

Study on Policy Adjustment to Promote the Steel Industry Innovation

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Abstract: This paper regards that China's rapid economic growth in recent years had brought the excessive consumption of resources and serious environment pollution through applying the problem analysis method. Especially, steel industry is facing with the unprecedented challenges because of the massive consumption of resources and energy. The annual iron ore import volume has accounted for a large proportion of the global trade. Besides the huge supply pressure, steel industry development is subject to the effective water resources guarantee and environmental protection, and it is hard to produce some kind of high added value steel products. So, this paper proposes that China's steel industry should not only pursue the quantity growth, but also pay more attention to the steel industry innovation. It comes to a conclusion that we must apply the policy adjustment, institutional arrangements, and the technical economy power to promote the steel industry innovation, so as to realize the steel industry development pattern transformation purpose.

Key words: Policy adjustment; Technical economy; China's steel industry; Industry innovation

1 Introduction

Steel is one of China's pillar industries, its production has ranked first in the world for many years. The subsistent development had necessarily aroused attention in theory. The present literatures can be divided into the following kinds: Firstly, some scholars did researches on the practical problems of the steel industry development. Compared with the advanced world level in technology and material consumptions, there was still some way to go for China's steel industry. The main reason for that was the weak innovation ability which resulted in weak competition ability and insufficient momentum to make further development. Secondly, due to the influence of the steel industry's material consumption and energy consumption on environment, many scholars did research on circular economy of the steel industry. They held the view that studying the steel industry from the perspective of circular economy was not only a systematic project, but also an important project that included multiple interpenetrative disciplines with strong theory and practicality. Such an angel involves a wide field and multiple research methods and many studies are going to deep. Thirdly, steel enterprises are typical of process manufacturing industry. Scholars explored effective approaches for steel enterprises development from the perspective of industry characteristics, pollution abatement, technology and equipment, business administration, technological process optimization, comprehensive waste treatment, ecological industry chain construction, energy conservation and emission reduction, etc. Fourthly, security and efficiency on the steel industry chain are the fundamental guarantee for steel enterprises' sustainable development, especially international iron ore prices are going to rise in recent years, which highlights that industry chain integration is important for enhancing enterprise competitiveness. Researches on this aspect are still going on.

In April 2011, China's steel industry association released that the steel industry ran at a high cost but low efficiency status in the first quarter. It also said that the average cost increased by 27.5% year on year, and the total profit of the seventy-seven large and medium-sized steel enterprises was 24.46 billion Yuan, the profit margins was only 2.91%, 3.29% lower than the national industry average sales rate. The data showed that 22 cities' social steel inventory grew by 39.28% and reached at 13.58 million tons at the end of March compared with the beginning of the year. The national production capacity has reached 768 million tons and up to the world the first in the end of 2010. The excess contradiction is highlighted compared with the demand. Such a state of excess capacity, low efficiency, enterprise difficulties and the stock surge is far away from the 1025 planning programs and the requirement of the scientific development concept. It is urge to transform the steel industry development mode.

Excess capacity of steel industry has always been a prominent problem in our country. Recent years practice had proved that administrative means neither reach the capacity control aims, nor promote

the steel industry development way transformation. Government should not act as the market participants to make the decision to eliminate a specific manufacturer in the full competitive steel industry, it should promote the steel industry development mode transformation through effective policy, and constructing the effective policy system so as to make the full use of the market basic role.

2 The Main Problems of China's Steel Industry

Since the reform and opening up, China's steel and iron industry has made great progress. At present, our country is the world's largest steel market, it shows as follows: steel annual production, consumption and import volume, as well as iron ore annual import and consumption volume all reached the world first. But the problems are also very prominent.

2.1 Low level disordered and redundant construction

In a few years before 2008, China's rapid economic development and the international economic recovery brought the rapid growth of the steel industry demand, and the industry profits, as well as attracted a lot of capital into the steel industry. At the same time, many local governments had taken a relatively loose attitude towards many applications of infrastructure project examination and approval based on the consideration of the financial income increase, even had not carried out the necessary punishment on the unexamined and unapproved construction project. These gave rise to the steel industry the fastest development but most disordered period in the past ten years.

Steel industry can stimulate local economic growth and contribute greatly to the financial income because of its huge investment and good yields under the fine economic environment. Therefore, many local governments constantly strengthen protection policy, and actively attract all kinds of capital investment, and support and protect the steel industry to grow stronger. By so doing, many local medium scale steel industry have grown into large enterprises. The development of steel industry was comparatively less restricted by the macro financial policy because of the high proportion of their own funds. So, our country's steel industry repetitive construction is very serious. This problem accumulated year by year and gave rise to the contradiction among enterprise and local environmental protection, energy conservation and emission reduction administrative management and bank loans.

2.2 The unreasonable industry layout

Reasonable layout is the key to reduce the cost and to improve the industry competitiveness. China's early steel industry layout was according to the principle of raw materials area proximity, so most of the steel enterprises located in the inland and away from the seaport. Drawbacks of Such kind of layout were emerging gradually with the improvement of the ore resources' foreign dependency. Unreasonable layout did not only increased the ore transportation costs and the national transport pressure, but also added the raw material loss which leading to the enterprise production cost boost. According to the transportation research department statistics, among the steel products and raw materials transportation, railway traffic volume ran only second to the coal; port traffic volume ran third only after the coal and oil.

Historical factors also led to such a kind of layout that China's many steel enterprises established in densely populated and resources shortage areas, which brought about resources and environment pressure to the cities, especially that of the north China, our country's largest steel production base. Due to the prosperous economy and the intensive population, and the insufficiency water resource, the average water consumption for one ton steel was 12tons, which made the contradiction among the water for the steel industry, water for other industries, water for agriculture and water for life obvious.

At present, there is a new tendency in our country that the steel industry began to transfer to the coastal areas. In there the economic development is very rapid, and the steel demand is exuberant, and the use of the imported iron ore is convenient. The main new established large steel enterprises also began to locate in the coastal areas. In the inland areas and the big cities, steel enterprises also began to integrate with the local mineral resources market situation, began to seek the way to harmonize the development direction.

2.3 Unreasonable product structure and high market pressure

Although in recent years, many large steel enterprises have begun to pay attention to the product structure adjustment, emphasize on the differentiation and high added value, due to various reasons, the effect was not obvious. Take the cold-rolled steel plate as an example. In 2001, the overall production of all kinds of cold rolling units (including cold rolling mill and cold strip mill) in our country was 13 million tons. But began with the 2005, there were a large number of high starting point and large

capacity production line going into production, the high speed development time for the cold rolling mill was coming, such as the 2230 mm cold rolling line in WISCO, 1700 mm pickling line in MASTEEL, 1700 mm steel line in Benxi Iron and Steel Co, 1.4 million tons cold rolling line in Baotou Iron and Steel Co, 1 million tons of cold rolling pickling line in Jinan Iron and Steel Co, etc. By 2006, China's cold rolling output has risen to 50 million tons. In 2007 and 2008, cold rolling output that went into production had reached 11 million tons and 14 million tons respectively. By the end of 2008, China's total cold rolling output has reached 75 million tons. These resulted in such a situation that the supply was greater than the demand. On the other hand, we imported a lot of steel that we could not produce at home or that the demand was greater than the supply. The price of the steel we exported in 2006 was \$610.2 one ton, but the average price that of the imported was up to \$1071 one. There was a big difference in prices. So it was visible that the high value steel products capacity in our country was obviously insufficient.

2.4 Low production efficiency

In the history of our country, many steel enterprises once experienced people overstaffed and organs overstaffed status because of the special position of China's state-owned enterprises in employment and our country's low wages, high employment policy. In recent years, the steel enterprises have begun to carry out reform one after another to downsize so as to improve the efficiency under the pressure of competition in the market, which has greatly increased the market competitiveness and productivity. China's steel industry labor productivity was still very low compared with the foreign countries, especially the developed countries. In 2006, China's large and medium-sized steel enterprises productivity was 292 tons/ people year, which of the world other major countries was about 600 tons/people year, and which of the developed countries and regions such as South Korea, Germany, the United States, Japan and Taiwan were both up to 1000 tons/people year.

2.5 Insufficient control of the upstream industry

Firstly, the foreign resources reliability is strong. Our country's rich iron ore mines were less and the mean iron ore mines were more, the average iron grade is only 33%. Among the 2000 proven recoverable deposits, large scale ones just account for 5%, and most of them are complicated original mineral deposits and covered with thick layer at the upper part, which leads to high stripping cost and high mining cost. Our country's iron ore resources are hard to prop up the steel industry now, which forces our country steel industry to seek ways from abroad and makes we become the world's largest ore importing countries. In the long run, China's future steel development will rely mainly on the imported iron ore and the reliance degree will be intensified.

In addition, although China occupies the world's largest coal carbon storage, the coking coal used in metallurgy is relatively insufficient. The total coking coal recoverable reserves are only 40 billion tons. There are 8.4 billion tons coking coal, and 5.1 billion tons fat coal. As a coking coal varieties, the strong bonding and the fat coking coal at present are in a condition that the demand significantly exceeds the supply. Therefore, it is also expected that within a period of time, it is necessary to import a lot of coking coal accompanying with the domestic steel production increase.

Secondly, the control of the upstream industry is insufficient. China's steel industry foreign dependence continues to improve. Overseas upstream industry includes ore mining industry and the shipping industry, whose price fluctuation will influence the normal domestic steel industry development. On one hand, three ore giants, BHP, Rio and CVRD control the amount of the international iron ore sea transport above 70%, make our country in iron ore resources in obvious weak position. On the other hand, Japanese packet ship, Kawasaki steamboat and the Mitsui merchant ship act as the representative to unit as Japan's shipping giant, which gradually control the shipping price on specific sea fields through establishing a perfect intermediary service system and marine system. And since the 1990 s, this group have begun to arrange overall on China's iron ore transportation market and gradually controlled our country's imported steel raw materials transportation business by signing long-term contracts and arranging the ports, which led to the further weakening of the control over the upstream industry.

3 Policy Adjustment to Promote Industrial Innovation

3.1 Perfect the environmental protection policy to control the capacity

First of all, applying the carbon emission limits to control the steel capacity. There is not a clear control index for the end of the 1025 plan, but it has already formed the common understanding that the steel industry development should not bring about new pressure to the environment, which is the

necessary condition for the development mode transformation. We can use the carbon emissions at the end of the eleventh five-year plan as the 1025 plan industry control index. Steel capacity control can be realized by the carbon emission limits carried out by various levels of the environmental protection departments.

Secondly, improving the control standard and focusing on shutting up the unreached steel enterprises to compress the steel capacity. During the steel capacity compression process, we used the equipment level as the standards for years, which regulated the age limit when the blast furnace, converter equipment capacity were lower than the normalized value. This regulation was lack of clear guidance provisions of environmental protection, and poor in practice implementation effect. Environmental protection equipment does not necessarily complete and the pollutants control level does not necessarily high in some enlarged equipment steel mill. Some steel mills with general equipment ability improve emissions standards so as to reduce environment pollution through applying the new desulfurization and denitration equipment.

During the 1025 period, the important content of the steel industry development mode transformation is to raise the level of pollutants management and to reduce the pollution of the industry development to the environment. To establish the environmental protection as the goal for steel capacity compression pattern and the emissions standards as the standard to decide whether the enterprise be washed out can encourage manufacturers to put high attention to the environmental protection from the beginning. At the same time, as the steel plant emissions standards' continuous improvement, the steel capacity compression will have clear roadmap and make the goal of productivity development way more in line with the change of the policy direction.

Finally, the emissions trading mechanism is needed to be perfected to promote the steel industry carbon emissions reduction. Under the precondition that carbon emissions are not increasing in 1025, it is helpful to form the energy saving and emission reduction steel and iron industry development mechanism by establishing a carbon emissions trading market. Carbon emissions trading market system should be further perfecting as follows: the new established enterprises can realize the reduction objective by purchasing the emissions reduction index; the old established enterprises can realize the technology innovation profit through emissions reduction market, which will encourage these enterprises to invest on emission reduction. Through the environment tough restrain to realize the hard steel capacity constraints is crucial to the steel industry development mode transformation.

3.2 Applying the quality policy to promote the steel products structure optimization

Our country's steel production volume ranks the world first, but the efficient steel production use ratio is low. Half of the steel are used for building and are the second lower strength level. The international common used steel, the third level steel, only account for 12% of the total steel amount. The second level steel will consume 15% more steel than the third level steel, and the fourth level steel rebar will save 30% less than the second steel rebar. Large scale uses of the inefficient steel are also existing in varieties such as steel and steel tube. Due to the historical reasons, low quality requirements for steel in China's building codes and the quality standards are the important reasons for the large scale use of the inefficient steel and obstacles for the efficient steel to enter the market.

The quality policy's effectiveness can be specified as follows: revising the building codes and the quality standards, improving the steel quality standards used in the construction and machinery industries, and limiting the use of low efficiency steel, improving the market demand for effective steel, promoting the steel enterprise to increase efficiency, and realizing the of the of steel products structure optimization.

3.3 Play the price policy role to encourage resources conservation

The steel industry consumes a lot of water, electricity. Statistics show that industrial energy consumption accounts for China's total energy consumption about 70%, 15% of which is used in steel industry. At the same time, the water volume consumed by steel industry accounts for about 15% of the total water consumption. The scale expansion of the steel industry has caused shortage of water in China's multi areas. To realize the steel industry development mode transformation, reducing the water and electricity resource consumption is one of the important goals.

Government should carry out the pricing rights on water and electricity that in control and adopt differential prices. The steel enterprises which set up the inside water resources recycling system and consume less water for per ton steel will enjoy the preferential price. The steel enterprises which adopt waste heat and complementary energy recycling technology will also enjoy the preferential price, or vice versa. Through the play of the guide role of the price policy, and the implementation of water and electricity prices differentiation, we will make the iron and steel enterprise get more effective economic

incentive to save resources.

3.4 Perfect the regional plan and explicitly define the steel industry development policies for each area

The layout of the steel industry in China is not reasonable. For example, steel factories are mainly built in inland far away from the clients and raw materials, so the logistics cost is high. To change the development path of the steel industry and optimize the layout of the steel industry, the government should strengthen regional planning to define the areas where the development of steel industry is encouraged or restricted or prohibited. For ecologically fragile areas, the construction of steel enterprises should be forbidden through planning. For coastal areas with good condition, the development of steel industry should be encouraged. And based on the new production capacity and the industrial layout adjustment, the steel enterprise should be guided to gather in these areas. The optimization of the layout of the steel industry can be achieved through regional planning.

All in all, only by innovating the thoughts, and perfecting the policies and measures from the following aspects: environmental protection, quality supervision, price policy, property building, and regional planning and so on, we will realize the goals to promote the steel industry development mode transformation.

4 Conclusion

During the next national twelfth five-year plan period, to change the development path of the steel industry, it is necessary to promote the increase of the industry concentration. The existence of a large amount of private steel enterprises sets up ownership barrier to make further improvement in the industry concentration. To overcome the barrier, state-owned and private steel enterprise should be integrated, and the system innovation in property right should be especially promoted continuously. In the process, the state-owned assets supervision departments at various levels shall encourage state-owned and private steel enterprises construct large enterprise groups with mixed ownership structure through standard forms. The steel enterprises integrate their owned steel enterprises into advantageous enterprises through share exchange to form larger steel enterprise groups. The original investors play their roles in the new enterprises through the platform of shareholders' meeting and board of directors to achieve the optimal configuration of production elements through capital cooperation.

References

- [1] Zoltan J. Acs. Innovation and Technical Change in the U.S. Steel Industry[J]. *Technovation*, 1988, 7(3):181-195
- [2] Christian Lutz, Bernd Meyer, Carsten Nathani, Joachim Schleich. Endogenous Technological Change and Emissions: The Case of the German Steel Industry[J]. *Energy Policy*, 2005,33(9):1143-1154
- [3] Yu Fanxian, Chen Jining, Sun Fu, Zeng Siyu, Wang Can. Trend of Technology Innovation in China's Coal-Fired Electricity Industry under Resource and Environmental Constraints[J]. *Energy Policy*, 2011, 39(3):1586-1599
- [4] Gao Chengkang, Wang Dan, Dong Hui, Cai Jiuju, Zhu Weiguang, Du Tao. Optimization and Evaluation of Steel Industry's Water-use System[J]. *Journal of Cleaner Production*, 2011, 19(1):64-69
- [5] Blandine Laperche, Gilliane Lefebvre, Denis Langlet. Innovation Strategies of Industrial Groups in the Global Crisis: Rationalization and New Paths[J]. *Technological Forecasting and Social Change*, In Press, Corrected Proof, Available online, 2011, (4)