



Opportunities and challenges in the manganese alloy industry

Kevin Fowkes
Managing Consultant

Metal Bulletin 14th Asian Ferroalloys Conference
Hong Kong, 27th March 2012



AlloyConsult
www.alloyconsult.com

Structure

1. Brief overview of recent developments in Mn alloy markets
2. Focus on India
3. Focus on Mn metal

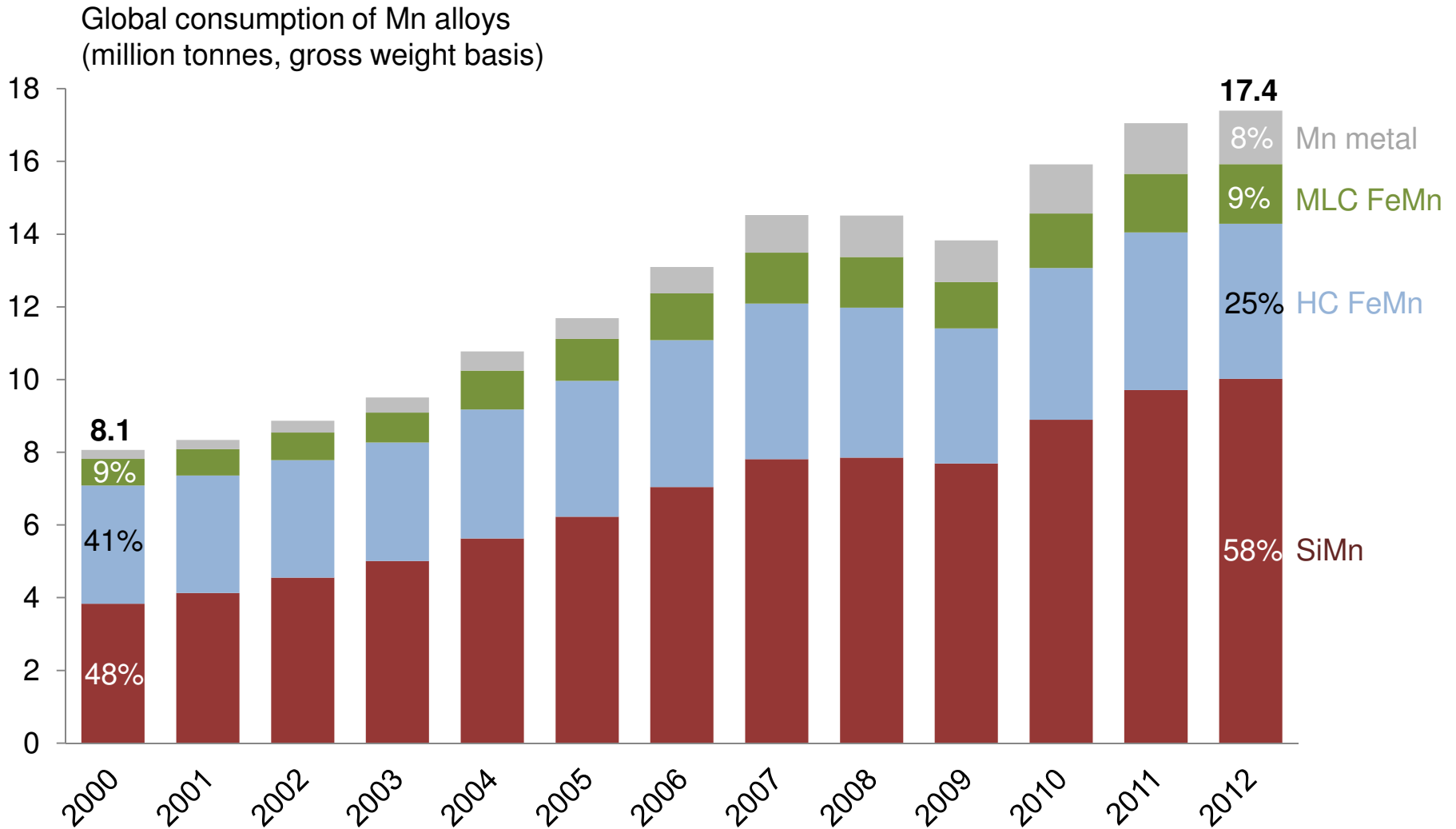
Structure

1. Brief overview of recent developments in Mn alloy markets
2. Focus on India
3. Focus on Mn metal

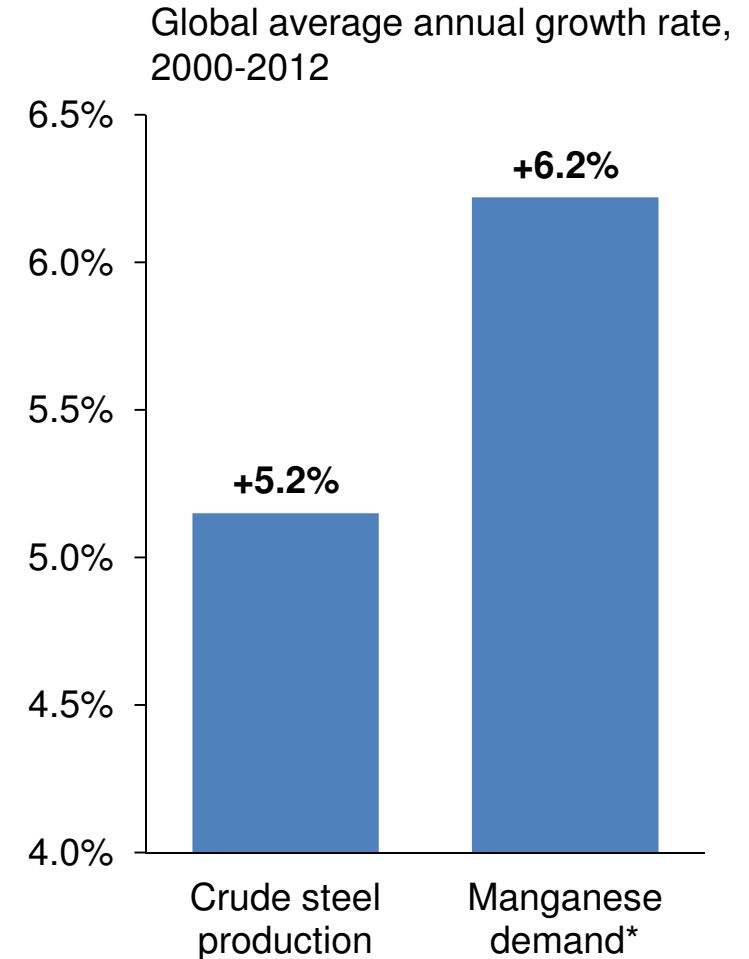
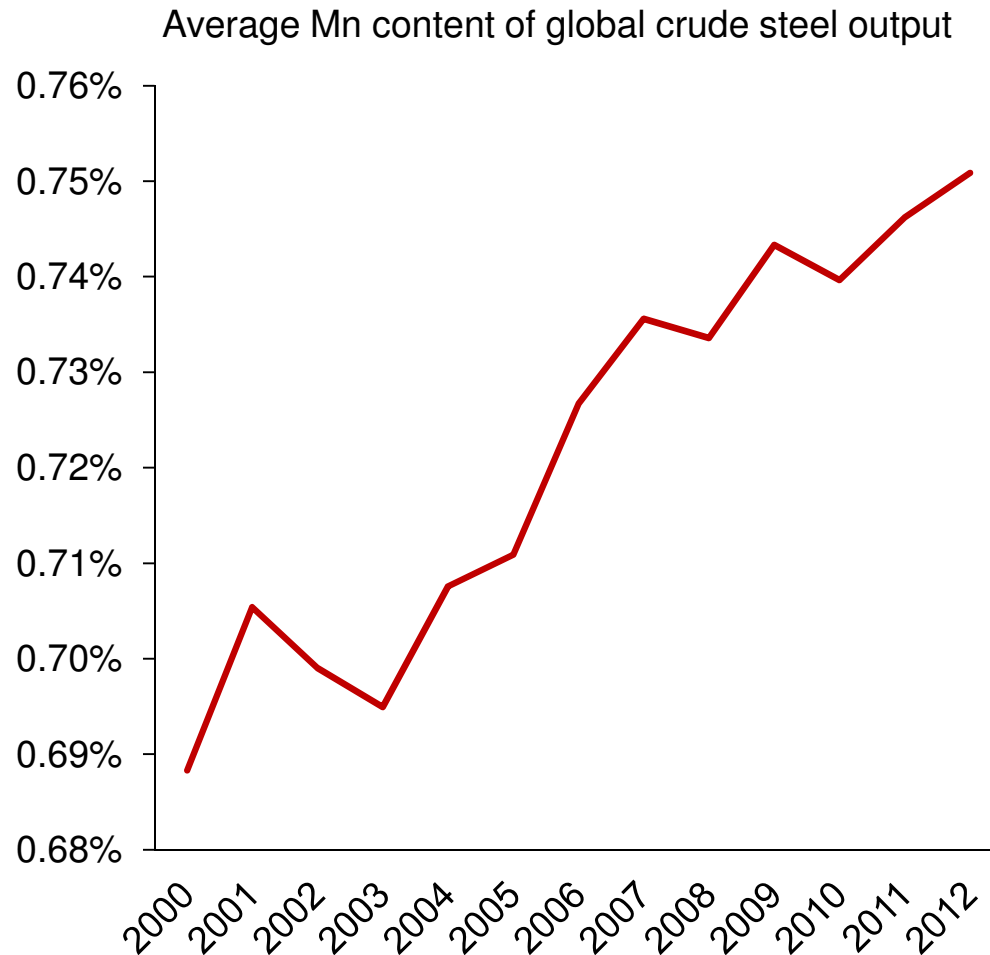
What is manganese?

- Manganese is the world's fourth most heavily consumed metal
- Global mine output of 16 million Mn units in 2012 – over 90% goes into steel
- All steels contain manganese
- Manganese is used to remove sulphur from liquid steel (sulphur causes steel to crack)
- There is no viable substitute for manganese as a de-sulphuriser
- Manganese is also used to improve the strength of certain steels (structural steels, high strength flat steels)
- Non-steel consumption of manganese includes de-polarisation of dry-cell batteries, and as an additive in certain aluminium and copper alloys

Global demand for Mn alloys rose in 2012, despite a generally poor year. Long-term trend has been towards SiMn, away from HC FeMn



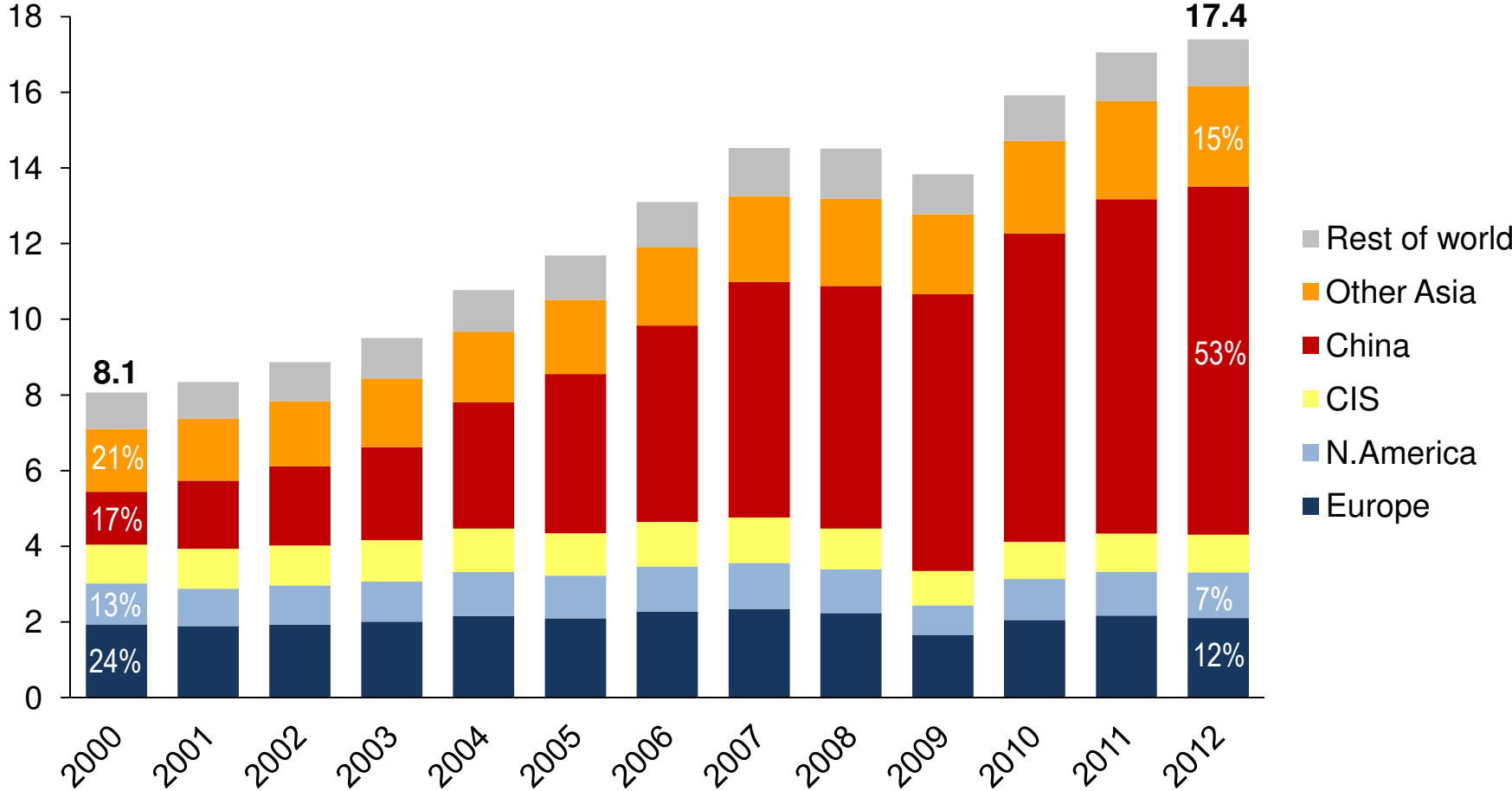
Average Mn content per tonne of steel has increased by ~10% over the past decade, and is continuing to rise



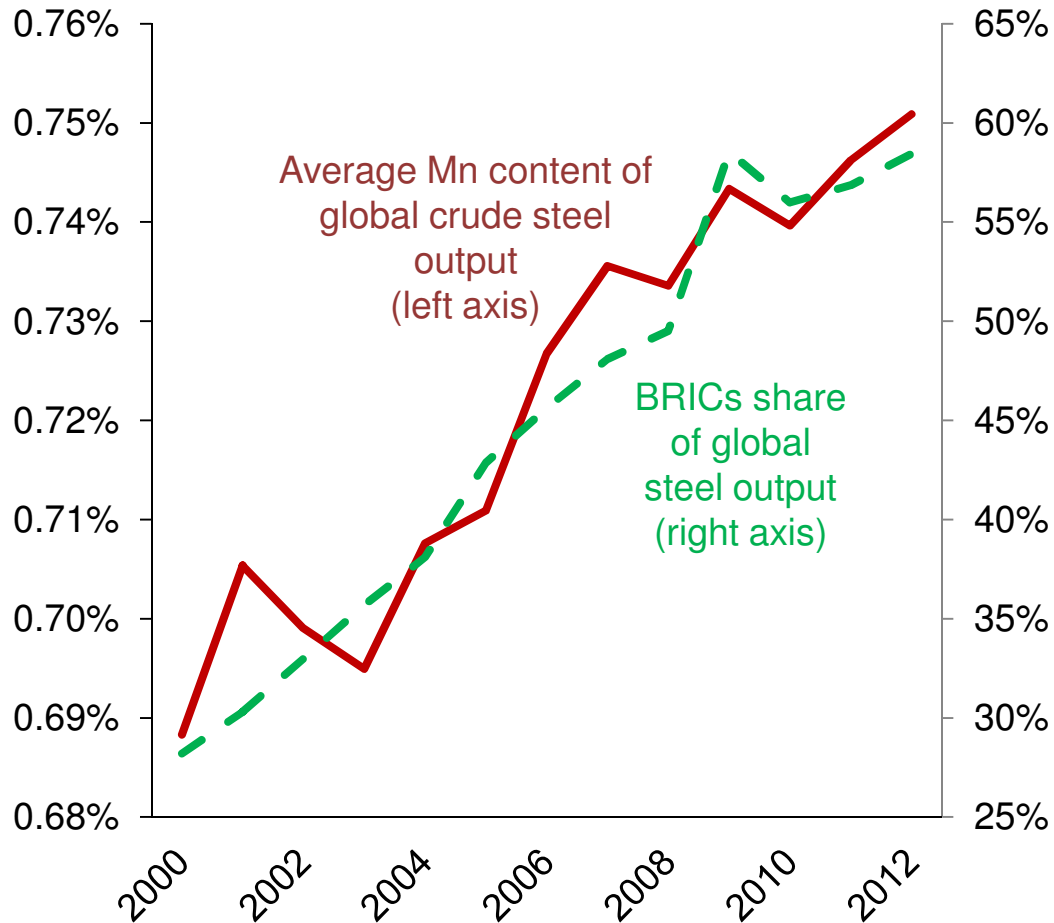
* includes non-steel applications

Mn alloy demand growth has been fuelled by China. In 2012 China accounted for 53% of global demand, Asia in total for 68%

Global consumption of Mn alloys
(million tonnes, gross weight basis)



There are good reasons to expect that the average Mn content of steel will continue to rise



Structural steels require strength, so tend to have a high manganese content

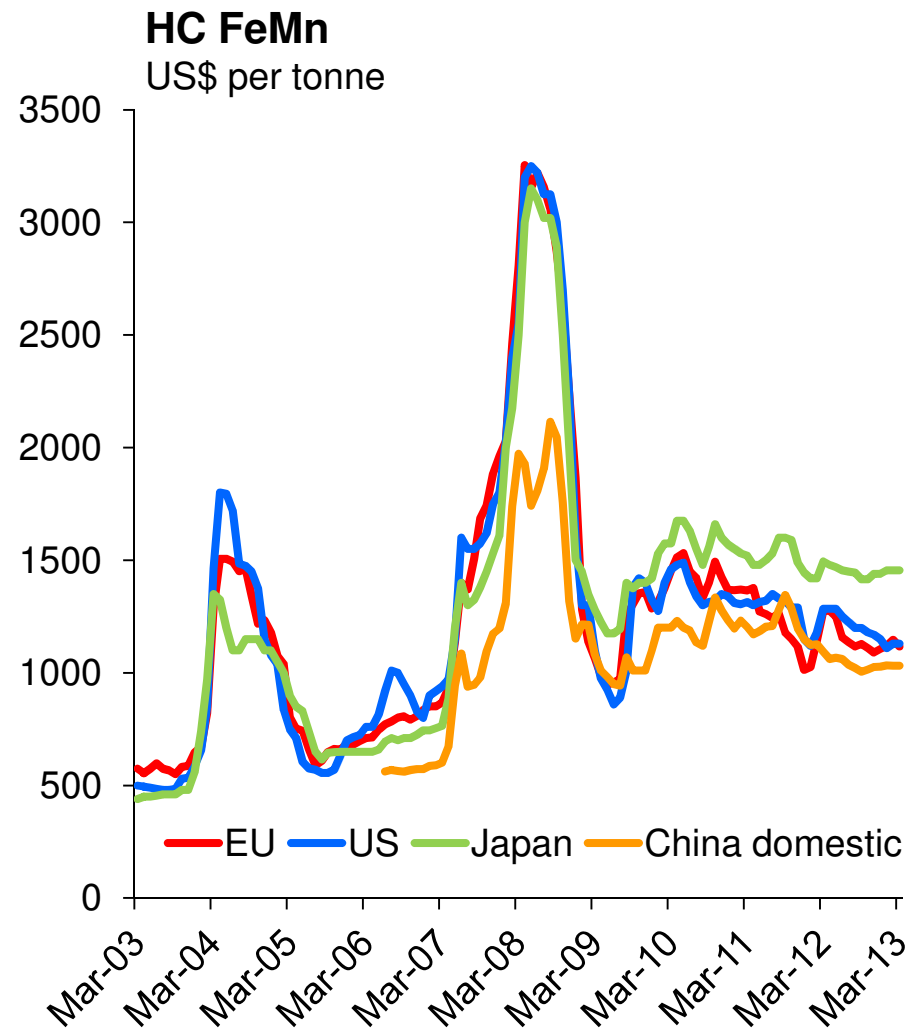
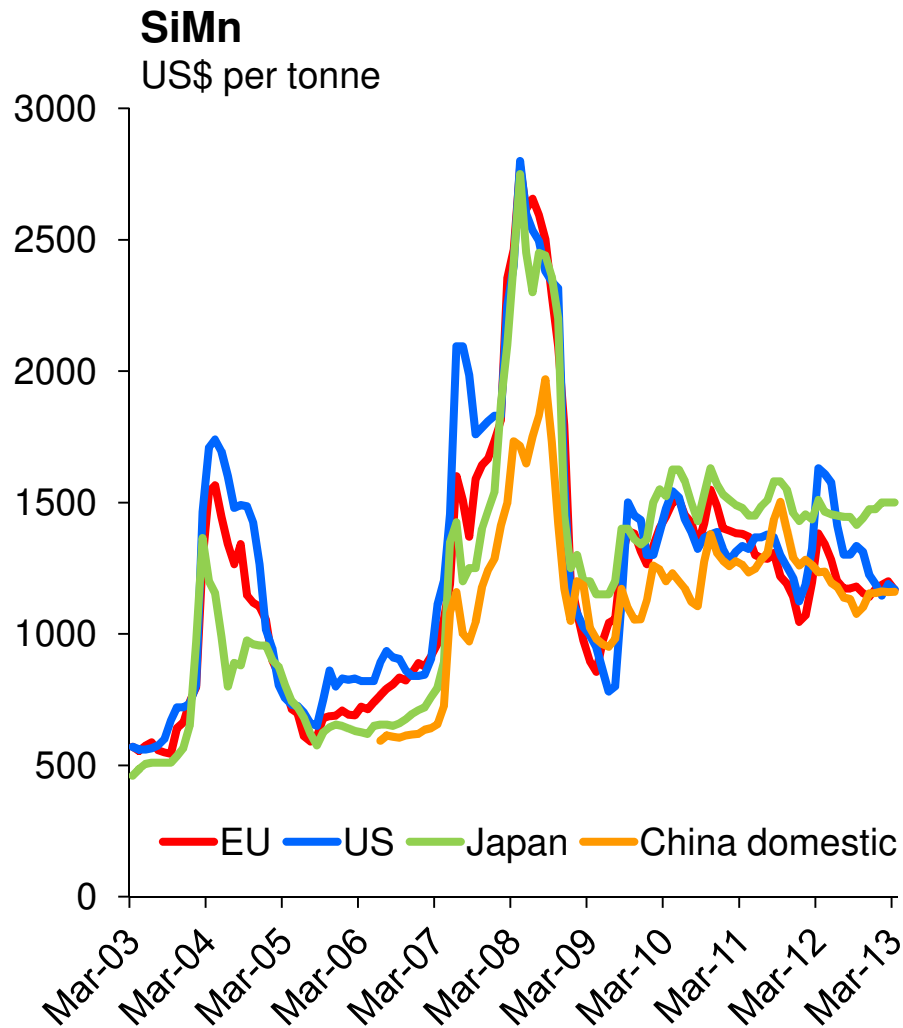
Developing countries focus more on structural steel consumption – for infrastructure and buildings

Chinese building / earthquake resistance standards will continue to tighten, leading to higher Mn content in steel (especially rebar)

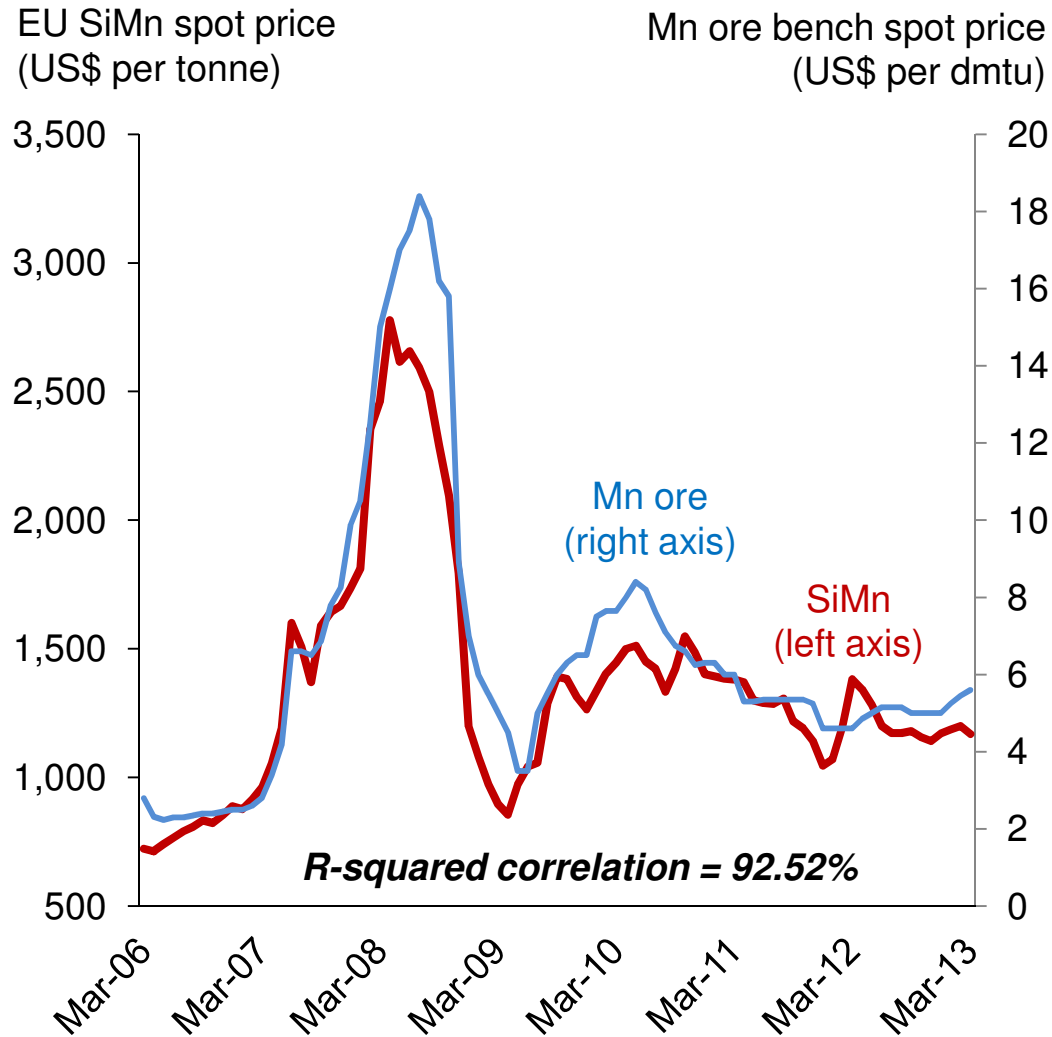
Strong demand potential from India and other early-stage developing nations

Increasing use of high-strength steels in automotive sector

Mn alloy prices have not shown any consistent improvement from the floor reached in Q4-2012



Modest increases in Mn ore prices, if they are sustained, will most likely filter through to Mn alloy prices in the coming months



Mn ore and Mn alloy prices are so well correlated because Mn ore prices impact production costs for non-integrated, higher cost production

Filters directly into Chinese prices – into Europe & elsewhere mostly through Indian imports

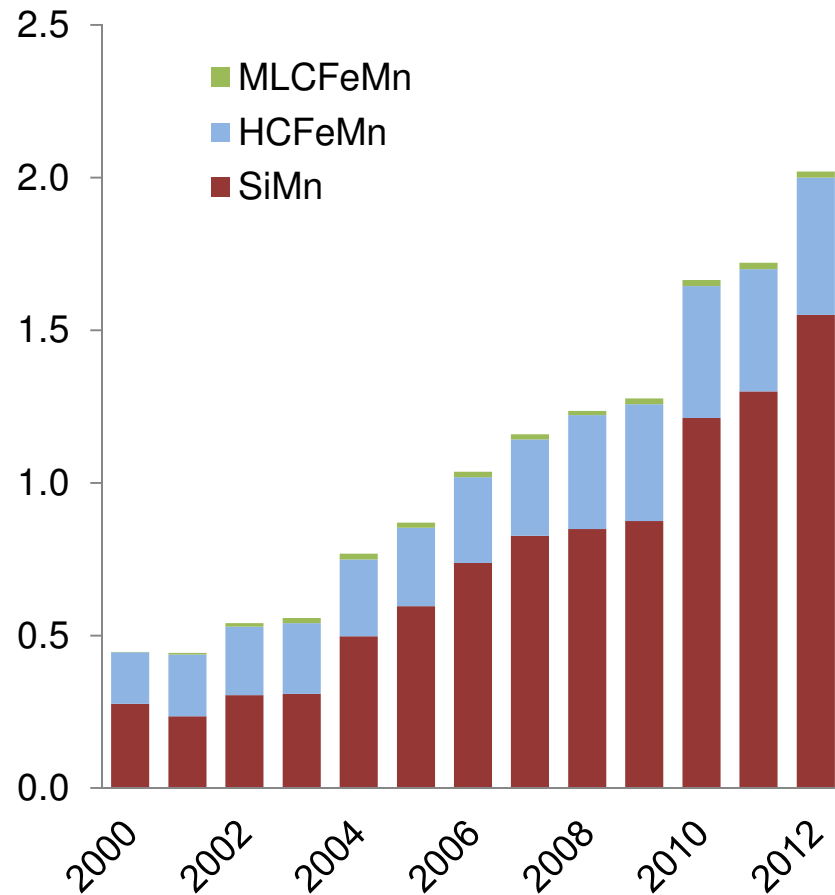
Recent modest improvements in Mn ore prices have not yet been much reflected in Mn alloy prices but if higher Mn ore prices are sustained then this is likely to change

Structure

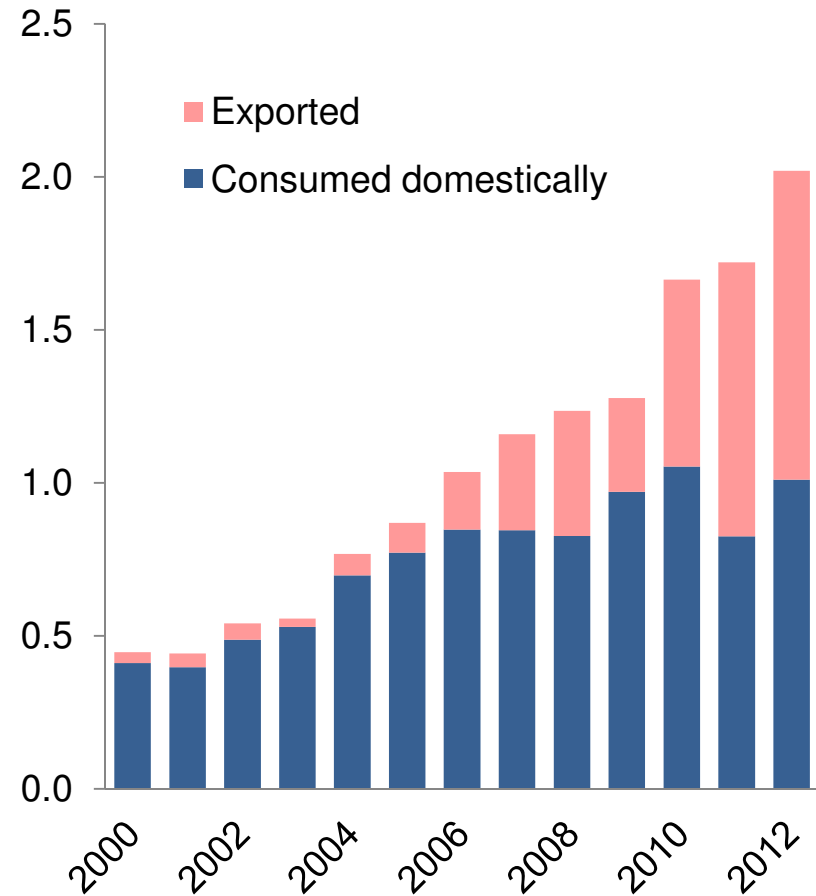
1. Brief overview of recent developments in Mn alloy markets
2. Focus on India
3. Focus on Mn metal

Indian Mn alloy output has risen fourfold over the past decade (~75% of output is SiMn). The growth has been driven by rising exports

India Mn alloy output by type
(million tonnes, gross weight basis)

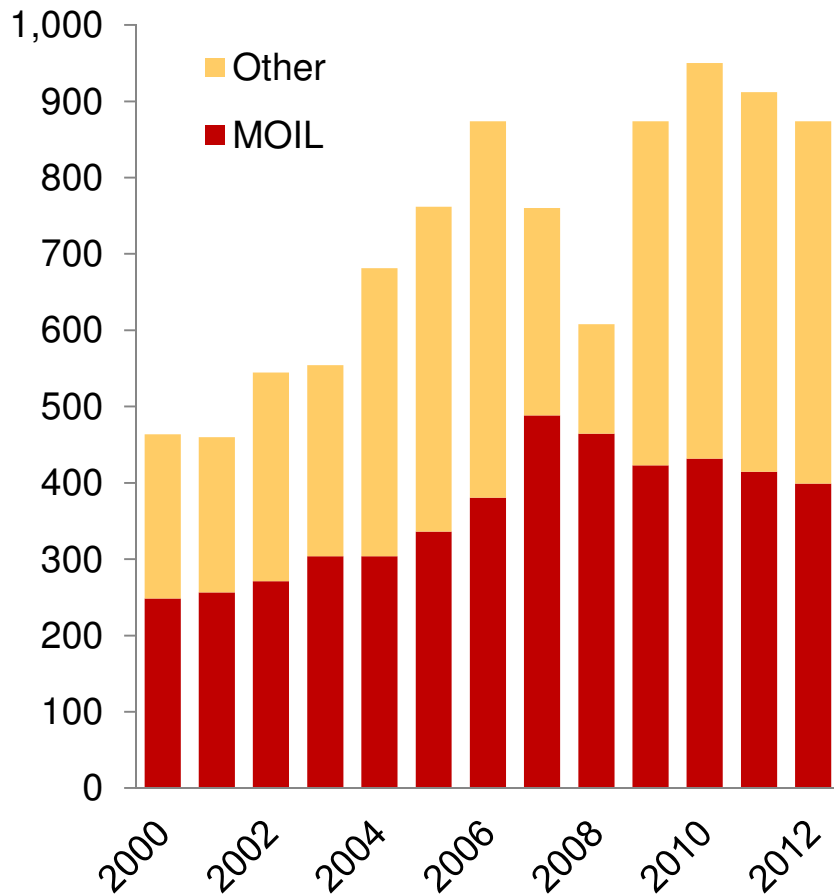


India Mn alloy output by consuming market
(million tonnes, gross weight basis)

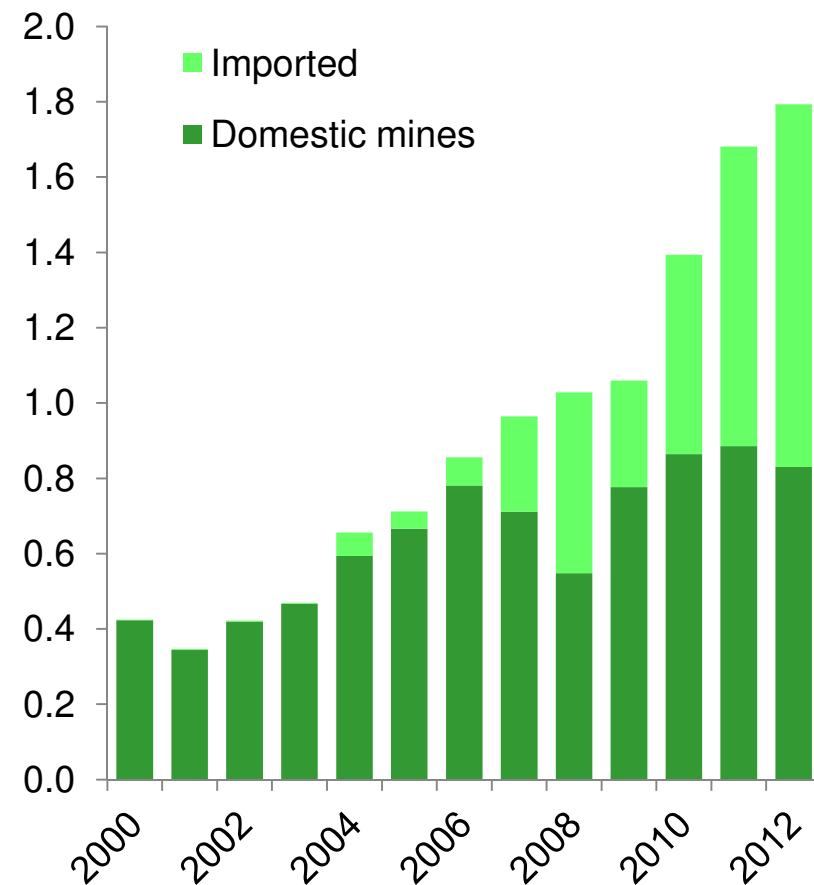


The growth of Indian Mn alloy output has been fuelled by imported ore. Indian Mn ore production has been quite stable for several years

India Mn ore output by company
(thousand tonnes, contained Mn basis)

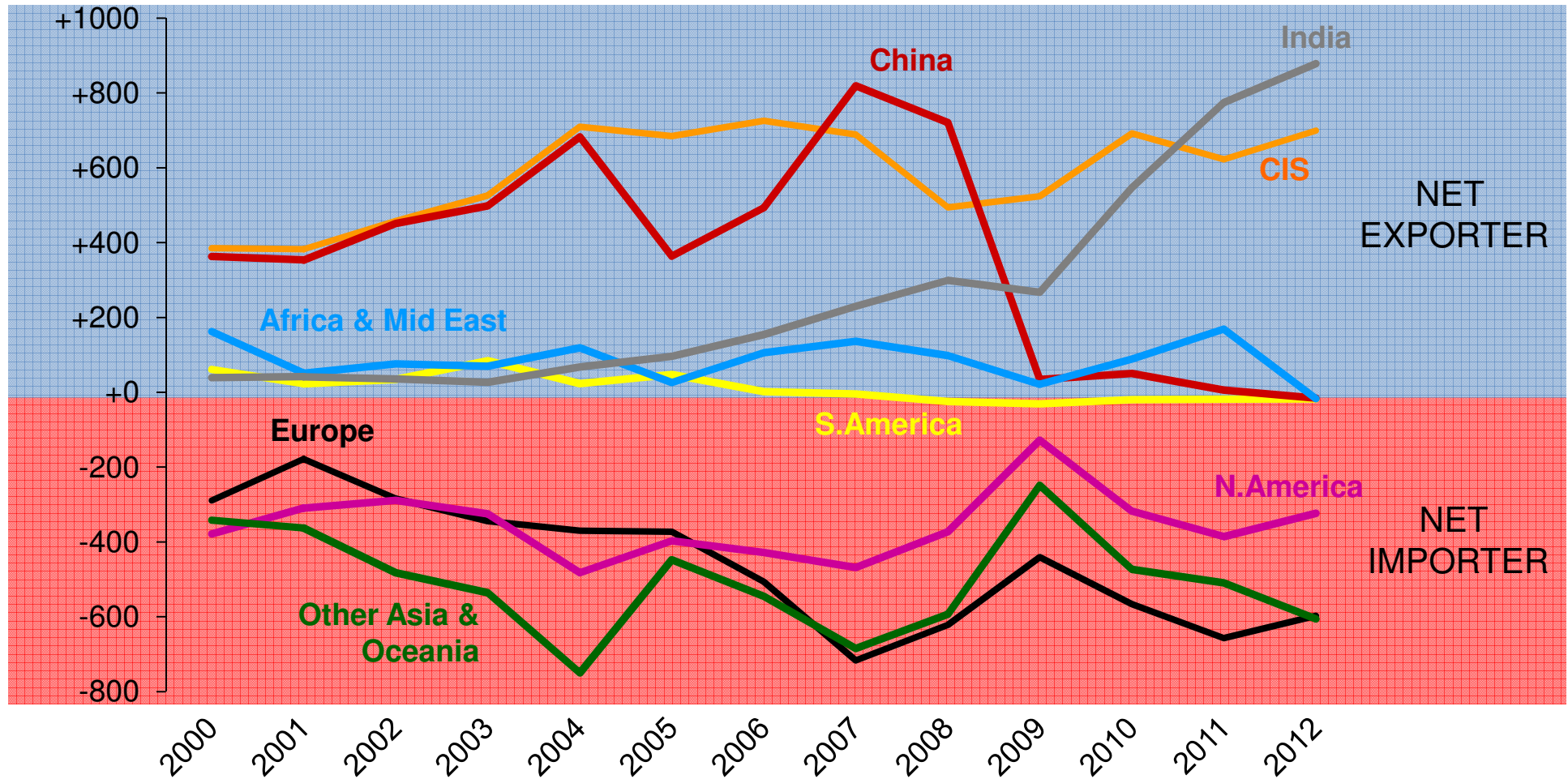


India Mn ore supply by source
(kt gross weight)

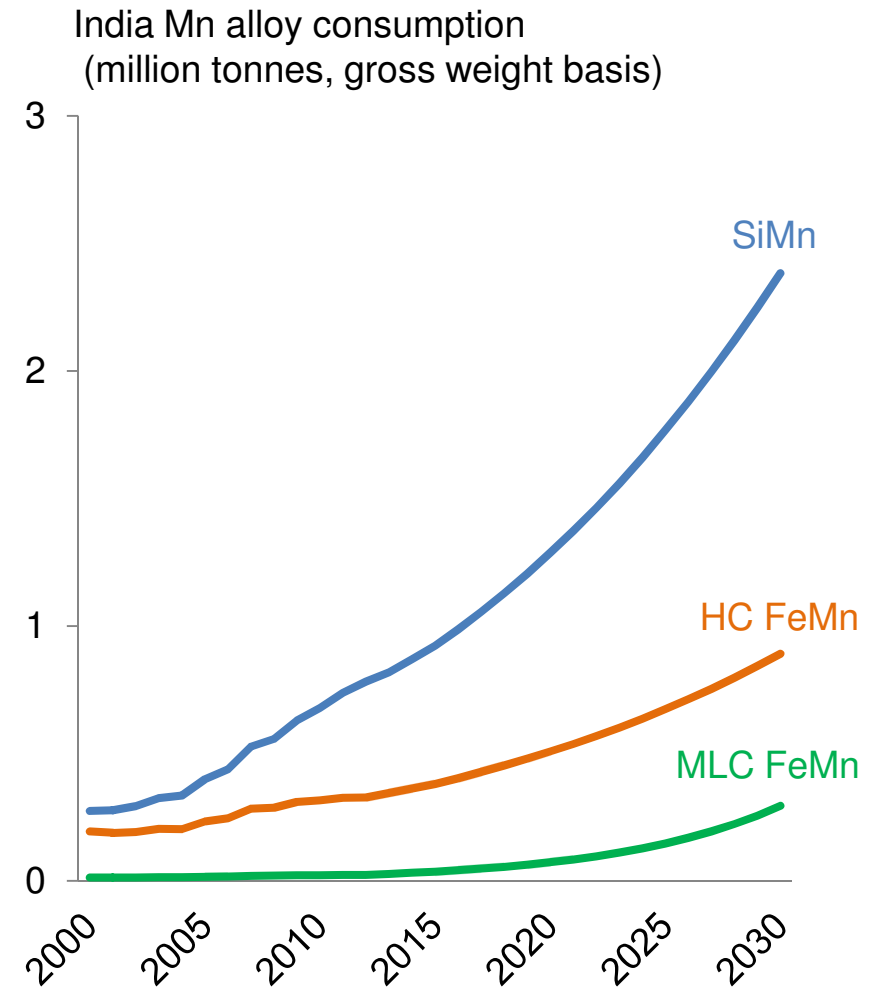
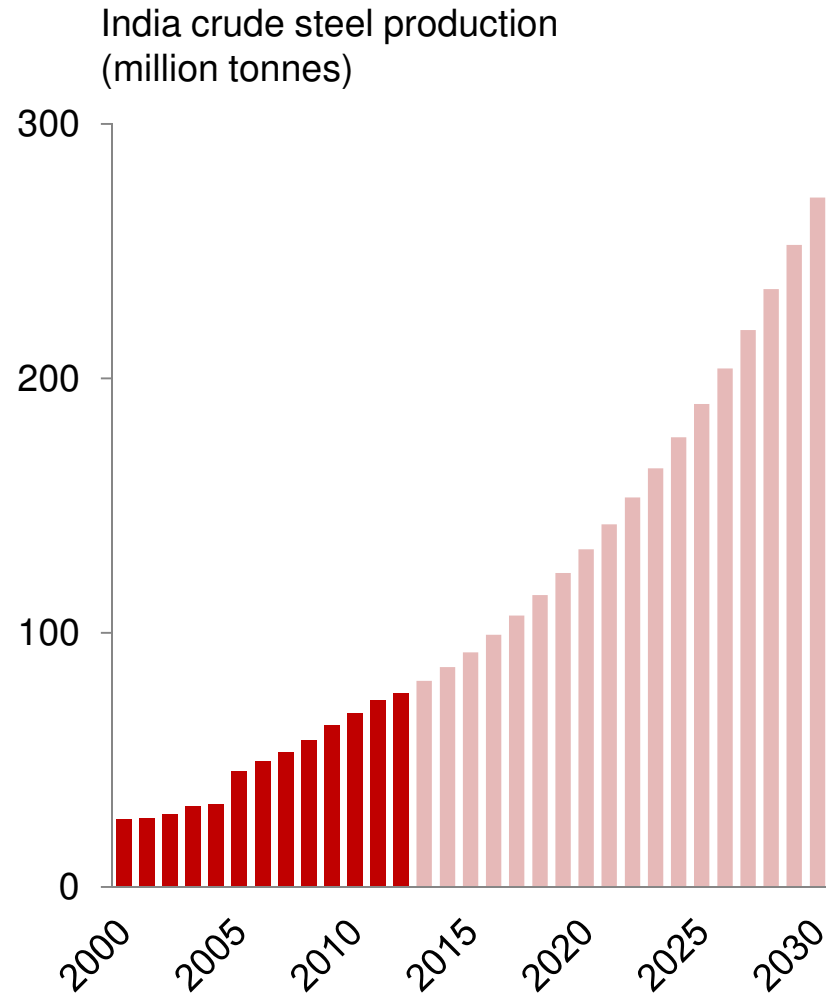


India has now supplanted both China and Ukraine as the leading global net exporter of SiMn

Net exports of SiMn
(thousand tonnes)



It is anticipated that Indian steel production will rise threefold by 2030, resulting in a similar increase in domestic demand for Mn alloys

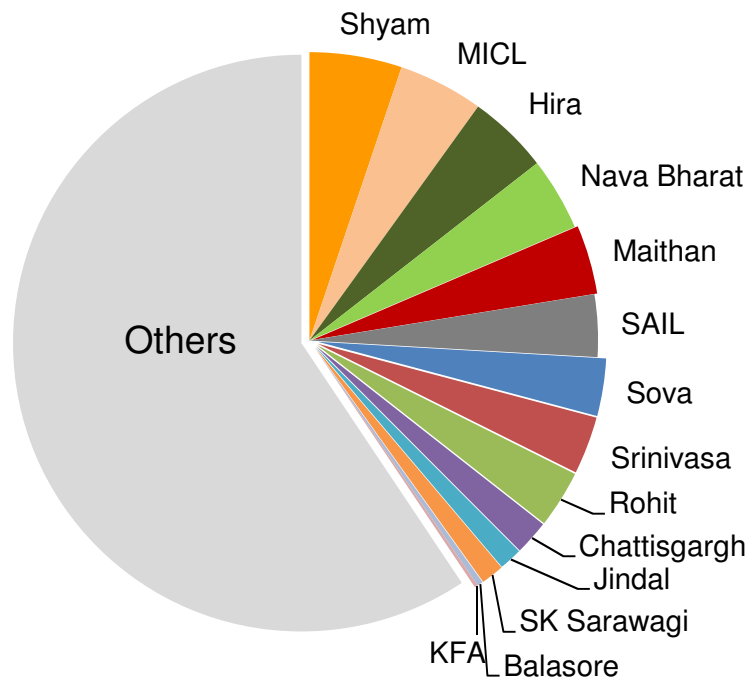


In the longer term, India may be unable to sustain its exports of Mn alloys due to the strong growth of domestic demand

- India's crude steel production is forecast to grow from 76 million tonnes in 2012 to ~270 million tonnes in 2030 (Source: Hatch, 2013)
- This will result in similar growth in Indian Mn alloy consumption:
SiMn + 1.6 million tonnes
HC FeMn +560,000 tonnes
MLC FeMn +270,000 tonnes
- The question is whether India will be able to maintain current Mn alloy export levels in the long-term
(maybe will follow China's path – exports end suddenly)
- Another parallel with China – India's Mn alloy production is generally not low cost, despite rapid capacity expansion
(increasing reliance on imported ore, captive power mostly based on coal & oil)

Indian Mn alloy production is increasingly showing parallels with China – a fragmented, non-integrated supply base with no clear leaders

India SiMn output by producer, 2012



total ~1.6 million tonnes

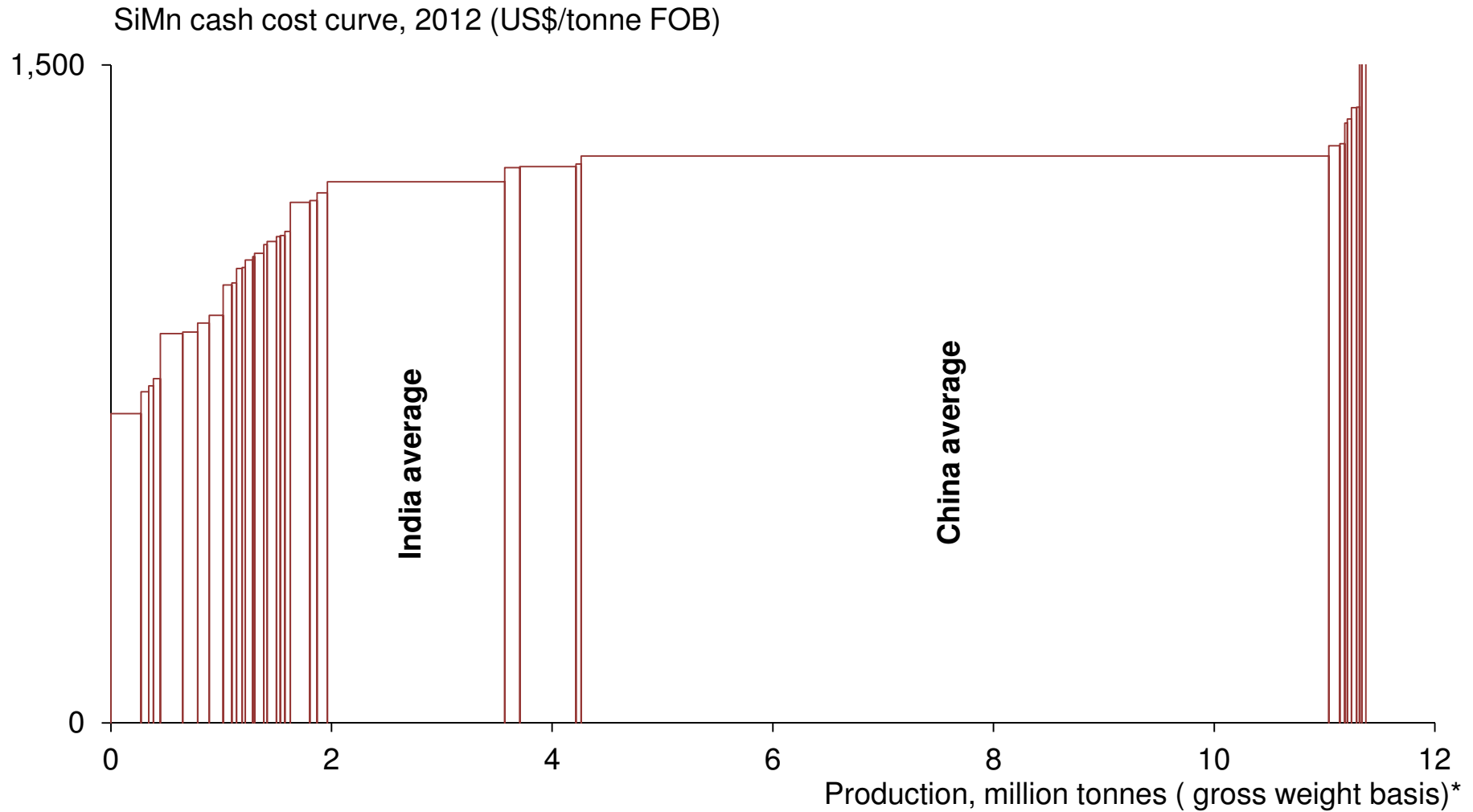
Indian Mn alloy production is fragmented amongst a large number of producers with no clear market leader (increasingly similar to China)

No. of SiMn producers: approx 50

Market shares:
Top-15 producers ~40%
Smaller producers ~60%

Major contrast to Indian Mn ore sector (MOIL market share ~45%)

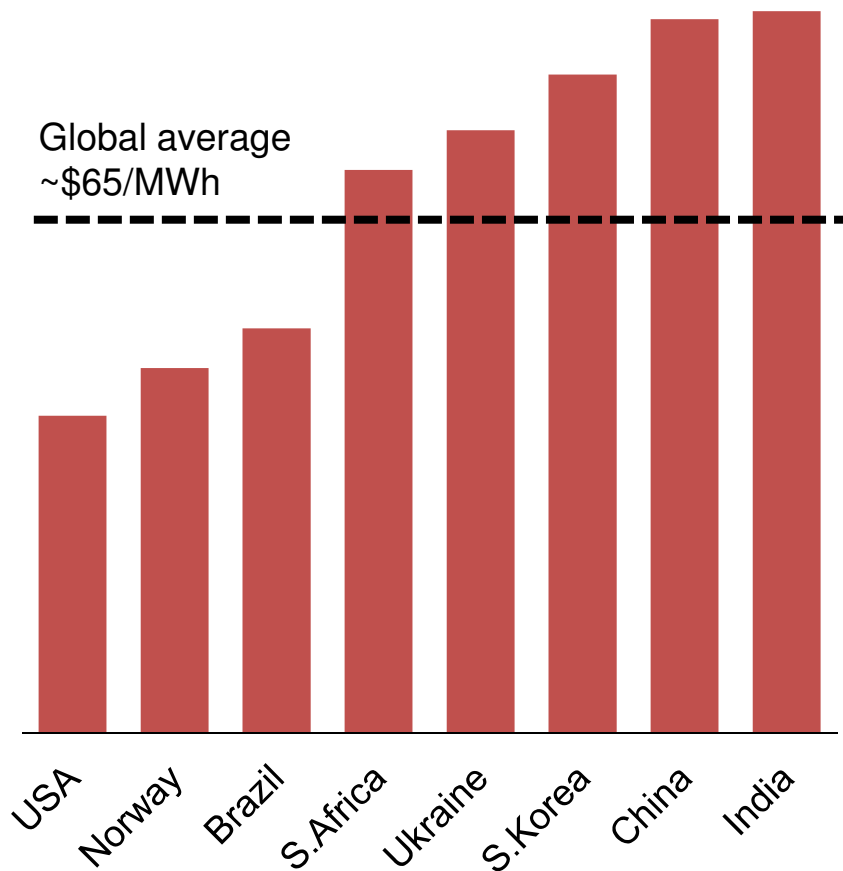
Indian suppliers are amongst the highest cost, yet are still in the most competitive half of the cost curve (due to the size of Chinese output)



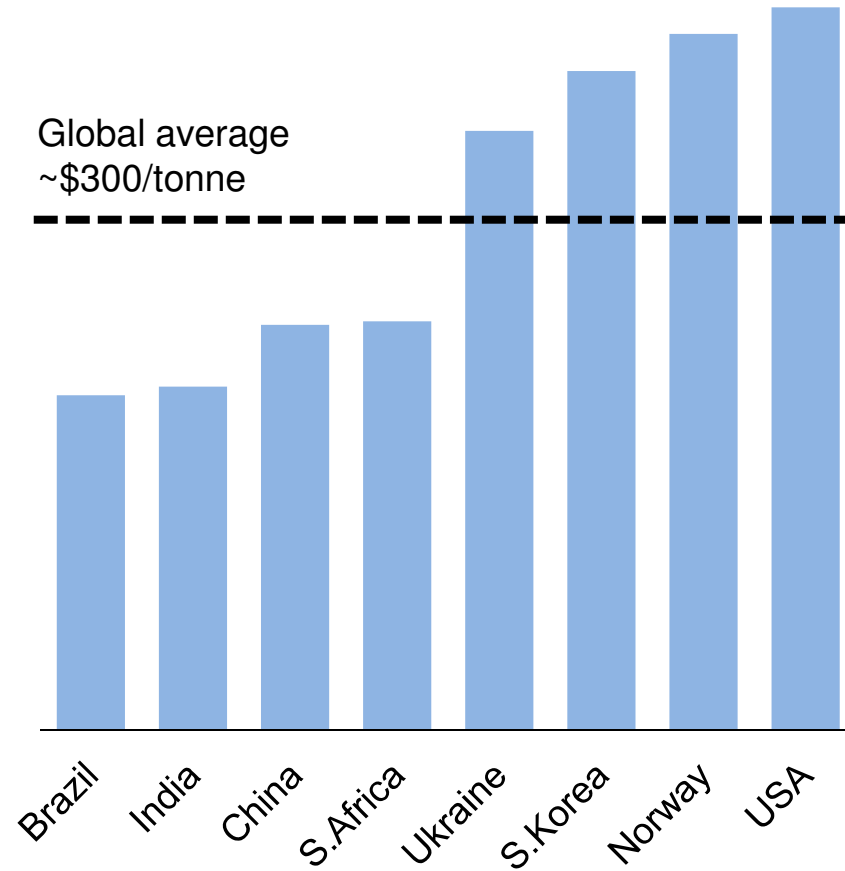
*includes SiMn remelted in the manufacture of MLC FeMn

Despite rising captive power generation, India has amongst the highest power rates in the Mn industry. However its cheap labour is an advantage

Average power prices in Mn alloy production, 2012



Average total labour-related costs in SiMn production, 2012*



* includes all maintenance, R&D and overhead costs

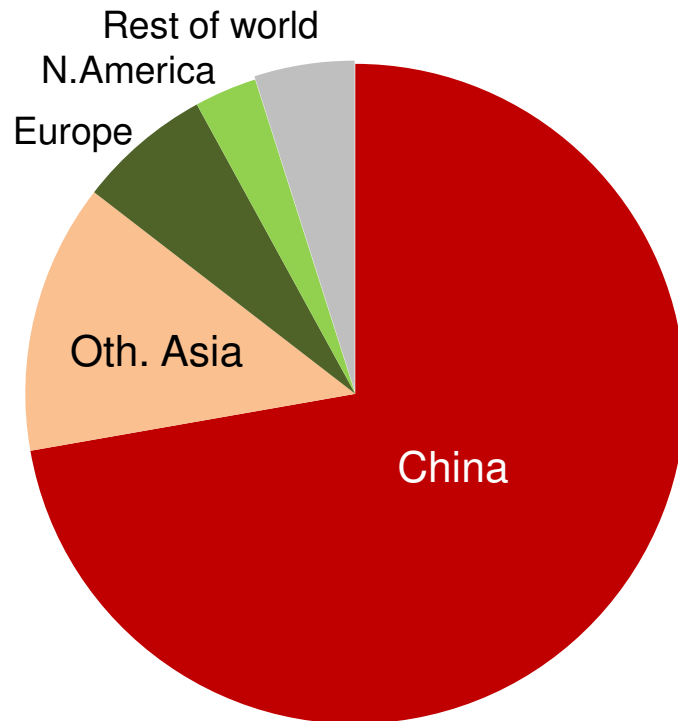
Structure

1. Brief overview of recent developments in Mn alloy markets
2. Focus on India
3. Focus on Mn metal

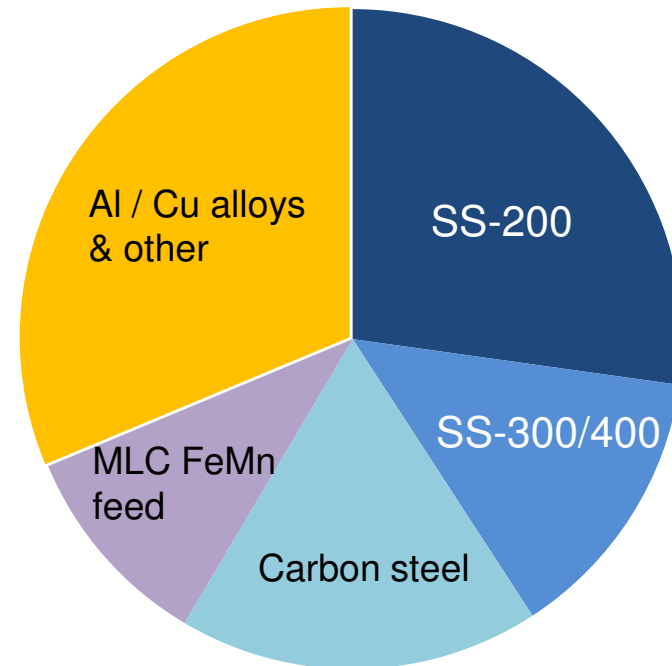
Mn metal is the only Mn alloy with a large non-steel demand segment (~30%). China accounts for ~70% of global demand

World Mn metal consumption, 2012

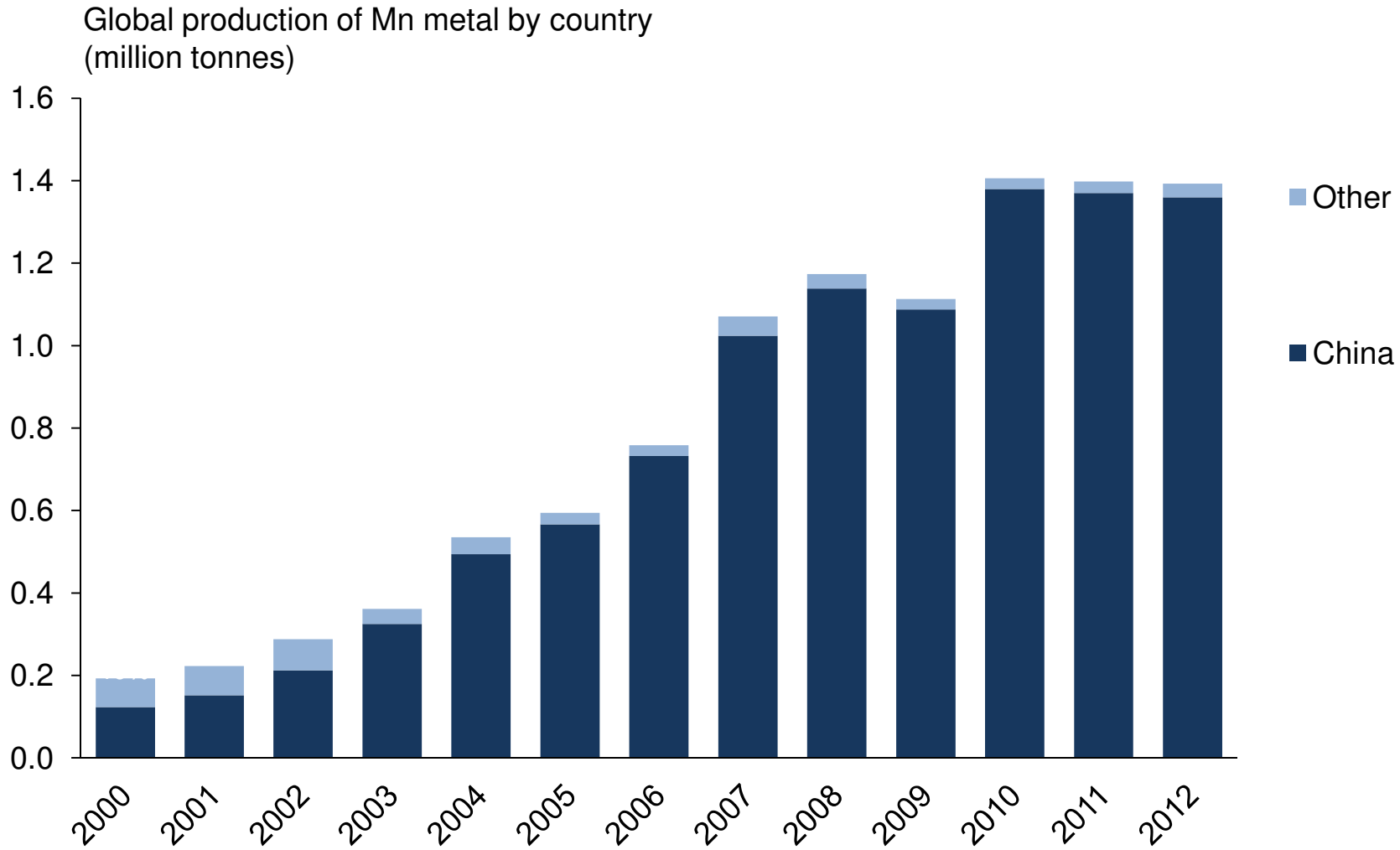
by region



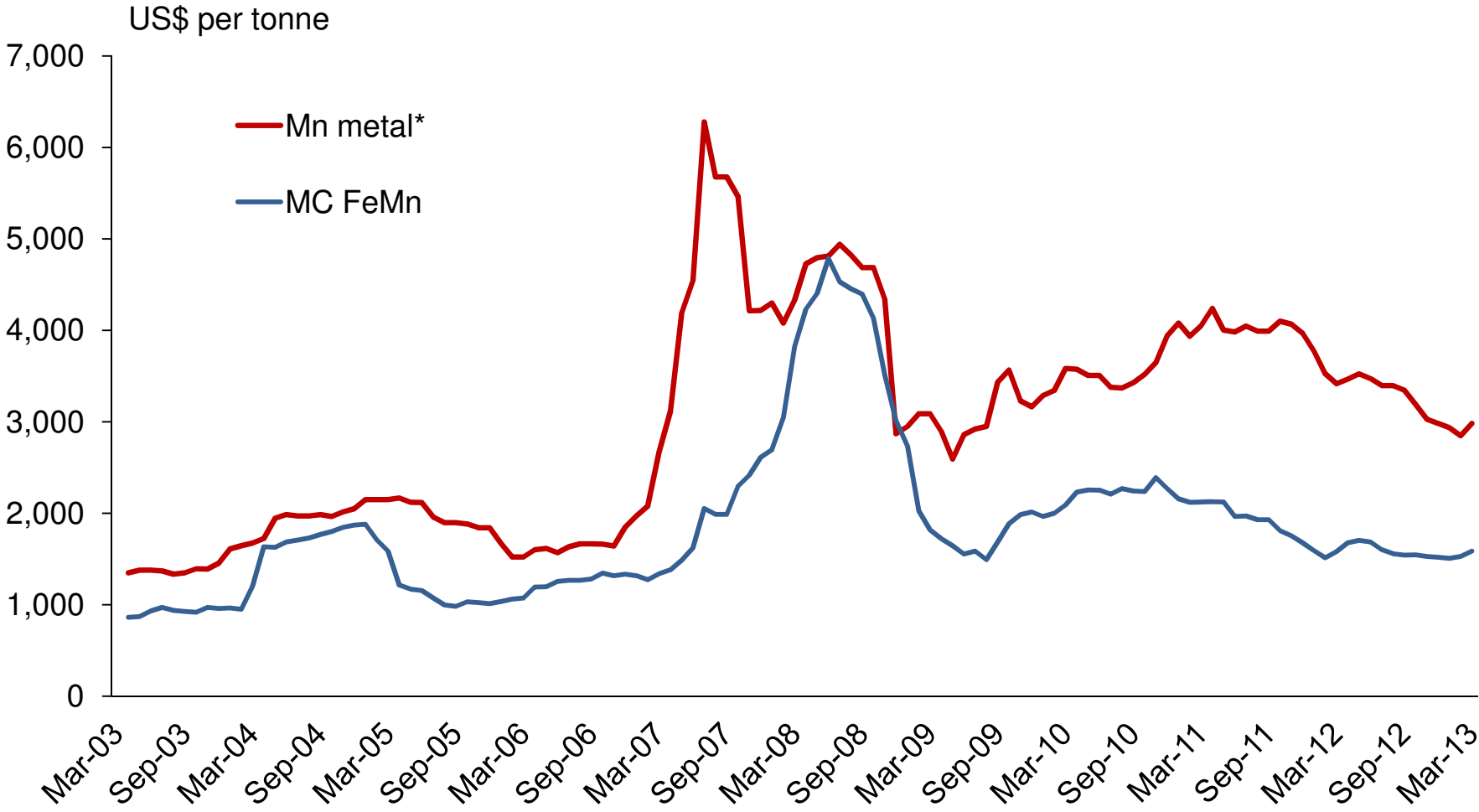
by end-use



Mn metal production grew very strongly between 2000 and 2010, since when it has stabilised. China produces 97% of the world's Mn metal



Mn metal usually trades at around double MC FeMn prices, but there are times when the two markets move differently



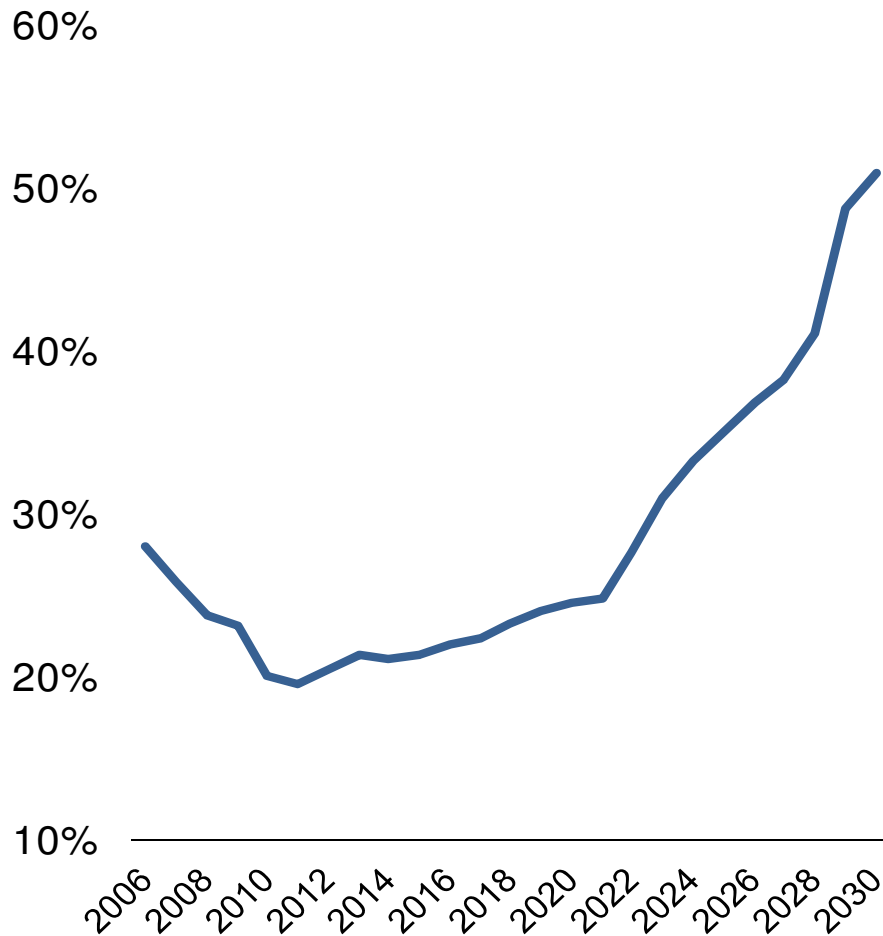
* Ryans' Notes price for EMM flake

Due to environmental and worker safety issues, it will become increasingly difficult to build new Mn metal capacity in China

- Mn metal production can be considered extremely harmful to both the environment and worker health, due to use and disposal of toxic acids in the production process. This is a major reason why 97% of global output now takes place in China
- Rising environmental awareness and stricter legislation will make it increasingly difficult to build new Mn metal capacity in China – already production seems to have plateaued somewhat since 2010
- Chinese Mn metal output increasingly using imported carbonate ores due to deteriorating quality of domestic Mn ore
- Some new Mn metal projects springing up outside China (Gabon, N.America, Malaysia), based on less polluting technology
- Also expect growth in demand from high-end steels to increasingly be based on refined alloys (LC SiMn, LC FeMn, ULC FeMn) rather than Mn metal

Anticipated trends in Chinese stainless scrap availability will make it easier to substitute refined alloys for Mn metal in the long term

Scrap charge in Chinese stainless steel production



Rising availability and use of stainless steel scrap in China will increase steelmakers' flexibility to use other alloys in place of Mn metal (LC SiMn, LC FeMn, ULC FeMn) because scrap contains fewer impurities (Si, C) than virgin raw materials



Opportunities and challenges in the manganese alloy industry

Thank you for your attention



AlloyConsult
www.alloyconsult.com