China’s Iron & Steel Industry and the Global Financial Crisis

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This article reviews the sustained and fast development of China’s iron & steel industry since the reform and opening-up, the serious impact of the global financial crisis in 2008 on China’s iron & steel industry and the domestic and foreign market backgrounds which rapidly brought China’s iron & steel industry into downturn. It introduces the important measures the Chinese government has taken to expand domestic demand and restrain economic decline. It analyses the profound problems accumulated during the long-term rapid development of China’s iron & steel industry and the challenges it faces. It raises important issues which need attention and main measures which should be adopted for China’s iron & steel industry to react to the crisis and realize long-term and stable development.

KEY WORDS: iron and steel; financial crisis; sustainable development; technical progress; self-innovation.

1. Prologue

Since 1978 when China carried out the policy of reform and opening-up, with the continued growth of GDP, the production and consumption of iron and steel has also boasted accelerated growth (Fig. 1). Over the past 30 years, the time of producing another 100 million tons of steel has also shortened surprisingly (Fig. 2). By the end of 2009, the production of steel had still reached 570 million tons during the financial crisis. Compared with the steel production of other major global countries, our country has been far ahead (Fig. 3).

2. The Impact on Iron & Steel Industry in China by the Global Financial Crisis

The global financial crisis in 2008 had brought great impact on China’s iron and steel industry. The iron and steel industry had maintained a steady and rapid development till the second-quarter of 2008. However, from the third-quarter, faced with a rapidly shrinking domestic and global steel market, the business situation had deteriorated rapidly and the monthly output had reduced continuously (Fig. 4). This was mainly caused by the global and domestic reasons.

2.1. The Deterioration of Export Environment

Until 2005, China was a steel importing country, which means that the annual volume of import exceeded its export. In 2005, the relation between supply and demand of the steel industry in China took the turning point, realizing the import-export balance of steel products. Since 2005, the export volume has continuously increased and exceeded the import volume. China had become a net exporter of steel. The increase of crude steel production was supported by the

Fig. 1. The crude steel output in China and its share in the whole world from 1990 to 2009.

Fig. 2. The time consumption of producing another 100 million tons of steel.
growth of domestic consumption and the net export of steel products. In 2008, the net export volume of steel accounted for 23% of the steel production in that year, becoming an important factor that promoted the growth of steel production. The global financial crisis which was originated in the U.S. credit crisis brought the downturn to global markets and caused rapid decline of steel export (Fig. 5).

2.2. The Decline of Domestic Demand

The global financial crisis had brought great impact on the domestic market, too, causing the shrink of domestic market and declining GDP. At the end of 2007, the annual growth rate of GDP was 11.7%, while in the third-quarter of 2008 it dropped to 9.9%, decreased by 2% (construction and manufacturing industries decreased by 2.9%). The domestic market of steel consumption was mainly industries such as ironware, home appliances, constructions, mechanical industries and so on. The downturn consumption of these downstream industries naturally made the steel production drop significantly.

2.3. Factors of Cost and Price

Meanwhile, the price of iron ore and coke continued to rise, so the cost of steel increased dramatically. Moreover, the devaluation of US dollar increased the export price, and China adjusted downward the export rebate rate. Thus, the low value-added processing industry which accounted for a large proportion of China’s industry couldn’t bear the raise of steel price. Steel suppliers and deep processing companies’ lack of confidence on the market expanded the market decline. All of these directly led to the decline of steel production.

As described above, the deterioration of export environment and the decline of domestic demands which are brought by the global financial crisis are the direct causes of the rapid downturn of China’s iron & steel industries.

3. Countermeasures on Crisis

By the first half of 2008, China had maintained sound development of its national economy. Since the third-quarter, the unexpected global financial crisis had reversed China’s economy rapidly. Under this circumstance, the Chinese government responded immediately, made decision decisively and carried out a series of important measures, including boosting domestic demand, controlling economic decline, and promoting steady and rapid economic development.

The prompt and significant economic decisions that the Chinese government had played a fundamental role in restricting the decline of iron & steel industry and promoting the recovery and steady development of iron & steel industry. For instance:

3.1. Ten Major Measures to Expand Domestic Demand and Promote Economic Growth

In November, 2008, the Chinese Government proposed a timely 4 trillion RMB economic stimulus plan, e.g. the “ten measures to further increase domestic demand” (Table 1). At the same time, all local governments also announced investment plans of 18 trillion RMB to stimulate economic recovery. The ten measures mainly focused on infrastructure construction, which provided a huge market for the recovery of iron & steel industry.

3.2. Revitalization Plans for Ten Key Industries

Then, the Chinese government successively formulated revitalization plans for “iron and steel, automobile, shipbuilding, petrochemical, light industry, textile, non-ferrous metals, equipment manufacturing, electronic information, logistics”, etc. Especially for the revitalization and development of iron and steel industry, the government gave greater policy support from four aspects: raising export rebates, technical updating (lower loan interest), steel production purchase and reserves, and mergers and reorganization of enterprises.
3.3. Implement a Proactive Fiscal Policy and a Moderately Easy Monetary Policy

The proactive fiscal policy and the moderately easy monetary policy has given a strong financial support to promote expansion of domestic demand, adjust the industrial structure, and ensure the implementation of the above two measures.

The above three measures not only provided policy support in aspects of finance and taxation for iron & steel enterprises, but also opened up a huge market space, so that the iron & steel enterprises could adapt to the new market requirement and formulate countermeasures rapidly, accelerate the adjustment and development of products.

4. The Thought of Sustainable Development

The “vulnerability” of China’s iron & steel industry has been exposed by the serious impact caused by global financial crisis, which also shows clearly the profound problems China’s iron & steel industry has accumulated during the rapid development. These problems are mainly: overcapacity in steel production, low intensive of iron & steel industries, irrational distribution of iron & steel enterprises, weak macro-control ability on resources and market, disorder of steel products circulation, low self-innovation capability and so on. To solve these profound problems is the long-term challenges for the China’s iron & steel industry. Therefore, facing the financial crisis, China’s iron & steel industries not only need to formulate measures to deal with the crisis, but also to think about and make a long-term strategy for sustainable development. Only in this way, can we change present “crisis” into “opportunity” of development, so that China’s iron & steel industries are able to realize the long-term steady development. On the whole iron & steel industry, attention should be paid to the following aspects:

4.1. Continue to Optimize the Geographical Distribution of Iron & Steel Enterprises

Due to historical reasons, since 1950s, the geographical distribution of iron & steel enterprises in China had been developed according to the principle of fully utilizing domestic resources and being closed to producing area of raw materials. These enterprises were mainly distributed in six major iron ore storage areas such as Anshan, Benxi and so on (Fig. 6). This distribution fitted the situation of that time in China.

Table 1. Ten measures to expand domestic demand and promote economic growth.

| Measure                                                                 |
|------------------------------------------------------------------------|
| 1. Accelerate the construction of protection of housing projects.       |
| 2. Accelerate the infrastructure constructions in rural areas.          |
| 3. Accelerate the constructions of railways, highways and airports and other major infrastructure. |
| 4. Accelerate the development of medical treatment and public health, culture and education. |
| 5. Strengthen the construction of ecological environment.               |
| 6. Accelerate independent innovation and structural adjustment.         |
| 7. Accelerate the reconstruction work of earthquake-stricken areas.     |
| 8. Improve the incomes of urban and rural residents.                    |
| 9. Fully implement transition and reform of value added tax in all regions and industries in the country. |
| 10. Increase financial support for economic growth.                     |

As the steel production continued to grow rapidly, consumption of iron ore had also grown rapidly. China’s iron ore mainly depends on imports. Meanwhile, the geographical distribution of iron & steel enterprises disaccorded with the distribution of domestic market which had been formed since the reform and opening up started three decades ago. Therefore, the distribution of iron and steel enterprises must change from resource-dependent to distribution of sea-based and market-based.

In recent years, the adjustment of steel enterprises’ distribution has continuously accelerated. Till 2008 the newly built and launched steel enterprises are all distributed in coastal areas (Fig. 6). However, in term of the overall situation of China’s steel industry, the geographical distribution of China’s steel enterprises still needs further adjustment and the following principles should be considered, for example: gradually reducing the proportion of total steel production in
large urban areas, scenic areas, serious water shortage areas, and excessive concentration of production capacity areas; relying on the existing large-scale iron and steel enterprises to transfer their production capacity to coastal areas with good development conditions and easy access to iron ore, especially to deep-water port areas; appropriately transferring iron and steel industries from big cities and water-deficient areas to big coastal ports and close market areas.

4.2. Continue to Accelerate the Merger and Reorganization of Enterprises

Facing the declining market demand and the increased risk of enterprise profit, steel enterprises must overcome the disadvantages of extensive development, improve their concentration, enhance the competitiveness of enterprises, and carry out enterprise mergers and reorganizations. The merger and reorganization of iron and steel enterprises should take volume control, transform of development model and structural adjustment as their goals. As promoting the merger and reorganization of iron and steel enterprises, we must vigorously eliminate backward production capacity to realize the optimal and upgrading configuration of iron & steel enterprises, and improve enterprises’ competitiveness and independent innovation capacity.

In recent years, the mergers and reorganization of iron & steel enterprises have made significant progress from regional reorganization to inter-provincial reorganization and even private enterprises reorganization. From Table 2, the concentration of top 15 steel enterprises’ crude steel production has greatly increased. Among the 500.488 million ton products of crude steel in 2008, the top 5 enterprises produced 143.2047 million tons, accounting for 28.6%; the top 10 enterprises produced 213.3732 million tons, accounting for 42.63%; the top 15 enterprises produced 253.5982 million tons, accounting for 50.67%. But till 2008 there are still 523 iron and steel enterprises and 2928 steel manufacturers. The task of merger and reorganization is still arduous.

In March of 2010, the Ministry of Industry and Information Technology of the State Council set the goal of acceleration of eliminating backward production capacity within 2 years, that is, from 2010 to 2011, eliminating iron production capacity of 100 million tons, and up to the end of 2011 eliminating blast furnace below 300 m³ and converter and electric furnace below 30 tons. At the end of 2011, blast furnace below 400 m³, converter and electric furnace below 30 tons will be eliminated.

4.3. Vigorously Promote Energy Conservation and Environmental Protection

The process of promoting the energy saving of China’s iron and steel industry has gone through three stages to make the enterprises’ energy consumption (Fig. 7) and fresh water consumption (Fig. 8) drop continuously, including the energy saving of single equipment, energy saving by optimization of production flow and enhancing the functions of energy conversion. But with China’s rapid economic development, the total energy consumption also increases and the proportion of iron and steel industry energy consumption is also significantly increased. In 2007 energy consumption of iron and steel industry accounted for over 12% of the national energy consumption (Fig. 9). In 2008 the key enterprises’ energy consumption was about 630 kce/ton which approached to the international advanced level, however, the

### Table 2. The steel output of top 15 enterprises in 2008.

| Order | Company Name       | Output of 2008 |
|-------|--------------------|---------------|
| 1     | Baosteel           | 3544.30       |
| 2     | Hebei Group        | 3328.39       |
| 3     | Wuhan Steel        | 2773.39       |
| 4     | Anshan-Bensi Group | 2343.93       |
| 5     | Sha Steel Group    | 2330.46       |
| 6     | Shan Dong Iron and Steel | 2184.08 |
| 7     | Masteel            | 1503.90       |
| 8     | Shougang           | 1219.28       |
| 9     | Hua Ling           | 1125.69       |
| 10    | Baotou Steel       | 983.90        |
| 11    | Tisco              | 920.17        |
| 12    | Anyang Steel       | 903.92        |
| 13    | Pangang Group      | 751.01        |
| 14    | Rizhao Steel       | 747.21        |
| 15    | Jisco              | 700.19        |

![Fig. 7. Evolving of specific energy consumption of Chinese steel industry from 1980 to 2009.](image-url)
whole steel enterprises’ energy consumption per ton is still 20% higher than the international advanced level, because of low corporate concentration, too many small-and-medium-sized enterprises (SMEs), backward technological equipment and energy-saving technology.

Steel enterprises’ emissions of pollutants account for about 10% of the whole country’s environmental load. During the past decade, China’s key steel enterprises’ emissions of pollutants (Fig. 10) and CO₂ emission (Fig. 11) has significantly reduced. However, the whole industry’s emissions of pollutants including SMEs’ are still not optimistic. China’s steel enterprises’ emissions of CO₂ account for more than 50% of the whole world’s steel industries. In 2007 China’s steel enterprises’ production of EAF accounted for only 9.1%, while the world average was 31%, and the energy consumption of coal accounted for 80%. Therefore, changing the energy structure and process flow of the iron and steel industry are two important resolutions for energy saving and emission reduction (Fig. 12).

On the basis of the above, over the past decade, the key enterprises’ energy conservation and reduction of pollutant emissions have achieved remarkable progress, but the status of the whole industry in China is still grim. With promoting merger and reorganization of enterprises and increasing intensity, urgent issues, such as change of energy structure, use of advanced production flow, technology, energy saving technology and emissions reduction technology are still need to face.

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4.4.1. Focus on Variety Development

There are two aspects worthy of attention: logical progress and enhance the independent innovation capability. The iron and steel enterprises must vigorously promote technological progress and improve independent innovation capacity. Nowadays, as they meet the huge domestic market demands, iron and steel enterprises, but also opportunities to promote technological progress and self-innovation, etc. The steel enterprises should develop the extended processing, extend to the downstream industries, and build the user supply chain. For example, deep processing of material-type, such as wire products, coating products, paint products, pipe products, etc.; deep processing of business-type, that is, the user-oriented intermediate products, such as laser welding, cutting and distribution, etc.; deep processing of industrial-type which provides users the final product, such as steel members, combined type housing and so on.

4.4.2. Focus on Deep Processing of Steel

The steel enterprises should develop the extended processing, extend to the downstream industries, and build the user supply chain. For example, deep processing of material-type, such as wire products, coating products, paint products, pipe products, etc.; deep processing of business-type, that is, the user-oriented intermediate products, such as laser welding, cutting and distribution, etc.; deep processing of industrial-type which provides users the final product, such as steel members, combined type housing and so on.

5. Summary

This article briefly reviews the history and current situation of rapid development of China’s iron & steel industry. On this basis, it mainly analyses the main reasons why global financial crisis caused impact on China’s iron & steel industry and influence on the development of China’s iron & steel industry by China’s economic stimulus plans reacting to global financial crisis. Moreover, this article indicates the long-term strategy that China’s iron & steel industry needs for its sustained development and the future developing direction, including continued promotion of geographical distribution adjustment of iron & steel enterprises, promotion of enterprises’ merge and re-organization, vigorous promotion of energy-saving and environmental protection, and enhancing technological progress and self-innovation, etc.

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Table 3. Evolving of techno-economic indexes of Chinese steel industry from 2000 to 2009.

| Year | Specific energy consumption (ice*/t) | PCI (kg/t) | Coke Ratio (kg/t) | BF productivity (t/(m³·d)) | BOF Campaign (heats) | CC ratio (%) | Yield of rolled products (%) |
|------|-------------------------------------|------------|------------------|---------------------------|----------------------|--------------|---------------------------|
| 2000 | 0.92                               | 117        | 437              | 2.15                      | 3500                 | 86.97        | 92.48                     |
| 2001 | 0.88                               | 122        | 422              | 2.34                      | 3526                 | 89.44        | 94.01                     |
| 2002 | 0.82                               | 126        | 417              | 2.46                      | 4386                 | 93.03        | 94.19                     |
| 2003 | 0.77                               | 118        | 430              | 2.47                      | 4631                 | 96.19        | 94.92                     |
| 2004 | 0.76                               | 116        | 427              | 2.52                      | 5218                 | 98.35        | 94.98                     |
| 2005 | 0.74                               | 120        | 412              | 2.64                      | 5647                 | 97.51        | 95.37                     |
| 2006 | 0.65                               | 134        | 397              | 2.71                      | 6824                 | 98.53        | 95.45                     |
| 2007 | 0.63                               | 136        | 396              | 2.74                      | 8558                 | 98.69        | 95.32                     |
| 2008 | 0.63                               | 134        | 400              | 2.63                      | 9233                 | 98.85        | 95.30                     |
| 2009 | 0.62                               | /          | /                | /                         | /                    | /            | /                         |

Table 4. China’s mid and long term development plan for integrated transport network to 2020.

| Type                                | Length    |
|-------------------------------------|-----------|
| Automobile highway                  | >5 million kms |
| Railway                             | >120 thousand kms |
| Express Way                         | >100 thousand kms |
| Urban railway system                | >2500 kms |
| Civil airports                      | 244       |
| Special railway line for passenger  | 15,000 kms |
| and inter-urban railway             |           |
| Natural gas, oil transferring pipe  | >120 thousand kms |
| Important port                      | 25        |
| Advanced automobile highway above 2nd level | >650 thousand kms |