Competitive Strategy of the Japanese Integrated Steel Firms in Mature Stage

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1 The Purpose of This Study

1.1 Subject of this Study and Lessons from Previous Studies

Around the turn of the century, the inter-firm relations in the Japanese steel industry changed greatly. Within the country, NKK and Kawasaki Steel consolidated all their businesses and chartered JFE Holdings. Nippon Steel, Sumitomo Metals, and Kobe Steel formed alliances. Abroad, all integrated producers formed alliances with foreign steel firms. Did those changes mean a new step forward in prosperity? Did they mean a desperate counterattack to arrest the decline of the industry? What did they reinforce – cooperation or competition?

This paper explains the reasons for those strategic choices of the Japanese integrated steel firms as a consequence of the environmental change and market competition in the 1990s and the early 2000s. The changing pattern of competition is considered, as integrated firms sought the best competitive strategy in the mature stage of the industry.[1]

Previous studies of the Japanese integrated steel firms in the 1970s and 1980s emphasized their innovative nature. In that period, the strong competitiveness of the Japanese integrated firms was quite a contrast to the technological stagnation, decrease of production, and decline in employment of the European and American integrated rivals. In those studies, the way in which the Japanese corporate and industrial system stimulated innovation has received attention (Yonekura 1994, Hashimoto 1991, Yoshikawa 1991, Itami and Itami Laboratory 1997).

A few studies have scrutinized the Japanese steel industry in the 1990s, though they are not in agreement. Some studies that have covered the first half of the 1990s believed that the innovative nature of the integrated firms was maintained (Yonekura and Guelle 1998, Itami and Itami Laboratory 1997). Other studies pointed out that the collapse of the Bubble Economy at the start of the 1990s disordered the industrial system that had worked well until that moment. In those studies, it was also pointed out that high technology was not necessarily the source of high profit (Nagai 1992, Tona 1996a; b, Baba and Takai 1997, Kawabata 1995b; 1998). Moreover, the industrial community and government were alarmed by the competitiveness of the steel industry and began to study future policy and strategy (Sozai Sangyo Kozo Mondai Kenkyukai 1999, Tekko Gyo no Kyosoryoku Kyoka to Syorai Tenbo Kenkyukai 2001).

This paper focuses on the inter-firm relations in the steel industry, and emphasizes the inevitability of their change. In other words, this paper tries to enrich the view of studies that pointed out a systemic malfunction. The 1990s is considered as the period when the integrated firms became more mature and that conventional inter-firm relations became non-viable. Moreover, domestic and global alliances are considered as ways of reconstructing the new industrial system. In parallel, the changing competitiveness of the integrated firms is evaluated.

One problem is defining a mature industry. In this paper, a mature industry is regarded as one that is in the process of losing its former comparative advantage. The major factor that promotes this maturity is the standardization of technology and product on the supply side, and the economic slowdown or contraction of the market on the demand side.[2] It may become a rational decision for the integrated firms to exit the industry or diversify, instead of continuing to invest in a mature steel industry.

At the 17th International Conference on Business History, international competition in the steel industry was discussed and the participants considered the 'mature hypothesis' proposed by Yoshitaka Suzuki. At the conference, Suzuki stated:

> The steel industry in developing countries could catch up with and outrun advanced countries in productivity levels by introducing the newest equipment, or by having the advantage of low-cost labour and capital. In other words, the steel industry of the leading countries is inevitably outrun by others. If so, it is not enough to examine the steel industry of advanced countries only in terms of new investments or the introduction of new technology, because such measures are more or less temporary in the long run (Suzuki 1991: 13).

Suzuki put forward a research program based on the logic of a firm and using the historical experiences of advanced countries. In the logic of a firm, unlike the steel industry, diversification and disinvestment are not necessarily the evidence of decline. Instead, they may be the best strategic option for the steel firm. In the discussion, however, participants emphasized that mobilizing the accumulated capability in the steel industry was important for successful diversification (Suzuki and Abe 1991). To accumulate capabilities for the growth of the firm, it is necessary to keep competitiveness and profitability of the mature steel industry at a certain level.

Based on that discussion, the steel business or the logic of the industry is worthy of attention again – especially for the Japanese integrated firms, because they have not changed their main business from steel to others. For these reasons, this paper concentrates on the steel business of the Japanese integrated firms.

1.2 Historical Condition

A rough sketch of inter-firm relations in the 1970s and 1980s is helpful. Japanese integrated steel firms have developed a certain industrial system since the foundation of Nippon Steel in 1970, which was referred to as the 'Symbiotic/ Resonant System' or the 'Japanese-Style Steel Industry' by previous studies. The feature of this system was cooperative oligopoly and homogeneous competition (Okamoto 1984, Tona 1996a, Baba and Takai 1997).

Integrated steel firms pursued price setting by the 'cost plus reasonable profit' method, based on a high concentration rate by the 'Big Five' or the 'Big Six'. In response to the fluctuating demand, they tried to avoid price competition and implemented production adjustment (Ohashi 1979).

However, such oligopolistic behaviour did not lead to stagnation of R&D and capital expenditure. Integrated firms fiercely competed by cost cutting and product development. In most cases, they competed in the same market for the sales of the same kind of product made by similar technology. As a result, each integrated producer grabbed a slice of each market. All 'Big Five' producers adopted new technologies, such as continuous casting, a continuous-annealing processing line, and top- and bottom-blown converters. All 'Big Five' producers made efforts to develop galvanized sheets for automobiles (Okamoto 1984, Kawabata 1995b, Baba and Takai 1997). Such fierce homogeneous competition upgraded the technological level of integrated firms, while market share amongst the 'Big Five' did not change much (Itami and Itami Laboratory 1997: 86).

In the 1980s, cooperative oligopoly became subject to erosion by some competitive factors. The increasing bargaining power of automakers and other big customers, the extension of the product line by electric mills, and imports from Korea made price hikes difficult. In the face of the strong yen in 1985, integrated steel firms gave up pricing by the 'cost plus' method and holding idle capacity for production adjustment. They promoted restructuring, including the permanent shut down of some blast furnaces (Kawabata 1998). At the time of the collapse of the Bubble Economy in the early 1990s, homogeneous competition was continuing, while cooperative oligopoly was being eroded.

Based on this historical backdrop, this paper examines further change in the 1990s and the early 2000s. The second section presents the changes in the market environment in which the integrated firms operated. The third section examines the investment and productivity improvement. The fourth section analyzes the competition processes in three major market segments and shows the collapse of cooperative oligopoly. The fifth section explores the reorganization of inter-firm relations and examines its competitive impact. The last section raises some important matters for the future of the integrated firms.

2 The Changing Business Environment after the Collapse of the Bubble Economy

The business environment in the Japanese steel industry has rapidly changed since the collapse of the Bubble Economy. This is shown from four perspectives: the stagnation of the domestic market, the growth of the East Asian market, the emergence of rival companies, and worldwide overcapacity.

2.1 Stagnation of the Domestic Steel Market

Since the collapse of the Bubble Economy, the Japanese steel market has stagnated. Apparent consumption of crude steel has decreased from an average of 93.06 million tons between 1988 and 1990 to an average of 74.13 million tons between 1998 and 2000 (*Tekko tokei yoran* [*Steel Statistical Yearbook*], Japan Iron and Steel Federation [JISF], 1993: 65, 2001: 63).

Comparison of domestic consumption of ordinary steel products by market classification between the averages for 1988-90 and 1998-2000 shows that all market segments except shipbuilding have declined (Table 1). Diminution was particularly serious in the markets for motor vehicles and construction. Total reduction volume of these two markets amounted to about 10 million tons. On the other hand, the proportion of each market segment has presented little change. A slight increase of civil engineering from 14.4 per cent to 16.0 per cent seems to be a reflection of the public works policy. This is shown more explicitly in the statistics of consumption of ordinary steel products classified by final demand sector. In this period, consumption for public fixed-capital formation has decreased slightly and its proportion has increased from 15.7 per cent to 19.7 per cent (*Tekko tokei yoran*, various years). It is clear that the collapse of capital expenditure in the private sector has been partly compensated for by public expenditure.

Decreasing domestic demand could be explained by three factors (For details, see *Tekko jukyu no ugoki* [*Trend of Demand-Supply Relations of Steel*], 199, Kozai-Kurabu, November 2000). First was the stagnation of industrial activity, especially the decreasing number of units of buildings commenced and the decreasing number of automobiles produced. Second was the overseas transfer of production units in industries such as automobiles and consumer electronics. Third was the decrease of unit steel consumption in user industries. In the automobile industry, domestic production has shifted from truck to passenger car. Moreover, weight saving and use of substitute materials like aluminum progressed. In electrical equipment, after the overseas transfer of the production of consumer electronics, domestic production of electronic components and telecommunication equipment has increased. Those industries, however, did not use much steel. In secondary products, like containers, plastic bottles have been ousting the steel can.

Table 1. Estimated consumption of ordinary steel products by market classification in Japan

	Average of fiscal 1988-90	%	Average of fiscal 1998-2000	%	Variation
Civil engineering	10,966	14.4%	9,574	16.0%	-1,392
Building and construction	27,333	36.0%	19,738	33.0%	-7,594
Shipbuilding and marine equipment	2,578	3.4%	3,793	6.3%	1,216
Motor vehicles	13,230	17.4%	10,288	17.2%	-2,942
Industrial machinery and equipment	6,609	8.7%	4,424	7.4%	-2,185
Electrical machinery and equipment	5,056	6.7%	4,221	7.0%	-835
Secondary product	5,026	6.6%	4,150	6.9%	-876
Other industries	5,127	6.8%	3,684	6.2%	-1,443
Total	75,924	100.0%	59,872	100.0%	-16,052

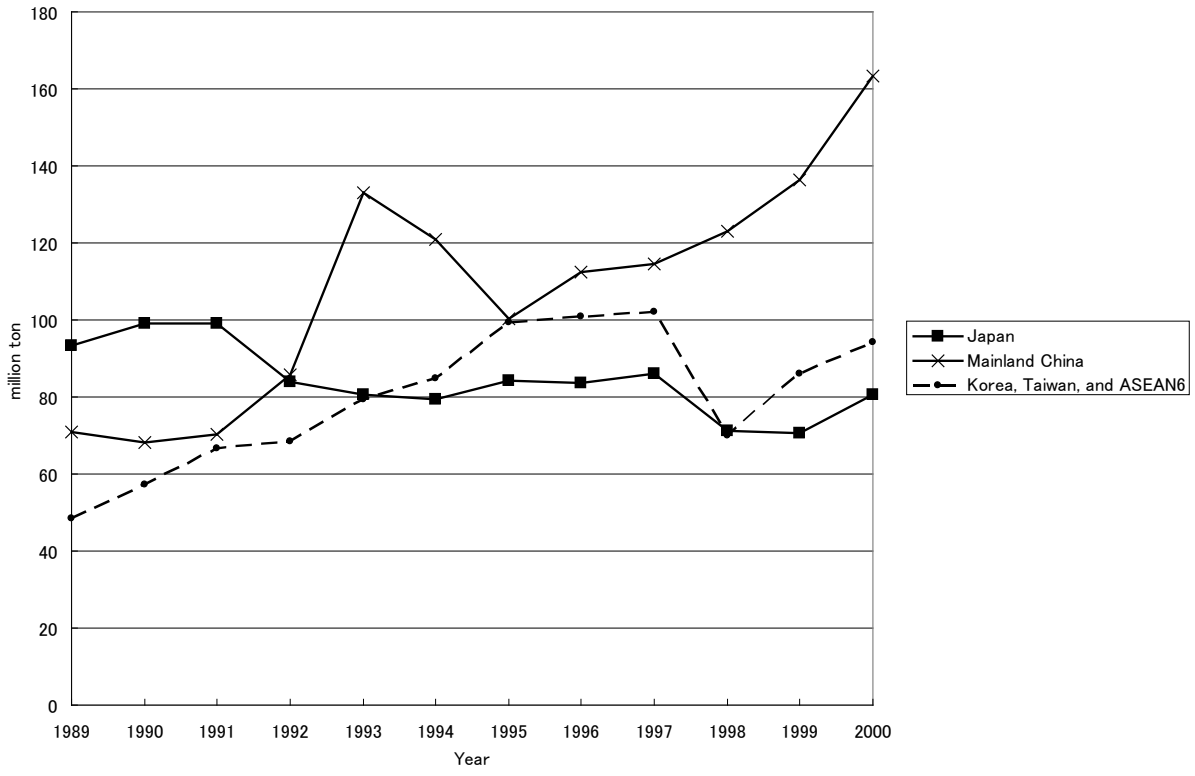
Unit: 1,000t.
Source: Japan Iron and Steel Federation, *Tekko Tokei Yoran*, various years.

Most negative factors seem to be difficult to reverse. Moreover, public works will shrink in the future, because of the huge fiscal deficit of the Japanese government, causing further contraction of the domestic steel market. Of course, economic recovery may expand steel demand. However, the steel intensity of the Japanese economy is as small as the other advanced economies,[3] so future rapid growth of domestic steel demand cannot be expected.

2.2 The Expansion of the East Asian Market

In contrast to the Japanese market, the East Asian steel market has expanded. In particular, growth of the market in China has been striking (Figure 1). It reached 163.24 million tons in 2000. Additionally, total demand volume in Korea, Taiwan, and the ASEAN [Association of South East Asian Nations] 6 has surpassed Japan, despite the slump caused by the Asian currency crisis.[4]

Figure 1. Apparent consumption of crude steel in some Asian economies



Source: International Iron and Steel Institute, Steel Statistical Yearbook, 1999,2000.

What is important is diversification of steel demand in those economies. Steel demand in China and developing countries in Asia spread from long products to flat products and pipes. Examination of the demand for galvanized sheet shows this trend. Galvanized sheet is one of the important products of integrated firms and is consumed in various industries from construction to automobile. Its demand decreased in Japan from 11.35 million tons in 1991 to 8.92 million tons in 2000. Meanwhile, however, total volume of demand in Korea, Taiwan and ASEAN 5 increased from 3.1 million tons to 5.97 million tons. Moreover, total volume of the latter economies and China surpassed Japan and reached 9.74 million tons in 2000.[5] This means a large-scale market shift for integrated firms in Japan.

2.3 Emergence of Rivals

From the 1980s to the 1990s, the Japanese integrated firms considered two groups as their rivals: namely, the new Asian integrated steel firms, and electric mills in Japan. Japanese integrated firms have competed with both, with side-glances at the defeat of American integrated firms in the fight over imports and mini-mills.[6]

After the Plaza Accord in 1985, Japanese integrated firms began regarding Pohang Iron & Steel (POSCO) in Korea as their strongest rival. In the face of increasing imports from Korea, each company tried to cut its labour costs to the level in Korea. The status of the Japanese integrated firms had now changed from pursuer to the pursued in global competition. In addition, China Steel (CSC) in Taiwan and Baoshan Iron & Steel (Baosteel) in China expanded their production in the 1990s.

Electric mills flourished in the market for long products on the strength of simple organization and innovative steelmaking technology. In 1991, Tokyo Steel Manufacturing, the largest electric mill in Japan, succeeded in entering the hot-coil market that had been monopolized by integrated firms.[7] Tokyo Steel sold its hot-coil at a lower price than integrated firms did. Moreover, it started to make cold-rolled wide strip and galvanized sheet. In spite of the limited application of Tokyo Steel's products due to impurities in the steel, integrated firms considered Tokyo Steel as a benchmark.

Competitive fields were not limited to the domestic market. In the late 1990s, user industries in Japan increasingly transferred overseas. The integrated steel firms had to face various foreign rivals, including European mills in the international market, with the added challenge that Japanese firms were not necessarily the biggest in the world. As a result of the growth of the Asian firms, and the mergers and acquisitions in Europe, some big steel producers emerged. In 1991, Nippon Steel was the biggest steel company in the world. NKK was fifth, Kawasaki Steel was seventh, Sumitomo Metals ninth, and Kobe Steel sixteenth. In 2001, however, POSCO was the biggest, Nippon Steel was second, with NKK fourth, Kawasaki eleventh, and Sumitomo thirteenth. Kobe Steel fell from the top 30.[8]

2.4 Worldwide Overcapacity

The world steel industry has had idle capacity since the first oil crisis in 1973. However, in the late 1990s, with increasing concern about steel trade friction in many countries, overcapacity came under scrutiny as the background for dumping. This problem was taken up by the inter-governmental High-Level Meeting of the OECD [Organization for Economic Co-operation and Development] steel committee. According to the estimation by the secretariat of OECD, worldwide effective capacity for the production of crude steel was 1,063.4 million tons in 2000. Consumption of crude steel was 738.24 million tons, and crude steel production was 846.17 million tons.[9] Simple mathematics shows that overcapacity amounted to 325.16 million tons, and that steel firms produced crude steel in excess of demand with an average operating rate of 80 per cent.

Overcapacity has depressed the prices of many kinds of steel products in the international market. This problem was most serious in the countries of the former Soviet Union (Russia, Ukraine, and Kazakhstan). In those countries, steelworks were old and the quality and delivery of steel products were not good. However, steel firms tried to obtain foreign currency through cheap exports (U.S. Department of Commerce, International Trade Administration 2000, International Section of JISF 2002).

In a High-Level Meeting, all countries agreed on the target of closing non-viable facilities. Capacity closure of 91-95 million tons was expected between 1998 and 2002. Additional closure of 23-33 million tons was expected between 2003 and 2005. However, capacity closure was charged to the independent decisions of private firms in each country, so it is not yet known whether it will be carried out.

Domestic demand has stagnated. Demand has shifted to the emerging Asian market. Rival companies in advanced countries have become bigger producers and rivals in Asian countries have emerged. Worldwide overcapacity has depressed the steel price. That was the business environment in which Japanese integrated steel firms operated after the collapse of the Bubble Economy.

3 Stagnation of Investment and Externalization of Managerial Resources

3.1 Stagnation of Research, Development, and Capital Expenditure

Since the first oil crisis in 1973, the Japanese steel industry has improved its technological capability through capital investment in research, development and equipment, though it has not constructed new integrated steelworks (Yonekura 1994, Itami and Itami Laboratory 1997, Tona 1996b, Yoshikawa 1991, Hashimoto 1991, Kawabata 1995b; 1998). In the early 2000s, the Japanese steel industry maintained the highest level of technology in the world. Of the 151 largest blast furnaces (with an internal volume of over 2,000 cubic meters) in the world, 31 were in Japan. As for giant furnaces over 4,000 cubic meters, 19 out of 28 furnaces were installed in Japan (*Tekko tokei yoran*, 2001: 164-7). The technical balance of trade has run in the black since 1974. The energy consumption rate for crude steel production was the

lowest of all advanced countries. The quality of steel products for the automobile industry was highly regarded. It was especially difficult for automobile assemblers to switch from a Japanese supplier to a foreign steel firm for surface-treated sheets, cold-rolled high-tensile steel, and bearing steel. In 1999, when steel firms in America filed anti-dumping suits, General Motors applied for an exemption for high-tensile steel ('IF steel'), as it was vital for weight-saving in its cars (JRCM 2001).

However, integrated steel firms were not eager to make investments in R&D and facilities after the collapse of the Bubble Economy. Instead, they made efforts to save money and promote investment efficiency. This attitude was due to their experience in the 1980s, when product development and capital expenditure for high-class sheets did not make sufficient profits because of fierce competition between integrated firms and the bargaining power of the automobile industry (Kawabata 1995b).

Expenditure on R&D by steel producers decreased by 57.4 per cent, from 360.05 billion yen in 1991 to 153.37 billion yen in 2000,[10] when total expenditure by manufacturing industries recorded an increase of 6.7 per cent. Meanwhile, expenditure as percentage of sales by the steel industry decreased from 2.84 per cent to 1.64 per cent, while it increased from 3.47 per cent to 3.7 per cent by manufacturing industries. In the early 1990s, expenditure on R&D for diversified products mostly decreased. In the latter half of that decade, expenditure for steel chiefly decreased.

Capital expenditure by the ordinary steel industry decreased by 65.6 per cent from 1,274.63 billion yen in 1991 to 437.98 billion yen in 2001. Expenditure by manufacturing industries also decreased by 46.4 per cent around the same time, but the rate of decrease was larger in the steel industry. Additionally, the target for capital expenditure changed from rationalization to maintenance and repair. In fiscal year 1992, 13.0 per cent of total investment was for capacity expansion, 29.2 per cent for rationalization and labour saving, and 23.6 per cent for maintenance and repair. In 2002, however, only 2.1 per cent was for capacity expansion, 13.6 per cent for rationalization and labour saving, and 60.4 per cent for maintenance and repair (Development Bank of Japan, *Chosa* [*Review*], various issues).

The attitude towards new technology needs noting. After the collapse of the Bubble Economy, only two innovations in the main processes had been made and they were not a success. One new method was seamless piping at Wakayama Works, where Sumitomo Metals invested 130 billion yen for a piping mill and adjacent steelmaking plant. Although this investment succeeded technically, it expanded long-term debt and led this company to financial difficulty. The other was the strip caster at the Hikari Works of Nippon Steel – a radical innovation that made sheets directly from molten steel. However, it proved a costly method and is now limited to stainless steel. (*Nikkan tekko shinbun* [*Japan Metal Daily*], November 16 2001).

Integrated steel firms were eager to adopt minor technologies that upgraded existing facilities, instead of making them obsolete. The prime example was modification of blast furnaces to expand cubic capacity and extend furnace life. In addition, minor innovations, such as the use of plastic waste as a reducer in the blast furnace, the perfectly continuous hot-strip mill, and recycling steel dust were put into practical use.

In some cases, developed technology was not applied to commercial equipment. For example, the Direct Iron Ore Smelting Reduction Process (DIOS) was developed as a national project supported by the Ministry of Trade and Industry (MITI) between 1988 and 1995. In the DIOS process, unlike in the blast furnace, low-grade fine ore can be reduced and non-caking coal can be used as a reducer; and it is also easier to stop and start than the blast furnace. The construction and production costs of DIOS were expected to be lower than that for blast furnaces (JISF 1996: 35). The DIOS project was valued as successful, but no integrated firm adopted it. Top managers preferred the repair and piecemeal expansion of existing blast furnaces to the risky construction of a new DIOS plant. The technology policy of the integrated steel firms has inclined toward conservatism.

After the DIOS project, SCOPE 21 (Super Coke Oven for Productivity and Environment Enhancement toward the 21st Century) was developed as a coke oven for the next generation and the key device for reducing the emission of greenhouse gases (Miura 1999). However, possibly the integrated steel firms will prefer the repair of existing coke ovens to adopting SCOPE 21. Though such conservatism may be economically rational in the short term, it will raise the environmental costs in the long term. It should be remembered that the negative effect of technological conservatism is the acknowledged lesson from the history of the US steel industry (Adams and Dirlam 1966, Lynn 1982, Yonekura 1986, Scheuerman 1986, Baldwin and Clark 1994).

3.2 Downsizing, Outsourcing, and Spin-Off

Integrated steel firms not only reduced capital investment, but also externalized unprofitable assets and human resources. There were two reasons for this policy. One was the labour-cost gap with Asian rivals, with employment cost per hour at POSCO at only 35 per cent of Japanese firms.[11] The other was the stagnating trend of domestic demand. To reduce production costs on the assumption of decreasing production volume, a firm had to reduce fixed costs.

The number of working employee at integrated firms decreased from 132,866 in 1990 to 69,574 in 2000.[12] The difference between the former and the latter did not necessarily signify the numbers of workers that had lost their jobs, because a cut in workforce went hand-in-hand with the externalization of operations. Sometimes only employees were loaned to affiliated firms (called Kyoryoku Kaisha) and other organizations. In other cases, operations, related facilities, and employees were all transferred to the control of affiliated firms. Many kinds of internal operations changed to subcontracted operations. This externalization had proceeded since the 1960s, but accelerated in the late-1980s (Facility for Research on Industrial Education Plan, School of Education, The University of Hokkaido 1995).

In the 1990s, not only peripheral operations, but also steel business units were spun off or transferred to subsidiaries. For example, some business units at Keihin Works of NKK were spun off as NKK Sheet and Strip, NKK Welded Pipe Manufacturing, and NKK Tubes. Sumitomo Metals spun off Naoetsu Works and Kokura Works as subsidiaries.[13]

In 1990, the number of workers at the 'Big Five' totaled 121,000. Additionally, 43,000 employees had been sent on loan. In 1998, employees at work decreased to 75,000, whereas the number of employees sent on loan stayed at 43,000.[14] Since 1998, the employees sent on loan decreased because of employment transfer. For example, the steel industry transferred 3,486 employees to other firms between October 1998 and September 1999. This scale of transfer surpassed the mandatory retirement (*Tekko nenkan*, 2000: 166). Sumitomo Metals, which until then had not carried out employment transfers, transferred 9,162 employees in fiscal year 2001(*Nikkan tekko shinbun,* August 1 2002).

As a result, the outsourcing rate in the integrated steelworks, measured by the rate of employees of affiliated firms to total workforce, increased from 57.4 per cent in 1990 to 70.6 per cent in 2001 (Calculated from JISF, *Tekko gyo no anzen kanri gaikyo* [*Safety Management in the Iron and Steel Industry*], various years).

Externalization, however, faced some challenges. First, it was not easy to cut labour costs smoothly. When leasing an employee, integrated firms had to bear the costs of making up the salary difference between the integrated firm and the affiliated firm. In employee transfer, integrated firms had to bear the costs of retirement payments. For example, Sumitomo Metals recorded an extraordinary loss due to the 90 billion yen retirement payment in fiscal year 2001, though it would be able to cut its future labour costs by 30 billion yen annually. Second, skill inheritance and retaining morale became challenges. During initial phases of externalization, skilful veteran employees were loaned or transferred, so the quality of outsourced operations could be preserved. As transfer completed the initial stage, affiliated firms came to have no choice but to invest in training and education by themselves. In addition, large-scale externalization reminded young employees of their gloomy future. It became the new challenge for integrated firms and their affiliated companies to keep excellent human resources.

3.3 Improvement and Stagnation of Productivity

Rationalization, downsizing, and externalization improved physical productivity. From 1990 to 2001, crude steel production per person/hour at the 15 integrated steelworks increased by 130 per cent. Even if employees of affiliated companies are included in the denominator, the revised record was 57.3 per cent.[15] In addition, the integrated firms depressed the proportion of labour cost to sales from 13.6 per cent in fiscal year 1990 to 10.8 per cent in fiscal year 2000 (*Tekko tokei yoran*, 1999: 246-7, 2001: 242-3).

However, value-added productivity did not keep pace with physical productivity. Value-added of integrated steel firms per person/year has declined from 19.69 million yen in fiscal year 1990 to 18.71 million yen in fiscal year 2001 (Calculated from Mitsubishi Research Institute [MRI], *Kigyo keiei no bunseki* [*Business Analysis*], various years). The reason for this twist was falling prices, which have offset efforts for rationalization. In the next section, competition that led to falling prices is analyzed by market segment.

4 Competitions in Some Market Segments

4.1 Segmentation of the Steel Market

The main users of steel products vary according to market segments. In addition, the sales contract system varies according to users. Different combinations of product, user, and sales contract systems are examined in this section.

Most sales contracts for steel are signed through trading companies. However, in the case of tied contracts (so-called Himo-Tsuki), the name of the final user is clearly stated in the sales contract between a producer and a trading company. For steel producers, a tied contract is a contract with a user's face. Trade terms are decided through direct negotiation between producers and users. Tied contract is used for the frequent transaction between an integrated firm and a big customer. On the other hand, in the case of contract for selling goods at a store (so-called Mise-Uri), the final user is not stated and generally not decided when a trading company places an order with a steel producer. For steel producers, selling at a store is a contract without a user's face. In most cases of selling at a store, a transaction between a trading company and a customer is temporary and accidental, while a transaction between a steel producer and a trading company is enduring in some cases. In the market of selling at a store, the product price is likely to fluctuate, because speculative purchasing is possible.

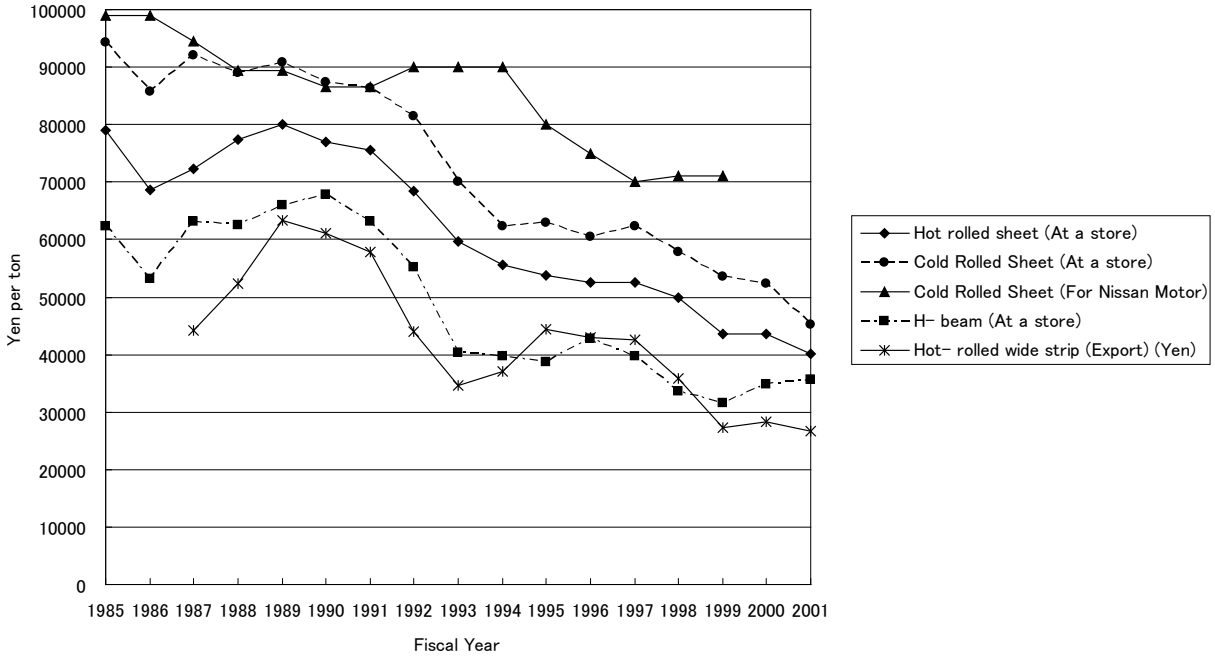
4.2 Competition in Selling at a Store: The H-Beam Case

The H-beam (wide-flange beam) market is a good example of selling at a store. H- beam is a typical construction steel and 80 per cent of production was sold in a store in fiscal 2000.[16] Domestic orders decreased from 7.24 million tons in fiscal year 1990 to 4.72 million tons in fiscal year 2000. Total orders including exports decreased from 7.60 million tons to 5.05 million tons around the same time. All producers had to compete in a smaller market.

The players in the H-beam market in the 1990s included four integrated firms, affiliated electric mills of integrated firms, and independent electric mills. In this market, the 'H-beam Wars' had been fought between Nippon Steel and Tokyo Steel as the main players since the first half of 1980s. Tokyo Steel gradually grabbed market share from the integrated firms, and at last became the leader in the mid-1980s. Tokyo Steel refused to be an anti-recession cartel member and aggressively invested in production facilities. It did not align with the production curtailment policies of the integrated firms, and instead expanded its market share by low-cost production and low prices (Yonekura 1993).

The minimill story in the United States is well known. Contrary to the American experience, Japanese integrated steel firms did not withdraw from the market for heavy shapes, including the H-beam. Instead, they counterattacked with their affiliated electric mills in the 1990s. First, integrated firms

Figure 2. Prices of some steel products 1985-2001



Notes: Price of Cold rolled sheet for Nissan is not available about 2000 and 2001.

Size of each product is as follows (millimeter).

Hot rolled sheet (at a store): 1.6*4*8.

Cold rolled sheet (at a store): 1.0*3*6.

H- beam (at a store): 5.5/8*200*10.

Cold rolled sheet (for Nissan): 0.9*9.14*coil.

Price at March of every year for Nissan.

Simple average of highest price and lowest price from January to December in each year for store contracts.

Source: Compiled from Tekko Shinbunsya Website, Annual Report of Nissan Motor, and Tekko Tokei Yoran.

expanded the production of high-class H-beam. Second, they placed production and marketing under the affiliated electric mills. What is especially important is that affiliated electric firms installed facilities on the site of steelworks owned by their parent companies, with the latter supplying materials, semi-finished products, and utilities. For example, Daiwa Steel acquired control of H-beam operations from Kawasaki Steel and installed steelmaking and rolling facilities at Mizushima integrated steelworks. In those facilities, 50-70 per cent of materials were melted iron supplied from Kawasaki's blast furnaces. The use of melted iron improved the quality of H-beam and reduced the electric costs, which made daytime operation on weekdays possible.[17] Correspondingly, the H-beam factory of Kyoei Seitetsu (now renamed

Sumikin Steel) was located at the Wakayama Works of Sumitomo Metals. Through such countermeasures, Nippon Steel returned as top producer as affiliated producers grabbed market share between 1994 and 1996.[18]

In the process, however, excess production appeared and the market price fell from the latter half of 1996. As in the past, integrated firms cut production, but independent electric mills did not and this behaviour further dampened the market price (Figure 2).

As a result, all the players became exhausted. On the one hand, Tokyo Steel recorded a deficit for the ninth straight year; on the other, affiliated electric mills faced recurrent financial crises. Toa Steel became bankrupt in 1998 and was reconstructed as NKK Bars and Shapes. Daiwa Steel and Kyoei Seitetsu had to receive support from their respective parent companies. In those cases, the sales function of H-beam was returned to the parent company.[19] It became clear that electric mills in integrated steelworks did not necessarily enjoy a cost advantage when the scrap price was low. The permanent shutdown of excess capacity seemed inevitable. In fact, electric furnaces, continuous casting machines, and large section mills were shut down at Toa Steel.

However, the situation had not changed fundamentally. Since 2000, groups of integrated firms reduced production further and the market price recovered at last (Figure 2). In this process, however, independent electric mills once again did not cooperate with integrated groups. As a result, Tokyo Steel returned to the top (Nikkei Sangyo Shinbun ed., *Sijo senyu ritsu*, various years).

In short, production adjustment by integrated groups became dysfunctional in the 1990s. As a prerequisite for a new form of adjustment, reduction of idle capacity is inevitable.

4.3 Competition in The Tied-Contract Market: Steel Sheets for Automobiles

In fiscal year 2000, 75.1 per cent of the production of hot-rolled ordinary steel products by integrated steel firms was sheets and strip (*Tekko ryutsu joho* [*Information of Steel Distribution*], 86, August 30 2002). Among the domestic orders for sheets and strip, 41.3 per cent was for automobiles in tied contracts.[20] In short, sales of sheets and strip to the automobile industry were very important for the integrated steel firms.

From fiscal year 1990 to 2000, however, shipment of sheets and strip for automobiles decreased from 11.52 million tons to 9.13 million tons (20.8 per cent). In this market, as in H-beams, players had to fight for a slice of a diminished pie.

In the 1980s, integrated steel firms developed high-class sheet products in cooperation with automobile producers. To produce new products, they invested in rolling and fabricating facilities aggressively. However, they could not shift the costs of development and capital onto the product price. The price of sheets and strip had fallen through the 1980s (Figure 2). After the collapse of the Bubble Economy, the operating rate of the new facilities fell into the doldrums and depreciation costs became a heavy burden on the integrated firms (Kawabata 1995b, *Kikan tetsu no sekai*, 82, January 1991). For

example, the new continuous galvanizing line that was installed at Nagoya Works of Nippon Steel in May 1993 did not start its operation until May 1995 (Nippon Steel Nagoya Works 1995: 82).

In 1991, integrated steel firms hiked prices and justified it by the burden of capital, logistics, and subcontract costs. However, deepening recession and price differentials between home and abroad, aggravated by a strong yen, forced integrated firms into price cutting in 1994. In that year, automobile assemblers proclaimed that they would use imported steel if the price gap between domestic and foreign reached 20 per cent. In fact, they began to use steel made by POSCO (*Nihon keizai shinbun* [*Nikkei Times*], April 20 1994, *Nikkei sangyo shinbun* [*Nikkei Industrial Times*], April 21 1994). In 1997, a price hike was carried out on the back of economic recovery, but it was a slight one. The general trend is shown in the example of the purchasing price of cold-rolled sheet at Nissan Motor (Figure 2).

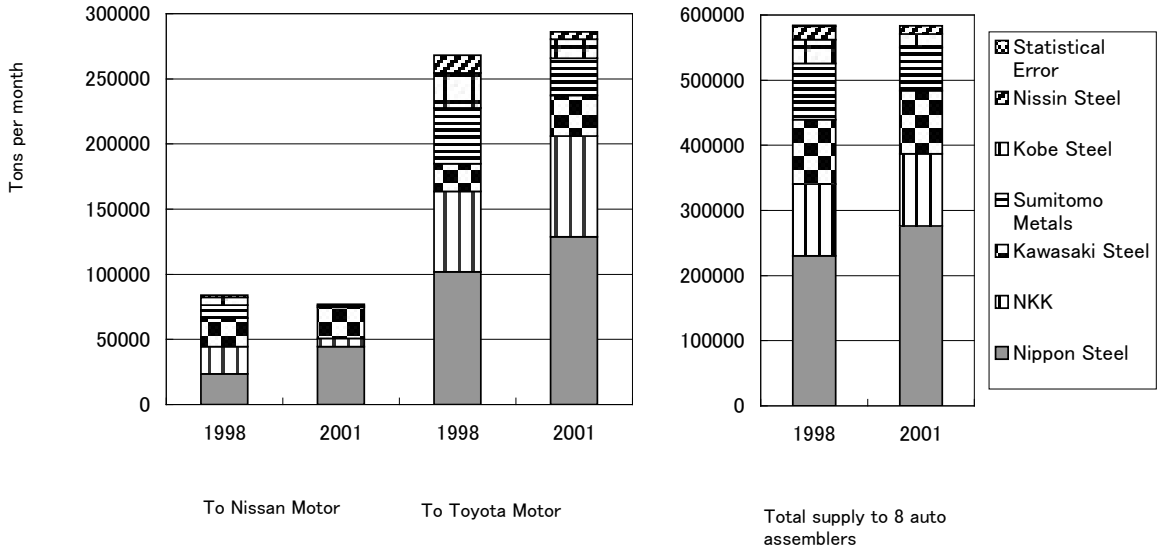
In the first half of the 1990s, auto assemblers remedied the overquality of their cars by reducing various specifications. Most of the assemblers changed automobile materials from double-galvanized sheets to single ones, from electrolytic-galvanized sheets to hot-dipped galvanized ones, and in some cases, from galvanized sheets to cold-rolled sheets. This shift of materials forced the steel industry to give up the high valued-added policy by supplying higher and higher-class sheets.

However, reducing specifications brought certain advantages to the steel industry, because it led to increased production lot size and a reduction of design costs. Specifications of steel for automobiles decreased from 650 in 1994 to 110 in 1997 through cooperation between the automobile and steel industries (JRCM 1999: 41). Moreover, the Japan Iron & Steel Federation set a standard for steel sheets for automobiles (JISF, Department of Standard 1996).

As stated above, the factors that regulated changes in the tied contract market from 1990 to 1999 included stagnation of domestic demand, competition with POSCO, and the amendment of the product development system. Those changes imposed on steel firms a hard path, but there were some advantages for steel firms. Moreover, those changes did not lead to a change of market share among integrated firms.

However, the situation changed drastically because of the managerial crises and international alliances that sucked in automobile assemblers. From 1999, automobile assemblers began to make a short list of parts and material suppliers. The announcement of the 'Revival Plan 2000-2002' by Nissan Motor in October 1999 was the turning point. The 'Revival Plan' included the goal of procurement cost reduction by 20 per cent. To realize this target, Nissan planned to reduce suppliers from 1,145 to 600. In fiscal year 1998, all the 'Big Five' integrated firms had supplied steel sheets to Nissan (Figure 3). Carlos Ghosn, chief operating officer of Nissan at that time, thought that too many sheets suppliers had driven up procurement costs (Ghosn 2001: 186). Nissan forced steel producers to propose the trade terms that led to the achievement of Nissan's goal. Price cutting, value analysis (VA), and value engineering (VE) were encouraged. As a result, Nippon Steel grabbed the biggest slice of the market at 60 per cent, Kawasaki Steel got 30 per cent, and NKK dropped to 10 per cent. Kobe Steel became a small supplier of special steel, and Sumitomo Metals disappeared from the suppliers list (Figure 3). Not only VA and VE proposals, but also price-cutting contributed to the changing market share. Sumitomo Metals dropped out

Figure 3. Supply of sheet and strip to automobile assemblers



Source: *Tekko Ryutsu Handbook* [*Handbook of Steel Distribution*], Tekko Ryutsu Joho Sya, various years.

of the competition when the chance to achieve a high rank disappeared, because a depressed price and small volume seemed to bring no profit.

Other automobile assemblers also made a move on cutting procurement costs and making a short list of suppliers. In the past, automobile assemblers had decentralized the supply source to promote competition among suppliers and reserve materials in case of emergency. In the face of stagnation of production volume, however, auto assemblers decided to give preference to promote the economies of scale in parts and material production. To that end, they placed larger orders with fewer suppliers. Though it was a rational policy for automobile assemblers, it had a grave impact on the steel industry, because it eroded the oligopolistic behaviour of price cooperation and share maintenance amongst the 'Big Five'.

From the latter half of 2000 to the first half of 2001, it was estimated that the sheets price for tied contracts fell by 15,000-20,000 yen per ton (*Nikkan tekko shinbun*, 17 April 2001). The share for Toyota Motor, the largest automobile firm in Japan, changed in fiscal year 2001. NKK, once defeated by Nissan, fought tooth and nail to get a big slice and succeeded (Figure 3). However, the comparison of the delivery volume to eight automobile assemblers between fiscal years 1998 and 2001 reveals that Nippon Steel received the lion's share with an increase of delivery by 46,132 tons per month (or about 550,000 tons annually). NKK and Kawasaki's delivery volume decreased slightly, while Sumitomo, Kobe, and Nisshin lost their markets.

At that moment, the executives of integrated steel firms recognized the importance of production scale and bargaining power for becoming a top supplier. Some executives publicly proclaimed that a low concentration ratio in the world steel industry was a problem, compared with the automobile industry.[21] It became one of the grounds of business consolidation between NKK and Kawasaki Steel. In 2002, integrated steel firms committed themselves to stop price-cutting against the new procurement plan of Nissan Motor (*Nikkan tekko shinbun*, 13 February 2002).

4.4 Competition for Foreign Markets

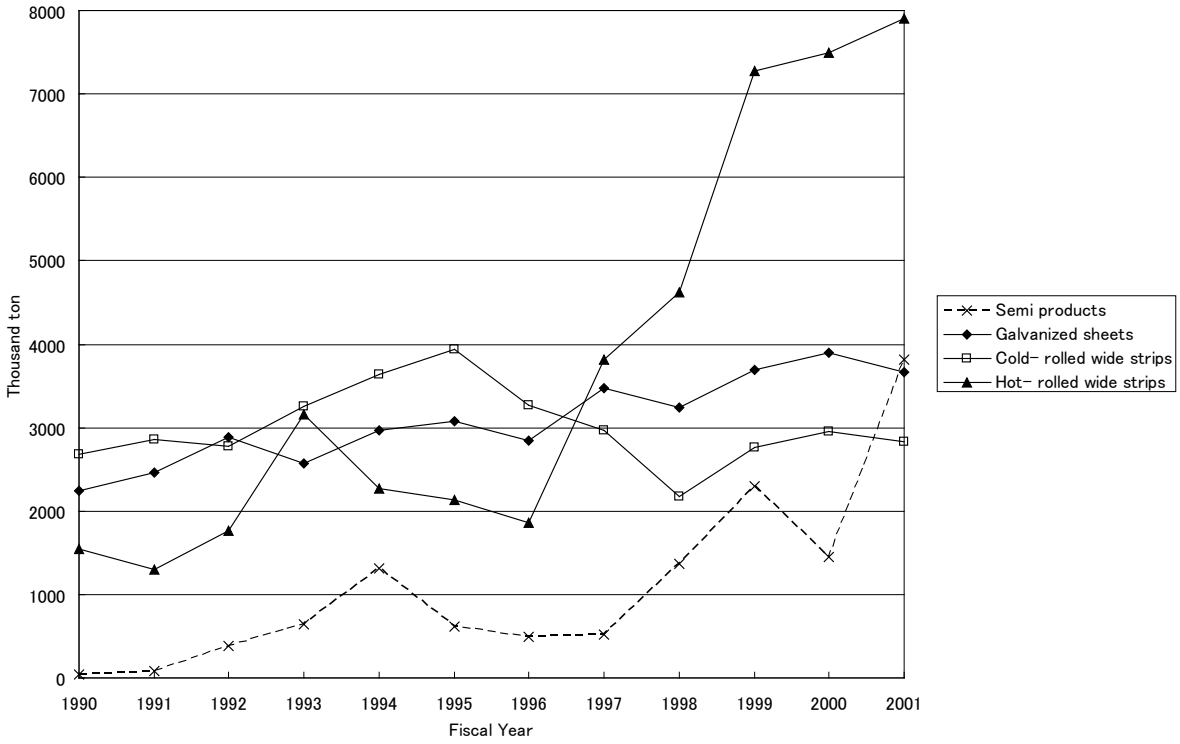
In the face of stagnating domestic demand, steel producers promoted exports to search for new opportunities. Steel exports increased from 17.26 million tons in fiscal year 1990 to 28.43 million tons in 2000. Export ratio to total orders increased from 14.9 per cent in fiscal year 1990 to 25.1 per cent in 2000 (*Tekko tokei yoran,* 2001: 78-9, 174-5). In particular, exports to Asian countries increased remarkably. The share of exports to Asia expanded from 62.8 per cent in fiscal year 1990 to 76.7 per cent in 2000 (*Tekko tokei yoran,* 1996: 192-3, 2001: 182-3). Although a shift to the American market occurred in 1998 with the shock of the Asian currency crisis, exports to Asia recovered thereafter.

For the integrated firms, sheets and strip made up a little less than 80 per cent of their exports. From another angle, almost all sheet exports and more than 80 per cent of semi-finished products were produced by integrated firms (*Tekko ryutsu joho*, 86, 30 August 2002). Among those products, the export of hot-rolled wide strips rapidly increased after the late 1990s. In addition, the export of semi-finished products, which hardly existed in the 1980s (Figure 4), increased.

The growth of galvanized sheets was attributable to Asia exports. From fiscal year 1990 to 2000, the exports of galvanized sheets to non-Asian countries decreased by 0.41 million tons, but increased by 2.07 million tons to Asian countries (*Tekko tokei yoran*, 2001: 174-175). What was exported from Japan was high-class sheets for the Japanese affiliated factories of automobile and electrical equipment in the Asian countries (*Tekko jukyu no ugoki*, 199, November 2000), while galvanized sheets for roof and wall were not difficult to fabricate for developing countries.

The decrease of cold-rolled wide strips and the rapid increase of hot ones stemmed largely from the improvement of import substitution in downstream processes in East Asian countries. In Korea, Taiwan, and the ASEAN 5 countries, many cold-rolling mills started in the 1990s. Among them, only mills owned by integrated firms could receive sufficient hot-coils as base material. Other mills owned by independent re-rolling firms could not purchase a sufficient volume, even in Korea and Taiwan in which integrated firms operated. For example, Hyundai Hysco, the cold re-roller in Korea, filed suit to the Fair Trade Commission that POSCO unfairly limited the supply of hot-coil (*Nikkan tekko shinbun*, 28 August 2002).

Figure 4. Exports of some steel products



Source: *Tekko Tokei Yoran*, various years.

Most of the re-rolling producers asked Japanese integrated firms to supply hot-coils. Using the imported hot-coils as base materials, import substitution of cold rolled sheets in East Asian countries improved and it led to a decrease of imports from Japan. In addition, cold rolled sheets from Japan had to compete with Korean, Taiwanese, and the former Soviet Union's products in those countries. Because of these factors, exports of cold rolled sheets decreased.

Additionally, some hot strip mills were constructed in Korea, Taiwan, and Thailand. This led to a demand for slabs – one type of semi-finished product. The increase of semi-finished product exports from Japan can be mainly explained by this factor, and partly by export to advanced countries.

In the case of mainland China, another pattern is observable. Unlike other East Asian economies, the Chinese iron and steel industry had a big capacity in upstream processes. In the 1990s, China became the largest steel producing country in the world. However, downstream capacity for high-class products was in short supply for the growing manufacturing and mining industries. As a result, imports of cold rolled sheets and galvanized sheets increased.

In short, sheets and strip exports by Japanese integrated firms were divided into two routes in the context of the international division of labour. One was the export of high-class products for user

industries, and the other was the export of base materials for foreign hot and cold rolling producers. The latter route especially grew in the 1990s.

The problems were that the base material was not value-added as compared with final products, and that it was more difficult to make product differentiation for base materials than it was for final products. Therefore, the export of base materials was subject to price cutting competition.

In fact, export prices declined remarkably in the late 1990s. In fiscal year 1990, the export price was $431 for hot-rolled wide strip, $559 for cold-rolled wide strip, and $664 for galvanized sheets.[22] However, these prices fell to $214, $374, and $410, respectively, in fiscal year 2001. The most depressed was the price of hot wide strip, which halved in eleven years. In addition to the competition among integrated producers, three factors led to the price decrease.

The first was inflows of Russian and Ukrainian products to the Asian market, which were exported below cost price and led to trade conflicts in many countries (JISEA, Marketing Research Committee 1999, U.S. Department of Commerce 2000). Russian and Ukrainian low-quality products did not directly compete with Japanese products in the market for automobile and electrical equipment producers. However, they competed in some markets, such as pipe fabrication and among other users that did not need high-class products. Thus, the dumped price of Russian and Ukrainian products had some effect on the Japanese products.[23] The second was POSCO's low prices that were triggered by the currency crisis (*Nikkan tekko shinbun*, March 26 1998). POSCO cut its product prices in 1998 to maintain operating rates of facilities that were installed before the currency crisis. Third, US protectionism, and specifically trade suits on hot-coil in 2000 that switched the steel trade flow from America to Asia (*Nikkan tekko shinbun,* 4 January 2001).

In 2002, the price recovered. The export price of hot-coil reached $260 per ton in August 2002 and that was a profitable level for integrated producers (*Nikkan tekko shinbun,* 26 August 2002). Overall, however, the Japanese integrated steel firms have been subject to market fluctuation since the collapse of the Bubble Economy.

4.5 Collapse of Cooperative Oligopoly and Homogeneous Competition

Despite fierce competition in various market segments, the share of crude steel production by each producer has changed slightly. From fiscal year 1990 to 2001, the share of Nippon Steel dropped from 26.1 per cent to 25.6 per cent, whereas NKK rose from 11.1 per cent to 12.6 per cent, Kawasaki rose from 10.1 per cent to 12 per cent, Sumitomo rose from 10 per cent to 10.7 per cent, and Kobe rose from 6 per cent to 6.3 per cent.[24] The fluctuation span was less than 2 percentage points for each firm. Crude steel production of the integrated steel firms in total decreased from 76.64 million tons on annual average between 1989 and 1991 to 73.52 million tons on average between 1999 and 2001(*Shinnittetsu Gaido*, various years). A long-term downward tendency can be observed. However, a decrease of 4.1 per cent in a decade was not very serious, because the demand level during the Bubble Economy was abnormal. In

this sense, no 'Big Five' producers dropped out of competition. However, all their operating results were battered, because they were forced to accept price-cutting competition in major market segments. Not one competitive factor, but four, deeply undermined cooperative oligopoly and homogeneous competition after the collapse of the Bubble Economy.

The first factor was the shift in demand from the domestic to the foreign market. Keeping sheet orders from foreign markets, in particular, became an important issue for integrated firms. It meant the development of markets beyond the control of domestic oligopoly. The second was competition with firms outside the oligopolistic system, especially POSCO and independent electric mills. In the domestic market of H-beam and in the international market of steel sheets, integrated firms have faced price competition with such rivals. The third factor was competition with big customers, especially automobile assemblers. The balance of bargaining power has come to favour customers. Integrated firms not only gave up keeping their product prices for tied contract, but also gave up cooperation to keep market share. The fourth factor was competition among integrated producers. Declining prices caused by overcapacity or overproduction were a commonly observed feature among all three market segments. In addition, in those market segments declining prices led in turn to share-oriented behaviour and overproduction. That vicious cycle with homogeneous behaviour among integrated firms was not sustainable.

It became impossible for integrated firms to make stable profits through cooperative oligopoly and homogenous competition. In the 1990s, integrated firms, in total, ran deficits three times in fiscal years 1993, 1994 and 1998 (MRI, *Kigyo keiei no bunseki*, various years). The integrated firms lost their standing in the capital market. Aggregated market value and market value average per share of steel firms were flagging compared to the values for all businesses.[25] Moreover, disparity of financial strength among the integrated firms widened. Nippon Steel recorded the most stable profits, while Sumitomo Metals suffered from thin profits and heavy debt.

Confronted with the breakdown of cooperative oligopoly, executives of the integrated firms had to devise new strategies. That is the theme of the next section.

5 Consolidation and Alliance Strategy of the Japanese Integrated Firms

5.1 Domestic Reorganization Towards a 'Big Two'

5.1.1 Alliances Centred on Nippon Steel

Since the collapse of the Bubble Economy, integrated firms have screened profitable businesses by products and market segments. This effort by each company was the driving force of the alliance between Nippon Steel and Sumitomo Metals. Nisshin Steel partly federated this alliance.

In the late 1990s, not only H-beam but also stainless steel and seamless tube were the sources of deficit for integrated firms. They tried to adjust production volume and capacity of those products. In June 1999, Nippon Steel and Kyoei Seitetsu, an affiliated firm of Sumitomo Metals, agreed a bilateral OEM (Original Equipment Manufacturer) production regarding H-beam (Nippon Steel and Sumitomo Metals, *News Release* [*NR*], 17 June 1999). In 2000, Nippon Steel, Sumitomo Metals and Nisshin Steel formed an alliance on stainless and seamless tube (Nippon Steel and Sumitomo Metals, *NR*, 11 May 2000.). Sumitomo stopped its electric furnace for stainless steel at Wakayama Works, and Nippon Steel stopped its seamless tube facility at Yawata Works. At the same time, Nippon Steel and Nisshin agreed on a bilateral provision for stainless hot-coils.

The financial difficulty of Sumitomo Metals triggered further cooperation. In 2002, Nippon Steel agreed with Sumitomo to consolidate the stainless business and cooperate in the restructuring of Wakayama Works. Sumitomo stopped most sheet facilities at the Wakayama Works and concentrated sheet production at Kajima Works. The production shortfall that amounted to 500,000 tons was made up of OEM production by Nippon Steel (Nippon Steel and Sumitomo Metals, *NR*, 27 February, 13 June 2002, *Nikkan tekko shinbun,* 28 February, 1 March 2002). Moreover, in May 2003, Sumitomo Metals, Sumitomo Corporation and CSC signed an agreement that blast furnaces, basic-oxygen furnaces, and a slab casting machine in the Wakayama Works would be transferred under the control of tripartite joint venture (Sumitomo Metals, Sumitomo Corp. and CSC, *NR*, 14 May 2003).

On the other hand, the alliance between Nippon Steel and Kobe Steel proceeded without capacity closure because Kobe Steel had not produced the three problematic products. The first highlight of the alliance that was announced in December 2001 was the cooperative supply of slabs for Nakayama Steel Works, which had also marked the shutdown of its blast furnaces (Nippon Steel and Kobe Steel, *NR*, 4 December 2001, *Tekko ryutsu joho*, No. 81, 29 March 2002). Additionally, Nippon Steel, Sumitomo Metals, and Kobe Steel signed a cross-shareholding agreement in November 2002 (Nippon Steel, Sumitomo Metals and Kobe Steel, *NR*, 14 November 2002, Kobe Steel, *NR*, 20 December 2002).

Aside from those, the alliance between Nippon Steel and Aichi Steel, an electric mill in Toyota Group, is worthy of attention. They agreed on cooperation in development and production of specialty bar and wire rod for Toyota Motor (Nippon Steel and Aichi Steel, *NR,* 28 November 2000).

5.1.2 Consolidation between NKK and Kawasaki Steel

Like Nippon Steel and other firms, NKK and Kawasaki Steel had checked the profitability of their businesses product by product. As mentioned above, they supported H-beam production by affiliated electric mills. In addition, NKK spun off some pipe mills and their surface-treated sheets factory into separate companies. However, this was not sufficient for NKK and Kawasaki. In the face of depressed prices and aggressive behaviour by Nippon Steel in some market segments, executives of NKK and Kawasaki had an acute feeling that neither could be a countervailing power against Nippon Steel.

In December 1999, presidents of both companies began moves for business consolidation.[26] After the some steps towards cooperation and agreement, JFE Holdings was established in September 2002 for consolidation of the entire business between NKK and Kawasaki Steel. NKK and Kawasaki became JFE Holdings subsidiaries and the steel businesses of both subsidiaries were merged into JFE Steel in April 2003. It was the beginning of the 'Big Two'-era in the domestic market. Based on production volume in fiscal year 2001, JFE's share was 24.7 per cent for crude steel and 34.7 per cent for ordinary steel hot strip, whereas Nippon Steel's share was 25.6 per cent and 37.5 per cent, respectively (*Tekko ryutsu joho*, 86, 30 August 2002).

According to the agreement for consolidation, JFE Holdings controlled five business companies including JFE Steel, JFE Engineering, and others. Four integrated steelworks of NKK and Kawasaki were reorganized into East Works and West Works. JFE Steel had two integrated steelworks and one pipe plant. The synergetic effect was assumed to be 80 billion yen, which consisted of reducing overheads and related expenses, reducing procurement costs through volume discount and unified specifications, reducing costs of production, maintenance and logistics by optimized production allocation, saving capital expenditure through integrated programs and optimized utilization of common facilities, and more efficient R&D operations and exchange of technology and know-how (NKK and Kawasaki Steel, *NR,* 21 December 2001).

JFE Steel tried to optimize its operation and reduce some facilities. It has shut down one blast furnace at West Works and decided to shut down another blast furnace in East Works. In addition, a reorganization plan was launched, which included the integration of steelmaking and casting operations of stainless steel, and the closure of some facilities for sheets, sections, and welded pipes (NKK and Kawasaki Steel, *NR,* 9 May 2002). Total reduced capacity amounted to 3.5 million tons of pig iron and 1.8-2.3 million tons of steel products (*Nikkan tekko shinbun*, 13 May 2002). Additionally, JFE Steel consolidated many group companies.

5.2 Three Types of Global Alliance

From the latter 1990s to early 2000s, the Japanese integrated firms have formed many alliances with foreign steel producers. Those alliances are divided into three types.

5.2.1 Alliances for Transfer and Exchange of Technology

The first type is alliance for transfer and exchange of technology. Specifically, most alliances of that type were formed for cooperation in R&D of steel products for automobiles. For Japanese firms, it was not only for technical exchange but also for capturing new market.

Japanese automobile assemblers have expanded their production capacity in Europe. Hence, procurement of steel products became a challenge. Japanese automobile assemblers needed specified

sheets made by Japanese integrated steel firms. It was inefficient, however, to ship steel products from Japan to Europe. International alliance was a solution. For example, Nippon Steel aimed to supply its technology to Arcelor so that the company might supply specified products to Japanese affiliated automobile plants. The same was true of JFE Steel that was allied with Thyssen Krupp Steel AG.

Of course, integrated firms tried not only to keep traditional customers but to win new ones. As an example, European and American automobile assemblers use tailored blanks for the body panel. For that reason, European and American steel firms are superior to Japanese firms in this fabricating technology. Japanese integrated firms aimed to acquire those technologies, and supply fabricated products to European and American affiliated plants around the world (*Nikkan tekko shinbun,* 1 May 2002).

So far the result of this type of alliance is not clear. In view of the nature of the challenges involved, it will take some years to see any result.

5.2.2 Alliances for the Supply of Base Materials

This second type of alliance is for the stable supply of base materials, including slab and hot-coil from the Japanese integrated firm to foreign business partners. Japanese integrated firms have engaged in joint ventures in North America and East Asia. Huge investments in the integrated firms in North America had ended in failure (Chiba 2003), so that the business was concentrated in downstream processes like hot rolling, cold rolling, and galvanizing and tubing in both areas. Japanese integrated firms provided base materials not only to the joint ventures created under their own initiatives, but also to the existing local partners that have accepted capital participation from Japan.

Kawasaki Steel had pursued such alliances most aggressively. As NKK had followed this path, it became a strategy of JFE Steel. In 2002, Kawasaki Steel supplied 400,000 tons of slab and 300,000 tons of hot coil to Dongkuk Group in Korea, 500,000 tons of hot coil to Hyundai Hysco in Korea, and less than 100,000 tons of cold rolled sheets for tinplating to Hainan Haiwoo Tinplate Industry in China. In addition, it agreed to supply less than 100,000 tons of hot coils to Corinth Pipework in Greece in October 2002. Therefore, exports of base materials to business partners amounted to about 1.4 million tons, or 30 per cent of Kawasaki's total exports (*Nikkan tekko shinbun*, October 10 2002).

This type of alliance was also observed at other integrated firms. NKK, now a part of JFE, supplied hot-coils to Thai Cold Rolled Steel Sheet (TCRSS), which was a cold rolling joint venture in Thailand, and to Dongbu Steel in Korea. Sumitomo Metals agreed with CSC in Taiwan for a stable supply of slabs to its subsidiary, Yieh Loong Enterprises. Nippon Steel also supplied slabs to CSC. In addition, Nippon Steel was the biggest shareholder and major supplier of hot-coils to the Siam United Steel (SUS), which was a cold rolling joint venture in Thailand.

Exports of hot-coils to foreign partners amounted to at least 2.5 million tons based on published data, or about 30 per cent of total exports of hot-coil in fiscal year 2001.[27] This type of alliance is expected to bolster operating rates of upstream processes in Japan. Moreover, in ventures where the Japanese firms

engage in production and quality management, the upstream process in Japan, the downstream process in foreign countries, and processes at Japanese affiliated customers are managed strictly and integrally. This creates an international process linkage like the tied contracts among Japanese integrated firms, joint ventures, and customers. TCRSS and SUS in Thailand are such cases (Kawabata 2003).

5.2.3 Alliances for Stabilization

The third type of alliance is for market stabilization. Such a strategic alliance was signed between Nippon Steel and POSCO in August 2000. At first, cross purchasing of shares and studies about cooperation were agreed. Candidate areas for study included the R&D of fundamental technologies, joint ventures in developing countries, and IT (Nippon Steel, *NR*, 2 August 2000). After that, cooperation in electronic commerce and an overseas joint development program to secure raw materials were decided upon (Nippon Steel, *NR*, 3 September 2001). Akira Chihaya, president of Nippon Steel at that time, explained that investment to joint ventures should avoid waste destabilization due to fierce competition in Asia. An additional capital injection to SUS in 2001 was regarded as one result of the alliance.

Nippon Steel also has friendly relations with other top integrated firms in Asia. For example, Nippon Steel and Sumitomo Metals are cooperating with CSC about a stable supply of slab. Additionally, a new development in the alliance strategy was observed in July 2003. Nippon Steel and Baosteel agreed on the incorporation of a new joint venture-company in China. The new company will engage in cold rolling and galvanizing of sheet products for automobiles. Nippon Steel will provide technology and a percentage of hot coils. Nippon Steel has explained that the venture would not lead to cutthroat competition or the boomerang effect, because it would aim to meet the demand in China (Nippon Steel, *NR* 22 July 2003, *Nikkan tekko shinbun,* July 23 2003). This case not only has the character of alliance for stabilization, but also characteristics of the foregoing two types of alliance. It could become a touchstone for the future of alliance strategy.

5.3 Global Oligopoly or Global Competition?

Domestic and global reorganization of inter-firm relations was a response to the collapse of cooperative oligopoly and homogeneous competition. Those alliances can be classified by goal and scope.

From the former perspective, there are three goals of alliances. The first is economies of scale. That means cost reduction through large-scale production, procurement, and distribution. Additionally, sharing various kinds of utilities and indirect functions are important. The second is reinforcement of pricing power, which controls market supply. The third is reinforcement of relationships with large customers. It means a stable order with high prices. Of course, a stable order means a high operating rate and cost reduction. From the latter perspective, the point is whether the alliance is domestic or global.

A classification is shown in Figure 5. Economies of scale cannot be divided. Thus, there are five combinations of goal and scope. The question is whether the Japanese integrated firms can achieve their goals or not, and whether they get back oligopolistic power or not. The prospect of each combination is examined below.

1) [Economies of scale] The 'Big Two' structure will concentrate production of some products in efficient facilities. Additionally, economies of scale will be brought about in procurement, logistics, and marketing. From the perspective of plant location, JFE will have a simpler structure with two integrated steelworks and one pipe plant. On the contrary, Nippon Steel has five integrated steelworks, three semi-integrated steelworks, and two rolling plants. JFE has the advantage of being able to achieve economies of scale, but organizational unification will take some years. Because of this, the merit of JFE is partly offset.

2) [Reinforcement of pricing power in the domestic market] In the domestic market, Nippon Steel and JFE will be able to reinforce their pricing power in some measure. They will carry out implicit cooperative production adjustment. Concerning segments like H-beam, where only domestic players are competing, oligopolistic adjustment by the 'Big Two' may work. However, the 'Big Two' cannot control the behaviour of independent electric mills.

3) [Reinforcement of relationships with customers in the domestic market] Through business consolidation, JFE will acquire a wide range of products and sufficient capacity as a top supplier to big customers. Then JFE can vie with Nippon Steel in competition for big customers. However, competition in the domestic market means scrambling for a shrinking pie, most likely by price competition to maintain its operating rate. Thus, integrated firms are trying to fence in big customers with specified quality products and services. The alliance between Nippon Steel and Aichi Steel, and the VE and VA proposals represent such efforts. Besides these efforts, integrated firms are competing in developing the supply chain management systems for big customers (Nippon Steel, *NR,* 20 May 2002, NKK, *Press Release*, 13 November 2001, 3 July 2002).

4) [Reinforcement of pricing power in the global market] In the global market, cooperation in production and investment is not easy. In response to the growth of the Asian market, most producers are expanding their capacities. CSC has a plan to construct its second integrated steelworks. Baosteel and other major producers in China are building up cold rolling mills and galvanizing lines. As it is impossible to stop them, Japanese integrated firms are getting involved in those processes as equipment suppliers and business partners.

Alliances among top producers cannot control all competitive factors. For example, in South East Asia there are some hot-rolling capacities sitting idle because of over investment and a shrunken market. Those mills are biding their time to reach higher operations. Moreover, alliances cannot stop cheap exports from Russia and Ukraine.

Even if an association is formed among top Asian producers, it will not hold strong oligopolistic power to adjust production and investment.

Figure 5 Goals and Scopes of Alliances

Economies of Scale	1) +'Big 2' structure	
Reinforcement of Pricing Power	2)+'Big 2' structure	4)+Alliance between Nippon Steel and POSCO +Possible alliance between top producers in Asia
Reinforcement of Relationships with Customers	3)+Wide range product mix of JFE +VE and VA proposal +Development of specific products and services	5)+Supply of base materials to business partners +Alliances for transfer and exchange of technology
↑Goal *Scope→*	*Domestic Market*	*Global Market*

Source: The author.

5) [Reinforcement of relationships with customers in the global market] It takes a few years for the integrated companies to get anywhere from alliances for technology transfer with European and American firms. In contrast, exports of base materials to foreign partners have already contributed to maintaining the operating rate of upstream processes. However, this strategy has two weak points. One is vulnerability to the fluctuation of foreign exchange rates. The other is import substitution in developing countries. To overcome such weak points, the Japanese integrated firms should make international process linkages between upstream processes to customers.

As a whole, there is no guarantee that domestic and international alliances achieve their targets. Moreover, the oligopolistic effect of consolidations and alliances may be small in the global market, even though it can be observed on some level in the domestic market. Global competition will be unrelenting in the steel industry.

6 The Japanese Integrated Steel Firms in the Future

The Japanese integrated steel firms have taken various measures to meet the competitive pressure at home and abroad since the collapse of the Bubble Economy. The question is whether they have stopped or reversed the tendency to maturity.

As mentioned above, the Japanese integrated firms did not lose out to rivals in major market segments. Despite some technological conservatism, technology remains advanced. In short, competitiveness has been maintained since the burst of the Bubble Economy.

However, as stated previously, profit indicators of the Japanese integrated firms have not shown a good performance and their market value has fallen. Some earlier studies pointed out the tendency that technology and competitiveness of products did not automatically lead to profitability. That tendency has become more acute since the collapse of the Bubble Economy. This problem should not be underestimated, because the collapse of cooperative oligopoly led to a disparity of financial performance among integrated firms. Continual low profitability will make the investment in R&D and equipment difficult, which will weaken competitiveness.

Between 2002 and 2003, business improvement in Asia raised product prices and ensured profitable conditions in some market segments. However, this is merely one phase of the business cycle and so far there is no evidence that a structural factor resurrected prices.

Reorganizations of inter-firm relationships have some significance, but consolidations and alliances do not ensure corporate growth alone. Cost reduction by economies of scale may be temporary. Oligopoly based on economic concentration cannot be expected in global competition. Moreover, following the requirements of customers does not necessarily ensure profits for the integrated firms. What they need is a competitive strategy that utilizes the competitive capability in reorganized inter-firm relations.

There are two possible directions for such strategy. One is global cost leadership. To take cost leadership in a mature industry needs the creation of cost competitiveness formidable enough to rebuff latecomers in developing countries and the volatility of the international market. Radical process innovation is necessary to create such competitiveness. One candidate is SCOPE 21, which reduces the cost of environmental control; the other is DIOS and any related new ironmaking processes that can reduce the production cost by flexible operation. Strip casting can also simplify the production process. However, it is true that the effects of these new technologies remain uncertain and integrated firms cannot rely solely on them.

Global differentiation strategy is the second important direction. That means not simply focusing on high-class products. As experiences since the 1980s have shown, even high-class sheets in tied contract do not necessarily make thick profit margins. What is missing for the Japanese integrated firms is a business model that makes profit based on technological capability. Some alliances have the possibility of making new business models for differentiation. As for the alliances for transferring and exchanging technology, the aim is strategic utilization of intellectual property. Another aim is market creation by acquiring fabrication technology like forging parts, tailored blank, and hydraulic forming. As for the alliances for the supply of base materials, the aim is the creation of an integrated management system from base material to the customers for the high-class products. In each type of alliance, the integrated firms can make a global high-value chain that is not easily imitated by rival companies.

In conclusion, the Japanese integrated steel firms have maintained competitiveness since the collapse of the Bubble Economy. However, they have not made stable profits. In other words, they have not reversed the move towards maturity, although they have not reached a stage of decline. After the collapse of the domestic system of cooperative oligopoly and homogeneous competition, inter-firm relations were reorganized through consolidations and alliances at home and abroad. The future of the integrated firms depends on whether they can take advantage of their competitive capabilities in the new inter-firm relations.

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[1] There are two dominant production forms in the modern iron and steel industry: integrated steelworks and the electric mill. Integrated steelworks contains three major processes. In ironmaking, liquid pig iron is made from iron ore in the blast furnace. In steelmaking, pig iron is refined into steel in the basic oxygen furnace. And liquid steel is cast by a continuous casting machine into various kinds of semi-finished products like slab, billet, and bloom. In rolling, various rolling mills produce different shapes of steel product. The minimum efficient scale of the integrated steelworks is 3 million tons per year. Electric mills contain steelmaking and rolling processes. The steelmaking process of that mill is different from the integrated steelworks, because it refines scrap in an electric arc furnace. The minimum efficient scale of the electric mill is 300,000 tons per year.

'Integrated firm' means that the firm has integrated process. In the 1990s, eight integrated steel makers were in operation in Japan. Nippon Steel, NKK, Kawasaki Steel, Sumitomo Metals, and Kobe Steel were referred to as the 'Big 5'. Sometimes Nissin Steel was considered a member of the 'Big 6'. However, Nissin was usually differentiated from the 'Big 5', because it specialized in stainless steel production. Godo Steel and Nakayama Steel Works shut down their blast furnaces in the 1990s; and NKK and Kawasaki were consolidated in 2003.

[2] It is generally accepted that demand for one product passes through phases of growth, maturity, and decline. For a systematic analysis of maturity on the supply side, see Abernathy, Clark and Kantrow (1983).

[3] Steel intensity is measured by Kg crude steel consumption per thousand US Dollar of GDP. In 1998, it was 19.648 for Japan, 16.153 for the United States, 12.41 for the United Kingdom, 86.241 for Korea, 32.27 for Thailand, and 48.238 for Malaysia. The figures were calculated from International Iron and Steel Institute [IISI], *Steel Statistical Yearbook*, various years, and International Monetary Fund [IMF], *International Financial Statistics Yearbook*, various years.

[4] In this paper, ASEAN 5 includes Singapore, Malaysia, Philippines, Thailand, and Indonesia. ASEAN 6 includes ASEAN 5 and Vietnam.

[5] Data on China is from JISF. On other countries, see South East Asia Iron and Steel Institute [SEAISI], *Steel Statistical Yearbook*, various years.

[6] There are many studies of the decline of American integrated firms. For a detailed analysis, see Kawabata (1995a), Adams (1995).

[7] Hot-coil means the coiled hot-rolled wide strip.

[8] *Shinnittetsu gaido* [*Basic Facts about Nippon Steel*], 1992, Nippon Steel Corporation: 75. *Tekkokai* [*Steel World*], May 2002, JISF: 19. Original data from *Metal Bulletin.* Crude steel production of affiliated firms is included in 2001data.

[9] *Steel Market Statistics*, OECD, December 2001, available on OECD website, http://www.oecd.org/home/ (Browsed in August 2003). In this paper, capacity means annual capacity.

[10] On R&D expenditure, see Statistics Bureau, Management and Coordination Agency, Government of Japan, *Report on the Survey of Research and Development*, various editions.

[11] Report by Makoto Kihara, vice-president of Nippon Steel. Nihon Keizai Chosa Kyogikai (2002): 162.

[12] JISF (1999): 314. *Tekko nenkan* [*Steel Almanac*] 2001, Tekko Shinbun Sha: 161. Total enrollment minus the number of workers on loan, full-time union officers, and long-term absentees equals working employees.

[13] In the next section, externalization to the affiliated electric mills will be described.

[14] Data from JISF. The author could not acquire the original data. It was quoted from Sozai Sangyo Kozo Mondai Kenkyu Kai (1999).

[15] Calculated from JISF, *Tekko gyo no anzen kanri gaikyo, Nenkan rodo saigai tokei chosa kekka* [*Annual Statistical Survey of Occupational Injury*], and *Tekko nenkan*, various years.

[16] Estimated from *Tekko tokei yoran* 2001: 80. Orders for steel dealers are considered as selling at a store.

[17] *Kikan tetsu no sekai* [*Quarterly Journal of Steel World*], 100, January 1997, 7. In Japan, electrical tariffs at the daytime rate during the weekdays are too high for electric mills to operate.

[18] Nikkei sangyo shinbun ed., *Shijo senyu ritsu* [*Market Share Almanac*], Nihon Keizai Shinbun Sha, various years.

[19] On this process, see 'H katako senryaku: Shin Nihon Seitetsu vs. Tokyo Seitetsu [H-beam Strategy: Nippon Steel vs. Tokyo Steel 1-11]', *Kikan tetsu no sekai*, 102-12, August 1997- February 2000.

[20] *Tekko tokei yoran*, 2001: 80-1. The latter numerical value includes the orders to non-integrated firms.

[21] For example, see the speech by Kazuo Sudo, President of Kawasaki Steel at that time, for new employees in fiscal year 2002. It is on JFE Steel Website, http://www.jfe-holdings.co.jp/ (Browsed in August 2003).

[22] Calculated from *Tekko tokei yoran,* various years. All prices are per metric ton.
[23] Interview with the staff of JISEA, Marketing Committee.
[24] Calculated from *Tekko nenkan*, 1991, *Tekko ryutsu joho*, 86, August 30 2002. Sumitomo Metals (Naoetsu) and Sumitomo Metals (Kokura) are included in Sumitomo Metals. Other affiliated companies are not included.
[25] Tekko Gyo no Kyosoryoku Kyoka to Syorai Tenbo Kenkyukai (2001): Annex 17. Non-integrated steel firms are included in this data.
[26] Kanji Emoto, president of Kawasaki Steel at that time, acknowledged that Nissan's 'Revival Plan' was a trigger for this contact. Yoichi Shimogaichi, president of NKK at that time, however, claimed that he had thought about initiating countervailing power against Nippon Steel from the start of fiscal year 1999. *Kikan tetsu no sekai*: 122-3, September 2002: 12, 16.
[27] Estimated from various published data.