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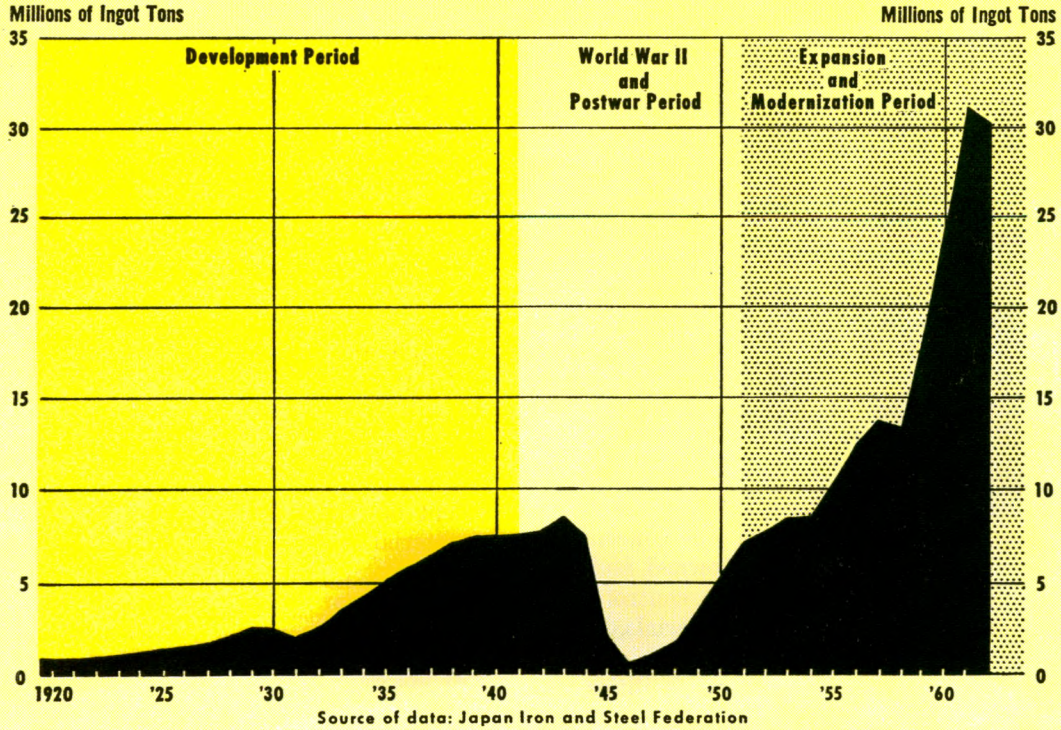
Japan's Crude Steel Production



Source of data: Japan Iron and Steel Federation

Expansion And Modernization of The Japanese Iron And Steel Industry

JAPAN'S unparalleled postwar recovery has shown remarkable progress in culture, politics, commerce, and industry. A typical part of the industrial recovery was the development of the Japanese iron and steel industry. In 1962 Japan — representing 7.6 percent of the world's crude steel production — was the fourth largest producer of crude steel, surpassed only by the United States, U.S.S.R., and West Germany.

The iron and steel industry has made a significant contribution to Japan's economic development and prosperity. The development of the industry has been a salient factor in enabling Japan to become a leading nation in the world and the most industrialized country in Asia. The industry has been successful not only in fulfilling domestic demands for steel, but it has also become one of the leading exporters of steel products, competing vigorously with the United States.

As illustrated by the chart on the cover, the Japanese iron and steel industry developed slowly during the 1920 decade. The 1930's were marked by increasing government ownership and control of the industry and by more rapid development in production, mainly to meet increasing military demands for iron and steel products.

Although there were a number of small concerns in the industry during the period from 1937 to 1941, output was concentrated in Nippon Seitetsu, a state owned and operated company.[1] Government control of the industry, in regard to raw materials, production, distribution, price, and subsidies, was extensive. As steel producing facilities were expanded, the prewar Japanese iron and steel industry depended upon obtaining pig iron from China and Manchuria, and semifinished steel products from Korea and Manchuria. Because Japan is poorly endowed with natural resources, the industry was required to import vast quantities of raw materials: namely, coking coal from China and Manchuria; iron ore from Korea, China, Malaya, the Philippines and India, and scrap from the United States.

Through the war years from 1941 to 1945, government control continued and the government spent freely in all fields in which it wished to encourage production. Under these conditions, the industry achieved a peak wartime production level of 8.4 million tons of crude steel in 1943. The basic wartime weakness of the industry was its great dependence upon imported raw materials. With the Allied blockade of Japan late in the war, vessels that transported raw materials for the industry were destroyed at a drastic rate. The import of raw materials dwindled, stockpiles vanished, and with extensive physical plant damage, production continued to fall until 1945 when the industry reached a state of collapse.

After World War II, the shortage of domestic coal and the dearth of coking coal, iron ore, and other essential raw materials kept output at a low level. Imports of raw materials were narrowly limited by the short-

(1) In accordance with the Japan Iron and Steel Manufacturing Company Law, Nippon Seitetsu (Japan Iron and Steel Manufacturing Company) was formed by the merger of government-operated steel plants with major nongovernment-operated enterprises. At the time of its formation in 1934, Nippon Seitetsu produced 96 percent of the entire pig iron output, more than half of crude steel output, and over two-fifths of the finished steel in Japan.

age of foreign exchange and by the policy of the occupation authorities, who at first contemplated permanent restrictions over the future size of the industry. Thus, in 1946 production was at a low level with an annual output of 0.6 million tons of crude steel.

The industry, affected by the confusion in Japan's postwar economic community, faced a major recovery problem before it would be able to meet domestic needs for steel. The problem involved finding new sources of material supply and coping with obsolescence, deconcentration, and loss of subsidies.

The industry could no longer obtain pig iron from China and Manchuria and semi-finished steel products from Korea and Manchuria. Coking coal was not obtainable from China and Manchuria. Korea and China were no longer a source of iron ore supply. Consequently, firms in the industry had to find new sources of material supply. The establishment of new sources of materials not only raised the cost of raw materials because of an increase in transportation distance, but also made the cost unstable since it was sensitive to fluctuations in freight rates. The result was a higher cost of Japanese iron and steel products.

Another reason for the high cost of Japanese iron and steel products was obsolescence. Although obsolescence was present in blast furnace equipment, open-hearth melting facilities, and electric furnace equipment, it was most serious in the rolling mill sector of the industry. The obsolescence had been caused mainly by the World War II focus on armaments and on machinery other than steel-making equipment; replacement was deferred during the postwar period because of the scarcity of capital funds.

As stated earlier, before and during World War II, output was very highly concentrated in the government-owned Nippon Seitetsu. To overcome excessive concentration in the industry, an anti-monopoly program was decided upon by occupational authorities in December 1947, with the passage of a far-reaching measure: the Law of the Elimination of Excessive Concentration of Economic Power. In compliance with this law, the reorganization of Nippon Seitetsu into two privately-owned steel companies introduced additional competition into the industry. To be competitive, individual firms were compelled to undertake programs to increase the efficiency of their steel-making operations.

In the governmental vacuum existing immediately after the war, huge amounts of military funds were disbursed.[2] With the output of commodities sharply curtailed, the disbursements caused an unprecedented and sudden expansion of the money supply that released a full-scale inflationary spiral.

To cope with soaring prices, the Supreme Commander for Allied Powers introduced a program of fiscal and monetary reform in February 1949.[3] When the economic stabilization plan was put into effect with the termination of all government subsidies, the industry was extremely apprehensive as to whether it could really become self-supporting. Its leaders were worried about their future operations because the disparity between international and domestic prices became more conspicuous than ever.

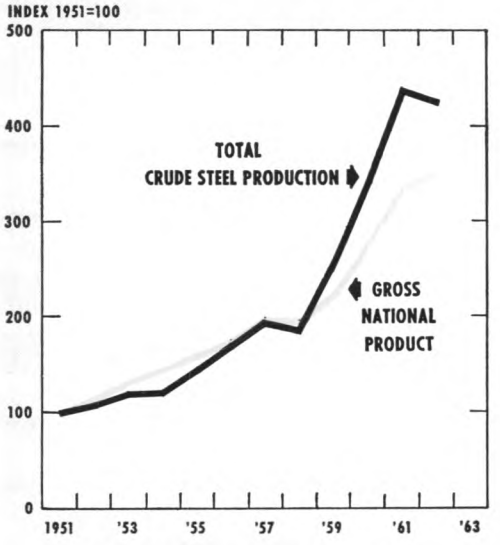
With the outbreak of the Korean War in June 1950, international prices of iron and steel were raised and the industry was able to export some of its products, enabling firms to pursue small-scale rehabilitation programs. The high cost of iron and steel products caused by new sources of material supply and obsolescence, additional competition due to the deconcentration of Nippon Seitetsu, and the elimination of government subsidies, pointed in only one direction: modernization of the industry.

In 1951 the industry commenced to overcome its difficulties and expanded output through modernization. For the first five years, the primary object was to modernize obsolete rolling mill equipment, with empha-

(2) Military funds were paid principally as indemnities to war industries and as discharge allowances and military pensions, often for years in advance.
(3) The Supreme Commander for Allied Powers, who controlled Japan following World War II, was an international agent designated by the United States.

Chart 1.

The increase in Japan's crude steel production was slightly less than the increase in gross national product from 1951 to 1958. In the last four years, steel production increased faster than gross national product.



Source of data: Japan Iron and Steel Federation, and the Bank of Japan

sis on sheet mills. In the following years, integrated steel plants were built and the construction of blast furnaces and converters was stressed to expand the industry.

The growth achieved by the industry under expansion and modernization was outstanding. Output increased more than threefold from 1951 to 1962. In 1961 six leading firms of the industry and a large number of small firms (approximately five hundred) produced an all-time high of 31.2 million tons of crude steel.(4)

As shown in Chart 1, the increase in steel production was slightly less than the increase in gross national product from 1951 to 1958. However, steel production increased faster than gross national product from 1958 to 1962 because of the rapid expansion and modernization of the industry. The growing steel industry suffered from three recessions that account for the irregular nature of its growth. In 1954 the industry experienced a slackening of production. More severe recessions brought sharp decreases in steel production in 1958 and 1962. In all three circumstances, the recessions were caused by a rapidly expanding Japanese economy. As a result there was a sharp rise in imports, which caused a balance of payments deficit. To correct the deficit, the Bank of Japan, Japan's central bank, pursued a restrictive monetary policy that contributed to a reduction in inventory and fixed investment: accordingly, the demand for steel decreased. Once the balance of payments difficulty was corrected, Japan's economy, including the iron and steel industry, expanded further.

To aid understanding of the expansion and modernization of Japan's steel industry from 1951 to 1962, the following pages examine some of the reasons for the phenomenal growth of the industry, focusing on the expanding use of steel products, raw material supply, labor relations, technology, and behavior of costs and prices.

Use of Steel Products

The growth of the Japanese iron and steel industry rested on the expanding use of steel products that was evident in the annual increase in steel consumption, as illustrated in Chart 2. Japan's increased consumer purchasing power was reflected in per capita steel consumption (measured in crude steel equivalent) that increased from 138 pounds in 1951 to 600.2 pounds in 1961. The decline in per capita steel consumption in 1962 to 525.9 pounds was caused by a decrease in general business activity and steel production. In 1960 Japan's steel consumption of 460 pounds per capita was considerably lower than the per capita consumption in the United States (1105 pounds), West Germany (1232 pounds), or

(4) The six leading firms of the industry accounted for 92 percent of total pig iron production, 68 percent of total crude steel production and approximately two-thirds of ordinary rolled steel products.

Great Britain (988 pounds); however, it was ten times that of countries in Southeast Asia.

Basically, there are four reasons for the expanding use of steel products. First, steel found its way into all phases of daily life as a result of changes in the nation's mode of living. In urban areas new buildings went up at a rapid pace and the construction industry enjoyed a booming business. In suburban areas new apartment buildings and an increasing number of steel-frame or reinforced concrete single dwellings replaced wood structures. The most notable change in the nation's mode of living was the extensive "electrification" of Japanese homes. Electric rice cookers, refrigerators, television sets, air conditioners, and other electrical appliances became household necessities. Steel furniture became commonplace in offices and found its way into homes by virtue of its durability and improved design. The growing number of privately-owned automobiles, as well as the thousands of other new vehicles that appeared on Japan's steadily improving roads, reflected the rising standard of living.

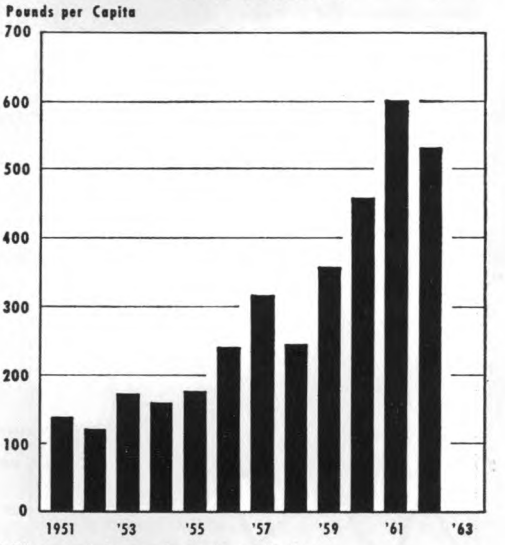
Second, use of steel increased because of the needs of the manufacturing industries who were catching up to the most advanced countries in the world. New industries in the engineering and chemical fields, emphasizing heavier industrialization — e.g., electronics, electrical household appliances, business machines, and petro-chemicals — stimulated the use of steel products. Japan's growing industrial structure, impelled by technical improvements, required steel for the production of steel products, additional equipment, and replacement of obsolete and inefficient equipment.

Third, demands for steel also resulted from the expansion and improvement of public utilities, such as communications, harbor facilities, power and water supplies, and railway and highway networks.

Last, the export of iron and steel products increased as the industry served Japan's export drive. When the Korean War began in 1950, iron and steel exports increased to over

Chart 2.

CONSUMPTION of STEEL PER CAPITA*



* Measured in crude steel equivalent
Source of data: Japan Iron and Steel Federation, and the Bank of Japan

0.6 million tons as a result of the use of steel for military application, followed by 1.1 million tons in 1951 and 1.8 million tons in 1952. Since then exports have been characterized by heavy fluctuations from year to year, tending to contract when the domestic use of steel products was brisk. As evidenced by Chart 3, iron and steel exports, which were 4.4 million tons in 1962, showed a large overall increase from 1951 to 1962. However, over the 12-year span, the ratio of iron and steel exports to total production decreased, as is also shown in Chart 3.[5] The decline indicates that a larger proportion of the industry's growth was absorbed by greater domestic use of iron and steel products.

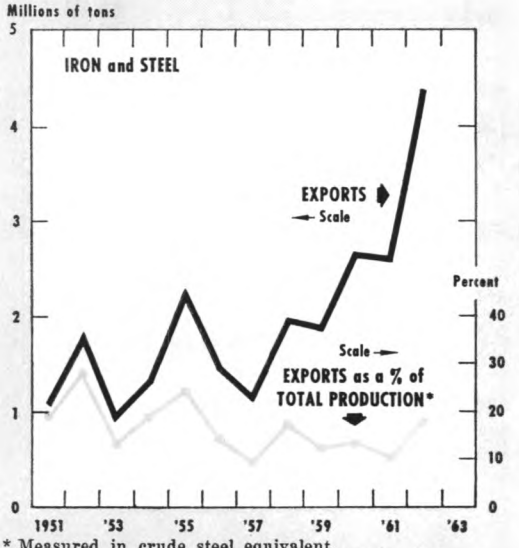
Raw Material Supply

Another of the principal reasons for the success of the industry's expansion and mod-

(5) Measured in crude steel equivalent.

Chart 3.

Japan's iron and steel exports have been characterized by heavy fluctuations from year to year, tending to contract when the domestic use of steel was brisk. From 1951 to 1962, exports showed an overall increase; however, the ratio of exports to total production decreased.



* Measured in crude steel equivalent
Source of data: Japan Iron and Steel Federation, and the United Nations

ernization is the development of raw material supply — namely, coking coal, iron ore, and scrap.

Japan's paucity of raw materials, a continuing handicap, compels the industry to depend on the import of raw materials: imports amount to 40-50 percent of coking coal, 90-95 percent of iron ore, and 20-35 percent of scrap.

To overcome the disadvantage of imported raw materials and to reduce their cost, the development of the three essential raw materials was directed mainly toward source dependability, high quality, cost reduction, and cost stability.

Coal is one of the chief weaknesses in Japan's industrial structure. The nation has a considerable quantity of coal reserves; however, the supply of high-grade coking coal, which represents 20 percent of total Japanese coal production, is not sufficient to fulfill the requirements of the industry.

Coking coal from the United States is the main source of foreign supply, primarily because of its excellent quality. The amount of coking coal furnished by the United States was 69 percent of total imported coking coal in 1951, 93 percent in 1954, and 89 percent in 1955. Since there was every reason to expect a large increase in future steel production, the industry was interested in securing less distant quality sources. Extensive world-wide exploration resulted in the opening of efficient coal mines in Australia. In 1962 Australia accounted for 27 percent of Japan's total imported coking coal, whereas the quantity imported from the United States was 57 percent of the total, a sharp decline from 1955.[6] The development of Australia as a new source of high-grade coking coal reduced the transportation distance of imported coking coal that, in turn, lowered the cost per ton. Furthermore, the efficiency of the coal-coke process and the sale of various by-products also played a role in the reduction of the cost of coking coal.

Achievements in obtaining iron ore were also prominent in the modernization process. Indigenous iron ore resources are so limited in Japan that annual production from 1951 to 1962 was relatively stable at 1.2 million tons per year, and in 1962 domestic production accounted for only 5 percent of total iron ore requirements. Consequently, the industry had to depend on iron ore imports.

The heavy reliance upon imported iron ore stimulated the industry to develop dependable and high-quality sources at the lowest possible cost. In cooperation with mining and trading firms in Japan, the industry extended loans and gave technical assistance to appropriate countries throughout the world for the development of iron ore sources. In addition,

(6) Although the fraction of imported coking coal from the United States in relation to total imported coking coal was declining from 1955 to 1962, the absolute quantity showed a substantial increase with the expansion of the industry.

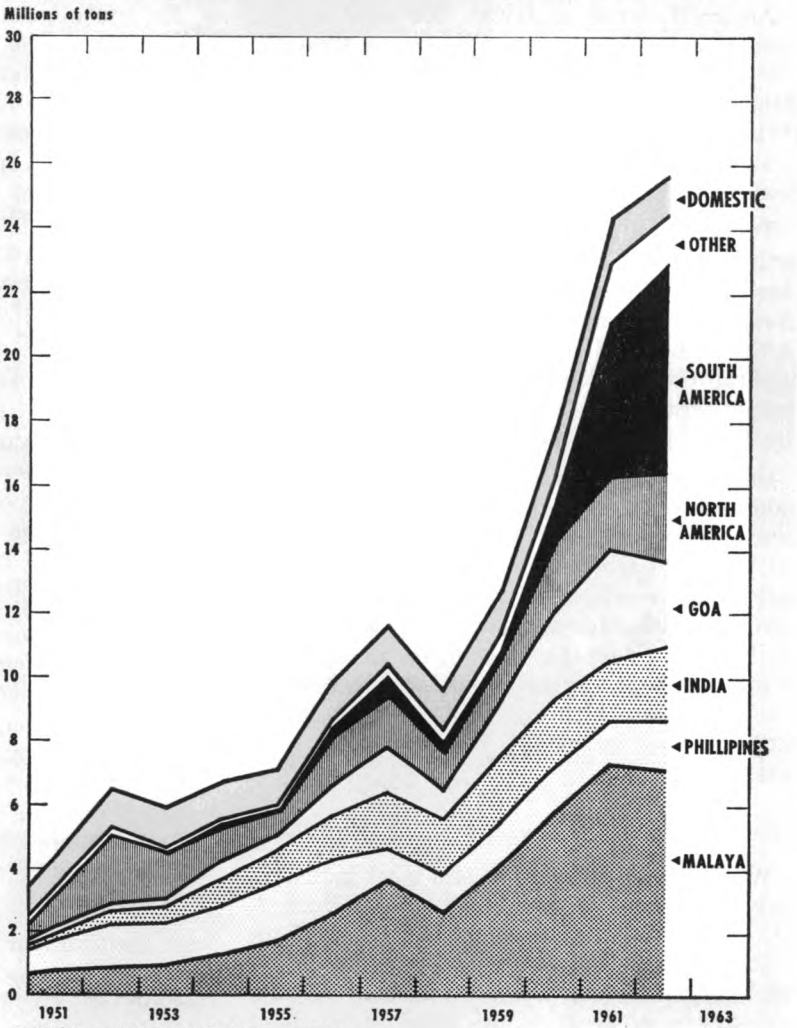
some investments in mining projects were undertaken to achieve a stable and long-range supply. The Japanese government also offered financial assistance to underdeveloped countries with iron ore reserves to expand further the industry's sources.

As shown in Chart 4, the supply of iron ore—including domestic production and imports by country or area — increased more than fourfold from 1951 to 1962. In 1962 Malaya was the largest supplier, followed by South America (Chile, Peru, and Brazil), North America (United States and Canada), Goa, and India, in that order. The eight countries accounted for 83 percent of Japan's total iron ore requirements.

As the industry grew, the procurement of foreign iron ore involved an increase in transportation distance. Iron ore mines in Malaya and the Philippines were unable to satisfy all of the new demands and the industry had to obtain iron ore from more distant sources such as India, Goa, and South America. Thus, the increased transportation distance for iron ore tended to raise its cost. Transportation costs, however, were reduced substantially with the construction of large carriers built specifically for ocean transportation of iron ore.

Chart 4

SUPPLY of IRON ORE, DOMESTIC PRODUCTION and IMPORTS by Country or Area



NOTE: MANGANESE ORE NOT INCLUDED
Source of data: Japan Iron and Steel Federation

The last principal raw material to consider is scrap. Generally speaking, an industralized nation should be able to supply most scrap needs from its own market. However, since Japan grew rapidly and many of its steel products were just developing or were exported, domestic supplies of scrap were insufficient. To overcome domestic deficiencies,

scrap was imported mainly from the United States, as was the case before World War II.

Among the raw materials for steel, scrap was relatively more costly in Japan than in other countries. The price of scrap was extremely sensitive to market fluctuations; the abrupt rise and fall in scrap prices contributed to the instability in the price of steel products.

To act as a buffer against excessive competition among steel producers in the purchase of scrap, cartels were formed to purchase domestic and foreign scrap. Since the cartels controlled approximately 80 percent of scrap consumption in Japan, domestic and import scrap prices tended to be stabilized by the cartel organization.

One bottleneck in the industry was the handling of the large volume of incoming foreign raw materials. To surmount the difficulty and to accommodate large ore carriers and other vessels, the industry made investments in anchorage and large-scale unloading facilities. The fact that most of the new plants were located at tidewater on land reclaimed from the ocean, with facilities to receive large carriers, was important in eliminating the bottleneck.

Labor Relations

While the Japanese iron and steel industry had a serious raw material problem during its expansion and modernization from 1951 to 1962, it was not confronted with a corresponding labor problem. The advancement of the industry was, in part, the product of close cooperation between employers and workers.

Labor agreements were concluded between the management and the labor union of individual companies. There was no industry-wide bargaining.

Technology

Another reason for the prosperity of Japan's steel industry was the development of a technology that helped the industry to overcome its geographical disadvantages, although it was still obliged to depend on imported materials.

The installation of new and larger blast furnaces for the production of pig iron in Japan was designed to meet the increasing use of steel. As efforts were made to modernize blast furnace techniques, steel plants in Japan made a special effort to control the size of iron ore for furnace charging. Improvements in blast furnace porosity played an appreciable part in reducing the coke ratio (defined as the amount of coke required to produce a ton of pig iron) to the lowest level in the world.

Because of various qualities of iron ore imported from many sources, the proper blending of iron ore became a major consideration. The proper blending of different kinds of iron ore by the industry helped in the successful operation of blast furnaces and produced pig iron of the homogeneous quality necessary for efficient open-hearth operations.

The development of open-hearth furnaces for the production of steel was always directed towards enlargement. Although combustion systems were improved and automatic controls were adopted, the main feature in the technical development of open-hearth steelmaking was the high utilization of oxygen. Of the 130 open-hearth furnaces in operation in 1960, over 90 percent used oxygen.

In addition to increased blast furnace and steel-melting facilities, expansion and modernization of the industry were directed toward installation of additional rolling mill and auxiliary equipment. Blooming mills, plate mills, slabbing mills, bar and merchant mills, and other mills were modernized. Soaking pits, reheating furnaces, continuous pickle lines, flying shear lines, and other auxiliaries were thoroughly renewed.

An automatic control system, using a card programming process, was adapted in the operation of slabbing and hot strip mills, while the final automatic gauging of a hot coil of steel was generally done by the use of X-rays or radioactive isotopes. The automatic

card programming ensured measurement uniformity, minimized the loss of time between rolling cycles, and assured an optimum operational schedule, besides reducing the number of operators.

With the installation of new equipment, marked advances in operating efficiencies, yield rates, and cost reductions were notable. Japan was no longer inferior to Western countries in steel-producing equipment.

The industry expanded through the acquisition of experience and technique from advanced countries in the world. Company executives, labor leaders, and technicians visited the United States and other countries and brought back technical and professional knowledge. Also, experts were brought to Japan, usually from the United States, to provide on-the-spot consultation and advice to Japanese leaders. Both ways of accumulating knowledge had a bearing on the technical progress of the industry, and it should be recorded as an epoch-making event in the history of cultural interchange.

The fast-growing technical innovations in the years of modernization led the industry to recognize the importance of basic research aimed at developing new techniques and products, in addition to research conducted along the line of improvements.

Behavior of Costs and Prices

Expansion and modernization activities, as disclosed in the preceding accounts of raw material supply, labor relations, and technology, come to focus in their impact on cost and prices.

Through modernization, the industry was successful in reducing the cost of raw materials, but materials still remained the largest element in the cost structure. Generally, as employee compensation increased, absolute labor costs were relatively constant, although some larger firms actually experienced a decline.

Manufacturing costs, including material and labor costs, together with repairs, motive power, and other miscellaneous costs showed a reduction with modernization of the industry. Productivity played a prominent role in lowering manufacturing costs, although material and labor costs were important. Productivity, expressed in the usual sense of output per man-hour, more than doubled during the expansion and modernization of the industry after 1951. Of course, no inference is possible as to the source of the improvement, whether in labor itself, raw materials, technology, or better management.

The main upward pressure on prices, if any, must have come from elements outside of manufacturing costs. The other elements include cost of capital funds, depreciation, taxes, and profit; all merit a brief investigation.

The cost of capital funds—i.e., total interest and discount paid, amortization of bond discount, and issue cost of securities—for the industry was high during expansion and modernization. Despite wide fluctuations in the cost of capital funds, it can be assumed that the overall increase for the industry from 1952 to 1960, as a percent of net sales and in absolute terms (dollars per ton), was not appreciable. The cost of capital funds showed no large increase because the rapid rise in investment compared with production (which tended to increase the cost of capital funds) was compensated for by declining interest rates.

To aid expansion and modernization, the industry was given a liberal depreciation arrangement that involved: (1) asset revaluation, (2) ordinary depreciation, and (3) special depreciation. To cope with the monetary inflation following the termination of World War II and to enable corporations to effect reasonable depreciation, the government enacted a law permitting asset revaluation in 1950.[7]

(7) The revaluation was to be voluntary and a 6 percent tax was to be levied on the write-up. In 1954, to cover the depreciation of the currency value, the government made revaluation compulsory for larger corporations and reduced the revaluation tax to 3 percent on a portion of the revaluation write-up. As an example of revaluation, one large steel company revalued its assets in 1950, 1952, and 1954.

Ordinary depreciation of assets was stipulated in the general tax law according to their useful life.[8] In addition to ordinary depreciation, special depreciation was authorized by the provision of a law enacted in 1952, expediting enterprise modernization. The purpose of special depreciation was to promote an early recovery of the invested capital funds by increasing the rate of depreciation, thereby encouraging replacement and modernization of equipment. Under this depreciation system, 50 percent of the acquisition cost of new equipment authorized by the government was depreciated in the first year or within the first five years of its use, and the remaining 50 percent was depreciated at the ordinary depreciation rate.[9]

Ordinary and special depreciation expenses for the industry increased substantially because of the liberal depreciation arrangement. Also, although the ratio of special depreciation to total depreciation expenses fluctuated widely, it showed an overall increase with expansion and modernization, indicating the fast rate of investment and the rapid recovery of invested funds.

Taxes levied on the industry were numerous, but not all types were included. There was no commodity tax, no tax on turnover, or on production. No excess profits tax was levied and capital gains were included in regular income and taxed at the normal rate. Royalties and interest received were included in taxable income, but dividends received were excluded.

As of September, 1960, a tax of 55 percent per annum has been levied on profits.[10] In addition to the profit tax, there was a fixed-asset tax levied on the land, buildings, and machinery of an enterprise and a host of other taxes. With such a tax structure, the Japanese iron and steel industry was not given any special tax consideration.

Profit, as the last main element in sales revenue outside of manufacturing costs, varied widely from 1951 to 1962. As modernization progressed, however, the earning power of the industry increased and in 1960, after ten years of expansion, the industry's profit position was slightly above the average for all Japanese industry.

When the control of steel prices and subsidies was discontinued by the government in 1950, the principle of "cost plus reasonable profit" became the main consideration in establishing the basic price of steel—a price set by leading steel companies. The policy of leading firms was to keep the basic price as stable as possible. With economic fluctuations, however, price leadership was ineffective. Smaller companies did not follow the leadership of large producers, and for the most part steel products sold according to market prices.

Market prices of steel products fluctuated widely. One reason for the price instability of steel products was the wide fluctuation of scrap prices. Also, small producers were financially unstable. As a result, they would raise their prices sharply during a period of prosperity, but in a recession the small producers would rush to liquidate inventory at any price, causing speculative buying among their customers. In addition to these difficulties, some steel wholesalers in Japan operated with relatively small capital and therefore had a limited ability to maintain their inventories. Thus, it was difficult for them to act as a buffer between supply and demand. Strong competition among wholesalers added to price instability, further weakening their financial position.

Price disruption became pronounced in 1956 and 1957, as the Japanese economy overexpanded. See Chart 5. To check the overexpansion and to combat a deterioration in the international balance of payments, the government instituted a tight-money policy. Large inventories of speculative wholesalers

(8) Japan Ministry of Finance, Tax Bureau, *Outline of Japanese Tax, 1961,* (Tokyo, December 15, 1961), pp. 69-71.

(9) As a result of a revised tax law effective April, 1961, special depreciation was reduced to one-third of the acquisition cost.

(10) The following taxes were levied on the profits of an enterprise:
Corporation tax — 38 percent per annum on profit.
Local taxes — Supplementary taxes include a prefectural tax equal to 5.4 percent of the corporation tax, a district tax equal to 8.1 percent of the corporation tax, and an enterprise tax of 12 percent on profit.

and customers caused steel prices to drop sharply. Prices dropped further because manufacturers would not curtail production, especially the many small producers with limited capital. In an attempt to maintain profit at a respectable level, small producers compensated for a drop in the price of steel products by increasing production. The price reduction increased bankruptcy among producers and wholesalers and caused further price instability. Japanese steel producers, individually or by concert, were not flexible to production control.

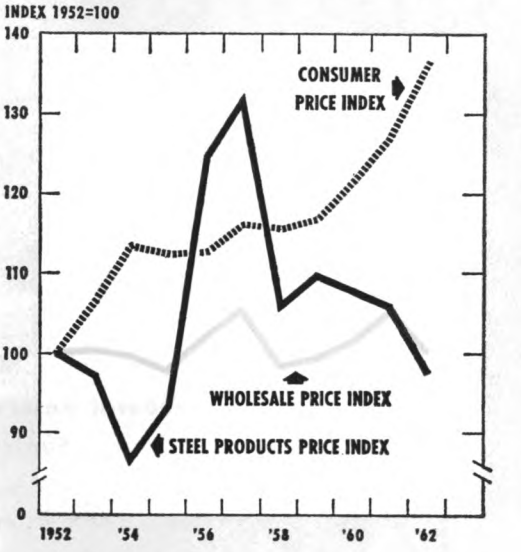
Because Japan's steel industry was in dire need of price stabilization, a new price system became effective in 1958. The new system—an agreement among leading steel producers under the watchful supervision of the Ministry of International Trade and Industry — attempted to regulate the supply of steel products to satisfy demand through the compulsory curtailment of production and an official sales price over major steel products. It was hoped that this would promote price stability. In many instances, market prices prevailed but the control of production reduced price fluctuations substantially although not entirely.

As further indicated in Chart 5, it is difficult to determine the trend in the movement of steel prices because of wide price fluctuations. However, it appears reasonable to assume that steel prices from 1958 to 1962 compared with 1952 showed a slight upward tendency as compared with wholesale prices, which showed little trend, despite short-term movements.[11] The widening gap between wholesale and consumer prices was caused mainly by rising public utility rates and private service charges, as well as increases in certain processed foods and housing.

The upward pressure on the price of steel products was not caused by manufacturing costs. As previously stressed, modernization was successful in reducing manufacturing costs. Along with a wider profit margin, the upward pressure on steel prices came from non-manufacturing costs, mainly from the high expense of ordinary and special depreciation and the cost of taxes, in that order.

Chart 5.

The trend in the movement of Japan's steel prices is difficult to determine because of wide price fluctuations. However, it appears that steel prices have tended to increase slightly. While wholesale prices were steady, the gap widened between wholesale and consumer prices.



Source of data: Bank of Japan

While the industry had slight upward pressure on steel prices with expansion and modernization, steel prices in other leading steel-producing countries apparently rose considerably more than was the case in Japan. As an example, the price index of steel products in the United States rose from a base of 100 in 1952 to 145 in 1962.

As modernization commenced in 1951, Japan's steel prices compared unfavorably with international prices. Through a successful expansion and modernization program, the industry was able to produce steel products with no appreciable inflation of steel

(11) Sharply depressed steel prices in the recession year 1962 should not be considered representative of long-term movements.

prices in comparison with other countries in the world. The disparity between domestic and international prices was reduced noticeably. Thus, the industry was successful not only in fulfilling domestic demands for steel, but it also became one of the leading exporters of steel products, competing vigorously with the United States.

Notes on Federal Reserve Publications

Among the [illegible] recently published in the monthly publications of other Federal Reserve Banks are:

"Foreign Long-Term Borrowing in the United States"
and
"Decline in Home Mortgage Credit Quality?"
Federal Reserve Bank of Chicago
September, 1963

"The Deficit Dilemma — Another View"
Federal Reserve Bank of Kansas City
July-August, 1963

"The Quality of Credit — Is It Strained?"
Federal Reserve Bank of Philadelphia
August, 1963

Recently [illegible] Board of Governors of the [illegible] items:

"Measuring and Analyzing Economic Growth"
FEDERAL RESERVE BULLETIN
August, 1963

(Copies may be obtained by writing to the Federal Reserve Bank named in each case.)

Regional Construction Patterns

During the past five years the dollar volume of total construction in the Fourth Federal Reserve District has accounted for a steadily declining proportion of total construction in the United States. (See Chart 1.) Construction contracts in the Fourth Federal Reserve District in 1958 represented nearly 10 percent of the total.[1] By 1962, however, the proportion had dropped to 8.5 percent and the gap may widen further in 1963. (See Table I on page 15.)

Construction activity is usually classified in three major categories: (1) residential buildings, (2) non-residential buildings, and (3) heavy engineering. Residential buildings account for approximately one-half of the dollar volume of construction in the U. S.; one-third is devoted to non-residential building and the balance is heavy engineering. The remainder of this article examines each of these three classifications to determine whether the recent sluggishness in construction in the Fourth District is characteristic of all types of construction or whether it is attributable to a lacklustre behavior in one particular category.

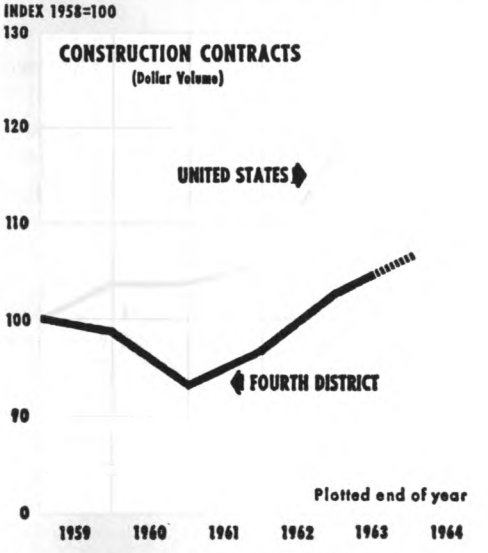
Residential Building

Between 1958 and 1963, contracts for residential building increased at an average annual rate of 6.4 percent in the United States and 4.5 percent in the District. In 1958 residential building contracts in the District were 8.7 percent of total U. S. residential contracts. By 1962, however, they had dropped to 7.7 percent of the total. There is some indication that residential construction may be relatively better in the District this year as the seasonally adjusted annual rate of contracts climbed back to 8.0 percent of the U. S. total in the first half of 1963.

For purposes of analysis, residential building activity is usually divided into one- and two-family dwellings, multi-family dwellings

Chart 1.

Since 1958, annual increases in the dollar volume of construction contracts in the Fourth District have been substantially below that of the nation as a whole. (The 1963 data are seasonally adjusted projections based on the first half of the year.)

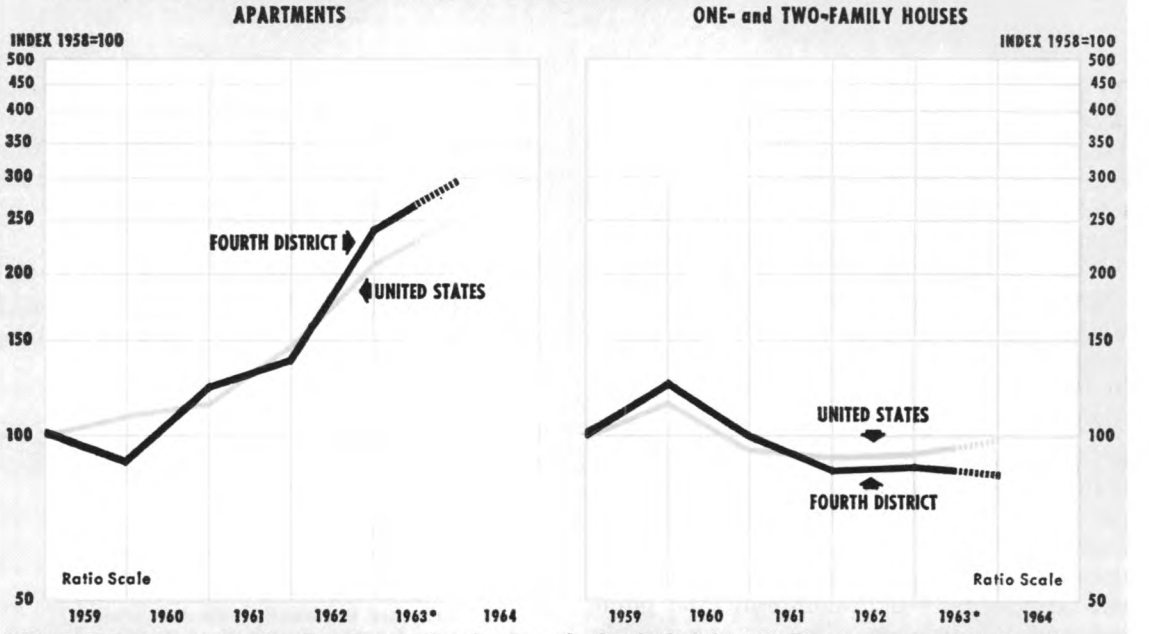


Source of data: F. W. Dodge Corporation

(1) This study is based on F. W. Dodge construction contract figures. The figures for the United States do not include construction contracts for either Alaska or Hawaii. The figures for the Fourth Federal Reserve District are based on the F. W. Dodge Fourth Region Summary which includes all of Kentucky and West Virginia as well as Ohio and Western Pennsylvania. Hereafter, references to Fourth District will be based on figures for the Dodge Fourth Region.

Chart 2.

The number of apartment units constructed in both the Fourth District and the United States shows sizeable gains since 1958, whereas the number of one- and two-family housing units has declined. Since 1962, increases in the rate of construction of apartment units in the Fourth District have outpaced that of the United States; however, in the case of one- and two-family dwelling units the Fourth District has trailed behind the nation as a whole.



* The 1963 data are seasonally adjusted projections based on the first half of the year. Figures are plotted at the end of the year.

Source of data: F. W. Dodge Corporation

(apartments) and other shelter.[2] The two most common measures of residential building activity are the number of dwelling units erected and the dollar volume of construction.

Chart 2 shows that the Fourth District has experienced greater gains than the United States as a whole in apartment building contracts, but it lags behind the national trend with respect to one- and two-family housing contracts. In fact, the construction of single and two-family homes has continued to decline since 1959.

The drop-off in construction may, in part, be blamed on rising costs. Average housing costs per unit in this District are now 17 percent higher than in the country as a whole —not a negligible difference.

Even though the number of new apartment units in the District is growing at a faster rate than the rest of the country, the District has not yet experienced the current 35 percent ratio of apartment units to total dwelling units reported for the entire country. Nevertheless, construction contracts for apartments in terms of housing units in the Fourth District now account for nearly 30 percent of the total, as compared with only 8.1 percent in 1958. This reflects the recent trend toward multi-family dwellings.

One of the important ramifications of the shift toward apartments has been to curtail the dollar volume of residential construction

(2) Nearly 90 percent of the residential construction in the United States is comprised of one- and two-family housing and multi-family dwellings. Other shelter includes such structures as hotels, motels, and dormitories but excludes hospitals and penal institutions which are classified as non-residential buildings.

contracts. Considering the fact that in this District the average cost per unit for single and two-family homes is two-thirds higher than the cost per apartment unit, it is obvious that a displacement of housing units by apartment units may cause a further drop in the dollar volume of construction activity.

Construction contracts for other residential buildings have increased in absolute value and as a proportion of residential building in both the Fourth District and the United States since 1958. The Fourth District shows a greater growth rate, however, reflecting in large part the relatively lower base point of 1958.

Construction contracts for hotels, motels, and dormitories increased from 5.0 percent to 7.5 percent of total residential contracts between 1958 and 1962 in the United States. In the District the ratio was up from 3.8 percent to 6.5 percent of residential contracts.

Non-Residential Building

In 1958 non-residential building contracts in the Fourth District, which include commercial and manufacturing buildings, schools, churches, hospitals, etc., were 9.8 percent of the total dollar volume in the United States. In 1962, the District accounted for 8.4 percent of the national level, and data for the first six months of 1963 indicate that non-residential construction in the District is 7.9 percent of the national total. As shown in Table I, all types of construction contracts for the District, measured as a percent of the United States, dropped 1.2 percent between 1958 and 1962 and an additional 0.3 percent in the initial six months of this year.

Since annual growth rates for a period of years may conceal large upswings or downswings in intervening years, it is advisable to consider the growth rate for non-residential building between 1958 and each succeeding year. Table II makes it apparent that there have been no sharp fluctuations in growth rates of either the United States or the Fourth District during the past five years. Nevertheless, the consistently larger growth rate of non-residential contracts in the United States has resulted in a declining proportion of total contracts accounted for by the Fourth District.

A check of the sub-divisions within the non-residential grouping indicates that a slowdown in construction of commercial buildings and manufacturing buildings has been chiefly responsible for the relative decline in non-residential building activity in the Fourth District. On the other hand, construction of education and science buildings and other non-residential buildings in the

Table I
CONSTRUCTION CONTRACTS IN MILLIONS OF DOLLARS

Year	United States	Fourth District	Fourth District as a Percent of Total U. S.
1958	35,089.7	3,409.3	9.7
1959	36,268.5	3,354.9	9.3
1960	36,317.6	3,170.5	8.7
1961	37,135.4	3,284.7	8.8
1962	41,303.5	3,494.1	8.5
1963	44,208.6 (a)	3,624.5 (a)	8.2

(a) Annual estimates are based on construction contracts for the first six months of 1963, seasonally adjusted.
Source: F. W. Dodge Corporation

Table II
AVERAGE ANNUAL GROWTH RATE FOR NON-RESIDENTIAL CONSTRUCTION CONTRACTS (a)

Years	United States	Fourth District
1958-1959	4.0%	2.1%
1958-1960	5.7	— 0.8
1958-1961	3.4	0.2
1958-1962	4.4	0.4
1958-1963	5.7	1.3

(a) Measured by dollar volume.
Source: F. W. Dodge Corporation

District, with the exception of an erratic year or two, has more closely reflected the national rate.

Heavy Engineering

Heavy engineering construction encompasses public works and utilities, with the dollar volume for the contracts being divided approximately into four-fifths public works and one-fifth utilities.[3]

Heavy engineering construction contracts in the United States remained below the 1958 level until 1962. To date in 1963, the dollar volume of heavy engineering contracts in the United States is 5% above that of 1958. The Fourth District, on the other hand, has consistently been below its 1958 level and thus far in 1963 is 16% below the 1958 pace.

The cause of the constantly decreasing ratio of heavy engineering contracts of this region to those of the country as a whole stems primarily from a sizeable reduction in the dollar volume of public works contracts in the Fourth District.

(3) Public works include streets, highways, bridges and sewerage systems. Utilities include electric light and power systems, water systems, and airports excluding buildings.

Summary

No *one* of the three categories of construction contracts is responsible for the decline in dollar volume of building activity, as all three experienced a decline. In terms of absolute dollar volume, non-residential contracts are down the most as a result of a greater amount of slowdown occuring in the construction of commercial and manufacturing buildings. Heavy engineering construction was not as sluggish as non-residential building activity but the reduction in dollar volume of public works contracts since 1958 is significant. The increase in the number of apartments being constructed has kept residential building activity at a higher level than other types of construction. Nevertheless, some decline in dollar volume is to be expected because of the lower per unit cost of apartments as compared to single dwellings.