Steel Industry Analysis

Steve Moore

GISB 692W

October 2, 2013

Steel is one of the most ubiquitous materials in the world today. It is used in countless industries and in the creation of products we all use on a daily basis. From the cars we drive to the structural elements of commercial buildings, steel truly pervades every aspect of modern life. Additionally, the steel industry directly employs over 2 million people across the globe, and indirectly provides jobs for 50 million (WorldSteel 2012). Once crude steel is manufactured in a plant, it can be exported to other manufacturers in a number of states. These manufacturers then further refine the raw steel into more specialized forms. Given the global reach of this industry, it is important to understand the geography of it and the other industries it interacts with. This analysis seeks to define the spatial extent of the steel production industry, examine how it has changed globally in recent years, describe important related industries, and understand how the steel industry interacts with those other industries.

SPATIAL EXTENT:

According to the World Steel Association, as of 2012 62 countries accounted for 98% of the world's steel production. Figure 1 depicts the amount of steel produced in thousands of metric tons by each of these 62 countries. While there are a number of countries which participate in steel production, much of it is concentrated in just a handful of countries: The United States, Russia, India, China, Japan, and South Korea. In fact, these six countries alone account for nearly 75% all the steel produced in the world. Even among these six dominant countries though, there is a clear frontrunner in terms of total production. China manufactured a staggering 708,784,000 metric tons of crude steel in 2012. To put this figure into perspective, the country with the second highest amount of crude steel production in 2012 was Japan, which produced just 107,234,682 metric tons. In fact, China produced more crude steel in 2012

than the five countries below it, and by nearly 300,000,000 metric tons at that. Globally speaking, China was responsible for just under half of the world's steel production in 2012, at about 47%.

The current distribution of global steel production is largely concentrated in Asia, with five of the six largest producers being located there. The United States is basically the only western country with a significant amount of steel production when compared to the likes of China and Russia. Brazil is rapidly becoming a global player in the steel industry for reasons which will be discussed later, but for now they are not on the same level as our six main countries. There is also some concentration of steel production in Europe, particularly in Germany, Italy, Turkey, and Ukraine, but they produce relatively small amounts. The Scandinavian countries have a low amount of production, and Africa essentially has none outside of South Africa and a handful of North African nations.

Beyond the initial production of the steel itself, it is important to also examine the global steel supply chain. Figure 2 shows the amount in thousands of metric tons of steel ingots imported around the world in 2011. As one may expect, this map is somewhat inverse in nature when compared to the steel production map. Generally speaking, the countries that do not produce their own steel purchase large amounts of crude steel ingots which can be used in a number of sub industries. In particular, many Western European countries as well as the Middle East import a large amount of ingots, as well as the United States. The most noticeable exception on this map is South Korea, which imports a high amount of steel ingots despite having a high amount of steel production themselves. This may be attributable to the growing

South Korean auto industry (Dicken 2011, p.335), which of course would require an enormous amount of steel.

CHANGES IN PRODUCTION:

This domination of the market by China was not always the case, though. Figure 3 shows the percentage change in steel production from 2001 to 2010 by steel-producing countries. Most obvious is the enormous increase in steel production by China during this time, at over 250%. In fact, the precise increase in Chinese steel production from 2001 to 2010 was 313%. India also saw a major increase in production, just over 150% to be precise. Given their position in the top six steel producing countries in the world this is no surprise. However, it is somewhat surprising to see that other top producing countries like Japan and South Korea had relatively modest increases of less than 50%. It is also important to note the 0-50% increases in Brazil and Australia, which will become more relevant later. Interestingly, Dicken (2011, pp. 334-335) notes that there has been a similar shift in automobile production, and now that industry is also dominated by China, India, Japan, South Korea, and Russia among others. It is difficult to say which industry came first, but certainly a healthy level of steel production is vital to supporting automobile production.

What also stands out are the countries where steel production actually decreased during this time period. Notably, the United States, Canada, Scandinavia, and much of Western Europe experienced declines in steel production. When viewed in context with the large increases in production in Asia though, these declines start to make more sense. From this map, one can visually see a shift in global steel production from the developed Western world to the

now dominant nations of Asia. This shift is possible in an industry like steel production because it is not necessarily tied to a specific location. Steel producers ship the raw materials for steel production in from all over the world, so their specific location is not as important. Of course the closer they are to their suppliers the better, but the steel itself can essentially be produced anywhere. The extractive industries which supply the steel industry, however, are very much tied down geographically as Dicken (2011) notes: “The geography of the extractive industries is of course, basically constrained by the distribution of the territorially embedded resources on which they are based…” (P. 263).

This is not to say that the location of industries which supply the steel industry have no impact on it though. As Summerfield (2012) notes Australia is currently the second largest producer of iron ore, a key ingredient in steel-making. China is a significant producer of iron ore itself, but a key fact is that China imports about 70% of Australia’s exported iron ore, and Japan and South Korea import most of the remainder (Christie, Mitchell, Orsmond, van Zyl, 2011). It would not be farfetched to assert that China’s steel production success is encouraged partly by their geographic proximity to Australia. The same goes for Japan and South Korea, who also have high steel production.

RELATED INDUSTRIES:

There are of course other industries that supply or are supplied by the steel making industry. The most obvious industries which are related to steel production are the extractive ones which provide raw materials to steel manufacturers so that they can produce crude steel. As previously mentioned, the main ingredient in steel is iron ore, which is produced by a

number of countries worldwide. Figure 4 shows that the steel production is indeed rather simple when it comes to inputs and outputs, with iron ore being the main input and finished crude steel being the output. Interestingly, four of the six major steel producers in the world are also in the top 10 as far as iron ore production goes. As of 2011, China led with Australia in second and Brazil in third (Summerfield 2012)**.** Numerically speaking, China produced 43% of the world's iron ore, Australia produced 17%, and Brazil produced 14% (Summerfield 2012). It stands to reason that if a country has access to a large supply of iron ore within their own borders, they will be in an advantageous position to increase their steel production. The nations which lead global steel production do not produce enough iron ore themselves though, so they must still import large amounts of it.

As Summerfield (2012) notes Australia is currently the second largest producer of iron ore. China is the world's leading producer of iron ore with well over double the production of Australia, but a key fact is that China imports about 70% of Australia's exported iron ore, and Japan and South Korea import most of the remainder (Christie, Mitchell, Orsmond, van Zyl, 2011). It would not be farfetched to assert that China's steel production success is encouraged partly by their geographic proximity to Australia. The same goes for Japan and South Korea, who also have high steel production. As Figure 5 Shows, it takes about 10 days to ship iron ore from Australia to China compared to 33 days to ship it from Brazil. Despite the 33 day trip from Brazil though, Burgering (2013) notes that Australia and Brazil are expected to dominate iron ore production for years to come. The amount of ore that China imports is also noteworthy, as basically every major iron ore producing country exports ore to China. This is shown in greater detail in Figure 6. Even other countries with a high amount of steel production like India export

some of their ore to China. If China, Japan and South Korea did not have the massive iron ore supply so near them and had to rely on other countries like Brazil, it becomes difficult to imagine them having the same level of steel production that they currently have.

It is also important to discuss the implications of the declining world economy and how that affects the steel industry and the industries which supply it. Serapio and Antonioli (2013) note that while the steel and iron ore industries were booming just a couple of years ago, demand has dropped off substantially. This is largely due to a slowdown in the growth of China's economy, which has in turn caused a slowdown in their steel production. This drop in demand coupled with an oversupply of raw steel-making materials has hurt iron ore prices, and also reduced steel prices and production. Additionally China has recently been oversupplying the world steel market with a surge of exports, to the point that Beijing has had to start pressuring steelmakers to reduce their output (Yap 2013). So while China's changing economy has been largely responsible for the shift in production and consumption of steel, its economy continues to change and thus will impact the steel industry in different ways in the future.

From this analysis we have seen that while the steel production industry stretches across the globe and is present in many countries, China currently dominates the market. We have examined how this change occurred over the past decade, and how it continues to change today with the lagging world economy. We have also identified the extractive industries which supply the steel industry with the raw materials necessary for production, and how their geographic location is important. The landscape of the steel industry has changed dramatically in recent years, and the iron ore industry has also experienced changes recently to adapt to its

main customer. With the volatile state of the global economy, there is no doubt that these changes will continue into the foreseeable future.

Figure 1

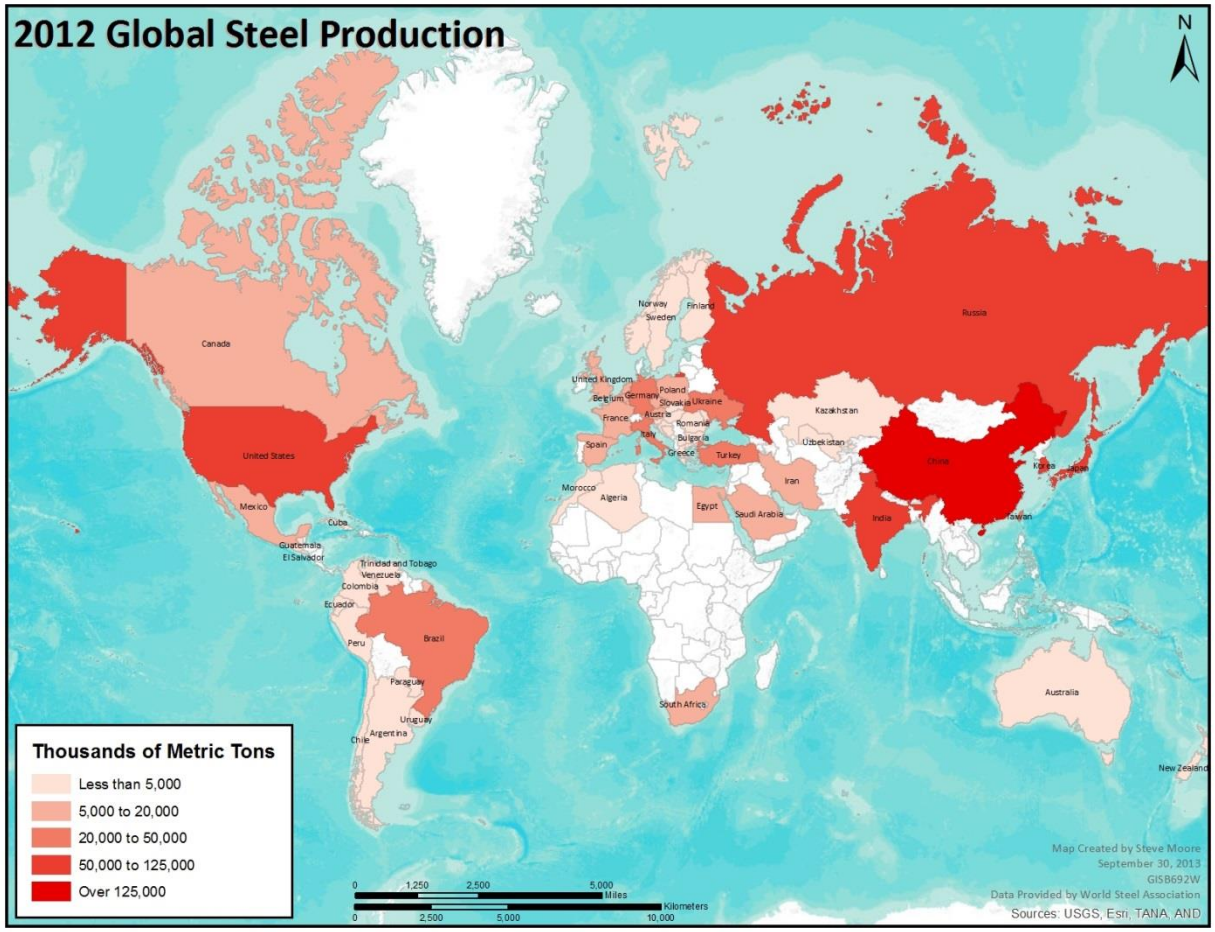

2012 Global Steel Production
N
Thousands of Metric Tons
Less than 5,000
5,000 to 20,000
20,000 to 50,000
50,000 to 125,000
Over 125,000
Canada
United States
Mexico
Cuba
Guatemala
El Salvador
Trinidad and Tobago
Venezuela
Colombia
Ecuador
Peru
Brazil
Paraguay
Uruguay
Argentina
Chile
Norway
Sweden
Finland
Russia
United Kingdom
Belgium
Germany
Poland
Slovakia
Ukraine
France
Austria
Romania
Italy
Bulgaria
Spain
Greece
Turkey
Kazakhstan
Uzbekistan
Iran
Morocco
Algeria
Egypt
Saudi Arabia
India
China
Korea
Japan
Taiwan
South Africa
Australia
New Zealand
0 1,250 2,500 5,000 Miles
0 2,500 5,000 10,000 Kilometers
Map Created by Steve Moore
September 30, 2013
GISB692W
Data Provided by World Steel Association
Sources: USGS, Esri, TANA, AND

Figure 2

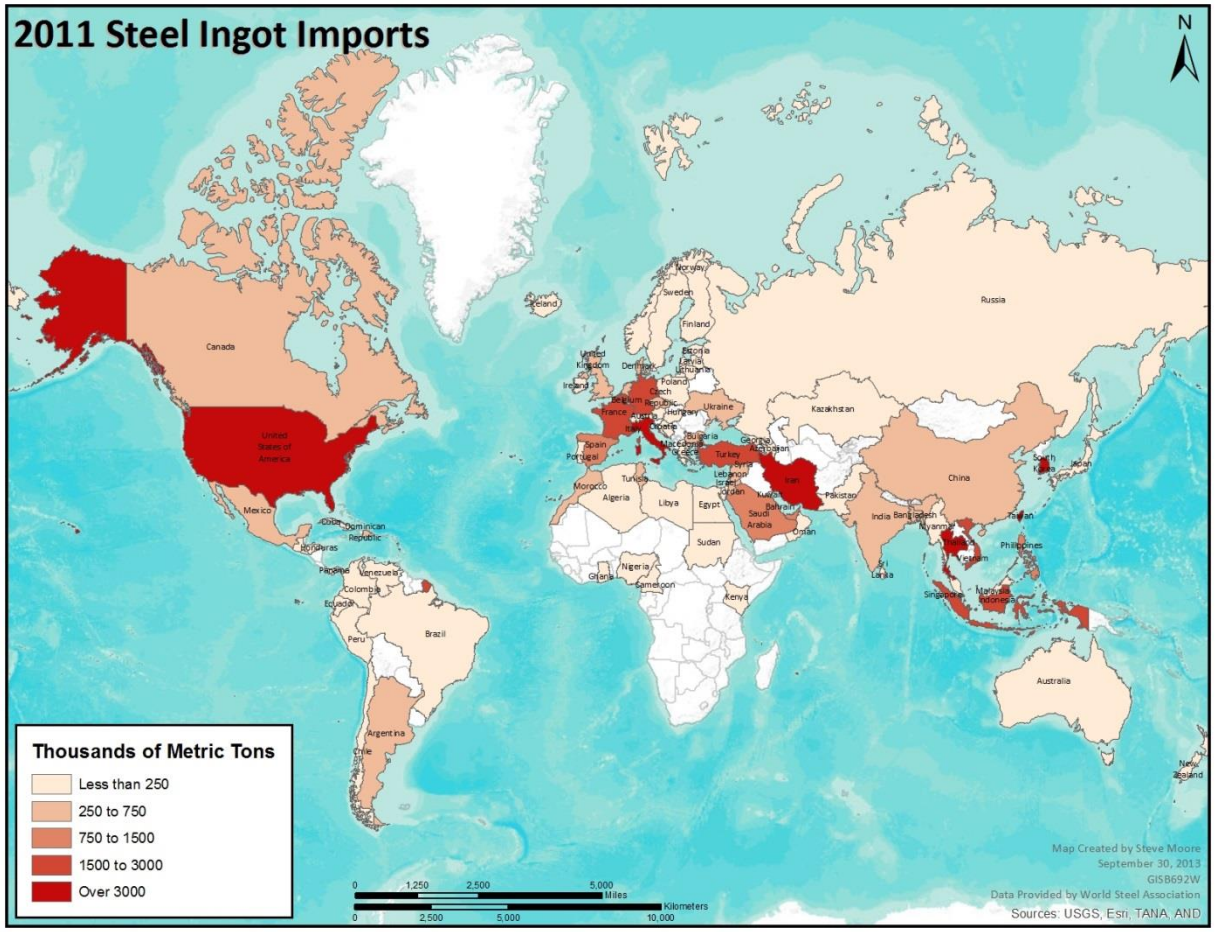

2011 Steel Ingot Imports
N
Thousands of Metric Tons
Less than 250
250 to 750
750 to 1500
1500 to 3000
Over 3000
Canada
United States of America
Mexico
Russia
China
India
Brazil
Argentina
Australia
Kazakhstan
Ukraine
Iran
Saudi Arabia
Turkey
Map Created by Steve Moore
September 30, 2013
GISB692W
Data Provided by World Steel Association
Sources: USGS, Esri, TANA, AND

Figure 3

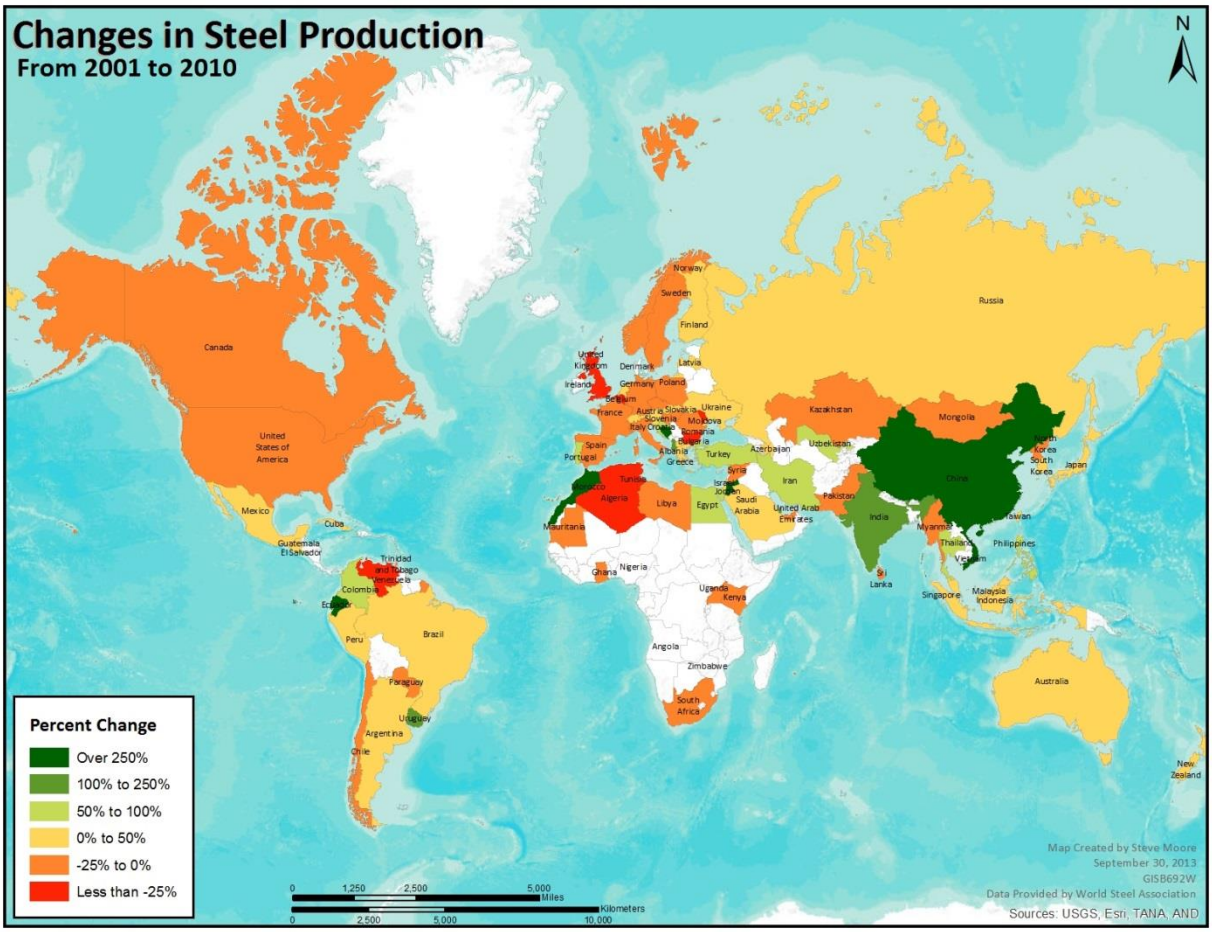


Figure 4

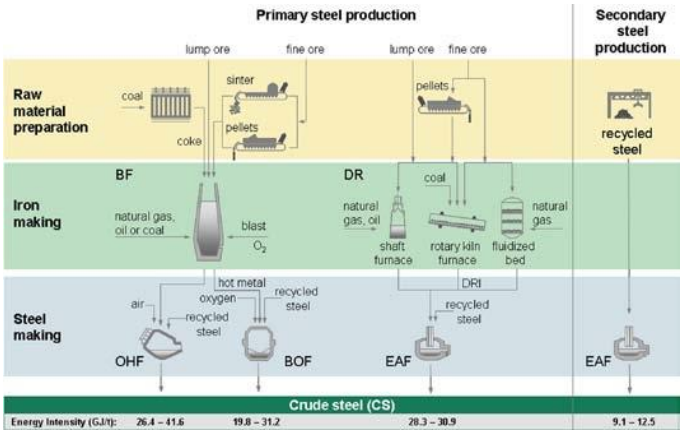
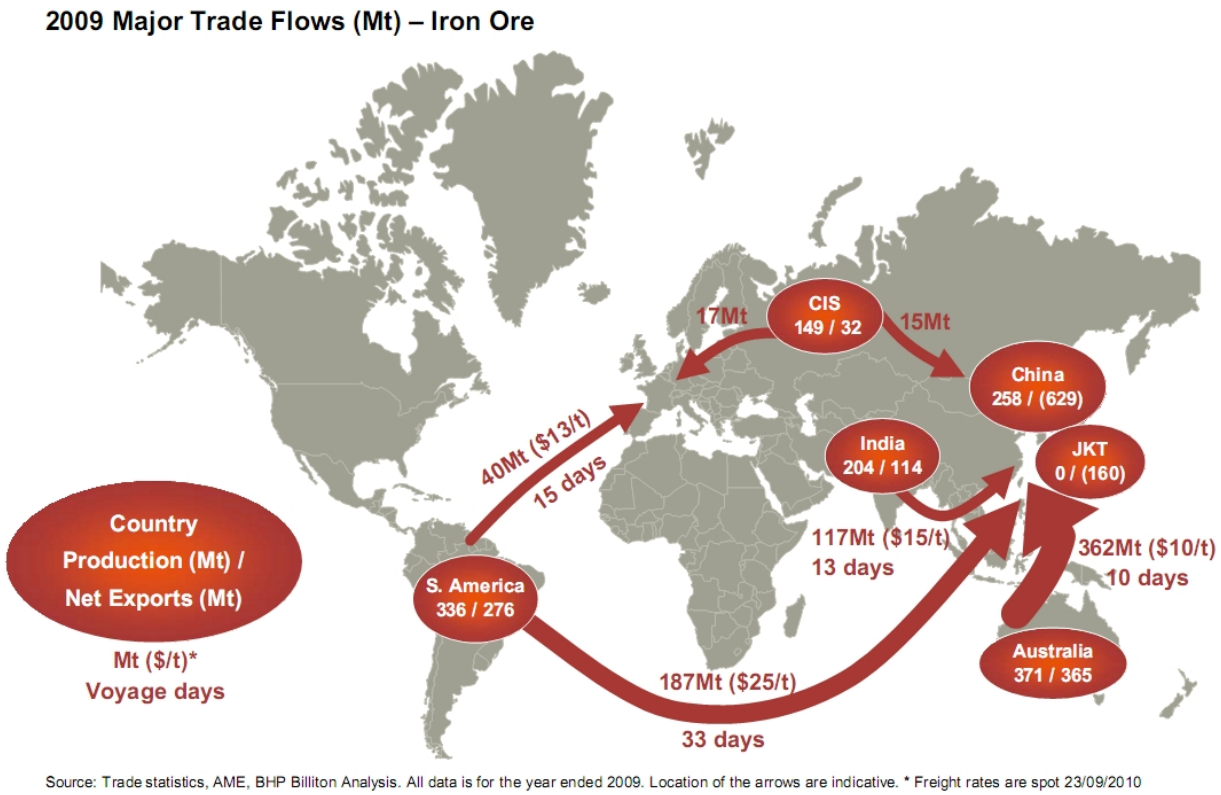
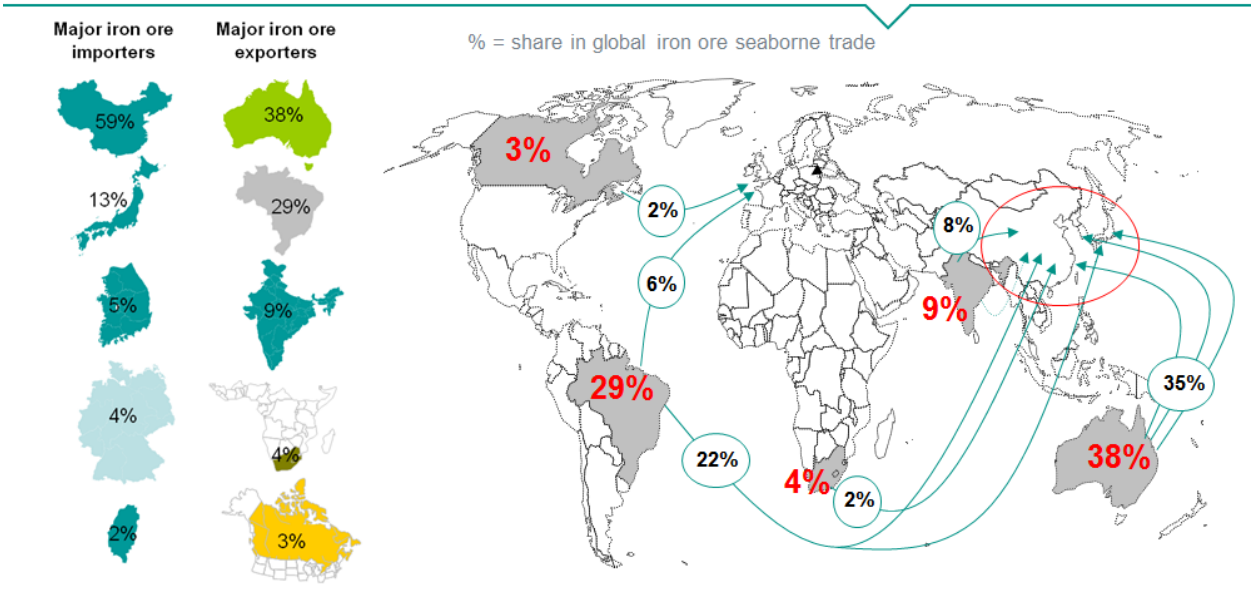


Figure 5



Source: Trade statistics, AME, BHP Billiton Analysis. All data is for the year ended 2009. Location of the arrows are indicative. * Freight rates are spot 23/09/2010

Figure 6



Retrieved from https://insights.abnamro.nl/en/iron-ore-outlook/

References

Antonioli, S., Serapio, M.(2013, September 10). China slowdown spells end of big payday for iron ore traders. *Reuters*. Retrieved from http://www.reuters.com/article/2013/09/10/ironore-trading-idUSL4N0GZ0WU20130910

Burgering, C.(2013, May 7). *Iron ore outlook – presentation.* Retrieved from https://insights.abnamro.nl/en/iron-ore-outlook/

Christie, V.,Mitchell, B., Orsmond, D., van Zyl, M.(March 2011). *The Iron Ore, Coal, and Gas Sectors.* Retrieved from http://www.rba.gov.au/publications/bulletin/2011/mar/1.html

Dicken, P. (2011). *Global shift: Mapping the changing contours of the world economy.* New York, NY: The Guilford Press

Summerfield, D.(2012). *Iron Ore*. Retrieved from http://www.australianminesatlas.gov.au/aimr/commodity/iron_ore.html#Production

World Steel Association (2012). *Key facts about the world steel industry.* Retrieved from http://www.worldsteel.org/media-centre/key-facts.html

World Steel Association (2012). *Crude Steel Production 2012* [Data File]. Retrieved from http://www.worldsteel.org/dms/internetDocumentList/statistics-archive/production-archive/steel-archive/Crude-steel-production-December-2012/document/Crude%20steel%20production%20December%202012.xls

World Steel Association (2011). *Steel Statistical Yearbook 2011* [Data File]. Retrieved from http://www.worldsteel.org/dms/internetDocumentList/statistics-archive/yearbook-archive/Steel-statistical-yearbook-2011/document/Steel%20statistical%20yearbook%202011.pdf

Yap, C. (2013, May 16). Surging Chinese steel exports put pressure on world prices. *The Wall Street Journal.* Retrieved from http://online.wsj.com/article/SB10001424127887323398204578486463173613012.html