

A History of Japanese Industry (7): High-Growth Period (1955-1978)

By Tsukamoto Takeshi

The Japanese economy achieved high growth between 1955 and 1973 (Table 1), with the nation's gross national product growing 2.5 times in the 10 years from 1955 to 1965 and outpacing that of Germany and France in 1968.

Japan accounted for only 1% of world GNP in 1950, but this rose to 3% in 1969, 6% in 1970 and further to 9% in 1980, making the country the second largest economy in the world, next only to the United States.

The 1955-78 economic development process included the 1955-65 and 1966-1978 business cycles. The so-called first high-growth period between 1955 and 1965 coincided with the former boom phase, and the second high-growth period between 1966 and 1973 with the latter boom phase.

1955-1965 (the first high-growth period)

During this period, Japan tried hard to narrow the technological gap between itself and Western countries in the machinery, metal and chemical industries, which had widened during World War II. At the same time, Japan endeavored to introduce state-of-the-art technologies from Western countries for new industries such as electronics, synthetic textiles and petrochemicals. 90% of technologies introduced from foreign countries were related to the machinery, metal and chemical industries. Leading companies obtained large financial accommodation from affiliated major banks to finance the purchase of patented technologies from U.S. and European companies and the construction of new factories.

The machinery, metal and chemical industries, in which low costs were achieved through mass production, built large factories one after another, and boosted capital spending. Factories were built in provincial cities, and coastal iron mills, thermal power stations,

hydropower stations, oil refineries and petrochemical complexes were set up throughout the Japanese archipelago. The Keihin (Tokyo-Yokohama), Chukyo (Nagoya), Hanshin (Osaka-Kobe) and Kitakyushu industrial areas were linked to each other to form the Pacific industrial belt. Production of textiles jumped 2.5 times and exports expanded likewise during the 1955-65 period, remaining the leading hard-currency earner.

However, production of steel, automobiles, electrical machinery (household appliances and communications equipment) increased faster than textiles. As machinery, metals and chemical products became more competitive through qualitative improvement, their exports increased. In 1965, the ratio of machinery exports to Japan's total exports topped that of textile exports, and combined exports of machinery, metals and chemical products accounted for 60% of the total, indicating that Japan had been transformed from an exporter of light industry products into one of heavy machinery products (Table 2).

Basic industries

Electric power

Generation of electric power continued to increase following the end of the war, from 30.2 billion kilowatts in 1946 to 65.2 billion kilowatts in 1955, and further to 179.5 billion kilowatts in 1964. Growth was most noticeable during the 1955-64 period. A large number of thermal power stations were built, with their power output exceeding that of hydropower stations. The rise in the building of thermal power stations was prompted by 1) relatively lower equipment costs achieved through the enlarged scale of production capacity, 2) lower fuel costs enabled by higher heat efficiency of fuel—made possible by a higher turbine steam temperature, and 3) lower prices of coal and oil for fuel use.

The building of an oil refinery in the neighborhood of a thermal power station would result in the formation of an

Table 1: Real Gross National Products

| Year | Real Gross National Product (¥1 Billion) | Real Growth Rate (%) |
|------|---|----------------------|
| 1955 | 36,677.6 | — |
| | 39,378.3 | 7.4 |
| | 42,553.8 | 8.1 |
| | 45,412.6 | 6.7 |
| | 49,641.9 | 9.3 |
| 1960 | 56,371.0 | 13.6 |
| | 63,107.0 | 11.9 |
| | 68,705.8 | 8.9 |
| | 74,494.7 | 8.4 |
| | 83,119.5 | 11.6 |
| 1965 | 87,991.6 | 5.9 |
| 1966 | 97,379.6 | 10.7 |
| | 108,193.6 | 11.1 |
| | 122,071.9 | 12.8 |
| | 137,331.6 | 12.5 |
| | 152,112.7 | 10.8 |
| 1970 | 158,766.8 | 4.4 |
| | 172,317.7 | 8.5 |
| | 185,922.9 | 7.9 |
| | 183,285.2 | (-) 1.4 |
| | 188,189.2 | 2.7 |
| 1975 | 197,214.8 | 4.8 |
| | 207,737.9 | 5.3 |
| | 218,521.5 | 5.2 |
| | 230,073.9 | 5.3 |
| | 239,914.5 | 4.3 |
| 1980 | 248,725.9 | 3.7 |
| | 256,395.2 | 3.1 |
| | 264,703.7 | 3.2 |
| | 278,140.0 | 5.1 |
| | 291,806.9 | 4.9 |
| 1985 | 299,023.9 | 2.5 |
| | 312,370.1 | 4.5 |
| | 330,098.4 | 5.7 |

industrial complex: the power station is supplied with fuel via a pipeline from the refinery, and this energy supply center in turn supplies electricity to petrochemical plants and iron mills. Mass power supply is the fundamental prerequisite for the development of machinery, metal and chemical industries.



Photo: The Mainichi Newspapers

A taste of growth: Fruit of the booming economy in the 1960s

Steel

Open-hearth furnace maker Sumitomo Metal Industries built an iron mill in Wakayama, and Kobe Steel built a blast furnace at its Kobe factory to join the ranks of Yawata Steel, Fuji Steel and Nippon Kokan Co. as integrated iron makers. Kawasaki Steel created a coastal industrial complex on the shore of Chiba prefecture which was sufficiently big to accommodate large ships, and built an integrated mill producing pig iron, steel and rolled steel. All the steelmakers introduced revolving or electric furnaces into the steelmaking process, and automated rolling operations through the introduction of strip mills. Nippon Kokan Co. introduced oxygen top-blown converter technology from Alpine Co. of Austria, which it later transferred to other Japanese steel companies. The introduction of revolving furnaces reduced steelmaking time, facilitated mass production and enhanced international competitiveness. Production of crude steel jumped from 9.4 million tons in 1955 to 41.16 million tons in 1965. With the introduction of six strip mills, Japan became the second-largest owner of strip mills in the world. Production of a large volume of

Table 2: Composition of Export Products (%)

| | Textiles | Machinery | Metals and Mineral Products | Chemicals | Non-Metal Mineral Products | Foodstuffs | Others |
|------|----------|-----------|-----------------------------|-----------|----------------------------|------------|--------|
| 1950 | 43.6 | 5.5 | 11.4 | — | 2.1 | 3.5 | 33.9 |
| 1955 | 37.3 | 12.3 | 19.2 | 4.7 | 4.2 | 6.8 | 15.5 |
| 1960 | 30.2 | 25.6 | 14.0 | 4.4 | 4.1 | 6.3 | 15.4 |
| 1965 | 18.7 | 35.2 | 20.3 | 6.5 | 3.1 | 4.1 | 12.1 |
| 1970 | 12.5 | 46.3 | 19.7 | 6.4 | 1.9 | 3.3 | 9.9 |
| 1975 | 6.7 | 53.8 | 22.4 | 7.0 | 1.3 | 1.4 | 7.4 |
| 1980 | 4.8 | 62.7 | 16.5 | 5.3 | 1.4 | 1.2 | 8.1 |

high-quality wide and thick steel plates contributed to the development of the shipbuilding industry, while production of high-quality and less costly thin steel plates helped the development of the automobile and household electrical appliance industries.

Petrochemicals

Petrochemical basic products (ethylene, propylene, etc) are the materials for making plastics (synthetic resin, synthetic rubber, plastic film, etc). Under government initiatives, the petrochemical industry was launched on a commercial basis in Japan in the 1950s, through

technological transfer from Western countries. Through a 1956 petrochemical industry program, the government authorized Mitsui Petrochemical, Mitsubishi Petrochemical, Sumitomo Chemical and Nippon Petrochemical to introduce petrochemical technologies from abroad, and assigned quotas for equipment /facilities investment, setting the minimum ethylene production level of each company at 5,500 tons per year. In order to lower costs through mass production, the Ministry of International Trade and Industry issued administrative guidance in 1960 advising petrochemical companies to expand annual ethylene production capacity to more than 40,000 tons. MITI raised the minimum annual production capacity requirement to 100,000 tons in 1965 and to 300,000 tons in 1967. In the early 1970s, nine petro-

chemical companies built ethylene centers each capable of producing 300,000 tons per year. On the back of the expansion of production of petrochemical basic products, plastic production in value terms rose to ¥369.8 billion in 1965 and further to ¥1.6821 trillion in 1978 from ¥40.2 billion in 1955.

Machinery industry

Shipbuilding and Industrial Machinery

During the first high-growth period, nine leading shipbuilding companies, including Mitsubishi Shipbuilding, Ishikawajima Heavy Industries, and Hitachi Shipbuilding, expanded produc-

tion of ships—mostly oil tankers—helped by the introduction of new technologies such as welding and block building. Japan's shipbuilding volume rose to 7.97 million tons in 1965 from 2.65 million tons in 1955, making the country the top shipbuilder in the world, outranking Sweden, Germany and Britain. Export credits from the Japan Export-Import Bank, relatively low wages and short delivery periods contributed to the surge in Japan's ship exports. After 1960, the shipbuilding companies diversified into the production of turbines, boilers and ferro-frame structures and later added chemical cement plants and industrial machinery to their production line-up, a move termed "amphibious operations." Companies specializing in machinery introduced technologies from Western countries or established joint ventures with foreign partners to launch production of bulldozers, power-shovels and forklifts.

Automobile industry

During the period 1950-55, production of motor tricycles outnumbered four-wheeled vehicles, such as trucks, buses and passenger cars, but in the latter half of the 1950s the pattern was reversed, with the production of four-wheeled vehicles jumping to 1,870,000 from 110,000 in the previous five-year period and that of motortricycles dropping to 40,000 from 100,000. Yet, 70% of the four-wheeled vehicles were trucks and buses, and passenger cars accounted for only 30%, a large portion of which were knockdown cars—Austins were assembled by Nissan Motor, Renaults by Hino Diesel and Hillmans by Isuzu Motor. These automakers quickly acquired technical knowhow from their Western partners and even started production of key components themselves within a few years. While producing Austin cars on a license basis, Nissan launched the development of their own passenger cars and released the Datsun 210 in 1957 and the Bluebird in 1959. Nissan discontinued the license agreement with Austin at its expiry. Other automakers followed Nissan, with Toyota releasing the Corona, and Fuji Precision Industries

debuting the Prince Skyline, both in 1957. The automakers built factories with annual production capacities of 150,000 to 200,000 with the introduction of state-of-the-art equipment such as transfer machines and large presses. Production of passenger cars surged subsequently. Production of compact cars jumped to 599,000 units in 1965 from 20,000 in 1955. Some 2,000 sedans were produced in 1965, whereas this type of car was nonexistent in 1955. Thus, domestic cars gradually replaced imported foreign cars and knockdown cars.

Electrical machinery

Electrical machinery production increased nine-fold between 1955 and 1965, far outpacing the average four-fold increase in production by manufacturing industries during the period. The electrical machinery industry accounted for 8.4% of manufacturing industries, a sharp increase from 3.8% in 1955, and led the high growth during this period. Electrical machinery companies expanded production of heavy electrical machinery for industrial use and communications equipment, while boosting production of household electrical appliances at a faster pace. New electrical appliances such as washing machines, television sets (then still monochrome), refrigerators, cleaners and cookers, found their way into ordinary households and changed Japanese people's lifestyle. Matsushita Electric Industries tied with Philips of the Netherlands and established a joint venture, Matsushita Electronics Corp., to produce Braun tubes and semiconductors, and launched the production of all types of electronic appliances, such as

tape recorders and television sets, using products by Matsushita Electronics. In 1965, ownership of TVs, washing machines and refrigerators surged to 90%, 69% and 51%, respectively. Tokyo Tsushin Kogyo developed and marketed a mini-sized, light-weight and high-performance portable radio, named "Sony," using the transistor invented by Bell Telephone Laboratories of the U.S. Simultaneously, the company started mass production of its own transistors. In an effort to narrow the technological gap with Western countries and enhance domestic technologies in this field, the Japanese government enacted in 1957 the "Special Law for the Promotion of the Electronic Industry", under which electronic companies were provided with tax incentives and preferential long-term financing. The same year, Toshiba Corp. built a new transistor factory, and other electronic companies followed in its footsteps, one after another. Germanium transistor manufacturing factories sharply increased and made Japan the largest transistor producer and exporter in the world in 1959.

Synthetic textile industry

The textile industry regained its position as Japan's main industry after World War II, as Japanese textile makers expanded production of natural textiles and rayon (viscose fiber). During the first high-growth period, they launched production of synthetic textiles such as nylon, polyester and acrylic (Table 3) based on a "program for rapidly building the synthetic textiles industry" enacted in 1949 to nurture the nylon industry in the country. The program led Toyo Rayon to start nylon production on a commercial basis in 1950

Table 3: Production of Textiles (1,000 tons)

| | Natural Textiles | | Chemical Textiles | |
|------|------------------|----------|-------------------|--------------------|
| | Cotton Yarn | Raw Silk | Rayon | Synthetic Textiles |
| 1955 | 419 | 17 | 186 | 13 |
| 1965 | 567 | 19 | 273 | 222 |
| 1978 | 448 | 16 | 107 | 496 |

and introduce technology from Dupont of the U.S. the following year. Nippon Rayon introduced technology from Inventa Co. of Switzerland in 1953 and started nylon production in 1955. These moves helped the spread of nylon stockings. Teikoku Artificial Silk (Teijin) tied up with Toyo Rayon to jointly introduce technology from Imperial Chemical Industries (ICI) of Britain and started production of polyester textiles in 1958. Wrinkle-free shirts made of cotton-polyester mixed yarn enjoyed brisk sales. Rayon makers Asahi Chemical Industries and Kanegafuchi Chemical Industries started acryl textile production with their own technology, while cotton spinners Toyobo and Sumitomo Chemical established a joint venture, Japan Exran Co., to launch acryl production in 1958 by introducing technology from Cyanamid Co. of the U.S.. Cotton yarn production rose to 567,000 tons in 1965 from 419,000 tons in 1955, and synthetic yarn production jumped to 222,000 tons from 13,000 tons during the same period.

1966-78

In the wake of the 1965 recession, heavy industries (such as steel, automobiles, shipbuilding, machinery, electric and chemicals) increased plant and equipment investment. They pushed for independent technological development through accelerated depreciation and heavy investment in research and development. During the second high-growth period from 1966 to 1970, the Japanese economy achieved annual growth of more than 10% consecutively, and narrowed the technological gap. As exports of steel, ships, automobiles and electrical appliances increased sharply, "Made in Japan", which used to be synonymous with low-priced, low-quality products, came to mean low-priced but high-quality products. Japan's trade balance swung into surplus. Ownership of automobile and air conditioners became widespread and color TVs replaced monochrome ones.

Electrical machinery industry

Production of electrical and electronic machinery jumped six-fold during the

1966-78 period, with production of electrical machinery increasing to ¥16.2463 trillion from ¥2.670 trillion and that of electronic machinery jumping to ¥6.432 trillion from ¥11.147 trillion. New products, such as color TVs, cassette tape recorders, refrigerators with freezers, microwave ovens, video-recorders, video cameras, copiers and office computer systems, debuted and created new demand. The boost in household electrical appliance production was led by color TVs, 40% of which were exported.

Production of electronic components and semiconductors also increased.

In 1965, Silicon replaced germanium as the main material for semiconductors after the silicon planar integrated circuit was developed by Fairchild Corp. From around 1964, U.S. semiconductor makers began to farm out production of silicon planar transistor ICs to Hong Kong, Taiwan and South Korea, from which they were exported. As low-priced silicon planar transistors were imported to Japan, germanium transistors made by Japanese companies lost international competitiveness. NEC Corp. purchased exclusive planar patent rights from Fairchild in 1964 and started IC production in 1966. Hitachi Ltd. and Toshiba Corp. later joined in IC production, boosting Japan's semiconductor IC production to ¥281.9 billion in 1978 from ¥5 billion in 1969. However, the bulk of domestic IC demand was covered by imports.

Computers and calculators using semiconductor ICs expanded subsequently. Hayakawa Electric Corp., the predecessor of Sharp Corp., marketed Japan's first electronic calculator (40 cm x 40 cm, weighing 25 kg) at ¥535,000 in 1964, when the average monthly salary was ¥63,000 and Nissan's Bluebird sedan was priced at ¥540,000. But the use of ICs pushed calculator prices down to the level of office appliances in the late 1970s, with the result that abacuses disappeared from the market.

Steel industry

The third Steel Industry Rationalization Plan (1961-65) which focused on the

building of large iron mills, was executed by the building of state-of-the-art mills—Yawata Steel in Kimitsu, Fuji Steel in Oita, Nippon Kokan Co. Co. in Fukuyama and Sumitomo Metal in Kashima. Yawata's Kimitsu mill adopted Japan's first computer-controlled online production control system. Yawata and Fuji merged in 1970 to create Nippon Steel. Japan's annual crude steel production capacity topped the 100 million ton mark for the first time in 1973, with the year's production totaling 119.32 million tons. Japan's exports of steelmaking technology outpaced imports in 1974 and the country achieved surplus in the balance of steel-making technology trade for the first time.

Automobile industry

Japanese automakers, who had already established a mass-production structure, stepped up investment in research and development and boosted export-oriented capital spending by building new factories and car-export ships, as well as opening overseas sales outlets. Technological innovation raised productivity and cut the worktime required for the production of one vehicle from 82.86 hours in 1962 to 37.12 hours in 1970. Production of passenger cars jumped from 870,000 in 1966 to 5.97 million units in 1978. Most of them were still compact cars but they were already being exported, not only to Asia and Latin America but also to the U.S. and Europe. In 1955, Japan had started automobile exports in a humble manner—two passenger cars and 907 trucks. However, in 1966, 150,000 passenger cars and 100,000 trucks were marketed worldwide, with the figure jumping to 3 million and 1.52 million, respectively, in 1978. ■

Tsukamoto Takeshi is professor emeritus of Tokyo University, and has authored several books such as Politics and Economy of the World Today (1991) and History of World Economy (1972).