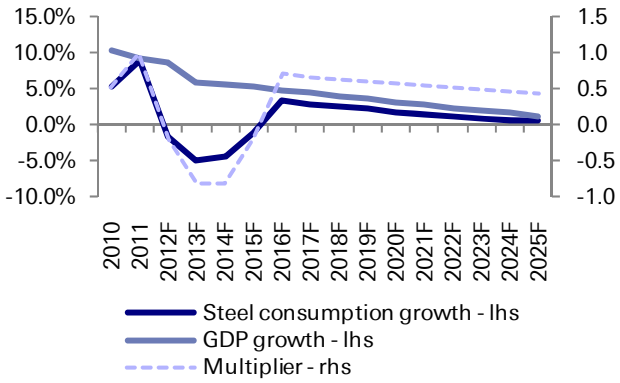
Our second bear case assumes steel production decreases in China.

Figure 19: Bear case 2 - China Steel consumption growth



Source: World Steel Association, IMF, CEIC, Deutsche Bank

Figure 20: Bear case 2 – China GDP versus steel demand

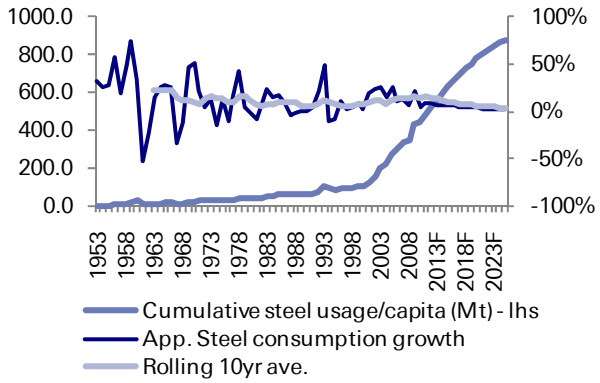


Source: World Steel Association, IMF, CEIC, Deutsche Bank

In our bull case scenario, we continue to assume declining GDP growth combined with a declining GDP to steel consumption multiplier. However in this scenario the multiplier decline is much slower. This equates to steel growth slowing from 8.1% in 2012F to 1.8% in 2025F. Under this scenario, China will consume an additional 570Mtpa by 2025F, equating to 915Mtpa of additional iron ore capacity.

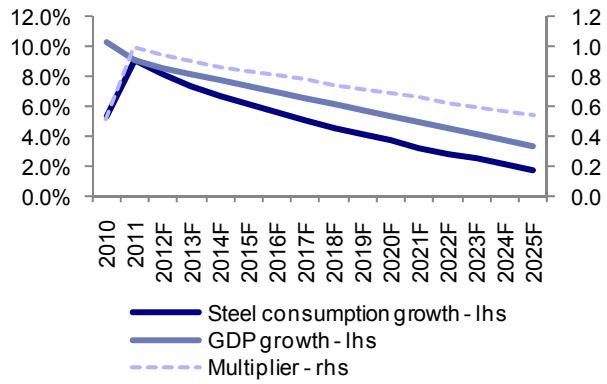
Our bull case assumes declining GDP growth, but a less aggressive multiplier (still less than 1 however).

Figure 21: Bull case - China Steel consumption growth



Source: World Steel Association, IMF, CEIC, Deutsche Bank

Figure 22: Bull – China GDP versus steel demand



Source: World Steel Association, IMF, CEIC, Deutsche Bank

The iron ore industry has historically delivered an additional c.65Mtpa over the past 7 years. Despite new entrants, we believe this rate is unlikely to be surpassed in the medium term (as outlined in the next section of the note). In our bear case scenario of flat Chinese steel production, it will take three years for the additional supply from outside of China to displace the domestic high cost ore. In our view it is unlikely that steel consumption will stall totally without much lower GDP growth rates, it will be at this point that iron ore prices are likely to return to the US$80/ levels.

Under our bear case, it would take the global suppliers 3 years to replace the high cost Chinese domestic production.

The supply will continue to struggle

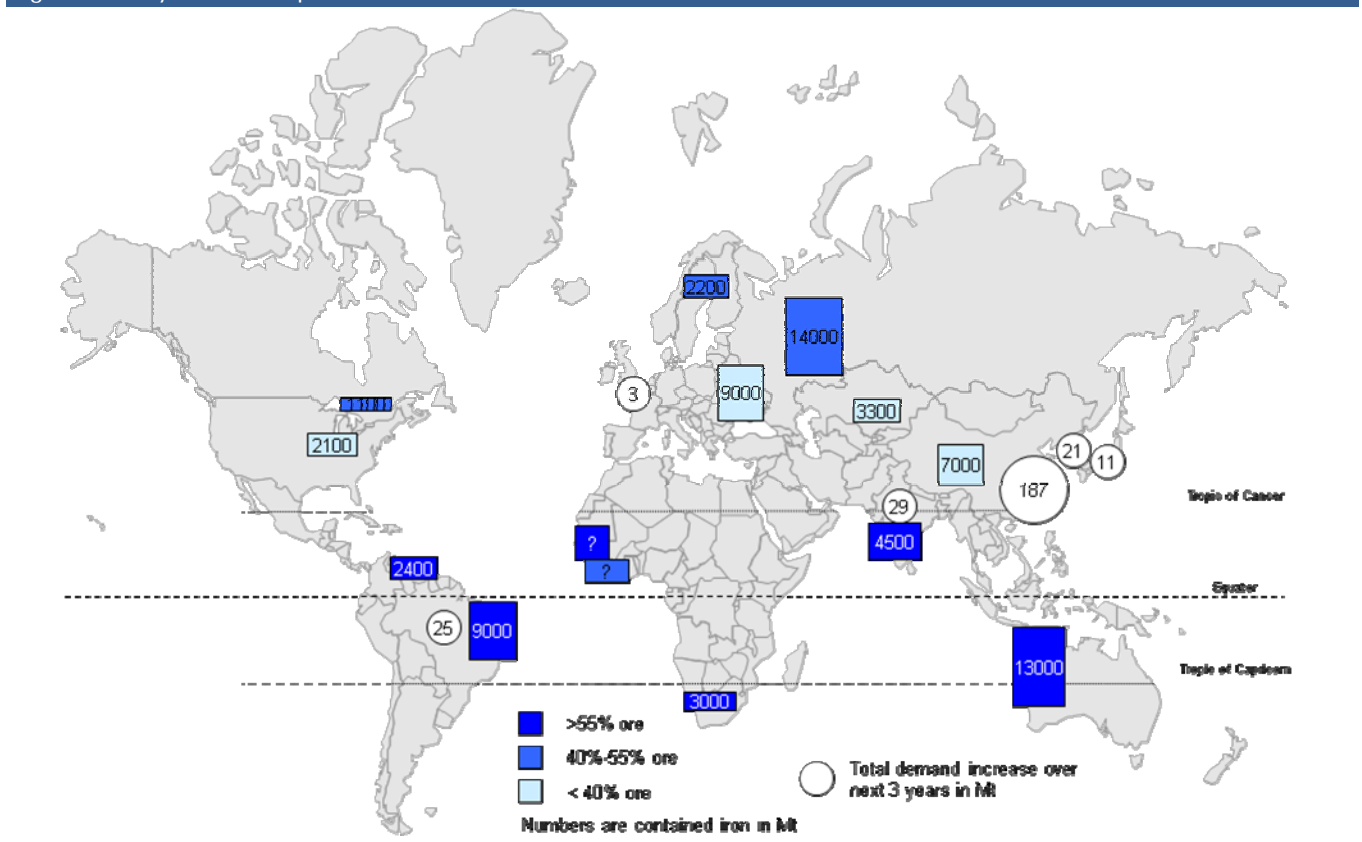
Despite nearly a decade of increasing demand for seaborne iron ore, the main global suppliers continue to struggle to step up to the demand requirements. The largest increase in demand has been from China, which has increased its annual steel production rate by 96% or 335Mtpa since 2005 which represents 88% of the world's steel production growth over that period. China has had to mine increasingly low grade domestic ore to compensate for the lack of import availability. We calculate that the average domestic iron ore grade has dropped from ~50% to 20% over this period with a doubling of the iron ore produced since the pre GFC levels in 2008! We calculate that there is between 150 and 200Mt of high cost Chinese production that will need to be replaced before the iron ore price can fall below US$100/t.

China has doubled its steel production since 2005 and global iron ore producers have struggled to keep up.

Mill capacity can expand rapidly – iron ore export capacity cannot

There is no shortage of iron ore as shown in Figure 23, however the high grade ore tends to be restricted to the tropics where tropical weathering has upgraded the ore. There is however a shortage of infrastructure to get the iron ore to market.

Figure 23: Key iron ore deposits and demand sinks in the near term



Source: Deutsche Bank, USGS

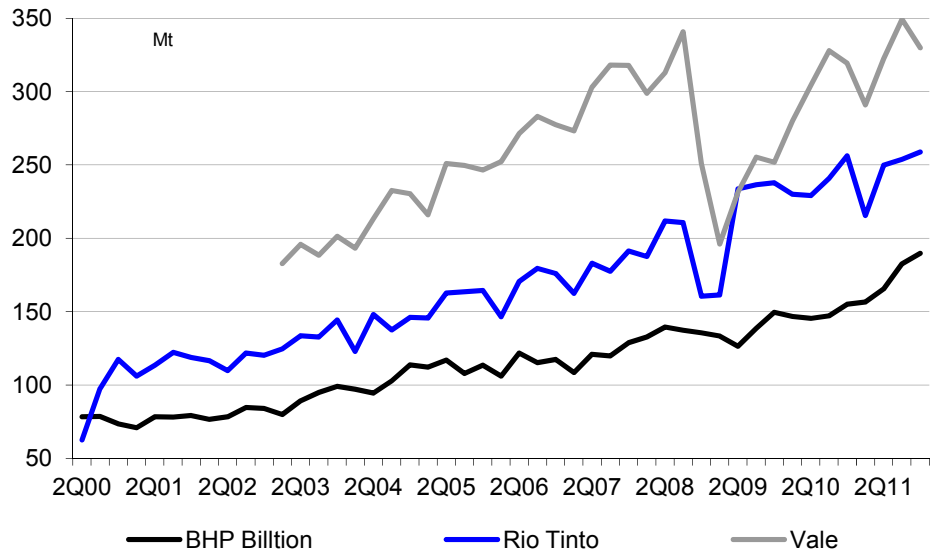
The key issue in the industry is that there are relatively low barriers to entry for steel mills and this has driven an industry with large number of players and hence a large capacity to expand production rapidly. There are high barriers to entry for the iron ore industry in terms of building the infrastructure required to get the ore from the mine to the customer (rail and port). Specifically the capital costs for the infrastructure are high and the building of infrastructure usually engenders additional government scrutiny/interest and bureaucracy. This has led to a very concentrated industry. The iron ore industry has been trying to expand rapidly, but with only a small number of players the rate has been limited and fallen short of requirements.

Low barriers to entry in the steel industry enable it to ramp up much more rapidly than the iron ore industry can.

Digging the dirt is harder than it looks

The three biggest global iron or producers (Vale, Rio Tinto and BHP Billiton) supply about 65% of the seaborne market. As can be seen from Figure 24 all have been growing production. It is worth noting that the first financial crisis in 2008 had a significant impact on production levels—Vale in particular was impacted initially by its desire to try and maintain the older contract pricing methodology (as it is furthest from the Chinese demand growth market and the largest supplier) by trying to enforce contracts. More recently it has been impacted by a weaker European market where it has more exposure relative to the other. This meant that it did not exceed its 3q08 peak until 3 years later in 3q11. Vale's production issues also highlight another barrier to mine development—permitting. Brazil has been increasing its environmental requirements and tightening up the process. This has extended the time taken to achieve all the relevant permits required to start constructing new operations.

Figure 24: Annualised, Controlled iron ore production for the big 3 producers.

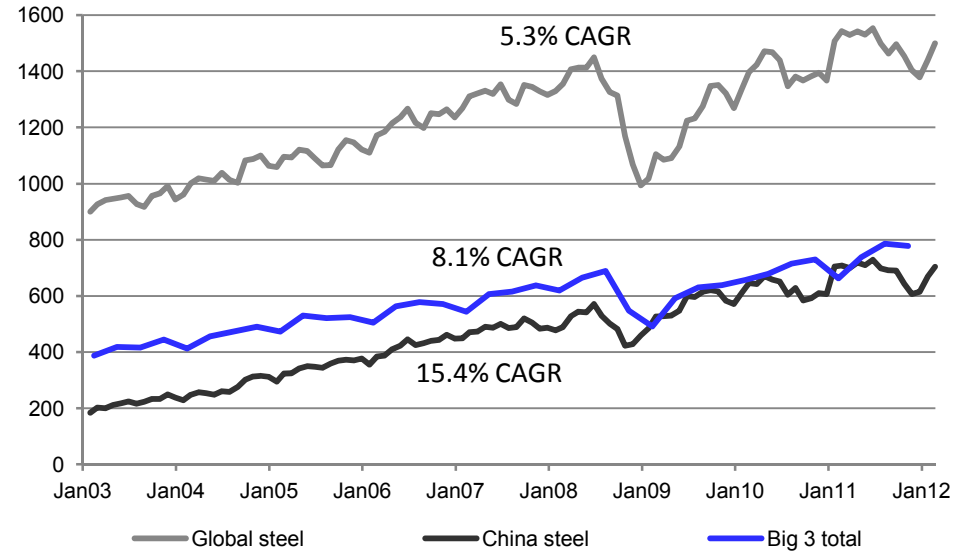


Source: Company data, Deutsche Bank

The 3 largest iron ore producers have been able to grow at a CAGR of 8.1% since 2003, but this has still fallen short of the increased demand for seaborne ore with Chinese steel production growing at 15.4% CAGR over the same time frame.

Despite the challenges, the large iron ore suppliers have actually grown reasonably well and achieved a combined 8.1% CAGR since 2003. This exceeds the global steel production rate of 5.3% over the same period (Figure 25). However about half the world's steel production is produced using local ore. The markets that use seaborne ore have grown more rapidly over this period. China's steel production rose at a 15.4% CAGR since 2003.

Figure 25: Steel growth—the big 3 production growth (Mt)



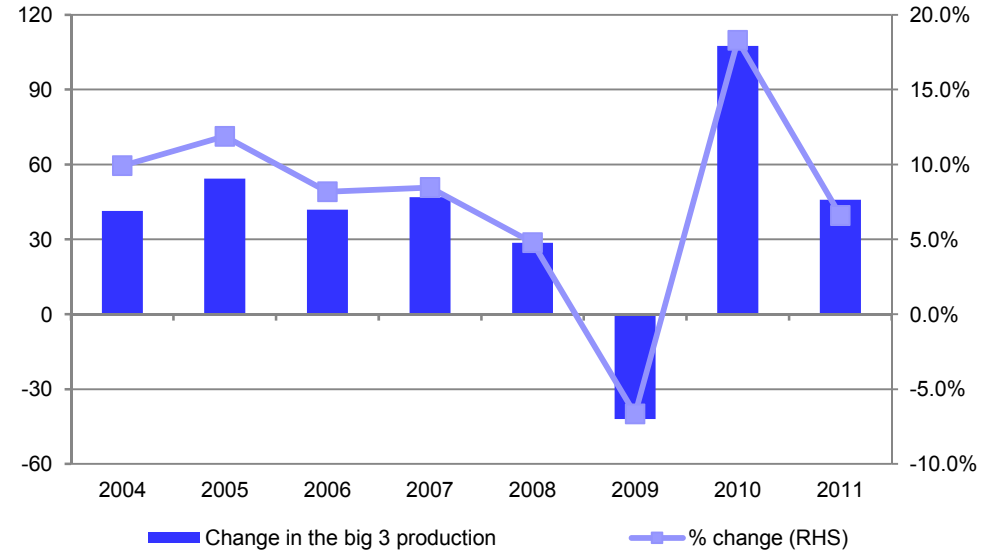
Source: Company data, Deutsche Bank

The rate of production growth of the major iron ore miners has been slowing. Figure 26 shows that the major miners appear to be able to add around 50Mtpa and have done so since 2004—this stable tonnage increase off an increasing production base results in the growth decline (note that 2008-2010 while impacted by the global financial crisis and recovery, they averaged an increase of 31mtpa over those 3 years).

As the iron ore industry is concentrated, its ability to grow rapidly is lessened: fewer players, fewer projects.

We contend that the miners appear to be limited to a fixed tonnage increase rather than a rate of increase. This will mean that the rate of production growth will slow as the production bases get bigger.

Figure 26: Iron ore production change



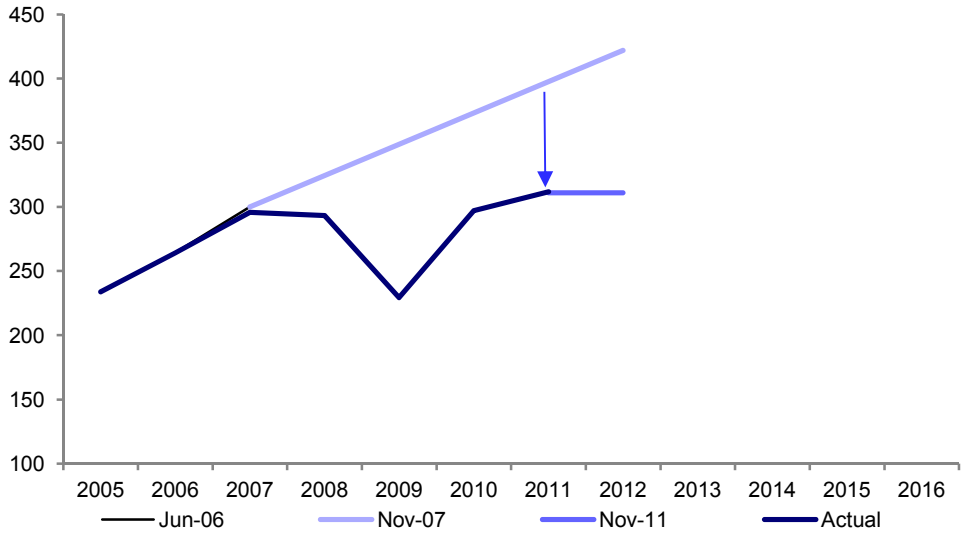
Source: Company data, Deutsche Bank

One of the concerns of the equity market has been that the massive growth plans described by the companies will lead to a massive over supply in the market. To date, the actual production outcomes have fallen significantly short of forecasts. For large,

diversified miners that ostensibly invest through the cycle to ensure high shareholder returns, the lack of performance to a plan over just 3 years is surprising (given planning horizons are often described as 10 years plus). The three major iron ore producers produced circa 170Mt less than they had been planning 3-4 years ago.

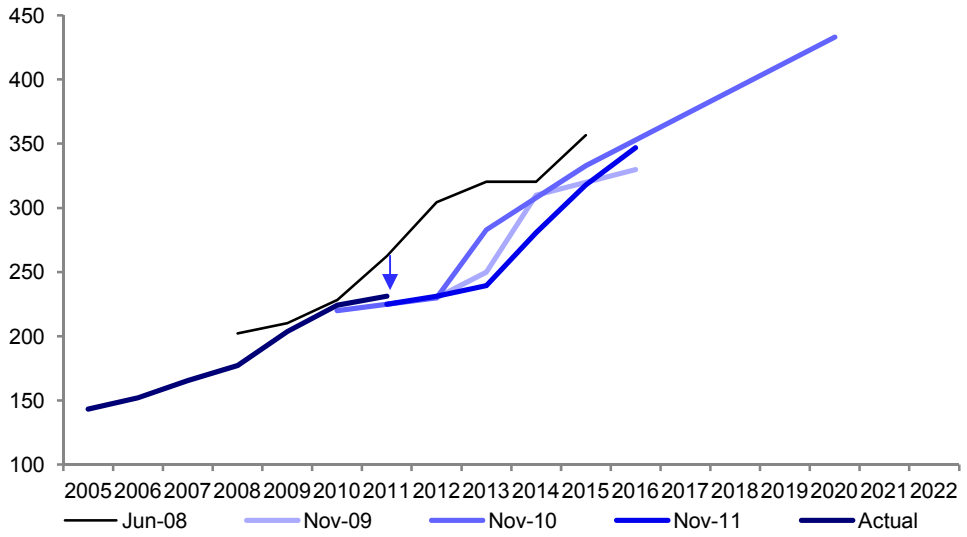
The major iron ore suppliers have struggled to meet their own plans and are producing a cumulative 170Mt less than they had been planning just 3-4 years ago.

Figure 27: Vale producing 100Mt less than projected



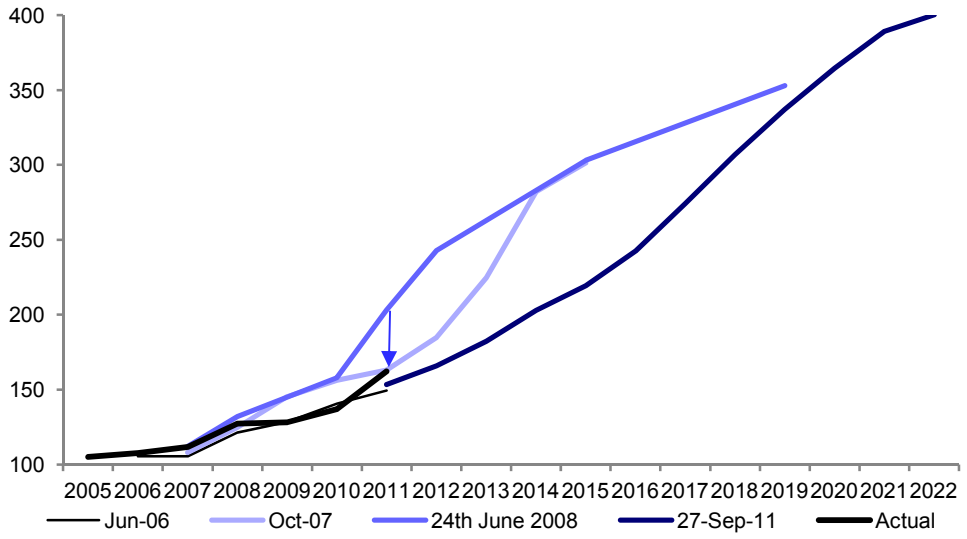
Source: Company data, Deutsche Bank

Figure 28: Rio producing 30Mt less than projected at its Pilbara operations



Source: Company data, Deutsche Bank

Figure 29: BHP producing 40Mt less than expected



Source: Company data, Deutsche Bank

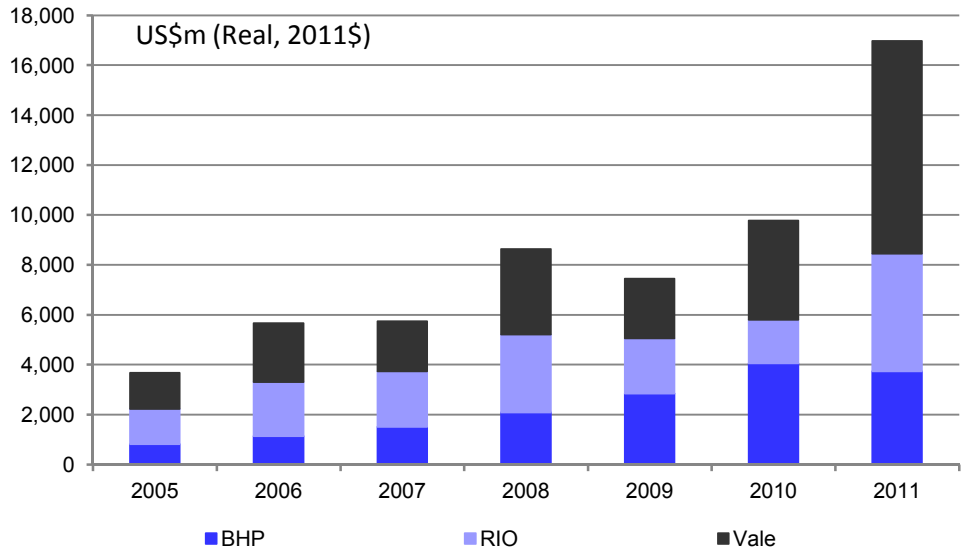
Capex on the move again

Despite the relatively constant annual tonnage increase driven by the majors, capex has been steadily increasing as shown in Figure 30. This means that the miners are not getting the same bang for their buck in terms of capacity outcomes. We believe that three factors have contributed to this:

- Capacity was underutilised before the Chinese demand really ramped up and the miners were able to achieve more capacity by sweating the existing assets.
- The easy/low capex expansion projects were completed first.
- Capex inflation been running at elevated levels during this period of increased mining demand.

Capital costs have been stepping up, providing additional barriers to iron ore growth.

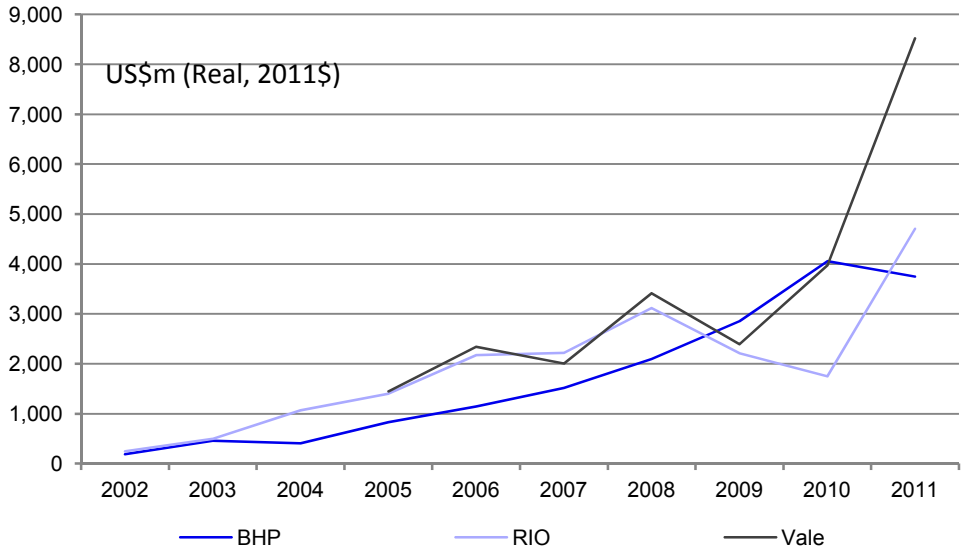
Figure 30: Combined iron ore capex of the 3 big producers (US$m, Real 2011$)



Source: Company data, Datastream, Deutsche Bank estimates.

While all three miners missed earlier growth plans, BHP Billiton was the only one of the three that did continue to invest through the 2008/09 downturn. Both Vale and Rio Tinto cut capex spending in 2009 and 2010 in the case of Rio Tinto. 2011 was a large capex year for both Vale and Rio Tinto as they attempt to accelerate their respective growth projects.

Figure 31: Real Iron ore capex by the three largest producers.

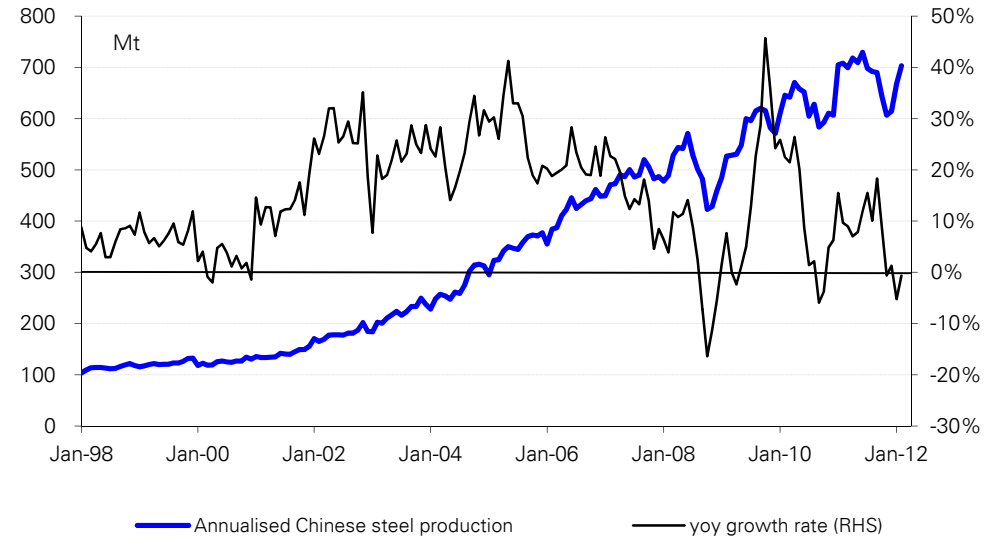


Source: Company data, datastream, Deutsche Bank

Desperate for ore

While the global iron ore miners have had trouble delivering to plan, the Chinese steel industry has not: 15% CAGR from the Chinese steel industry over the last decade has lifted the annualised run rate to over 700Mtpa (703Mtpa in February 2012).

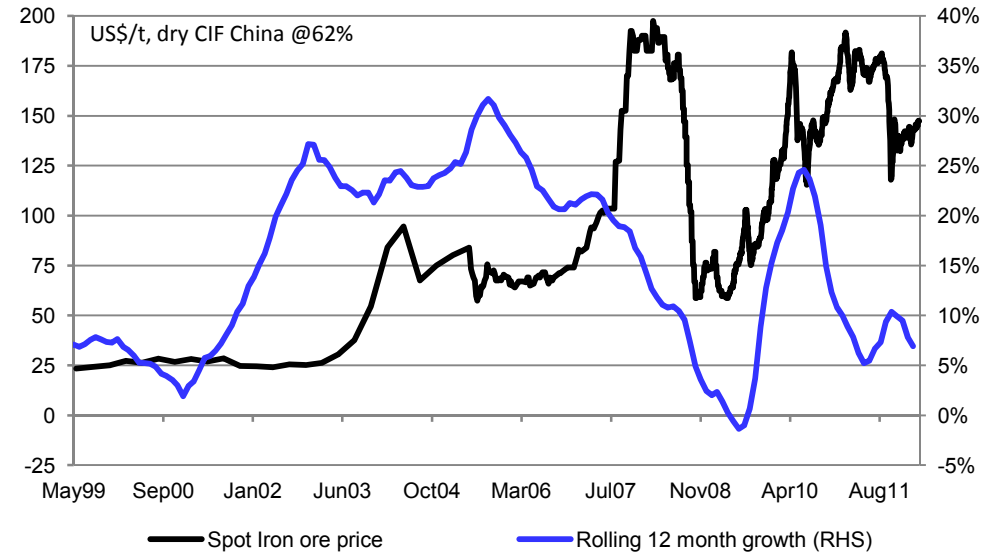
Figure 32: Chinese annualised steel production and yoy growth rate



Source: IISI, Deutsche Bank

The rate of steel production growth in Chins has slowed considerably over the last 5 years compared with the 5 years prior. Contrary to the market fear that slowing steel production growth (and hence slowing iron ore demand growth) will lead to lower iron ore prices, the chart below shows the contrary – the spot iron ore prices strengthened as steel production growth in China slowed. The iron ore price is a function of the total supply and demand picture. While Chinese steel production growth may have been decelerating, it was still growing. This combined with the iron ore miners struggling to produce the tonnes leading to a shortage in supply.

Figure 33: Chinese steel production growth and the spot iron ore price.



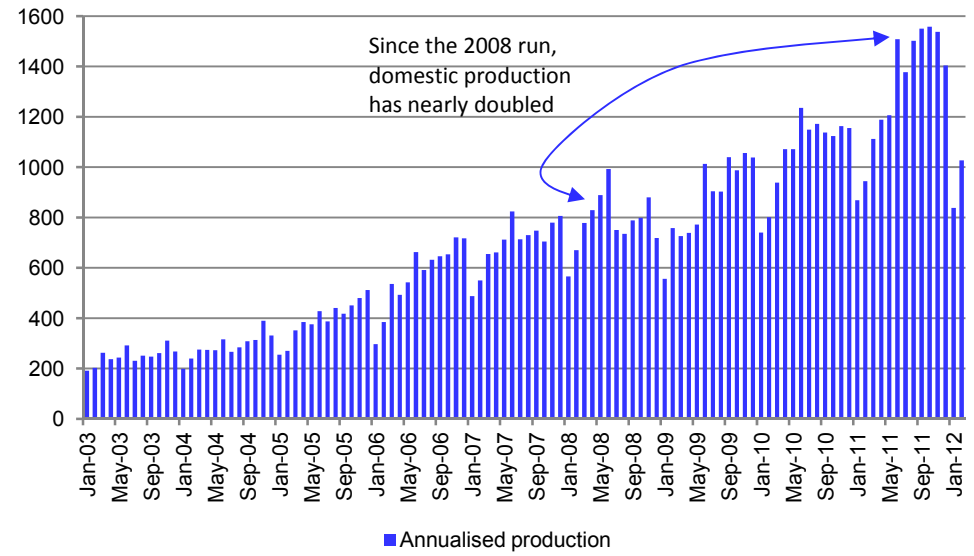
Source: Company data, Datastream, Tex report, IISI, Deutsche Bank

Despite slowing steel production rates over the last five years, iron ore supply could not keep up and the iron ore price rose to unprecedented levels.

The shortfall in seaborne supply drove the iron ore price up and enticed higher-cost Chinese domestic production into the market. Since the "boom times" preceding the first global financial crisis, China has doubled its domestic production from a runrate of just under 800mtpa to a run rate of just under 1600mtpa. (Note the seasonal dips in

production in January and February driven by winter and the Chinese New Year celebrations)

Figure 34: Annualised domestic iron ore production in China (Mt)

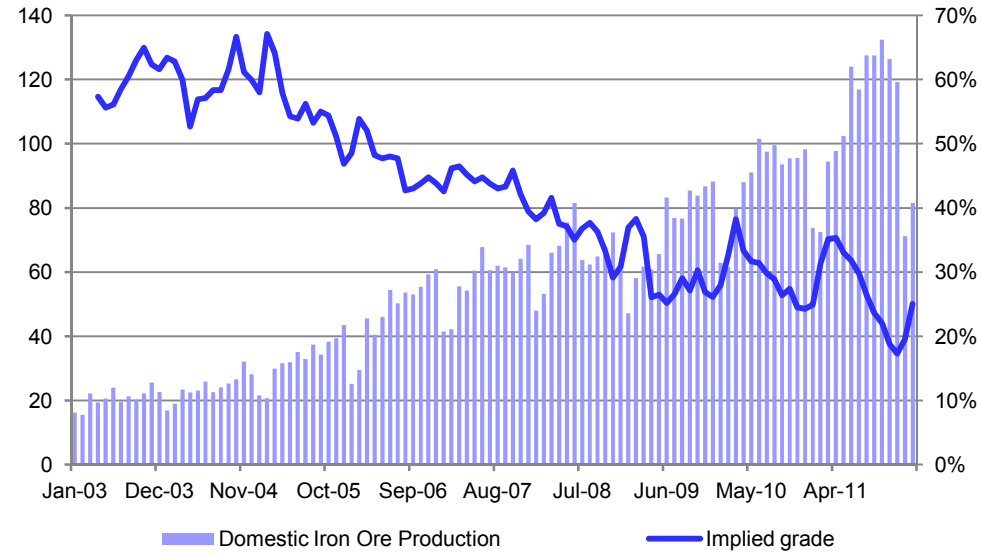


Source: China customs data, Deutsche Bank

Lack of supply into the seaborne market meant that China had to step up iron ore production from its own resources.

While the total production has been increasing to meet demand, the quality of the domestic ore has been declining. We estimate that the iron ore grade has fallen from around 55% at the start of last decade to around 20% now as shown in Figure 35. The grade calculation is influenced by changes in iron ore and steel inventories which are not visible and is impacted by seasonal variations, however the trend is clear.

Figure 35: Annualised domestic iron ore production and implied grade



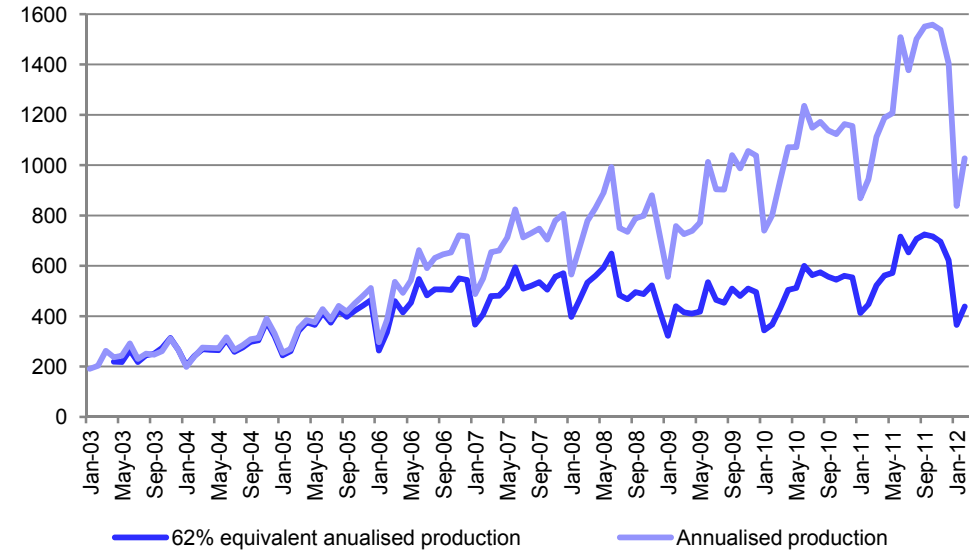
Source: Deutsche Bank

Unfortunately for China, its iron ore resources are low-grade and have been rapidly getting lower.

The growth in domestic production has not been as stark when converted to 62% equivalent levels using the implied domestic grade calculated above. These additional tonnes will be at much higher cost given that iron ore mining is fundamentally about

moving dirt around. At 20% Fe grade, a miner has to move more than 3x the amount of dirt for an equivalent amount of iron as import quality ore.

Figure 36: Annualised domestic Chinese production and implied 62% equivalent production



Source: Deutsche Bank

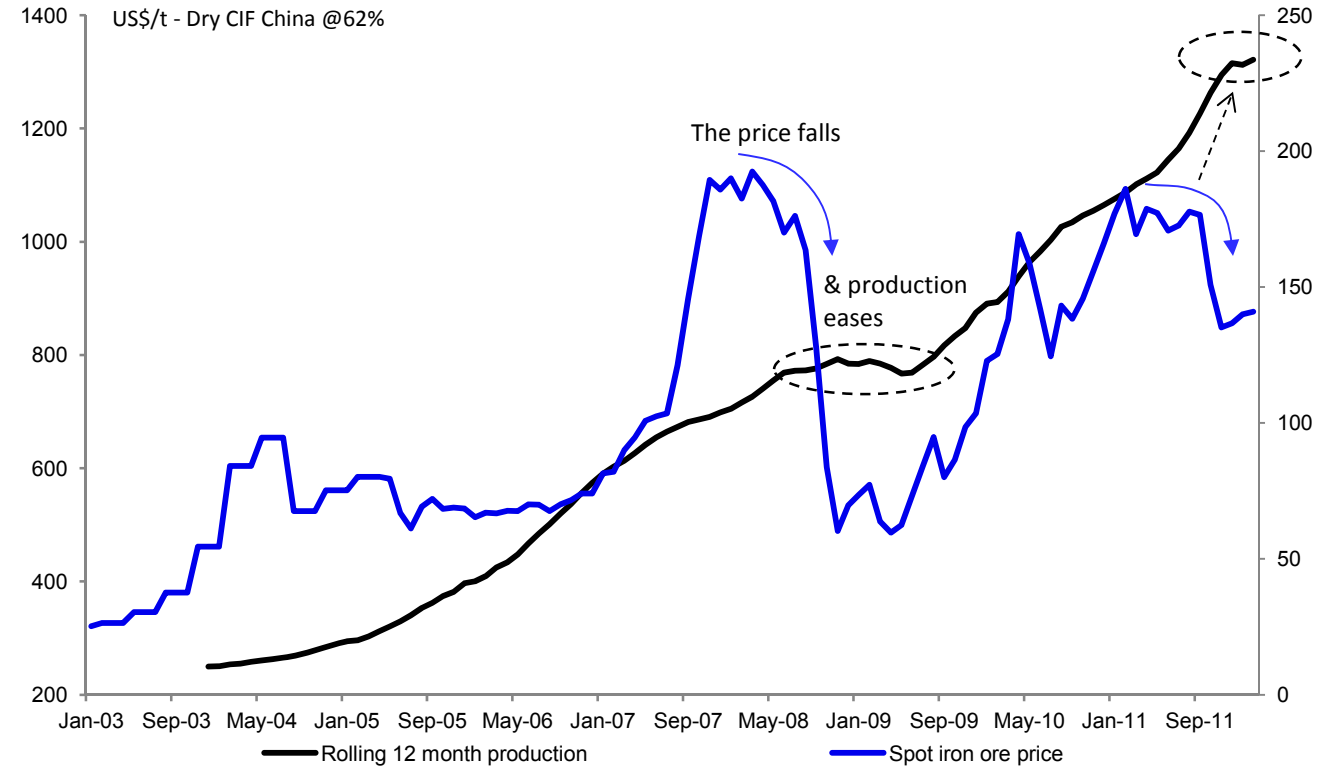
Domestic costs setting the price

This increase in high-cost production is setting the floor for iron ore prices at around US$135/t in our view. With 1400+ individual miners in China, it is very difficult to get all encompassing data on the industry, however the mines are very price responsive to examining their collective behaviour is instructive for finding the cost pressure points.

We show below the iron ore spot price and rolling 12-month Chinese domestic production (to smooth out the seasonality). In 2008, iron ore demand fell, the market moved into surplus and the price fell rapidly to US$60/t amid multiple reports of Chinese mine closures—it then rebounded and ran up as high as US$80/t (production increased) and then declined again. We believe the marginal cost of production at that time in China was around US$75/t. In the ensuing period, the iron ore market moved back into deficit and the price ran up again. In late 2011, the financial issues in Europe drove a slowdown in steel production which forced iron ore destined for Europe into the Asia-Pacific region. China's steel production also slowed over that period and this led to a surplus in the seaborne iron ore market. Again the iron ore price fell (with accompanying Chinese domestic iron ore production closures), but this time to only US$116/t and then it recovered quickly to ~US$130-US$140/t. We believe this represents the current marginal cost of production in China.

The iron ore price is currently trading at the cost of production in China.

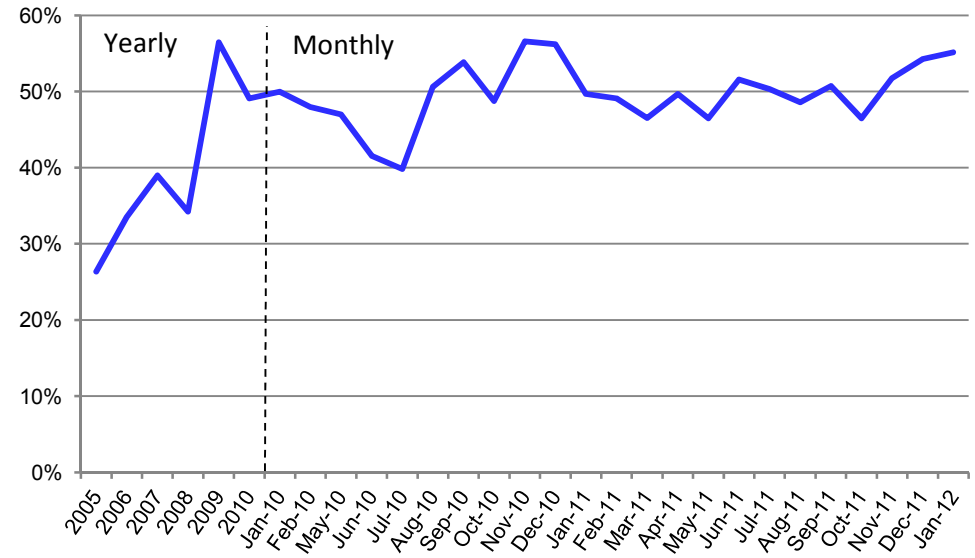
Figure 37: Iron ore spot price and domestic iron ore production



Source: Datastream, Company data, Tex Report, China Customs data, Deutsche Bank

Iron ore production pressures into Asia are evident in the shipping data which show a shift in the export patterns from Europe into China. Figure 38 shows the movement in the proportion of Brazilian Iron ore exports to China. In 2005, 26% of Brazilian iron ore exports went to China and 34% went to Europe. In January this year, 55% of the Brazilian iron ore exports went to China and just 11% went to Europe.

Figure 38: Proportion of Brazilian iron ore exports to China.

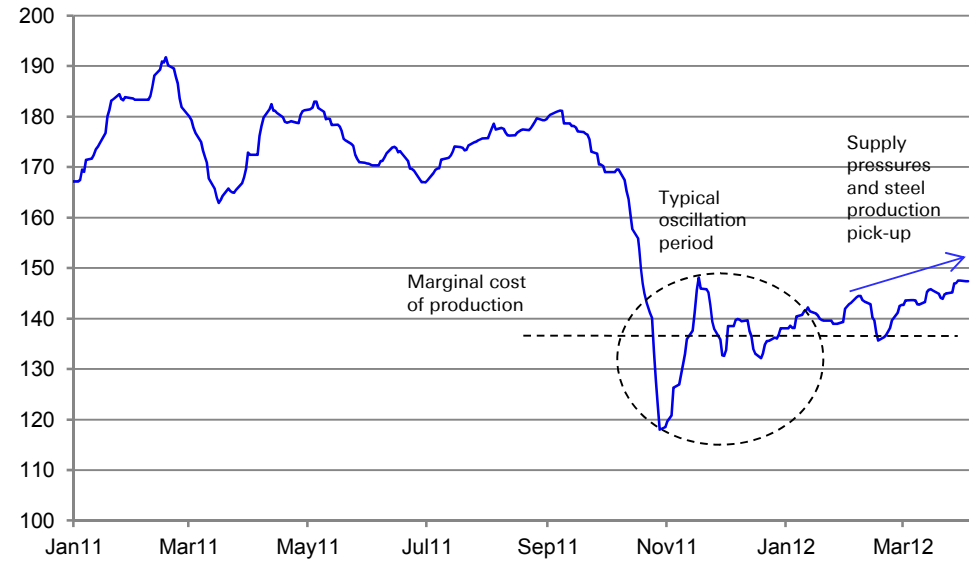


Source: Tex Report, Deutsche Bank

Brazil has shifted its iron ore into China and now ships just 11% into Europe from 34% in 2005.

Figure 39 shows the near-term price movement in more detail. The drop in iron ore price in October and November last year overshot the marginal cost on the way down and then went through a typical overshoot/undershoot period as the domestic production found its new level. The more recent increase in the price has been driven by short-term supply issues (a bridge failure on one of Vale's rail lines and cyclone activity off the coast of Western Australia impacting shipping) and by a pick-up in Chinese steel production. The ongoing price strength suggests Chinese steel production in March was at least as high as that in February.

Figure 39: Near-term iron ore spot price performance (US$/t Dry CIF China @62%)



Source: Datastream, Deutsche Bank

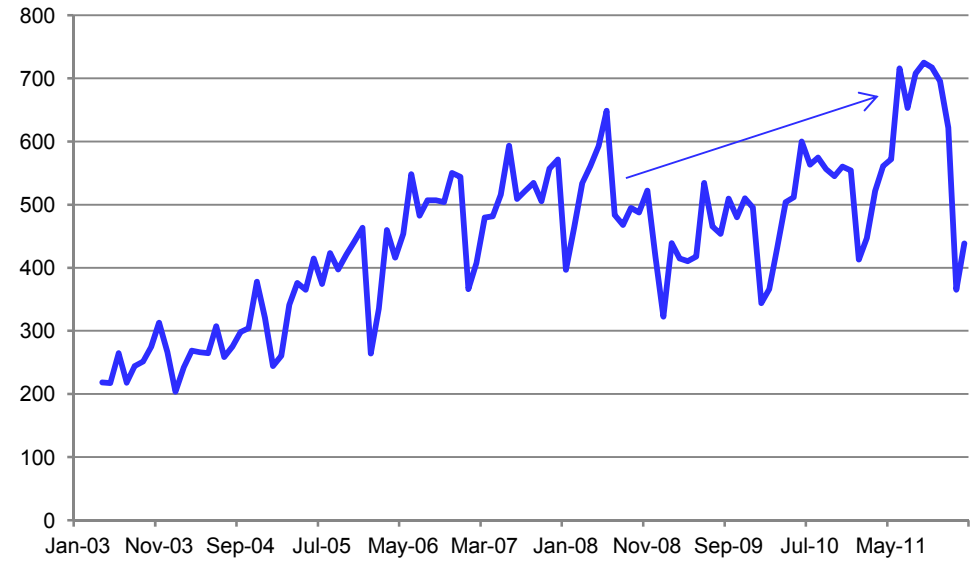
We believe a marginal cost of US$135/t has supported the price over the last few months.

150mt cost buffer

Since 2008 when we estimate the marginal cost of production in China to have been US$75/t and now when the marginal cost is US$135 we estimate that between 150Mt and 200Mt of 62% equivalent capacity has been brought on stream in China. This means that 150Mt to 200Mt of imports plus any additional demand will be needed to replace this higher cost production before the price returns to US$75/t (note this is in 2008 dollars… including inflation this is probably around US$86/t now.

Since the 2009 recovery, we estimate that ~150Mt of high-cost Chinese production has come on stream.

Figure 40: Annualised Chinese domestic iron ore production on 62% equivalent basis (Mt)



Source: Deutsche Bank estimates

Equity read through

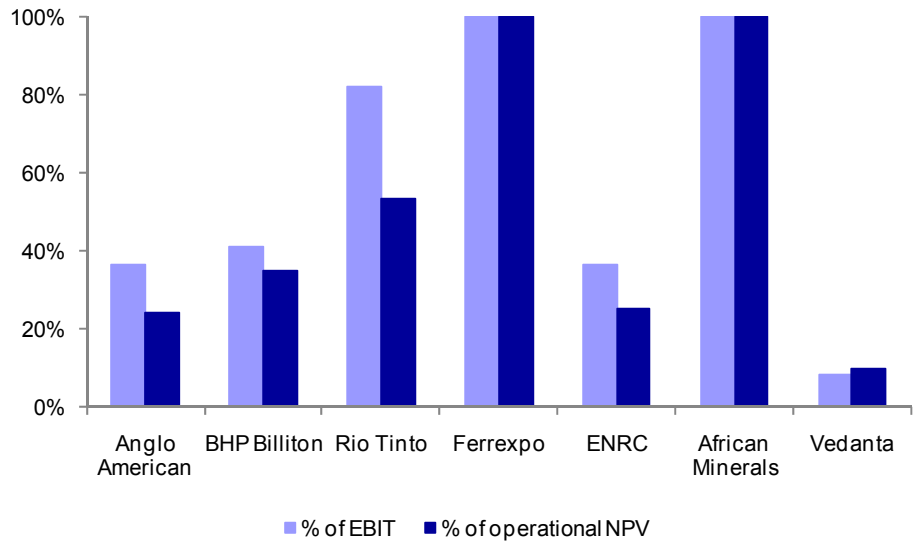
What is the market pricing in?

The market is pricing in an iron ore price of US$76/t into the iron ore equities… today the price is US$147/t.

In our assessment, the equity market is taking a very cautious view on the Chinese economy and slowing steel demand, and this bearish view is being expressed in the mining equities with a significant iron ore exposure. The UK mining sector (as defined by stocks under our coverage) is trading on a P/NAV of 0.74x, however equities with an exposure to iron ore have the largest discount to their NAVs. In ascertaining just how bearish the market is, we have used two approaches. Firstly we have lowered our commodity prices by 10% across all time frames (including our long-term prices), and then "solved" for an iron ore price to achieve our NAV. Secondly, we have stripped out any growth from the equities to assess how much of the potential growth is being priced in.

The companies with an iron ore exposure under our coverage range from Vedanta, with 8% of EBIT from iron ore in 2012F, to Rio at 82% of EBIT and finally Ferrexpo and African Minerals which are pure iron ore companies.

Figure 41: UK listed miners with iron ore exposure in 2012F

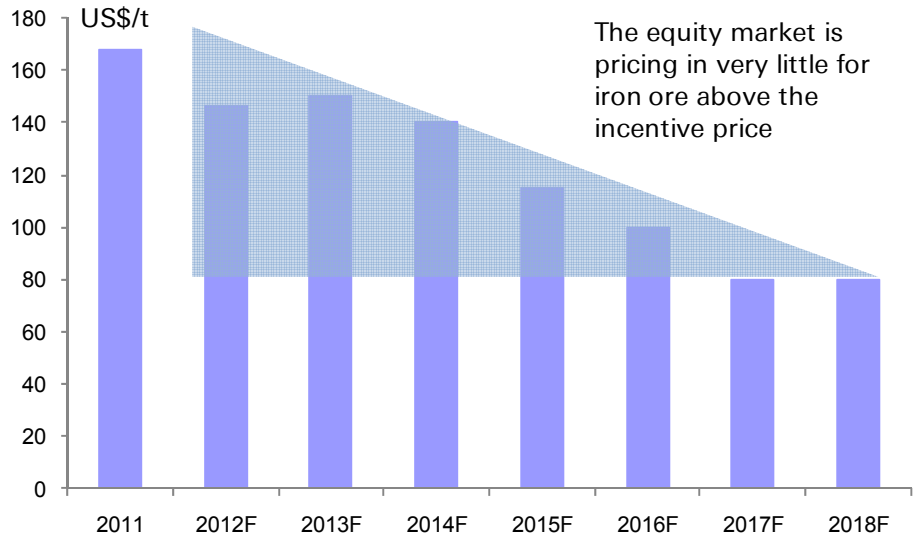


Source: Deutsche Bank estimates

For the three diversified miners, iron ore comprises an average of 53% of 2012F EBIT and 38% of the operational NAV. As all companies have growth in iron ore, the lower contribution to NAV versus EBIT implies that the combination of growth in other divisions outweighs the growth in iron ore and that the additional volumes will be outweighed by the declining price profile. Since the acquisition of Cairn India, and the introduction of a 30% export duty, which we assume is permanent, Vedanta's exposure to iron ore has fallen to c.10% on both an EBIT and NAV basis.

Our NAVs are determined using the Deutsche Bank commodity price deck, which includes a long-run iron ore fines price of US$80/t CIF to China on a 62% basis. However, we forecast iron ore prices to remain above this "incentive price" until 2017F, as shown in Figure 42 below:

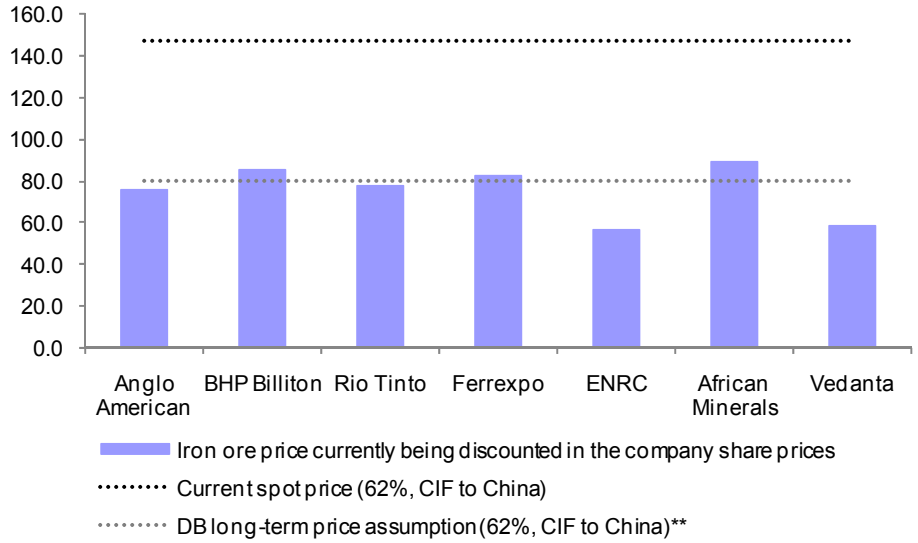
Figure 42: Deutsche Bank's Iron ore price forecasts (Fine, CIF to China, 62%)



Source: Thomson Financial datastream, Deutsche Bank

Three of the companies under our coverage are pricing in iron ore above our long-term price of US$80/t for life-of-mine. These are the BHP and two pure play iron ore companies: African Minerals at US$89.5/t, BHP Billiton at US$85.5/t (after lowering the price deck for all other commodities by 10%) and Ferrexpo at US$82.5/t. The other four companies are discounting an iron ore price below US$80/t for the life-of-mine. Anglo American is discounting US$76/t, Rio Tinto US$77/t, and ENRC and Vedanta, US$56/t and 59/t respectively.

Figure 43: Iron ore price currently being priced in to some of the UK miners



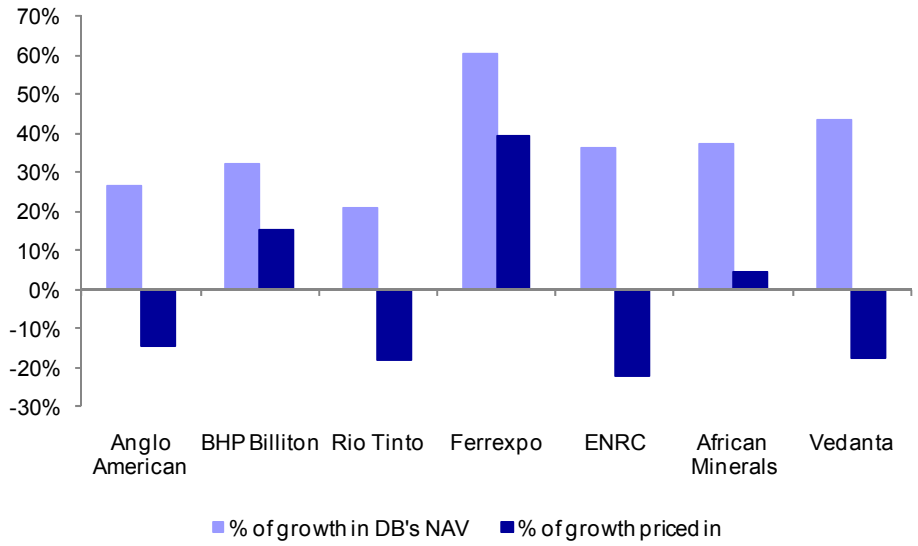
*Source: *Share prices taken intraday on the 4th of April, **from 2017 onwards in real terms, Deutsche Bank*

The market is factoring lower prices than our long-run price for most of the miners under coverage.

In order to cross reference what commodity prices are being discounted, we have looked at how much growth potential the equity market is pricing in. An average of c.37% of our NAVs of the seven focus companies comprises growth potential. We include the highest proportion for Ferrexpo at 60%, and the lowest for Rio at 21%. In our assessment the equity market is pricing in 39% of the growth (the Yeristovkoe

expansion) for Ferrexpo, a more modest 5% of the growth (Phase II of Tonkolili) and 15% of BHP Billiton's growth options. We think the equity market is pricing in none of the growth options for Anglo American, Rio Tinto, ENRC and Vedanta. Furthermore, we think the current operations are being under-valued by between 15% for Anglo American to 22% for ENRC.

Figure 44: Volume growth being priced in as a % of the DB NAV



Source: *Share prices taken intraday on the 4th of April, Deutsche Bank

Alternatively, the market only appears to be ascribing any value to the growth available to 3 of the seven companies.

We think it is slightly incongruent that the pure play iron ore stocks are pricing in either more growth or a higher iron ore price than their diversified mining peers, despite the equity market being cautious on the outlook for China. We believe this is due to the more mining-focused investor which both African Minerals and Ferrexpo tend to attract. We believe the opposite is true for BHP Billiton, which is more the default investment in the sector, but also has a long history of developing greenfield projects.

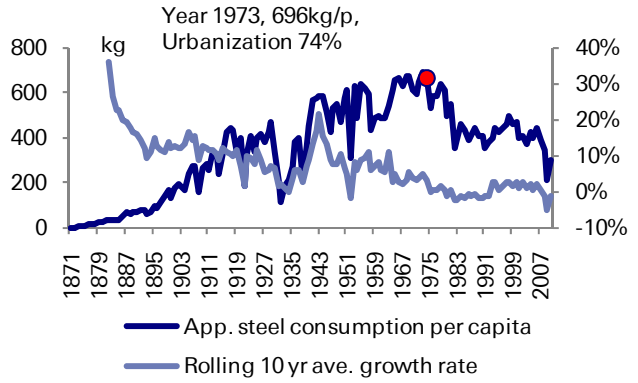
Our 2 top picks are Rio Tinto and African Minerals.

In a sector which is under-valued in our view, we reiterate our two top picks Rio Tinto and African Minerals. Rio Tinto's share price is currently pricing in either very conservative iron ore prices or no growth out of the portfolio, which we think is too conservative given the resource base and advantaged infrastructure position in the Pilbara. African Minerals have received funding for Phase II of the Tonkolili expansion from Chinese partner Shandong, an endorsement from the Chinese state. Although there are some execution risks, not least the potential for capex overruns, we think African Minerals' growth has been de-risked to the extent that a higher proportion will become priced in over the course of the year. Both ENRC and Vedanta remain two of the most under-valued stocks in our coverage list, but both lack a catalyst over the next 12 months in our view. ENRC has no growth over 2012, and the process of building trust with the investment community will take time. We think that Vedanta will achieve the necessary approvals to simplify its corporate holding structure, but the process is likely to be drawn out. The potential buy-out of minorities in HZL and BALCO and the securing of bauxite in Orissa are potential catalysts. Anglo American is also discounting a low iron ore price in its share price, making the stock attractive. However, potential permitting and construction delays at the company's Brazilian Minas Rio iron ore project, along with a lengthy legal dispute around the Minera Sur option in Chile remain impediments to a strong stock performance in our view.

Appendix A: Steel intensity of use history

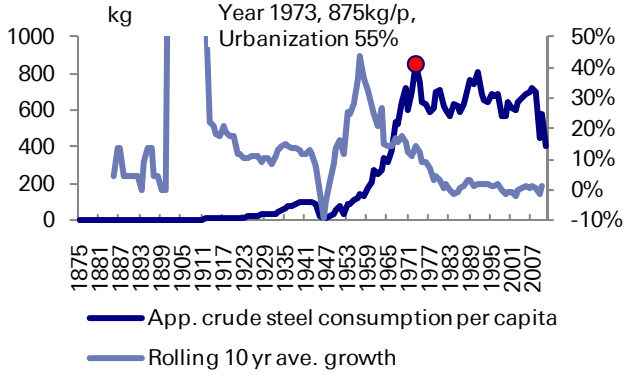
Benchmarking against the developed nations

Figure 45: US steel consumption history



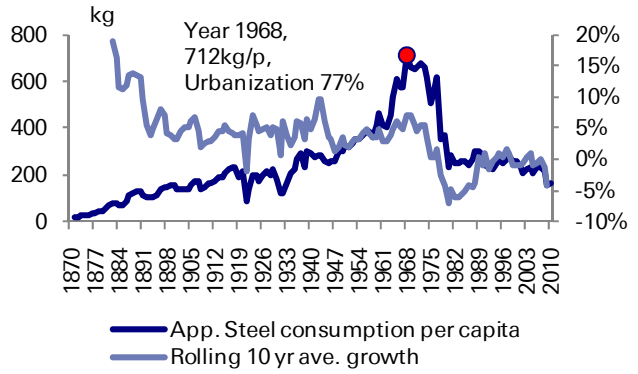
Source: World Steel Association, IMF Deutsche Bank

Figure 46: Japan steel consumption history



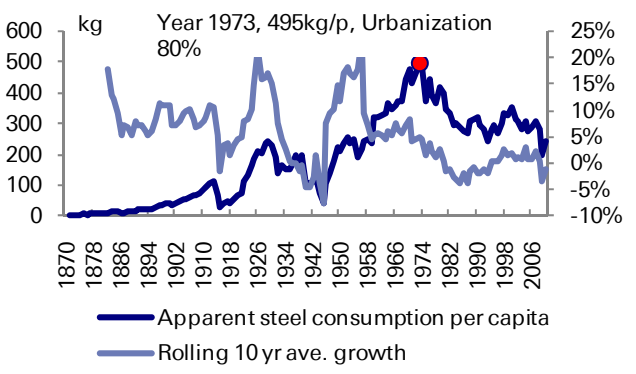
Source: World Steel Association, IMF, Deutsche Bank

Figure 47: UK steel consumption history



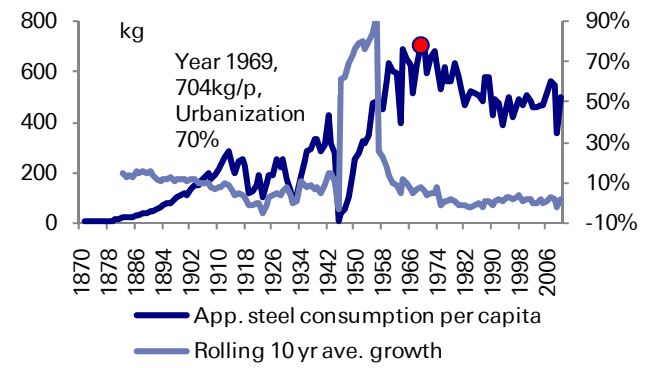
Source: World Steel Association, IMF, Deutsche Bank

Figure 48: France steel consumption history



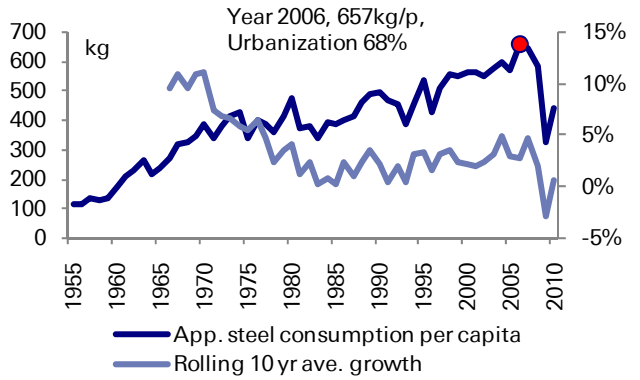
Source: World Steel Association, IMF, Deutsche Bank

Figure 49: Germany steel consumption history



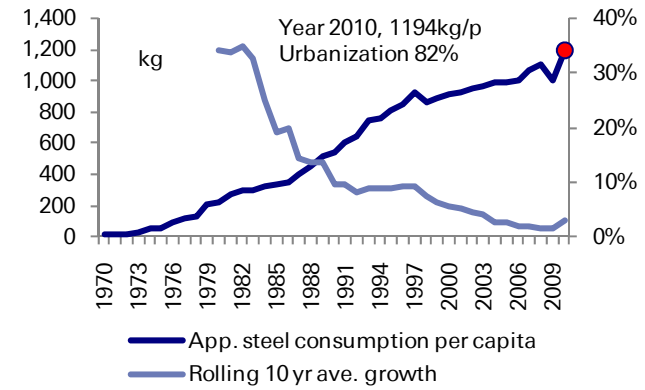
Source: World Steel Association, IMF, Deutsche Bank

Figure 50: Italy steel consumption history



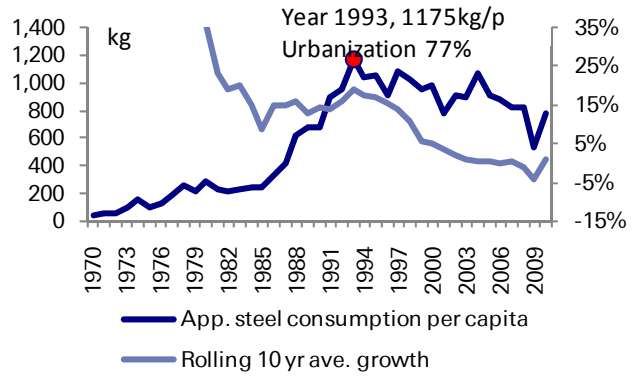
Source: World Steel Association, IMF, Deutsche Bank

Figure 51: South Korea steel consumption history



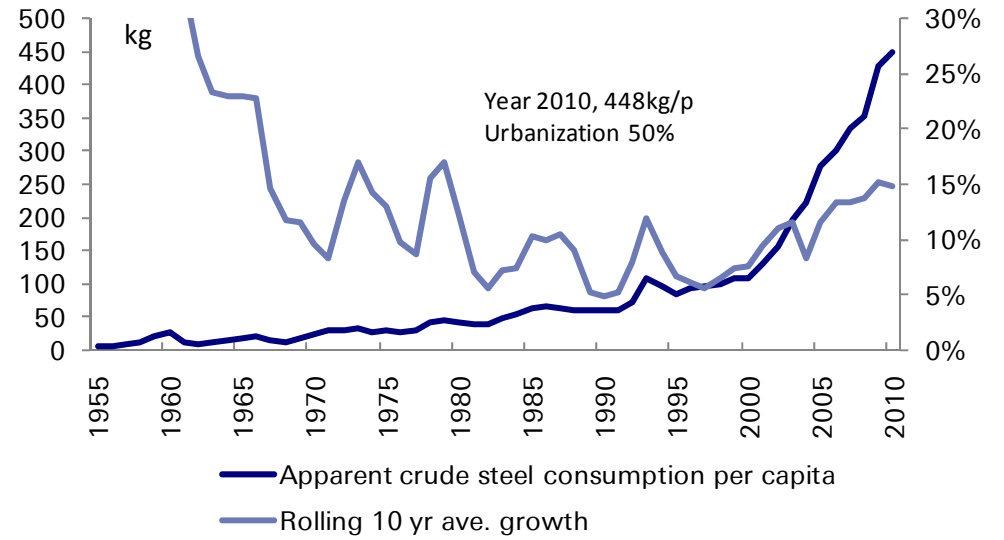
Source: World Steel Association, IMF, Deutsche Bank

Figure 52: Taiwan steel consumption history



Source: World Steel Association, IMF, Deutsche Bank

Figure 53: China Steel consumption history



Source: World Steel Association, IMF ,CEIC, Deutsche Bank

Appendix 1

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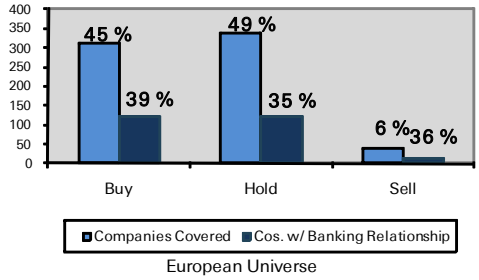

European Universe

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