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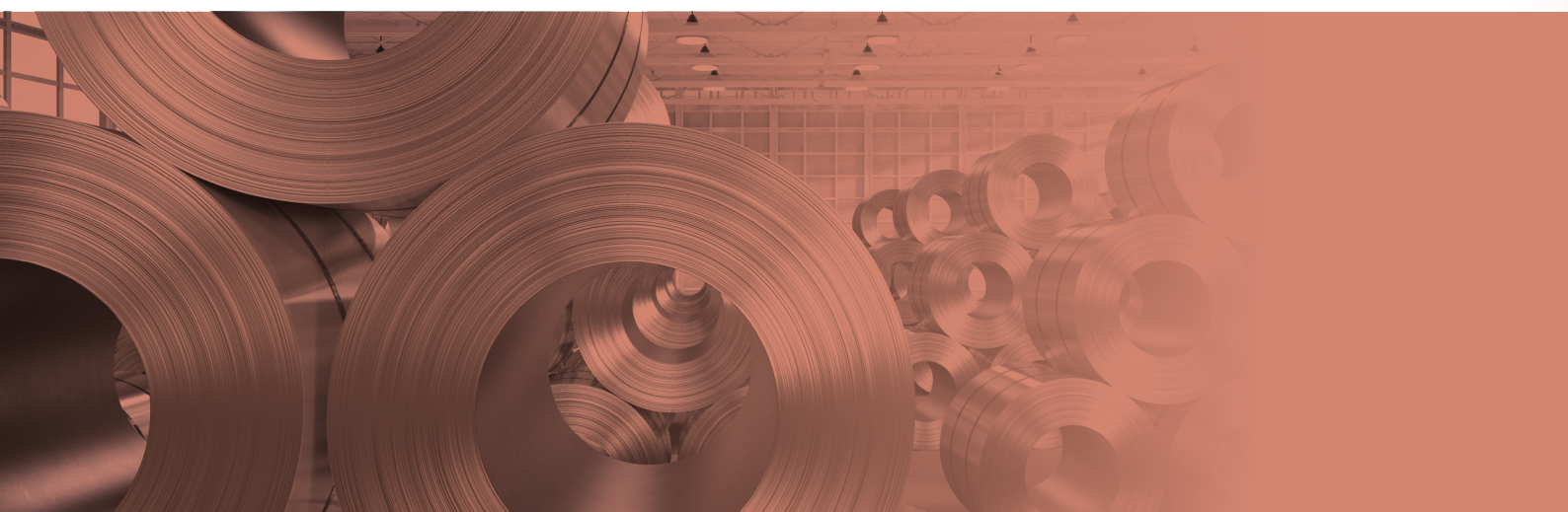

Legacy from **Europe's Restructuring Experiences and Its Implications** to the Asian Steel Industry

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Europe has been at the forefront of the development of the global steel industry over the past 200 years. Its steel industry has enjoyed great success in a variety of areas and, as well, witnessed both booms and depressions during such a long-time evolution. In particular, the restructuring experience following the steel demand peak in the mid-1970s has been widely viewed as a classic case in terms of industry governance. Studying what happened during the restructuring process could hopefully help facilitate the steel industry restructuring in the emerging economies including Asia.

European steel industry restructuring in retrospect

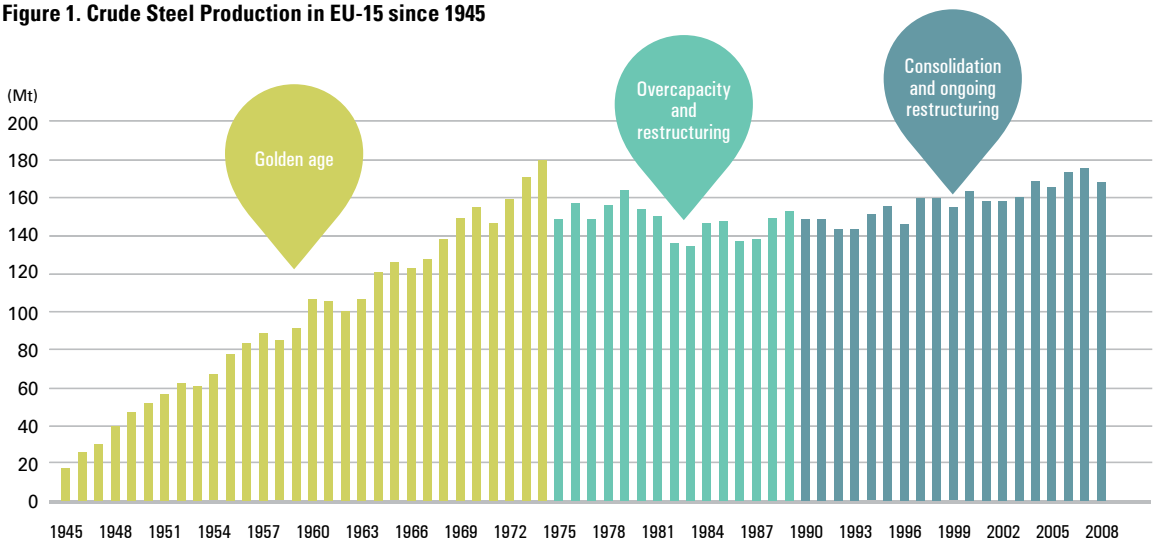
The word restructuring is sometimes misleading and ambiguous since people can restructure the production location, concentration, product mix, or human resources. Even M&A could be regarded as some kind of restructuring. What do we mean when we talk about restructuring? According to Mr. Dietrich v. Hülsen, the then head of Eurofer, concept of restructuring contains two aspects. Firstly, restructuring means a permanent and continuous process where steel producers make efforts to strengthen competitiveness, ensure long-term profitability, and improve cost management and process-and-product innovation in an ever-changing world. Secondly, in particular, restructuring means specific measures in order to meet the dangers and challenges of a temporary crisis. The European steel restructuring experiences in the 1970s discussed in this paper are more of the second type.

Evolution of the European steel industry

As shown in Figure 1, the evolution of the European steel industry exhibited different trajectories in different periods.

• Golden age (1945-1973): Over the period from 1945 to 1973, the steel industry was badly destroyed in the Second World War, but enjoyed a golden age from 1946 to 1973 with crude steel production growing from less than 30 Mt to over 180 Mt. This was mainly driven by post-war

Figure 1. Crude Steel Production in EU-15 since 1945



Source: worldsteel

construction, manufacturing boom, and other steel-intensive industries.

• Overcapacity and restructuring (1974-1988): The European steel industry faced several periods of massive restructuring after rapid expansion. Sets of measures from national governments and the European Union were adopted to cut excessive capacity and employment and hence to improve efficiency and profitability.

• Privatization/consolidation and ongoing restructuring (1988 to 2008): Privatization and consolidation started as the steel industry was streamlined. Privatization started in the Great Britain as British Steel Corporation was sold, and then followed by its western European peers. Consolidation moved from national level to European level and finally to global level. Now three big market players are in place in Europe, ArcelorMittal, ThyssenKrupp, and Tata Europe.

Restructuring history of the European steel industry

The steel industry in Europe expanded rapidly for 30 years after World War Ⅱ. Since the 1973 oil crisis when steel demand peaked, the steel industry experienced a long, hard and costly restructuring process. This restructuring process could be roughly divided into three phases, according to the different focuses in different period. The first phase was at the beginning of the restructuring when national financial supports were provided to the suffering industry and then the second on capacity cuts and redundancy reductions. This phase was the most dramatic period in terms of magnitude of capacity cuts, laid-offs, and labor productivity improvement. Moreover, this phase helped streamline the EU steel industry and offered favorable conditions for further restructuring programs as external economic conditions improved and liberalization programs were in place. The last phase focused on changes in ownership, initiated by the British steel industry, and then about consolidation and rationalization. This is a general picture of what happened in the European steel industry during the restructuring period. As the first oil crisis broke out in 1973,

restructuring in the steel industry means to take specific measures to rebalance steel demand and supply; when the crisis was over, the steel industry restructured itself again in a continuous manner.

Post-war background

Institutional arrangements

During such a golden age, steel was regarded as a strategic product. The Treaty of Paris and Treaty of Rome were signed, and the European Coal and Steel Community (ECSC) was created on April 18, 1951 and put into force on July 23, 1952 in order to manage coal and steel, for the very purpose of a peaceful, united, and prosperous Europe. The validity period of this treaty lasted 50 years untill 2002. Member states included German Federal Republic, the Kingdom of Belgium, the French Republic, the Italian Republic, the Grand Duchess of Luxembourg, and the Kingdom of the Netherlands. By 1954, nearly all trade barriers for coal, coke, pig iron, and steel had been removed among those member states of the ECSC.

This was the first time for Europe to come up with a generally binding supranational agreement for development of the coal and steel industry. Within the ECSC, High Authority, Common Assembly, Special Council, and Court of Justice were instituted. The High Authority was empowered to assure the fulfillment of the ECSC purposes. Besides these institutions, guidelines concerning investments and financial assistance, production, prices, concentrations, and movement of labor were specified. It was worthy to note that when a manifest crisis was declared, such emergency measures as production quota, minimum price, and import restrictions might be implemented in the steel industry within the ECSC.

Crude steel production and capacity expansion

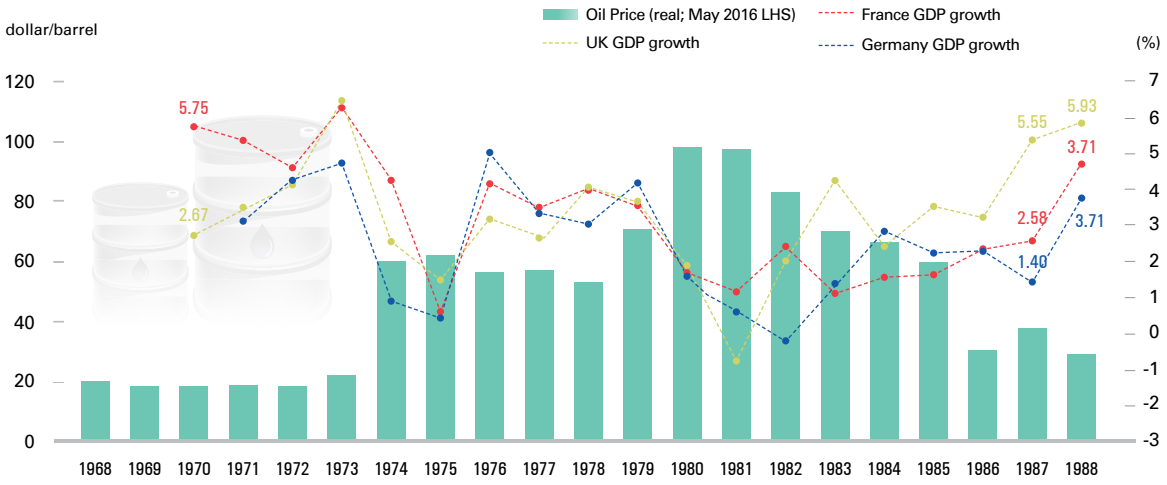
The European steel industry expanded massively from 1946 to 1973, driven by post-war reconstruction, manufacturing boom, and urbanization. Generally, crude steel production in the EU-15 in 1974 was seven times that of 1946. Its share in the world represented a little more than 31%. Four biggest producers were Germany, UK, France and Italy, among which the former FR Germany witnessed the most dramatic progress from less than 5 Mt in 1946 to over 50 Mt in 1973.

As the book *50 Years of the ECSC Treaty Coal and Steel Statistics*: *data 1952-2002* indicates, investment in the iron and steel industry in the ECSC's original six countries grew from 544.7 million ECU in 1952 to over 2620 million ECU in 1973. Crude steel capacity in these six countries rose from 63 Mt in 1957 to 145 Mt in 1973. The magnitude of expansion in investment, capacity, and crude steel production was unprecedented in the Europe.

Oil crisis as a trigger

As the industry boomed, an unexpected oil crisis (see Figure 2) brought such momentum to a halt in steel demand in 1973. Nowadays, people sided with the argument that the mid-1970s marked a turning point for the European steel industry as

Figure 2. Oil Prices and GDP Growth Rate from 1968 to 1988



Source: EIA, World Bank

the oil shock led to an economic recession. The saturated steel market led to a dramatic decrease in demand among industrialized economies, and the changing competitive landscape in the steel industry between Europe and newly industrializing countries imposed some influences on imports and exports among those countries. At that time, however, many specialists, especially those from the industry tended to believe such a crisis was cyclical and market conditions would surely improve in the years to come. Based on such assumptions, more resources like capital and supportive policies were poured into the steel industry that was then suffering from excessive capacity, but few recognized this situation or were willing to accept the changed market situation as the public, including people working in the steel industry, enjoyed or indulged themselves in the pride such a heavy industry brought with it.

On the supply side of the steel industry, more investments were poured into the industry and more capacities were installed as people were overoptimistic about the future demand. Regardless of the contraction in steel demand, new steelmaking capacity was still excessively installed because people expected this demand decline to be a cyclical rather than structural change.

Reaction to the crisis

Three phases in the restructuring process

The European steel industry was forced to react to the crisis and the reaction lasted about 15 years from 1974 to 1988. The reaction could be sub-divided into three phases according to the difference in participants and focuses.

• First phase (1974-1977): This period was primarily focusing on national support for the steel industry without European Union intervention;

• Second phase (1977-1980): This period was mainly characterized by national support as well as European burden-sharing intervention;

• Third phase (1980-1988): This period was the

longest one which was well-known for stricter and tougher European intervention into the crisis.

First phase 1974-1977

As the oil crisis broke out and continued, steelmakers in Europe suffered greatly from the deteriorating steel markets such as sharp decline of demand and gradual collapse of prices. They were in urgent need of support from governments; otherwise, bankruptcy was inevitable. From the viewpoint of the national and local governments, the steel industry was a big employer and the proven pillar of economic development. Therefore, plant closures were politically and economically unacceptable at the beginning of the crisis.

Financial supports were given and steel companies were nationalized to reduce risks of bankruptcy and plant closures. Supranational bodies like Eurofer (1976) and the Steel Committee of OECD (1978) were created for the purpose of information sharing and exploring possible coordinated measures against this steel crisis.

From 1974 to 1977, steelmaking capacity continued to rise whereas both production and capacity utilization rate fell further in the EU-9 countries (see Figure 3).

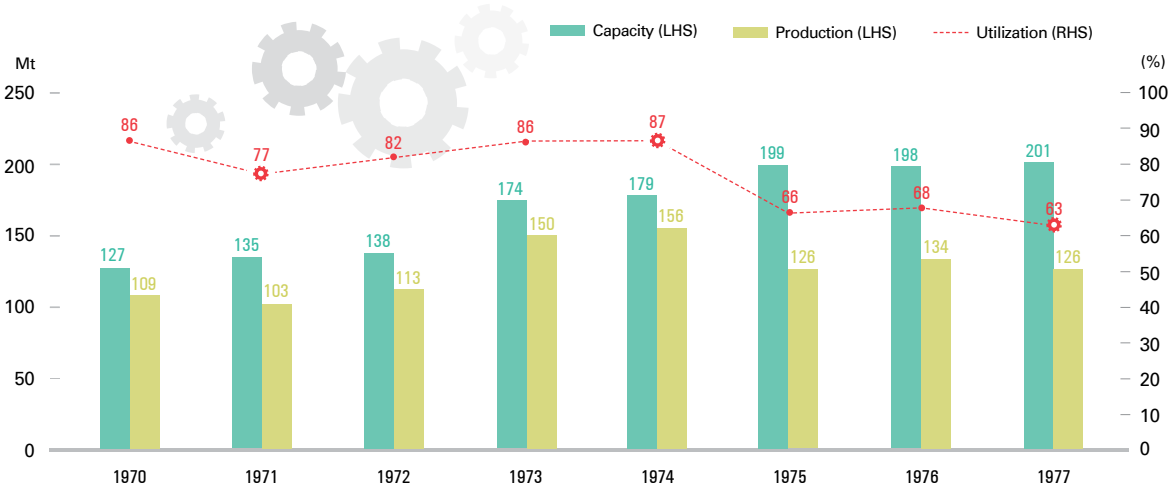
Second phase 1977-1980

During this period, member states increased their investments in the steel industry in order to keep the industry viable while at the ECSC level, a series of coordinated measures were introduced in 1977 in response to the rapidly deteriorating steel market. These measures were led by Étienne Davignon who was at that time the member of the Commission for Industrial Affairs and Energy and commissioner for Industrial Affairs and Energy from 1981 to 1985. These measures were named as the First Davignon Plan by the following academia. The First Davignon Plan focused on three dimensions: internal market, external market and social measures. Within the internal market, measures were adopted to set minimum prices and production quota, and prohibited new production capacities while, as to the external market, measures were taken to control import prices and volumes, and anti-dumping measures were also used. While the excess capacities were removed and new technical processes such as continuous casting were introduced, both the European Union and member states endeavored to establish a social safety net by retraining laid-offs, early retirements, and transfers. All these measures and decisions were designated to control supply and maintain prices and keep steel companies viable.

However, those measures were believed not to achieve the expected results. Taking minimum price system as an example, this system was introduced in 1977 first covering six reinforcing bars and, as markets worsened, was broadened to include most strips. As to a production quota system, it was voluntary in nature in 1977 but turned mandatory in 1980. These changes in the tone and magnitude of coordinated measures indicated that the Community was being involved in a much deeper and stronger manner.

Controversies also existed about such a burden-sharing plan. Objections to production quotas and minimum prices were from efficient

Figure 3. Western Europe's Production, Capacity and Utilization Rate (1970-1977)



Source: *Restructuring of the European Steel Industry* delivered by Mr. Etienne Davignon during the OECD Symposium on April 18th 2016.

steelmakers who claimed such measures deprived their competitive advantages. Both production quota system and minimum price system were commented to tend to shift production to the less efficient producers in the EC, helping them stay in business longer. This caused efficient producers to earn lower profits or incur greater losses, thereby discouraging them from making investments necessary for long-run survival.

Import restriction and minimum price systems were generally believed by industry observers to impose some extra costs on their economies and consumers each year they are in place, even though no one had calculated the exact details.

As there were many objections, the First Davignon Plan witnessed weak implementation. These measures were not effective as expected. As situations became worse, manifest crisis was declared, more and tougher measures were adopted

Third phase 1980-1988

Until this point, the crisis had lasted for six years. Measures adopted either by governments of member states or the Community were not satisfactorily sufficient to solve it. Reasons why these measures failed might be dubious understandings that people had towards the nature of the crisis, the particularity of the steel industry and gradual changes of economic structures. As the crisis continued and worsened, both the public and the steel industry believed steel demand could not return to the level of 1974, and tougher and stricter rebalancing measures were necessary for the then European steel industry. In 1981, the European Commission declared such a crisis as Manifest Crisis. From 1980 onwards, the Commission formulated a series of measures on state aid, namely the Second Davignon Plan.

Each state-level aid code had its own focus and duration. In general, state-level aid fell into five categories, including investment aid, aid for plant closures, aid for continued operation, emergency aid, and aid for research and development. The first state-level aid code was primarily a legal framework under which state aids were permissi-

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ble under clearly defined conditions while ECSC regulations did not, in principle, allow subsidies or state assistance by the state, in any form whatsoever. The second state-level aid code was about investment aid, aid for plant closures, aid for continued operation, emergency aid, and aid for research and development as such a code stated clearly "it has also become clear that if restructuring is to be accomplished in a coherent, equitable and socially acceptable manner, it is desirable to establish a comprehensive community aid system to take account of both changed circumstances and experience acquired in the application of Decision No 257/80/ECSC." The third state-level aid code was principally about aid for research and development, aid for environmental protection, and aid for plant closures while the fourth about aid for environmental protection, aid for research and development, and aid for closures. The last two covered only aid for research and development, aid for environmental protection, and aid for closures but have a different validity period.

According to the Opinion of the European Economic and Social Committee on 'Industrial Change and State Aid in the Steel Sector' (2005/c 120/09),

The steel subsidy codes, based on Article 95, stipulated from 1980 onwards that aid to steel companies could only be granted under strictly defined circumstances. However, the types of aid still permitted initially included almost all the aid which member states were already paying out to their companies anyway. Thus, for the most part, the first subsidy code only served to legalize existing practices. It was only gradually that the kinds of aid most damaging to competition, such as rescue, operating and investment aid were banned completely.

Different sources suggested slightly different numbers in capacity reduction, redundancy cuts, and state-level aids. According to the Opinion of the European Economic and Social Committee on 'Industrial Change and State Aid in the Steel Sector' (2005/C 120/09) published in the Official Journal of the European Union (May 20, 2005), the total budget poured into the ECSC steel industry was quite big, EUR 70 billion for 1975-

1995 with three different phases: EUR 12 billion for 1975-1980, EUR 41 billion for 1980-1985 and EUR 17 billion for 1986-1995. Part of the budget was in return for capacity reduction. "Capacity equivalent to about 44 Mt of raw steel and 32 Mt of hot rolled steel was dismantled."

Based on the speech "Restructuring of the European Steel Industry" delivered by Mr. Etienne Davignon during the OECD Symposium on April 18th 2016, European producers got state-level aid of almost 38 billion ECU during the Second Davignon Plan, and with the support of part of this money, Europe reduced 40 Mt of steel capacity (roughly 20%) within five years. As to how this big amount of money was allocated among continued operations of plants or closures, the former commissioner said that 23 billion was for continued operations, 12 billion for improvement of ongoing operations, two billion for closures and one billion for R&D and others.

Post-1988 restructuring

Ever since this dramatic restructuring period with ups and downs in steelmaking capacity and employment, the European steel industry continued its rationalization process with slightly different priorities but similar objectives being suited to unique national economic evolution and to the global steel industry. Privatization and consolidation were two key features during the post 1988 restructuring process.

In the book *Privatization and Changing Ownership in the Steel Industry ECE Steel Series 1996,* privatization is defined as a set of actions aiming at transferring ownership of state enterprises into private hands and simultaneously securing effective private control of the business. In 1986, crude steel production from private steel makers in the original six ECSC countries took up 48% of the whole but this ratio grew gradually as the Great Britain privatized its British Steel Corporation in 1988 and set a good example for its European peers. Privatization could be categorized into different types, sell-off as a single entity, split-into different parts before privatization, sale of a portion of a company to some pre-selected parties and other portion to the public or commercialization into joint stock companies. Table 1 shows a list of ten major privatization cases with the year of completion in the EU region. The list suggests that the privatization process started from 1998, 15 years after the peak of steel demand, and lasted for 10 years.

Table 1. Privatization of West European Steel Companies

Company	Country	Privatization
British steel	GB	1988
SSAB	Sweden	1987-89
AST	Italy	1994
EKO Stahl	Germany	1994
Ilva	Italy	1995
voestalpine	Austria	1995
Usinor/Sacilor	France	1995
Ruukki	Finland	1997
Aceralia	Spain	1998
Cockerill	Belgium	1997

Source: worldsteel

Restructuring is a long, hard, costly, but inevitable process. It is a result of economic evolution and industrial particularity.

After steel companies were privatized, consolidation continued at the European level from national level. Around the year 2000, USINOR, Arcelor, and Corus were formed; consolidation at the international level started and ended with the three big steel players in Europe, ArcelorMittal, ThyssenKrupp, and Tata Europe, as shown in the Figure 4.

Consolidation was a continuous process driven by competitiveness within the steel industry and from other industries. Such logic was demonstrated clearly by the questionnaire designed by BBC upon the time Tata Steel was acquiring Corus. One question went as "what does the takeover of a big European firm like Corus by a small Indian steel firm as Tata mean to UK manufacturing? "

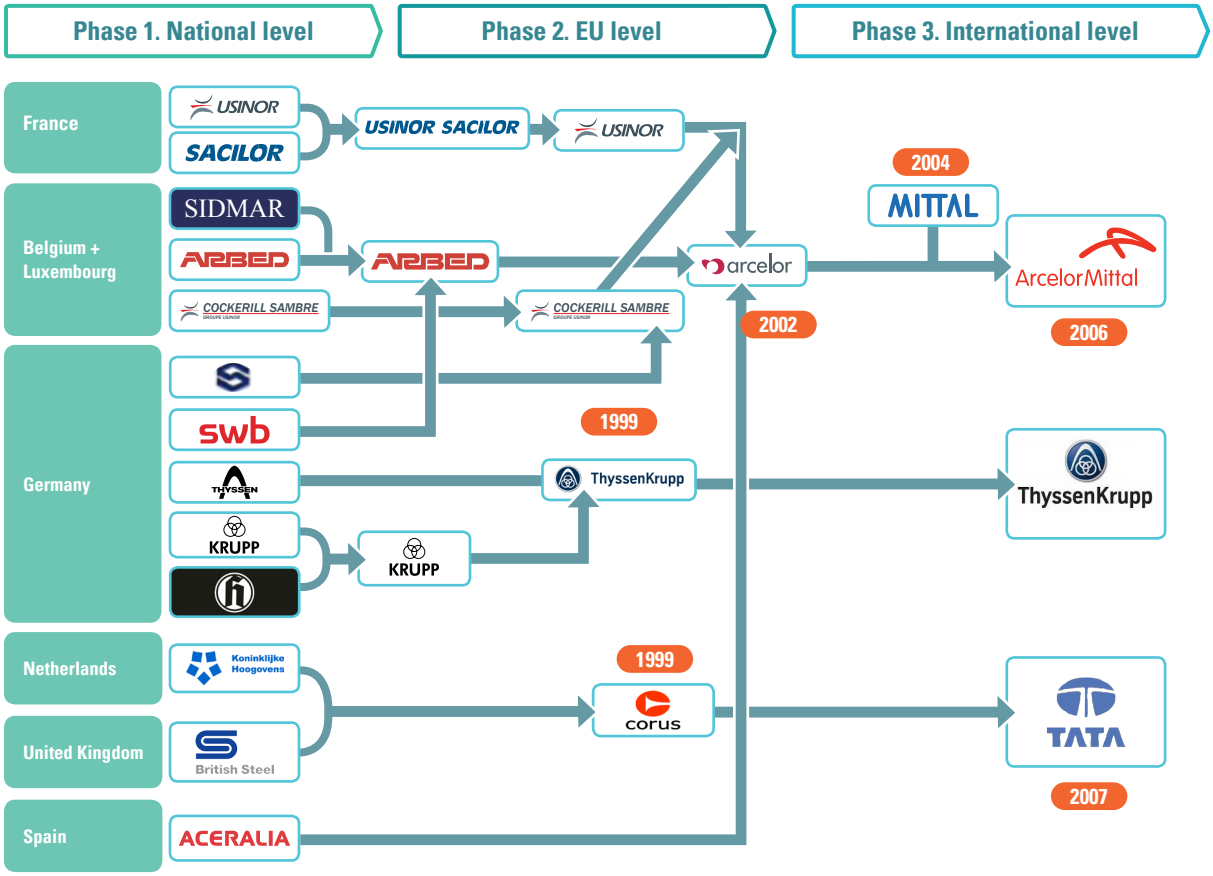
Corus chief executive once said, just as British Steel and Dutch group Hoogovens merged in 1999 because they felt they could not simply be national companies, Corus now felt it was "no longer sufficient to be European." "This is a global industry," he said. "We have got to respond with passion, but with commercial passion." He continued "It's not about big companies and small companies; it's a matter of being globally commercial."

Evaluation and implications

Restructuring of the European steel industry was taking place from the mid-1970s under such a context that the steel demand had passed its peak level as industrialization and urbanization had seen their close completion. National economic priorities were then transforming gradually from industrial sector to service sector and industrial sector itself was transforming from traditional manufacturing industries to advanced and hi-tech ones. This process was inevitable, costly, and hard; however, timely, effective and efficient restructuring was very worthwhile as far as the whole national economy was concerned because this could save and re-allocate necessary resources to newly fostered industries. Otherwise, national economy would suffer from a much more costly, harder, and longer transformation process.

National re-positioning in the post-peak steel industry exerts great impacts upon how people evaluate the restructuring programs. During the structural crisis period, restructuring will necessarily result in rebalancing between supply and demand, capacity cuts, and redundancy; however, capacity cuts and redundancy are not the ultimate goals but intermediate steps to re-shape the competitiveness of the steel industry and to

Figure 4. Consolidation Process in the European Steel Industry

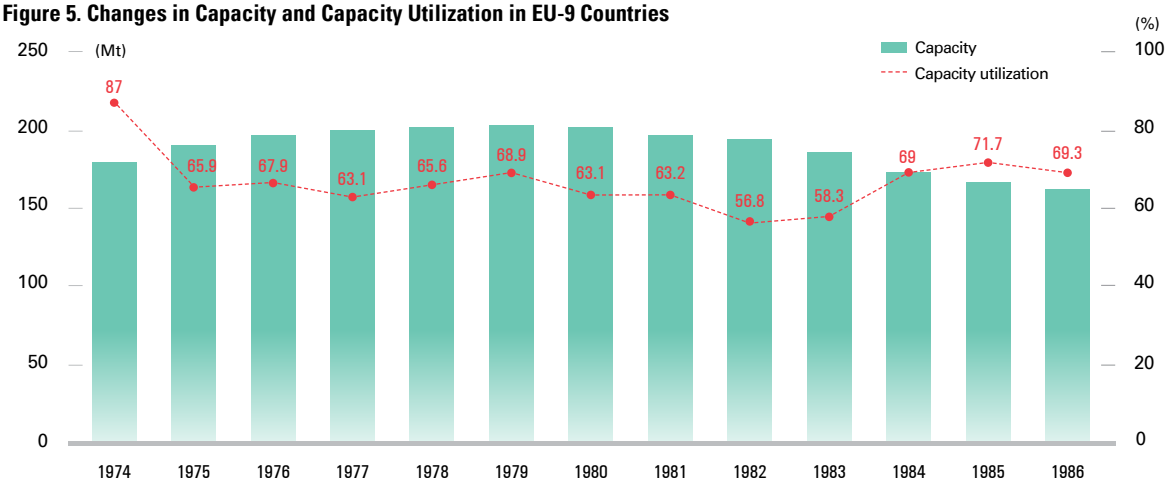


Source: Compiled from media reports

help the industry adapt to internal and external changes as required. Germany took opportunities offered by division of labor in the 1980s and expanded their business in manufactured products and activities into global markets, which drove their manufacturing industries and, in turn, upgraded their steel industry. Its steel industry moved forward with down-stream industries, while steel industries in other countries lost its share gradually no matter what restructuring measures were adopted.

What was the result of restructuring like? The First and Second Davignon Plans were supragovernmental coordinated measures to re-balance supply and demand in the European steel industry in devastating market situations, involving different levels of actors like ECSC, member states, steel companies, and trade unions. These two plans had different priorities. The first was primarily voluntary and mild in nature like setting up minimum prices, production quota, and import limits while the second was basically harder and stricter by pushing forward capacity reduction and redundancy based on the evaluation of viability of steel makers and supervision of detailed implementation from consultative groups. But, both plans focused on the supply side by reducing steel supply and endeavored to

Figure 5. Changes in Capacity and Capacity Utilization in EU-9 Countries



Source: worldsteel, EUROSTAT

facilitate the streamlining of the European steel industry.

During the most dramatic period from 1980 to 1985, steel capacity was cut by 20% and steel capacity utilization ratio surpassed 70% (see Figure 5), employment reduced by 44%, and labor productivity of the west European steel industry improved by 60% (see Figure 6). As the steel productivity enhanced and macroeconomic situations improved, performance of the whole steel industry turned better.

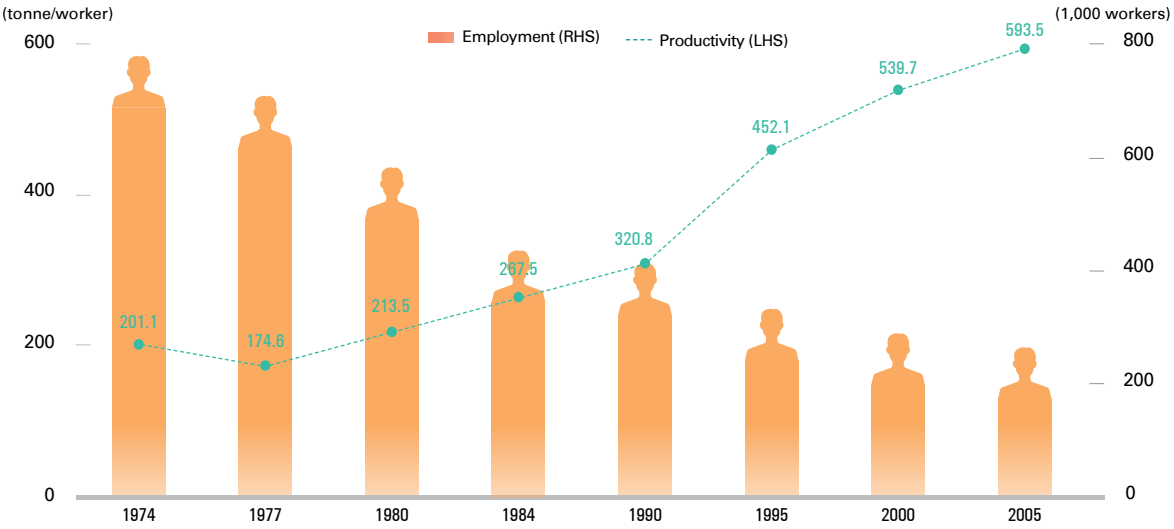
Both the European Union and member states formulated measures for a social security net. Measures did not differ substantially from each other and they shared the following points: early retirement, job transfers, reduction in work time, incentives for voluntary departures, or benefits to laid-off workers.

Here, it should be worthy to note that more than one factor, like capacity cut, was responsible for employment reduction, for example, technical breakthrough. Besides, many other external factors existed like macro-economic changes from manufacturing to the service sector and ownership transfers.

As shown in Figure 7, continuous casting in most countries improved dramatically from approximately 20% in the mid-1970s to over 80% in the mid-1980s. This transformation towards brand-new technology had naturally reduced manpower in the steel industry and the industry's overall productivity improved significantly.

Europe, together with the USA and Japan, witnessed its steel industry restructuring process from the 1970s, which reshaped the steel industry and improved the competitiveness and viability. Over 40 years have passed; our steel industry is again confronted with global overcapacity and structural challenges. According to "Capacity Developments in the World Steel Industry" released by OECD in August 2017, the total global crude steelmaking capacity reads 2,380.69 Mt and capacity addition projects are still underway or planned in some regions, including Asia. The current Asian steel industry differs substantially from the West European steel industry in the

Figure 6. Changes in Employment and Productivity in EU-9 Countries



Source: 50 years of the ECSC Treaty Coal and Steel Statistics (Data 1952-2002)

1970s. The steel industry in Asian countries presents an unbalanced evolution phase as far as technology, demand magnitude, capacity scale, and growth rate are concerned. It is a diverse picture. For example, the Japanese steel industry has already peaked and has gone through capacity replacement, capacity cuts, M&As, and rationalization programs, and like its peers in Europe and America, is what we see now. The Chinese steel industry, as many people believe, has passed its peak and already initiated its restructuring programs. As we learn from various media reports, the Chinese steel industry witnessed capacity cuts (both obsolete capacity and illegal intermediate-frequency induction furnaces) as well as M&As. The Indian and ASEAN steel industries are in the expansion phase, and we can read news on capacity addition programs from time to time, but as its industrialization and urbanization reach a certain level, it will face similar challenges.

Could the European steel industry restructuring experience offer some valuable insights for evolution of the Asian steel industry?

As abovementioned, restructuring is a long, hard, costly, but inevitable process. It is a result of economic evolution and industrial particularity. As the restructuring is to begin, exit barriers (social barrier, financial barrier, environmental barrier, etc.) and institutional accommodation prevent restructuring from timely start-up and completion. As shown in history, the steel industry is especially important both for local economy and national sentiment. It is a big tax-payer, a big employer, and a big debtor. And steel men enjoy great pride as they provide basic materials for social and economic development. No economy could afford to lose such a backbone industry all of a sudden.

The government has a role to play in the restructuring process at different levels. It can provide a policy framework where restructuring can take place. As far as the European steel industry is concerned, the European Union, member states, and local districts formulated guiding policies for restructuring their steel industry. For example, the European Commission adopted Commission

Decision No 257/80/ECSC of 1 February 1980 establishing Community rules for specific aids to the steel industry, saying:

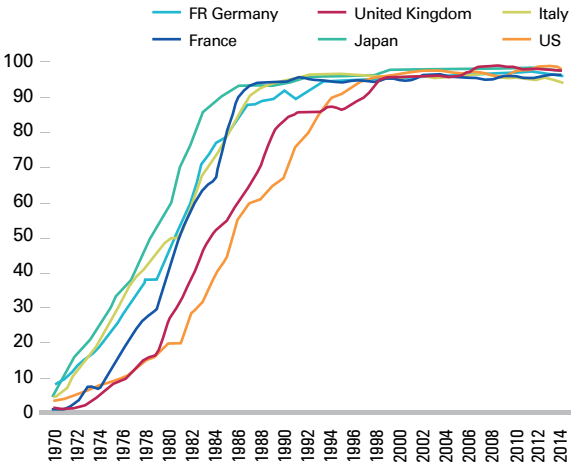
In order to ensure the orderly functioning of the common market, the adaptation of the steel industry's production capacity to foreseeable demand and the restoration of competiveness to the industry by means of the extension, modernization, and rationalization of plant with the best prospects for viability must be carried out in an orderly and socially acceptable fashion.

And the government can ensure a level playing field during the restructuring process. In the 1970s' European steel restructuring experiences, rules were formulated and supervision committees were established. According to Commission Decision No 2496/96/ECSC of 18 December 1996 establishing Community rules for State aid to the steel industry,

In order to ensure that the steel industry and other industries have equal access to aid for research and development and to aid for environmental protection, the compability of the aid with the common market should be assessed in light of the existing Community framework for state aid for research and development……Furthermore, it opens some limited possibilities for operating aid, in particular for relief from environmental taxes in cases where it is necessary to prevent firms from being placed at a disadvantage compared with their competitors in countries that do not have such measures.

Supervision committees assumed their responsibilities by producing regular reports based on actual examinations, like Report from the Commission Monitoring of Article 95 ECSC Steel aid cases, Sixteenth Report, November 2001.

Figure 7. Continuous Casting (% of Crude Steel Production)



Source: worldsteel

The government could also facilitate the reduction of exit barriers preventing timely reaction to overcapacities and mitigate social impacts of closures. Taking work force reduction policies in French as an example, the government adopted four measures to relieve the impact, including early retirement, job transfers, short-time in work week, and incentives for voluntary departure. As far as early retirement was concerned, workers at or above 50 were obliged to leave the company, but workers within different age groups enjoyed different benefits. For example, workers who were 50 to 55 could get 75% of gross wage; those whose age ranged from 55 to 60 obtained 70% of gross wage and those who were older than 60 enjoyed normal early retirement benefits. The French government covered about 90% of the costs while E.C. reimbursed the state for some of the costs.

While macro-economic conditions and government favorable measures came out, it is then the individual steel company that plays a vital role in the restructuring process. At the corporate level, it seems crucial for steelmakers to move from volume to value by focusing on product differentiation and specification in niche market in that economic structures are under transformation and labor division deepens. voestalpine could serve as a good example. It has transformed from a typical, traditional steel company to a "no n-typical steel company," with its main products as common steel to steel-based technologies and capital goods; moreover, it focuses on niche markets like premium sheets, rails, switches, turnouts, bearing steels used in the automotive, railway, aircraft, and energy industry. Sales from metal engineering and forming take up nearly 50% of the whole group in 2016.

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Besides focusing on internal adjustments, individual steel companies could pay some due attention to changes both in the economy and society. I was inspired by a steel seminar in Hangzhou this August, one of whose subjects was involved in the social and industrial megatrends (demographics, technologies, process, and IoT), and their possible impacts upon the future steel industry. In the mid-1970s, continuous casting process represented one megatrend in the technical field, and some steelmakers in Western Europe installed such newly-introduced process that helped themselves go farther and faster than their peers in terms of efficiency and cost management. Those introducing CCM at a relatively later time or at a much slower pace were gradually but permanently thrown away by history. Nowadays, artificial intelligence, big data, robotics, IoT, smart manufacturing, and other disruptive techniques are drawing increasing attention among the steel circle and smart steel factories are under construction or starting production. Highly automated, fully digitalized continuous casting lines are reported to be established and research centers founded with a dedication to developing even lighter, much more corrosion-resistant and stronger steels. Megatrends take place also at a macro-level, like sharing economy that will surely exert significant impacts on both the whole society and the steel industry. Embrace megatrends, study them and connect them with our mighty industry as nobody could afford to miss any opportunity from this Fourth Industrial Revolution. Steel industrialists need to try and embrace new things represented by the megatrends. Megatrend is always there, but it enjoys only different ingredients in different periods. This is the legacy.

The Korean Steel Industry in Retrospect
: Lessons for Developing Countries

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The rise of Korea from the ashes of war

At the end of the Second World War in 1945, South Korea had secured its independence, but five years later, the Korean War broke out. A GDP per capita at a nominal value hovered around USD 67 in 1953 when the Korean War ended. It remained one of the world's poorest countries. However, the South Korean economy grew exponentially following the government-led economic development initiatives launched in the early 1960s. Today, Korea has joined the ranks of advanced countries, becoming the world's seventh-largest exporter, 12th largest economy in terms of GDP, and 30th largest in terms of GDP per capita as of 2016. Together with this economic expansion, the Korean steel industry has grown robustly. It today enjoys a lofty global standing just like the overall Korean economy. In the 1960s the Korean steel industry was starting from nothing: it lacked technology, resources, and expertise. However, as shown in Table 1, by the mid-1990s it had become the world's sixth-largest steel producing country and has maintained this status ever since.

What was the key to this success? The experience of the Korean steel industry offers useful lessons for emerging economies pursuing economic development. Therefore, it would be meaningful to analyze the factors that drove the Korean steel industry to success.

Many emerging economies are seeking to achieve the self-sufficient development of their steel industries since steel, dubbed "the staple of industry," is the fundamental industry that underpins other basic industries, such as the automotive, home appliance, shipbuilding, machinery, and construction sectors. By doing so, it contributes to the improvement of competitiveness across industries, and eventually to national economic growth. In addition, with high forward-backward linkage effects, as can be seen in Table 2, the steel industry can bring about positive ripple effects in an entire economy, including in investment, employment, and growth.

Table 1. Development of the Korean Steel Industry

	1970	1975	1980	1985	1990	1995	2000	2005	2010	2016
Crude steel production (Mt)	0.5	2.5	8.6	13.5	23.1	36.8	43.1	47.8	58.9	68.6
Share of global production (%)	0.1	0.4	1.2	1.9	3.0	4.9	5.1	4.2	4.1	4.2
World ranking	34	29	13	10	7	6	6	5	6	6
Apparent crude steel use per capita (kg)	51	84	141	234	501	827	851	1,015	1,101	1,171

Source: "Steel Statistical Yearbook" worldsteel (2016)

Table 2. Forward-Backward Linkage Effect in the Korean Industry

	Primary metal	Chemical	Machinery and equipment	Construction	Transport equipment	Precision industry
Impact coefficient (Backward linkage effect)	1.282	1.106	1.220	1.177	1.278	1.092
Sensitivity coefficient (Forward linkage effect)	1.988	1.945	0.915	0.601	0.931	0.641

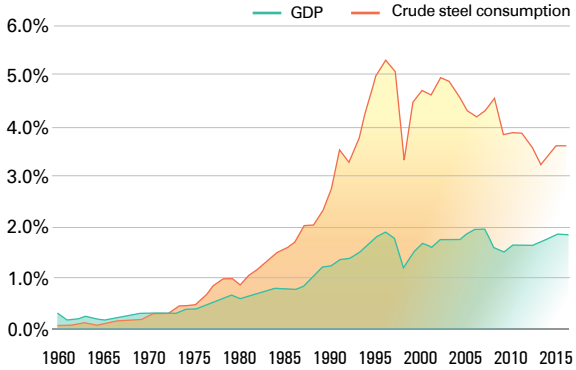
Source: Numbers are based on 2014, Source: Bank of Korea (BOK)

However, despite these advantages, it is not easy for latecomers to successfully nurture a local steel industry. The field requires massive investments, advanced technologies, and operational know-how, which requires a long time to accumulate before first movers can be overtaken.

Retrospective view on the development of the Korean steel industry

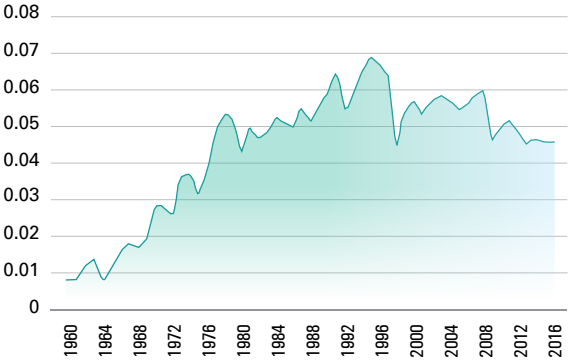
To identify what made the Korean steel industry successful, it is reasonable to examine the history of its development. The pertinent patterns differ before and after the financial crisis of 1998. Looking at the proportions of Korea's GDP and steel production versus global GDP and global steel production in Figure 1, the figures shift notably around the financial crisis of 1998. The Korean economy and steel industry entered a period of full-blown boom times in the late 1980s and Korea's GDP and steel production continued to grow until 1997. However, everything changed after

Figure 1. Share of Korea in Global GDP and Steel Consumption



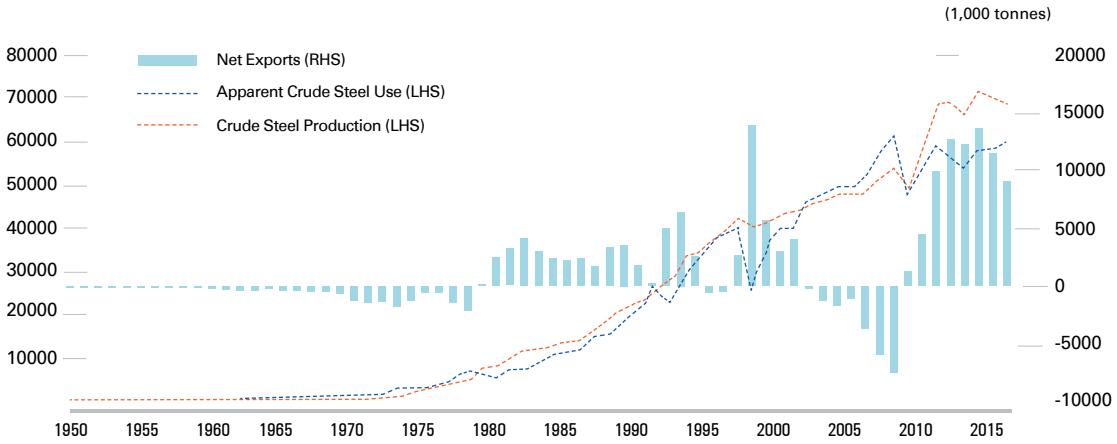
Source: IMF, worldsteel

Figure 2. Korea's Steel Intensity of GDP



Source: BOK, worldsteel
Note: Steel intensity = Crude steel consumption (kg) / Nominal GDP(KRW)

Figure 3. Korea's Apparent Crude Steel Use, Crude Steel Production, and Net Exports



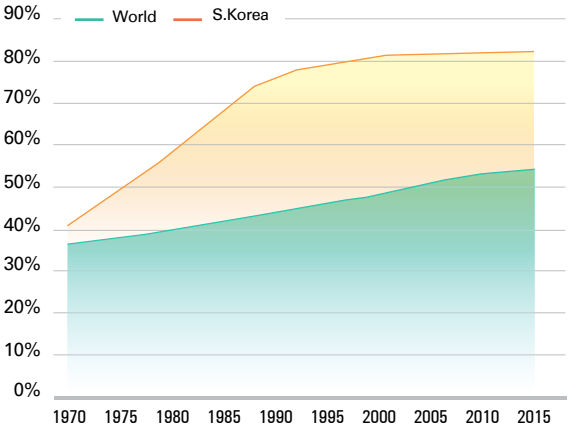
Source: worldsteel

the financial crisis: Korea's proportion within global GDP peaked first in 1996 and then crested again in 2007. In contrast, Korea's global share of steel consumption peaked in 1996, but declined afterwards despite some periods of reglobal GDP peaked first in 1996 and then crested again in 2007. In contrast, Korea's international share of steel consumption peaked in 1996, but declined afterwards despite some periods of recovery. This mismatch is attributed to the fact that the Korean economy, heavily dependent on IT-driven growth after the financial crisis, had maintained its share of GDP consistent, but Korea's share in global consumption has been falling faster than that of GDP due to declining steel intensity of GDP. Figure 2 shows that Korea's steel intensity of GDP peaked in 1995 and began to decline afterwards.

Figure 3 shows Korea's apparent crude steel use and crude steel production trends from 1950 to 2016. The growth rates of apparent crude steel use and crude steel production from 1970 to 1997 increased at compound annual growth rates (CAGR) of 12.5% and 17.9%, respectively, but a mere 2.1% and 2.5% from 1997 to 2016. In particular, crude steel use has stagnated since the financial crisis of 2008, and even by 2016 it had failed to recover the levels in 2008. Meanwhile, crude steel production has surged since the operation of Hyundai Steel's blast furnace in 2011, and the gap between supply and demand has widened.

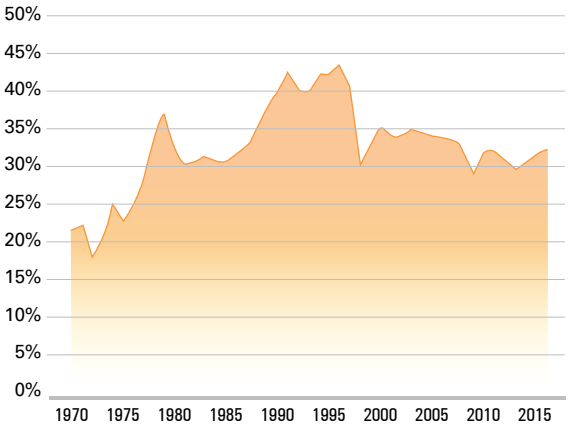
Examining the changes that took place around the crisis of 1998 based on factors related to steel use, there are two distinctive items. The first is as shown in Figure 4–a significant slowing in the urbanization rate after 1996. Second, gross capital formation as percentage of GDP declined after peaking in 1996 (See Figure 5). Along with industrialization, urbanization is an important driver of both economic growth and steel demand. Gross capital formation, comprised of invest-

Figure 4. Urbanization Rate



Source: IMF

Figure 5. Gross Capital Formation (% of GDP)



Source: BOK, worldsteel

ments in construction and facilities, is also closely related to steel demand. Namely, stagnating urbanization around the financial crisis of 1998 and a plunge in investment caused by aggravated oversupply in the Korean economy led to stagnation in steel demand.

Interestingly, the Korean economy shifted from government-driven to market-driven in 1998. The Korean government had implemented seven Five-Year Economic Development Plans, with the final installment ending in 1997. Recognizing the limitations of government-led operations in expanding the economy, Korea attempted to shift to a more market-led economy, but was hit by the Asian financial crisis of 1997-98. Korea accepted emergency loans from the International Monetary Fund (IMF) and accordingly took measures to deregulate markets, such as introducing a fully-floating exchange rate system and opening the stock and bond markets. As a result, the year 1998 became a turning point for the Korean economy as it shifted from government-driven to market-driven.

Success factors for the Korean steel industry

This article examines the development of the Korean steel industry from a theoretical perspective and draws policy implications for latecomers. It is no easy task to apply only a single perspective and generalize success factors for what has been dubbed Korea's "Miracle on the Han River." Therefore, it is important to consider varying economic theories to identity such factors.

Based on existing research on the success of the steel industry by academia, research institutions, and the media, the author adopted various theories to re-examine the success factors and offer implications for developing nations—catch-up theory, infant industry argument, fourth factor of

The experience of the Korean steel industry offers useful lessons for emerging economies pursuing economic development. Therefore, it would be meaningful to analyze the factors that drove the Korean steel industry to success.

production, Lewis turning point, and endogenous growth theory.

Explanation of Success factors based on catch-up theory

The catch-up theory was represented by Seoul National University Professor Keun Lee.[1] This part mainly leans upon his explanation and analysis. According to the catch-up theory among countries, industries, and companies, there are windows of opportunity, in which latecomers can catch up with first movers. Four representative windows are the emergence of new technological and economic paradigms, recession in business cycles, changes in demand conditions, and industrial policies and government restrictions.

Even when a window for opportunity opens, not every latecomer is able to seize the opportunity and outperform first movers. The result varies depending on how the first movers react and how well latecomers overcome their disadvantages and make the most of their advantages. As first movers wish to retain their own advantages in the market, they often ignore new technologies and fall into the first-mover trap. On the other hand, latecomers are disadvantaged by their requirement of massive funds and government support in the initial stage, but they are able to skip stages by adopting first movers' advanced technologies at low cost, and even become first movers themselves. If willing to take risks, they are given an opportunity for leapfrogging.

This catch-up theory explains how the Korean economy was able to take a window for opportunity and succeed in catching up to advanced economies. This is also true not only for the steel industry, but for other sectors as well, including electronics, automobiles, and petrochemicals.

The catch-up cycle for the Korean steel industry is divided into three stages. The first is the entry stage (1968 – 1972) when its development was fueled largely by goverment activism. The Korean government incorporated POSCO as a

1 Keun Lee and Jee-hoon Ki, "Rise of the Latecomers and Catch-Up Cycles in the World Steel Industry," Research Policy, Volume 46, Issue 2 March 2017, Pages 365–375

state-owned company in 1968, and enacted the Steel Industry Promotion Law to actively support the establishment of the Pohang Steelworks. In addition, POSCO was provided with a variety of benefits: long-term loans at low interest rates, establishment of infrastructure, reduction or abolition of taxes and tariffs, and reductions in utility rates.

The second phase is the gradual catch-up stage (1973 – 1986) in which global economic recessions sparked by the first and second oil shocks offered a sort of opportunity to Korea. Pohang Steelworks began producing steel in 1973 and expanded production capacity through 1983. Under the global recession that followed the first oil shock in 1973, POSCO was able to purchase old equipment at prices lower than normal. The government also implemented policies to nurture heavy and chemical industries (1973-1979), focusing on six sectors—steel, petrochemicals, machinery, shipbuilding, electronics, and non-ferrous metal. This significantly drove up steel demand.

Third is the forging ahead stage—a period of soaring expansion after 1987. POSCO started building its Gwangyang Steelworks in 1981. The second oil shock of 1979 and subsequent economic recession had provided a chance for POSCO to catch up with first-movers. POSCO took advantage of this recession to promote competition among equipment suppliers and managed to buy equipment at reduced prices. Moreover, the recession also offered a further opportunity for POSCO to introduce cutting-edge technologies at reasonable cost. During this stage-skipping catch-up phase, POSCO was able to secure greater cost advantage than ever before.

To summarize, the Korean goverment established the state-owned steel company POSCO in an effort to enter the steel industry, and recessions in the global steel industry and domestic industrial policies provided Korean companies with opportunities. Due to stagnation in the global steel industry in the 1970s and 1980s, POSCO could save on costs of new investment. Namely, the success of POSCO is characterized by path-following at the early stage and then by stage-skipping.

The infant industry argument and the government's role

As suggested by the catch-up theory, the Korean government has played a pivotal role in the growth of the steel industry. Examining government policies of the time, it basically implemented development strategies based on the infant industry argument. The core of this argument is that nascent industries often lack the competitiveness of their better-established competitors in other countries and thus require protection until they are able to attain similar competitiveness and contribute to national development. This argument was first fully articulated in the 1790s by the US statesman Alexander Hamilton and later systematically developed by the German economist Friedrich List. Korea is a good example of turning a disadvantaged industry into one with a comparative advantage.

The Korean government's role at that time

One of the most important theories to explain the splendid growth of the Korean steel industry is the fourth factor of production—entrepreneurship and leadership.

can be categorized into five patterns. First, it established a state-owned company and provided focused government support. This is a "selection and concentration" strategy. In fact, this strategy is seemingly the only choice for a country lacking the resources, technologies, or capital for nurturing key industries. The second is an industrial strategy centered on heavy and chemical industries. Industrialization is key in that it has a high industrial linkage effect and can easily create high added value based on improved effectiveness. A virtuous cycle was effectively created in that the development of heavy and chemical industries increased steel demand and fueled the steel industry, while the rise of the steel industry secured economies of scale to supply cost competitive products to steel-consuming industries. Finally, the steel-consuming industries were able to grow further.

Third, the government was actively involved in building infrastructure, such as roads, railways, and ports, even in the early stages of economic development. When the Korean government began constructing the Gyeongbu Expressway connecting the southern and northern reaches of South Korea, it was met with pessimism and the opinion that pouring such a tremendous amount of money into infrastructure was inappropriate while people were struggling to make a living. However, the construction of infrastructure increased logistics efficiency and enhanced industrial competitiveness. In addition, steel demand was created while the infrastructure was being erected.

The fourth pattern is import restrictions and export-driven growth strategies. The government delayed market openings for as long as possible in an effort to help the industry gain competitiveness and sought export-driven strategies with a view to overcoming the small domestic market. The export-driven strategy is advantageous for a country with a low sovereign credit rating seeking to borrow foreign funds for purchasing facilities, as well as to ensure global competitiveness in the competition for exports.

Fifth, the government has stepped forward to

instill labor consciousness, and was actively involved in sourcing experts for the industry. Under the slogan "Let's live well," the government inspired passion and boosted labor consciousness. In response to Koreans' fervor for education, the government expanded educational systems and provided talent to companies in a timely manner.

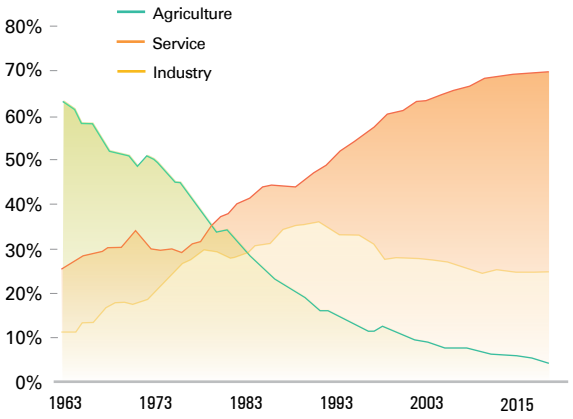
Source: POSCO

The fourth factor of production–entrepreneurship and leadership

One of the most important theories to explain the splendid growth of the Korean steel industry is the fourth factor of production—entrepreneurship and leadership. There are three basic factors of production: land, labor, and capital. In addition, entrepreneurship is often appended as an additional factor. When the Korean government began nurturing the steel industry, very few expected success. The Korean government sought international financing to build a steel mill in the 1960s, but the International Bank for Reconstruction and Development (IBRD, now the World Bank) issued a report skeptical of Korea's steel industry prospects in 1969. The report insisted that it was too early for Korea to enter such a capital and technology-intensive industry as steel, and advised it to first develop more labor-intensive industries. Namely, it claimed that a strategy of producing intermediate products to replace imports would increase steel production costs in Korea as well as export costs and eventually erode the country's global competitiveness.

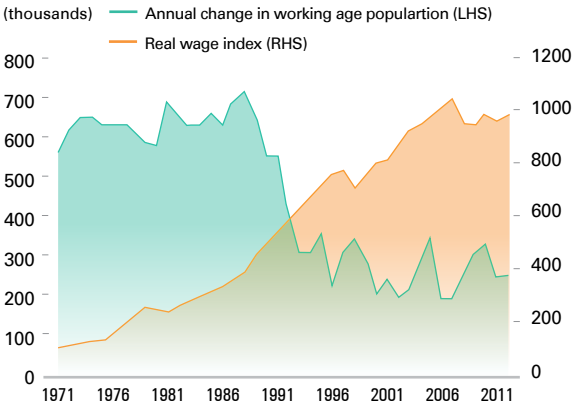
Then-CEO of POSCO, Park Tae-joon, suggested that the government allocate Japanese war reparations to build a steel mill, and eventually made the impossible possible. In 1986, 17 years after the IBRD report, Park met the author of the report, Dr. John W. P. Jaffe on business trip to London and asked him whether he still believed his report was correct. Jaffe stood by his original analysis, but added that the report turned out to be incorrect since not all variables were known. One was Park Tae-joon. There is another interesting anecdote, as well. When the Chinese leader Deng Xiaoping visited Nippon Steel in August 1978 and asked Chairman Yoshihiro Inayama for help to build a steel plant like that of POSCO, Mr. Inayama said, "It's impossible. A steel company is not built with money or technology, but with

Figure 6. Proportion of Employment by Industry



Source: World Bank

Figure 7. Annual Changes in Working-age Population and Real Wage Index



Source: UNCTAD, Economic Statistics Yearbook

men," he added, "but China does not have a man like Park." Deng replied, "I shall import Park Tae-joon." Additionally, a report published in 1991 by the Mitsubishi Research Institute analyzed that a major factor for the success of POSCO was the outstanding leadership, insight, and drive of Park Tae-joon.

Korea's demographic changes and the Lewis turning point

Another success factor was the demographic changes taking place at the time and the subsequent urbanization and industrialization. Urbanization increases steel demand by creating construction demand. Rural to urban migration allows cheap labor and lays a foundation for successful industrialization. The renowned economist Jeffrey Sachs said in his book *The End of Poverty* that China was able to achieve economic reform based on its cheap rural labor. In the case of Korea, only 20% of the population lived in urban areas in the 1960s, but 30 years later in the mid-1990s, this figure had surged to about 80%. Under the policy with emphasis on industy, massive industrial employment was created thanks to the transfer of surplus rural labor. Examining the proportion of employment by industry as shown in Figure 6, the share of agriculture continued to decline, while that of industry increased into the early 1990s but fell afterwards. There are several reasons for this. One may be that the decline in cheap labor migration pushed up manufacturing labor costs and reduced industry job creation. Figure 7 shows that annual changes in the working-age population also slowed profoundly in the 1990s, and the real wage index surged in the 1990s prior to the Asian financial crisis.

Such changes can be explained by the Lewis turning point, named after Nobel Prize winner W. Arthur Lewis. The Lewis turning point describes a

moment at which surplus rural labor is depleted. This in turn typically causes urban wages to rise and economic growth to dwindle. When a country reaches this point, there occurs a mismatch between the supply of and demand for labor, leading to a spike in wages and the entrenchment of a high cost-low efficient structure across society. Korea experienced such a Lewis turning point in the 1990s, and its GDP growth rate and steel demand growth rate have slowed gradually ever since.

The endogenous growth theory– accumulation of technological innovation, knowledge, and human capital

The endogenous growth theory, first suggested by Paul Romer, holds that technological innovation is not driven by external forces, but through knowledge accumulated by human capital, and that such technological innovation significantly contributes to economic growth. Notably, corporate efforts and government support for achieving technological innovation is one of the most important factors for the success of the Korean steel industry.

For example, at the time of its establishment POSCO adopted technologies from Nippon Steel and worked diligently to learn everything it could from this advanced Japanese steelmaker, from operational technology to product technology. As the Korean steel industry grew rapidly after the late 1970s, steel companies in Japan and other advanced countries became no longer willing to transfer new technologies. Therefore, POSCO established POSCO Technical Research Lab, RIST, and POSTECH to develop technologies unassisted. POSCO has earmarked more than 1% of sales for R&D in order to foster advanced technologies and build high value-added production systems. POSCO's relentless efforts paid off over time. In 2007, POSCO built the world's first commercial FINEX plant, which was able to replace the conventional blast furnace-based steelmaking process. Today POSCO is even selling its unique technologies overseas, such as POIST (POSCO Innovative Steelmaking Technology), FINEX, and CEM (Compact Endless Cast and Rolling Mill). It is attempting to improve profitability by increasing sales of WB/WF (World's Best & World's First) products. In short, these continuous efforts to secure global competitiveness through technological innovation has been a key contributor in the Korea steel industry overcoming fierce competition with other advanced steel companies and eventually emerging as a steel powerhouse.

Lessons for late-arriving developing nations

Based on its analysis on the development and success factors of the Korean steel industry, this article offers several policy implications for developing countries.

The first is the importance of the government's role and strategic decisions. At an early stage of economic growth with only scarce resources, it is necessary to maximize efficiency through selection and concentration. Korea offers a good example in that the government priori-

Developing countries can draw lessons from Korea's experiences and overcome the disadvantages faced by latecomers. They can make full use of the given opportunities to catch up. Then, there will be more positive cases in developing countries mirroring the success that took place in Korea.

tized economic development through its Five-Year Plans and allocated resources accordingly. As a capital-intensive process, the steel industry faces high entry barriers and can secure economies of scale only with a certain degree of production capacity. Therefore, the government should focus resources on the steel industry and provide benefits in terms of finance, taxation, foreign loans, and technological development. One viable strategy is establishing a representative state-owned company and focusing resources on nurturing it.

The government's strategic choices are of high importance as well. For instance, despite negative public sentiment, at the early stage of economic developement the Korean government concentrated resources on infrastructure construction, which later served to increase logistical efficiency and drive economic growth. In addition, the authorities implemented policies with emphasis on heavy and chemical industries that triggered mutual growth in steel and steel-consuming industries and finally realized economic growth as well. The Korean government also protected its market until the industry had gained the required degree of competitiveness. Taking into account this importance of strategic decision-making, developing countries should make optimal decisions based on their own conditions and drawing upon the experiences of advanced countries.

The second implication is entrepreneurial leadership and a "can-do" attitude. Korea's nascent steel industry was able to overcome its comparative disadvantage and write a new chapter in its history because of POSCO founder Park Tae-joon's passion, drive, sacrifice, vision, and strong leadership. This has been acknowledged by Korean scholars, in the media, and even by foreign industry insiders. In addition to this entrepreneurial leadership, another factor was involved—Korean workers' labor consciousness and desire for economic growth. With their "can-do" attitude, Korean laborers' hard work is certainly the foundation for the country's industrial development. However, this consciousness movement was also led by the government—a fact that developing countries should keep in mind.

The third is the importance of industrial policy based on medium- to long-term outlook for supply and demand. As shown in the case of Korea, there are several key variables to consider for mid- to long-term steel demand outlook: demographic shifts, industrialization, urbanization, and the advent of the Lewis turning point. Based on these variables, demand forecasts should be updated annually and supply policies should be carefully implemented to prevent a widening of the gap between supply and demand. Steel demand in Korea plunged after the two financial crises of 1998 and 2008, but the variables affecting mid- to long-term steel demand had begun to change even before. Considering this, it would be advisable for developing countries to first examine these variables and take pre-emptive actions. In other words, economic crisis management is important. If a crisis occurs, capital investment growth plunges and steel demand falls into prolonged recession, resulting in an aggravation of oversupply. In Korea, oversupply significantly worsened after 2010 as capacity expansion policies were implemented despite sluggish demand.

Finally, there is the importance of determined drive of technological development and R&D investment. Before becoming a steel powerhouse, the Korean industry underwent an extensive period of knowledge accumulation, technology development, and R&D investment. Without improvements in product competitiveness through technological advancement and cost competitiveness, it is impossible to survive in global competition.

In conclusion, developing countries can draw lessons from Korea's experiences and overcome the disadvantages faced by latecomers. They can make full use of the given opportunities to catch up, since luck is what happens when preparation meets opportunity. Then, there will be more positive cases in developing countries mirroring the success that took place in Korea.

Learning from the Experiences of the Japanese Steel Industry in the Lost Decades

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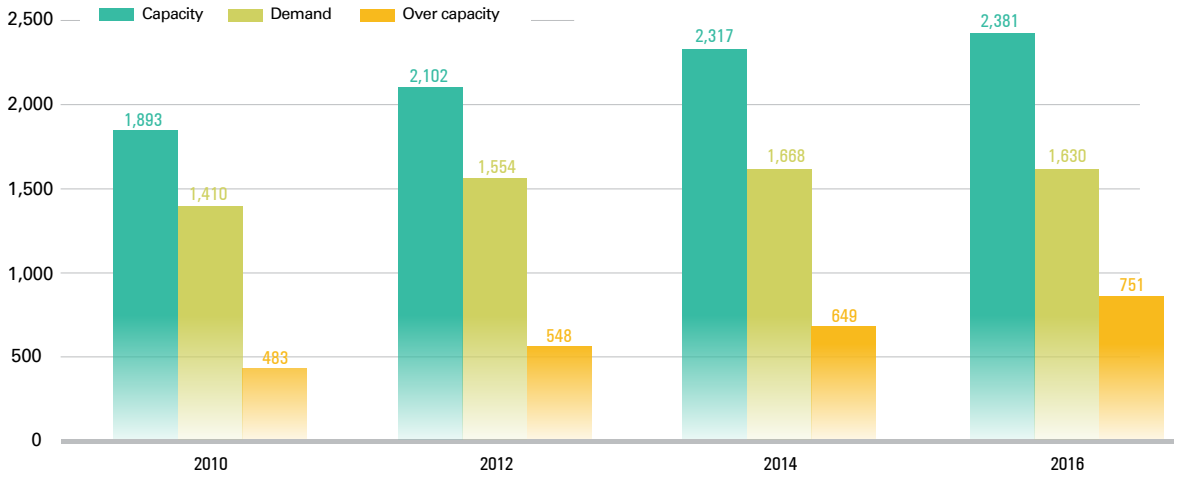
As the impact of the "China Effect" has declined, global steel demand has slowed apace. Since turning to negative growth in 2014, China's steel demand has remained on a low-growth trend. Despite some recoveries, steel industry experts predict that Chinese domestic steel demand will remain sluggish at 0~1% through the near future. This decline in China, a country that has provided over 45% of global steel demand, is the major contributor to low growth across the global steel industry. Despite a recent slight recovery, China's steel demand will not return to the accelerated growth of the past. It is unclear weather other emerging markets such as India and Southeast Asia, which are regarded as potential substitutes for the Chinese market, will grow at the rates anticipated. Despite recent recoveries, it seems that structural stagnation of the global steel market will continue for a time as steel-consuming industries grow slowly. The shipbuilding industry is in a dire situation, facing what has been called an "order cliff." The manufacturing industry including automobile growing at only 1-2%, a rate much lower than in the past.

Another issue is that steel overcapacity remains high, while demand is low. According to OECD, global crude steel capacity is approximately 2.38 billion tonnes. Given that global demand was about 1.63 billion tonnes in 2016, an excess capacity around 751 Mt can be assumed.

This overcapacity issue is inevitable over the near-term as steel mega-projects initiated four to five years ago are still underway in China and other Asian nations. Since China accounts for more than 60% of global steel overcapacity, the degree to which restructuring is realized there will be a decisive factor in addressing the issue. It remains to be seen whether the Chinese government, which in the past has reacted to overcapacity only tepidly out of fears over tax revenue reduction and job decline, will roll up its sleeves and actively see restructuring through to success.

In East Asia, there are three major steel-exporting countries—China, Japan, and Korea. In response to current sluggish domestic demand, the competition for steel exports among the

Figure 1. Global Crude Steel Overcapacity Trend



Source: worldsteel, OECD

three is bound to intensify. East Asian steelmakers' active attempts at expanding exports is accelerating steel industry protectionism in advanced countries, including the USA and Europe. These advanced economies have recently raised trade barriers protecting their domestic steel markets by imposing high anti-dumping duties, not only on Chinese steel, but on Korean steel as well.

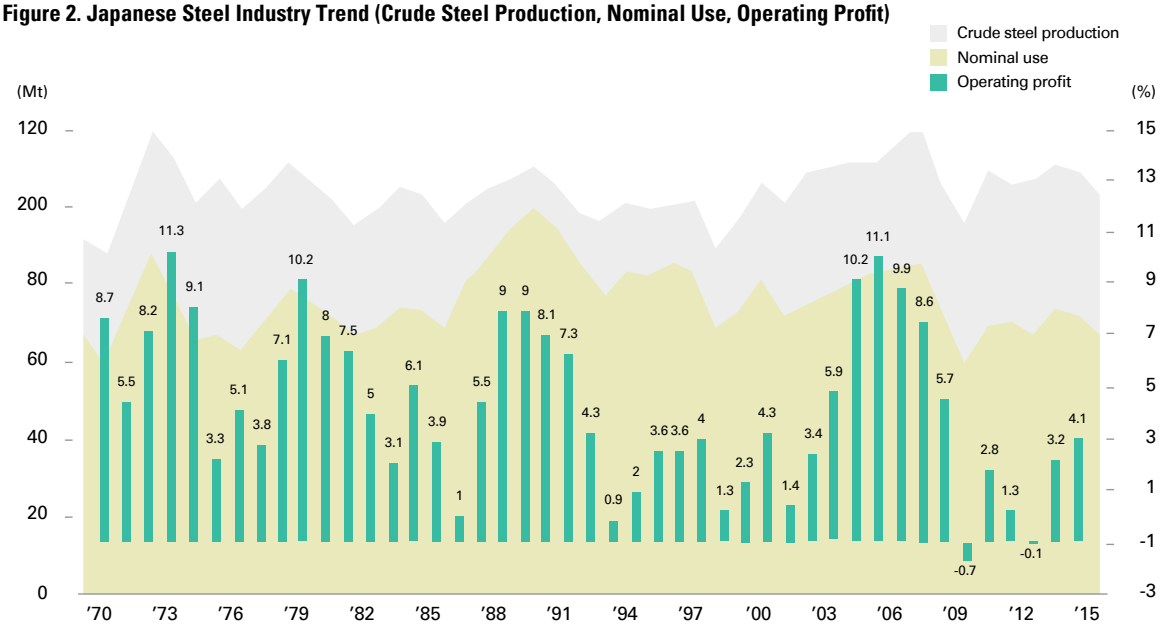
How did the Japanese steel industry find solutions during the period of sluggish demand it has undergone since the 1970s? The experience of their Japanese counterparts might provide lessons for East Asian steelmakers as they navigate tumultuous times.

Lessons from the Japanese steel industry

The Japanese steel industry enjoyed splendid growth for 25 years: a whopping CAGR of 22% from 1948 to 1973. In the early 1970s, Japanese crude steel production first exceeded 100 Mt. With the establishment of new steelworks and relentless efforts to enhance productivity during times of high growth, Japan's steel industry achieved a production system that could outperform its counterparts in Europe, the USA, and other advanced countries. However, ever since production peaked in 1973, it has undergone a difficult period of prolonged low growth. It has repeatedly experienced decades of stagnation, from the oil crisis of the 1970s and appreciation of the yen after the Plaza Accord in the 1980s to the bursting of the Japanese asset price bubble in the early 1990s, the Asian financial crisis of the late 1990s, and the global financial crisis in the late 2000s.

Despite ongoing shrinkage of steel demand, Japan's crude steel production has been maintained at around 100 Mt—a fact that is of special note. Japanese steelmakers turned their eyes to overseas markets with a view to overcoming stagnation. Major steelmakers including Nippon Steel and JFE built overseas downstream facilities and supplied materials to the domestic upstream sector. They have also entered foreign markets

Figure 2. Japanese Steel Industry Trend (Crude Steel Production, Nominal Use, Operating Profit)



Source: The Japan Iron and Steel Federation (JISF)

alongside their Japanese clients to increase steel exports. For these reasons, the Japanese steel industry has been able to sustain its 100-Mt production system.

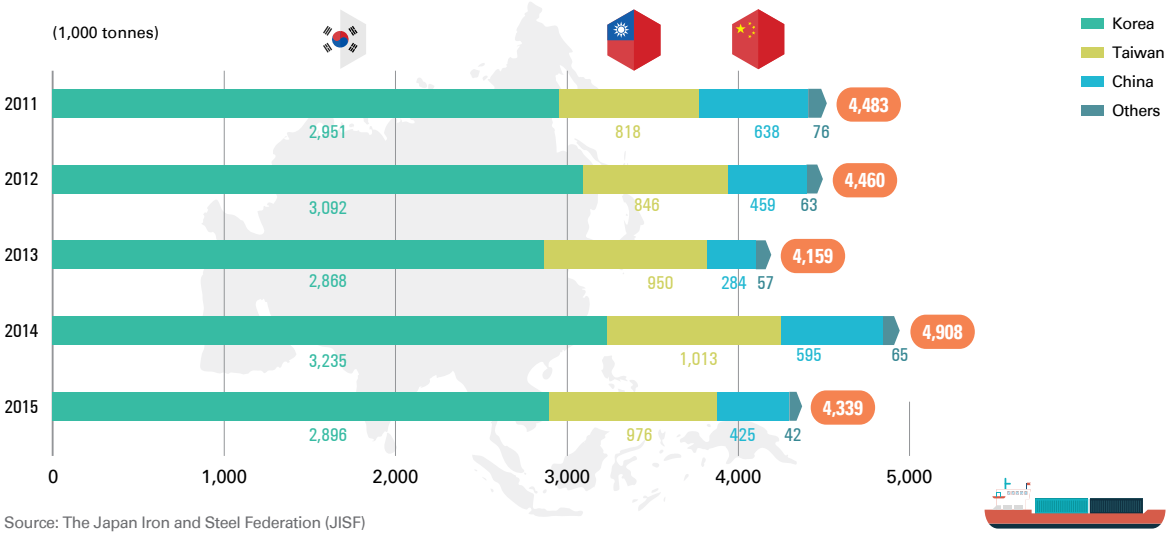
Why are Chinese steel products not particularly competitive in Japan?

During lean years, the Japanese steel industry was not idle in its efforts to increase steel exports as well as protect the domestic market. The Japanese domestic steel market is totally distinct from Korea's, which is inundated with Chinese steel. In 2015, only 430,000 tonnes of ordinary steel were imported from China to Japan. Chinese steel products have not been well-received in the Japanese market.

There are several reasons for this, including long-established characteristics of Japan's steel and steel-consuming industries, trade practices, and distribution structures. Rather than proving a legal or institutional barrier, the closeness of supply chains, which is firmly entrenched as a practice in the Japanese steel sector, is naturally serving as a trade barrier. The characteristics of these practices vary by steel-consuming industry. In the construction sector, there remains the phenomenon that even if a foreign steel company obtains approval under Japanese Industrial Standards (JIS), Japanese project owners overlook imported steel imports during procurement. There is even the case of designing companies expressly stating standards and product names of Japanese blast furnace companies on the specification statement. In terms of auto steel, high technology barriers, intensive purchase of Japanese products, and demanding delivery conditions make it difficult for Chinese imports to enter the Japanese market.

Trading companies play an interesting role in

Figure 3. Japan's Ordinary Steel Imports by Country (Ording Steel Products)



Source: The Japan Iron and Steel Federation (JISF)

the Japanese steel market. They are addressing the complexity of supply chains in the Japanese steel market and helping sustain trade between steelmakers and steel-consuming industries. Trading companies in Japan share market information and support steelmakers and steel-consuming industries in making rational decisions. In particular, trading companies vicariously respond to detailed requests from Japan's steel-consuming industries, for example, high diversity in products and services (steel type/product specification, lot, size, etc.). Steel companies have taken advantage of the distribution networks of trading companies as a means to maintain market stability. By doing so, the steel industry can focus on production to the greatest degree possible while avoiding potential volatility in production output through fierce market competition. On the part of steel-consuming industries, they can utilize trading companies' networks and funds to ensure a stable supply of high-quality materials.

In the supply chain connecting Japan's steel-producing and -consuming industries, there exists a long-established order. They do not change existing suppliers or find new suppliers simply to save costs. They tend to exclude new players as much as possible and create a closed club of their own. Any who attempt to disrupt this order are ostracized from the market.

It clearly is not feasible to mimic Japan's practices and policies for short periods in an effort to defend against steel imports. Notably, however, we can learn lessons from Japan's practices which have stubbornly persisted. Many Japanese steelmakers tolerate a rather high cost structure for a time and select steel materials through a long-term perspective, thus increasing the overall competitiveness of their own supply chains. In close cooperation with existing suppliers and cli-

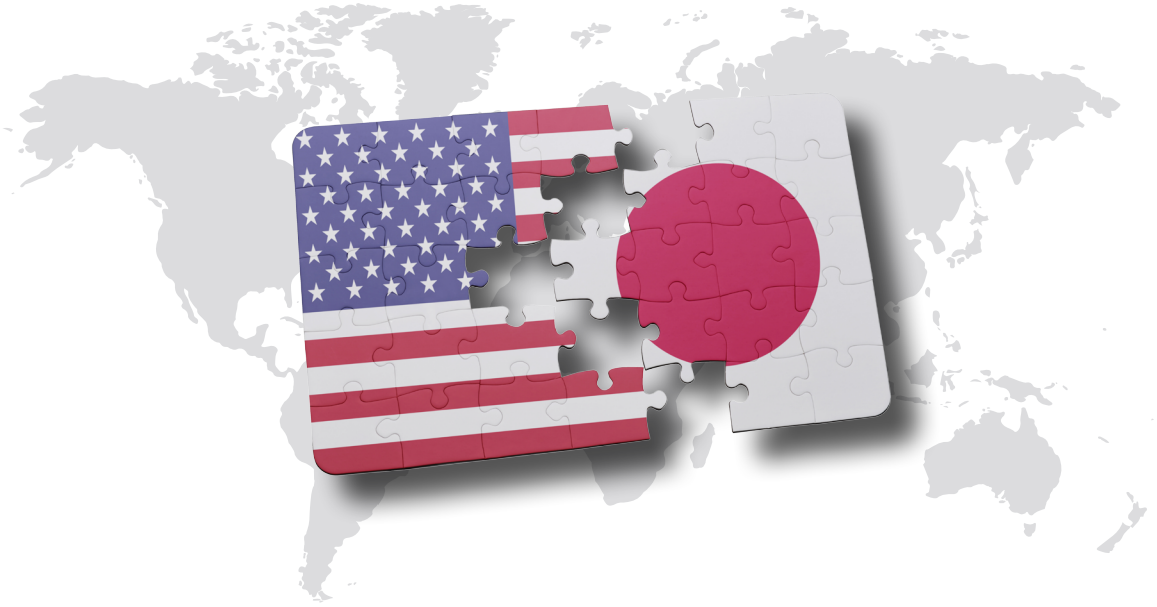
Many Japanese steelmakers tolerate a rather high cost structure for a time and select steel materials through a long-term perspective, thus increasing the overall competitiveness of their own supply chains. In close cooperation with existing suppliers and clients, they have overcome challenges and worked diligently to keep quality and service high.

ents, they have overcome challenges and worked diligently to keep quality and service high.

Japanese response to trade conflicts after the 1980s

In the 1980s, the Japanese steel industry became a focus of trade conflicts with the USA since Japan was exporting high-quality steel to the USA and importing little. Today, however, US pressure surrounding Japanese imports is less severe compared to that faced by Chinese and Korean imports. Japan has been withstanding US trade pressure for more than 40 years; it seems to have become resistant. The Japanese government and the steel industry have cooperated on formidable strategic reactions. Examining how Japan has overcome US trade pressure can provide lessons for steel companies seeking to formulate global corporate strategies and for policy malkers in response to the Trump administration.

One example falls in the early 1980s, when US trade pressure on the Japanese steel industry was at its peak. With cost competitiveness far below that of their Japanese competitors, US steelmakers faced dire deficits and regarded Japanese steel products as a threat. At that time, the only solution for US steelmakers seemed to be to take the offensive against Japanese imports. The US steel industry desperately demanded that the government and Congress strengthen trade restrictions on Japanese steel imports. They raised a groundless suspicion that Japan subsidized its steel industry, and claimed that Japan made use of an artificially low yen to allow unfairly low steel prices. The United Steelworkers Union and eight steel companies pressed the government to pursue trade measures, such as Section 301 of the US Trade Act, to protect the domestic market from Japanese steel imports. The US administration, while a champion of free trade, could not help but make concessions to this pressure. Some politicians switched their position to one of active support for the interests of the US steel industry in an effort to win votes. The US steel



industry at that time aimed for strong quantitative restrictions on Japanese steel imports. In the end, the US government requested its Japanese counterparts to restrain the proportion of Japanese steel products in the US market to below 5.8%.

In response to intensifying US trade pressure, the Japanese trade authorities and steel industry vented anger, but at the same time they took swift conciliatory action. Japan accepted a Voluntary Restraint Agreement (VRA), which is a negotiated arrangement through which an exporting country willingly agrees to limit its exports by means of legislation or some other manner of enforcement within the exporting country. The basic direction of Japan's trade policy at the time was acknowledging and adapting to a US-led trade order. In negotiations over the VRA with the USA, the Japanese government and steel industry showed an interesting response—they willingly accepted US requests, but sought as many benefits as possible in return.

The greatest challenge for Japan's policy authorities was to prevent trade conflicts with the USA. To this end, the government has been actively involved in coordinating actions among domestic steel companies. Japan's Ministry of International Trade and Industry (MITI), a channel for negotiations over the US-Japan VRA, listened to opinions from the management of steel companies and reflected them in policies. The MITI held regular meetings with steel companies and steel-exporting trading companies in order to share the developments taking place in the negotiations and craft strategic reactions. Through restrictions and the private-public operation of organization, the government implemented policies for controlling Japanese steelmakers' production output and export volume. Japan tried its best to prevent trade conflicts by monitoring export volumes to the USA through an export authorization system and by operating an export association to coordinate shipments to the country.

The response by Japanese steelmakers also deserves attention. They did not pursue opportunist individual reactions, but complied with gov-

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ernment policies and took orderly action. They avoided reckless competition over exports, and instead formulated medium- to long-term strategies for the US market. Although not satisfied with the US demands, they thought that it would be advantageous for them to at least maintain their market share and survive in the lucrative US market. They perhaps shared the conception that it would be better to accept US requests to the degree possible in the short term, but gain benefits over the long term.

Over the course of the 1980s, Japan actually reduced steel exports to below the level requested. They diversified their export targets from a focus on the USA to include Southeast Asia and other emerging markets. They pursued qualitative growth for the US market rather than quantitative expansion. They also shifted their product portfolio for the US market to high value-added products. Instead of exporting steel products at cheap prices, they focused on increasing sales to long-term end users and pursuing high value-added exports. Japanese steel companies did not slacken their efforts to expand their markets for long-term businesses, such as auto steel. They also worked to strengthen local networks and forge friendly relations through technology transfers with US steelmakers and M&As with local companies. In short, Japan managed to bring Americans around to a relatively favorable feeling toward the country by instilling an image that Japanese steel imports are of generally high quality and contribute to the development of the US steel and steel-consuming industries.

The Japanese government and steel industry's responses from the past cannot be perfectly synchronized with the current situations facing the steel industry today. However, significant implications for steel companies and policymakers in East Asia can be found in the strategies they applied: the Japanese government's priority on the avoidance of trade conflicts, systematic responses through private-public cooperation, and Japanese steelmakers' efforts to protect their access to the US market over the long term.

NSSMC Oita Works

Source: https://fi.wikipedia.org/wiki/Nippon_Steel_%26_Sumitomo_Metal

Characteristics of Japan's steel restructuring

The history of restructuring in the Japanese steel industry is also interesting. The patterns differ greatly before and after the 2000s. From the late 1970s to the 1990s, restructuring occurred through two different methods: facility revamps and workforce rationalization. Japanese companies concentrated on improvements to their operation rate by cutting production capacity, mainly among major blast furnace companies. Looking at changes in BOF crude steel capacity, it peaked at 141 Mt in 1977, but plunged to 81 Mt by 2003. As a result, the industry's operation rate increased from about 60% in the late 1970s to surpass 90% in 2003. Nippon Steel took radical measures to shutter inefficient facilities during a period of sluggish demand, but also attempted to improve product quality. They spared no efforts at developing high-value-added products, such as auto steel, electrical sheet, and high-quality steel construction materials, and also in seeking new markets for these products. It became inevitable for them to increase per capita productivity through facility revamps and rationalization of human resources. They took active steps to do so in order to minimize labor expenses and improve labor productivity. It is a daunting task to conduct massive labor restructuring in Japan, where job security is considered paramount. The rationalization was conducted via personnel rearrangement through diversification to non-steel businesses. Moreover, they utilized a form of job transfer or dispatch from steel companies to partner companies, steel trading companies, distribution companies, or steel-using companies.

Since the 2000s, restructuring of the Japanese steel industry has been conducted through integration and reshuffling among companies. As the 30-year-old cooperation between Nippon Steel

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and JFE eroded, the industry was reorganized into two main camps under Nippon Steel and JFE. In 2002, Kawasaki Steel was combined with NKK. Nippon Steel and Sumitomo Metal Industries merged to become the country's largest steel maker, Nippon Steel and Sumitomo Metal Corporation (NSSMC). The industry attempted to increase its global competitiveness by enhancing economies of scale through integration and reducing redundancies via reshuffling. Even recently, the Japanese government has encouraged the industry to continue with restructuring of companies, for example through the integration of NSSMC with Nisshin Steel. Overall, the restructuring strategy for the two major steelmakers has involved scaling up in size, but for the entire industry this has meant reducing redundancies and streamlining.

Lessons for the steel industry in a low-growth period

Restructuring in the steel industry should not simply be aimed at capacity reductions, but focus on the continuous advancement and sophistication of the industry. Rather than remaining complacent with stable business during a period of high growth, the industry should take the opportunity to transform itself. The ideal direction for a restructuring would be a scaling down in size, especially in uncompetitive low-quality steel, as well as encouraging the pursuit of qualitative growth. This means making the steel supply chain more competitive. In detail, the steel industry can develop high-value-added products and create demand in the long term, taking into account changing trends for future steel-consuming industries. It is also important to sustain efforts to develop high-quality steel for eco-friendly vehicles, energy, construction, and infrastructure. The industry will have to evolve in order to satisfy increasing social demands for safety in infrastructure and buildings amid an increasing tendency toward natural disasters.

In periods of low growth, steel companies are prone to cutthroat price competition in an effort to maintain their operation rate, and steel-using

companies tend to lean toward cheaper steel materials to reduce production costs. However, such an undesirable situation can undermine the competitiveness of the entire industry. It becomes all the more necessary for stakeholders in steel and its backward and forward industries to put their heads together and set rational directions. Importantly, steel products produced via the supply chain of a given steel company should remain competitive in non-cost areas compared to competing products. Steel distribution companies and related SMEs along the supply chain should also join forces to hone their competitiveness. Distribution companies need to boost their specialties in the market, for example by strengthening their capability to suggest proper products to end users or improving just-in-time (JIT) responsiveness. In addition, companies that have duplicated functions in the market would do better to seek integration in pursuit of breakthroughs. They should secure economies of scale through integration and save costs by minimizing duplication.

For survival in times of sluggish domestic demand, steel companies place a top priority on maintaining their operation rate. To this end, sustaining and expanding exports remains an important task. These days, the export environment has become challenging under a strong trend toward protectionism. Under these circumstances, steel companies need to diversify their export destinations, products, and portfolios in the medium- to long-term. Rather than focusing excessively on short-term profits, major steel companies should solidify ongoing stable trade relations as part of their marketing strategies. From a long-term perspective, it is important for them to maintain consistent pricing and trade volume policies in order to build trust among their customers. Steel companies should also strive to boost cooperation with steel-consuming companies, such as with joint development and equity investments. Through such efforts, the steel industry will be better able to overcome challenges and move forward toward a better future.