THE COTTON INDUSTRY

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I. PREFACE

THE modern Japanese cotton industry comprised of the spinning industry and the weaving industry was totally divorced from the traditional production pattern which had existed during the Tokugawa period. It was created as a result of large-scale mechanized plant transfer which in itself is a uniquely capitalistic form of production. After the management failure of a spinning plant with 2,000 mule spindles, previously transferred and powered by water wheels, the beginning of modern plant transfer was marked by the establishment of Osaka Spinning Co. (10,500 spindles) in 1882. Triggered by the success at Osaka Spinning such representative companies in the Japanese cotton industry as Mie Spinning (1886), Kanegafuchi Spinning, Naigai Cotton, Kurashiki Spinning (1887), Settsu Spinning, Amagasaki Spinning (1889), Kishiwada Spinning (1892), Fuji Spinning, Tokyo Gas Spinning (1896), and Osaka Gōdō Spinning (1900) were established as a result of plant transfer. Consequently, in 1900 when Japanese capitalism was being established, the modern Japanese cotton industry had developed into the largest industry in Japan with 79 companies, 80 plants, 1,135,000 spindles and approximately 3,000 power looms.

These spinning plants which were created as a result of transfer relied upon foreign raw cotton (Chinese and Indian cotton, and later American cotton), and many of them came to operate the weaving process simultaneously. They were defined as the "transfer type" of cotton industry as against the cotton industry of the "endogenous type." The latter relied upon domestic raw cotton for either hand spinning or Gara Boki spinning to be made into textiles through hand loom weaving which existed during the Tokugawa period. The transfer type of cotton industry rapidly superseded hand spinning or Gara Boki spinning of the endogenous type and thus the production of domestic raw cotton declined. The weaving industry of the endogenous type, however, continued on a strong footing. It first relied upon imported cotton yarn from Britain and India and later shifted its basis of cotton yarn supply to that supplied by the spinning industry of the transfer type. Furthermore, the endogenous cotton weaving industry was transformed to bring about modernized plants even on a small-scale basis through reliance upon domestic power looms. These were developed due to the technological stimulation caused by the transfer type. Subsequently, it saturated the domestic market and aimed at production for the export market.

Consequently, in an examination of transformation and development of technology in the Japanese cotton industry, it is necessary to first discuss the tech-

nological interaction between the endogenous and the transfer type of cotton weaving industry before analyzing the transformation and development of the transfer type.

The second problem pertains to the quality of engineers who were able to digest and transform the system of transferred technology, and their ability to develop new technology. Moreover, the quality of operatives who were able to keep up with the innovated system of technology, and the fact that they made technical change and development possible by a smooth operation of machines should not be overlooked.

The third problem is the attitude of the managers. The managers contributed greatly because they were eager to absorb and develop new technology, and to pursue rationalization and stabilization. Their attitude, on one hand which can be paralleled to the warp threads, was ultimately based upon the philosophy of "enrich the nation and strengthen the military" which led to another slogan of "promote industry and enhance productivity" so that excessive imports could be prevented and a self-sufficient economy could be achieved. Their attitude, on the other hand paralleling the woof threads, was also nurtured by the severe competition to secure as great a share as possible of both the domestic and foreign markets. Thus, innate problem of modernization cannot be discussed adequately without analyzing their attitude.

II. COPING WITH TECHNOLOGICAL TRANSFORMATION

A. *Technological Transformation in the Spinning Process*

The transfer from steam power to electric power must be pointed out as a premise in coping with the theme of technological transformation in the Japanese cotton spinning industry. In Japan, electric power prevailed from 1906 when hydroelectric power generation surpassed thermoelectric power generation. Its prevalence became especially marked after 1914 when Inawashiro Hydroelectric Power Plant was completed, as this was the starting point for the era of the transmission of long distant high-voltage current.

Corresponding to this, the electrification of the Japanese cotton spinning industry progressed rapidly. In 1922, the average actual horsepower of hydro, gas, and electric power consumed per day was 69,000 horsepower (52.4 per cent of the total actual horsepower), thus exceeding thermoelectric power which accounted for 63,000 horsepower and by the 1930s the former predominated [6, p. 8]. A breakdown according to engines reveals that although the number of electric motors completely surpassed that of the others in 1920, the actual horsepower supplied by them was about the same as the actual horsepower supplied by steam engines and steam turbines, and in 1923 even the actual horsepower supplied by electric motors surpassed that supplied by the others. Moreover, a breakdown according to the amount of electricity usage based upon industries reveals that electricity consumed by the dyeing and weaving industry compares remarkably with those of the chemical, machine, and mining and

refining industries, which due to the nature of these industries would naturally consume a high ratio of electricity. This fact denotes that the power source of the cotton spinning industry was transferred from steam power suited for the productive power of industrial capitalism in its infancy to electric power which yielded the higher productivity necessary for the stage of monopoly capitalism. The rapidity and high ratio of electrification in the Japanese spinning industry deserves special attention in view of the fact that the ratio of electrification in the spinning industry in Britain, the United States, and Germany in 1924 was 19 per cent, 59 per cent, and 59 per cent respectively [1, p. 555].

The profits of electrification for the spinning industry are considered to be as follows: (1) unit driving, (2) economy in power expenditure, (3) simple distribution of power, (4) liberation of the mill from the engine room, (5) easy handling of power motors, (6) lighting, and (7) substitution of gas burners. The greatest merit, however, is said to be unit driving. In comparison to group driving run by steam power which was transmitted through a long shaft installed along the center of the ceiling to belts attached to individual spinning frames, unit driving which was made possible by the use of motors attached to individual spinning frames offered the following merits: (1) increased productivity per spinning machine, (2) economy in installation expenditure, (3) reduction of female operatives, (4) improved quality of yarns, (5) decreased possibility of impediments and danger, (6) reduction of dust, and (7) easy ventilation in winter.

With regard to the productivity of spinning machines, the spindle frequency was about 7,000 to 8,000 revolutions per minute around 1910. However, this was increased through the use of unit driving and while foreign ring spinners were designed to take a maximum frequency of 9,000 revolutions, an epoch-making Japanese spindle called N.S. ring spinner (Nippon Spindle Co.) which was developed in 1928 allowed for a frequency of more than 10,000 revolutions. In addition, the spindle frequency was maximized up to 14,000 revolutions which was the limit of rotational frequency without imposing danger to human bodies.

As far as the quality of yarns was concerned, a method which regulated the motor speed by degrees was adopted in order to stabilize the cop-winding speed due to the fact that the faster the cop-winding speed, the easier the yarn snapped. Because there was a tendency for yarns to snap during the dry winter season and during summer when temperature and humidity are high, the caver system which regulated the temperature and humidity within mills at a steady level was introduced at the end of the 1920s so that the seasonal fluctuation of yarn quality and efficiency could be eliminated. An additional significance of unit driving was the fact that the Japanese cotton spinning industry freed itself from uneconomical operations which was the case when only a few spinning frames were used at the very end of a long shaft. Furthermore, unit driving became the technical foundation for labor reinforcement based upon the completion of efficiency among units, which was closely related to the contractural labor system (the gradational wage system based on piecework system). This factor pertaining to unit driving is said to be the "greatest merit for capitalists."

The actual introduction of unit driving should be considered to be from 1915

onwards in view of the examples provided by Fuji Gas Spinning, Kawasaki plant; Kurashiki Spinning, Manju plant; and Osaka Gōdō Spinning, Kanzaki plant. The prevalency rate of unit driving cannot be shown quantitatively. But viewing the case of Toyo Spinning Co. (sometimes abbreviated and now known as Toyobo), it appears that the Japanese cotton spinning industry plunged into the installation of unit driving very rapidly in the 1920s.

Lastly, it must be pointed out that the prevalency of unit driving enlarged the scale of the plants because space no longer had to be given up for the shafts. Although there was already a definite tendency for the plants to be large-scale as of 1914, plants with 10,000 to 30,000 spindles were predominant. In 1937, the predominant scale rose to more than 30,000 spindles and 35 plants out of 209 plants (17 per cent) had more than 100,000 spindles. In comparison to the beginnings of modern Japanese cotton spinning started by Osaka Spinning Co. in 1882 with 10,500 spindles, such large-scale plants reveal the rapid growth of the industry. Due to the enlarged scale, production costs diminished because of reduced costs to build plants and to transport goods within the plants.

The process of spinning itself was shortened on the basis of unit driving. The process of spinning consists of opening→blending→scutching→carding→drawing→roving or initial roving (slubbing→intermediate roving→roving)→spinning→finishing. The most time-consuming is the opening, blending, and scutching process, and the process which can most easily be eliminated is roving as it is a matter of procedure.

The shortening of the blending and scutching process was actualized in the 1920s when the blending and scutching machines were directly connected, thus eliminating the intermediate scutching machine. This system which combined the blending and scutching process became prevalent at the end of 1920s. The simplification of the roving process was achieved by the introduction of high-draft spinning frame which increased the draft rate of cotton yarn. The simplification process depended upon each individual case. While some eliminated an intermediate roving frame or a roving frame, others slightly shortened the hours spent on three frames. The most common way of simplification was to eliminate a roving frame. According to a description of a mill with 74,000 spindles owned by Platt Brothers & Co., fifty-six units of roving frames became totally unnecessary. It was estimated that 15 per cent of the machinery cost, 10 per cent of the plant floor space, and 10 per cent of the labor would be economized by this simplification [1, p. 560].

Although in the West the device of high-draft spinning frame materialized prior to the First World War, it was not until the postwar period that the device was transferred to Japan. In spite of the fact that yarn count was increased to medium and high, high-draft spinning frame developed in the West were not directly applicable for Japanese cotton spinning. This was because the main portion of Japanese production was made up of low count yarns and a unique blending method[1] using short fiber Indian cotton was prevalent. Thus each

[1] Kurashiki Spinning attempted in vain to produce low count yarns by high-draft spindles

spinning company became intent on developing a high-draft spinning frame suitable for Japanese cotton spinning through the remodeling of Casablancas Apron type spinning frame. As a result of this, Kusuo Imamura of Dainippon Spinning devised an ECO type high-draft spinning frame, Takuji Nakamura of Toyobo an TN Apron spindle, and Masurō Kobayashi of Kurashiki Spinning an independent device in the early 1930s. There were additional models such as an OM type and a Nittō type [6, p. 14]. Consequently, high-draft spinning frame became prevalent during the 1930s, and in particular the ECO type is said to have become "extremely prevalent in view of the fact that it is well suited for the spinning technology existent in Japan, and it can easily be attached to a Platt spinning frame which is most commonly used in the Orient."[2]

Kusuo Imamura, a graduate of Kyoto Imperial University with a bachelor of engineering degree, studied at Massachusetts Institute of Technology, and subsequently entered Settsu Spinning.[3] He was, therefore, an engineer with the best possible technological knowledge in Japan at the time. Furthermore, Imamura remodeled an English intermediate roving frame with six-line rollers which did not become prevalent due to its inconvenience. He devised a four-pair roller to enhance the draft rate, and completed a simplex frame which resulted in the shortening of the roving process. This was the simplex high-draft spinning frame. In consequence, it became possible to reduce the number of machines and operatives. In comparison to a conventional spinning machine, the ratio of operatives reduced was as much as 44.6 per cent. Although Toyobo purchased a superhigh-draft spinning frame made by Hartmann, Germany, together with a sliver condensing machine and installed them at the Tomita plant on a test basis, they were cancelled because of the difficulty of handling and the high costs. It appears that superhigh-draft spinning frames were not put to practical use in the prewar period.

B. *Technological Transformation in the Weaving Process*

With regard to technological transformation in the weaving process, the transfer type which are the modern cotton spinning and weaving industry and the modern weaving industry must be grasped separately from the endogenous type of cotton weaving. In view of the fact that from the beginning, the former depended upon imported power looms and automatic looms,[4] the mechanization of the endogenous

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but later succeeded in production by blending a lot of American cotton (Kurashiki Spinning Co., *Kaiko 65-nen* [The sixty-five years in retrospect] [Osaka: Kurashiki Spinning Co., 1953]).

[2] [11, p. 157]. Kusuo Imamura not only devised the roller part and cradle but also specially designed the position of the rollers and the spindle beams to improve the frame itself.

[3] [11, p. 159]. The Japanese spinning industries never failed to employ graduates from faculties of engineering of the imperial universities and not a small number of graduates of the engineering high schools.

[4] It was about 1904 and 1905 that automatic looms were imported, and there were types made by Northrop, Stafford, and Draper. In the latter half of the 1920s, looms made by Schwaben, Hartmann, Luchie, and Henry Beggie were also imported. Nevertheless, they

cotton textile industry, namely, the steps leading to the usage of power looms will be dealt with here. The prevalency of electric motors was a prior condition for the mechanization of the endogenous cotton textile industry to use power looms. In this case, however, the capacity of the motors was no more than about ten horsepower.

In the Enshū region, Shizuoka Prefecture which had been one of the major centers of endogenous cotton weaving, a "tall" hand loom (*takabata*) with a built-in seating board and a treadle was popular around about the time of the Meiji Restoration and a "slam" loom (*battanbata*) was introduced at the end of the 1870s. The cotton textile industry in the Enshū region was operated on a small-scale basis and appears to have been at the initial stage of capitalistic management. After the introduction of Matsuda Model treadle looms in the 1890s, weaving became an independent industry rather than subsidiary work for farmers, and it moved towards putting-out domestic industry or the manufacture stage. Although the endogenous cotton textile industry totally relied upon the modern cotton spinning industry of the transfer type for the supply of raw material, it managed to make relatively unique progress mainly producing for the domestic cotton fabric market. The cotton textile industry in the Enshū region which developed into a manufacture-type of industry and established an extensive network of weaver and waged piecework relationships on the basis of such hand looms came to adopt power looms. By the early 1910s, the number of power looms greatly exceeded that of hand looms and treadle looms in this region. (There were 3,513 power looms as against 5,680 hand and treadle looms in 1910, 6,938 power looms as against 4,597 in 1912, and 8,119 power looms as against 2,627 hand and treadle looms in 1914.)

The introduction of power looms in the Enshū region tended to be more on a test basis prior to the Russo-Japanese War and the onset of a full-scale introduction came after the war. The types of looms existent in the Enshū region in the early 1910s were Toyoda Model (676 looms), Suzuki Model (206), Takayanagi Model (176), Suyama Model (160), Nakamura Model (142), Iida Model (122), Nakayama Model (107), modified treadle looms (657), and others such as Iketani Model and Suzumasa Model. The above reveals how many types of power looms were devised. It is probably accurate to state that there was definitely a phase similar to the Industrial Revolution within the endogenous cotton textile industry. As an extension of the successful transfer from hand looms to power looms, the Enshū cotton textile industry not only gained its position in the domestic market, but also was on its way to making inroads into the export market.

With regard to the nationwide trend concerning the transfer to power looms, it can be seen that they accounted for only 19.8 per cent in 1914 but increased

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could not be used as automatic looms from the beginning. The automatic device was detached and they were used as power looms. It was in the latter half of the 1920s that they could be used as automatic looms. Moreover, it was during this period that power looms began to be remodelled into automatic looms (*Toyobo 70-nen-shi shiryō* [The materials for history of Toyobo during the past seventy years]).

rapidly with the introduction of the broadcloth power loom in 1922 and accounted for 63 per cent in 1928. The rapid progress to facilitate power looms since the latter half of the 1920s at the same time denotes the progress of transfer from the narrow-cloth power loom to the broadcloth power loom. The average per capita annual cotton consumption grew from 1.19 yen for the period of 1895–99 and 1.32 yen for 1900–1904 to 2.03 yen for the period of 1905–09 and 2.51 yen for 1910–14. Such increased cotton demand must be taken into consideration as one of the underlying factors which led to the adoption of power looms by the endogenous cotton textile industry.

Those who devised these power looms were house or loom carpenters who represented one of the groups of small producers and engineers in Japan at that time. Sakichi Toyoda who founded Toyoda-shiki Shokki Kabushiki-gaisha (Toyoda Model Loom Manufacturing Co.) in 1907 and Toyoda Automatic Loom Works was a house carpenter. Ishimatsu Kubota who produced the first iron power loom in Japan (1903) was also a carpenter. Masajirō Suzuki who founded Suzumasa-shiki Shokki Kabushiki-gaisha (Suzumasa Model Loom Manufacturing Co.) and later established Enshū Shokki Seisaku Gaisha (Enshū Loom Manufacturing Co.) switched from house carpentry to loom carpentry in 1904 and completed an iron narrow-cloth power loom in 1908. Moreover, Michio Suzuki who founded Suzuki-shiki Shokki Kabushiki-gaisha (Suzuki Model Loom Manufacturing Co.), the predeccessor of Suzuki Motor Co., was formerly a carpenter and made his model power loom in 1913.

In the case of Sakichi, he had come to invent the power loom and the automatic loom after going through many hardships as is usually the case with inventors. He was born the son of a carpenter in 1867 in Hamana County which was the center of the Enshū cotton textile industry. Although he himself became a carpenter, he was intent on developing a power loom. He was motivated in this direction after seeing the textile industry operated by farmers as subsidiary work. In addition to his environment, such factors as the establishment of the Monopoly Patent Act in 1885 (revised as the Patent Act in 1888) and the holding of the Third Domestic Industrial Promotion Exhibition as part of the campaign to "promote industry and enhance productivity" appeared to have greatly influenced Sakichi's invention [7, pp. 14–16 and pp. 31–32]. In 1890, he invented the Toyoda Model Manual Loom (a wooden manual loom) which was classified together with the hand loom. He then made an improved treadle loom with a thread feeder. It was in 1897 that he invented the first narrow-cloth power loom called the Toyoda Model Wooden Power Loom operated by an oil engine. In autumn of the same year, he and Tōhachi Ishikawa who was a cotton fabric broker (weaver) founded Otogawa Menpu Gōshi-gaisha (Otogawa Cotton Weaving Co.) which was equipped with sixty power looms. The first domestic power looms began production in the following year in the cotton producing area of Chita.

Furthermore, Sakichi established a general partnership with Mitsui & Co. and founded Igeta Shōkai in 1900. Here, he invented a thread feeder and a device to supply the woof threads while the loom was running. After the partnership with Mitsui was cancelled, he went into the cotton textile industry by establishing

TABLE I

A. The Number of Plants with Toyoda Looms as of March 1909

No. of Looms Installed	10 and Below	11–20	21–30	31–40	41–50	51–100	101–150	200 and Above
	44	62	36	15	29	24	1	5

B. The Number of Toyoda Looms as of March 1909

Types of Looms	Broadcloth		Narrow-cloth			
			Iron & Wood Models			All Iron Model
	Iron & Wood Model	All Iron Model	38-nen Model	39-nen Model	Handy Model	
	68	175	947	2,307	4,021	511

Source: Toyoda-shiki Shokki Kabushiki Gaisha, *Sōritsu 30-nen kinen-shi* [The 30th anniversary of the foundation] (Nagoya: Toyoda-shiki Shokki Kabushiki-gaisha, 1936), p. 24.

Toyoda Shōkai with 138 looms. Using the profit gained from this textile company, he manufactured such models as 38-nen Model, 39-nen Model, and Keiben ("handy") Model. In 1907, he founded Toyoda-shiki Shokki Kabushiki-gaisha (Toyoda Model Loom Manufacturing Co.) (capital one million yen) with capital accumulated from financial leaders in Tokyo, Osaka, and Nagoya so that power looms would come into general use. Table I illustrates the number of plants equipped with Toyoda looms and the types as of March 1909, after the company had operated for full two years. The fact that Toyoda looms were particularly widespread in the category of narrow-cloth looms used by the endogenous cotton textile industry can be clearly seen.[5]

After leaving the company in 1910, Sakichi went to the United States and Europe to do research on automatic looms,[6] and became confident that he would be able to materialize his long-cherished desire.[7] He founded Toyoda Bōshoku Kabushiki-gaisha (Toyoda Spinning and Weaving Co.) in 1911, and started a full-scale project to develop an automatic loom using the profit gained from this company. Although it was not completely automatic, Sakichi who had invented the automatic shuttle switch devised the automatic shuttle receiver, the warp release and the tension mechanism in 1914, and the safety mechanism in 1916. Thus the new automatic loom which was incomparable to the old incomplete one was put on a test operation in 1923, and in 1926 Sakichi completed the

[5] The greatest factor which contributed to the rapid prevalence of domestic power looms was due to the inexpensiveness of the Toyoda power loom which cost 93 yen as against 872 yen for the four-shuttle power loom made by Hartmann, Germany [7, p. 48].

[6] It is said that Sakichi left this company because his zeal in inventions conflicted with company policy which was aimed at profit-making only [12, pp. 112–13].

[7] Although Sakichi was amazed to see in America that one operative could handle eighteen to twenty-four looms, he discovered the following regarding the American looms: (1) slow rotational speed, (2) easily broken, (3) much vibration, (4) the warp threads snapped frequently, and (5) the textile quality was inferior. Thus he came to the conclusion that "American looms are nothing to be feared of" [12, pp. 115–16].

TABLE II

THE EXPORT QUANTITY OF TOYODA LOOMS AND SPINNINGS, 1927–42

	Loom	Spinnig Frame	Slubbing Frame	Drawing Frame	Carding Machine	Scutcher
China	23,236	1,095(460)	102	140	897	186
India	452	218(88)	33	36	192	166
Korea	1,887					
Thailand	270					
Indonesia	41					
U.K.	2					
Total	25,888	1,313(548)	135	176	1,089	352

Source: [11, p. 702].

Note: Figures in parentheses are the numbers of spindles, unit=1,000.

Toyoda automatic loom which was far superior to those found in the rest of the world. He subsequently established Toyoda Automatic Loom Works in order to produce and propagate his automatic looms.

There was a marked increase in the production of Toyoda model looms in the 1910s. In such a relatively progressive endogenous cotton textile area as Enshū, textile manufacturers not only operated narrow-cloth looms but also began to install broadcloth looms from the 1910s. Thus not only Toyoda model broadcloth looms, but also many other models were produced.

Domestic power looms thus contributed to the mechanization of the endogenous cotton textile industry. Moreover, they were adopted by the transfer type of spinning and weaving mills or by the transfer type of the textile industry which used to depend upon imported looms. Consequently, the imported looms began to be replaced by the domestic ones. If we take the mills which bought more than 500 looms from Toyoda between 1923 and 1929, it can be seen that most of the Japanese spinning companies and textile companies purchased a large quantity. Furthermore, the Toyoda automatic loom rapidly prevailed after its completion. Thus starting off with the improvement of hand looms, Sakichi Toyoda invented the power loom and contributed to the factory weaving of the endogenous cotton textile industry. He also promoted automated production in the transfer types of the spinning and weaving industry, and the textile industry specialized in weaving with the use of domestic automatic looms.

Toyoda Automatic Loom Works not only manufactured looms but also was involved in the production of the ECO type high-draft spinning frame devised by Kusuo Imamura, and thus ventured into the full-scale production of spinning frame. They made a narrow-scale spinning frame in 1934, developed a Jα type of improved high-draft mechanism in 1936 and completed the four-line superhigh-draft spinning frame which increased the draft ratio by one hundred times in 1937. Toyoda's automatic looms and spinners became widespread domestically as well as abroad, as they began exporting mainly to China and India (Table II), which contributed to promotion of a self-sufficient industry by preventing the excessive importation of spinning frames and looms. Table III illustrates the trend of decreasing importation. Toyoda Automatic Loom Works, moreover,

TABLE III

THE IMPORT, EXPORT TRANSITION OF SPINNING AND WEAVING MACHINES

(10,000 yen)

Year	Import		Export	
	Spinning Machinery	Weaving Machinery	Spinning Machinery	Weaving Machinery
1920	1,816	137		339
1921	2,918	297		443
1922	3,060	133		504
1923	2,236	134		380
1924	1,204	80		359
1925	771	61		345
1926	502	57		262
1927	1,020	36		288
1928	1,043	43		307
1929	1,449	64		366
1930	637	65		385
1931	351	22		516
1932	800	45		365
1933	352	13		488
1934	639	10	628	210
1935	461	49	898	357
1936	228	24	1,015	497
1937	310	38	1,758	786
1938	163	3	2,167	833

Sources: Dainippon Bōseki Rengōkai, *Dai-37-ji menshi bōseki jijō sankōsho* [The 37th reference materials for the condition of cotton spinning industries] (Osaka: Dainippon Bōseki Rengōkai, 1921) and *Dai-72-ji menshi bōseki jijō sankōsho* [The 72nd reference materials for the condition of cotton spinning industries] (Osaka: Dainippon Bōseki Rengōkai, 1939). For the data on 1920–29, from Bank of Japan, Statistics Bureau, *Hompō shuyō keiazi tōkei* [Major economic statistics of Japan], 1966.

had sold the patent right for £100,000 in 1929 to Platt Brothers & Co. which had been the world's largest cotton machinery maker so that Platt Brothers could produce and sell the Toyoda automatic looms in countries excluding Japan, China, and the United States. This is significant in the sense that Japan was able to export technology to an advanced capitalist nation.[8]

In concluding this section, it may be in order to mention the domestic spinning frames and looms as of 1920. The production of spinning frames in Japan was so negligible that it can be said to have been nothing more than on an experi-

[8] Platt Brothers purchased the patent on the Toyoda automatic loom, however, not to produce looms but to monopolize the patent. When Toyoda began exporting automatic looms from 1937, Toyoda had to pay the following patent handling fees to Platt Brothers. In the case of exports to India the fee was £3.10 per loom, £1.15 per loom when it was exported to countries with the registered patent on the automatic loom other than India, and £1.00 on the export to countries without the patent [11, pp. 150–51].

mental level. On the other hand, domestic looms occupied 36.4 per cent of the total number of 49,244, and it can thus be seen that they had received fairly positive results.

III. THE RECRUITMENT OF OPERATIVES AND THEIR TRAINING

A. *The System of Operative Recruitment*

In the latter half of the 1920s, the modern Japanese cotton spinning industry of the transfer type had an employment of approximately 200,000 workers the majority of whom were females. Approximately 70 per cent of these were boarding female operatives. The age distribution of female labor reveals that, as of 1927, 24.3 per cent of 181,000 women were aged sixteen and seventeen, and this was the highest. Secondly, 20.6 per cent were aged eighteen and nineteen and lastly 16.6 per cent were aged fourteen and fifteen. The highest concentration was made up of females aged nineteen and downward, which was 63.5 per cent. If the age group included those up to twenty-four years of age, the percentage would be 85.8 per cent, thus revealing the characteristic of the Japanese cotton spinning industry which relied upon unmarried young female labor. The majority of them were employed for less than three years, and even if the years of reemployment were included, the years of employment were no more than five years. It was rather exceptional to work for more than five years. The wage system was set up to suit short-term employment. While the wage increase rate up to three years was high, the rate stagnated for those who worked any longer. The wage increase according to age distribution reveals that there was a steady increase up to age nineteen. However, the increase rate stagnated for those who were older than nineteen. In fact the wage decreased for those who were over twenty-four. It can, thus, be said that the wage system was again geared to young labor.

Owing to the structure of the Japanese cotton industry which consumed young female labor en masse on a short-term basis, they left the mills after three years or five years in the case of reemployment. In other words, because over 30 per cent of the female operatives left the mills annually, the same ratio had to be supplemented, revealing the high mobility rate of workers in the Japanese cotton industry.

The recruitment of operatives became, in consequence, an important issue. The operative recruitment extended as far out as 1,000 km from the mills. It was already stated in the establishment period of the cotton spinning industry in Japan that "the majority of operatives working at each mill are recruited out in the country and an extremely small number are recruited directly at the mills" [2, p. 14]. The system of operative recruitment, thus, became increasingly important. According to a survey on the recruitment routes of 21,852 female operatives in 1927, those who were recruited by company-designated recruitment agents accounted for 62.8 per cent; 8.3 per cent were recruited directly by the

company; 5.6 per cent were recruited through parents and siblings; 5.1 per cent by acquaintances; and 0.2 per cent through the employment offices. The percentile recruited by the recruitment agents, thus, was incomparably high. Although the Employment Stabilization Act (*shokugyō shōkaijo hō*) was promulgated in 1921, and public employment stabilization offices were functioning, female operatives did not utilize their services at all.

Those agents involved in recruitment ran about trying to secure as many girls as possible and they often relied upon honeyed words and lies. There were even cases similar to kidnapping simply to secure another recruit. The situation became so bad that various prefectural local autonomies had to establish regulations in order to curb some of their abuses. This culminated in a 1924 ordinance issued by the Ministry of Internal Affairs as the Ordinance Pertaining to the Control of Labor Recruitment (*rōdōsha boshū torishimari rei*), which provided the legal basis for nationwide control. The "period of free competition" with regard to the recruitment of female operatives thus came to an end. Consequently, each mill established its own labor affairs branch office in the country to which the mills sent out their employees whenever needed in order to supervise the recruitment agents.

According to the aforementioned survey of 1927, the majority of these female operatives namely, 67.1 per cent came from a farming and fishing background, 6.7 per cent of them had a merchant background, and those with a laborer background accounted for only 6.3 per cent. As for the reasons of seeking employment, as many as 17.2 per cent stated that they "wished to become self-supportive or to save money for their trousseaus", which implies that there would be one less mouth to feed at home. However, the first and foremost reason given by 69.3 per cent was because they wanted to "help the family finances." Due to the semi-feudal and parasitic landownership system which existed in Japan prior to the Second World War, the farmers sought to relieve their financially deprived status by sending girls out of the rural village to a city mill to work for a short period in order to supplement the family finances by borrowing money in advance. Thus it became the pattern to "make the payment on the exorbitant tenant fees possible by the supplemented wages, while by virtue of the supplement the wage itself is made low" [13, p. 91].

B. *On-the-Job Training of Operatives*

In the 1910s, more than half of the female operatives were either uneducated or elementary school dropouts. Many of the male operatives were also either elementary school graduates or dropouts, although there were quite a number of male operatives who either finished higher elementary school or dropped out. In the 1920s, however, elementary school graduates became predominant due to the influence of compulsory education. The proportion of the male operatives who finished higher elementary school became greater in the 1930s, and uneducated or elementary school dropouts became an exception. Thus, a certain educational standard had been achieved by the workers of the Japanese cotton spinning industry. Should the educational level coincide with the quality of labor,

it is permissible to state that the labor quality of cotton industry was relatively high.

These workers received various education according to the independent system of education provided by each mill. Based upon the general pattern, boarding female operatives could benefit from the following: elementary school education, girls' high school education, courses on domestic affairs, etc. Commuting female operatives could benefit from wives' association, courses on handicraft, lectures, and children's association, etc. As for the male operatives, there were as follows: technical school education, adult lectures, a military branch association, etc. Elementary school education was available for those who were either uneducated or elementary school dropouts. Most of this was established in the form of private elementary schools within a mill or dormitory. These schools mainly provided regular elementary education, but some also provided higher elementary education. They had two consecutive hours of classes per day after work. There were cases such as at Fuji Gas Spinning where the boarding female operatives were taught how to read and write and compose essays at night in the dormitory corridors under a so-called corridor itinerant school system.

Apart from such general education, technical training necessary for new male and female operatives was provided. There was a "method of apprenticeship" whereby a newly recruited operative was put under the care of an experienced operative as an apprentice from whom he received practical training. There was also a method of training which was conducted in a special training room to teach necessary skills systematically. Although the former method prevailed at the beginning, once scientific plant management and research on standard motions came to the fore in the 1910s, major plants began to rely upon the latter method.

According to *Jokō Aishi* [Pathetic life of mill girls] [4, pp. 252–67], the training process of the newly recruited operatives at Toyobo, weaving division which appears to have had the most systematic program is as follows. The training department was established to train newly hired female operatives and the following staff members were allocated: the chief of the training department; a full-time assistant; trainee inspectors who supervised the new female operatives at the mill and the dormitory; teacher operatives who taught skills; and acting supervisors who took care of the newly recruited female operatives on both public and private matters. The term of training was limited to three months of which early part was then divided into three periods. One period was for more than a week but for less than two weeks. General explanations and readiness with regard to the entire work process were taught in the first period. Courses of action regarding standard motions were taught in the second period. Lastly, necessary skills required by contract labor were taught and these were concerned with the application of basic and standard motions. When training in the third period was completed, the new operatives were given on-the-job training as juniors so that they could learn the swift operation of experienced operatives. The standard motions were completely mastered during this period. After completing the training term, the newly hired operatives were classified according to the rating on skills (generally the lowest) and were put to work as piecework labor.

On the other hand, the training of the newly recruited male operatives according to the example of Kanegafuchi Spinning (sometimes abbreviated and now known officially as Kanebo) which started a systematic program in 1916 was as follows. They were given a total of sixty-six hours of lecture; firstly on a general description of spinning for twenty-four hours, secondly twenty-four hours of lecture on regular technical work, and lastly eighteen hours on special technical work.

Regarding the regulations made in 1916 for the newly recruited male operatives at their weaving plant, each lecture was one and half hours long everyday and altogether there were thirty-six hours of general lectures, thirty-six hours of lectures on regular technical work, twenty-seven hours on special technical work, and seventy-two hours on practical instructions.

As it can be seen in the above passage, the training of newly hired male and female operatives at major companies from about the middle of the 1910s became more systematic, which directly corresponds to the two facts which occurred in the 1910s, namely, the Japanese cotton spinning industry to move toward full-scale rationalization and the stage of monopoly.

Besides such training of the newly hired, there was on-the-job training of female operatives in the daily work process. Thus there was also a program to nurture those who would become personnel directly in charge of training or chief of operatives. They functioned as foremen at the work place. Those who were carefully chosen from the operatives were given quite an advanced level of education on specialized knowledge and technology for a relatively long period of one to one and half years. The most representative of this system were Kanebo's Operatives' School (Shokkō Gakkō) and Toyobo's Operative Education Center (Shokkō Kyōikujo).

The case of Kanebo Operatives' School is examined first. The origin of this school was the Junior Operatives' Training School (Yōnen Shokkō Yōseijō) which was established at their Hyōgo plant in 1902. The effect of this school is unknown. However, faced with a shortage of chief operatives and senior operatives, Kanebo opened Kanebo Operatives' School in 1905 under the direct control of the business department.[9]

The academic program of this school consisted of five hours of daily work which included spinner, arithmetic, physics, and drawing in the first semester; and spinner, arithmetic, and applied mechanics in the second semester. After the First World War, the company no longer accepted general applicants and only those who had worked at their plant for more than six months could qualify for admission [9, p. 116 and p. 118]. The school sent out graduates twice a year in March and September and from its opening to the first half of the 1920s there were as many as 1,038 graduates of those, 443 operatives either died or left the company while 595 remained. Of those who remained at the plant, 44 were operatives-in-charge, 124 were given the same treatment as those who were

[9] [8, Supplement, p. 390]. This school was modelled after various practical schools in Germany, particularly after spinning schools [8, Vol. 2, pp. 140–41].

operatives-in-charge, and 179 were either chief operatives or assistant chief operatives.

However, as the spinning industry developed further, the skills taught by operatives' schools were insufficient for students to "become operatives-in-charge who are the most cardinal middle ranked plant workers," and thus a training center for operatives-in-charge was established in July 1915. Trainees were given a three-month education to become operatives-in-charge. These were the personnel in charge of operatives who were primarily involved in the training of newly hired, as was stated previously. The training of operatives-in-charge can be classified as supplementary education.

In 1922, Kanebo, moreover, established Training School for Cotton Textile Plant Operatives (Menshifu-kōjō Kōshu Yōseijo) which was one rank lower than the operatives' school. This school gave five hours of specialized practical training, five hours of specialized lectures, one to two hours of lecture on general plant knowledge, one hour per week of lecture on plant ethics for those who had the academic qualification of more than elementary school graduation and who had been working for the plant for more than one year. This was done for a period of one to two months as reinforcement education.

The school which can be regarded as identical to Kanebo Operatives' School is Toyobo's Operative Education Center. There were 520 who graduated from the regular course, 174 who finished training on spinning and weaving, and 1,280 who completed short-term training from the school's establishment to 1933.

As shown above the Japanese cotton spinning industry, having major companies at its nucleus, carried out extensive systematic training of operatives in the company. Moreover, in the case of Kanebo, they established under the title of the Training Program for the First Grade Technical Trainee (*kōshu gijutsu minaraisei yōsei naiki*) a one-year program for graduates of higher technical schools as second-grade engineers and graduates of universities engineering departments as first-grade engineers. The outline of the structure and operation of machinery was taught in the first two months and the first half of the remaining ten months was spent on the study of structure, handling, and safety of machinery from blending and scutching to drawing. The latter half of this ten-month period was spent on the same kind of study covering the areas from initial spinning to bundling.

Furthermore Kanebo began in 1915 to recruit female workers for engagement in office work and it is pertinent to mention that they established a girls' training center to train female office workers for three months.

IV. CHARACTERISTICS OF RATIONALIZATION IN JAPAN

The rationalization of the Japanese cotton spinning industry is inseparable from the Factory Act which was promulgated in 1911. The execution of the act had a deferment period of five years until September 1, 1916 and the abolishment of night work for young operatives who were under the age of fifteen was deferred

for fifteen years after its execution. Despite the fact that the total deferment period was made for twenty years, the act signified that the Japanese spinning industry which used night work as its greatest weapon to maximize the operation hours of equipment was put in a position where it was forced to set forth some realistic measures against the restriction laid upon night operations. Rationalization thus was taken up as a solution to this predicament. Aforementioned installations of high-draft spinners and automatic looms as well as the training of operatives all comprised a part of this rationalization process. In addition, due to domestic and foreign criticism on night work at international conferences, the Revised Factory Act was realized in 1923, and finally night work for women was prohibited in 1929.

Scientific plant management and standard motions based upon the motion study formulated by an American, F. Taylor after studying cases at iron factories, therefore, were systematically pursued by Japanese spinning mill managers.[10] Prior to this, however, various measures were taken by the Japanese cotton spinning industry in order to enhance the financial potentiality of the corporation. For example, after 1905 the system of fixed capital depreciation was introduced and additionally, various reserves was made to make capital more abundant. The cumulative amount of these capital reserves in proportion to paid-up capital was 71 per cent in 1919, and the proportion of reserve funds was increased to 112 per cent in the same year. On the other hand, the ratio of corporation debts as against paid-up capital was decreased from less than 40 per cent in the early 1910s to 11 per cent in 1920 [5, pp. 54–55]. It is probable to state that the Japanese cotton spinning industry had made a remarkable accumulation of internal reserves in the 1910s.[11] This was possible because of the fact that Japanese cotton spinning had amalgamated the weaving industry; it pursued the scale merit; and a special cotton blending method was applied in order to minimize the cost of raw cotton which was 100 per cent imported. Moreover, the grading system adopted by the Osaka Commodity Exchange on Three Items (Osaka San-pin Teiki Torihikisho) promoted the improving of the quality of cotton yarns.

Furthermore, the Japanese cotton spinning industry adopted a cost accounting

10 The first company which adopted scientific plant management and standard motion study in the Japanese spinning industry was probably Kanebo Co. Sanji Mutō of the company had ordered a survey to be conducted in 1912 on the basis of scientific management and standard motions [8; Supplement, pp. 365–66]. It is assumed that these were applied when the wage problem developed in Tōbu Railways in 1910–11 [10, p. 182]. Moreover, it was in 1917 that Toyobo began studies on standard motions. By the end of that year Toyobo had established standard motions pertaining to operation and safety according to each work process in both the spinning and weaving departments [10, pp. 182–83].

11 It is well known that his abundant capital acted as background for the advancement of Japanese cotton spinning into the Chinese market. The capital was systematically exported to so-called *zaikabō* or China spinning. For further information on the formation of *zaikabō*, refer to T. Izumi, "Nihon bōseki shihon no Chūgoku shijō shinshutsu ni kansuru ichi-kōsatsu—1920-nen zengo no iwayuru 'zaikabō' ni tsuite" [A study on pushing of Japanese spinning capital into the Chinese market—On the so-called *zaikabō* before and after 1920], *Senshū keizaigaku ronshū*, Vol. 7, No. 1 (February 1972).

system in order to compare the production costs at each individual mill.[12]

Scientific management and motion study materialized standard motions at each production process. For example, at Kanebo motions for all operatives involved in a section were systematically unified in 1920. By utilizing the time gap among frames, it became possible to increase the number of frames per operative without increasing the amount of work for female operatives.

Once the standard motions for each process was established, the standard of equipment, the number of operatives, and efficiency were also determined and in consequence, comparisons of production costs and productivity among mills and among different yarn counts became easier. At about the same time, Kanebo revised the format of its inventory expenditure reports in 1921 to reveal expenditures on the following four items in the case of a plant which produced regular yarns, gassed yarns, thick yarns for textiles, spools, and cheese winding: (1) from scutching to spinning, (2) from yarn-twisting to winding, (3) from yarn-twisting to gassing, and (4) from finishing to bunding. It can be stated that this method made cost accounting far more exacting.

At the same time, Toyobo aimed at establishing more exact conversion rates than the existing conversional rates, as it became necessary to obtain accurate comparisons of productivity among its mills in view of the depression after the First World War. In 1921, Toyobo began to use a method similar to the uniform price list which was generally used in Lancashire, United Kingdom. Under this method, goods produced in greatest volume were given the standard index of 1. The cost accounting of goods by each individual mill was converted into standard types by multiplication with a fixed coefficient, and a monthly profit-and-loss account was thus compiled. It, therefore, became possible for Toyobo to compare the results of each mill. Consequently, it became easier to improve upon mills with a record of poor performance. The conversion rate method was applied to the cost accounting of different counts of yarn, which then resulted in the decrease of costs of one bale of No. 20 cotton yarn which was 50 to 60 yen at that time to about 14 yen less within five to six years. These methods are said to have greatly contributed to the promotion of business rationalization of all the mills.

Owing to labor reinforcement on the basis of standard motions, the number of operatives was reduced drastically. As shown in Table IV, there were overall cutbacks of operatives from the latter half of 1914 to the end of 1926 in Kanebo with two or three exceptions. Therefore, it can easily be seen that the aforementioned company education was closely linked with the training of operatives who could withstand such exacting labor for many hours. Kurashiki Spinning established the Standard Regulations for the Operative Physical Examination (*kōshu taikaku kensa hyōjun kitei*) in 1920 and later in 1923 the company

[12] Refer to the following for further information: T. Izumi, "Dokusentai-teki kyodai menbō shihon no seisan kōzō to sakushu kiban—Dai-ichi-ji taisen-ki no Kanebo o jirei toshite" [Production set-up and exploitation system in huge monopolistic cotton spinning interests —example of Kanebo in the First World War period], *Shakaikagaku nempō* [Annual bulletin of social sciences], No. 13 (1979), pp. 202–206 and 217–24.

TABLE IV

A COMPARISON OF THE NUMBER OF OPERATIVES PER 10,000 SPINDLES

	Latter Half of 1914		Dec. 25, 1926		Ratio of Increase/Decrease (%)	
	Male	Female	Male	Female	Male	Female
Blending	2.8	4.6	1.9	1.1	−32.1	−76.1
Scutching	6.1		4.7		−23.0	
Carding	14.1		10.1	1.3	−28.4	
Drawing	0.4	17.0	0.6	8.7	50.0	−48.9
Roving	9.7	63.4	7.6	44.3	−21.6	−30.1
Spinning	19.4	133.2	9.6	79.8	−50.5	−40.1
Sub-total	52.5	218.2	34.6	135.2	−34.1	−44.2
Yarn-twisting	32.5	308.5	23.3	172.1	−28.3	−44.2
Gassing	2.2	6.4		1.2	−100.0	−81.3
Finishing	10.5	120.9	8.5	64.5	−19.4	−46.7
Bundling	11.5	3.7	5.7	2.4	−50.4	−35.1
Selecting	2.8	4.3	1.4	1.7	−50.0	−60.5
Additional engineering	4.2	2.7	1.8	3.6	−57.1	33.3

Source: [3, Nos. 1 and 10].

established the Standard Regulations for the Operative Aptitude Test (*shokkō tekisei kensa hyōjun kitei*) so that the recruitment of operatives was made more selective. As can be seen by these regulations, the Japanese cotton spinning industry began to aim at securing operatives with certain qualifications which again was related to the changes pertaining to the methods of operative recruitment.

As is shown in Table IV, rationalization pursued by the cotton industry in Japan was synonymous with increased labor productivity in proportion to the number of frames worked by the operatives. The same holds true for the weaving process. The manufacturer of the Toyoda automatic looms aptly recognized the value of automatic looms as follows: "The major objective of automatic looms is to drastically reduce the number of operatives required per loom through the use of automated shuttles" [11, p. 118]. Table V reveals that on the basis of conventional looms one female operative was in charge of 3.3 looms, while her responsibility soared to 25 looms after the installation of automatic looms, which resulted in a drastic reduction of operatives and wage cost. However, the mechanical efficiency of automatic looms was only higher by 8.6–9.9 per cent than that of regular looms. It can thus be understood that the process of rationalizing the cotton industry in Japan which started in the 1910s was primarily aimed at improving labor productivity based upon the reduction of operatives rather than enhancing mechanical efficiency, except for the transformation from hand looms to power looms.

While the reinforcement of labor was being undertaken, a policy to involve not only the physical quality of female operatives, but also that of their spiritual quality was adopted. Since 1919 Toyobo's Himeji plant had introduced a "Policy

TABLE V

COMPARATIVE NUMBER OF WORKERS AND LABOR COSTS PER 1,000 LOOMS, OCTOBER 1926

	Regular Looms	Automatic Looms	Ratio of Increase/Decrease (%)
The details of required operatives:			
Female operatives (single shift);			
In charge of looms	300	40	−86.7
Floorwalker	45	10	−77.8
Apprentice	30	10	−66.7
Male operatives (single shift);			
Repair and reserve	20	9	−55
Looms	10	10	0
Business & others	8	8	0
Male operatives (day shift);			
In charge of safety	13	7	−46.2
Cleaning & oiling	12	12	0
The total of required operatives (double shift):			
Female operatives	750	120	−84
Male operatives	101	73	−27.8
Total	851	193	−77.3
Annual wages (double shift);	(1,000 yen)	(1,000 yen)	
Female operatives	374	69	−81.6
Male operatives	62	52	−16.1
Total	436	121	−72.2

Source: [11, p. 119].

of Practice Our Motto" which meant that a monthly motto determined by the executive committee, consisting of employees and operatives, was to be posted in the plants, exhorted and put into practice. For example, the following monthly mottoes were used in 1928: "Harmonious Cooperation" in January, "Curtailment of Expenditure" in February, "Improvement of Efficiency" in March, 'Thorough Education" in April, and "Serve for Public Morality" in May.

While on one hand spirituality of female operatives was fully incorporated into productive efficiency, on the other hand there were cases whereby boarding female operatives[13] were restricted for the natural entire day. Toyobo started to conduct surveys about 1923 on boarding female operatives, namely, their entire work hours (from the time they arose to after work), rest periods, and sleeping hours. The results of the surveys revealed that their sleeping hours were restricted to seven hours (eight hours after 1928) and all other time, spent on washing the face, getting dressed, working, hairdressing, defecation, taking a bath, practices, lessons, and leisure, were restricted.

Owing to the execution of the Revised Factory Act on July 1, 1929, night

[13] The dormitory was different from the kind that one usually associated with a welfare facility. It was provided for the female operative as a means to prevent them from running away, to objectively secure the necessary labor for the day and night two-shift work hours, and to maintain the low wage standard by cutting down on their living expenses in the city.

work which had benefited the Japanese cotton industry was prohibited. Moreover, the gold standard was actualized as of January 11, 1930 due to the November 21, 1929 ordinance to remove the prohibition of the gold export which had been in effect since 1917. At the beginning of 1930, the Japanese economy also plunged into the world depression which started when the U.S. stock market fell heavily on October 24, 1929. The cotton industry in Japan which was directly affected by these trends attempted to rationalize the industry systematically during the period from 1929 to 1931. Results of a test operation from 1928 to 1929 for rationalization at Kanebo showed that they were able to reduce the number of workers per 10,000 spindles by 25.8 per cent and the number of workers per day for the production of No. 40 yarn by 29.5 per cent. As was mentioned earlier, it was during this period that high-draft spinners, simplex high-draft spinners and automatic looms were adopted, which made further reduction of the number of workers possible.

The number of female operatives involved in the spinning process had been reduced by 30.9 per cent from 142,000 persons in 1926 to 98,000 persons in 1931. The reduction ratio with regard to the weaving process was 52.2 per cent from 48,000 persons in 1926 to 23,000 persons in 1931.[14]

The characteristics of the Japanese cotton industry can be summarized as follows. In the case of spinning, the increased output of cotton yarn was supported by the increased running spindleage, namely, the increased output per female operative who was, therefore, made responsible for a greater number of spindles in view of the fact that output per ring spindle was stagnant.[15] The same was true with weaving and the output per female operative was increased as each operative was responsible for an increased number of looms. That which supported the increased output of cotton textiles was due more to the increased number of looms in operation rather than to the increased productivity of each loom. Labor productivity and labor reinforcement were ultimately the cardinal factors in materializing increased productivity in cotton industry. Consequently, it must be stated that the nucleus of higher productivity consisted entirely of young female operatives. However, despite the incessant effort to reinforce labor productivity, the net wage index which was compiled by the Bank of Japan (taking 1926 as 100) showed that their wages were on a constant decline. The decline was as follows: 96.4 in 1927, 86.8 in 1930, 74.5 in 1931, and 65.3 in 1932.

[14] After the prohibition of night work, Dainippon Spinning discharged about half of its workers, Toyobo also reduced the number of workers drastically. It was said that male operatives with responsibilities were filling the jobs done by male operatives at both mills. Kanebo decided to defer the recruitment of male operatives for the same reason [8, Supplement, pp. 527–28].

[15] The number of bolsters held responsible per yarn operative in the spinning process, in reality, was 101 bolsters in July 1928, which was increased to 139 bolsters by July 1929 [3, No. 10].

V. POSTSCRIPT

In lieu of a summary, the position of the cotton industry in the Japanese economy shall be discussed briefly. The spinning industry which evolved around the tripartite processes (raw cotton production—spinning—weaving) started on the basis of a negligible standard from the viewpoint of modern large-scale mechanized plants. However, rapid development was materialized and in 1890 the output of domestic production surpassed the quantity of imports owing to the following: utilization of oriental raw cotton (Indian cotton first imported in 1885 and in 1896 the import quantity of Indian cotton surpassed that of Chinese cotton); early change from mule spindles to ring spindles; the adoption of the corporation system; the introduction of the gradational wage system based upon the piece-work labor system; and the low wages which were even lower than those in India, namely, lower wages than those paid in a colony. This simultaneously denotes not only the regaining of the domestic market from British cotton yarn and Indian cotton yarn in particular, but also the establishment of the Japanese cotton spinning industry. In this sense, therefore, it can be stated that it marked a step toward a self-sufficient national economy. The Japanese cotton spinning industry continued to prosper from that point onwards, and in 1897 the quantity of cotton yarn export came to surpass that of cotton yarn import.

Concerning the weaving industry, on the other hand, the total value of domestic production surpassed that of imported production in 1885. This, however, does not denote the establishment of the modern Japanese cotton weaving industry, because it was realized by hand looms of the endogenous type. Nevertheless, what is noteworthy is the fact that it was the endogenous type of weaving industry that regained the domestic market from the prevalence of foreign cotton textiles, particularly from Britain. Broadly speaking, it was the weaving industry of the transfer type equipped with transferred power looms that was engaged in the production of cotton textiles for export. The weaving industry of the endogenous type, on the other hand, produced for the domestic market. Through the maintenance of division of work socially by both sectors, the export value of cotton textiles came to supercede the import value in 1909. It can be stated that from 1900 to 1910 when Japanese capitalism was being established, the self-sufficiency of the domestic cotton yarn and textile markets were achieved due to the cooperation of both the transfer type and the endogenous type in the Japanese cotton industry. Furthermore, in the early 1910s by expelling Indian yarn, the Japanese cotton industry dominated the China market which was the largest export market for Japanese cotton yarn. It also came to dominate the world cotton textile market in the early 1930s because Japan surpassed Britain which had been the largest cotton textile exporter.

The position of the Japanese cotton industry in comparison to the industrial composition of private plants (plants with more than five workers excluding mining) reveals that as of 1909, while the ratio of plants for the metal industry was 3.2 per cent, 4.9 per cent for the machine industry, and 1.9 per cent for the

chemical industry, the ratio for the silk yarn industry was 11.5 per cent, 14.7 per cent for the silk weaving industry, 0.3 per cent for the cotton yarn and spinning industry, and 11.1 per cent for the cotton weaving industry. While the ratio of the number of workers in the metal industry was 2.4 per cent, 1.0 per cent for the machine industry, and 1.7 per cent for the chemical industry, the ratio for the silk yarn industry, the silk weaving industry, the cotton spinning industry, and the cotton weaving industry, was 23.6 per cent, 8.2 per cent, 10.9 per cent, and 8.8 per cent respectively. This composition remained unchanged until the early 1930s. The size of the Japanese spinning industry on the basis of the number of plants and workers was not at all in proportion to the total textile industry. However, approximately 10 per cent of the workers were concentrated in the plants which occupied less than 1 per cent of the total number of plants. This denotes that the cotton spinning industry contained a form of large-scale mechanized plant system in the national economy. Although the number of plants in the weaving industry outnumbered those in the spinning industry, its proportionate number of workers was smaller, thus indicating the smallness of the business scale.

In order for a national economy to be established on a self-sufficient, modern, and capitalistic basis, there is a premise that a balanced development exists between the sector of consumer goods production and the sector of productive means production. First, the former, particularly the qualitative and quantitative development in the production of clothing, precedes the development in the production of means of labor in the latter. In the case of prewar Japan, there existed an abnormal imbalance between the two sectors. Due to extreme backwardness in the sector of productive means production, it had to not only depend upon imports for a long time, but also totally rely upon the leadership of state capital. Under these circumstances, it can be stated that the Japanese cotton industry, which was guided by the Japanese spinning industry of the transfer type, contributed greatly in the promotion of a self-sufficient national economy and capitalistic system.

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