

Silk-reeling Technology and Female Labour

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The technological development of silk-reeling during Japan's early industrialization followed a distinctive pattern. Unlike other modern industries introduced from the West, silk-reeling was characterized by a combination of indigenous Japanese technology developed during the Tokugawa period (1603–1867) and advanced Western technology. Technological development in the silk-reeling industry from the Meiji era (1868–1912) to the end of the Second World War can be divided into three major periods: (1) the early 1870s, when Western technology for mechanized silk-reeling was introduced; (2) from about 1875 to 1900, when mechanized silk-reeling was transformed and adapted to indigenous conditions and diffused throughout Japan; and (3) from the early 1900s to 1945, a period that saw major improvements and innovations in mechanized silk-reeling, such as the multiple-spool reeler. A fourth period can be designated, based on the introduction of the automatic reeling machine, but this occurred in the 1950s and is beyond the scope of this essay.

The process of introducing and adopting foreign technologies cannot be viewed separately from the historical and social conditions of the recipient country. This consideration also applies to silk-reeling in Meiji Japan. In this case, however, three factors in particular should be considered.

First, since silk-reeling was a traditional indigenous industry dating back to much earlier times, it is necessary to ascertain the technological level reached before the advent of Western technology. A second factor involves the type and features of the technology introduced and the way in which it was modified and adapted before its diffusion as a Japanese technology.

In this respect, it should be made clear that the introduction of Western technology did not mean the mere import of foreign models. When the government established its first silk filatures, it actively introduced Western technology, but took local conditions and the state of indigenous technology into account. Moreover, with the diffusion of mechanized silk-reeling from government filatures to private enterprises, the new technology was further modified and adapted to local conditions.

This process was particularly evident after the 1870s, when the development of the industry was due mainly to the efforts of middle-class farmers turned entrepreneurs. Lacking adequate financial resources, these silk-reelers of rural origin could not afford to tie up their scarce capital in costly investments for infrastructure and equipment. They needed to simplify and adapt Western technology to reduce the amount of capital required. This was the salient characteristic of technological development in Japanese silk-reeling.

Third, because of the delicacy and fineness of silk textiles, silk-reeling depended to a great extent—compared with cotton-spinning—on the dexterity and skill of the workers. Consequently, the level of technology was a determining factor in the quality of the labour force. Still, that relationship could be reversed, with the quality of the labour force determining the level of technology. This is confirmed in a 1913 survey: “In silk-reeling, machinery can be effectively applied only to a very small, limited extent. In large part, one has to rely on the skill of female workers. As a consequence, rather than rely on superior machinery, it is definitely better for efficient operations to rely mainly on the technical skill [of the workers].”¹ An earlier survey also notes that “It is as if the workers were a part of the silk-reeling machine.”²

Of course, this peculiar feature, together with the specific type of technology adopted and its subsequent development, had far-reaching implications for the composition of the workforce, working conditions, and the organization of labour in the industry. For this reason, this essay emphasizes working conditions and labour-management relations in Japanese silk-reeling, as well as the transfer and transformation of silk-reeling technology in Japan. Before discussing these main topics, a brief explanation of the silk-reeling process itself is in order.³

From about 1910 to the 1920s, when the silk-reeling industry was at its height, the production of raw silk from silkworm cocoons consisted of six operations: (1) storing the cocoons; (2) cocoon-sorting; (3) cocoon-boiling; (4) silk-reeling; (5) re-reeling; and (6) silk finishing.

In the first stage, cocoons were stored in large warehouses equipped with facilities for regulating temperature and humidity. Before storage, cocoons were dried in order to kill the chrysalis and to prevent it from emerging from the cocoon as a moth. Drying also protected the cocoons from mould. Sorting eliminated defective cocoons (double-shaped or loosely formed), leaving the rest for the next operation, boiling. Here cocoons were placed in basins of hot water so that the ends of the silk filament would loosen and could easily be drawn out. The basic operation of silk-reeling consisted in first searching for and picking from the water basin the ends of the silk filaments, a process known as *sakuchō* in Japanese. Four or five of these ends were then joined and passed onto a twisting device (*yorikake sōchi*) to obtain a single thread, which was finally wound onto the reel itself.

In silk-reeling, about half of the work of the female operators consisted in monitoring the reeling thread and adding new strands whenever necessary

to maintain a uniform degree of thickness. The manual addition of new filament ends to the reeling thread, an operation known as *setcho* or *tencho*, was very demanding, since the silk filaments could be easily broken, especially when the cocoon was nearly finished. Furthermore, the operation had to be executed dexterously while the machine was in motion, and the process occupied 50 per cent of the silk-reeling female labour force.⁴ Needless to say, this was the most important part of the entire production process, so efforts to improve silk-reeling technology concentrated on the invention of a suitable device, a *setchoki*, that would simplify and mechanize the addition of new silk filaments.

Once reeled, raw silk was passed from the small reel frame onto a larger frame (re-reeling). The hanks thus obtained were then twirled to prevent tangling, inspected, classified, and finally packed, ready for shipment to silk markets. Below, we examine the evolution of raw silk production, focusing on the basic silk-reeling process.

I. Introduction of Western Mechanized Silk-reeling

1. Traditional Silk-reeling Technology

Japanese raw silk exports jumped sharply after the opening of major ports to international trade in 1859. Before that date, indigenous silk-reeling technology had achieved a high level of development, but during the Tokugawa period it remained at the hand-reeling stage. Two slightly different reeling techniques were widespread at that time.

An 1803 document, *Yōsan hiroku* [The Secrets of Sericulture], described the *dōguri* reeling method, which involved use of a cylindrical frame. Silk filaments from several cocoons were passed through a ring of horsehair or woman's hair fixed near the water basin. The operator guided the thread with her left hand while turning with her right the cylindrical frame on which the thread was reeled. The second technique, *tebiki*, was a modification of the former. Here, the cylindrical *dōguri* was replaced by a wooden frame to which a handle was attached at one end. The operator turned the frame with her right hand. The drawback to this method was that the operator had to use the left hand to twist the filaments and could not add new filaments while reeling.

Based on the premise of household production and a self-sufficient economy, these techniques kept silk-reeling at a low level of efficiency. As a result, traditional technology was unable to satisfy the enormous growth of demand for silk following the opening of Japanese ports. After 1859, a new reeling device came into use, the *zaguri*, which could be operated sitting down. Using the *tebiki*, the reeler had to turn the frame directly with the hand. The *zaguri* was designed with a handle independent of the reel. The action of the handle was transmitted to the latter via a belt or a system of gears, accelerating the rotation of the frame. Regional variations included

the Ōshū *zaguri* in north-eastern Honshu, which transmitted the rotation of the handle to the reel by means of wheels and strings. In Jōshū (present-day Gumma Prefecture), a gear wheel was used.

Zaguri reels were equipped with a swinging device that led the reeling thread from left to right and back again, allowing it to be wound evenly on the reel. This device freed one of the operator's hands from the task of changing the course of the silk thread, further improving the efficiency of the machine. The invention spread rapidly after 1859. The Jōshū *zaguri*, for example, was introduced to the neighbouring Shinshū region (present-day Nagano Prefecture) between 1860 and 1863 and quickly became ubiquitous there.⁵

But the *zaguri*, too, had its drawbacks. The operator still had to turn the reel by hand while adding new threads. The *zaguri* remained inefficient and tended to produce thread that was of uneven thickness and had many joints and knots. Its use resulted in the poor reputation of Japanese raw silk in foreign markets of the time. It was in order to overcome these shortcomings that the Meiji government introduced Western silk-reeling technology.

2. Western Silk-reeling Technology

Japan's modern silk-reeling technology came from two different sources. French technology was introduced via the Tomioka Silk Filature. A silk-reeling mill operated by a domain-run factory in Maebashi (Gumma Prefecture) and the Tsukiji Silk Filature (in Tokyo) owned by the Ono Group, a merchant house with strong government connections, imported Italian technology (table 1.1).

Of these model factories, the Tomioka Silk Filature, a fully mechanized steam-powered filature set up and operated by the Japanese government, played an important role in introducing modern technology. Shibusawa Eiichi (1840–1931), an entrepreneur and business leader during the Meiji and Taishō periods, commented on the objectives of the Tomioka plant as follows:

At that time, the raw silk we exported was not of the same quality as the fine raw silk produced in Italy. It was all made using *zaguri* reels, none from European machines. We produced only raw silk of irregular denier [a unit for measuring the thickness of silk thread], and its utilization on the customers' markets was limited to the weft. Under these conditions, it was impossible to expand the market and make silk an important export item. We all believed we had to shift to mechanized reeling, as in France and Italy, in order to produce high-quality raw silk for the warp . . . and the first step turned out to be the establishment of the Tomioka Silk Filature.⁶

For the planning and building of the Tomioka Mill, the Meiji government employed Paul Brunat, a French technician, in June 1870. The construction

Table 1.1. Traditional and Mechanized Silk-reeling Technology (Tomioka Silk Filature)

| | Tomioka S.F. (French-type) | <i>Zaguri seishi</i> (Japanese-type) |
|---|---|--|
| Machine | Made of metal | Wooden |
| Rotation of the wheel | Steam engine | Manual |
| Re-reeling | Required | Required |
| Reeling basins and cocoen-boiling basins | Separated | Combined |
| Cocoen-boiling | Steam | Direct heat |
| Operator | Performed both operations of cocoen-boiling and silk-reeling proper | Performed all opera- tions including reel rotation |

Source: Okumura Shōji, *Koban, kiito, watetsu* [Gold Coins, Raw Silk, Japanese Iron] (Iwanami Shoten, Tokyo, 1973), p. 107.

of this modern silk filature was completed about two years later at a total cost of 198,572 yen. The Tomioka plant was a large-scale, Western-style complex built of red brick. It comprised a total of 17 buildings, including cocoon warehouses, a boiler room, building for cocoon-drying, silk-reeling, and re-reeling, dormitories for the workers, and an official residence for the French employees. The facility was equipped with 300 reeling basins, making it a significantly larger factory than the Maebashi Silk Filature (12 reeling basins) or the Tsukiji Silk Filature (60 reeling basins). According to a newspaper report of that time: "If we should mention the three largest enterprises in our country today, these would be the Osaka Mint, the Yokosuka Shipyard, and the Tomioka Silk Filature. These are enterprises rarely found in any European country and even Westerners often praise them."⁷

In what way, then, did the technology of the Tomioka Silk Filature differ from traditional Japanese *zaguri* technology? As shown in table 1.1, the basic difference between traditional and Western (Tsukiji and Tomioka Silk Filature) silk-reeling technology concerned:

1. The method of rotating the reeling frame. This was completely mechanized through the substitution of manual operations by a steam-powered mechanism. It was thus possible for the operator to use both hands for the silk-reeling process itself, a radical change from the traditional reeling method.
2. The method of heating water for cocoon-boiling. Here steam produced by a central boiler was used for heating the water in all the basins instead of the traditional method of heating by means of small fire placed directly under each basin.
3. Separation of the water basin for cocoon-boiling from the basin for silk-reeling itself.

4. The application of a device for twisting the silk thread. In this way, various silk filaments were intertwined, while, through friction, water was squeezed out and the remaining sericin acted as a binding agent combining all filaments in a single thread.⁸

There were other innovations involving operations other than the silk-reeling itself, for example, in the method employed for killing the chrysalis and drying the cocoons.

During the Edo period, fresh cocoons were exposed to the sun, whose warmth killed the chrysalis. This was the so-called sun-drying method, but Brunat did not use it and adopted instead the method of killing the chrysalis by steam. The sun-drying method lowered the quality of the cocoons. Moreover, if there was insufficient sunlight the chrysalis was sometimes not killed and the moth or maggot could develop in the cocoon. [However], with the new method using steam the cocoons placed in a container were exposed for a short time to a hot steam current and were then immediately dried. After the establishment of the Tomioka Silk Filature, silk-reelers everywhere in Japan changed at once to the new method.⁹

As shown above, the silk-reeling technology of the model factories of Tsukiji and Tomioka marked the passage from the tool stage to the machine stage, although, as already pointed out, silk-reeling machines were still imperfect devices, since the crucial operation of adding new threads (*setcho*) had still to be performed manually by the operator. For this reason, it is more correct to say that the Western type of silk-reeling machine represented an intermediate stage of development between production tool and machine. It is also important to note that French silk-reeling technology was not introduced passively, but the equipment and the production process adjusted and modified to suit the specific conditions in Japan, the quality of its cocoons, and the level of existing traditional technology.¹⁰ For example, in Europe, silk thread was reeled directly on a large frame, but in Tomioka the process was separated into two stages. First, silk was reeled on a small frame and only later re-reeled onto a larger one.

While the large factories introduced up-to-date machines and other equipment relatively smoothly, the recruitment of female workers posed the greatest difficulty for the management of the Tomioka Silk Filature. Since only five or six years had elapsed from the fall of the Tokugawa regime, prejudices and feudal customs still survived among the people. A feeling of distrust of and opposition to the adoption of modern (Western) civilization and "enlightened ideas" was widespread. The Meiji government first announced the recruitment of female workers in the Iruma area near Tokyo, as well as in Gumma, Tochigi, Saitama, and Nagano, but the number of applicants turned out to be a mere 50 or 60. Resistance and rumour spread: "It is unthinkable that we should be taught by Westerners!" "The smoke of the coal is poisonous." "They [the Westerners] extract blood and

drink it every day [referring to red wine].” It was thus not surprising that the number of persons willing to apply was very small. Thereafter, in May 1872, the government distributed throughout the country a pamphlet on silk-reeling, *Seishi kokuyusho* [Official Proclamation on the Silk-reeling Industry] and in September of the same year issued in ten northern prefectures (Mizusawa, Iwate, Miyagi, Akita, Iwaki, Yamagata, Wakamatsu, Fukushima, Oitama, and Sakata) “Regulations concerning the Employment of Female Trainees in Silk-reeling at the Tomioka Silk Filature” (*Tomioka seishi kōjō kuriito denshūkōjō yatoire kokoroe*). Notwithstanding these efforts to quell the rumours, the number of applicants did not increase. In these circumstances, the government had no choice but to resort to the employment of daughters of the old class of samurai, but even so it could not recruit more than 100 workers, a fourth of the workforce actually needed. At this point, the first factory director, Odaka Atsutada, convinced all the officials involved with the project to send their daughters to the factory. This pump-priming policy proved effective, and the number of applicants began to increase, finally reaching 404 in February 1873. This process is vividly described in *Tomioka nikki* [Tomioka Diary] by Wada Hide, the daughter of a samurai from Nagano Prefecture who was among the first employees at the Tomioka Silk Filature. According to the register of the dormitory of Tomioka Silk Filature, female workers were recruited from all over the country. The majority, 278, were from Gumma Prefecture, where the factory was located, but others came from Iruma (98), Nagano (11), Tochigi (5), Tokyo (1), Nara (2), Mizawa (8), Oitama (14), Miyagi (15), Shizuoka (6), Hamamatsu (12), Sakata (3), and Ishikawa (1). Almost all were young, unmarried girls of about 18 years old, who later made an important contribution to the diffusion of mechanized silk-reeling technology in other parts of the country.

The case of the Tomioka Silk Filature is interesting, as it shows how a new technology introduced into a different social environment can produce all kinds of cultural frictions. On the other hand, the success of the enterprise produced the stimulus for the diffusion of technical and organizational knowledge concerning mechanized silk-reeling. It also contributed to the formation of the first group of skilled workers.

3. Transformation and Adaptation of Western Silk-reeling Technology

The influence of the Tomioka and Tsukiji silk filatures soon spread throughout the country. From the end of the 1870s, filatures operating with steam were set up in rapid succession, especially in Nagano, Gifu, and Yamanashi prefectures in central Japan. The industry flourished particularly in Nagano (then known as Shinano), where in 1879 there were already 358 steam filatures employing more than ten workers, that is, 54 per cent of the total of 655 filatures nationwide (see table 1.2).

According to the second volume of *Shinano sanshigyo-shi* [History of

Table 1.2. Diffusion of Western Silk-reeling Technology in the Early Meiji Period (factories with 30 or more reeling basins)

| Year established | Prefecture | Founder | No. of basins | Power source |
|---|------------|--|---------------|--------------|
| A. French type (Tomioka Silk Filature model) | | | | |
| 1874 | Nagano | Ôsato C. (Rokkusha) | 50 | Hydraulic |
| 1874 | Nagano | Takahashi H. (Seishisha) | 32 | Hydraulic |
| 1874 | Ishikawa | Prefectural Silk Filature of Kanazawa | 100 | Hydraulic |
| 1874 | Tōyama | Hirano I. et al. | 64 | Hydraulic |
| 1877 | Hyōgo | Prefectural Model Silk Filature (Kakusansha) | 76 | Hydraulic |
| B. Italian type (Maebashi Silk Filature model) | | | | |
| 1872 | Gumma | Hoshino C. (Mizunuma Silk Filature) | 32 | — |
| 1875 | Gumma | Fukazawa O. and Kuwashima S. (Sekine Silk Filature) | 48 | — |
| 1876 | Saitama | Shimizu M. (Yōgyōsha) | 80 | Hydraulic |
| C. Italian type (Tsukiji Silk Filature model) | | | | |
| 1872 | Nagano | Dobashi H. (Miyamada Silk Filature) | 36 | Hydraulic |
| 1873 | Nagano | Hirazawa C. et al. | 54 | Hydraulic |
| 1873 | Nagano | Kamiya N. | 72 | — |
| 1873 | Nagano | Yamagishi S. (Shin- yōsha) | 200 | — |
| 1873 | Fukushima | Anzai U. (Nihonmatsu Silk Filature) | 48 | Hydraulic |
| 1873 | Fukushima | Kawamata Silk Filature | 48 | Hydraulic |
| 1875 | Nagano | Shiozawa S. (Taiyōsha) | 32 | Hydraulic |
| D. Mixed type: French and Italian technology | | | | |
| 1873 | Nagano | Seki K. | 96 | Hydraulic |
| 1873 | Yamanashi | Prefectural Silk Filature | 30 | — |
| 1873 | Niigata | (Gosen Silk Filature) | 60 | — |
| 1874 | Nagano | Hasegawa H. | 30 | Hydraulic |
| 1875 | Nagano | Susaka Y. | 80 | Hydraulic |
| 1876 | Nagano | Okuzawa K. | 60 | — |
| 1876 | Nagano | Kitahara S. | 40 | Hydraulic |
| 1876 | Yamanashi | Kazama I. (Seishinsha) | 60 | — |
| 1877 | Nagano | Katakura K. | 32 | Hydraulic |

Source: Katō Sōichi, *Nihon seishi gijutsu-shi* [History of Silk-reeling Technology in Japan] (Seishi Gijutsushi Kenkyūkai, 1976), pp. 105–109.

Sericulture in Shinano], Italian silk-reeling technology from the Tsukiji Silk Filature was introduced at first in the Miyamada Silk Filature located in Suwa district, in the southern part of Nagano Prefecture. On the other hand, French technology from the Tomioka Silk Filature was introduced at Rökkusha, a company set up in Matsushiro, in the northern part of the prefecture. Further, at Nakayamasha, a silk filature established in 1875 in the town of Hirano (present-day Okaya) in Suwa, French and Italian technology were combined in the so-called "Suwa method" or "Shinshū method."

As for Rökkusha, it started operations on 22 July 1874, with 50 reeling basins. Among its employees were Wada Hide and 15 other female workers who had learned the new skill required for mechanized silk-reeling at the Tomioka Silk Filature. To them the company entrusted the task of instructing and training the other workers. Although the company had taken the Tomioka Silk Filature as its model, it suffered as a private enterprise from a shortage of capital, and for this reason its founders attempted to simplify and reduce the cost of the factory's facilities and equipment. When Wada Hide visited the factory in July 1874 upon returning from Tomioka, she recorded in her diary the following impressions:

I saw the machinery and the rest. As I was already prepared, I did not feel particularly surprised. On the contrary, I thought that they had managed to do it fairly well. However, as regards the difference with Tomioka, it was like comparing heaven and earth. Copper, iron, and brass had become wood. Glass had changed into wire, bricks into clay. It was like seeing a dream within a dream. Well, that day I left thinking that, after all, their having managed to start using steam to get the silk was praiseworthy, at least.¹¹

This simplification of Western technology described by Wada was carried even further in the case of Nakayamasha, a company set up by nine small silk-reelers led by Takei Daijirō and equipped with 100 reeling basins. As already mentioned, the Nakayamasha blended the French and Italian technology of the Fukayamada and the Rökkusha, thus developing the prototype of the "Suwa method," for mechanized silk-reeling. Since this method was widespread in Japan, six features that distinguished Nakayamasha from the Tomioka Silk Filature are listed below.¹²

1. As in the case of Rökkusha, wooden structures were substituted for all the Western-style brick edifices.
2. The power source for rotating the reels had been changed from steam to water, although later, in other silk filatures, even human power was employed. Elsewhere, the history of power sources in silk-reeling followed the general pattern of development: from human to water, steam, and finally electric power. Actually, throughout the Meiji period human power, in the direct form of manual operation of reels and more indirectly by means of treadles, continued to be relied upon in silk-reeling, together with water and steam power. On the other hand, in the Nakayamasha and other steam filatures adopting the "Suwa method,"

- steam boilers continued to be used to produce the energy for heating the water in reeling basins.
3. The material for the reeling machines was changed from metal to wood.
 4. The material and the shape of the reeling basins was changed, the former from metal to ceramic, and the latter from a circular to a semi-circular shape. The new semi-circular reeling basins were not only less costly to produce, they were even superior to the cooper-made ones since they did not damage the brilliance of the silk.¹³
 5. Twisting devices made of copper and zinc were changed to wood and a new "Inazuma" type of device created by combining the French and Italian models. With the Inazuma the thread was frail and not well twisted, but the device was easy to handle and efficient in terms of productivity, so its adoption quickly spread through the Suwa district and throughout Nagano Prefecture. The Inazuma twisting device also featured a mechanism to prevent friction caused by back-up of the thread, helping to decrease the number of thread breaks and thereby enhancing labour productivity. Its drawback was that the threads did not hold together well, lowering the quality of the thread. The new "Azuma-type" twisting device invented in 1896 succeeded in eliminating these faults in the Inazuma, and its fundamental principle continued to be used even after the application of the multiple-spool reeling machine.
 6. Modifications had also been introduced in the method for picking out the ends of the silk filament (*sakucho*) and for adding new ends to the reeling thread (*setcho*). In the former operation, a small brush made of *migo* (the core of the ears of the rice plant) came to be widely used. In the case of *setcho*, the practice adopted was to "throw" new ends to the reeling thread in order to join them. This practice, known as *nagetsuke* in Japanese, was particularly suitable for large-scale, low-quality production. It became widespread in Nagano Prefecture, where it continued to be used until the end of the nineteenth century.

As we have seen, the technical changes introduced at the Nakayamasha, and then diffused as the "Suwa method" of silk-reeling, represent a typical example of the adaptation to Japanese conditions of a technology originally introduced from the West. What is important to note is that this process meant simplification of Western technology, although it implied some improvements as well. It was determined by the need to save scarce capital resources and to reduce production costs, and it did result in higher relative output, although this was accompanied by a definite lowering of standards in the quality of the raw silk produced.

The new indigenous type of silk-reeling technology became widespread. With the exception of a minority of silk-reelers producing high-quality silk for the warp, it formed the backbone of Japanese silk-reeling technology as late as the end of the 1890s. Meanwhile, the production of machine-reeled raw silk continued to grow and in 1894 it surpassed in quantitative terms the production of raw silk reeled by the traditional *zaguri* method. This clearly shows that mechanized silk-reeling was by that time well established in

Japan. It was on the basis of this acquired strength that, from the turn of the century, Japanese silk-reelers began to improve the technology they had inherited from the second half of the 1870s.

However, before analysing this new phase of technical change in silk-reeling, it might be useful to examine more closely how Japanese silk-reelers faced the problems accompanying technological progress.

4. Silk-reelers' Attitudes toward Technological Progress

By the turn of the century, the Japanese silk-reeling industry had acquired a productive capacity competitive with that of Italy, Japan's major competitor in the American market. However, the type and the structure of reeling machines had not basically changed, nor could any substantial technical progress be noticed. For example, in 1905, silk-reeling machines completely built of iron, common in advanced countries, represented a mere 4.1 per cent of the machinery in Japan. Of these machines, 68.5 per cent were still made entirely of wood.¹⁴ Of course, this was linked to the backwardness of both the iron-and-steel and the machine industries in Japan, but it was also related to the passivity of silk-reelers toward technical progress.

As late as 1931, for example, Harada Shinichi, the inventor of the automatic reeling machine, lamented: "I would like to try the automatic silk-reeling machine I invented, but the silk-reeling industry is more than 50 years behind. Silk-reelers, too, have in mind only immediate interest rates and prices. Moreover, circumstances are such that capital is badly needed and there is no way to introduce more advanced machinery."¹⁵ This attitude toward technological progress was a constant feature of the Meiji period, as shown by the following examples.

In the early years of Meiji, the Japanese government had sent technical trainees abroad to have them learn French and Italian sericulture and silk-reeling technology. Tanaka Bunsuke and Sasaki Nagaatsu were two leading individuals within this group of technical trainees. In his later years, Tanaka recalled that:

In 1886 I went to France, where I obtained a set of devices for adding new silk threads in four-spool reeling machines. After bringing it back to Japan, I experimented with the new device, but . . . without satisfactory results. After all sorts of considerations, I invented and applied to the original device a thread-cutter and a comber for eliminating knots and joints. In 1889 I obtained a patent and then tried to spread its use in the industry. [However], at that time silk-reelers were mostly satisfied with two-spool reeling machines and they did not like three- or four-spool reeling machines. Thus they were extremely cool toward the new device. . . .¹⁶

Why, then, were silk-reelers so unenthusiastic about the new device? On this point Onda Sadao and Tōno Denjirō observe in *Seishi shinron* [New

Study of Silk-reeling]: "At present the tendency among Japanese silk-reelers is to view the use of the *setchoki* (device for adding new filament ends while the machine is in motion) as they would a destitute person wearing rags who displays a gold watch hung round his neck. It is not an exaggeration to say that today, even if we should use the *setchoki*, its benefits would be practically nil."¹⁷

The reason lay in the fact that the *setchoki* was either a delicately built device easily subject to breakdown, or, if sturdily built, a device whose use required even more time than manual operation. Besides, the application of the costly *setchoki* was also considered a loss, since Japan could take advantage of cheap female labour highly skilled in manual operation. The authors of *Seishi shinron* had a thorough knowledge of actual conditions in the private silk filatures. They were well aware that there was a gap, which could not be easily filled, between the technology directly transferred from abroad and the technology of private enterprises. No matter how extraordinary the new inventions, their application and diffusion was very difficult, unless the conditions for reception were already present in the private sector. As mentioned before, these conditions developed in Japan by around the turn of the century, at first in the larger enterprises but gradually throughout the industry.

5. Improvement and Innovation in Mechanized Silk-reeling

With the turn of the century, the silk-reeling industry in Japan, which had maintained a conservative attitude toward technological progress, began to introduce improvements and innovations in technology. According to the research of Ishii Kanji, until the end of the 1890s the majority of Japanese silk filatures were equipped with simplified versions of the two-spool reeling machine. In contrast, in Italy and France technological progress in silk reeling had advanced conspicuously. Four- to six-spool reeling machines were already widely used, while in the 1910s six to eight spools were standard.¹⁸

Labour productivity in Japanese silk-reeling was also low. It is estimated that the annual production per capita of female Japanese workers was roughly half the production of Italian and French workers.

However, after the beginning of the twentieth century, three-spool reeling machines became widespread in the Suwa district in Nagano Prefecture. Then, at the end of the first decade of the twentieth century, the Katakura Group (Japan's largest silk-reeling company) and other major silk-reelers took the lead in the introduction of four-spool reeling machines, which rapidly spread in use. By 1911 four-spool reeling machines represented more than half the machinery installed in Japan.

From the turn of the century, the number of small silk filatures equipped with fewer than 50 reeling basins began to decline as well. Conversely, larger enterprises with 100 or more reeling basins became more numerous. In particular, during this period some very large enterprises emerged, equipped with 500 or more reeling basins.

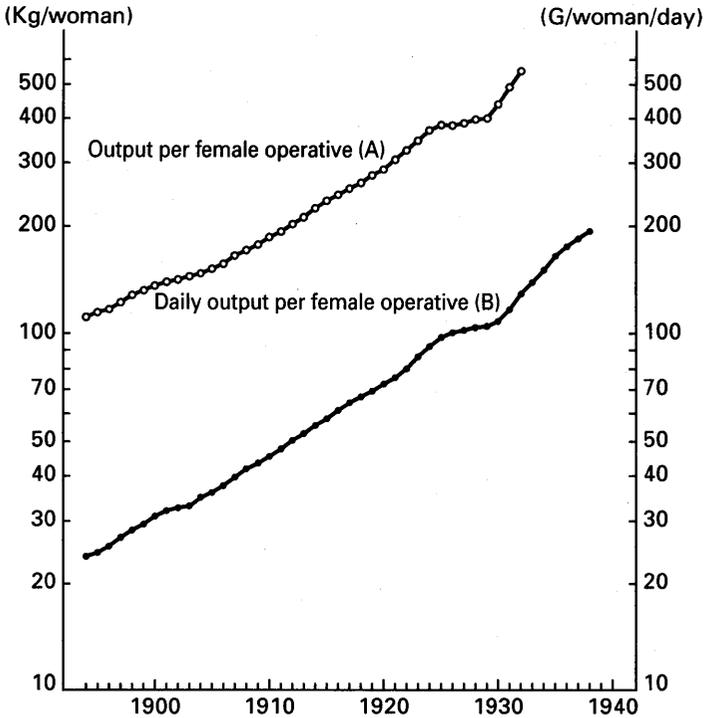


Fig. 1.1. Labour Productivity in Silk-reeling (five-year moving average)

Note: Silk filatures with ten or more reeling basins. Figures are on a silk-year basis: June to May.

Source: Fujino Shōzaburō et al., *Sen'i kōgyō* [The Textile Industry], vol. 11, in Ōkawa Kazushi et al., ed., *Chōki keizai tōkei* [Estimates of Long-term Economic Statistics of Japan since 1868] (Tōyō Keizai Shimpōsha, Tokyo, 1979), p. 169.

As a result of these developments, annual and daily worker per capita production of raw silk increased steadily, as shown in figure 1.1. Moreover, the quality of Japanese raw silk was also improved, so that by 1910 Japan had become the major exporter of raw silk on world markets, surpassing Italy, China, and France. (Seventy per cent of Japanese exports went to the American market.)

Technical progress also continued during the Taishō period, when it affected sericulture as well as reeling. Later on, a major innovation was made with the application of the multiple-spool reeling machine. The introduction of this machine permitted a conspicuous increase in labour productivity and an improvement in the quality of the silk, since it enabled further mechanization of the production process and significantly reduced the artisan character of silk-reeling.

The multiple-spool machine had been conceived and tested by Minorikawa Naosaburō, a Japanese inventor, as early as 1903, but it did not find practical application until much later. In 1919 a new type of *setchoki* (the V-shaped revolving *setchoki*) was invented, which made the multiple-spools reeling machine even more efficient.²⁰ The device was first introduced by the Katakura Group and other large silk filatures only in the 1920s. It came into general use in the subsequent decade, when Japanese silk-reeling, suffering from the depression of the American market and the diffusion of artificial silk, had already begun to decline. Thus, from the second half of the 1870s until the 1920s, Japanese silk-reeling production continued to be basically dependent on the skill and performance of female workers. As we shall see in the next section, in order to be competitive on international markets, Japanese silk-reeling concerns continued to rely for their capital accumulation on low wages, harsh working conditions, and a pre-modern type of industrial relations.

II. Female Labour in Silk-reeling

1. Composition of the Workforce

This section examines the composition of the workforce in Japanese silk-reeling, particularly in the silk filatures around Suwa (Nagano Prefecture), where the industry was concentrated during the Meiji and Taishō periods. In general, the number of workers in silk-reeling grew considerably from the middle of the 1880s, the years of the onset of the Japanese industrial revolution. As shown in table 1.3, in 1879 female workers in Japanese silk filatures employing ten or more workers numbered fewer than 18,000, but their numbers rose to almost 125,000 by 1896. Then, after a brief stagnation toward the end of the century, the number of female workers grew constantly, reaching a peak of more than 375,000 in 1929.

Following the distribution patterns of the industry, workers were particularly numerous in Nagano (about one-third of the total) and specifically in the Suwa district, around the lake of the same name (table 1.4). A large number of silk-reeling workers could also be found in Gifu and Yamanashi prefectures in central Honshu. Toward the end of the Meiji period, there was a conspicuous increase also in Aichi Prefecture (Tokai area) and in the northern part of the Kanto Plain (Gumma and Saitama prefectures), partly as a result of the establishment of new silk filatures by reelers from Suwa.

As already pointed out, female workers comprised the great majority of workers in the sector. For example, in 1911 there were only 1,884 male workers employed in the silk filatures of Suwa as compared to 23,445 females.²¹ In general, male workers in silk filatures were assigned only to supervisory tasks, or to such jobs as cocoon drying and storage, packing, and transport of finished products. The main operations of cocoon-reeling and re-reeling were invariably performed by female workers.

Table 1.3. Female Workers in Silk Filatures with Ten or More Employees, 1879-1934

| Year | Silk filatures (A) | Number of female workers (B) | $\frac{B}{A}$ |
|------|-----------------------|------------------------------------|---------------|
| 1879 | 666 | 17,084 | 25.7 |
| 1896 | 2,283 | 124,441 | 54.5 |
| 1900 | 2,072 | 117,861 | 56.9 |
| 1905 | 2,320 | 126,077 | 54.3 |
| 1908 | 2,385 | 159,460 | 66.9 |
| 1911 | 2,491 | 191,855 | 77.0 |
| 1915 | 2,260 | 206,650 | 91.4 |
| 1918 | 2,680 | 284,549 | 106.2 |
| 1921 | 2,693 | 293,815 | 109.1 |
| 1926 | 2,789 | 312,792 | 112.2 |
| 1929 | 3,352 | 375,330 | 112.0 |
| 1934 | 2,709 | 261,344 | 96.5 |

Source: For 1879, Ishii Kanji, *Nihon sanshigyō-shi bunseki* [Analysis of the History of the Japanese Silk Industry] (Tokyo Daigaku Shuppankai, Tokyo, 1972), p. 129; 1896-1921, calculated from Nōshōmushō Nōmukyoku [Ministry of Agriculture and Commerce, Agricultural Affairs Bureau], *Zenkoku seishi kōjō chōsahyō* [Survey of Silk-reeling Factories throughout Japan], nos. 3 and 9 (1902 and 1923); 1926-1934, Nōrinshō Sanshi Kyoku [Ministry of Agriculture and Forestry, Sericulture Bureau], *Sanshigyō yōran* [A Survey of the Silk Forestry] (1935), p. 88.

Table 1.4. Distribution of Female Workers in Silk-reeling

| Area | 1900 | 1911 | 1912 |
|-----------------|---------|---------|---------|
| Nagano Pref. | 32,813 | 56,289 | 85,186 |
| Suwa district | 11,180 | 23,445 | 36,667 |
| Gifu Pref. | 9,886 | 13,187 | 12,321 |
| Yamanashi Pref. | 7,271 | 14,099 | 12,054 |
| Aichi Pref. | 6,062 | 18,286 | 19,903 |
| Shizuoka | 5,835 | 6,260 | 5,921 |
| Yamagata | 3,400 | 5,831 | 8,289 |
| Gumma Pref. | 3,019 | 6,588 | 25,110 |
| Saitama Pref. | 1,386 | 10,344 | 18,111 |
| Fukushima Pref. | 1,637 | 4,141 | 10,492 |
| Other | 44,102 | 56,830 | 96,428 |
| Total | 117,861 | 191,855 | 293,815 |

Source: Calculated from Nōshōmushō Nōmukyoku [Ministry of Agriculture and Commerce, Agricultural Affairs Bureau], *Zenkoku seishi kōjō chōsahyō* [Survey of Silk-reeling Factories throughout Japan], nos. 3, 6, and 9 (1902, 1913, and 1923).

Table 1.5. Age of Female Workers in Silk-reeling, Suwa District, May 1923

| Age (years) | Number of workers | Percentage |
|--------------|-------------------|------------|
| <13 | 150 | 0.4 |
| 13-14 | 5,811 | 14.9 |
| 15-17 | 12,682 | 32.5 |
| 18-20 | 9,595 | 24.6 |
| 21-25 | 7,812 | 20.0 |
| 26-30 | 1,760 | 4.5 |
| 31-40 | 955 | 2.4 |
| 41-50 | 266 | 0.7 |
| More than 50 | 11 | — |
| Total | 39,042 | 100.0 |

Source: Calculated from *Nagano kenshi, Kindai shiryōhen, sanshigyō* [History of Nagano Prefecture, Documents on the Modern Period, Silk Industry], vol. 5. (3) (1980), p. 898.

The average age of female workers was extremely low. According to a survey of 205 silk filatures in Nagano Prefecture in 1901, 66 per cent of the workers were under 20 years old. Of these, 2,285 (18 per cent) were under 14, and 150 were little children of less than 10 years old.²²

In 1916, the enforcement of the Factory Act (*Kōjōhō*) restricted to a certain extent the exploitation of child labour in silk-reeling, but its effects were rather limited. In principle, the Factory Law prohibited the employment of workers less than 12 years old, but this clause applied only to factories with 15 or more workers or to factories whose environment could be detrimental to the health of child workers. Besides, administrative officials could always authorize the employment of children of 10 or older, "provided that they were assigned to simple, light tasks."²³

As shown in table 1.5, as late as 1923 the majority of the workforce in Suwa's silk filatures still consisted of very young female workers of less than 20 years old. In general, most of the girls left the factory when reaching the age then considered suitable for marriage.

As for the origin of the Suwa workers, in the early stages of the industrialization process female workers were mostly recruited locally, in the villages of the Suwa district or in the neighbouring districts of Ina and Higashi-Chikuma.

In the first place, the low percentage of female workers coming from the Suwa district in subsequent years should be noted. This percentage in 1903 was already a mere 12.6 per cent, and it decreased further to 8.4 per cent in 1918. The percentage of workers from the neighbouring districts of Kamiina, Higashi-Chikuma, and Gifu Prefecture decreases as well,²⁵ while, on the contrary, the number of workers from faraway districts or prefectures

Table 1.6. Origin of Female Workers in Okaya Silk Filatures^a

| Area | 1903 | | 1918 | |
|--------------------------|-------------------|-------|-------------------|-------|
| | Number of workers | % | Number of workers | % |
| <i>Nagano Prefecture</i> | | | | |
| Suwa district | 521 | 12.6 | 2,063 | 8.4 |
| Kami-Ina | 792 | 19.2 | 2,113 | 8.6 |
| Shimo-Ina | 98 | 2.4 | 184 | 0.8 |
| Nishi-Chikuma | 4 | 0.1 | 473 | 1.9 |
| Higashi-Chikuma | 690 | 16.7 | 2,795 | 11.4 |
| Minami-Azumino | 161 | 3.9 | 1,027 | 4.2 |
| Kita-Azumino | 145 | 3.5 | 703 | 2.8 |
| Minami-Saku | 5 | 0.1 | 341 | 1.4 |
| Kita-Saku | 49 | 1.2 | 423 | 1.7 |
| Chiisagata | 117 | 2.8 | 824 | 3.4 |
| Other | 36 | 0.9 | 504 | 2.1 |
| Hanishina | 44 | 1.1 | 920 | 3.8 |
| Sarashina | 27 | 1.1 | 759 | 3.8 |
| Kamiminochi | — | — | 786 | 3.1 |
| Kamitakai | — | — | 674 | 2.7 |
| Total | 2,689 | 65.2 | 14,589 | 59.5 |
| <i>Other prefectures</i> | | | | |
| Yamanashi | 670 | 16.3 | 4,541 | 18.5 |
| Niigata | — | — | 2,434 | 9.9 |
| Toyama | 195 | 4.7 | 1,391 | 5.7 |
| Gifu | 592 | 13.6 | 1,233 | 5.0 |
| Other | 9 | 0.2 | 338 | 1.4 |
| Total | 1,436 | 34.8 | 9,937 | 40.5 |
| Grand total | 4,125 | 100.0 | 24,526 | 100.0 |

a. The town of Okaya (then known as Hirano) was the most important centre of silk-reeling in the Suwa district.

Source: Calculated from Hirano-mura Yakuba [Hirano Village Hall], *Hirano sonshi* [History of the Village of Hirano], vol. 2 (1932), p. 406

shows a remarkable increase. In particular, an increasing number of workers was recruited from the prefectures of Yamanashi and Niigata, accounting in 1918 for 28.4 per cent to the total of female employees in the Okaya filatures.

The regions supplying female workers to the silk-reeling industry were agricultural areas with almost no industry (table 1.6). As pointed out by Ishii Kanji, these regions were characterized by the existence of a high per-

centage of tenant farmers—higher than in the rest of Japan—or, as in the case of the northern part of Gifu Prefecture, by an extremely low level of agricultural productivity.²⁶ Moreover, as shown by the research of Ishii Kanji and Nakamura Masanori, the vast majority of female workers came from farmers' families belonging either to the group of tenant farmers or to the group of small proprietors owning a tiny patch of arable land.²⁷

For tenant farmers, the small income brought home by their daughters working in silk filatures in distant regions was badly needed to make a living possible and to pay the exorbitant, oppressive tenant fees, which could amount to 50 or 60 per cent of the yearly crop.²⁸ On the other hand, it was probably because they were so inured to oppression at the hands of local landlords that these workers from rural areas found even the extremely harsh working conditions of the silk filatures bearable. In this sense we can say that the landlord system which dominated Japan's pre-war rural society was closely linked to the development of silk-reeling.

From the above analysis we may conclude that, during the second half of the Meiji period and in the Taishō period, the composition of the workforce in silk-reeling demonstrated the following characteristics:

1. The overwhelming majority were young and female workers.
2. The period of employment was limited to a few years before marriage.
3. Workers came from rural districts—in particular from families of tenant farmers or small owner-farmers—often located in remote areas far from the centre of industry.

To sum up, silk-reeling workers continued to be closely linked with the traditional rural society in which they were born and to which they usually returned after leaving the factory. In this respect, they clearly belonged to the *dekasegi* type, that is, workers closely tied to their native villages but whose temporary occupation was in the industrial sector.²⁹ This peculiarity of the workforce in silk-reeling was further reinforced by the seasonal character of the industry: operations were usually suspended during the winter, forcing all workers to return to their villages. As a whole, then, it was a docile workforce which could be easily controlled and regimented, although episodes of passive and even active resistance against harsh working conditions did occur, especially during the 1920s.

2. Labour–Employer Relations

We shall turn now to the analysis of the employment practices in silk-reeling, and in particular to the recruitment system and the employment contract. It should be noted first that the contract of employment lasted for only one season, and the hiring of workers for the silk filatures of Suwa was repeated every year during the winter months, when operations were suspended. The hiring was done by recruiters (usually the male supervisors in the silk filatures), who were sent to the remote rural areas supplying the workers. Recruiters relied on the service of local middlemen who provided introductions to families of potential workers. This is the way the vast

majority of workers were recruited, since at that time a horizontal, free labour market had not yet developed. For workers in silk-reeling it was actually rather difficult to move from one factory to another owing to the existence of a rigid, binding employment relationship. Worker mobility was made even more difficult by the practice of accommodating workers in factory dormitories and, from the beginning of this century, by the introduction of a system for the registration of workers.³⁰ Nevertheless, as we shall see later, worker mobility could not be completely controlled, especially in times of sharp increases in labour demand. In these periods, silk-reelers could even resort to illegal, violent means in order to ensure a sufficient number of workers. According to *Shokkō jijō* (a government report on the conditions of factory workers published in 1903), "at the time of growing demand for raw silk . . . [silk-reelers] in Suwa used thugs to kidnap girls employed by other factories during their outings. . . ." ³¹

As for employment contracts, we quote below an example of a typical contract used by the silk-reelers of Suwa. This contract was signed in 1895 between the head of the family of a female worker from the district of Higashi-Chikuma (Nagano Prefecture) and the silk filature of Miyazaka Kauemon, in Hirano (present-day Okaya:)

Agreement concerning Female Workers
in Silk-reeling

Amount: 3 yen

Worker
(Address)
(Name)

I declare hereby that I have duly received the sum of 3 yen on the understanding that the above-mentioned person will be employed in silk-reeling as a worker in your "house" in the _____ year of Meiji until December of the same year. It is understood that she will work without fail during the period, and she will strictly respect the established customs of your "house." In case, by unavoidable circumstances, she might not be able to work, in order to avoid any inconvenience, a substitute shall be immediately found and sent to you. It is understood that during the time of the agreement she will not work at other places.

In case of transgression of the above agreement a sum equal to _____ times the amount received will be paid as damages.

28 January 1895
(Name of family head)
(Name of worker)

(Address and name of
the company)

Several features of this "agreement" are notable. In the first place, it should be noted that the contract did not take the form of a bilateral contract of employment, but was drafted in the form of a unilateral promise on the part of the worker. No mention is made of conditions of employment such as wages, working hours, and so on. The unilateral promise was based simply on the receipt of a sum of money advanced by the employer, who thus obtained the right to employ the worker for the period of about one year.

A second point of importance is that the duties of the worker were only vaguely defined; they were not limited to the execution of reeling work, but even included respect for the established "customs" of the house. Third, the worker was not allowed to leave the factory during the time of the contract. A substitute had to be found in case unavoidable circumstances prevented her from working. Fourth, in case of transgression of one of the clauses of the contract, compensation had to be paid—compensation which could amount to 20 times the amount of the money advanced by the employer. Finally, it should be noted that the contract was stipulated and signed by the head of the family. This was partly due to the young age of the workers, but more generally it reflected the fact that in Meiji Japan the family had absolute authority over the members of the household and particularly over female members, who were treated virtually as incompetents.

In sum, female workers in silk-reeling were not hired as free wage-earners; their condition closely resembled the state of bonded feudal serfs, whose obligation in this case originated in the sum of money advanced by the employer.

Later, with the turn of the century, contracts of employment became more formal, in line with the requirements of modern law. However, the basic content did not change, as shown by the numerous examples analysed by Ōishi Kaichirō.³³ Formally, the contract of employment was drafted as a bilateral agreement, based on the consent of the workers themselves. It also mentioned explicitly the duty of the employer to pay a salary to the worker. However, the precise amount of the salary continued to be left undetermined. It was calculated *ex post facto* "on the basis . . . of the results of the work." Practically, as we shall see, it was impossible to know the amount of the wage earned until the end of the work, owing to the existence of a peculiar piece-rate wage system (*tōkyū chingin sei*).

As for other aspects, the contract of employment remained virtually unchanged in substance. For example, the rationale of the contract continued to be the money advanced by the employer. The worker, moreover, was still prohibited from changing her employment during the period of validity of the contract, and in case of violation of one of its clauses she had to pay a heavy penalty. No mention was made of the possibility of breach of contract or the payment of penalties by the employer. There is, instead, enough evidence to show that the payment of penalties was actually demanded from workers or their families. For example, in October 1906, a judge in the Court of Ueda (Nagano Prefecture) upheld the plea of a silk-reeler regarding the payment of a penalty of 60 yen for breach of contract.³⁴

Only from the 1920s did the duties of the employer, to a certain extent, become more clearly indicated in employment contracts. This development reflected the emergence of unions (*jokō kyōkyū kumiai*) at the local level for the protection of female workers. However, the efforts of these unions, which were more often controlled by village officials and authorities than by the workers themselves, could not essentially change employer–employee relationships. Thus the workers continued to be practically bound to their employers by virtue of their debts.

The existence of this pre-modern employment relationship, together with the composition of the workforce, enables us to understand how the peculiar organization of labour and harsh working conditions could be introduced and maintained in Japanese silk filatures, as discussed below.

III. Labour Management

1. Working Conditions

Although working conditions could differ depending on the size of the enterprise, in the larger filatures set up after the middle of the 1880s they tended to be quite similar, as pointed out in many government reports. Apart from the case of small silk filatures located within the premises of the silk-reeler's household, the typical filature consisted of a central two-storied building housing the offices, the dormitories, a dining room, and other facilities for the workers; to this building were connected in rows, like the teeth of a comb, the mills for silk-reeling, re-reeling, cocoon-boiling, and so forth. Scattered around this central structure could be found the warehouses, the boiler plant and other buildings. The layout of the factory thus resembled that of a contemporary European silk filature. However, the fact that all the facilities for the workers' everyday lives were placed within the factory compound was distinctive of the Japanese filatures. All the factories were built of wood, in the local style. Private entrepreneurs could not afford costly structures of red brick like those of the Tomioka Silk Filature, which was built by the government. In general, the reeling departments were narrow, oblong buildings less than 7 metres wide, where the reeling machines were placed in rows on both sides facing the windows.³⁵

As a whole, the workplace was designed with very little attention to the needs of the workers. The reeling machines were very low and the girls operating them had to sit at an angle, with the lower half of their bodies twisted at 30 degrees, because there was no space for their legs under the machine.³⁶ According to various reports, the light inside the mills was insufficient because the buildings were close together. The problem of poor illumination was particularly acute in the evening hours. According to an official survey of 1920, out of 603 silk filatures in Nagano Prefecture, only 36 could provide each worker with more than 6 candle-power for illumination, although the officials estimated that at least 10 candle-power was necessary for the delicate task of silk-reeling.³⁷

The high degree of humidity in silk filatures was also detrimental to the health of the workers. Ishiwara Osamu, a sympathetic doctor who did a detailed study of the conditions of female textile workers, wrote: "In silk filatures, thick vapour always fills the place . . . It is quite strange that young girls who are not yet fully grown can maintain good health under such conditions."³⁸ In fact, tuberculosis and diseases of the digestive and reproductive organs were very common among female silk-reeling workers. Many also suffered from eye ailments, rheumatism and eczema, from having their hands constantly in hot water. Working conditions were particularly severe in the last month of the working season, when it could be extremely cold in the highlands of Suwa.

Shokkō jijō reports that at the turn of the century most of the silk filatures were not equipped with any heating system whatsoever. "In winter, female workers in silk filatures were usually affected with chilblains and frostbite, and in the afternoon the lower half of their legs became violet."³⁹

Only toward the end of the Meiji period (1911) was a simple heating system finally adopted, since (*sic*) "the high number of workers affected by frostbite influenced quite considerably the efficiency of operations."⁴⁰ The heating system consisted of small pipes placed at the girls' feet, through which flowed hot water or steam during working hours.

Accidents were also frequent, often due to the explosion of poorly built boilers. It thus appears that the low level of fixed capital investment—one of the major features of the industry's development—resulted in an extremely poor working environment. Moreover, efforts to economize on fixed capital investment kept labour productivity to a very low level, a condition that was offset by low wages, long working hours, and high work intensity.

As for working hours, in 1902 a silk-reeler from Suwa opposed to the Factory Law made the following statement in a local newspaper:

At present, we work 15 hours a day. In summer, from 4 a.m. to 7 p.m., and in winter, from 6 a.m. to 9 p.m. For meals we take just two or three minutes . . . [swallowing the food rather than eating it]. For us silk-reelers these working hours are necessary . . . For us every moment is precious. This idea of one hour and thirty minutes (the rest period indicated in the 1902 draft of the Factory Act) is really the cause of serious anxiety. At the longest, I wish it would be limited at most to about one minute after each meal.⁴¹

In general, at the beginning of the century working hours could vary from a minimum of 12 to 15 hours a day, as shown in table 1.7, which is based on the information provided by the silk-reelers themselves. Independent observers, however, report that in reality the upper limit was often exceeded.

According to Sano Zensaku, a pioneer of the study of commerce in Japan who visited the Suwa area in 1894, female workers in silk filatures worked on average 15 or 16 hours per day.⁴² *Shokko jijō* reports that the average

Table 1.7. Working Days and Working Hours (1900 survey)

| Silk filature | Working days per year | Daily working hours |
|----------------|--------------------------|------------------------|
| Tōyōkan | 210 | 15 |
| Ryūjōkan | 235 | 13 |
| Shinryōsha | 191 | 13 |
| Imaikan | 200 | 12 |
| Kyūseikan | 185 | 14 |
| Shin'eisha | 220 | 12 |
| Shichiyōseisha | 230 | 12 |

Source: *Seishi kankei shorui*, 8, *Hirano-mura yakuba*, Meiji 23–35 [Documents on Silk-reeling, 8, Hirano Village Hall, 1890–1902], document kept at the Municipal Museum of Sericulture in Okaya.

working hours in Suwa did not go below 15 hours per day, but in case of favourable market conditions “it often happened that working hours could be extended up to 18 hours a day.”⁴³

The enforcement of the Factory Act in 1916 limited the daily working hours for female workers and for young men under 15 years old to 12 hours, at least in the factories with 15 or more employees (Article 3). However, for certain sectors like silk-reeling, the law allowed for an extension of the working time by another two hours a day for a period of 15 years from its enforcement. Further, Article 8 stipulated that the factory owner could extend the working hours another hour for a certain period not exceeding 120 days a year, provided that he obtained beforehand the approval of the administrative authorities.

Thus the silk-reelers of Suwa could continue the practice of long working hours by skilfully exploiting all these exceptions. For example, it is reported that in 1917 in Nagano Prefecture, 598 factories (the highest number in Japan) applied for an extension of working hours.⁴⁴ A female worker employed in the same year in a silk filature of Okaya recalls that: “At that time the factory was worse than a jail. We used to reel from 5 a.m. until the evening. When we were late, until 8 or 9 p.m., we rested for about 10 minutes in the morning at 9 a.m. and in the afternoon at 3 p.m. Earlier, people used to work all day long even without that brief rest.”⁴⁵

Another characteristic of silk filatures in Suwa was the high intensity of work, referred to by many observers. Sano Zensaku, for example, wrote that, notwithstanding the long working hours, “everybody was working hard, and there was no sign of lassitude. Unwilling to waste a single moment, none of the workers sat down at ease for their meals. They rather gathered in a hurry into the factory, having barely finished eating.”⁴⁶

Another observer in 1917 describes the tension, the intensity of work in the silk filature owned by the silk-reelers of Suwa, as something “unparalleled.”⁴⁷

How was it possible that, despite the harsh working conditions we have just seen, workers could be so highly motivated and ready to sacrifice themselves for such miserable wages? In order to understand this point we shall examine in the following pages the peculiar wage system and the organization of labour, which, together with the general social conditions of the period, in our opinion determined the high intensity of the work.

2. Wage System and Control of Workers

(1) The *Tōkyū chingin sei*

The peculiar wage system in Japanese silk filatures of the pre-war period was one of wages by ranking (*tōkyū*).⁴⁸ As already mentioned, this system is based on piece-rate wages, but was peculiar because the wage of each worker was calculated by comparing the productivity of that worker with the "average productivity" of all the workers. As a consequence, it was possible that for the same performance a worker could receive an inferior wage if, in the meantime, the average performance had gone up. Besides, since the "average productivity" could not be known until the end of the working day, the system created an extremely competitive working environment and, as a consequence, the high intensity of work we have just mentioned. On the other hand, the silk-reelers themselves knew in advance the total

Table 1.8. Wage Differentials in Suwa Silk Filatures

| Daily wage in sen ($\frac{1}{100}$ yen) | Number of workers | | | | |
|---|-------------------|-----------------|-----------------|-------------------------|-----------------|
| | Yamajō, 1889 | Yamani, 1897 | Yamajō, 1899 | Yamajō, 1909 | Yamani, 1911 |
| 50 or more | | | | 1 (0.8) ^a | |
| 40-49 | | | 6 (6.8) | 14 (10.9) | 10 (13.7) |
| 30-39 | | 5 (3.8) | 10 (11.4) | 32 (25.0) | 20 (27.4) |
| 20-29 | | 49 (37.4) | 35 (39.8) | 53 (41.4) | 22 (30.2) |
| 15-19 | 8 (16.0) | 42 (32.1) | 25 (28.4) | 13 (10.2) | 14 (19.2) |
| 10-14 | 34 (68) | 30 (22.9) | 9 (10.2) | 12 (9.4) | 6 (8.2) |
| Less than 10 | 8 (16.0) | 5 (3.8) | 3 (3.4) | 3 (2.3) | 1 (1.4) |

a. Figures in parentheses are percentages.

Source: Ishii Kanji, *Nihon sanshigyōshi bunseki*, p. 304.

Table 1.9. Wages for Female Workers, 1894–1903 (in sen)

| Year | Silk-reeling | Cotton-spinning | Agricultural day labourers |
|------|--------------|-----------------|----------------------------|
| 1894 | 13 | 9 | 11 |
| 1895 | 13 | 10 | 11 |
| 1896 | 15 | 12 | 13 |
| 1897 | 18 | 14 | 16 |
| 1898 | 20 | 15 | 18 |
| 1899 | 22 | 17 | 17 |
| 1900 | 20 | 18 | 19 |
| 1901 | 20 | 19 | 20 |
| 1902 | 20 | 20 | 19 |
| 1903 | 20 | 21 | 19 |

Source: Sumiya Mikio et al., *Nihon shihonshugi to rōdō mondai* [Japanese Capitalism and the Labour Problem] (Tokyo Daigaku Shuppankai, 1967), p. 101.

amount of wages to be paid, since they usually fixed (*ex ante*) wages related to a certain placement in the final ranking without regard to the amount of work done.

In this sense, the wage system was perfectly tailored so as to foster a high intensity of labour, while keeping down its overall cost. Moreover, since the silk-reeling operation depended heavily on the individual skill of the worker, the system resulted in conspicuous wage differentials. As shown in table 1.8, at the end of the Meiji period a skilled worker could earn as much as four to five times more than an unskilled operator. Besides, the wage differential tended to grow during the period, since the system for computing wages was made more complex, in particular by the introduction of a system of fines based on qualitative standards (finess, shine, existence of knots, and so on.) from the second half of the 1880s.

In general, wages on average were very low, just above the level of female day-labourers in agriculture (table 1.9). The table also shows that, from 1903 onward, the average wage for female workers in silk-reeling was inferior to wages in cotton-spinning, a more highly mechanized sector which employed large numbers of female workers. Basically, wages and working conditions in silk-reeling were thus related to the conditions prevailing in the rural sector, as could be expected considering the composition of the workforce. On the other hand, the higher wages paid to a small percentage of the workers could serve as a decoy in hiring new workers, or as an incentive for raising the level of work efficiency.

(2) The Role of the Supervisor

Besides the peculiar wage system, a strict system of controls on worker activities, during and outside of working hours, contributed to maintaining the

high intensity of work in the filatures. In particular, the supervisor system—called the *kenban seido*—played a major role in ensuring the discipline of the workforce. According to the detailed, informative report on the *kenban seido* published in 1917 in *Shakai seisaku jihō*, in Suwa the supervisor (*kenban*) was a male employee who controlled the activities of a group of female workers (20 to 50 workers depending on the size of the factory).⁴⁹ Although in other regions, especially in the Kansai area, supervisors might be chosen among older female workers, in the silk filatures of Suwa this task was always assigned to male employees. Perhaps it was assumed that female supervisors could not maintain strict discipline under the harsher working conditions prevailing in Suwa.

The *kenban*, as already mentioned, was also in charge of recruiting each year the girls who were to work under his surveillance during the reeling season. Usually, as pointed out by Takizawa Hideki, the supervisor concentrated his efforts in a limited, specific area of the country.⁵⁰ This practice, besides economizing on hiring costs, had the advantage of reducing the risk of in-group conflicts and friction while stressing, on the other hand, competition among working groups from different regions. Moreover, it could be functional in maintaining work morale by preventing some girls from feeling isolated in the factory surroundings. It is interesting to note that the Japanese Imperial Army followed the same system of regional recruiting for its conscription system.

As for the supervisor's tasks, besides controlling the operations of the workforce under his surveillance, every morning the *kenban* read to the workers the production results achieved by each worker during the previous day. The report also mentions that every 15 days, when the production results of all the departments were compared, the supervisor received a red and white flag if his department had achieved outstanding results, or a black flag for poor results. The flag was paraded through the department either to keep up the workers' pride if they had been successful, or, if they had not, to encourage them to work harder in order to compete with their colleagues in other departments.

Since the wage and the promotion chances of the supervisor were directly related to the production results in his department, "the *kenban* were eager to use any methods whatsoever so as to improve work efficiency." This fact often led to the authoritarian, despotic use of their power that is often mentioned in the literature of the period.⁵¹

(3) The Dormitories

The system of dormitories for female workers was widespread in the Japanese textile industry, especially in Suwa's silk filatures. The system emerged partly because of the need to accommodate girls from distant districts. From the 1890s, moreover, they were relied upon to keep workers from leaving the factory before the expiration of their contracts, as well as to prevent their outright kidnapping by competitors.

Dormitories also made it possible to extend the supervision of workers beyond working hours, giving the factories control over their private lives as well. As a silk-reeler candidly declared in 1894: "Although the accommodation of female workers in dormitories requires a certain amount of expense, it makes possible full control of their conduct, from the time they wake, to the commencement of work, to the time they go to bed."⁵²

The "Dormitory Regulations" printed in 1904 by a major silk filature in Suwa help us to imagine how the workers were treated in these institutions.⁵³ First, the regulations prescribe that all the workers, without exception, are to live in the dormitory. They were forbidden from commuting from boarding houses or even from their own homes. Since a similar rule can be found in the regulations of other silk filatures (for example, in those of the Ozawa Group),⁵⁴ it is likely that it was a generally applied rule in the Suwa area. This practice only too clearly shows that the dormitory was not simply an institution for accommodating workers from distant areas, but also had a specific function related to the control of the workforce.

From the regulations we can also infer that a strict, almost military discipline was enforced in the dormitories. For example, older women controlled the discipline, "patrolling inside and outside the rooms, . . . constantly observing the behaviour of the workers. In case of misconduct by some of the workers, they report it immediately to the director and solicit punishment for the workers concerned."⁵⁵

Permission to leave the factory was also severely restricted. *Shokkō jijō* reports that female workers were generally forbidden to leave the factory grounds in the silk filatures of Suwa. Only in case of dire necessity could they leave, and then had to be accompanied by a supervisor or some kind of attendant.⁵⁶ Some factories kept a register of worker outings, in which was indicated not only the date and time of the outing, but also its destination and purpose.⁵⁷

Concerning hygienic standards for the dormitories, a wealth of information is provided by a survey of the Ministry of Agriculture and Commerce conducted in 1917 and covering 120 silk filatures in Nagano Prefecture.⁵⁸ Dormitories were wooden structures, usually with few and small windows so as to keep out the cold. In some cases, however, there were no windows at all. The dormitories were usually located on the second floor of the main building, just above the offices—in other words, directly under the control of the management. Usually they were partitioned into big rooms, one of which, in one case, was more than 190 square metres in size. The average space set aside for each worker, however, was less than one mat (generally less than two square metres), and in some cases, when two or more girls had to share bedding, even less than half a mat was available (table 1.10).

The wooden floor was usually covered in the Japanese style with *tatami* mats (thick straw matting), or, in some cases, with thinner straw mats (*waramushiro*). Bedding was placed on these mats, and often shared by two or even three girls at the same time. Of 50 large silk filatures surveyed, only

Table 1.10. Mat Area Available for Each Worker in Silk Filature Dormitories in Nagano Prefecture, 1917

| Number of mats | Number of silk filatures |
|----------------|--------------------------|
| Less than 0.5 | 7 |
| 0.51-0.6 | 12 |
| 0.61-0.7 | 23 |
| 0.71-0.8 | 23 |
| 0.81-0.9 | 22 |
| 0.91-1.0 | 13 |
| More than 1.0 | 16 |
| Total | 116 |

Source: Nōshōmushō [Ministry of Agriculture and Commerce], *Kōjō kantoku nenpō, Taishō 5 nen* [Annual of Factory Inspection, 1916] (1918), p. 101.

four provided a set of bedding for each worker. Needless to say, in these conditions it was impossible to get enough rest after long hours of work. The unhealthy life of the dormitories greatly contributed to the diffusion of infectious diseases, particularly tuberculosis, among the workers.

3. "Welfare" Facilities

We shall now consider the function and realities of so-called "welfare facilities" in Japanese silk filatures. Medical, educational, and recreational facilities, which have become a standard part of employee benefits today, were only introduced in the major silk filatures in Suwa toward the end of the Meiji period (1912). This development reflected the growth of the industry and, in particular, its consolidation after the turn of the century. It seems however, that their introduction, as in other industrial sectors, was related, in the first place, to the difficulties of acquiring a stable workforce.

As a matter of fact, from the second half of the 1880s female worker mobility in silk filatures was rising, notwithstanding the binding clauses of the employment contract, the strict control on worker activities, and even the introduction of the complex system of worker registration by the Association of Silk-reelers. Female workers, taking advantage of the competition among silk-reelers, increasingly refused to renew their contracts at the end of the reeling season, or simply escaped from the factory. In this way they made their protest against harsh working conditions.

The introduction of "welfare facilities" was probably conceived as a countermeasure against this form of worker resistance. They were designed first to make factory life more attractive, thereby increasing the chances of recruiting and keeping new workers. Second, as we shall see, they functioned to extend further the sphere of control over workers.

Medical care, although referred to as part of "welfare facilities" (*fukuri*

shisetsu), had little connection to the improvement of the "welfare" of workers. In the best of cases it was simply an attempt to provide a belated remedy for the damage caused by harsh working conditions. It is more likely, however, that the introduction of medical facilities was related to the need to prevent workers from leaving the factory.

In general, medical facilities were introduced from the early phases of the industry's development. An official report mentioned the existence of infirmaries in some Suwa filatures already in the 1890s.⁵⁹ Generally, however, they were no more than simply wooden barracks for recuperating patients. For example, at the Sanzensha, a large factory employing more than 800 workers, the infirmary built in 1894 was a small building of 60 square metres for the convalescence of up to 36 patients. According to the same report, some companies, including the Sanzensha, also paid for medicine and meals for the workers who suffered injuries due to occupational causes. In all other cases, only meals were provided.⁶⁰

Medical facilities and various forms of assistance became more widespread after the Russo-Japanese War (1904–1905). Then, in 1910, the silk-reelers of Suwa inaugurated their own hospital (Hirano Seishi Kyōdō Byōin).⁶¹ In the meantime, especially after the turn of the century, major silk filatures had begun to organize educational activities for their workers. A 1901 report points out that already at that time some of the largest factories organized lectures for female workers on a regular basis.⁶² In the silk filatures of the Katakura Group, "regular lectures were held from one to three times every month, and special lectures were also held from time to time . . . The lectures dealt with themes such as morals, housekeeping, hygiene, technology, and so on. These were given by Buddhist priests, teachers or members of the staff." In one factory, the Shinkōkan, even policemen were invited to give lectures to the workers.⁶³

Educational activities became more systematic toward the end of the Meiji period, probably as part of the national campaign for "popular education" (*tsūzoku kyōiku*) launched after the Russo-Japanese War. In 1911, at the Ozawa Group, "instructive, edifying lectures on education, morals, housekeeping, hygiene, and so on were given three or four times a month for a couple of hours after the end of work. Usually the lectures were given by the owner or the supervisors, although Protestant pastors, Buddhist priests, and specialists could also be invited."⁶⁴

We shall now examine in some detail a booklet, *Kōjōkun* [Ethics for Female Workers], which was published in 1910 and presumably used in the silk filatures of Suwa for ethics lectures.⁶⁵ According to *Okaya-shi shi* [History of the City of Okaya], this booklet was recommended by the trade association of Suwa silk-reelers. There are also records showing that Katakura and other major silk filatures ordered several copies of the booklet,⁶⁶ and it can be assumed to be a fairly typical example of an ordinary text used for the moral education of female workers.

The booklet is written in simple language easily understood by young

girls. All the ideographs have syllabary *kana* at the side to facilitate reading. The text emphasizes first the contribution and importance of silk exports for the economic and military development of Japan. Developing his own version of the official slogan *fukoku kyōhei* ("enrich the country and strengthen its arms"), the author sees the mission of female workers as identical to that of a soldier. To quote the author's words:

Japan has emerged with one bound as a first-class nation after the Sino-Japanese and the Russo-Japanese wars. However, no matter how high might be its position in the world, Japan cannot achieve the final victory only by relying on force. Together with (military) might, a country must possess wealth. . . . Each of you should work as hard as you can in order to increase the wealth of the nation. You should strive so that Japan will not be defeated by foreign nations.⁶⁷

By appealing to Japanese nationalism in this way, the author tries to implant in the workers' minds a high sense of responsibility and pride in their occupation. For the same reason, he also underlines the fact that the imperial family had always encouraged sericulture, and that the Empress was actually practising it in the Imperial Palace in Tokyo.

Further, the booklet emphasizes, together with the Confucian virtue of filial piety, the virtue of loyalty (*chūgi*) toward the master. The emphasis on filial piety, a deeply felt sentiment in Japan, might have been quite common in popular texts, but the emphasis on loyalty, regarded as the highest virtue of the warrior, was rather out of place in the context of the lives of young girls of the Meiji period. However, it is obvious that the usual importance given to loyalty reflected the author's tacit condemnation of worker mobility as anti-social. On this point the author writes:

Not only could the warriors of former days not serve two masters. . . . You, too, must be determined not to have two masters. . . . There are workers who move daily from filature to filature, selling themselves for a small gain, without showing any gratitude to their masters. These workers deserve to be called vagabonds. Once you choose a master, you should strive to serve him for all the years to come.⁶⁸

We can infer from the content of this booklet that lectures on morals in the filatures were regarded as a means of keeping workers docile and obedient. Of course, it is hard to believe that this kind of lecture could have a strong impact on the minds of the workers. After many hours of hard work, they could not have been that eager to listen. Besides, the hardships of their lives were certainly more real and impressive than the shallow rhetoric of these booklets.

The introduction of so-called "welfare facilities" looks like an attempt to strengthen the control of the workforce in face of growing resistance. On

the other hand, the reality of factory life continued to be dominated by long working hours, high work intensity, and almost limitless control over workers' lives—factors which, in our opinion, played a determining role in the industry's growth in pre-war Japan.

Notes

1. Mitsuya Tetsuya, *Seishi-gaku* [The Study of Silk-reeling], vol. 2, p. 5, as cited by Okumura Shōji, *Koban, kiito, watetsu* [Gold Coins, Raw Silk, Japanese Steel] (Iwanami Shoten, Tokyo, 1973), p. 108.
2. Sanshi Dōgyō Kumiai Chūōkai [Silk-reelers Industry Union Central Committee], *Kiito seisanhi ni kansuru kenkyū* [Study on Raw Silk Production Costs], in Okumura, *Koban, kiito, watetsu*, p. 108.
3. On the production process of raw silk in Japan, see Katō Sōichi, *Nihon seishi gijutsu-shi* [History of Silk-reeling Technology in Japan] (Seishi Gijutsushi Kenkyūkai, 1976), and Okumura, *Koban, kiito, watetsu*.
4. Okumura, *Koban, kiito, watetsu*, p. 81.
5. See *Shinao sanshigyo-shi* [History of the Silk Industry in Shinano], vol. 2 (1937).
6. Shibusawa Eiichi, *Shibusawa Eiichi denki shiryō* [Documents on the Life of Shibusawa Eiichi] (Shibusawa Eiichi Denki Kankōkai), vol. 2.
7. Cited in Katō, *Nihon seishi gijutsu-shi*, p. 89.
8. Nagaoka Shinkichi, *Sangyō kakumei* [The Industrial Revolution] (Kyōikusha Rekishi Shinsho, 1979), p. 102.
9. Okumura, *Koban, kiito, watetsu*, pp. 106–107.
10. Katō, *Nihon seishi gijutsu-shi*, p. 116.
11. Wada Hide, *Tomioka nikki* [Tomioka diary] (Chuō Kōronsha, 1978), pp. 21–22.
12. Katō, *Nihon seishi gijutsu-shi*, p. 116.
13. Hirano-son Yakuba [Hirano Town Hall], *Hiranoson-shi* [History of the Town of Hirano], vol. 2 (1932), p. 340.
14. Ishii Kanji, “Sangyō shihon (2): Kengyō” [Industrial Capital (2): The Silk Industry], in Oishi Kaichirō, ed., *Nihon sangyō kakumei no kenkyū* [Studies on the Industrial Revolution in Japan], vol. I (Tokyo Daigaku Shuppankai, Tokyo, 1975), p. 175.
15. *Tokyo asahi shimbun*, 6 January 1931. Cited in Yamada Moritaro, *Nihon shihonshugi bunseki* [Analyses of Japanese Capitalism] (Iwanami Shoten, Tokyo, 1934), p. 41.
16. Cited in Shinohara Akira, “Seishi kikai no rekishi—Meiji shoki made no hatten katei” [The History of Silk-reeling Machines: Development up to the Early Meiji period], *Journal of the Faculty of Textile Science and Technology, Shinshū University*, no. 74, ser. B, Engineering, no. 13, December 1978: 28–29.
17. *Ibid.*
18. Ishii Kanji, *Nihon sanshigyo-shi bunseki* [Analysis of the History of Japan's Silk Industry] (Tokyo Daigaku Shuppankai, Tokyo, 1972), p. 245.
19. *Ibid.*
20. See Minorikawa Naosaburō, *Minorikawa Naosaburō-Ō jiden* [Autobiography of Minorikawa Naosaburō] (Minorikawa Naosaburō-Ō Kankokai, Tokyo, 1933).
21. Nōshōmushō Nōmukyoku [Ministry of Agriculture and Commerce, Agricultural and Commerce Bureau], *Zenkoku seishi kōjō chōsahyō* [Survey of Silk-reeling Factories throughout Japan], no. 6 (1913), p. 171.

22. Nōshōmushō Shōkōkyoku [Ministry of Agriculture and Commerce, Commerce and Industry Bureau], *Shokkō jijō* [Conditions of Workers], vol. 1, 1903 (1976), p. 163.
23. See Andō Yoshio, ed., *Kindai Nihon keizaishi yōran* [A Survey of Japan's Modern Economic History] (Tokyo Daigaku Shuppankai, Tokyo, 1975), p. 98.
24. *Hiranoson-shi*, vol. 2, p. 157.
25. The decrease was particularly evident in Kami-ina district, probably reflecting the growth in this region of cooperatives of silk-reelers that were competing with Suwa's capitalist enterprises. On the development of cooperatives in Kami-ina, see Oshima Eiko, "Issen Kyūhyaku Nijūnendai ni okeru kumiai seishi chitai ni okeru nōgyō kōzō to tei-rishikin no igi" [Silk-reeling Cooperatives' Production of High-quality Silk in the 1920s: The Significance of Low-interest Funds and Agricultural Structure in the Silk-reeling Cooperatives' District of Kami-ina in Nagano Prefecture], *Rekishigaku kenkyū* (November 1980).
26. Ishii, *Nihon sanshigyō-shi bunseki*, p. 265.
27. *Ibid.*, and Nakamura Masanori, "Seishigyō no tenkai to jinushi-sei" [The Development of Silk-reeling and the Landlord System], *Shakai keizai shigaku*, vol. 32, nos. 5-6 (February 1967).
28. On this point see the diary of a landlord's administrator cited in Nakamura Masanori, "Seishigyō no tendai to jinushi-sei," p. 60.
29. The definition of "dekasegi-type" of workers, see Okochi Kazuo, *Reimeiki no Nihon rōdō undō* [Japanese Labour Movement in the Early Period] (Iwanami Shoten, Tokyo, 1953), pp. 4-10.
30. On factory dormitories see section 2(3). As for the system of worker registration introduced as a measure against job mobility, see Ishii, *Nihon sanshigyō shi bunseki*, pp. 277-290, and Tōjō Yukihiko, "Seishi Dōmei no joko toroku seido no hensen ni tsuite" [On Changes in the Registration System of Female Workers under the League of Silk Reelers], *Tochi seido shigaku*, No. 101 (October 1983). Questioning the result of previous research, Tōjō underlines the fact that the system was rather ineffective in reducing worker mobility.
31. Commerce and Industry Bureau, *Shokko jijō*, pp. 178-179.
32. The original document is in the Okaya Municipal Museum of Sericulture (Shirit-su Okaya Sanshi Hakubutsukan).
33. Oishi Kaichirō, "Kōjō keiyakusho no hensen kara mita seishigyō chinrōdō no keitai henka" [The Transformation of Wage Labourers in Silk-reeling Seen through the Change of Employment Contracts], *Shakai kagaku kenkyū*, vol. 24, no. 2 (1972): 87.
34. *Nagano kenshi, Kindai Shiryōhen, sanshigyō* [History of Nagano Prefecture, Documents on the Modern Period, Silk Industry], vol. 5 (3) (1980), pp. 874-875.
35. Maps, plans, and photographs of silk filatures are collected at the Okaya Municipal of Sericulture. On the structure of silk filatures around Suwa, see also *Hiranoson-shi*, vol. 2, p. 313, and Ministry of Agriculture and Commerce, *Kōjō kantoku nenpō, Taishō 5 nen* [Annual of Factory Inspection, 1916] (1918), p. 91.
36. *Ibid.*, p. 92.
37. Tokyo Chihō Shokugyō Shōkai Jimukyoku, *Kannai seishi kōjō chōsa* [Survey of Silk Filatures within the Jurisdiction of the Employment Office for the Tokyo Region] (1925), p. 180. See also Mitani Tetsu, "Naganoken seishigō ippan" [Outline of Silk-reeling in Nagano Prefecture], *Dai Nippon sanshi kaihō* [Reports on the Silk-reeling Industry of Japan], no. 149 (1904).
38. Ishiura Osamu, "Jokō to kekkaku" [Female Workers and Tuberculosis], in *Seikatsu kōten sōcho*, vol. 5, 1970, p. 179.

39. Commerce and Industry Bureau, *Shokkō jijō*, vol. 1, p. 189.
40. Ministry of Agriculture and Commerce, *Kōjō kantoku nenpō*, *Taisho 5 nen*, p. 91.
41. *Shinano mainichi shimbun*, 17–18 February 1902. Cited in Ishii, *Nihon sanshigyō shi bunseki*, pp. 363–64.
42. Sano Zensaku, Kobayashi Wakai, *Yamanashi-en Ichien, Nagano-ken Suwa/Ina shisatsu hōkokusho* [Report on a Survey of Yamanashi Prefecture and the Suwa and Ina districts of Nagano Prefecture] (1894) (Hitotsubashi University Library).
43. Commerce and Industry Bureau, *Shokkō jijō*, vol. 1, p. 174.
44. Ministry of Agriculture and Commerce, *Kōjō kantoku nenpō*, *Taisho 6 nen*, [Annual of Factory Inspection, 1917] (1919), p. 97.
45. Chiiki Shakai Kenkyūjo, Kōnenreishō Kenkyū Iinkai, *Kōnenrei o okiru, 14, Ken nōgyōka no otoshiyori-tachi Nagano-ken Suwa-shi kōnan no kurashi* [Living to Advanced Age (14), The Lives of Older Farming People of the Town of Suwa, Nagano Prefecture] (1981), p. 56.
46. Sano and Kobayashi, *Yamanashi-ken Ichien, Nagano-ken Suwa/Ina shisatsu hōkokusho*.
47. Fujii Tei, “Seishi jokō to suettingu shisutemu” [Female Workers in Silk-reeling and the Sweatshop System], *Shakai seisaku jijō*, no. 10 (June 1920): 21.
48. On the *Tōkyū chingin sei*, see Ōishi Kaichirō, “Nihon seishigyō chinrōdō no kōzōteki tokushitsu—Tōkyū chingin sei o chūshin toshite” [Structural Characteristics of Wage Labour in Japanese Silk-reeling: Centring on the Ranked Wage System], in Kawashima Takemi et al., *Kokumin keizai no shoruikei* [Aspects of the National Economy] (Iwanami Shoten, Tokyo, 1968), and Ishii, *Nihon sanshigyō-shi bunseki*.
49. Fujii Tei, “Seishi jokō to suettingu shisutemu.” Unless otherwise noted, our description of the *kenban seido* is based on this report.
50. Takizawa Hideki, *Nihon shihonshugi to sanshigyō* [Japanese Capitalism and the Silk Industry] (Mirai-sha, Tokyo, 1978), pp. 395–408.
51. See, for example, the revealing book of Sakura Takuji, *Seishijokō gyakutaishi* [The History of the Cruel Treatment of Female Workers in Silk-reeling] (Tokyo, 1927).
52. Sano and Kobayashi, *Yamanashi-ken Ichien, Nagano-ken Suwa/Ina shisatsu hōkokusho*.
53. *Nagano kenshi, Kindai Shiryōhen, sanshigyō*, vol. 5 (3), pp. 869–870.
54. Tokyo Kōtōshōgyō Gakkō [Tokyo Higher Commercial School], *Shokkō toriatsukai ni kansuru chōsa* [Survey on the Treatment of Workers] (1911), p. 89.
55. *Nagano kenshi, Kindai Shiryōhen, sanshigyō*, vol. 5 (3), pp. 869–870.
56. Commerce and Industry Bureau, *Shokkō jijō*, p. 203.
57. One of these registers, compiled in 1910, is now reprinted in *Nagano kenshi, Kindai Shiryōhen, sanshigyō*, vol. 5 (3), pp. 878–879.
58. Ministry of Agriculture and Commerce, *Kōjō kantoku nenpō*, *Taisho 5 nen*, pp. 91–131.
59. See Ministry of Agriculture and Commerce, Commerce and Industry Bureau, *Kakukōjō ni okeru shokkō kyūsai sono ta jikeūteki shisetsu ni kansuru chōsa gaigyō* [Summary of a Survey on Worker Relief and Other Assistance Facilities in Factories] (1903).
60. *Ibid.*, p. 37.
61. Ministry of Agriculture and Commerce, *Kōjō kantoku nenpō*, *Taisho 5 nen*, p. 124.
62. Commerce and Industry Bureau, *Kakukōjō ni okeru shokkō kyūsai sono ta*

- jikeiteki shisetsu ni kansuru chōsa gaiyō*, pp. 5–6.
63. *Ibid.*, pp. 17–18.
64. Tokyo Kōtōshōgyō Gakkō, *Shokkō toriatsukai ni kansuru chōsa*, pp. 15–16.
65. Katō Tomomasa, *Kōjō kun* [Precepts for Female Workers] (1910).
66. *Okayashi-shi* [History of the Town of Okaya], vol. 2, p. 590.
67. Katō Tomomasa, *Kōjō kun*, pp. 4–6.
68. *Ibid.*, pp. 22–23.