



# The short and long term outlook for manganese

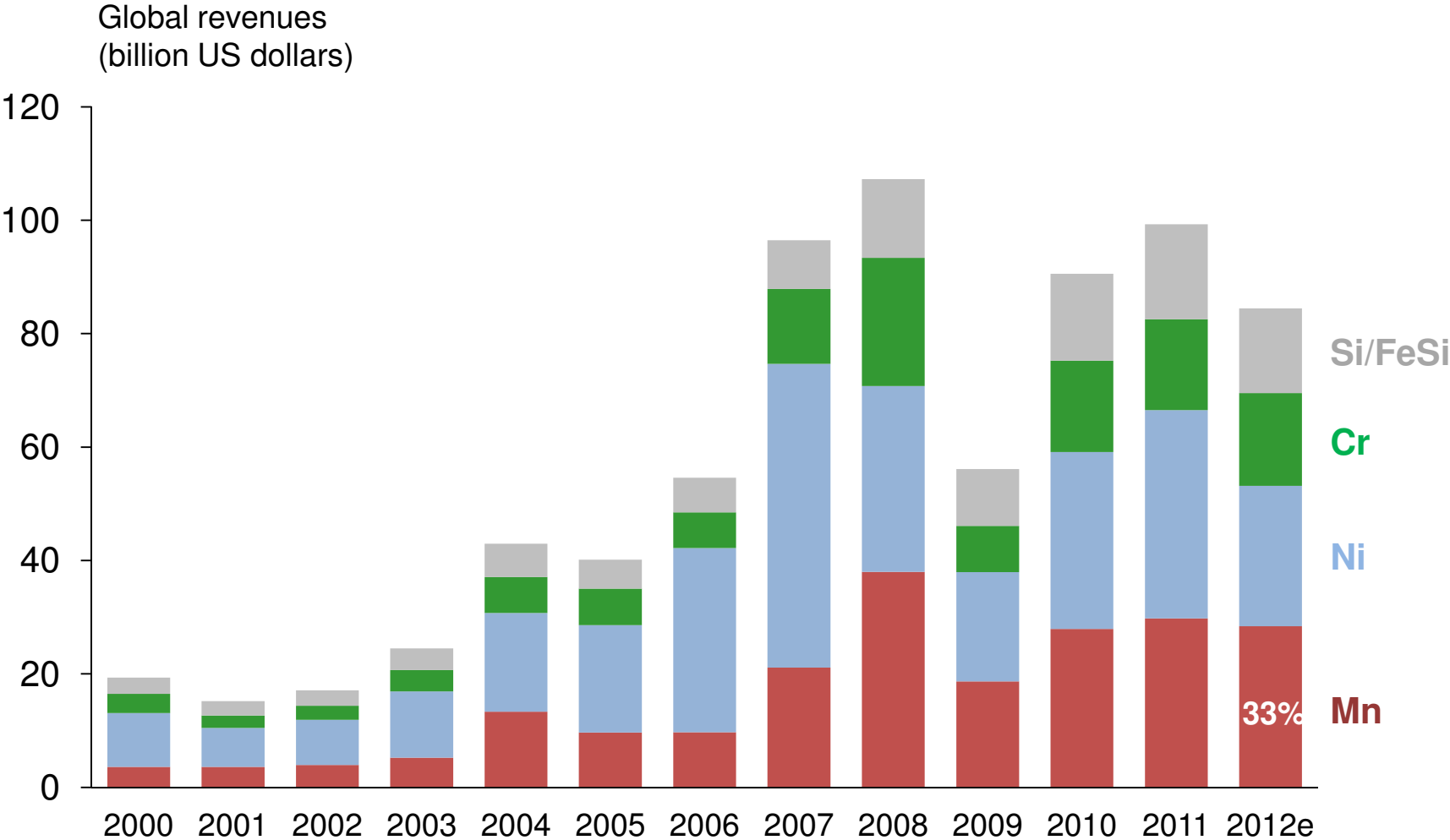
Kevin Fowkes  
*Managing Consultant*

Platts SBB Steelmaking Raw Materials Conference, Amsterdam  
27<sup>th</sup> September 2012



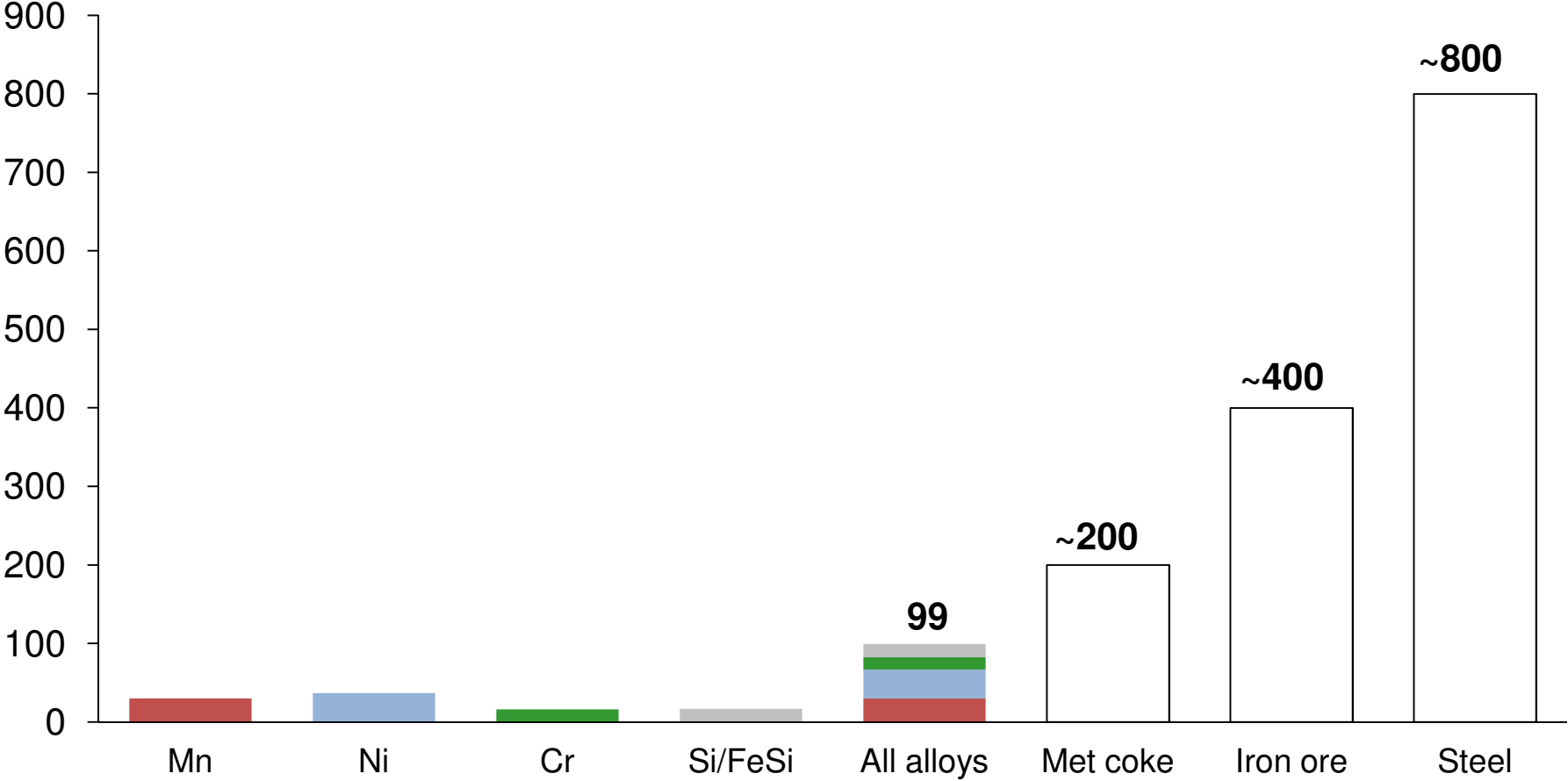
**AlloyConsult**  
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# Ferroalloys is an \$80-100bn per year business, a five-fold increase over the past decade

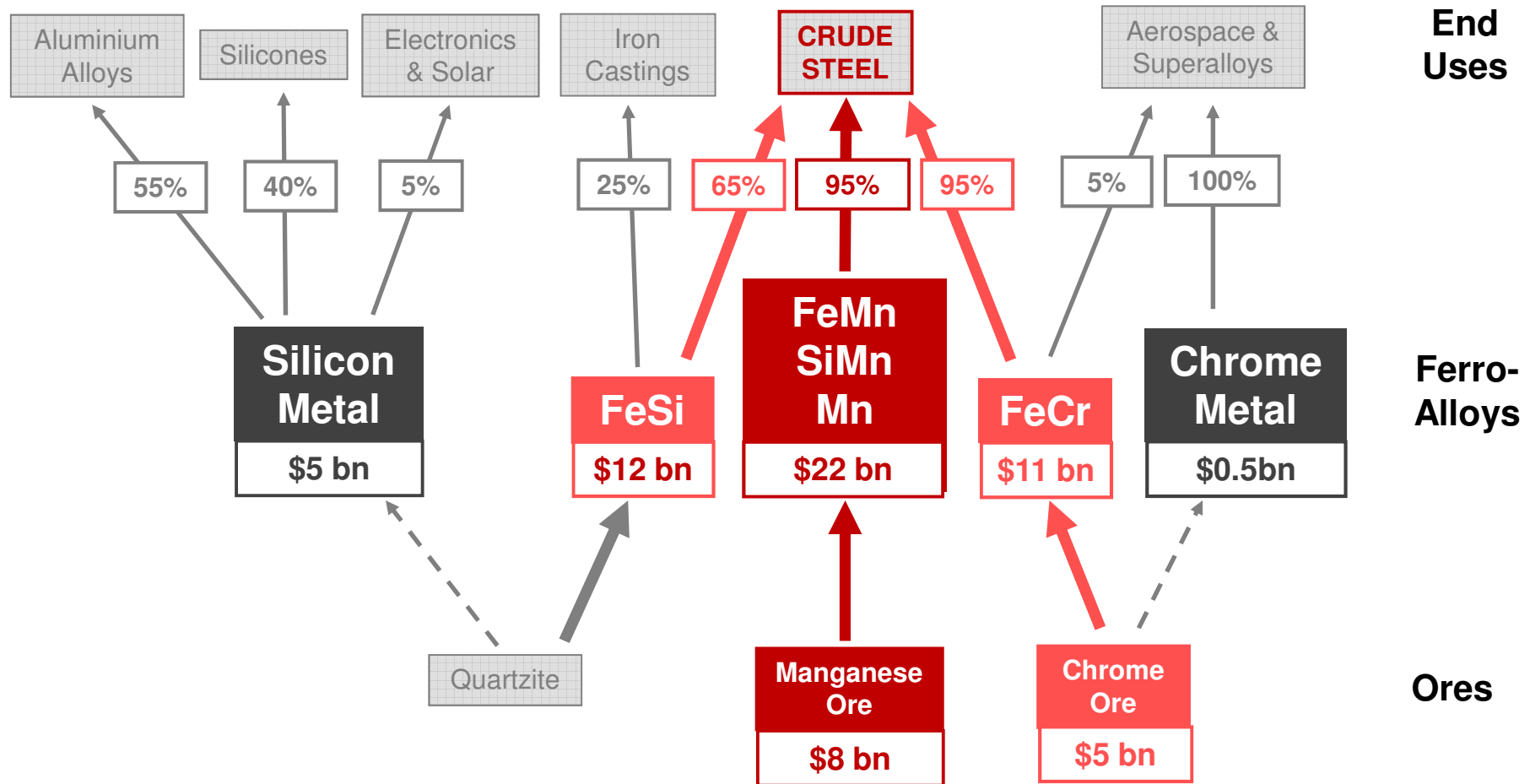


# Ferroalloys is ~25% of the size of the iron ore business and ~12% of the size of the steel business

Global revenues, 2011  
(billion US dollars)



# Steel accounts for >80% of ferroalloy consumption. Unlike iron, ferroalloy ores are smelted before adding into steel



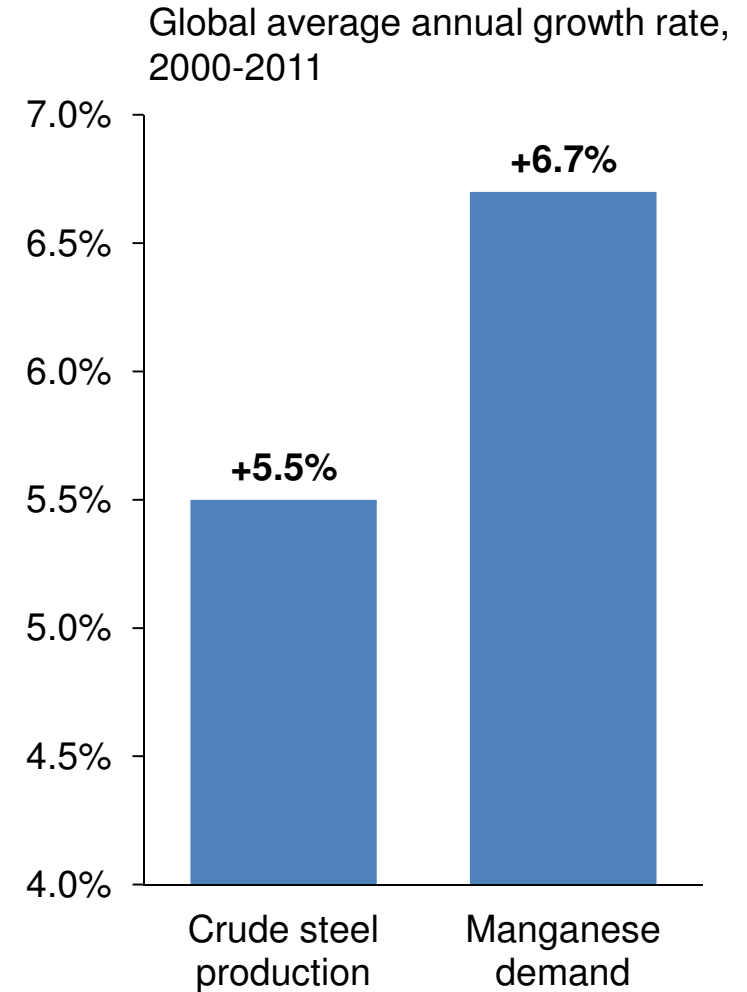
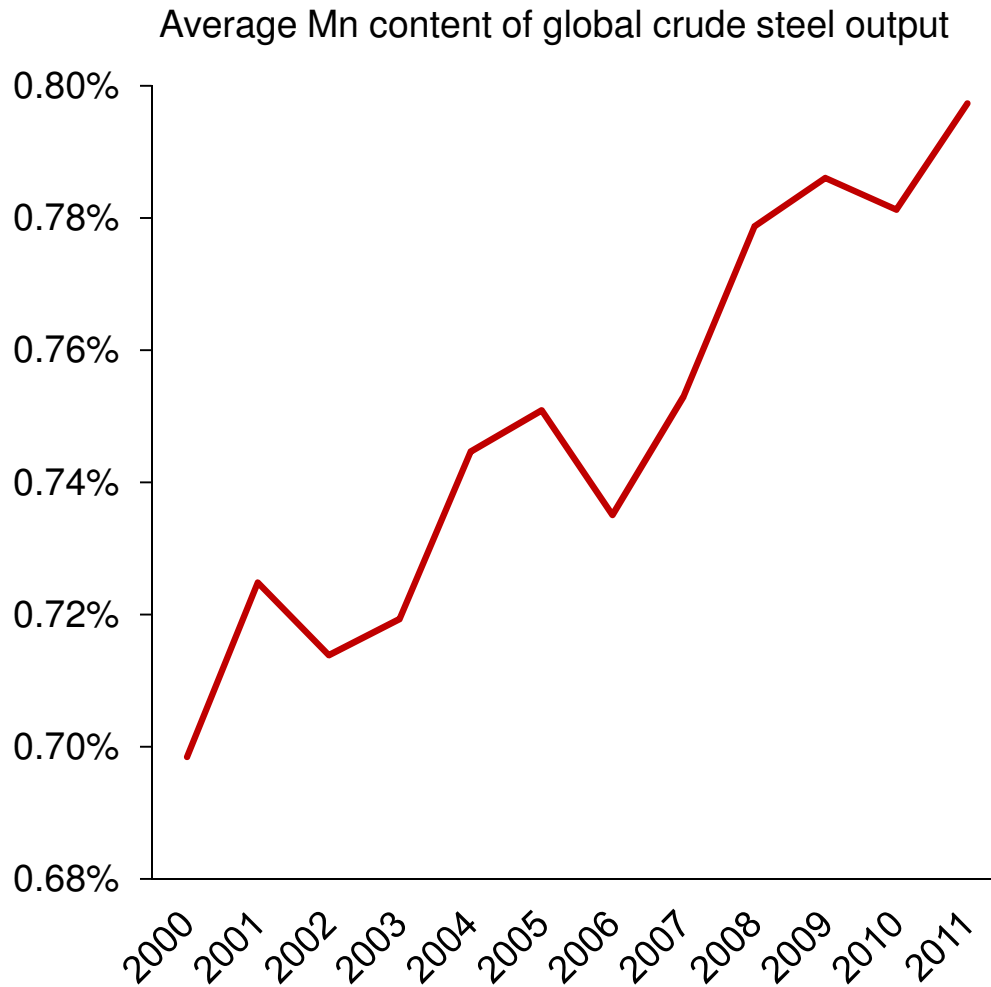
Estimated revenues for 2011

# What is manganese?

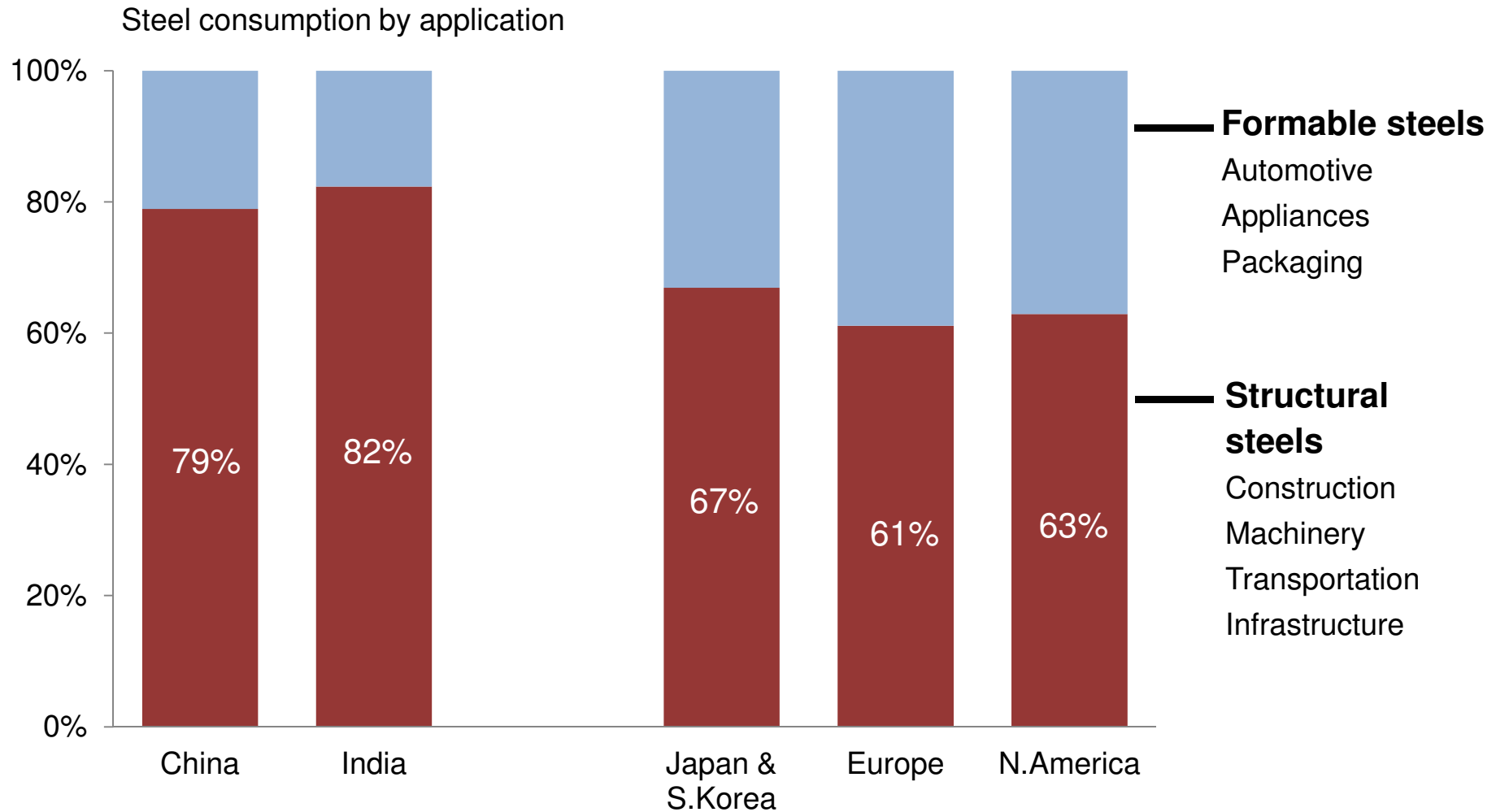
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- Manganese is the world's fourth most heavily consumed metal
- Global mine output of 15 million tonnes in 2011 – over 90% goes into steel
- All steels contain manganese
- Manganese is used to remove sulphur from liquid steel (sulphur causes steel 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

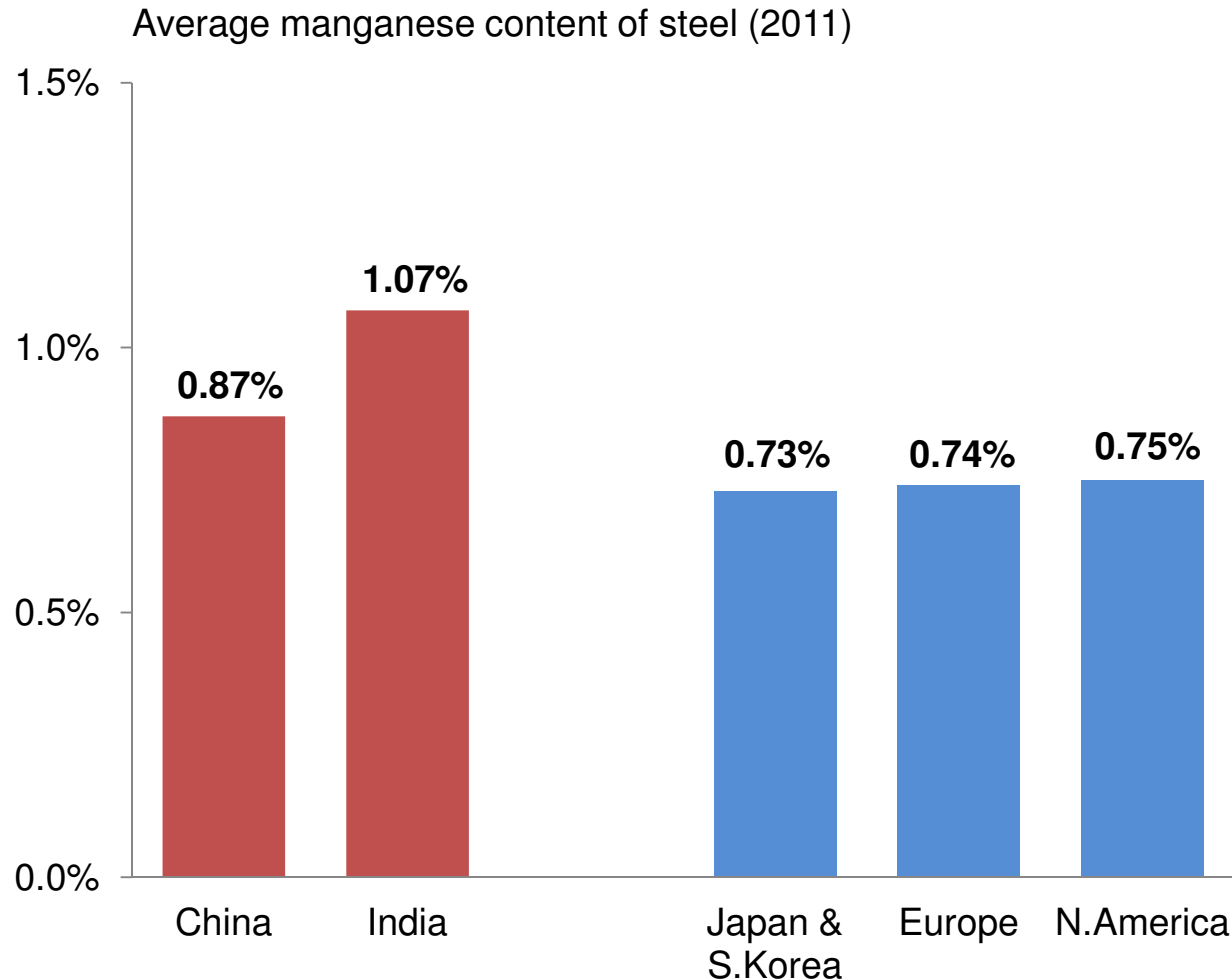
# Average Mn content per tonne of steel has increased by 15% over the past decade



# Structural steels form a higher proportion of steel consumption in developing countries



# Countries with a bigger share of structural steels have higher average Mn content in their steel



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

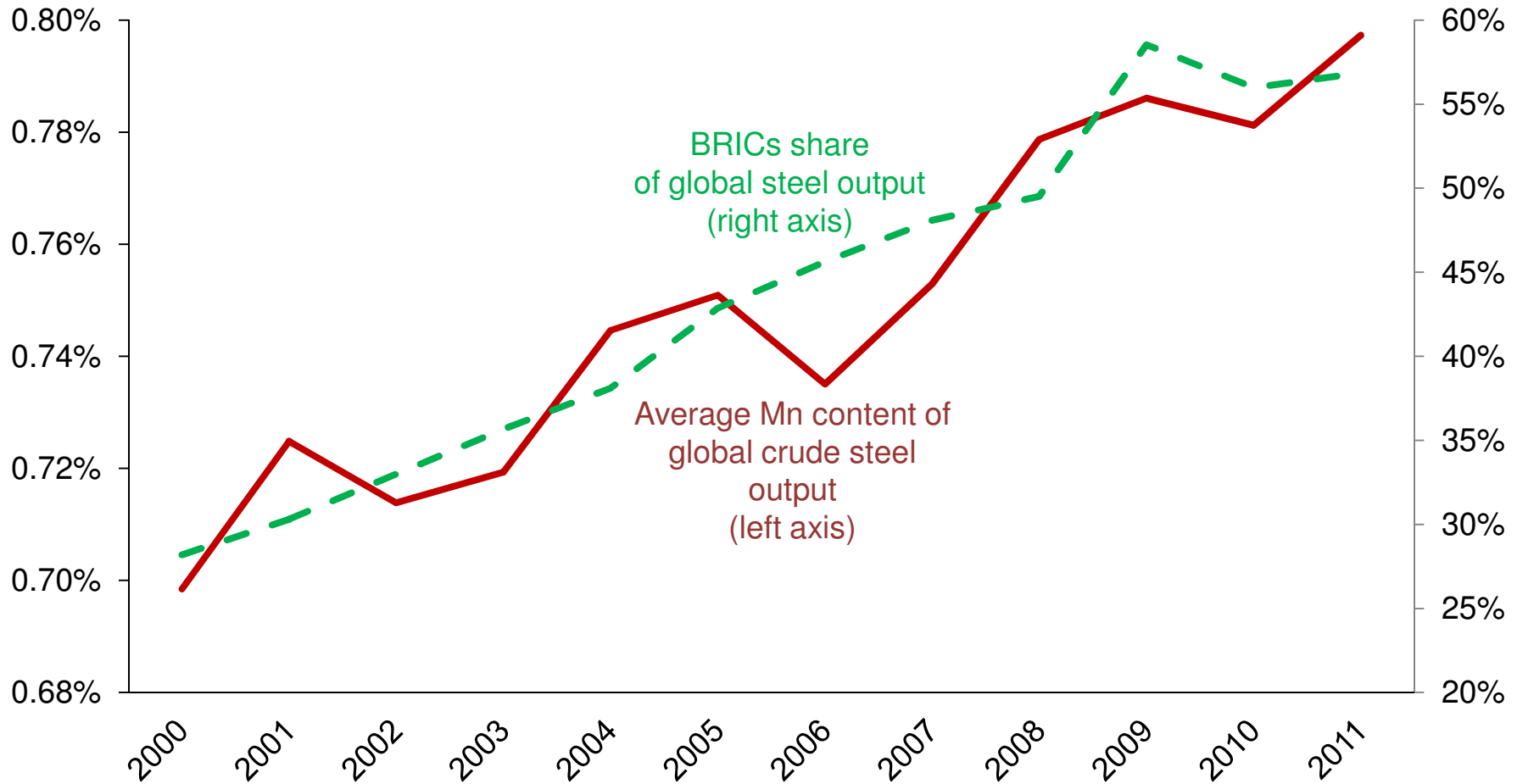
Most formable steels do not require strength and tend to be lower in manganese

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

Developed countries are more focused on consumer goods / automotive so use more formable steels



# Rising average Mn content of steel therefore correlates with developing countries' increasing domination of steel output

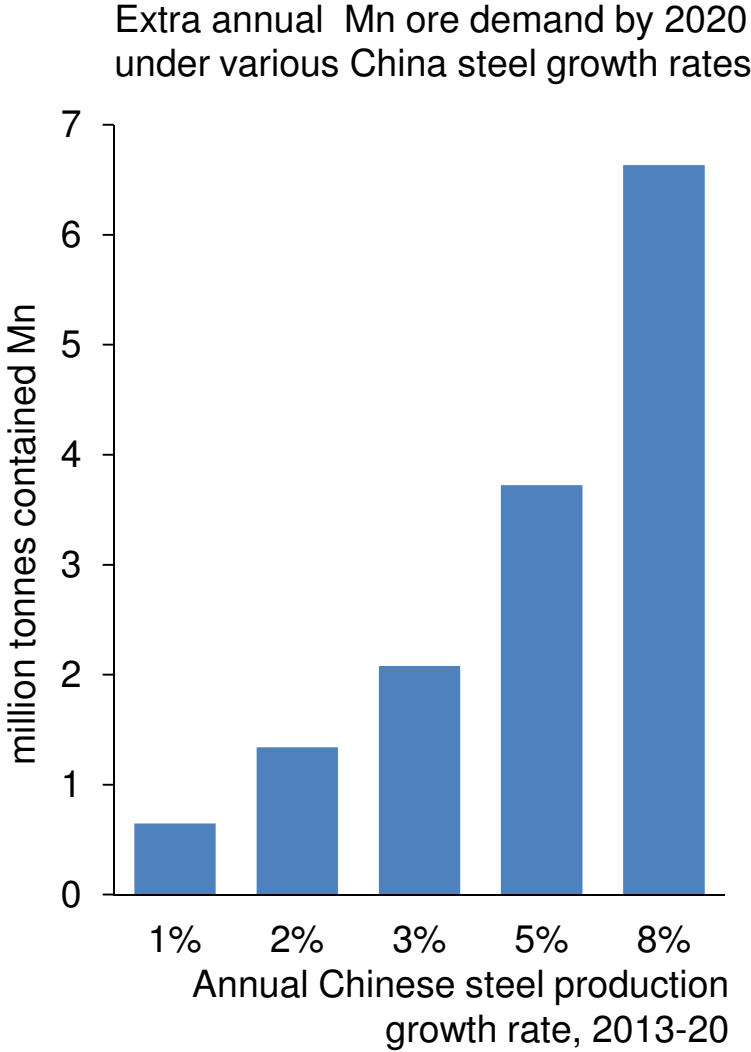
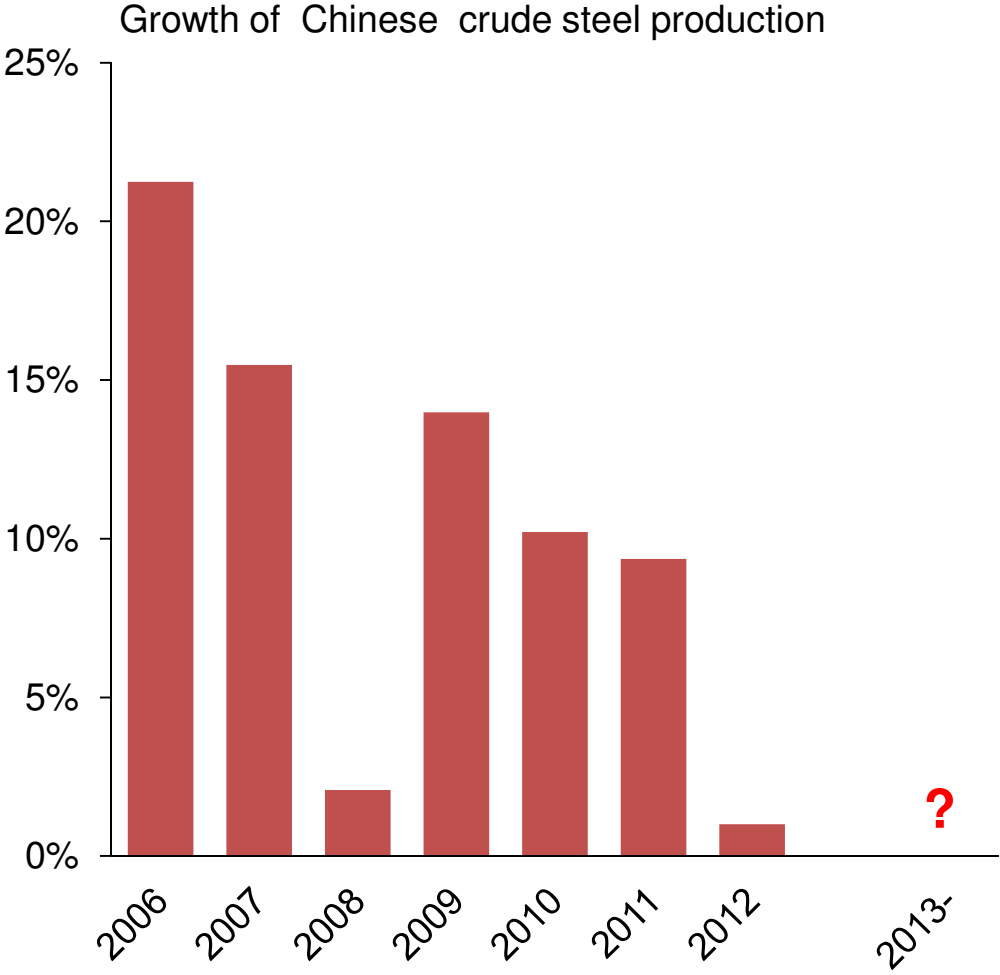


# Reason for optimism: future developments in steel consumption imply rising average Mn content

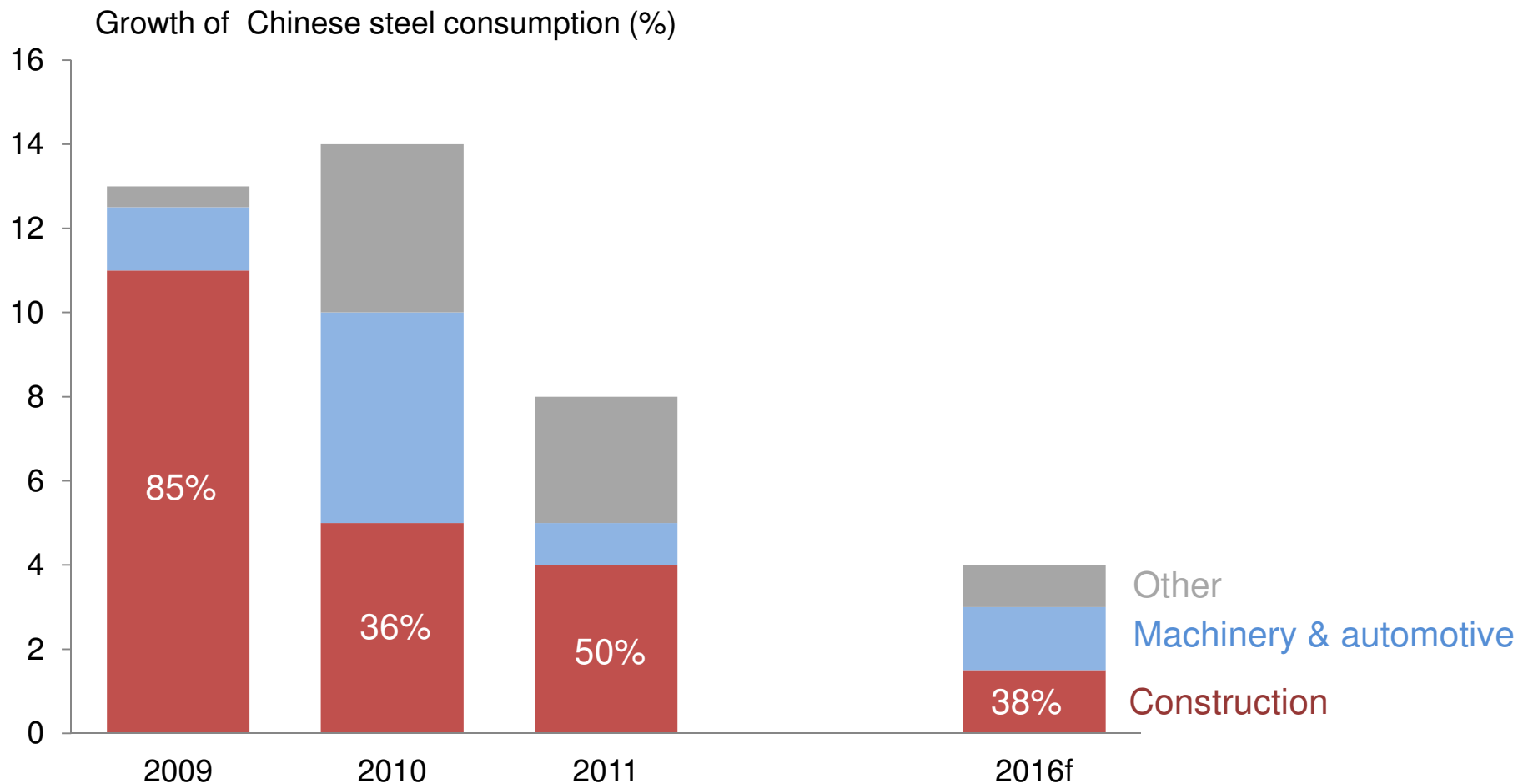
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- Chinese building / earthquake resistance standards will continue to tighten, leading to higher Mn content in steel (especially rebar)
- Development / urbanisation of western China
- Strong potential from India and other early-stage developing nations
- Move towards high-strength, high-Mn automotive steels will continue in developed regions
- Automotive sector in developing world will grow, and eventually adapt to western quality and emission standards

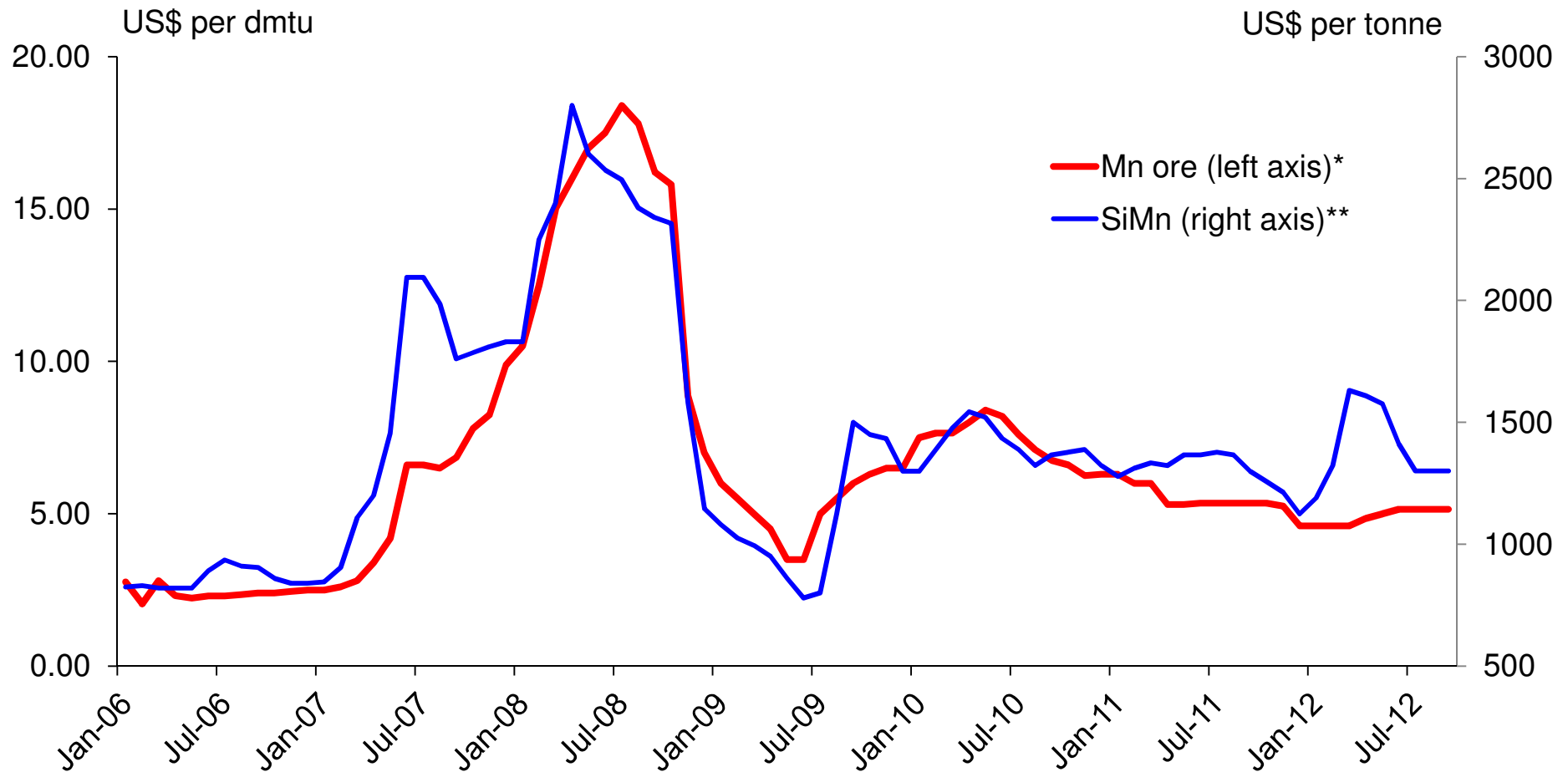
# Reason to be cautious: demand outlook very reliant on China, where steel growth has come to a halt in 2012



# Reason to be cautious: future Chinese steel consumption growth will overall be less driven by construction



# Reason to be cautious: Mn ore prices have declined significantly since 2010, despite relatively strong demand

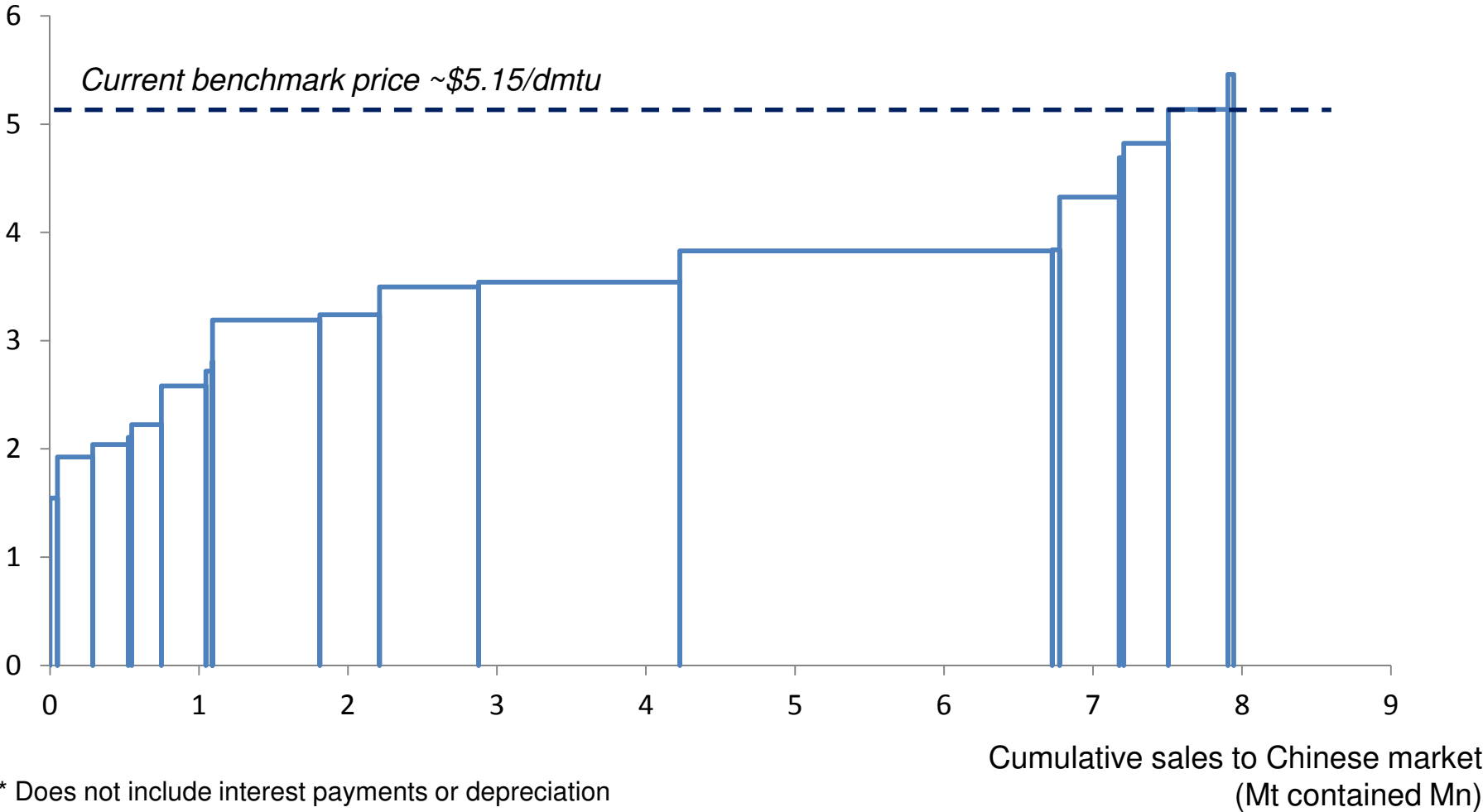


\*Benchmark price for Australian 44/45% lumpy ore on a CIF China basis, as reported in various sources

\*\*US spot price for silicomanganese, delivered to warehouse

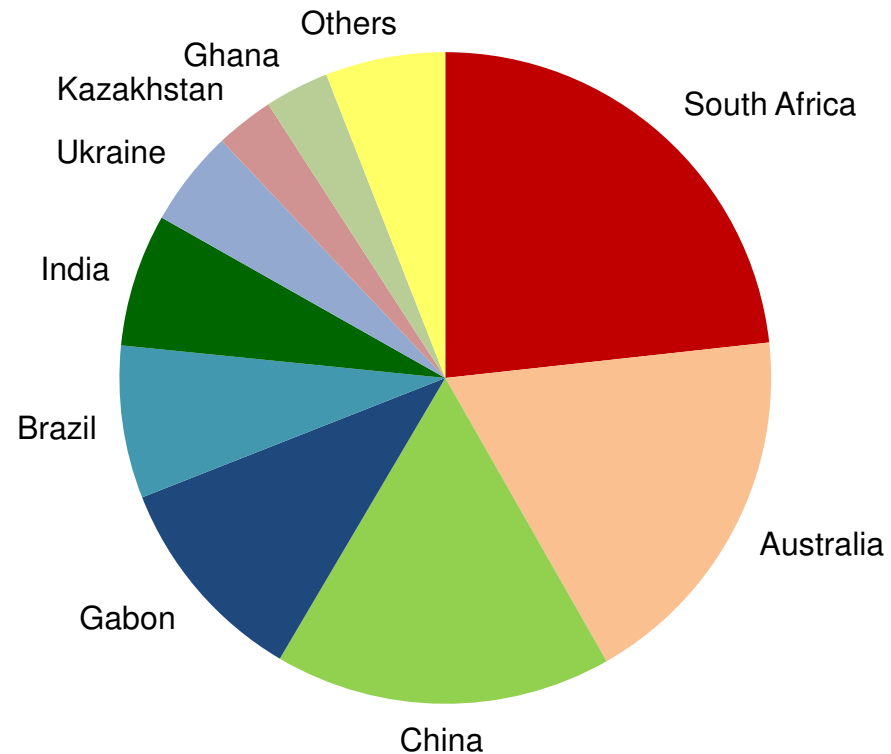
# Mn ore price levels correlate well with marginal production costs on a cash basis

Estimated Mn ore cash production costs, CIF China\*  
(US\$ per dmtu)

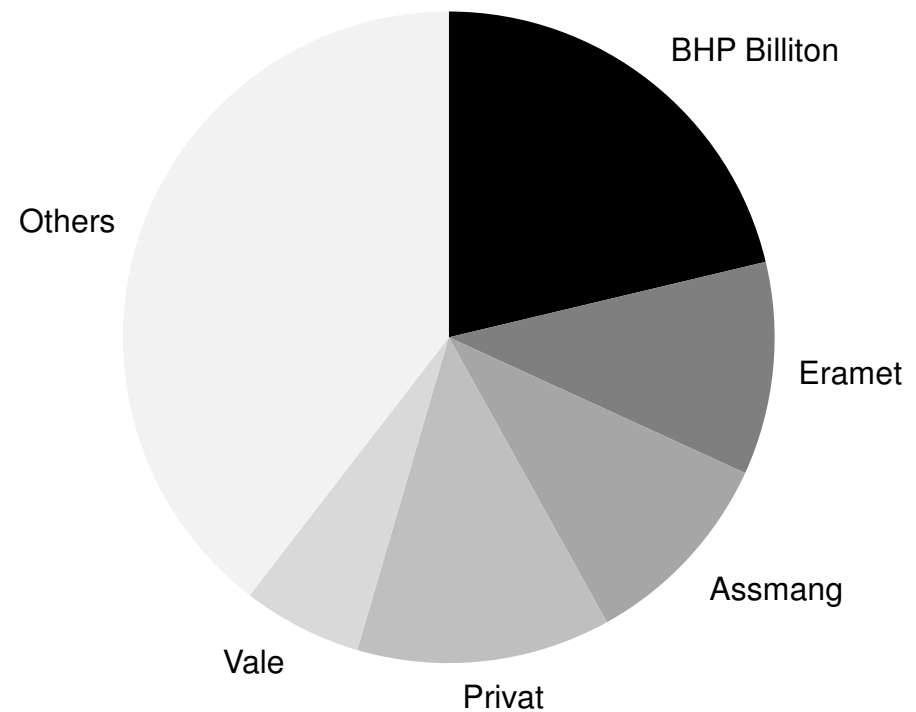


# Mn ore production is relatively concentrated, both geographically and in terms of number of producers

Global Mn ore production by country, 2011



Global Mn ore production by company, 2011



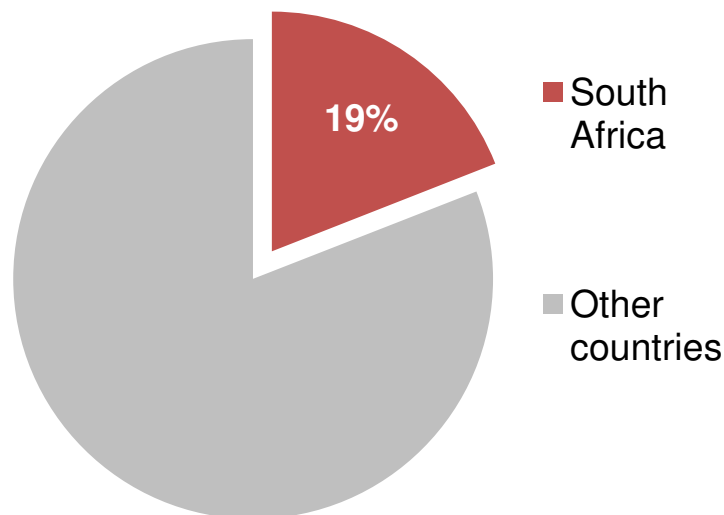
**Total: 15 million tonnes**

Data shown on a contained Mn basis

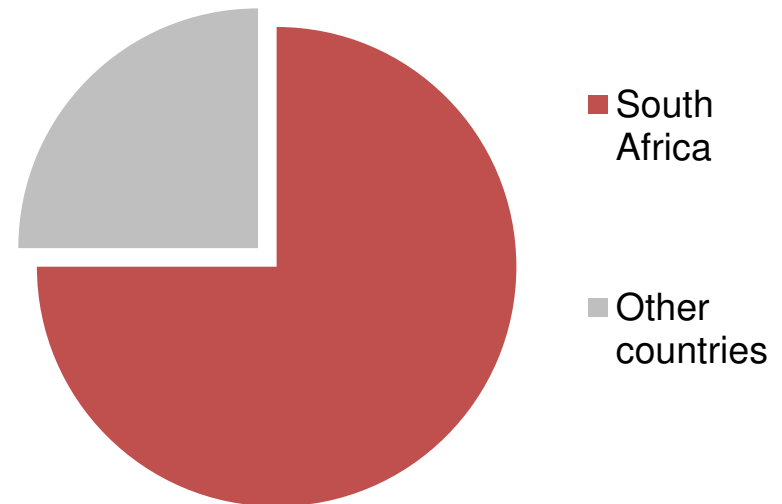
# Where will future increases in manganese demand be supplied from?

- Most extra demand in the past decade has been met by brownfield expansion, but for demand growth on this scale, new greenfield capacity will be essential
- South Africa will need to be the focal point of large-scale greenfield projects

**World Mn ore reserves**

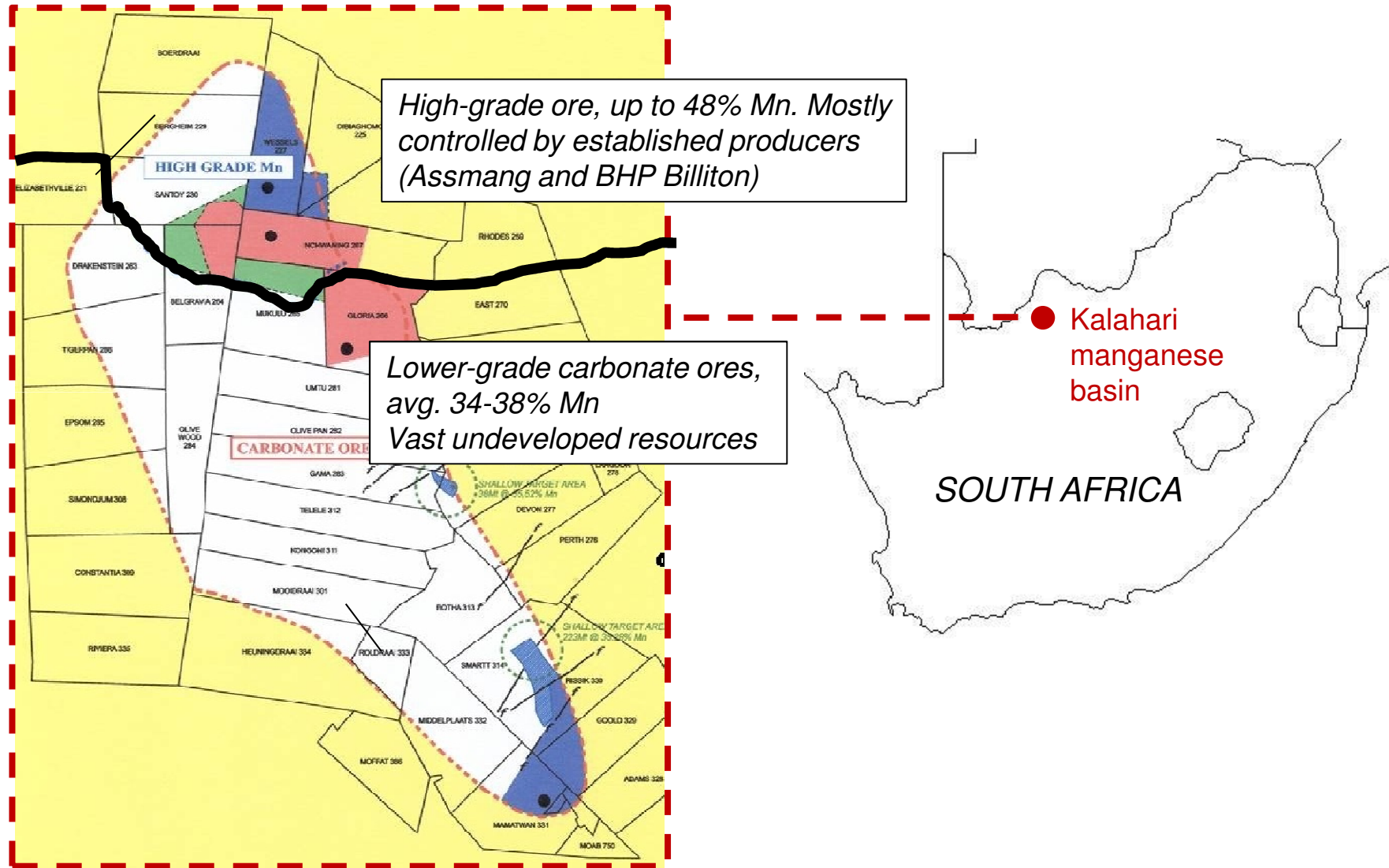


**World Mn ore resources**





# Most Mn ore in S.Africa is in the Kalahari basin. New operations will be based on lower grade carbonate ore



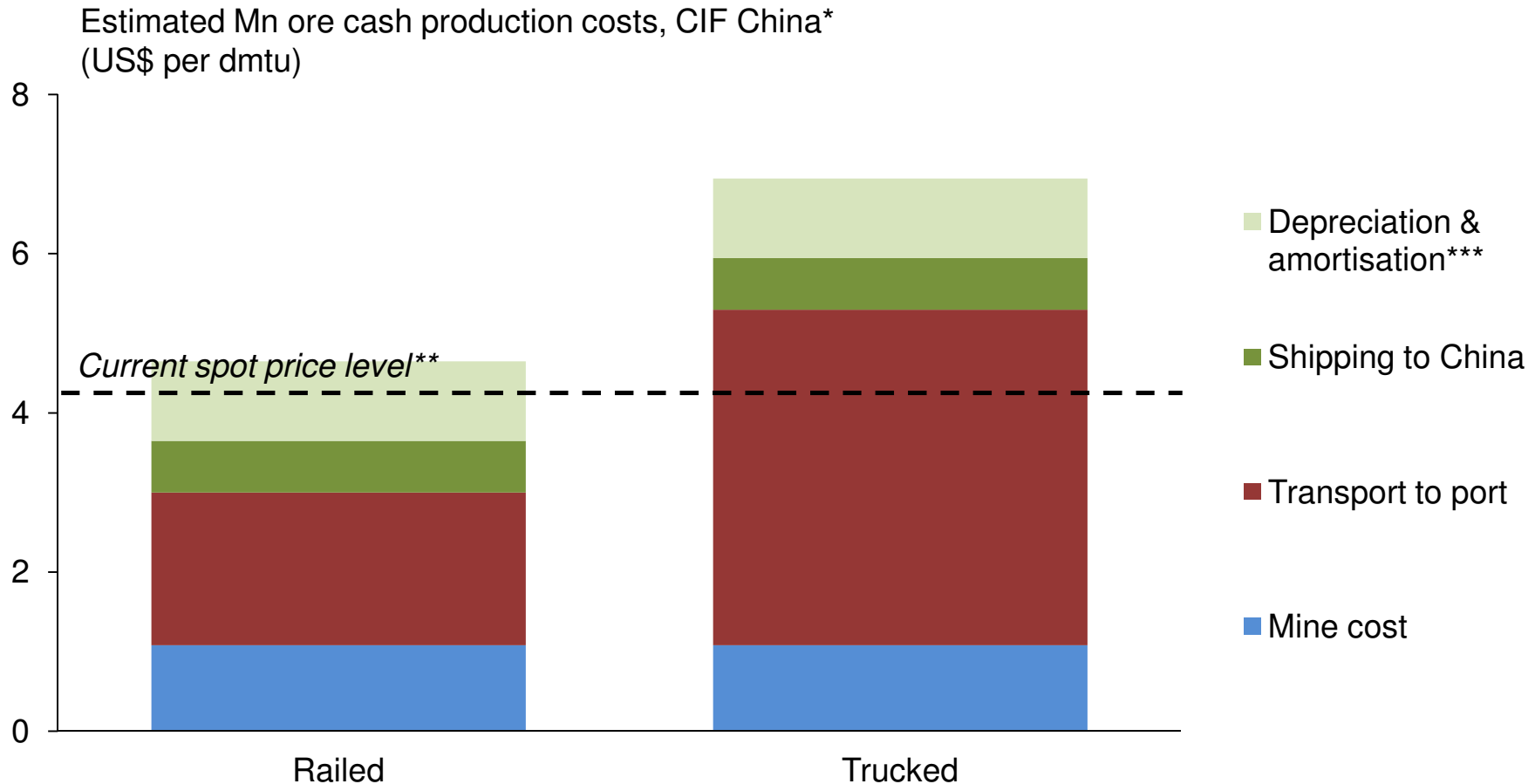
Map of Kalahari manganese basin courtesy of Assmang

# Mn ore exports from S.Africa will be constrained by rail and port capacity bottlenecks for the next decade

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- Manganese ore for export from the Kalahari mines is subject to severe logistical bottlenecks in terms of rail and port capacity
- This has already leading to rationing of rail paths between producers, with increasing pressure from the new mines coming on-stream
- Current plans propose a new rail link and port terminal by earliest 2017. This makes it challenging for new entrants to ramp up as planned from 2012-15
- Trucking of Mn ore from the Kalahari has risen substantially, but comes with its own constraints in terms of cost, road/truck capacity and environmental/safety pressures. Trucking not viable at current prices
- Current low Mn prices reduce business case for infrastructure investment
- Sintering is a potential solution, but expensive

# Incorporating payback of investment, trucked Kalahari carbonate ore will require a price of \$7/dmtu CIF China



\* Based on 37% Kalahari ore with no sinter plant

\*\* Assumes 20% quality discount to published benchmark Mn ore spot prices

\*\*\* Incorporates estimates for both construction and sustaining capital

# Conclusion

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- Short/medium term outlook: flat pricing for 1-2 years at least, within \$4.50-5.50/dmtu range
- Short/medium term demand growth will be satisfied by brownfield expansion of low-cost existing mines
- Long-term outlook heavily dependent on growth rate for Chinese steel output
- Rising demand will eventually require large-scale greenfield South African capacity to come on-line, much of it initially based on trucking product to port
- There will need to be a step change of prices to  $> \$7/\text{dmtu}$  to attract this production, in order to generate an adequate return for new producers
- However this looks to be at least several years into the future
- Consolidated industry structure limits downside risks