Recent Trends and Price-Cost Margins in Japan's Iron and Steel Industry

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Abstract

This paper investigates the sources of profitability changes in Japan's iron and steel industry during 1980-1999 by decomposing the price-cost margin into value added factor, intermediate materials factor, and labor factor.

The first major finding is that price-cost margins in Japan's iron and steel industry in the 1980s increased mainly due to the positive contribution of value added, and it decreased in the 1990s mainly due to its negative contribution. It also should be noted that this negative effect was larger with the five major steel makers (Nippon Steel, NKK, Kawasaki Steel, Sumitomo Metal Industries, and Kobe Steel), which was accompanied with a decline of their value added share in Japan's iron and steel industry. The second, when the growth rate of total sales were decomposed into price and quantity factors in both domestic and export markets, the decrease of the domestic price factor turned out the major cause to reduce total sales in the 1990s. The decrease of export price factor also reduced total sales, whereas export quantity factor had effects to increase total sales. However, those export factors were very small compared with the negative domestic price factor. Considering those findings and the fall of domestic steel prices in the 1990s, Japan's iron and steel industry might have less market power with more competitive product markets than expected.

Contents

1. Introduction

Since archiving the peak level of 119 million ton in 1973, the production of crude steel in Japan has kept the level of nearly 100 million. However, the share of Japan's iron and steel industry to the total value added or labor force declined. Its share of the total exports also declined after the two times of the oil shocks. Therefore, in 1970's, Japan's iron and steel industry switched from the scale enlargement policy after the war to a production structure with energy-saving and input-saving technological innovations.[1] And since the yen appreciation following to the Plaza Agreement in 1985, and especially in the Heisei recession after the economic boom of the Bubble Economy broke, Japan's iron and steel industry has been making efforts to prevent reduction in profitability and to improve production efficiency through employee reductions and disposals of excessive facilities and equipments. As a result, Japan's iron and steel industry has coped with the change of the economic surroundings through changing its production structure.

Turning to the market structure, an iron and steel industry is regarded as an oligopolistic market of products, because it is a process industry with large fixed costs. And there was an evidence to show that the product market of Japan's iron and steel industry was imperfect competition, as reflected in estimates of markup rate, namely, the ratio of price over marginal cost, by Nishumura, Ohkusa, and Ariga (1999) from 1971 to 1994 and Shirai (2000) from 1962 to 1984. However, Japan's iron and steel industry recently has been confronted by difficulties of sharp declines of steel prices since the burst of the Bubble Economy, and the decline of steel prices was relatively larger than the overall deflation of the Japanese economy during the Heisei Recession. This tendency is reflected partly in the growing competition between major domestic steel makers with blast furnaces and smaller domestic makers without blast furnaces, and furthermore, in the competition among major domestic steel makers themselves. Therefore, in recent years, there is a possibility that Japan's iron and steel industry has been losing its market power in product markets because of an increasing domestic competition.

In past two decades, Japan's iron and steel industry has been making efforts to prevent reduced profitability through improvement of production efficiency by adjustments of production structure, such as energy-saving and input-saving technological innovations and employee reductions. On the other hand, recent declining prices of steel products reduce profitability. When profitability is measured

[1] Technological progress and substitution of energies were the one of the major topics at that time, for instance, in Kitasaka (1992).

with the price-cost margin (defined as profit rate per cost in monetary basis), changes of production structure and market structure could affect this price-cost margin. For instance, a restructuring of production process raises price-cost margin through a reduction of variable costs, whereas a fall in prices decreases it. [2]

Thus, the purpose of this paper is to investigate the sources of profitability changes in Japan's iron and steel industry, by decomposing price-cost margin into value added factor, intermediate materials factor, and labor factor from 1981 to 1999. Rather than investigating price-setting strategies of steel makers, we examine recent trends of price-cost margin and the effect of overall market power changes and cost structural changes in Japan's iron and steel industry.

The remainder of this paper is organized as follows. Section 2 overviews the recent trends of Japan's iron and steel industry, and especially focuses on the recent decline of steel prices. Section 3 describes the data used. Section 4 investigates price-cost margin in Japan's iron and steel industry with aggregated industrial classification, and its decomposition. Using the same methodology in section 4, section 5 investigates them in Japan's iron and steel sub-industries with more disaggregated industrial classification. Finally, some concluding remarks are offered in Section 6.

2. Overview of Japan's Iron and Steel Industry

Recent Trends

Table 1 indicates recent trends for Japan's iron and steel industry. As the economic boom (the Bubble economy) since the late 1980s ended in the early 1990s and Japan's economy plunged into Heisei Recession, all indices of gross output, value added and employment in Japan's steel industry decreased from the early 1990s to 2000. The shares of steel industry for value added and labor force also decreased during this period. On the other hand, labor productivity (measured by value added per employee) and compensation per employee increased, reflecting the 35 percent employment reduction from the beginning to the end of the 1990s. Rising wage rate and an reduced employment resulted in slightly increased share of wages and salaries to value added. The share of operating surplus to value added decreased as far as both shares of wages and salaries and depreciation increased. Concerning the trade of steel, exports

[2] Odagiri and Yamashita (1987) analyzed the determinants of markup rate (measured by price over average variable cost) in Japan's manufacturing industries, mainly focusing on the relationship between business cycle and markup rate. In other words, Odagiri and Yamashita (1987) concerned the effect of market structure on the price-cost margin.

increased in the late 1990s and 2000, compared with the low levels in the economic boom of the early 1990s, and then has been stable. Japan's imports of steel have been very small, about 20 to 30 percent of its exports.

Table 2 shows the value of Japan's exports by commodity and destination. Exports of all steel (SITC 67) mainly went to Asian countries (China, Korea, and Taiwan), and their amount increased by 2000. Exports to the United Sates was the second largest, however, the amount tend to decrease in 2000. Among steel products, universals, plats, sheets (SITC 674) accounted for roughly 60 percent of the all steel exports, with large part of it going to Asia (more than 80 percent, except in 1998 after the Asian crisis). The export share of tubes, pipes, fittings (SITC 678) to all steel products was the second largest, however, its share to the all steel exports declined 26 percent from 1990 to 1992 to 14 percent in 2000. And the export share of pig iron and other primary steels (SITC 671 and 672) to the all steel products were very low.

The value of Japan's imports is shown in Table 3. Japan's import of all steel (SITC 67) was mainly from Asian countries, especially from Korea. And import share from Asian countries increased from 58 percent in 1990-1992 to 72 percent in 2002, mainly due to the increase of imports from China. By commodity, universals, plates, sheets (SITC 674) accounted for almost half of all imports, mainly from Korea. The imports of pig iron, sponge iron, etc. (SITC 671) account for almost 30 percent of all imports, and Japan increased its import from China during the periods, whereas imports from Europe decreased.

<<< Insert Table 1,2,3 >>>

A Fall in the Steel Prices

Since the end of the economic boom in the late 1980s, the Japanese economy turned into a recession, and it has been experiencing price deflation, as overall wholesale price index for all commodities declined (as shown in Figure 1). Overall wholesale price index for steel products increased higher than for all commodities during the economic boom, but it decreased rapidly during the 1990s by 20 percent. A sharp decline of steel prices in the 1990s is partly due to an increase of imports, especially during the economic boom. However, they slightly decreased in the late 1990s (Table 3). Thus, there may be other reasons to explain the fall in steel prices in the 1990s.

<<< Insert Figure 1 >>>

The fall in the price of steel products in the 1990s may have been caused partly by a severe competition among domestic steel makers. Figure 2 indicates shares of

sales, value added, and variable costs (the sum of intermediate materials and compensation of employees) for the five major integrated steel makers[3] to the total of Japan's iron and steel industry during 1986 to 1999.[4] The share of sales for the five major steel makers has been stable from 40 to 50 percent during the period, and similar trend is observed for the share of variable costs. However, the share of value added for the five major steel makers declined from 54 percent in 1986 to 35 percent in 1999. This indicates the decreasing market power for the five major steel makers, which may be one of the causes of falling prices in steel products.

<<< Insert Figure 2 >>>

One reason is the increased domestic competition between major integrated steel makers with blast furnaces and relatively smaller steel makers with electric furnaces. According to Itami and Itami's Office (1997), steel makers with electric furnaces has smaller scale with simple facilities, which allows them to produce steel products with less cost compared with major integrated steel makers. It was also suggested that it was easier for steel makers with electric furnaces to enter into the steel markets because of less fixed costs compared with the existing major integrated makers (ibid.). Thus, the quantity share of crude steel produced with electric furnaces to the total production increased from 32 percent in 1980 to 44-50 percent in the 1990s.[5]

Furthermore, domestic competition among major steel makers is also expected to be another reason of the recent fall in the steel prices in Japan. Japan's major users of steel products purchased those products dispersedly from several major steel makers shown in Table 4 (Itami and Itami's Office, 1997). Because of this type of market structure, Ministry of Economy, Trade and Industry (2001) indicated that the bargaining power of the major steel users was relatively strong in Japan.[6]

<<< Insert Table 4 >>>

3. The Data

Turning to the data used in this paper, price-cost margin in Japan's iron and steel industry is analyzed with four kinds of database, namely, (1) Input-Output Tables,

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[3] It will be called the five major steel makers afterward, including Nippon Steel, NKK, Kawasaki Steel, Sumitomo Metal Industries, and Kobe Steel.

[4] Those shares are measured with the data for the five major steel makers from the Committee for Iron and Steel Statistics (various years) divided by the aggregated data in the iron and steel industry in Financial Statement Statistics of Corporations from Ministry of Finance (several issues).

[5] See Ministry of International Trade and Industry (MITI, several issues, c).

[6] These low prices of steel products is causing great concerns in Japan's iron and steel industry, and there is an opinion that the consolidation of Kawasaki Steel and NKK is expected to raise bargaining power of steel makers.

(2) Census of Manufactures, (3) Financial Statement Statistics of Corporations, and (4) the summary financial reports of the five major steel makers (Nippon Steel, NKK, Kawasaki Steel, Sumitomo Metal Industries, and Kobe Steel). First, Input-Output Tables are annual databases published by Ministry of Economy, Trade and Industry (several issues, a), which are estimated on the basis of Input-Output Tables published by the Management and Coordination Agency every five years. This data provides consistent data for domestic demand and exports. However, its weak point is they are estimates, rather than census. Second, Census of Manufactures published by Ministry of Economy, Trade and Industry (several issues, b), in turn, is an aggregated data of census for establishments. Third, Financial Statement Statistics of Corporations is an aggregate financial data, compiled by the Ministry of Finance. And finally, we use the summary of financial reports for the five major steel makers in Handbook for Iron and Steel Statistics compiled by Committee on Iron and Steel Statistics (several issues). The third database is convenient to contrast the performance of the five major steel makers in the fourth database with the whole Japan's iron and steel industry.

Table 5 summarizes the performance of Japan's iron and steel industry in 1999 with breakdown of those databases, and makes comparison with other official data. Three major points are notable. First, value added of Input-Output Tables and Census of Manufactures cover more than 90 percent of the one published by national accounts (Annual Report on National Statistics). Exports in Input-Output Tables also cover 90 percent of the one in the Summary Report on Trade of Japan (Japan Tariff Association, several issues). Second, the ratio of intermediate materials to output is 58 percent with Census of Manufactures, which is lower than 73-78 percent with other databases. Similarly, the ratio of compensation of employees to value added is 32 percent with Census of Manufactures, and also is lower than 47-50 percent with other databases. This difference is because the Census of Manufactures counts intermediate materials and compensation only in production process, whereas other three databases include them not only in production process, but also non-production process, such as sales management costs. Third, from this table, the five major steel makers account for 40 percent of total sales and 35 percent of value added in Japan's iron and steel industry.

<<< Insert Table 5 >>>

Japan's iron and steel industry had already started to make efforts to cut down costs since the oil shock in 1972, mainly by improvements in production process and energy-saving technologies. And after the strong yen in 1985, the industry implemented additional cost reductions by means of labor cuts and disposals of excessive facilities and equipments. Figure 3-1 shows that the ratio of intermediate

materials to total sales for Japan's iron and steel industry decreased sharply before and after 1985. Figure 3-2 also shows the ratio of compensation to total sales. There seem no trends in spite of fluctuations since the mid 1980s. When wage rate was increasing during the period, Japan's iron and steel industry kept labor cost share constant by a personnel reduction[7]. As already shown in Table 1, the number of employees in the industry decreased by 35 percent in the 1990s. And since the late 1990s, further restructuring has been carried on, and the ratio of compensation to total sales tend to decrease, especially with the five major steel makers (Figure 3-2).

<<< Insert Figure 3-1 and 3-2 >>>

4. Price-cost Margin in Japan's Iron and Steel Industry

Price-cost Margin in Japan's Iron and Steel Industry

In this analysis, price-cost margin (*PCM*) is defined as follows,

$$PCM \equiv \frac{VA - WB}{M + WB},$$

where *VA*, *M*, and *WB* denote the amounts of value added, intermediate materials, and compensation of employees, respectively. It should be noted that the price-cost margin in this definition indicates price over average variable cost minus one, or in other word, profit rate per cost in monetary basis. [8]

Using this definition, price-cost margins are calculated across industries in the Japanese manufacturing sector in 1990 and 1999. As shown in Figure 4, the price-cost margin in Japan's iron and steel industry was 0.26 in 1990, which was not too high compared with other industries (the ninth smallest out of 13 industries), and it decreased sharply to 0.16 in 1999, becoming the twelfth smallest across industries[9].

<<< Insert Figure 4 >>>

Figure 5 shows trends of price-cost margins in Japan's iron and steel industry during 1980-2000, which were from the four databases.[10] The price-cost margins in the Census of Manufactures have two major peculiarities. First, they are 0.25 to 0.45, which is higher than in other databases (0.12 to 0.27). As mentioned above, this is because the data in the Census of Manufactures includes variable costs only under

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[7] See Itami and Itami's Office (1997).

[8] For an estimation of price-cost margin in Japan's iron and steel industry defined as price over marginal cost (markup rate) minus one, see Matsuoka (2002).

[9] The data is taken from Input-Output Tables published by Ministry of Economy, Trade and Industry (several issues, a).

[10] Data of each database are deflated with wholesale price index of all commodities from Price Indexes Annual (Bank of Japan, several issues), which makes it possible to obtain effects of changes of prices in the iron and steel industry by removing general effects of changes of prices.

production process, whereas other databases include variable costs under both production and non-production processes. Second, the price-cost margins for other three databases continued to decline in 1990s (after reaching to the peak levels at 0.23 to 0.27 in 1988), to the levels of 0.14 to 0.17 in 1999, reflecting the following recession. On the other hand, the price-cost margin in Census of Manufactures also declined, but only slightly compared with other three databases (from 0.45 in 1988 to 0.40 in 1999). From this point of difference, there is a probability that a burden of variable costs under non-production process, not those under production process, may cause the decline of price-cost margin of Japan's iron and steel industry in the 1990s. This point will be discussed later in the analysis of a decomposition of the growth rate of price-cost margins.

However, there is a common feature for trends of the price-cost margins with those databases in Figure 5. The price-cost margins started to rise sharply from 1986, when the economic boom started after the recession caused by a strong yen, and reached to the peak in 1988. After the peaks, they continued to decline during 1990s, though its decline in Census of Manufactures was slow compared with other databases. That is, price-cost margin rises during prosperity and decreases during recession in Japan's iron and steel industry. This tendency is consistent with the results of Odagiri (2001) and Nishimura, et al (1999), suggesting that the price-cost margin is procyclical in Japan.[11]

<<< Insert Figure 5 >>>

Factor Decomposition of Price-cost Margin

From the definition mentioned above, the price-cost margin changes under the influences of both the changes of total sales coming from market conditions and the changes of variable costs. Thus, it is possible to investigate the causes of changes of the price-cost margin from 1980 to 1999 by decomposing into three factors as follows;

$$\frac{\Delta PCM}{PCM} = \frac{\Delta VA}{(VA - WB)} - \frac{\Delta M}{(M + WB)} - \left(\frac{1}{(VA - WB)} + \frac{1}{(M + WB)} \right) \cdot \Delta WB ,$$

where ΔX indicates a first difference of variable X. The first term of the decomposition formula denotes the value added factor, the second term is the intermediate materials factor, and the third term is the labor factor.

[11] Odagiri (2001) also suggests price-cost margin may decrease during a recession in industries with large fixed costs because of excessive competition of price cut. Furthermore, he suggested that the Japanese large companies try to keep output quantity by decreasing prices to secure their employment.

As already discussed, the price-cost margin in Japan's iron and steel industry rose during the economic boom and declined thereafter. Thus, it is important to compare the changes of the price-cost margin and their factor decompositions (value added factor, intermediate materials factor, and labor factor) between the 1980s and the 1990s. Table 6 shows period averages for the growth rates of the price-cost margin and each of the factor decompositions. Though they are calculated with four different databases, they have two common points. First, the growth rates of price-cost margin during 1981-1990 were positive about 0.6 to 6.8 percent per year in period average, however, they turned into negative (ranging from 0 to -3.2 percent) during 1991-1999. Second, the price-cost margins increased during 1981-1990, mainly due to the large positive contribution of value added, whereas, the intermediate materials factor and the labor factor had negative effects. However, the price-cost margins decreased during 1991-1999 because of the large negative contribution of value added, which exceeded the positive contribution of the intermediate materials factor and the labor factor.

It is interesting to note the three points below when the decomposition results for growth rates of the price-cost margin are compared among those databases. First, the period average of the negative contribution of value added for the five major steel makers during 1991-1999 was relatively larger, with -9.3 percent than other databases. As already discussed in Figure 2, the share of value added for the five major steel makers to the total of the iron and steel industry declined since 1986. Thus, the large negative contribution of value added to the price-cost margin for the five major steel makers are related to their reduced market power. Second, in the five major steel makers, the positive contribution of labor during 1991-1999 was relatively larger with 5.2 percent points compared with other databases (0.7 to 1.8 percent points). The five major steel makers have been the first to reduce labor force since the 1980, and the total number of employee reduced from 169,000 in 1986, to 92,000 in 1995, and then to 61,000 in 2000 (Committee on Iron and Steel Statistics, several issues), and their ratio of compensation decreased rapidly (as shown in Figure 3-2).[12] Such a restructuring of the production structure induced the positive effects on the price-cost margin. Third, the positive contribution of intermediate materials factor for Census of Manufactures during 1991-1999 was 3.4 percent points and larger than those for other three databases (1.3 to 2.6 percent points). As already pointed out in Figure 5, higher levels of the price-cost margin in Census of Manufactures compared with other databases was caused partly by an inclusion of intermediate materials costs in both production and

[12] See also The Japan Steel and Iron Federation (1999).

non-production process (such as sales management costs), in the other databases, whereas Census of Manufactures includes costs only in production process. Thus, it is possible that costs of non-production process is the one of the causes to reduce the price-cost margin in Japan's iron and steel industry in the 1990s, though intermediate materials are used relatively efficiently in production process.

<<< Insert Table 6 >>>

Decomposition of Total Sales

Factor decomposition of the price-cost margin in the previous section indicates that price-cost margin decreased much more in the 1990s than in the 1980s, mainly due to the large negative contribution of value added. As far as the contribution of intermediate materials and labor to the price-cost margin turned to be positive in the 1990s from the negative in the 1980s, the large negative contribution of value added is mainly caused by the decrease of total sales. As already shown in Figure 6, steel exports decreased sharply after 1985, which leaded to sharp decline of total sales. After that, total sales recovered during the economic boom in the late 1980s, and it decreased again in the following recession of the 1990s. However, exports remained stable after it decreased.

<<< Insert Figure 6 >>>

Therefore, the growth rate of total sales (*SL*) is decomposed into four factors of domestic steel price, domestic sales quantity, export steel price, and export quantity, as follows;

$$\frac{\Delta SL}{SL} = s_D \cdot \frac{\Delta P_D}{P_D} + s_D \cdot \frac{\Delta Y_D}{Y_D} + s_X \cdot \frac{\Delta P_X}{P_X} + s_X \cdot \frac{\Delta Y_X}{Y_X},$$

where, SL, P_D, Y_D, P_X, and Y_X denote total sales, domestic price, domestic sales quantity, export price, and export quantities, respectively, and s_D denotes the share of domestic sales to the total sales, and s_X as the share of exports to the total sales ($s_D \equiv \frac{P_D \cdot Y_D}{SL} = 1 - s_X$). Each of the first two terms in the formula indicates the contribution to the change of total sales of domestic prices, and domestic sales quantity, and the sum of these two factors interprets the domestic demand factor. Similarly, each of the third and forth term indicates the contribution to the change of total sales of export prices, and export quantity, with the sum of them interpreting the export factor.

The growth rates of the domestic price and export price are taken from the domestic wholesale price index and export price index of iron and steel industry (Bank of Japan, several issues). The growth rate of domestic sales quantity (or export

quantity) is obtained by subtracting the growth rate of domestic price (or export price) from the growth rate of domestic sales value (or export value) taken from Input-Output Table Ministry of Economy, Trade and Industry (several issues). Input-Output Table is used to decompose total sales because it contains consistent data of domestic demand and exports.[13]

According to the decomposition method, Table 7 shows results of decomposition for the growth rates of total sales in period average of the 1980s and the 1990s in Japan's iron and steel industry. During 1981-1990, the growth rate of total sales in period average is 0.79 percent per year with the domestic demand factor as 1.18 percent points and the export factor as -0.38 percent points. This indicates that the positive domestic demand factor in period average exceeded the negative export factor, contributing to increase total sales. After 1985, a strong yen reduced exports, and triggered a short-term recession, but the economy started to recover due to the economic stimulus policy, leading to the economic boom from the late 1980s to the early 1990s. In addition, total sales grew in 1980s mainly due to the positive contribution of the domestic demand quantity (1.24 percent point in period average). Furthermore, the negative contribution of exports was almost the same magnitude between export price factor and export quantity factor (-0.18 percent points and -0.20 percent points, respectively). On the other hand, during 1991-1999, the growth rate of total sales in period average is -2.46 percent, due to the negative contribution of both domestic demand and exports factors (-2.33 percent points and -0.13 percent points, respectively). However, the negative contribution of the domestic demand was very large, reflecting the ongoing recession.

Compared with the 1980s, the first to remark is that the negative contribution of domestic prices became the most major cause of the negative growth of total sales in 1990s, with -1.49 percent points. Second, exports had negative contribution to the growth of total sales during both the 1980s and the 1990s. With a detailed decomposition, however, the export quantity factor turned to contribute positively to the change of total sales with 0.17 percent points during 1991-1999 from -0.2 percent points during 1981-1990. The export price factor remained negative during the two periods. However, it must be noted that negative domestic demand factor, especially the domestic price factor, causes the large part of the reduction of total sales in 1990s.

<<< Insert Table 7 >>>

[13] Domestic demand in this analysis is calculated by subtracting export value from total sales value.

5. Price-cost Margin in Japan's Iron and Steel Sub-industry

So far the study of price-cost margin in Japan's iron and steel industry was based on the aggregated classification with several databases. This section expands the analysis into the iron and steel sub-industry with disaggregated classification, using Input-Output Table by Ministry of Economy, Trade and Industry (several issues, a), because Census of Manufactures, another candidate, uses a unique industrial classification to the iron and steel industry in accordance with manufacturing process or facilities.[14] Those sub-industries in this analysis are pig iron and crude steel, hot rolled steel, steel pipes and tubes, and cold rolled and coated steel.

Table 8 shows the performance of these sub-industries in 1980, 1990, and 1999. The industry share of value added for pig iron, hot rolled steel, and cold rolled and coated steel have been between 20 to 24 percent, except for hot rolled steel in 1990 due to the economic boom. The share of value added for steel pipes decreased from 11 percent in 1980 to about 5 percent in the 1990s, corresponding to the decline of the industry share of export from 28 percent in 1980 to 16 percent in 1999. The industry shares of exports are large in hot rolled steel and cold rolled steel, and its share for steel and pipes declined, as its export ratio to total sales decreased.

<<< Insert Table 8 >>>

Price-cost Margin in the Iron and Steel Sub-industry

Similar with Figure 5, Figure 7 shows trends of price-cost margins in the iron and steel sub-industry calculated during 1980-1999.[15] Price-cost margin of pig iron and crude steel increased from the level of 0.1 in the early 1980s to 0.24 in 1987 when the economic boom started, then after it, it kept about 0.2 before decreasing a little after 1998. Price-cost margin of hot rolled steel also increased sharply from less than about 0.1 in the early 1980s to more than 0.25 during the economic boom, however it decreased to about 0.15 the 1990s. On the other hand, the price-cost margin of steel pipes and tubes, which had the highest export ratio to total sales among these sub-industries (Table 8), kept about 0.20 to 0.25 before falling to 0.15 since 1996. The price-cost margin of cold rolled and coated steel was the highest among them in the

[14] Census of Manufactures published by Ministry of Economy, Trade and Industry (several issues, b) also releases the data with a disaggregated industrial classification in accordance with Japan Standard Industrial Classification, except iron and steel industry. They adopts a unique disaggregated industrial classification to iron and steel industry in accordance with manufacturing process or facilities, for instance, "steel industry with blast furnaces," "steel industry without blast furnaces," "steel mills," "steel makers without steel mills," and so on.

[15] Similar with Figure 5, data are deflated with overall wholesale price index of all commodities to remove the overall effect of the deflation.

1980s, however it tended to decrease since the early 1980s before increasing since 1996.

<<< Insert Figure 7 >>>

Factor Decomposition of Price-cost Margin in the Iron and Steel Sub-industry

Similar with a methodology of the decomposition of the growth rate of price-cost margin in Table 6 with aggregated classification of the iron and steel industry, the growth rates of the price-cost margin in the iron and steel sub-industry are decomposed into the value added factor, the intermediate materials factor, and the labor factor. Table 9 shows the decomposition results of the price-cost margin in each of sub-industry from 1981-1990 and 1991-1999. They were similar to the results with the more aggregated classification shown in Table 6. The growth rates of price-cost margin during 1981 to 1990 were positive, ranging from 0.0 to 15.3 percent per year in period average, mainly due to the large positive contribution of value added (6.7 to 19.6 percent points), except steel pipes and tubes. However, they turned to be negative about -1.3 to -3.7 percent points during 1991-1999, because of the large negative contribution of value added (-2.7 to -12.2 percent points). The effects of the intermediate materials factor and the labor factor to the price-cost margin vary across sub-industries in 1981-1990, however, they tend to have positive contribution in 1991-1999.

<<< Insert Table 9 >>>

Decomposition of Total Sales in the Iron and Steel Sub-industry

The previous results in the sub-industries shows again that the major cause to reduce price-cost margins in the 1990s was a decrease of value added. Therefore, we decompose the total sales in each of sub-industry into four factors of domestic price, domestic sales quantity, export price, and export quantity with the similar methodology described in the previous section, and the results are shown in Table 10.

During 1981 to 1990, growth rate of total sales varied from -0.19 to 2.4 percent per year, however, domestic demand factors had positive effect to increase total sales (1.6 to 2.8 percent points), reflecting the economic boom, except pig iron and crude steel. And export factors had negative effects with -0.4 to -2.3 percent points, because of the strong yen. Then negative effect of export factors was especially large in steel pipes and tubes, which export ratio to the total sales was the highest.

Compared with the 1980s, total sales decreased during 1991 to 1999 mainly due to the decline of the domestic price factor in all of the iron and steel sub-industries. The export price factors were all negative and the export quantity factors were positive,

however, their contributions were very small compared with the domestic factors. Similar with the results with more aggregated classification of the iron and steel industry, the fall of domestic steel prices in each of sub-industry was the major cause of reduced total sales during 1990s.

<<< Insert Table 10 >>>

6. Conclusion

The purpose of this paper is to investigate the sources of the profitability changes in Japan's iron and steel industry, by decomposing the price-cost margin into value added factor, intermediate materials factor, and labor factor during 1980 to1999.

The first major finding is that price-cost margins in Japan's iron and steel industry increased in the 1980s mainly due to the positive contribution of value added, and decreased in the 1990s mainly due to its negative contribution. This tendency was observed in a large industrial classification with several databases. The large negative contributions of value added in the 1990s are also observed in the iron and steel sub-industries with more disaggregated classification. It also should be noted that this negative effect was larger with the five major steel makers (Nippon Steel, NKK, Kawasaki Steel, Sumitomo Metal Industries, and Kobe Steel), which was accompanied with a decline of their value added share in Japan's iron and steel industry. The second, when the growth rate of total sales were decomposed into the factors of domestic price, domestic quantity, export price, and export quantity, the decrease of domestic price factor was the major cause to reduce total sales in the 1990s. The decrease of export price factor also reduced total sales, whereas export quantity factor increased total sales. However, those export factors were very small compared with the negative domestic price factor. Considering those findings and the fall of domestic steel prices in the 1990s, Japan's iron and steel industry might have less market power with more competitive product markets than expected.

This paper also compares the decomposition of the growth rate of price-cost margin with several databases. In Census of Manufactures, the decline of the price-cost margin in the 1990s was slow as compared with other databases, and also the positive contribution of intermediate materials was larger than in other databases. When it is considered that costs of intermediate materials in Census of Manufactures don't include non-production process, this may suggest that costs of intermediate materials under non-production process (such as sales management costs), increase variable costs and lead to decreased profitability, whereas variable costs under production process are used more efficiently.

This analysis focuses on examining recent trends of price-cost margin and the effect of overall market power changes and cost structural changes, and tries to find the facts in Japan's iron and steel industry through its factor decomposition. However, there are several tasks to be considered. First, this paper finds that price-cost margin in the 1990s declined mainly due to the reduced value added, which is related with the fall of domestic steel prices. This may be due to the recession in 1990s, as former literature on Japan's case suggests that the price-cost margins tend to be procyclical. This should be investigated, as well as the hypothesis of price setting strategies for Japan's steel makers. In addition the, analysis with the firm-level data is also required. The second, it is interesting to analyze the relationship between the price-cost margin and exports by Japanese producers to verify the recent allegations about the dumping of steel products.

Reference

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Table 1: Basic Indicators for Japan's Steel Industry

Indicator	1990-1992	1993-1996	1997	1998	1999	2000	2001
Gross Output							
Billion current US$	116.682	121.115	107.711	87.548	88.019	#N/A	#N/A
Trillion current yen	15.783	12.561	13.032	11.461	10.026	#N/A	#N/A
Trillion 1995 yen	13.859	12.443	12.865	11.647	10.863	#N/A	#N/A
Value Added							
Billion US$	53.218	57.902	50.561	37.549	41.421	48.851	#N/A
Trillion current yen	7.181	6.002	6.117	4.916	4.718	5.265	#N/A
- % of GDP	1.55	1.21	1.17	0.95	0.92	1.03	#N/A
Trillion 1995 yen	6.350	5.970	6.277	5.063	5.068	5.792	#N/A
- % of GDP	1.34	1.20	1.20	0.98	0.97	1.08	#N/A
Employment							
Number	305,000	261,000	230,000	226,000	208,000	197,000	#N/A
- % of total	1.29	1.11	0.99	0.97	0.82	0.79	#N/A
Value Added/Employee							
Current US$	174,497	222,836	219,831	166,148	199,141	247,976	#N/A
Thousand current yen	23,544	23,070	26,597	21,750	22,684	26,724	#N/A
Thousand 1995 yen	20,820	22,992	27,291	22,403	24,367	29,399	#N/A
Compensation/Employee							
Current US$	44,826	62,536	56,719	50,585	59,627	#N/A	#N/A
Thousand current yen	6,046	6,477	6,862	6,622	6,792	#N/A	#N/A
Shares of Value Added in Percent							
Wages & salaries	26.39	30.86	28.47	29.70	31.71	#N/A	#N/A
Depreciation	13.09	16.10	15.19	16.22	16.90	#N/A	#N/A
Other operating surplus	60.52	53.05	56.33	54.09	51.39	#N/A	#N/A
Exports (value from Stats Canada, quantity from OECD)							
Billion current US$	13.608	15.838	16.446	15.493	14.178	15.792	#N/A
- % of Gross Output	11.66	13.08	15.27	17.70	16.11	#N/A	#N/A
Quantity 1995=100	notyet	97.969	102.410	120.871	123.402	127.469	133.360
Implicit Price 1995=100	notyet	93.304	90.585	72.304	64.808	69.885	#N/A
Imports (value from Stats Canada, quantity from OECD)							
Billion current US$	4.339	4.487	4.239	2.981	3.043	3.728	#N/A
- % of Gross Output	3.72	3.70	3.94	3.41	3.46	#N/A	#N/A
Quantity 1995=100	97.869	83.719	81.592	56.536	54.971	65.805	51.561
Implicit Price 1995=100	77.304	96.890	89.946	91.300	95.846	98.101	#N/A

Sources: METI (several issues,b); Ministry of Labor (several issues); Bank of Japan (several issues); OECD (2001, 2002); Statistics Canada (2002); International Monetary Fund (2002).

Table 2: The Value of Japan's Steel Exports by Commodity and Destination (US$ millions)

Indicator	1990-1992	1993-1996	1997	1998	1999	2000	2001
All Steel (SITC 67)	13,608	15,838	16,446	15,493	14,178	15,792	#N/A
Asia	9,301	12,086	12,363	9,490	10,528	12,186	#N/A
China	1,388	2,425	1,955	1,621	1,882	2,445	#N/A
Korea	1,410	1,886	2,115	1,235	1,980	2,657	#N/A
Taiwan	1,450	1,720	1,611	1,473	1,413	1,458	#N/A
Europe	676	646	680	923	604	542	#N/A
North America	2,388	1,907	2,086	3,724	1,914	1,753	#N/A
U.S.A.	2,218	1,751	1,922	3,387	1,699	1,483	#N/A
Pig iron, sponge iron, etc. (SITC 671)	63	219	259	434	402	369	#N/A
Asia	41	172	205	326	348	321	#N/A
China	2	6	8	8	19	22	#N/A
Korea	18	71	89	166	170	123	#N/A
Taiwan	9	62	79	104	122	148	#N/A
Europe	5	6	21	6	8	16	#N/A
North America	16	37	27	87	40	29	#N/A
U.S.A.	16	37	27	87	40	29	#N/A
Ingots, primary forms, etc. (SITC 672)	54	236	171	268	408	358	#N/A
Asia	52	131	148	200	260	240	#N/A
China	7	9	5	12	38	40	#N/A
Korea	12	65	97	34	84	108	#N/A
Taiwan	28	52	33	117	90	47	#N/A
Europe	1	1	1	19	51	37	#N/A
North America	2	104	22	48	97	81	#N/A
U.S.A.	2	103	22	48	82	81	#N/A
Bars, rods, angles, shapes (SITC 673)	1,516	1,897	1,904	1,926	1,566	1,668	#N/A
Asia	1,114	1,521	1,486	1,106	1,142	1,267	#N/A
China	70	247	168	170	134	120	#N/A
Korea	209	303	357	191	303	350	#N/A
Taiwan	354	341	274	229	176	187	#N/A
Europe	58	64	67	78	52	57	#N/A
North America	288	263	299	671	320	303	#N/A
U.S.A.	264	245	282	637	295	242	#N/A
Universals, plates, sheets (SITC 674)	8,043	9,772	10,244	9,021	8,747	10,575	#N/A
Asia	5,856	8,115	8,358	5,962	6,998	8,762	#N/A
China	812	1,670	1,444	1,030	1,398	1,968	#N/A
Korea	936	1,151	1,308	699	1,242	1,847	#N/A
Taiwan	878	1,060	998	819	845	890	#N/A
Europe	217	196	156	238	213	225	#N/A
North America	1,395	877	1,013	1,934	792	597	#N/A
U.S.A.	1,326	803	957	1,771	697	491	#N/A
Tubes, pipes, fittings (SITC 678)	3,507	3,168	3,315	3,324	2,528	2,248	#N/A
Asia	2,053	1,870	1,895	1,691	1,522	1,313	#N/A
China	484	442	292	364	240	230	#N/A
Korea	203	247	218	126	148	190	#N/A
Taiwan	142	156	171	162	132	141	#N/A
Europe	372	352	408	550	244	170	#N/A
North America	532	452	496	727	456	518	#N/A
U.S.A.	475	404	441	623	398	436	#N/A

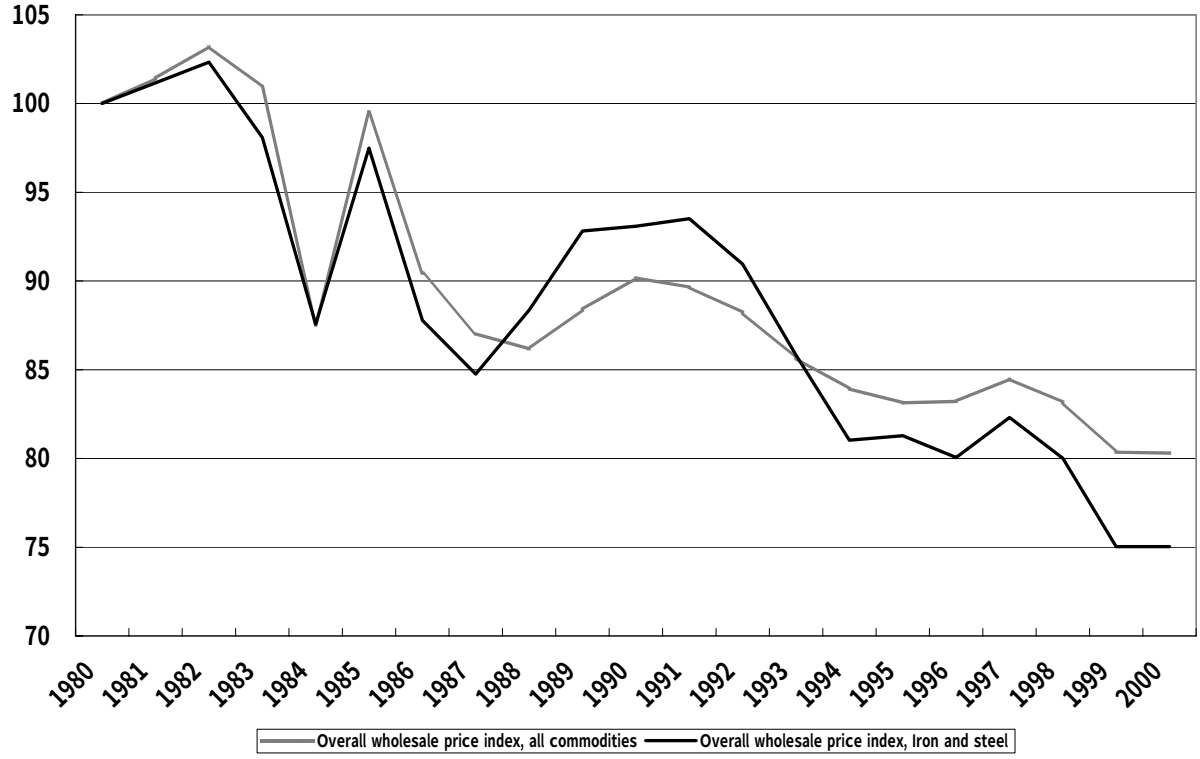
Source: Statistics Canada (2002).

Table 3: The Value of Japan's Steel Imports by Commodity and Source (US$ millions)

Indicator	1990-1992	1993-1996	1997	1998	1999	2000	2001
All Steel (SITC 67)	4,339	4,487	4,239	2,981	3,043	3,728	#N/A
Asia	2,507	2,926	3,030	2,253	2,104	2,699	#N/A
China	341	648	819	592	477	763	#N/A
Korea	1,495	1,557	1,521	1,155	1,101	1,291	#N/A
Taiwan	347	408	458	356	372	438	#N/A
Europe	455	357	266	193	165	208	#N/A
North America	235	168	161	133	130	193	#N/A
U.S.A.	222	163	153	127	125	185	#N/A
Pig iron, sponge iron, etc. (SITC 671)	1,193	1,288	1,146	725	882	1,136	#N/A
Asia	297	503	470	293	255	460	#N/A
China	203	403	382	240	213	389	#N/A
Korea	1	2	14	10	5	11	#N/A
Taiwan	1	0	0	1	1	0	#N/A
Europe	159	102	58	43	32	37	#N/A
North America	30	46	78	62	62	69	#N/A
U.S.A.	26	44	73	59	60	64	#N/A
Ingots, primary forms, etc. (SITC 672)	227	201	139	69	81	64	#N/A
Asia	104	109	111	57	29	52	#N/A
China	6	35	54	50	28	49	#N/A
Korea	44	38	57	5	1	2	#N/A
Taiwan	4	26	0	0	0	0	#N/A
Europe	21	20	13	7	5	8	#N/A
North America	22	4	6	5	5	1	#N/A
U.S.A.	15	4	6	5	5	1	#N/A
Bars, rods, angles, shapes (SITC 673)	343	221	128	94	89	107	#N/A
Asia	205	154	89	67	70	81	#N/A
China	21	9	5	2	1	3	#N/A
Korea	139	100	60	53	54	61	#N/A
Taiwan	6	3	4	4	8	7	#N/A
Europe	57	26	29	18	11	15	#N/A
North America	16	11	9	8	7	11	#N/A
U.S.A.	16	9	8	7	6	9	#N/A
Universals, plates, sheets (SITC 674)	2,093	2,124	2,054	1,442	1,382	1,658	#N/A
Asia	1,509	1,648	1,728	1,305	1,244	1,507	#N/A
China	69	92	164	103	77	128	#N/A
Korea	1,064	1,164	1,135	882	830	983	#N/A
Taiwan	278	316	389	303	317	371	#N/A
Europe	180	136	89	56	65	84	#N/A
North America	120	46	13	11	10	18	#N/A
U.S.A.	119	46	12	10	10	17	#N/A
Tubes, pipes, fittings (SITC 678)	303	355	372	298	281	400	#N/A
Asia	242	267	292	228	222	287	#N/A
China	22	35	56	55	46	69	#N/A
Korea	152	131	117	80	82	99	#N/A
Taiwan	32	31	36	28	24	34	#N/A
Europe	22	40	48	34	22	33	#N/A
North America	38	47	31	35	36	78	#N/A
U.S.A.	38	47	31	35	35	78	#N/A

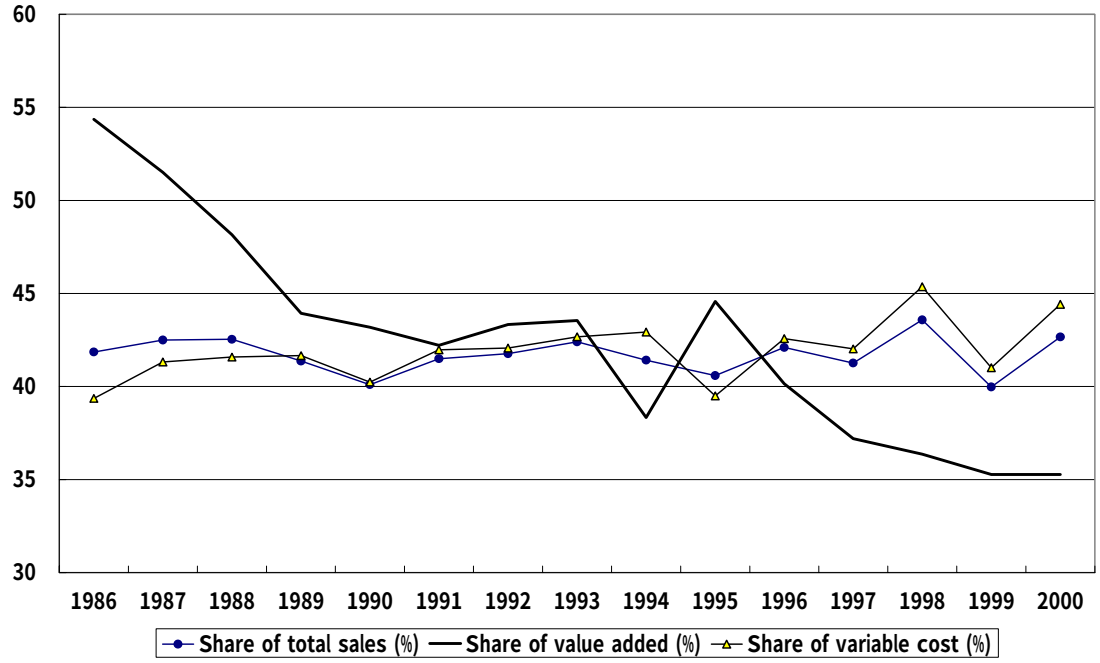
Source: Statistics Canada (2002).

Figure 1: Japan's whole sales price index of all commodities, and iron and steel (1980=100)



Source: Bank of Japan (several issues)

Figure 2: The share of the five major steel makers in Japan's iron and steel industry



Source: Committee on Iron and Steel Statistics (several issues), and Ministry of Finance (several issues)
Note: The five major steel makers include Nippon Steel, NKK, Kawasaki Steel, Sumitomo Metal Industries, and Kobe Steel.

Table 4: Shares of steel products purchased by major Japanese users from major steel makers

(%)

	Toyota Motor Corp.	Nissan Motor Co., Ltd	Mitsubishi Motors Corp.	Matsushita Electric Industrial Co., Ltd.	Mitsubishi Electric Corp.	Mitsubishi Heavy Industries, Ltd.*	Hitachi Zosen Corp.*
Nippon Steel Corp.	40	31	36	56	40	38	47
NKK Corp.	23	22	10	6	22	14	-**
Kawasaki Steel Corp.	5	23	40	7	11	20	27
Sumitomo Metal Industries, Ltd.	15	15	4	21	21	11	22
Kobe Steel, Ltd.	10	8	3	4	2	17	4
Nisshin Steel Co., Ltd.	7	1	7	4	1	-	-
Others	-	-	-	2	3	-	-
Purchased Quantity (Monthly average, ton)	280,000	105,000	84,000	2,700	12,000	23,100	14,600

Source: Table 6-5 in Itami and Itami's Office (1997)

Note: Data with "*" are in 1992, otherwise in the second half of 1992. "-**" means negligible.

Table 5: Major performances of Japan's iron and steel industry with several databases in 1999

(Million of yen)

	Input-Output Tables	Census of Manufactures	Financial Statements Statistics of Corporations (A)	The five major steel makers (B)	B/A (%)	Annual Report on National Statistics	The Summary Report on Trade of Japan	Year Book of Labor Statistics
Total sales (or output)*	16,288,675	10,026,219	13,295,527	5,314,900	40.0	---	---	---
Value added	4,361,188	4,200,522	3,510,865	1,238,372	35.3	4,718,300	---	---
Intermediate materials	11,927,487	5,768,648	9,784,662	4,076,528	41.7	---	---	---
Compensation	2,111,029	1,331,910	1,647,192	611,214	37.1	---	---	---
Exports	1,415,592	---	---	---	---	---	1,533,471	---
Number of employees (persons)	---	196,097	277,840	61,792	22.2			208,000
Ratio of intermediate materials to total sales (%)	73.2	57.5	73.6	76.7	---	---	---	---
Ratio of compensation to value added (%)	48.4	31.7	46.9	49.4	---	---	---	---
Source	(a)	(b)	(c)	(d)		(e)	(f)	(g)

Source: Author's calculation from several databases as follows;
(a) Ministry of Economy, Trade and Industry (several issues,a),
(b) Ministry of Economy, Trade and Industry (several issues,b),
(c) Ministry of Finance (several issues),
(d) The data of the five major steel makers are referred as Handbook for Iron and Steel Statistics by Committee on Iron and Steel Statistics (several issues).
(e) Economic Planning Agency (2000),
(f) Japan Tariff Association (several issues),
(g) Ministry of Labor (2000).
Note: * indicates output rather than total sales for Input-Output Tables and Census of Manufactures.

Figure 3-1: The ratio of intermediate materials to total sales (%)

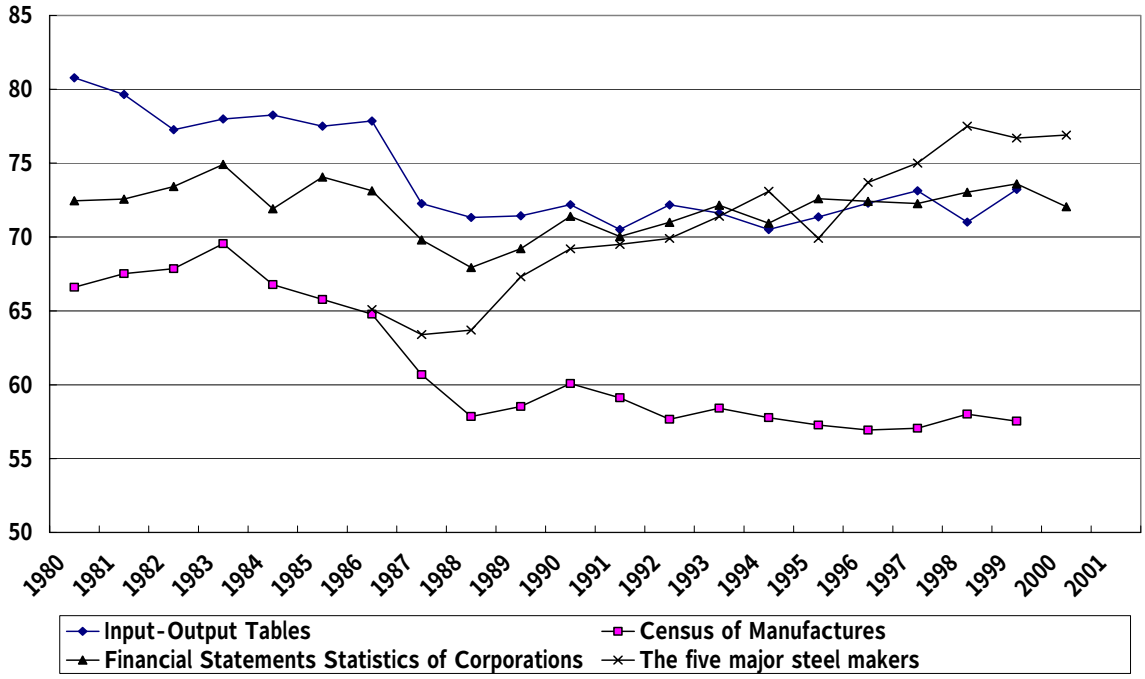
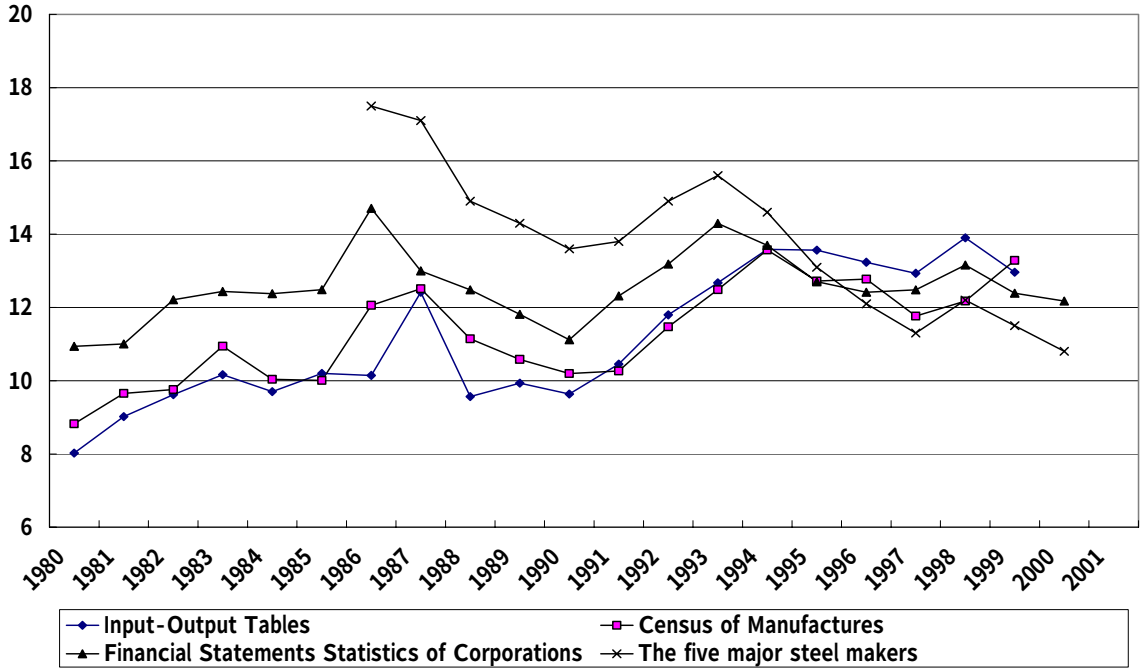
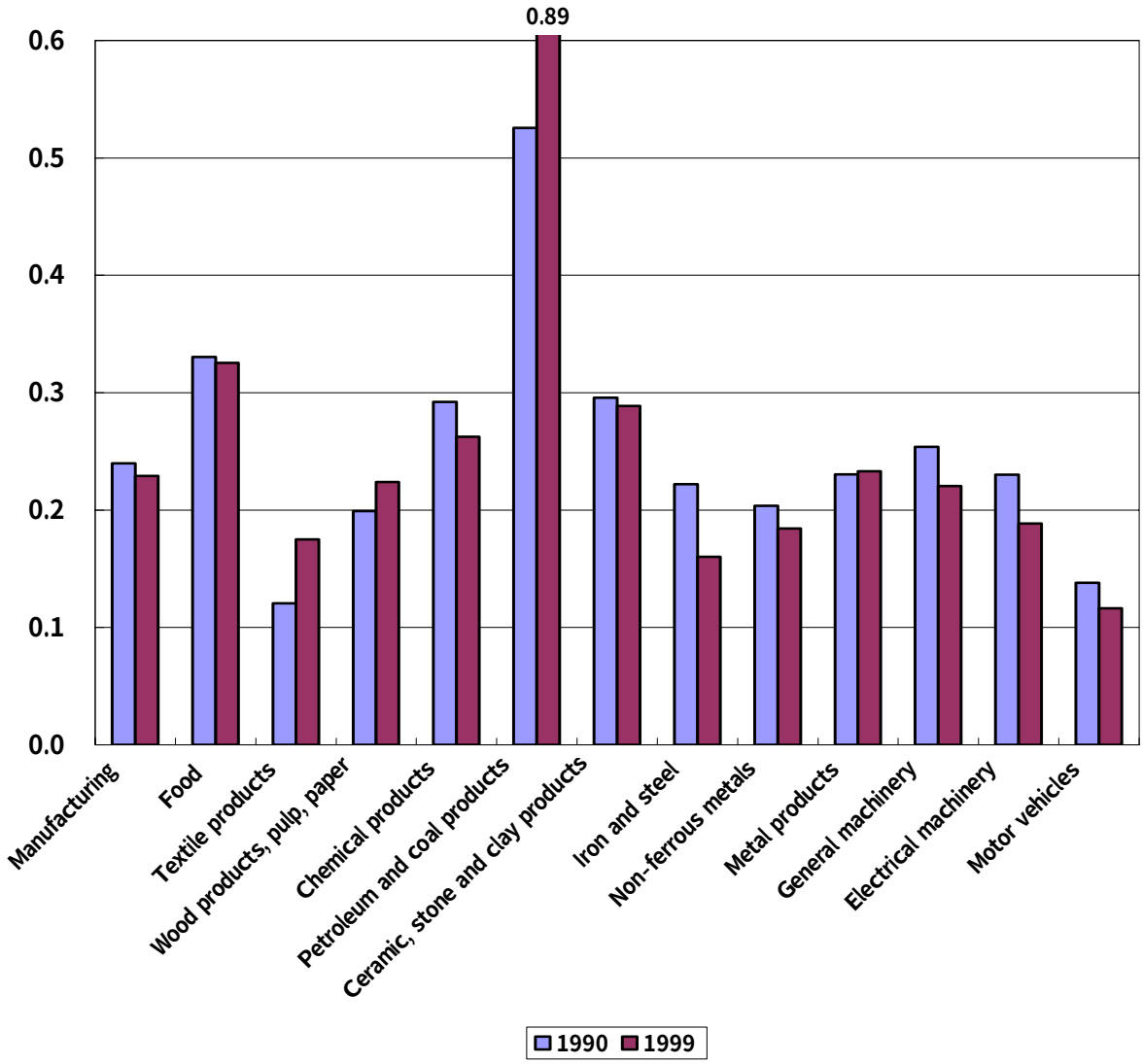


Figure 3-2: The ratio of compensation to total sales (%)



Source: The same with source (a) to (d) in Table 5.

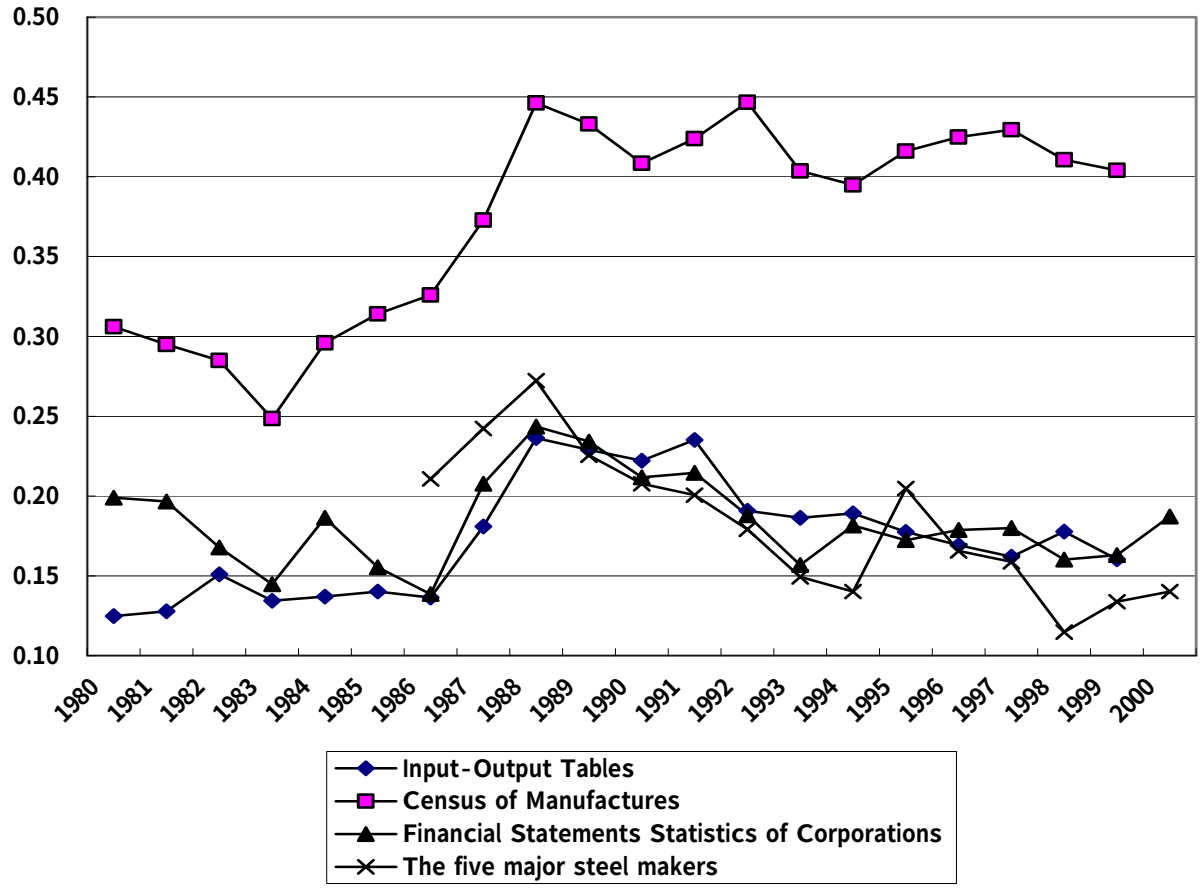
Figure 4: Price cost margins of Japan's major industries in 1990 and 1999



Source: Author's calculation from Input-Output Tables by Ministry of Economy, Trade and Industry (several issues,a).

Note: Price-cost margin (PCM) is calculated as PCM = (VA - WB) / (M + WB), where VA, WB, and M denote value added, compensation, and intermediate materials.

Figure 5: Price-cost margins of Japan's iron and steel industry with several databases



Source: Author's calculation from source (a) to (d) in Table 5.

Table 6: Decomposition of the growth of price-cost margins in Japan's iron and steel industry with several databases

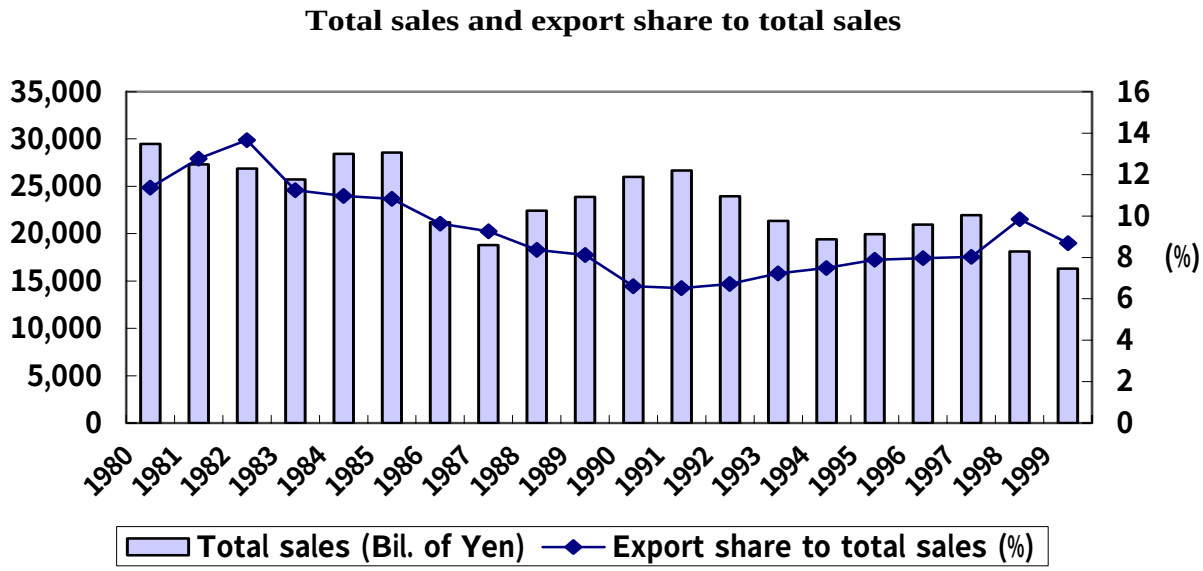
(Period average, %)

	1981-1990*	1991-1999
Input-Output Tables		
Growth rate of Price-cost margin	**6.8**	**-3.2**
Value added	8.2	-7.3
Intermediate materials	-0.5	2.6
Labor	-0.8	1.5
Census of Manufactures		
Growth rate of Price-cost margin	**3.5**	**0.0**
Value added	5.6	-4.1
Intermediate materials	-0.9	3.4
Labor	-1.3	0.7
Financial Statements Statistics of Corporations		
Growth rate of Price-cost margin	**2.5**	**-2.4**
Value added	7.0	-5.5
Intermediate materials	-2.8	1.3
Labor	-1.6	1.8
The five major steel makers		
Growth rate of Price-cost margin	**0.6**	**-2.8**
Value added	6.2	-9.3
Intermediate materials	-6.3	1.3
Labor	0.7	5.2

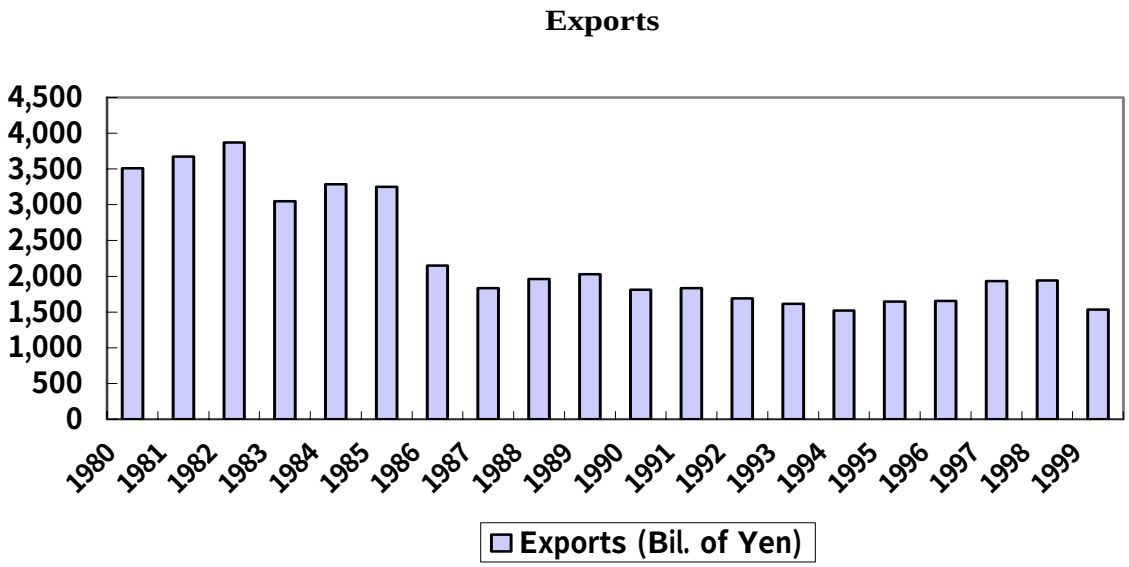
Source: Author's calculation from source (a) to (d) in Table 5.

Note: Period of the data for the five major steel makers in "*" is 1986-1990.

Figure 6: Total sales, exort share to total sales, and exports in Japan's iron and steel industry



Source: Ministry of Economy,Trade and Industry (several issues,a).



Source: Japan Tariff Association (several issues).

Table 7: Decomposition of the growth of total sales in Japan's iron and steel industry

(Period average, %)

	1981-1990	1991-1999
Growth rate of total sales	**0.8**	**-2.5**
Domestic demand	**1.2**	**-2.3**
Price	-0.1	-1.5
Quantity	1.2	-0.8
Export	**-0.4**	**-0.1**
Price	-0.2	-0.3
Quantity	-0.2	0.2

Source: Author's calculation from Ministry of Economy,Trade and Industry (several issues,a).

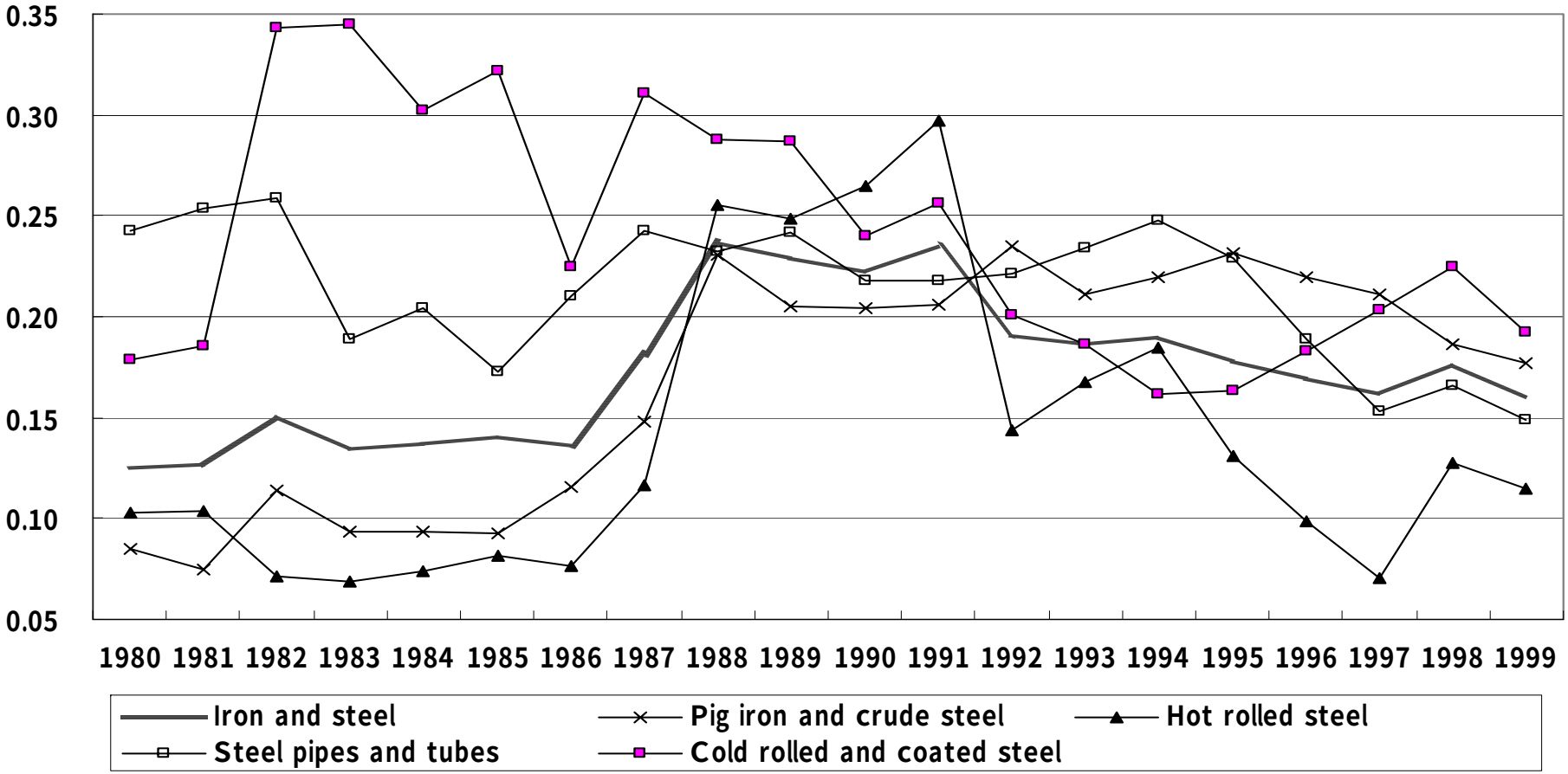
Table 8: Performances in Japan's iron and steel sub-industries

	1980	Industry share (%)	1990	Industry share (%)	1999	Industry share (%)
Value added (million yen)						
Iron and steel	**5,077,359**	100.0	**7,232,563**	100.0	**4,894,774**	100.0
Pig iron and crude steel	1,182,369	23.3	1,503,327	20.8	1,159,915	23.7
Hot rolled steel	1,161,335	22.9	2,120,096	29.3	992,861	20.3
Steel pipes and tubes	574,473	11.3	461,905	6.4	256,229	5.2
Cold rolled and coated steel	1,031,213	20.3	1,429,261	19.8	1,115,658	22.8
Others	1,127,969	22.2	1,717,974	23.8	1,370,111	28.0
Intermediate materials (million yen)						
Iron and steel	**21,469,735**	100.0	**18,773,487**	100.0	**13,386,799**	100.0
Pig iron and crude steel	8,064,647	37.6	5,053,487	26.9	3,882,774	29.0
Hot rolled steel	6,439,864	30.0	5,656,291	30.1	3,938,341	29.4
Steel pipes and tubes	1,426,147	6.6	1,094,220	5.8	607,022	4.5
Cold rolled and coated steel	3,206,311	14.9	3,639,654	19.4	2,775,661	20.7
Others	2,332,767	10.9	3,329,835	17.7	2,183,001	16.3
Compensation (million yen)						
Iron and steel	**2,132,953**	100.0	**2,506,434**	100.0	**2,369,311**	100.0
Pig iron and crude steel	460,988	21.6	391,327	15.6	402,346	17.0
Hot rolled steel	450,874	21.1	490,529	19.6	486,352	20.5
Steel pipes and tubes	184,111	8.6	183,259	7.3	144,551	6.1
Cold rolled and coated steel	389,890	18.3	449,143	17.9	488,597	20.6
Others	647,089	30.3	992,176	39.6	847,465	35.8
Exports (million yen)						
Iron and steel	**3,022,254**	100.0	**1,719,698**	100.0	**1,589,380**	100.0
Pig iron and crude steel	32,864	1.1	15,109	0.9	75,416	4.7
Hot rolled steel	1,122,876	37.2	541,666	31.5	621,319	39.1
Steel pipes and tubes	856,113	28.3	397,174	23.1	252,591	15.9
Cold rolled and coated steel	979,985	32.4	740,007	43.0	623,466	39.2
Others	30,417	1.0	25,742	1.5	16,588	1.0
Export ratio to total sales (%)						
Iron and steel	11.4	---	6.6	---	8.7	---
Pig iron and crude steel	0.4	---	0.2	---	1.5	---
Hot rolled steel	14.8	---	7.0	---	12.6	---
Steel pipes and tubes	42.8	---	25.5	---	29.3	---
Cold rolled and coated steel	23.1	---	14.6	---	16.0	---
Others	1.6	---	1.0	---	0.9	---

Source: Ministry of Economy, Trade and Industry (several issues,a)

Note: Those data are in real basis with overall wholesale price index by Bank of Japan (several issues).

Figure 7: Price-cost margins in Japan's iron and steel sub-industries



Source: Author's calculation from Ministry of Economy, Trade and Industry (several issues,a)

Table 9: Decomposition of the growth of price-cost margins in Japan's iron and steel sub-industries

(Period average, %)

	1981-1990*	1991-1999
Pig iron and crude steel		
Growth rate of price-cost margin	**11.9**	**-1.3**
Value added	6.7	-2.7
Intermediate materials	3.8	1.9
Labor	1.4	-0.5
Hot rolled steel		
Growth rate of Price-cost margin	**15.3**	**-2.7**
Value added	19.6	-8.3
Intermediate materials	-2.2	5.2
Labor	-2.1	0.4
Steel pipes and tubes		
Growth rate of price-cost margin	**0.0**	**-3.7**
Value added	0.0	-12.2
Intermediate materials	0.2	5.0
Labor	-0.2	3.5
Cold rolled and coated steel		
Growth rate of price-cost margin	**6.8**	**-1.7**
Value added	8.1	-4.1
Intermediate materials	0.5	2.4
Labor	-1.8	0.0

Source: Author's calculation from Ministry of Economy, Trade and Industry (several issues,a).

Table 10: Decomposition of the growth of total sales in Japan's iron and steel sub-industries

(Period average, %)

	1981-1990	1991-1999
Pig iron and crude steel		
Growth rate of total sales	**-1.9**	**-2.2**
Domestic demand	**-1.9**	**-2.3**
Price	-1.2	-3.0
Quantity	-0.7	0.7
Export	**0.0**	**0.1**
Price	0.0	0.0
Quantity	0.0	0.1
Hot rolled steel		
Growth rate of total sales	**1.8**	**-4.7**
Domestic demand	**2.6**	**-4.8**
Price	0.2	-4.1
Quantity	2.4	-0.7
Export	**-0.8**	**0.1**
Price	-0.4	-0.4
Quantity	-0.4	0.5
Steel pipes and tubes		
Growth rate of total sales	**-0.7**	**-6.0**
Domestic demand	**1.6**	**-4.7**
Price	-0.7	-2.6
Quantity	2.2	-2.0
Export	**-2.3**	**-1.3**
Price	-2.2	-1.5
Quantity	-0.1	0.2
Cold rolled and coated steel		
Growth rate of total sales	**2.4**	**-2.8**
Domestic demand	**2.8**	**-2.5**
Price	0.7	-3.1
Quantity	2.1	0.7
Export	**-0.4**	**-0.3**
Price	-0.4	-0.4
Quantity	0.0	0.2

Source: Author's calculation from Ministry of Economy, Trade and Industry (several issues,a).