# Why Did Japan's Steel Industry Contract So Much in the 1990s?

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**Abstract**

Between 1990 and 1999, the value of steel shipments and value added measured in current prices fell 38 percent and 32 percent, respectively. A large portion of the decline can be accounted for by the 19 percent fall in steel prices during the period and real production thus fell much more slowly, but the number of employees also declined by 28 percent during the period. This study decomposes the growth of sales in several dimensions, first showing that declines in intermediate material costs and the operating surplus or profits accounted for the large portions of falling steel production in most years, but that falling labor costs have become more important in recent years. Second, declines in domestic demand components, both price and quantity, account for much larger proportions of the decline in steel production than do declines in exports. Third, declines in domestic sales of hot-rolled steel, cold-rolled steel, and crude steel, as well as declines in production of blast furnace products, rolled products, and steel materials were also relatively large compared to declines in other product categories.

## 1. Introduction

Between 1990 and 1999, the value of shipments and value added in Japan's steel plants fell 38 percent and 32 percent, respectively, if measured in measured in current prices. A large portion of the decline can be accounted for by the 19 percent fall in steel prices during the period and real production thus fell much more slowly (Table 1). However, the number of employees also declined relatively rapidly, 28 percent, during the period. These declines have largely paralleled the sharp deceleration in Japanese economic growth from 1992 forward, and reduced domestic demand for steel is closely related to the overall decline in aggregate demand in this period. Another cause of reduced steel demand is the fact that Japanese industries have gradually reduced their dependence on steel as an intermediate good. The purpose of this paper is to examine the large changes that this contraction caused in Japan's steel industry and several of the causes of those changes.

The following section of the paper first summarizes major trends in production, employment, trade and related indicators in more detail, highlighting the declines described above and their major economic causes. Section 3 then compares estimates of production, employment, and trade from three major data sources, input-output tables, manufacturing censuses, and corporation statistics, highlighting important differences among these sources. Subsequently, sections 4-6 use these three sources and a few others to decompose the decline of steel production into three different types of components, cost and profit components (e.g., intermediate materials, depreciation, labor, and the operating surplus or profits), price and quantity components of exports and domestic sales, and product components of exports and domestic sales. Finally, section 7 provides a summary of the major patterns observed and their implications for the future of Japan's steel industry.

## 2. An Overview of Production, Employment, and Trade

As indicated above, the most outstanding characteristic of Japan's steel industry in the 1990s was the rapid rate at which production and employment declined in the industry. One of the major causes of these declines was the marked slowdown in overall economic growth after 1992.[1] However, the decline of steel production surpassed the decline of production in general. This is illustrated by the decline in the ratio of value added in the steel to total value added or gross domestic product (GDP), measured in current prices, from an average of 1.6 percent in 1980-1991 to an average of 1.0 percent in 1999-2001 (Table 1). The relatively rapid decline in steel prices was one reason that the share in current prices fell so rapidly and this is illustrated by the slower decline in the share when measured in constant 1995 prices, from an average 1.3 percent in 1986-1991, which was higher than the 1.1 percent average in 1980-1985, to an average of 1.0 percent in 1999-2001. The production data thus indicate that steel production fell at a relatively slow rate after 1991 relative to total production in the economy. In some contrast, if the industry's size relative to the Japanese economy is measured in terms of employment, it fell relatively rapidly in the 1980s and much more slowly in the 1990s, from an average of 0.7 percent of the total in 1980-1985 to 0.5 percent in 1990-1996 and 0.4 percent in 1997-2001.

Trends in value added, which is an alternative measure of production equal to shipments less intermediate production, were similar to trends in shipments after the mid-1980s. Consequently, value added per worker in current yen, the most common measure of average labor productivity, increased markedly in the late 1980s, but then remained relatively constant at 19.9-22.5 million yen all years after 1990, except 1993-1994 (18.5-19.2 million). Here again, the rapid declines of steel prices in the 1990s means that real labor productivity continued to rise during this period if real productivity is calculated using a steel price deflator. Even if measured

[1] The growth rate of real GDP fell from between 3.0 and 6.5 percent in 1986-1991 to 1 percent or less in 1992-1994, 1998-1999, and 2001-2002 and 2-3 percent in 1995-1997 and 2000 (International Centre for the Study of East Asian Development 2003).

in current prices, salaries per worker rose continuously to a peak of 6.4 million in 1997 before stagnating and falling back to 6.0 million by 2001. The decline in wages partially reflects the large changes in Japan's labor market in the late 1990s when employment practices began to change and unemployment rose markedly, as well as the need for restructuring which became apparent in Japan's steel firms. The declines in employment and wages are also particularly important indicators of the large restructuring undertaken by Japan's steel firms, which are discussed in more detail in Ramstetter and Movshuk (2002), because they represent a marked break with traditional labor management practices which emphasized lifetime employment and steady wage growth.

Although the slow growth of aggregate demand was clearly a major cause of relatively slow growth in the Japanese steel industry during the 1990s, slow aggregate growth cannot explain why production and employment grew ever more slowly in steel than in the economy as a whole. One reason that production and employment fell relatively rapidly in steel is because the steel has gradually become less important as an intermediate product over time, indicating the substitution of other materials for steel in the production process. For example, steel accounted for 6.0 percent of all intermediate production in Japan in 1985, but this share fell gradually over the following decade to 4.6 percent by 1995 (Table 2). As a result the total value of intermediate consumption of steel increased only 1.9 percent in 1985-1995. The steel industry is itself the largest user of steel as an intermediate product, accounting for 57 percent of the total in 1985 and 49-50 percent in 1990 and 1995. Steel also accounted for 63.8 percent of all intermediate consumption by the steel industry in 1985 (and 1990) and 65.4 percent in 1995 but the value of steel intermediate consumption by the steel industry fell 12 percent in 1985-1995, reflecting the decline in steel output in this period. In contrast, the value of steel consumed by the metal products industry rose 44 percent in this period, but the share of steel in total intermediate consumption remained rather constant at about 26 percent. The largest declines in steel's share of intermediate consumption came in the transportation machinery (6.3 to 4.9 percent) and other

industries (1.0 to 0.8 percent), but the value of steel consumption rose in the relatively rapidly growing industries.

Excessive debt burdens were a major problem facing a large number of Japanese firms after so-called financial bubble burst in the early 1990s. In the steel industry, the total debt burden did not change much in the 1990s, however, with total debt never accounting for more than 74 percent of total assets in 1990 and 1995 and 72-73 percent in all other years except 2000, when the share fell to 70 percent (Ministry of Finance, various years). Equivalently, total debt-equity ratios were never over 283 percent and usually in the 262-269 percent range. Likewise, trends in the ratios of current liabilities to total assets reveal little financial distress at the industry level, falling from 42-43 percent of total assets in 1990-1991 to 38-40 percent in 1992-1997 and 2001, and as low as 34-35 percent in 1998-2000. Although the debt figures do not suggest financial difficulties, trends in the ratio of operating profits to interest payments and discounts, or the interest coverage ratio, suggest a somewhat different story. Largely because of very low operating profits, the interest coverage ratio was less than 100 percent in 1993-1994 (30-72 percent) and 1998 (78 percent), indicating that operating profits were insufficient to cover debt service burdens. This ratio was also precariously low in 1992 (130 percent) and 2001 (105 percent) but much higher in other years (154-173 percent in 1995 and 1999 and 221 percent or more in 1990-1991, 1996-1997, and 2000). Thus, although balance sheets have remained relatively strong in the Japan's steel industry, interest payments have been a large burden during several years of low profitability after the bubble burst.

Another important trend was the marked rise in the share of domestic sales in total sales in the mid- to late-1980s, followed by a slow decline in this share after the early 1990s. Correspondingly, the ratio of exports in total shipments fell from 20 percent in the early- to mid-1980s to 10 percent in the early 1990s before rebounding slowly to 11-12 percent in 1993-1996 and 13-15 percent in 1997-2001 (Table 1). The sharp decline in export propensities in the 1980s followed the imposition of voluntary restraints on exports to the United States in the

early 1980s, the large appreciation of the yen in the mid-1980s, and the domestic investment boom that accompanied Japan's bubble economy in the late 1980s. Conversely, despite the elimination of voluntary export restraints in 1992 and slow growth in Japan, export propensities grew very little in the mid-1990s and only moderately in the late 1980s. Partially as a result of these policy changes and partially as a result of declining competitiveness, the index of revealed comparative advantage for Japanese steel fell from 2.75 in the early 1980s to a low of 1.28 in 1994 before rebounding to 1.35-1.54 in 1996-2001.[2] Moreover, it is worth emphasizing the fact that domestic sales were much larger than exports throughout this period, a fact that tends to be underappreciated given the prominence issues related to exports and trade protection in the press and academia.

The recent prominence of issues related to U.S.-instigated protectionist measures such as the anti-dumping measures pursued since the late 1990s is also somewhat puzzling because the U.S. share of Japanese steel exports never exceeded 12 percent in 1993-1997 and 1999-2001 (Table 3). This share did jump to 22 percent in 1998, when demand in Asia, Japan's largest export market, fell markedly after the Asian financial crisis. Indeed, Asia's shares of Japan's steel exports were very large and grew rapidly in the mid-1990s, from 68 percent in 1990-1992 to an average of 76 percent in 1993-1996. As indicated above this share fell markedly in 1998, to 61 percent, but it remained in the 74-77 percent range both before (in 1997) and after (in 1999-2001. Increased exports to China and Korea accounted for most of the growth in exports to Asia. Likewise in 1998, exports to Korea fell most rapidly, 42 percent, with exports to China, Taiwan, and other Asian economies also declined 17 percent, 8 percent, and 23 percent, respectively.

By far the largest commodity group consisted of universals, plates, and sheets in all years. Exports of these commodities were more concentrated in Asia and fell farther in 1998 than exports of all steel products.[3] This spike in Japan's exports to the United States was accompanied by a

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[2] This index is calculated as the ratio of the share of steel in Japanese exports to the share of steel in world exports. As indicated in the text, trends in this index reflect both changes in comparative advantage, traditionally defined as comparative costs, and trends in other factors such as price-cost margins in imperfect competition and trade policies.

[3] For example, the share of universals, plates and sheets in total exports exceeded 62 percent in 1995-1997 and 1999-2000 but was only 58 percent in 1998 and 59 percent in 2001. Asia's shares

similar surges in exports from China and Korea (Lee 2003, Movshuk 2003), and the surge in steel exports from these economies was one of the major causes of the recent round of U.S. protectionism (James and Parsons 2003). Interestingly, U.S. protectionist pressure has continued on Japan, even though the rise in Japanese steel exports to the United States was very short-lived and small relative to total Japanese steel exports.[4]

Japan's imports of steel have always been very small, never exceeding US$6 billion or 4 percent of total shipments in 1980-2001 (Table 1). However, imports rose rapidly in the late 1980s from an average of US$1.3 billion or 1.8 percent of shipments in 1980-1985 to US$4.6-5.5 billion or 3.6-4.0 percent of shipments in 1988-1991 and then averaged about US$3.9 billion or 3.2 percent of shipments in 1992-2001, though import-shipment ratios were unusually large in 1995 and 1997. Asian economies, particularly Korea, China, and Taiwan, are also large and growing sources of imported steel in Japan. Asia's overall share grew from 58 percent in 1990-1992 to 65 percent in 1993-1996, and 69-72 percent in 1997 and 1999-2001, with a spike of 76 percent in 1998 after the Asian financial crisis (Table 4). Throughout this period, Korea accounted for a little more than one-third of total steel imports, while the share of China increased from 8 percent in 1990-1992 to 19-20 percent in 1997-1998 and 2000-2001, with a trough of 16 percent in 1999. Universals, plates, and sheets were again the largest commodity group and Korea is the largest source of these imports. However, there are also substantial imports of pig iron and related products, a large portion of which come from China.

## 3. Comparing Estimates of Production, Employment, and Exports

There are several possible ways to measure production, employment, and exports in

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of these exports were over four-fifths in 1993-1997 and 1999-2001 but only 66 percent in 1998. In 1998, exports of these commodities to Korea fell 47 percent, while exports to China declined 29 percent, exports to Taiwan fell 18 percent, and exports to other Asia shrunk 26 percent.

[4] A similar pattern is also observed with respect to Korea's steel exports to the United States. In contrast, the increase in Chinese steel exports has been maintained.

Japan's steel industry. The purpose of this section is to describe these data sources, the major differences among them, and some important trends they reveal. The next section will then use these data sources to decompose the growth of Japanese steel sales in three different dimensions.

Table 5 reports estimates of production and its components from three major sources: input-output tables, plant-based compilations from manufacturing censuses, and financial statement statistics of corporations. In principle, the input-output estimates are the most comprehensive as they are supposed to cover the entire industry but these data are not as up-to-date as the other sources. Manufacturing census data covering all plants with 4 or more employees were used in Table 1 above because they are up-to-date plant-based compilations, making them the most comparable with often-used national accounts' estimates of production.[5] Financial statement statistics are also relatively up-to-date but differ in that they are compilations of firm-level data, which means that they include non-steel plants owned by steel firms but exclude steel plants that are owned by firms belonging to other industries (e.g., trading companies). Partially because Japan has several very large trading companies and because many large Japanese firms (including large steel firms) own plants in many industries, there are often large differences between plant- and firm-based compilations for Japanese industries.

For example, in the steel industry shipments of plants covered in the manufacturing censuses and sales of firms covered in the financial statement statistics were almost equal on average for 1980-1987 (Table 5). However, in 1988-2001 sales of steel firms reported in the financial statistics exceeded shipments of plants reported in the manufacturing censuses by an average of 5 percent, and by 10 percent or more in some years (1994-1996, 1999). The growth of this differential partially reflects the growth of sales by plants involved in non-steel operations that are owned by steel firms, which accompanied the diversification efforts of several steel firms, especially several larger ones, during this and previous periods. Input-output estimates of total output are much larger than these two similar measures. These differentials were very large,

[5] National accounts data do not include estimates for the steel industry alone.

60-62 percent on average in 1980-1985 and remained at 40 percent or more in subsequent years when compared with manufacturing census estimates and 28 percent or more when compared with financial statement statistics. These differentials result partially from differences in the definitions of output, shipments, and sales and differences in data estimation methodology (e.g., differences between firm- and plant-based surveys and differences resulting from the exclusion of small plants or firms from manufacturing censuses and the financial statement statistics). However, the differentials between these conceptually similar measures of output seem to be too large to be explained by these differences alone and suggest that sizeable measurement errors are involved as well.

Differences in estimates of intermediate consumption are larger than differences in estimates of output, especially when input-output estimates are compared with manufacturing census estimates (Table 5). Correspondingly, differences in value added estimates (not shown here; see Matsuoka 2002a) are somewhat smaller. Estimates of labor compensation are generally larger in the input-output statistics than in the other two sources but are rather close to the sum of salaries and other labor compensation estimates in the financial statistics. Manufacturing estimates of labor's return are much smaller, partially because only salaries are included. Input-output estimates of depreciation are also largest in most years, followed again by financial statistics estimates. Finally, there are significant differences in the estimates of the operating surplus in the three sources. The manufacturing census definition is the broadest and includes non-salary labor compensation, subsidies less indirect taxes, net interest income, and net rent income, as well as profits. Input-output estimates exclude all labor compensation as well as subsidies less indirect taxes but still include interest and rent. The financial statement statistics are most illuminating in this respect because they show that interest, rent, and taxes were generally far larger than net operating profits for most of this period. Indeed net operating profits were negative in 1986-1987, 1993-1994, and 1998, though the operating surplus inclusive of interest, rent, and taxes, was always positive.

In contrast to estimates of output, intermediate consumption, and labor compensation, for example, input-output estimates are smaller than alternative estimates for exports, though the differences among data sources were much smaller for exports than for other indicators in Table 5. For example, compared to estimates from Japanese trade statistics, input-output estimates were an average of 5 percent lower in 1980-1995 and an average of 8 percent lower in 1996-1999. Differences between the input-output data and alternative estimates from Statistics Canada (e.g., Tables 3-4) and UNIDO were somewhat larger but even in these cases differences were relatively small, never more than 12 percent lower. These differences occur because the Statistics Canada estimates synthesize estimates of exporters and importers and UNIDO data attempt to estimate exports in a way that is more consistent with the International Standard Industry Classification (ISIC) than is normally done in commodity classifications. Because estimates of exports are relatively small and estimates of output are relatively large, input-output estimates of export propensities (i.e., export-output ratios) are much smaller than those reported in Table 1, which are estimated from Japanese trade statistics and manufacturing census estimates of shipments.[6]

Manufacturing censuses and financial statement statistics also contain estimates of employment for steel plants and steel firms. There are large differences in these estimates with the employment of steel firms exceeding employment of steel plants by an average of about one-fifth in 1981-2001. Two obvious causes of this differential are (1) the inclusion of non-steel plants in the financial statements statistics and (2) the exclusion of plants with fewer than 4 employees from the manufacturing census data. The corresponding difference between firm sales and plant shipments is much smaller, an average of only 4 percent, suggesting that non-steel sales were relatively small and excluded plants were either very small or had very low shipments per worker.

Output or shipments can also be disaggregated by product category using the input-output

[6] For example, input-output data suggest that export propensities were 12 percent in 1980-1985 and 8-10 percent in 1986-1999 while calculations in Table 1 indicate that these propensities were 20 percent and 10-15 percent, respectively.

or manufacturing census data (Table 6), though the product categories contained in these data sets differ, making them difficult to compare. The input-output data can also be disaggregated into exports and domestic sales (calculated as output less exports). However, it is very difficult to match commodity categories from the Japanese trade statistics and the manufacturing census, particularly in the Japanese steel industry where large multi-product steel plants are quite important.[7]

Despite their differences, both data sets suggest that the structure of steel production changed somewhat in the mid-1980s, and remained relatively similar thereafter. According to the input-output data, domestic sales of pig iron were largest, accounting for an average of 33 percent of total output in 1980-1985, 24-26 percent in 1986-1995, and 26-29 percent in 1996-1999. Domestic sales of hot-rolled steel followed with shares of about one-fourth while domestic sales of cold-rolled steel and domestic sales of other products had shares of about one-fifth or slightly less. Hot-rolled steel and cold-rolled steel were the largest export categories but they were very small, accounting for only 4 percent of total output or less. In the manufacturing census classification, blast furnace production was largest but the share of this item fell from 39 percent in 1980-1985 to 35 percent in 1988-1989 and 30-33 percent in 1990-2001. Among the specific product categories, steel produced with rolling facilities followed with shares of 15-19 percent. Machine parts and tooling products also had shares of 11-12 percent in from 1990 forward.[8] The heterogeneous categories of steel materials not included elsewhere and other steel products were also rather large, accounting for about one-sixth to one-fifth of total shipments.

[7] The existence of multi-product plants makes impossible to construct accurate concordances between commodity-based classifications from trade data and plant-based compilations from manufacturing censuses because plant-based compilations classify plants into only one industry.

[8] Data for this machine parts and tooling products as well as for other steel products are not comparable for 1990-2001 and earlier years because of changes in Japan's standard industrial classification that were used from 1990 forward.

## 4. Decomposing the Decline of Steel Output by Expenditure Component

The purpose of this section is to use the data described in the previous section to decompose the decline of steel output in Japan in the 1990s in three dimensions. The first decomposition examines how changes in intermediate consumption (IC), labor compensation (LC), depreciation (DP), and the operating surplus plus indirect taxes less subsidies (OS) or related components contributed to output (OU) growth using the following identity:

$$(1)\ \Delta OU_t/OU_{t-1} = (\Delta IC_t/IC_{t-1})(IC_{t-1}/OU_{t-1}) + (\Delta LC_t/LC_{t-1})(LC_{t-1}/OU_{t-1}) + (\Delta DP_t/DP_{t-1})(DP_{t-1}/OU_{t-1}) + (\Delta OS_t/OS_{t-1})(OS_{t-1}/OU_{t-1})$$

where subscripts indicate years t and t-1, respectively, and $\Delta$ indicates the first difference between the year indicated and the previous year.

As explained in the previous section definitions of labor compensation and the operating surplus do not always correspond to those in equation (1), and different data sources allow different degrees of disaggregation of these components. For example, in the input-output data, the operating surplus and indirect taxes less subsidies can be distinguished (Table 7). Decompositions using these data indicate that changes in intermediate consumption were by far the largest component of output growth in almost all periods and years, reflecting the relatively large size of this component. This component was generally followed distantly by changes in the operating surplus. In some periods, notably in 1981-1987 and 1996-1999, changes in labor compensation were also relatively large.

The manufacturing census data differ in that the operating surplus and indirect taxes less subsidies cannot be distinguished and in that the labor compensation term includes only salary payments, which means that the operating surplus term includes substantial non-salary labor compensation (Table 7). Nonetheless, these data suggest that changes in intermediate

consumption were by far the largest component of the growth of steel shipments, followed by changes in the operating surplus, taxes, etc. Likewise these data also suggest that falling salaries was a relatively large component of falling steel shipments after 1996.

The financial statistics data allow explicit isolation of salary and non-salary components of labor compensation, as well as net profits (Table 7). When this is done, the results of the decomposition again suggest that changes in intermediate consumption were again the largest component of changes in sales. This result again reflects the relatively large size of this component and the corresponding fact that steel plants must adjust intermediate consumption when changes in demand conditions lead to changes in output. Interestingly, these data also suggest that adjustments in the net profit term were relatively large even though this measure of profits was much smaller than corresponding measures of the operating surplus in the other two data sets. Taken together, the results from these three data sets suggest that changes in profits account for a relatively large portion of growth in steel sales even though this component is relatively small compared to others. One interesting difference in the results from the financial statement statistics and the other two sources is the finding that changes in salaries were relatively large in a number of years, including most of the 1990s. There is thus some disagreement as to the contribution of changes in labor compensation, but all sources agree that this component has accounted for a relatively large portion of output growth since the mid-1990s.

## 5. Decomposing the Decline of Steel Output by Market

The second decomposition separates the growth of output into changes of price and quantity components for domestic sales and exports, based on the following identity:

$$(2)\ \Delta OU_t/OU_{t-1} = (gPd_t)(OUd_{t-1}/OU_{t-1}) + (\Delta Qd_t/Qd_{t-1})(OUd_{t-1}/OU_{t-1}) + (gPx_t)(OUx_{t-1}/OU_{t-1}) + (\Delta Qx_t/Qx_{t-1})(OUx_{t-1}/OU_{t-1})$$

where gPd=growth of domestic prices calculated as $(\Delta OUd_t/OUd_{t-1})-(\Delta Qd_t/Qd_{t-1})$, gPx=growth of export prices calculated as $(\Delta OUx_t/OUx_{t-1})-(\Delta Qx_t/Qx_{t-1})$, OU=output in current prices, OUd=domestic sales in current prices calculated as (OU-OUx), OUx=exports at current prices, Qd=domestic sales in 1995 prices calculated as (OUd/Pou)-Qx, and Qx=exports in 1995 prices, subscripts indicate years t and t-1, respectively, and $\Delta$ indicates the first difference between the year indicated and the previous year.

These decompositions are performed with two data bases, the input-output data and a combination of Japanese trade statistics and manufacturing census data (Table 8).[9] The input-output calculations suggest that changes in domestic sales accounted for the vast majority of growth of output in most years, especially from 1986 forward. A similar pattern is also observed in the trade and manufacturing census data from 1988 forward but these data suggest that changes in exports were more important in the early 1980s than suggested by the input-output data. Falling domestic prices accounted for relatively large portions of declining output (40 percent or more of the total decline) in 1981-1987, 1993-1994, and 1998-1999 according to input-output data and in 1981-1985, 1993-1994, 1996, and 2001 according to trade and manufacturing census data. Falling domestic output contributed 40 percent or more of the decline in 1986-1987, 1992-1993, and 1998 according to the input-output data and in all years with falling shipments from 1992 (1992-1994, 1996, 1998-1999, 2001) according to the trade and manufacturing censuses data. Likewise, in years of rising output, increasing domestic quantities accounted for large portions of the increase in 1988-1991 and 1995 according to both data sources, as well as in 1997 according to the input-output data and in 2000 according to the trade and manufacturing census data. Increasing prices accounted for similarly large shares of rising output in only a few years, in 1996 according to input output data and in 1991 and 1998 according to trade and manufacturing census data. Thus, changes in domestic demand were relatively large and tended to be dominated by

[9] Matsuoka (2002a) performs similar decompositions with the input-output data but provides less annual detail.

quantity changes, though price changes were also relatively large in a number of years when domestic demand fell.

In marked contrast to other periods, the contribution of falling export prices was very large in 1981-1985, exceeding 75 percent of the total growth according to both sources. In contrast, contributions of changes in export prices and quantities were both below 20 percent in most other periods of falling output. The only exceptions were observed in the trade and manufacturing census data in 1986-1987 and 1999 for export prices and 1996 for export quantities. In years of rising output, this threshold was exceeded only in 1991 and 1997 for quantities and in 1995 for prices according to the trade and manufacturing census data and in no years or periods according to the input-output data. Thus, in the early 1980s, falling prices, both for exports and domestic sales, explain most of the decline in output, while changes in domestic quantities followed by changes in domestic prices explain most of the growth of output, positive or negative, in subsequent years.

One final point of some interest is that changes in prices and quantities generally moved in the same direction for domestic sales, whereas changes in prices and quantities often moved in the opposite direction for exports.[10] Assuming that these prices and quantities reflect equilibria of upward sloping supply curves and downward sloping demand curves, this would suggest that changes in demand were larger than changes in supply in domestic markets but, conversely, changes in supply were larger than changes in demand in export markets. This is consistent with the view that Japanese steelmakers made relatively large adjustments in supply in export markets in order to protect their shares of those markets (e.g., James and Parsons 2003). It is also consistent with the view expressed above that changes in domestic demand had very large effects on Japan's steel industry in the 1990s. However, it should also be emphasized that the existence

[10] According to the input-output data prices and quantities moved in opposite directions in 1981-1985, 1991, and 1995-1996 for domestic sales and in 1981-1985, 1988-1989, 1991-1994, 1996, and 1998 for exports. According to trade and manufacturing data this was true only in 1981-1985 and 1995-1996 for domestic sales but 1988-1989, 1991-1996, 1998, and 2000 for exports.

of substantial scale economies and the possibility of dumping means that these prices and quantities may not reflect standard equilibria.

## 6. Decomposing the Decline of Steel Output by Product Category

The third and final decomposition examines how changes in output of various product categories contributed to the growth of overall steel output (OU) using an identity very similar to (1) above:

$$(3)\ \Delta OU_t/OU_{t-1} = (\Delta O1_t/O1_{t-1})(O1_{t-1}/OU_{t-1}) + (\Delta O2_t/O2_{t-1})(O2_{t-1}/OU_{t-1}) + \ldots + (\Delta On_t/On_{t-1})(On_{t-1}/OU_{t-1})$$

where O1=the output of product category 1, O2=the output of product category 2, On=the output of product category n, subscripts indicate years t and t-1, respectively, and $\Delta$ indicates the first difference between the year indicated and the previous year.

In the input-output data there are five product categories which can each be divided into domestic sales and exports (Table 9). Changes in domestic sales of pig iron and crude steel and hot rolled steel were generally larger than other changes in most of the periods examined. For example, changes in domestic sales of pig iron and crude steel accounted for one-fifth or more of the growth in steel output in 1981-1990 and 1993-1998 while changes in domestic sales of hot rolled steel exceeded this threshold in 1986-1994 and 1997-1999. In contrast this threshold was rarely exceeded for domestic sales of other products, the exceptions being steel and tubes in 1981-1985, cold and rolled steel in 1991, and other products in 1991-1993 and 1999. For exports this threshold was exceeded in only one product category for one of the periods examined, steel pipes and tubes in 1981-1985. Thus, it was changes in domestic sales of pig iron and crude steel, as well as hot rolled steel, which dominated the growth of steel output in the input-output

classification.[11]

In the manufacturing census data, the largest category was blast furnace production and it accounted for one quarter or more of the growth in shipments in most of the years examined, 1986-1989 and 1992-2001. This decline was related to the decline in pig iron and crude steel production observed in the input-output data. Another one fifth of the total growth came from changes in steel produced with rolling facilities in a number of years, 1986-1989, 1991-1992, 1995, and 1998-2001. The latter threshold was also exceed by steel materials not included elsewhere in 1990-1991 and 1993-1994, by machine products and tooling products in 1991 and 1994-1995, and by other steel products in 1999.

Thus, these data sets suggest that declines in the production of relatively standardized products (e.g., pig iron and crude steel, rolled steel) with the relatively old technology (blast furnaces) tended to account for the largest portions of the declines in the growth of steel production in the 1990s. However, the manufacturing census data suggest that other products also contributed to the decline of steel shipments in this period.

## 7. Major Findings and Their Implications for the Future of Japan's Steel Industry

This paper first examined the decline of steel output, shipments, and sales in Japan in the 1990s. The decline of all these three measures of steel output was very pronounced. Part of the decline can be accounted for by declining steel prices during this period, but steel employment also fell rapidly as did steel's share of total production and employment in Japan. The decline of employment is a particularly important indication of the large restructuring that has occurred in Japan's steel industry, largely as a result of declining output. Perhaps contrary to popular perception, Japanese steel was heavily dependent on the domestic market. Of the small portion of

[11] Matsuoka (2002a) also decomposes the changes of domestic sales and exports of each commodity into price and quantity components using equations similar to equation (2) above. Her results are similar to those obtained for all steel products in that changes in domestic quantities and prices accounted for most of the changes in output.

production exported, most steel exports were sent to other Asian markets. These two characteristics meant that Japan's steel industry was very vulnerable to declines in demand that followed the drastic slowdown of the Japanese economy from 1992 and the collapse of Asian demand after the financial crisis. Another factor was the long-term decline in steel's importance as an intermediate product in Japan.

The paper then examined three sources of data on steel output, (1) input-output estimates of total output, broken down by cost component as well as by exports and domestic sales of major product categories, (2) census of manufacturing estimates of total shipments broken down by cost component and by major product category, and (3) financial statements statistics data on sales broken down by cost component. The analysis highlighted the important fact that all three data sets suggest large declines in steel production in the 1990s, and also pointed out several differences among the various estimates.

The importance of the differences was further underscored when changes in production were decomposed by cost component, with the financial statement statistics suggesting that salary reductions played a larger role in the 1990s than suggested by the other two sources. On the other hand, the three sources consistently suggested that changes in intermediate consumption and profits or the operating surplus also accounted for a relatively large portion of the fall in steel production in the 1990s. Decompositions by market and price and quantity factors were similar across sources, suggesting that changes in domestic quantities and domestic prices were the most important element of declining steel output in the 1990s. Finally, declines in pig iron and crude steel production and in blast furnace production were the largest among product categories, although a number of other product categories experienced relatively large declines in some years.

Taken together these findings suggest that the decline of steel production during the 1990s resulted from a combination of cyclical and long-term forces. The most important long-term factors are the gradual decline of the importance of steel as an intermediate product and Japan's reduced comparative advantage in steel. By contrast, the negative effects of the Asian

financial crisis should be cyclical in nature as should the effects of the slowdown in Japan's economic growth. However, there are important questions about how much of the decline in growth after the early 1990s in Japan and after the Asian financial crisis in many Asian economies is indeed cyclical, and how much may be the result of longer-term structural weaknesses related to aging and reduced consumption growth as well as weaknesses in fiscal positions and financial markets. The answers to these questions are clearly beyond the scope of this paper, but the results of this analysis underline how important they are to the fate of Japan's steel industry. If growth continues to be slow, there will be pressure for even further reductions in production and employment and more restructuring. On the other hand, if growth can recover some, then Japan's steel industry is still in a strong position to benefit from that growth. Correspondingly, despite the large attention U.S. protectionist moves have attracted in the steel industry, such moves are not likely to have a large effect on Japan's steel industry unless they lead to similar moves by other importers, especially those in Asia. Finally, it is worth reemphasizing the important fact that Japan's own economic performance will have by far the largest effect on the future of Japan's steel industry.

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**Table 1: Basic Indicators of Production, Employment, and Trade for Japan's Steel Industry**

| Indicator | 1980-1985 | 1986-1987 | 1988-1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PRODUCTION, EMPLOYMENT, AND SALARIES FROM CENSUS OF MANUFACTURES (4 or more employees, prices from Bank of Japan)** | | | | | | | | | | | | | | | |
| Shipments, current US$ billion | 74 | 92 | 124 | 126 | 138 | 131 | 134 | 133 | 150 | 128 | 120 | 99 | 99 | 111 | 92 |
| Shipments, current yen billion | 17,278 | 14,292 | 16,445 | 18,269 | 18,631 | 16,588 | 14,932 | 13,574 | 14,073 | 13,890 | 14,563 | 12,942 | 11,322 | 11,927 | 11,202 |
| Shipments, 1995 yen billion | 14,096 | 13,462 | 14,747 | 15,952 | 16,195 | 14,825 | 14,143 | 13,616 | 14,073 | 14,102 | 14,382 | 13,148 | 12,265 | 12,922 | 12,397 |
| Value added, current US$ billion | 24 | 34 | 50 | 49 | 55 | 55 | 55 | 56 | 63 | 55 | 51 | 41 | 42 | 47 | 39 |
| Value added, current yen billion | 5,549 | 5,332 | 6,680 | 7,122 | 7,424 | 6,973 | 6,166 | 5,701 | 5,956 | 5,932 | 6,168 | 5,412 | 4,829 | 5,098 | 4,780 |
| - % of GDP | 1.96 | 1.53 | 1.69 | 1.61 | 1.58 | 1.45 | 1.27 | 1.16 | 1.20 | 1.20 | 1.18 | 1.05 | 0.94 | 0.99 | 0.94 |
| Value added, 1995 yen billion | 4,528 | 5,026 | 5,992 | 6,219 | 6,454 | 6,232 | 5,841 | 5,718 | 5,956 | 6,022 | 6,091 | 5,498 | 5,231 | 5,523 | 5,291 |
| - % of GDP | 1.35 | 1.31 | 1.39 | 1.34 | 1.35 | 1.29 | 1.20 | 1.17 | 1.20 | 1.18 | 1.16 | 1.06 | 1.00 | 1.03 | 0.99 |
| Producer prices, 1995=100 | 122.59 | 106.13 | 111.44 | 114.52 | 115.04 | 111.89 | 105.57 | 99.69 | 100.00 | 98.49 | 101.26 | 98.43 | 92.31 | 92.30 | 90.36 |
| Number of employees | 406,166 | 358,683 | 337,428 | 337,811 | 339,572 | 330,524 | 321,868 | 307,577 | 296,824 | 284,881 | 273,840 | 261,024 | 242,616 | 236,525 | 223,817 |
| - % of total | 0.71 | 0.61 | 0.56 | 0.54 | 0.53 | 0.51 | 0.50 | 0.48 | 0.46 | 0.47 | 0.42 | 0.40 | 0.38 | 0.37 | 0.35 |
| Value Added/Employee, US$ | 57,528 | 95,841 | 148,764 | 145,602 | 162,304 | 166,570 | 172,281 | 181,339 | 213,339 | 191,409 | 186,159 | 158,375 | 174,734 | 200,013 | 175,752 |
| Thousand current yen | 13,598 | 14,880 | 19,799 | 21,082 | 21,863 | 21,096 | 19,157 | 18,534 | 20,067 | 20,821 | 22,524 | 20,732 | 19,903 | 21,554 | 21,359 |
| Salaries/Employee, US$ | 18,198 | 31,159 | 40,167 | 38,593 | 42,752 | 46,154 | 53,018 | 59,418 | 65,568 | 58,352 | 53,237 | 47,552 | 55,665 | 56,191 | 49,736 |
| Thousand current yen | 4,304 | 4,844 | 5,342 | 5,588 | 5,759 | 5,845 | 5,895 | 6,073 | 6,167 | 6,348 | 6,441 | 6,225 | 6,341 | 6,055 | 6,044 |
| **TRADE IN STEEL FROM JAPANESE CUSTOMS STATISTICS (prices from Bank of Japan, revealed comparative advantage index from Statistics Canada)** | | | | | | | | | | | | | | | |
| Exports, current US$ billion | 14.672 | 12.658 | 15.055 | 12.509 | 13.612 | 13.336 | 14.514 | 14.871 | 17.481 | 15.212 | 15.947 | 14.824 | 13.463 | 14.850 | 13.573 |
| - % of shipments | 19.92 | 13.82 | 12.19 | 9.91 | 9.84 | 10.18 | 10.81 | 11.20 | 11.68 | 11.40 | 13.25 | 14.99 | 13.54 | 13.42 | 14.73 |
| Exports, current yen trillion | 3.442 | 1.983 | 2.002 | 1.811 | 1.834 | 1.689 | 1.614 | 1.520 | 1.644 | 1.655 | 1.929 | 1.941 | 1.534 | 1.600 | 1.650 |
| Exports, 1995 yen trillion | 1.963 | 1.717 | 1.524 | 1.364 | 1.467 | 1.512 | 1.683 | 1.724 | 1.644 | 1.579 | 1.730 | 1.840 | 1.749 | 1.864 | 1.871 |
| Export prices, 1995=100 | 175.31 | 115.27 | 131.51 | 132.80 | 124.97 | 111.69 | 95.88 | 88.18 | 100.00 | 104.79 | 111.52 | 105.47 | 87.70 | 85.86 | 88.17 |
| Revealed Comparative Advantage | 2.75 | 1.79 | 1.60 | 1.40 | 1.43 | 1.38 | 1.38 | 1.28 | 1.29 | 1.35 | 1.40 | 1.41 | 1.40 | 1.35 | 1.54 |
| Imports, current US$ billion | 1.320 | 2.123 | 4.847 | 4.584 | 5.519 | 3.790 | 4.080 | 4.069 | 5.804 | 4.449 | 4.417 | 3.190 | 2.949 | 3.659 | 2.779 |
| - % of shipments | 1.79 | 2.32 | 3.92 | 3.63 | 3.99 | 2.89 | 3.04 | 3.06 | 3.88 | 3.37 | 3.67 | 3.23 | 2.97 | 3.31 | 3.01 |
| Imports, current yen trillion | 0.311 | 0.328 | 0.646 | 0.664 | 0.743 | 0.480 | 0.454 | 0.416 | 0.546 | 0.484 | 0.534 | 0.418 | 0.336 | 0.394 | 0.338 |
| Imports, 1995 yen trillion | 0.185 | 0.261 | 0.440 | 0.487 | 0.562 | 0.395 | 0.420 | 0.428 | 0.546 | 0.484 | 0.514 | 0.404 | 0.387 | 0.448 | 0.421 |
| Import prices, 1995=100 | 169.02 | 126.53 | 146.41 | 136.43 | 132.20 | 121.56 | 107.91 | 97.27 | 100.00 | 100.03 | 104.03 | 103.43 | 86.80 | 87.96 | 80.26 |

Sources: Bank of Japan (2003); Bank of Japan (various years); International Monetary Fund (2003); Ministry of Economy, Trade and Industry (various years a). Statistics Canada (various years)

**Table 2: Intermediate Consumption of Steel in Japan**

| Industry | Intermediate Consumption of Steel (yen billions) | | | Intermediate Consumption of Steel/ Total Intermediate Consumption (%) | | |
|---|---|---|---|---|---|---|
| | 1985 | 1990 | 1995 | 1985 | 1990 | 1995 |
| All industries | 18,972 | 21,309 | 19,277 | 5.99 | 5.22 | 4.56 |
| Steel | 10,728 | 10,723 | 9,442 | 63.82 | 63.84 | 65.44 |
| Metal products | 2,158 | 3,044 | 3,109 | 25.96 | 26.44 | 25.90 |
| General machinery | 1,919 | 2,489 | 2,248 | 15.79 | 15.61 | 15.18 |
| Transportation machinery | 1,530 | 1,724 | 1,569 | 6.34 | 5.11 | 4.94 |
| Other industries | 2,637 | 3,329 | 2,908 | 1.03 | 1.01 | 0.83 |

Source: Ministry of Economy, Trade and Industry (various years b)

**Table 3: 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 | 14,227 | 15,820 | 14,902 |
| Asia | 9,301 | 12,086 | 12,363 | 9,490 | 10,564 | 12,206 | 11,385 |
| China | 1,388 | 2,425 | 1,955 | 1,621 | 1,898 | 2,502 | 2,500 |
| Korea | 1,410 | 1,886 | 2,115 | 1,235 | 1,982 | 2,658 | 2,374 |
| Taiwan | 1,450 | 1,720 | 1,611 | 1,473 | 1,417 | 1,461 | 1,071 |
| Europe | 676 | 646 | 680 | 923 | 606 | 542 | 625 |
| North America (including Mexico) | 2,486 | 2,031 | 2,276 | 3,984 | 2,167 | 2,191 | 2,010 |
| U.S.A. | 2,218 | 1,751 | 1,922 | 3,387 | 1,692 | 1,485 | 1,421 |
| Pig iron, sponge iron, etc. (SITC 671) | 63 | 219 | 259 | 434 | 403 | 369 | 301 |
| Asia | 41 | 172 | 205 | 326 | 349 | 322 | 273 |
| China | 2 | 6 | 8 | 8 | 19 | 22 | 35 |
| Korea | 18 | 71 | 89 | 166 | 171 | 123 | 117 |
| Taiwan | 9 | 62 | 79 | 104 | 122 | 148 | 98 |
| Europe | 5 | 6 | 21 | 6 | 8 | 16 | 9 |
| North America (including Mexico) | 16 | 37 | 27 | 96 | 43 | 29 | 17 |
| U.S.A. | 16 | 37 | 27 | 87 | 40 | 29 | 17 |
| Ingots, primary forms, etc. (SITC 672) | 54 | 236 | 171 | 268 | 410 | 358 | 583 |
| Asia | 52 | 131 | 148 | 200 | 261 | 240 | 477 |
| China | 7 | 9 | 5 | 12 | 38 | 40 | 117 |
| Korea | 12 | 65 | 97 | 34 | 85 | 108 | 149 |
| Taiwan | 28 | 52 | 33 | 117 | 90 | 48 | 149 |
| Europe | 1 | 1 | 1 | 19 | 51 | 37 | 63 |
| North America (including Mexico) | 2 | 104 | 22 | 48 | 98 | 81 | 44 |
| U.S.A. | 2 | 103 | 22 | 48 | 82 | 81 | 44 |
| Bars, rods, angles, shapes (SITC 673) | 1,516 | 1,897 | 1,904 | 1,926 | 1,571 | 1,671 | 1,508 |
| Asia | 1,114 | 1,521 | 1,486 | 1,106 | 1,145 | 1,269 | 1,104 |
| China | 70 | 247 | 168 | 170 | 136 | 123 | 136 |
| Korea | 209 | 303 | 357 | 191 | 303 | 350 | 315 |
| Taiwan | 354 | 341 | 274 | 229 | 176 | 188 | 145 |
| Europe | 58 | 64 | 67 | 78 | 53 | 57 | 47 |
| North America (including Mexico) | 290 | 266 | 305 | 687 | 332 | 316 | 321 |
| U.S.A. | 264 | 245 | 282 | 637 | 296 | 242 | 301 |
| Universals, plates, sheets (SITC 674) | 8,043 | 9,772 | 10,244 | 9,021 | 8,778 | 10,594 | 8,810 |
| Asia | 5,856 | 8,115 | 8,358 | 5,962 | 7,023 | 8,777 | 7,216 |
| China | 812 | 1,670 | 1,444 | 1,030 | 1,412 | 2,023 | 1,819 |
| Korea | 936 | 1,151 | 1,308 | 699 | 1,242 | 1,848 | 1,564 |
| Taiwan | 878 | 1,060 | 998 | 819 | 847 | 892 | 549 |
| Europe | 217 | 196 | 156 | 238 | 214 | 226 | 199 |
| North America (including Mexico) | 1,474 | 970 | 1,182 | 2,133 | 1,008 | 984 | 803 |
| U.S.A. | 1,326 | 803 | 957 | 1,771 | 689 | 492 | 384 |
| Tubes, pipes, fittings (SITC 678) | 3,507 | 3,168 | 3,315 | 3,324 | 2,536 | 2,253 | 3,256 |
| Asia | 2,053 | 1,870 | 1,895 | 1,691 | 1,527 | 1,313 | 2,103 |
| China | 484 | 442 | 292 | 364 | 240 | 230 | 342 |
| Korea | 203 | 247 | 218 | 126 | 148 | 191 | 198 |
| Taiwan | 142 | 156 | 171 | 162 | 133 | 142 | 98 |
| Europe | 372 | 352 | 408 | 550 | 245 | 169 | 274 |
| North America (including Mexico) | 543 | 474 | 508 | 758 | 470 | 549 | 639 |
| U.S.A. | 475 | 404 | 441 | 623 | 398 | 436 | 520 |

Source: Statistics Canada (various years).

**Table 4: 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 | 3,049 | 3,737 | 2,840 |
| Asia | 2,507 | 2,926 | 3,030 | 2,253 | 2,107 | 2,691 | 1,949 |
| China | 341 | 648 | 819 | 592 | 479 | 763 | 558 |
| Korea | 1,495 | 1,557 | 1,521 | 1,155 | 1,101 | 1,291 | 921 |
| Taiwan | 347 | 408 | 458 | 356 | 372 | 438 | 301 |
| Europe | 455 | 357 | 266 | 193 | 165 | 213 | 209 |
| North America (including Mexico) | 238 | 223 | 161 | 134 | 173 | 190 | 129 |
| U.S.A. | 222 | 163 | 153 | 127 | 126 | 182 | 121 |
| Pig iron, sponge iron, etc. (SITC 671) | 1,193 | 1,288 | 1,146 | 725 | 886 | 1,141 | 930 |
| Asia | 297 | 503 | 470 | 293 | 257 | 460 | 342 |
| China | 203 | 403 | 382 | 240 | 214 | 390 | 290 |
| Korea | 1 | 2 | 14 | 10 | 5 | 11 | 10 |
| Taiwan | 1 | 0 | 0 | 1 | 1 | 0 | 2 |
| Europe | 159 | 102 | 58 | 43 | 32 | 37 | 37 |
| North America (incl. Mexico) | 31 | 46 | 78 | 63 | 63 | 69 | 26 |
| U.S.A. | 26 | 44 | 73 | 59 | 60 | 64 | 20 |
| Ingots, primary forms, etc. (SITC 672) | 227 | 201 | 139 | 69 | 82 | 64 | 37 |
| Asia | 104 | 109 | 111 | 57 | 29 | 52 | 24 |
| China | 6 | 35 | 54 | 50 | 28 | 49 | 19 |
| Korea | 44 | 38 | 57 | 5 | 1 | 2 | 5 |
| Taiwan | 4 | 26 | 0 | 0 | 0 | 0 | 0 |
| Europe | 21 | 20 | 13 | 7 | 5 | 8 | 8 |
| North America (including Mexico) | 22 | 56 | 6 | 5 | 48 | 1 | 4 |
| U.S.A. | 15 | 4 | 6 | 5 | 5 | 1 | 4 |
| Bars, rods, angles, shapes (SITC 673) | 343 | 221 | 128 | 94 | 90 | 108 | 104 |
| Asia | 205 | 154 | 89 | 67 | 70 | 81 | 68 |
| China | 21 | 9 | 5 | 2 | 1 | 3 | 4 |
| Korea | 139 | 100 | 60 | 53 | 54 | 61 | 52 |
| Taiwan | 6 | 3 | 4 | 4 | 8 | 7 | 7 |
| Europe | 57 | 26 | 29 | 18 | 11 | 15 | 19 |
| North America (including Mexico) | 16 | 11 | 9 | 8 | 7 | 10 | 15 |
| U.S.A. | 16 | 9 | 8 | 7 | 6 | 9 | 14 |
| Universals, plates, sheets (SITC 674) | 2,093 | 2,124 | 2,054 | 1,442 | 1,381 | 1,660 | 1,057 |
| Asia | 1,509 | 1,648 | 1,728 | 1,305 | 1,244 | 1,497 | 932 |
| China | 69 | 92 | 164 | 103 | 77 | 128 | 33 |
| Korea | 1,064 | 1,164 | 1,135 | 882 | 829 | 983 | 638 |
| Taiwan | 278 | 316 | 389 | 303 | 317 | 371 | 245 |
| Europe | 180 | 136 | 89 | 56 | 65 | 86 | 82 |
| North America (including Mexico) | 122 | 49 | 13 | 11 | 10 | 18 | 21 |
| U.S.A. | 119 | 46 | 12 | 10 | 10 | 17 | 21 |
| Tubes, pipes, fittings (SITC 678) | 303 | 355 | 372 | 298 | 281 | 401 | 355 |
| Asia | 242 | 267 | 292 | 228 | 222 | 288 | 276 |
| China | 22 | 35 | 56 | 55 | 46 | 69 | 77 |
| Korea | 152 | 131 | 117 | 80 | 83 | 99 | 82 |
| Taiwan | 32 | 31 | 36 | 28 | 24 | 34 | 30 |
| Europe | 22 | 40 | 48 | 34 | 22 | 35 | 35 |
| North America (including Mexico) | 38 | 47 | 31 | 35 | 36 | 77 | 45 |
| U.S.A. | 38 | 47 | 31 | 35 | 35 | 76 | 44 |

Source: Statistics Canada (various years).

**Table 5: Alternative Estimates of Production, Employment, and Exports for Japan's Steel Industry (billion current yen except as noted)**

| Source, Indicator | 1980-85 | 1986-87 | 1988-89 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **INPUT-OUTPUT TABLES** | | | | | | | | | | | | | | | |
| Total output | 27,732 | 19,993 | 23,168 | 26,006 | 26,672 | 23,951 | 21,355 | 19,411 | 19,928 | 20,250 | 21,972 | 18,136 | 16,289 | - | - |
| Intermediate consumption | 21,802 | 15,040 | 16,538 | 18,773 | 18,807 | 17,288 | 15,293 | 13,685 | 14,221 | 14,567 | 16,069 | 12,878 | 11,927 | - | - |
| Labor compensation | 2,617 | 2,242 | 2,260 | 2,506 | 2,787 | 2,825 | 2,706 | 2,637 | 2,703 | 2,102 | 2,842 | 2,521 | 2,111 | - | - |
| Depreciation | 1,252 | 804 | 886 | 975 | 1,031 | 1,168 | 1,070 | 1,019 | 1,030 | 1,297 | 1,392 | 1,272 | 1,046 | - | - |
| Indirect taxes-subsidies, etc. | 510 | 575 | 857 | 862 | 871 | 673 | 541 | 481 | 546 | 693 | 742 | 749 | 632 | - | - |
| Operating surplus | 1,550 | 1,333 | 2,627 | 2,889 | 3,176 | 1,997 | 1,744 | 1,588 | 1,428 | 1,592 | 928 | 716 | 572 | - | - |
| Exports | 3,270 | 1,888 | 1,908 | 1,720 | 1,739 | 1,609 | 1,541 | 1,454 | 1,570 | 1,508 | 1,763 | 1,784 | 1,416 | - | - |
| Output deflator, 1995=100 | 135 | 132 | 127 | 120 | 119 | 117 | 109 | 101 | 100 | 103 | 105 | 98 | 90 | - | - |
| Export deflator, 1995=100 | 194 | 181 | 166 | 145 | 140 | 122 | 101 | 94 | 100 | 103 | 106 | 111 | 98 | - | - |
| **CENSUS OF MANUFACTURES** | | | | | | | | | | | | | | | |
| Shipments | 17,278 | 14,292 | 16,445 | 18,269 | 18,631 | 16,588 | 14,932 | 13,574 | 14,073 | 13,890 | 14,563 | 12,942 | 11,322 | 11,927 | 11,202 |
| Intermediate consumption | 11,728 | 8,959 | 9,765 | 11,147 | 11,207 | 9,616 | 8,766 | 7,874 | 8,116 | 7,958 | 8,395 | 7,530 | 6,493 | 6,829 | 6,421 |
| Salaries | 1,723 | 1,737 | 1,803 | 1,888 | 1,956 | 1,932 | 1,898 | 1,868 | 1,831 | 1,808 | 1,764 | 1,625 | 1,538 | 1,432 | 1,353 |
| Depreciation | 806 | 776 | 815 | 820 | 872 | 914 | 898 | 895 | 865 | 856 | 850 | 794 | 735 | 708 | 676 |
| Operating surplus, taxes, etc. | 3,021 | 2,819 | 4,063 | 4,414 | 4,597 | 4,126 | 3,371 | 2,938 | 3,261 | 3,267 | 3,554 | 2,993 | 2,555 | 2,958 | 2,752 |
| Employees, number | 409,965 | 358,683 | 337,428 | 337,811 | 339,572 | 330,524 | 321,868 | 307,577 | 296,824 | 284,881 | 273,840 | 261,024 | 242,616 | 236,525 | 223,817 |
| **FINANCIAL STATEMENT STATISTICS OF CORPORATIONS** | | | | | | | | | | | | | | | |
| Sales | 17,103 | 14,356 | 16,975 | 18,948 | 18,343 | 16,784 | 15,280 | 15,177 | 15,748 | 15,375 | 15,560 | 12,970 | 13,296 | 12,461 | 12,224 |
| Intermediate consumption | 12,519 | 10,263 | 11,645 | 13,529 | 12,845 | 11,915 | 11,025 | 10,766 | 11,432 | 11,135 | 11,245 | 9,472 | 9,785 | 8,979 | 9,200 |
| Salaries | 2,032 | 1,990 | 2,060 | 2,107 | 2,259 | 2,212 | 2,184 | 2,079 | 2,000 | 1,908 | 1,942 | 1,707 | 1,647 | 1,517 | 1,447 |
| Other labor compensation | 375 | 424 | 429 | 418 | 440 | 448 | 479 | 427 | 422 | 405 | 392 | 367 | 331 | 306 | 320 |
| Depreciation | 860 | 851 | 879 | 912 | 993 | 989 | 986 | 953 | 854 | 934 | 904 | 861 | 842 | 788 | 727 |
| Interest, rent & taxes | 1,242 | 1,001 | 947 | 1,048 | 1,074 | 1,053 | 930 | 1,073 | 798 | 691 | 684 | 623 | 582 | 508 | 522 |
| Net Operating Profit | 75 | -172 | 1,016 | 935 | 732 | 167 | -325 | -120 | 242 | 301 | 394 | -60 | 109 | 362 | 8 |
| Employees, number | 494,001 | 451,204 | 417,029 | 394,617 | 394,452 | 388,431 | 389,397 | 371,259 | 357,331 | 331,547 | 331,607 | 302,548 | 300,823 | 282,988 | 275,064 |
| **OTHER ESTIMATES OF STEEL EXPORTS** | | | | | | | | | | | | | | | |
| Japanese trade statistics | 3,442 | 1,983 | 2,002 | 1,811 | 1,834 | 1,689 | 1,614 | 1,520 | 1,644 | 1,655 | 1,929 | 1,941 | 1,534 | 1,600 | 1,650 |
| Statistics Canada | 3,618 | 2,089 | 2,069 | 1,885 | 1,889 | 1,746 | 1,661 | 1,529 | 1,667 | 1,711 | 1,990 | 2,028 | 1,621 | 1,705 | 1,811 |
| UNIDO, ISIC base | 3,496 | 2,034 | 2,055 | 1,870 | 1,891 | 1,749 | 1,663 | 1,572 | 1,705 | 1,715 | 1,993 | 2,009 | 1,592 | 1,654 | - |

Note: Depreciation for 2001 is estimated as 1.037 times the depreciation for plants with 30 or more employees (the actual ratio for 1999-2000).

Sources: Bank of Japan (various years); Ministry of Economy, Trade and Industry (various years a, various years b); Statistics Canada (various years); United Nations Industrial Organization (2003).

**Table 6: Alternative Estimates of Total Output or Total Shipments of Iron and Steel by Product Category (billion current yen)**

| Source, Indicator | 1980-85 | 1986-87 | 1988-89 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **INPUT-OUTPUT TABLES** | | | | | | | | | | | | | | | |
| Total output | 27,732 | 19,993 | 23,168 | 26,006 | 26,672 | 23,951 | 21,355 | 19,411 | 19,928 | 20,250 | 21,972 | 18,136 | 16,289 | - | - |
| Domestic sales | 24,462 | 18,105 | 21,260 | 24,286 | 24,933 | 22,342 | 19,813 | 17,957 | 18,358 | 18,742 | 20,209 | 16,352 | 14,873 | - | - |
| Pig iron & crude steel | 9,327 | 5,292 | 5,578 | 6,542 | 6,412 | 6,080 | 5,410 | 4,751 | 5,108 | 5,602 | 6,475 | 4,740 | 4,426 | - | - |
| Hot-rolled steel | 6,722 | 4,501 | 6,070 | 7,235 | 7,402 | 5,990 | 5,317 | 4,894 | 4,864 | 4,776 | 5,165 | 4,215 | 3,840 | - | - |
| Steel pipes and tubes | 966 | 855 | 973 | 1,159 | 1,146 | 941 | 846 | 747 | 789 | 802 | 741 | 649 | 544 | - | - |
| Cold-rolled steel | 3,521 | 3,558 | 4,098 | 4,329 | 4,480 | 4,398 | 4,043 | 3,669 | 3,663 | 3,586 | 3,752 | 3,221 | 2,912 | - | - |
| Other products | 3,925 | 3,899 | 4,541 | 5,022 | 5,495 | 4,933 | 4,198 | 3,896 | 3,933 | 3,977 | 4,076 | 3,527 | 3,152 | - | - |
| Export sales | 3,270 | 1,888 | 1,908 | 1,720 | 1,739 | 1,609 | 1,541 | 1,454 | 1,570 | 1,508 | 1,763 | 1,784 | 1,416 | - | - |
| Pig iron & crude steel | 32 | 24 | 17 | 15 | 13 | 25 | 23 | 35 | 29 | 48 | 51 | 81 | 67 | - | - |
| Hot rolled steel | 1,171 | 686 | 645 | 542 | 515 | 497 | 574 | 509 | 577 | 513 | 630 | 701 | 554 | - | - |
| Steel pipes and tubes | 1,027 | 427 | 446 | 397 | 447 | 344 | 310 | 274 | 236 | 266 | 324 | 350 | 225 | - | - |
| Cold & rolled steel | 999 | 734 | 786 | 740 | 738 | 725 | 616 | 620 | 715 | 665 | 741 | 639 | 556 | - | - |
| Other products | 41 | 17 | 14 | 26 | 26 | 19 | 18 | 15 | 13 | 16 | 17 | 13 | 14 | - | - |
| **CENSUS OF MANUFACTURES DATA** | | | | | | | | | | | | | | | |
| Shipments | 17,278 | 14,292 | 16,445 | 18,269 | 18,631 | 16,588 | 14,932 | 13,574 | 14,073 | 13,890 | 14,563 | 12,942 | 11,322 | 11,927 | 11,202 |
| Iron, with blast furnaces | 6,801 | 5,243 | 5,801 | 6,086 | 6,061 | 5,432 | 4,794 | 4,223 | 4,380 | 4,230 | 4,591 | 4,107 | 3,678 | 3,849 | 3,628 |
| Iron, without blast furnaces | 332 | 162 | 175 | 194 | 164 | 152 | 132 | 120 | 123 | 125 | 138 | 131 | 97 | 140 | 126 |
| Steel, with rolling | 2,938 | 2,181 | 2,704 | 3,007 | 3,132 | 2,599 | 2,502 | 2,445 | 2,635 | 2,629 | 2,726 | 2,299 | 1,888 | 2,048 | 1,903 |
| Steel materials, n.i.e. | 2,893 | 2,497 | 2,872 | 3,259 | 3,434 | 3,125 | 2,724 | 2,442 | 2,403 | 2,420 | 2,509 | 2,257 | 2,012 | 2,111 | 1,977 |
| Coated steel | 249 | 228 | 260 | 279 | 302 | 269 | 240 | 228 | 229 | 215 | 218 | 195 | 196 | 199 | 182 |
| Machine parts, tooling prod. | - | - | - | 1,967 | 2,050 | 1,898 | 1,735 | 1,454 | 1,561 | 1,575 | 1,626 | 1,403 | 1,259 | 1,324 | 1,264 |
| Other steel products | - | - | - | 3,477 | 3,488 | 3,113 | 2,804 | 2,662 | 2,742 | 2,696 | 2,755 | 2,549 | 2,191 | 2,256 | 2,121 |

Sources: Ministry of Economy, Trade and Industry (various years a, various years b).

**Table 7: Decomposing the Growth of Output or Sales by Cost Component and Profits (percent)**

| Source, Indicator | 1981-85 | 1986-87 | 1988-89 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **INPUT-OUTPUT TABLES** | | | | | | | | | | | | | | | |
| Total output | -0.43 | -18.54 | 12.91 | 8.85 | 2.56 | -10.20 | -10.84 | -9.10 | 2.66 | 1.62 | 8.51 | -17.46 | -10.19 | - | - |
| Intermediate consumption | -1.02 | -16.74 | 8.80 | 7.14 | 0.13 | -5.69 | -8.33 | -7.53 | 2.76 | 1.74 | 7.42 | -14.52 | -5.24 | - | - |
| Labor compensation | 0.40 | -0.90 | 0.01 | 0.56 | 1.08 | 0.14 | -0.50 | -0.32 | 0.34 | -3.02 | 3.65 | -1.46 | -2.26 | - | - |
| Depreciation | 0.04 | -0.85 | 0.28 | 0.24 | 0.21 | 0.51 | -0.41 | -0.24 | 0.06 | 1.34 | 0.47 | -0.55 | -1.25 | - | - |
| Indirect taxes-subsidies, etc. | 0.00 | 0.17 | 0.70 | -0.02 | 0.04 | -0.74 | -0.55 | -0.28 | 0.33 | 0.74 | 0.24 | 0.03 | -0.65 | - | - |
| Operating surplus | 0.15 | -0.22 | 3.13 | 0.94 | 1.10 | -4.42 | -1.05 | -0.73 | -0.82 | 0.82 | -3.28 | -0.96 | -0.79 | - | - |
| **CENSUS OF MANUFACTURES** | | | | | | | | | | | | | | | |
| Shipments | 0.02 | -11.69 | 11.87 | 5.79 | 1.98 | -10.96 | -9.99 | -9.09 | 3.67 | -1.30 | 4.85 | -11.13 | -12.52 | 5.35 | -6.08 |
| Intermediate consumption | -0.31 | -10.11 | 6.35 | 4.85 | 0.33 | -8.54 | -5.12 | -5.97 | 1.79 | -1.13 | 3.15 | -5.94 | -8.02 | 2.97 | -3.42 |
| Salaries | 0.22 | -0.26 | 0.43 | 0.24 | 0.37 | -0.13 | -0.21 | -0.20 | -0.27 | -0.16 | -0.32 | -0.95 | -0.67 | -0.94 | -0.67 |
| Depreciation | 0.09 | -0.16 | 0.15 | 0.04 | 0.28 | 0.23 | -0.10 | -0.02 | -0.22 | -0.06 | -0.04 | -0.39 | -0.45 | -0.24 | -0.27 |
| Operating surplus, taxes, etc. | 0.02 | -1.17 | 4.94 | 0.66 | 1.00 | -2.53 | -4.55 | -2.90 | 2.38 | 0.05 | 2.06 | -3.85 | -3.38 | 3.56 | -1.73 |
| **FINANCIAL STATEMENT STATISTICS OF CORPORATIONS** | | | | | | | | | | | | | | | |
| Sales | -0.83 | -8.27 | 11.71 | 7.31 | -3.19 | -8.50 | -8.96 | -0.67 | 3.76 | -2.37 | 1.20 | -16.65 | 2.51 | -6.27 | -1.90 |
| Intermediate consumption | -0.30 | -8.13 | 7.71 | 7.41 | -3.61 | -5.07 | -5.31 | -1.70 | 4.39 | -1.88 | 0.72 | -11.40 | 2.41 | -6.06 | 1.77 |
| Salaries | 0.20 | -0.94 | 0.84 | 0.12 | 0.80 | -0.25 | -0.17 | -0.69 | -0.51 | -0.58 | 0.22 | -1.51 | -0.46 | -0.98 | -0.56 |
| Other labor compensation | 0.01 | 0.13 | -0.03 | -0.02 | 0.12 | 0.04 | 0.19 | -0.34 | -0.03 | -0.11 | -0.08 | -0.16 | -0.28 | -0.18 | 0.11 |
| Depreciation | 0.07 | -0.05 | 0.15 | 0.12 | 0.43 | -0.02 | -0.02 | -0.22 | -0.65 | 0.51 | -0.20 | -0.27 | -0.15 | -0.41 | -0.49 |
| Interest, rent & taxes | -0.21 | -0.69 | 0.01 | 0.58 | 0.14 | -0.12 | -0.73 | 0.93 | -1.81 | -0.68 | -0.05 | -0.39 | -0.31 | -0.56 | 0.11 |
| Net Operating Profit | -0.61 | 1.41 | 3.03 | -0.89 | -1.07 | -3.08 | -2.93 | 1.34 | 2.39 | 0.38 | 0.60 | -2.91 | 1.30 | 1.91 | -2.84 |

Sources: Authors' calculations from data underlying Table 5.

**Table 8: Decomposing the Growth of Output or Sales by Price and Quantity Component in Domestic and Export Markets (percent)**

| Source, Indicator | 1981-85 | 1986-87 | 1988-89 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **INPUT-OUTPUT TABLES** | | | | | | | | | | | | | | | |
| Total output | -0.43 | -18.54 | 12.91 | 8.85 | 2.56 | -10.20 | -10.84 | -9.10 | 2.66 | 1.62 | 8.51 | -17.46 | -10.19 | - | - |
| Domestic sales | -0.23 | -15.99 | 12.41 | 9.78 | 2.49 | -9.72 | -10.56 | -8.69 | 2.07 | 1.93 | 7.24 | -17.55 | -8.15 | - | - |
| Domestic prices | -0.29 | -7.84 | 3.99 | 0.96 | -0.37 | -0.96 | -5.76 | -6.23 | -1.83 | 2.44 | 2.39 | -7.34 | -6.75 | - | - |
| Domestic quantity | 0.06 | -8.15 | 8.42 | 8.81 | 2.86 | -8.75 | -4.79 | -2.47 | 3.90 | -0.51 | 4.86 | -10.22 | -1.41 | - | - |
| Export sales | -0.19 | -2.55 | 0.51 | -0.92 | 0.08 | -0.49 | -0.29 | -0.41 | 0.60 | -0.31 | 1.26 | 0.10 | -2.03 | - | - |
| Export prices | -0.33 | -1.88 | 1.27 | -0.30 | -0.23 | -0.86 | -1.15 | -0.51 | 0.49 | 0.23 | 0.21 | 0.43 | -1.21 | - | - |
| Export quantity | 0.13 | -0.68 | -0.77 | -0.62 | 0.31 | 0.37 | 0.87 | 0.10 | 0.11 | -0.54 | 1.05 | -0.33 | -0.82 | - | - |
| **CENSUS OF MANUFACTURES & JAPANESE TRADE DATA** | | | | | | | | | | | | | | | |
| Shipments | 0.02 | -11.69 | 11.87 | 5.79 | 1.98 | -10.96 | -9.99 | -9.09 | 3.67 | -1.30 | 4.85 | -11.13 | -12.52 | 5.35 | -6.08 |
| Domestic sales | 0.30 | -7.54 | 11.12 | 7.12 | 1.86 | -10.19 | -9.53 | -8.46 | 2.75 | -1.38 | 2.87 | -11.21 | -9.37 | 4.76 | -6.49 |
| Domestic prices | -0.20 | -3.82 | 3.49 | 0.96 | 0.99 | -1.69 | -4.04 | -4.61 | -1.19 | -2.03 | 1.94 | -2.23 | -3.68 | 0.29 | -2.45 |
| Domestic quantity | 0.50 | -3.72 | 7.63 | 6.16 | 0.87 | -8.50 | -5.50 | -3.85 | 3.95 | 0.66 | 0.93 | -8.98 | -5.69 | 4.47 | -4.05 |
| Export sales | -0.29 | -4.16 | 0.75 | -1.33 | 0.12 | -0.78 | -0.45 | -0.63 | 0.92 | 0.07 | 1.98 | 0.08 | -3.14 | 0.59 | 0.41 |
| Export prices | -0.28 | -2.83 | 1.42 | -0.44 | -0.58 | -1.05 | -1.44 | -0.87 | 1.50 | 0.56 | 0.77 | -0.72 | -2.53 | -0.28 | 0.36 |
| Export quantity | -0.01 | -1.33 | -0.67 | -0.88 | 0.71 | 0.27 | 0.99 | 0.24 | -0.58 | -0.49 | 1.21 | 0.80 | -0.62 | 0.87 | 0.05 |

Sources: Authors' calculations from data underlying Table 5.

**Table 9: Decomposing the Growth of Output or Shipments by Product Category (percent)**

| Source, Indicator | 1981-85 | 1986-87 | 1988-89 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **INPUT-OUTPUT TABLES, OUTPUT BY PRODUCT CATEGORY, MARKET, PRICE, & QUANTITY** | | | | | | | | | | | | | | | |
| Total output | -0.45 | -18.54 | 12.91 | 8.85 | 2.56 | -10.20 | -10.84 | -9.10 | 2.66 | 1.62 | 8.51 | -17.46 | -10.19 | - | - |
| Pig iron & crude steel | -0.48 | -9.24 | 2.81 | 3.34 | -0.51 | -1.20 | -2.80 | -3.03 | 1.81 | 2.58 | 4.33 | -7.76 | -1.81 | - | - |
| Domestic sales | -0.49 | -9.17 | 2.80 | 3.36 | -0.50 | -1.24 | -2.80 | -3.09 | 1.84 | 2.48 | 4.31 | -7.90 | -1.73 | - | - |
| Exports | 0.01 | -0.07 | 0.01 | -0.02 | -0.01 | 0.05 | -0.01 | 0.05 | -0.03 | 0.09 | 0.02 | 0.14 | -0.08 | - | - |
| Hot rolled steel | -0.11 | -6.26 | 5.18 | 4.03 | 0.54 | -5.36 | -2.49 | -2.28 | 0.19 | -0.77 | 2.50 | -4.00 | -2.88 | - | - |
| Domestic sales | -0.08 | -5.21 | 5.05 | 4.63 | 0.64 | -5.29 | -2.81 | -1.98 | -0.15 | -0.44 | 1.92 | -4.32 | -2.07 | - | - |
| Exports | -0.03 | -1.05 | 0.13 | -0.60 | -0.10 | -0.07 | 0.32 | -0.30 | 0.35 | -0.32 | 0.58 | 0.32 | -0.81 | - | - |
| Steel pipes and tubes | -0.28 | -1.26 | 0.72 | 0.27 | 0.14 | -1.16 | -0.54 | -0.63 | 0.02 | 0.21 | -0.01 | -0.30 | -1.27 | - | - |
| Domestic sales | -0.17 | -0.30 | 0.54 | 0.32 | -0.05 | -0.77 | -0.40 | -0.46 | 0.22 | 0.06 | -0.30 | -0.42 | -0.58 | - | - |
| Exports | -0.10 | -0.96 | 0.18 | -0.05 | 0.19 | -0.39 | -0.14 | -0.17 | -0.20 | 0.15 | 0.29 | 0.12 | -0.69 | - | - |
| Cold & rolled steel | 0.17 | -1.19 | 2.12 | -0.12 | 0.57 | -0.35 | -1.94 | -1.73 | 0.46 | -0.64 | 1.20 | -2.88 | -2.16 | - | - |
| Domestic sales | 0.23 | -0.75 | 1.94 | 0.19 | 0.58 | -0.31 | -1.48 | -1.75 | -0.03 | -0.39 | 0.82 | -2.42 | -1.71 | - | - |
| Exports | -0.06 | -0.44 | 0.18 | -0.31 | -0.01 | -0.05 | -0.46 | 0.02 | 0.49 | -0.25 | 0.38 | -0.47 | -0.46 | - | - |
| Other products | 0.25 | -0.59 | 2.08 | 1.33 | 1.82 | -2.14 | -3.07 | -1.43 | 0.18 | 0.23 | 0.49 | -2.51 | -2.07 | - | - |
| Domestic sales | 0.26 | -0.56 | 2.08 | 1.28 | 1.82 | -2.11 | -3.07 | -1.41 | 0.19 | 0.22 | 0.49 | -2.50 | -2.07 | - | - |
| Exports | 0.00 | -0.03 | 0.00 | 0.05 | 0.00 | -0.03 | 0.00 | -0.01 | -0.01 | 0.02 | 0.00 | -0.02 | 0.00 | - | - |
| **CENSUS OF MANUFACTURES DATA** | | | | | | | | | | | | | | | |
| Shipments | 0.02 | -11.69 | 11.87 | 5.79 | 1.98 | -10.96 | -9.99 | -9.09 | 3.67 | -1.30 | 4.85 | -11.13 | -12.52 | 5.35 | -6.08 |
| Iron, with blast furnaces | -0.23 | -5.55 | 3.59 | 0.37 | -0.14 | -3.38 | -3.85 | -3.83 | 1.16 | -1.07 | 2.60 | -3.32 | -3.31 | 1.51 | -1.85 |
| Iron, without blast furnaces | -0.15 | -0.46 | 0.15 | 0.03 | -0.16 | -0.06 | -0.12 | -0.08 | 0.02 | 0.02 | 0.09 | -0.04 | -0.27 | 0.38 | -0.11 |
| Steel, with rolling | -0.10 | -2.70 | 2.65 | 0.71 | 0.68 | -2.86 | -0.58 | -0.39 | 1.40 | -0.04 | 0.70 | -2.93 | -3.17 | 1.41 | -1.22 |
| Steel materials, n.i.e. | -0.17 | -1.38 | 2.01 | 1.45 | 0.96 | -1.66 | -2.42 | -1.89 | -0.29 | 0.12 | 0.64 | -1.73 | -1.90 | 0.88 | -1.13 |
| Coated steel | 0.04 | -0.16 | 0.19 | 0.02 | 0.13 | -0.18 | -0.18 | -0.08 | 0.00 | -0.09 | 0.02 | -0.16 | 0.01 | 0.02 | -0.14 |
| Machine parts, tooling prod. | - | - | - | - | 0.45 | -0.82 | -0.99 | -1.88 | 0.79 | 0.10 | 0.37 | -1.53 | -1.11 | 0.57 | -0.50 |
| Other steel products | - | - | - | - | 0.06 | -2.01 | -1.86 | -0.95 | 0.59 | -0.33 | 0.43 | -1.42 | -2.77 | 0.58 | -1.13 |

Sources: Authors' calculations from data underlying Table 6.