





Closing Remarks: Toward Sustainable Growth of the Steel Industry in East Asia

Masashi Yamamoto  and *Jun Ma* 

This book summarizes East Asia's steel industry from its catch-up stage to becoming a world-leading player. Each chapter explains key factors that have allowed the steel industry in China, Japan, and the Republic of Korea (ROK) to be successful in the last 50–60 years from different perspectives. It was not our original intention to look back to the past and summarize the steel industry in East Asia, but we believe this is the best time to do so for the following reasons.

Just one year ago, COVID-19 was widespread in all three of these East Asian countries. As the following pandemic restricted most people in various ways, such as city lockdowns and travel bans, the world economy slowed to an unprecedented pace. Since steel products play a major role in

M. Yamamoto (✉)
Tokai University, Hiratsuka, Japan
e-mail: yamamoto@tsc.u-tokai.ac.jp

J. Ma
School of Economics, Center for Far Eastern Studies, University of Toyama,
Toyama, Japan
e-mail: majun@eco.u-toyama.ac.jp

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many industries in our modern economy, this stagnation severely affected the industry, which was already suffering from overcapacity problems before the pandemic. In fact, the production of crude steel decreased by approximately 11% in the EU and 17% in the US, according to the World Steel Association (2021). Japan and the ROK also reduced their crude steel production by 16% and 6%, respectively, while total production in Asia increased by 1.5% due to 5% growth in China.

The overcapacity issue in the steel industry has been discussed repeatedly in this book, but the issue is so complicated that we cannot derive a simple solution. One reason for the difficulty is that the steel industry, especially because of its need for towering blast furnaces, needs long-term investment to build, which makes it difficult to exit the business. Another reason is the ineffectiveness of domestic subsidies. As the steel produced by each of three East Asian countries becomes closer in terms of quality, the competition among them is becoming closer to Cournot competition, where one country's gain is other countries' loss. In such a competitive environment, as Mai and Hwang (1988) argued, a welfare-maximizing national government tends to expand subsidies when its domestic industry is more competitive than the same industry in exporting countries. When China, Japan, and the ROK specialized in producing steel products of different qualities in "segregated" markets, industrial policy through subsidization or its equivalent could result in mutual prosperity among the three countries. However, in the current competitive situation and with similar quality, the competition to subsidize a country's own industry could end in a so-called race to the bottom with the consequence that no one wins. It seems that the pandemic has made an already complicated problem more complicated. The longer the steel industry in East Asia stagnates, the more likely it is that it will not stand on its accomplishments over the last 50 years but will transform them into a new business model with fewer demands for steel products.

The role of national governments should be reevaluated in the new business model. The overcapacity problem will become increasingly serious if governments simply put in place policies to increase the competitive advantage of their own steel industry. It will be necessary for governments to collaborate with each other to establish policies for how companies can grow sustainably in a good competitive environment based on competitive and dependency relationships in the international market for steel products and steel-related final products, with a view to not

only quantitative adjustments but also structural adjustments in the value chain.

In addition, companies in the ROK and China have achieved competitive advantages by continually engaging in government-sponsored catch-up innovation activities. However, companies need to voluntarily change from learning innovation to creative innovation, as Japan Steel has done, if they are to maintain their leadership position in the global steel industry.

Late in 2020, the environment surrounding the steel industry became increasingly complicated due to the declaration of carbon neutrality by national leaders in many countries in the world. Following these statements, including one by ArcelorMittal, POSCO, and Nippon Steel, which are the leading steel producers in ROK and Japan, respectively, announced in December 2020 that they would commit to carbon neutrality by 2050. In January 2021, the Baosteel Group, the second-largest steel producer in China, also announced its commitment to carbon neutrality by 2050.

Steel production is carbon intensive in the process of extracting iron from ore. Towering blast furnaces need to be heated to over 1,000 degrees Celsius to remove oxygen molecules from iron oxide. Along with the energy input for heating, a large amount of CO₂ must be generated as a by-product of this reaction. This means that carbon neutrality cannot be achieved without drastic changes in the way steel is produced.

Major steel producers aim to achieve carbon neutrality by adopting carbon-capturing technology and hydrogen reduction methods (instead of using coke) as well as introducing more electric furnaces that use renewable energy. All of these alternatives are associated with problems that must be solved before they can be launched as real alternatives to current business operations. For example, electric furnaces cannot always produce the quality required for certain applications, such as trains and automobiles, and scrap supplies in many areas are currently very limited.

These changes will demand huge investments for steel producers. ArcelorMittal, a leading steel producer in the world, estimates it will need between 15 and 40 billion euros to decarbonize its facility by 2050,¹ while Nippon Steel announced that it will need an investment of between 4 trillion yen and 5 trillion yen² along with a 20% reduction in production capacity. Obviously, not all of the current steel producers can afford this level of investment.

¹Pooler (2021).

²Yumae and Morikuni (2021).

The four issues discussed in this book, restructuring of international value chains, sustainable use of resources, environmental protection, and overcapacity, are common issues among the three countries. In the interviews that we conducted with representative steelmakers and related organizations in the three countries during the research period, these four issues were frequently mentioned as common topics. However, the fact remains that protectionism and political relations among the three countries have hampered the resolution of these issues.

In the future, it will be necessary for the government of each country to cooperate with the others to build a good competitive environment in the international market and to formulate policies that promote international cooperation at the corporate level in each country.

Whether these governments want it or not, the shrinking demand following the COVID-19 pandemic and the world commitment to carbon neutrality will force the steel industry to drastically reshape its business operations. In the next ten to twenty years, the steel industry will become very different, especially in East Asia. It is obvious that maintaining not only the same production capacity but also the same methods of production is not realistic. In studying the new trend of the industry that has recently emerged, we believe that this book, a summary of what Chinese, Japanese, and ROK steel producers have experienced, can provide various implications to prepare for the new road ahead.

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