COAL MINING

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INTRODUCTION

THE theme of the original paper of this article is to clarify the modernization process of Japanese coal mining during the period when capitalism was being established in Japan. In other words, it is to reveal the concrete process by which the Japanese coal mining industry which could neither invent nor produce pertinent machinery of its own transferred coal mining machinery and its corresponding technology from advanced Western nations. This was then digested and ultimately transformed into a self-sufficient industry.

The following is a summary of the first three chapters with brief comments prepared for the convenience of those who would read only this excerpt which pertains to Chapter IV.

In the first chapter on the "Developmental Standard of Endogenous Coal Mining," the standard reached by the endogenous coal industry up to the period of Western technology transfer is described in view of the fact that the endogenous standard was a premise as well as the foundation of modern coal mining in Japan.

Endogenous coal mining in Japan germinated in the late seventeenth century and continued to develop until the 1880s, and thus established the foundation for the modern coal mining industry in Japan. Although endogenous coal mining which developed centering around the three prefectures of Yamaguchi, Fukuoka and Nagasaki had been negligible in scale up to the middle of the eighteenth century, there was a marked development at the end of the eighteenth century. The coal market expanded gradually at this time because coal which had been used quite commonly as a substitute fuel for firewood for home consumption had come to be used as fuel for manual production and in particular for salt manufacturing. Endogenous coal mining, therefore, began to be established as an industry for the purpose of commercial production at the end of the eighteenth

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century, and more advanced coal mining techniques than the primitive method emerged. The opening of the ports contributed not only to the extension of the coal market as a result of the supplying of coal to foreign steamships and steamships owned by the shogunate and the *han* governments, but also to the characterization of the coal market as a modern one due to its link to the world market.

Coal mine management could not develop in a capitalistic form in view of the exploitation on the part of the *han* governments controlling the coal mines. The management scale, however, was gradually enlarged and more advanced technology was accumulated. Having good quality coal and favorable topography, the Miike Coal Mine and the Takashima Coal Mine, in particular, grew into large-scale coal mines with the highest technological standard available among the endogenous coal mines. These coal mines produced an annual output of nearly thirty thousand tons and had several hundred miners. The miners who were employed by the endogenous coal industry in its germinal stage were mere peasants who were free of farm work. From the late eighteenth century, however, coal mining gradually became an independent industry, and professional miners together with specialized coal mine managers who were addressed as "mountain owner" (*yamamoto*) became the bearers of coal extraction technology of the endogenous coal industry. These bearers of endogenous technology were instrumental in bringing about the modernization of the coal industry after the Meiji Restoration.

The modernization of Japanese coal mining after the Meiji Restoration, namely the transfer and implantation of Western coal mining machinery and coal extraction technology was largely due not only to the effort of endogenous coal miners and managers, but also to the positive mining policies set forth by the Meiji government. These factors are examined in the second chapter on the "Development of Modern Japanese Coal Mining and Governmental Policies."

The following deserves attention concerning the modernization policies on mining pursued by the Meiji government. Firstly, the government employed foreign scholars and engineers, who were assigned to train modern mining bureaucrats immediately. Furthermore, the government modernized its bureaucratic system, established the modern mining act, nationalized mines, and thus took the initiative in the modernization of mines. Secondly, the government established the College of Technology in order to train the necessary modern government and civilian technical staff members. The graduates were given practical training at the state-run mines and competent ones were sent abroad for further studies. Consequently, the government was able to overcome its dependency upon foreign scholars and technology which had occurred in the initial stage of modernization. It thus became possible for the Japanese alone to operate self-sufficient mines and to give technical guidance and education on mining. Thirdly, the government permitted the diffusion of mining areas at the beginning so that endogenous coal mining would develop freely but this led to disorganized growth, random mining and the destruction of resources. In consequence, the government amalgamated diffused areas into large scale

mining districts and thus provided more favorable conditions to the management of modern coal mines by large capital.

These positive policies for the modernization of mining set forth by the Restoration government eliminated the danger of the colonization of coal mining and at the same time, they covered the weaknesses of private coal mining enterprises. In this manner they played a cardinal role in propelling the coal mining industry toward self-sufficiency and rapid modernization.

Nevertheless, the modernization of coal mining in Japan, the industrial development of which lagged far behind that of the advanced Western nations, was not easy. The process of modernization, moreover, was not at all simple. The third chapter on the "Modernization of Two Major Endogenous Coal Mines during the First Half of the Meiji Period" and the fourth chapter on the "Modernization Process of Coal Mining in the Chikuhō Region" analyze the process by which Western coal mining machinery and its corresponding mining methods were transferred and implanted, and clarify the problems which existed in the modernization process.

Although the modernization of Japanese coal mining had been attempted in Chikuhō and Hokkaidō until the 1870s, every attempt resulted either in total failure or brought about negligible results. On the other hand, it was symbolic that the two major endogenous coal mines, i.e., the Takashima Coal Mine and the Miike Coal Mine (both of which showed the highest standard of endogenous coal mining technology) were successful in their modernization.

The Takashima Coal Mine which had been under the control of the Saga *han* from the late Tokugawa period was already a large-scale coal mine with an annual output of approximately twenty thousand tons. It was subsequently developed in 1868 as the first Western-style coal mine in Japan under the joint management of the Saga *han* and a British merchant, T. Glover. The extent of modernization included the partial mechanization of both coal transport and water drainage the latter being powered by an imported steam engine bought by joint investment. A newly opened pit and the level of mechanization, however, were on a small-scale in comparison to the existing standard in the Western nations. The method of coal extraction was no more than a compromise between the modern and the endogenous technologies. Nevertheless, the fact that the difficulty of water drainage which had been the greatest obstacle in endogenous coal mining was somewhat overcome and that the system of coal extraction was partially mechanized stimulated the endogenous coal mining industry so greatly that there arose a strong desire for modernization.

The Miike Coal Mine at the end of the Tokugawa period consisted of two coal mines with again an annual output of approximately thirty thousand tons. After the Meiji Restoration, however, these two mines were nationalized in 1873 by the new government due to a dispute which existed between the two managers. The development toward modernization as a modern coal mine was initiated by the government in 1876. In the first half of the modernization process which in total took ten years, the Miike Coal Mine reached a similar level of modernization as that reached by the Takashima Coal Mine through the introduction of

foreign engineers and the mobilization of endogenous technology on the part of the Japanese coal miners. More modernized coal mines were realized in the second half of the modernization process. This was through the introduction of partially domestic machinery under the guidance of Japanese engineers who had already made much progress and due to the effort on the part of the transferred miners from initially modernized mines where they had acquired the necessary skills.

The modernization of these two mines brought about the accumulation of modern coal mine management techniques as well as Western coal extraction technology. It paved the way for the establishment of modernization in Japanese coal mining because it not only had a great impact upon the promotion of modernization in the Chikuhō region, but also prepared the necessary technical staff members required for the modernization process. The following is especially noteworthy concerning the modernization of these two mines. Firstly, modernization was realized not solely by foreign engineers and workers but by the cooperation of endogenous engineers together with the support given by rank-and-file endogenous miners under the guidance of foreign engineers. This also denotes that endogenous engineers and miners had acquired certain modern technology in the process of modernization. Secondly, the modernization of these two mines provided Japanese engineers (who were nurtured as a result of governmental policies on mining) with specific places for them to be active. They were able to enhance their accumulated technology under the guidance of foreign engineers. Moreover, the use of domestic machinery not only revealed the result of governmental policies on the promotion of industrial machinery but also strengthened the system for domestic production. Thirdly, although modernization concerned such a unique industry as coal mining, it did not aim at the immediate development of large-scale modern coal mines through the transfer of advanced foreign technology under the sole guidance of foreign engineers. On the contrary, it was a gradual process beginning with a relatively elementary standard of development. Japanese engineers mobilized in the process of modernization had acquired modern technology which enabled them to gain further technology of a higher level.

The fourth chapter on the "Modernization Process of Coal Mining in the Chikuhō Region" clarifies the development process of coal mining in this region which grew on the basis of modernization accomplished at these two mines.

I. THE DEVELOPMENT OF THE ENDOGENOUS COAL INDUSTRY SINCE THE MEIJI RESTORATION

The formation and expansion of the modern coal market since the Meiji Restoration brought about, on one hand, the modernization of the two major endogenous coal mines and, on the other, the development of the endogenous coal industry in the Hizen and Chikuhō regions.[1] The development of the endogenous coal

[1] Data concerning the development of endogenous coal mining in northern Kyūshū after the Meiji Restoration are primarily based upon [8], *Kōzan shiryō shirabe* [An examination

TABLE I

THE NUMBER OF COAL MINES IN NORTHERN KYŪSHŪ

Year	Chikuzen	Buzen	Hizen
1873	177	—	308
1877	315	—	550
1882	533	127	922

Sources: Data for 1873 are from [2, Vol. 2, Book 2, pp. 386–87] and from [3, bibliographical notes, p. 4]. The other data are from [14, pp. 142–44].
Note: The number of mines in Hizen for 1877 is based upon the number for 1878. Data for 1882 denote the number of mining districts.

TABLE II

THE NUMBER OF COAL MINES ACCORDING TO SIZE IN OGI COUNTY, HIZEN (1881)

Number of Miners	Number of Mines	%
Less than 5	11	42.8
6–10	7	
11–15	5	21.4
16–20	4	
21–30	5	21.4
31–50	4	
51–70	2	14.4
71–100	2	
101–150	1	
More than 151	1	
Total	42	100.0

Source: Data formulated from [8].

industry in northern Kyūshū since the Meiji Restoration was derived from the energy of the general public which was, for the first time, allowed to manage private coal mines.

The number of coal mines in Chikuzen which was only 177 grew to 315 in 1877 and to 533 in 1882. Moreover, there was far more active development in Hizen than in Chikuzen (Table I).

The endogenous coal mining industry, however, was small-scale and was based mainly upon the endogenous technology. Medium-sized coal mines with more than fifty miners were rare. For example, 42.8 per cent of the coal mines in Ogi County, Hizen in 1881 had less than ten miners. Only 14.4 per cent of the mines were operated by more than fifty miners. It is presumed that conditions were about the same in Chikuhō (Table II).

The annual output of coal in Chikuhō which was approximately 75,000 tons

on mining data] in [3]. Other information is based upon [14, Chap. 2] [15] [12, Chap. 2] [17].

TABLE III

TRANSITION OF COAL OUTPUT IN THE CHIKUHŌ REGION

(10,000 tons)

Year	Four Countries in Chikuhō	Year	Four Countries in Chikuhō
1877	7.5	1992	124.4
78	—	93	123.4
79	15.9	94	171.0
80	18.1	95	213.6
81	18.2	96	234.2
82	19.8	97	272.6
83	23.0	98	363.4
84	30.2	99	346.0
85	35.3	1900	401.7
86	30.9	01	485.5
87	41.3	02	493.0
88	55.6	03	505.6
89	67.5	04	538.7
90	79.4	05	580.4
91	92.8	06	644.5

Sources: Data formulated from [14] and other sources.
Note: Figures for the Miike Coal Mine are excluded.

in 1877 grew to 198,000 tons in 1882. It soared to 413,000 tons in 1887. The sharp increase in the 1880s was due to the rapid establishment of modernized coal mines (Table III).

The development of the endogenous coal industry in northern Kyūshū such as in Chikuhō contributed not only to the advancement of the endogenous coal mining technology but also to an accumulation of experienced and skilled coal miners. The necessary conditions for the modernization of the coal mines in this region were met. Furthermore, the backwardness of conventional technology was revealed in the interim, and modernization in Chikuhō became an obvious necessity.

II. THE MODERNIZATION OF THE ENDOGENOUS COAL MINING INDUSTRY

A. *Initial Attempts at Modernization in the Early Meiji Period*

The modernization of other coal mines during their developmental process was not as successful as in the case of the Takashima and Miike coal mines. Various attempts at modernization made by those coal mines shall be examined in this section in order to illustrate their problems.

After the modernization of the Takashima Coal Mine, an attempt was made at modernizing the Hokkaidō coal mines at the end of the Tokugawa era.[2] Due

[2] Regarding attempts to modernize coal mining in Hokkaidō refer to: M. Yano and two others, *Sekitan no kataru Nihon no kindai* [Modern Japan through coal mining] (Tokyo:

to the conclusion of the "Treaty of Kanagawa" in 1854, the Tokugawa government was made responsible for the supply of coal to American ships at Hakodate. The Tokugawa government subsequently opened the Shiranuka Coal Mine using conventional technology in 1856, but it was unsuccessful. A coal survey was carried out by an American mining engineer at Kayanuma in 1862. In 1864, the Kayanuma Coal Mine was excavated but the results were poor. An attempt at the modernization of the Kayanuma mine was made in 1866 by a British engineer who was employed for this purpose. In spite of this attempt the mine, in reality, was not any larger than the existing endogenous coal mines. Furthermore, the technological standard was conventional and there was not much mechanization. The mechanization level was no more than the installation of tracks inside and outside the mine and these were operated manually. It was not until the development of the state owned Horonai Coal Mine that the modernization of coal mining in Hokkaidō succeeded.

The reasons for the unsuccessful attempts at modernization in Hokkaidō are as follows. Firstly, because Hokkaidō was an underdeveloped area, an external economy necessary for the existence of the coal industry was lacking. It required a tremendous sum of money to develop facilities other than coal mines such as a coal transportation system. Secondly, there was no endogenous coal industry in either Hokkaidō or Tōhoku. In consequence, it was difficult enough to operate a conventional coal mine, let alone a modern one. The successful modernization of the Takashima and Miike coal mines was accomplished because they were based upon a solid endogenous coal mining industry. This fact is made more obvious when it is contrasted to the unsuccessful attempts which were made in Hokkaidō at the end of the Tokugawa period and during the early Meiji period.

The next attempt following Hokkaidō was made in the Ube region of the Chōshū *han*.[3] The coal bureau of the Chōshū *han* which had been troubled by the drainage system, invited an American in 1868. Although a drainage pump was introduced, it proved unsuccessful. Then in 1870, three coal miners were sent to the Takashima Coal Mine for two months to learn modern coal mining methods. The Chōshū authorities also invited Morris to conduct test boring and to install a steam-powered pump but these efforts were unsuccessful. It was, therefore, not until the 1880s that modernization in Ube was achieved. The reason why early modernization in Ube could not materialize is presumably because Ube coal which was inferior could not compete on the market, especially

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Soshiete-sha, 1978), and Kayanuma Coal Mining Co., Ltd., ed., *Kaikō hyakunen-shi* [A centennial history since the opening of the mine] (1956). See articles written by K. Katayama, "Taki-ishi monogatari" [Tales of coal], *Atarashii dōshi* [A new history of Hokkaidō], Vol. 1, No. 1 (December 1963), K. Katayama, "Kan-ei ni yoru Kayanuma tankō no kaihatsu" [The development of the state-run Kayanuma Coal Mine], *Atarashii dōshi,* Vol. 2, No. 1 (January 1969), T. Enomoto, "Hokkaidō Shiribeshi Iwanai-gun Kayanoma-mura sekitanyama torishirabe-sho" [A survey of the coal mine at Kayanoma village, Iwanai County, Shiribeshi Province, Hokkaido], *Atarashii dōshi,* Vol. 8, No. 2 (March 1970).

[3] Regarding the modernization attempts in Ube, see [4, p. 23].

when it was costly as a result of mechanization. Moreover, due to the extraction of coal from a deep bed, there was a severe water seepage problem. There could well have been a limit to what a small pump could manage.

Although it is recorded that Morris attempted modernization in Hizen, in the early Meiji period, the particulars are unknown.[4] However, there is a record which states that the Kishiyama Coal Mine in Higashi Matsuura County, Hizen which had been a promising mine since the latter half of the 1850s began mechanized drainage using a steam driven pump from about 1873 [8, p. 22]. This modernization, however, was no more than the addition of a steam driven pump to a conventional mine.

The initial attempt at modernization in Chikuhō was made in 1875 by Iwajirō Hayakawa, a wealthy farmer from Tagawa County who cooperated with Itsuta Katayama, a former mechanic of the Nagasaki Shipyard.[5] Although they tried to introduce a steam driven pump and a hoisting machine to the Itoda Coal Mine, the attempt was unsuccessful.

Another attempt was made by Tasuke Kaijima who had cooperated with the mechanization project of the Itoda Coal Mine. Although he purchased steam driven machinery in Nagasaki and began a test operation, it was a failure. An attempt to introduce a drainage pump to the Katsuki Coal Mine in Onga County, was made by Yoshikata Hoashi in 1880 which also was unsuccessful [12, pp. 59, 61].

All the initial attempts to mechanize the coal mines in Chikuhō were, thus, unsuccessful. The reasons for their failure are as follows. Firstly, there were no foreign engineers to give guidance and local knowledge pertaining to coal mine machinery was too limited to be applied to the operation of machines which had been purchased. Secondly, the managers lacked sufficient capital. In view of the fact that they could not afford coal mine machinery, they purchased small second-hand marine boilers and marine pumps which were of no use in coal mines.

The modernization of the coal mines in Chikuhō started in the 1880s.

B. *The Modernization Process of the Endogenous Coal Mining Industry*

During the period when Japanese capitalism was being established, the modernization of the coal industry in Chikuhō was carried out roughly in two

[4] For further information refer to [6, pp. 15, 74]. What is noteworthy concerning an attempt to modernize coal mining in Hizen is the railroad construction plan for the transport of Taku coal proposed by the mine manager, a descendant of a samurai and a coal merchant. This did not materialize because the government withheld a permit due to the fact that foreign capital was involved. For further information, see [6, p. 198]. A similar case arose when the manager of the Matsushima Coal Mine in Ōmura, Hizen attempted its modernization through the employment of an Englishman in 1874. This resulted in failure due to the government's disapproval. Coal machinery was bought up by the government. For further information, see [5, pp. 60–61].

[5] See [12, p. 58]. Concerning the analysis on the modernization process of coal mining in Chikuhō, refer to [14, Chaps. 2, 3] [17] [16], and A. Asai, *Nihon sekitan tokuhon* [A reader on Japanese coal mining] (Tokyo: Kokon-shoin, 1941).

TABLE IV

DISTRIBUTION OF LEASED AREAS BY SIZE IN CHIKUZEN

(Number of lessee)

Size (tsubo)	1883		1886	
Less than 500	152	(25.7)	114	(24.4)
501– 1,000	198	(33.5)	126	(27.0)
1,001– 2,000	139	(23.5)	115	(24.6)
2,001– 3,000	40	(6.7)	22	(4.7)
3,001– 5,000	30	(5.0)	23	(4.9)
5,001–10,000	15	(2.5)	10	(2.1)
10,001–20,000	7		33	(7.0)
20,001–30,000	2	(2.7)	9	(1.9)
More than 30,000	7		14	(3.0)
Total	590	(100.0)	466	(100.0)

Source: Data formulated from [1, pp. 10–11].
Note: Figures in parentheses are percentage. One tsubo is equivalent to 3.3 square meters.

steps. The first stage took place from about 1882 to about 1892. This was the stage when small-scale modernization was attempted primarily by the endogenous coal mine managers who neither had the capital nor the guidance of foreign engineers. The second stage was the period which started at the end of the 1880s when fairly large-scale modernization was introduced into the coal mines by big capital mainly affiliated with the *zaibatsu*.

Let us first examine the modernization process in the first stage. As it was already pointed out, the endogenous coal industry which developed from early Meiji in Chikuhō was limited to small-scale mines. In 1883, however, these small coal mine managers were taken over by more powerful ones due to the revision of the Japanese Coal Mining Act which stipulated a minimum lease area to be over ten thousand tsubo (1 tsubo=3.3 square meters) instead of the previous five hundred tsubo. In 1883, only thirty-one managers (5.2 per cent of the applicants) had lease areas of over ten thousand tsubo in Chikuhō. The number, however, grew to sixty-six (14 per cent) three years later. The initial period of coal mine modernization in Chikuhō was carried out, therefore, primarily by powerful endogenous coal mine managers (Table IV).

The first successful modernization of a coal mine in Chikuhō, which made this the third instance in Japan, was accomplished at the Shakanoo Coal Mine by Tokusaburō Sugiyama [12, p. 60]. He was a retainer of the Chōshū *han* and he had been sent to Nagasaki at the age of eighteen. He was chosen to study mechanical technology at the Nagasaki Iron Mill in 1856. Based upon the connection which he made with Hirobumi Itō after the Meiji Restoration, he was able to obtain a lease to manage the Yokohama Iron Mill. He returned the lease, however, when the operation proved to be unsuccessful. He then decided to take up the management of a coal mine using the compensation which he had received. In this manner, he began the management of a modern coal mine in 1880 with a lease area of seventy thousand tsubo at the Shakanoo Coal Mine.

A pit measuring forty-five meters in depth was excavated. A horizontal boiler of Cornish design, two new eight-inch special pumps and a hoisting machine were installed. Although the particulars pertaining to the modernization of the Shakanoo Coal Mine are unclear, it was probably no different to that of the Hokkei Pit at the Takashima Coal Mine. In this connection, the output of coal at the Shakanoo Coal Mine in 1890 was fifty thousand tons. In view of the fact that Sugiyama was well versed in mechanics, its mechanization was successful. Foreign engineers, however, were not mobilized for the excavation of the mine. He, therefore, had to depend entirely upon foremen (*tōryō*) from among the endogenous coal miners as he knew nothing about coal mine management or coal mining technology.

Consequently, the first mechanized coal mine in the Chikuhō region, although small, was opened and managed due to the collaboration between an ex-warrior who came with capital and mechanical knowledge from another *han* and the endogenous coal managers who possessed coal mining technology.

The establishment of the modern Shakanoo mine by Sugiyama had a great impact upon the endogenous coal industry in Chikuhō. Coal mines operating at about the same level as the Shakanoo Coal Mine began to be established in rapid succession. One who followed the example set by Sugiyama was Yoshikata Hoashi who came from Akō in Hyōgo [12, p. 61]. He became interested in the coal industry when he came to Chikuhō at the time of the Satsuma Rebellion. From that time on, he was engaged in the management of a coal mine. Despite his initial failure in mechanizing the mine, he continued to study technical books on his own. He then opened the Shinnyū Coal Mine in Kurate County in 1883, and made another attempt at modernization. A pit measuring thirty-nine meters in depth was excavated and it was equipped with two boilers, a thirty horsepower hoisting machine and a drainage pump.

Since he was not well versed in coal mine management and coal mining technology, he tried to modernize the mine by mobilizing foremen. It appears that Hoashi who had no particular knowledge of machinery invited mechanics from the advanced coal mines.

It is found that in 1885, the Hontō Coal Mine under Takasuke Konomi, and the Mineji Coal Mine under Masakazu Kurachi and Jirosaku Kurauchi were excavated and equipped with machinery. The same was done in 1886 at the Namazuta and Tadakuma coal mines by Takichi Asō, at the Ōnoura Coal Mine by Tasuke Kaijima and at the Uruuno Coal Mine by the Japan Coal Mine Company. Moreover, the Daijō Coal Mine was excavated and equipped with machinery by Keiichirō Yasukawa in 1887.[6]

Although the modernization level reached by the mines is not necessarily clear, based upon their coal output it is understood that they were small-scale. The mechanization was still limited to drainage and to the transport of coal from the bottom of the pit to its entrance. There was hardly any technical guidance

[6] Concerning the way in which endogenous coal miners actualized their attempts at the modernization of coal mines, refer to literature cited as well as to [1] [9].

TABLE V
COAL OUTPUT OF THE MAJOR COAL MINES IN CHIKUHŌ, 1880
(10,000 tons)

Name of Coal Mine	Owner	Output	Remark
Shinte Hontō	Takasuke Konomi	5.9711	
Daijō	Keiichirō Yasukawa and three others	5.0965	
Shakanoo	Matsutarō Sugiyama and one other	5.0728	
Ōtsuji	Seiichi Miyata	4.8346	The former Katsuki Pit owned by Hoashi
Shinnyū	Yanosuke Iwasaki	3.8129	Used to be called the Kurumi Pit
Namazuta	Yanosuke Iwasaki	3.4532	
Ōnoura	Tarō Kaijima	3.2677	
Tadakuma	Takichi Asō	2.5093	
Sugamuta	Shinjirō Katsuki	2.2646	Cooperated with Tasuke Kaijima
Aida	Hisomu Matsumoto	1.8879	The later Takao Pit
Itoda	Uzaemon Isono and two others	1.8393	The later Hōkoku Coal Mine
Kasamatsu	Takichi Asō	1.6590	
Mineji	Shigetoshi Kurachi	1.4687	
Igisu	Denroku Itō	1.4286	
Kama	Takichi Asō and Bunroku Arimatsu	1.3094	
Shōji	Yotsu Chikamatsu and four others	1.3690	
Ikumasa	Kaneo Iwami and one other	1.2290	
Hiyakifuruta	Masao Konomi	1.1645	

Sources: Data from a survey by Chikuhō-sekitan-kōgyō-kumiai and [1, p. 194].

TABLE VI
THE PERCENTAGE OF COAL MINES WITH MORE THAN 20,000 TONS IN CHIKUHŌ

Year	Number of Mines	Percentage
1890	9	49.2
1891	14	71.3
1892	15	78.6

Sources: Data formulated from [14, pp. 224, 240] [1, p. 194].

given by either foreign engineers or by modern Japanese mining engineers. Thus the methods of extraction were totally dependent upon conventional technology. Foremen and skilled miners, however, who had become well trained in Western coal mining methods at modern mines gradually began to spread this knowledge elsewhere (Table V).

In 1880, there were four coal mines with an output of about fifty thousand

tons and five coal mines with a capacity of twenty thousand to thirty thousand tons. The percentage of coal mines which had an output of over twenty thousand tons in the Chikuhō region in the same year was 49.2 per cent. It grew to 78.6 per cent in 1882 and this brought about the predominance of modern coal mines (Table VI).

III. THE MODERNIZATION OF THE COAL INDUSTRY BY BIG CAPITAL

The second stage of the modernization of the coal industry in the Chikuhō region took place over a period of about twenty years starting from the end of the 1880s. It was during this stage that modern coal mines were established by the penetration of *zaibatsu* capital into this coal region as well as by the emergence of powerful endogenous coal mine managers.

The modernization process by big capital can be divided into two stages which are demarcated by the Sino-Japanese War. The first instance of the modernization of the coal industry by big capital began in the decade which started at the end of the 1880s. This was undertaken by the Tagawa Coal Mining Company which established a joint operation using central capital and small local capital.[7]

Such Tokyo capitalists as Eiichi Shibusawa, Ryōsuke Fukushima, and Seiichi Taneda, and an Ōsaka capitalist by the name of Denzaburō Fujita wanted to venture into coal mining in the Chikuhō region. They established, together with influential managers in Fukuoka Prefecture, the Tagawa Coal Mining Company in 1889. The company which was founded with a capital of 650,000 yen obtained in December 1889 a large mining area of 2,510,000 tsubo in Tagawa County.

First of all, an inclined shaft with a measurement of 2.1 meters in height, 4.2 meters in width and 126 meters in length and a pit measuring 4.2 meters in length, 2.4 meters in width and 48 meters in depth were excavated. Seihō Asō who was a member of the second graduating class of the College of Technology, the Department of Mining, was appointed as the chief engineer of this company. He, thus, was in charge of the excavation of this mine. Due to excessive water seepage and the obstruction caused by the rock bed, the excavation project did not progress as it was originally planned. The executives were confronted with a difficult situation as the excavation budget of 480,000 yen was consumed prior to the completion of the project.

Executives such as Asō, therefore, felt so responsible for this bad state of affairs that they resigned. Osamu Ishida from the fourth graduating class of the College of Technology, the Department of Mining who was a staff member of the Fujita Company (Fujita gumi) was appointed to complete the task. Moreover, Tsunohei Tani who was an influential endogenous coal mining engineer at Tagawa was appointed as the foreman. They began excavation at a shallower coal bed than was originally planned and started the operation of a small-scale

[7] See [15, p. 882 ff.] for further information.

TABLE VII

COAL OUTPUT OF MITSUBISHI IN CHIKUHŌ

Year	Output (10,000 tons)	
	Namazuta Pit	Shinnyū Pit
1889	0.8	—
90	4.0	4.2
91	8.2	6.0
92	11.5	12.9
93	12.2	14.0
94	11.7	12.6
95	16.4	15.8
96	17.7	18.7
97	18.0	25.6
98	18.1	26.4
99	19.4	28.7
1900	18.7	28.5
01	20.7	34.0
02	19.9	34.6
03	21.5	40.0
04	22.4	44.0
05	22.2	42.7
06	20.6	37.5
07	24.7	44.3
08	27.6	43.3
09	27.4	39.9
10	33.5	42.4
11	38.9	39.8

Source: [10].

modern coal mine. In 1891, this coal mine produced 23,800 tons. This was increased to approximately 60,000 tons the following year and its scale as a modern coal mine was, therefore, rather small.

Mitsubishi which bought up the Takashima Coal Mine in 1881 had sufficient experience in the management of modern coal mining. Mitsubishi made advances into Chikuhō prior to Mitsui because Mitsubishi had lost a bid to Mitsui on the sale of the Miike Coal Mine.[8] Mitsubishi, thus, bought up both the Namazuta Coal Mine and the Shinnyū Coal Mine in 1889. These mines were gradually modernized and Mitsubishi ventured into the management of large-scale coal mines (Table VII).

The Namazuta Coal Mine was a small modern mine opened by Takichi Asō who was an endogenous coal mining manager. As soon as this mine was purchased, Mitsubishi transferred engineers and miners from its Takashima Coal Mine in order to bring about full scale modernization. The first measure taken was to improve the machines in the old pit and further mechanization was accomplished by the installation of an endless rope outside the pit. In 1891 the long wall extraction method which was a full scale coal extraction method was introduced. As a result of these improvements, coal production increased to

8 For further information, refer to [10] [16].

TABLE VIII

THE CONDITIONS OF MECHANIZATION AT THE NAMAZUTA COAL MINE, 1897

		The First Pit	The Second Pit	The Third Pit
Boiler	Two 7-*shaku* furnaces in diameter	1 unit	2 unit	1 unit
	Two 6-*shaku* furnaces in diameter	8	—	3
	One 5-*shaku* furnaces in diameter	2	—	—
Pump	18 inches	20	6	4
	12 inches	3	2	4
	10 inches	2	—	—
	8 inches	—	—	2
	6 inches	—	—	4
Hoist	18-inch double cylinder	1	—	1
	13-inch double cylinder	—	1	—
Fan	Gival-model 14-inch single cylinder	1	—	—
Grader	8-inch single cylinder	1	—	—

Source: Data formulated from [16, pp. 443–46].
Note: One *shaku* is equivalent to 30 centimeters.

87,000 tons and this became the biggest coal mine in the Chikuhō region. Two new pits were excavated in 1893. These pits were furnished with machines for drainage, coal transportation, and ventilation. The Namazuta Coal Mine, thus, became the largest modernized coal mine in the region. Its output was 115,000 tons in 1892 and this grew to 162,000 tons two years later. It was, thus, the largest and the most modernized model coal mine in the decade starting from the end of the 1880s in the Chikuhō region. The scale of mechanization was radically different from that of the small modern coal mines (Table VIII). The Shinnyū Coal Mine was also modernized to the same degree.

Noteworthy regarding the modernization of the coal industry in the Chikuhō region is the construction of railways for the transportation of coal [12, p. 75 ff.]. In spite of the development of the endogenous coal industry and the formation of modernized coal mines in the Chikuhō region, the transportation of coal was dependent upon conventional river boat transport along the Onga River. In view of the limited quantity which could be transported by river boat, however, riverboat and commission agents used this factor as a means to unjustly raise the transportation cost. Since this in turn caused the cost of coal to soar, the coal mine managers found themselves in a difficult position.

In order to overcome the above predicament, the managers attempted the construction of railways. Railway construction was started in June 1888 by interested parties from the five counties in Chikuhō. They established the Chikuhō Industrial Railway Company (Chikuhō-kōgyō-tetsudō-kaisha) with a capital of 750,000 yen and commenced railway construction. Due to insufficient local

TABLE IX

THE CONDITIONS OF THE MODERNIZATION OF CHIKUHŌ COAL TRANSPORT

(%)

Year	Railway	Waterway
1891	3.4	96.6
1892	16.2	83.8
1893	33.0	67.0
1894	49.0	51.0
1895	57.0	43.0
1896	64.1	35.9
1899	69.1	30.9
1903	82.2	17.8

Source: Data formulated from [14, pp. 227, 353].

capital, however, it became necessary to rely upon central capital. Mitsubishi which in 1890 had already become involved in modern coal mine management in this region, participated in the construction of a railway in order to modernize the transportation of coal. It eventually gained full control of the operation. Mitsubishi's involvement made it possible to complete the construction of a line between Wakamatsu and Nōgata in 1891. The line was then extended to Kaho and Tagawa counties in 1893. Furthermore, the Bushū Railway (Bushū-tetsudō) was founded in 1894, and it established a line in Tagawa County two years later. The solution to the problem of transportation in Chikuhō was thus found (Table IX).

The second stage of the modernization of the coal industry by big capital corresponds to the rapid development of Japanese capitalism after the Sino-Japanese War.

Following the example of Mitsubishi, others such as Sumitomo, Furukawa, and Mitsui ventured into the Chikuhō region.[9] Sumitomo which already managed the Besshi Copper Mine bought up the Tadakuma Coal Mine from Asō in 1894. Since its aim was for the management of a modern coal mine, it excavated two new pits in 1896 and 1900, respectively. Furukawa which managed the Ashio Copper Mine bought up and modernized the Shiogashira Coal Mine in 1896. In the same year, it purchased the Shakanoo Coal Mine from Sugiyama.

Mitsui's advance into Chikuhō lagged behind that of the others because it had had to spend the tremendous sum of 4,500,000 yen when it purchased the Miike Coal Mine. In 1896, however, it bought up the Yamano Coal Mine in Kaho County and similarly, it purchased the Tagawa Coal Mine in 1900. These purchases enabled Mitsui to become dominant in the Chikuhō region. Mitsubishi, meanwhile bought up the Hōjō Coal Mine in Tagawa and it also purchased a new coal mining area at Kamiyamada in Kaho County. Mitsubishi thereby became the second largest coal concern after Mitsui.

The characteristics of the modernization of the coal industry in Chikuhō by

[9] For further information, refer to sections pertaining to individual companies in [16].

TABLE X

COAL OUTPUT ACCORDING TO INDIVIDUAL ENTERPRISES, 1903

(10,000 tons)

Enterprise	Name of Mine	Output	Output by the Enterprise	Percentage in Chikuhō
Mitsubishi	Shinnyū	40.8	68.1	13.4
	Namazuta	22.9		
	Kami Yamada	4.4		
Mitsui	Mitsui-Tagawa	45.8	61.0	12.0
	Mitsui-Yamano	15.2		
Furukawa	Shiogashira	34.8	42.5	8.4
	Shakanoo			
	Shimo Yamada	7.7		
Sumitomo	Tadakuma	12.6	12.6	2.4
Kaijima	Ōnoura	36.4	62.5	12.3
	Ōtsuji	26.1		
Meiji	Meiji	45.4	60.4	11.9
	Akaike	15.0		
Asō	Yoshio	4.9	10.9	2.1
	Mameda	6.0		
Kōtarō Hiraoka	Hōkoku	18.7	68.5	13.5
The Mōri Family	Kanada	15.5		
Yoshitani Tankō K.K.	Yoshitani	14.9		
Kumekichi Iwasaki	Iwasaki	10.4		
Kyūshū Tankō K.K.	Shinte	5.5		
Tokujirō Nakano	Aida	3.5		
Total of the 20 coal mines			386.5	76.0
Total output in Chikuhō			505.6	100.0

Source: Data formulated from [13, Appendix Table].

zaibatsu capital are as follows. Firstly, those companies which ventured into the region had prior experience in either modern coal mines or mine management in general. They thus possessed modern miners and mining engineers. Secondly, their large capital allowed them to hire the necessary Japanese engineers with modern mining skills, something which the endogenous coal mine managers could not easily afford. Thirdly, full scale modernization by big capital was achieved because it bought up coal mines which had been partially modernized by the endogenous coal mine managers.

Although many of the endogenous coal mine managers were driven out of business during the launching period of *zaibatsu* capital, several of them became large coal mine managers through the establishment of modern coal mines. Among these were Keiichirō Yasukawa of Meiji Mining (Meiji-kōgyō), as well as Tasuke Kaijima and Takichi Asō. They were the forerunners of the modernization of endogenous coal mining from the 1880s to the early 1890s. The fact that they exhibited superior ability in management and in labor administration deserves special attention. The reason why they were driven out of business

except above three managers was because they did not have any affiliation with central capital.

The modernization of the coal industry in Chikuhō during the period of the establishment of Japanese capitalism was thus achieved with *zaibatsu* capital. The output of coal increased rapidly from the end of the Sino-Japanese War. While the output prior to the war in 1893 was 1,230,000 tons, it increased to 2,340,000 tons in 1896 and ten years later it reached 6,440,000 tons.

As of 1903, the output of individual coal mines reveals that large coal mines with an annual production of over three hundred thousand tons were the Shinnyū Coal Mine, the Mitsui-Tagawa Coal Mine, the Shiogashira Coal Mine, the Shakanoo Coal Mine, the Ōnoura Coal Mine and the Meiji Coal Mine. These coal mines, in reality, comprised several coal mines which produced approximately one hundred thousand tons. It was the objective during the late Meiji and early Taisho periods to introduce large-scale coal mining based upon technical innovation such as the application of electricity to coal mines and the excavation of large pits (Table X).

IV. THE ROLE OF THE FOREMAN SYSTEM DURING THE MODERNIZATION PROCESS IN CHIKUHŌ

A. *The Concept and General Function of the Foreman System (Tōryō-sei)*

It has been repeatedly stated that the endogenous coal mining industry played a cardinal role in the modernization of the coal industry in Japan. In the case of modernization in Chikuhō, a group of miners called *tōryō* ("foreman") played an especially important role. They were the organizers and the bearers of the endogenous technology.[10] This section analyzes the actual circumstances of the foremen and examines their role in the modernization of the coal mining industry.[11]

The foreman system was already formed at the beginning of the nineteenth century. At the time of the Meiji Restoration, however, during the developmental process of both the endogenous coal mining industry and modern coal mining,

[10] There have been various interpretations of the foreman system. The literature which contains the most representative interpretations shall be cited here as there is no room to discuss this subject in detail. These are S. Ōyama, *Kōgyō rōdō to oyakata seido* [Mining labor and the foreman system] (Tokyo: Yūhikaku, 1964), M. Sumiya, "Naya seido no seiritsu to hōkai" [The establishment and the breakdown of the bunkhouse system] in his *Nihon chingin rōdō no shiteki kenkyū* [Historical research on Japanese wage labor] (Tokyo: Ochanomizu-shobō, 1976), and [11].

[11] The most interesting data on the foreman system from O. Kodama [7]. Kodama, the author, appears to be one of the foremen himself and understands the problems of foremen well. He was acting as a secretary of the foremen association which was established around 1887. He recorded brief backgrounds of approximately 120 foremen and clarified their actual conditions. Although there is a slight tendency for him to glorify the foremen, his approach is predominantly based upon a claimed and collected analysis. The description in this chapter owes much to this work.

the foreman developed into an independent category of its own. The foreman system, at least since the Meiji Restoration, was based upon a contract between the manager of a coal mine and those who were skilled in coal mining technology. They were contracted to carry out coal extraction and to oversee labor management. Some undertook these tasks instead of the coal mine managers.

The foreman system can be broadly divided into two major types. The first type was the system where a hired foreman was contracted to be in full charge of the entire coal mining operation. The foreman was paid a proportionate sum of money in relation to the amount of coal extracted. Although there were cases whereby the foreman was also an investor, he was solely in charge of the coal mining operation. In lieu of the coal mine manager, he conducted the operation by hiring pitmen to work for him. The pitmen were controlled and supplied under a special labor system called the "bunkhouse system" (*naya-seido*). This type of foremen was necessary in view of the fact that coal mine managers were not experienced and they, therefore, needed a foreman to run the entire operation. This type of foreman system existed from early Meiji to the 1890s, at the time of the development of the endogenous coal industry as well as during the formation of modern coal mines. This type is often called the "chief foreman system" (*dai-tōryō-sei*).

The second type which developed after the dissolution of the first type was a system whereby a foreman was contracted specifically to be responsible for labor management. This type was functional when the manager was either experienced in management and technology or capable of directly employing competent staffers for the operation. The foreman's task, thus, was limited to labor management. This type of foreman existed mainly from the 1880s, and was called the "bunkhouse foreman system" (*naya-tōryō-sei*).[12]

When the managers did not yet have sufficient management ability, the foremen were solely in charge of the coal mines. Consequently, they had to have, first of all, a command of conventional coal mining technology. Moreover, they were excellent labor administrators who could control and give the pitmen technological instruction. However, there were often gamblers and gangster-like villains among them, and it cannot be negated that foremen as a whole tended to be of this nature. Such a tendency, nevertheless, is not within the fundamental nature of the foreman system. To equate them, therefore, with gambler bosses and gangsters as a whole cannot be said to be a correct interpretation.[13]

[12] Kodama's *Tōryō-den* shares a similar view. The author's view expressed in [11] which identifies the foreman system with the bunkhouse system namely, the first type being the early bunkhouse system and the second type being the late bunkhouse system, thus, seems feasible empirically.

[13] Typical of such a viewpoint was that expressed by Y. Yoshimoto who criticized the violence on the part of bunkhouse foremen at the Takashima Coal Mine under Mitsubishi's management in his article "Takashima tankō kōfu gyakugū no jikkyō" [Conditions of maltreatment faced by coal miners at the Takashima Coal Mine], in *Meiji bunka zenshū* [A complete collection of Meiji culture], Vol. 6 (Tokyo: Nihon-hyōronsha, 1929). As a result of his article, his viewpoint that the bunkhouse foremen were the same category of people as gang bosses and gamblers became prevalent.

TABLE XI

YEARS OF EXPERIENCE AS A MINER PRIOR TO BECOMING A FOREMAN

The Year Appointed as Foreman	Years of Experience						Total
	1–5	6–10	11–15	16–20	21–25	26–30	
1868–72	2	2					4
1873–77		5	1				6
1878–82	2	3	1				6
1883–87	1	3	1	1			6
1888–92	2	6	2	2	1	1	14
1893–97	1	4	12	2	1		24
1898–1902			5				5
Total	8	27	22	5	2	1	65

Source: Data formulated from [7].

Table XI reveals the number of years that foremen described in *Chikuhō kōgyō tōryō den* [7] worked in coal mines prior to becoming foremen. This table shows that they worked in coal mines as pitmen for an extremely long time, where they learned and mastered coal mining technology of a high level. In particular, it is also revealed that a longer period was required to qualify for foremen status since the establishment of modern coal mines (Table XI).

There were various types of foremen such as those who aimed at becoming entrepreneurs, those who took pride in their skills and functioned as conventional foremen, and those who became gallant bosses through gambling and fighting, thus placing them in charge of labor management. The type which played a significant role in the modernization of coal mines in Chikuhō was only limited to those who had superior technology.

It is also necessary to pay attention to that aspect of labor management which was pursued by the foreman system on a contractual basis. A foreman was contracted to take full responsibility of labor management which involved recruitment and supervision of labor as well as the supervision of the living conditions of the pitmen through the management of a bunkhouse. Although such tasks are often grasped as part of the function of the bunkhouse system, the foremen who fell into the first type were contracted to take charge of coal mining as well as labor management. The foremen of the second type were only responsible for the latter task. The formation of the labor market for coal mining was not yet sufficiently developed during the period when Japanese capitalism was being established. It thus cannot be said that miners were predominantly controlled by capitalists. Coal mine managers were not well experienced in the management of labor. At this stage, therefore, the substitution of labor management by foremen had a significant role. The bunkhouse system was functional especially as a unique place for the technical education as well as for the recruitment of miners.[14] As far as labor management was concerned, the modern coal mines were also greatly dependent upon the bunkhouse system.

[14] For further information pertaining to the analysis on the historical development of the foremen in the bunkhouse system, refer to [11, Section 1].

B. *The Positive Role of Foremen in the Modernization of Coal Mines*

The fact that foremen played a significant role in the modernization of coal mines is, for example, epitomized in the case of the Shakanoo Coal Mine. Although the coal mine owner, Tokusaburō Sugiyama was an experienced engineer, he was a complete amateur when it came to the management of a coal mine. In order to be a modern coal mine owner, therefore, he hired foremen to run the coal mining operation.

One of the foremen whom Sugiyama hired when he was planning to excavate a modern coal mine was Toshikichi Iida [7, p. 40]. Iida was born in 1837 at Gotoku, Kurate County. He began working at a coal mine from about the age of ten and he worked at various coal mines in different areas. After becoming a foreman at age nineteen, he moved to Hizen where he learned the endogenous technology as he moved from one mine to another. He was about fifty-four years old when he was hired by Sugiyama. He was, thus, a veteran chief foreman with a coal mining experience of over forty years.

When he was hired, his payment was based upon "a-pound-measure-full of twenty *sen* coins per ten thousand *kin* of coal, and the income from the bunkhouse." He was, thus, hired under very good terms receiving "ten yen a day" (about three hundred yen a month). The degree of his expertise in coal mining is clearly revealed by the following facts. When he resigned from the Shakanoo Coal Mine one and a half years later, he was employed as a "practical sub-engineer for a survey of coal reserves which was conducted by the Imperial Navy" in the Chikuhō region. Subsequently, he was hired as a chief foreman for the modern Hontō Coal Mine by Takasuke Konomi, and as a bunkhouse foreman at Mitsubishi's Shinnyū Coal Mine.

Three other foremen were hired by Sugiyama of whom Yaichi Uryū is noteworthy [7, p. 125]. He was born in Kama County and in his boyhood he learned how to write from a temple priest. He, thus, was one of the few educated foremen who could read and write.[15] In 1869 when he was sixteen years old, he went as a migrant laborer to work at a coal mine in Karatsu. He became a large bunkhouse foreman at a coal mine in Sasebo at the age of twenty. Then he worked for one and a half years at the Takashima Coal Mine, and as a bunkhouse foreman at various coal mines in the Hizen region. He returned home ten years later and was invited to act as a chief foreman by Sugiyama.

His competence lies in the fact that he solidified the pit of the Shakanoo Coal Mine "by creating coal pillars (*seritate*) which rose precipitously in order to compete against large-scale coal mines." This was accomplished despite strong opposition from the previously mentioned chief foreman, Toshikichi Iida. Uryū, thus, introduced the modern pillar method of coal extraction which he had obviously acquired when he worked for the Takashima Coal Mine. Thus, it

[15] Uryū tried to organize a foremen's association while he was working as a foreman at the Shakanoo Coal Mine [7, p. 125].

can be seen that the first modern coal mine in Chikuhō was founded and maintained by endogenous miners who had studied modern coal mining methods at advanced coal mines. Uryū resigned from the Shakanoo Coal Mine after working there for four years. He subsequently cooperated with Yoshikata Hoashi in the modernization of the Uruuno Coal Mine.

Competent foremen contributed to the establishment of other modern coal mines. For example, Tsunosuke Tani who was invited to excavate a new pit at the Tagawa Coal Mine was a capable foreman [23, p. 118]. He was asked to take charge of the excavation when the guidance which was given by a modern mining engineer resulted in failure. He was born in Tagawa and began working at a coal mine from the age of thirteen. He was forty-two years old when he was employed by the Tagawa Coal Mine. It was said of him that "as far as the methods of extraction and the management ability of labor are concerned, he is such a veteran that he can be compared to none," and "he has trained and produced as many as forty-seven or forty-eight honorable foremen to follow him." He was a great foreman with a coal mining experience which ranged nearly thirty years.

What should be remembered here, as it was previously stated, is the fact that the foremen who acquired modern coal mining technology while working at the Takashima and Miike Coal Mines later contributed to the establishment and maintenance of the modern coal mines in Chikuhō. Among the 120 foremen described in *Chikuhō-kōgyō tōryō-den,* there were as many as 20 (14 at the Takashima Coal Mine) who had worked either at the modern Takashima or Miike coal mines.[16] Many of them cooperated in the modernization of the coal mines in Chikuhō.

Rikuhei Matsuoka, for example, who was born in 1852 in Tagawa became a pitman at the age of nineteen when the fortunes of his family declined [7, p. 119]. He exhibited his unique talent during the Satsuma Rebellion, and was chosen to become a telegraph operator. After spending some years in the underworld, he became the large bunkhouse foreman at a large coal mine in the Hizen region. He returned home after working for the Takashima Coal Mine and he became a foreman for Kōtarō Hiraoka's coal mine in the Chikuhō region. He contributed to the modernization of the Akaike Coal Mine in 1891.

As described above, capable foremen aided in the modernization of the coal mines in Chikuhō. They continued to do so together with modern mining engineers even after modernization by big capital started. For example, Hachiemon Abe was hired by Asō to work for the modernization of the Namazuta Coal Mine [7, p. 98]. He was a veteran foreman who was born at Namazuta in 1839. He was invited to work as a chief foreman even after the Namazuta Coal Mine was bought up by Mitsubishi, and he contributed to its modernization.

[16] Their names are Katsuzō Iwanaga, Jūgorō Handa, Mantarō Mine, Denzō Shibata, Yaichi Uryū, Ichimatsu Murakami, Chōkichi Tanaka, Wasuke Tamazumi, Daikichi Tsuruta, Ichijirō Uchida, Yoichi Yamada, Naoichi Shinohara, Rikuhei Matsuoka, Seiichi Shibata (at the Takashima Coal Mine), and Shigegorō Handa, Hikoichi Ōyabu, Kunitarō Shinohara, Kametarō Nakamura (at the Miike Coal Mine).

The management of the coal mines by big capital, however, no longer needed to depend upon the technology of conventional foremen, once big capital gained sufficient experience and acquired its own modern mining engineers. There was definitely a limitation as to what the endogenous technology could offer when it came to the establishment of full-scale modern mines. In addition, the boss-gang system which was inherent in the foreman system, the violent control of the pitmen and the irrational aspects pertaining to the bunkhouse system placed fetters upon the modern management of coal mines. In consequence, the foreman system which had played a certain positive role in the modernization of the coal mines began to be eliminated by big capital from about the 1900s. Many of the foremen were absorbed as middle and low ranking staffers by the coal capital, and their historical mission was completed.[17]

POSTSCRIPT

The modernization process of coal mining in the Chikuhō region thus reveals how the transfer and implantation of Western technology took root in Japanese soil. Namely, the initial attempts on modernization from the early Meiji period by some endogenous miners in the Chikuhō region failed due to a lack of capital and technology. On the other hand, due to the development of modernization at the Takashima and Miike coal mines from the 1880s onward, influential miners were able to mobilize competent miners with their accumulated technology so that coal mines could be modernized even if only at an elementary level.

Full-scale modernization of coal mining from the 1890s was carried out in the Chikuhō region owing to large capital mainly of the *zaibatsu*. These big capitalists were already experienced in the development of modern mines, namely Mitsubishi at the Takashima Coal Mine, Mitsui at the Miike Coal Mine, and Sumitomo and Furukawa at the metal mines. It was they who carried out the full-scale development of modern coal mines through the mobilization of modern engineers, endogenous engineers and skilled miners.

Although initial modernization was dependent upon foreign engineers and machinery, the government's policies aimed at self-sufficient management which led to the transfer of technology whose standard was relatively low. Even though the path zig-zagged, somewhat rapid modernization was actualized as the gradual introduction of technology gave enough time for the endogenous engineers to accept and digest modern technology, which resulted in the transfer of more advanced technology. Moreover, endogenous coal miners and their technology which were often underestimated as being pre-modern as well as the pre-modern labor system played a certain positive role in the promotion of modernization. They were, however, eliminated upon the completion of their role during the implantation process of modern technology.

In the historical analyses on modernization in Japan, there had been a tendency

[17] Concerning the actual cases on the abolishment of the bunkhouse system, see [11] [9, p. 46].

to simplify the process of Western technological transfer and implantation and to overlook the historical role played by what was pre-modern and non-Western. Multifarious problems contained in the historical process of modernization experienced by Japan appear to have relevance for the developing nations at the present.

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