

Technological and Organizational Absorption in the Development of the Modern Japanese Cotton Industry

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It is well known that the cotton industry in modern Japan, which was made up of larger spinning companies, small-and medium-sized independent weavers in local producing centres (*sanchi*), merchants and trading companies among others, became an extremely powerful organization. In 1933, in terms of the volume of cotton cloth exports Japan surpassed the United Kingdom, which had dominated the world export markets since the Industrial Revolution (see Appendix 1).

The first objective of this paper is to statistically demonstrate how important this industry was for the Japanese economy. Although there are some earlier attempts to grasp its magnitude, this paper makes the first attempt to elucidate the share of this industry in national income, particularly for the interwar period.

The following two sections of the paper discuss the importance of absorption by large spinning companies of technology and organizations from advanced countries, especially from the United Kingdom and the United States of America. In particular, the paper addresses issues relating to the adoption of manufacturing technology of modern spinning in the late nineteenth century, mergers and acquisitions around 1900, and vertical integration in the 1900s and 1910s.

1. The Significance of Japanese Cotton Industry

Japanese cotton industry was a leading industry in Japan's industrial development since the Meiji period (1868-1912) until the beginning of High Growth Era (1955-1973) after the Second World War. Not only were the industry's production and export rates high, but as a typical labour-intensive industry it absorbed a large amount of labour power. Japanese cotton industry also promoted the development of other related industries in such sectors as machinery manufacturing, shipping, and trade. In addition, its spinning sector which was the representative of big business prior to World War II contributed to the establishment of a system of factories, companies, commodity exchanges, stock exchanges and so on. Also the spinning companies played an important role in the formation of labour and engineering management techniques. In particular, they are credited with the promotion of such management techniques as horizontal integration and vertical integration in the late Meiji era, and direct overseas investment, technological innovation and diversification during the interwar period.

Scholars often refer to the large numbers of employees in this industry. According to Table 1, in the process of Japan's industrialization, the share of manufacturing in total employment increased from 13 percent in 1907 to 18 percent in 1937, although it declined slightly in 1931 when the Great Depression hit Japan. In this period the textile industry took up 6 to 7 percent of Japanese workforce, while the heavy and chemical industries' share rose from 3 percent to 7 percent. Among the largest firms

(see Appendix 2) were many cotton spinning companies and some silk filatures, which absorbed a large number of workers.

Other scholars point to the fact that the production of the textile sector was very large, measured either in value or in volume (see Table 8), and that, above all, the cotton industry as well as the silk industry occupied high percentages in foreign trade. According to Table 2, up to 1882 cotton yarn and cotton cloth were the main import items, but thereafter, their percentages in the total imports rapidly decreased, while the textile materials, mainly raw cotton, became the most important item of imports from the 1890s. As for exports, although raw silk was an important item just after the opening of ports in 1859, cotton yarn exports began in 1890, increasing till the First World War (1914-1918), and cotton cloth exports began to increase rapidly around the Russo-Japanese War (1904-1905). In the 1930s the cotton cloth came to be the most important export item, while the raw silk exports apparently declined because of the contraction of the American market in the Great Depression.

The above-mentioned data are relatively well known. However, as far as the years since 1929 are concerned, it is possible to calculate the value added of Japanese manufacturing industries from *Kojo Tokeihyo* (Factory Statistical Year Book), compiled by Shokosho (the Ministry of Commerce and Industry), although no one appears to have tried to confirm the ratio of the cotton industry in Gross National Product. The results are given on Table 3, which shows that cotton industry took up 50 to 60 percent of the total value added of textiles, while silk industry occupied 30 to 40 percent. Their shares in GNP were 2 to 3 percent for

cotton and 1 to 2 percent for silk respectively, while the percentages of the total manufacturing industry in GNP rose 19 percent in 1929 to 26 percent in 1937 except for the temporary decrease in 1930-1931. As the data compiled in *Kojo Tokeihyo* do not include the figures of small factories or workshops with less than nine workers, the above-mentioned ratios of the cotton industry must be somewhat an underestimate. In any case, we can confirm the significance of the industry for the prewar Japanese economy.

2. Technological Absorption

The purpose of this section is to show some features of the engineers in the modern cotton spinning companies at the early stage of Japanese industrialization. Japanese industrialization began at the latter half of the 1880s, and one of the key industries was cotton spinning. There were of course other important modern industries in this period, namely silk reeling, mining (coal and copper), transportation (railway and shipping), trading, banking, insurance and so on. But there were very few modern manufacturing establishments except for cotton spinning and silk reeling (see Appendix 2).

Japanese spinning firms started with the establishment of Kagoshima Bosekijo in 1867, and many spinning factories including the public ones were erected thereafter, most of which were not successful. However, after Osakabo (Osaka Spinning Company¹) began its operation

¹ 'Bo' means 'spinning company' in Japanese.

in 1883 and reported high dividends at the time of severe depression, many spinning companies came to be erected, and modern private spinning factories were firmly built into the Japanese economy. There are several reasons why these new firms successfully developed. First, the new firms had factories with over 10,000 spindles, while the older factory had only 2,000 spindles. Secondly, as most of the new firms adopted the joint-stock company system, they could easily raise funds. Thirdly, as the new firms adopted steam engines, their factories could work at a stable pace. By contrast, the older factories, which used water wheels, often had to stop their operations when the supply of water decreased. Fourthly, as the older factories preferred the places where the domestic raw cotton and the rivers for water wheels were available, it was very difficult for them to secure access to workers and markets. The new firms, which used imported raw cotton and steam engines, were released from such locational constraints, and were easily able to get access to workers and markets. Lastly, the new firms managed to get good Japanese engineers whom the older firms could not employ.

This section discusses the significance of the last point through the case study of the selected five important engineers.

(1) Takeo Yamanobe (1851-1920) ²

Takeo Yamanobe was born in Iwami Province (now Shimane

² See Ishikawa (ed)(1923); Shoji & Uno (1918); Toyo Boseki Kabushiki Kaisha 'Toyo Boseki 70 Nenshi' Henshu linkai (ed.)(1953); Toyo Boseki Kabushiki Kaisha Shashi Henshu-shitsu (ed.)(1986); Kato (1986 & 1995); Miyamoto & Abe (2004).

Prefecture) in 1851 as a son of *samurai*, and became a son-in-law of *samurai*, the Yamanobes, in 1854. Yamanobe started learning English in 1872, went to London in 1877 with a son of his lord, Kamei, and entered the University College. Yamanobe was initially interested in insurance business, and majored in economics.

There were more than ten cotton spinning factories with 2,000 spindles in Japan around 1880, which were operating at a loss. Eiichi Shibusawa, a supreme business leader, planned to establish a spinning company with 10,000 spindles, and persuaded the merchants in Tokyo and the former *daimyo* (feudal lords) to invest their funds in a new company. In Osaka Jutaro Matsumoto and Denzaburo Fujita also proceeded to establish a spinning company, and these two streams had been united by the end of 1881.

In Japanese spinning factories in those days the British technicians dispatched by the Platt Brothers Co., etc. taught Japanese workers how to install and operate the machinery. However, it was difficult for Japanese workers to master such skills due to the language barrier. Shibusawa, fully appreciating this situation, realized the importance of bringing up Japanese engineers, and found Yamanobe.

Yamanobe accepted Shibusawa's proposal in 1879, and moved to King's College to study mechanical engineering. However, after a short while he went to Manchester to search after a spinning factory where he could acquire the technology relating to spinning. Since September 1879 he acquired the technology on raw cotton, spinning and weaving by joining

the Rose Hill Mill of J. and W. E. Briggs (1848-1908)³ in Blackburn as a worker, and returned to Japan in July 1880 with Kamei.

After his return, Shibusawa's plan made headway. Under Yamanobe's guidance steam engine was selected as motive power, and the location of the factory was decided at Sangenya in Nishinari-gun in Osaka Prefecture (later became part of the City of Osaka). In May 1882 the establishment of Osakabo was permitted by the Osaka Prefectural Government. The machinery for the factory built in 1883 was selected by Yamanobe, and the English mule spinning machines with 10,500 spindles were imported. From April 1884 when all the machines began its operation, the company reported profits and high dividends in spite of the Matsukata Deflation, and this encouraged the emergence of a number of spinning factories with 10,000 spindles. Thereafter, Osakabo created such innovations as the introduction of the night shift system in 1883, the change from mule spindles to ring ones from 1886 on, the integration of weaving process since 1890, and the translation of many English technical terms into Japanese. Although it is doubtful whether all of them owed to Yamanobe, the last two points were apparently his contributions.

In the early Osakabo, the influential stockholders monopolized the board of directors, and it looked as if the company had been ruled by the owners. However, all the directors were too busy to devote themselves to the work of top management and lacked the knowledge on technology of spinning. Therefore, the salaried managers such as Yamanobe effectively

³ About the career of this person, see Miller (1959, pp.54-56).

took the role of top managers. Even so, they were not free to act, as the large stockholders or the directors constantly demanded high returns. Although Yamanobe was promoted to the director in 1895, to the executive director in 1896 and to the president in 1898, he was often torn between the interests of the stockholders and those of Osakabo. However, he gradually increased his influence in the company. After the establishment of Toyobo in June 1914 through the amalgamation of Osakabo and Miebo, Yamanobe secured the position of a president, and remained at this post until 1916.

(2) Dr. Shun'ichi Hattori (1853-1927)⁴

Shun'ichi Hattori was born in Nagato Province (now Yamaguchi Prefecture) in 1853 as a son of *samurai*, and later became a son-in-law of his teacher of Chinese classics, Toyo Hattori. In 1875 Hattori entered Kobu Daigakko (the Imperial College of Engineering) at Tokyo and majored in mechanical engineering. Graduating from the college in 1881, he worked as the chief engineer at the Hyogo Shipyard of the Ministry of Agriculture and Commerce until 1886. Having served for the Naval Ministry in 1886-1887, Hattori moved in May 1887 to Owaribo, established at Nagoya in Aichi Prefecture in the same year by Masaka Okuda and Tomoemon Kondo. Okuda erected many companies in Nagoya, and Kondo was a famous merchant of textiles there. The person who recommended Hattori to them was Reiko Okada. He was well known as

⁴ See Iijima (ed.)(1929); Kinugawa (1939).

the former manager of the national Aichi Bosekijo, the pioneer cotton spinning factory with 2,000 mule spindles, and an officer of Fukushima Prefecture at that time. Hattori left for England soon in July 1887 with Okada, who returned to Japan in January 1888, in order to conduct research on spinning and to buy the machinery. Hattori stayed mainly in Lancashire. Especially during the period from the late November 1887 till the early July 1888, Hattori worked at some spinning factories at Oldham and Middleton in the daytime as a worker, and studied at a technical school in Manchester after dark. As with the case of Kikuchi (see below), factory owners in Lancashire hated the idea of letting foreigners enter into their factories. Hattori and Okada used bribes to accomplish their plan.

In July 1888 Hattori came back to Japan, and became the manager of engineering of Owaribo. From its opening in July 1889 Owaribo used not only mule spinning machines but ring ones, and two British technicians, John Row and George Holden, installed the machinery.

Hattori's starting monthly salary was 100 yen. But soon the stockholders criticized that the salary was too high, and it was decreased to 80 yen. Hattori helped the design and management of the other spinning companies established in 1886, Kuwanabo and Chitabo. In 1905 when two large spinning companies, Owaribo and Nagoyabo, were acquired by Miebo, Hattori moved to Miebo, and became its chief engineer. After Miebo further acquired five companies, Tsushimabo, Nishinaribo, Kuwanabo, Chitabo and Shimotsukebo, Hattori became the director of Miebo. After the establishment of Toyobo in 1914, he became one of its directors and stayed at that post until May 1920.

(3) Dr. Kyozo Kikuchi (1859-1942)⁵

Kyozo Kikuchi was born at Iyo Province (now Ehime Prefecture) in 1859 as a son of a rich farmer. He learnt mechanical engineering at Kobu Daigakko in 1879-1885. The title of his BA dissertation was 'the Design of an Engine for Vessel'. Graduating from the college, he worked at the Yokosuka Naval Shipyard from June 1885 till March 1887. Kikuchi took over the post occupied by Tsunezo Saito (see below) at the Mint of the Ministry of Finance in Osaka in April 1887, but in July he was asked whether he would assume the chief engineer at Hiranobo, the establishment of which was being planned. Kikuchi agreed to the proposal on condition that he would have one year's stay in England.

In August 1887, Kikuchi resigned from the Mint and entered Hiranobo near Osaka. It was in October 1887 that Kikuchi left Yokohama for England. In December he reached London, where he met the London Branch Manager of Mitsui Bussan Kaisha, Senjiro Watanabe. In January 1888 Kikuchi moved to Manchester, where he learnt the spinning technology, working as a worker at a factory of a private spinner, T. B. Wood & Son Ltd. at Park Mill of Middleton, which was introduced to Kikuchi by the Platt Brothers Co. At the factory Kikuchi seems to have handed some money to the female workers in order to get technological know-how. After dark, Kikuchi learnt at a technical school in Manchester. By the end of August Kikuchi became confident that he could operate the machinery well. Kikuchi's another important role was to purchase spinning

⁵ See Kinugawa (1939); Nitta (ed.)(1948).

machines for Hiranobo. Although it was said that a ring machine was suitable for spinning of less than 36 count yarn, while a mule machine should be used for the production of finer yarns, Kikuchi had decided to buy the ring spinning machines made by Platt Brothers Co. before his foreign trip. In September he ordered 4,992 ring machines. Kikuchi also purchased a useful book on cotton spinning technology, *Cotton Spinning* (1883) written by R. Marsden, an editor of a leading journal, *Textile Manufacturer*, an act which was later to prove of great help to Narazo Takatsuji (see below).

In October 1888 Kikuchi left Liverpool, arrived at Yokohama in November and became the manager and the chief engineer of Hiranobo. He made great efforts to establish the company, which began to operate in May 1889 with 10,520 ring machines. The machines were installed during the period from December 1888 till June 1889 by an English technician, Thomas Walter Dronsfield who had worked at the Platt Bros. Co. and was invited to Japan by Miebo.

Kikuchi also became the manager and the chief engineer of newly established Amagasakibo in June 1889, and further came to be the chief engineer of Settsubo. In those days good engineers were scarce, and there emerged a 'Golden Age of Kikuchi', who did take care of the technology of three spinning companies. Incidentally, the expense for the foreign business trip by Kikuchi was later shared among three companies. Amagasakibo seems to have fostered the initiatives of Kikuchi considerably. The company president, Gennosuke Fukumoto promoted Kikuchi to the director in 1893, in spite of the opposition of the other

directors who argued against Fukumoto's plan for the reason that Kikuchi was not a wealthy man. Also at Amagasakibo, Juemon Tashiro, another leader and a talented yarn merchant, decided to spin the higher count yarns (namely, 32 and 42 counts), and Kikuchi greatly contributed to its realization. In 1901 Kikuchi finally became the company president of Amagasakibo. Kikuchi was respected also at Settsubo, where he became the director in 1897 and the president in 1915. By contrast, Hiranobo's directors never fully appreciated Kikuchi, and the relationship between the company and Kikuchi came to an end in 1898. By the way, Hiranobo was acquired by Settsubo later in 1902. In June 1918 Settsubo and Amagasakibo merged to form Dai Nihonbo, where Kikuchi came to be the president and stayed at the post until 1936. Kikuchi also became the president of the Sanju-shi Bank, the representative large bank in Osaka, in 1924, and assumed the position of a president of the Sanwa Bank, established in 1933 through the merger of three banks including the Sanju-shi Bank. In addition, he established Nihon Rayon Co., a subsidiary of Dai Nihonbo, in 1937, and became the president. By holding many respectable positions of large companies, Kikuchi amassed his personal wealth, and came to be one of the richest people in Japan.

(4) Dr. Tsunezo Saito (1858-1937)⁶

Tsunezo Saito was born in Nagato Province in 1858, and became a

⁶ See Kinugawa (ed.)(1936); Kinugawa (1937); Toyo Boseki Kabushiki Kaisha 'Toyo Boseki 70 Nenshi' Henshu Iinkai (ed.)(1953); Toyo Boseki Kabushiki Kaisha Shashi Henshu-shitsu (ed.)(1986).

son-in-law of the Saitos in 1868. He entered Kobu Daigakko in 1876, majoring in mechanical engineering. Graduating from the college in 1882, he engaged in the improvement and reinforcement of machinery at the Mint of the Ministry of Finance by order of the Minister of Public Works, Yozo Yamao (1837-1917) who was also born in Nagato. During this period, Saito succeeded in the installation of a large motor with 2.1 meters in diameter and 9.1 meters in length, which had been opposed by a British engineer, William Nield, who had belonged to Platt Bros. Co. and came to Japan in 1883. Observing the process, Yamanobe of Osakabo appreciated the technological ability of Saito, and strongly recommended him as the chief engineer of Miebo, the establishment of which was being planned by Eiichi Shibusawa and Denshichi Ito. Yamanobe's proposal was accepted, and Saito moved to Miebo in 1886. Saito, who soon began to design its factories, left for England at the end of the year, and ordered the spinning machinery to Platt Bros. Co. with requests on minute details. He also acquired a great deal of knowledge on spinning through actually watching some factories. At first Miebo's directors told Saito to buy only mule spinning machines. But Saito, who recognized the advantage of ring ones, advised that they should change their mind by mail, and they were persuaded. Saito purchased not only mule machines but 3,000 ring machines, and adopted a technician, Dronsfield, for the installation of machinery from Platt Bros. Co. When the factory of Miebo was burnt in fire in April 1898, the company changed all the mule machines into the new ring ones by using the fire insurance. Saito also noticed that Indian raw cotton was available for cotton spinning in Japan. Soon after he did, not

only Miebo but also most of the Japanese spinning firms came to use it.

After Saito's return to Japan in October 1887, the company president, Ito, who had much suffered from lack of a good engineer at the time of running Kawashima Bosekijo, the forerunner of Miebo, paid a monthly salary of 100 yen to Saito, while Ito himself got no salary.

Saito actively worked on the great merger by Miebo in 1905, became the managing director in 1912, and stayed at the same post in Toyobo after 1914. He was the president of Toyobo in 1920-1926.

(5) Dr. Narazo Takatsuji (1865-c.1950?)⁷

Narazo Takatsuji was born in Osaka in 1865, and entered Kobu Daigakko in 1883, majoring in mechanical engineering. As his brother-in-law often told him the importance of the spinning industry, and of the protection of the domestic market from foreign imports, Takatsuji had been interested in textile manufacturing since his childhood. When he was a student of Kobu Daigakko, Takatsuji lived at the house of Seiryu Ishikawa, a famous engineer of early spinning factories with 2,000 mule spindles, and acquired a great deal of knowledge from him. After graduation, Takatsuji entered the graduate school for a further study of spinning and weaving.

Meanwhile, with the encouragement of the Governor of Shiga Prefecture, Hiroshi Nakai, Masahiro Tamura, the Chief of Agriculture and Commerce Section of the same prefecture, planned to establish a

⁷ See Nitta (ed.)(1932); Kinugawa (1939); Kanebo Kabushiki Kaisha Shashi Hensan-shitsu (ed.)(1988).

company which would manufacture fine cotton yarn and shirting cloth, in order to prevent imported goods from flowing into the domestic market. This idea was realized in the form of the establishment of Kanakin Seishoku (Shirting Weaving) Co., which was sponsored and managed by Tamura and the famous merchants in Shiga Prefecture (Omi Merchants) including the Abe family and Shinsuke Koizumi, and the company began to operate in October 1889. The factory in Osaka had 13,560 ring spindles of Platt Bros. Co. and 50 power looms of Hargreaves Co.

As a graduate student, Takatsuji studied the construction of machinery at the manufacturing division of the Ministry of Public Works for about one year after September 1890, while he learnt the installation of cotton spinning and weaving machinery and the operation of a factory at Kanakin Seishoku Co. In July 1891 he left school, joined the company with the recommendation of his supervisor, Professor Iguchi, and became the chief engineer and the manager of engineering in September. He left for England and the U.S.A. in August 1892, bought spinning and weaving machines, and observed the operation of some factories. In Manchester he took rooms, which S. Watanabe of Mitsui Bussan recommended to Takatsuji as well as to Yamanobe, Hattori and Kikuchi.

After he returned to Japan in 1893, Takatsuji extended technological help to many spinning companies; to Kyotobo at the request of Giichi Iida of Mitsui Bussan, to Yamatobo at the request of Shukichi Abe, to Kunishimabo at the request of the Abes, to Fushimibo, to Nihon Kenmenbo and so on. But in about 1898 the tie between Takatsuji and Kanakin Seishoku weakened, while the Mitsui family came to pay special

attention to Takatusji through the restructuring of Kunishimabo, which would be merged into Kanebo in 1899. In 1899 Takatsuji was dispatched to foreign countries by Mitsui to investigate weaving business, and later Mitsui established a weaving factory in Hyogo Branch of Kanebo. Takatsuji finally moved to Kanebo, became its managing director⁸ in 1907, and stayed at the position of a director in 1908-1918.

Let me sum up five engineers' careers. First, except for Yamanobe, four of them were the graduates of Kobu Daigakko. This college was erected in Tokyo in 1873 by the Ministry of Public Works (Kobusho) of the Meiji Government in order to promote many modern manufacturing industries, and a young Scottish principal, Henry Dyer (1848-1918), established the structure, and invited some foreign scholars, most of whom were British. The eight courses that had been set up were; civil engineering, mechanical engineering, telecommunication, architecture, chemical engineering, mining, metallurgy and shipbuilding. The lectures were given in foreign languages, mainly in English. Not only OJT (On the Job Training) but also Off JT, namely practical training, was actively pursued. Its educational system was unique, although Dyer later failed to build a similar system in Britain. During the period from 1879 to 1885, 211 people graduated from the college, most of whom became technological leaders in Meiji Japan. It is impressive that all of four persons selected

⁸ In the following year, he became an ordinary director.

here majored in mechanical engineering. In March 1886 the college was absorbed into the newly established Tokyo Imperial University⁹.

Secondly, all of five engineers learnt the technology on spinning in Lancashire, the world centre of the cotton industry. Although the periods in which they stayed there were less than one year, they studied very hard. Three of them worked as workers at the factories in the daytime, and studied at night schools after dark. One reason why they were able to acquire a great deal of knowledge within a very short space of time was that they had mastered English and acquired the academic base of mechanical engineering including practical training at Kobu Daigakko.

Thirdly, their important work in Lancashire was to purchase the machinery made by Platt Bros. Co. at Oldham. The information might be brought about by Mitsui Bussan. It is worth noting that at least two engineers, Kikuchi and Saito, fully understood the significance of the ring machines. Saito further spotted the availability of Indian raw cotton.

Lastly, all of the five engineers reached the position of top managers. In Japanese manufacturing in the Meiji period, not only engineers but also managers were scarce, and the engineers were often appointed to the top managers because of their ability and aspiration to improve the management¹⁰. The case of cotton spinning is a good example of this.

Tables 4 and 5 well show the supreme positions of such large spinning companies as Toyobo (former Osakabo, Miebo, Owaribo and

⁹ See Miyoshi (1983); Checkland (1999); Kakihara (2002).

¹⁰ See Morikawa (1975).

Kanakin Seishoku¹¹), Dai Nihonbo (former Hiranobo, Amagasakibo and Settsubo) and Kanebo in prewar Japan. It is no coincidence that the above-mentioned five engineers worked for those companies.

2. Managerial Absorption

Large cotton spinning companies absorbed not only technological achievements but also various managerial skills from advanced countries. Kuwahara scrutinized the fact that from the early twentieth century Sanji Muto (1867-1931), well-known executive of Kanebo, actively introduced welfare policies of the Krupp family in Germany and labour management practices of John Patterson of the National Cash Register Co. in the U.S.A. and so on, in an attempt to improve the management of the company¹². It is also well known that Kanebo and Toyobo actively introduced the Taylor system from the 1910s¹³. Here I would like to suggest that large spinning companies also adopted such important managerial strategies as horizontal integration and vertical integration from the U.S.A. and the U.K.

(1) Horizontal Integration

In the late 1890s and the early 1900s, after the post-Sino-Japanese-War boom was over, a serious depression hit the

¹¹ Osaka Godobo was also merged into Toyobo in 1931.

¹² Kuwahara (2004).

¹³ Kanebo Kabushiki Kaisha Shashi Hensan-shitsu (ed.)(1988); Toyo Boseki Kabushiki Kaisha 'Toyo Boseki 70 Nenshi' Henshu linkai (ed.)(1953); Toyo Boseki Kabushiki Kaisha Shashi Henshu-shitsu (ed.)(1986).

Japanese economy, and the cotton spinning firms experienced a series of mergers and acquisitions. In adopting the horizontal integration strategy, Hikojiro Nakamigawa (1854-1901), a distinguished salaried manager of the Mitsui zaibatsu, played an important role. Nakamigawa was taught by his uncle, Yukichi Fukuzawa, at Keio Gijuku which Fukuzawa founded, and stayed in England for seven years from 1874. Having worked for the Sanyo Railway Company as the president, he was invited by the Mitsui family in 1888, and succeeded in restructuring the then sluggish Mitsui's businesses. In those days the pillar of Mitsui's businesses was the Mitsui Bank, which ruled such manufacturing firms as Kanebo, Shinmachi Silk Spinning Factory, Tomioka Filature, Oji Paper Company, Shibaura Works (later Toshiba) and so on. Nakamigawa attempted to concentrate Mitsui's businesses into manufacturing. Kanebo was established in 1888 as Mitsui's subsidiary company, of which Nakamigawa became the chairman after 1893. It was one of the most important firms for his strategy¹⁴. Nakamigawa noticed the fact that some European cotton spinning factories were erected in China and began to operate after the first Sino-Japanese War, and planned not only to foster Kanebo in order to win the keen competition in cotton yarn exports in China but also to have another cotton spinning firm for producing cotton goods there. Thus, in October 1895, the land for a factory site was secured in Shanghai and in November Shanghaibo was established as a subsidiary of Kanebo. However, as the Chinese Government might introduce a new tax on cotton

¹⁴ Kanebo Kabushiki Kaisha Shashi Hensan-shitsu (ed.)(1988).

goods, Nakamigawa hesitated to actually erect a new factory in China, and in March 1896 he decided not to have it in China and to build another factory of Shanghaibo in Kobe in Japan. In the same year the China government abandoned the plan of introducing the new tax, and in early 1897 abolished the native customs dues. At that time Nakamigawa reconsidered the possibility to establish a spinning factory in China, but he changed his mind after reading Muto Sanji's report. Muto, who was dispatched to China in March 1898 by Nakamigawa in order to investigate the Chinese cotton factories, insisted in his report that spinning factories in Shanghai owned by the Europeans and the Chinese were not well managed. In March 1898, when Japan's economy suffered from the depression, Seishu Iwashita (1857-1928), who used to be a personnel of the Mitsui Bussan and the Mitsui Bank, and was an auditor of Kanebo in 1893-1896 and the director of the Kitahama Bank in Osaka, strongly advocated the importance of the mergers among the cotton spinners. Presumably enlightened by this argument, Nakamigawa decided to merge not only Shanghaibo but Miikebo, Kashubo, Kunijimabo and Awajibo into Kanebo in February 1899¹⁵, and the acquisitions of Shanghaibo, Kashubo, Kunijimabo and Awajibo were soon realized (see Table 6). Nakamigawa died in October 1901, but his horizontal integration strategy was further pursued by a young manager, Sanji Muto. An admirer of Nakamigawa and having studied in the U.S.A. in 1885-1887, Muto scrutinized the Trust movement. It must have been easy for him to get the information on

¹⁵ Kuwahara (1990, Chapter 2).

businesses in the U.S.A. He published *Boseki Dai Godoron* [On the Large Mergers of Cotton Spinners](Osaka, Dai Nihon Boseki Rengokai) in December 1901, in which he, referring to the American Trust movement, strongly recommended that the spinning firms should form a small number of powerful large companies through mergers and acquisitions, in order to win the cut-throat competition in the cotton yarn market in China, and he himself completed the great mergers planned by Nakamigawa, through the acquisitions of three spinning firms in Kyushu (see Table 6).

In the U.S.A in the 1880s the Trust movement prevailed, and thereafter in the period from the late nineteenth century to the early twentieth century, mergers and acquisitions were apparently found in many industries¹⁶. In the U.K. too many firms were merged, and large firms appeared during the same period. Among the cotton spinners and finishers in particular, such enterprises as J & P. Coats (in 1896), Fine Cotton Spinners' & Doublers' Association (1898), Bradford Dyers' Association (1898), Calico Printer Association (1899), Bleachers' Association (1900) and British Cotton & Wool Dyers' Association (1900) were formed¹⁷. Although it is difficult to find the influence of the U.K., Muto was apparently enlightened by the Trust movement in the U.S.A.

Besides Kanebo, Osaka Godobo managed by Fusazo Taniguchi, a cotton cloth merchant in Osaka, was keen to acquire weak spinners (see

¹⁶ Chandler (1977).

¹⁷ Hannah (1974).

Table 6). ‘Godo’ in Japanese means ‘merger’, and the Kitahama Bank managed by Iwashita was the financial supporter of Osaka Godobo¹⁸.

In Japan persuasive explanations for the economic rationale behind those mergers and acquisitions are very few. Only Takamura argued for the following advantages of the mergers and acquisitions in such companies as Kanebo; First, they could acquire the weaker firms very cheaply (see Table 6). Secondly, mergers and acquisitions brought about the enlargement of such transaction units as interests, purchase of raw cotton, trading of yarn, transportation and insurance, and therefore large companies took advantage of the economies of scale in marketing and finance¹⁹.

(2) Vertical Integration

The vertical integration of Japanese cotton spinning companies was first seen in the form of forward integration into weaving. During and after the First World War large spinning companies such as Kanebo made a further forward integration into finishing, but here I would like to concentrate on the integration of weaving²⁰.

Although vertical integration began in the 1890s, as Table 7 shows, its significance became apparent after the Russo-Japanese War, as Table 8 suggests. It was above all prominent in the strategies of Osakabo and Miebo, both of which became rather more of weaving firms than spinning

¹⁸ Sakata (ed.) (1931).

¹⁹ Takamura (1971), Vol 2, pp.104-106.

²⁰ As for the integration of Japanese spinning companies into finishing, see Abe (2004).

ones. In 1914 two companies merged to form Toyobo. One reason behind this merger was that similar companies had fiercely competed with each other.

Here let me show the case of Osakabo²¹. After the appointment of Yamanobe as president in 1898, the company shifted its emphasis from the production and sale of low counts of yarn, which used to be profitable in the early days but later suffered under the competition from other major spinning companies in the 1890s, to ancillary weaving and cloth exports after the first decade of the twentieth century. A 120-loom expansion in 1898 was undertaken, and this was followed in 1901 by the introduction of 500 “new-type power looms” (Northrop automatic power loom) which were purchased when Yamanobe went to the U.S.A. Moreover, in 1906 Osakabo acquired Kanakin Seishoku, which ranked third at that time in terms of the scale of weaving plants, with the result that Osakabo became the No. 1 weaver in Japan.

Of the engineers and managers shown in section 2, Yamanobe was the president of Osakabo, and Hattori and Saito were the executives of Miebo. They seem to have acknowledged the significance of vertical integration between spinning and weaving in Lancashire. According to Farnie, many Lancashire cotton spinners integrated spinning and weaving in the 1830s-1850s, but from the mid-nineteenth century this combination disintegrated, and vertical specialization instead became an important feature of the Lancashire cotton industry²².

²¹ Miyamoto & Abe (2004).

²² Farnie (1979, Chapter 8).

Thus the late 1870s or the latter half of the 1880s when three Japanese engineers stayed in Lancashire was the period when integrated firms were declining. However, Yamanobe studied at an integrated firm at Blackburn, a typical weaving area in Lancashire. He actually established Osaka Weaving Company in 1899 as a subsidiary of Osakabo, and let it merge with Osakabo in the following year. As for Hattori and Saito, who also stayed in Lancashire, they might have had the knowledge on integrated firms there. Unfortunately there is no evidence to show that the influence of integrated firms in Lancashire on them was important, but a speculation that Miebo energetically promoted a vertical integration into weaving sector might owe something to those two persons may be permitted.

Although the advantages of the vertical integration of Japanese spinning companies into weaving seem not to have been fully considered by Japanese scholars, Kiyoshi Inoue, a salaried manager of Kanebo and an expert in sales of cloth, left an interesting testimony. According to him, its most important advantage was the reduction of such transaction costs of yarn as packing, transportation, and purchase and sale. He suggested that cutting the costs of packing and transportation in particular, which took up a full one third of all the manufacturing costs except for the cost of raw cotton, was a very important factor promoting vertical integration²³.

²³ Inoue (1925).

Concluding Remarks

First, this paper calculated the ratios of Japanese cotton industry in GNP in 1929-1937. In value added terms the industry took up 50 to 60 percent of the total textile industry, while silk industry occupied 30 to 40 percent. Their percentages in GNP were 2 to 3 percent for cotton and 1 to 2 percent for silk respectively, while the percentages of the total manufacturing industry in GNP rose 19 percent in 1929 to 26 percent in 1937 except for their temporary decrease in 1930-1931.

Secondly, the paper discussed the careers of five engineers in Japanese modern cotton spinning companies at the early stage of the Japanese industrialization. Four of them were the graduates of Kobu Daigakko, erected by the Ministry of Public Works. All of five engineers learnt the technology of spinning in Lancashire, and an important work they had undertaken there was the purchase of the spinning machinery. All of five engineers later reached the position of top managers. Apparently the technological absorption from the U.K., as well as the higher education arranged by the Japanese government, played an important role at the take-off stage of Japanese cotton spinning companies.

Finally, this paper considered the absorption of organizations from advanced countries. In Japanese cotton spinning firms, mergers and acquisitions were observed around 1900 when the Japanese economy was put under the serious depression, and the vertical integration into weaving forged ahead in the 1900s and 1910s. The horizontal integration was influenced by the Trust movement in the U.S.A. in the 1880s, and the

vertical integration seems to have been influenced by the movement in Lancashire. However, these suggestions remain a considered speculation, which awaits further scrutiny.

Appendix 1

A Short History of Prewar Japanese Cotton Industry²⁴

I would like to briefly explain the development of the pre-war Japanese cotton industry for the benefit of non-specialists.

Since about the late 17th century Japanese traditional cotton industry had highly developed, and after 1867 when the Kagoshima Spinning Factory began operations, the Meiji government tried to plant modern cotton spinning factories with 2,000 spindles with the use of the technology developed in Lancashire in the United Kingdom. However, it was not until the mid-1880s that modern spinning companies like the Osaka Spinning Company (Osakabo²⁵), which newly emerged and had the factories with 10,000 spindles, took off, with the support of the governmental monetary policy rather than the financial policy. Thereafter they remarkably developed as Table 8 shows, expelling not only the domestic hand spun yarn but also the imported yarn of Lancashire and India. Around 1890 the cotton spinning industry achieved import substitution, rapidly began to increase yarn exports, and in 1897 after the First Sino-Japanese War (1894-1895) exports of yarn surpassed its imports in volume, apparently supported by the repeal of the export duty on cotton yarn in 1894. After 1896 when the import duty on raw cotton was repealed, many Japanese farmhouses producing raw cotton were obliged to abandon the production, while the cotton spinning companies could

²⁴ This part was summarized from Abe(1992, 2004 and forthcoming).

²⁵ 'Bo' means 'spinning firm' in Japanese.

come to get cheaper and higher quality raw cotton, especially from India, with the assistance of a few large trading companies such as Mitsui Bussan Kaisha, Nihon Menka, etc., the big shipping companies like Nihon Yusen Kaisha, the Yokohama Specie Bank and so on. During the depression after 1897 the larger cotton spinning companies started to enlarge themselves through mergers and acquisitions movement, following the example of the Trust movement in the United States of America. Particularly after the Russo-Japanese War (1904-1905) six large companies, Osakabo, Miebo, Osaka Godobo, Kanegafuchibo (Kanebo), Amagasakibo and Settsubo, became prominent, all of which produced not only various yarns but also mainly plain grey cloth²⁶.

According to Table 8, before World War I the markets of Japanese yarn were divided into three categories: export, integrated weaving factories, and domestic weavers in the local producing centres. Of the three, the first two markets gradually increased their shares. Nevertheless, the last category, independent weavers' weight was almost over 50 percent even just before the First World War.

Thus the cotton weaving industry in modern Japan is divided into two large business groups. The first group combines spinning and weaving; the second specializes in weaving. It is the second group which made up the producing-centre cotton weaving industry, while the first group, which started to develop around 1890, consisted of large-scale factories equipped with power looms from the beginning, and was keen on

²⁶ Takamura(1971); Abe(1990); Fletcher(1996).

adopting the latest mechanized technology. The latter group, in contrast, boasted a history dating back to the Edo period (1603-1868), and the overwhelming majority of weavers, at least until about the time of the Russo-Japanese War, were part of the cottage industry under the putting-out system, in which members of farming households, using hand looms and working in their spare time, wove cotton cloth that was collected by local merchants. It was common for large members of such independent weavers, merchants and finishers to become concentrated within a relatively small area, thus forming what were called *sanchi*, cotton-textile producing centres. After the Russo-Japanese War some producing centres like Sen'nan and Senboku both in Osaka Prefecture, Chita in Aichi Prefecture, Enshu in Shizuoka Prefecture and Banshu in Hyogo Prefecture moved towards a factory structure. In these producing centres the construction of small- and medium-sized factories equipped with power looms increased remarkably; on the other hand, the cottage industry that relied upon hand looms began to decline, and these classical representatives of traditional industry for the most part metamorphosed into small and medium-sized manufacturing industries.

After the Japanese cotton industry experienced a prosperous period during and just after the First World War (1914-1918), the spinning companies of the interwar period continued to use the strategies of horizontal and vertical integration that originated at a time before the start of World War I. However, what is notable from this period is the strengthening of the industry's international competitiveness through the promotion of a new vertical integration into the finishing sector. The

primary product of the Japanese cotton industry in the post-war period became a finished cotton cloth targeted for export. The large spinning companies increased their middle and high-count cotton yarn production around this time. Many large spinning companies continued their integrated weaving factories, to the extent that the weaving factories did not obstruct the development of the *sanchi* cotton textile industry, whose importance as consumers of cotton yarn had increased. The large spinning companies further advanced their efforts towards self-sufficiency in the finishing sector. In particular, Kanebo's Yodogawa factory, which boasted prominence in scale, not only finished its own cotton cloth but also that of a large amount of Japan's foremost cotton textile *sanchi* such as Sen'nan.

Combining traditional strategies, the large spinning companies first sought to invest directly in the Chinese market through establishing *zaikabo* (Japanese cotton spinning factories in China). This action was taken to combat their diminishing capacity in yarn export to China in the cut-throat international competition. The *zaikabo* advanced the combined management of weaving and finishing and strove to advance the technology of high drafting spinning machinery. The *zaikabo* came to directly command the Chinese cotton yarn and cloth markets, which had previously been difficult to penetrate through foreign trade, and came to dominate one sector of the Japanese cotton industry's bid for world dominance.

The growth of productivity in Japanese cotton spinning companies from the end of the nineteenth century was sluggish. However, over the

interwar period, in particular through the 1930s, it achieved a rapid progress. This progress was due largely to technological development in the industry, which, from the time before and during the war, was based on the introduction of scientific management. Around the time of implementation of the revised Factory Law in July 1929, and through the time of the Great Depression in 1930-1931, Japanese cotton spinning companies sought to strengthen their international competitiveness through the use of automatic power looms, the advancement of high drafting spinning machines, and the installation of air-conditioning equipment. This investment in technological advancement was supported by the profits made through the speculative manipulation of raw cotton by the large spinning companies during the 1930s, during the time of violent fluctuations of the exchange rate of the yen.

During the prosperous times of the 1930s when Japan was off the gold standard, Japan's cotton industry faced the difficult problems of the loss of the huge Chinese cotton cloth market and the strengthening of import quotas placed on Japanese products throughout the British Empire, and so on. These problems were troublesome to the Japanese cotton industry whose development was supported by cotton cloth exports. To overcome their troubles, the large spinning companies diversified into alternative textile areas such as silk products, rayon and rayon staple, and wool products; this diversification served to strengthen the spinning companies as a whole. New strategies employed by Japanese spinning companies resulted in a noticeable increase in their international competitive capabilities.

Our discussion up to this point has concentrated on the large spinning companies. However, the Japanese cotton industry of the interwar period did not develop solely from these firms. The industry's development only became possible through its organic relationship with the industry's organizational core. First, the introduction of high drafting spinning machinery, simplex machinery, and air conditioning equipment was initially accepted only with great caution by Dai Nipponbo (former Amagasakibo and Settsubo) and the other large spinning companies. It was the new large firms such as Kurehabo, and the smaller-sized spinning companies such as Aichi Orimono, Tokaibo, Tenma Orimono, and Toyamabo that took the lead in introducing this new technology.

The spinning companies correctly foresaw that the direction for development of the Japanese cotton industry during this period was in finished cotton cloth exports. However, what they did see at the same time was the importance of expanding integrated weaving factories. They directed their attention towards the expansion of cotton yarn sales to the few cotton weaving *sanchi* that had risen at this time. Large spinning companies began to manage on a large scale the finishing factories that had hitherto been dominated by the small and middle-sized specialized firms. Not only did these spinning companies manufacture their own products, but they also placed emphasis on their finishing of the cotton cloth produced by the white cotton cloth *sanchi*.

Mass and Lazonick regard the high degree of vertical integration as an important factor behind the development of large Japanese spinning

companies during the interwar period²⁷. Although this is not entirely wrong, it must also be noted that the large spinning companies fundamentally did not advance to the point of distribution, the acquisition of raw cotton, or the selling of cotton products. The large companies was able to manage jointly both the weaving and finishing of cotton cloth but, concerning the former, it was only able to form a niche against the products of the *sanchi* cotton textile industry. As for finishing, in addition to the cotton cloth produced at their factories, the large spinning companies was also able to accommodate the products of the special weaving industrialist. Here we can see the limitations of vertical integration of the spinning firms. Moreover, such actions were not taken for the development of the spinning companies alone, but also as a strategy employed by the Japanese cotton industry as a whole of strengthening its competitiveness. The Japanese cotton industry of the interwar period was not limited to the large spinning companies, but also included the *zaikabo* that commanded the Chinese market, the smaller-sized spinning companies which were full of vitality but not notably integrated vertically, and the weaving *sanchi* such as Sen'nan including the large-scale weaving industrialists and Banshu, that retained a high degree of organization. Also the industry included the raw cotton trading companies and the cotton products trading companies that collected rich information on domestic and foreign markets. Together this elaborate industrial organization worked to strengthen Japan's international competitive capacity.

²⁷ Mass and Lazonick(1990).

References:

- Abe, Takeshi (1990), "Men-gyo" (The cotton industry in Meiji Japan) in Shunsaku Nishikawa and Takeshi Abe (eds.), *Sangyoka no Jidai* (The Age of Industrialization) Vol.1, *Nihon Keizai-shi* (Economic History of Japan) Vol. 4: Tokyo, Iwanami Shoten.
- Abe, Takeshi (1992), "The Development of the Producing-Center Cotton Textile Industry in Japan between the Two World Wars", *Japanese Yearbook on Business History*, Vol.9 (Repr. in W.Lazonick & W.Mass (eds.), *Organizational Capability and Competitive Advantage*: Aldershot, Routledge, 1995).
- Abe, Takeshi (2004), "Organizational Changes in the Japanese Cotton Industry during the Inter-War Period: From Inter-Firm-Based Organization to Cross-Sector-Based Organization" in Douglas A.Farnie & David J.Jeremy (eds.), *The Fibre that Changed the World: The Cotton Industry in International Perspective, 1600-1990s*: Oxford, Oxford University Press.
- Abe, Takeshi (forthcoming), "The Chinese Market for Japanese Cotton Textile Goods, 1914-30" in Kaoru Sugihara (ed.), *The Growth of the Asian International Economy, 1850-1949*: Oxford, Oxford University Press.
- Chandler, Jr., Alfred D. (1977), *The Visible Hand: The Managerial Revolution in American Business*: Cambridge, Mass. & London, The Belknap Press of Harvard University Press.

- Checkland, Olive(1999), “Henry Dyer at the Imperial College of Engineering Tokyo, and afterwards in Glasgow” in J.E.Hoare (ed.), *Britain & Japan: Biographical Portraits*, Vol. 3: Surrey.
- Dai Nihon Boseki Rengokai, *Menshi Boseki Jijo Sankosho* [Greater Japan Cotton Spinners' Association, A Half Year Report of Cotton Spinning Industry].
- Fletcher III, W. Miles (1996), “The Japan Spinners Association: Creating Industrial Policy in Meiji Japan”, *Journal of Japanese Studies*, Vol.22, No.1.
- Hannah, Leslie (1974), “Mergers in British Manufacturing Industry, 1880-1918”, *Oxford Economic Papers* (New Series), Vol.26, No.1.
- Iijima, Seita (ed.) (1929), *Kogaku Hakushi Hattori Shun'ichi-shi Tsuisoroku* (Memoirs of Dr. Shun'ichi Hattori): Osaka.
- Inoue, Kiyoshi (1925), “Honpo Mengyo-kai no Gaiyo” (The Outline of Japanese Cotton Industry) in Seiichi Takimoto & Shikamatsu Mukai (eds.), *Nihon Sangyo Shiryo Taikei*, Vol.6: Tokyo, Chugai Shinposha, 1926.
- Ishikawa, Yasujiro (ed.) (1923), *Kozan no Hen'ei* (A Piece of Cloud of the Lonely Mountain): Osaka.
- Kajinishi, Mitsuhaya (ed.) (1964), *Gendai Nihon Sangyo Hattatsu-shi 11 Sen'I Jo* [History of Industrial Development of Modern Japan, Vol.11, Textile Industry]: Tokyo. Kojunsha.
- Kakihara, Yasushi (2002) “Kobusho no Gijutsusha Yosei”(Education for Engineers at Ministry of Public Works) in Jun Suzuki(ed.), *Kobusho*

- to Sono Jidai* (Ministry of Public Works and its Age): Tokyo, Yamakawa Shuppansha.
- Kanebo Kabushiki Kaisha Shashi Hensan-shitsu (ed.) (1988), *Kanebo 100 Nen-shi* (100 Years History of Kanebo), Vol.1: Osaka.
- Kato, Kozaburo(1986), “Yamanobe Takeo to Kindai-teki Boseki-gyo” (Takeo Yamanobe and Modern Spinning Industry) in Keiji Nagahara et al.(eds.), *Koza Nihon Gijutsu no Shakai-shi: Bekkan 2 Jinbutsu-hen Kindai* (Social History of Japanese Technology: Supplementary Volume 2, Key Persons of Modern Age): Tokyo, Nihon Hyoronsha.
- Kato, Kozaburo (1995), “Yamanobe Takeo and the Modern Cotton Spinning Industry” in Erich Pauer (ed.), *Papers on the History of Industry and Technology of Japan Volume II: From the Meiji-Period to Postwar Japan*: Marburg, Foerderverein Marburuger Japan-Reihe.
- Kinugawa, Taichi (ed.)(1936), *Ito Denshichi O* (Biography of Mr. Denshichi Ito): Osaka.
- Kinugawa, Taichi (1937), *Honpo Menshi Boseki-shi* (History of Cotton Spinning Firms in Japan), Vol.2: Osaka, Nihon Mengyo Kurabu.
- Kinugawa, Taichi(1939), *Honpo Menshi Boseki-shi*, Vol.4: Osaka, Nihon Mengyo Kurabu.
- Koda, Yudo(1931), *Honpo Mengyo no Tokei-teki Kenkyu* (Statistical Analyses of the Japanese Cotton Industry): Osaka.

- Kuwahara, Tetsuya (1990), *Kigyo Kokusaika no Shiteki Bunseki* [Historical Analyses on the Internationalization of Firms]: Tokyo, Moriyama Shoten.
- Kuwahara, Tetsuya (2004), "The Development of Factory Management in Japan during the Early Stages of Industrialization: The Kanegafuchi Cotton-Spinning Company before the First World War" in Douglas A.Farnie & David J.Jeremy (eds.), *The Fibre that Changed the World: The Cotton Industry in International Perspective, 1600-1990s*: Oxford, Oxford University Press.
- Mass, William & William Lazonick (1990), "The British Cotton Industry and International Competitive Advantage", *Business History* , Vol.32 , No.4.
- Miller, George.C. (1959), *Blackburn Worthies of Yesterday: A Biographical Galaxy*: Blackburn, Blackburn Society of Antiquaries.
- Miyamoto, Matao & Takeshi Abe (2004), "The Corporate Governance of Japanese Firms at the Early Stage of Industrialization: Osaka Cotton Spinning and Nippon Life Assurance" in Robert Fitzgerald & Etsuo Abe (eds.), *The Development of Corporate Governance in Japan and Britain*: Ashgate, Aldershot & Burlington.
- Miyoshi, Nobuhiro (1983), *Meiji no Enjinia Kyoiku* (Education for Engineers in Meiji Japan): Tokyo, Chuo Koronsha.
- Morikawa, Hidemasa (1975), *Gijutsusha* (Engineers): Tokyo, Nihon Keizai Shinbunsha.
- Nitta, Naozo (ed.) (1932), *Tamura Masahiro O* (Biography of Mr.Masahiro Tamura): Osaka.

- Nitta, Naozo (ed.) (1948), *Kikuchi Kyozo O Den* (Biography of Mr.Kyozo Kikuchi): Osaka.
- Ohkawa, Kazushi, Nobukiyo Takamatsu & Yuzo Yamamoto (1974), *Kokumin Shotoku* [National Income], Kazushi Ohkawa, Miyohei Shinohara & Mataji Umemura (eds.), *Choki Keizai Tokei* [Estimates of Long-Term Economic Statistics of Japan since 1868], Vol.1: Tokyo, Toyo Keizai Shinposha.
- Sakata, Mikita (ed.), *Taniguchi Fusazo O Den* (The Biography of Mr. Fusazo Taniguchi): Osaka, 1931.
- Seki, Keizo (1956), *The Cotton Industry of Japan*: Tokyo, Japan Society for the Promotion of Science.
- Shoji, Otokichi & Yonekichi Uno (eds.) (1918), *Yamanobe Takeo Kun Shoden* (A Short Biography of Mr.Takeo Yamanobe), Boshoku Zasshisha: Osaka.
- Shokosho (ed.), *Kojo Tokeihyo* [Factory Statistics]
- Takamura, Naosuke (1971), *Nihon Boseki Gyoshi Josetsu* (The History of the Cotton Spinning Industry in Meiji Japan) 2 volumes: Tokyo, Hanawa Shobo.
- Toyo Boseki Kabushiki Kaisha ‘Toyo Boseki 70 Nenshi’ Henshu linkai (ed.) (1953), *Toyo Boseki 70 Nenshi* (70 Years History of Toyo Boseki): Osaka.
- Toyo Boseki Kabushiki Kaisha Shashi Henshu-shitsu (ed.) (1986), *100 Nen-shi Toyobo* (100 Years History of Toyobo), Vol.1: Osaka.
- Umemura, Mataji, Keiko Akasaka, Ryoshin Mimami, Nobukiyo Takamatsu, Kurotake Arai & Shigeru Ito (1988), *Rodoryoku* [Manpower],

Kazushi Ohkawa, Miyohei Shinohara & Mataji Umemura (eds.),
Choki Keizai Tokei [Estimates of Long-Term Economic Statistics of
Japan since 1868], Vol.2: Tokyo, Toyo Keizai Shinposha.

Yamazawa, Ippei & Yuzo Yamamoto (1979), *Boeki to Kokusai Shushi*
[Foreign Trade and Balance of Payments], Kazushi Ohkawa,
Miyohei Shinohara & Mataji Umemura (eds.), *Choki Keizai Tokei*
[Estimates of Long-Term Economic Statistics of Japan since 1868],
Vol.14: Tokyo, Toyo Keizai Shinposha.